US007298851B1

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Hendricks et al.

(10) **Patent No.:** **US 7,298,851 B1**
(45) **Date of Patent:** ***Nov. 20, 2007**

(54) **ELECTRONIC BOOK SECURITY AND COPYRIGHT PROTECTION SYSTEM**

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(73) Assignee: **Discovery Communications, Inc.**, Bethesda, MD (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **09/400,296**

(22) Filed: **Sep. 21, 1999**

Related U.S. Application Data

(63) Continuation-in-part of application No. 09/191,520, filed on Nov. 13, 1998, and a continuation-in-part of application No. 08/906,469, filed on Aug. 5, 1997, now Pat. No. 6,408,437, and a continuation-in-part of application No. 08/336,247, filed on Nov. 7, 1994, now Pat. No. 5,986,690, and a continuation-in-part of application No. 08/160,194, filed on Dec. 2, 1993, now Pat. No. 5,990,927, and a continuation-in-part of application No. 07/991,074, filed on Dec. 9, 1992.

(51) **Int. Cl.**
H04L 9/00 (2006.01)

(52) **U.S. Cl.** **380/282**; 380/277; 380/278; 380/279; 713/156; 713/164; 713/165; 713/167; 713/168; 726/21; 726/26; 726/27

(58) **Field of Classification Search** 380/277–279, 380/282; 713/156, 200, 164, 165, 167, 168; 726/21, 26–27
See application file for complete search history.

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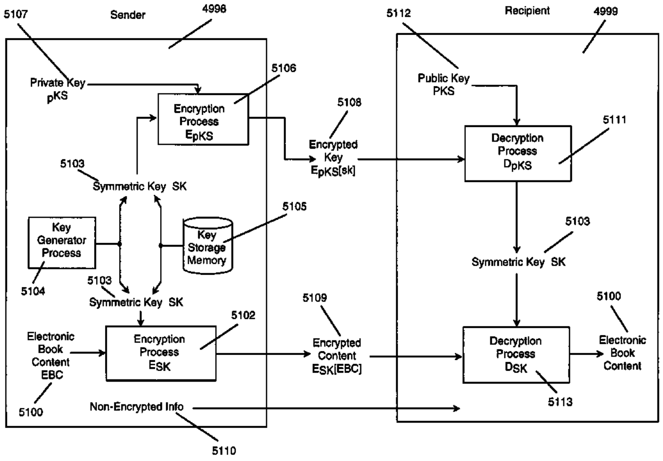
(Continued)

Primary Examiner—Kim Vu
Assistant Examiner—Beemnet W Dada
(74) *Attorney, Agent, or Firm*—Arent Fox LLP

(57) **ABSTRACT**

The invention, electronic book security and copyright protection system, provides for secure distribution of electronic text and graphics to subscribers and secure storage. The method may be executed at a content provider's site, at an operations center, over a video distribution system or over a variety of alternative distribution systems, at a home subsystem, and at a billing and collection system. The content provider or operations center and/or other distribution points perform the functions of manipulation and secure storage of text data, security encryption and coding of text, cataloging of books, message center, and secure delivery functions. The home subsystem connects to a secure video distribution system or variety of alternative secure distribution systems, generates menus and stores text, and transacts through communicating mechanisms. A portable book-shaped viewer is used for secure viewing of the text. A billing system performs the transaction, management, authorization, collection and payments utilizing the telephone system or a variety of alternative communication systems using secure techniques.

171 Claims, 55 Drawing Sheets



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WO	WO 97/22104	6/1997
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WO	WO 97/22107	6/1997
WO	WO 97/22108	6/1997
WO	WO 97/22109	6/1997
WO	WO 97/22110	6/1997
WO	WO 97/22111	6/1997
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Goldberg, M.W. et al., “World Wide Web-Course tool: An environment for building WWW-based courses”, Computer Networks and ISDN Systems, NL, North Holland Publishing, Amsterdam, vol. 28, No. 11, May 1, 1996, pp. 1219-1231, XP004018222, ISSN: 0169-7552.

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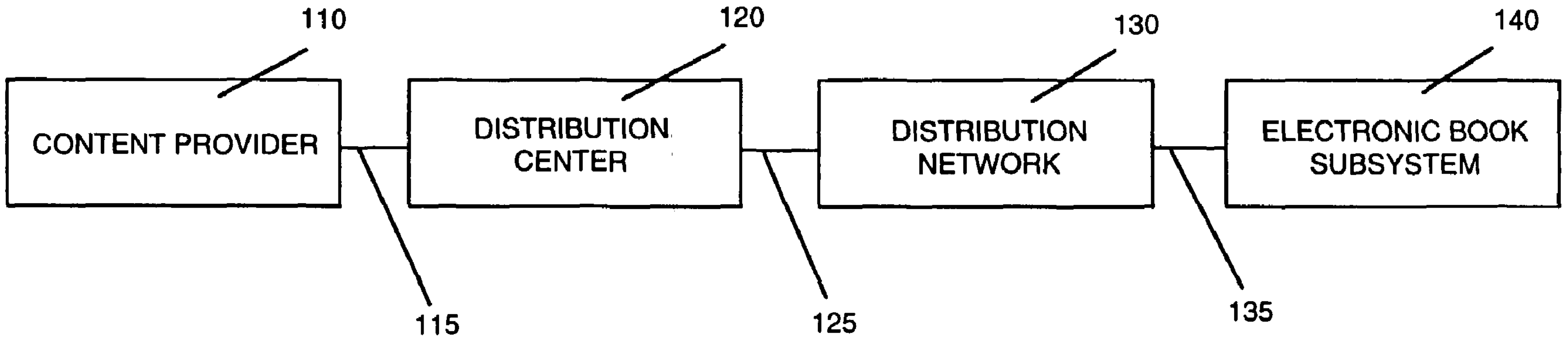

110
120
130
140
CONTENT PROVIDER
DISTRIBUTION CENTER
DISTRIBUTION NETWORK
ELECTRONIC BOOK SUBSYSTEM
115
125
135

Fig. 1a

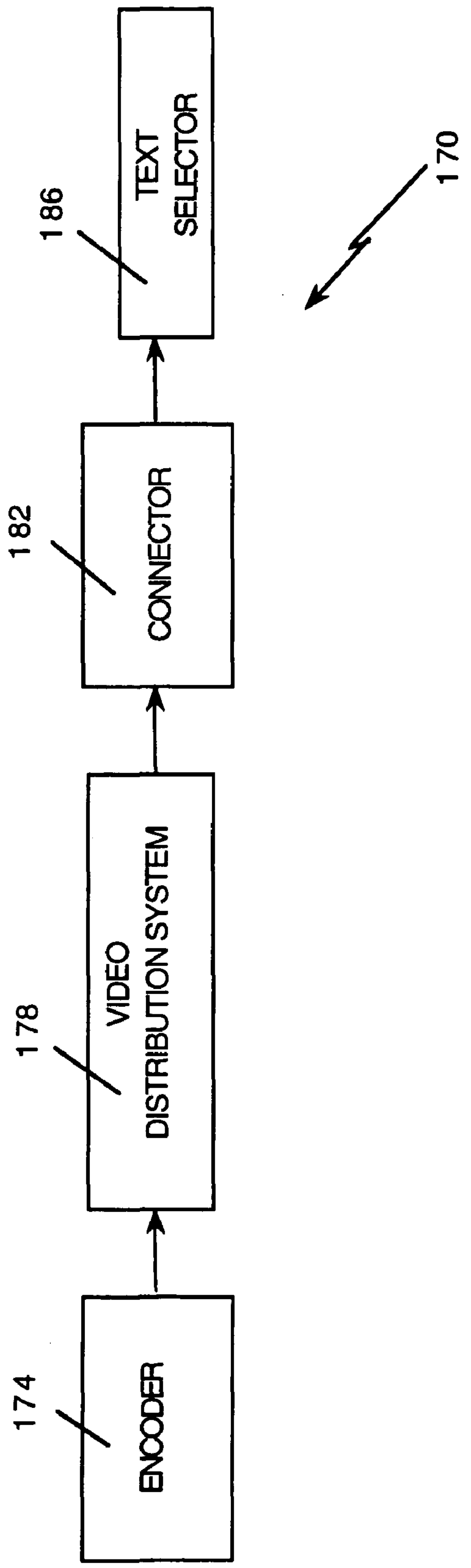

170
174
ENCODER
178
VIDEO DISTRIBUTION SYSTEM
182
CONNECTOR
186
TEXT SELECTOR

Fig. 1b

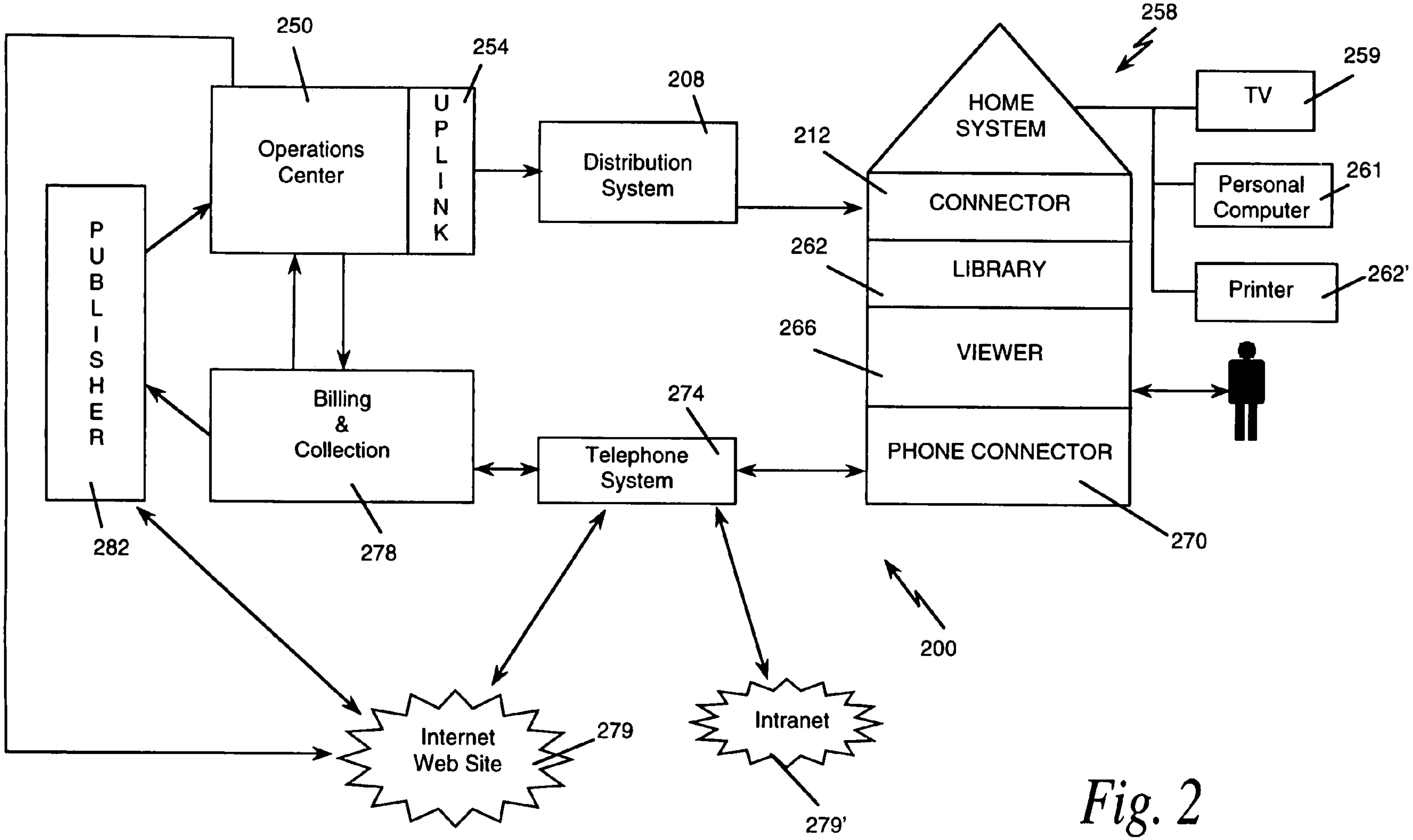

250
254
Operations Center
U P L I N K
208
Distribution System
212
258
HOME SYSTEM
CONNECTOR
262
LIBRARY
266
VIEWER
PHONE CONNECTOR
270
259
TV
261
Personal Computer
262'
Printer
P U B L I S H E R
282
Billing & Collection
278
274
Telephone System
200
Internet Web Site
279
Intranet
279'

Fig. 2

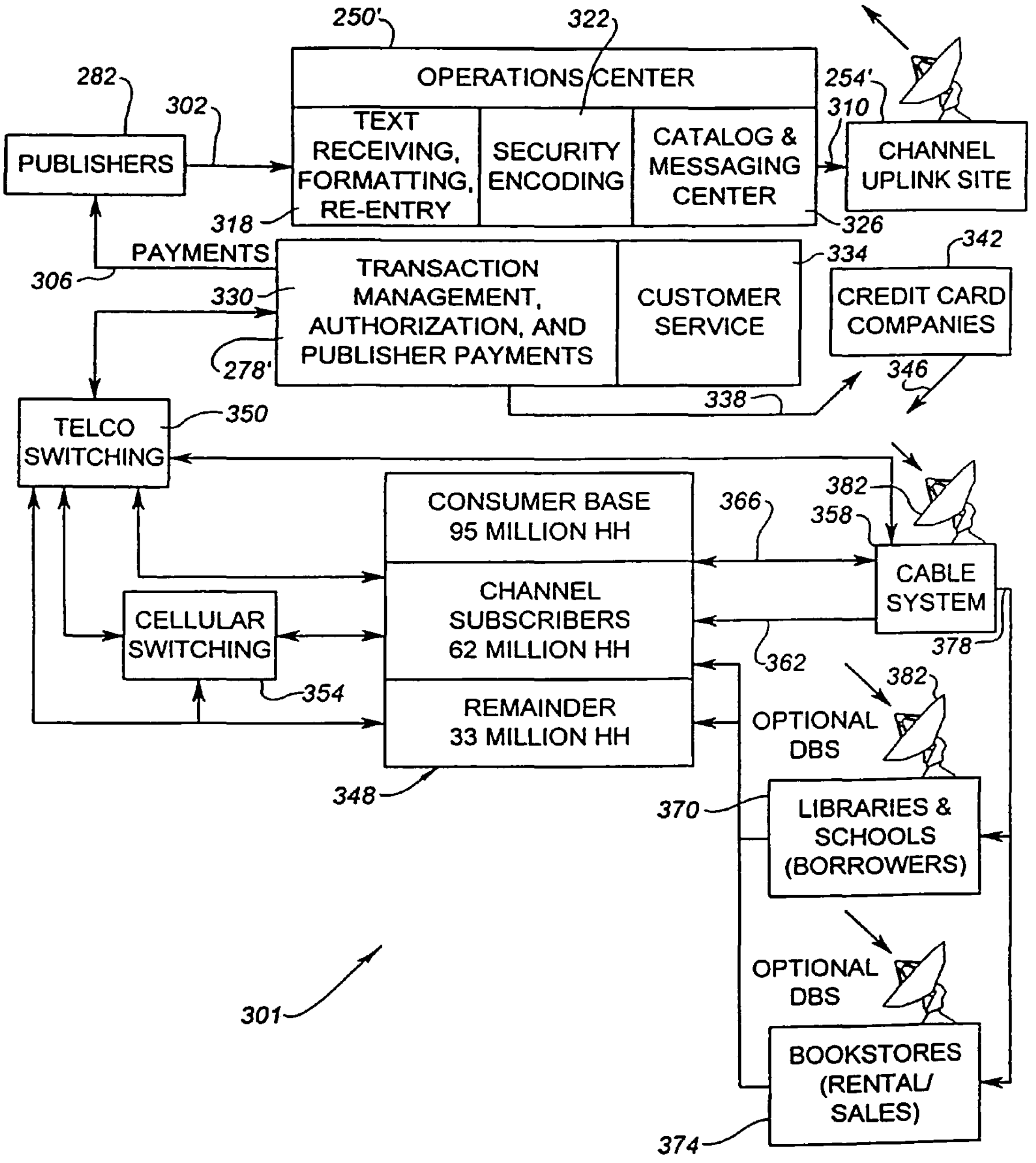

250'
322
OPERATIONS CENTER
282
302
PUBLISHERS
TEXT RECEIVING, FORMATTING, RE-ENTRY
SECURITY ENCODING
CATALOG & MESSAGING CENTER
254'
310
CHANNEL UPLINK SITE
318
326
PAYMENTS
306
TRANSACTION MANAGEMENT, AUTHORIZATION, AND PUBLISHER PAYMENTS
330
278'
CUSTOMER SERVICE
334
342
CREDIT CARD COMPANIES
346
338
TELCO SWITCHING
350
CONSUMER BASE 95 MILLION HH
366
382
358
CABLE SYSTEM
CHANNEL SUBSCRIBERS 62 MILLION HH
CELLULAR SWITCHING
354
362
378
382
REMAINDER 33 MILLION HH
OPTIONAL DBS
348
370
LIBRARIES & SCHOOLS (BORROWERS)
OPTIONAL DBS
301
BOOKSTORES (RENTAL/ SALES)
374

Fig. 3

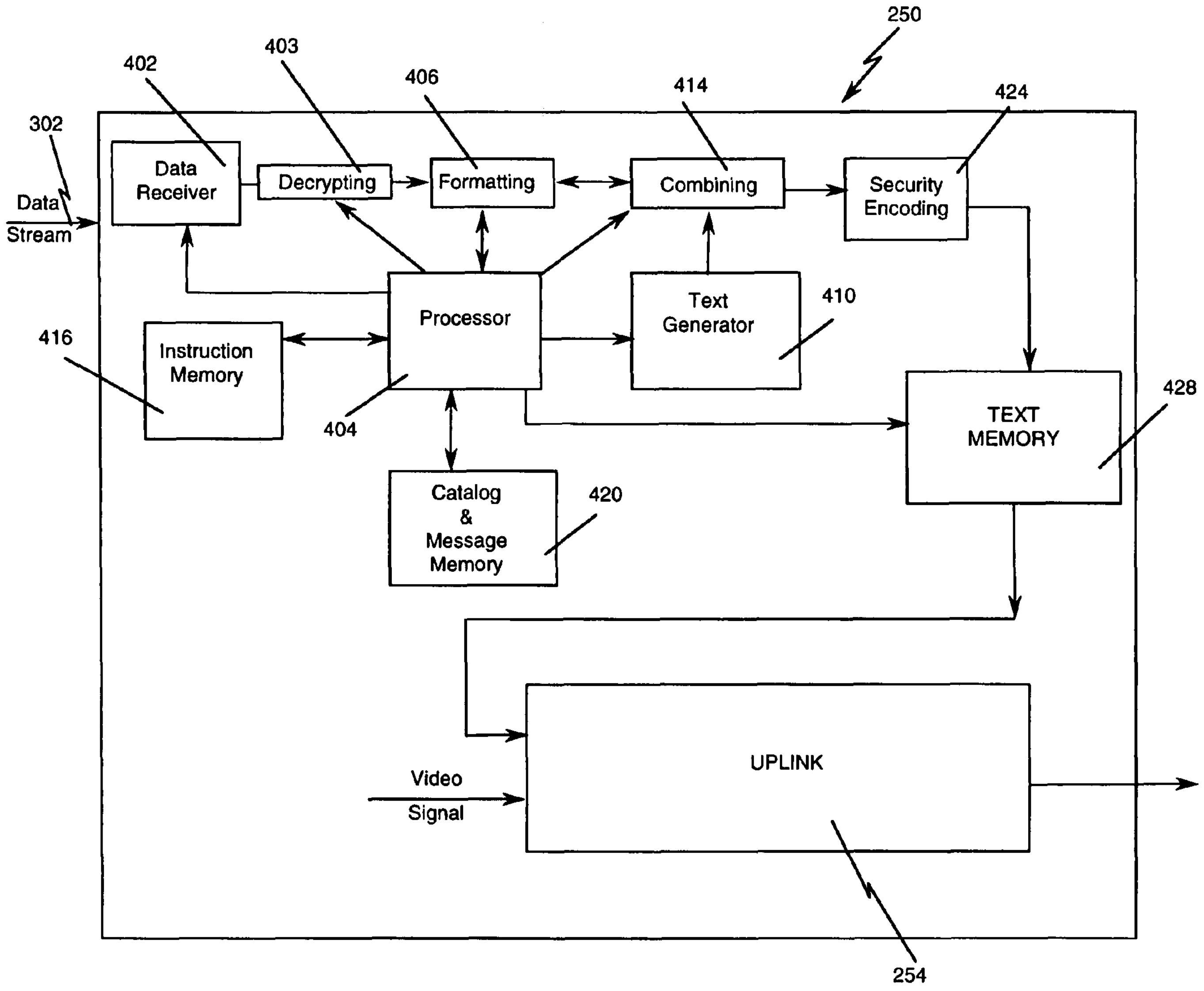

250
402
403
406
414
424
302
Data Receiver
Decrypting
Formatting
Combining
Security Encoding
Data Stream
Processor
Text Generator
410
416
Instruction Memory
404
TEXT MEMORY
428
Catalog & Message Memory
420
UPLINK
Video Signal
254

Fig. 4

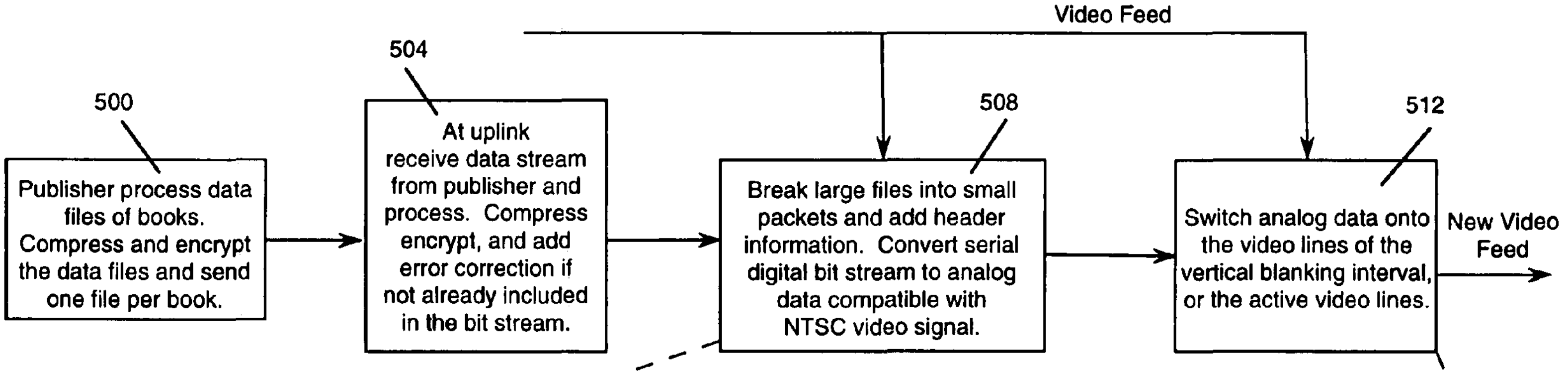

Video Feed
500
Publisher process data files of books. Compress and encrypt the data files and send one file per book.
504
At uplink receive data stream from publisher and process. Compress encrypt, and add error correction if not already included in the bit stream.
508
Break large files into small packets and add header information. Convert serial digital bit stream to analog data compatible with NTSC video signal.
512
Switch analog data onto the video lines of the vertical blanking interval, or the active video lines.
New Video Feed

Fig. 5a

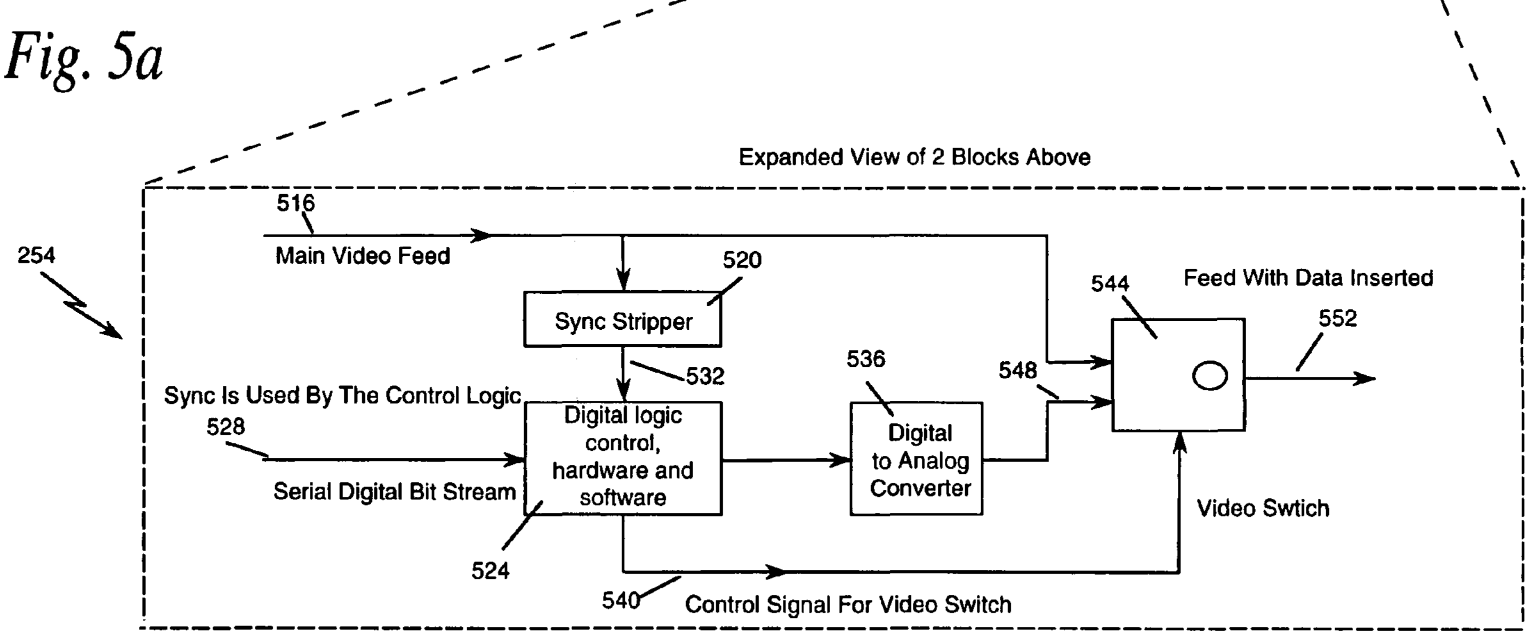

Expanded View of 2 Blocks Above
254
516
Main Video Feed
520
Sync Stripper
532
Sync Is Used By The Control Logic
528
Serial Digital Bit Stream
Digital logic control, hardware and software
524
536
Digital to Analog Converter
548
544
Feed With Data Inserted
552
Video Swtich
540
Control Signal For Video Switch

Fig. 5b

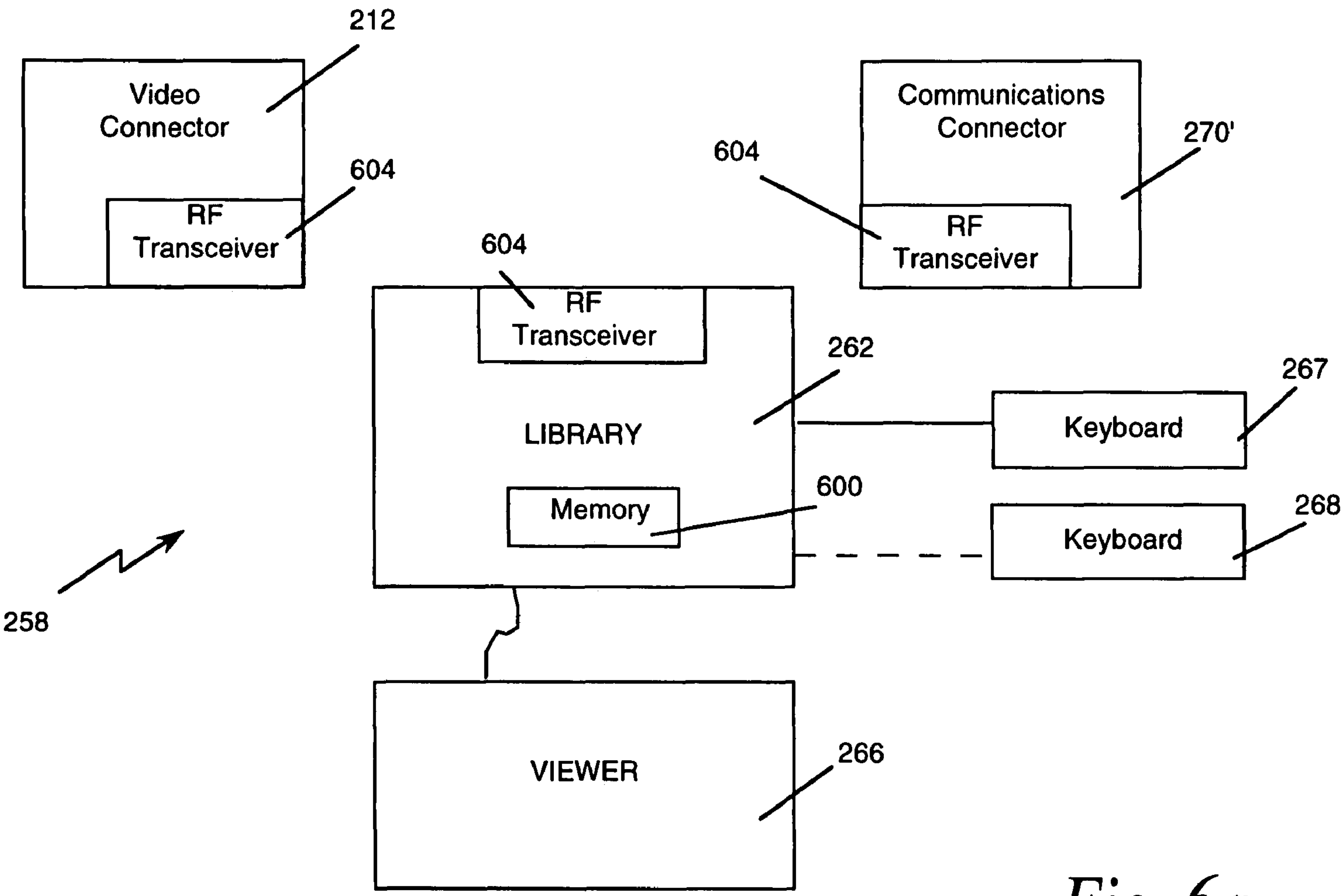

212
Video
Connector
604
RF
Transceiver
Communications
Connector
270'
604
RF
Transceiver
604
RF
Transceiver
LIBRARY
262
Memory
600
267
Keyboard
268
Keyboard
258
VIEWER
266

Fig. 6a

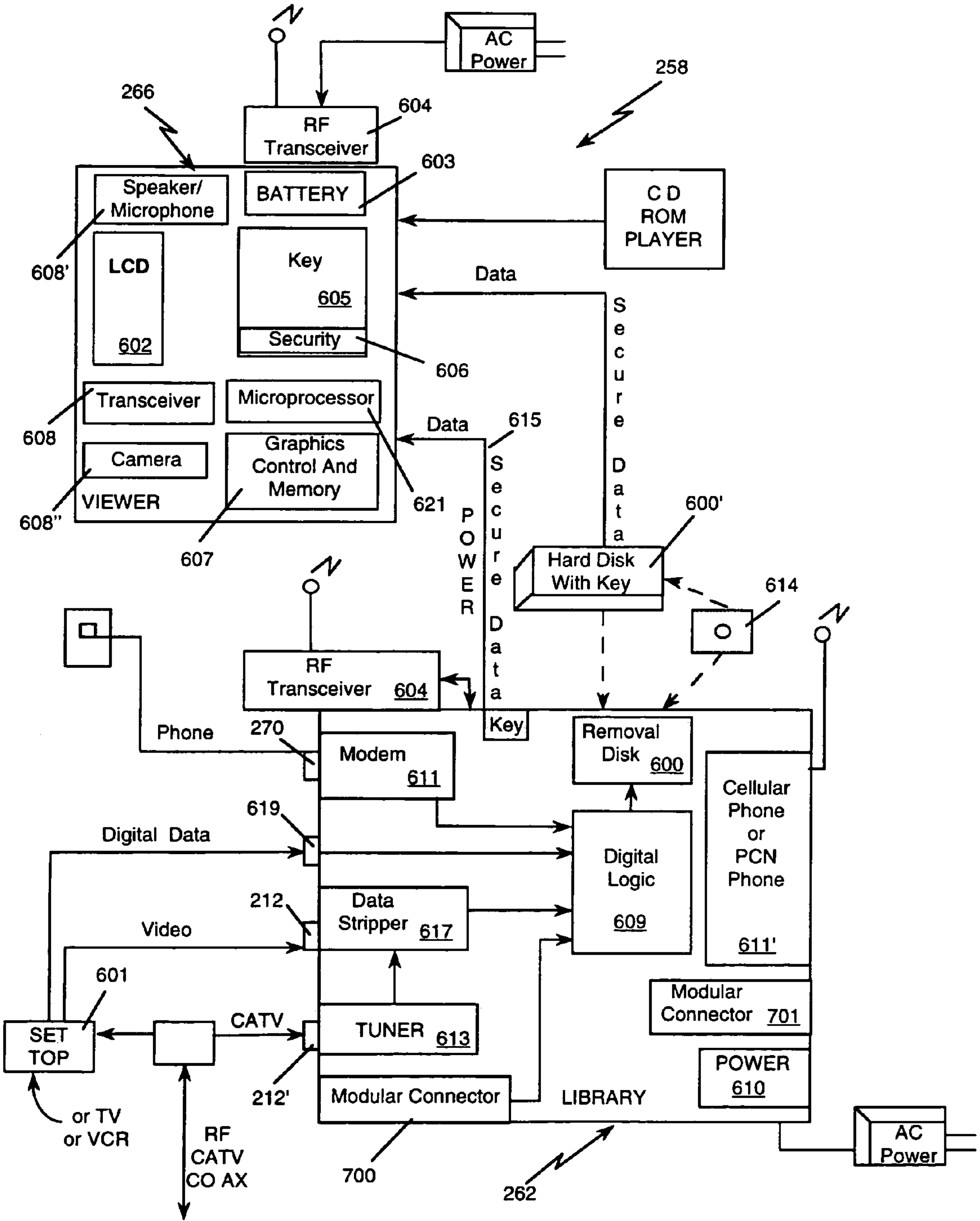

AC Power
RF Transceiver
604
266
258
603
BATTERY
Speaker/ Microphone
608'
LCD
602
Key
605
Security
606
C D ROM PLAYER
Data
Secure Data
Transceiver
608
Microprocessor
621
Camera
608"
VIEWER
Graphics Control And Memory
607
Data
615
POWER
Secure Data
Hard Disk With Key
600'
614
RF Transceiver 604
Key
Phone
270
Modem 611
Removal Disk 600
Cellular Phone or PCN Phone 611'
619
Digital Data
Digital Logic 609
212
Video
Data Stripper 617
601
SET TOP
CATV
TUNER 613
Modular Connector 701
212'
Modular Connector
LIBRARY
POWER 610
or TV or VCR
RF CATV CO AX
700
262
AC Power

Fig. 6b

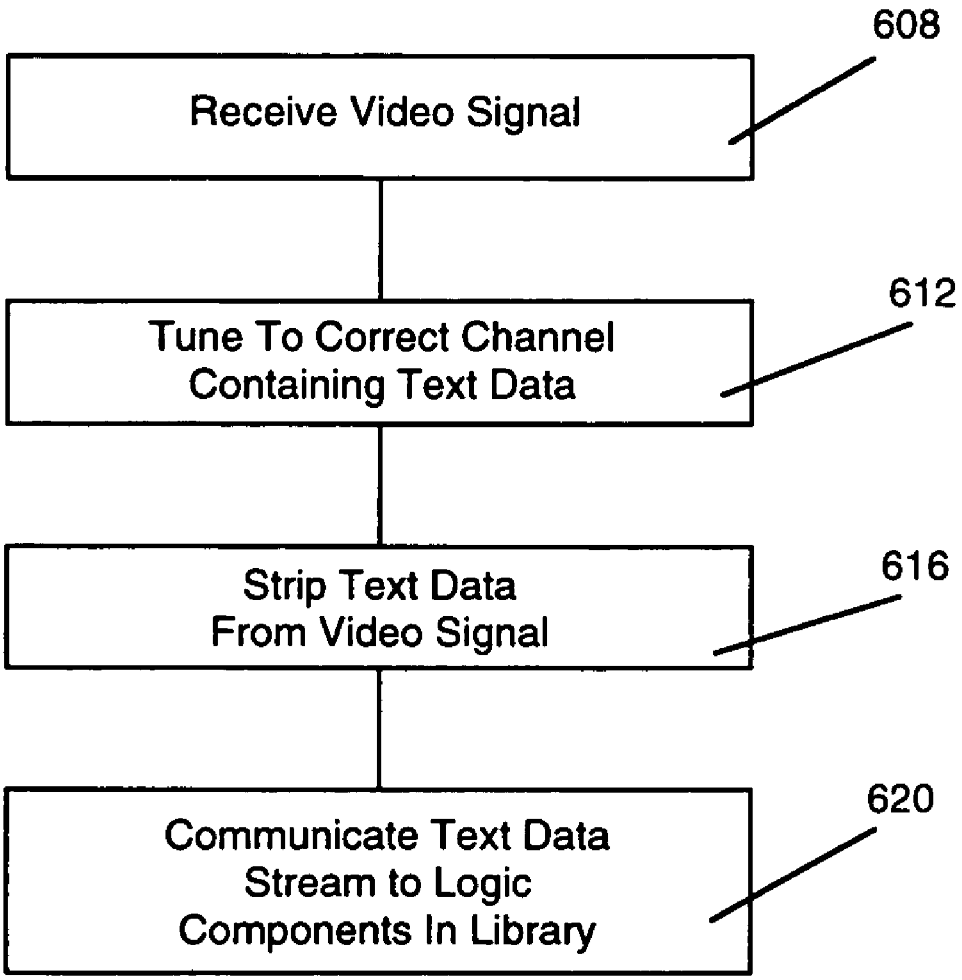

608
Receive Video Signal
612
Tune To Correct Channel Containing Text Data
616
Strip Text Data From Video Signal
620
Communicate Text Data Stream to Logic Components In Library

Fig. 7

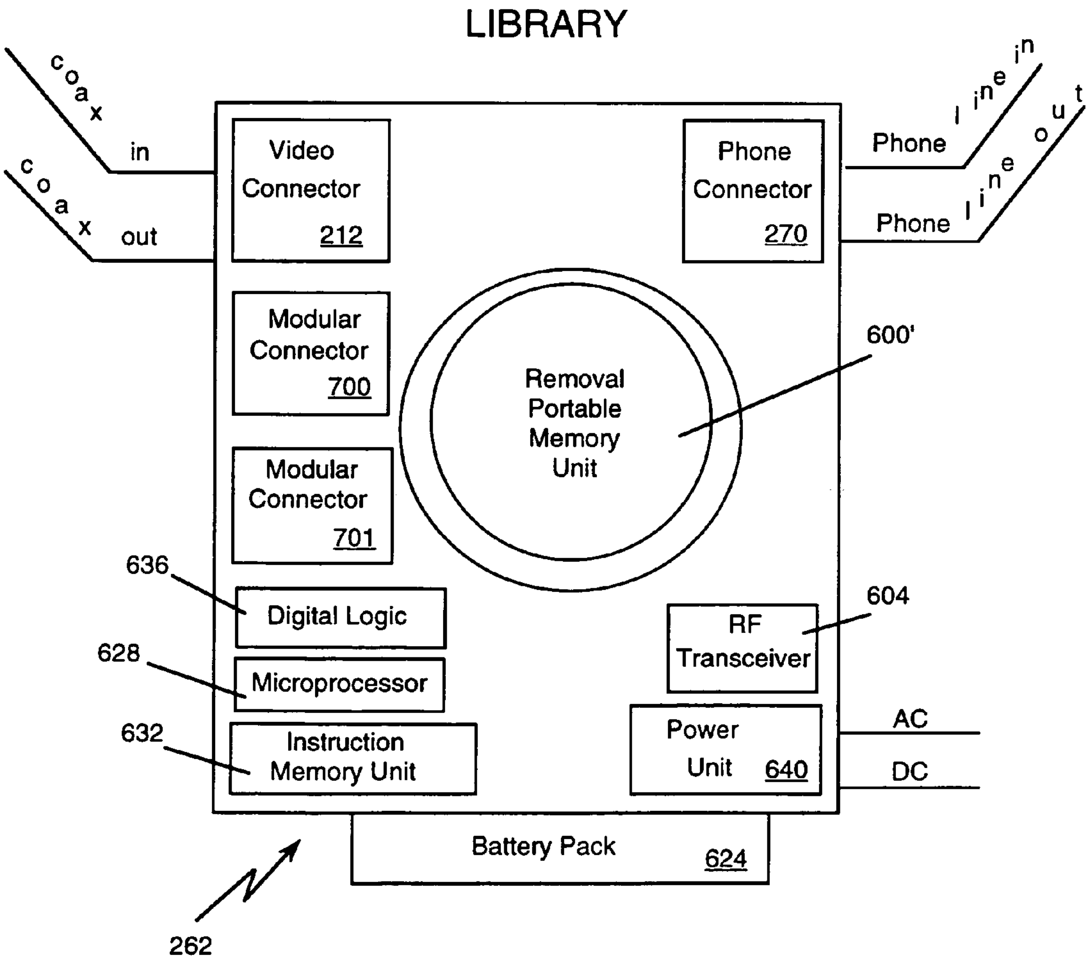

LIBRARY
coax in
coax out
Video Connector 212
Phone Connector 270
Phone line in
Phone line out
Modular Connector 700
Modular Connector 701
Removal Portable Memory Unit
600'
636
Digital Logic
628
Microprocessor
632
Instruction Memory Unit
604
RF Transceiver
Power Unit 640
AC
DC
Battery Pack 624
262

Fig. 8

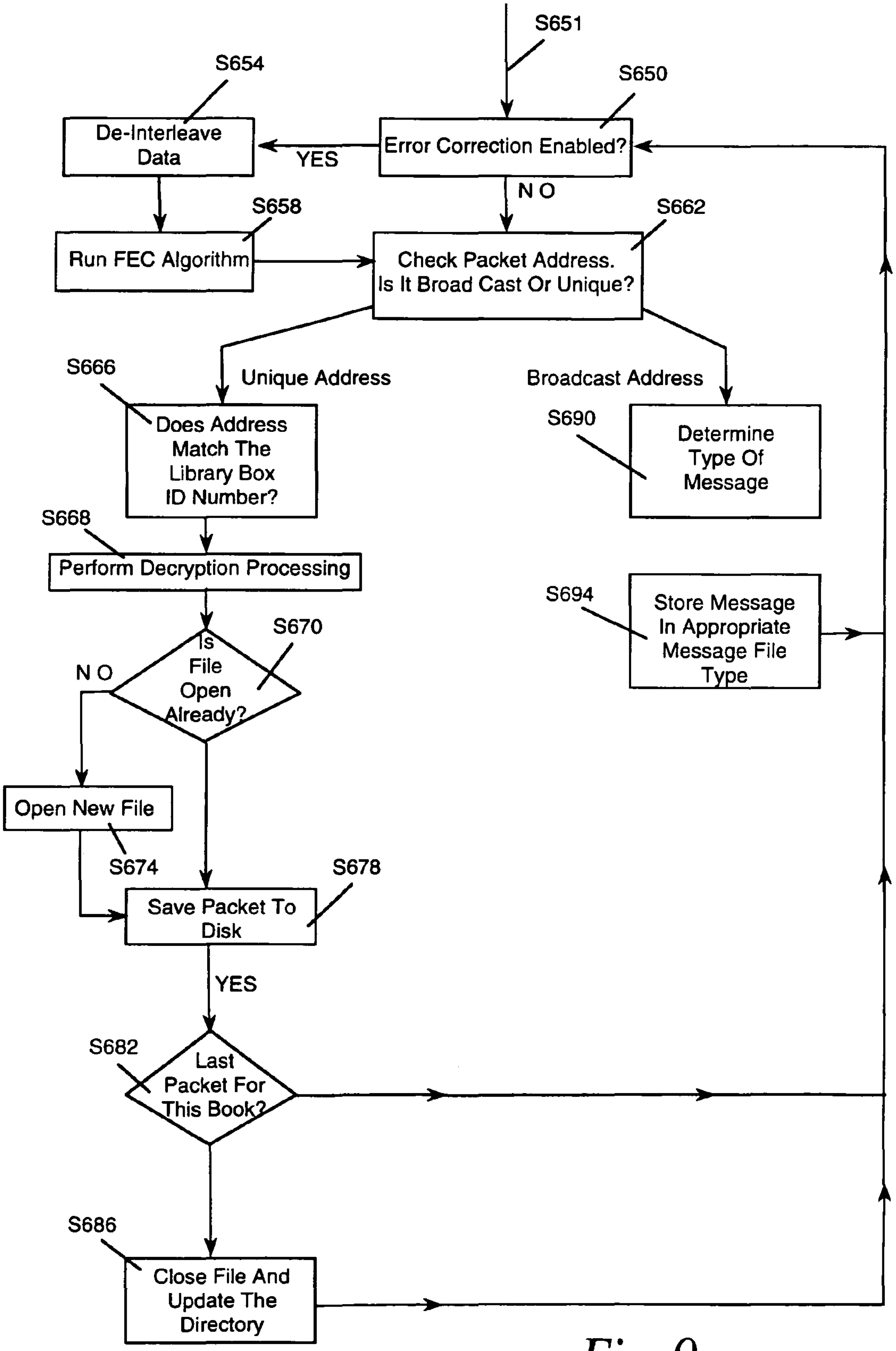

S651
S654
S650
De-Interleave Data
YES
Error Correction Enabled?
N O
S658
S662
Run FEC Algorithm
Check Packet Address. Is It Broad Cast Or Unique?
S666
Unique Address
Broadcast Address
Does Address Match The Library Box ID Number?
S690
Determine Type Of Message
S668
Perform Decryption Processing
S694
Store Message In Appropriate Message File Type
S670
N O
Is File Open Already?
Open New File
S674
S678
Save Packet To Disk
YES
S682
Last Packet For This Book?
S686
Close File And Update The Directory

Fig. 9

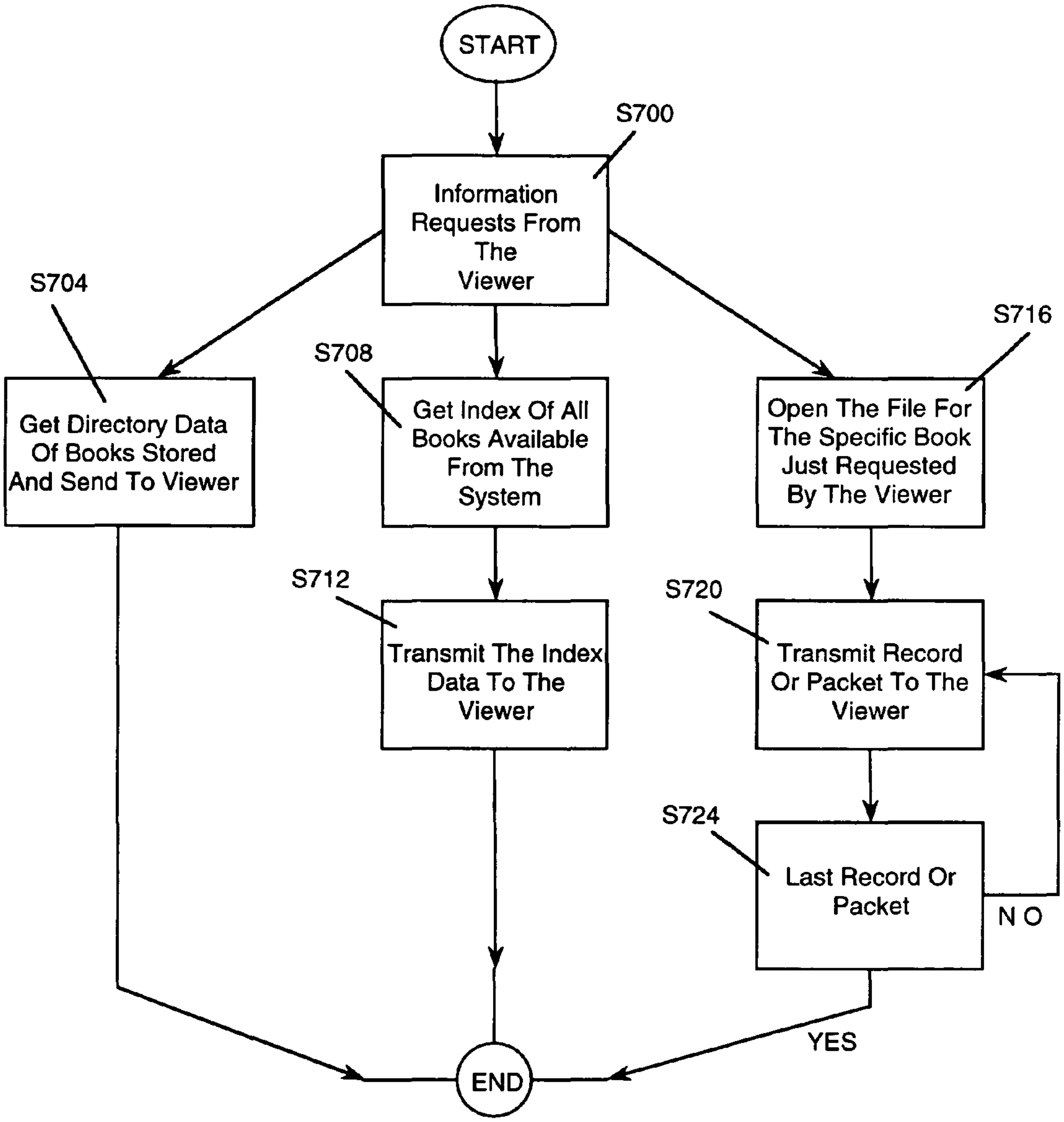

START
S700
Information Requests From The Viewer
S704
Get Directory Data Of Books Stored And Send To Viewer
S708
Get Index Of All Books Available From The System
S716
Open The File For The Specific Book Just Requested By The Viewer
S712
Transmit The Index Data To The Viewer
S720
Transmit Record Or Packet To The Viewer
S724
Last Record Or Packet
N O
YES
END

Fig. 10

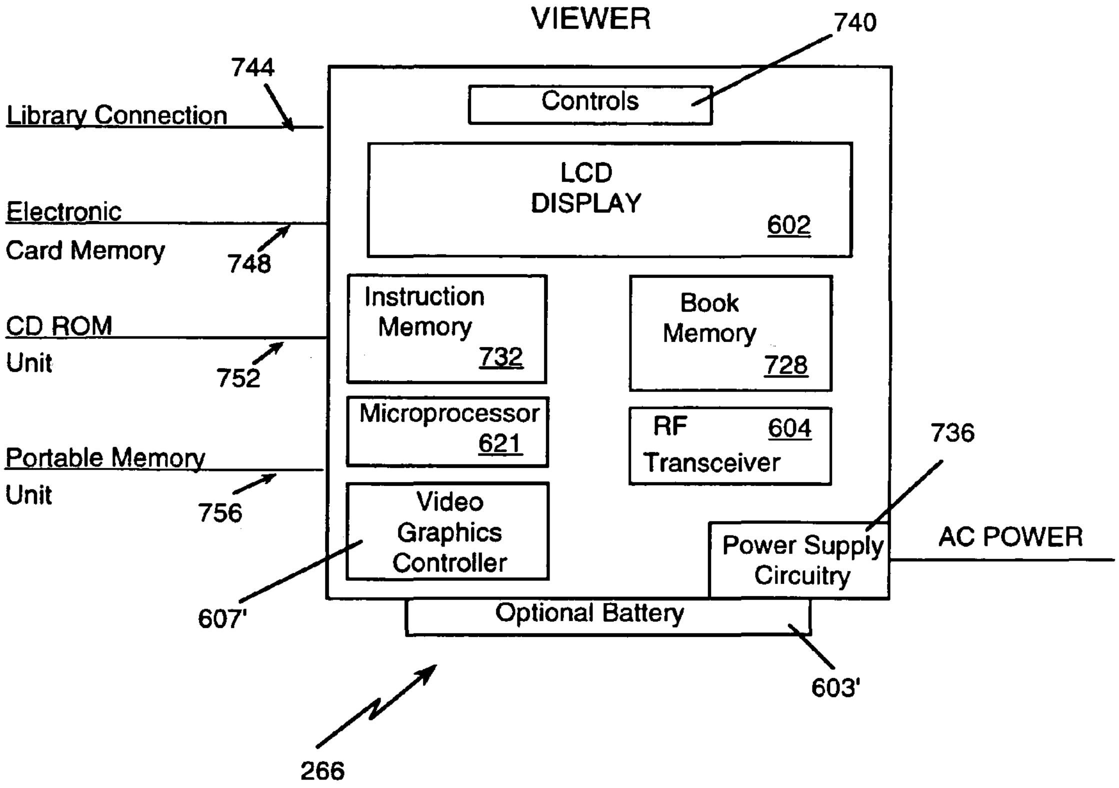

VIEWER
740
744
Library Connection
Controls
LCD DISPLAY
602
Electronic Card Memory
748
CD ROM Unit
752
Instruction Memory
732
Book Memory
728
Microprocessor
621
RF 604 Transceiver
736
Portable Memory Unit
756
Video Graphics Controller
Power Supply Circuitry
AC POWER
607'
Optional Battery
603'
266

Fig. 11

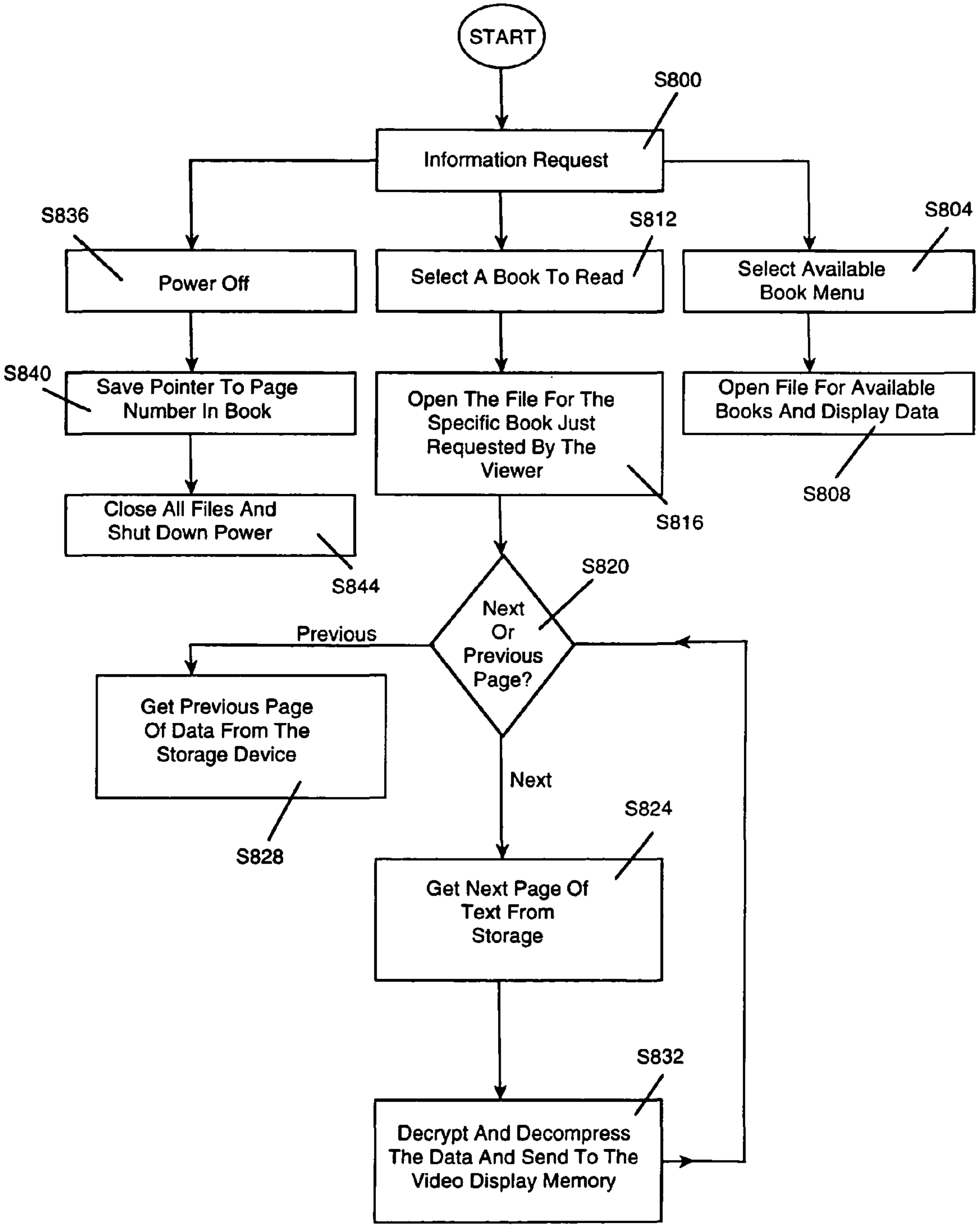

START
S800
Information Request
S836
Power Off
S812
Select A Book To Read
S804
Select Available Book Menu
S840
Save Pointer To Page Number In Book
Open The File For The Specific Book Just Requested By The Viewer
Open File For Available Books And Display Data
S808
S816
Close All Files And Shut Down Power
S844
S820
Next Or Previous Page?
Previous
Get Previous Page Of Data From The Storage Device
S828
Next
S824
Get Next Page Of Text From Storage
S832
Decrypt And Decompress The Data And Send To The Video Display Memory

Fig. 12

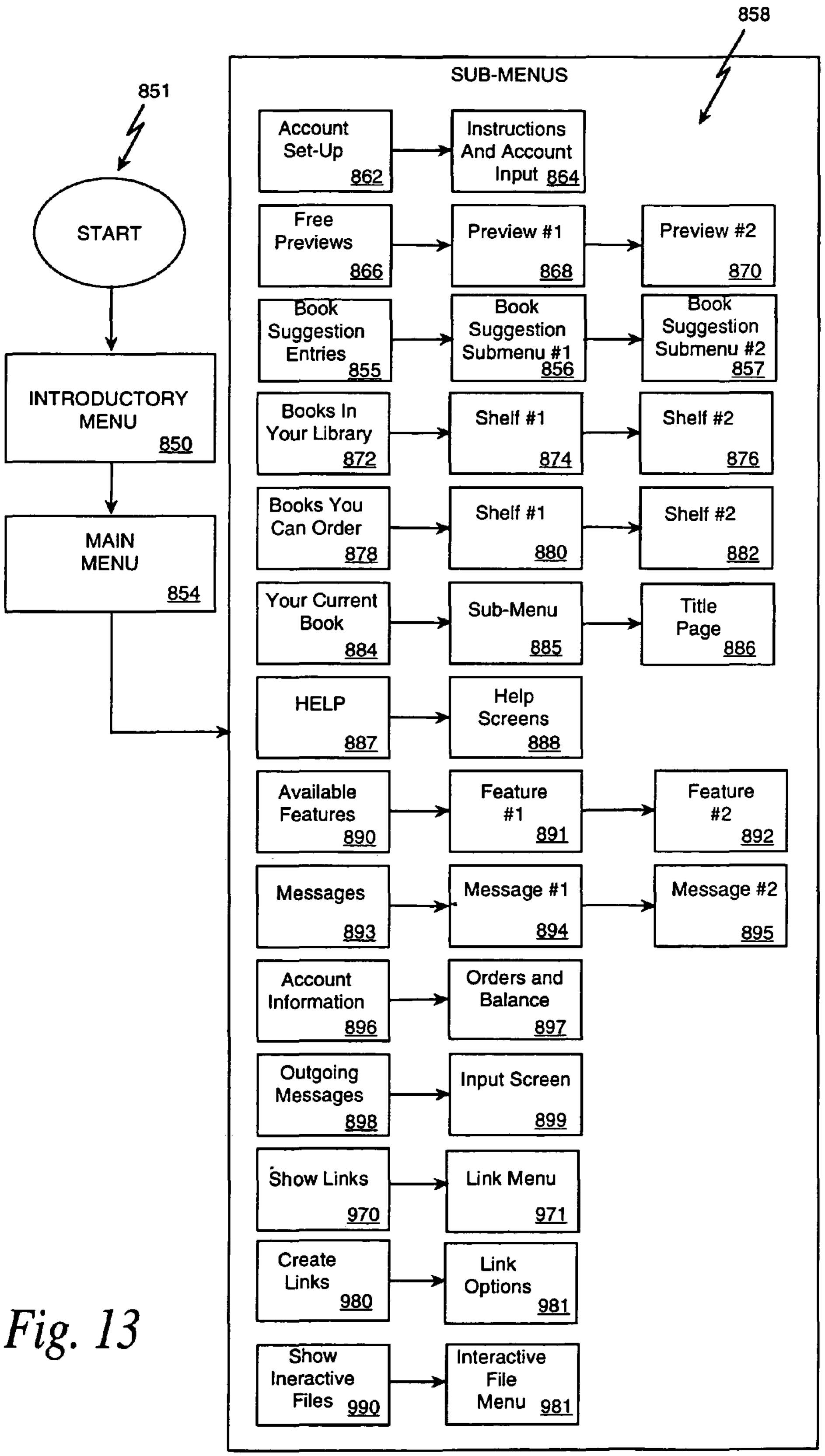

858
SUB-MENUS
851
START
INTRODUCTORY MENU 850
MAIN MENU 854
Account Set-Up 862
Instructions And Account Input 864
Free Previews 866
Preview #1 868
Preview #2 870
Book Suggestion Entries 855
Book Suggestion Submenu #1 856
Book Suggestion Submenu #2 857
Books In Your Library 872
Shelf #1 874
Shelf #2 876
Books You Can Order 878
Shelf #1 880
Shelf #2 882
Your Current Book 884
Sub-Menu 885
Title Page 886
HELP 887
Help Screens 888
Available Features 890
Feature #1 891
Feature #2 892
Messages 893
Message #1 894
Message #2 895
Account Information 896
Orders and Balance 897
Outgoing Messages 898
Input Screen 899
Show Links 970
Link Menu 971
Create Links 980
Link Options 981
Show Ineractive Files 990
Interactive File Menu 981

Fig. 13

Fig. 14a

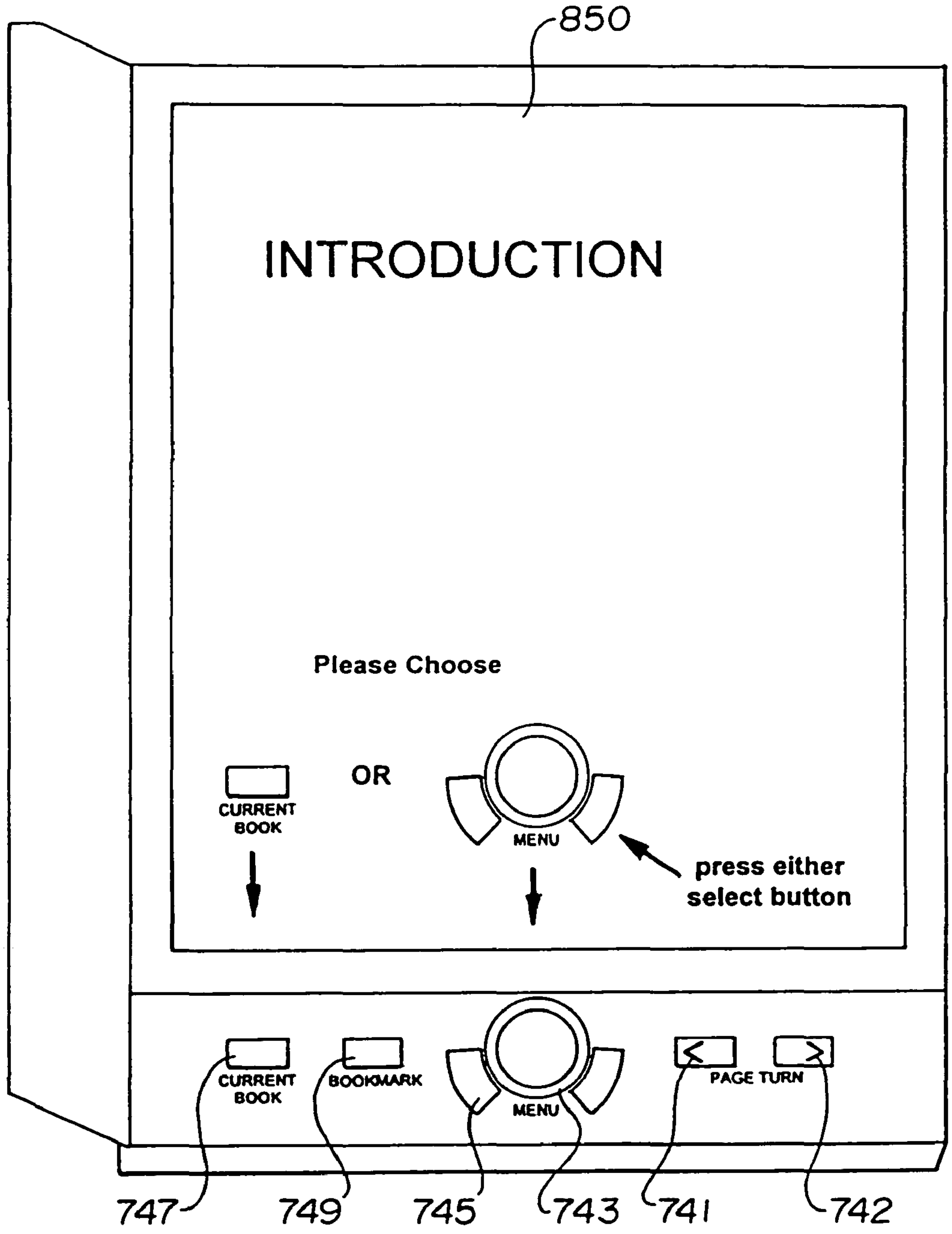
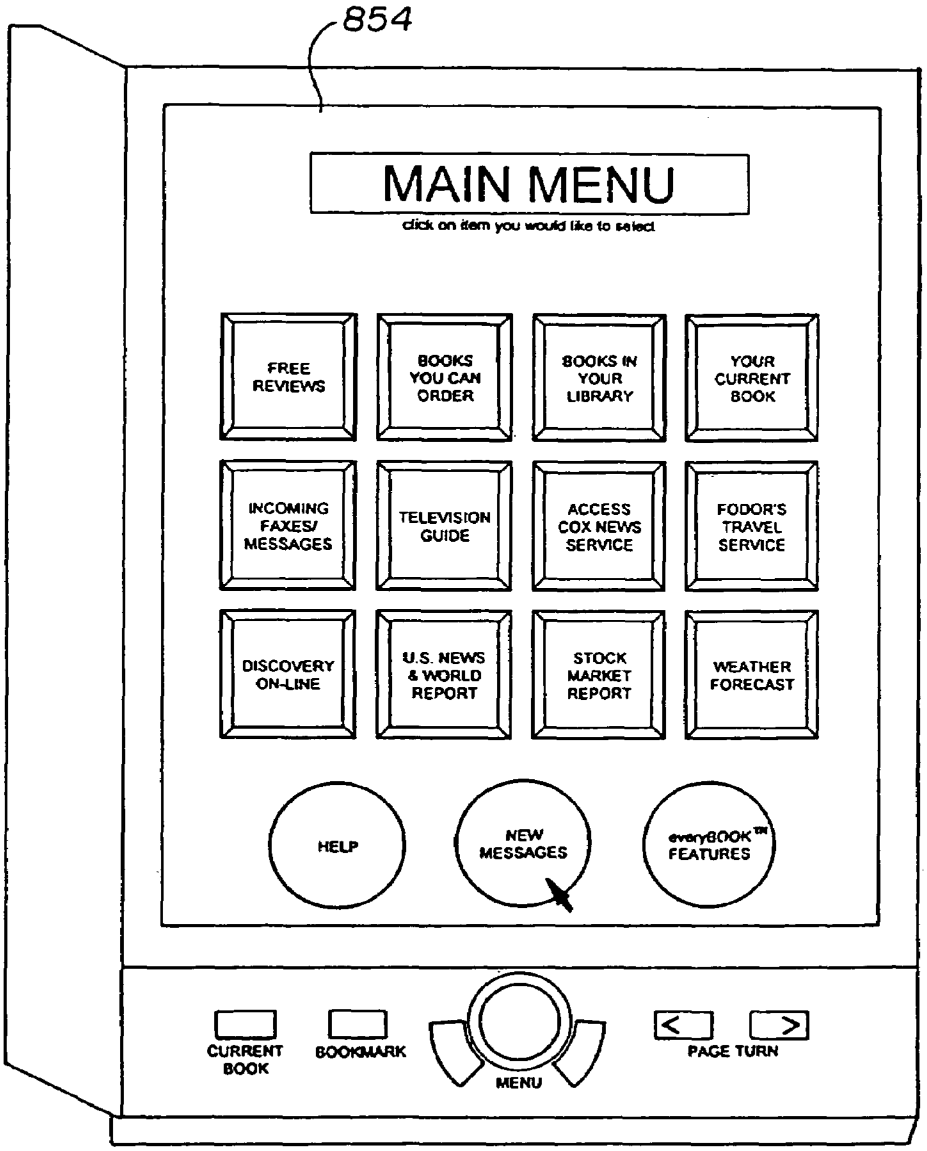

850
INTRODUCTION
Please Choose
CURRENT BOOK
OR
MENU
press either select button
CURRENT BOOK
BOOKMARK
MENU
PAGE TURN
747
749
745
743
741
742

Fig. 14b


854
MAIN MENU
click on item you would like to select
FREE REVIEWS
BOOKS YOU CAN ORDER
BOOKS IN YOUR LIBRARY
YOUR CURRENT BOOK
INCOMING FAXES/ MESSAGES
TELEVISION GUIDE
ACCESS COX NEWS SERVICE
FODOR'S TRAVEL SERVICE
DISCOVERY ON-LINE
U.S. NEWS & WORLD REPORT
STOCK MARKET REPORT
WEATHER FORECAST
HELP
NEW MESSAGES
everyBOOK™ FEATURES
CURRENT BOOK
BOOKMARK
MENU
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>
PAGE TURN

Fig. 14c

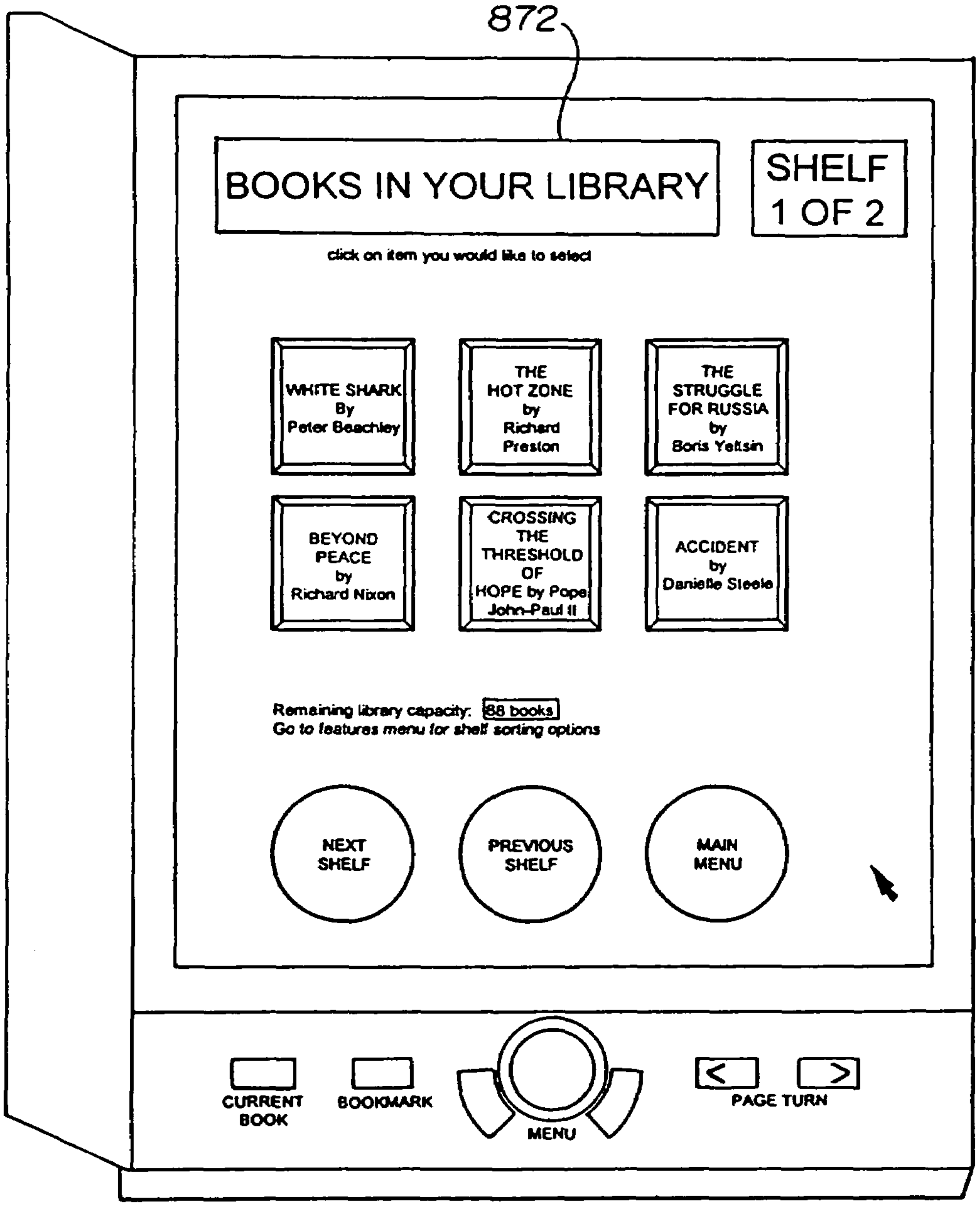

872
BOOKS IN YOUR LIBRARY
SHELF 1 OF 2
click on item you would like to select
WHITE SHARK By Peter Beachley
THE HOT ZONE by Richard Preston
THE STRUGGLE FOR RUSSIA by Boris Yeltsin
BEYOND PEACE by Richard Nixon
CROSSING THE THRESHOLD OF HOPE by Pope John-Paul II
ACCIDENT by Danielle Steele
Remaining library capacity: 88 books
Go to features menu for shelf sorting options
NEXT SHELF
PREVIOUS SHELF
MAIN MENU
CURRENT BOOK
BOOKMARK
MENU
<
>
PAGE TURN

Fig. 14d

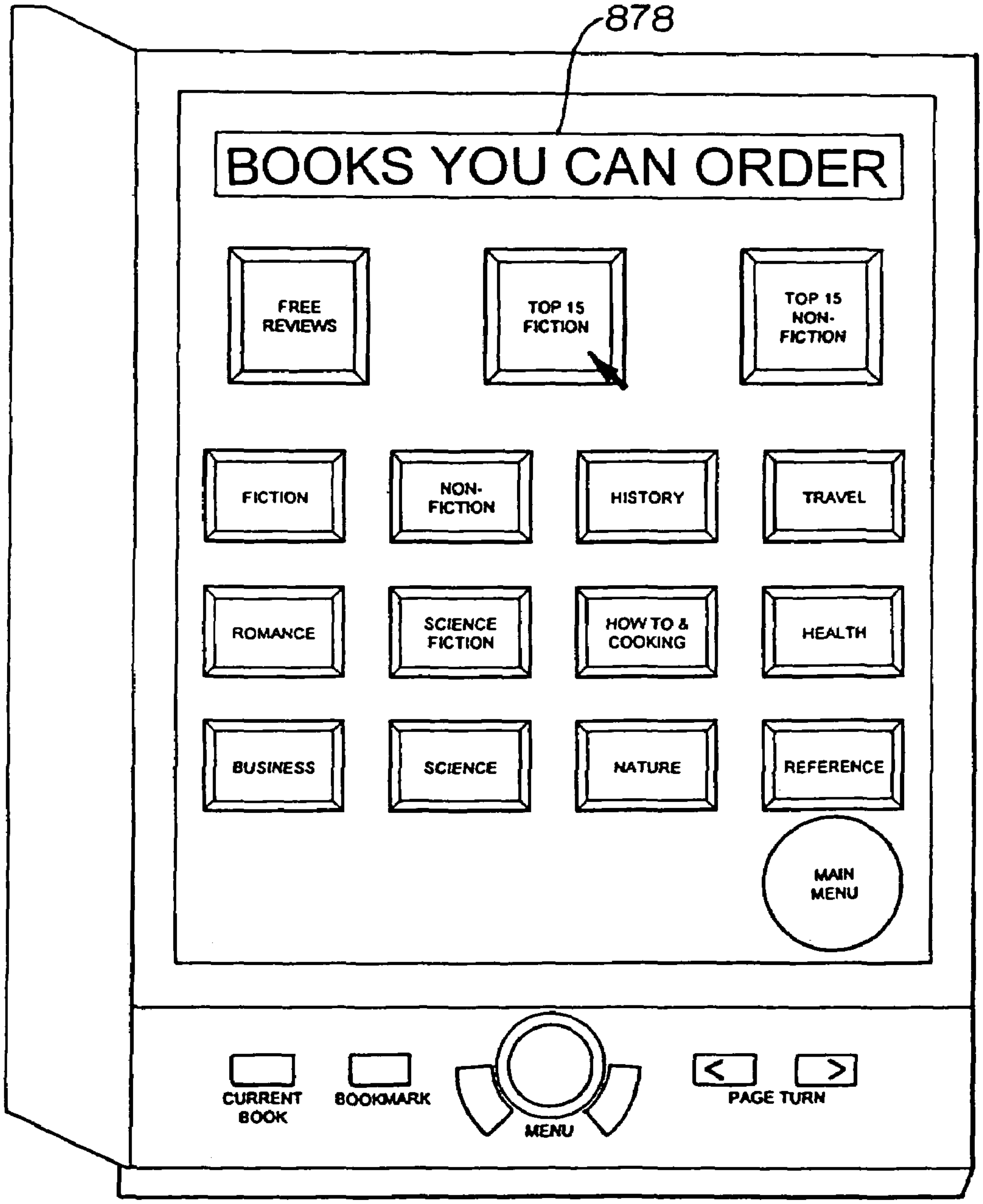
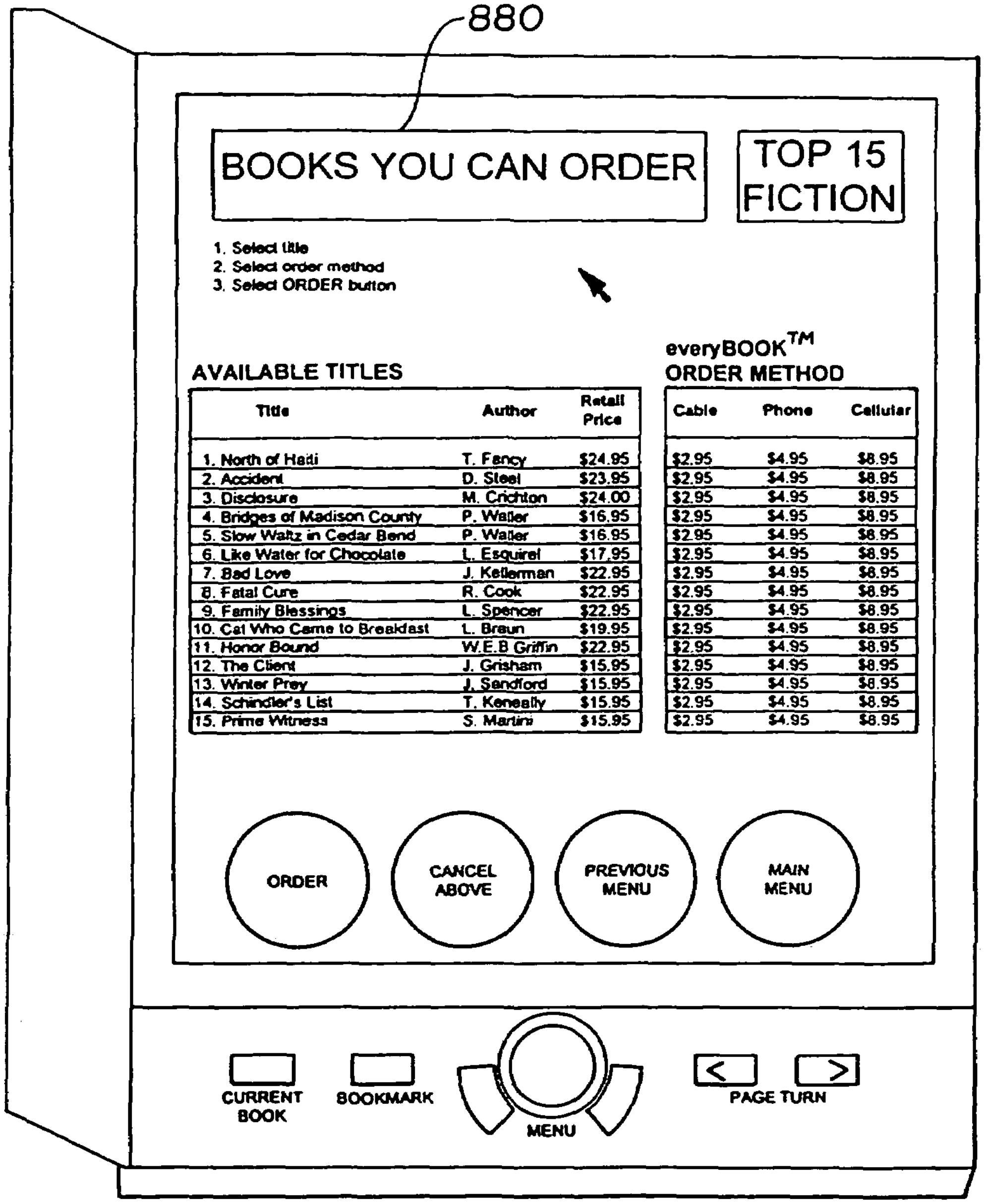

878
BOOKS YOU CAN ORDER
FREE REVIEWS
TOP 15 FICTION
TOP 15 NON-FICTION
FICTION
NON-FICTION
HISTORY
TRAVEL
ROMANCE
SCIENCE FICTION
HOW TO & COOKING
HEALTH
BUSINESS
SCIENCE
NATURE
REFERENCE
MAIN MENU
CURRENT BOOK
BOOKMARK
MENU
<
>
PAGE TURN

Fig. 14e



BOOKS YOU CAN ORDER

1. Select title
2. Select order method
3. Select ORDER button

AVAILABLE TITLES

Title	Author	Retail Price
1. North of Haiti	T. Fancy	$24.95
2. Accident	D. Steel	$23.95
3. Disclosure	M. Crichton	$24.00
4. Bridges of Madison County	P. Waller	$16.95
5. Slow Waltz in Cedar Bend	P. Waller	$16.95
6. Like Water for Chocolate	L. Esquirel	$17.95
7. Bad Love	J. Kellerman	$22.95
8. Fatal Cure	R. Cook	$22.95
9. Family Blessings	L. Spencer	$22.95
10. Cat Who Came to Breakfast	L. Braun	$19.95
11. Honor Bound	W.E.B Griffin	$22.95
12. The Client	J. Grisham	$15.95
13. Winter Prey	J. Sandford	$15.95
14. Schindler's List	T. Keneally	$15.95
15. Prime Witness	S. Martini	$15.95

everyBOOK^{TM}
ORDER METHOD

Cable	Phone	Cellular
$2.95	$4.95	$8.95
$2.95	$4.95	$8.95
$2.95	$4.95	$8.95
$2.95	$4.95	$8.95
$2.95	$4.95	$8.95
$2.95	$4.95	$8.95
$2.95	$4.95	$8.95
$2.95	$4.95	$8.95
$2.95	$4.95	$8.95
$2.95	$4.95	$8.95
$2.95	$4.95	$8.95
$2.95	$4.95	$8.95
$2.95	$4.95	$8.95
$2.95	$4.95	$8.95
$2.95	$4.95	$8.95

Fig. 14f

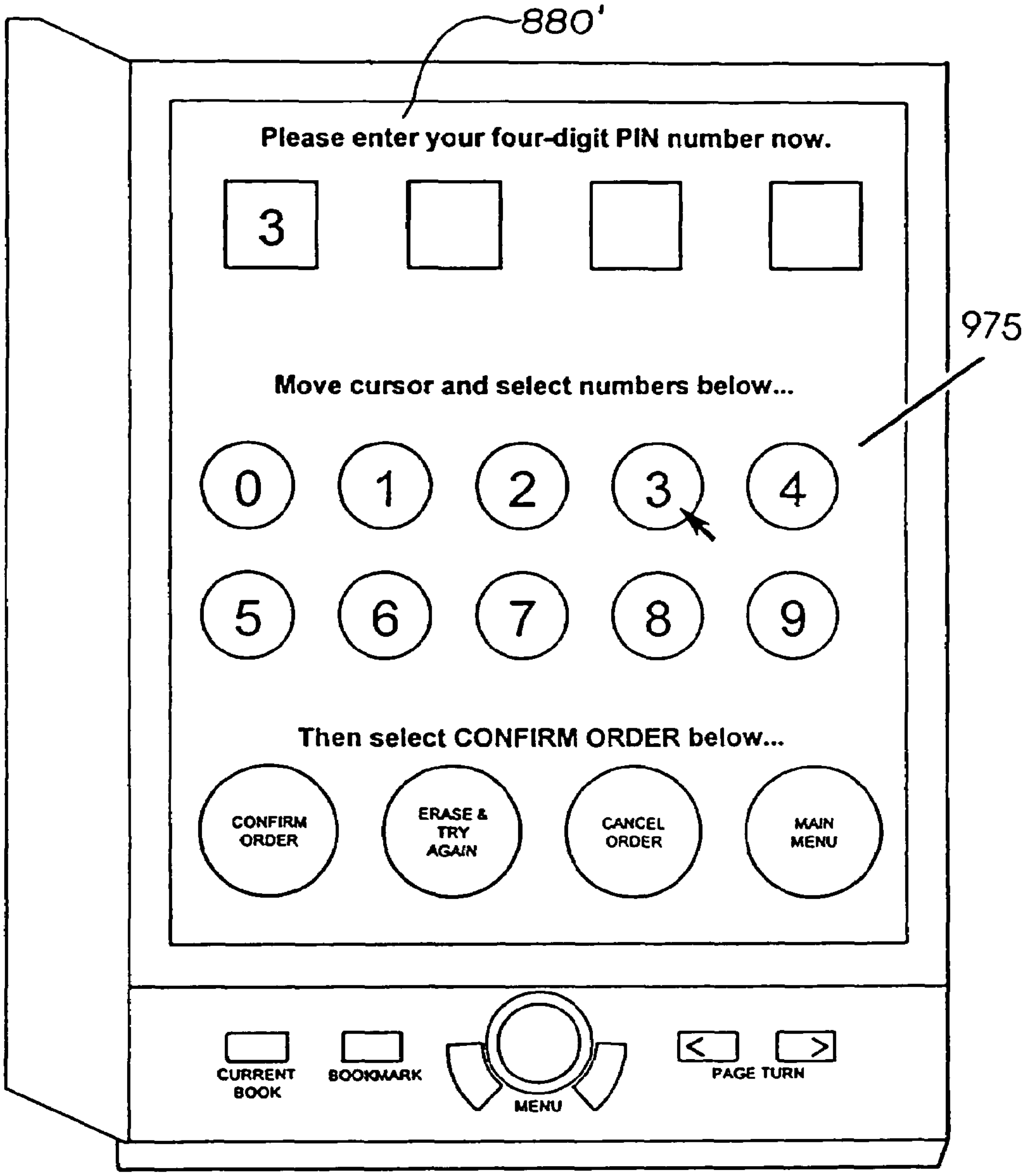
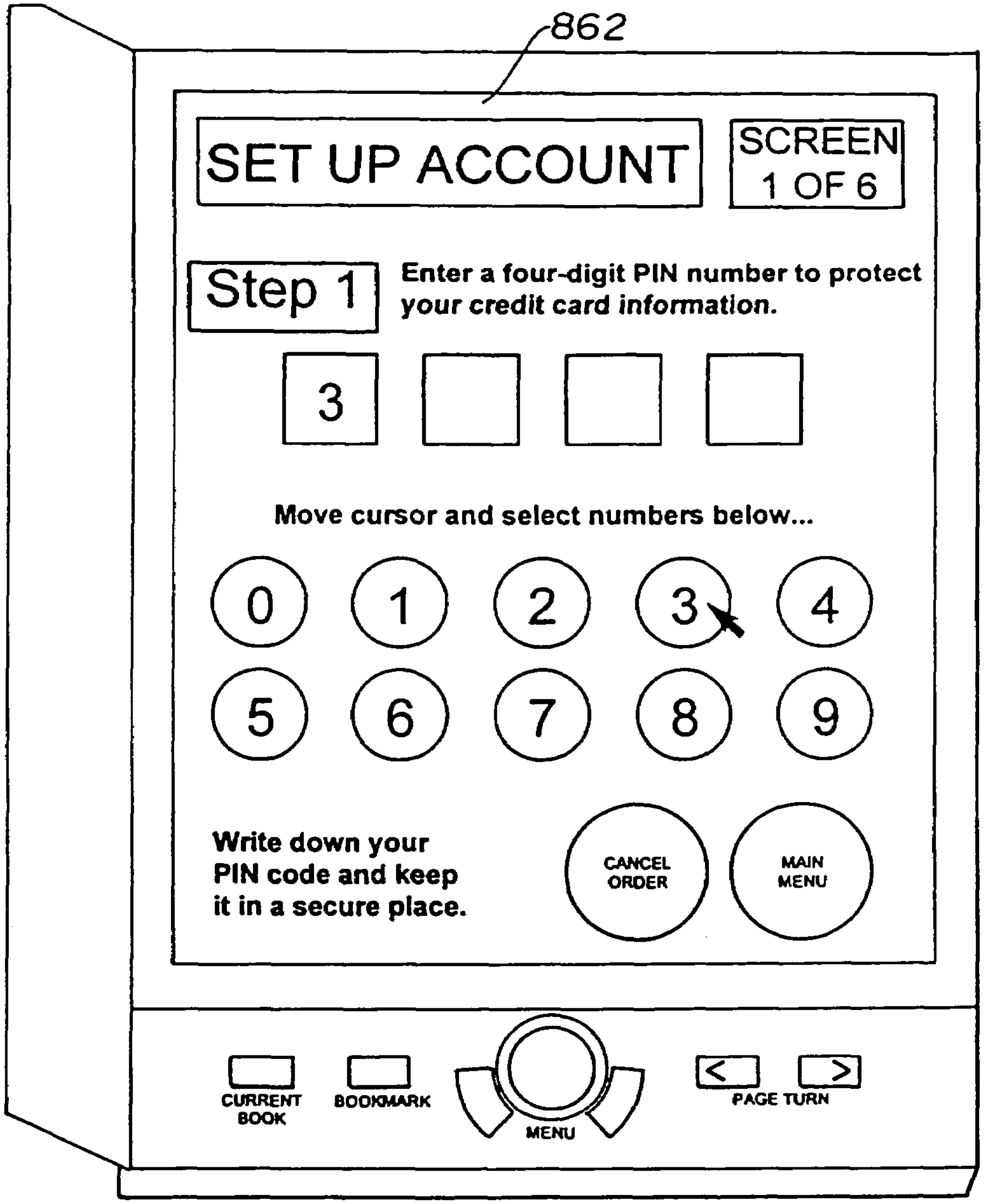

880'
Please enter your four-digit PIN number now.
3
975
Move cursor and select numbers below...
0
1
2
3
4
5
6
7
8
9
Then select CONFIRM ORDER below...
CONFIRM ORDER
ERASE & TRY AGAIN
CANCEL ORDER
MAIN MENU
CURRENT BOOK
BOOKMARK
MENU
<
>
PAGE TURN

Fig. 14g



SET UP ACCOUNT

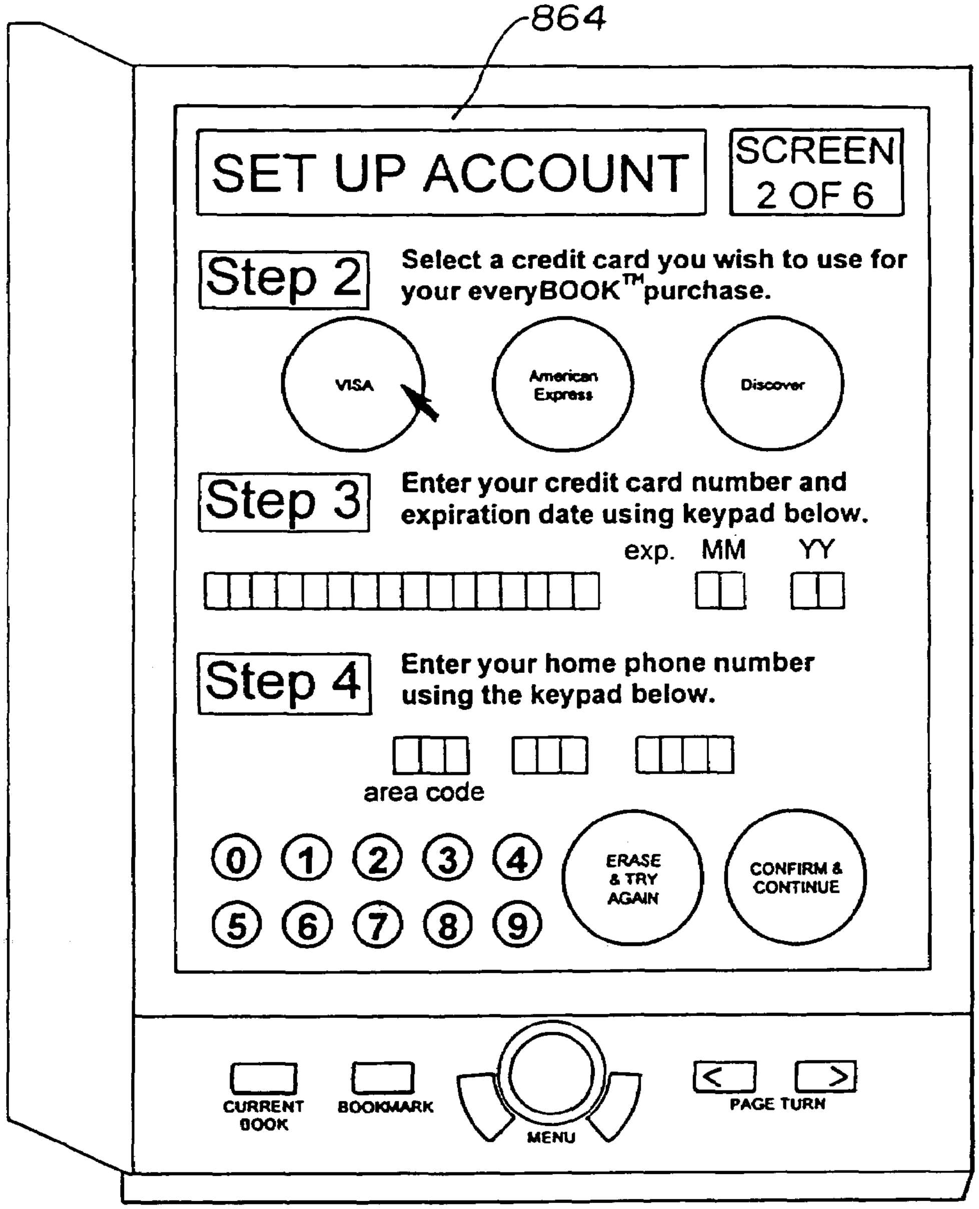
SCREEN 1 OF 6

Step 1 Enter a four-digit PIN number to protect your credit card information.

Move cursor and select numbers below...

Write down your PIN code and keep it in a secure place.

Fig. 14h

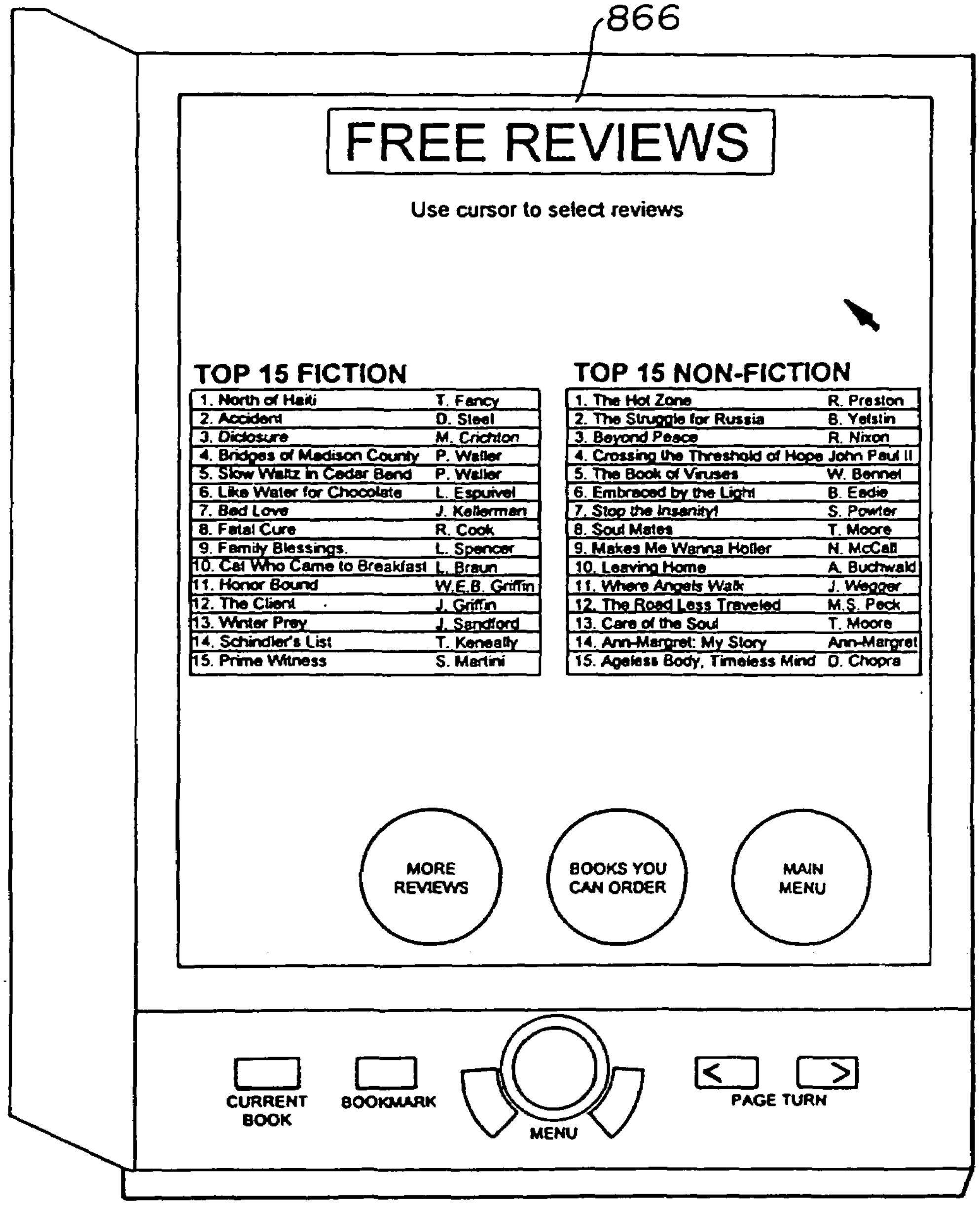


Select a credit card you wish to use for your everyBOOK™ purchase.

Enter your credit card number and expiration date using keypad below.

Enter your home phone number using the keypad below.

Fig. 14i



FREE REVIEWS

Use cursor to select reviews

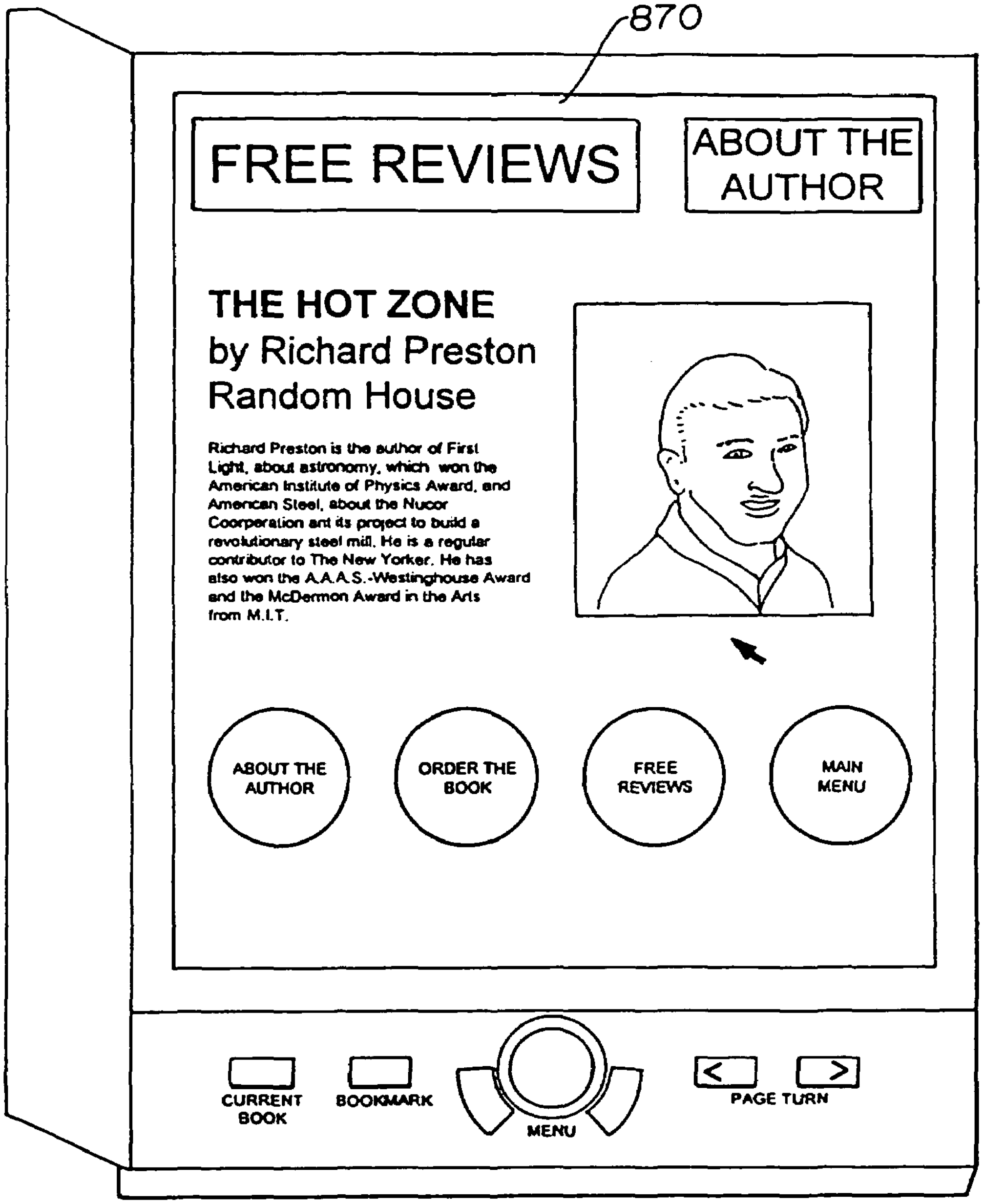
TOP 15 FICTION

1. North of Haiti	T. Fancy
2. Accident	D. Steel
3. Diclosure	M. Crichton
4. Bridges of Madison County	P. Waller
5. Slow Waltz in Cedar Bend	P. Waller
6. Like Water for Chocolate	L. Espuivel
7. Bad Love	J. Kellerman
8. Fatal Cure	R. Cook
9. Family Blessings.	L. Spencer
10. Cat Who Came to Breakfast	L. Braun
11. Honor Bound	W.E.B. Griffin
12. The Client	J. Griffin
13. Winter Prey	J. Sandford
14. Schindler's List	T. Keneally
15. Prime Witness	S. Martini

TOP 15 NON-FICTION

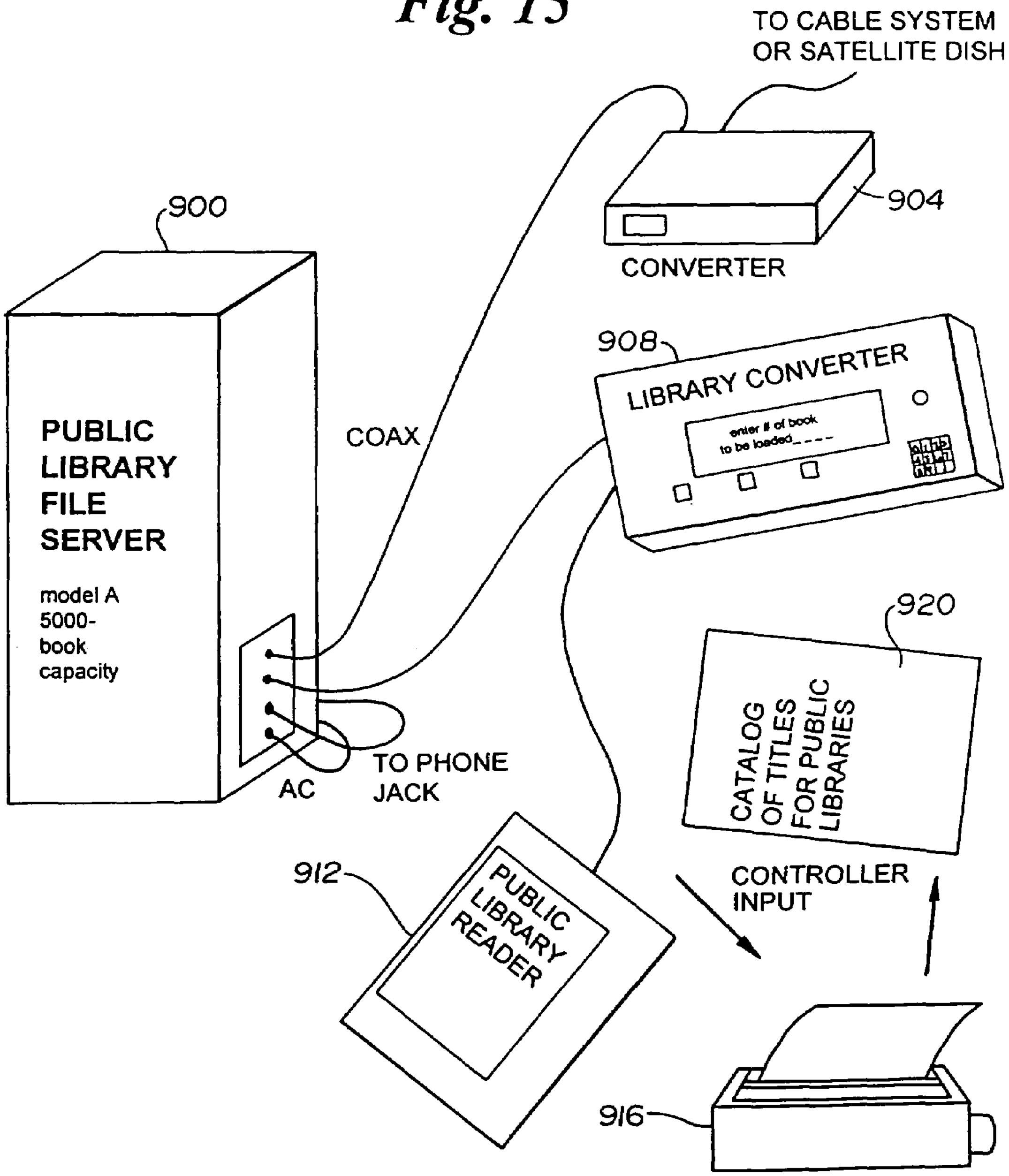
1. The Hot Zone	R. Preston
2. The Struggle for Russia	B. Yelstin
3. Beyond Peace	R. Nixon
4. Crossing the Threshold of Hope	John Paul II
5. The Book of Viruses	W. Bennet
6. Embraced by the Light	B. Eadie
7. Stop the Insanity!	S. Powter
8. Soul Mates	T. Moore
9. Makes Me Wanna Holler	N. McCall
10. Leaving Home	A. Buchwald
11. Where Angels Walk	J. Wegger
12. The Road Less Traveled	M.S. Peck
13. Care of the Soul	T. Moore
14. Ann-Margret: My Story	Ann-Margret
15. Ageless Body, Timeless Mind	D. Chopra

Fig. 14j



Richard Preston is the author of First Light, about astronomy, which won the American Institute of Physics Award, and American Steel, about the Nucor Coorperation ant its project to build a revolutionary steel mill. He is a regular contributor to The New Yorker. He has also won the A.A.A.S.-Westinghouse Award and the McDermon Award in the Arts from M.I.T.

Fig. 15


TO CABLE SYSTEM
OR SATELLITE DISH
900
904
CONVERTER
PUBLIC
LIBRARY
FILE
SERVER
model A
5000-
book
capacity
COAX
908
LIBRARY CONVERTER
enter # of book
to be loaded____
AC
TO PHONE
JACK
920
CATALOG
OF TITLES
FOR PUBLIC
LIBRARIES
912
PUBLIC
LIBRARY
READER
CONTROLLER
INPUT
916

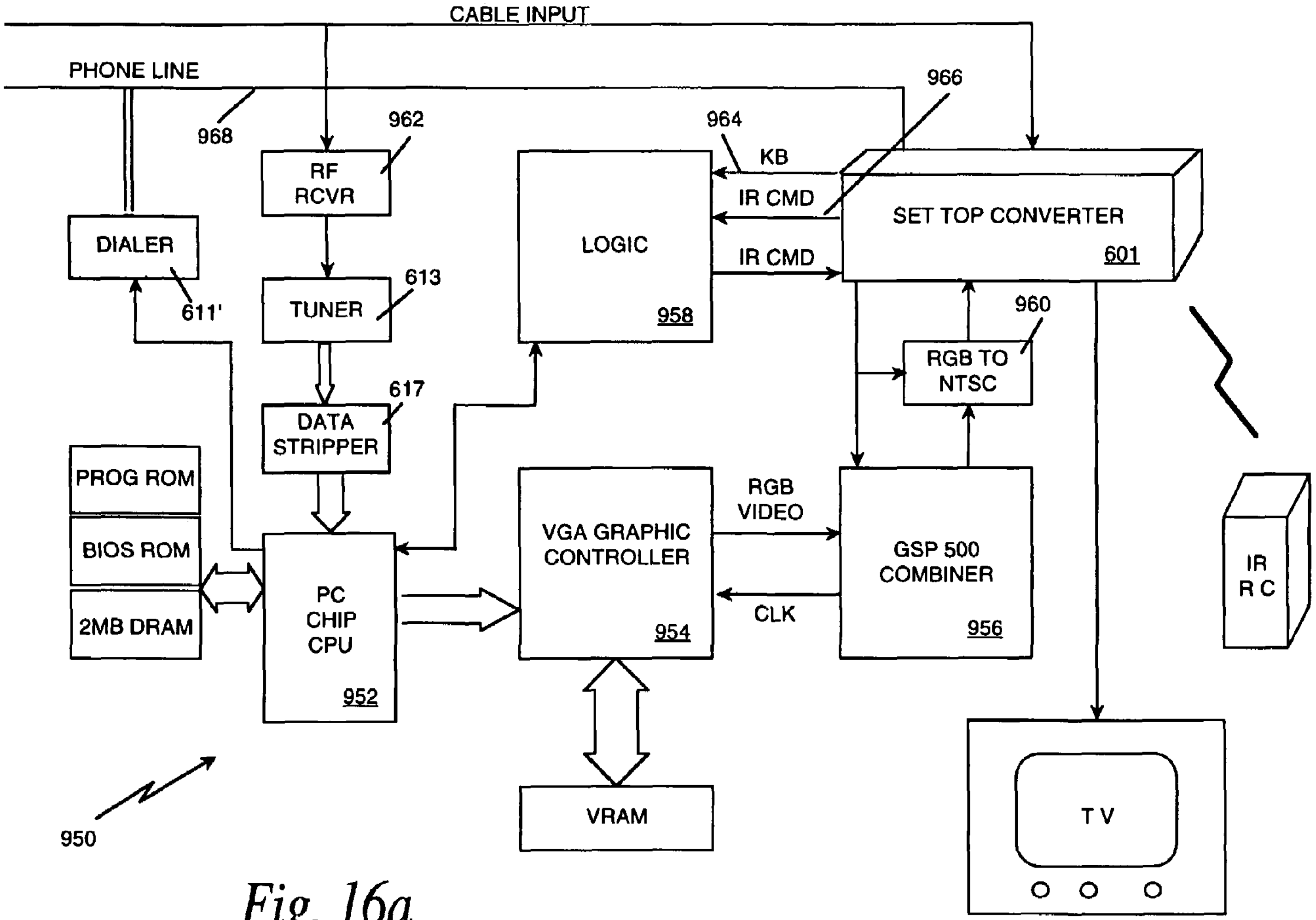

CABLE INPUT
PHONE LINE
968
962
964
966
RF RCVR
DIALER
611'
TUNER
613
DATA STRIPPER
617
LOGIC
958
KB
IR CMD
IR CMD
SET TOP CONVERTER
601
960
RGB TO NTSC
PROG ROM
BIOS ROM
2MB DRAM
PC CHIP CPU
952
VGA GRAPHIC CONTROLLER
954
RGB VIDEO
CLK
GSP 500 COMBINER
956
IR R C
VRAM
T V
950

Fig. 16a

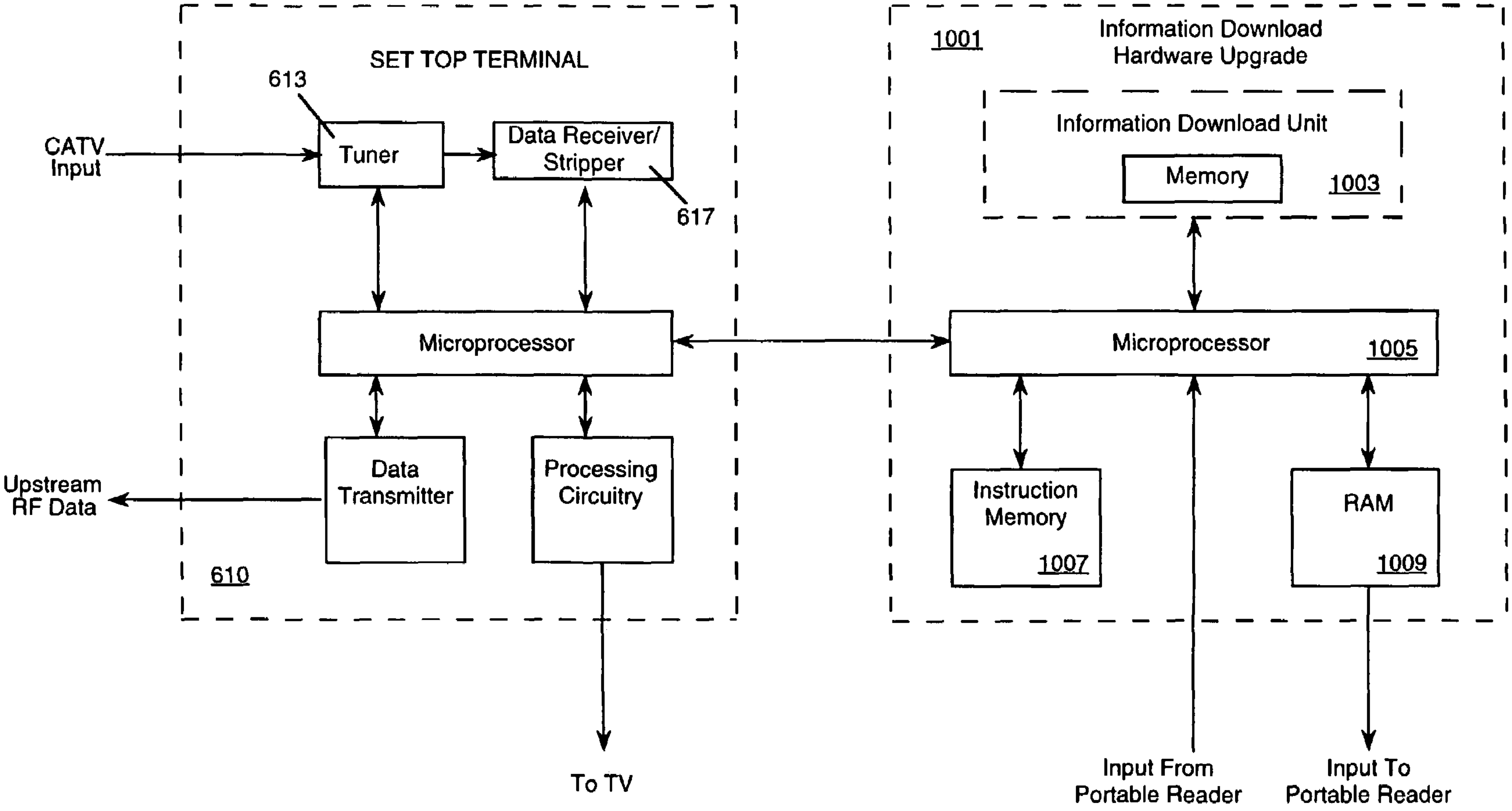

SET TOP TERMINAL
613
CATV Input
Tuner
Data Receiver/ Stripper
617
Microprocessor
Upstream RF Data
Data Transmitter
Processing Circuitry
610
To TV
1001
Information Download Hardware Upgrade
Information Download Unit
Memory
1003
Microprocessor
1005
Instruction Memory
1007
RAM
1009
Input From Portable Reader
Input To Portable Reader

Fig. 16b

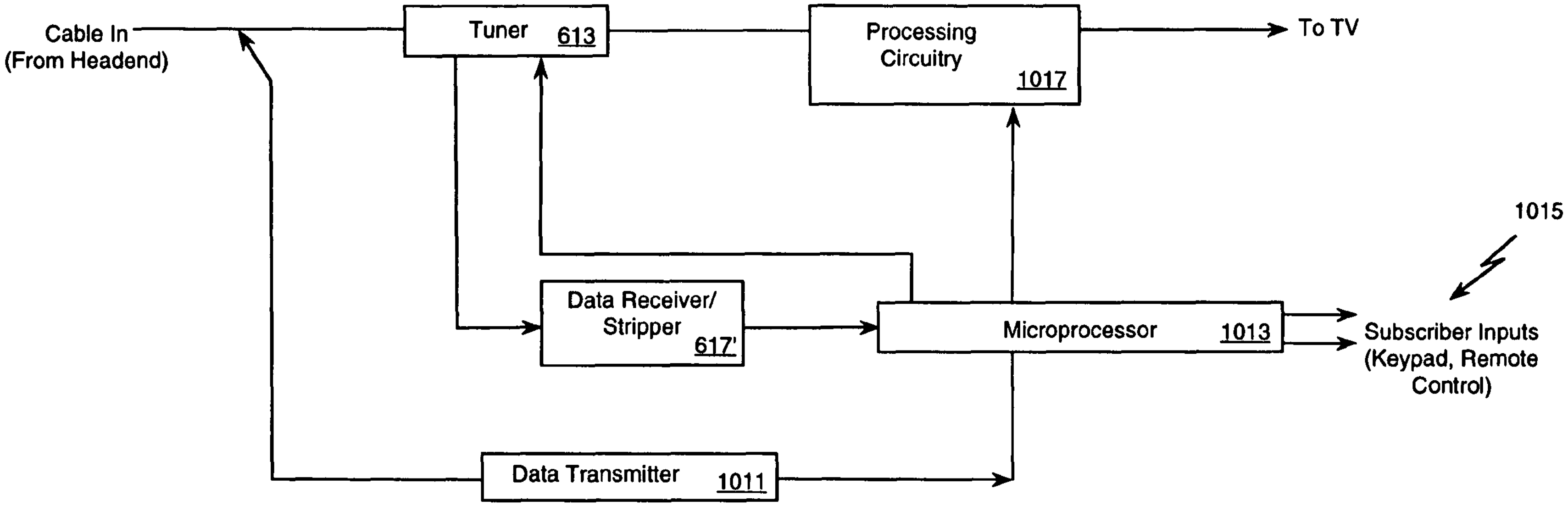

Cable In
(From Headend)
Tuner 613
Processing
Circuitry
1017
To TV
1015
Data Receiver/
Stripper
617'
Microprocessor 1013
Subscriber Inputs
(Keypad, Remote
Control)
Data Transmitter 1011

Fig. 17

Fig. 18a

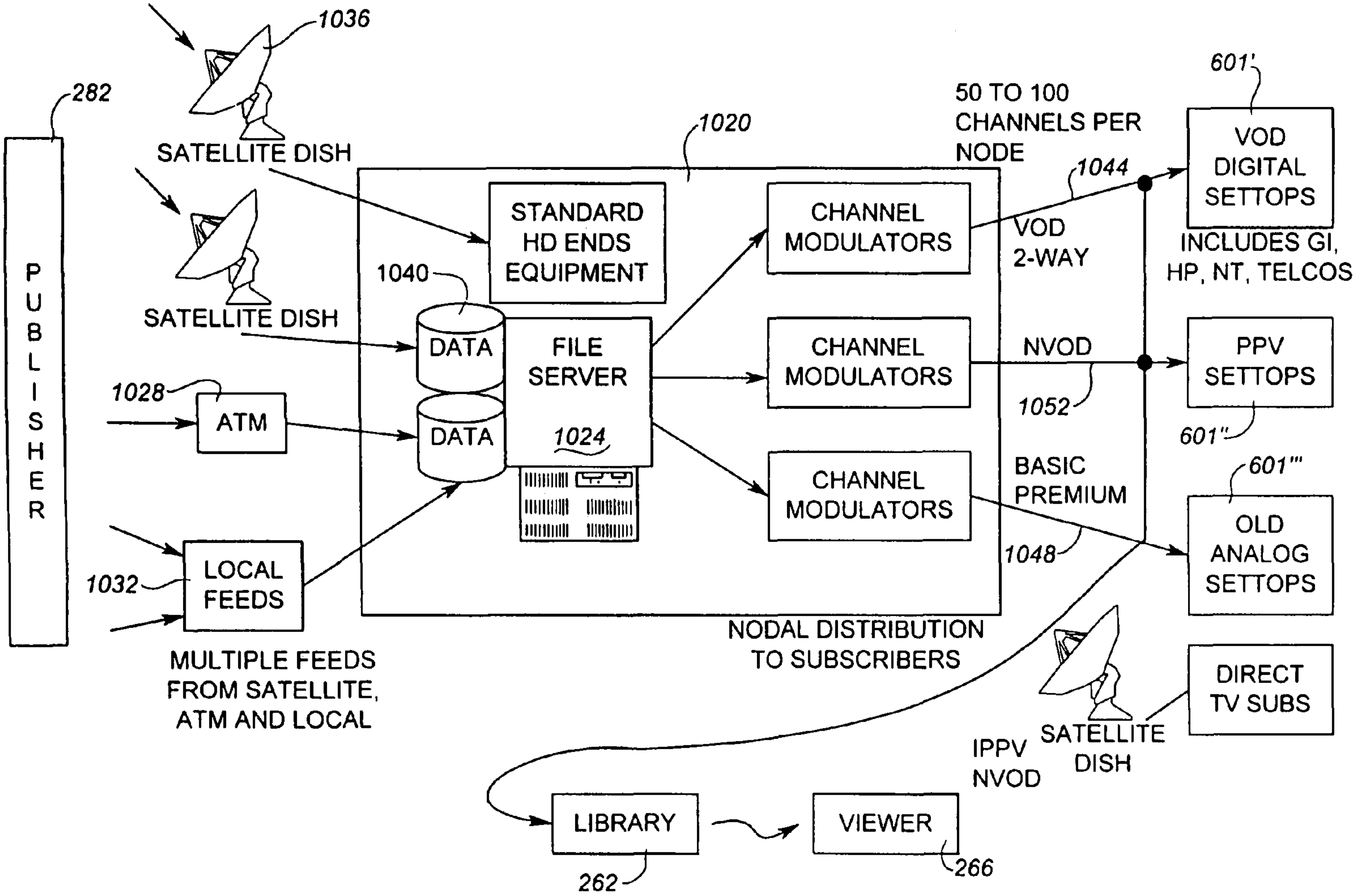
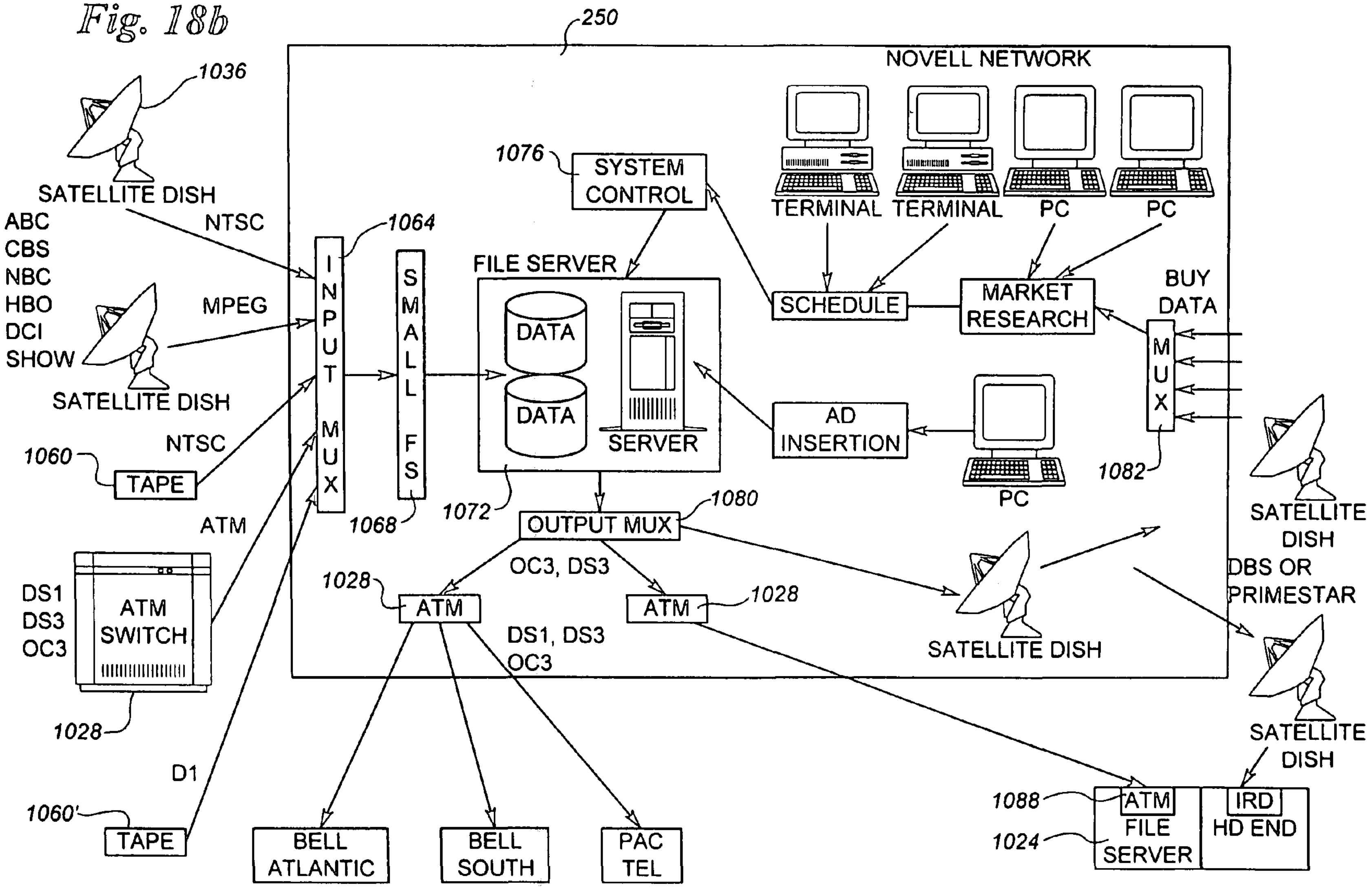

1036
282
SATELLITE DISH
1020
50 TO 100
CHANNELS PER
NODE
601'
VOD
DIGITAL
SETTOPS
1044
STANDARD
HD ENDS
EQUIPMENT
CHANNEL
MODULATORS
VOD
2-WAY
INCLUDES GI,
HP, NT, TELCOS
P
U
B
L
I
S
H
E
R
SATELLITE DISH
1040
DATA
FILE
SERVER
1024
CHANNEL
MODULATORS
NVOD
PPV
SETTOPS
1028
ATM
DATA
1052
601''
BASIC
PREMIUM
CHANNEL
MODULATORS
601'''
OLD
ANALOG
SETTOPS
1048
1032
LOCAL
FEEDS
NODAL DISTRIBUTION
TO SUBSCRIBERS
MULTIPLE FEEDS
FROM SATELLITE,
ATM AND LOCAL
DIRECT
TV SUBS
SATELLITE
DISH
IPPV
NVOD
LIBRARY
262
VIEWER
266

Fig. 18b


250
NOVELL NETWORK
1036
SATELLITE DISH
ABC
CBS
NBC
HBO
DCI
SHOW
NTSC
MPEG
SATELLITE DISH
1060
TAPE
NTSC
ATM
DS1
DS3
OC3
ATM SWITCH
1028
D1
1060'
TAPE
1064
INPUT MUX
SMALL FS
1068
1076
SYSTEM CONTROL
FILE SERVER
DATA
DATA
SERVER
1072
TERMINAL
TERMINAL
PC
PC
SCHEDULE
MARKET RESEARCH
BUY DATA
MUX
1082
AD INSERTION
PC
OUTPUT MUX
1080
OC3, DS3
1028
ATM
ATM
1028
DS1, DS3
OC3
SATELLITE DISH
SATELLITE DISH
DBS OR PRIMESTAR
SATELLITE DISH
BELL ATLANTIC
BELL SOUTH
PAC TEL
1088
1024
ATM
FILE SERVER
IRD
HD END

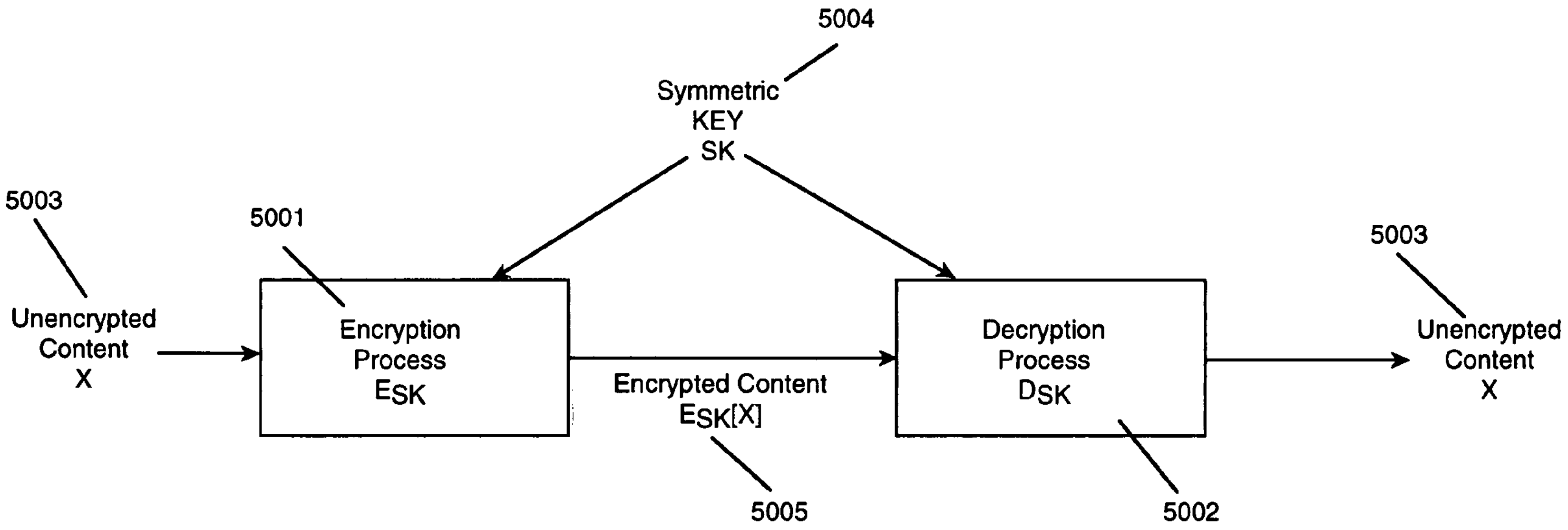

5004
Symmetric
KEY
SK
5003
Unencrypted
Content
X
5001
Encryption
Process
E_{SK}
Encrypted Content
$E_{SK}[X]$
5005
Decryption
Process
D_{SK}
5002
5003
Unencrypted
Content
X

Fig. 19a

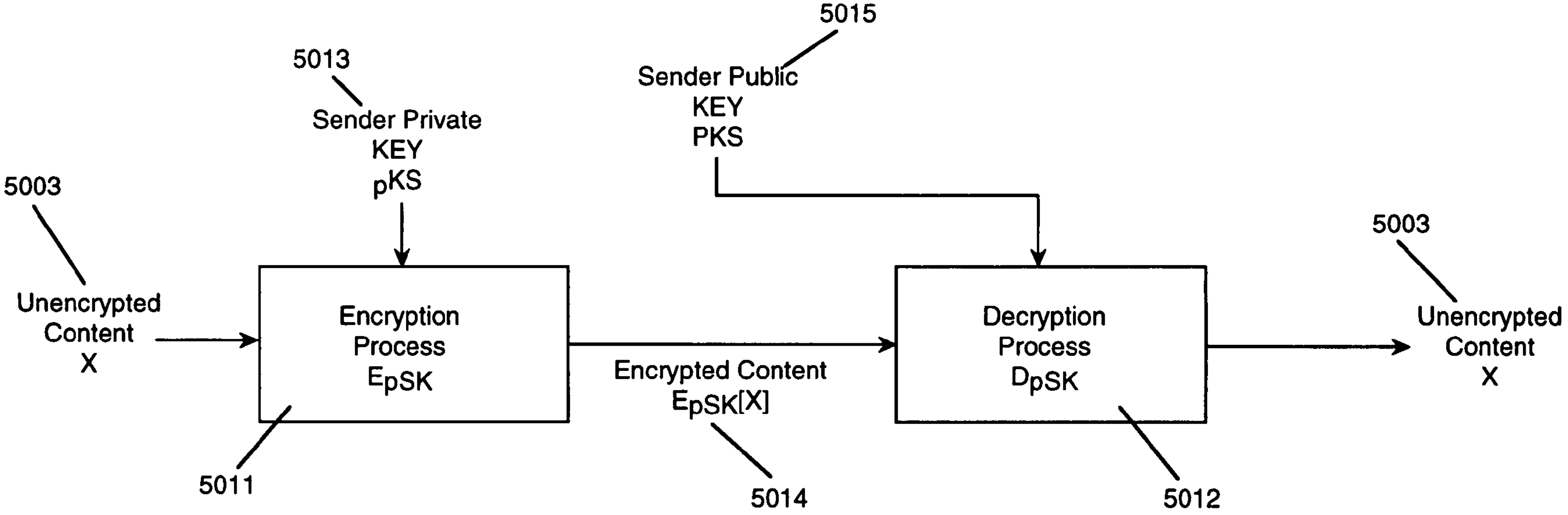

5015
5013
Sender Private
KEY
pKS
Sender Public
KEY
PKS
5003
5003
Unencrypted
Content
X
Encryption
Process
EpSK
Encrypted Content
EpSK[X]
Decryption
Process
DpSK
Unencrypted
Content
X
5011
5014
5012

Fig. 19b

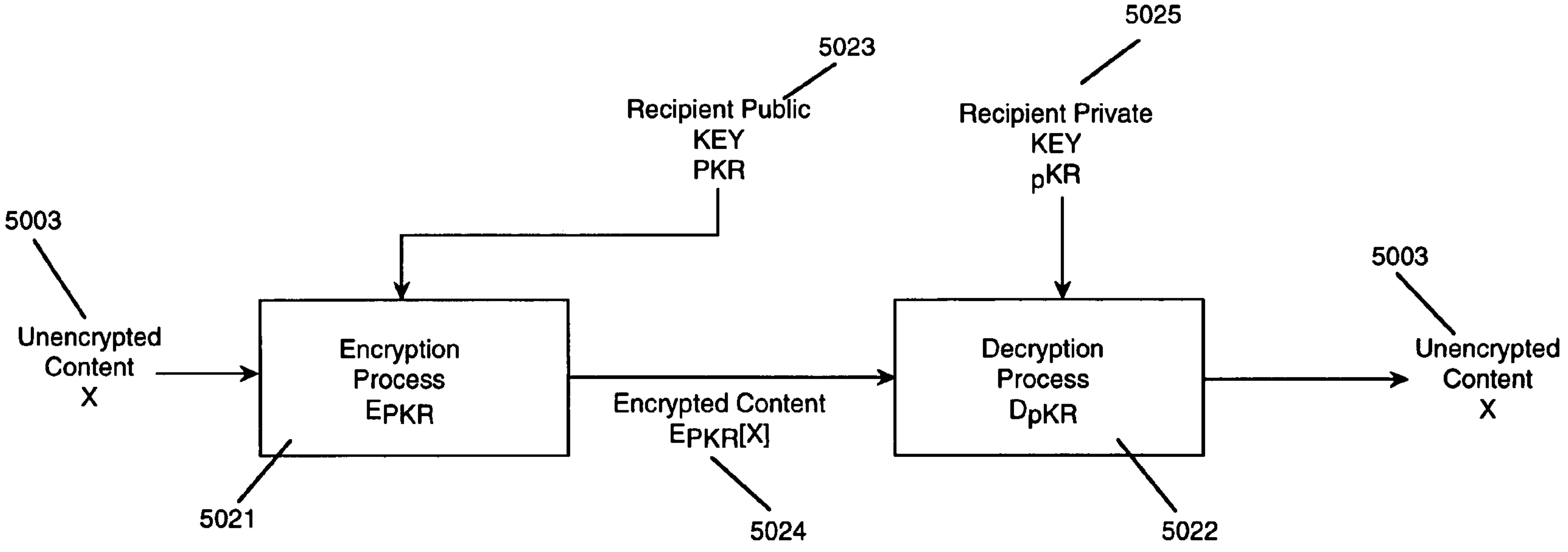

5023
Recipient Public
KEY
PKR
5025
Recipient Private
KEY
pKR
5003
Unencrypted
Content
X
Encryption
Process
EPKR
Encrypted Content
EPKR[X]
Decryption
Process
DpKR
5003
Unencrypted
Content
X
5021
5024
5022

Fig. 19c

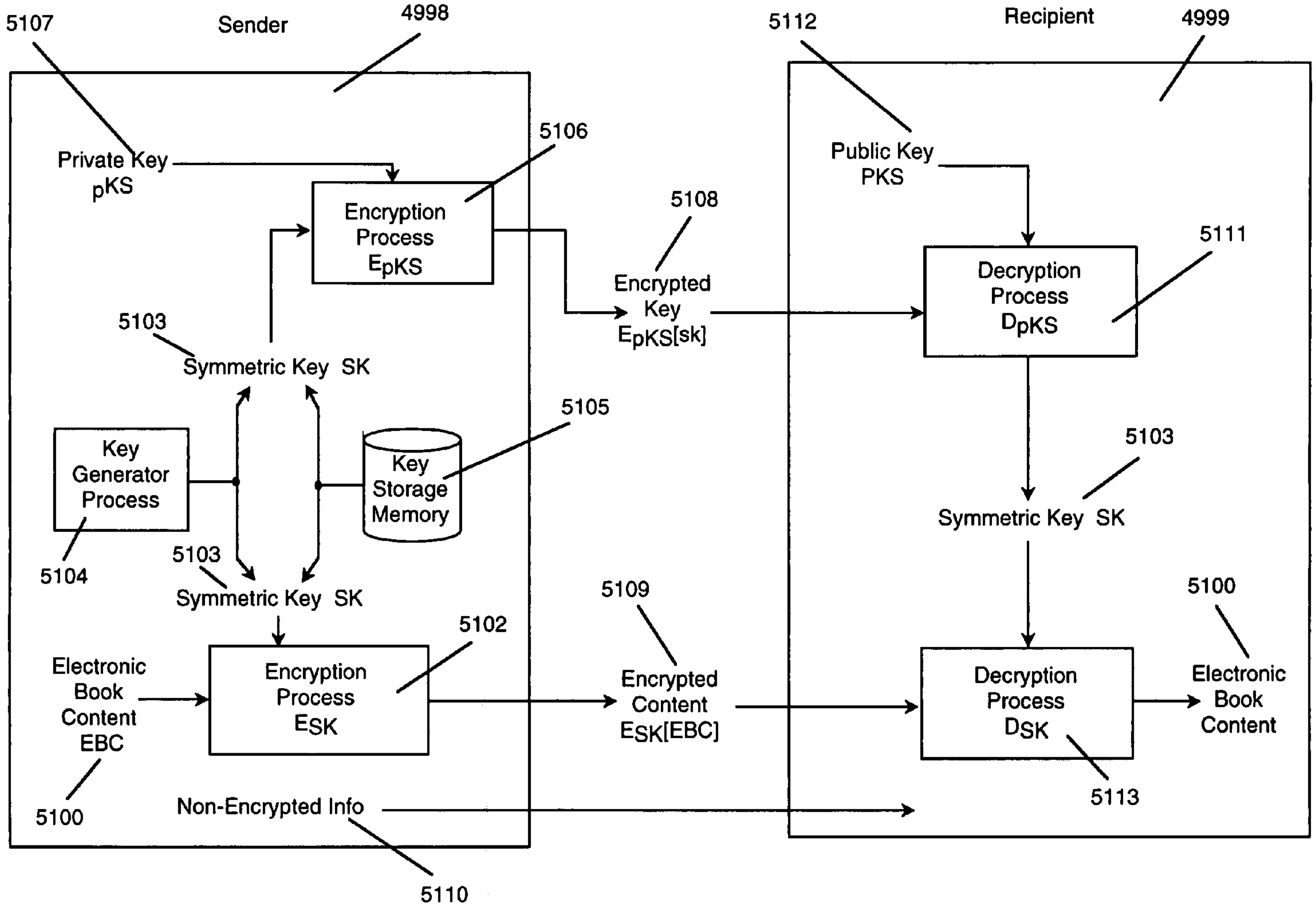

5107
Sender
4998
Private Key
pKS
5106
Encryption
Process
EpKS
5103
Symmetric Key SK
Key
Generator
Process
5104
Key
Storage
Memory
5105
5103
Symmetric Key SK
5102
Electronic
Book
Content
EBC
Encryption
Process
ESK
5100
Non-Encrypted Info
5110
5108
Encrypted
Key
EpKS[sk]
5109
Encrypted
Content
ESK[EBC]
5112
Recipient
4999
Public Key
PKS
5111
Decryption
Process
DpKS
5103
Symmetric Key SK
5100
Decryption
Process
DSK
5113
Electronic
Book
Content

Fig. 20

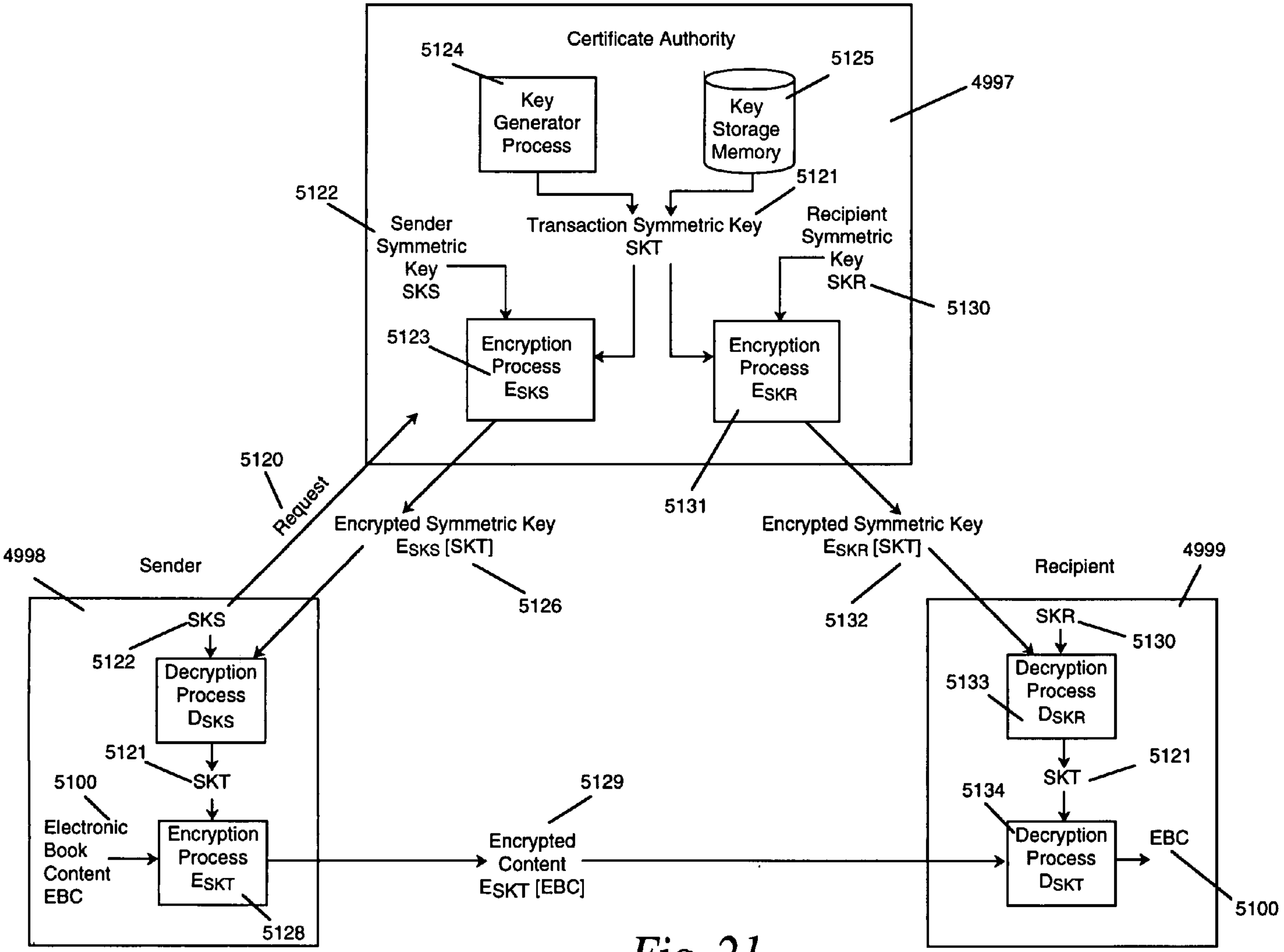

Certificate Authority
4997
5124
Key Generator Process
5125
Key Storage Memory
5121
Transaction Symmetric Key SKT
5122
Sender Symmetric Key SKS
Recipient Symmetric Key SKR
5130
5123
Encryption Process ESKS
Encryption Process ESKR
5131
5120
Request
Encrypted Symmetric Key ESKS [SKT]
5126
Encrypted Symmetric Key ESKR [SKT]
5132
4998
Sender
SKS
5122
Decryption Process DSKS
5121
SKT
5100
Electronic Book Content EBC
Encryption Process ESKT
5128
5129
Encrypted Content ESKT [EBC]
4999
Recipient
SKR
5130
5133
Decryption Process DSKR
5121
SKT
5134
Decryption Process DSKT
EBC
5100

Fig. 21

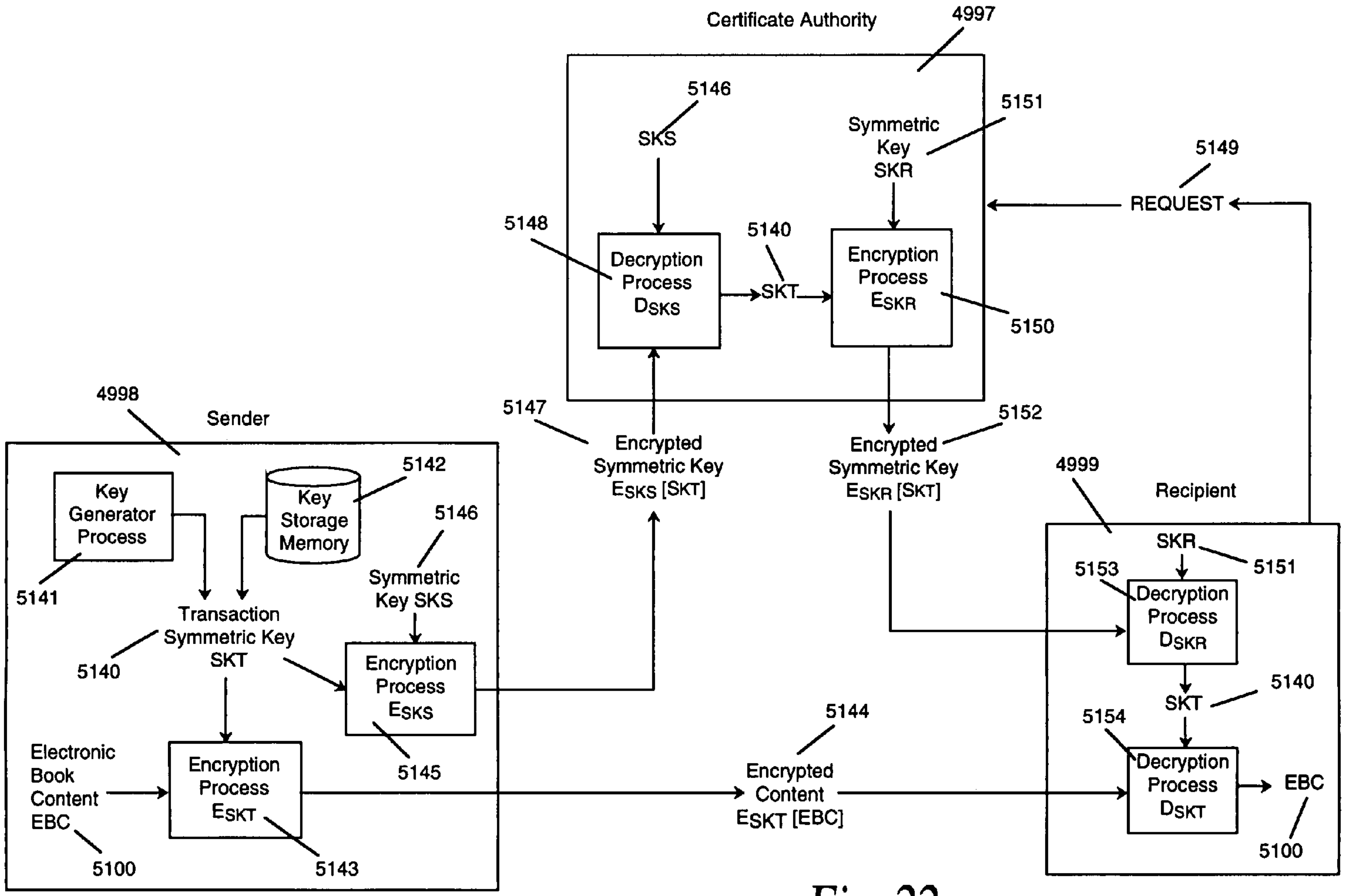

Certificate Authority
4997
5146
SKS
5151
Symmetric Key SKR
5149
REQUEST
5148
Decryption Process DSKS
5140
SKT
Encryption Process ESKR
5150
4998
Sender
5147
Encrypted Symmetric Key ESKS [SKT]
Encrypted Symmetric Key ESKR [SKT]
5152
Key Generator Process
Key Storage Memory
5142
5146
Symmetric Key SKS
5141
Transaction Symmetric Key SKT
5140
Encryption Process ESKS
5145
4999
Recipient
SKR
5151
5153
Decryption Process DSKR
SKT
5140
5154
Decryption Process DSKT
EBC
5100
Electronic Book Content EBC
5100
Encryption Process ESKT
5143
5144
Encrypted Content ESKT [EBC]

Fig. 22

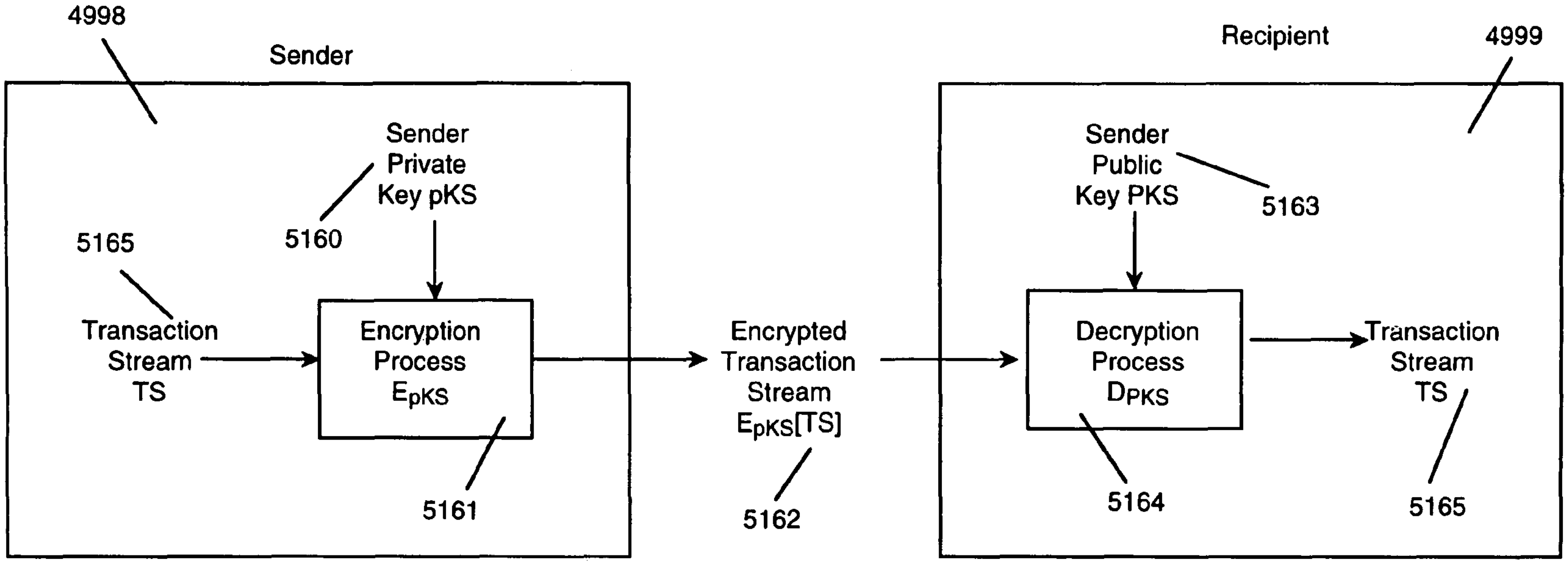

4998
Sender
Sender Private Key pKS
5160
5165
Transaction Stream TS
Encryption Process E_{pKS}
5161
Encrypted Transaction Stream $E_{pKS}[TS]$
5162
Recipient
4999
Sender Public Key PKS
5163
Decryption Process D_{PKS}
5164
Transaction Stream TS
5165

Fig. 23a

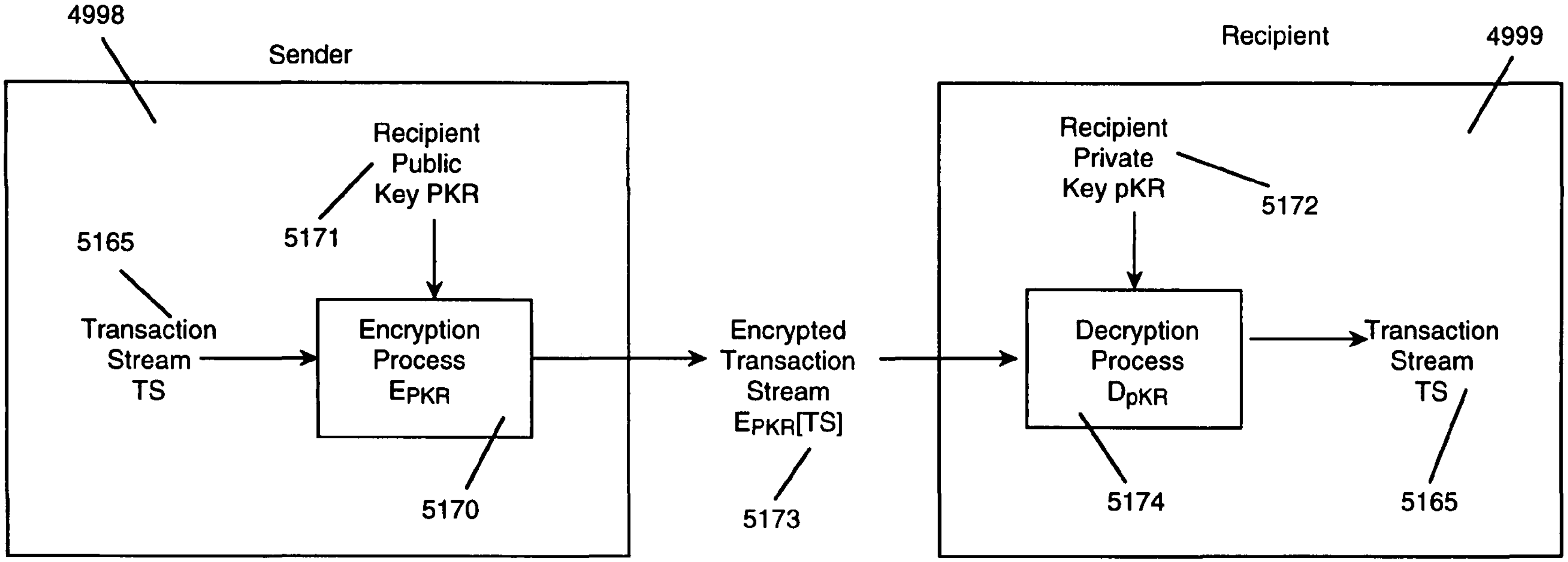

4998
Sender
Recipient
Public
Key PKR
5171
5165
Transaction
Stream
TS
Encryption
Process
E_{PKR}
5170
Encrypted
Transaction
Stream
$E_{PKR}[TS]$
5173
Recipient
4999
Recipient
Private
Key pKR
5172
Decryption
Process
D_{pKR}
5174
Transaction
Stream
TS
5165

Fig. 23b

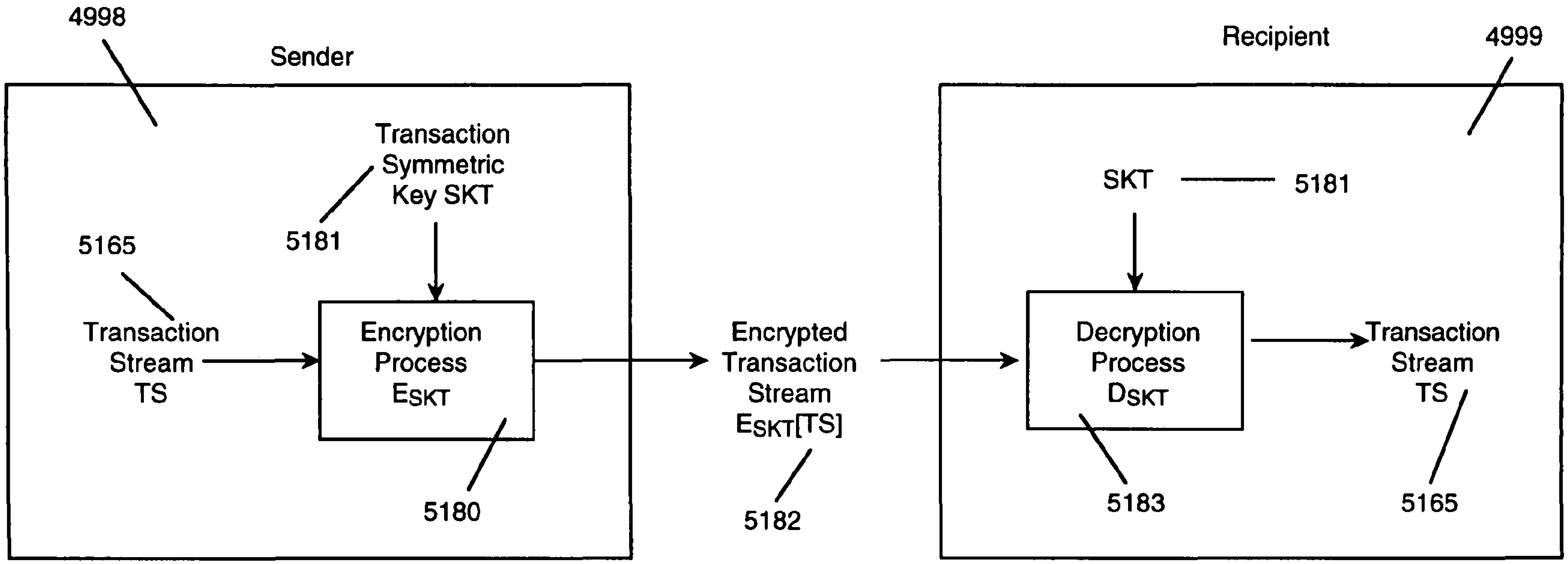

4998
Sender
Transaction Symmetric Key SKT
5181
5165
Transaction Stream TS
Encryption Process E_{SKT}
5180
Encrypted Transaction Stream $E_{SKT}[TS]$
5182
Recipient
4999
SKT
5181
Decryption Process D_{SKT}
5183
Transaction Stream TS
5165

Fig. 23c

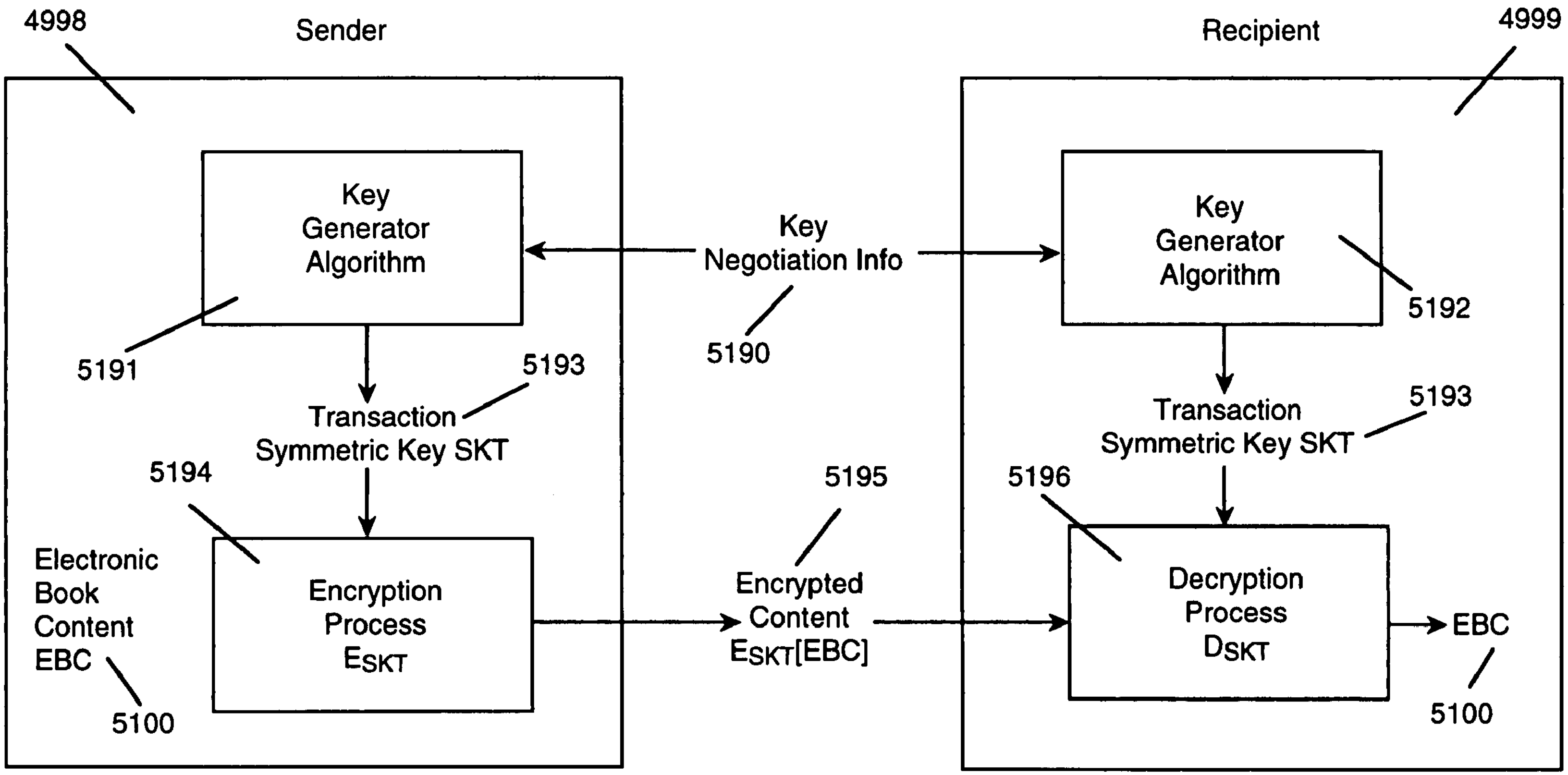

4998
Sender
Recipient
4999
Key Generator Algorithm
5191
Key Negotiation Info
5190
Key Generator Algorithm
5192
Transaction Symmetric Key SKT
5193
Transaction Symmetric Key SKT
5193
5194
5195
5196
Electronic Book Content EBC
5100
Encryption Process E_{SKT}
Encrypted Content E_{SKT}[EBC]
Decryption Process D_{SKT}
EBC
5100

Fig. 24a

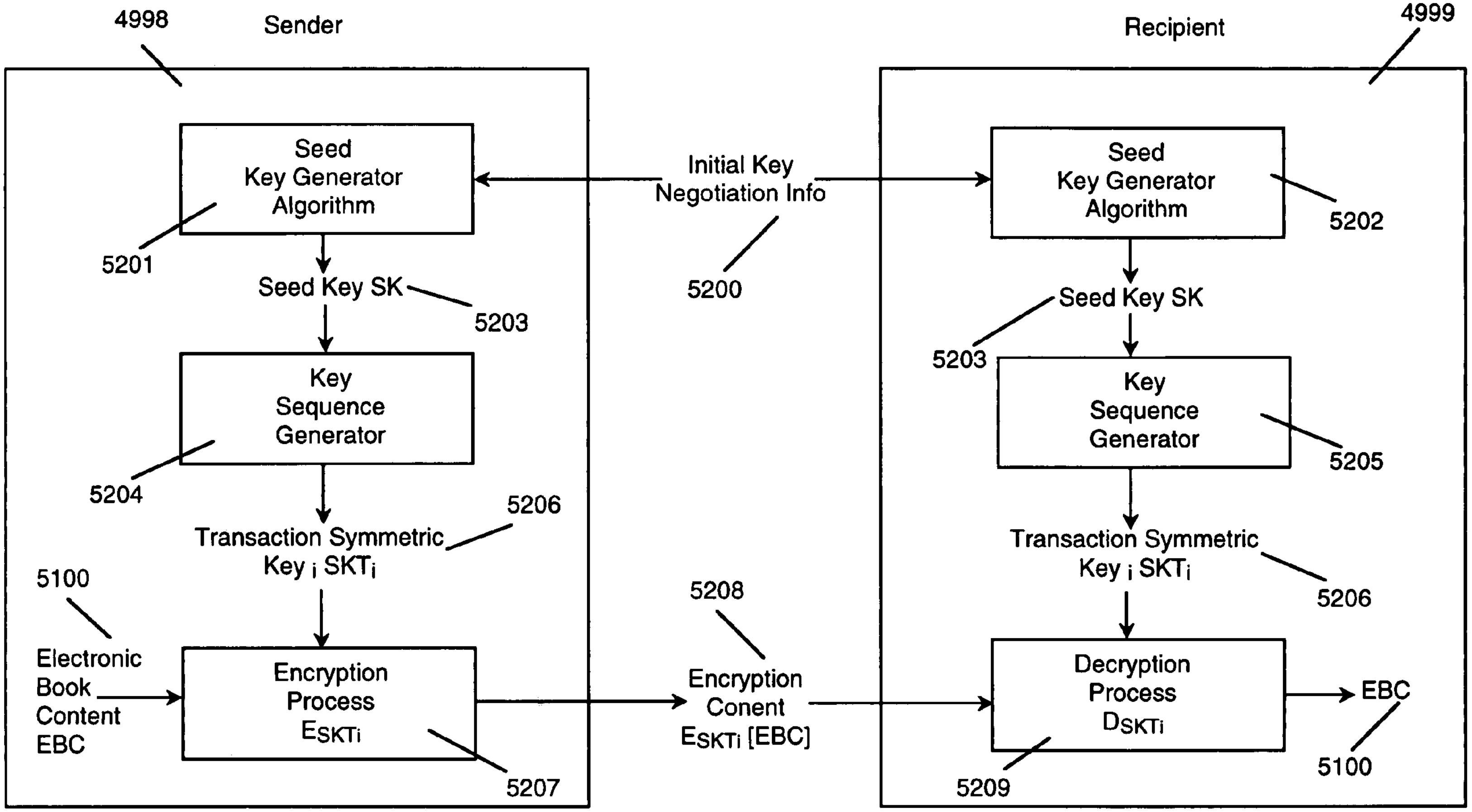

4998
Sender
Recipient
4999
Seed
Key Generator
Algorithm
5201
Initial Key
Negotiation Info
5200
Seed
Key Generator
Algorithm
5202
Seed Key SK
5203
Seed Key SK
5203
Key
Sequence
Generator
5204
Key
Sequence
Generator
5205
5206
Transaction Symmetric
Key i SKTi
Transaction Symmetric
Key i SKTi
5206
5100
Electronic
Book
Content
EBC
5208
Encryption
Process
ESKTi
5207
Encryption
Conent
ESKTi [EBC]
Decryption
Process
DSKTi
5209
EBC
5100

Fig. 24b

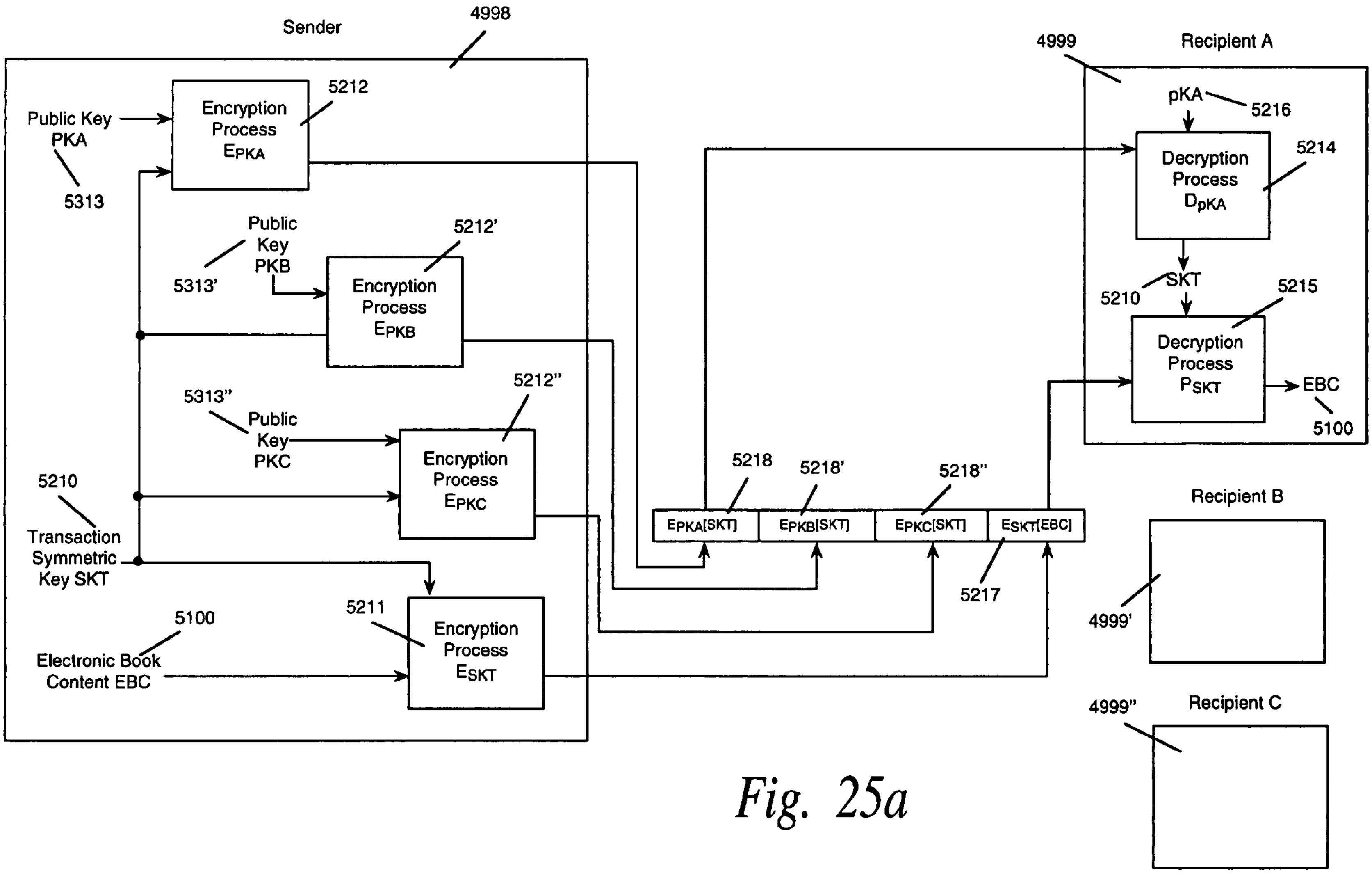

Sender
4998
Public Key
PKA
5313
Encryption
Process
EPKA
5212
Public
Key
PKB
5313'
Encryption
Process
EPKB
5212'
5313"
Public
Key
PKC
Encryption
Process
EPKC
5212"
5210
Transaction
Symmetric
Key SKT
5100
Electronic Book
Content EBC
5211
Encryption
Process
ESKT
5218
5218'
5218"
EPKA[SKT]
EPKB[SKT]
EPKC[SKT]
ESKT[EBC]
5217
4999
Recipient A
pKA
5216
Decryption
Process
DpKA
5214
5210
SKT
5215
Decryption
Process
PSKT
EBC
5100
Recipient B
4999'
4999"
Recipient C

Fig. 25a

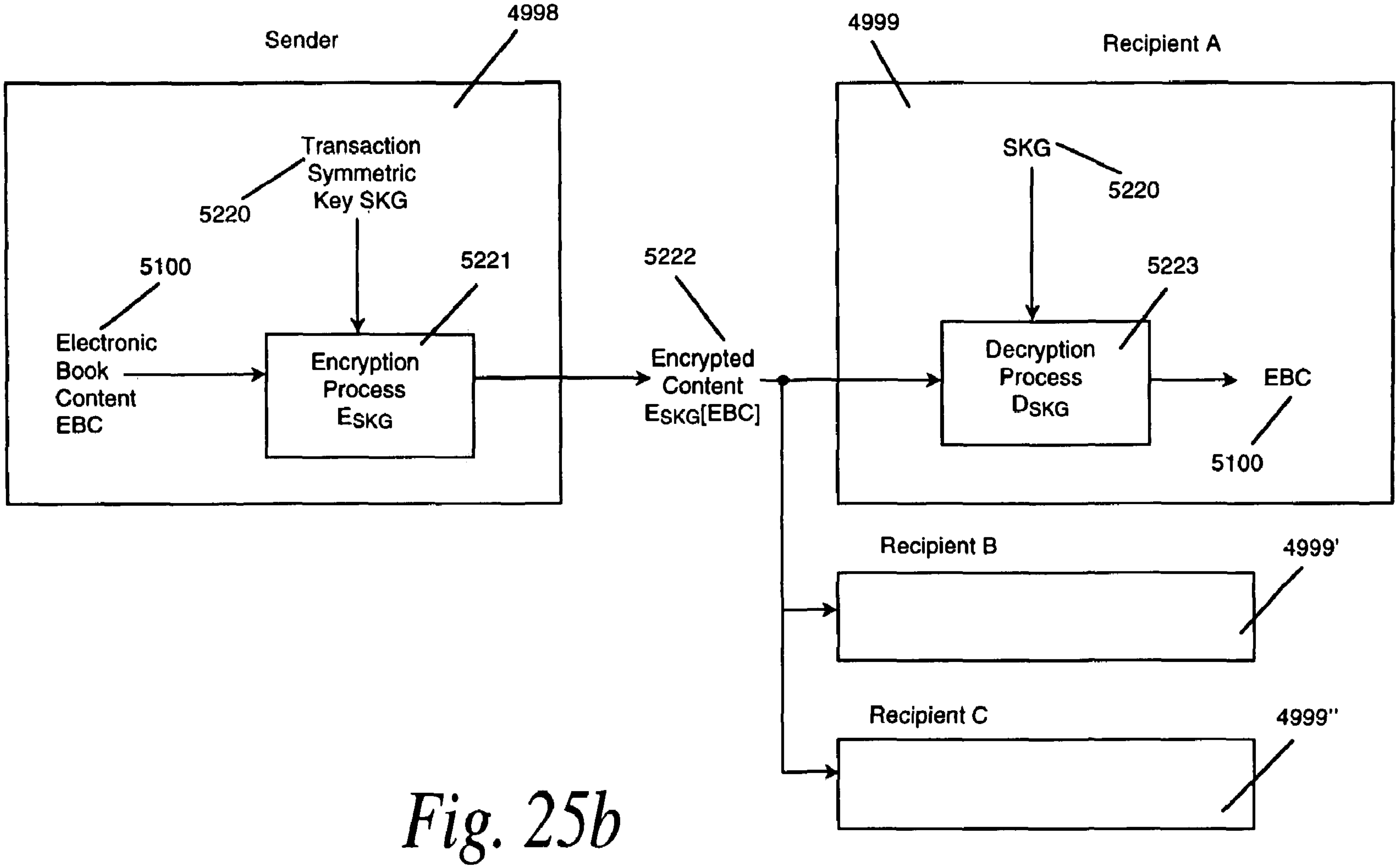

Sender
4998
Transaction Symmetric Key SKG
5220
5100
5221
Electronic Book Content EBC
Encryption Process E_{SKG}
5222
Encrypted Content E_{SKG}[EBC]
4999
Recipient A
SKG
5220
5223
Decryption Process D_{SKG}
EBC
5100
Recipient B
4999'
Recipient C
4999''

Fig. 25b

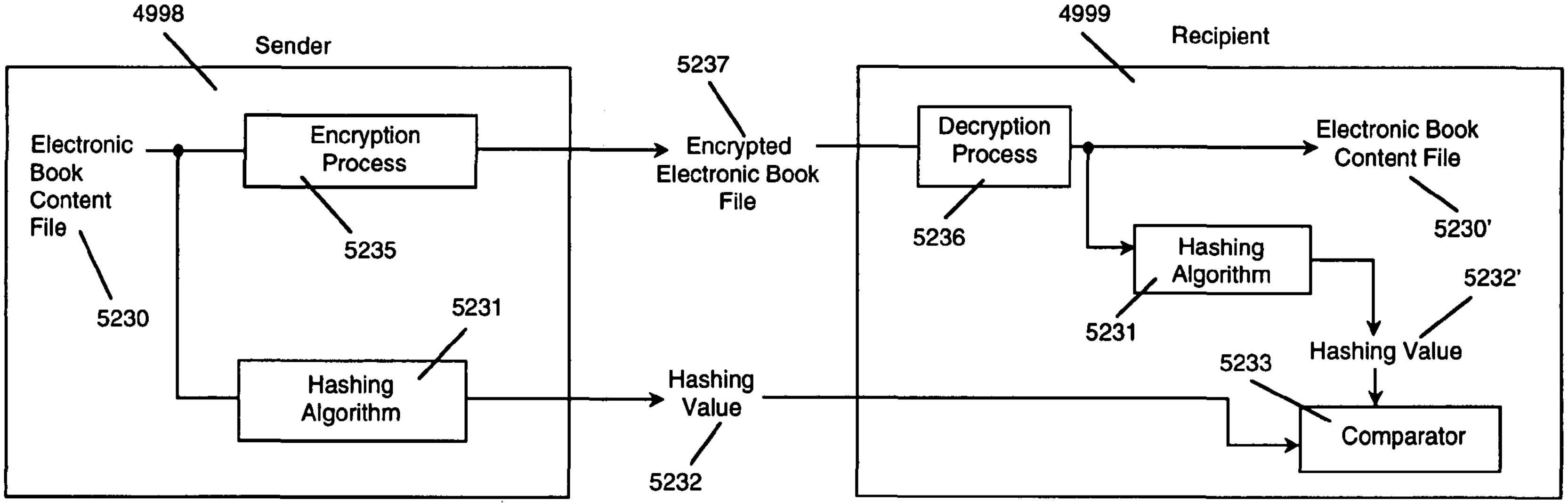

4998
Sender
Electronic Book Content File
5230
Encryption Process
5235
5231
Hashing Algorithm
5237
Encrypted Electronic Book File
Hashing Value
5232
4999
Recipient
Decryption Process
5236
Electronic Book Content File
5230'
Hashing Algorithm
5231
5232'
Hashing Value
5233
Comparator

Fig. 26

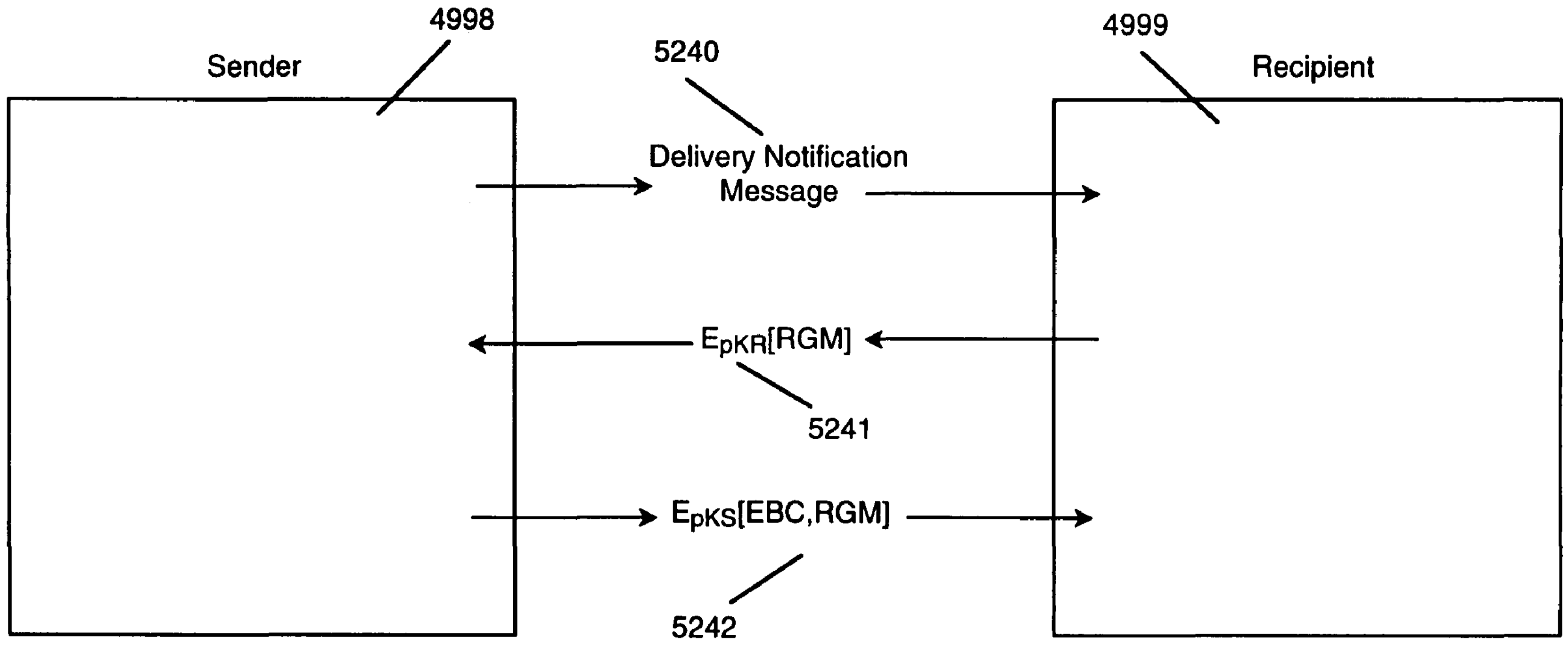

4998
Sender
5240
Delivery Notification Message
4999
Recipient
$E_{pKR}[RGM]$
5241
$E_{pKS}[EBC,RGM]$
5242

Fig. 27

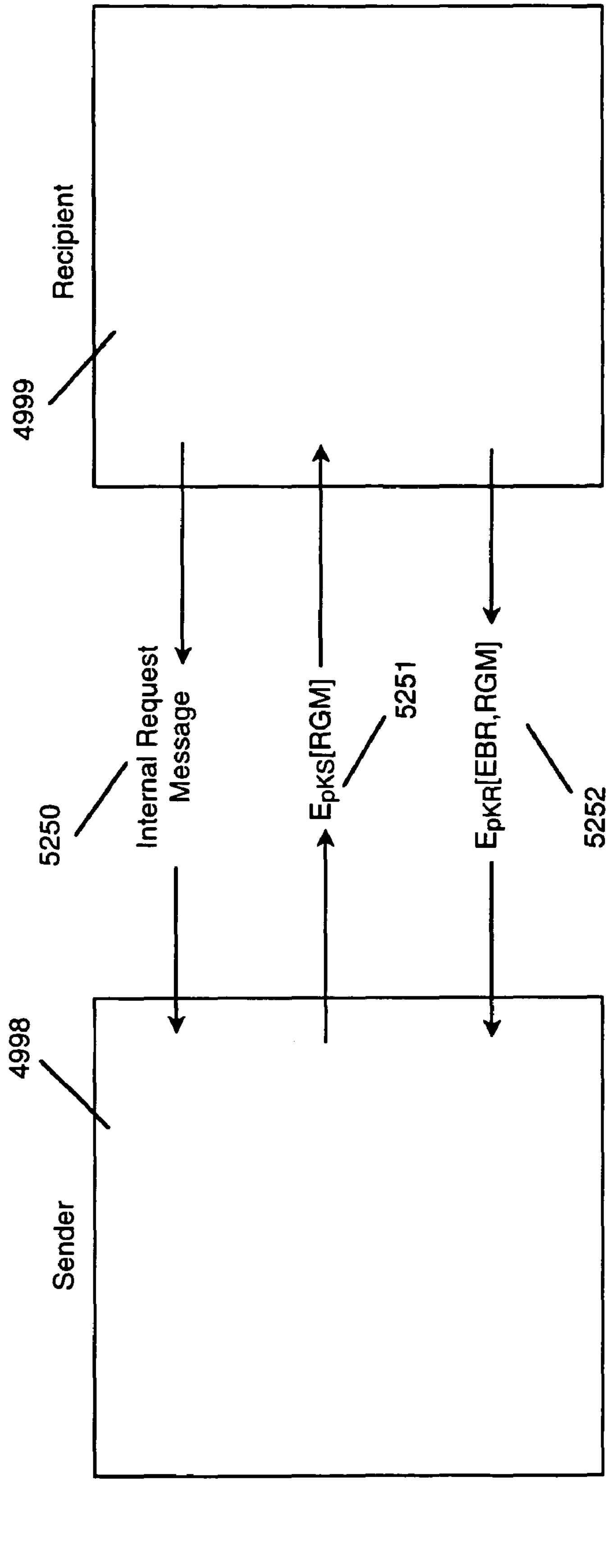

Recipient
4999
Internal Request Message
5250
E_{pKS}[RGM]
5251
E_{pKR}[EBR,RGM]
5252
4998
Sender

Fig. 28

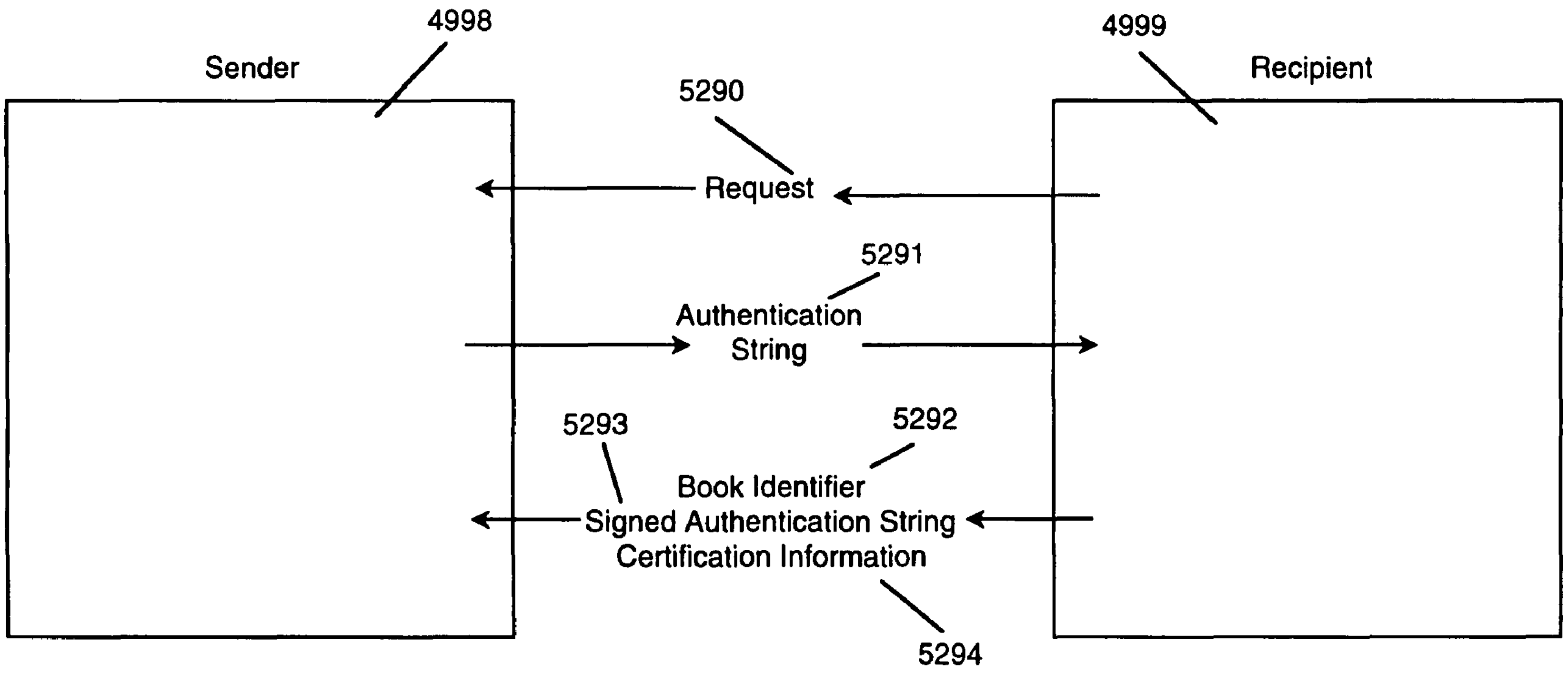

4998
Sender
4999
Recipient
5290
Request
5291
Authentication String
5293
5292
Book Identifier
Signed Authentication String
Certification Information
5294

Fig. 29

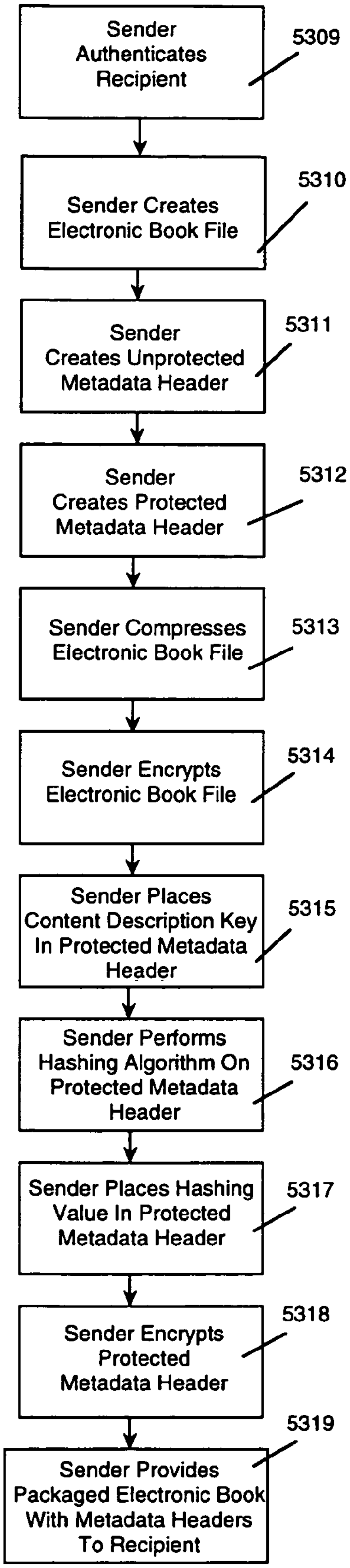

Sender Authenticates Recipient
5309
Sender Creates Electronic Book File
5310
Sender Creates Unprotected Metadata Header
5311
Sender Creates Protected Metadata Header
5312
Sender Compresses Electronic Book File
5313
Sender Encrypts Electronic Book File
5314
Sender Places Content Description Key In Protected Metadata Header
5315
Sender Performs Hashing Algorithm On Protected Metadata Header
5316
Sender Places Hashing Value In Protected Metadata Header
5317
Sender Encrypts Protected Metadata Header
5318
Sender Provides Packaged Electronic Book With Metadata Headers To Recipient
5319

Fig. 30

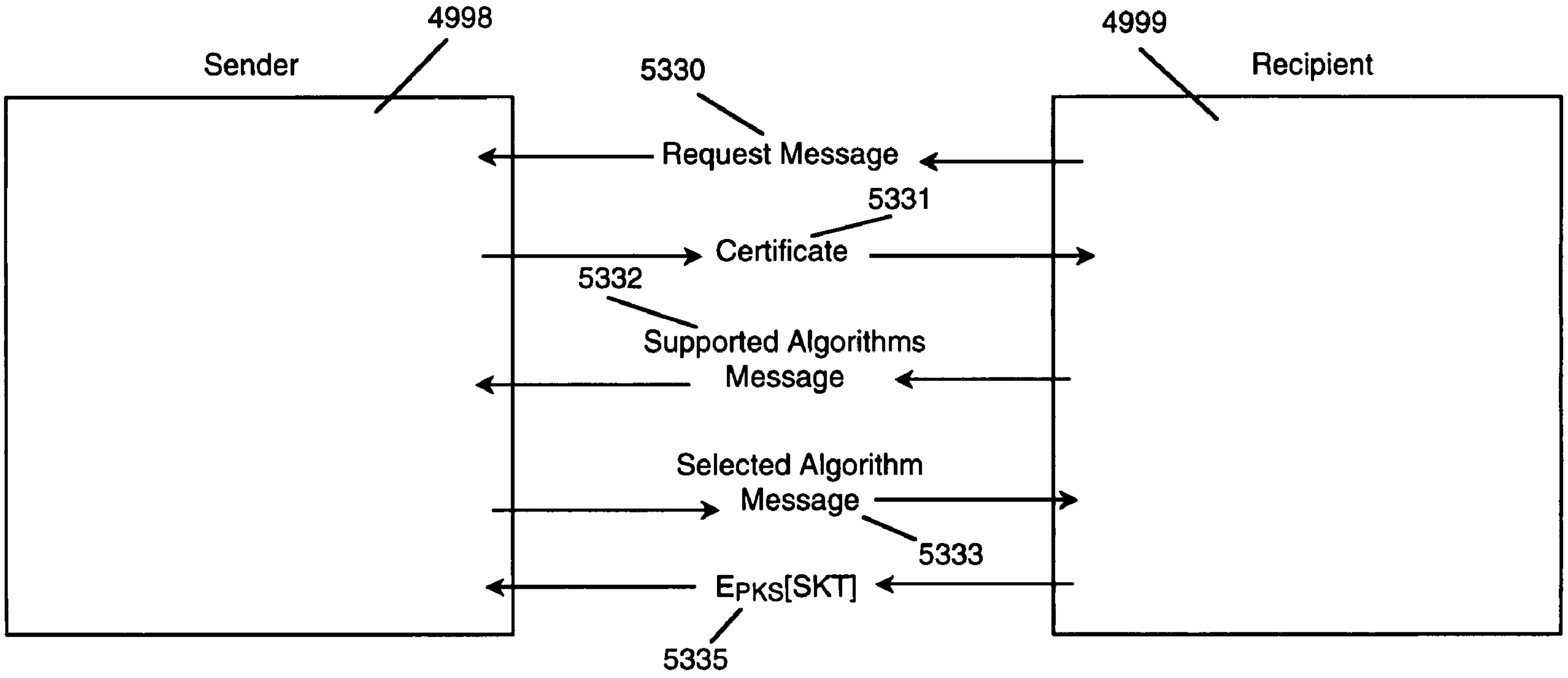

4998
Sender
5330
4999
Recipient
Request Message
5331
Certificate
5332
Supported Algorithms Message
Selected Algorithm Message
5333
E_PKS[SKT]
5335

Fig. 31

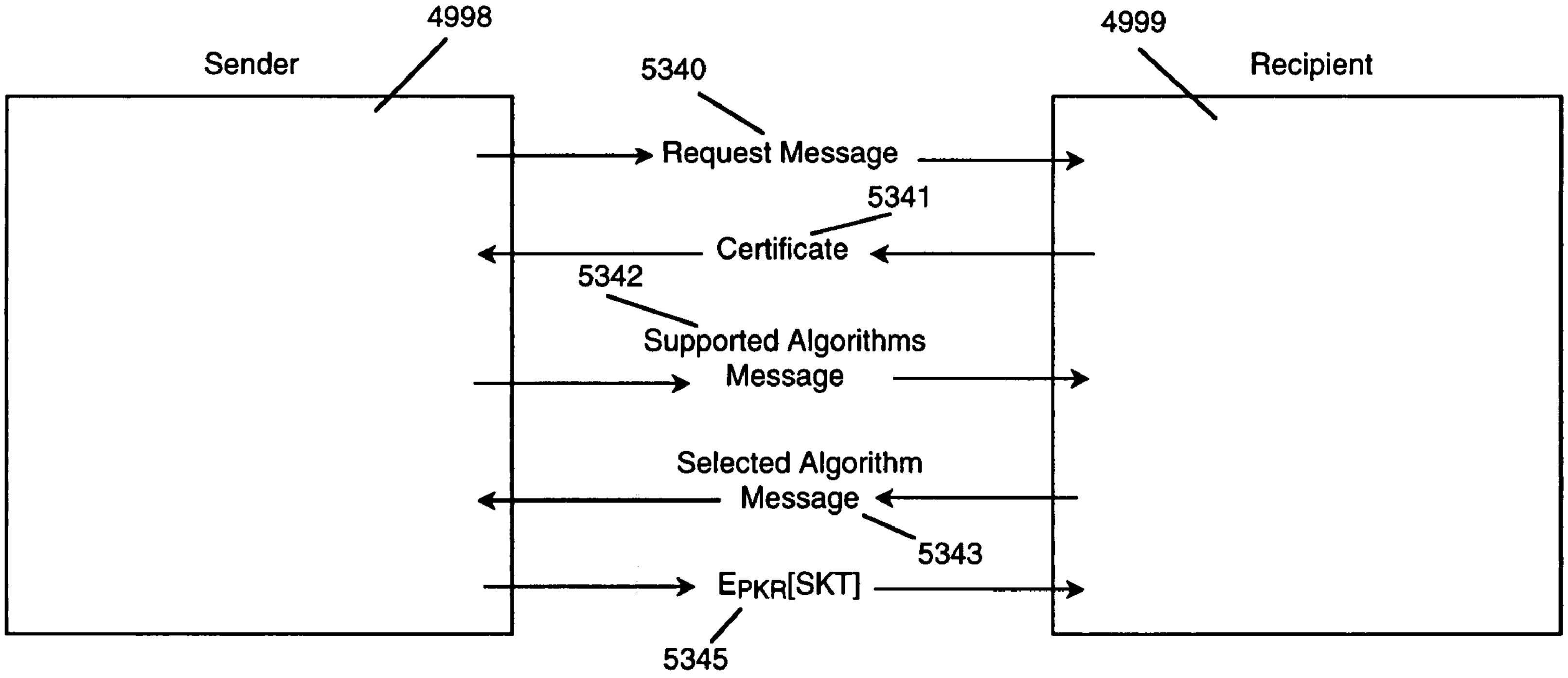

4998
Sender
4999
Recipient
5340
Request Message
5341
Certificate
5342
Supported Algorithms Message
Selected Algorithm Message
5343
EPKR[SKT]
5345

Fig. 32

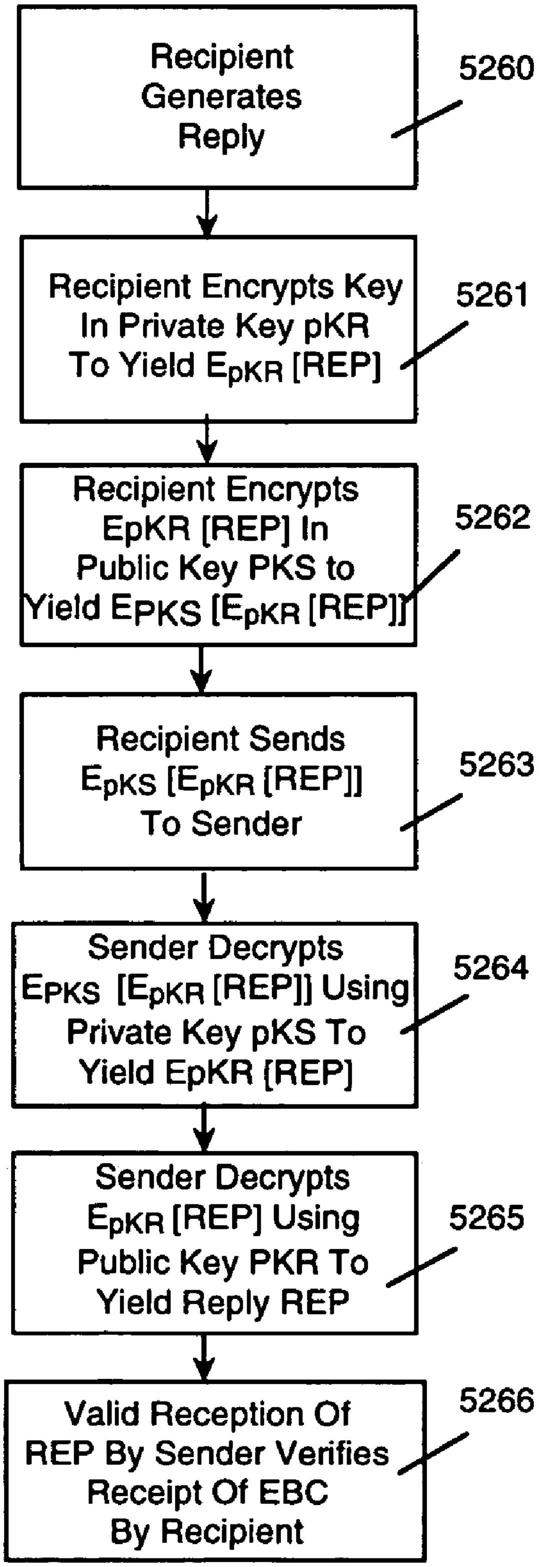

Recipient Generates Reply
5260
Recipient Encrypts Key In Private Key pKR To Yield E_{pKR} [REP]
5261
Recipient Encrypts EpKR [REP] In Public Key PKS to Yield E_{PKS} [E_{pKR} [REP]]
5262
Recipient Sends E_{pKS} [E_{pKR} [REP]] To Sender
5263
Sender Decrypts E_{PKS} [E_{pKR} [REP]] Using Private Key pKS To Yield EpKR [REP]
5264
Sender Decrypts E_{pKR} [REP] Using Public Key PKR To Yield Reply REP
5265
Valid Reception Of REP By Sender Verifies Receipt Of EBC By Recipient
5266

Fig. 33

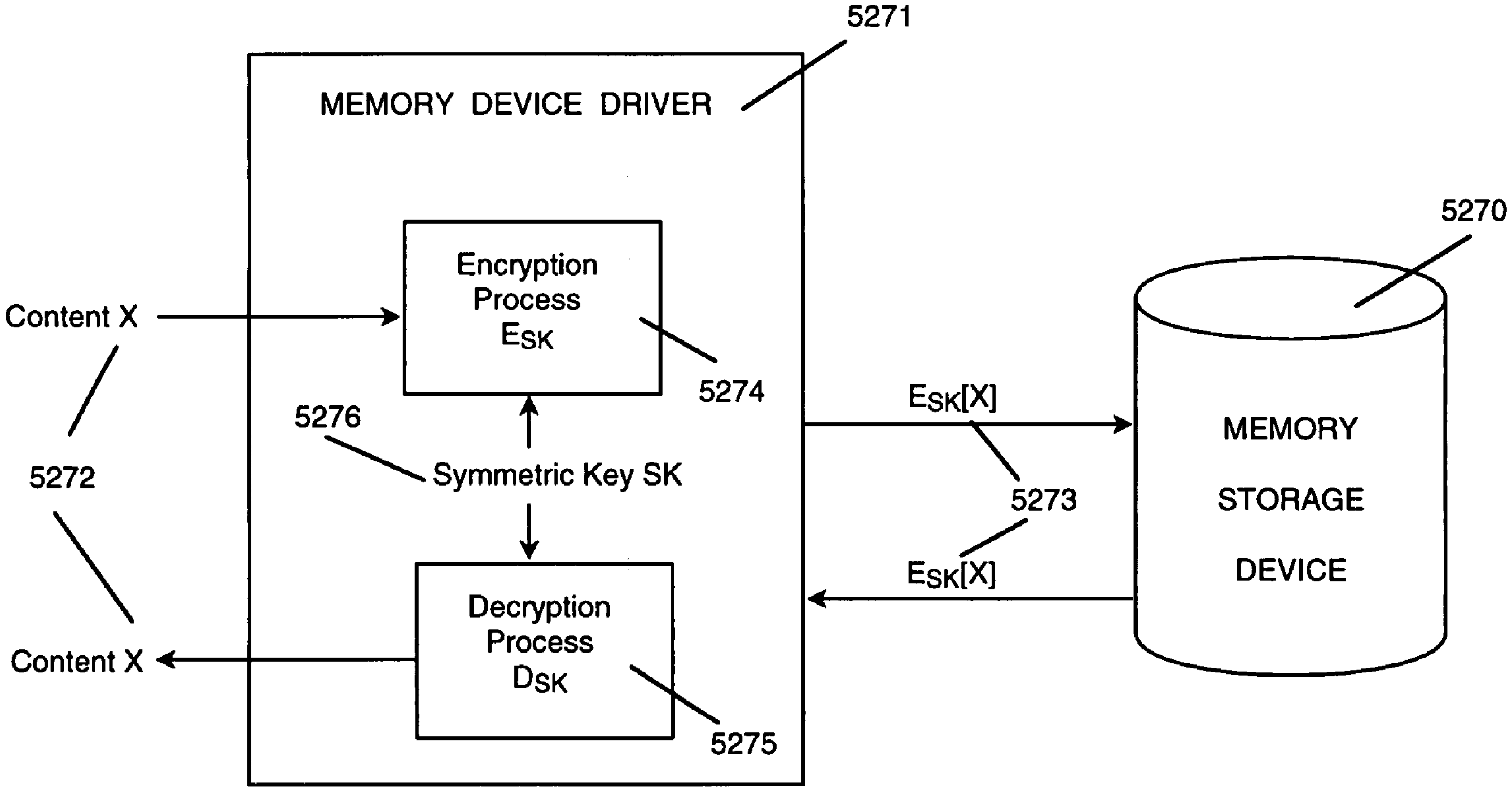

5271
MEMORY DEVICE DRIVER
Encryption Process E_{SK}
5274
Content X
5272
5276
Symmetric Key SK
Decryption Process D_{SK}
5275
Content X
$E_{SK}[X]$
5273
$E_{SK}[X]$
5270
MEMORY STORAGE DEVICE

Fig. 34

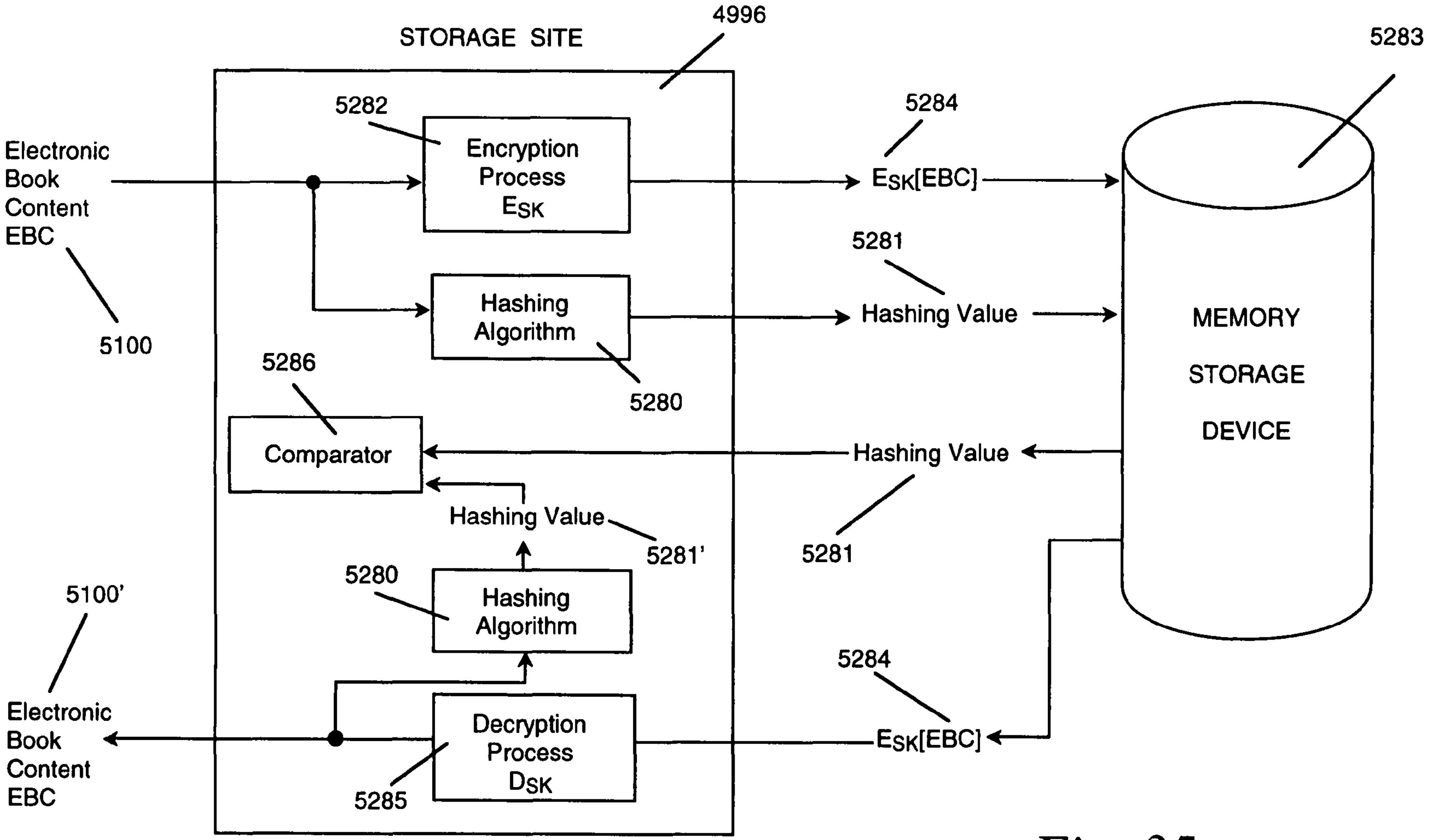

STORAGE SITE
4996
5282
Encryption Process E_{SK}
Electronic Book Content EBC
5100
Hashing Algorithm
5280
5286
Comparator
Hashing Value
5281'
5280
Hashing Algorithm
5100'
Electronic Book Content EBC
Decryption Process D_{SK}
5285
5284
E_{SK}[EBC]
5281
Hashing Value
Hashing Value
5281
5284
E_{SK}[EBC]
5283
MEMORY STORAGE DEVICE

Fig. 35

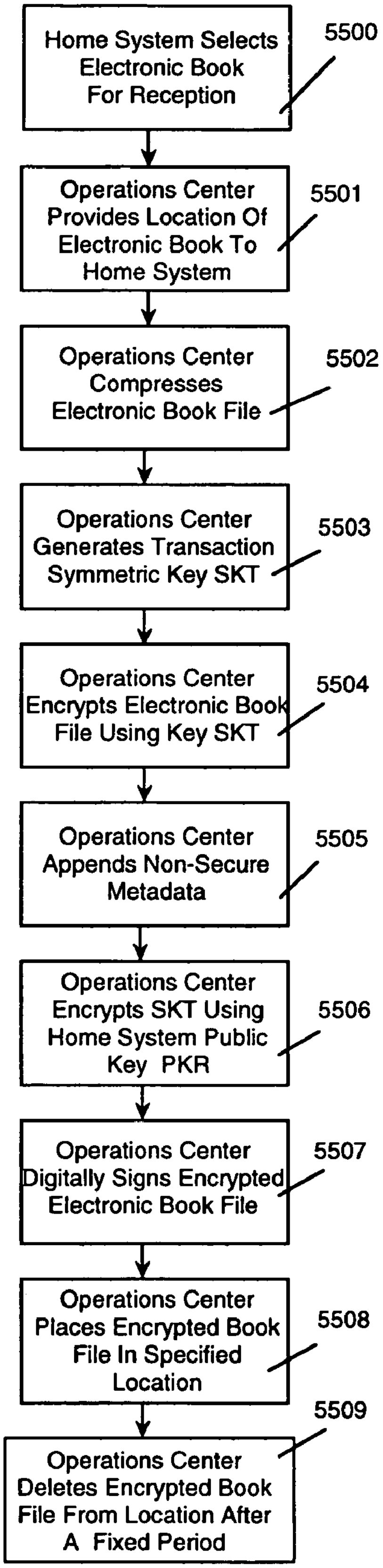

Home System Selects Electronic Book For Reception
5500
Operations Center Provides Location Of Electronic Book To Home System
5501
Operations Center Compresses Electronic Book File
5502
Operations Center Generates Transaction Symmetric Key SKT
5503
Operations Center Encrypts Electronic Book File Using Key SKT
5504
Operations Center Appends Non-Secure Metadata
5505
Operations Center Encrypts SKT Using Home System Public Key PKR
5506
Operations Center Digitally Signs Encrypted Electronic Book File
5507
Operations Center Places Encrypted Book File In Specified Location
5508
5509
Operations Center Deletes Encrypted Book File From Location After A Fixed Period

Fig. 36

ELECTRONIC BOOK SECURITY AND COPYRIGHT PROTECTION SYSTEM

RELATED APPLICATIONS

This application is a continuation-in-part of U.S. application Ser. No. 07/991,074 entitled TELEVISION PROGRAM PACKAGING AND DELIVERY SYSTEM WITH MENU DRIVEN SUBSCRIBER ACCESS, filed Dec. 9, 1992, and U.S. application Ser. No. 08/336,247 entitled ELECTRONIC BOOK SELECTION AND DELIVERY SYSTEM, filed Nov. 7, 1994, now U.S. Pat. No. 5,986,690, and U.S. application Ser. No. 08/160,194 now U.S. Pat. No. 5,990,927, and PCT/US93/11606 entitled ADVANCED SET-TOP TERMINAL FOR CABLE TELEVISION DELIVERY SYSTEMS, filed Dec. 2, 1993, and U.S. application Ser. No. 08/906,469 entitled REPROGRAMMABLE TERMINAL FOR SUGGESTING PROGRAMS OFFERED ON A TELEVISION PROGRAM DELIVERY SYSTEM, filed Aug. 5, 1997, now U.S. Pat. No. 6,408,437, and U.S. application Ser. No. 09/191,520 entitled DIGITAL BROADCAST PROGRAM ORDERING, filed Nov. 13, 1998. These applications are incorporated by reference herein. Also incorporated by reference are co-pending U.S. application Ser. No. 09/237,827 entitled ELECTRONIC BOOK HAVING LIBRARY CATALOG MENU AND SEARCHING FEATURES, filed Jan. 27, 1999, U.S. application Ser. No. 09/237,828 entitled ELECTRONIC BOOK ELECTRONIC LINKS, filed Jan. 27, 1999, U.S. application Ser. No. 09/289,956, entitled ELECTRONIC BOOK ALTERNATIVE DELIVERY METHODS, filed on Apr. 13, 1999, and U.S. application Ser. No. 09/289,957, entitled ELECTRONIC BOOK ALTERNATIVE DELIVERY SYSTEMS, filed on Apr. 13, 1999.

BACKGROUND ART

Sparked by the concept of an information superhighway, a revolution will take place in the distribution of books. Not since the introduction of Gutenberg's movable typeset printing has the world stood on the brink of such a revolution in the distribution of text material. The definition of the word book will change drastically in the near future. Due to reasons such as security, convenience, cost, and other technical problems, book and magazine publishers are currently only able to distribute their products in paper form. This invention solves the problems encountered by publishers.

TECHNICAL FIELD AND BRIEF SUMMARY OF INVENTION

The electronic book selection and delivery system is a new way to distribute books to bookstores, public libraries, schools and consumers. The technological breakthroughs of this invention provide a secure electronic system for both delivering selected books and receiving payments. The system has an unusual combination of features that provides the consumer with a daily use household appliance that has a high tech aura while being very practical, portable, and easy to use.

An advantage of the system is that it eliminates the distribution of any physical object such as a paper book or computer memory device from any book or text distribution system. The purchase of a book becomes a PAY-PER-READ event avoiding the overhead, middle-men, printing costs, and time delay associated with the current book distribution system. Published material and text such as the President's speech, a new law, a court decision on abortion, or O. J. Simpson's testimony can be made immediately available to the consumer at a nominal fee. Alternatively, books may be made available free to the end use consumer, subsidized by advertisers who sponsor books or embed advertising within the books.

The system is a novel combination of new technology involving the television, cable, telephone, and computer industries. It utilizes high bandwidth data transmissions, strong security measures, sophisticated digital switching, high resolution visual displays, novel controls, and user friendly interface software.

The primary components of the text delivery system are the subsystem for preparing the text for secure delivery and the subsystem for receiving and selecting text that was delivered. An embodiment of the system includes additional components and optional features that enhance the system. The system may be configured for use by bookstores, public libraries, schools and consumers. In one embodiment, the system for consumer use is made up of four subsystems, namely: (1) an operations center, (2) a distribution system, (3) a home subsystem including reception, selection, viewing, transacting and transmission capabilities, and (4) a billing and collection system. Alternative configurations of the system are defined to allow for a variety of traditional and non-traditional delivery methods.

The operations center performs several primary functions: manipulating text data (including receiving, formatting and storing of text data), security encoding of text, cataloging of books, providing a messaging center capability, and performing uplink and secure delivery functions. In one embodiment, the system delivers the text from the operations center to consumer homes by inserting text data within analog video signals. The insertion of text is generally performed with an encoder at an uplink site that is within or near the operations center. The system can use several lines of the Vertical Blanking Interval (VBI), all the lines of the analog video signal, a digital video signal or unused portions of bandwidth to transmit text data. Using the VBI delivery method, the top ten or twenty book titles may be transmitted with video during normal programming utilizing existing cable or broadcast transmission capability without disruption to the subscriber's video reception. Using the entire video signal, thousands of books may be transmitted within just one hour of air time. Nearly any analog or digital video or data distribution system may be used to deliver the text data. The text data may also be transmitted over other low and high speed signal paths including a telephone network (e.g., a public switched telephone network) having a high speed connection such as an asynchronous digital subscriber line (ADSL) connection and the Internet, for example. The text data is delivered in a secure fashion over the distribution systems.

The home subsystem performs at least four functions: connecting to the distribution system, selecting text, storing text, and transacting through a communicating mechanism. The components of the home subsystem may be configured in a variety of hardware configurations. Each function may be performed by a separate component, the components may be integrated, or the capability of existing cable set top converter boxes, computers, and televisions may be utilized. A connector, library unit and viewer unit may be used. In one embodiment, the connector portion of the home subsystem receives an analog video signal and strips or extracts the text from the video. The home library stores the text signal, provides a user friendly software interface to the system and processes the transactions at the consumer home. The viewer provides a screen for viewing text or menus and novel user friendly controls. Alternative embodiments are presented that support the secure delivery and storage of text using a variety of communication and security mechanisms.

The viewing device may be a portable book shaped viewer which securely stores one or more books for viewing and provides a screen for interacting with the home library unit. A high resolution LCD display is used to both read the books and to interact with the home library software. In one embodiment, an optional phone connector or return-path cable connection initiates the telephone calls and, with the aid of the library, transmits the necessary data to complete the ordering and billing portion of the consumer transaction. Alternative embodiments are presented in the referenced related applications that support ordering and billing using a variety of communication mechanisms. The user-friendly controls include a bookmark, current book and page turn button. The billing and collection system performs transaction management, authorizations, collections and publisher payments automatically.

A system similar to the system for consumer use may be used in bookstores, schools and public libraries.

The electronic books are delivered from an operations center or other remote location to an end-user location such as a home system using security mechanisms that prevent unauthorized access to the electronic books. An asymmetric public key encryption technique may be used by the operations center, serving as a sending party. The operations center encrypts the electronic book using a symmetric key and a symmetric key encryption algorithm. The symmetric key may be randomly generated, or the symmetric key may be previously defined and retrieved from storage. The operations center then encrypts the symmetric key. The encrypted electronic book and the encrypted symmetric key are delivered to the home system. The home system decrypts the encrypted symmetric key and uses the symmetric key to decrypt the encrypted electronic book.

In another embodiment, only symmetric key encryption is used to protect the electronic book during delivery. A third party trusted source may provide a symmetric key to both the party sending the electronic book and the party receiving the electronic book. The trusted source encrypts the symmetric key using a symmetric key of the sending party and delivers the encrypted symmetric key to the sending party. The sending party decrypts the symmetric key and uses the decrypted symmetric key to encrypt the electronic book. The receiving party, which also receives the symmetric key from the trusted source in an encrypted format, decrypts the symmetric key using the receiving party's symmetric key. The receiving party then uses the decrypted symmetric key from the trusted source to decrypt the electronic book.

In another embodiment, the sending party and the receiving party negotiate a shared key for use in the delivery of the electronic book. The parties exchange key negotiation information and use the same key generation algorithm to generate the same key.

In yet another embodiment, a seed key generation algorithm is used to generate a sequence of encryption keys.

In an embodiment, the encrypted electronic book is broadcast to home systems. In another embodiment, the encrypted electronic book is provided on demand. In yet another embodiment, the encrypted electronic book is provided on a physical storage medium such as a smart card.

The system for providing secure electronic book delivery may also include integrity checking algorithms to ensure the electronic book was not altered in route. The system may also include mechanisms that identify the sending party and the receiving party.

Secure delivery of electronic books may be provided between a content provider such as a publisher and a distribution center such as an operations center. Secure delivery may also be provided between the operations center and a home system, between the home system library and the home system viewer, between a lending facility such as a public library and a home system, and between multiple viewers.

The system may also incorporate copyright protection mechanisms including application of visible copyright notices to the delivered electronic books. Other copyright information may be embedded within the electronic book using a visible watermark, for example.

BRIEF DESCRIPTION OF DRAWINGS

FIG. **1***a* is a block diagram of the primary components of an electronic book selection and delivery system.

FIG. **1***b* is a block diagram of an electronic book selection and delivery system that uses a composite video signal.

FIG. **2** is a schematic showing an overview of the electronic book selection and delivery system.

FIG. **3** is a schematic of a delivery plan for the electronic book selection and delivery system.

FIG. **4** is a block diagram of the operations center.

FIG. **5***a* is a flow diagram of processing at the operations center and uplink.

FIG. **5***b* is a block diagram of a hardware configuration for an uplink site.

FIG. **6***a* is a block diagram of a hardware configuration for a four component home subsystem.

FIG. **6***b* is a schematic of a two unit home subsystem.

FIG. **7** is a flow diagram of processes performed by a video connector.

FIG. **8** is a block diagram for an example of a library unit.

FIG. **9** is a flow diagram of processes performed by a library unit on the received data stream.

FIG. **10** is a flow diagram of processes performed by a library unit on information requests from a viewer.

FIG. **11** is a block diagram showing the components for an example of a viewer.

FIG. **12** is a flow diagram of processes performed by a viewer on an information request from a subscriber.

FIG. **13** is a chart depicting a menu structure and sequencing of menus in a menu system.

FIG. **14***a* is a schematic of an introductory menu.

FIG. **14***b* is a schematic showing an example of a main menu.

FIGS. **14***c*, **14***d*, **14***e*, **14***f*, **14***g*, **14***h*, **14***i* and **14***j* are schematics showing examples of submenus.

FIG. **15** is a schematic diagram of an electronic book system for a bookstore or public library.

FIG. **16***a* and FIG. **16***b* are schematics of hardware modifications or upgrades to a set top converter.

FIG. **17** is a schematic showing a set top terminal that includes a data receiver and data transmitter.

FIG. **18***a* is a schematic of a book-on-demand system.

FIG. **18***b* is a schematic of an operations center supporting a book-on-demand system.

FIG. **19***a* is a diagram of symmetric key encryption.

FIG. **19***b* is a diagram depicting asymmetric encryption using a private key.

FIG. **19***c* is a diagram depicting asymmetric encryption using a public key.

FIG. **20** is a depiction of public key encryption for electronic book distribution.

FIG. **21** is a depiction of symmetric key encryption for electronic book distribution where a certificate authority provides the encryption key.

FIG. **22** is a depiction of symmetric key encryption for electronic book distribution where a certificate authority is provided the encryption key.

FIG. **23***a* is a diagram depicting asymmetric encryption using a private key for an entire transaction stream.

FIG. **23***b* is a diagram depicting asymmetric encryption using a public key for an entire transaction stream.

FIG. **23***c* is a diagram of symmetric key encryption for an entire transaction stream.

FIG. **24***a* depicts transaction key negotiation process.

FIG. **24***b* depicts seed key negotiation process.

FIG. **25***a* depicts a secure method for broadcast distribution.

FIG. **25***b* depicts a secure method for group distribution.

FIG. **26** depicts a hashing function process.

FIG. **27** depicts a sender initiated, sender identification process.

FIG. **28** depicts a recipient initiated, sender identification process.

FIG. **29** depicts a recipient authentication sequence.

FIG. **30** depicts a secure delivery process.

FIG. **31** depicts a recipient initiated, secure socket layer exchange.

FIG. **32** depicts a sender initiated, secure socket layer exchange.

FIG. **33** depicts a reception verification sequence.

FIG. **34** depicts driver level secure storage.

FIG. **35** depicts file level secure storage.

FIG. **36** depicts an operations center to home system delivery process.

DETAILED DESCRIPTION OF INVENTION

FIG. **1***a* shows an electronic book distribution system **100** that may be used for secure distribution of an electronic book. A content provider **110** may publish hard copy versions of books or other printed media including newspapers, magazines, and product catalogs, for example. The content provider **110** may convert printed materials to an electronic format, apply security mechanisms, and provide the electronic formatted materials to a distribution center **120**, over uplink path **115**. The uplink path **115** may be a wired or a wireless path. The uplink path **115** may be a telecommunications network, for example. The uplink path **115** may be a satellite relay path or a wireless telephone path. The uplink path **115** may involve providing electronic books to the distribution center on a fixed media, such as a CD-ROM, for example.

In FIG. **1***a*, the content provider **110** and the distribution center **120** are shown as separate components of the electronic book distribution system **100**. However, the content provider **110** and the distribution center **120** may be co-located. The distribution center **120** may convert printed matter into an electronic format. Alternately, the distribution center **120** may receive electronic files from an outside source, such as the content provider **110**. The distribution center **120** may process and store electronic books using secure techniques as presented in Section VII.

The distribution center **120** distributes electronic books. The distribution may be, for example, over distribution path **125**, distribution network **130**, and distribution path **135** to an electronic book subsystem or terminal **140**, which may include an electronic book viewer (not shown). The terminal may also be a television, a set top terminal, a personal computer, or similar device. An apparatus and method for the secure distribution of electronic books is disclosed in greater detail later. The distribution network **130** may be an electronic book store, an Internet web site, a wired or wireless telecommunications network, an intranet, a radio program delivery system, a television program delivery system, including cable television, satellite television broadcast, and over-the-air broadcast, for example. The electronic book distribution network **130** could include direct delivery through a mail delivery system of electronic books on a fixed media, such as a CD-ROM, for example.

FIG. **1***b* shows components of an electronic book distribution system **170** using a television program delivery system to distribute electronic books. In the embodiment shown in FIG. **1***b*, the components of the electronic book selection and delivery system **170** are an encoder **174**, a video distribution system **178**, a connector **182**, and a text selector **186**. The encoder **174** places textual data on a video signal to form a composite video signal. Although the composite signal may contain only textual data, it usually carries both video and textual data. A variety of equipment and methods may be used to encode text data onto a video signal. The video distribution system **178** distributes the composite video signal from the single point of the encoder **174** to multiple locations, which have connectors **182**. The connector **182** receives the digital or analog video signal from the video distribution system **178** and separates, strips or extracts the text data from the composite video signal. If necessary, the extracted text data is converted into a digital bit stream. The text selector **186** works in connection with the connector **182** to select text.

Using the connector **182** and text selector **186** combination, various methods of selecting and retrieving desired text from a composite or video signal are possible. Text may be preselected, selected as received or selected after being received and stored. One method is for the connector **182** to strip or extract all the text from the video signal and have the text selector **186** screen all the text as received from the connector **182**. The text selector **186** only stores text in long term or permanent memory if the text passes a screening process described below.

FIG. **2** shows another embodiment of an electronic book selection and delivery system **200**. The delivery system **200** includes: an operations center **250** including an uplink site **254**, a video distribution system **208**, a home system **258** including a video connector **212**, a library **262**, a viewer **266**, and a phone connector **270**, telephone system **274**, an Internet web site **279** and a billing and collection system **278**. Also as shown in FIG. **2**, the home system **258** may include connections to a television **259** and a personal computer **261** may be used to display menu screens, electronic books, electronic files, or any other information associated with the electronic book delivery system **200**. In addition, the television **259** and the personal computer **261** may provide control functions that replicate and supplement those of the viewer **266**.

The operations center **250** receives textual material from outside sources **282** such as publishers, newspapers, and on-line services. Alternately, the outside sources may maintain electronic books at the Internet web site **279**. The outside sources **282** may convert textual and graphical material to digital format and apply security mechanisms, or may contract with another vendor to provide this service. The operations center **250** may receive the textual and graphical material in various digital formats and may convert the textual material to a standard compressed format for storage. In so doing, the operations center **250** may create a pool of textual material that is available to be delivered to the home system **258**. The textual material may be grouped by books or titles for easy access.

As used herein, "book" means textual or graphical information such as contained in any novels, encyclopedias, articles, magazines, newspapers, catalogues, periodicals, or manuals. The term "title" may represent the actual title assigned by an author to a book, or any other designation indicating a particular group, portion, or category of textual information. The title may refer to a series of related textual information, a grouping of textual information, or a portion of textual data. For example, "Latest Harlequin Romance", "Four Child Reading Books (Ages 10-12)," "Encyclopedia 'BRITANNICA'™," "President's Speech," "Instruction Manual," "Schedule of 4th of July Events," "Pet Handbooks," "Roe v. Wade," and "The Joy of Cooking," are suitable titles. Also, the title may be a graphical symbol or icon. Thus, a picture of a wrench may be a title for a repair book, a picture of a computer a title for a computer book, a graphical symbol of a telephone a title for a telephone book, a drawing of a dagger a title for a mystery book, a picture of a bat and ball a title for a sports book, and a picture of tickertape a title for a business book.

The operations center **250** includes the uplink site **254** for placing the text onto a telecommunications signal in a secure fashion and sending the telecommunications signal into a distribution system. The uplink site **254** would generally include an encoder **204** (not shown in FIG. **2**) to encode the text onto the telecommunications signal.

Many analog and digital video distribution systems may be used with the electronic book delivery system **200**, such as cable television distribution systems, broadcast television distribution systems, video distributed over telephone systems, direct satellite broadcast distribution systems, and other wire and wireless video distribution systems. Nearly any distribution system which can deliver a telecommunications signal, including a video signal, will work with the electronic book delivery system **200**. It is also possible to distribute the electronic book without using a telecommunications signal as described in the embodiments presented in the referenced related applications. Methods used for securing the distribution of materials over the electronic book delivery system **200** are presented in Section VII.

The home system **258** performs five functions: (1) connecting with a video distribution system; (2) selecting data; (3) storing data; (4) displaying data; and (5) handling transactions. An important optional function of the home system **258** is communicating using, in one embodiment, a telephone communication system **274**. The home system **258** may be made up of four parts: a video connector **212** or similar type of connector for connecting with the distribution system **208**, a library **262** for storing and processing, a viewer **266** for viewing menus and text and a telephone connector **270** for connecting with a telephone communications system **274**. Additional embodiments are presented in the referenced related applications that address alternative communication mechanisms.

The billing and collection system **278** may be co-located with the operations center **250** or located remote from the operations center **250**. The billing and collection system **278** may be in communication with the home system **258** using telephone-type communication systems (for example **274**). Any of a number of communication systems as presented in the referenced related applications, such as a cellular system or the Internet, will operate with the billing and collection system **278**. The billing and collection system **278** records the electronic books or portions of text that are selected or ordered by the subscriber. The collection system will charge a subscriber's credit account or bill the subscriber. In addition, the billing and collection system **278** may monitor that amount due to publishers or other outside sources **282** who have provided textual data or other services such as air time to enable the text delivery system **200** to operate.

Also shown in FIG. **2** is an intranet **279'**. The intranet **279'** may be used as a part of a private distribution network for distributing and circulating electronic books. For example, a university library may use the intranet **279'** to circulate electronic books to university students and professors.

FIG. **3** is an expanded overview of a delivery plan **301** for the electronic book delivery system **200**. It is a comprehensive delivery plan **301** to support various types of users and various billing systems. FIG. **3** shows that publishers **282** may provide text transfer **302** to the operations center **250'** and receive payments **306** from the billing and collection system **278'**. A separate channel uplink site **254'** is shown in this configuration receiving data **310** from the operations center **250'**. The operations center **250'** has three separate sections (**318**, **322**, **326**) one for text receiving, formatting and re-entry **318**, a second for security encoding and processing **322** and a third section for catalog and messaging center functions **326**.

The collection and billing system **278'** shown has two sections (**330**, **334**) one for transaction management, authorizations and publisher payments **330**, and the other for customer service **334**. The customer service section **334** provides for data entry and access to customer account information. Transaction accounting information **338** is supplied to credit card companies **342** by the transaction management section **330** of the billing and collection system **278'**. The credit card companies **342** provide billing **346** to customers either electronically or by mail.

Methods for communicating between the subscriber base **348** and the billing and collection system **278'** include: by telephone switching **350** alone, cellular switching **354** and telephone switching **350** combined, and by use of the cable system **358** and the telephone switching **350**. The system shown supports both one-way **362** and two-way cable communication **366** with subscribers. Additional communication methods are presented in the referenced related applications. Public libraries and schools **370** as well as bookstores **374** may use the delivery system **301**. Methods used for securing these communications are presented in Section VII.

Public libraries and schools **370** could have a modified system to allow the viewer to be checked-out or borrowed while bookstores **374** would rent or sell the viewer and sell electronic book data. The bookstores **374** as well as the public libraries and schools **370** may be serviced by cable **378**. Optional direct broadcast systems (DBS) **382** can also be used with the system **200** as detailed in the referenced related applications.

I. The Operations Center

FIG. **4** is a schematic of the operations center **250**, which includes the uplink The operations center **250** may gather text or books by receiving, decrypting, formatting, storing, and encoding. A data stream **302** containing text may be received at the operations center **250** by a data receiver **402**. The data receiver **402** is under the control of a processor **404**. After reception, the data stream is decrypted using digital logic for decrypting **403** which is under the control of the processor **404**. The data stream is then formatted using digital logic for formatting **406** which is also under the control of the processor **404**. If any additional text is generated at the operations center **250** locally for insertion into the distributed signal, the text generation is handled through text generator hardware **410**, which may include a data receiver and a keyboard (not shown). Following processing by the text generator **410**, the additional text can be added to the text received by the combining hardware **414** that includes digital logic circuitry (not shown).

The processing at the operations center **250** is controlled by a processor **404**, which uses an instruction memory **416**. The processor **404** and instruction memory **416** may be supplied by a personal computer or mini-computer, for example. To perform the catalog and messaging functions, the operations center **250** uses a catalog and message memory **420** and the text generator **410** if necessary.

The data stream of text, catalog and messages may be encoded by security module encoding **424** prior to being sent to the uplink module **254**. Various encoding techniques may be used by the security encoding module **424** such as the commercial derivative of NSA's encryption algorithm (Data Encryption System (DES)) and General Instrument's DigiCipher II. Additional embodiments are presented n Section VII. Following encoding, the encoded text may be stored in text memory **428** prior to being sent to the uplink **254**. A first-in-first-out text memory arrangement may be used under the control of the processor **404**. Various types of memory may be used for the text memory **428** including RAM. The operations center **250** may use file server technology for the text memory **428** to catalog and spool books for transmission as is described below. The operations center **250** may also store the electronic book as secure compressed data files using the secure storage techniques presented in Section VII.

In an embodiment, to transmit textual data, the distribution system **208** (see FIG. **2**) may use high bandwidth transmission techniques such as those defined by the North American Broadcast Teletext Standard (NABTS) and the World System Teletext (WST) standard. Using the WST format (where each line of the Vertical Blanking Interval contains 266 data bits), a four hundred page book, for example, may be transmitted during regular television programming using four lines of the Vertical Blanking Interval at a rate of approximately one book every 1.6 minutes (63,840 bits per second). Alternatively, books may be transmitted over a dedicated channel, which interrupts programming so that 246 lines of video can be used to transmit approximately 2,250 books every hour (3.9 Mbits per second). A teletext type format is the simplest but possibly the slowest text format to use with the electronic book delivery system **200**. In either event, an encoder **204** may be used at an uplink site **254** to insert textual data into the analog video signal. In many other respects, the delivery of the textual information may be completed using an existing cable television plant and equipment. Alternative transmit formats and delivery systems are presented in the referenced related applications.

FIG. **5***a* is a flowchart of steps involved in processing text from the publisher or provider **282** that may occur at the operations center **250**. As shown in block **500**, the publisher **282** processes data files of text for books, compresses, encrypts and sends the data files to the operations center **250** or uplink **254**. Text files for books may be sent one book at a time. As shown in block **504**, the uplink **254** or operations center **250** receives and processes the data stream from the publisher **282**. Generally, part of this processing includes encryption and error correction. Specific embodiments used for encryption are presented in Section VII. Text files may be delivered for receipt by multiple home subsystems simultaneously, or to a specific individual home subsystem.

In FIG. **5***a*, the electronic books are distributed to consumers using a video distribution system such as a cable television system. However, the electronic books may also be packaged as data packets and distributed over other telecommunications networks such as a digital wireless telephone network, for example.

In one embodiment, as shown in block **508**, files are broken into smaller packets of information. Header information is added to the packets. The bit stream is converted from a serial digital bit stream to an analog bit stream that is compatible with an NTSC video signal. Block **512** shows the switching of analog data into the video lines of a video signal. The analog data may be placed either in the VBI or the active video lines. In some instances, unused portions of bandwidth (such as 5-40 MHZ, 70-75 MHZ, 100-109 MHZ or other guard bands) may be used instead of the video lines. Alternate transmission methods are presented in the referenced related applications.

FIG. **5***b* is an example of a hardware configuration to perform some of the functions for blocks **508** and **512**. A video feed **516** is received and processed through a sync stripper **520**. The stripped sync signal **532** is used by the digital logic control **524**. The digital logic control **524** receives the sync signal **532** and a serial digital bit stream **528** for processing. The digital logic control **524** passes the serial digital bit stream to the Digital to Analog converter **536** and outputs a control signal **540** for the video switch The video switch **544** integrates the video feed **516** and analog data stream **548** into a video feed with analog data signal inserted **552**.

As an alternative to cable, broadcast or other television delivery methods, the public telephone system may be used to transmit books to the subscribers. An average book would take about 7 minutes to transmit over the public telephone system. Using the telephone system, it is not necessary to combine video and text into a composite signal. In most other respects, the operations center would remain similar whether text delivery was by telephone or cable. File server technology (such as that described in U.S. Pat. No. 5,262,875, entitled AUDIO/VIDEO FILE SERVER INCLUDING DECOMPRESSION/PLAYBACK MEANS, issued to Mincer, et al., and, U.S. Pat. No. 5,218,695, entitled FILE SERVER SYSTEM HAVING HIGH-SPEED WRITE EXECUTION, issued to Noveck, et al., incorporated herein by reference) may be used at the operations center with a telephone system text delivery method.

As another alternative to cable, television, and telephone system delivery, the public telephone system may be used to provide access to the Internet, where the Internet web site **279** may be accessed. Electronic books may be ordered, paid for, and delivered directly from the Internet web site **279** over the telephone system. In addition, the electronic book viewer **266** may be used for wireless voice and data communications using the Internet.

When a wireless telephone network is used to distribute electronic books, or otherwise communicate with the home system **258**, the home system **258** may receive data using any one or more standard protocols including time division multiple access (TDMA), code division multiple access (CDMA), Global Systems for Mobile Communications (GSM) and Advanced Mobile Telephone System (AMPS) protocols. In any delivery system using the telephone system, individual subscribers may increase the electronic book deliver rate by incorporating high speed modems or other communications devices such as an Integrated Services

Digital Network (ISDN) connector, or by use of a Digital Subscriber Line (DSL). These alternative delivery methods are presented in the referenced related applications.

II. The Home System

The hardware configuration for a four component home system **258** is shown in FIG. **6***a*. FIG. **6***b* shows a hardware configuration for a two component home subsystem. The home system **258** performs several functions, such as receiving data and video transmissions, stripping (or extracting) the data from the video signal, decrypting the data, screening and storing the data, providing user friendly interface controls and software, displaying menus and text, processing transactions, initiating telephone calls and transmitting billing data. Various hardware configurations may be utilized to achieve the desired functions of the home system **258**. For example, as shown in FIG. **6***b*, the home system **258** can be configured to utilize the reception and channel tuning capability of the current installed subscriber base of cable converter boxes and televisions **601** and networked computers. The home system **258** can also be designed as an advanced set top terminal converter box with menu generation capability, electronic memory and a telephone modem as described in section V below. Alternatively, the home system **258** can be configured to support alternate delivery and ordering methods as described in the referenced related applications.

The electronic components which make up the home system **258** can be arranged in a variety of ways. In the four unit subsystem of FIG. **6***a* the viewer **266** and library **262** are wired together while the remaining components communicate through RF transceivers **604**. In a simple version of the home system **258** there are only two units, a library **262** and a viewer **266**. FIG. **6***b* shows a two unit home system **258** with certain optional features.

The viewer **266** is generally equipped with a high resolution viewing area **602**, digital logic (including a key **605**, security **606**, and a microprocessor **621**), video graphics control and memory **607**, power supply circuitry **602** (not shown), an optional battery **603** and an optional RF transceiver **604**. In a two unit arrangement, the library **262** contains the connector function to the electronic book distribution system **208**, connector function to a public telephone communications system, and memory **600** (which may be removable and portable **600'**). More specifically, the library **262** would include data stripping functions **617**, digital logic **609**, memory storage **600**, power circuitry **610**, optional connections **611** (including cellular or PCN **611'**), optional battery (not shown), optional tuner module **613** and an optional RF transceiver **604**. The connector **212** and the public telephone system connection **270**, as well as the removable portable memory unit **600** of the library **262** may be broken out into separate components. (FIG. **6***b* shows a removable portable hard disk memory **600'** with removable cartridges **614**.) Finally, the home system **258** may include an attached keyboard **267** or a wireless keyboard **268**. Both the attached keyboard **267** and the wireless keyboard **268** may be used to communicate with the viewer **266** (not shown) or the library unit **262**. The wireless keyboard **268** may communicate using radio frequency (RF) signaling, for example.

In an alternate arrangement, all functions of the home system **258** may be incorporated into a single unit. The functions of the library **262**, for example, may be carried out by a card or chipset in the viewer **266**. All the communications devices needed to couple the home system **258** to various telecommunications networks may also be incorporated into the viewer. All interfaces between the home system **258** and the subscriber may be included with the viewer **266**. In this embodiment, the viewer **266** may include a communication device for receiving inputs from a separate keyboard. The viewer **266** may also include a built-in video camera **608"** that may be used to transmit images of the subscriber. Using the transceiver **608**, the camera **608"** and the speaker/microphone **608'**, the subscriber may use the viewer **266** for video conferencing, for example.

Therefore, the home system **258** may have as many as five separate components, which communicate with each other. The two, three, four or five separate components which make up the home subsystem can communicate with each other in a variety of ways, including hardwired connection **615**, RF transceiver **604** and other wireless methods.

RF communications may be used in the home, allowing separate components to be located throughout the home without restriction. The data communicated between the units may be secure data using security techniques presented in Section VII. In addition, the library **262** may provide power to the viewer **266** through the hard wire communication link **615**.

To receive and strip data from a video signal at the consumer's home, a device such as a cable interface device or cable connector **212** is used. The cable connector device includes a tuner **613**, while the cable interface device makes use of existing tuning equipment in the home. In either configuration, data is stripped from the video signal and stored at the subscribers location in the library **262**. The phone connector **270**, optional connector **611**, and modular connector **701** initiate communications and transmit ordering and billing information to the operations center **250** or billing and collection system **278**. A digital connector **619** is provided to communicate digital information with the set top **601**. The library **262** is the intelligent component of the home subsystem, incorporating the hardware and software necessary to store the text data, generate menus and effect the purchase transactions. In addition to an RF transceiver **604**, the home library **262** also includes the necessary jacks and connections to allow the system to be connected to the viewer **266**. As shown in FIG. **6***b*, the library **262** communicates the text data to the viewer **266** in a secure format, which requires a key **605** for decryption. The text may be decrypted page by page just before viewing. Alternative security embodiments for library **262** to viewer **266** communications are presented in Section VII.

a. The Video Connector

FIG. **7** shows the flow of the processes performed by the video connector **212**. The video connector **212** receives the video signal **608**, tunes to the channel containing the text data **612**, strips the text data from the video signal **616**, and communicates the text data stream to logic components in the library **622**.

The connection to the video distribution system may be a cable connector to a cable television delivery system, as shown in FIG. **6***b*. The cable connector includes a data stripper circuit **617**, which accepts video input from either a set top converter, TV or VCR **601**, or an optional tuner block **613** that receives the CATV signal through the cable connector **212'**. The data stripper circuit **617** strips data out of the video, and outputs a digital bit stream to the digital logic portion **609** of the library unit **262**. The data is embedded in the video signal either in the vertical blanking interval or the active video portion in an encrypted and compressed format. The data stripper circuit **617** can be placed inside the set top converter box **601**, TV, or in the library **262**. The data stripper circuit **617** outputs the digital bit stream to be used by the library digital logic **609**.

The video connector **212** may also contain a channel tuner module **613** that can tune to the video channel and provide access to the video that contains the data to be stripped. Using the optional tuner module **613**, a set top converter, VCR, or TV tuner is not needed in the home system **258**. The optional tuner module **613** would instead receive the CATV signal directly through the cable connector **212**. Additional connector options, which allow for the receipt of text files using alternative delivery methods, are presented in the referenced related applications. This ubiquitous access is provided using the modular connector **700** as depicted in FIG. **6***b*.

b. Library

An embodiment of the library **262** for a two unit home subsystem is shown in both FIG. **6***b* and FIG. **8**. The embodiment shown includes the following optional parts: the video connector **212**, phone connector **270**, RF transceiver **604**, and battery pack **624** in addition to a removal portable memory **600'**, microprocessor **628**, instruction memory unit **632**, digital logic **636**, and power unit **640**.

The library **262** contains a digital logic section **609** (not shown in FIG. **8**) which includes the microprocessor **628**, the digital logic **636** and the instruction memory unit **632**. The microprocessor **628** may be a secure microprocessor such as the Mot SC21 device sold by Motorola. The digital logic section **609** will receive the serial digital bit stream from the data stripper circuit **617** and process the data. Error correction and security processing will also be performed by the digital logic section **609** and the data will be checked for proper address. If the address of the data is correct and the library **262** is authorized to receive the data, the data will be decrypted and transferred to the memory storage unit **600**, **600'**. Authorization to receive the data may be provided by the cable headend or another distribution point. An authorization code may be sent in the serial digital bit stream. The digital logic section **609** will send appropriate text and graphical data to the memory storage unit **600**, **600'**. It may decrypt then re-encrypt the data or transfer this data in a compressed and encrypted format and the data remains stored in a compressed and encrypted format.

i. Memory Storage Unit

The memory storage unit of the library may be a removable portable memory unit **600'** (as shown in FIGS. **6***a*, **6***b* and **8**). A variety of options are available for memory storage: a hard disk drive, such as an 80 megabyte, a 200 megabyte, a hard disk with removable platters, and CD ROM. Referring to FIG. **6***b*, a hard disk drive unit **600'**, which contains removable platters, may also be used. This would provide virtually unlimited library storage capacity. Data may be stored in the memory storage unit in a compressed and encrypted format. As is also shown in FIG. **6***b*, the data may also contain a key or unique ID number that matches the ID or key of the viewer **266**. This matching of a unique key or ID number prevents unauthorized transfer of text data from the memory storage unit to an unauthorized viewer. Alternative embodiments to store text data in encrypted format are addressed in Section VII. Small memory devices such as smart cards, electronic memory cards or PCMCIA cards (personal computer memory card industry association) may also be used to store the data.

ii. Power Circuitry

As shown in FIGS. **6***b* and **8**, the library **262** will accept power from AC wall power **610**, DC power **640**, or optional battery power **624**. The power circuitry **610**, **640** may provide all the voltage necessary from either the battery **624** or AC unit for the various circuitry in the library. The power circuitry **610**, **640** may also provide power to the viewer through a single data cable when connected to the viewer. The power circuitry **610**, **640** will recharge the battery using AC power when in operation. With the optional battery unit **624** installed, the library **262** becomes a portable unit and can still provide power to the viewer **266**. In order to extend battery life, power conservation measures may be utilized, such as shutting down the memory system when not in use. When the viewer unit **266** is being utilized and the library circuitry is not being utilized, virtually all power may be shut down to the library **262**.

iii. Connection to the Public Telephone System

In an embodiment, the connection to the telephone system may be provided by a connector device **611**, which consists of a modem. Various available modems may be used to perform this function. As shown in FIG. **6***b*, cellular phone or PCN phone connections **611'** may also be provided. When the home system **258** is first initialized, the modem may be used to transfer the name and credit card information of the consumer to the billing and collection system **278**. The telephone connection **270** may be utilized each time an electronic book is purchased by a consumer to complete and record the transaction. The telephone connection **270** may also be used to receive the text data from the operations center **250**, by-passing the video distribution system **208**. The phone connection **270** may be a separate unit as shown in FIG. **6***b*. However, alternate means exist to connect the home system **258** to the billing and collection system **278** or the operations center **250**. The modular connector **701** (shown in FIGS. **6***b* and **8**) provides access to each communication network to provide a path from the home system **258** to the billing and collection system **278** or the operations center **250**. These alternatives are presented in detail in the referenced related applications.

iv. Library Processing

FIG. **9** shows for one embodiment, an example of processing performed by the digital logic section **609** of the library **262** on the data stream **651** received from the video connector **212** or stripper circuit **617**. In step S**650**, digital logic section **609** checks the data stream **651** for error correction. If an error is detected, in step S**654** digital logic section **609** de-interleaves the data and in step S**658** runs a FEC (Forward Error Correcting) algorithm. In steps S**650**, S**654** and S**658**, the digital logic section **609** performs the error correction needed on the data stream. If no error correction is necessary the digital logic section **609** proceeds to step S**662** and checks data packets individually for packet address.

If the address is a unique address, the process moves to step S**666** and the digital logic section **609** checks whether the address of the packet matches the library box ID number. The library box ID number is a unique number associated with the library **262**. The library box ID is used to ensure security of the data. The process then moves to Step S**668**, and the digital logic section **609** performs the decryption processing, as presented in Section VI. The process then moves to step S**670** and the digital logic section **609** determines whether an electronic file has already been opened into which the data packet can be saved. If no data file has been opened, the digital logic section **609** opens a new data file for that packet. If an electronic file has been opened, the process moves to step S**678** and the digital logic section **609** saves the packet in the electronic file on disk. The process moves to step **682** and the digital logic section **609** checks to see if this is the last packet for a particular book for a particular textual data block being received. If it is the last packet of information, the process moves to step **686** and the digital logic section **609** closes the electronic file and updates the directory of available electronic files. Following either step S**682** or S**686**, the process returns to receive another data packet from the data stream received from the data stripper block.

If the packet address is checked and the address is determined to be a broadcast address, the process moves to step S**690** and the digital logic section **609** determines the type of message that is being sent. The message may be an index of book titles, menu (and menu graphics) information, announcements, special offerings, discounts, promotions, and previews, for example. The process then moves to step S**694** and the digital logic section **609** stores the message in an appropriate electronic message file. The process then returns to step S**650** to receive another data packet and perform another error check.

Using the process of FIG. **9**, the library **262** is able to receive, store and update directories related to the textual data and graphical data (that can be used to depict pictures in a given book or to generate menus). Variations of the processes are possible depending on the format of the data and operating system of the library **262**. FIG. **10** shows an example of the processing of information requests from the viewer **266** at the library **262**. Information requests from the viewer **266** are received either through the cable connecting the viewer **266** to the library **262** or through wireless transmissions such as RF. It is possible in some embodiments for subscribers' requests to come from a set top converter box **602** (see Section V).

Information requests received from the viewer **266** generally fall into three categories: (1) directory data of books stored in the library **262**, (2) index of all available books on the system, and (3) requests for a specific book (step S**700**). In step S**704**, the digital logic section **609** answers a request from the viewer **266** for a directory of data showing the books stored at the viewer **266**. The directory of data is sent to the viewer **266** so that it may be displayed to the subscriber. In step S**708**, the digital logic section **609** handles requests from the viewer **266** for an index of all available books on the system. The library **262** will obtain an index of all the available books on the system and transmit that index, in step S**712**, with menu information to the viewer **266**. In step S**716**, the digital logic section **609** replies to a request from the viewer **266** for a specific book. In step S**720**, the digital logic section **609** opens an electronic file for the specific book requested by the viewer **266** and transmits the record or transmits the information on a packet-by-packet basis to the viewer **266**. This process of transmitting the specific book, record, or packets to the viewer **266** continues until the last record or packet has been sent in step S**724**.

In addition to the processes shown on FIG. **10** in handling a request for a specific book, the library **262** also orders and receives specific books from the operations center **250** using the process as described in step S**716**. Following a request for a specific book which is not stored at the library **262**, the library **262** will proceed to determine the next available time the book will be on the video distribution system **208** or an alternative delivery system and ensure reception and storage of that book (process not shown). In performing this process the library **262** will transmit to the viewer information on when it will obtain the text data for the book so that the subscriber may view the book. In addition to timing information, price and other ordering information may also be passed by the library **262** to the subscriber.

C. The Viewer

FIG. **11** is a block diagram of a viewer **266** showing its internal components. The viewer **266** of FIG. **11** is similar to the viewer **266** depicted in FIG. **6***b*. The viewer **266** is designed to physically resemble a bound book. The viewer **266** is made up of five primary components and seven optional components: (1) LCD display **602**, (2) digital circuitry (not shown), (3) video graphics controller **607**N, (4) controls **740**, (5) book memory **728**, (6) optional power supply circuitry **736**, (7) optional battery **603**N, (8) optional RF transceiver **604**, and (9) optional cellular or mobile connector (such as **611**N) (10) optional keyboards **267** and **268**, and (11) an optional speaker/microphone **608'**, (12) optional alternative communication interface devices.

(1) A high resolution LCD screen **602**, of VGA quality, may be used by the viewer **266** to display text and graphic images. The screen may be the size of one page of an electronic book. A two page screen or two screens may also be used with the viewer **266**.

(2) Digital circuitry that includes a secure microprocessor **621**, instruction memory **732**, and digital logic. Data is transferred to the viewer **266** in compressed and encrypted format. In one embodiment, the secure microprocessor **621** compares the ID number of the viewer **266** with the incoming data stream and only stores the text data if the ID number of the viewer **266** matches that within the incoming data stream. The viewer **266** may be configured to not output text data or other data and that the data is decompressed and decrypted only at the moment of viewing and only for the current page being viewed. These measures provide additional security against unauthorized access to data. Additional embodiments are presented in Section VII.

(3) A video graphics controller **607'** that is capable of assisting and displaying VGA quality text and graphic images is included in the viewer **266**. The graphics controller **607'** is controlled by the digital circuitry described above. Text may be displayed in multiple font sizes.

(4) The viewer **266** of FIG. **11** has touch panel controls **740**. These unique and novel controls **740** allow the consumer to select stored electronic books and electronic books from catalogues, move a cursor, and turn pages in an electronic book. Typically, the controls **740** include forward and reverse page buttons **742**, **741**, a ball **743** for cursor movement, one or more selection buttons **745**, a current book button **747** and a bookmark button **749** (see FIG. **14***a*).

The controls **740** should be easy to use and conveniently located. Referring to FIG. **14***a*, the controls for the viewer **266** may be located below the screen **602** at the bottom portion of the viewer **266**. The next page turn button **742** is the most used button **740** and is located towards the right edge of the page. The subscriber is likely to use right hand thumb movements to work the controls particularly the page turn buttons **741**, **742**. Therefore, the buttons may be arranged in such a manner that the buttons are easily controlled by a subscriber's right thumb. Generally, this can be accommodated either on the lower portion of the viewer **266** (as shown) or along the right hand margin of the viewer **266** (not shown). The current book button **747** and bookmark button **749** are usually the least used of the controls **740**. Therefore, in the example shown, those buttons **747**, **749** are located on the inside portion towards the binder of the viewer **266**.

Locating the ball **743** or other cursor movement device (such as four pointer arrows not shown) in the bottom center of the viewer **266** is both easier for the subscriber to use and easier in manufacturing the viewer **266**. The selection buttons for the cursor **745** may be located below the middle diameter of the cursor ball **743** on the right and left sides of the ball as shown. If pointer arrows are used for cursor movement, a selection button **745** may be located in the center of the four arrow buttons (not shown). Again, the most used controls **740** should be located where a subscriber's right hand thumb would normally rest.

(5) Book memory **728** for at least one electronic book or more of text is included in the viewer **266**. The memory **728** stores text and any graphics, which represent pictures in a book. The memory **728** can also store menu graphics data. Two different memory **728** devices may be used in the viewer **266**, one for the instructions for the microprocessor **621** in the digital circuitry and a second type of memory may be used for the book memory **728** (and graphics). Various memory devices available on the market may be used such as, ROM, RAM or a small hard disk. Since an electronic book requires approximately 0.6 megabytes of storage, a small hard disk providing approximately 60 MBytes of storage provides memory to store approximately 100 electronic books.

Text for electronic books may be displayed in various font sizes. To accommodate various fonts for display, a variety of fonts are stored in instruction **732** or book memory **728**. Thus larger or smaller fonts may be recalled from memory **621**, **728** to create displays desired by the subscriber.

(6) Power supply circuitry **736** in the viewer **266** will accept power from either an AC power source or from an optional battery **603'**, or the library **262**. The power supply circuitry **736** provides the necessary voltages to accommodate the various systems within the viewer **266**.

(7) An optional battery **603'** is provided in one embodiment. The battery **603'** is automatically recharged when AC power is available.

(8) An optional RF transceiver **604** which provided two-way data link between the viewer **266** and other components of the home subsystem can also be included in the viewer **266**.

(9) Also, the viewer **266** may include a cellular transceiver (not shown) for mobile communications.

(10) The optional wired (attached) keyboard **267** and wireless (e.g., RF) keyboard **268** (see FIG. **6***a*) may be used with the viewer **266** to provide communications between the subscriber and the viewer **266**.

(11) The optional speaker and microphone **608'** allow the viewer **266** to provide audio signals to the subscriber, and allow the subscriber to provide an audio input. The speaker and microphone **608'** may be used in conjunction with the cellular transceiver **608** or other telecommunications equipment to provide for reception and transmission of telephony and data.

(12) The optional alternative communication interface devices allow the viewer **266** to make use of a variety of communication paths, including wireless Internet paths.

The viewer **266** of FIG. **11** has parts available for providing connections to: a library **744**, electronic card memory **748**, CD ROM units **752**, and a portable memory unit **756** (such as that shown in FIG. **6***b* as **600'**). Various electronic memory cards such as PCMCIA can be used with the viewer **266** to supply and store electronic books.

Security, low power consumption and excellent display technology are desired features of the viewer **266** design. The viewer **266** should be lightweight and portable. The viewer **266** contains a software operating system that allows electronic books to be stored, read and erased and includes the capability to order electronic books and retain them in memory **728** for a predefined period of time determined by the system operator. The software can be configured to allow the electronic book to be read during a period of time (i.e., two weeks) and then automatically erased, read once and erased, or held in memory permanently. In one embodiment, each viewer **266** may have a unique key **605**. All of the data storage may be encrypted with the key **605** for an individual viewer **266** to prevent more than one viewer **266** accessing the text file or electronic book file. Alternative security embodiments are presented in Section VII.

FIG. **12** is a flow diagram of some of the processes executed by the microprocessor **621** in the viewer **266**. The viewer **266** may receive inputs from the subscriber through touch panel controls **740**. In step S**800**, the subscriber's information requests are then processed by the microprocessor **621**.

In step S**804**, if the subscriber requests a menu of available electronic books, the microprocessor **621** will select an electronic book menu. In step S**808**, the microprocessor **621** will open the electronic files that list the electronic books which are available (related to the category of topic of the menu) and display the menu with the names of the available electronic books.

If the subscriber selects a particular book to read, then in step **S812**, the microprocessor **621** will process the selection and determine the electronic file that contains the specific electronic book. In step S**816**, the microprocessor **621** will open the file for that specific electronic book and normally access the first page. (If a pointer has already been set in that books electronic file, the process may default to that page.) In step S**820**, the microprocessor **621** will then determine which page needs to be displayed. That is, the microprocessor **621** will determine whether a next page, previous page or a bookmarked page needs to be displayed. If the pointer for the electronic file is not in the correct location then in step S**828**, the microprocessor **621** will move the pointer and obtain the previous page of data from the stored file. Otherwise, in step S**824**, the microprocessor **621** will normally obtain the next page of text from the stored electronic file. In step S**832**, the microprocessor **621** decrypts the text data using one of the embodiments presented in Section VII, decompresses the text data and sends the data to the video display. The video display will generally have a video display memory associated with it. In step S**832**, the microprocessor **621** will send the data directly to that video display memory. The circuitry for the display then completes the process of displaying the page of text.

If the subscriber, through the controls **740**, requests (from step S800) that the power be turned off, then in step S**836**, the microprocessor **621** initiates power off. In step S**840**, the microprocessor **621** saves the pointer in memory to the page number in the book that the viewer **266** is currently reading. In step S**844**, the microprocessor **621** closes all the electronic files and signals the power circuitry to shut down the power to the various circuits in the viewer **266**. With these examples of basic processes the viewer **266** is able to display book selections and display text from those electronic books.

d. Menu System

Referring generally to FIG. **13**, the electronic book system **200** may have a menu system **851** for selecting features and books from the electronic book system **200**. The operating software and memory required for the menu system **851** may be located at the viewer **266** (e.g., the instruction memory **732** and/or book memory **728**). However, it can also be located at the library **262** (e.g., the instruction memory **632**) or the library **262** and the viewer **266** can share the software and memory needed to operate the menu system **851**. Since the menus are usually displayed on the viewer, and since the viewer **266** may be capable of operating in the absence of the library **262**, the basic software and memory to create the menus is more conveniently located at the viewer **266**.

The menu system **851** allows sequencing between menus and provides menu graphics for graphical displays such as on the LCD display **602** of the viewer **266**. In an electronic book system that uses a set top converter these menus may also be displayed on a television screen. In an electronic book system that uses a computer, these menus may also be displayed on the computer monitor. In an embodiment, the menus provide just basic text information from which the subscriber makes choices. In other embodiments, the menus provide visual displays with graphics and icons to assist the subscriber and allow for subscriber interaction and real-time ordering of electronic books or other content available to the subscriber.

FIG. **13** depicts the menu system **851** with sequencing. The primary menus in the menu system **851** are an introductory menu **850**, a main menu **854** and various submenus **858**. In the embodiment shown, there are three levels of submenus **858**. In certain instances one or two submenus **858** is sufficient to easily direct the subscriber to the selection or information requested. However, there are features in which three or more submenus **858** make the user interface more friendly for the subscriber. Each level of submenus **858** may consist of multiple possible menus for display. The particular menu displayed depends on the selection by the subscriber on the previous shown menu. An example of this tree sequence of one to many menus are the help submenus **887**, **888**. Depending upon the specific help requested, a different level two help menu is displayed to the subscriber.

An example of an introductory menu **850** is shown on FIG. **14***a*. Generally the introductory menu **850** introduces the viewer **266** to the system and provides initial guidance, announcements and instruction. The introductory menu **850** is followed by a main menu **854**, an example of which is shown in FIG. **14***b*. The main menu provides the viewer **266** with the basic selection or features available in the system. FIG. **14***b* is an example of a main menu **854** offering many additional features and submenus **858** to the subscriber. For example, FIG. **14***b* shows that the viewer **266** is able to choose by a point and click method, many options including: (1) free previews, (2) books you can order, (3) books in your library, (4) your current book, (5) help, (6) on-line services and (6) other system features. Following a selection on the main menu **854**, a corresponding submenu **858** is shown.

FIG. **13** shows fourteen available primary or first level submenus. They are (1) account set up **862**, (2) free previews **866**, (3) book suggestion entries **855**, (4) books in your library **872**, (5) books you can order **878**, (6) your current book **884**, (7) help **887**, (8) available features **890**, (9) messages **893**, (10) account information **896**, (11) outgoing message submenu **898**, (12) show links submenu **970**, (13) create links submenu **980**, and (14) show interactive files submenu **990**. FIG. **14***c* is an example of a first level submenu for books in your library **872**. This "Book In Your Library" example submenu **872** shows six available books by title and author and provides the subscriber with the ability to check a different shelf of books **874** or return to the main menu **854**. FIGS. **14***d* and **14***e* show example submenus **858** for books that may be ordered using the "Books You Can Order" submenu **878**.

FIG. **14***f* is an example of a confirmation menu which confirms a subscribers order. In this particular example, the subscriber is required to enter a PIN number to complete the subscriber's order. Any alpha-numeric or similar password may be used to ensure the subscriber is an authorized subscriber. In one embodiment, the subscriber confirms an order with a PIN or password and then receives a final confirmation screen. The final confirmation screen is primarily text and may state:

> Your book order is now being processed using CABLE.
> Your book will be delivered overnight and your VISA account will be charged $2.95.
> Your book will be available for reading at 6:00 AM EST tomorrow. Make sure that:
> 1. your Library Unit and Cable Connection Unit are plugged in with aerials up tonight; and
> 2. you tune your cable converter to THE BOOK Channel. The TV set does not have to remain on.

or similar language.

Examples of the "Account Set Up Menu" 862 and further submenus **858** related to account set up (which provide instructions and account input **864**) are shown in FIG. **14***g* and FIG. **14***h*. These submenus **858** allow initialization of an account at the operations center **250** and orders to be charged to credit cards. The submenus **858** include the ability to enter data related to your desired PIN number or password, credit cards, phone numbers, etc. In one embodiment, the account set up is performed using the telephone system. A confirmation menu verifies that the account has been properly set up with the desired PIN or password and credit card. However, additional set-up methods are presented in the referenced related applications.

Free previews for books **866** are also provided by submenus (**868**, **870**). Examples of the free preview menus are shown in FIG. **14***i* and FIG. **14***j*. FIG. **14***i* shows a menu depicting various books for which previews are available for viewing. Following a book selection, a screen submenu showing an excerpt of the selected book cover's description is provided along with an excerpt from a critic's review of the selected book. In one embodiment, this preview screen for a particular book also allows the subscriber to select a submenu, which provides information about the author. The book preview submenu may also include a still video picture or graphics portraying a book cover or a scene from the book. An example of such a still video picture or graphics is shown in FIG. **14***j*, which depicts a preview screen **870** about the author. The author's preview screen **870** shows a picture of the author, provides a short biography, and may allow the subscriber to order the author's books. The price for ordering the authors various books may also be shown on the menu.

In addition to free previews, in other embodiments, the electronic book system **200** provides the subscriber with a book suggestion feature (see **855**). This is accomplished using the menu system **851** and the processor with associated memory located at the viewer **266**, library **262** or at the distribution point (**1020** or **250**). When necessary, information for the book suggestion feature is sent in the text data of the signal to the home system **258**. With this feature, books or authors are suggested to a subscriber based upon historical data of the subscriber's previous orders, demographics or mood of the subscriber, other indicators, and/or by text word searches.

In one book suggestion embodiment, text word searches of preview information (such as book cover descriptions, critics reviews and biographies about the author) and/or text of books or other titles are performed by the library **262** using databases stored in the library memory **600**. Personalized book or author suggestions are made to the subscriber by obtaining information from the subscriber indicative of general subscriber interests. Subscriber entries may be solicited from the subscriber using the book suggestion entry submenu **855**. The system uses these subscriber entries either directly or indirectly to search for books or authors to suggest to the subscriber.

Generally, the electronic book suggestion methods may be categorized into two categories, either responsive methods (which respond to a series of subscriber menu entries), or intelligent methods (which analyze data to suggest a book). Using a responsive or intelligent method, the system **200** determines a list of suggested titles or authors and creates a second or third level submenu **856**, **857** to suggest the titles for subscriber selection.

Responsive methods of suggesting titles include, for example, the use of mood questions, searching for authors, and keyword searching. Using the instruction memory **732** and menu generation hardware (e.g., **607**) of the viewer **266**, a series of mood questions can be presented on menus to determine a subscribers interest at a particular time. For this methodology, the home system's **250** processor **404** and instruction memory **416** assign each title mood indicators (and sub-indicators) from a group such as light, serious, violent, short, long, dull, exciting, complex, easy-read, young theme, old theme, adventure, romance, drama, fiction, science-fiction, etc. These indicators are sent to the home system **258** with the text data and are stored in library memory **600**. Based upon the subscriber entries, the processor associates a set of indicators with the subscriber's request and a set of books with matching indicators are located for suggesting to the subscriber.

Responsive searches for authors or keywords (a search word provided by the subscriber) are generally performed by the library processor **628** and instruction memory **632** on data stored in the library memory **600**. For example, a keyword given by the subscriber may be searched for a match in library memory **600** storing the book reviews, critics and previews databases. Thus, if a subscriber provided an entry of the word "submarine" on an appropriate submenu, the title "Hunt For Red October" may be located by the microprocessor **628** using instruction from a routine in instruction memory **632**.

Intelligent methods of suggesting programs include analyzing personal profile data on the subscriber and/or historical data about the subscriber such as past books ordered by the subscriber (or buy data). This method may be performed at the distribution point or operations center **250** by the on-site processor **404** using subscriber databases stored in memory **428**. The home system **258** receives the text data including program suggestion information from the distribution point or operations center **250** and generates the program suggestion submenus **855**, **856**, **857** using the same text data receiving **212** and viewer menu generation hardware (e.g., **607**, **621**) described above. Software routines and algorithms stored in instruction memories (e.g., **632**, **732**) are used to analyze historical data and book ordered data to determine a line of books to suggest to the subscriber.

The algorithms for this powerful feature of suggesting books or authors to subscribers is disclosed in great detail in U.S. Pat. No. 5,798,785, entitled TERMINAL FOR SUGGESTING PROGRAMS OFFERED ON A TELEVISION PROGRAM DELIVERY SYSTEM, filed Dec. 2, 1993, which is incorporated herein by reference.

Referring to FIG. **13**, submenus **858** are shown on the "Books In Your Library" submenu **872** and may be broken into shelf numbers with submenus for each shelf **874**, The submenus **858** for the "Books You Can Order" submenu **878** is similarly broken out into submenus by shelves **880**, **882**. These shelves may each be a category or genre of books. Books may be grouped into categories such as best sellers, novels, fiction, romance, etc. See FIG. **14***d.*

Referring to FIG. **13**, the submenu **858** for "Your Current Book" **884** allows a subscriber to select a current book **884** and then determine what page to view. This selection is confirmed with a level two submenu **885**. The help submenu **887** provides the subscriber with additional help screens **888**. The submenus **858** for available features **890** may be broken out into a sequence of separate submenus for each feature **891**, **892**. Referring to FIG. **13**, messages can also be sent with the electronic book selection and delivery system **200**. A level one message screen provides the subscriber with the ability to select from various messages the subscriber has pending **893**. Each message is then shown on a separate submenu screen **894**, **895**. The message may contain text and graphics.

Referring to FIG. **13**, account information is shown on a level one submenu **896** and then follow-on submenus **858** show the recent orders and your account balance **897**. There is also a level one submenu for outgoing messages **898** which has a follow-on submenu used as an input screen **899**.

In addition to the specific features and submenus described in FIG. **13** and FIG. **14***a* through FIG. **14***j*, many other variations and features are possible. When a book is finally selected for viewing the title page **886** will appear on the screen followed by a page of text.

III. The Billing and Collection System

In one embodiment, the billing and collection system **278** (shown in FIGS. **2** and **3**) utilizes the latest technology in electronic transaction and telephone switching to track orders, authorize deliveries, bill consumers, and credit publishers automatically. The telephone calls initiated by the phone connector **270** are received by the billing and collection system **278** which responds immediately without human intervention by placing the order and charging the consumers credit card account. Data is compiled periodically and publishers **282** are credited for sales of their books or other text. The billing and collection system **278** may also connect with subscribers through two-way cable connections, cellular, or other communication means. These additional methods are detailed in the referenced related applications.

The billing and collection system **278** communicates with the operations center to track changes in available books and to provide statistical data to the operations center **250**.

IV. Public Library, School, and Bookstore System

The electronic book system can be modified to be used at public libraries, schools, bookstores, newsstands, or standalone kiosks. FIG. **15** shows one possible arrangement of components for the distribution location. The main unit is the file server **900**. The file server **900** is a large electronic memory unit that can store thousands of books, newspapers, or periodicals. Various electronic storage means may be used in the file servers, such as hard disks, read-write CD ROMs and read-only CD ROMs.

The system comprises five components; the file server **900**, a converter or video connector **904** or connector capable of interfacing to one of the alternative delivery systems presented in the referenced related applications, a controller **908**, a viewer **912**, and a catalog printer **916**. The software for controlling the system is primarily located in the controller **908**. The converter or video connector **904** is similar to those described above. In this configuration the controller unit **908** monitors the data being transferred to the file server **900** by the converter **904**. The controller **908** may be provided with a viewing screen and several control buttons. When it is necessary to have a larger screen to perform more sophisticated controlling of the system a viewer **266** may be connected to the controller **908** and the viewer screen and controls **740** may be used.

For security reasons, the controller **908** is only able to download books to public viewers **912** which are authorized to receive books from the particular file server **900**. Also for security reasons it is not desirable that the public viewer **912** have access to more than one file server **900**. In this way, security can be maintained over the text data for books. The public viewer **912** may be limited to receiving one or two books at a time from the controller **908**. When the user of the public viewer **912** needs a new or additional book, the user returns the viewer **912** to the school or public library where the user receives a new book from the controller **908**. Additional security mechanisms associated with this kiosk-based distribution of electronic books are presented in Section VII.

In order to track the books that are available on the file server **900**, the titles of the available books may be printed on a catalog printer **916**. The catalog printer **916** is connected to the library controller **908** and the titles of the books are downloaded to the catalog printer **916**. For security reasons, the coded text for any of the electronic books may not be authorized for printing using the controller **908** and catalog printer **916**. In order to maintain security over the data, none of the electronic book data may be allowed to be downloaded to the printer **916**. Once a complete printout of available book titles, magazines, or other textual material is complete, a hard copy of the catalog **920** can be maintained at the file server **900**.

The system shown may also be used at bookstores. The bookstores can rent the public viewer **912** to customers with the text for one or two books loaded onto the public viewer **912**. The public viewer **912** may be provided with an automatic timeout sequence. The timeout sequence would erase the textual data for the books after a certain period of time, for example, two weeks. It is expected that after a period of time (perhaps within two weeks) the renter would return the public viewer **912** to the bookstore and receive additional books for viewing. Using this arrangement, it is also possible for the bookstore to (permanently) sell a viewer **912** to a regular customer. The customer then returns to the bookstore from time to time to receive textual data for a book which the customer can then store permanently on the customer's own viewer **912**. Various other configurations are possible for bookstores, schools and public libraries using the file server **900** and public viewer **912** can be described.

V. Use of a Set Top Converter

Existing set top converter boxes such as those made by Scientific Atlanta or General Instruments are presently unequipped to handle the book selection system of the present invention. Although set top converters may be built which include the library functions, hardware modifications are necessary in order to use the book selection system with existing set top converter technology.

FIGS. **16***a* and **16***b* are examples of hardware modifications or upgrades. A port is used to attach hardware upgrades described below to a set top terminal. Two upgrades are possible to set top converters **601** to assist in receiving and selecting electronic books, a menu generation card upgrade (FIG. **16***a*) and an information download unit (FIG. **16***b*). Each of these upgrades may be connected to the set top terminal unit through an upgrade port. A four wire cable, ribbon cable, FireWire (IEEE 1394B) interface connector, USB connector, or the like may be used to connect the upgrade to the set top converter **601**.

A card addition **950** to a set top converter **601** is depicted in FIG. **16***a*. The card **950** shown provides the additional functionality needed to utilize the book selection system with existing set top converter **601** technology. The card **950** may be configured to slip inside the frame of a set top terminal and become part of the set top terminal, an advanced set top terminal. The primary functions the card **950** adds to the set top converter **601** are the interpreting of data signals, generating of menus, sequencing of menus, and, ultimately, the ability of the subscriber to select a book using either the television or a viewer **266**. The card **950** also provides a method for a remote location, such as the cable headend, to receive information on books ordered. The books ordered information and control commands may be passed from the cable headend to the card **950** using telephone lines or alternative ordering methods as presented in the referenced related applications.

The primary components of the card **950** are a PC chip CPU **952**, a VGA graphic controller **954**, a video combiner **956**, logic circuitry **958**, NTSC encoder **960**, a receiver **962**, demodulator (not shown), and a connector **611'**, which consists of a dialer. The card **950** operates by receiving the data text signal from the cable headend through the coaxial cable. The logic circuitry **958** of the card **950** receives data **964**, infrared commands **966**, and synchronization signals (not shown) from the set top converter **601**. Menu selections made by the viewer **266** on the remote control are received by the set top converter's **601** IR equipment and passed through to the card **950**. The card **950** interprets the IR signal and determines the book (or menu) the subscriber has selected. The card **950** modifies the IR command to send the information to the set top converter **601**. The modified IR command contains the channel information needed by the set top converter **601**. Using the phone line **968** and dialer **611'**, the card **950** is able to transmit electronic books ordered information to the cable headend. It is also possible to receive the electronic books over the telephone lines and other telecommunications networks, including wireless networks, and by-pass the video distribution system.

These commands are passed through the interface linking the set top terminal's microprocessor with the microprocessor of the hardware upgrades. In this way, subscriber inputs, entered through the set top terminal keypad or remote control, can be transferred to any of the hardware upgrades for processing and responses generated therein can then be sent back to the set top terminal for display. In one embodiment the IR commands **966** are transferred from set top terminal **601** to hardware upgrade.

Hardware upgrades may include a microprocessor, interactive software, processing circuitry, bubble memory, and a long-term memory device. In addition to these basic components, the hardware upgrade may make use of an additional telephone modem or CD-ROM device.

An information download hardware upgrade **1001** shown in FIG. **16***b* allows the subscriber to download large volumes of information from the operations center **250** or cable headend using a set top terminal **610**. The hardware upgrade **1001** will enable subscribers to download data, such as electronic books and electronic magazines, to local secure storage. Primarily, the hardware upgrade **1001** is an additional local storage unit **1003** (e.g., hard disk, floppy, optical disk or magnetic cartridge and may include a microprocessor **1005**, instruction memory **1007**, and a random access memory **1009**, as shown in FIG. **16***b*). A small portable viewer may also provided with the upgrade **1001** to enable downloaded text to be read without the use of a television.

The downloadable information may be text or graphics supplied by the operations center **250** or cable headend. With the upgrade **1001**, electronic books may be downloaded and read anywhere with the viewer **266**. Using the upgrade **1001**, electronic books may be downloaded and stored in compressed form for later decompression. The electronic books may be decompressed only at the time of viewing. Important text that the public desires immediate access may made available through this system. Text such as the President's speech, a new law, or a recent abortion decision rendered by the Supreme Court may be made immediately available.

In one embodiment, electronic book ordering information is stored at each set top terminal **610** until it is polled by the cable headend using a polling request message format. An example of a polling request message format consists of six fields, namely: (1) a leading flag at the beginning of the message, (2) an address field, (3) a subscriber region designation, (4) a set top terminal identifier that includes a polling command/response (or P/F) bit, (5) an information field, and (6) a trailing flag at the end of the message. A similar response frame format for information communicated by the set top terminal to the cable headend in response to the polling request may be used. FIG. **17** shows components of a set top terminal **610'**. The components include a data receiver **617'** and a data transmitter **1011**. The data transmitter provides upstream data communications capability between the set top terminal **610'** and the cable headend. Upstream data transmissions are accomplished using the polling system described and, using a data transmitter **1011**. Both receiver **617'** and transmitter **1011** may be built into the set top terminal **610'** itself or added through an upgrade module. Regardless of the specific hardware configuration, the set top terminal's data transmission capabilities may be accomplished using the hardware shown in FIG. **17**.

FIG. **17** shows RF signals, depicted as being received by a data receiver **617'** and tuner **613** working in unison. Both of these devices are interfaced with the microprocessor **1013**, which receives inputs **1015**, from the subscriber, either through a set top terminal's keypad, a remote control unit or viewer **266**. Generally, all cable signals intended for reception on the subscriber's TV are accessed by the tuner **613** and subsequently processed by the processing circuitry **1017**. This processing circuitry **1017** typically includes additional components (not shown) for descrambling, demodulation, volume control and remodulation on a Channel 3 or 4 TV carrier.

Data targeted to individual set top terminals is received by the data receiver **617'** according to each set top terminal's specific address or ID. In this way, each addressable set top terminal **610'** only receives its own data. The data receiver **617'** may receive set top terminal **610'** specific data in the information field of the signal frame described or on a separate data carrier located at a convenient frequency in the incoming spectrum. The received data includes information regarding electronic books and menus available for selection. The subscriber may enter a series of commands **1015** using a keypad or remote control in order to choose an electronic book or menu. Upon receipt of such commands, the set top terminal's microprocessor **1013** instructs the tuner to tune to the proper frequency of the channel carrying data and subsequently instructs the processing circuitry **1017** to begin descrambling of this data.

Upon selection of an electronic book, the microprocessor **1013** stores any selection information in local memory (not shown) for later data transmission back to the cable headend. The set top terminal's microprocessor **1013** coordinates all CATV signal reception and also interacts with various upstream data transmission components. Typically, the data transmitter **1011** operates in the return frequency band between 5 and 30 MHZ. In an alternative embodiment, the frequency band of 10 to 15 MHZ may be used. Regardless, however, of the frequency band used, the data transmitter **1011** sends information to the cable headend in the information field of the response frame described. Those skilled in the art will recognize that a number of variations and combinations of the above-described set top terminal hardware components may be used to accomplish upstream data transmissions.

VI. Books-On-Demand System

The electronic book system **200** described may also be configured in a book-on-demand style. FIG. **18***a* shows one example of a configuration for a book-on-demand system. A book on demand system requires more powerful two-way communications between the consumer's home, bookstore, school or public library and either the operations center **250** or a distribution site **1020** such as the cable headend. In one embodiment, this type of two-way communication can be provided by the hardware shown in FIG. **17** and described above. Additional methods related to alternative communication paths are presented in the referenced related applications.

Referring to FIG. **18***a*, in a book-on-demand system, the subscriber selects the book to be download from an available menu of books (see for example FIGS. **14***d* and **14***e*). The data for menus of available books is usually sent to the subscriber location by the distribution site **1020**. After the subscriber's menu selection, information about the subscriber selection (or request) is then communicated to either a distribution point **1020** (such as a cable headend) or the operations center **250**. Upon receipt of this request, the needed textual and graphical information for the book is spooled and sent to the subscriber. In this manner, electronic books are only sent when requested by the subscriber and are sent immediately upon demand for the electronic book (or text).

In order to support such a demand system, the text delivery and distribution must be conducted on a strong nodal architecture distribution system, such as, a video-on-demand cable or telephone television system, through use of individual telephone calls on the public telephone system or cellular phone system, through the use of the Internet, or a number of other data network options.

The book-on-demand system allows for a greater selection of electronic books to the subscriber and limits the amount of communicated book data that is unnecessary or unneeded. It also provides the electronic book to the subscriber in a much timelier fashion.

In addition to a stronger distribution system, a book-on-demand system requires a distribution point **1020** to have more sophisticated equipment to access and "spool out" the textual information. This can be accomplished using file server technology **1024** for storing the books and distribution technology such as ATM **1028** or telephone-type switching (not shown) to distribute the textual information. The file server **1024** and distribution technology that can be used in configuring such a book-on-demand system is described in U.S. Pat. No. 5,262,875 and U.S. Pat. No. 5,218,695, cited above.

FIG. **18***a* shows an embodiment for a book-on-demand system that utilizes file server technology. In addition to books, the embodiment of FIG. **18***a* will support distribution of nearly any digital data. Books or textual files are received from publishers **282** and other sources through local feeds **1032**, ATM **1028**, or by satellite dish **1036**, for example. The data is then stored in memory **1040** at the file server **1024**. In one embodiment, the distribution point **1020** is a cable headend that receives requests from subscribers and delivers text to subscribers over a two-way communication system (such as a video-on-demand system (VOD) **1044**).

The library **262** can be connected to either a basic premium-type service cable system **1048**, a near video-on-demand type cable system (or pay-per-view (PPV) **1052**) or a video-on-demand cable system **1044**. In connecting with either of these three systems the library **262** may access the cable directly or may access the system through a set top terminal **601'**, **601''**, or **601'''**.

Using the two-way video-on-demand system **1044**, a subscriber is able to request a specific book title and receive that text immediately following its request. To accomplish this, the distribution point **1020** transmits a list of available books through the cable delivery system to the library **262**. The library **262** displays the list of available books on a menu or similar format. As described earlier, the library **262** may use menus which list categories of available books to form its request from the distribution point **1020**. After selecting a book the library **262** then sends a request signal on the two-way communication system **1044** back to the distribution point **1020**. This request signal can be handled in two ways. The library **262** either initiates the request or the distribution point **1020** polls the various libraries on to the two-way system **1044**. Upon receiving the request for the book title, the text associated with that book title is transmitted to the library **262** using the two-way cable system **1044**.

FIG. **18***b* is an expanded view of an operations center **250** that supports a regional or national book-on-demand system. In fact, the operations center **250** shown supports distribution of nearly any digital data. The operations center **250** supports multiple feeds to receive digital information by tape **1060**, **1060'**, ATM **1028**, or satellite **1036**. The information is processed through an input MUX **1064** and a small file server **1068** before reaching the master file server **1072**. Digital data such as books received from publishers **282** is then stored on the master file server **1072**. The digital data may be stored compressed in a standard format such as MPEG2.

A system controller **1076** provides control over the regional or national book-on-demand system. Books may be packaged into groups to provide feeds to various cable headends. In addition, scheduling and marketing research are conducted at the operations center **250**. In order to handle the scheduling and market research, book buy data is received at the operations center **250** through a multiplexer **1082**. Book buy information can be provided by the operations center **250** to the billing and collection system **278**.

The operations center **250** is also equipped to insert messages or advertisements into the file server. These messages or advertisements will eventually be received by the subscribers.

The master file server **1072** uses an output multiplexer **1080** and ATM **1028** as well as satellite connections to distribute digital data. In one embodiment, cable headends receive text data on books from the master file server **1080** through the output multiplexer **1028** and an ATM system **1028**. After receiving the digital book data, the cable headends store the books in a local file server **1024**. FIG. **18***a*'s distribution point **1020** is an example of a cable headend which may receive data from the operations center **250** of FIG. **18***b* through an ATM hookup **1088** or satellite hookup. All communications and storage in the Book on Demand system may make use of the security mechanisms presented in Section VII.

VII. Electronic Book Security Mechanisms

The electronic book distribution system and components may incorporate various forms of security using cryptographic mechanisms. Cryptography consists of an encryption and reversing decryption process. A basic encryption process operates on a string of digital bits, or clear text, by modifying the clear text using a series of mathematical operations with both the clear text and a second string of bits, called an encryption key, as inputs, resulting in a third string of bits, called ciphertext. A reversing process exists using a fourth string of bits, called a decryption key, that, when input into a decryption process consisting of a second series of mathematical operations, along with the ciphertext, the resulting output is the original clear text string of digital bits.

Two types of techniques underlie the majority of encryption mechanisms associated with electronic book security: symmetric encryption and asymmetric public key encryption. Referring to FIG. **19***a*, symmetric encryption uses a cryptographic algorithm where the same key used by encryption process **5001** to encrypt data is also used by decryption process **5002** to decrypt data. Henceforth, for uses of symmetric key encryption, encryption of unencrypted content X **5003**, using symmetric key SK **5004** is represented as $E_{SK}[X]$ **5005**, whereas decryption of encrypted content $E_{SK}[X]$ **5005** using symmetric key SK **5004**, is represented as $D_{SK}[E_{SK}[X]]$ and results in unencrypted content X **5003**.

Asymmetric public key encryption is a cryptographic system using two keys, one key to encrypt content, and a different key to decrypt the same content. These key pairs and the associated cryptographic algorithms are constructed such that knowledge of one of the two keys does not reveal the other key. Additionally, in asymmetric public key encryption, content encrypted using one key cannot be decrypted using the same key. Therefore, one of the keys of the key pair, the public key, can be distributed widely, while the other key of the key pair is held closely and protected, the private key. This allows a first party, or a sender S to encrypt content using the sender's private key, pKS **5013** and encryption process E_{pKS} **5011**. The sender can then distribute the resulting encrypted content $E_{pKS}[X]$ **5014** to any second party, or recipient that possesses the sender's public key PKS **5015**. The recipient can then decrypt the encrypted content $E_{pKS}[X]$ **5014** using the sender's public key, PKS **5015** and decryption process D_{PKS} **5012**. Encryption of unencrypted content X **5003** using the private key of sender S is represented as $E_{pKS}[X]$, whereas decryption of the encrypted content, using the public key of the sender is represented as $D_{PKS}[E_{pKS}[X]]$. FIG. **19***b* depicts the case where content is encrypted in a private key. Alternatively, the sender could use the recipient public key PKR **5023** and encryption process E_{PKR} **5021** to encrypt the unencrypted content X **5003**. Then, only the recipient, using a recipient's private key pKR **5025**, is able to decrypt the encrypted content $E_{PKR}[X]$ **5024** using decryption process D_{pKR} **5022**. Encryption of the unencrypted content X **5003** using the recipient's public key PKR **5025**, is represented as $E_{PKR}[X]$, whereas decryption of the encrypted content $E_{pKS}[X]$ **5014**, using the recipient's private key **5025** is represented as $D_{pKR}[E_{PKR}[X]]$. FIG. **19***c* depicts the case where content is encrypted in a public key.

A. Publisher to Operations Center Communications Security

Publishers **282** or other content providers **110** can deliver their electronic book content to the operations center **250** via a secured mechanism. In one embodiment, an asymmetric public key encryption technique is used, as described in Contemporary Cryptography, edited by Gustavus Simmons, published by IEEE Press in 1992, and hereby incorporated by reference. Public key algorithms used may include the Merkle-Hellman Knapsacks technique, as described in U.S. Pat. No. 4,218,582 to Hellman and Merkle, the RSA technique, as described in U.S. Pat. No. 4,405,829 to Rivest, Shamir, and Adleman, the Pohlig-Hellman technique, as described in U.S. Pat. No. 4,424,414 to Hellman and Pohlig, the Schnorr Signatures technique, as described in U.S. Pat. No. 4,995,082 to Schnorr, or any comparable public key technique. The techniques described in these U.S. Patents are hereby incorporated by reference. In an embodiment depicted in FIG. **20**, a publisher **282**, serving as a sender **4998**, first encrypts electronic book content EBC **5100** destined for the operations center **250**, which serves as the recipient **4999**, using a symmetric key encryption process E_{SK} **5102** and DES, PKZIP, BLOWFISH, or any other symmetric encryption algorithm, resulting in encrypted content E_{SK}[EBC] **5109**. The encryption process E_{SK} **5102** uses a symmetric key SK **5103** either randomly generated by a key generator process **5104** or previously defined and retrieved from key storage memory **5105**. Then, the publisher **282** encrypts the symmetric key SK **5103** with private key encryption process E_{pKS} **5106** using the publisher's private key pKS **5107**, resulting in encrypted key E_{pKS}[SK] **5108**. Then, the publisher **282** packages encrypted key E_{pKS}[SK] **5108**, encrypted content E_{SK}[EBC] **5109** and non-encrypted information **5110** related to the electronic book or the exchange and delivers the package to the operations center **250**. Using decryption process D_{PKS} **5111** and the publisher's public key PKS **5112**, the operations center **250** decrypts the encrypted key E_{pKS}[SK] **5108** and uses the recovered symmetric key SK **5103** to decrypt the encrypted content E_{SK}[EBC] **5109** using decryption process D_{SK} **5113**.

In an alternate embodiment, depicted in FIG. **21**, symmetric key encryption is used in conjunction with a certificate authority **4997**. The certificate authority **4997**, a trusted source, provides a symmetric key to each publisher **282**, serving as the sender **4998**, and the operations center **250**, serving as the recipient **4999**. The certificate authority **4997** may be an existing commercial entity such as Entrust or Verisign or a private entity established for the sole purpose of electronic book secure distribution. The publisher **282** contacts the certificate authority **4997**, sending a request **5120** for a transaction symmetric key SKT **5121** to be used during a transaction. The certificate authority **4997** either randomly generates the transaction symmetric key SKT **5121** by using a key generator process **5124** or retrieves the previously defined transaction symmetric key SKT **5121** from key storage memory **5125**. The transaction symmetric key SKT **5121** is encrypted by the certificate authority **4997** using symmetric key encryption process E_{SKS} **5123** and the publisher's symmetric key SKS **5122**. A resulting encrypted transaction symmetric key E_{SKS}[SKT] **5126** is delivered by the certificate authority **4997** to the publisher **282**. The publisher **282** decrypts the encrypted transaction symmetric key E_{SKS}[SKT] **5126** using decryption process D_{SKS} **5127** and the publisher's symmetric key SKS **5122** to recover the transaction symmetric key SKT **5121**. The publisher **282** then uses the recovered transaction symmetric key SKT **5121** received from the certificate authority **4997** to encrypt the electronic book content EBC **5100** using encryption process E_{SKT} **5128**, resulting in encrypted content E_{SKT}[EBC] **5129**. The publisher **282** then delivers the encrypted content E_{SKT}[EBC] **5129** to the operations center **250**. The transaction symmetric key SKT **5121** is also encrypted by the certificate authority **4997** using symmetric key encryption process E_{SKR} **5131** and the operations center's symmetric key SKR **5130**. The resulting encrypted transaction symmetric key E_{SKR}[SKT] **5132** is delivered by the certificate authority **4997** to the operations center The operations center **250** decrypts the encrypted transaction symmetric key E_{SKR}[SKT] 5132 using decryption process D_{SKR} **5133** and the operations center's symmetric key SKR **5130** to recover the transaction symmetric key SKT **5121**. The operations center **250** then uses the recovered transaction symmetric key SKT **5121** received from the certificate authority **4997** to decrypt the encrypted content E_{SKT}[EBC] **5129** using decryption process D_{SKT} **5134**, resulting in unencrypted electronic book content **5100**.

In yet another embodiment, depicted in FIG. **22**, the publisher **282**, acting as the sender **4998**, generates a transaction symmetric key SKT **5140**. The publisher **282** either randomly generates the transaction symmetric key SKT **5140** by using a key generator process **5141**, or retrieves a previously defined transaction symmetric key SKT **5140** from key storage memory **5142**. The publisher **282** encrypts the electronic book content EBC **5100** using encryption process E_{SKT} **5143** and the transaction symmetric key SKT **5140**, and delivers encrypted content E_{SKT}[EBC] **5144** to the operations center **250**, acting as recipient **4999**. The publisher **282** then encrypts the transaction symmetric key SKT **5140** using encryption process E_{SKS} **5145** and a publisher's symmetric key SKS **5146** that it shares with a third party certificate authority **4997** and delivers an encrypted symmetric key E_{SKS}[SKT] 5147 to the certificate authority **4997**. The certificate authority **4997** decrypts the encrypted symmetric key E_{SKS}[SKT] 5147 using decryption process D_{SKS} **5148** and the publisher's symmetric key SKS **5146**. The operations center **250** may contact the certificate authority **4997** using request **5149** to obtain the transaction symmetric key SKT **5140**. Prior to the certificate authority **4997** delivering the needed transaction symmetric key **5140** to the operations center **250**, the operations center **250** may be required to complete a financial transaction with the certificate authority **4997**, paying for the electronic book content first. The certificate authority **4997** then encrypts the transaction symmetric key SKT **5140** using encryption process E_{SKR} **5150** and an operations center's symmetric key SKR **5151** that the certificate authority **4997** shares with the operations center **250** and delivers encrypted symmetric key E_{SKR}[SKT] **5152** to the operations center **250**. The operations center **250** decrypts the encrypted symmetric key E_{SKR}[SKT] **5152** using decryption process D_{SKR} **5153** and the operations center's symmetric key SKR **5151**, and uses the recovered transaction symmetric key SKT **5140** to decrypt the encrypted content E_{SKT}[EBC] **5144** using decryption process D_{SKT} **5154**, resulting in electronic book content EBC **5100**.

In another embodiment, depicted in FIG. **23***a*, the publisher **282**, serving as the sender **4998**, encrypts a transaction stream TS **5165** between the publisher **282** and the operations center **250**, serving as the recipient **4999**. To do so, the publisher **282** may use a sender private key pKS **5160** and encryption process E_{pKS} **5161** to encrypt the transaction stream TS **5165**, resulting in encrypted transaction stream E_{pKS}[TS] **5162**.

In this embodiment, the operations center **250** uses decryption process D_{pKS} **5164** and sender public key PKS **5163** to decrypt the encrypted transaction stream E_{pKS}[TS] **5162**. In another embodiment, depicted in FIG. **23***b*, the publisher **282**, serving as the sender **4998**, may use a public key of the operations center **250**, serving as the recipient **4999**, to encrypt the transaction stream TS **5165**. To do so, the publisher **282** may use a recipient public key PKR **5171** and encryption process E_{PKR} **5170** to encrypt the transaction stream TS **5165**, resulting in encrypted transaction stream E_{PKR}[TS] **5173**.

In this embodiment, the operations center **250** uses decryption process D_{pKR} **5174** and recipient private key pKR **5172** to decrypt the encrypted transaction stream E_{PKR}[TS] **5173**. In another embodiment, depicted in FIG. **23***c*, the publisher **282**, serving as the sender **4998**, may use a transaction symmetric key SKT **5181** that both the publisher **282** and the operations center **250** have stored in advance of the transaction to encrypt the transaction stream TS **5165**. In this embodiment, the publisher **282** uses encryption process E_{SKT} **5180** and transaction symmetric key SKT **5181** to generate the encrypted transaction stream E_{SKT}[TS] **5182**. The operations center **250** uses decryption process D_{SKT} **5183** and transaction symmetric key SKT **5181** to decrypt the encrypted transaction stream E_{SKT}[TS] **5182**, resulting in the transaction stream TS **5165**.

In another embodiment, depicted in FIG. **24***a*, the publisher **282**, serving as the sender **4998**, and the operations center **250**, serving as the recipient **4999**, initiate the transaction by negotiating a shared key to use for the transaction, using, for example, the Elliptic Curve Diffie-Hellman key exchange algorithm, described in U.S. Pat. No. 4,200,700 to Hellman, Diffie, and Merkle, which is hereby incorporated by reference, to generate the shared transaction symmetric key. Key negotiation information **5190** is exchanged between the publisher **282** and the operations center **250**. As a result of the negotiation process, a publisher's key generator algorithm **5191** generates the transaction symmetric key SKT **5193** and the operations center's key generator algorithm **5192** generates the transaction symmetric key SKT **5193**. The publisher **282** encrypts the electronic book content EBC **5100** using encryption process E_{SKT} **5194** and the shared transaction symmetric key SKT **5193** and delivers the resulting encrypted content E_{SKT}[EBC] **5195** to the operations center **250**. The operations center **250** uses the shared transaction symmetric key SKT **5193** and decryption process D_{SKT} **5196** to decrypt encrypted content E_{SKT}[EBC] **5195**. In a different embodiment, depicted in FIG. **24***b*, the publisher **282** serves as the sender **4998** and operations center **250** serves as the recipient **4999**. Initial key negotiation information **5200** is exchanged between a seed key generation algorithm **5201** at the publisher **282** and a seed key generation algorithm **5202** at the operations center **250**. As a result, the seed key generation algorithm **5201** at the publisher **282** and the seed key generation algorithm **5202** at the operations center **250** each generate seed key SK **5203** using, for example, the Elliptic Curve Diffie-Hellman key exchange algorithm, as described in U.S. Pat. No. 4,200,700. The seed key SK **5203** is then used by key sequence generator **5204** at the publisher **282** to generate the first in a sequence of keys, transaction symmetric key SKTi **5206**. Similarly, the seed key SK **5203** is used by key sequence generator **5205** at the operations center **250** to generate an identical sequence of keys, beginning with shared transaction symmetric key SKTi **5206**. The publisher **282** encrypts the electronic book content EBC **5100** using encryption process E_{SKTi} **5207** and the shared transaction symmetric key SKTi **5206** and delivers a resulting encrypted content E_{SKTi} [EBC] **5208** to the operations center **250**. The operations center **250** uses the transaction symmetric key SKTi **5206** and decryption process D_{SKTi} **5209** to decrypt the encrypted content E_{sKTi}[EBC] **5206**. The publisher key sequence generator **5204** and the operations center key sequence generator **5205** continue to generate matching transaction symmetric keys for use in encrypting each subsequent transaction between the publisher **282** and the operations center **250**.

The publisher **282** may deliver the electronic book content to multiple operations centers. In one embodiment, the publisher **282** delivers the electronic book content to each operations center **250** independently using one of the embodiments described herein. In an alternative embodiment, the publisher **282** may broadcast the electronic book content to multiple operations centers **250** simultaneously. In one embodiment used for broadcasting, depicted in FIG. **25***a*, the publisher **282**, serving as the sender **4998**, encrypts the electronic book content EBC **5100** using encryption process E_{SKT} **5211** and transaction symmetric key SKT **5210**, resulting in encrypted content E_{SKT}[EBC] **5217**. The transaction symmetric key SKT **5210** is then encrypted using public key encryption process E_{PKA} **5212** and public key PKA **5213** for recipient A **4999**, the first operations center **250** to receive the electronic book content, resulting in encrypted key E_{PKA}[SKT] **5218**. The transaction symmetric key SKT **5210** is then encrypted using public key encryption process E_{PKB} **5212'** and public key PKB **5213'** for recipient B **4999'**, the second operations center **250** to receive the electronic book content, resulting in encrypted key E_{PKB}[SKT] **5218'**. This process is repeated for each of the operations centers **250** receiving the electronic book content. The encrypted content E_{SKT}[EBC] **5217**, along with encrypted keys **5218**, **5218'**, and **5218"**, are delivered to all the receiving operations centers **250**. Each operations center **250** uses its own private key to decrypt the transaction symmetric key SKT **5210**. For example, recipient A **4999** uses decryption process D_{pKA} **5214** and private key pKA **5216** to decrypt the encrypted key E_{PKA}[SKT] **5218**, recovering the transaction symmetric key SKT **5210**. Decryption process D_{SKT} **5215** is then used to decrypt encrypted content E_{SKT}[EBC] **5217** using transaction symmetric key SKT **5210**.

In another embodiment, depicted in FIG. **25***b*, operations centers **250** may be assigned to predefined groups. Prior to the distribution of electronic book content EBC **5100** by publisher **282**, serving as the sender **4998**, for each defined group, a group symmetric key SKG **5220** is created and distributed by the publisher **282** to each operations center **250**, serving as recipients **4999**, **4999'** and **4999"** within the group.

When the publisher **282** sends the electronic book content EBC **5100** to a pre-defined group of operations centers, the publisher **282** encrypts the electronic book content EBC **5100** using encryption process E_{SKG} **5221** and the group symmetric key SKG **5220** pre-defined for that group and delivers the encrypted content E_{SKG}[EBC] to all the operations centers **250** in the group. Recipients **4999**, **4999'**, and **4999"** use decryption process D_{SKG} **5223** and the group symmetric key SKG **5220** for that group to which they are assigned to decrypt the encrypted content E_{SKG}[EBC].

To ensure that the electronic book content delivered by the publisher **282** to the operations center **250** was not altered in route, integrity checking algorithms may be employed. In one embodiment, depicted in FIG. **26**, the publisher **282**, serving as sender **4998**, uses a one-way hashing algorithm **5231**, as presented in Applied Cryptography, by Bruce Schneier, published by John Wiley & Sons, Inc. in 1996, and hereby incorporated by reference, where a hashing value **5232** is calculated by the publisher **282** based on the electronic book content file **5230** as an input. This resulting hashing value **5232**, along with the actual encrypted electronic book file **5237** that has been encrypted by the publisher **282** via encryption process **5235** is delivered to the operations center **250**, serving as the recipient **4999**.

The operations center **250** decrypts the encrypted electronic book file **5237** using decryption process **5236** to recover electronic book content file **5230'**. The operations center **250** then uses the hashing algorithm **5231** with the electronic book content file **5230'** as an input to generate a hashing value **5232'**. A comparator **5223** compares the hashing value **5232'** and the hashing value **5232** delivered with the encrypted electronic book file **5237**. If the hashing value **5232'** calculated by the operations center **250** coincides with the hashing value **5232** delivered by the publisher **282**, the integrity of the electronic book content file **5230'** is ensured.

To identify the publisher **282** delivering the electronic book and to guarantee non-repudiation, i.e., that the publisher **282** cannot deny that the electronic book was sent, the publisher **282** and operations center **250** may use an authentication method. In one embodiment, a Digital Signature Algorithm (DSA) is used, as described in U.S. Pat. No. 5,231,668 to Kravitz, and hereby incorporated by reference. In another embodiment, the publisher **282** uses a password as an identifier. This password may be delivered along with the electronic book content to authenticate the publisher **282** as the sender. The operations center **250** compares this password with the password the operations center **250** has for the publisher **282**. If the passwords match, the source of the electronic book content, i.e., the publisher **282**, is verified.

In yet another embodiment, public key encryption is used as a digital signature to authenticate the publisher **282**. The publisher **282** encrypts the electronic book content using the publisher's private key pKS. When the operations center **250** correctly decrypts the encrypted electronic book content with the publisher's public key PKS, the identity of the publisher **282** is authenticated since only the publisher **282** has access to the publisher's private key pKS used to encrypt the electronic book content.

In another embodiment, depicted in FIG. **27**, upon initiation of the transaction, the publisher **282**, serving as the sender **4998**, notifies the operations center **250**, serving as the recipient **4999**, of the publisher's intention to deliver electronic book content to the operations center **250**. This notification may be in the form of delivery notification message **5240**. The operations center **250** then encrypts a randomly generated message RGM generated by the operations center **250** using encryption process E_{PKR} and the operations center's private key pKR and sends the resulting E_{pKR}[RGM] **5241** to the publisher **282**. The publisher **282** decrypts E_{pKR}[RGM] **5241** using decryption process D_{PKR} and the operations center's public key PKR. The publisher **282** then encrypts the electronic book content EBC, along with the randomly generated message RGM received from the operations center **250** using encryption process E_{pKS} and the publisher's private key pKS and sends the resulting E_{pKS}[EBC,RGM] **5242** to the operations center **250**. The operations center **250** decrypts E_{pKS}[EBC,RGM] **5242** using decryption process DPKS and the publisher's public key PKS. If the randomly generated message RGM received from the publisher **282** coincides with the randomly generated message RGM that the operations center **250** originally sent to the publisher **282**, the publisher's identity is verified.

In another embodiment, the ISO one-way authentication protocol framework, as defined in ISO standard X.509 is used to provide authentication of the publisher's identity.

The operations center **250** may initiate the transaction with the publisher **282** by requesting that an electronic book be delivered from the publisher **282** to the operations center **250**. To validate the identity of the operations center **250**, the publisher **282** and operations center **250** may use any of the above authentication method embodiments. In one embodiment, the Digital Signature Algorithm (DSA) is used, as described in U.S. Pat. No. 5,231,668 to Kravitz, and hereby incorporated by reference.

In another embodiment, the operations center **250** uses a password as an identifier. This password is delivered along with the electronic book request to authenticate the operations center **250**. The publisher **282** compares this password with the password the publisher **282** has for the operations center **250**. If the passwords match, the source of the electronic book request, i.e., the operations center **250**, is verified.

In yet another embodiment, public key encryption is used as a digital signature to authenticate the operations center **250**. The operations center **250** encrypts the electronic book request using the operations center private key pKR and send the encrypted request to the publisher **282**. When the publisher **282** correctly decrypts the encrypted request with the operations center's public key PKR, the identity of the operations center **250** is authenticated since only the operations center **250** has access to the operations center's private key pKR used to encrypt the electronic book request.

In another embodiment, depicted in FIG. **28**, upon initiation of the transaction, the operations center **250**, serving as the recipient **4999**, notifies the publisher **282**, serving as the sender **4998**, of the operations center's intention to request electronic book content from the publisher **282**. This notification may be in the form of initial request message **5250**. The publisher **282** then encrypts a randomly generated message RGM generated by the publisher **282** using encryption process E_{pKS} and the publisher's private key pKS and sends the resulting E_{pKS}[RGM] **5251** to the operations center **250**. The operations center **250** decrypts E_{pKS}[RGM] **5251** using decryption process D_{PKS} and the publisher's public key PKS. The operations center **250** then encrypts the electronic book request EBR, along with the randomly generated message RGM received from the publisher **282** using encryption process E_{PKR} and the operations center's private key pKR, and sends the resulting E_{pKR}[EBR,RGM] **5252** to the publisher **282**. The publisher **282** decrypts E_{pKR}[EBR,RGM] **5252** using decryption process D_{PKR} and the operations center's public key PKR. If the randomly generated message RGM received from the operations center **250** coincides with the randomly generated message RGM that the publisher **282** originally sent to the operations center **250**, the operations center's identity is verified.

In another embodiment, the ISO one-way authentication protocol framework, as defined in ISO standard X.509 is used to provide authentication of the publisher's identity.

In yet another embodiment involving delivery of electronic book content from the publisher **282** to the operations center **250**, the operations center **250** requests an electronic book from the publisher **282**. The publisher **282** first authenticates the requesting operations center **250**. An embodiment of the authentication sequence is shown in FIG. **29**, where the publisher **282** is serving as the sender **4998** and the operations center **250** is serving as the recipient **4999**. To authenticate the operations center **250** requesting an electronic book from the publisher **282**, an authentication sequence may be initiated by the operations center **250**. The authentication sequence begins with the operations center **250** sending a request **5290** to the publisher **282** for a given electronic book content file **5300**. The publisher **282** then responds to the operations center **250** by generating and returning an authentication string **5291** to the operations center **250**. The operations center **250** returns a message to the publisher **282** that contains: 1) a book identifier **5292**, identifying the requested electronic book; 2) the signed authentication string **5293** that has been signed using a one-way hash function and then encrypted using the private key of the operations center **250**; and 3) operations center **250** certification information **5294** that the publisher **282** can authenticate with the certificate authority **4997** (not shown in FIG. **29**).

FIG. **30** presents the remaining steps of a secure delivery process, where the publisher **282** serves as the sender **4998** and the operations center **250** serves as the recipient **4999**. First, the publisher **282** authenticates the operations center **250**, shown as authentication step **5309**. The publisher **282** then creates the requested electronic book file **5300** in file creation step **5310**, creates an unprotected metadata header **5301** containing non-secure information about the electronic book in step **5311**, and creates a protected metadata header **5302** containing secure information about the electronic book, shown in metadata header step **5312**. Secure information about the electronic book may include an electronic book identifier, an identifier of the format being used for the protected metadata header **5302**, the content decryption key **5306** and decryption algorithm to be used to decrypt the electronic book content, the number of copies of the electronic book that are allowed to be derived from the original electronic book version, distribution features supported for the electronic book, fair use features associated with the electronic book, and integrity checking information to ensure the protected metadata header **5302** is unaltered since its creation.

Distribution features may include the ability to sell one or more copies of the electronic book at a cost, distribute one or more copies of the electronic book at no cost, or loan one or more copies of the electronic book. Fair use features may include the ability to use the electronic book for a defined time period, the ability to loan or print a number of copies of the entire electronic book or portions of the electronic book, and the ability to define and track the number of copies already loaned or printed. The publisher **282** may then compress the electronic book file **5300**, shown in compression step **5313**, and the publisher **282** may then perform an encryption process on the electronic book file **5300**, shown in encryption step **5314**.

Alternatively, the publisher **282** may perform the encryption process on the electronic book file **5300** and then compress the encrypted electronic book file. To encrypt the electronic book, the publisher **282** may use a pre-defined or randomly generated symmetric key or the publisher **282** may use its own private key. The content decryption key **5306** may then be placed in the protected metadata header **5302**, shown in decryption key loading step **5315**.

The publisher **282** then may calculate and place integrity checking information in the protected metadata header **5302**, as shown in integrity checking steps **5316** and **5317**, respectively. Integrity checking information may include the results of a one-way hashing algorithm **5304**, for example, using an algorithm as presented in Applied Cryptography by Bruce Schneier, performed on all or a portion of the protected metadata header **5302**. The hashing function **5304** may be performed using the content decryption key **5306** or another predefined hashing key, resulting in hashing value **5305**. The publisher **282** may then encrypt the entire protected metadata header **5302** or some portion of the protected metadata header **5302** using the public key of the operations center **250** or a pre-determined symmetric key known by both the publisher **282** and the operations center **250**, as shown in encryption step **5318**.

The packaged electronic book with metadata headers may then be delivered to the operations center **250** or the operations center **250** may retrieve the packaged electronic book from the publisher **282**, as shown in delivery step **5319**. Upon receipt of the packaged electronic book, along with metadata headers **5301** and **5302**, by the operations center **250**, the operations center **250** may decrypt the protected metadata header **5302**, validate that the protected metadata header **5302** has not been altered by performing a one-way hash calculation on the protected metadata header **5302** and comparing the result to the hash value **5305** contained in the protected metadata header **5302**, and re-encrypt the protected metadata header **5302** for storage. Alternatively, the operations center **250** may store the received packaged electronic book directly without decrypting the protected metadata header **5302**.

Processing and storage of the decryption and encryption keys used on the protected metadata header **5302** at the operations center **250** may be done entirely in software, entirely on a secure smart card or removable device, or some combination of the two.

In still another embodiment, a publisher **282**, or third party electronic book formatter, converts the electronic book content and associated metadata into a deliverable format. The prepared electronic book file is then delivered to the operations center **250**, for example over the Internet using a secure socket layer (SSL) protected communication link. This exchange, depicted in FIG. **31**, may be initiated by the operations center **250**, serving as the recipient **4999**, sending a request message **5330** to the publisher **282**, serving as the sender **4998**, to deliver the requested electronic book content **5100** to the operations center **250**.

The request message **5330** may contain a login and password sequence that is used by the publisher **282** to initially validate the operations center **250**. Alternatively, or in addition, the publisher **282** may use the specific Internet Protocol (IP) address of the operations center **250**, included in the request message **5330**, for validation purposes. In response, the publisher **282** may send a certificate **5331**, which may include identifying information and the publisher's public key PKS, to the operations center **250**. The operations center **250** verifies the certificate **5331** was issued by a trusted third party certificate authority **4997**. The operations center **250** compares the information in the certificate that is received from the trusted third party certificate authority **4997**, including the publisher's identifying information and public key PKS.

The operations center **250** then notifies the publisher **282** which encryption algorithms that the operations center **250** can support using a supported algorithm message **5332**. The publisher **282** selects an algorithm and notifies the operations center **250** of the selection using a selected algorithm message **5333**. The operations center **250** generates a transaction symmetric key SKT **5334**, encrypts the transaction symmetric key SKT **5334** using the public key PKS of the publisher **282** and the algorithm provided in the selected algorithm message **5333** and sends the resulting E_{PKS}[SKT] **5335** to the publisher **282**. The publisher **282** decrypts E_{PKS}[SKT] **5335** using decryption process D_{pKS} and the publisher's private key pKS. The transaction symmetric key SKT **5334** is then used to encrypt and decrypt the transaction between the publisher **282** and the operations center **250**.

Alternatively, an exchange, as depicted in FIG. **32**, may be initiated by the publisher **282**, serving as sender **4998**, by sending a request message **5340** to the operations center **250**, serving as recipient **4999**, that the publisher **282** wishes to deliver electronic book content to the operations center **250**.

The request message **5340** may contain a login and password sequence that may be used by the operations center **250** to initially validate the publisher **282**. Alternatively, or in addition, the operations center **250** may use the specific IP address of the publisher **282**, included in the request message **5340**, for validation purposes. In response, the operations center **250** sends a certificate **5341** to the publisher **282** that may include identifying information and the operations center's public key PKR.

The publisher **282** verifies the certificate was issued by a trusted third party certificate authority **4997** (not shown in FIG. **32**). The publisher **282** compares the information in the certificate **5341** that is received from the trusted third party certificate authority **4997**, including operations center's identifying information and public key PKR. The publisher **282** then notifies the operations center **250** which encryption algorithms the publisher **282** can support using a supported algorithms message **5342**. The operations center **250** selects an algorithm and notifies the publisher **282** of the selection via a selected algorithm message **5434**. The publisher **282** generates a transaction symmetric key SKT **5344**, encrypts the transaction symmetric key SKT **5344** using the public key PKR of the operations center **250** and the algorithm provided in the selected algorithm message **5343** and sends the resulting E_{PKR}[SKT] **5345** to the operations center **250**. The operations center **250** decrypts E_{PKR}[SKT] **5345** using decryption process D_{pKR} and the operations center's private key pKR. The transaction symmetric key SKT **4344** is then used to encrypt and decrypt the transaction between the publisher **282** and the operations center **250**.

Once the electronic book content is received and decrypted by the operations center **250**, the operations center **250** may store the electronic book file unencrypted or may re-encrypt the electronic book file for storage. Alternatively, the operations center **250** may also compute a hash value of the electronic book file to be used for validation the integrity of the file when recovered from storage for delivery to a home system **258**.

To ensure the publisher **282** that the electronic book content delivered to the operations center **250** was received, the operations center **250**, serving the recipient **4999** in FIG. **33**, may respond to the publisher **282**, serving as the sender in FIG. **33**, by first generating a reply message REP as shown in reply generation step **5260**. The operations center **250** then encrypts reply message REP in the operations center's private key pKR using encryption process E_{pKR}, resulting in E_{pKR}[REP], as shown in encryption step **5261**. The operations center **250** then encrypts E_{pKR}[REP] in the publisher's public key PKS using encryption process E_{PKS}, resulting in E_{pKS}[E_{PKR}[REP]], as shown in encryption step **5262**. The operations center sends E_{pKS}[E_{PKR}[REP]] to the publisher, as shown in sending step **5263**. The publisher **282** then decrypts E_{pKS}[E_{PKR}[REP]], using decryption process D_{pKS} and the publisher's private key pKS, resulting in E_{pKR}[REP] as shown in decruption step **5264**. The publisher **282** then decrypts the resulting E_{pKR}[REP] using decryption process D_{PKR} and the operations center's public key PKR, as shown in decryption step **5265**. As shown in verification step **5266**, the valid reception of reply message REP by publisher **282** serves as verification of receipt of the electronic book content delivered to the operations center **250** by the publisher **282**.

In another embodiment, the ISO two-way authentication protocol framework, as defined in ISO standard X.509 is used to provide verification of receipt of electronic book content by the operations center **250**.

Exchanging encryption key information between the publisher **282** and the operations center **250** may be done using communication networks. Alternatively, encryption key distribution may be accomplished by storing the encryption key information on a smart card, PCMCIA card device, CD ROM, or other portable memory storage device and delivering the device to the appropriate location for retrieval and use in future encryption and decryption activities. When the key is delivered in physical form, the key may have associated with it a valid time period of use. Once this period has expired, a new key is required. Alternatively, the device may support the capability to be updated remotely via a communication network.

Encryption, decryption, hashing, digital signature processing, formatting, compression, key management, and other security related activities presented herein that are performed by the publisher **282** or the operations center **250** may be done in hardware using a specialized processor. In an alternate embodiment, security related activities may be done in software via a standard or secure processor. In yet another alternative, a portion of security related activities may be done in software using a standard or secure processor while the remaining portion done in hardware via a specialized processor.

Once electronic book content is received and decrypted by the operations center **250**, the operations center **250** may encrypt the electronic book content EBC with a symmetric key algorithm and store the encrypted electronic book content along with any non-encrypted content associated with the electronic book in storage memory device **5270** at the operations center **250**. In one embodiment, depicted in FIG. **34**, secure storage is done on a memory device at the driver-level, where all information stored on the memory storage device **5270** is encrypted by a memory device driver prior to being stored on memory storage device **5270**, as described in Applied Cryptography, by Bruce Schneier and hereby incorporated by reference. In this embodiment, any content X **5272** to be stored on the memory storage device **5270**, including electronic book content, is encrypted using encryption process E_{SK} **5274** in memory device driver **5271** and a symmetric key SK **5276**, resulting in encrypted content E_{SK}[X] **5273**. The encrypted content E_{SK}[X] **5273** is then stored on memory storage device **5270**. Upon retrieval from the memory storage device **5270**, decryption process D_{SK} **5275** decrypts encrypted content E_{SK}[X] **5273** with symmetric key SK **5276**, resulting in the original content X **5272**. In another embodiment, secure storage is done at the file level, also as described in Applied Cryptography, by Bruce Schneier, where each file is encrypted individually with a different symmetric key prior to storage and stored in its encrypted form on memory storage device **5270**. The symmetric key SK **5276** can then be stored separate from the stored encrypted content X **5272**. In one such embodiment, encryption is done in hardware using a specialized encryption processor. In an alternate embodiment, encryption is done in software using a standard or secure processor.

To ensure the electronic book content file has not been modified while it was stored, in one embodiment, depicted in FIG. **35**, the operations center **250**, serving as the storage site **4996**, uses a one-way hashing algorithm **5280**, as presented in Applied Cryptography, by Bruce Schneier and hereby incorporated by reference, where a hashing value **5281** is calculated by the operations center **250** based on the electronic book content EBC **5100** prior to encryption process **5282**. The hashing value **5281**, along with encrypted content E_{SK}[EBC] **5284** is then stored on memory storage device **5283**. When the encrypted content E_{SK}[EBC] **5284** is retrieved from storage, the operations center **250** decrypts encrypted content E_{SK}[EBC] **5284** using decryption process DSK **5285** and retrieves the stored hashing value **5281**. The operations center **250** then calculates a hashing value **5281'**, using the hashing algorithm **5280** and the retrieved electronic book content EBC **5100**. Comparator **5286** compares the hashing value **5281** to the hashing value **5281'** to determine if they coincide. If hashing value **5281** and the hashing value **5281'** coincide, the integrity of the electronic book content EBC **5100** retrieved for memory storage device **5283** can be ensured.

B. Operations Center to Home System Security

The operations centers **250** can deliver their electronic book content to home systems **258** via a secured mechanism. In one embodiment, an asymmetric public key encryption technique is used, as described in Contemporary Cryptography, edited by Gustavus Simmons, published by IEEE Press in 1992, and hereby incorporated by reference. Public key algorithms used may include the Merkle-Hellman Knapsacks technique, as described in U.S. Pat. No. 4,218,582, the RSA technique, as described in U.S. Pat. No. 4,405,829, the Pohlig-Hellman technique, as described in U.S. Pat. No. 4,424,414, the Schnorr Signatures technique, as described in U.S. Pat. No. 4,995,082, or any other public key technique.

In this embodiment, depicted in FIG. **20**, the operations center **250**, serving as the sender **4998**, first encrypts the electronic book content EBC **5100** destined for the home system **258**, serving as the recipient **4999**, and using a symmetric key encryption process E_{SK} **5102**, using DES, PKZIP, BLOWFISH, or any other symmetric encryption algorithm, resulting in encrypted content E_{SK}[EBC] **5109**. The encryption process E_{SK} **5102** uses a symmetric key SK **5103** either randomly generated by a key generator process **5104** or previously defined and retrieved from key storage memory **5105**. Then, the operations center **250** encrypts the symmetric key SK **5103** with private key encryption process E_{pKS} **5106** using the operations center's private key pKS **5107**, resulting in encrypted key E_{pKS}[SK] **5108**. Then, the operations center **250** packages encrypted key E_{pKS}[SK] **5108**, encrypted content E_{SK}[EBC] **5109** and non-encrypted information **5110** related to the electronic book or the exchange and delivers the package to the home system **258**. Using decryption process D_{PKS} **5111** and the operations center's public key PKS **5112**, the home system **258** decrypts the encrypted key E_{pKS}[SK] **5108** and uses the recovered symmetric key SK **5103** to decrypt the encrypted content E_{SK}[EBC] **5109** using decryption process D_{SK} **5113**.

In an alternate embodiment, depicted in FIG. **21**, only symmetric key encryption is used, with a certificate authority **4997**. The certificate authority **4997**, a trusted source, provides a symmetric key to the operations center **250**, serving as the sender **4998**, and to the home system **258**, serving as the recipient **4999**. The certificate authority **4997** may be an existing commercial entity such as Entrust or Verisign or a private entity established for the sole purpose of electronic book secure distribution. The operations center **250** contacts the certificate authority **4997**, sending the request **5120** for the transaction symmetric key SKT **5121** to be used during the transaction. The certificate authority **4997** either randomly generates the transaction symmetric key SKT **5121** by using the key generator process **5124** or retrieves the previously defined transaction symmetric key SKT **5121** from key storage memory **5125**. The transaction symmetric key SKT **5121** is encrypted by the certificate authority **4997** using the symmetric key encryption process E_{SKS} **5123** using the operations center's symmetric key SKS **5122**.

The resulting encrypted symmetric key E_{SKS}[SKT] **5126** is delivered by the certificate authority **4997** to the operations center **250**. The operations center **250** decrypts the encrypted symmetric key E_{SKS}[SKT] **5126** using decryption process D_{SKS} **5127** and using the operations center's symmetric key SKS **5122** to recover the transaction symmetric key SKT **5121**. The operations center **250** then uses the recovered transaction symmetric key SKT **5121** received from the certificate authority **4997** to encrypt the electronic book content EBC **5100** using encryption process E_{SKT} **5128**, resulting in encrypted content E_{SKT}[EBC] **5129**. The operations center **250** delivers the encrypted content E_{SKT}[EBC] **5129** to the home system **258**. The transaction symmetric key SKT **5121** is also encrypted by the certificate authority **4997** using symmetric key encryption process E_{SKR} **5131** and the home system's symmetric key SKR **5130**. The resulting encrypted symmetric key E_{SKR}[SKT] **5132** is delivered by the certificate authority **4997** to the home system **258**. The home system **258** decrypts the encrypted symmetric key E_{SKR}[SKT] **5132** using decryption process D_{SKR} **5133** and using the home system's symmetric key SKR **5130** to recover the transaction symmetric key SKT **5121**. The home system **258** then uses the recovered transaction symmetric key SKT **5121** received from the certificate authority **4997** to decrypt the encrypted content E_{SKT}[EBC] **5129** using decryption process D_{SKT} **5134**, resulting in the unencrypted electronic book content **5100**.

In yet another embodiment, depicted in FIG. **22**, the operations center **250**, acting as the sender **4998**, generates a transaction symmetric key SKT **5140**. The operations center **250** either randomly generates the transaction symmetric key SKT **5140** by using the key generator process **5141** or retrieves the previously defined transaction symmetric key SKT **5140** from key storage memory **5142**. The operations center **250** encrypts the electronic book content EBC **5100** using encryption process E_{SKT} **5143** and the transaction symmetric key SKT **5140**, and delivers the encrypted content E_{SKT}[EBC] **5144** to the home system **258**, acting as the recipient **4999**.

The operations center **250** encrypts the transaction symmetric key SKT **5140** using encryption process E_{SKS} **5145** and the operations center's symmetric key SKS **5146** that the operations center **250** shares with a third party certificate authority **4997** and delivers the encrypted transaction symmetric key E_{SKS}[SKT] **5147** to the third party certificate authority **4997**. The certificate authority **4997** decrypts the encrypted transaction symmetric key E_{SKS}[SKT] **5147** using decryption process D_{SKS} **5148** and the operations center's symmetric key SKS **5146**. The home system **258** may contact the certificate authority **4997** using request **5149** to obtain the transaction symmetric key SKT **5140**. Prior to the certificate authority **4997** delivering the needed transaction symmetric key **5140** to the home system **258**, the home system **258** may be required to complete a financial transaction with the certificate authority **4997**, paying for the electronic book content first. The certificate authority **4997** then encrypts the transaction symmetric key SKT **5140** using encryption process E_{SKR} **5150** and the home system's symmetric key SKR **5151** that the certificate authority **4997** shares with the home system **258**, and delivers the encrypted symmetric key E_{SKR}[SKT] **5152** to the home system **258**. The home system **258** decrypts the encrypted symmetric key E_{SKR}[SKT] **5152** using decryption process D_{SKR} **5153** and the home system's symmetric key SKR **5151**, and uses the recovered transaction symmetric key SKT **5140** to decrypt the encrypted content E_{SKT}[EBC] using decryption process D_{SKT} **5154**, resulting in electronic book content EBC **5100**.

In another embodiment, depicted in FIG. **23***a*, the operations center **250**, serving as the sender **4998**, encrypts the entire transaction stream TS **5165** between the operations center **250** and the home system **258**, serving as the recipient **4999**. To do so, the operations center **250** may use the sender private key pKS **5160** and encryption process E_{pKS} **5161** to encrypt the transaction stream TS **5165**, resulting in encrypted transaction stream E_{pKS}[TS] **5162**. In this embodiment, the home system **258** uses decryption process D_{PKS} **5164** and sender public key PKS **5163** to decrypt the encrypted transaction stream E_{pKS}[TS] **5162**.

In another embodiment, depicted in FIG. **23***b*, the operations center **250**, serving as sender **4998**, may use the public key of the home system **258**, serving as the recipient **4999**, to encrypt the transaction stream TS **5165**. To do so, the operations center **250** may use the recipient public key PKR **5171** and encryption process E_{PKR} **5170** to encrypt the transaction stream TS **5165**, resulting in encrypted transaction stream E_{PKR}[TS] **5173**. In this embodiment, the home system **258** uses decryption process D_{PKR} **5174** and recipient private key pKR **5172** to decrypt the encrypted transaction stream E_{PKR}[TS] **5173**. In another embodiment, depicted in FIG. **23***c*, the operations center **250**, serving as sender **4998**, may use a transaction symmetric key SKT **5181** that both the operations center **250** and the home system **258** have stored in advance of the transaction to encrypt the transaction stream TS **5165**. In this embodiment, the operations center **250** uses encryption process E_{SKT} **5180** and transaction symmetric key SKT **5181** to generate encrypted transaction stream E_{SKT}[TS] **5182**. The home system **258** uses decryption process D_{SKT} **5183** and transaction symmetric key SKT **5181** to decrypt encrypted transaction stream E_{SKT}[TS] **5182**, resulting in transaction stream TS **5165**.

In another embodiment, depicted in FIG. **24***a*, the operations center **250**, serving as the sender **4998**, and the home system **258**, serving as the recipient **4999**, initiate the transaction by negotiating a shared key to use for the transaction, using, for example, the Elliptic Curve Diffie-Hellman key exchange algorithm, as described in U.S. Pat. No. 4,200,700, to generate the shared transaction symmetric key. Key negotiation information **5190** is exchanged between key generation algorithms **5191** operated by both the operations center **250** and the home system **258**. As a result of the negotiation process, the operations center's key generator algorithm **5191** generates the transaction symmetric key SKT **5193** and the home system's key generator algorithm **5192** generates the transaction symmetric key SKT **5193**.

The operations center **250** encrypts the electronic book content EBC **5100** using encryption process E_{SKT} **5194** and the shared transaction symmetric key SKT **5193** and delivers the resulting encrypted content E_{SKT}[EBC] **5195** to the home system **258**. The home system **258** uses the shared transaction symmetric key SKT **5193** and decryption process DSKT **5196** to decrypt the encrypted content E_{SKT}[EBC] **5195**.

In a different embodiment, depicted in FIG. **24***b*, the operations center **250** serves as the sender **4998** and home system **258** serves as the recipient **4999**. Initial key negotiation information **5200** is exchanged between the seed key generation algorithm **5201** at the operations center **250** and the seed key generation algorithm **5202** at the home system **258**. As a result, the seed key generation algorithm **5201** at the operations center **250** and the seed key generation algorithm **5202** at the home system **258** each generate seed key SK **5203** using, for example, the Elliptic Curve Diffie-Hellman key exchange algorithm, as described in U.S. Pat. No. 4,200,700. Seed key **5203** is then used by key sequence generator **5204** at the operations center **250** site to generate the first in a sequence of keys, transaction symmetric key S_{KTi} **5206**. Similarly, seed key **5203** is used by key sequence generator **5205** at the home system **258** to generate the identical sequence of keys, beginning with transaction symmetric key S_{KTi} **5206**.

The operations center **250** encrypts the electronic book content EBC **5100** using encryption process E_{SKTi} **5207** and the shared transaction symmetric key S_{KTi} **5206** and delivers the resulting encrypted content E_{SKTi}[EBC] **5208** to the home system **258**. The home system **258** uses the transaction symmetric key S_{KTi} **5206** and decryption process DSKTi **5209** to decrypt the encrypted content E_{SKTi}[EBC] **5206**. The operations center **250** key sequence generator **5204** and home system **258** key sequence generator **5205** continue to generate matching transaction symmetric keys for use in encrypting each subsequent transaction between the operations center **250** and the home system **258**.

The operations center **250** may deliver the electronic book content to multiple home systems. In one embodiment, the operations center **250** delivers the electronic book content to each home system **258** independently using one of the embodiments contained herein. In an alternative embodiment, the operations center **250** may broadcast the electronic book content to multiple home systems simultaneously.

In one embodiment used for broadcasting, depicted in FIG. **25***a*, the operations center **250**, serving as the sender **4998**, encrypts the electronic book content EBC **5100** using encryption process E_{SKT} **5211** and transaction symmetric key SKT **5210**, resulting in encrypted content E_{SKT}[EBC] **5217**. The transaction symmetric key SKT **5210** is then encrypted using public key encryption process E_{PKA} **5212** and public key PKA **5213** for recipient A **4999**, the first home system **258** to receive the electronic book content, resulting in encrypted key E_{PKA}[SKT] **5218**. The transaction symmetric key SKT **5210** is then encrypted using public key encryption process E_{PKB} **5212'** and public key PKB **5213'** for recipient B **4999'**, the second home system **258** to receive the electronic book content, resulting in encrypted key E_{PKB} [SKT] **5218'**. This is repeated for each of the home systems **258** receiving the electronic book content. The encrypted content E_{SKT}[EBC] **5217**, along with the encrypted keys **5218**, **5218'**, and **5218"**, are delivered to all the receiving home systems **258**. Each home system **258** uses its own private key to decrypt the transaction symmetric key SKT **5210**. For example, recipient A **4999** uses decryption process D_{pKA} **5214** and private key pKA **5216** to decrypt the encrypted key E_{PKA}[SKT] **5218**, recovering the transaction symmetric key SKT **5210**. Decryption process D_{SKT} **5215** is then used to decrypt encrypted content E_{SKTi}[EBC] **5217** using transaction symmetric key SKT **5210**.

In another embodiment, depicted in FIG. **25***b*, home systems may be assigned to predefined groups. Prior to the distribution of electronic book content EBC **5100** by operations center **250**, serving as the sender **4998**, for each defined group, a group symmetric key SKG **5220** is created and distributed by the operations center **250** to each home system **258**, serving as recipients **4999**, **4999'** and **4999"** within the group.

When the operations center **250** sends electronic book content EBC **5100** to a pre-defined group of home systems **258**, the operations center **250** encrypts the electronic book content EBC **5100** using encryption process E_{SKG} **5221** and the group symmetric key SKG **5220** pre-defined for that group and delivers the encrypted content E_{SKG}[EBC] to all the home systems in the group. Recipients **4999**, **4999'**, and **4999"** use decryption process D_{SKG} **5223** and the group symmetric key SKG **5220** for that group to which they are assigned to decrypt the encrypted content E_{SKG}[EBC].

To ensure that the electronic book content delivered by the operations center **250** to the home system **258** was not altered in route, integrity checking algorithms may be employed. In one embodiment, depicted in FIG. **26**, the operations center **250**, serving as the sender **4998**, uses a one-way hashing algorithm **5231**, as presented in Applied Cryptography, by Bruce Schneier, published by John Wiley & Sons, Inc. in 1996, and hereby incorporated by reference, where a hashing value **5232** is calculated by the operations center **250** based on the electronic book content file **5230** as an input. This resulting hashing value **5232**, along with the actual encrypted electronic book file **5237** that has been encrypted by the operations center **250** via encryption process **5235** is delivered to the home system **258**, serving as the recipient **4999**.

The home system **258** decrypts the encrypted electronic book file **5237** using decryption process **5236** to recover the electronic book content file **5230'**. The home system **258** then uses the hashing algorithm **5231** with the electronic book content file **5230'** as input to generate a hashing value **5232'**, which is compared to the hashing value **5232** delivered with the encrypted electronic book file **5237**. If the hashing value **5232'** calculated by the home system **258** coincides with the hashing value **5232** delivered by the operations center **250** as determined by comparator **5233**, the integrity of the electronic book content file **5230'** can be ensured.

To identify the operations center **250** delivering the electronic book and to guarantee non-repudiation, i.e., that the operations center **250** cannot deny that the electronic book was sent, the operations center **250** and home system **258** may use an authentication method. In one embodiment, the Digital Signature Algorithm (DSA) is used, as described in U.S. Pat. No. 5,231,668, and hereby incorporated by reference. In another embodiment, the operations center **250** uses a password as an identifier. This password may be delivered along with the electronic book content to authenticate the operations center **250**. The home system **258** compares this password with the password the home system **258** has for the operations center **250**. If the passwords match, the source of the electronic book content, i.e., the operations center **250**, is verified.

In yet another embodiment, public key encryption is used as a digital signature to authenticate the operations center **250** as the sender. The operations center **250** encrypts the electronic book content using the operations center's private key pKS. When the home system **258** correctly decrypts the encrypted electronic book content with the operations center's public key PKS, the identity of the operations center **250** is authenticated since only the operations center **250** has access to the operations center's private key pKS used to encrypt the electronic book content.

In another embodiment, depicted in FIG. **27**, upon initiation of the transaction, the operations center **250**, serving as the sender **4998**, notifies the home system **258**, serving as the recipient **4999**, of the operations center's intention to deliver electronic book content to the home system **258**. This notification may be in the form of delivery notification message **5240**. The home system **258** then encrypts a randomly generated message RGM generated by the home system **258** using encryption process EpKR and the home system's private key pKR and sends the resulting E_{pKR}[RGM] **5241** to the operations center **250**. The operations center **250** decrypts E_{pKR}[RGM] **5241** using decryption process D_{PKR} and the home system's public key PKR. The operations center **250** then encrypts the electronic book content EBC, along with the randomly generated message RGM received from the home system **258** using encryption process E_{pKS} and the operations center's private key pKS and sends the resulting E_{pKS}[EBC,RGM] **5242** to the home system **258**. The home system **258** decrypts E_{pKS}[EBC, RGM] **5242** using decryption process D_{PKS} and the operations center's public key PKS. If the randomly generated message RGM received from the operations center **250** coincides with the randomly generated message RGM that the home system **258** originally sent to the operations center **250**, the operations center's identity is verified.

In another embodiment, the ISO one-way authentication protocol framework, as defined in ISO standard X.509 is used to provide authentication of the operations center's identity.

The home system **258** may initiate the transaction with the operations center **250** by requesting that an electronic book be delivered from the operations center **250** to the home system **258**. To validate the identity of the home system **258**, the operations center **250** and home system **258** may use any of the above authentication method embodiments. In one embodiment, the Digital Signature Algorithm (DSA) is used, as described in U.S. Pat. No. 5,231,668, and hereby incorporated by reference.

In another embodiment, the home system **258** uses a password as an identifier. This password is delivered along with the electronic book request to authenticate the home system **258**. The operations center **250**, or the billing and collection system **278** operating on behalf of the operations center **250**, compares this password with the password it has for the home system **258**. If the password matches, the source of the electronic book request, i.e., the home system **258**, is verified.

In yet another embodiment, public key encryption is used as a digital signature to authenticate the home system **258**. The home system **258** encrypts the electronic book request using the home system's private key pKR and sends the encrypted request to the operations center **250**, or the billing and collection system **278** operating on behalf of the operations center **250**. When the operations center **250**, or the billing and collection system **278** operating on behalf of the operations center **250** correctly decrypts the encrypted request with the home system's public key PKR, the identity of the home system **258** is authenticated since only the home system **258** has access to the home system's private key pKR used to encrypt the electronic book request.

In another embodiment, depicted in FIG. **28**, upon initiation of the transaction, the home system **258**, serving as the recipient **4999**, notifies the operations center **250**, serving as the sender **4998**, of the home system's intention to request electronic book content from the operations center **250**. This notification may be in the form of initial request message **5250**. The operations center **250** then encrypts a randomly generated message RGM generated by the operations center **250** using encryption process EPKs and the operations center's private key pKS and sends the resulting E_{pKS}[RGM] **5251** to the home system **258**. The home system **258** decrypts E_{pKS}[RGM] **5251** using decryption process DPKS and the operations center's public key PKS. The home system **258** then encrypts the electronic book request EBR, along with the randomly generated message RGM received from the operations center **250** using encryption process EpKR and the home system's private key pKR, and sends the resulting E_{pKR}[EBR,RGM] **5252** to the operations center **250**. The operations center **250** decrypts E_{pKR}[EBR,RGM] **5252** using decryption process DPKR and the home system's public key PKR. If the randomly generated message RGM received from the home system **258** coincides with the randomly generated message RGM that the operations center **250** originally sent to the home system **258**, the home system's identity is verified.

In another embodiment, the ISO one-way authentication protocol framework, as defined in ISO standard X.509 is used to provide authentication of the operations center's identity.

In yet another embodiment of electronic book content delivery from the operations center **250** to the home system **258**, the home system **258** requests an electronic book from the operations center **250**. The operations center **250** first authenticates the requesting home system **258**. An embodiment of the authentication sequence is shown in FIG. **29**, where the operations center **250** is serving as the sender **4998** and the home system **258** is serving as the recipient **4999**. To authenticate a home system **258** requesting an electronic book from the operations center **250**, an authentication sequence may be initiated by the home system **258**. The authentication sequence begins with the home system **258** sending a request **5290** to the operations center **250** for a given electronic book content file **5300**. The operations center **250** then responds to the home system **258** by generating and returning an authentication string **5291** to the home system **258**. The home system **258** returns a message to the operations center **250** that contains: 1) a book identifier **5292**, identifying the requested electronic book; 2) the signed authentication string **5293** that has been signed using a one-way hash function and then encrypted using the private key of the home system **258**; and **3**) home system **258** certification information **5294** that the operations center **250** can authenticate with the certificate authority **4997** (not shown in FIG. **29**).

The operations center **250** then retrieves the requested encrypted electronic book, along with its associated unprotected metadata header **5301** and protected metadata header **5302** from storage. The operations center **250** decrypts the protected metadata header **5302** and validates that the protected metadata header **5302** has not been altered by performing a one-way hash function on the protected metadata header **5302** and comparing the result to the hash value contained in the protected metadata header **5302**. If the protected metadata header **5302** was stored unencrypted, the operations center **250** retrieves the encrypted electronic book, along with its associated unprotected metadata header **5301** and protected metadata header **5302** from storage and validates the protected metadata header **5302** using a one-way hashing function. The operations center **250** then modifies the fields of the unprotected metadata header **5301** and protected metadata header **5302** based on the home system **258** request and the rules established by the publisher **282** and the operations center **250** for electronic book use. The operations center **250** may then encrypt the entire protected metadata header **5302** or some portion of the protected metadata header **5302** using the public key of the home system **258** or a predetermined symmetric key known by both the operations center **250** and the home system **258**. The packaged electronic book with metadata headers may then be delivered to home system **258** or the home system **258** may retrieve the packaged electronic book from the operations center **250**.

Upon receipt of the packaged electronic book, along with metadata headers **5301** and **5302**, by the home system **258**, the home system **258** may decrypt the protected metadata header **5302**, validate that the protected metadata header **5302** has not been altered by performing a one-way hash calculation on the protected metadata header **5302** and comparing the result to the hash value **5305** contained in the protected metadata header **5302**, and re-encrypt the protected metadata header **5302** for storage, or store the received packaged electronic book directly without decrypting the protected metadata header **5302**. When the electronic book is opened for display on the viewer **266**, the viewer **266** decrypts the protected metadata header **5302** using the decryption key, recovers the content decryption key, and decrypts the electronic book content for display on the viewer. Processing and storage of the decryption and encryption keys used on the protected metadata header **5302** at the home system **258** may be done entirely via software, entirely on a secure smart card or removable device, or some combination of the two.

In still another embodiment, an operations center **250**, or third party electronic book formatter, converts the electronic book content and associated metadata into a deliverable format. The prepared electronic book file is then delivered to the home system **258**, for example over the Internet using a secure socket layer (SSL) protected communication link. This exchange, depicted in FIG. **31**, may be initiated by the home system **258**, serving as the recipient **4999**, sending a request message **5330** to the operations center **250**, serving as the sender **4998**, to deliver the requested electronic book content **5100** to the home system **258**.

The request message **5330** may contain a login and password sequence that is used by the operations center **250** to initially validate the home system **258**. Alternatively, or in addition, the operations center **250** may use the specific Internet Protocol (IP) address of the home system **258**, included in the request message **5330**, for validation purposes. In response, the operations center **250** may send a certificate **5331**, which may include identifying information and the operations center's public key PKS, to the home system **258**. The home system **258** verifies the certificate **5331** was issued by a trusted third party certificate authority **4997**. The home system **258** compares the information in the certificate that is received from the trusted third party certificate authority **4997**, including the operations center's identifying information and public key PKS.

The home system **258** then notifies the operations center **250** which encryption algorithms that the home system **258** can support using a supported algorithm message **5332**. The operations center **250** selects an algorithm and notifies the home system **258** of the selection using a selected algorithm message **5333**. The home system **258** generates a transaction symmetric key SKT **5334**, encrypts the transaction symmetric key SKT **5334** using the public key PKS of the operations center **250** and the algorithm provided in the selected algorithm message **5333** and sends the resulting E_{PKS}[SKT] **5335** to the operations center **250**. The operations center **250** decrypts E_{PKS}[SKT] **5335** using decryption process D_{pKS} and the operations center's private key pKS. The transaction symmetric key SKT **5334** is then used to encrypt and decrypt the transaction between the operations center **250** and the home system **258**.

Alternatively, an exchange, as depicted in FIG. **32**, may be initiated by the operations center **250**, serving as the sender **4998**, by sending a request message **5340** to the home system **258**, serving as the recipient **4999**, that the operations center **250** wishes to deliver electronic book content to the home system **258**.

The request message **5340** may contain a login and password sequence that may be used by the home system **258** to initially validate the operations center **250**. Alternatively, or in addition, the home system **258** may use the specific IP address of the operations center **250**, included in the request message **5340**, for validation purposes. In response, the home system **258** sends a certificate **5341** to the operations center **250** that may include identifying information and the home system's public key PKR.

The operations center **250** verifies the certificate was issued by a trusted third party certificate authority **4997** (not shown in FIG. **32**). The operations center **250** compares the information in the certificate **5341** which is received from the trusted third party certificate authority **4997**, including home system's identifying information and public key PKR. The operations center **250** then notifies the home system **258** which encryption algorithms the operations center **250** can support using a supported algorithms message **5342**. The home system **258** selects an algorithm and notifies the operations center **250** of the selection using a selected algorithm message **5434**. The operations center **250** generates a transaction symmetric key SKT **5344**, encrypts the transaction symmetric key SKT **5344** using the public key PKR of the home system **258** and the algorithm provided in the selected algorithm message **5343** and sends the resulting E_{PKR}[SKT] **5345** to the home system **258**. The home system **258** decrypts E_{PKR}[SKT] **5345** using decryption process D_{pKR} and the home system's private key pKR. The transaction symmetric key SKT **4344** is then used to encrypt and decrypt the transaction between the operations center **250** and the home system **258**.

Once the electronic book content is received and decrypted by the home system **258**, the home system **258** may store the electronic book file unencrypted or may re-encrypt the electronic book file for storage. Alternatively, the home system **258** may also compute a hash value of the electronic book file to be used for validation the integrity of the file when recovered from storage for delivery to a home system **258**.

In still another embodiment, depicted in FIG. **36**, once an electronic book is selected by the home system **258**, as shown in selection step **5500** and paid for, the operations center **250** is requested to initiate the delivery of the electronic book to the requesting home system **258**. The home system **258**, which may be a dedicated library **262** and viewer **266**, or alternatively a personal computer serving the functions of the library system **262**, along with a dedicated electronic book viewer **266**, is provided with the location to obtain the requested electronic book file by the operations center **250**, as shown in location step **5501**. This location may be an Internet website or any other location accessible by the home system **258**. The operations center **250** compresses the requested electronic book file, as shown in compression step **5502**. The operations center **250** then generates a random transaction symmetric key SKT, as shown in key generation step **5503** and encrypts the compressed electronic book file using encryption process E_{SKT} and the transaction symmetric key SKT, as shown in encryption step **5504**. Non secure metadata is then appended to the compressed, encrypted electronic book file, as shown in appending step **5505**. The transaction symmetric key SKT is then encrypted using the public key PKR of the requesting home system **258** and encryption process E_{PKR}, as shown in encryption step **5506**. The encrypted electronic book file is then digitally signed as shown in signature step **5507**, for example, using the algorithm presented in Applied Cryptography by Bruce Schneier, and the private key of the operations center **250** pKS and is placed in the location provided to the home system **258** for retrieval in distribution step **5508**. The operations center **250** removes the electronic book file from the location after a fixed period if the electronic book file is not retrieved by the home system **258**, as shown in removal step **5509**.

The home system **258** retrieves the compressed, encrypted electronic book file from the specified location and stores the retrieved encrypted electronic book file for future viewing. Non secure metadata information is stored and used to identify and manage the encrypted electronic book files residing on the home system **259** for use by the viewer **266**. The operations center **250** generates a public and private key pair PKR and pKR for the home system **258** and provides the home system **258** the generated private key pKR during an initial home system **258** registration process. During this initial home system **258** registration process, the operations center **250** also provides the home system **258** with the public key of the operations center **250**, PKS.

In another embodiment, encrypted electronic book content E_{SK}[EBC] **5515** is stored in compressed and encrypted format at the operations center **250** for access by requesting home systems **258**. The symmetric key SK **5510** used to encrypt the electronic book content EBC **5512** is stored in protected memory at the operations center **250**. In this embodiment, a home system **258**, which may consist of a library **262** and viewer **266** or a standalone viewer **266**, contacts the operations center **250** using any one of a number of communication means as presented in the co-pending U.S. patent application Ser. No. 09/289,957 titled ALTERNATIVE ELECTRONIC BOOK DELIVERY SYSTEMS and incorporated herein by reference, including direct dial-in by the viewer **266** using a PSTN.

Access to the operations center **250** by the home system **258** may be password protected where the home system **258** presents a password to the operations center **250** upon accessing the operations center **250**. The password provided by the home system **258** must match a password the operations center **250** is expecting from a specific home system **258** for before the operations center **250** allows for the purchase of any electronic book content. A request message **5511** is sent by the home system **258** to the operations center **250** to purchase a specific electronic book EBC **5512**. In this request message **5511**, the home system **258** provides unique identifying information, including the home system **258** internal serial number. Once the requesting home system **258** is verified using the provided password and the identifying information provided in the request message **5511**, the operations center **250** retrieves the stored symmetric key SK **5510** used to encrypt the requested electronic book from protected memory and encrypts symmetric key SK **5510** using encryption process E_{SKS} **5512** and shared key SKS **5513**.

The shared key SKS **5513** is obtained from the home system **258** during an initial home system **258** registration process and is stored by the operations center **250** after this initial registration process. The encrypted electronic book content E_{SK}[EBC] **5515** and the encrypted key E_{SKS}[SK]

5514 are then moved to a location assigned to the requesting home system **258**. Any encrypted electronic book and associated encrypted key residing in the home system's assigned location can then be selected and downloaded to the requesting home system **258** at any time. Other information shared by the operations center **250** and the home system **258**, including the home system **258** unique internal serial number, is used to authenticate the validity of a requesting home system **258** prior to initiating the download of encrypted electronic book content to the home system **258**. The operations center **250** obtains information about the home system **258**, including the shared key SKS **5513** and internal serial number during an initial home system **258** registration process. Also, the operations center **250** provides the assigned location for the home system **258** to retrieve future electronic book content during this registration process.

Once the encrypted electronic book content E_{SK}[EBC] **5515** and the encrypted key E_{SKS}[SK] **5514** are downloaded to a home system **258**, the home system **258** uses shared key SKS **5513** and decryption process D_{SKS} to decrypt the encrypted key E_{SKS}[SK] **5514** to recover the symmetric key SK **5510**. The encrypted electronic book content E_{SK}[EBC] **5515** or a portion thereof is then decrypted using the recovered symmetric key SK **5510** and decryption process D_{SK} and the resulting electronic book content EBC **5512** is then decompressed for display on the viewer **266**.

To ensure the operations center **250** that the electronic book content delivered to the home system **258** was received, the home system **258**, serving as the recipient **4999** in FIG. **33**, may respond to the operations center **250**, serving as the sender in FIG. **33**, by first generating a reply message REP as shown in step **5260**. The home system **258** then encrypts reply message REP in the home system's private key pKR using encryption process E_{pKR}, resulting in E_{pKR}[REP], as shown in step **5261**. The home system **258** then encrypts E_{pKR}[REP] in the operations center's public key PKS using encryption process E_{PKS}, resulting in E_{pKS} [E_{pKR}[REP]], as shown in step **5262**. The home system **250** sends E_{PKS}[E_{pKR}[REP]] to the operations center **250**, as shown in step **5263**. The operations center **250** then decrypts E_{pKS}[E_{PKR}[REP]], using decryption process D_{pKS} and the operations center's private key pKS, resulting in E_{pKR}[REP] as shown in step **5264**. The operations center **250** then decrypts the resulting E_{pKR}[REP] using decryption process D_{PKR} and the home system's public key PKR, as shown in step **5265**. As shown in step **5266**, the valid reception of reply message REP by operations center **250** serves as verification of receipt of the electronic book content delivered to the home system **258** by the operations center **250**.

In another embodiment, the ISO two-way authentication protocol framework, as defined in ISO standard X.509 is used to provide verification of receipt of electronic book content by the home system **258**.

Exchanging encryption key information between the operations center **250** and home system **258** may be done using communication networks. Alternatively, encryption key distribution may be accomplished by storing the encryption key information on a smart card, PCMCIA card device, CD ROM, or other portable memory storage device and delivering the device to the appropriate location for retrieval and use in future encryption and decryption activities. When the key is delivered in physical form, the key may have associated with it a valid time period of use. Once this period has expired, a new key is required. Alternatively, the device may support the capability to be updated remotely via a communication network.

Encryption, decryption, hashing, digital signature processing, formatting, compression, key management, and other security related activities presented herein that are performed by the operations center **250** or the home system **258** may be done in hardware using a specialized processor. In an alternate embodiment, security related activities may be done in software using a standard or secure processor. In yet another alternative, a portion of security related activities may be done in software using a standard or secure processor while the remaining portion done in hardware via a specialized processor.

Once electronic book content is received and decrypted by the home system **258**, the home system **258** may encrypt the electronic book content EBC **5100** with a symmetric key algorithm and may store the encrypted electronic book content along with any non-encrypted content associated with the electronic book in storage memory device **5270** at the home system **258**. In one embodiment, depicted in FIG. **34**, secure storage is done on a memory device at the driver-level, where all information stored on the memory storage device **5270** is encrypted by a memory device driver prior to being stored on memory storage device **5270**, as described in Applied Cryptography, by Bruce Schneier and hereby incorporated by reference. In this embodiment, any content X **5272** to be stored on the memory storage device **5270**, including electronic book content, is encrypted using encryption process ESK **5274** in the memory device driver **5271** and a symmetric key SK **5276**, resulting in encrypted content E_{SK}[X] **5273**. The encrypted content E_{SK}[X] **5273** is then stored on the memory storage device **5270**. Upon retrieval from memory storage device **5270**, decryption process D_{SK} **5275** decrypts encrypted content E_{SK}[X] **5273** with symmetric key SK **5276**, resulting in the original content X **5272**. In another embodiment, secure storage is done at the file level, also as described in Applied Cryptography, by Bruce Schneier, where each file is encrypted individually with a different symmetric key prior to storage and stored in its encrypted form on memory storage device **5270**. The symmetric key SK **5276** can then be stored separate from the stored encrypted content X **5272**. In one such embodiment, encryption is done in hardware using a specialized encryption processor. In an alternate embodiment, encryption is done in software using a standard or secure processor.

To ensure the electronic book content file has not been modified while it was stored, in one embodiment, depicted in FIG. **35**, the home system **258**, serving as the storage site **4996**, uses a one-way hashing algorithm **5280**, as presented in Applied Cryptography, by Bruce Schneier and hereby incorporated by reference, where a hashing value **5281** is calculated by the home system **258** based on the electronic book content EBC **5100** prior to encryption process **5282**. The hashing value **5281**, along with encrypted content E_{SK}[EBC] **5284** is then stored on memory storage device **5283**. When the encrypted content E_{SK}[EBC] **5284** is retrieved from storage, the home system **258** decrypts encrypted content E_{SK}[EBC] **5284** using decryption process D_{SK} **5285** and retrieves the stored hashing value **5281**. The home system **258** then calculates a hashing value **5281'**, using the hashing algorithm **5280** and the retrieved electronic book content EBC **5100**. Comparator **5286** compares the hashing value **5281** to the hashing value **5281'** to determine if they coincide. If the hashing value **5281** and the hashing value **5281'** coincide, the integrity of the electronic book content EBC **5100** retrieved for memory storage device **5283** can be ensured.

The security methods described above may also be applied to the communications between an operations center **250** or cable headend and an upgraded cable set-top converter **601** that is configured to function as a library **262**.

C. Library to Viewer Security

In one embodiment, the home system **258** combines the library **262** and viewer **266** functions into a single device. In another embodiment, the home system **258** includes two separate devices, a library **262** and a viewer **266**. For this two device embodiment, all security processing required with the viewer **266** may be done entirely in the viewer **266**. Alternatively, all security processing required with the viewer **266** may be done entirely in the library **262**. When security processing between the home system **258** and the viewer **266** is done by the library **262**, separate security processing may be implemented between the library **262** and the viewer **266**. The library **262** can deliver electronic book content to the viewer **266** via a secured mechanism.

In one embodiment, an asymmetric public key encryption technique is used, as described in Contemporary Cryptography, edited by Gustavus Simmons, published by IEEE Press in 1992, and hereby incorporated by reference. Public key algorithms used may include the Merkle-Hellman Knapsacks technique, as described in U.S. Pat. No. 4,218,582, the RSA technique, as described in U.S. Pat. No. 4,405,829, the Pohlig-Hellman technique, as described in U.S. Pat. No. 4,424,414, the Schnorr Signatures technique, as described in U.S. Pat. No. 4,995,082, or any other public key technique.

In this embodiment, depicted in FIG. **20**, the library **262**, serving as the sender **4998**, first encrypts the electronic book content EBC **5100** destined for the viewer **266**, serving as the recipient **4999**, using a symmetric key encryption process E_{SK} **5102**, and using DES, PKZP, BLOWFISH, or any other symmetric encryption algorithm, resulting in encrypted content E_{SK}[EBC] **5109**. The encryption process E_{SK} **5102** uses a symmetric key SK **5103** either randomly generated by a key generator process **5104** or previously defined and retrieved from key storage memory **5105**. Then, the library **262** encrypts the symmetric key SK **5103** with private key encryption process E_{pKS} **5106** using the library's private key pKS **5107**, resulting in encrypted key EPKs[SK] **5108**. Then, the library **262** packages encrypted key E_{pKS} [SK] **5108**, encrypted content E_{SK}[EBC] **5109** and non-encrypted information **5110** related to the electronic book or the exchange and delivers the package to the viewer **266**. Using decryption process D_{PKS} **5111** and the library's public key PKS **5112**, the viewer **266** decrypts the encrypted key E_{pKS}[SK] **5108** and uses the recovered symmetric key SK **5103** to decrypt the encrypted content E_{SK}[EBC] **5109** using decryption process D_{SK} **5113**.

In another embodiment, depicted in FIG. **23***a*, the library **262**, serving as the sender **4998**, encrypts the entire transaction stream TS **5165** between the library **262** and the viewer **266**, serving as the recipient **499**. To do so, the library **262** may use the sender private key pKS **5160** and encryption process E_{pKS} **5161** to encrypt the transaction stream TS **5165**, resulting in encrypted transaction stream E_{pKS}[TS] **5162**. In this embodiment, the viewer **266** uses decryption process D_{PKS} **5164** and sender public key PKS **5163** to decrypt the encrypted transaction stream E_{pKS}[TS] **5162**.

In another embodiment, depicted in FIG. **23***b*, the library **262**, serving as the sender **4998**, may use the public key of the viewer **266**, serving as the recipient **4999**, to encrypt the transaction stream TS **5165**. To do so, the library **262** may use the recipient public key PKR **5171** and encryption process E_{PKR} **5170** to encrypt the transaction stream TS **5165**, resulting in encrypted transaction stream E_{PKR}[TS] **5173**. In this embodiment, the viewer **266** uses decryption process D_{pKR} **5174** and recipient private key pKR **5172** to decrypt the encrypted transaction stream E_{PKR}[TS] **5173**. In another embodiment, depicted in FIG. **23***c*, the library **262**, serving as sender **4998**, may use a transaction symmetric key SKT **5181** that both the library **262** and the viewer **266** have stored in advance of the transaction to encrypt the transaction stream TS **5165**. In this embodiment, the library **262** uses encryption process E_{SKT} **5180** and transaction symmetric key SKT **5181** to generate encrypted transaction stream E_{SKT}[TS] **5182**. The viewer **266** uses decryption process D_{SKT} **5183** and transaction symmetric key SKT **5181** to decrypt encrypted transaction stream E_{SKT}[TS] **5182**, resulting in transaction stream TS **5165**.

In another embodiment, depicted in FIG. **24***a*, the library **262**, serving as the sender **4998**, and the viewer **266**, serving as the recipient **4999**, initiate the transaction by negotiating a shared key to use for the transaction, using, for example, the Elliptic Curve Diffie-Hellman key exchange algorithm, as described in U.S. Pat. No. 4,200,700, to generate the shared transaction symmetric key. Key negotiation information **5190** is exchanged between key generation algorithms **5191** operated by both the library **262** and the viewer **266**. As a result of the negotiation process, the library's key generator algorithm **5191** generates the transaction symmetric key SKT **5193** and the viewer's key generator algorithm **5192** generates the transaction symmetric key SKT **5193**.

The library **262** encrypts the electronic book content EBC **5100** using encryption process E_{SKT} **5194** and the shared transaction symmetric key SKT **5193** and delivers the resulting encrypted content E_{SKT}[EBC] **5195** to the viewer **266**. The viewer **266** uses the shared transaction symmetric key SKT **5193** and decryption process D_{SKT} **5196** to decrypt the encrypted content E_{SKT}[EBC] **5195**. In a different embodiment, depicted in FIG. **24***b*, the library **262** serves as the sender **4998** and viewer **266** serves as the recipient **4999**. Initial key negotiation information **5200** is exchanged between the seed key generation algorithm **5201** at the library **262** and the seed key generation algorithm **5202** at the viewer **266**. As a result, the seed key generation algorithm **5201** at the library **262** and the seed key generation algorithm **5202** at the viewer **266** each generate seed key SK **5203** using, for example, the Elliptic Curve Diffie-Hellman key exchange algorithm, as described in U.S. Pat. No. 4,200,700. Seed key **5203** is then used by key sequence generator **5204** at the library **262** site to generate the first in a sequence of keys, transaction symmetric key SKTi **5206**.

Similarly, seed key **5203** is used by key sequence generator **5205** at the viewer **266** to generate the identical sequence of keys, beginning with transaction symmetric key S_{KTi} **5206**. The library **262** encrypts the electronic book content EBC **5100** using encryption process E_{SKTi} **5207** and the shared transaction symmetric key S_{KTi} **5206** and delivers the resulting encrypted content E_{SKTi}[EBC] **5208** to the viewer **266**. The viewer **266** uses the transaction symmetric key S_{KTi} **5206** and decryption process D_{SKTi} **5209** to decrypt the encrypted content E_{SKTi}[EBC] **5206**. The library **262** key sequence generator **5204** and viewer **266** key sequence generator **5205** continue to generate matching transaction symmetric keys for use in encrypting each subsequent transaction between the library **262** and the viewer **266**.

To ensure that the electronic book content delivered by the library **262** to the viewer **266** was not altered in route, integrity checking algorithms may be employed. In one embodiment, depicted in FIG. **26**, the library **262**, serving as the sender **4998**, uses a one-way hashing algorithm **5231**, as presented in Applied Cryptography, by Bruce Schneier, published by John Wiley & Sons, Inc. in 1996, and hereby incorporated by reference, where a hashing value **5232** is calculated by the library **262** based on the electronic book content file **5230** as an input. This resulting hashing value **5232**, along with the actual encrypted electronic book file **5237** that has been encrypted by the library **262** via encryption process **5235** is delivered to the viewer **266**, serving as the recipient **4999**.

The viewer **266** decrypts the encrypted electronic book file **5237** using decryption process **5236** to recover the electronic book content file **5230'**. The viewer **266** then uses the hashing algorithm **5231** with the electronic book content file **5230'** as input to generate a hashing value **5232'**, which is compared to the hashing value **5232** delivered with the encrypted electronic book file **5237**. If the hashing value **5232'** calculated by the viewer **266** coincides with the hashing value **5232** delivered by the library **262** as determined by comparator **5233**, the integrity of the electronic book content file **5230'** can be ensured.

To identify the library **262** delivering the electronic book, the library **262** and viewer **266** may use an authentication method. In one embodiment, the Digital Signature Algorithm (DSA) is used, as described in U.S. Pat. No. 5,231,668, and hereby incorporated by reference. In another embodiment, the library **262** uses a password as an identifier. This password may be delivered along with the electronic book content to authenticate the library **262** as the sender. The viewer **266** compares this password with the password the viewer **266** has for the library **262**. If the passwords match, the source of the electronic book content, i.e., the library **262**, is verified.

In yet another embodiment, public key encryption is used as a digital signature to authenticate the library **262**. The library **262** encrypts the electronic book content using the library's private key pKS. When the viewer **266** correctly decrypts the encrypted electronic book content with the library's public key PKS, the identity of the library **262** is authenticated since only the library **262** has access to the library's private key pKS used to encrypt the electronic book content. In another embodiment, the ISO one-way authentication protocol framework, as defined in ISO standard X.509 is used to provide authentication of the library's identity.

A viewer **266** may initiate the transaction with the library **262** by requesting that an electronic book be delivered from the library **262** to the viewer **266**. To validate the identity of the viewer **266**, the library **262** and viewer **266** may use the above authentication method embodiments. In another embodiment, the Digital Signature Algorithm (DSA) is used, as described in U.S. Pat. No. 5,231,668, and hereby incorporated by reference. In another embodiment, the viewer **266** uses a password as an identifier. This password may be delivered along with the electronic book request to authenticate the viewer **266**. The library **262** compares this password with the password the library unit **266** has for the viewer **266**. If the passwords match, the source of the electronic book request, i.e., the viewer **266**, is verified.

In yet another embodiment, public key encryption is used as a digital signature to authenticate the viewer **266**. The viewer **266** encrypts the electronic book request using the viewer **266** private key pKR and send the encrypted request to the publisher **282**. When the publisher **282** correctly decrypts the encrypted request with the viewer's public key PKR, the identity of the viewer **266** is authenticated since only the viewer **266** has access to the viewer's private key pKR used to encrypt the electronic book request.

In another embodiment, depicted in FIG. **28**, upon initiation of the transaction, the viewer **266**, serving as the recipient **4999**, notifies the library **262**, serving as the sender **4998**, of the viewer's intention to request electronic book content from the library **262**. This notification is in the form of initial request message **5250**. The library **262** then encrypts a randomly generated message RGM generated by the library **262** using encryption process E_{pKS} and the library's private key pKS and sends the resulting E_{pKS}[RGM] **5251** to the viewer **266**. The viewer **266** decrypts E_{pKS}[RGM] **5251** using decryption process D_{PKS} and the library's public key PKS. The viewer **266** then encrypts the electronic book request EBR, along with the randomly generated message RGM received from the library **262** using encryption process E_{PKR} and the viewer's private key pKR and sends the resulting E_{pKR}[EBR,RGM] **5252** to the library **262**. The library **262** decrypts E_{pKR}[EBR,RGM] **5252** using decryption process D_{PKR} and the viewer's public key PKR. If the randomly generated message RGM received from the viewer **266** coincides with the randomly generated message RGM that the library **262** originally sent to the viewer **266**, the viewer's identity is verified.

In another embodiment, the ISO one-way authentication protocol framework, as defined in ISO standard X.509 is used to provide authentication of the library's identity.

In yet another embodiment, the compressed and encrypted electronic book content file E_{SKT}[EBC] is stored on the library system **262**. Once the electronic book is ready to be displayed on the viewer **266**, the entire compressed and encrypted electronic book file E_{SKT}[EBC] is downloaded to the viewer **266** from the library system **262**. The viewer **266** verifies the source of the electronic book by using the public key of the viewer **266** PKS to decrypt the digital signature provided. The viewer **266** then decrypts the symmetric key using decryption process D_{pKR} and the viewer's private key pKR. The viewer **266** then uses decryption process D_{SKT} and the transaction symmetric key SKT to decrypt all or a portion of the electronic book file prior to display. The viewer **266** then decompresses the electronic book file and displays a page of the electronic book on the viewer **266** display.

Exchanging encryption key information between the library **262** and viewer **266** may be done using communication networks. Alternatively, encryption key distribution may be accomplished by storing the encryption key information on a smart card, PCMCIA card device, CD ROM, or other portable memory storage device and delivering the device to the appropriate location for retrieval and use in future encryption and decryption activities. When the key is delivered in physical form, the key may have associated with it a valid time period of use. Once this period has expired, a new key may be required. Alternatively, the device may support the capability to be updated remotely via a communication network.

Encryption, decryption, hashing, digital signature processing, formatting, compression, key management, and other security related activities presented herein that are performed by the library **262** or the viewer **266** may be done in hardware using a specialized processor. In an alternate embodiment, security related activities may be done in software using a standard or secure processor. In yet another alternative, a portion of security related activities may be done in software using a standard or secure processor while the remaining portion done in hardware using a specialized processor.

Once the electronic book content EBC **5100** is received and decrypted by the viewer **266**, the viewer **266** may encrypt the electronic book content EBC **5100** with a symmetric key algorithm and store the encrypted electronic book content along with any non-encrypted content associated with the electronic book in storage memory device **5270** at the viewer **266**. In one embodiment, depicted in FIG. **34**, secure storage is done on a memory device at the driver-level, where all information stored on the memory storage device **5270** is encrypted by memory device driver prior to being stored on memory storage device **5270**, as described in Applied Cryptography, by Bruce Schneier and hereby incorporated by reference. In this embodiment, any content X **5272** to be stored on the memory storage device **5270**, including electronic book content, is encrypted using encryption process E_{SK} **5274** in memory device driver **5271** and symmetric key SK **5276**, resulting in encrypted content E_{SK}[X] **5273**. The resulting encrypted content E_{SK}[X] **5273** is then stored on memory storage device **5270**. Upon retrieval from memory storage device **5270**, decryption process DSK **5275** decrypts encrypted content E_{SK}[X] **5273** with symmetric key SK **5276**, resulting in the original content X **5272**. In another embodiment, secure storage is done at the file level, also as described in Applied Cryptography, by Bruce Schneier, where each file is encrypted individually with a different symmetric key prior to storage and stored in its encrypted form on memory storage device **5270**. The symmetric key SK **5276** can then be stored separate from the stored encrypted content X **5272**. In one such embodiment, encryption is done in hardware using a specialized encryption processor. In an alternate embodiment, encryption is done in software using a standard or secure processor.

To ensure the electronic book content file has not been modified while it was stored, in one embodiment, depicted in FIG. **35**, the viewer **266**, serving as the storage site **4996**, uses a one-way hashing algorithm **5280**, as presented in Applied Cryptography, by Bruce Schneier and hereby incorporated by reference, where a hashing value **5281** is calculated by the viewer **266** based on the electronic book content EBC **5100** prior to encryption process **5282**. The hashing value **5281**, along with the encrypted content E_{SK}[EBC] **5284** is then stored on the memory storage device **5283**. When the encrypted content E_{SK}[EBC] **5284** is retrieved from storage, the viewer **266** decrypts encrypted content E_{SK}[EBC] **5284** using decryption process D_{SK} **5285** and retrieves the stored hashing value **5281**. The viewer **266** then calculates hashing value **5281'**, using hashing algorithm **5280** and the retrieved electronic book content EBC **5100**. Comparator **5286** compares the hashing value **5281** to the hashing value **5281'** to determine if they coincide. If the hashing value **5281** and the hashing value **5281'** coincide, the integrity of the electronic book content EBC **5100** retrieved for memory storage device **5283** can be ensured and the viewer **266** displays the retrieved content.

The security methods described above may also be applied to the communications between an upgraded cable set-top converter **601** that is configured to function as a library unit **262** and a viewer **266**.

D. Kiosk to Viewer Security

Kiosks, public libraries, schools, and bookstore systems can deliver electronic book content to a viewer **266** or public viewer **912** using a secured mechanism. In one embodiment, an asymmetric public key encryption technique is used, as described in Contemporary Cryptography, edited by Gustavus Simmons, published by IEEE Press in 1992, and hereby incorporated by reference. Public key algorithms used may include the Merkle-Hellman Knapsacks technique, as described in U.S. Pat. No. 4,218,582, the RSA technique, as described in U.S. Pat. No. 4,405,829, the Pohlig-Hellman technique, as described in U.S. Pat. No. 4,424,414, the Schnorr Signatures technique, as described in U.S. Pat. No. 4,995,082, or any other public key technique.

In this embodiment, depicted in FIG. **20**, a kiosk, serving as the sender **4998**, first encrypts the electronic book content EBC **5100** destined for the viewer **266** or the public viewer **912** (see FIG. **15**), serving as the recipient **4999**, using a symmetric key encryption process E_{SK} **5102**, and using DES, PKZIP, BLOWFISH, or any other symmetric encryption algorithm, resulting in encrypted content E_{SK}[EBC] **5109**. The encryption process E_{SK} **5102** uses a symmetric key SK **5103** either randomly generated by a key generator process **5104** or previously defined and retrieved from key storage memory **5105**. Then, the kiosk encrypts the symmetric key SK **5103** with private key encryption process E_{pKS} **5106** using the kiosk's private key pKS **5107**, resulting in encrypted key E_{pKS}[SK] **5108**. The kiosk packages encrypted key E_{pKS}[SK] **5108**, encrypted content E_{SK}[EBC] **5109** and non-encrypted information **5110** related to the electronic book or the exchange and delivers the package to the viewer **266** or public viewer **912**. Using decryption process D_{PKS} **5111** and the kiosk's public key PKS **5112**, the viewer **266** or public viewer **912** decrypts the encrypted key E_{pKS}[SK] **5108** and uses the recovered symmetric key SK **5103** to decrypt the encrypted content E_{SK}[EBC] **5109** using decryption process DSK **5113**.

In an alternate embodiment, depicted in FIG. **21**, only symmetric key encryption is used, using a certificate authority **4997**. The certificate authority **4997**, a trusted source, provides a symmetric key to each kiosk, serving as the sender **4998**, and the viewer **266** or public viewer **912**, serving as the recipient **4999**. The certificate authority **4997** may be an existing commercial entity such as Entrust or Verisign or a private entity established for the sole purpose of electronic book secure distribution. The kiosk contacts the certificate authority **4997**, sending a request **5120** for a transaction symmetric key SKT **5121** to be used during the transaction. The certificate authority **4997** either randomly generates the transaction symmetric key SKT **5121** by using a key generator process **5124** or retrieves the previously defined transaction symmetric key SKT **5121** from key storage memory **5125**. The transaction symmetric key SKT **5121** is encrypted by the certificate authority **4997** using symmetric key encryption process E_{SKS} **5123** and the kiosk's symmetric key SKS **5122**.

The resulting encrypted symmetric key E_{SKS}[SKT] **5126** is delivered by the certificate authority **4997** to the kiosk. The kiosk decrypts the encrypted symmetric key E_{SKS}[SKT] **5126** using decryption process D_{SKS} **5127** and using the kiosk's symmetric key SKS **5122** to recover the transaction symmetric key SKT **5121**. The kiosk then uses the recovered transaction symmetric key SKT **5121** received from the certificate authority **4997** to encrypt the electronic book content EBC **5100** using encryption process E_{SKT} **5128**, resulting in encrypted content E_{SKT}[EBC] **5129**. The kiosk delivers the encrypted content E_{SKT}[EBC] **5129** to the viewer **266** or public viewer **912**. The transaction symmetric key SKT **5121** is also encrypted by the certificate authority **4997** using symmetric key encryption process E_{SKR} **5131** using the viewer's symmetric key SKR **5130**. The resulting encrypted symmetric key E_{SKR}[SKT] **5132** is delivered by the certificate authority **4997** to the viewer **266** or public viewer **912**. The viewer **266** or public viewer **912** decrypts the encrypted symmetric key E_{SKR}[SKT] **5132** using decryption process DSKR **5133** and the viewer's symmetric key SKR **5130** to recover the transaction symmetric key SKT

5121. The viewer **266** or public viewer **912** then uses the recovered transaction symmetric key SKT **5121** received from the certificate authority **4997** to decrypt the encrypted content E_{SKT}[EBC] **5129** using decryption process D_{SKT} **5134**, resulting in the unencrypted electronic book content **5100**.

In yet another embodiment, depicted in FIG. **22**, the kiosk, acting as the sender **4998**, generates a transaction symmetric key SKT **5140**. The kiosk either randomly generates the transaction symmetric key SKT **5140** by using the key generator process **5141** or retrieves the previously defined transaction symmetric key SKT **5140** from key storage memory **5142**. The kiosk encrypts the electronic book content EBC **5100** using encryption process E_{SKT} **5143** and the transaction symmetric key SKT **5140**, and delivers the encrypted content E_{SKT}[EBC] **5144** to the viewer **266** or public viewer **912**, acting as the recipient **4999**.

The kiosk encrypts the transaction symmetric key SKT **5140** using encryption process E_{SKS} **5145** and the kiosk's symmetric key SKS **5146** that the kiosk shares with a third party certificate authority **4997** and delivers the encrypted symmetric key E_{SKS}[SKT] **5147** to the third party certificate authority **4997**. The certificate authority **4997** decrypts the encrypted symmetric key E_{SKS}[SKT] **5147** using decryption process D_{SKS} **5148** and the kiosk's symmetric key SKS **5146**. The viewer **266** or public viewer **912** may contact the certificate authority **4997** using the request **5149** to obtain the transaction symmetric key **5140**. Prior to the certificate authority **4997** delivering the needed transaction symmetric key **5140** to the viewer **266** or public viewer **912**, the viewer **266** or public viewer **912** may be required to complete a financial transaction with the certificate authority **4997**, paying for the electronic book content first. The certificate authority **4997** then encrypts the transaction symmetric key SKT **5140** using encryption process EsKR **5150** and the viewer's symmetric key SKR **5151** that the certificate authority **4997** shares with the viewer **266** or public viewer **912**, and delivers the encrypted symmetric key E_{SKR}[SKT] **5152** to the viewer **266** or public viewer **912**. The viewer **266** or public viewer **912** decrypts the encrypted symmetric key E_{SKR}[SKT] **5152** using decryption process D_{SKR} **5153** and the viewer's symmetric key SKR **5151**, and uses the recovered transaction symmetric key SKT **5140** to decrypt the encrypted content E_{SKT}[EBC] using decryption process D_{SKT} **5154**, resulting in electronic book content EBC **5100**.

In another embodiment, depicted in FIG. **23***a*, the kiosk, serving as the sender **4998**, encrypts the entire transaction stream TS **5165** between the kiosk and the viewer **266** or public viewer **912**, serving as the recipient **499**. To do so, the kiosk may use the sender private key pKS **5160** and encryption process E_{pKS} **5161** to encrypt the transaction stream TS **5165**, resulting in encrypted transaction stream E_{pKS}[TS] **5162**. In this embodiment, the viewer **266** or public viewer **912** uses decryption process D_{PKS} **5164** and sender public key PKS **5163** to decrypt the encrypted transaction stream E_{pKS}[TS] **5162**.

In another embodiment, depicted in FIG. **23***b*, the kiosk, serving as the sender **4998**, may use the public key of the viewer **266** or public viewer **912**, serving as the recipient **4999**, to encrypt the transaction stream TS **5165**. To do so, the kiosk may use the recipient public key PKR **5171** and encryption process E_{PKR} **5170** to encrypt the transaction stream TS **5165**, resulting in encrypted transaction stream E_{PKR}[TS] **5173**. In this embodiment, the viewer **266** or public viewer **912** uses decryption process D_{pKR} **5174** and recipient private key pKR **5172** to decrypt the encrypted transaction stream E_{PKR}[TS] **5173**.

In another embodiment, depicted in FIG. **23***c*, the kiosk, serving as the sender **4998**, may use a transaction symmetric key SKT **5181** that both the kiosk and the viewer **266** or public viewer **912** have stored in advance of the transaction to encrypt the transaction stream TS **5165**. In this embodiment, the kiosk uses encryption process E_{SKT} **5180** and transaction symmetric key SKT **5181** to generate encrypted transaction stream E_{SKT}[TS] **5182**. The viewer **266** or public viewer **912** uses decryption process D_{SKT} **5183** and transaction symmetric key SKT **5181** to decrypt encrypted transaction stream E_{SKT}[TS] **5182**, resulting in transaction stream TS **5165**.

In another embodiment, depicted in FIG. **24***a*, the kiosk, serving as the sender **4998**, and viewer **266** or public viewer **912**, serving as the recipient **4999**, initiate the transaction by negotiating a shared key to use for the transaction, using, for example, the Elliptic Curve Diffie-Hellman key exchange algorithm, as described in U.S. Pat. No. 4,200,700, to generate the shared transaction symmetric key. Key negotiation information **5190** is exchanged between key generation algorithms **5191** operated by both the kiosk and the viewer **266** or public viewer **912**. As a result of the negotiation process, the kiosk's key generator algorithm **5191** generates the transaction symmetric key SKT **5192** and the viewer's key generator algorithm **5192** generates the transaction symmetric key SKT **5193**.

The kiosk encrypts the electronic book content EBC **5100** using encryption process E_{SKT} **5194** and the shared transaction symmetric key SKT **5193** and delivers the resulting encrypted content E_{SKT}[EBC] **5195** to the viewer **266** or public viewer **912**. The viewer **266** or public viewer **912** uses the shared transaction symmetric key SKT **5193** and decryption process D_{SKT} **5196** to decrypt the encrypted content E_{SKT}[EBC] **5195**.

In a different embodiment, depicted in FIG. **24***b*, the kiosk serves as the sender **4998** and viewer **266** or public viewer **912** serves as the recipient **4999**. Initial key negotiation information **5200** is exchanged between the seed key generation algorithm **5201** at the kiosk and the seed key generation algorithm **5202** at the viewer **266** or public viewer **912**.

As a result, the seed key generation algorithm **5201** at the kiosk and the seed key generation algorithm **5202** at the viewer **266** or public viewer **912** each generate seed key SK **5203** using, for example, the Elliptic Curve Diffie-Hellman key exchange algorithm, as described in U.S. Pat. No. 4,200,700. Seed key **5203** is then used by key sequence generator **5204** at the kiosk site to generate the first in a sequence of keys, transaction symmetric key S_{KTi} **5206**. Similarly, seed key **5203** is used by key sequence generator **5205** at the viewer **266** or public viewer **912** to generate the identical sequence of keys, beginning with transaction symmetric key SKTi **5206**.

The kiosk encrypts the electronic book content EBC **5100** using encryption process E_{SKTi} **5207** and the shared transaction symmetric key S_{KTi} **5206** and delivers the resulting encrypted content E_{SKTi}[EBC] **5208** to the viewer **266** or public viewer **912**. The viewer **266** or the public viewer **912** uses the transaction symmetric key S_{KTi} **5206** and decryption process D_{SKTi} **5209** to decrypt the encrypted content E_{SKTi} [EBC] **5206**. The kiosk key sequence generator **5204** and viewer **266** or public viewer **912** key sequence generator **5205** continue to generate matching transaction symmetric keys for use in encrypting each subsequent transaction between the kiosk and the viewer **266** or public viewer **912**.

To ensure that the electronic book content delivered by the kiosk to the viewer **266** or public viewer **912** was not altered in route, integrity checking algorithms may be employed. In one embodiment, depicted in FIG. **26**, the kiosk, serving as sender **4998**, uses a one-way hashing algorithm **5231**, as presented in Applied Cryptography, by Bruce Schneier, published by John Wiley & Sons, Inc. in 1996, and hereby incorporated by reference, where a hashing value **5232** is calculated by the kiosk based on the electronic book content file **5230** as input. This resulting hashing value **5232**, along with the actual encrypted electronic book file **5237** that has been encrypted by the kiosk via encryption process **5235** is delivered to the viewer **266** or public viewer **912**, serving as recipient **4999**.

The viewer **266** or public viewer **912** decrypts the encrypted electronic book file **5237** using decryption process **5236** to recover the electronic book content file **5230'**. The viewer **266** or public viewer **912** then uses the hashing algorithm **5231** with the electronic book content file **5230'** as input to generate a hashing value **5232'**, which is compared to the hashing value **5232** delivered with the encrypted electronic book file **5237**. If the hashing value **5232'** calculated by the viewer **266** or public viewer **912** coincides with the hashing value **5232** delivered by the kiosk as determined by comparator **5233**, the integrity of the electronic book content file **5230'** can be ensured.

To identify the kiosk of the electronic book, the kiosk and viewer **266** or the public viewer **912** may use an authentication method. In one embodiment, the Digital Signature Algorithm (DSA) is used, as described in U.S. Pat. No. 5,231,668, and hereby incorporated by reference.

In another embodiment, the kiosk uses a password as an identifier. This password is delivered along with the electronic book content to authenticate the kiosk. The viewer **266** or the public viewer **912** compares this password with the password the viewer **266** or the public viewer **912** has for the kiosk. If the passwords match, the source of the electronic book content, i.e., the kiosk, is verified.

In yet another embodiment, public key encryption is used as a digital signature to authenticate the kiosk. The kiosk encrypts the electronic book content using the kiosk's private key. When the viewer **266** or the public viewer **912** correctly decrypts the encrypted electronic book content with the kiosk's public key, the identity of the kiosk is authenticated since only the kiosk has access to the kiosk's private key used to encrypt the electronic book content.

In another embodiment, depicted in FIG. **27**, upon initiation of the transaction, the kiosk, serving as the sender **4998**, notifies the viewer **266** or the public viewer **912**, serving as the recipient **4999**, of the kiosk's intention to deliver electronic book content to the viewer **266** or public viewer **912**. This notification may be in the form of delivery notification message **5240**. The viewer **266** or the public viewer **912** then encrypts a randomly generated message RGM generated by the viewer **266** or the public viewer **912** using encryption process E_{pKR} and the viewer's private key pKR and sends the resulting E_{pKR}[RGM] **5241** to the kiosk. The kiosk decrypts E_{pKR}[RGM] **5241** using decryption process D_{PKR} and the viewer's public key PKR. The kiosk then encrypts the electronic book content EBC **5100**, along with the randomly generated message RGM received from the viewer **266** or the public viewer **912** using encryption process E_{pKS} and the kiosk's private key pKS and sends the resulting E_{pKS}[EBC,RGM] **5242** to the viewer **266** or the public viewer **912**. The viewer **266** or the public viewer **912** decrypts E_{pKS}[EBC,RGM] **5242** using decryption process D_{PKS} and the kiosk's public key PKS. If the randomly generated message RGM received from the kiosk coincides with the randomly generated message RGM that the viewer **266** or public viewer **912** originally sent to the kiosk, the kiosk's identity is verified. In another embodiment, the ISO one-way authentication protocol framework, as defined in ISO standard X.509 is used to provide authentication of the kiosk's identity.

A viewer **266** or public viewer **912** may initiate the transaction with the kiosk by requesting that an electronic book be delivered from the kiosk to the viewer **266** or the public viewer **912**. To validate the identity of the viewer **266** or the public viewer **912**, the kiosk and viewer **266** or the public viewer **912** may use the above authentication method embodiments. In another embodiment, the Digital Signature Algorithm (DSA) is used, as described in U.S. Pat. No. 5,231,668, and hereby incorporated by reference. In another embodiment, the viewer **266** or the public viewer **912** uses a password as an identifier.

This password is delivered along with the electronic book request to authenticate the viewer **266** or the public viewer **912**. The kiosk compares this password with the password it has for the viewer **266** or the public viewer **912**. If the password matches, the source of the electronic book request, i.e., the viewer **266** or the public viewer **912** is verified. In yet another embodiment, public key encryption is used as a digital signature to authenticate the viewer **266** or the public viewer **912**. The viewer **266** or the public viewer **912** encrypts the electronic book request using the viewer **266** or the public viewer **912** private key pKR and send the encrypted request to the kiosk. When the kiosk correctly decrypts the encrypted request with the viewer's public key PKR, the identity of the viewer **266** or the public viewer **912** is authenticated since only the viewer **266** or the public viewer **912** has access to the viewer's private key pKR used to encrypt the electronic book request.

In another embodiment, depicted in FIG. **28**, upon initiation of the transaction, the viewer **266** or the public viewer **912**, serving as the recipient **4999**, notifies the kiosk, serving as the sender **4998**, of the viewer's intention to request electronic book content from the kiosk. This notification is in the form of initial request message **5250**. The kiosk then encrypts a randomly generated message RGM generated by the kiosk using encryption process E_{pKS} and the kiosk's private key pKS and sends the resulting E_{pKS}[RGM] **5251** to the viewer **266** or public viewer **912**. The viewer **266** or the public viewer **912** decrypts E_{pKS}[RGM] **5251** using decryption process D_{PKS} and the kiosk's public key PKS. The viewer **266** or the public viewer **912** then encrypts the electronic book request EBR, along with the randomly generated message RGM received from the kiosk using encryption process E_{PKR} and the viewer's private key pKR and sends the resulting E_{pKR}[EBR,RGM] **5252** to the kiosk. The kiosk decrypts E_{pKR}[EBR,RGM] **5252** using decryption process D_{PKR} and the viewer's public key PKR. If the randomly generated message RGM received from the viewer **266** or the public viewer **912** coincides with the randomly generated message RGM that the kiosk originally sent to the viewer **266** or the public viewer **912**, the viewer's identity is verified.

In another embodiment, the ISO one-way authentication protocol framework, as defined in ISO standard X.509 is used to provide authentication of the kiosk's identity.

In yet another embodiment, where the kiosk is functioning as a public library, a viewer **266** or the public viewer **912** requests an electronic book to be borrowed from the kiosk. The kiosk must first authenticate the viewer **266** or the public viewer **912**. An embodiment of the authentication sequence is depicted in FIG. **29**, where the kiosk is serving as sender **4998** and the viewer **266** or the public viewer **912** is serving as recipient **4999**. To authenticate an viewer **266** or the public viewer **912** requesting an electronic book from the kiosk, an authentication sequence may be initiated by the viewer **266** or the public viewer **912**. The authentication sequence begins with the viewer **266** or the public viewer **912** sending a request **5290** to the kiosk for a given electronic book content file **5300**. The kiosk then responds to the viewer **266** or the public viewer **912** by generating and returning an authentication string **5291** to the viewer **266** or the public viewer **912**.

The viewer **266** or the public viewer **912** returns a message to the kiosk that contains: 1) a book identifier **5292**, identifying the requested electronic book; 2) the signed authentication string **5293** that has been signed using a one-way hash function and then encrypted using the private key of the viewer **266** or public viewer **912**; and 3) viewer **266** or the public viewer **912** certification information **5294** that the kiosk can authenticate with a certificate authority **4997**. The kiosk retrieves the encrypted electronic book, along with its associated unprotected metadata header **5301** and protected metadata header **5302** from storage. The kiosk decrypts the protected metadata header **5302** using the decryption key and validates that the protected metadata header **5302** has not been altered by performing a one-way hash function on the protected metadata header **5302** and comparing the result to the hash value contained in the protected metadata header **5302**.

If the protected metadata header **5302** was stored unencrypted, the kiosk retrieves the encrypted electronic book, along with its associated unprotected metadata header **5301** and protected metadata header **5302** from storage and validates the protected metadata header using a one-way hashing function. The kiosk then modifies the fields of the unprotected metadata header **5301** and protected metadata header **5302** based on the viewer **266** or the public viewer **912** request and the rules established by the kiosk and the public library for electronic book uses and the loan duration time. The kiosk may then encrypt the entire protected metadata header **5302** or some portion of the protected metadata header **5302** using the public key of the viewer **266** or the public viewer **912** or a pre-determined symmetric key known by both the kiosk and the viewer **266** or the public viewer **912**.

The packaged electronic book with metadata headers may then be delivered to viewer **266** or the public viewer **912** or the viewer **266** or the public viewer **912** may retrieve the packaged electronic book from the kiosk. Upon receipt of the packaged electronic book, along with metadata headers **5301** and **5302**, by the viewer **266** or the public viewer **912**, the viewer **266** or the public viewer **912** may decrypt the protected metadata header **5302**, validate that the protected metadata header **5302** has not been altered by performing a one-way hash calculation on the protected metadata header **5302** and comparing the result to the hash value **5305** contained in the protected metadata header **5302**, and re-encrypt the protected metadata header **5302** for storage, or store the received packaged electronic book directly without decrypting the protected metadata header **5302**.

When the electronic book is opened for display on the viewer **266** or the public viewer **912**, the viewer decrypts the protected metadata header **5302** using the appropriate decryption key, recovers the content decryption key, and decrypts the electronic book content for display on the viewer. To return a borrowed electronic book to a kiosk, the viewer **266** or the public viewer **912** sends a return request to the kiosk. To authenticate a kiosk and to obtain the public key of the kiosk if not already known by the viewer **266** or the public viewer **912**, an authentication sequence may be initiated by the viewer **266** or the public viewer **912**. The authentication sequence begins with the viewer **266** or the public viewer **912** sending a request to the kiosk to return a given electronic book content file. The viewer **266** or the public viewer **912** generates and inserts an authentication string in the request sent to the kiosk. The kiosk returns a message to the viewer **266** or the public viewer **912** that contains an authentication string that has been signed using a one-way hash function and then encrypted using the private key of the kiosk. The protected metadata header **5302** or some portion of the header may then be encrypted in the public key of the kiosk or the private key of the viewer.

Once the kiosk has been authenticated by the viewer **266** or the public viewer **912**, the packaged electronic book with metadata headers may then be returned to the kiosk and deleted from the viewer. The kiosk decrypts the protected metadata header **5302**, modifies the protected metadata header **5302** to reflect that the electronic book is no longer being borrowed, and stores the modified protected metadata header **5302**. This return process may also be used to return an electronic book to a kiosk for a refund. Processing of and storage of the decryption and encryption keys used on the protected metadata header **5302** at the viewer **266** or the public viewer **912** may be done entirely via software, entirely on a secure smart card or removable device, or some combination of the two.

To ensure the kiosk that the electronic book content delivered to the viewer **266** or the public viewer **912** was received, the viewer **266** or the public viewer **912**, serving a recipient **4999** in FIG. **33** may respond to the kiosk, serving as the sender in FIG. **33**, by first generating a reply message REP as shown in step **5260**. The viewer **266** or the public viewer **912** then encrypts reply message REP in the viewer's private key pKR using encryption process E_{PKR}, resulting in E_{pKR}[REP], as shown in step **5261**. The viewer **266** or the public viewer **912** then encrypts E_{pKR}[REP] in the kiosk's public key PKS using encryption process E_{PKS}, resulting in E_{PKS}[E_{pKR}[REP]], as shown in step **5262**. The viewer **266** or the public viewer **912** sends E_{pKS}[E_{PKR}[REP]] to the kiosk, as shown in step **5263**. The kiosk then decrypts E_{pKS}[E_{PKR}[REP]], using decryption process D_{pKS} and the kiosk's private key pKS, resulting in E_{PKR}[REP] as shown in step **5264**. The kiosk then decrypts the resulting E_{pKR} [REP] using decryption process D_{PKR} and the viewer's public key PKR, as shown in step **5265**. As shown in step **5266**, the valid reception of reply message REP by kiosk serves as verification of receipt of the electronic book content delivered to the viewer **266** or the public viewer **912** by the kiosk.

In another embodiment, the ISO two-way authentication protocol framework, as defined in ISO standard X.509 is used to provide verification of receipt of electronic book content by the viewer **266** or the public viewer **912**. Exchanging encryption key information between the kiosk and viewer **266** or the public viewer **912** may be done via communication networks. Alternatively, encryption key distribution may be accomplished by storing the encryption key information on a smart card, PCMCIA card device, CD ROM, or other portable memory storage device and delivering the device to the appropriate location for retrieval and use in future encryption and decryption activities. When the key is delivered in physical form, the key may have associated with it a valid time period of use. Once this period has expired, a new key is required. Alternatively, the device may support the capability to be updated remotely using a communication network.

Encryption, decryption, hashing, digital signature processing, formatting, compression, key management, and other security related activities presented herein that are performed by the kiosk or the viewer **266** or the public viewer **912** may be done in hardware using a specialized processor. In an alternate embodiment, security related activities may be done in software using a standard or secure processor. In yet another alternative, a portion of security related activities may be done in software using a standard or secure processor while the remaining portion done in hardware using a specialized processor.

Once electronic book content is received and decrypted by the viewer **266** or the public viewer **912**, the viewer **266** or the public viewer **912** may encrypt the electronic book content EBC **5100** with a symmetric key algorithm and store the encrypted electronic book content along with any non-encrypted content associated with the electronic book in storage memory device **5270** at the viewer **266** or the public viewer **912**. In one embodiment, depicted in FIG. **34**, secure storage is done on a memory device at the driver-level, where all information stored on the memory storage device **5270** is encrypted by memory device driver prior to being stored on memory storage device **5270**, as described in Applied Cryptography, by Bruce Schneier and hereby incorporated by reference. In this embodiment, any content X **5272** to be stored on the memory storage device **5270**, including electronic book content, is encrypted using encryption process E_{SK} **5274** in memory device driver **5271** and symmetric key SK **5276**, resulting in encrypted content E_{SK}[X] **5273**. The resulting encrypted content E_{SK}[X] **5273** is then stored on memory storage device **5270**. Upon retrieval from memory storage device **5270**, decryption process D_{SK} **5275** decrypts encrypted content E_{SK}[X] **5273** with symmetric key SK **5276**, resulting in the original content X **5272**. In another embodiment, secure storage is done at the file level, also as described in Applied Cryptography, by Bruce Schneier, where each file is encrypted individually with a different symmetric key prior to storage and stored in its encrypted form on memory storage device **5270**. The symmetric key SK **5276** can then be stored separate from the stored encrypted content X **5272**. In one such embodiment, encryption is done in hardware using a specialized encryption processor. In an alternate embodiment, encryption is done in software using a standard or secure processor.

To ensure the electronic book content file has not been modified while it was stored, in one embodiment, depicted in FIG. **35**, the viewer **266** or the public viewer **912**, serving as storage site **4996**, uses a one-way hashing algorithm **5280**, as presented in Applied Cryptography, by Bruce Schneier and hereby incorporated by reference, where a hashing value **5281** is calculated by the viewer **266** or the public viewer **912** based on the electronic book content EBC **5100** prior to encryption process **5282**. This hashing value **5281**, along with the encrypted content E_{SK}[EBC] **5284** is then stored on memory storage device **5283**. When the encrypted content E_{SK}[EBC] **5284** is retrieved from storage, the viewer **266** or the public viewer **912** decrypts encrypted content E_{SK}[EBC] **5284** using decryption process DSK **5285** and retrieves the stored hashing value **5281**. The viewer **266** or the public viewer **912** then calculates hashing value **5281'**, using hashing algorithm **5280** and the retrieved electronic book content EBC **5100**. Comparator **5286** compares hashing value **5281** to hashing value **5281'** to determine if they coincide. If the hashing value **5281** and the hashing value **5281'** coincide, the integrity of the electronic book content EBC **5100** retrieved for memory storage device **5283** can be ensured.

The security methods described above may also be applied to the communications between a public library system and a viewer, between a school or school library system and a viewer, and between a bookstore system and a viewer.

E. Viewer to Viewer Security

In an embodiment where an electronic book is being lent by one viewer to another, the borrowing viewer requests an electronic book to be borrowed from the lending viewer. The lending viewer may first authenticate the borrowing viewer. An embodiment of the authentication sequence is depicted in FIG. **29**, where the lending viewer is serving as the sender **4998** and the viewer **266** or the public viewer **912** is serving as the recipient **4999**. To authenticate a borrowing viewer requesting an electronic book from the lending viewer, an authentication sequence may be initiated by the borrowing viewer. The authentication sequence begins with the borrowing viewer sending a request **5290** to the lending viewer for a given electronic book content file **5300**.

The lending viewer then responds to the borrowing viewer by generating and returning an authentication string **5291** to the borrowing viewer. The borrowing viewer returns a message to the lending viewer that contains: 1) a book identifier **5292**; identifying the requested electronic book; 2) the signed authentication string **5293** that has been signed using a one-way hash function and then encrypted using the private key of the borrowing viewer; and 3) borrowing viewer certification information **5294** that the lending viewer can authenticate with a certificate authority **4997**. The lending viewer retrieves the encrypted electronic book, along with its associated unprotected metadata header **5301** and protected metadata header **5302** from storage. The lending viewer decrypts the protected metadata header **5302** using the decryption key and validates that the protected metadata header **5302** has not been altered by performing a one-way hash function on the protected metadata header **5302** and comparing the result to the hash value contained in the protected metadata header **5302**. If the protected metadata header **5302** was stored unencrypted, the lending viewer retrieves the encrypted electronic book, along with its associated unprotected metadata header **5301** and protected metadata header **5302** from storage and validates the protected metadata header using a one-way hashing function. The lending viewer then modifies the fields of the unprotected metadata header **5301** and protected metadata header **5302** based on the borrowing viewer request and the rules established by the lending viewer and the public library for electronic book uses and the loan duration time. The lending viewer may then encrypt the entire protected metadata header **5302** or some portion of the protected metadata header **5302** using the public key of the borrowing viewer or a predetermined symmetric key known by both the lending viewer and the borrowing viewer.

The packaged electronic book with metadata headers may then be delivered to borrowing viewer or the borrowing viewer may retrieve the packaged electronic book from the lending viewer. Upon receipt of the packaged electronic book, along with metadata headers **5301** and **5302**, by the borrowing viewer, the borrowing viewer may decrypt the protected metadata header **5302**, validate that the protected metadata header **5302** has not been altered by performing a one-way hash calculation on the protected metadata header **5302** and comparing the result to the hash value **5305** contained in the protected metadata header **5302**, and re-encrypt the protected metadata header **5302** for storage, or store the received packaged electronic book directly without decrypting the protected metadata header **5302**. When the electronic book is opened for display on the borrowing viewer, the viewer decrypts the protected metadata header **5302** using the appropriate decryption key, recovers the content decryption key, and decrypts the electronic book content for display on the viewer. To return a borrowed electronic book to a lending viewer, the borrowing viewer sends a return request to the lending viewer. To authenticate a lending viewer and to obtain the public key of the lending viewer if not already known by the borrowing viewer, an authentication sequence may be initiated by the borrowing viewer.

The authentication sequence begins with the borrowing viewer sending a request to the lending viewer to return a given electronic book content file. The borrowing viewer generates and inserts an authentication string in the request sent to the lending viewer. The lending viewer returns a message to the borrowing viewer that contains an authentication string that has been signed using a one-way hash function and then encrypted using the private key of the lending viewer. The protected metadata header **5302** or some portion of the header may then be encrypted in the public key of the lending viewer or the private key of the viewer.

Once the lending viewer has been authenticated by the borrowing viewer, the packaged electronic book with metadata headers may then be returned to the lending viewer and deleted from the viewer. The lending viewer decrypts the protected metadata header **5302**, modifies the protected metadata header **5302** to reflect that the electronic book is no longer being borrowed, and stores the modified protected metadata header **5302**. Processing of and storage of the decryption and encryption keys used on the protected metadata header **5302** at the borrowing viewer may be done entirely using software, entirely on a secure smart card or removable device, or some combination of the two.

F. Copyright Protection

A number of mechanisms may be implemented in the electronic book delivery system to support copyright protection. In one embodiment, all transactions between the publisher **282** and the operations center **250**, the operations center **250** and home systems **258**, the library **262** and the viewer **266**, or a kiosk and the viewer **266** or the public viewer **912**, may make use of the protocol defined in the **5**C Digital Transmission Content Protection Specification, developed by Hitachi, Ltd., Intel Corporation, Matsushita Electric Industrial Co., Ltd., Sony Corporation, and Toshiba Corporation, available from the Digital Transmission Licensing Administrator, at www.dtcp.com and hereby incorporated by reference. Alternate embodiments to support copyright protection in the distribution of electronic books are addressed below.

Visible copyright notifications may be applied to electronic book content, establishing the rights holder's legal claim to copyright protection. Copyright holder information, electronic book source information, and/or copyright disclaimer information may be embedded as a visible watermark within the electronic book. This copyright information may be associated with the electronic book and delivered with the electronic book when the electronic book is distributed from one entity to another or the electronic book is copied. The copyright information may be displayed the first time an electronic book is viewed. The copyright information may be displayed initially, each time an electronic book is viewed. Alternatively, the information may always be displayed whenever an electronic book is being viewed. This copyright information may be inserted as actual text, overlaid on electronic book text, or inserted as background graphical information in the electronic book.

Associated with a delivered electronic book may be an indication of an electronic book's printing rights. Printing rights information may be applied to all users of an electronic book title, or printing rights may apply to a specific user of an electronic book. Printing rights information may be delivered with an electronic book by the operations center **250** and used by the home system **258** in determining what printing capabilities are allowed. An electronic book may be allowed to be printed an unlimited number of times. An electronic book may be allowed to be printed one time only. An electronic book may not be allowed to be printed at all.

Finally, an electronic book may be allowed to be printed, but the electronic version of the electronic book title may be deleted after this one printing. If the electronic book viewer **266** or library **262** has a printing capability, the copyright information may be applied to the printed content. The copyright information may be applied on the first page printed, on several pages printed, or on all pages printed. The software running on the secure processor in the home system **258** performs the print management function.

The electronic book distribution system can make use of steganography to further protect electronic books from copyright violation attempts. Steganography serves to hide secret messages in other messages, concealing the existence of the secret message. The most familiar form of steganographic technique is invisible ink. Steganographic techniques can allow for hidden identifiers to be inserted into electronic books for identifying and tracking purposes.

In one embodiment, the source and various intermediate handlers of electronic book content can insert their identifying marker within an electronic book. This identifier may be a message signed with the private key of the entity inserting the identifier. In another embodiment, an identification value representing the purchasing viewer **266** or the public viewer **912** may be inserted in the electronic book using steganographic techniques. The operations center **250** may insert the purchasing viewer's identifier, or alternatively, the home system **258** may insert the purchasing viewer's identifier. In one embodiment, the steganographic technique of modifying graphics on a pixel basis is used to encode hidden identifying information. In another embodiment, non-obvious markings are added to the text of an electronic book. In yet another embodiment, modification of line spacings is used to encode hidden identifying information.

Audio watermarking techniques can be used to encode identifying information into audio provided with electronic books. Graphic watermarking, using HighWater Designs' fingerprinted binary information technique or Digimarc Corporation's DigiMarc technology, as defined in U.S. Pat. No. 5,721,788, Method and System for Digital Image Signature, to Powell, hereby incorporated by reference, may be used. In yet another embodiment, video watermarking techniques may be used to encode identifying information into video provided with electronic books.

Prior to the delivery of the electronic book containing steganographic identifiers, a hashing value may be calculated and also delivered with the electronic book. The hashing value may be recalculated and compared with the hashing value calculated prior to delivery of the electronic book to the home system **258**. If the hashing values match, the steganographic identifiers can be assured to be unaltered.

Steganographics may be incorporated into a security and validation system. Embedded steganographic information, including the electronic book publisher **282**, rightholders, the originating operations center **250**, and other intermediate sources and the purchasing home system **258** identifier, may be delivered within each electronic book sold to a home system **258**. Whenever a home system **258** requests the purchase of a new electronic book, the operations center **250** or billing and collection subsystem **278** may query the home system **258** to determine the sources of all resident electronic books and to ensure that the books are assigned to that specific home system **258**. This query may include the operations center **250** or billing and collection subsystem **278** accessing and retrieving the steganographically-hidden information from within each electronic book stored at the home system **258**. If the home system **258** contains an electronic book from a source that is not valid or an electronic book for which the home system **258** was not the valid recipient, the operations center **250** or billing and collection subsystem **278** may not allow the transaction to proceed and may send a disable command that disables the home system **258** from operation until the issue can be resolved with the operations center **250**. Alternatively, the home system **258**, under the control of the secure processor, may only display electronic books that are watermarked with that home system's unique identifier.

Critical to the security of electronic book distribution system is the ability to modify the security algorithms in case of a security breach.

In one embodiment, the security algorithms operating on the electronic book home system **258** are updated by software downloaded using a communication network. In an alternative embodiment, the security algorithms operating on the electronic book home system **258** are updated using software downloaded from a smart card, PC-MCIA device, or other memory device attached to the home system **258**.

The invention claimed is:

1. A method for encrypting, sending and receiving electronic books upon demand, comprising:

creating a list of titles of available electronic books;

transmitting the list of titles of available electronic books;

selecting a title from the transmitted list of titles;

communicating the selected title to an electronic book source;

supplying a selected electronic book corresponding to the selected title to be encrypted;

supplying an encryption key;

encrypting the selected electronic book using the encryption key;

supplying the encrypted selected electronic book;

supplying a decryption key; and

decrypting the encrypted selected electronic book using the decryption key.

2. The method of claim **1**, wherein the encryption key and the decryption key are a symmetric key.

3. The method of claim **2**, further comprising generating the symmetric key.

4. The method of claim **3**, wherein the symmetric key is generated randomly.

5. The method of claim **3**, wherein the symmetric key is generated using a key generator.

6. The method of claim **2**, further comprising retrieving the symmetric key from a key storage memory.

7. The method of claim **2**, wherein the symmetric key is a transaction symmetric key, the transaction symmetric key supplied by a certificate authority.

8. The method of claim **7**, further comprising:

sending a transaction symmetric key request to the certificate authority;

encrypting the transaction symmetric key using a first party symmetric key to produce a first encrypted transaction symmetric key;

delivering the first encrypted transaction symmetric key to a first party;

decrypting the first encrypted transaction symmetric key, wherein the electronic book is encrypted by the first party using the transaction symmetric key;

encrypting the transaction symmetric key using a second party symmetric key to produce a second encrypted transaction symmetric key;

delivering the second encrypted transaction symmetric key to a second party; and

decrypting the second encrypted transaction symmetric key, wherein the electronic book is decrypted using the transaction symmetric key.

9. The method of claim **2**, wherein electronic book content and a transaction symmetric key are encrypted by a first party and wherein the encrypted electronic book content is supplied to a second party and the encrypted transaction symmetric key is supplied to a third party.

10. The method of claim **9**, wherein the second party requests the encrypted transaction symmetric key from the third party.

11. The method of claim **10**, wherein the third party decrypts the encrypted transaction symmetric key using a first party symmetric key.

12. The method of claim **11**, further comprising:

encrypting the decrypted transaction symmetric key using a second party symmetric key;

supplying the encrypted transaction key to the second party; and

decrypting the encrypted transaction symmetric key using the second party symmetric key.

13. The method of claim **12**, further comprising completing a financial transaction between the first party and the second party before supplying the encrypted electronic book.

14. The method of claim **12**, wherein the first party is an electronic book publisher, the second party is an operations center of an electronic book distribution system and the third party is a certificate authority.

15. The method of claim **12**, wherein the first party is an electronic book distributor, the second party is an electronic book viewer and the third party is a certificate authority.

16. The method of claim **2**, further comprising:

encrypting the symmetric key with a private key and a private key encryption process;

packaging the encrypted symmetric key and the encrypted electronic book; and

delivering the package to an electronic book viewer.

17. The method of claim **16**, further comprising:

decrypting the encrypted symmetric key using a public key and a public key decryption process; and

decrypting the encrypted electronic book using the decrypted symmetric key.

18. The method of claim **17**, wherein the encryption method is one of a Merkle-Hellman Knapsack technique, a RSA technique, a Pohlig-Hellman technique and a Schnorr Signature technique.

19. The method of claim **8**, further comprising completing a financial transaction between the first party and the second party prior to delivery of the encrypted selected electronic book.

20. The method of claim **8**, further comprising completing a financial transaction between the first party and the second party prior to delivery of the encrypted transaction symmetric key to the second party.

21. The method of claim **8**, wherein the symmetric key is a shared transaction symmetric key, further comprising negotiating the shared transaction symmetric key between a first party and a second party, wherein the first party supplies the encrypted selected electronic book to the second party.

22. The method of claim **21**, wherein the shared transaction symmetric key is generated by first party and second party key negotiation algorithms.

23. The method of claim **21**, further comprising:

encrypting the electronic book using the shared transaction symmetric key;

delivering the encrypted electronic book to the second party; and

decrypting the encrypted electronic book using the shared transaction symmetric key.

24. The method of claim **2**, further comprising:

supplying the encrypted electronic book using a first communications path; and

supplying the symmetric key using a second communications path.

25. The method of claim **2**, further comprising supplying the encrypted electronic book and the symmetric key using a same communications path.

26. The method of claim **25**, wherein the encrypted electronic book and the symmetric key are supplied simultaneously.

27. The method of claim **1**, wherein the encryption key is generated by a first seed key generation algorithm and the decryption key is generated by a second seed key generation algorithm.

28. The method of claim **27**, wherein the first and the second key generation algorithms generate a seed key.

29. The method of claim **28**, further comprising:

using the seed key at a first party location to generate a first shared transaction symmetric key in a sequence of keys;

encrypting the electronic book using the first shared transaction symmetric key;

delivering the encrypted electronic book to a second party;

using the seed key at a second party location to generate a shared transaction symmetric key corresponding to the first shared transaction symmetric key generated at the first party location;

decrypting the encrypted electronic book using the shared transaction symmetric key; and

repeating the process to generate a second and subsequent shared transaction keys to encrypt and decrypt subsequent electronic books.

30. The method of claim **1**, wherein the encryption key and the decryption key are asymmetric.

31. The method of claim **30**, wherein the electronic book is encrypted using one of a Merkle-Hellman Knapsack technique, a RSA technique, a Pohlig-Hellman technique and a Schnorr Signatures technique.

32. The method of claim **30**, wherein the encryption key is a public key and the decryption key is a private key.

33. The method of claim **30**, wherein the encryption key is a private key and the decryption key is a public key.

34. The method of claim **1**, further comprising providing the decryption key with the encrypted electronic book.

35. The method of claim **34**, further comprising encrypting the decryption key.

36. The method of claim **1**, further comprising using a first cryptographic algorithm with the encryption key to encrypt the electronic book.

37. The method of claim **36**, wherein the first cryptographic algorithm is one of DES, PKZIP and BLOWFISH.

38. The method of claim **1**, further comprising using a second cryptographic algorithm with the decryption key to decrypt the encrypted electronic book.

39. The method of claim **1**, wherein encrypted electronic books are delivered to home systems individually.

40. The method of claim **1**, further comprising:

providing multiple electronic books to a home system; and

supplying the decryption key upon request for a particular electronic book by the home system.

41. The method of claim **1**, wherein the encrypted electronic book is broadcast to multiple home systems simultaneously.

42. The method of claim **41**, wherein the encryption key is a transaction symmetric key.

43. The method of claim **42**, further comprising:

encrypting the transaction symmetric key using a first public key corresponding to a first home system;

encrypting the transaction symmetric key using second and subsequent public keys corresponding to second and subsequent home systems, respectively;

delivering the first through the subsequent encrypted transaction symmetric keys to the multiple home systems;

decrypting the delivered first encrypted transaction symmetric key at the first home system using a first private key;

decrypting the second and subsequent encrypted transaction symmetric keys at one or more of corresponding ones of the multiple home systems using second and subsequent private keys, respectively; and

decrypting the delivered encrypted electronic book at one or more of the multiple home systems using the decrypted transaction symmetric key.

44. The method of claim **43**, further comprising:

assigning one or more of the multiple home systems to one or more predefined groups;

generating a group symmetric key for each of the one or more groups of home systems; and

distributing the corresponding group symmetric key to each home system in the one or more groups of home systems.

45. The method of claim **1**, wherein the encrypted electronic book is delivered to a home system, the home system comprising:

a library; and

a viewer.

46. The method of claim **45**, wherein security processing is completed in the library.

47. The method of claim **45**, wherein security processing in completed in the viewer.

48. The method of claim **45**, further comprising completing security processing between the viewer and the library.

49. The method of claim **48**, further comprising:

receiving the encrypted electronic book at the library;

decrypting the received electronic book;

storing the decrypted electronic book in a memory;

retrieving the stored electronic book;

encrypting the retrieved electronic book using a symmetric key;

encrypting the symmetric key using a library private key;

delivering the encrypted electronic book and the encrypted symmetric key to the viewer;

decrypting the encrypted symmetric key using a viewer public key; and

decrypting the encrypted electronic book using the decrypted symmetric key.

50. The method of claim **49**, wherein the symmetric key is randomly generated.

51. The method of claim **49**, wherein the symmetric key is generated by a key generator process.

52. The method of claim **49**, wherein the symmetric key is previously defined, further comprising retrieving the previously-defined symmetric key.

53. The method of claim **1**, further comprising performing integrity checking of the electronic book.

54. The method of claim **53**, wherein the step of integrity checking, comprises:

calculating a first hashing value based on content of the electronic book and a hashing algorithm;

associating the first hashing value with the electronic book;

calculating a second hashing value using the decrypted electronic book and the hashing algorithm;

comparing the first and the second hashing values; and

storing the decrypted electronic book when the first and the second hashing values match.

55. The method of claim **53**, wherein a digital signature algorithm is used to identify a party sending the electronic book.

56. The method of claim **1**, further comprising verifying an identity of a party sending the electronic book.

57. The method of claim **56**, wherein the verifying step, comprises:

delivering a password with the electronic book;

comparing the delivered password with a pre-defined password; and

storing the delivered electronic book when the delivered password and the predefined password match.

58. The method of claim **56**, wherein the verifying step comprises decrypting the delivered electronic book using the decryption key.

59. The method of claim **56**, wherein the verifying step, comprises:

sending a delivery notification message from a sending party to a receiving party receiving the electronic book

encrypting a randomly generated message;

returning the randomly generated message to the sending party sending the delivery notification message; and

decrypting the randomly generated message;

re-encrypting the randomly generated message; and

returning the re-encrypted randomly generated message to the receiving party with the encrypted electronic book.

60. The method of claim **56**, wherein the verifying step comprises using an ISO standard X.509 one-way authentication protocol.

61. The method of claim **1**, further comprising verifying an identity of a first party requesting the electronic book.

62. The method of claim **61**, wherein the verifying step, comprises:

receiving an electronic book request from the first party;

generating an authentication string;

sending the authentication string to the first party; and

returning a response message, wherein the response message, comprises:

an identifier that identifies the requested electronic book,

a signed authentication string, wherein the signed authentication string is signed using a one-way hash function and wherein the signed authentication string is encrypted, and

a first party certification information.

63. The method of claim **1**, further comprising:

creating a non-secure metadata header for the electronic book;

creating a secure metadata header for the electronic book, wherein the secure metadata header includes one or more of an electronic book identifier, the decryption key, a decryption algorithm, a number of copies of the electronic book that are allowed to be derived from an original electronic book file, distribution and fair use features and integrity checking information; and

packaging the non-secure and the secure headers with the electronic book to create an electronic book distribution file.

64. The method of claim **63**, further comprising:

compressing the electronic book distribution file; and

sending the electronic book distribution file to a receiving party.

65. The method of claim **64**, wherein the receiving party is an operations center of a television distribution system.

66. The method of claim **64**, wherein the receiving party is an electronic book home system.

67. The method of claim **64**, wherein the receiving party is a library.

68. The method of claim **64**, wherein the receiving party is a kiosk.

69. The method of claim **64**, wherein the electronic book distribution file is distributed by a publisher.

70. The method of claim **64**, wherein the electronic book distribution file is distributed by an operations center.

71. The method of claim **64**, wherein the electronic book distribution file is distributed by a library.

72. The method of claim **64**, wherein the electronic book distribution file is distributed by an electronic book home system.

73. The method of claim **64**, wherein the electronic book distribution file is distributed at a kiosk.

74. The method of claim **64**, wherein the electronic book distribution file is delivered from a first viewer to a second viewer.

75. The method of claim **64**, wherein the electronic book distribution file is distributed over an Internet using a secure socket layer protected communication link.

76. The method of claim **75**, wherein the receiving party sends an electronic book request message to request the electronic book, the request message including an Internet Protocol address of the receiving party.

77. The method of claim **76**, wherein the request message includes a login and password sequence.

78. The method of claim **76**, further comprising:

sending a certificate to the receiving party, the certificate including information identifying a sending party and a sending party public key;

verifying the certificate by comparing the information included in the certificate to expected values for the information;

sending an algorithms supported message to the sending party; returning a selected algorithm to the receiving party; generating a transaction symmetric key; encrypting the transaction symmetric key using the sending party public key and the selected algorithm;

sending the encrypted transaction symmetric key to the sending party;

- decrypting the encrypted transaction symmetric key using a sending party private key; and
- using the transaction symmetric key to encrypt and to decrypt a transaction between the sending party and the receiving party.

79. The method of claim **75**, wherein a sending party sends an electronic book distribution message to the receiving party, the distribution message including Internet Protocol address of the sending party.

80. The method of claim **79**, wherein the distribution message further comprises a login and password sequence.

81. The method of claim **80**, further comprising:

- sending a certificate to the sending party, the certificate including information identifying a sending party and a receiving party public key;
- verifying the certificate by comparing the information included in the certificate to expected values for the information;
- sending an algorithms supported message to the receiving party;
- returning a selected algorithm to the sending party;
- generating a transaction symmetric key;
- encrypting the transaction symmetric key using the receiving party public key and the selected algorithm;
- sending the encrypted transaction symmetric key to the receiving party; decrypting the encrypted transaction symmetric key using a receiving party private key; and
- using the transaction symmetric key to encrypt and to decrypt a transaction between the sending party and the receiving party.

82. The method of claim **1**, wherein the electronic book is delivered to a receiving party by a sending party, the method further comprising verifying that the receiving party received the electronic book.

83. The method of claim **82**, wherein the verifying step, comprises:

- generating a reply message;
- encrypting the reply message using a private key of the receiving party; encrypting the encrypted reply message using a public key of the sending party:
- sending the doubly encrypted reply message to the sending party; and
- decrypting the doubly encrypted reply message using a private key of the sending party and a public key of the receiving party.

84. The method of claim **82**, wherein the verifying step comprises using an ISO standard X.509 two-way authentication protocol framework.

85. The method of claim **1**, wherein encryption key information is supplied between a sending party and a receiving party using a telecommunications network.

86. The method of claim **85**, wherein the telecommunications network comprises one or more of a television delivery system, a wired telephone network, a wireless telephone network, a personal communications network (PCS), an Internet, an intranet, a local area network, a radio communications network, and an optical fiber network.

87. The method of claim **1**, wherein encryption key information is supplied between a sending party and a receiving party using a portable memory storage device.

88. The method of claim **87**, wherein the portable memory storage device includes one or more of a PCMCIA card, a CD ROM, a memory stick, and a smart card.

89. The method of claim **88**, wherein the encryption key includes a valid time period of use.

90. The method of claim **88**, wherein the portable memory storage device is updated remotely using a telecommunications network.

91. The method of claim **1**, further comprising:

- receiving the encrypted electronic book at a receiving party; and
- storing the electronic book in an encrypted format in a memory storage device.

92. The method of claim **91**, wherein the encrypted storage is performed at a driver level, comprising:

- encrypting the electronic book using a memory storage device driver level; and
- storing the encrypted electronic book at the memory storage device.

93. The method of claim **92**, wherein the electronic book is encrypted using a symmetric key.

94. The method of claim **91**, wherein the encrypted storage is performed at a file level, further comprising:

- encrypting the electronic book using a unique symmetric key;
- storing the encrypted electronic book in the memory storage device; and
  - storing the symmetric key, wherein the symmetric key is stored in a memory location apart from a memory location for the electronic book.

95. The method of claim **91**, further comprising:

- computing a first hashing value, using a one-way hashing algorithm and the electronic book, prior to encrypting the electronic book and storing the encrypted electronic book in the memory storage device;
- storing the first hashing value;
- retrieving the encrypted electronic book and the first hashing value; decrypting the retrieved encrypted electronic book;
- computing a second hashing value using the retrieved decrypted electronic book and the one-way hashing algorithm; and comparing the first and the second hashing values, wherein when the first and the second hashing values coincide, an integrity of the stored encrypted electronic book is assured.

96. An electronic book viewer for receiving an electronic book from a sending party, and for storing and displaying the electronic book, comprising: a receiver, wherein the receiver:

- receives a created, transmitted list of titles of available electronic books, wherein an electronic book is available if text associated with the electronic book is available for transmission;
- selects a title from the transmitted list of titles;
- communicates the selected title; and
- receives transmitted text associated with the selected title as encrypted electronic books and encryption information;

a memory coupled to the receiver that stores the encrypted electronic books and the encryption information;

a processor coupled to the memory that processes the encryption information using an encryption/decryption algorithm, wherein the processor comprises:

a key generator that generates encryption and decryption keys; and a transmitter coupled to the processor that sends encryption information to the sending party, wherein the encryption information includes information that allows encryption and decryption of the electronic book and encryption and decryption of encryption and decryption keys.

97. The electronic book viewer of claim **96**, wherein the encryption keys and the decryption keys are symmetric keys.

98. The electronic book viewer of claim **97**, wherein the symmetric keys are generated randomly.

99. The electronic book viewer of claim **97**, wherein the memory stores the symmetric keys, and wherein the processor retrieves a stored symmetric key from the memory.

100. The electronic book viewer of claim **97**, wherein the receiver receives a transaction symmetric key from a certificate authority, and the memory stores the transaction symmetric key.

101. The electronic book viewer of claim **100**, wherein the processor generates a transaction symmetric key request, the transmitter sends the request to the certificate authority and the receiver receives an encrypted transaction symmetric key, and wherein the processor uses the encrypted transaction symmetric key to decrypt the encrypted received electronic book.

102. The electronic book viewer of claim **97**, wherein the symmetric key is encrypted with a private key and a private encryption algorithm and wherein the processor decrypts the encrypted symmetric key using a public key and a public key decryption algorithm.

103. The electronic book viewer of claim **97**, wherein the processor further comprises a shared key negotiation algorithm, wherein the symmetric key is a shared transaction symmetric key, and wherein the processor negotiates with the sending party to generate the shared transaction symmetric key.

104. The electronic book viewer of claim **96**, wherein the processor further comprises a first seed key generation algorithm and a second seed key generation algorithm, the processor using the first seed key generation algorithm to generate an encryption key and using the second seed key generation algorithm to generate a decryption key.

105. The electronic book viewer of claim **96**, wherein an encryption key is a public key and a decryption key is a private key.

106. The electronic book viewer of claim **96**, wherein the encryption key is a private key and the decryption key is a public key.

107. The electronic book viewer of claim **96**, wherein the receiver receives a decryption key with the electronic book.

108. The electronic book viewer of claim **107**, wherein the decryption key is encrypted before shipment to the electronic book viewer.

109. The electronic book viewer of claim **96**, wherein the electronic book is encrypted using one of DES, PKZIP and BLOWFISH encryption algorithms.

110. The electronic book viewer of claim **96**, wherein the encrypted electronic books are broadcast to the electronic book viewer.

111. The electronic book viewer of claim **110**, wherein the electronic book is encrypted using a first public key system corresponding to the electronic book viewer.

112. The electronic book viewer of claim **96**, wherein the electronic book viewer is assigned to one or more predefined groups of electronic book viewers.

113. The electronic book viewer of claim **96**, further comprising a library unit coupled to the electronic book viewer, wherein the library unit completes security processing.

114. The electronic book viewer of claim **96**, wherein the processor includes an integrity checking algorithm.

115. The electronic book viewer of claim **96**, wherein the processor includes a verification algorithm that verifies an identity of the sending party.

116. The electronic book of claim **96**, wherein the processor includes an authentication algorithm.

117. The electronic book of claim **96**, wherein the sending party is a book publisher.

118. The electronic book viewer of claim **96**, wherein the sending party is an operations center of a cable television delivery system.

119. The electronic book viewer of claim **96**, wherein the sending party sends electronic books using an Internet web site.

120. The electronic book viewer of claim **96**, wherein the sending party is a kiosk.

121. The electronic book viewer of claim **96**, wherein the sending party is another electronic book viewer.

122. The electronic book viewer of claim **96**, wherein the electronic book viewer receives encrypted electronic books and encryption information using a telecommunications network.

123. The electronic book viewer of claim **122**, wherein the telecommunications network includes one or more of a television delivery system, a wired telephone system, a wireless telephone network, a personal communications network, a wired Internet system, a wireless Internet system, an intranet, a local area network, a radio communications network, and an optical fiber network.

124. The electronic book viewer of claim **96**, further comprising a data entry port, wherein the electronic book viewer receives encryption key information using the data entry port and a portable memory storage device.

125. The electronic book viewer of claim **124**, wherein the portable memory storage device includes one or more of a PCMCIA card, a CD ROM, a smart card and a memory stick.

126. The electronic book viewer of claim **125**, wherein the encryption key includes a valid time period of use.

127. The electronic book viewer of claim **125**, wherein the encryption key includes a valid time period of use.

128. The electronic book viewer of claim **124**, wherein the portable memory storage device is updated remotely using a telecommunications network.

129. A method for secure distribution of electronic books, comprising:

creating a list of titles of available electronic books, wherein an electronic book is available if text associated with the electronic book is available for transmission;

transmitting the list of titles of available electronic books to multiple home systems simultaneously, the multiple home systems including a first, a second, and subsequent home systems;

selecting a title from the transmitted list of titles of available electronic books;

communicating the selected title to a text source;

selecting an electronic book corresponding to the selected title;

obtaining an encryption key;

processing the selected electronic book using the encryption key and an encryption algorithm wherein the encryption key is a transaction symmetric key;

broadcasting the encrypted electronic book to multiple home systems simultaneously;

obtaining a decryption key;

encrypting the transaction symmetric key using a first public key corresponding to the second and subsequent home systems, respectively, to create a first, a second, and subsequent encrypted transaction symmetric keys;

delivering the first through the subsequent encrypted transaction symmetric keys to the multiple home systems;

decrypting the delivered first encrypted transaction symmetric key at the first home system using a first private key;

decrypting the second and subsequent encrypted transaction symmetric keys at one or more of corresponding ones of the multiple home systems using second and subsequent private keys, respectively; and

decrypting the delivered encrypted electronic book at one or more of the multiple home systems using the decrypted transaction symmetric key.

130. The method of claim **129**, further comprising:

assigning one or more of the multiple home systems to one or more predefined groups;

generating a group symmetric key for each of the one or more groups of home systems; and

distributing the corresponding group symmetric key to each home system in the one or more groups of home systems.

131. The method of claim **129**, further comprising storing the electronic book in memory as an encrypted file.

132. The method of claim **129**, wherein the encrypted electronic book is sent by a publisher and the recipient is an operations center of an electronic book distribution system.

133. The method of claim **129**, wherein the encrypted electronic book is sent by an operations center and the recipient is a home system.

134. The method of claim **129**, wherein the encrypted electronic book is sent by a lending facility and the recipient is a home system.

135. The method of claim **129**, wherein the encrypted electronic book is sent by a home system library and the recipient is a home system viewer.

136. The method of claim **129**, wherein the encrypted electronic book is sent by a first home system viewer and the recipient is a second home system viewer.

137. The method of claim **129**, further comprising creating a protected metadata header related to the electronic book, wherein the protected metadata header comprises an electronic book identifier, a metadata format identifier, the decryption key, and a decryption algorithm.

138. The method of claim **137**, wherein the protected metadata header is provided with the encrypted electronic book.

139. The method of claim **137**, wherein the protected metadata header is provided separate from the encrypted electronic book.

140. The method of claim **137**, wherein the protected metadata header further comprises a number of allowed copies of the encrypted electronic book, distribution features supported for the electronic book, fair use features and integrity checking information.

141. The method of claim **140**, wherein the fair use features comprise using the electronic book for a specified time.

142. The method of claim **141**, wherein the fair use features comprise a print enable function.

143. The method of claim **142**, wherein the print enable function enables a specified number of copies of the electronic book to be printed.

144. The method of claim **140**, wherein the distribution features comprise a loan enable feature, the loan enable feature allowing a sending party to send the electronic book to one or more recipients.

145. The method of claim **129**, further comprising compressing the encrypted electronic book before sending to the recipient.

146. The method of claim **129**, further comprising authenticating an identity of the recipient.

147. The method of claim **146**, wherein the authenticating step comprises using a digital signature algorithm.

148. The method of claim **146**, wherein the authenticating step comprises using a password.

149. The method of claim **129**, wherein the step of sending the encrypted electronic book comprises sending the encrypted electronic book to a remote location, wherein the recipient retrieves the encrypted electronic book from the remote location.

150. The method of claim **149**, wherein the remote location is an Internet website.

151. The method of claim **149**, wherein the remote location is a computer, and wherein the recipient is coupled to the computer.

152. The method of claim **151**, wherein the recipient and the computer are coupled by a communications network.

153. The method of claim **151**, wherein the communications network is an infra red network.

154. The method of claim **151**, wherein the communications network is a radio frequency network.

155. The method of claim **149**, wherein the sending party removes the encrypted electronic book from the remote location after a specified time.

156. The method of claim **129**, wherein the recipient is a home system, further comprising:

registering the home system with the sending party;

assigning the home party an electronic book deposit location; and

sending electronic books for the home system to the deposit location.

157. The method of claim **156**, further comprising sending decryption information to the deposit location.

158. The method of claim **156**, wherein the sending party obtains information from the home system during the registering step, and wherein the information includes an internal serial number of the home system.

159. The method of claim **129**, further comprising:

generating a reply message upon receipt of the encrypted electronic book; and

returning the reply message to the sending party, the reply message indicating receipt of the encrypted electronic book.

160. The method of claim **129**, further comprising:

generating a reply message upon decrypting the encrypted electronic book; and

returning the reply message to the sending party.

161. The method of claim **129**, wherein the recipient is a public viewer.

162. The method of claim **129**, further comprising sending a data header with the encrypted electronic book, wherein the data header comprises a time duration for retention of the electronic book by the recipient.

163. The method of claim **129**, wherein a first part of the electronic book is encrypted and a second part of the electronic book is not encrypted.

164. The method of claim **129**, further comprising applying a copyright notice to the electronic book.

165. The method of claim **129**, wherein stenographic information is embedded in the electronic book.

166. The method of claim **165**, wherein the stenographic information identifies a valid recipient viewer.

167. The method of claim **166**, wherein a viewer displays only electronic books for which the stenographic information matches the displaying viewer.

168. The method of claim **129**, wherein the encryption and the decryption algorithms are updated using a software download over a distribution network.

169. The method of claim **129**, wherein the encryption and the decryption algorithms are updated using physical media.

170. The method of claim **169**, wherein the physical media comprises one of a PCMCIA card, a smart card, a memory stick and a memory device.

171. The method of claim **129**, wherein the electronic book comprises one or more pages and wherein a viewer decrypts the electronic book page by page, each page of the one or more pages of the electronic book being decrypted just before viewing.

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