US 20070185813A1

(19) United States

(12) Patent Application Publication (10) Pub. No.: US 2007/0185813 A1

Shear et al. (43) Pub. Date: Aug. 9, 2007

(54) CRYPTOGRAPHIC METHODS, APPARATUS AND SYSTEMS FOR STORAGE MEDIA ELECTRONIC RIGHTS MANAGEMENT IN CLOSED AND CONNECTED APPLIANCES

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(21) Appl. No.: **11/431,344**

(22) Filed: **May 9, 2006**

Related U.S. Application Data

(63) Continuation of application No. 08/848,077, filed on May 15, 1997, and which is a continuation-in-part of application No. PCT/US96/14262, filed on Sep. 4, 1996, which is a continuation-in-part of application No. 08/689,606, filed on Aug. 12, 1996, now Pat. No. 5,943,422, which is a continuation-in-part of application No. 08/689,754, filed on Aug. 12, 1996, now Pat. No. 6,157,721, which is a continuation-in-part of application No. 08/699,712, filed on Aug. 12, 1996, now abandoned, which is a continuation-in-part of application No. PCT/US96/02303, filed on Feb. 13, 1996, which is a continuation-in-part of application No. 08/388,107, filed on Feb. 13, 1995, now abandoned.

(60) Provisional application No. 60/037,931, filed on Feb. 14, 1997.

(30) **Foreign Application Priority Data**

Jan. 17, 1996 (EP) ..... EP 329681

Publication Classification

(51) **Int. Cl.**
G06Q 99/00 (2006.01)
H04K 1/00 (2006.01)

(52) **U.S. Cl.** **705/51**; 380/255

(57) ABSTRACT

A rights management arrangement for storage media such as optical digital video disks (DVDs, also called digital versatile disks) provides adequate copy protection in a limited, inexpensive mass-produceable, low-capability platform such as a dedicated home consumer disk player and also provides enhanced, more flexible security techniques and methods when the same media are used with platforms having higher security capabilities. A control object (or set) defines plural rights management rules for instance, price for performance or rules governing redistribution. Low capability platforms may enable only a subset of the control rules such as controls on copying or marking of played material. Higher capability platforms may enable all (or different subsets) of the rules. Cryptographically strong security is provided by encrypting at least some of the information carried by the media and enabling decryption based on the control set and/or other limitations. A secure "software container" can be used to protectively encapsulate (e.g., by cryptographic techniques) various digital property content (e.g., audio, video, game, etc.) and control object (i.e., set of rules) information. A standardized container format is provided for general use on/with various mediums and platforms. In addition, a special purpose container may be provided for DVD medium and appliances (e.g., recorders, players, etc.) that contains DVD program content (digital property) and DVD medium specific rules. The techniques, systems and methods disclosed herein are capable of achieving compatibility with other protection standards, such as for example, CGMA and Matsushita data protection standards adopted for DVDs. Cooperative rights management may also be provided, where plural networked rights management arrangements collectively control a rights management event on one or more of such arrangements.

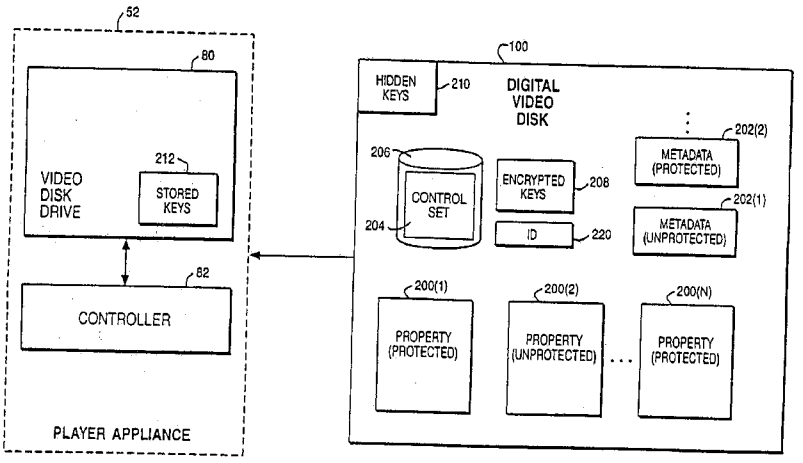


Fig. 1B

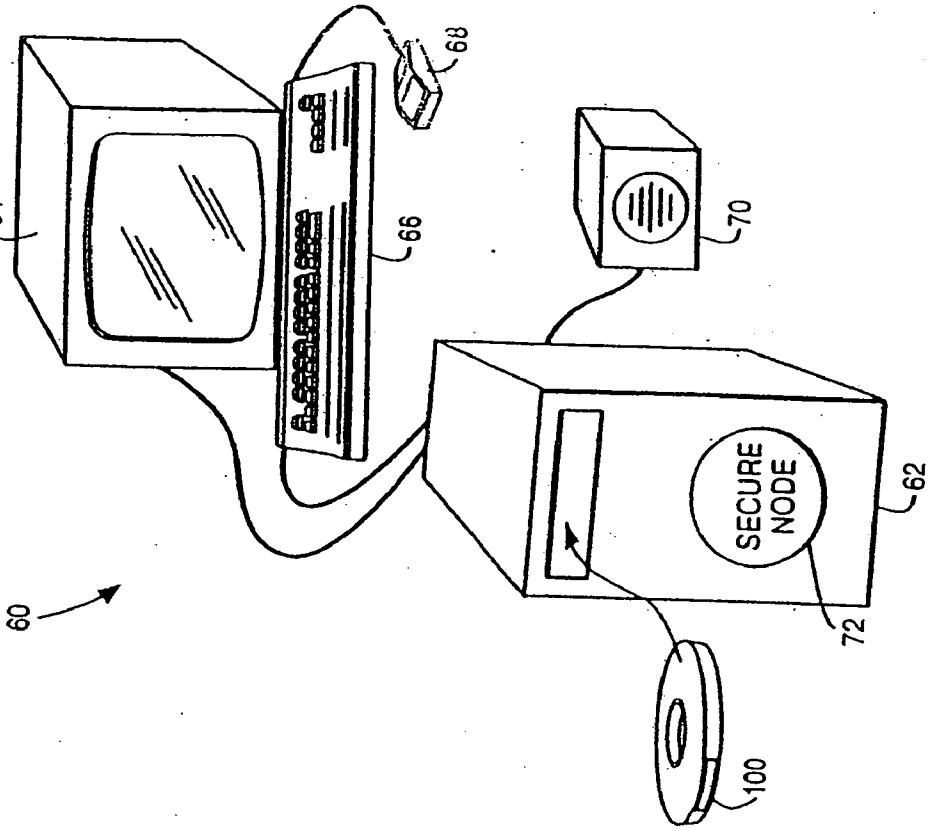
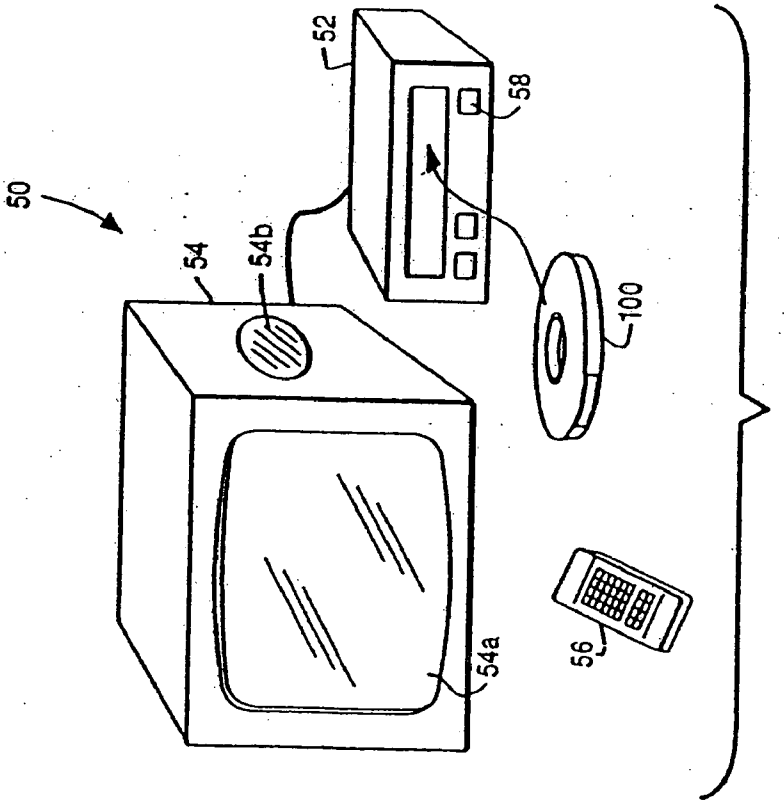


Fig. 1A



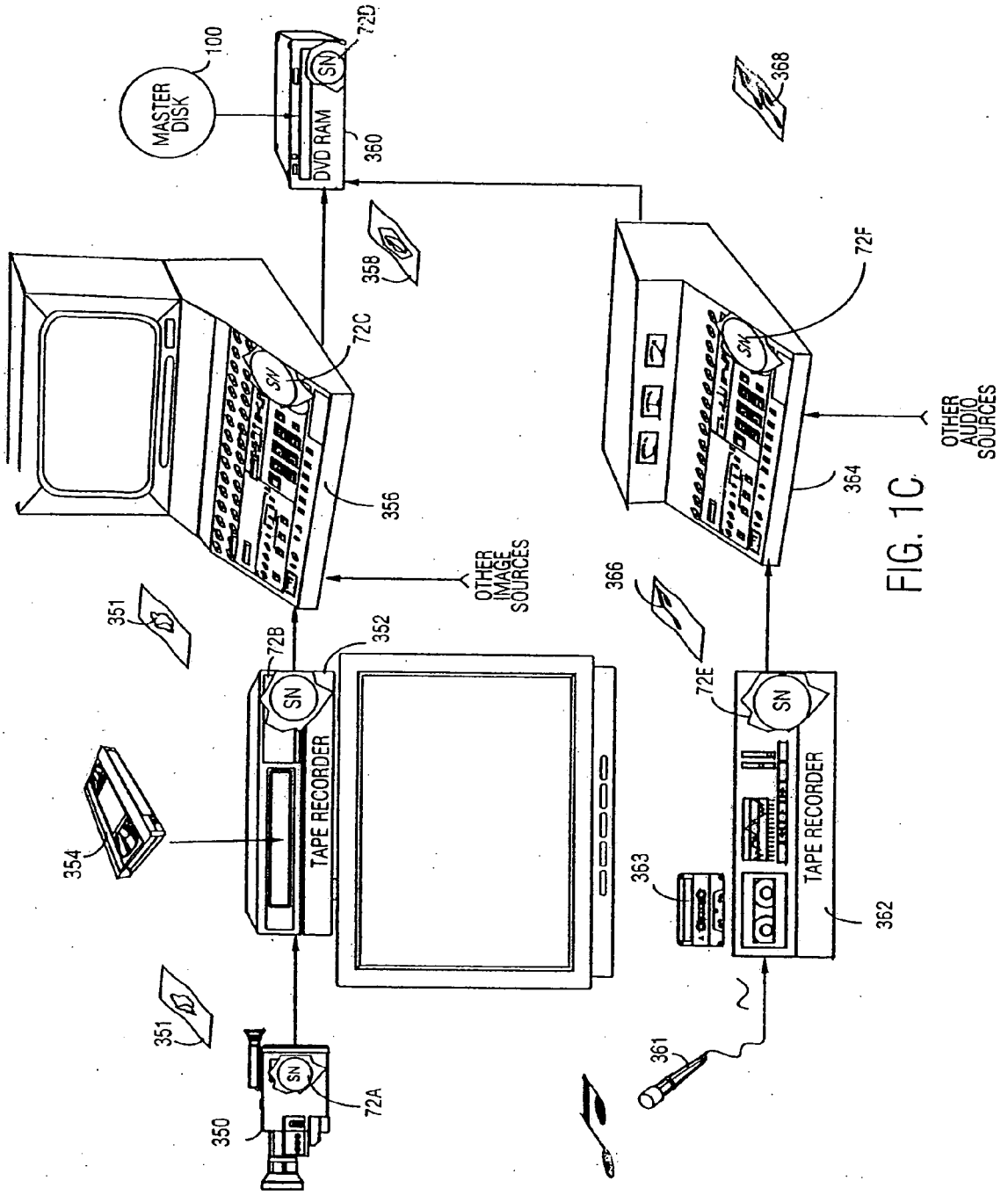

MASTER DISK
100
DVD RAM
360
SN
72D
368
358
72C
356
OTHER IMAGE SOURCES
72F
364
OTHER AUDIO SOURCES
351
72B
352
TAPE RECORDER
354
366
72E
363
362
361
350
72A

FIG. 1C

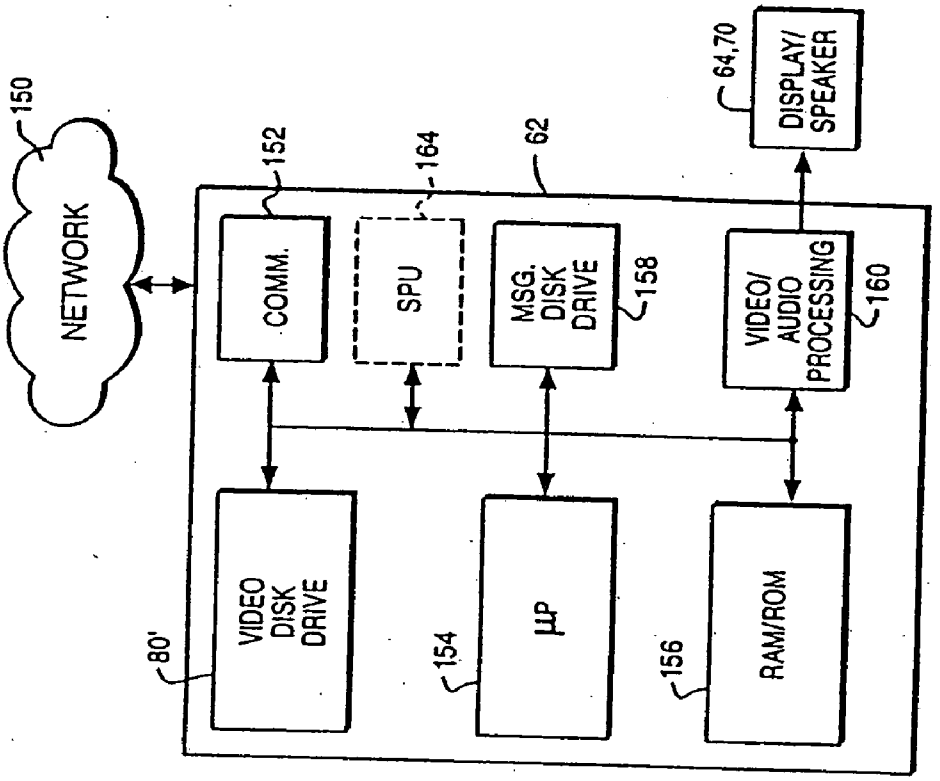


Fig.2B

EXAMPLE SECURE NODE ARCHITECTURE

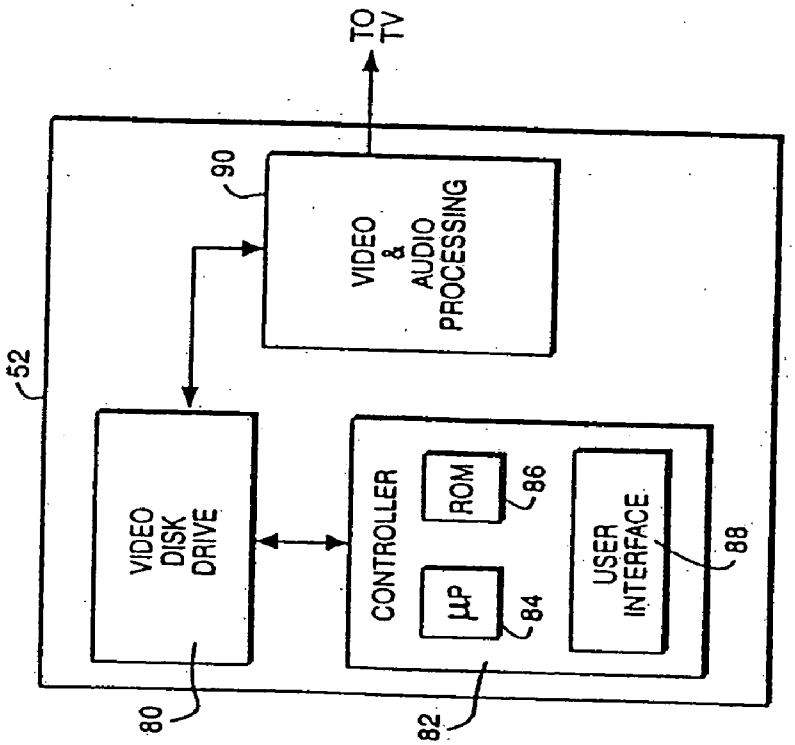
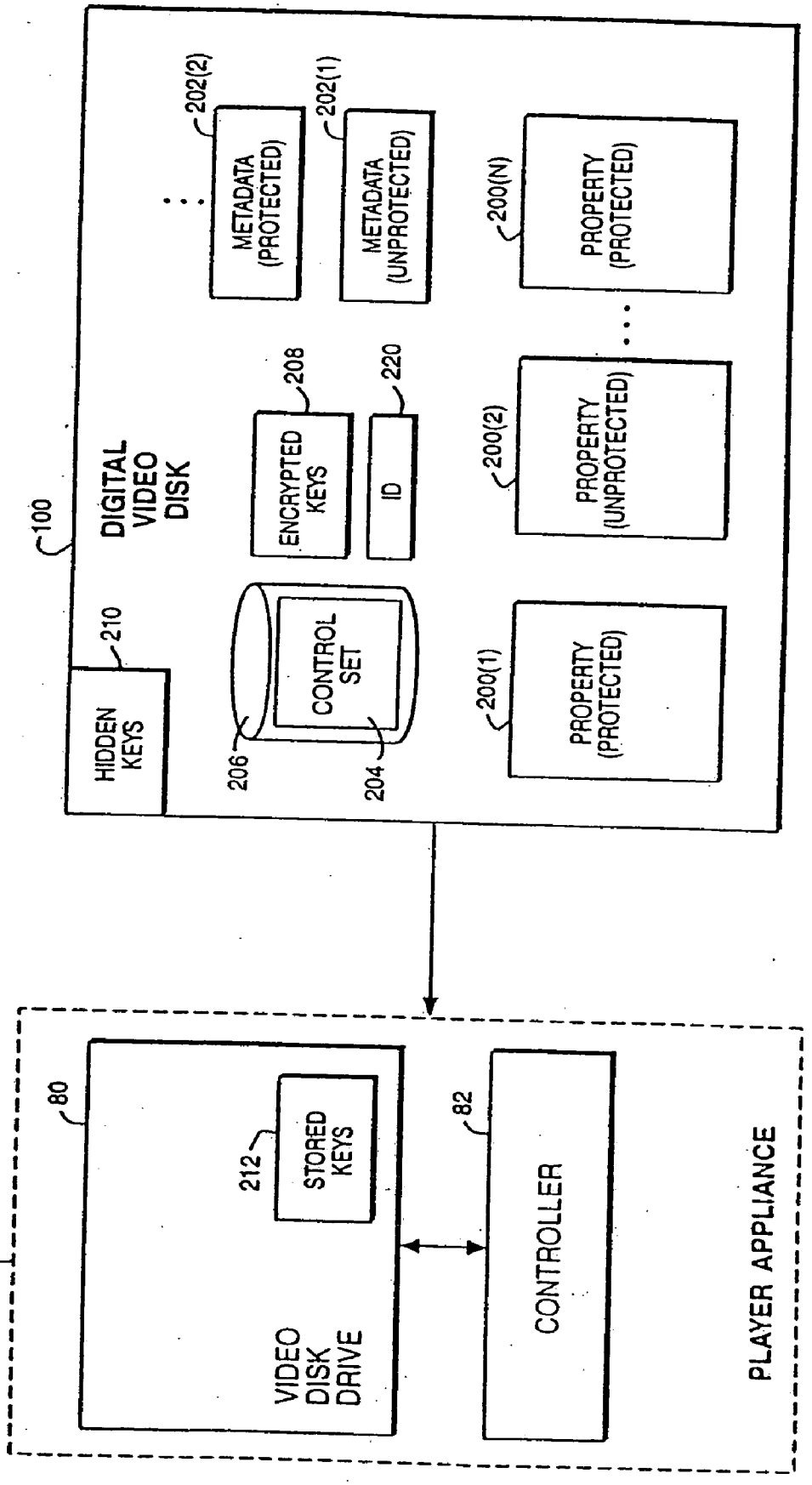


Fig.2A

EXAMPLE PLAYER ARCHITECTURE

Fig.3


DIGITAL VIDEO DISK
100
METADATA (PROTECTED)
202(2)
METADATA (UNPROTECTED)
202(1)
PROPERTY (PROTECTED)
200(N)
ENCRYPTED KEYS
208
ID
220
PROPERTY (UNPROTECTED)
200(2)
HIDDEN KEYS
210
CONTROL SET
206
204
PROPERTY (PROTECTED)
200(1)
52
80
STORED KEYS
212
VIDEO DISK DRIVE
82
CONTROLLER
PLAYER APPLIANCE

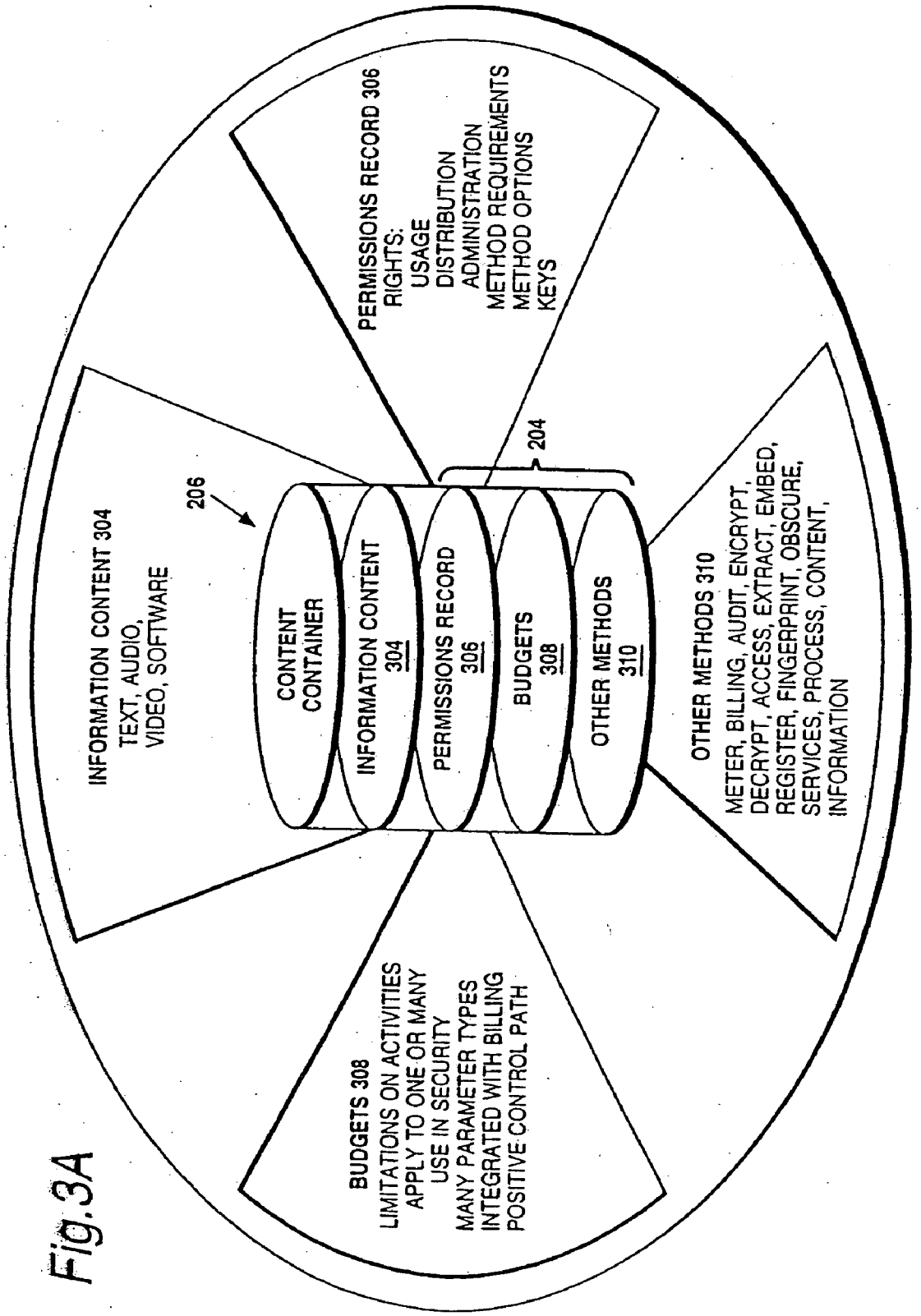

PERMISSIONS RECORD 306
RIGHTS:
USAGE
DISTRIBUTION
ADMINISTRATION
METHOD REQUIREMENTS
METHOD OPTIONS
KEYS
204
206
INFORMATION CONTENT 304
TEXT, AUDIO,
VIDEO, SOFTWARE
CONTENT CONTAINER
INFORMATION CONTENT 304
PERMISSIONS RECORD 306
BUDGETS 308
OTHER METHODS 310
OTHER METHODS 310
METER, BILLING, AUDIT, ENCRYPT,
DECRYPT, ACCESS, EXTRACT, EMBED,
REGISTER, FINGERPRINT, OBSCURE,
SERVICES, PROCESS, CONTENT,
INFORMATION
BUDGETS 308
LIMITATIONS ON ACTIVITIES
APPLY TO ONE OR MANY
USE IN SECURITY
MANY PARAMETER TYPES
INTEGRATED WITH BILLING
POSITIVE CONTROL PATH

Fig. 3A

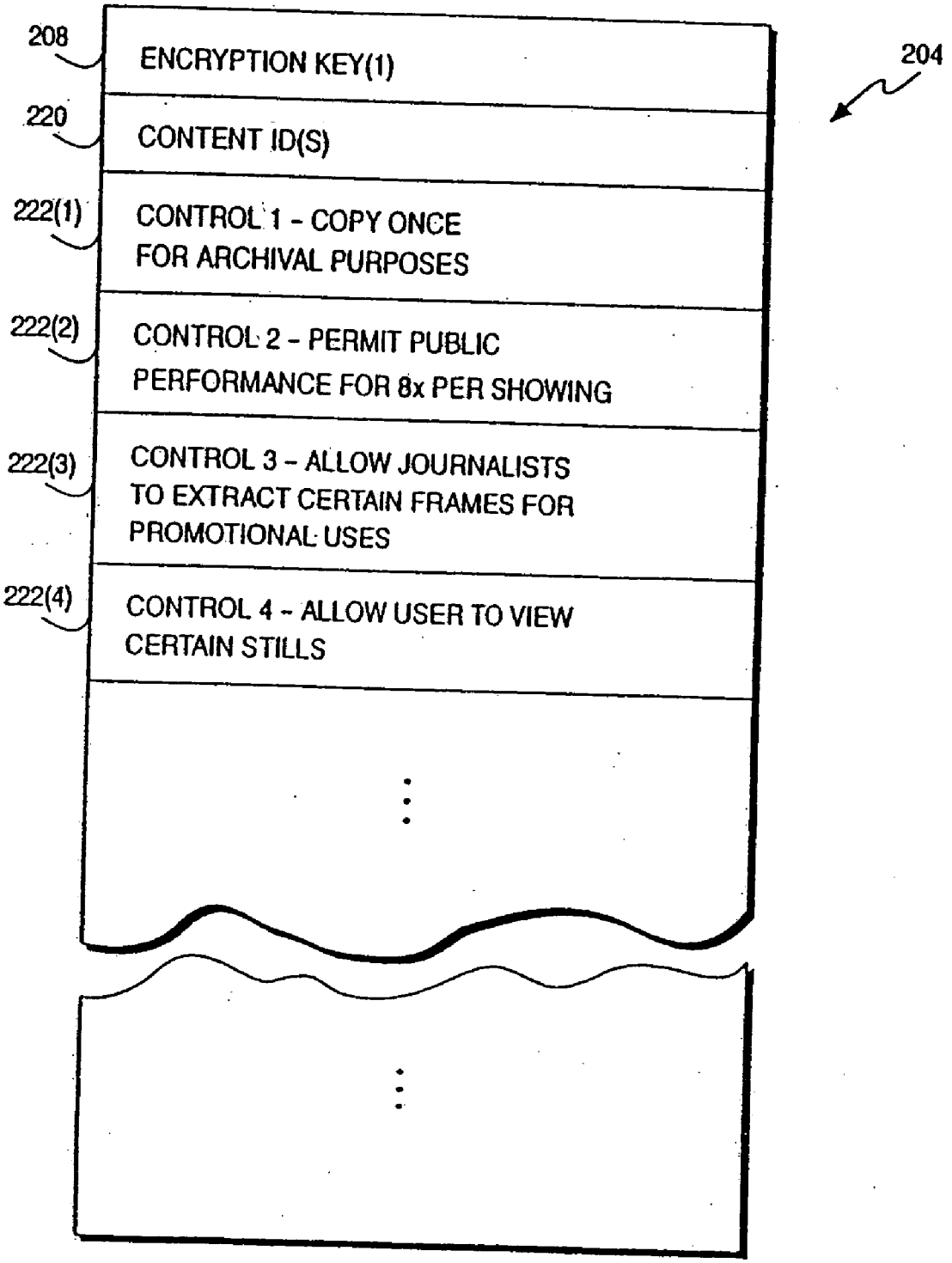


Fig.3B

EXAMPLE CONTROL SET

Fig.4A
EXAMPLE PLAYER STEPS

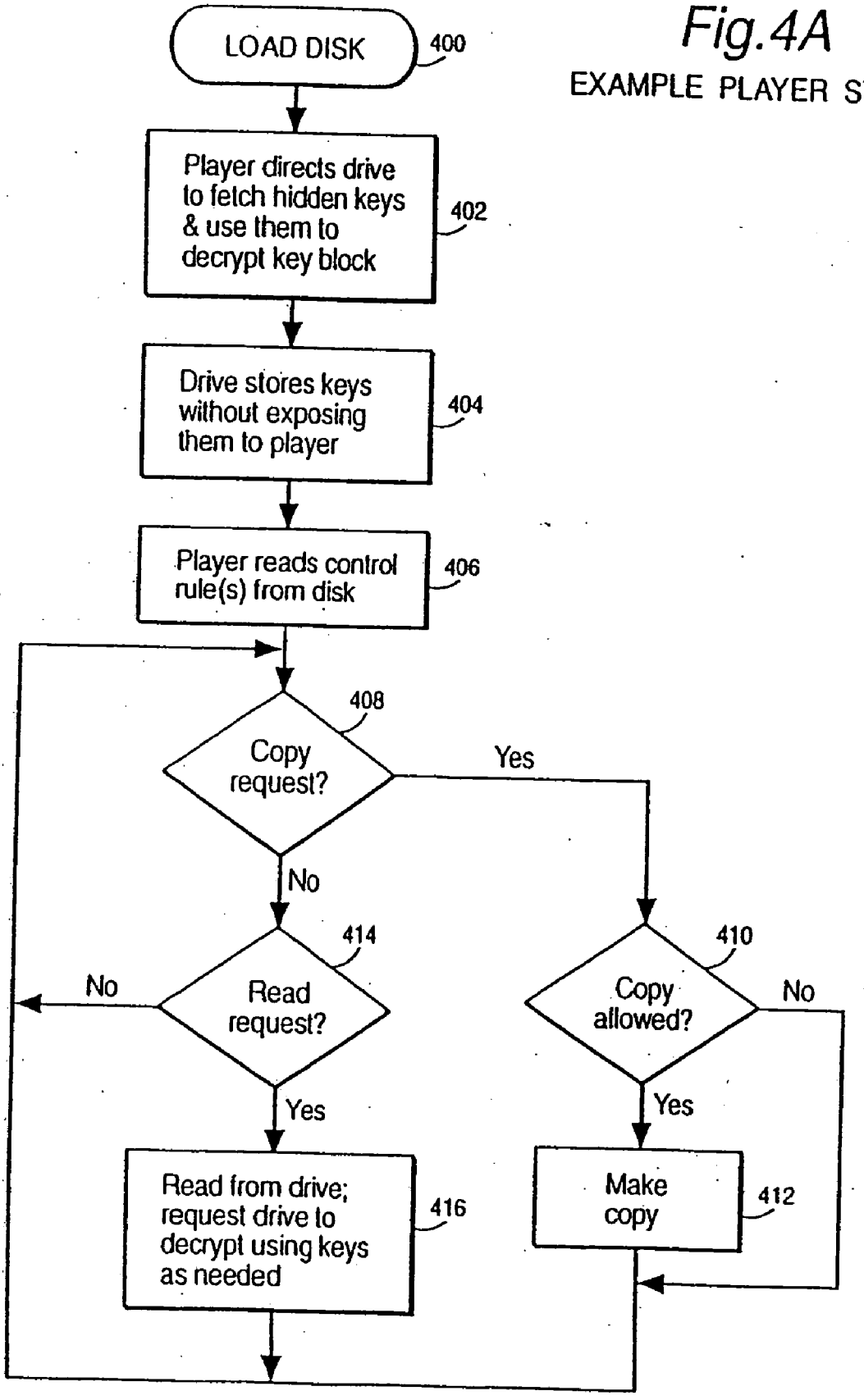
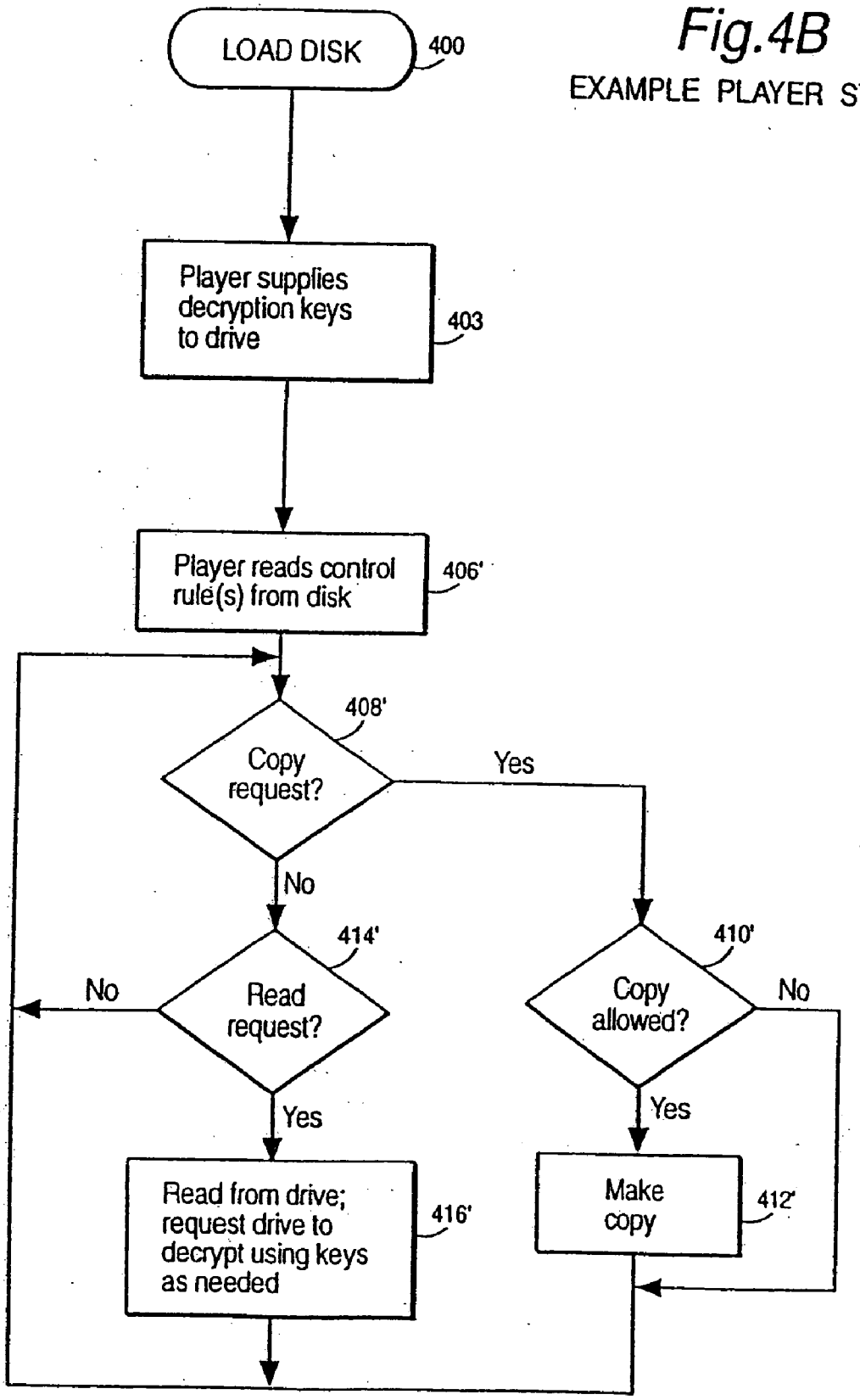


Fig.4B
EXAMPLE PLAYER STEPS



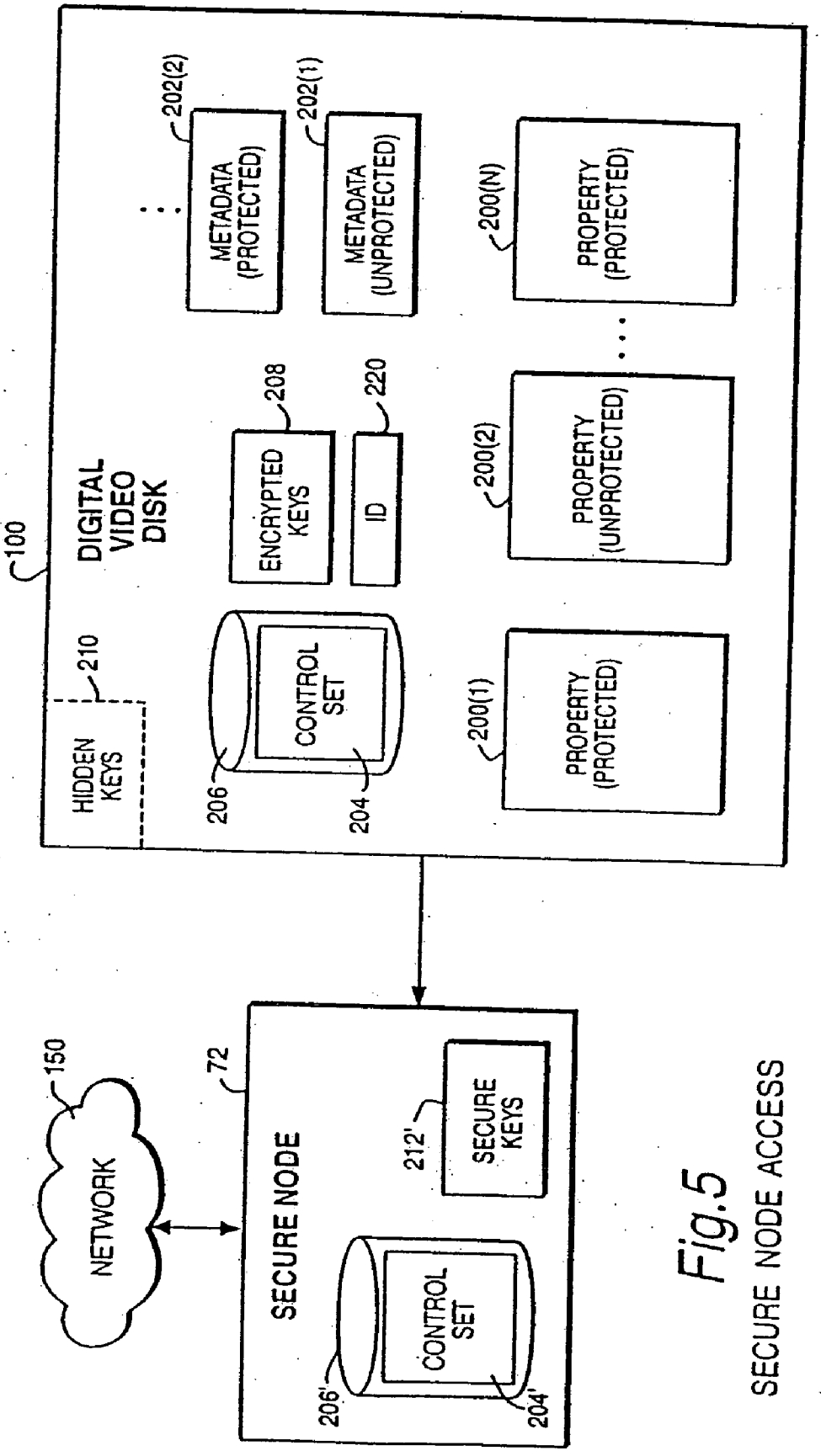


Fig.5

SECURE NODE ACCESS

Fig.6

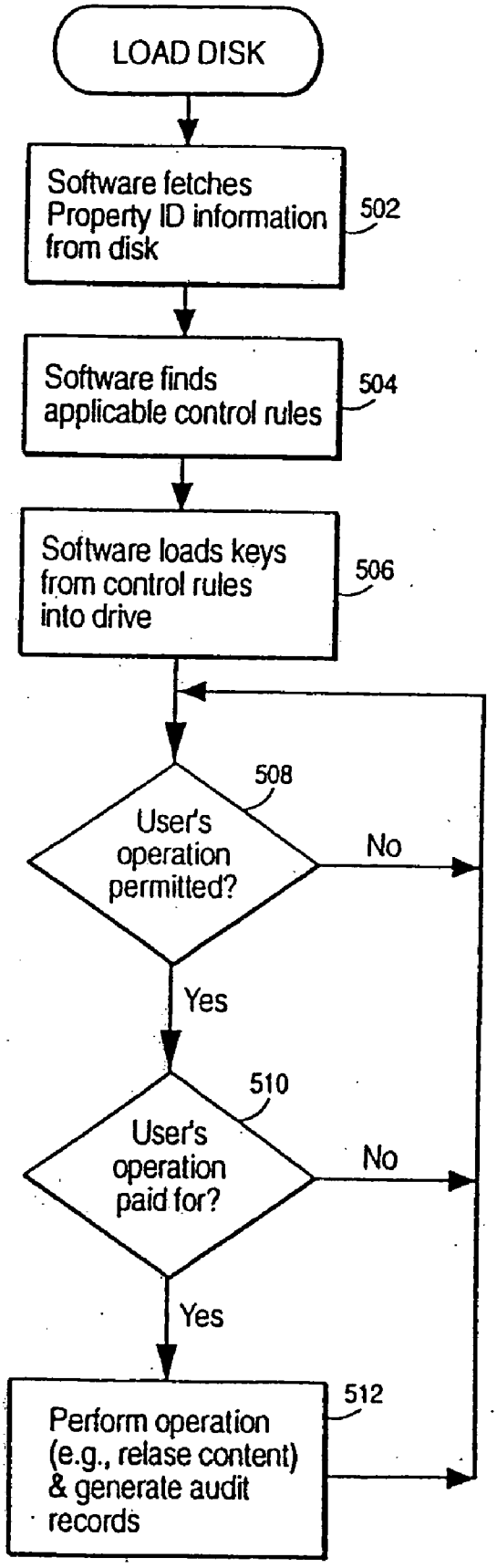

LOAD DISK
Software fetches Property ID information from disk
502
Software finds applicable control rules
504
Software loads keys from control rules into drive
506
508
User's operation permitted?
No
Yes
510
User's operation paid for?
No
Yes
Perform operation (e.g., relase content) & generate audit records
512

FIG. 7

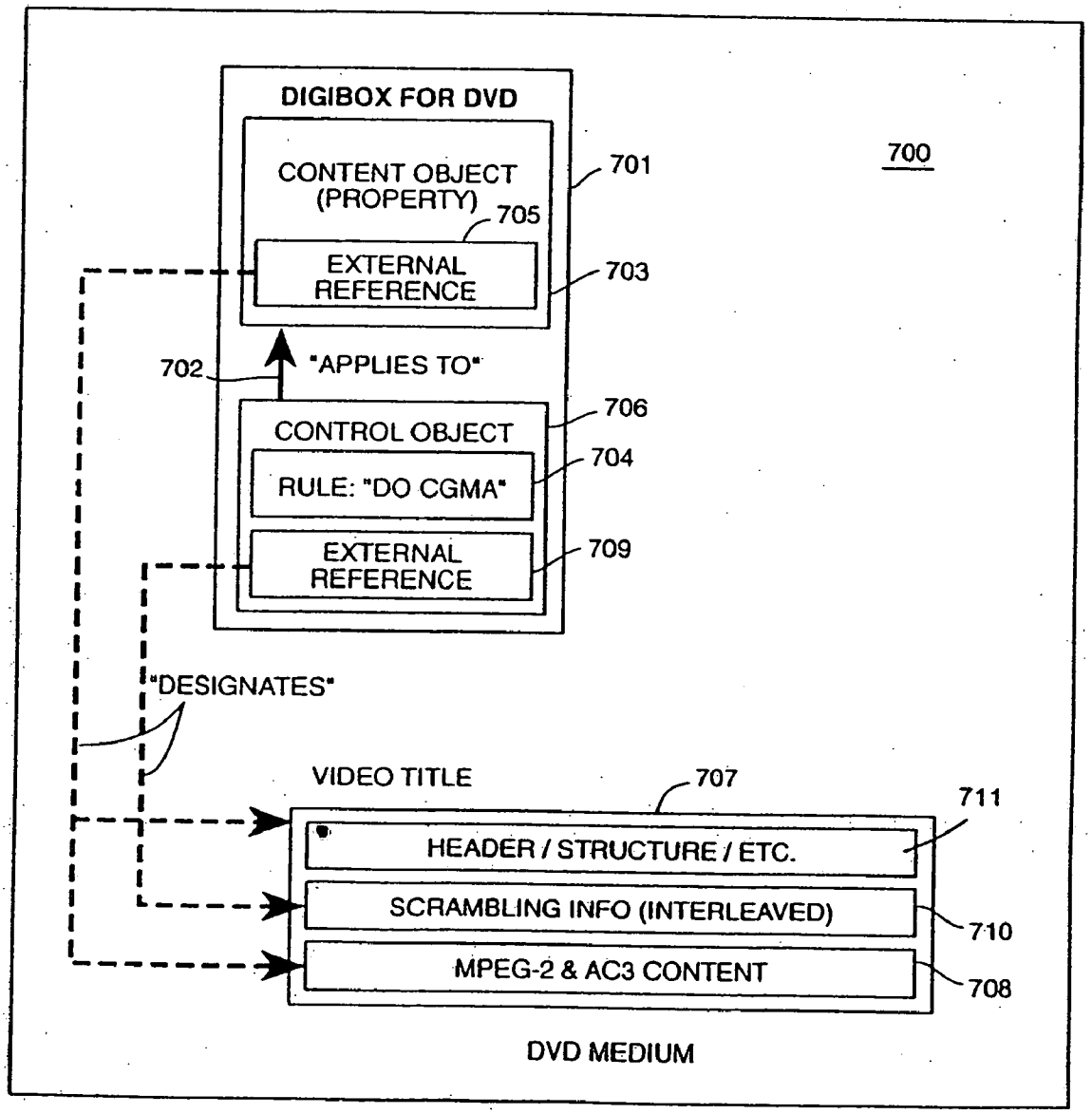

DIGIBOX FOR DVD
CONTENT OBJECT (PROPERTY)
705
EXTERNAL REFERENCE
703
701
700
702
"APPLIES TO"
CONTROL OBJECT
706
RULE: "DO CGMA"
704
EXTERNAL REFERENCE
709
"DESIGNATES"
VIDEO TITLE
707
711
HEADER / STRUCTURE / ETC.
SCRAMBLING INFO (INTERLEAVED)
710
MPEG-2 & AC3 CONTENT
708
DVD MEDIUM

FIG. 8

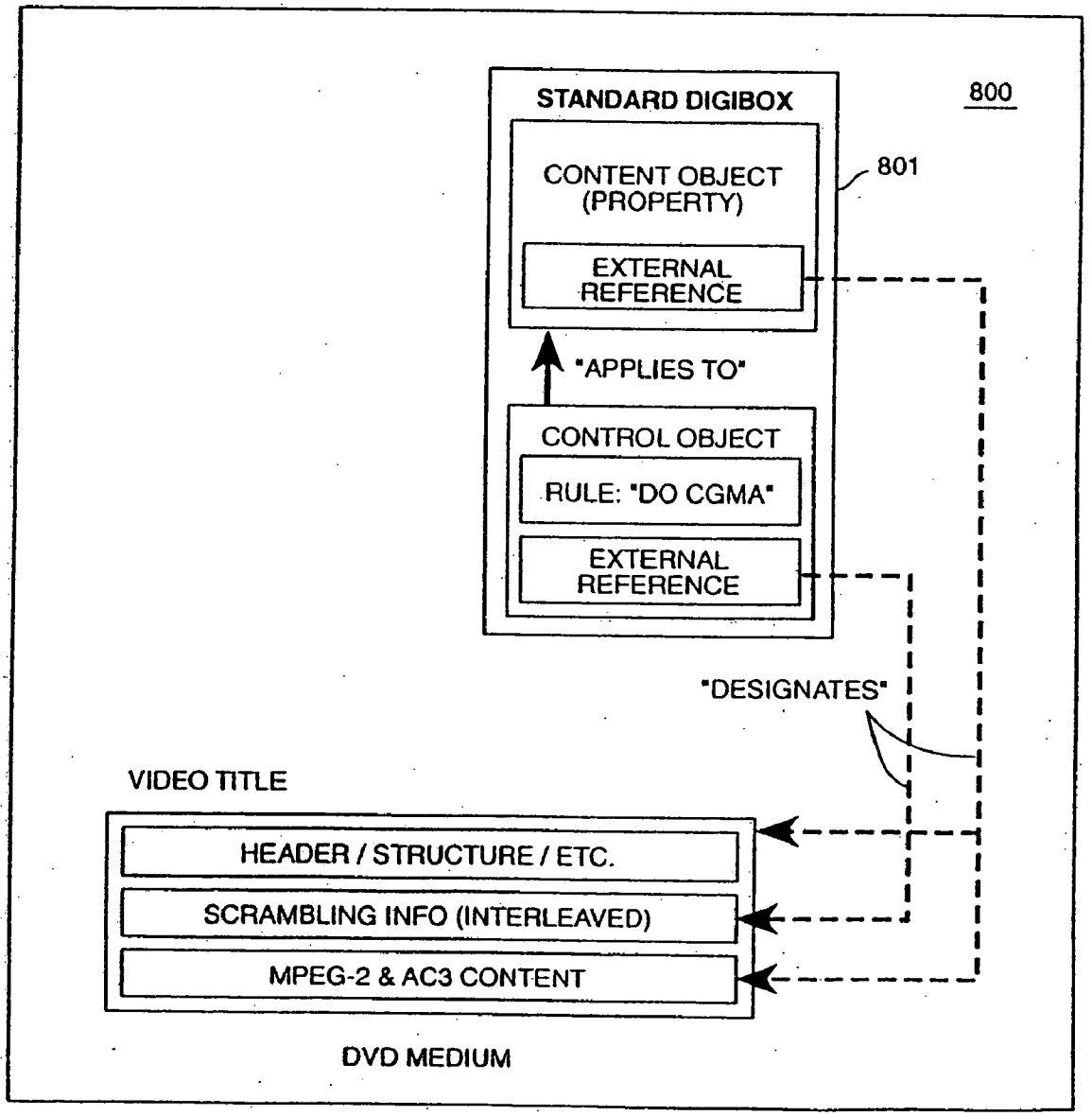

STANDARD DIGIBOX
800
CONTENT OBJECT (PROPERTY)
801
EXTERNAL REFERENCE
"APPLIES TO"
CONTROL OBJECT
RULE: "DO CGMA"
EXTERNAL REFERENCE
"DESIGNATES"
VIDEO TITLE
HEADER / STRUCTURE / ETC.
SCRAMBLING INFO (INTERLEAVED)
MPEG-2 & AC3 CONTENT
DVD MEDIUM

FIG. 9

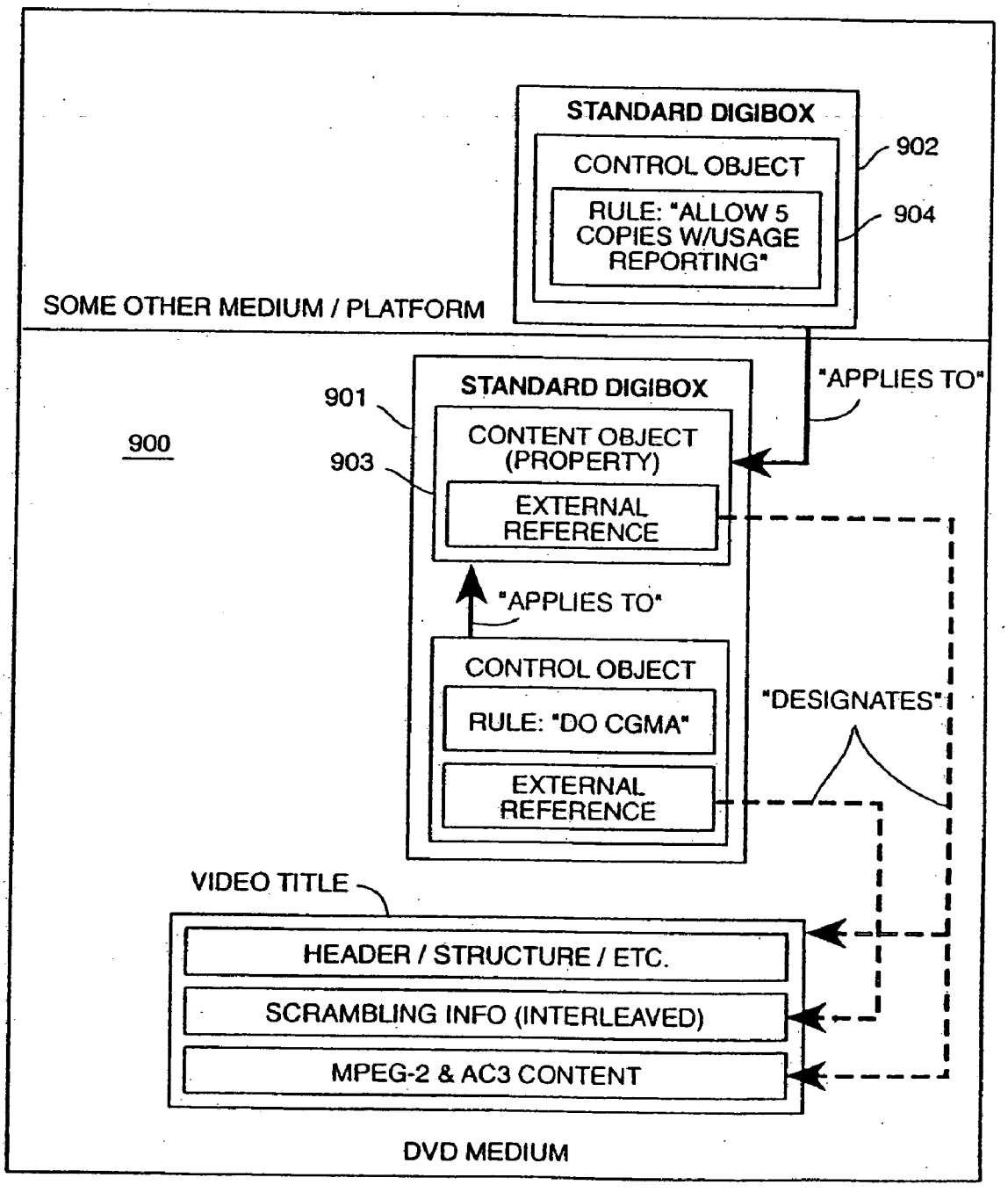

STANDARD DIGIBOX
CONTROL OBJECT
RULE: "ALLOW 5 COPIES W/USAGE REPORTING"
902
904
SOME OTHER MEDIUM / PLATFORM
"APPLIES TO"
901
STANDARD DIGIBOX
900
CONTENT OBJECT (PROPERTY)
903
EXTERNAL REFERENCE
"APPLIES TO"
CONTROL OBJECT
RULE: "DO CGMA"
"DESIGNATES"
EXTERNAL REFERENCE
VIDEO TITLE
HEADER / STRUCTURE / ETC.
SCRAMBLING INFO (INTERLEAVED)
MPEG-2 & AC3 CONTENT
DVD MEDIUM

FIG. 10

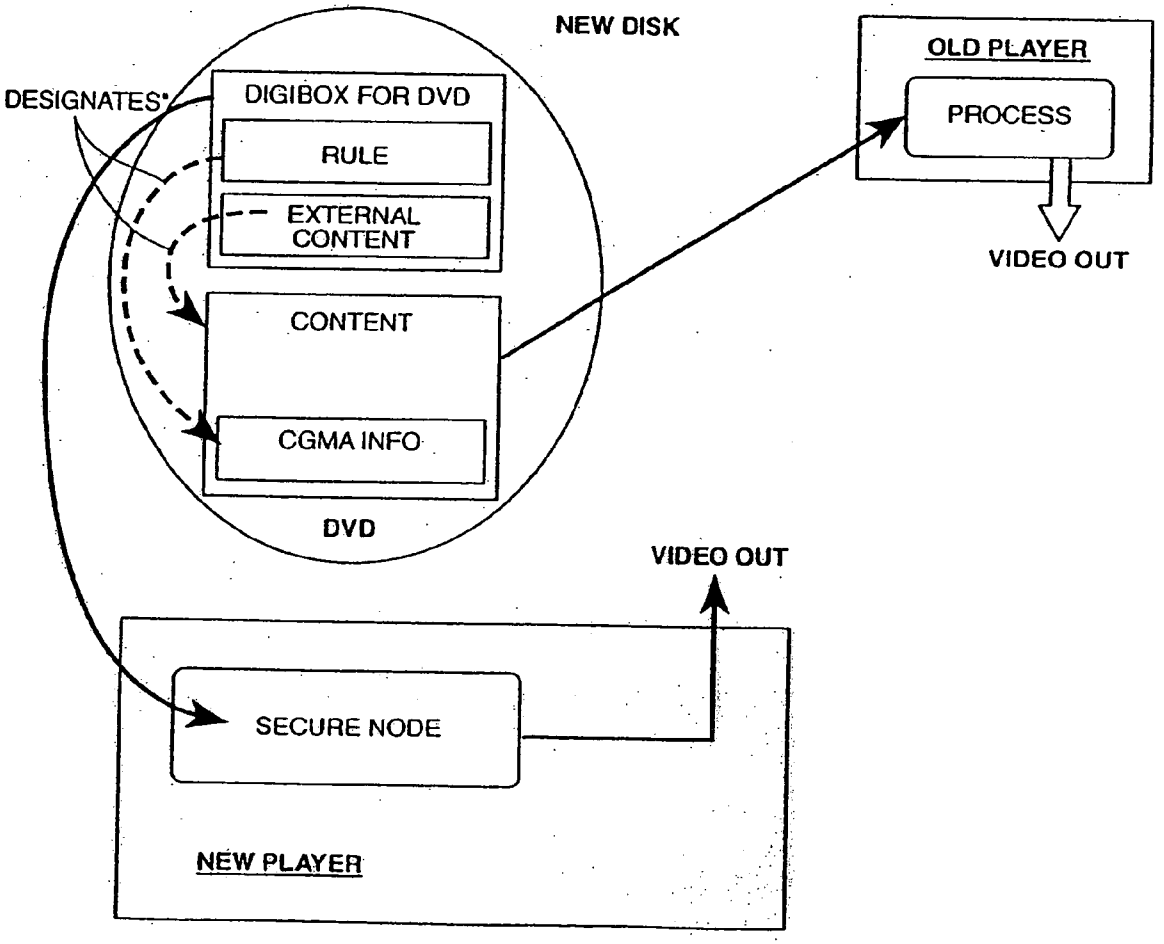
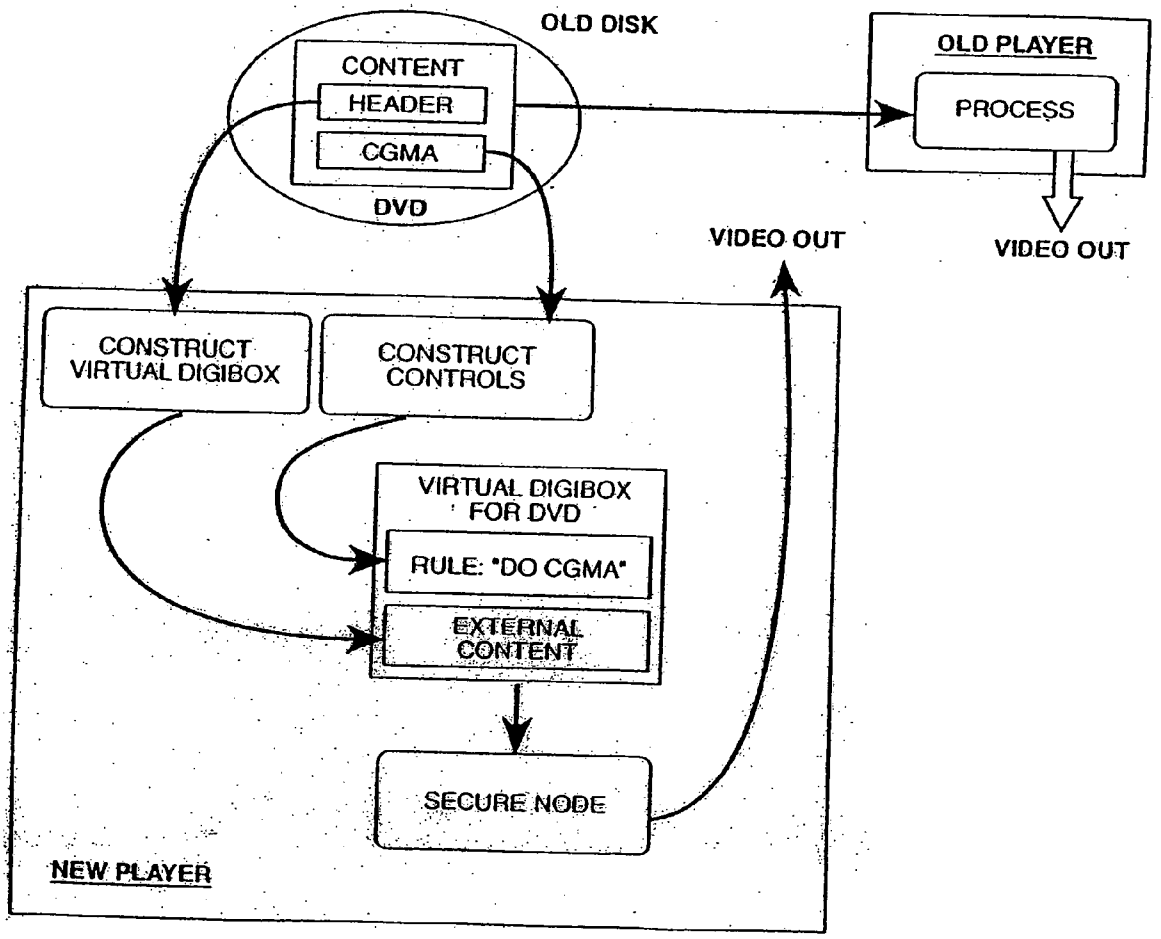

NEW DISK
DESIGNATES
DIGIBOX FOR DVD
RULE
EXTERNAL CONTENT
CONTENT
CGMA INFO
DVD
OLD PLAYER
PROCESS
VIDEO OUT
VIDEO OUT
SECURE NODE
NEW PLAYER

FIG. 11


OLD DISK
CONTENT
HEADER
CGMA
DVD
OLD PLAYER
PROCESS
VIDEO OUT
VIDEO OUT
CONSTRUCT VIRTUAL DIGIBOX
CONSTRUCT CONTROLS
VIRTUAL DIGIBOX FOR DVD
RULE: "DO CGMA"
EXTERNAL CONTENT
SECURE NODE
NEW PLAYER

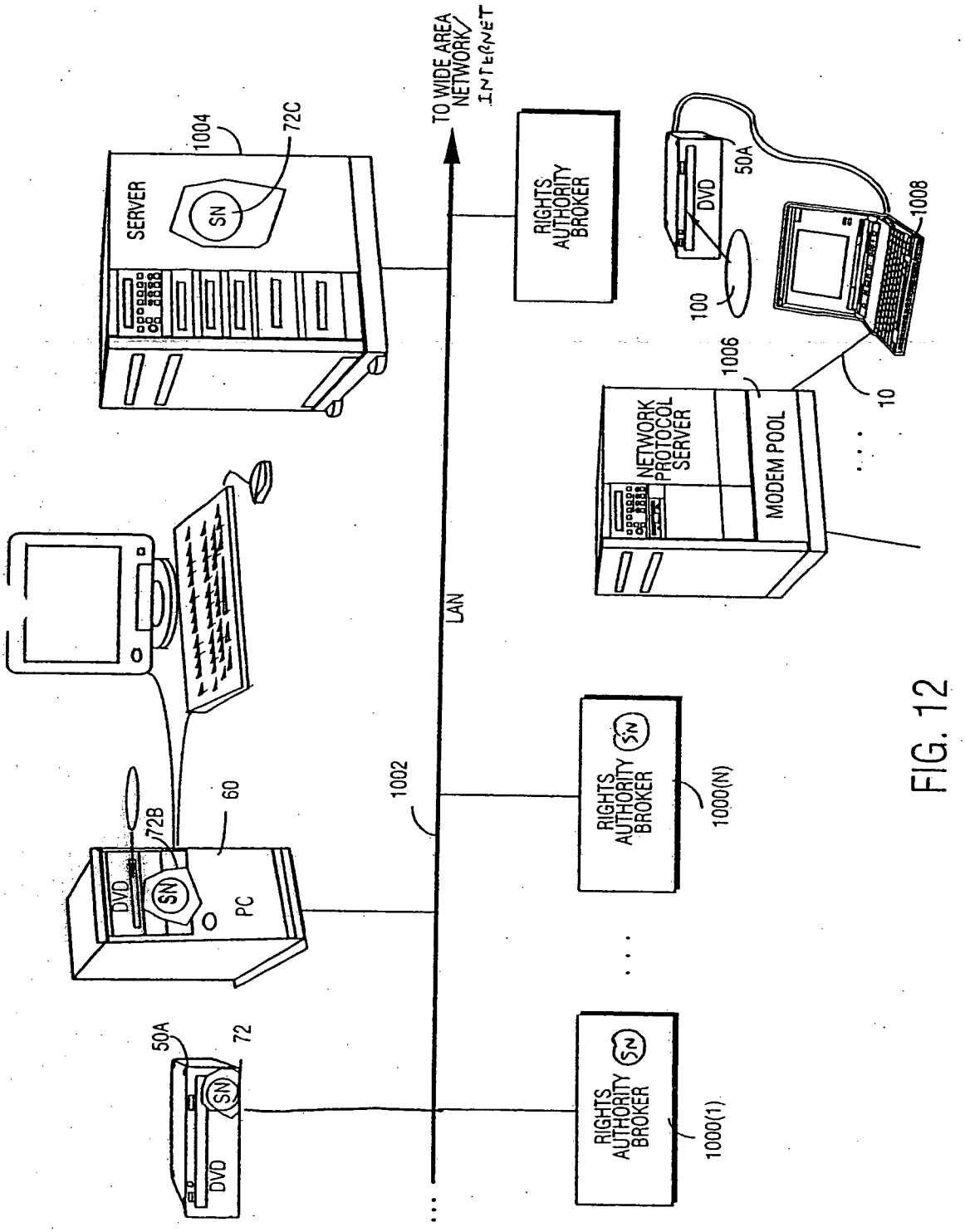

TO WIDE AREA NETWORK/ INTERNET
1004
72C
SERVER
SN
RIGHTS AUTHORITY BROKER
50A
DVD
100
1008
1006
NETWORK PROTOCOL SERVER
MODEM POOL
10
LAN
1002
72B
60
DVD
SN
PC
RIGHTS AUTHORITY BROKER
1000(N)
50A
72
DVD
SN
RIGHTS AUTHORITY BROKER
1000(1)

FIG. 12

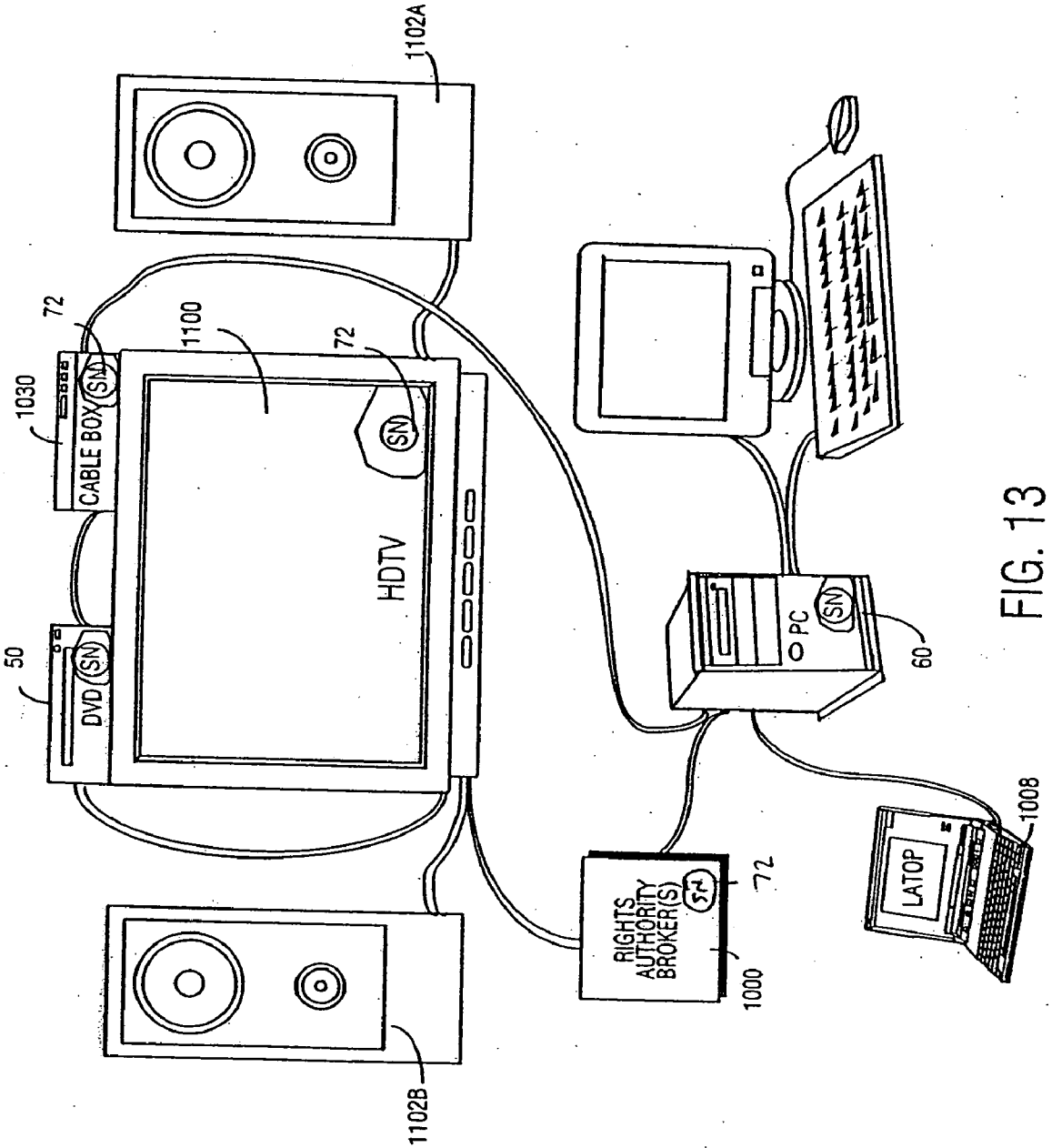

1102A
72
1100
72
1030
CABLE BOX
SN
HDTV
50
DVD
SN
PC
SN
60
1008
LATOP
RIGHTS AUTHORITY BROKER(S)
SN
72
1000
1102B

FIG. 13

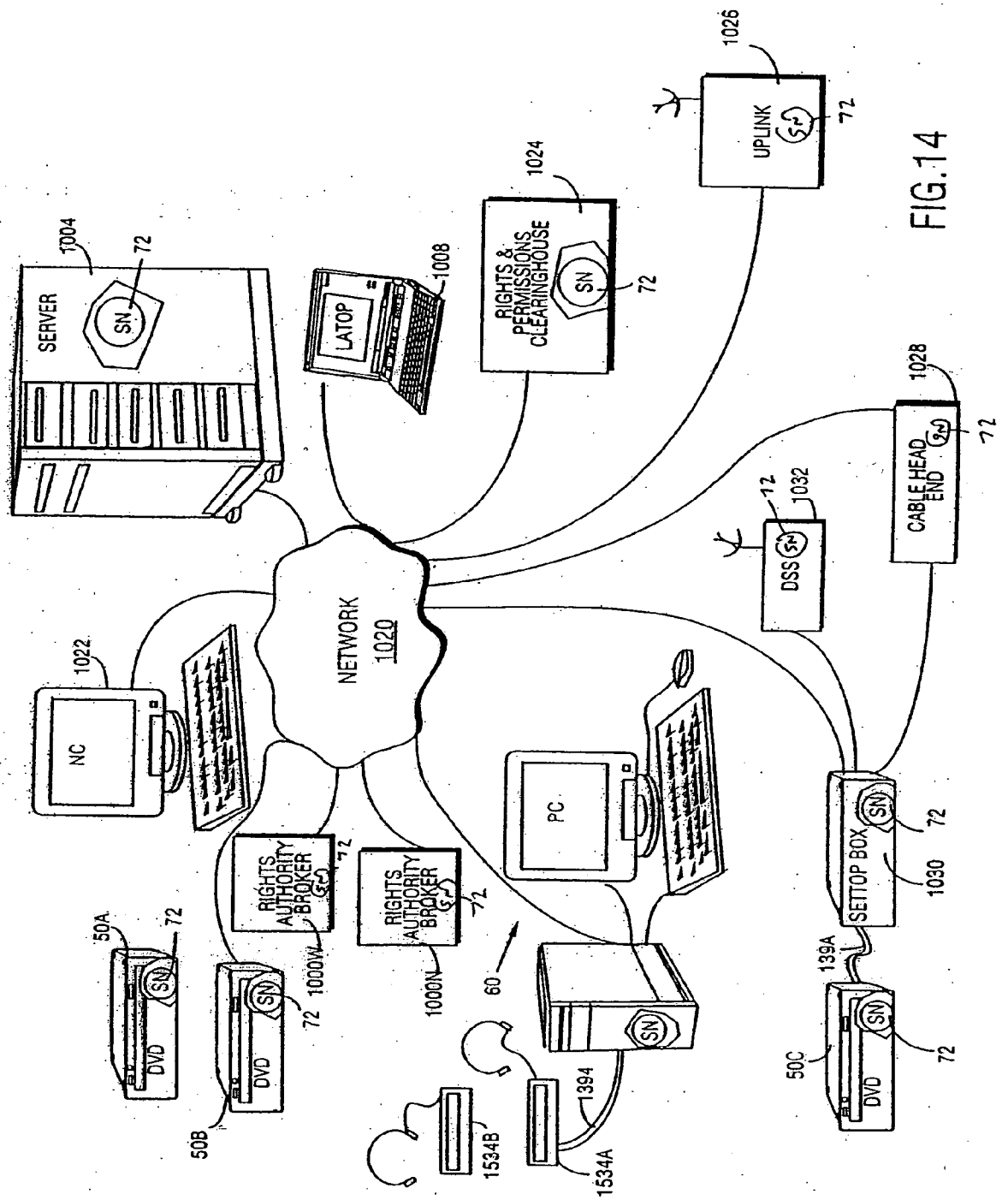

1026
UPLINK
72
1024
RIGHTS & PERMISSIONS CLEARINGHOUSE
SN
72
1004
SERVER
SN
72
1008
LATOP
1028
CABLE HEAD END
SN
72
12
1032
DSS
SN
NETWORK
1020
1022
NC
PC
RIGHTS AUTHORITY BROKER
72
1000N
RIGHTS AUTHORITY BROKER
72
1000N
60
50A
DVD
SN
72
50B
DVD
SN
72
1534B
1534A
1394
SETTOP BOX
SN
72
1030
139A
50C
DVD
SN
72

FIG.14

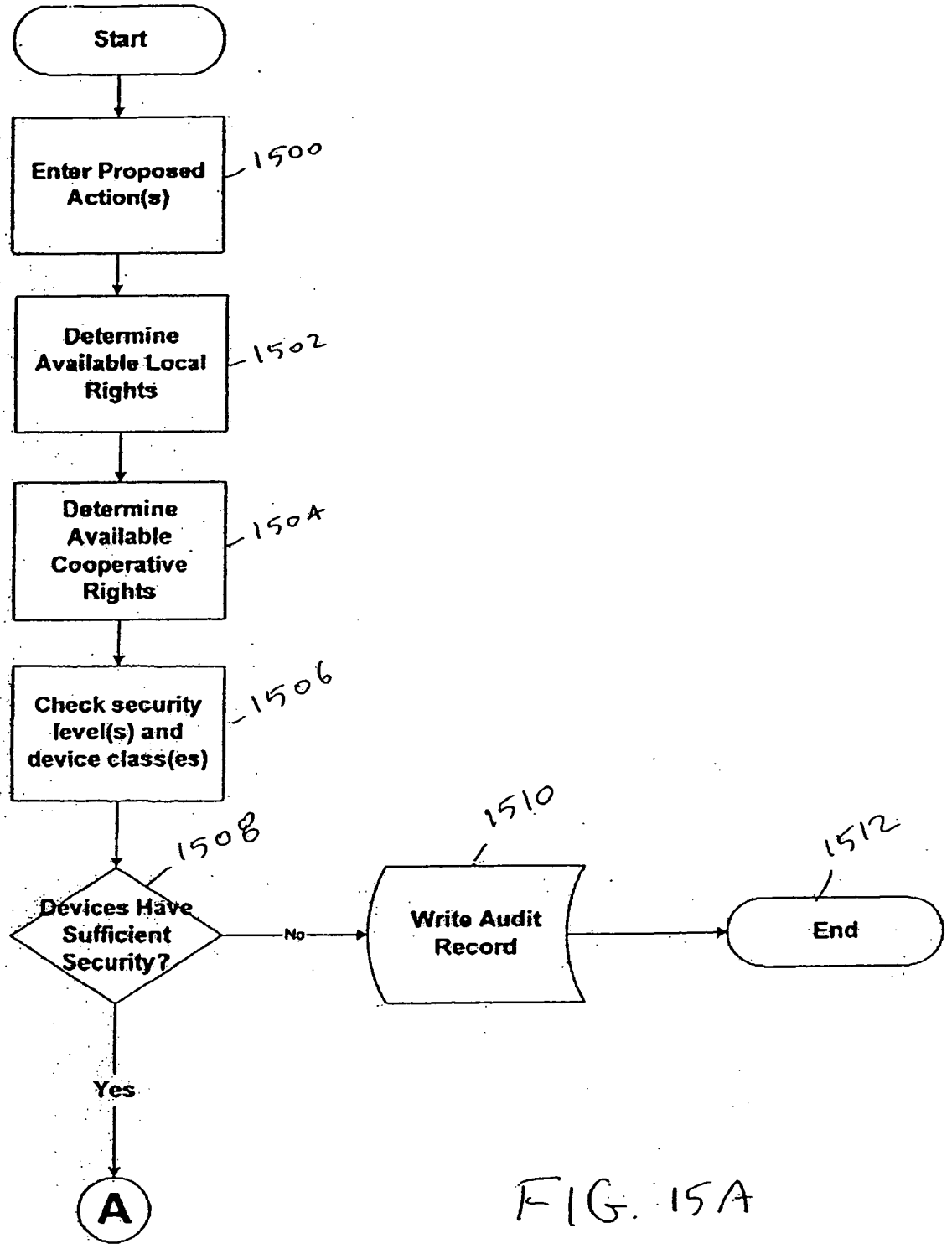

Start
Enter Proposed Action(s)
1500
Determine Available Local Rights
1502
Determine Available Cooperative Rights
1504
Check security level(s) and device class(es)
1506
Devices Have Sufficient Security?
1508
No
Write Audit Record
1510
End
1512
Yes
A

FIG. 15A

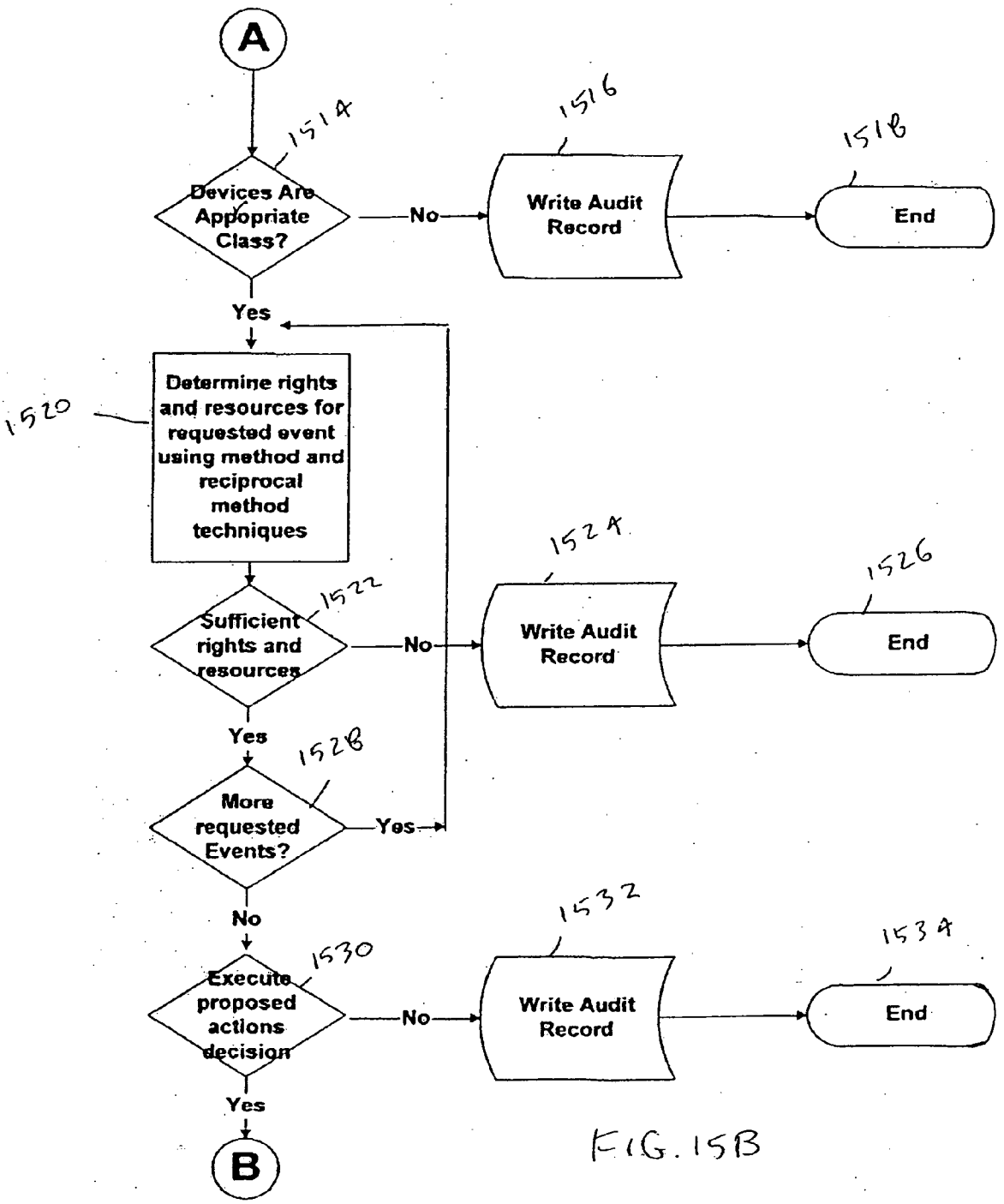

A
1514
Devices Are Appopriate Class?
No
1516
Write Audit Record
1518
End
Yes
1520
Determine rights and resources for requested event using method and reciprocal method techniques
1522
Sufficient rights and resources
No
1524
Write Audit Record
1526
End
Yes
1528
More requested Events?
Yes
No
1530
Execute proposed actions decision
No
1532
Write Audit Record
1534
End
Yes
B

FIG. 15B

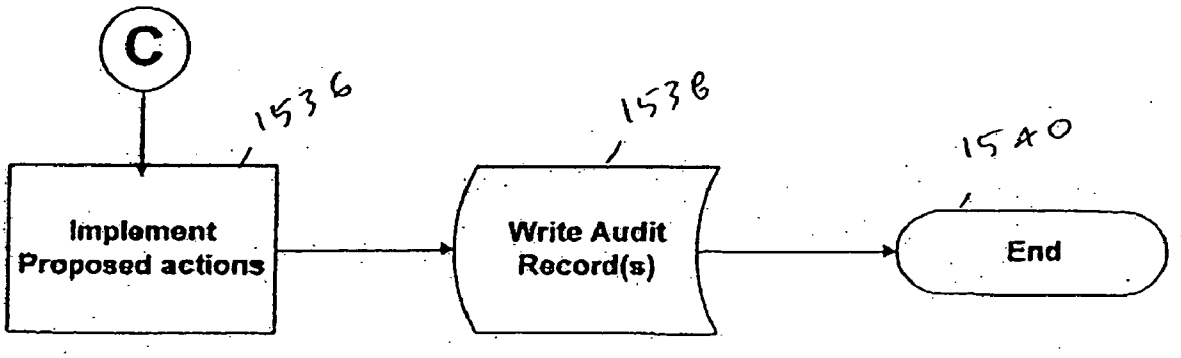

C
1536
Implement Proposed actions
1538
Write Audit Record(s)
1540
End

FIG. 15C

CRYPTOGRAPHIC METHODS, APPARATUS AND SYSTEMS FOR STORAGE MEDIA ELECTRONIC RIGHTS MANAGEMENT IN CLOSED AND CONNECTED APPLIANCES

CROSS-REFERENCE TO RELATED APPLICATIONS AND PATENTS

[0001] This application is a continuation application of U.S. patent application Ser. No. 08/848,077 (U.S. Patent Publication No. 2001/0042043), filed May 15, 1997, titled "Cryptographic Methods, Apparatus And Systems For Storage Media Electronic Rights Management In Closed And Connected Appliances,"

[0002] which is pending and claims priority from U.S. Provisional Application No. 60/037,931, filed Feb. 14, 1997, titled "Cryptographic Method And Apparatus For Storage Media Electronic Rights Management," and

[0003] which is a continuation-in-part application of PCT/US96/14262 (PCT Publication No. WO 1998/10381), filed Sep. 4, 1996, titled "Trusted Infrastructure Support Systems, Methods And Techniques For Secure Electronic Commerce, Electronic Transactions And Rights Management," and

[0004] which is a continuation-in-part application of U.S. patent application Ser. No. 08/689,606, filed Aug. 12, 1996, now issued U.S. Pat. No. 5,943,422, titled "Steganographic Techniques For Securely Delivering Electronic Digital Rights Management Control Information Over Insecure Communication Channels," and

[0005] which is a continuation-in-part application of U.S. patent application Ser. No. 08/689,754, filed Aug. 12, 1996, now issued U.S. Pat. No. 6,157,721, titled "Systems And Methods Using Cryptography To Protect Secure Computing Environments," and

[0006] which is a continuation-in-part application of U.S. patent application Ser. No. 08/699,712, filed Aug. 12, 1996, now abandoned, titled "Trusted Infrastructure Support Systems, Methods And Techniques For Secure Electronic Commerce, Electronic Transactions And Rights Management," which is a continuation application of PCT/US96/02303 (PCT Publication No. WO 1996/27155), filed Feb. 13, 1996, titled "System And Methods For Secure Transaction Management And Electronic Rights Protection," and

[0007] which claims priority from U.S. Provisional Application No. 60/018,132, filed May 22, 1996, titled "Cryptographic Method And Apparatus For Storage Media Electronic Rights Management," and

[0008] which claims priority from U.S. Provisional Application No. 60/017,722, filed May 15, 1996, titled "Cryptographic Method And Apparatus For Storage Media Electronic Rights Management," and

[0009] which is a continuation-in-part application of U.S. patent application Ser. No. 08/388,107, filed Feb. 13, 1995, titled "System And Methods For Secure Transaction Management And Electronic Rights Protection,"

[0010] all of which are incorporated herein by reference.

[0011] In addition, the specifications and drawings of the following prior published patent specifications are incorporated by reference into this patent specification:

[0012] U.S. Pat. No. 4,827,508 entitled "Database Usage Metering and Protection System and Method" dated May 2, 1989;

[0013] U.S. Pat. No. 4,977,594 entitled "Database Usage Metering and Protection System and Method" dated Dec. 11, 1990;

[0014] U.S. Pat. No. 5,050,213 entitled "Database Usage Metering and Protection System and Method" dated Sep. 17, 1991; and

[0015] U.S. Pat. No. 5,410,598 entitled "Database Usage Metering and Protection System and Method" dated Apr. 25, 1995; and

[0016] European Patent No. EP 329681 entitled "Database Usage Metering and Protection System and Method" dated Jan. 17, 1996.

FIELD OF THE INVENTION

[0017] This invention relates to information protection techniques using cryptography, and more particularly to techniques using cryptography for managing rights to information stored on portable media—one example being optical media such as Digital Video Disks (also known as "Digital Versatile Disks" and/or "DVDs"). This invention also relates to information protection and rights management techniques having selectable applicability depending upon, for example, the resources of the device being used by the consumer (e.g., personal computer or standalone player), other attributes of the device (such as whether the device can be and/or typically is connected to an information network ("connected" versus "unconnected")), and available rights. This invention further relates, in part, to cooperative rights management—where plural networked rights management arrangements collectively control a rights management event on one or more of such arrangements. Further, important aspects of this invention can be employed in rights management for electronic information made available through broadcast and/or network downloads and/or use of non-portable storage media, either independent of, or in combination with portable media.

BACKGROUND OF THE INVENTION

[0018] The entertainment industry has been transformed by the pervasiveness of home consumer electronic devices that can play video and/or audio from pre-recorded media. This transformation began in the early 1900s with the invention of the phonograph—which for the first time allowed a consumer to listen to his or her favorite band, orchestra or singer in his or her home whenever he or she wishes. The availability of inexpensive video cassette recorders/players beginning in the early 1980s brought about a profound revolution in the movie and broadcast industries, creating an entirely new home consumer market for films, documentaries, music videos, exercise videos, etc.

[0019] The entertainment industry has long searched for optimal media for distributing content to home consumers. The original phonograph cylinders distributed by Thomas Edison and other phonograph pioneers had the advantage that they were difficult to copy, but suffered from various disadvantages such as high manufacturing costs, low resistance to breakage, very limited playback time, relatively low playback quality, and susceptibility to damage from wear,

scratching or melting. Later-developed wax and vinyl disks could hold more music material but suffered from many of the same disadvantages. Magnetic tapes, on the other hand, could be manufactured very inexpensively and could hold a large amount of program material (e.g., 2, 4 or even 6 hours of video and/or audio). Such magnetic tapes could reproduce program material at relatively high quality, and were not as susceptible to damage or wearing out. However, despite the many clear advantages that magnetic tape provides over other media, the entertainment industry has never regarded it as an ideal or optimum medium because of its great susceptibility to copying.

[0020] Magnetic tape has the very flexible characteristic that it can be relatively easily recorded on. Indeed, the process for recording a magnetic tape is nearly as straightforward as that required for playing back pre-recorded content. Because of the relative ease by which magnetic tape can be recorded, home consumer magnetic tape equipment manufacturers have historically provided dual mode equipment that can both record and play back magnetic tapes. Thus, home audio and video tape players have traditionally had a "record" button that allows a consumer to record his or her own program material on a blank (un-recorded) magnetic tape. While this recording ability has given consumers additional flexibility (e.g., the ability to record a child's first words for posterity, and the ability to capture afternoon soap operas for evening viewing), it has unfortunately also been the foundation of an illegal multi-billion dollar content pirating industry that produces millions of illegal, counterfeit copies every year. This illegal pirating operation—which is international in scope—leeches huge amounts of revenue every year from the world's major entertainment content producers. The entertainment industry must pass along these losses to honest consumers—resulting in higher box office prices, and higher video and audio tape sales and rental prices.

[0021] In the mid 1980s, the audio entertainment industry developed the optical compact disk as an answer to some of these problems. The optical compact disk—a thin, silvery plastic platter a few inches in diameter—can hold an hour or more of music or other audio programming in digital form. Such disks were later also used for computer data. The disk can be manufactured very inexpensively, and provides extremely high quality playback that is resistant to noise because of the digital techniques used to record and recover the information. Because the optical disk can be made from plastic, it is light weight, virtually unbreakable, and highly resistant to damage from normal consumer handling (unlike the prior vinyl records that were easily scratched or worn down even by properly functioning phonographs). And, because recording on an optical disk is, so far, significantly more difficult than playing back an optical disk, home consumer equipment providing both recording and playback capabilities is unlikely, in the near future, to be as cost-effective as play-only equipment—greatly reducing the potential for illicit copying. Because of these overwhelming advantages, the music industry has rapidly embraced the new digital compact disk technology—virtually replacing older audio vinyl disk media within the space of a few short years.

[0022] Indeed, the threat of widespread and easy unauthorized copying in the absence of rights management technologies apparently has been an important contributing factor to the demise of digital audio tape (DAT) as a media for music distribution and, more importantly, home audio recording. Rightsholders in recorded music vigorously opposed the widespread commercialization of inexpensive DAT technology that lacked rights management capabilities since the quality of the digital recording was completely faithful to the digital source on, for example, music CDs. Of course, the lack of rights management was not the only factor at work, since compared with optical media, tape format made random access difficult, for example, playing songs out of sequence.

[0023] The video entertainment industry is on the verge of a revolution similar to that wrought by music CDs based on movies in digital format distributed on high capacity read-only optical media. For example, digital optical disk technology has advanced to the point where it is now possible to digitally record, among other things, a full length motion picture (plus sound) on one side of a 5" plastic optical disk. This same optical disk can accommodate multiple high-quality digital audio channels (e.g., to record multi-channel "sensurround" sound for home theaters and/or to record film dialog in multiple different languages on the same disk). This same technology makes it possible to access each individual frame or image of a movie for still image reproduction or—even more exciting—to provide an unprecedented "random access" playback capability that has never before existed in home consumer equipment. This "random access" playback could be used, for example, to delete violence, foul language or nudity at time of playback so that parents could select a "PG" playback version of an "R" rated film at the press of a button. The "random access" capability also has exciting possibilities in terms of allowing viewers to interact with the pre-recorded content (e.g., allowing a health enthusiast to select only those portions of an exercise video helpful to a particular day's workout). See, for example, "Applications Requirements for Innovative Video Programming," DVD Conference Proceedings (Interactive Multimedia Association, 19-20 Oct. 1995, Sheraton Universal Hotel, Universal City, Calif.).

[0024] Non-limiting examples of the DVD family of optical media include:

[0025] DVD (Digital Video Disk, Digital Versatile Disk), a non-limiting example of which includes consumer appliances that play movies recorded on DVD disks;

[0026] DVD-ROM (DVD-Read Only Memory), a non-limiting example of which includes a DVD read-only drive and disk connected to a computer or other appliance;

[0027] DVD-RAM (DVD Random Access Memory), a non-limiting example of which includes a read/write drive and optical media in, for example, consumer appliances for home recording and in a computer or other appliance for the broadest range of specific applications; and

[0028] Any other high capacity optical media presently known or unknown.

[0029] "DVDs" are, of course, not limited to use with movies. Like CDs, they may also be used for other kinds of information, for example:

[0030] sound recordings

[0031] software

[0032] databases

[0033] games

[0034] karaoke

[0035] multimedia

[0036] distance learning

[0037] documentation

[0038] policies and manuals

[0039] any kind of digital data or other information

[0040] any combination of kinds of digital data or other information

[0041] any other uses presently known or unknown.

[0042] The broad range of DVD uses presents a technical challenge: how can the information content distributed on such disks, which might be any kind or combination of video, sound, or other data or information broadly speaking, be adequately protected while preserving or even maximizing consumer flexibility? One widely proposed requirement for the new technology (mainly within the context of video), is, to the extent copying is permitted at all, to either: (a) allow a consumer to make a first generation copy of the program content for their own use, but prevent the consumer from making "copies of copies", or multi-generational copies of a given property (thus keeping honest people honest); or (b) to allow unlimited copying for those properties that rightsholders do not wish to protect against copying, or which consumers have made themselves.

[0043] However, providing only such simplistic and limited copy protection in a non-extensible manner may turn out to be extremely shortsighted-since more sophisticated protection and/or rights management objectives (e.g., more robust and selective application of copy protection and other protection techniques, enablement of pay-per-view models, the ability of the consumer to make use of enhanced functionality such as extracting material or interactivity upon paying extra charges, and receiving credit for redistribution, to name a few) could be very useful now or in the future. Moreover, in optimally approaching protection and rights management objectives, it is extremely useful to take differing business opportunities and threats into account that may relate to information delivered via DVD media, for example, depending upon available resources of the device and/or whether the device is connected or unconnected.

[0044] More sophisticated rights management capabilities will also allow studios and others who have rights in movies and/or sound recordings to better manage these important assets, in one example, to allow authorized parties to repurpose pieces of digital film, video and/or audio, whether specific and/or arbitrary pieces, to create derivative works, multimedia games, in one non-limiting example. Solutions proposed to date for protecting DVD content have generally focused solely on limited copy protection objectives and have failed to adequately address or even recognize more sophisticated rights management objectives and requirements. More specifically, one copy protection scheme for the initial generation of DVD appliances and media is based on an encryption method developed initially by Matsushita and the simple CGMA control codes that indicate permitted copying: a one-generation copy, no copies, or unlimited copying.

SUMMARY OF THE INVENTIONS

[0045] Comprehensive solutions for protecting and managing information in systems that incorporate high capacity optical media such as DVD require, among other things, methods and systems that address two broad sets of problems: (a) digital to analog conversion (and vice versa); and (b) the use of such optical media in both connected and unconnected environments. The inventions disclosed herein address these and other problems. For example, in the context of analog to digital conversion (and vice versa), it is contemplated that, in accordance with the present inventions, at least some of the information used to protect properties and/or describe rights management and/or control information in digital form could also be carried along with the analog signal. Devices that convert from one format and/or medium to another can, for example, incorporate some or all of the control and identifying information in the new context(s), or at least not actively delete such information during the conversion process. In addition, the present inventions provide control, rights management and/or identification solutions for the digital realm generally, and also critically important technologies that can be implemented in consumer appliances, computers, and other devices. One objective of the inventions is to provide powerful rights management techniques that are useful in both the consumer electronics and computer technology markets, and that also enable future evolution of technical capabilities and business models. Another non-limiting objective is to provide a comprehensive control, rights management and/or identification solution that remains compatible, where possible, with existing industry standards for limited function copy protection and for encryption.

[0046] The present inventions provide rights management and protection techniques that fully satisfy the limited copy protection objectives currently being voiced by the entertainment industry for movies while also flexibly and extensibly accommodating a wide range of more sophisticated rights management options and capabilities.

[0047] Some important aspects of the present inventions (that are more fully discussed elsewhere in this application) include:

[0048] Selection of control information associated with information recorded on DVD media (for example, rules and usage consequence control information, that comprise non-limiting example elements of a Virtual Distribution Environment (VDE)) that is based at least in part on class of appliance, for example, type of appliance, available resources and/or rights;

[0049] Enabling such selected control information to be, at least in part, a subset of control information used on other appliances and/or classes of appliance, or completely different control information;

[0050] Protecting information output from a DVD device, such as applying rights management techniques disclosed in Ginter et al. and the present application to the signals transmitted using an IEEE 1394 port (or other serial interface) on a DVD player;

[0051] Creation of protected digital content based on an analog source;

[0052] Reflecting differing usage rights and/or content availability in different countries and/or regions of the world;

[0053] Securely managing information on DVD media such that certain portions may be used on one or more classes of appliance (e.g., a standalone DVD player), while other portions may be used on the same or different classes of appliance (e.g., a standalone DVD player or a PC);

[0054] Securely storing and/or transmitting information associated with payment, auditing, controlling and/or otherwise managing content recorded on DVD media, including techniques related to those disclosed in Ginter et al. and in Shear et al.;

[0055] Updating and/or replacing encryption keys used in the course of appliance operation to modify the scope of information that may be used by appliances and/or classes of appliances;

[0056] Protecting information throughout the creation, distribution, and usage process, for example, by initially protecting information collected by a digital camera, and continuing protection and rights management through the editing process, production, distribution, usage, and usage reporting.

[0057] Allowing "virtual rights machines," consisting of multiple devices and/or other systems that participate and work together in a permanently or in a temporarily connected network to share some or all of the rights management for a single and/or multiple nodes including, for example, allowing resources available in plural such devices and/or other systems, and/or rights associated with plural parties and/or groups using and/or controlling such devices and/or other systems, to be employed in concert (according to rights related rules and controls) so as to govern one or more electronic events on any one or more of such devices and/or other systems, such event governance including, for example: viewing, editing, subsetting, anthologizing, printing, copying, titling, extracting, saving, and/or redistributing rights protected digital content.

[0058] Allowing for the exchange of rights among peer-to-peer relating devices and/or other systems, wherein such devices and/or other systems participate in a temporary or permanently connected network, and wherein such rights are bartered, sold for currency, and/or otherwise exchanged for value and/or consideration where such value and/or consideration is exchanged between such peer-to-peer participating commercial and/or consumer devices and/or other systems.

General Purpose DVD/Cost-Effective Large Capacity Digital Media Rights Protection and Management

[0059] The inventions described herein can be used with any large capacity storage arrangement where cost-effective distribution media is used for commercial and/or consumer digital information delivery and DVD, as used herein, should be read to include any such system.

[0060] Copy protection and rights management are important in practical DVD systems and will continue to be important in other large capacity storage, playback, and recording systems, presently known or unknown, in the future. Protection is needed for some or all of the information delivered (or written) on most DVD media. Such protection against copying is only one aspect of rights management. Other aspects involve allowing rightsholders and others to manage their commercial interests (and to have them enforced, potentially at a distance in time and/or space) regardless of distribution media and/or channels, and the particular nature of the receiving appliance and/or device. Such rights management solutions that incorporate DVD will become even more significant as future generations of recordable DVD media and appliances come to market. Rightsholders will want to maintain and assert their rights as, for example, video, sound recordings, and other digital properties are transmitted from one device to another and as options for recording become available in the market.

[0061] The apparent convergence between consumer appliances and computers, increasing network and modem speeds, the declining cost of computer power and bandwidth, and the increasing capacity of optical media will combine to create a world of hybrid business models in which digital content of all kinds may be distributed on optical media played on at least occasionally connected appliances and/or computers, in which the one-time purchase models common in music CDs and initial DVD movie offerings are augmented by other models, for example, lease, pay per view, and rent to own, to name just few. Consumers may be offered a choice among these and other models from the same or different distributors and/or other providers. Payment for use may happen over a network and/or other communications channel to some payment settlement service. Consumer usage and audit information may flow back to creators, distributors, and/or other participants. The elementary copy protection technologies for DVD now being introduced cannot support these and other sophisticated models.

[0062] As writable DVD appliances and media become available, additional hybrid models are possible, including, for example, the distribution of digital movies over satellite and cable systems. Having recorded a movie, a consumer may elect a lease, rental, pay-per-view, or other model if available. As digital television comes to market, the ability of writable DVDs to make faithful copies of on-air programming creates additional model possibilities and/or rights management requirements. Here too, simplistic copy protection mechanisms currently being deployed for the initial read-only DVD technologies will not suffice.

Encryption is a Means, not an End

[0063] Encryption is useful in protecting intellectual properties in digital format, whether on optical media such as DVD, on magnetic media such as disk drives, in the active memory of a digital device and/or while being transmitted across computer, cable, satellite, and other kinds of networks or transmission means. Historically, encryption was used to send secret messages. With respect to DVD, a key purpose of encryption is to require the use of a copy control and rights management system in order to ensure that only those authorized to do so by rightsholders can indeed use the content.

[0064] But encryption is more of a means, rather than an end. A central issue is how to devise methods for ensuring, to the maximal extent possible, that only authorized devices and parties can decrypt the protected content and/or otherwise use information only to the extent permitted by the rightsholder(s) and/or other relevant parties in the protected content.

The Present Inventions

[0065] The present inventions provide powerful right management capabilities. In accordance with one aspect provided by the present invention, encrypted digital properties can be put on a DVD in a tamper-resistant software "container" such as, for example, a "DigiBox" secure container, together with rules about "no copy" and/or "copy" and/or "numbers of permitted copies" that may apply and be enforced by consumer appliances. These same rules, and/or more flexible and/or different rules, can be enforced by computer devices or other systems that may provide more and/or different capabilities (e.g., editing, excerpting, one or more payment methods, increased storage capability for more detailed audit information, etc.). In addition, the "software container" such as for example, a "DigiBox" secure container, can store certain content in the "clear" (that is, in unencrypted form). For example, movie or music titles, copyright statements, audio samples, trailers, and/or advertising can be stored in the clear and/or could be displayed by any appropriate application or device. Such information could be protected for authenticity (integrity) when available for viewing, copying, and/or other activities. At the same time, valuable digital properties of all kinds-film, video, image, text, software, and multimedia• may be stored at least partially encrypted to be used only by authorized devices and/or applications and only under permitted, for example rightsholder-approved, circumstances.

[0066] Another aspect provided in accordance with the present invention (in combination with certain capabilities disclosed in Ginter et al.) is that multiple sets of rules could be stored in the same "container" on a DVD disk. The software then applies rules depending on whether the movie, for example, was to be played by a consumer appliance or computer, whether the particular apparatus has a backchannel (e.g., an on-line connection), the national and/or other legal or geographic region in which the player is located and/or the movie is being displayed, and/or whether the apparatus has components capable of identifying and applying such rules. For example, some usage rules may apply when information is played by a consumer device, while other rules may apply when played by a computer. The choice of rules may be left up to the rightsholder(s) and/or other participants—or some rules may be predetermined (e.g., based on the particular environment or application). For example, film rightsholders may wish to limit copying and ensure that excerpts are not made regardless of the context in which the property is played. This limitation might be applied only in certain legal or geographic areas. Alternatively, rightsholders of sound recordings may wish to enable excerpts of predetermined duration (e.g., no more than 20 seconds) and that these excerpts are not used to construct a new commercial work. In some cases, governments may require that only "PG" versions of movies and/or the equivalent rating for TV programs may be played on equipment deployed in their jurisdiction, and/or that the applicable taxes, fees and the like are automatically calculated and/or collected if payments related to content recorded on DVD is requested and/or performed (e.g., pay-per-use of a movie, game, database, software product, etc.; and/or orders from a catalog stored at least in part on DVD media, etc.).

[0067] In a microprocessor controlled (or augmented) digital consumer appliance, such rules contemplated by the present inventions can be enforced, for example, without requiring more than a relatively few additions to a central, controlling microprocessor (or other CPU, a IEEE 1394 port controller, or other content handling control circuitry), and/or making available some ROM or flash memory to hold the necessary software. In addition, each ROM (or flash or other memory, which such memory may be securely connected to, or incorporated into, such control circuitry in a single, manufactured component) can, in one example, contain one or more digital documents or "certificate(s)" that uniquely identifies a particular appliance, individual identity, jurisdiction, appliance class(es), and/or other chosen parameters. An appliance can, for example, be programmed to send a copy of a digital property to another digital device only in encrypted form and only inside a new, tamper-resistant "software container." The container may also, for example, carry with it a code indicating that it is a copy rather than an original that is being sent. The device may also put a unique identifier of a receiving device and/or class of devices in the same secure container. Consequently, for example, in one particular arrangement, the copy may be playable only on the intended receiving device, class(es) of devices, and/or devices in a particular region in one non-limiting example and rights related to use of such copy may differ according to these and/or other variables.

[0068] The receiving device, upon detecting that the digital property is indeed a copy, can, for example, be programmed not to make any additional copies that can be played on a consumer device and/or other class(es) of devices. If a device detects that a digital property is about to be played on a device and/or other class(es) of devices other than the one it was intended for, it can be programmed to refuse to play that copy (if desired).

[0069] The same restrictions applied in a consumer appliance can, for example, be enforced on a computer equipped to provide rights management protection in accordance with the present inventions. In this example, rules may specify not to play a certain film and/or other content on any device other than a consumer appliance and/or classes of appliances, for example. Alternatively, these same powerful capabilities could be used to specify different usage rules and payment schemes that would apply when played on a computer (and/or in other appliances and/or classes of appliances), as the rightsholder(s) may desire, for example, different pricing based upon different geographic or legal locales where content is played.

[0070] In addition, if "backchannels" are present—for example, set-top boxes with bi-directional communications or computers attached to networks—the present inventions contemplate electronic, independent delivery of new rules if desired or required for a given property. These new rules may, for example, specify discounts, time-limited sales, advertising subsidies, and/or other information if desired. As noted earlier, determination of these independently delivered rules is entirely up to the rightsholder(s) and/or others in a given model.

[0071] The following are two specific examples of a few aspects of the present invention discussed above:

1. An Analog to Digital Copying Example

[0072] a) Bob has a VHS tape he bought (or rented) and wants to make a copy for his own use. The analog film has copy control codes embedded so that they do not interfere with the quality of the signal. Bob has a writable DVD appliance that is equipped to provide rights management protection in accordance with the present invention. Bob's DVD recorder detects the control codes embedded in the analog signal (for example, such recorder may detect watermarks and/or fingerprints carrying rights related control and/or usage information), creates a new secure container to hold the content rules and describe the encoded film, and creates new control rules (and/or delivers to a secure VDE system for storage and reporting certain usage history related information such as user name, time, etc.) based on the analog control codes and/or other information it detected and that are then placed in the DigiBox and/or into a secure VDE installation data store such as a secure data base. Bob can play that copy back on his DVD appliance whenever he chooses.

[0073] b) Bob gives the DVD disk he recorded to Jennifer who wishes to play it on computer that has a DVD drive. Her computer is equipped to provide rights management protection in accordance with the present invention. Her computer opens the "DigiBox," detects that this copy is being used on a device different from the one that recorded it (an unauthorized device) and refuses to play the copy.

[0074] c) Bob gives the DVD disk to Jennifer as before, but now Jennifer contacts electronically a source of new rules and usage consequences, which might be the studio, a distributor, and/or a rights and permissions clearinghouse, (or she may have sufficient rights already on her player to play the copy). The source sends a DigiBox container to Jennifer with rules and consequences that permit playing the movie on her computer while at the same time charging her for use, even though the movie was recorded on DVD by Bob rather than by the studio or other value chain participant.

2. A Digital to Analog Copying Example

[0075] a) Jennifer comes home from work, inserts a rented or owned DVD into a player connected to, or an integral part of her TV, and plays the disk. In a completely transparent way, the film is decrypted, the format is converted from digital to analog, and displayed on her analog TV.

[0076] b) Jennifer wishes to make a copy for her own use. She plays the film on an DVD device incorporating rights management protection in accordance with the present invention, that opens the DigiBox secure container, accesses the control information, and decrypts the film. She records the analog version on her VCR which records a high-quality copy.

[0077] c) Jennifer gives the VCR copy to Doug who wishes to make a copy of the analog tape for his own use, but the analog control information forces the recording VCR to make a lower-quality copy, or may prevent copying. In another non-limiting example, more comprehensive rights management information may be encoded in the analog output using the methods and/or systems described in more detail in the above referenced Van Wie and Weber patent application.

[0078] In accordance with one aspect provided by this invention, the same portable storage medium, such as a DVD, can be used with a range of different, scaled protection environments providing different protection capabilities. Each of the different environments may be enabled to use the information carried by the portable storage medium based on rights management techniques and/or capabilities supported by the particular environment. For example, a simple, inexpensive home consumer disk player may support copy protection and ignore more sophisticated and complex content rights the player is not equipped to enable. A more technically capable and/or secure platform (e.g., a personal computer incorporating a secure processing component possibly supported by a network connection, or a "smarter" appliance or device) may, for example, use the same portable storage medium and provide enhanced usage rights related to use of the content carried by the medium based on more complicated rights management techniques (e.g., requiring payment of additional compensation, providing secure extraction of selected content portions for excerpting or anthologizing, etc.). For example, a control set associated with the portable storage medium may accommodate a wide variety of different usage capabilities—with the more advanced or sophisticated uses requiring correspondingly more advanced protection and rights management enablement found on some platforms and not others. Lower-capability environments can, as another example, ignore (or not enable or attempt to use) rights in the control set that they don't understand, while higher-capability environments (having awareness of the overall capabilities they provide), may, for example, enable the rights and corresponding protection techniques ignored by the lower-capability environments.

[0079] In accordance with another aspect provided by the invention, a media- and platform-independent security component can be scaled in terms of functionality and performance such that the elementary rights management requirements of consumer electronics devices are subsets of a richer collection of functionality that may be employed by more advanced platforms. The security component can be either a physical, hardware component, or a "software emulation" of the component. In accordance with this feature, an instance of medium (or more correctly, one version of the content irrespective of media) can be delivered to customers independently of their appliance or platform type with the assurance that the content will be protected. Platforms less advanced in terms of security and/or technical capabilities may provide only limited rights to use the content, whereas more advanced platforms may provide more expansive rights based on correspondingly appropriate security conditions and safeguards.

[0080] In accordance with a further aspect provided by the present invention, mass-produced, inexpensive home consumer DVD players (such as those constructed, for example, with minimum complexity and parts count) can be made to be compatible with the same DVDs or other portable storage media used by more powerful and/or secure platforms (such as, for example, personal computers) without degrading advanced rights management functions the storage media may provide in combination with the more powerful and/or

secure platforms. The rights management and protection arrangement provided and supported in accordance with this aspect of the invention thus supports inexpensive basic copy protection and can further serve as a commercial convergence technology supporting a bridging that allows usage in accordance with rights of the same content by a limited resource consumer device while adequately protecting the content and further supporting more sophisticated security levels and capabilities by (a) devices having greater resources for secure rights management, and/or (b) devices having connectivity with other devices or systems that can supply further secure rights management resources. This aspect of the invention allows multiple devices and/or other systems that participate and work together in a permanently or temporarily connected network to share the rights management for at least one or more electronic events (e.g., managed through the use of protected processing environments such as described in Ginter et al.) occurring at a single, or across multiple nodes and further allows the rights associated with parties and/or groups using and/or controlling such multiple devices and/or other systems to be employed according to underlying rights related rules and controls, this allowing, for example, rights available through a corporate executive's device to be combined with or substitute for, in some manner, the rights of one or more subordinate corporate employees when their computing or other devices of these parties are coupled in a temporary networking relationship and operating in the appropriate context. In general, this aspect of the invention allows distributed rights management for DVD or otherwise packaged and delivered content that is protected by a distributed, peer-to-peer rights management. Such distributed rights management can operate whether the DVD appliance or other electronic information usage device is participating in a permanently or temporarily connected network and whether or not the relationships among the devices and/or other systems participating in the distributed rights management arrangement are relating temporarily or have a more permanent operating relationship. In this way, the same device may have different rights available depending on the context in which that device is operating (e.g., in a corporate environment such as in collaboration with other individuals and/or with groups, in a home environment internally and/or in collaboration with external one or more specified individuals and/or other parties, in a retail environment, in a classroom setting as a student where a student's notebook might cooperate in rights management with a classroom server and/or instructor PC, in a library environment where multiple parties are collaboratively employing differing rights to use research materials, on a factory floor where a hand held device works in collaboration with control equipment to securely and appropriately perform proprietary functions, and so on).

[0081] For example, coupling a limited resource device arrangement, such as a DVD appliance, with an inexpensive network computer (NC), or a personal computer (PC), may allow an augmenting (or replacing) of rights management capabilities and/or specific rights of parties and/or devices by permitting rights management to be a result of a combination of some or all of the rights and/or rights management capabilities of the DVD appliance and those of an Network or Personal Computer (NC or PC). Such rights may be further augmented, or otherwise modified or replaced by the availability of rights management capabilities provided by a trusted (secure) remote network rights authority.

[0082] These aspects of the present invention can allow the same device, in this example a DVD appliance, to support different arrays, e.g., degrees, of rights management capabilities, in disconnected and connected arrangements and may further allow available rights to result from the availability of rights and/or rights management capabilities resulting from the combination of rights management devices and/or other systems. This may include one or more combinations of some or all of the rights available through the use of a "less" secure and/or resource poor device or system which are augmented, replaced, or otherwise modified through connection with a device or system that is "more" or "differently" secure and/or resource rich and/or possesses differing or different rights, wherein such connection employs rights and/or management capabilities of either and/or both devices as defined by rights related rules and controls that describe a shared rights management arrangement.

[0083] In the latter case, connectivity to a logically and/or physically remote rights management capability can expand (by, for example, increasing the available secure rights management resources) and/or change the character of the rights available to the user of the DVD appliance or a DVD appliance when such device is coupled with an NC, personal computer, local server, and/or remote rights authority. In this rights augmentation scenario, additional content portions may be available, pricing may change, redistribution rights may change (e.g., be expanded), content extraction rights may be increased, etc.

[0084] Such "networking rights management" can allow for a combination of rights management resources of plural devices and/or other systems in diverse logical and/or physical relationships, resulting in either greater or differing rights through the enhanced resources provided by connectivity with one or more "remote" rights authorities. Further, while providing for increased and/or differing rights management capability and/or rights, such a connectivity based rights management arrangement can support multi-locational content availability, by providing for seamless integration of remotely available content, for example, content stored in remote, Internet world wide web-based, database supported content repositories, with locally available content on one or more DVD discs.

[0085] In this instance, a user may experience not only increased or differing rights but may use both local DVD content and supplementing content (i.e., content that is more current from a time standpoint, more costly, more diverse, or complementary in some other fashion, etc.). In such an instance, a DVD appliance and/or a user of a DVD appliance (or other device or system connected to such appliance) may have the same rights, differing, and/or different rights applied to locally and remotely available content, and portions of local and remotely available content may themselves be subject to differing or different rights when used by a user and/or appliance. This arrangement can support an overall, profound increase in user content opportunities that are seamlessly integrated and efficiently available to users in a single content searching and/or usage activity by exploiting the rights management and content resources of plural, connected arrangements.

[0086] Such a rights augmenting remote authority may be directly coupled to a DVD appliance and/or other device by modem, or directly or indirectly coupled through the use of an I/O interface, such as a serial **1394** compatible controller (e.g., by communicating between a 1394 enabled DVD appliance and a local personal computer that functions as a smart synchronous or asynchronous information communications interface to such one or more remote authorities, including a local PC or NC or server that serves as a local rights management authority augmenting and/or supplying the rights management in a DVD appliance).

[0087] In accordance with yet another aspect provided by this invention, rights provided to, purchased, or otherwise acquired by a participant and/or participant DVD appliance or other system can be exchanged among such peer-to-peer relating devices and/or other systems through the use of one or more permenantly or temporarily networked arrangements. In such a case, rights may be bartered, sold, for currency, otherwise exchanged for value, and/or loaned so long as such devices and/or other systems participate in a rights management system, for example, such as the Virtual Distribution Environment described in Ginter, et al., and employ rights transfer and other rights management capabilities described therein. For example, this aspect of the present invention allows parties to exchange games or movies in which they have purchased rights. Continuing the example, an individual might buy some of a neighbor's usage rights to watch a movie, or transfer to another party credit received from a game publisher for the successful superdistribution of the game to several acquaintances, where such credit is transferred (exchanged) to a friend to buy some of the friend's rights to play a different game a certain number of times, etc. In accordance with yet another aspect provided by this invention, content carried by a portable storage medium such as a DVD is associated with one or more encryption keys and a secure content identifier. The content itself (or information required to use the content) is at least partially cryptographically encrypted—with associated decryption keys being required to decrypt the content before the content can be used. The decryption keys may themselves be encrypted in the form of an encrypted key block. Different key management and access techniques may be used, depending on the platform.

[0088] In accordance with still yet another aspect provided by this invention, electronic appliances that "create" digital content (or even analog content)—e.g., a digital camera/video recorder or audio recorder—can be readily equipped with appropriate hardware and/or software so as to produce content that is provided within a secure container at the outset. For example, content recorded by a digital camera could be immediately packaged in a secure container by the camera as it is recording. The camera could then output content already packaged in a secure container(s). This could preclude the need to encapsulate the content at a later point in time or at a later production stage, thus, saving at least one production-process step in the overall implementation of electronic rights management in accordance with the present invention. Moreover, it is contemplated that the very process of "reading" content for use in the rights management environment might occur at many steps along a conventional production and distribution process (such as during editing and/or the so called "pressing" of a master DVD or audio disk, for example). Accordingly, another significant advantage of the present invention is that rights management of content essentially can be extended throughout and across each appropriate content creation, editing, distribution, and usage stages to provide a seamless content protection architecture that protects rights throughout an entire content life cycle.

[0089] In one example embodiment, the storage medium itself carries key block decryption key(s) in a hidden portion of the storage medium not normally accessible through typical access and/or copying techniques. This hidden key may be used by a drive to decrypt the encrypted key block—such decrypted key block then being used to selectively decrypt content and related information carried by the medium. The drive may be designed in a secure and tamper-resistant manner so that the hidden keys are never exposed outside of the drive to provide an additional security layer.

[0090] In accordance with another example embodiment, a video disk drive may store and maintain keys used to decrypt an encrypted key block. The key block decryption keys may be stored in a drive key store, and may be updatable if the video disk drive may at least occasionally use a communications path provided, for example, by a set top box, network port or other communications route.

[0091] In accordance with a further example embodiment, a virtual distribution environment secure node including a protected processing environment such as a hardware-based secure processing unit may control the use of content carried by a portable storage medium such as a digital video disk in accordance with control rules and methods specified by one or more secure containers delivered to the secure node on the medium itself and/or over an independent communications path such as a network.

[0092] Certain conventional copy protection for DVD currently envisions CGMA copy protection control codes combined with certain encryption techniques first proposed apparently by Matsushita Corporation. Notwithstanding the limited benefits of this approach to digital property protection, the present invention is capable of providing a supplementary, compatible, and far more comprehensive rights management system while also providing additional and/or different options and solutions. The following are some additional examples of advantageous features provided in accordance with the inventions:

[0093] Strong security to fully answer content supplier needs.

[0094] Value chain management automation and efficiencies including distributed rights protection, "piece of the tick" payment disaggregation to value chain participants, cost-effective micro-transaction management, and superdistribution, including offline micropayment and microtransaction support for at least occasionally connected devices.

[0095] Simplified, more efficient channel management including support for the use of the same content deliverable on limited resource, greater resource, standalone, and/or connected devices.

[0096] Can be used with any medium and application type and/or all forms of content and content models—not just compressed video and sound as in some prior techniques and supports the use of copies of the same or materially the same content containers across a wide

variety of media delivery systems (e.g., broadcast, Internet repository, optical disc, etc) for operation on a wide variety of different electronic appliances (e.g., digital cameras, digital editing equipment, sound recorders, sound editing equipment, movie theater projectors, DVD appliances, broadcast tape players, personal computers, smart televisions, etc).

[0097] Asset management and revenue and/or other consideration maximizing through important new content revenue and/or other consideration opportunities and the enhancement of value chain operating efficiencies.

[0098] Is capable of providing 100% compatibility with the other protection techniques such as, for example, CGMA protection codes and/or Matsushita data scrambling approaches to DVD copy protection.

[0099] Can be employed with a variety of existing data scrambling or protection systems to provide very high degrees of compatibility and/or level of functionality.

[0100] Allows DVD technology to become a reusable, programmable, resource for an unlimited variety of entertainment, information commerce, and cyberspace business models.

[0101] Enables DVD drive and/or semiconductor component manufacturers and/or distributors and/or other value adding participants to become providers of, and rights holders in, the physical infrastructure of the emerging, connected world of the Internet and Intranets where they may charge for the use of a portion (e.g., a portion they provided) of the distributed, physical infrastructure as that portion participates in commercial networks. Such manufacturers and/or distributors and/or other value adding participants can enjoy the revenue benefits resulting from participation in a "piece of the tick" by receiving a small portion of the revenue received as a result of a participating transaction.

[0102] Provides automated internationalization, regionalization, and rights management in that:

[0103] DVD content can be supplied with arrays of different rule sets for automatic use depending on rights and identity of the user; and

[0104] Societal rights, including taxes, can be handled transparently.

[0105] In addition, the DVD rights management method and apparatus of the present invention provides added benefits to media recorders/publishers in that it:

[0106] Works with a current "keep honest people honest" philosophy.

[0107] Can provide 100% compatibility with other protection schemes such as for example, Matsushita data scrambling and/or CGMA encoded discs.

[0108] Can work with and/or supplement other protection schemes to provide desired degree and/or functionality, or can be used in addition to or instead of other approaches to provide additional and/or different functionality and features.

[0109] Provides powerful, extensible rights management that reaches beyond limited copy protection models to rights management for the digitally convergent world.

[0110] Empowers recording/publishing studios to create sophisticated asset management tools.

[0111] Creates important business opportunities through controlled use of studio properties in additional multimedia contexts.

[0112] Uniquely ties internationalization, regionalization, superdistribution, repurposing, to content creation processes and/or usage control.

[0113] Other aspects of the present invention provide benefits to other types of rightsholders, such as for example:

[0114] Persistent, transparent protection of digital content-globally, through value chain and process layers.

[0115] Significant reduction in revenue loss from copying and pass-along.

[0116] Converts "pass-along," copying, and many forms of copyright infringement from a strategic business threat to a fundamental business opportunity.

[0117] A single standard for all digital content regardless of media and/or usage locality and other rights variables.

[0118] Major economies of scale and/or scope across industries, distribution channels, media, and content type.

[0119] Can support local usage governance and auditing within DVD players allowing for highly efficient micro-transaction support, including multiparty microtransactions and transparent multiparty microtransactions.

[0120] Empowers rightsholders to employ the broadest range of pricing, business models, and market strategies—as they see fit.

[0121] Further aspects of the present invention which may prove beneficial to DVD and other digital medium appliance manufacturers are:

[0122] Capable of providing bit for bit compatibility with existing discs.

[0123] Content type independent.

[0124] Media independent and programmable/reusable.

[0125] Highly portable transition to next generation of appliances having higher density devices and/or a writable DVD and/or other optical media format(s).

[0126] Participation in revenue flow generated using the appliance.

[0127] Single extensible standard for all digital content appliances.

[0128] Ready for the future "convergent" world in which many appliances are connected in the home using, as one example, IEEE 1394 interfaces or other means (e.g., some appliances will be very much like computers and some computers will be very much like appliances).

[0129] Aspects of the present inventions provide many benefits to computer and OS manufacturers such as for example:

[0130] Implementation in computers as an extension to the operating system, via for example, at least one transparent plug-in, and does not require modifications to computer hardware and/or operating systems.

[0131] Easy, seamless integration into operating systems and into applications.

[0132] Extremely strong security, especially when augmented with "secure silicon" (i.e., hardware/firmware protection apparatus fabricated on chip).

[0133] Transforms user devices into true electronic commerce appliances.

[0134] Provides a platform for trusted, secure rights management and event processing.

[0135] Programmable for customization to specialized requirements.

[0136] Additional features and advantages provided in accordance with the inventions include, for example:

[0137] Information on the medium (for example, both properties and metadata) may be encrypted or not.

[0138] Different information (for example, properties, metadata) may be encrypted using different keys. This provides greater protection against compromise, as well as supporting selective usage rights in the context of a sophisticated rights management system.

[0139] There may be encrypted keys stored on the medium, although this is not required. These keys may be used to decrypt the protected properties and metadata. Encrypted keys are likely to be used because that allows more keying material for the information itself, while still keeping access under control of a single key.

[0140] Multiple sets of encrypted keys may be stored on the medium, either to have different sets of keys associated with different information, or to allow multiple control regimes to use the same information, where each control regime may use one or more different keys to decrypt the set of encrypted keys that it uses.

[0141] To support the ability of the player to access rights managed containers and/or content, a decryption key for the encrypted keys may be hidden on the medium in one or more locations that are not normally accessible. The "not normally accessible" location(s) may be physically enabled for drives installed in players, and disabled for drives installed in computers. The enablement may be different firmware, a jumper on the drive, etc.

[0142] The ability of the player to access rights managed containers and/or content may also be supported by one or more stored keys inside the player that decrypts certain encrypted keys on the medium.

[0143] Keys in a player may allow some players to play different properties than others. Keys could be added to, and/or deleted from the player by a network connection (e.g., to a PC, a cable system, and/or a modem connection to a source of new and/or additional keys and/or key revocation information) or automatically loaded by "playing" a key distribution DVD.

[0144] Controlling computer use may be supported by some or all of the same techniques that control player use of content and/or rights management information.

[0145] Controlling computer use of content and/or rights management information may be supported by having a computer receive, through means of a trusted rights management system, one or more appropriate keys.

[0146] A computer may receive additional keys that permit decryption of certain encrypted keys on the medium.

[0147] A computer may receive additional keys that permit decryption of one or more portions of encrypted data directly. This may permit selective use of information on the medium without disclosing keys (e.g., a player key that decrypts any encrypted keys).

[0148] In accordance with further aspects provided by the present invention, a secure "software container" is provided that allows:

[0149] Cryptographically protected encapsulation of content, rights rules, and usage controls.

[0150] Persistent protection for transport, storage, and value chain management.

[0151] Sophisticated rules interface architecture.

[0152] Elements can be delivered independently, such as new controls, for example, regarding discount pricing (e.g. sale pricing, specific customer or group discounts, pricing based on usage patterns, etc.) and/or other business model changes, can be delivered after the property has been distributed (this is especially beneficial for large properties or physical distribution media (e.g., DVD, CD-ROM) since redistribution costs may be avoided and consumers may continue to use their libraries of discs). In addition, encrypted data can be located "outside" the container. This can allow, for example, use of data stored independently from the controls and supports "streaming" content as well as "legacy" systems (e.g., CGMS).

BRIEF DESCRIPTION OF THE DRAWINGS

[0153] These and other features and advantages provided in accordance with these inventions may be better and more completely understood by referring to the following detailed description of presently preferred examples in conjunction with the drawings, of which:

[0154] FIG. 1A shows example home consumer electronics equipment for using portable storage media such as digital video disks;

[0155] FIG. 1B shows example secure node equipment for using the same portable storage media but providing more advanced rights management capabilities;

[0156] FIG. 1C shows an example process for manufacturing protected optical disks;

[0157] FIG. 2A shows an example architecture of the FIG. 1A consumer electronics equipment;

[0158] FIG. 2B shows an example architecture for the FIG. 1B secure node equipment;

[0159] FIG. **3** shows example data structures used by the FIG. **1**A equipment;

[0160] FIGS. **3**A and **3**B show example control set definitions;

[0161] FIGS. **4**A and **4**B show example usage techniques provided by the FIG. **1**A appliance;

[0162] FIG. **5** shows example data structures used by the FIG. **1**B secure node for accessing information on the storage medium;

[0163] FIG. **6** shows an example usage technique performed by the FIG. **1**B secure node;

[0164] FIG. **7** is a block diagram illustrating an example of a special secure software container contained on a DVD;

[0165] FIG. **8** is a block diagram illustrating an example of a secure container along with the video property content stored on a DVD medium;

[0166] FIG. **9** is a block diagram illustrating another example of a standard container stored on a DVD medium including an additional container having a more complex rule arrangement for use, for example, with a secure node;

[0167] FIG. **10** shows an example use of a DVD having a container (i.e., stored on the medium) with a DVD player provided with a secure rights management node, and also shows use of the same DVD with a DVD player that does not have a secure rights management node;

[0168] FIG. **11** is a block diagram illustrating use of a DVD that does not have a container on a DVD player that is provided with rights management secure node in accordance with the present invention as compared with use of the same DVD with a DVD player that does not have a secure node;

[0169] FIGS. **12-14** show example network configurations; and

[0170] FIGS. **15**A-**15**C show an example virtual rights process.

DETAILED DESCRIPTION OF PRESENTLY PREFERRED EXAMPLE EMBODIMENTS

Overall Example Digital Video Disk Usage System

[0171] FIG. **1**A shows example inexpensive mass-produced home consumer electronics equipment **50** for using information stored on a storage medium **100** such as a portable digitally-encoded optical disk (e.g., a digital video disk or "DVD"). Consumer equipment **50** includes a dedicated disk player **52**, that in some embodiments, may also have the capability to write optical media (writeable DVD disks, or "DVD-RAM") for example) as well, connected to a home color television set **54**. A remote control unit **56** may be used to control the disk player **52** and/or television set **54**.

[0172] In one example, disk **100** may store a feature length motion picture or other video content. Someone wishing to watch the content stored on disk **100** may purchase or rent the disk, insert the disk into player **52** and use remote control **56** (and/or controls **58** that may be provided on player **52**) to control the player to play back the content via home television set **54**.

[0173] In some embodiments, remote control **56** (and/or controls **58** that may be provided on device **52**) may be used to control the recording of a movie, for example. Player **52** reads the digitized video and audio information carried by disk **100**, converts it into signals compatible with home color television set **54**, and provides those signals to the home color television set.

[0174] In some embodiments, television set **54** (and/or a set top box) provide the video signals to be recorded by device **52** on writable optical media, DVD-RAM in one non-limiting example. Television set **54** produces images on screen **54***a* and produces sounds through loudspeakers **54***b* based on the signals player **52** provides to the television set.

[0175] The same disk **100** may be used by a more advanced platform **60** shown in FIG. **1**B. Platform **60** may include, for example, a personal computer **62** connected to a display monitor **64**, a keyboard **66**, a mouse pointing device **68**, and a loudspeaker **70**. In this example, platform **60** may be able to play back the content stored on disk **100** in the same way as dedicated disk player **52**, but may also be capable of more sophisticated and/or advanced uses of the content as enabled by the presence of secure node **72** within the platform. (In some embodiments, platform **60** may also be able to record content on writable optical media, DVD-RAM, in one non-limiting example.) For example, it may be possible, using platform **60** and its secure node **72**, to interactively present the motion picture or other content such that the user may input choices via keyboard **66** and/or mouse pointing device **68** that, in real time, change the presentation provided via display **64** and loudspeaker **60**.

[0176] As one example, the platform **60** user selects from options displayed on display **64** that cause the content presentation sequence to change (e.g., to provide one of a number of different endings, to allow the user to interactively control the flow of the images presented, etc.). Computer **62** may also be capable of using and manipulating digital data including for example computer programs and/or other information stored on disk **100** that player **52** cannot handle.

[0177] Secure node **72** provides a secure rights management facility that may, for example, permit more invasive or extensive use of the content stored on disk. For example, dedicated player **52** may prevent any copying of content stored by disk **100**, or it may allow the content to be copied only once and never again. Platform **60** including secure node **72**, on the other hand, may allow multiple copies of some or all of the same content—but only if certain conditions are met (e.g., the user of equipment **60** falls within a certain class of people, compensation at an agreed on rate is securely provided for each copy made, only certain excerpts of the content are copied, a secure audit trail is maintained and reported for each copy so made, etc.). (In some embodiments, dedicated player **52** may send protected content only to devices authenticated as able to enforce securely rights management rules and usage consequences. In some embodiments, devices may authenticate using digital certificates, one non-limiting example being certificates conforming to the X.509 standard.) Hence, platform **60** including secure node **72** can, in this example, use the content provided by disk **100** in a variety of flexible, secure ways that are not possible using dedicated player **52**—or any other appliance that does not include a secure node.

Example Secure Disk Creation and Distribution Process

[0178] FIG. 1C shows an example secure process for creating a master multimedia DVD disk **100** for use with players **50**, **60**. In this example, a digital camera **350** converts light images (i.e., pictures) into digital information **351** representing one or a sequence of images. Digital camera **350** in this example includes a secure node **72**A that protects the digital information **351** before it leaves camera **350**. Such protection can be accomplished, for example, by packaging the digital information within one or more containers and/or associating controls with the digital information.

[0179] In this example, digital camera **350** provides the protected digital image information **351** to a storage device such as, for example, a digital tape recorder **352**. Tape recorder **352** stores the digital image information **351** (along with any associated controls) onto a storage medium such as magnetic tape cartridge **354** for example. Tape recorder **352** may also include a secure node **72**B. Secure node **72**B in this example can understand and enforce the controls that the digital camera secure node **72**A applies to and/or associated with the digital information **351**, and/or it may apply its own controls to the stored information.

[0180] The same or different tape recorder **352** may play back protected digital information **351** to a digital mixing board **356**. Digital mixing board **356** may mix, edit, enhance or otherwise process the digital information **351** to generate processed digital information **358** representing one or a sequence of images. Digital mixing board **356** may receive additional inputs from other devices such as for example other tape recorders, other digital cameras, character generators, graphics generators, animators, or any other image-based devices. Any or all of such devices may also include secure nodes **72** to protect the information they generate. In some embodiments, some of the digital information can be derived from equipment including a secure node, and other digital information can be derived from equipment that has no secure node. In still other embodiments, some of the digital information provided to digital mixer **356** is protected and some is not protected.

[0181] Digital mixing board **356** may also include a secure node **72**C in this example. The digital mixing board secure node **72**C may enforce controls applied by digital camera secure node **72**A and/or tape recorder secure node **72**B, and/or it may add its own protections to the digital information **358** it generates.

[0182] In this example, an audio microphone **361** receives sound and converts the sound into analog audio signals. The audio signals in this example are inputted to a digital audio tape recorder **362**. In the example shown, tape recorder **362** and audio mixer **364** are digital devices. However, in other embodiments, one, the other or both of these devices may operate in the analog domain. In the example shown, digital audio tape recorder **362** converts the analog audio signals into digital information representing the sounds, and stores the digital information (and any associated controls) onto a tape **362**.

[0183] In this example, audio tape recorder **362** includes a secure node **72**E that may associate controls with the information stored on tape **363**. Such controls may be stored with the information on the tape **363**. In another embodiment, microphone **361** may include its own internal secure node **72** that associates control information with the audio information (e.g., by steganographically encoding the audio information with control information). The tape recorder **362** may enforce such controls applied by microphone **361**.

[0184] Alternatively, microphone **361** may operate in the digital domain and provide digital representations of audio, perhaps including control information supplied by secure node **72** optionally incorporated in microphone **361**, directly to connected devices such as audio tape recorder **362**. Digital representations may optionally be substituted for analog representations of any signals between the devices in the example FIG. **1**C.

[0185] The same or different tape recorder **362** may play back the information recorded on tape **363**, and provide the information **366** to an audio mixer **364**. Audio mixer **364** may edit, mix, or otherwise process the information **366** to produce information **368** representing one or a sequence of sounds. Audio mixer **364** may also receive inputs from other devices such as for example other tape recorders, other microphones, sound generators, musical synthesizers, or any other audio-based devices. Any or all of such devices may also include secure nodes **72** to protect the information they generate. In some embodiments, some of the digital information is derived from equipment including a secure node, and other digital information is derived from equipment that has no secure node. In still other embodiments, some of the digital information provided to audio mixer **364** is protected and some is not protected.

[0186] Audio mixer **364** in this example includes a secure node **72**F that enforces the controls, if any, applied by audio tape recorder secure node **72**E; and/or applies its own controls.

[0187] Digital image mixer **356** may provide digital information **358** to "DVD-RAM" equipment **360** that is capable of writing to master disks **100** and/or to disks from which master dicks may be created Similarly, audio mixer **364** may provide digital information **368** to equipment **360**. Equipment **360** records the image information **358** and audio information **368** onto master disk **100**. In this example, equipment **360** may include a secure node **72**D that enforces controls applied by digital camera secure node **72**A, tape recorder secure node **72**B, digital mixer secure node **72**C audio tape recorder secure node **72**E and/or audio mixer secure node **72**F; and/or it may add its own protections to the digital information **358** it writes onto master disks **100**. A disk manufacturer can then mass-produce disks **100**(**1**)-**100**(N) based on the master disk **100** using conventional disk mass-production equipment for distribution through any channels (e.g., video and music stores, websites, movie theaters, etc.). Consumer appliances **50** shown in FIGS. **1**A and **1**B may play back the disks **100**—enforcing the controls applied to the information stored on the disks **100**. Secure nodes **72** thus maintain end-to-end, persistent secure control over the images generated by digital camera **350** and the sounds generated by microphone **361** during the entire process of making, distributing and using disks **100**.

[0188] In the FIG. **1**C example shown, the various devices may communicate with one another over so-called "IEEE 1394" high-speed digital serial busses. In this context, "IEEE 1394" refers to hardware and software standards set forth in the following standards specification incorporated

by reference herein: 1394-1995 *IEEE Standard for a High Performance Serial Bus*, No. 1-55937-583-3 (Institute of Electrical and Electronics Engineers 1995). This specification describes a high-speed memory mapped digital serial bus that is self-configuring, hot pluggable, low cost and scalable. The bus supports isochronous and asynchronous transport at 100, 200 or 400 Mbps, and flexibly supports a number of different topologies. The specification describes a physical level including two power conductors and two twisted pairs for signalling. The specification further describes physical, link and transaction layer protocols including serial bus management. Alternatively, any other suitable electronic communication means may be substituted for the "IEEE 1394" medium shown in FIG. **1**C, including other wired media (e.g., Ethernet, universal serial bus), and/or wireless media based on radio-frequency (RF) transmission, infra-red signals, and/or any other means and/or types of electronic communication.

Example Dedicated Player Architecture

[0189] FIG. **2**A shows an example architecture for dedicated player **52**. In this example, player **52** includes a video disk drive **80**, a controller **82** (e.g., including a microprocessor **84**, a memory device such as a read only memory **86**, and a user interface **88**), and a video/audio processing block **90**. Video disk drive **80** optically and physically cooperates with disk **100**, and reads digital information from the disk. Controller **82** controls disk drive **80** based on program instructions executed by microprocessor **84** and stored in memory **86** (and further based on user inputs provided by user interface **88** which may be coupled to controls **58** and/or remote control unit **56**). Video/audio processing block **90** converts digital video and audio information read by disk drive **80** into signals compatible with home color television set **54** using standard techniques such as video and audio decompression and the like. Video/audio processing block **90** may also insert a visual marking indicating the ownership and/or protection of the video program. Block **90** may also introduce a digital marking indicating to a standard recording device that the content should not be recorded.

Example Secure Node Architecture

[0190] FIG. **2**B shows an example architecture for platform **60** shown in FIG. **1**B—which in this example is built around a personal computer **62** but could comprise any number of different types of appliances. In this example, personal computer **62** may be connected to an electronic network **150** such as the Internet via a communications block **152**. Computer equipment **62** may include a video disk drive **80'** (which may be similar or identical to the disk drive **80** included within example player **52**). Computer equipment **62** may further include a microprocessor **154**, a memory **156** (including for example random access memory and read only memory), a magnetic disk drive **158**, and a video/audio processing block **160**. Additionally, computer equipment **62** may include a tamper-resistant secure processing unit **164** or other protected processing environment. Secure node **72** shown in FIG. **1**B may thus be provided by a secure processing unit **164**, software executing on microprocessor **154**, or a combination of the two. Different embodiments may provide secure node **72** using software-only, hardware-only, or hybrid arrangements.

[0191] Secure node **72** in this example may provide and support a general purpose Rights Operating System employing reusable kernel and rights language components. Such a commerce-enabling Rights Operating System provides capabilities and integration for advanced commerce operating systems of the future. In the evolving electronic domain, general purpose, reusable electronic commerce capabilities that all participants can rely on will become as important as any other capability of operating systems. Moreover, a rights operating system that provides, among other things, rights and auditing operating system functions can securely handle a broad range of tasks that relate to a virtual distribution environment. A secure processing unit can, for example, provide or support many of the security functions of the rights and auditing operating system functions. The other operating system functions can, for example, handle general appliance functions. The overall operating system may, for example, be designed from the beginning to include the rights and auditing operating system functions plus the other operating system functions, or the rights and auditing operating system functions may, in another example, be an add-on to a preexisting operating system providing the other operating system functions. Any or all of these features may be used in combination with the invention disclosed herein.

Example Disk Data Structures and Associated Protections

[0192] FIG. **3** shows some example data structures stored on disk **100**. In this example, disk **100** may store one or more properties or other content **200** in protected or unprotected form. Generally, in this example, a property **200** is protected if it is at least in part encrypted and/or associated information needed to use the property is at least in part encrypted and/or otherwise unusable without certain conditions having being met. For example, property **200**(**1**) may be completely or partially encrypted using conventional secure cryptographic techniques. Another property **200**(**2**) may be completely unprotected so that it can be used freely without any restriction. Thus, in accordance with this example, disk **100** could store both a movie as a protected property **200**(**1**) and an unprotected interview with the actors and producers or a "trailer" as unprotected property **200**(**2**). As shown in this example, disk **100** may store any number of different properties **200** in protected or unprotected form as limited only by the storage capacity of the disk.

[0193] In one example, the protection mechanisms provided by disk **100** may use any or all of the protection (and/or other) structures and/or techniques described in the above-referenced Shear patents. The Shear patents describe, by way of non-exhaustive example, means for solving the problem of how to protect digital content from unauthorized use. For example, the Shear patent specifications describe, among other things, means for electronically **6**"overseeing"—through distributed control nodes present in client computers—the use of digital content. This includes means and methods for fulfilling the consequences of any such use.

[0194] Non-limiting examples of certain elements described in the Shear patent specifications include:

[0195] (a) decryption of encrypted information,

[0196] (b) metering,

[0197] (c) usage control in response to a combination of derived metering information and rules set by content providers,

[0198] (d) securely reporting content usage information,

[0199] (e) use of database technology for protected information storage and delivery,

[0200] (f) local secure maintenance of budgets, including, for example, credit budgets,

[0201] (g) local, secure storage of encryption key and content usage information,

[0202] (h) local secure execution of control processes, and

[0203] (i) in many non-limiting instances, the use of optical media.

[0204] Any or all of these features may be used in combination in or with the inventions disclosed herein.

[0205] Certain of the issued Shear patents' specifications also involve database content being local and remote to users. Database information that is stored locally at the end-user's system and complemented by remote, "on-line" database information, can, for example, be used to augment the local information, which in one example, may be stored on optical media (for example, DVD and/or CD-ROM). Special purpose semiconductor hardware can, for example, be used to provide a secure execution environment to ensure a safe and reliable setting for digital commerce activities.

[0206] The Shear patents also describe, among other things, database usage control enabled through the use of security, metering, and usage administration capabilities. The specifications describe, inter alia, a metering and control system in which a database, at least partially encrypted, is delivered to a user (e.g., on optical media). Non-limiting examples of such optical media may, for example, include DVD and CD-ROM. Subsequent usage can, for example, be metered and controlled in any of a variety of ways, and resulting usage information can be transmitted to a responsible party (as one example).

[0207] The Shear patent specifications also describe the generation of a bill in response to the transmitted information. Other embodiments of the Shear patents provide, for example, unique information security inventions which involve, for example, digital content usage being limited based on patterns of usage such as the quantity of particular kinds of usage. These capabilities include monitoring the "contiguousness," and/or "logical relatedness" of used information to ensure that the electronic "conduct" of an individual does not exceed his or her licensed rights. Still other aspects of the Shear patents describe, among other things, capabilities for enabling organizations to securely and locally manage electronic information usage rights. When a database or a portion of a database is delivered to a client site, some embodiments of the Shear patents provide, for example, optical storage means (non-exhaustive examples of which include DVD and CD-ROM) as the mechanism of delivery. Such storage means can store, for example, a collection of video, audio, images, software programs, games, etc., in one example, on optical media, such as DVD and/or CD-ROM, in addition to other content such as a collection of textual documents, bibliographic records, parts catalogs, and copyrighted or uncopyrighted materials of all kinds. Any or all of these features may be used in the embodiments herein.

[0208] One specific non-limiting embodiment could, for example, involve a provider who prepares a collection of games. The provider prepares a database "index" that stores information pertaining to the games, such as for example, the name, a description, a creator identifier, the billing rates, and the maximum number of times or total elapsed time each game may be used prior to a registration or re-registration requirement. Some or all of this information could be stored in encrypted form, in one example, on optical media, non-limiting examples of which include DVD and CD-ROM. The provider may then encrypt some or all portions of the games such that a game could not be used unless one or more encrypted portions were decrypted. Typically, decryption would not occur unless provider specified conditions were satisfied, in one example, unless credit was available to compensate for use and audit information reflecting game usage was being stored. The provider could determine, for example: which user activities he or she would allow, whether to meter such activities for audit and/or control purposes, and what, if any, limits would be set for allowed activities. This might include, for example, the number of times that a game is played, and the duration of each play. Billing rates might be discounted, for example, based on total time of game usage, total number of games currently registered for use, or whether the customer was also registered for other services available from the same provider, etc.

[0209] In the non-limiting example discussed above, a provider might, for example, assemble all of the prepared games along with other, related information, and publish the collection on optical media, non-limiting examples of which include CD-ROM and/or DVD. The provider might then distribute this DVD disk to prospective customers. The customers could then select the games they wish to play, and contact the provider. The provider, based on its business model, could then send enabling information to each authorized customer, such as for example, including, or enabling for use, decryption keys for the encrypted portion of the selected games (alternatively, authorization to use the games may have arrived with the DVD and/or CD-ROM disk, or might be automatically determined, based on provider set criteria, by the user's secure client system, for example, based on a user's participation in a certified user class). Using the user's client decryption and metering mechanism the customer could then make use of the games. The mechanism might then record usage information, such as for example, the number of times the game was used, and, for example, the duration of each play. It could periodically transmit this information the game provider, thus substantially reducing the administration overhead requirements of the provider's central servers. The game provider could receive compensation for use of the games based upon the received audit information. This information could be used to either bill their customers or, alternatively, receive compensation from a provider of credit.

[0210] Although games provide one convenient, non-limiting example, many of these same ideas can be easily applied to all kinds of content, all kinds of properties, including, by way of non-limiting examples:

[0211] video,

[0212] digitized movies,

[0213] audio

[0214] images,

[0215] multimedia,

[0216] software,

[0217] games,

[0218] any other kind of property

[0219] any combination of properties.

[0220] Other non-limiting embodiments of the Shear patent specifications support, for example, securely controlling different kinds of user activities, such as displaying, printing, saving electronically, communicating, etc. Certain aspects further apply different control criteria to these different usage activities. For example, information that is being browsed may be distinguished from information that is read into a host computer for the purpose of copying, modifying, or telecommunicating, with different cost rates being applied to the different activities (so that, for example, the cost of browsing can be much less than the cost of copying or printing).

[0221] The Shear patent specifications also, for example, describe management of information inside of organizations by both publishers and the customer. For example, an optional security system can be used to allow an organization to prevent usage of all or a portion of an information base unless the user enters his security code. Multiple levels of security codes can be supported to allow restriction of an individual's use according to his security authorization level. One embodiment can, for example, use hardware in combination with software to improve tamper resistance, and another embodiment could employ an entirely software based system. Although a dedicated hardware/software system may under certain circumstances provide assurance against tampering, techniques which may be implemented in software executing on a non-dedicated system may provide sufficient tamper resistance for some applications. Any or all of these features may be used in combination with the technology disclosed in this patent specification.

FIG. **3** Disks May also Store Metadata, Controls and Other Information

[0222] In this example, disk **100** may also store "metadata" in protected and/or unprotected form. Player **52** uses metadata **202** to assist in using one or more of the properties **200** stored by disk **100**. For example, disk **100** may store one metadata block **202**(**1**) in unprotected form and another metadata block **202**(**2**) in protected form. Any number of metadata blocks **202** in protected and/or unprotected form may be stored by disk **100** as limited only by the disk's storage capacity. In this example, metadata **202** comprises information used to access properties **200**. Such metadata **202** may comprise, for example, frame sequence or other "navigational" information that controls the playback sequence of one or more of the properties **200** stored on disk **100**. As one example, an unprotected metadata block **202** may access only selected portions of a protected property **200** to generate an abbreviated "trailer" presentation, while protected metadata block **202** may contain the frame playback sequence for the entire video presentation of the property **200**. As another example, different metadata blocks **202** may be provided for different "cuts" of the same motion picture property **200** (e.g., an R-rated version, a PG-rated version, a director's cut version, etc.).

[0223] In this example, disk **100** may store additional information for security purposes. For example, disk **100** may store control rules in the form of a control set **204**—which may be packaged in the form of one or more secure containers **206**. Commerce model participants can securely contribute electronic rules and controls that represent their respective "electronic" interests. These rules and controls extend a "Virtual Presence™" through which the commerce participants may govern remote value chain activities according to their respective, mutually agreed to rights. This Virtual Presence may take the form of participant specified electronic conditions (e.g., rules and controls) that must be satisfied before an electronic event may occur. These rules and controls can be used to enforce the party's rights during "downstream" electronic commerce activities. Control information delivered by, and/or otherwise available for use with, VDE content containers may, for example, constitute one or more "proposed" electronic agreements which manage the use and/or consequences of the use of such content and which can enact the terms and conditions of agreements involving multiple parties and their various rights and obligations.

[0224] The rules and controls from multiple parties can be used, in one example, to form aggregate control sets ("Cooperative Virtual Presence™") that ensure that electronic commerce activities will be consistent with the agreements amongst value chain participants. These control sets may, for example, define the conditions which govern interaction with protected digital content (disseminated digital content, appliance control information, etc.). These conditions can, for example, be used to control not only digital information use itself, but also the consequences of such use. Consequently, the individual interests of commerce participants are protected and cooperative, efficient, and flexible electronic commerce business models can be formed. These models can be used in combination with the present invention.

Disks May Store Encrypted Information

[0225] Disk **100** may also store an encrypted key block **208**. In this example, disk **100** may further store one or more hidden keys **210**. In this example, encrypted key block **208** provides one or more cryptographic keys for use in decrypting one or more properties **200** and/or one or more metadata blocks **202**. Key block **208** may provide different cryptographic keys for decrypting different properties **200** and/or metadata blocks **202**, or different portions of the same property and/or metadata block. Thus, key block **208** may comprise a large number of cryptographic keys, all of which are or may be required if all of the content stored by disk **100** is to be used. Although key block **208** is shown in FIG. **3** as being separate from container **206**, it may be included within or as part of the container if desired.

[0226] Cryptographic key block **208** is itself encrypted using one or more additional cryptographic keys. In order for player **52** to use any of the protected information stored on disk **100**, it must first decrypt corresponding keys within the encrypted key block **208**—and then use the decrypted keys from the key block to decrypt the corresponding content.

[0227] In this example, the keys required to decrypt encrypted key block **208** may come from several different (possibly alternative) sources. In the example shown in FIG.

3, disk **100** stores one or more decryption keys for decrypting key block **208** on the medium itself in the form of a hidden key(s) **210**. Hidden key(s) **210** may be stored, for example, in a location on disk **100** not normally accessible. This "not normally accessible" location could, for example, be physically enabled for drives **80** installed in players **52** and disabled for drives **80'** installed in personal computers **62**. Enablement could be provided by different firmware, a jumper on drive **80**, etc. Hidden key(s) **210** could be arranged on disk **100** so that any attempt to physically copy the disk would result in a failure to copy the hidden key(s). In one example a hidden key(s) could be hidden in the bit stream coding sequences for one or more blocks as described by J. Hogan (Josh Hogan, "DVD Copy Protection," presentation to DVD copy protect technical meeting #4, May 30, 1996, Burbank, Calif.)

[**0228**] Alternatively, and/or in addition, keys required to decrypt encrypted key block **208** could be provided by disk drive **80**. In this example, disk drive **80** might include a small decryption component such as, for example, an integrated circuit decryption engine including a small secure internal key store memory **212** having keys stored therein. Disk drive **80** could use this key store **212** in order to decrypt encrypted key block **208** without exposing either keys **212** or decrypted key block **208**—and then use the decrypted key from key block **208** to decrypt protected content **200**, **202**.

Disks May Store and/or Use Secure Containers

[**0229**] In yet another example, the key(s) required to decrypt protected content **200**, **202** is provided within secure container **206**. FIG. **3**A shows a possible example of a secure container **206** including information content **304** (properties **200** and metadata **202** may be external to the container—or alternatively, most or all of the data structures stored by video disk **100** may be included as part of a logical and/or actual protected container). The control set **204** shown in FIG. **3** may comprise one or more permissions record **306**, one or more budgets **308** and/or one or more methods **310** as shown in FIG. **3**A. FIG. **3**B shows an example control set **204** providing one or more encryption keys **208**, one or more content identifiers **220**, and one or more controls **222**. In this example, different controls **222** may apply to different equipment and/or classes of equipment such as player **52** and/or computer equipment **62** depending upon the capabilities of the particular platform and/or class of platform. Additionally, controls **220** may apply to different ones of properties **200** and/or different ones of metadata blocks **202**. For example, a control **222**(**1**) may allow property **200**(**1**) to be copied only once for archival purposes by either player **52** or computer equipment **62**. A control **222**(**2**) (which may be completely ignored by player **52** because it has insufficient technical and/or security capabilities but which may be useable by computer equipment **62** with its secure node **72**) may allow the user to request and permit a public performance of the same property **200**(**1**) (e.g., for showing in a bar or other public place) and cause the user's credit or other account to be automatically debited by a certain amount of compensation for each showing. A third control **222**(**3**) may, for example, allow secure node **72** (but not player **52**) to permit certain classes of users (e.g., certified television advertisers and journalists) to extract or excerpt certain parts of protected property **200**(**1**) for promotional uses. A further control **222**(**4**) may, as another example, allow both video player **52** and secure node **72** to view certain still frames within property **200**(**1**)—but might allow only secure node **72** to make copies of the still frames based on a certain compensation level.

Example Disks and/or System may Make Use of Trusted Infrastructure

[**0230**] Controls **222** may contain pointers to sources of additional control sets for one or more properties, controls, metadata, and/or other content on the optical disk. In one example, these additional controls may be obtained from a trusted third party, such as a rights and permissions clearinghouse and/or from any other value chain participant authorized by at least one rightsholder to provide at least one additional control set. This kind of rights and permissions clearinghouse is one of several distributed electronic administrative and support services that may be referred to as the "Distributed Commerce Utility," which, among other things, is an integrated, modular array of administrative and support services for electronic commerce and electronic rights and transaction management. These administrative and support services can be used to supply a secure foundation for conducting financial management, rights management, certificate authority, rules clearing, usage clearing, secure directory services, and other transaction related capabilities functioning over a vast electronic network such as the Internet and/or over organization internal Intranets, or even in—home networks of electronic appliances. Non-limiting examples of these electronic appliances include at least occasionally connected optical media appliances, examples of which include read-only and/or writable DVD players and DVD drives in computers and convergent devices, including, for example, digital televisions and settop boxes incorporating DVD drives.

[**0231**] These administrative and support services can, for example, be adapted to the specific needs of electronic commerce value chains in any number of vertical markets, including a wide variety of entertainment applications. Electronic commerce participants can, for example, use these administrative and support services to support their interests, and/or they can shape and reuse these services in response to competitive business realities. Non-exhaustive examples of electronic commerce participants include individual creators, film and music studios, distributors, program aggregators, broadcasters, and cable and satellite operators.

[**0232**] The Distributed Commerce Utility can, for example, make optimally efficient use of commerce administration resources, and can, in at least some embodiments, scale in a practical fashion to optimally accommodate the demands of electronic commerce growth.

[**0233**] The Distributed Commerce Utility may, for example, comprise a number of Commerce Utility Systems. These Commerce Utility Systems can provide a web of infrastructure support available to, and reusable by, the entire electronic community and/or many or all of its participants. Different support functions can, for example, be collected together in hierarchical and/or in networked relationships to suit various business models and/or other objectives. Modular support functions can, for example, be combined in different arrays to form different Commerce Utility Systems for different design implementations and purposes. These Commerce Utility Systems can, for example, be distributed across a large number of electronic appliances with varying degrees of distribution.

[0234] The "Distributed Commerce Utility" provides numerous additional capabilities and benefits that can be used in conjunction with the particular embodiments shown in the drawings of this application, non-exhaustive examples of which include:

[0235] Enables practical and efficient electronic commerce and rights management.

[0236] Provides services that securely administer and support electronic interactions and consequences.

[0237] Provides infrastructure for electronic commerce and other forms of human electronic interaction and relationships.

[0238] Optimally applies the efficiencies of modern distributed computing and networking.

[0239] Provides electronic automation and distributed processing.

[0240] Supports electronic commerce and communications infrastructure that is modular, programmable, distributed and optimally computerized.

[0241] Provides a comprehensive array of capabilities that can be combined to support services that perform various administrative and support roles.

[0242] Maximizes benefits from electronic automation and distributed processing to produce optimal allocation and use of resources across a system or network.

[0243] Is efficient, flexible, cost effective, configurable, reusable, modifiable, and generalizable.

[0244] Can economically reflect users' business and privacy requirements.

[0245] Can optimally distribute processes—allowing commerce models to be flexible; scaled to demand and to match user requirements.

[0246] Can efficiently handle a full range of activities and service volumes.

[0247] Can be fashioned and operated for each business model, as a mixture of distributed and centralized processes.

[0248] Provides a blend of local, centralized and networked capabilities that can be uniquely shaped and reshaped to meet changing conditions.

[0249] Supports general purpose resources and is reusable for many different models; in place infrastructure can be reused by different value chains having different requirements.

[0250] Can support any number of commerce and communications models.

[0251] Efficiently applies local, centralized and networked resources to match each value chain's requirements.

[0252] Sharing of common resources spreads out costs and maximizes efficiency.

[0253] Supports mixed, distributed, peer-to-peer and centralized networked capabilities.

[0254] Can operate locally, remotely and/or centrally.

[0255] Can operate synchronously, asynchronously, or support both modes of operation.

[0256] Adapts easily and flexibly to the rapidly changing sea of commercial opportunities, relationships and constraints of "Cyberspace."

[0257] Any or all of these features may be used in combination with the inventions disclosed herein.

[0258] The Distributed Commerce Utility provides, among other advantages, comprehensive, integrated administrative and support services for secure electronic commerce and other forms of electronic interaction. These electronic interactions supported by the Distributed Commerce Utility may, in at least some embodiments, entail the broadest range of appliances and distribution media, non-limiting examples of which include networks and other communications channels, consumer appliances, computers, convergent devices such as WebTV, and optical media such as CD-ROM and DVD in all their current and future forms.

Example Access Techniques

[0259] FIGS. **3**, **4**A and **4**B show example access techniques provided by player **52**. In this example, upon disk **100** being loaded into player disk drive **80** (FIG. **4**A, block **400**), the player controller **82** may direct drive **80** to fetch hidden keys **210** from disk **100** and use them to decrypt some or all of the encrypted key block **208** (FIG. **4**A, block **402**). In this example, drive **80** may store the keys so decrypted without exposing them to player controller **82** (e.g., by storing them within key store **212** within a secure decryption component such as an integrated circuit based decryption engine) (FIG. **4**A, block **404**). The player **52** may control drive **80** to read the control set **204** (which may or may not be encrypted) from disk **100** (FIG. **4**A, block **406**). The player microprocessor **82** may parse control set **204**, ignore or discard those controls **222** that are beyond its capability, and maintain permissions and/or rights management information corresponding to the subset of controls that it can enforce (e.g., the "copy once" control **222**(**1**)).

[0260] Player **52** may then wait for the user to provide a request via control inputs **58** and/or remote control unit **56**. If the control input is a copy request ("yes" exit to FIG. **4**A, decision block **408**), then player microprocessor **84** may query control **222**(**1**) to determine whether copying is allowed, and if so, under what conditions (FIG. **4**A, decision block **410**). Player **52** may refuse to copy the disk **100** if the corresponding control **222**(**1**) forbids copying ("no" exit to FIG. **4**A, decision block **410**), and may allow copying (e.g., by controlling drive **80** to sequentially access all of the information on disk **100** and provide it to an output port not shown) if corresponding control **222**(**1**) permits copying ("yes" exit to FIG. **4**A, decision block **410**; block **412**). In this example, player **52** may, upon making a copy, store an identifier associated with disk **100** within an internal, non-volatile memory (e.g., controller memory **86**) or elsewhere if control **222**(**1**) so requires. This stored disk identifier can be used by player **52** to enforce a "copy once" restriction (i.e., if the user tries to use the same player to copy the same disk more than once or otherwise as forbidden by control **222**(**1**), the player can deny the request).

[0261] If the user requests one of properties **200** to be played or read ("yes" exit to FIG. **4**A, decision block **414**), player controller **82** may control drive **80** to read the

corresponding information from the selected property **200** (e.g., in a sequence as specified by metadata **202**) and decrypt the read information as needed using the keys initially obtained from key block **208** and now stored within drive key storage **212** (FIG. **4**A, block **416**).

[**0262**] FIG. **4**B is a variation on the FIG. **4**A process to accommodate a situation in which player **52** itself provides decryption keys for decrypting encrypted key block **208**. In this example, controller **82** may supply one or more decryption keys to drive **80** using a secure protocol such a Diffie-Hellman key agreement, or through use of a shared key known to both the drive and some other system or component to which the player **52** is or once was coupled (FIG. **4**B, block **403**). The drive **80** may use these supplied keys to decrypt encrypted key block **208** as shown in FIG. **4**A, block **404**, or it may use the supplied keys to directly decrypt content such as protected property **200** and/or protected metadata **202**(**2**).

[**0263**] As a further example, the player **52** can be programmed to place a copy it makes of a digital property such as a film in encrypted form inside a tamper-resistant software container. The software container may carry with it a code indicating that the digital property is a copy rather than an original. The sending player **52** may also put its own unique identifier (or the unique identifier of an intended receiving device such as another player **52**, a video cassette player or equipment **50**) in the same secure container to enforce a requirement that the copy can be played only on the intended receiving device. Player **52** (or other receiving device) can be programmed to make no copies (or no additional copies) upon detecting that the digital property is a copy rather than an original. If desired, a player **52** can be programmed to refuse to play a digital property that is not packaged with the player's unique ID.

Example Use of Analog Encoding Techniques

[**0264**] In another example, more comprehensive rights management information may be encoded by player **52** in the analog output using methods for watermarking and/or fingerprinting. Today, a substantial portion of the "real world" is analog rather than digital. Despite the pervasiveness of analog signals, existing methods for managing rights and protecting copyright in the analog realm are primitive or non-existent. For example:

[**0265**] Quality degradation inherent in multigenerational analog copying has not prevented a multi-billion dollar pirating industry from flourishing.

[**0266**] Some methods for video tape copy and pay per view protection attempt to prevent any copying at all of commercially released content, or allow only one generation of copying. These methods can generally be easily circumvented.

[**0267**] Not all existing devices respond appropriately to copy protection signals.

[**0268**] Existing schemes are limited for example to "copy/no copy" controls.

[**0269**] Copy protection for sound recordings has not been commercially implemented.

[**0270**] A related problem relates to the conversion of information between the analog and digital domains. Even if information is effectively protected and controlled initially using strong digital rights management techniques, an analog copy of the same information may no longer be securely protected.

[**0271**] For example, it is generally possible for someone to make an analog recording of program material initially delivered in digital form. Some analog recordings based on digital originals are of quite good quality. For example, a Digital Versatile Disk ("DVD") player may convert a movie from digital to analog format and provide the analog signal to a high quality analog home VCR. The home VCR records the analog signal. A consumer now has a high quality analog copy of the original digital property. A person could re-record the analog signal on a DVD-RAM. This recording will in many circumstances have substantial quality—and would no longer be subject to "pay per view" or other digital rights management controls associated with the digital form of the same content.

[**0272**] Since analog formats will be with us for a long time to come, rightsholders such as film studios, video rental and distribution companies, music studios and distributors, and other value chain participants would very much like to have significantly better rights management capabilities for analog film, video, sound recordings and other content. Solving this problem generally requires a way to securely associate rights management information with the content being protected.

[**0273**] In combination with other rights management capabilities, watermarking and/or fingerprinting, may provide "end to end" secure rights management protection that allows content providers and rights holders to be sure their content will be adequately protected—irrespective of the types of devices, signaling formats and nature of signal processing within the content distribution chain. This "end to end" protection also allows authorized analog appliances to be easily, seamlessly and cost-effectively integrated into a modern digital rights management architecture.

[**0274**] Watermarking and/or fingerprinting may carry, for example, control information that can be a basis for a Virtual Distribution Environment ("VDE") in which electronic rights management control information may be delivered over insecure (e.g., analog) communications channels. This Virtual Distribution Environment is highly flexible and convenient, accommodating existing and new business models while also providing an unprecedented degree of flexibility in facilitating ad hoc creation of new arrangements and relationships between electronic commerce and value chain participants—regardless of whether content is distributed in digital and/or analog formats.

[**0275**] Watermarking together with distributed, peer-to-peer rights management technologies providers numerous advantages, including, but not limited to:

[**0276**] An indelible and invisible, secure technique for providing rights management information.

[**0277**] An indelible method of associating electronic commerce and/or rights management controls with analog content such as film, video, and sound recordings.

[**0278**] Persistent association of the commerce and/or rights management controls with content from one end

of a distribution system to the other—regardless of the number and types of transformations between signaling formats (for example, analog to digital, and digital to analog).

[0279] The ability to specify "no copy/one copy/many copies" rights management rules, and also more complex rights and transaction pricing models (such as, for example, "pay per view" and others).

[0280] The ability to fully and seamlessly integrate with comprehensive, general electronic rights management solutions.

[0281] Secure control information delivery in conjunction with authorized analog and other non-digital and/or non-secure information signal delivery mechanisms.

[0282] The ability to provide more complex and/or more flexible commerce and/or rights management rules as content moves from the analog to the digital realm and back.

[0283] The flexible ability to communicate commerce and/or rights management rules implementing new, updated, or additional business models to authorized analog and/or digital devices.

[0284] Any or all of these features may be used in combination in and/or with the inventions disclosed in the present specification.

[0285] Briefly, watermarking and/or fingerprinting methods may, using "steganographical" techniques, substantially indelibly and substantially invisibly encode rights management and/or electronic commerce rules and controls within an information signal such as, for example, an analog signal or a digitized (for example, sampled) version of an analog signal, non-limiting examples of which may include video and/or audio data, that is then decoded and utilized by the local appliance. The analog information and stenographically encoded rights management information may be transmitted via many means, non-limiting examples of which may include broadcast, cable TV, and/or physical media, VCR tapes, to mention one non-limiting example. Any or all of these techniques may be used in combination in accordance with the inventions disclosed herein.

[0286] Watermarking and/or fingerprinting methods enable at least some rights management information to survive transformation of the video and/or other information from analog to digital and from digital to analog format. Thus in one example, two or more analog and/or digital appliances may participate in an end-to-end fabric of trusted, secure rights management processes and/or events.

Example, More Capable Embodiments

[0287] As discussed above, the example control set shown in FIG. **3**B provides a comprehensive, flexible and extensible set of controls for use by both player **52** and computer equipment **62** (or other platform) depending upon the particular technical, security and other capabilities of the platform. In this example, player **52** has only limited technical and security capabilities in order to keep cost and complexity down in a mass-produced consumer item, and therefore may essentially ignore or fail to enable some or all of the controls **222** provided within control set **204**. In another example, the cost of memory and/or processors may continue to decline and manufacturers may choose to expand the technical and security capabilities of player **52**. A more capable player **52** will provide more powerful, robust, and flexible rights management capabilities.

[0288] FIG. **5** shows an example arrangement permitting platform **60** including secure node **72** to have enhanced and/or different capabilities to use information and/or rights management information on disk **100**, and FIG. **6** shows an example access technique provided by the secure node. Referring to FIG. **5**, secure node **72** may be coupled to a network **150** whereas player **52** may not be—giving the secure node great additional flexibility in terms of communicating security related information such as audit trails, compensation related information such as payment requests or orders, etc. This connection of secure node **72** to network **150** (which may be replaced in any given application by some other communications technique such as insertion of a replaceable memory cartridge) allows secure node **72** to receive and securely maintain rights management control information such as an additional container **206'** containing an additional control set **204'**. Secure node **72** may use control set **204'** in addition or in lieu of a control set **204** stored on disk **100**. Secure node **72** may also maintain a secure cryptographic key store **212** that may provide cryptographic keys to be used in lieu of or in addition to any keys **208**, **210** that may be stored on disk **100**. Because of its increased security and/or technical capabilities, secure node **72** may be able to use controls **222** within control set **204** that player **52** ignores or cannot use—and may be provided with further and/or enhanced rights and/or rights management capabilities based on control set **204'** (which the user may, for example, order specially and which may apply to particular properties **200** stored on disk **100** and/or particular sets of disks).

Example Secure Node Access Techniques

[0289] The FIG. **6** example access technique (which may be performed by platform **60** employing secure node **72**, for example) involves, in this particular example, the secure node **72** fetching property identification information **220** from disk **100** (FIG. **6**, block **502**), and then locating applicable control sets and/or rules **204** (which may be stored on disk **100**, within secure node **72**, within one or more repositories the secure node **72** accesses via network **150**, and/or a combination of any or all of these techniques) (FIG. **6**, block **504**). Secure node **72** then loads the necessary decryption keys and uses them to decrypt information as required (FIG. **6**, block **506**). In one example, secure node **72** obtains the necessary keys from secure containers **206** and/or **206'** and maintains them within a protected processing environment such as SPU **164** or a software-emulated protected processing environment without exposing them externally of that environment. In another example, the secure node **72** may load the necessary keys (or a subset of them) into disk drive **82'** using a secure key exchange protocol for use by the disk drive in decrypting information much in the same manner as would occur within player **52** in order to maintain complete compatibility in drive hardware.

[0290] Secure node **72** may monitor user inputs and perform requested actions based on the particular control set **204**, **204'**. For example, upon receiving a user request, secure node **72** may query the control set **204**, **204'** to

determine whether it (they) permits the action the user has requested (FIG. **6**, block **508**) and, if permitted, whether conditions for performing the requested operation have been satisfied (FIG. **6**, block **510**). In this example, secure node **72** may effect the operations necessary to satisfy any such required conditions such as by, for example, debiting a user's locally-stored electronic cash wallet, securely requesting an account debit via network **150**, obtaining and/or checking user certificates to ensure that the user is within an appropriate class or is who he or she says he is, etc.—using network **150** as required (FIG. **6**, block **510**). Upon all necessary conditions being satisfied, secure node **72** may perform the requested operation (and/or enable microprocessor **154** to perform the operation) (e.g., to release content) and may then generate secure audit records which can be maintained by the secure node and/or reported at the time or later via network **150** (FIG. **6**, block **512**).

[**0291**] If the requested operation is to release content (e.g., make a copy of the content), platform **60** (or player **52** in the example above) may perform the requested operation based at least in part on the particular controls that enforce rights over the content. For example, the controls may prevent platform **60** from releasing content except to certain types of output devices that cannot be used to copy the content, or they may release the content in a way that discourages copying (e.g., by "fingerprinting" the copy with an embedded designation of who created the copy, by intentionally degrading the released content so that any copies made from it will be inferior, etc.). As one specific example, a video cassette recorder (not shown) connected to platform **60** may be the output device used to make the copy. Because present generations of analog devices such as video cassette recorders are incapable of making multigenerational copies without significant loss in quality, the content provider may provide controls that permit content to be copied by such analog devices but not by digital devices (which can make an unlimited number of copies without quality loss). For example, platform **60** may, under control of digital controls maintained by secure node **72**, release content to the video cassette recorder only after the video cassette recorder supplies the platform a digital ID that designates the output device as a video cassette recorder—and may refuse to provide any output at all unless such a digital ID identifying the output device as a lower quality analog device is provided. Additionally or in the alternative, platform **60** may intentionally degrade the content it supplies to the video cassette recorder to ensure that no acceptable second-generation copies will be made. In another example, more comprehensive rights management information may be encoded by platform **60** in the analog output using watermarking and/or fingerprinting.

Additional Examples of Secure Container Usage

[**0292**] FIG. **7** shows a basic example of a DVD medium **700** containing a kind of secure container **701** for use in DVDs in accordance with the present invention. As shown in this example, container **701** ("DigiBox for DVDs") could be a specialized version of a "standard" container tailored especially for use with DVD and/or other media, or it could, alternatively (in an arrangement shown later in FIG. **8**), be a fully "standard" container. As shown in this example, the specialized container **701** incorporates features that permit it to be used in conjunction with content information, metadata, and cryptographic and/or protection information that is stored on the DVD medium **700** in the same manner as would have been used had container **701** not been present. Thus, specialized container **701** provides compatibility with existing data formats and organizations used on DVDs and/or other media. In addition, a specialized container **701** can be tailored to support only those features necessary for use in support of DVD and/or other media, so that it can be processed and/or manipulated using less powerful or less expensive computing resources than would be required for complete support of a "standard" container object.

[**0293**] In this example, specialized "DVD only" container **701** includes a content object (a property) **703** which includes an "external reference"**705** to video title content **707**, which may be stored on the DVD and/or other medium in the same manner as would have been used for a medium not including container **701**. The video title content **707** may include MPEG-2 and/or AC-3 content **708**, as well as scrambling (protection) information **710** and header, structure and/or meta data **711**. External reference **705** contains information that "designates" (points to, identifies, and/or describes) specific external processes to be applied/executed in order to use content and other information not stored in container **701**. In this example, external reference **705** designates video title content **707** and its components **708**, **710**, and **711**. Alternatively, container **701** could store some or all of the video title content in the container itself, using a format and organization that is specific to container **701**, rather than the standard format for the DVD and/or other medium **700**.

[**0294**] In this example, container **701** also includes a control object (control set) **705** that specifies the rules that apply to use of video title content **707**. As indicates by solid arrow **702**, control object **705**"applies to" content object (property) **703**. As shown in this example, rule **704** can specify that protection processes, for example CGMA or the Matsushita data scrambling process, be applied, and can designate, by external reference **709** contained in rule **704**, data scrambling information **710** to be used in carrying out the protection scheme. The shorthand "do CGMA" description in rule **704** indicates that the rule requires that the standard CGMA protection scheme used for content on DVD media is to be used in conjunction with video title content **707**, but a different example could specify arbitrary other rules in control object **705** in addition to or instead of the "do CGMA" rule, including other standard DVD protection mechanisms such as the Matsushita data scrambling scheme and/or other rights management mechanisms. External reference **709** permits rule **704** to be based on protection information **710** that is stored and manipulated in the same format and manner as for a DVD medium that does not incorporate container **701** and/or protection information that is meaningful only in the context of processing container **701**.

[**0295**] FIG. **8** shows a example of a DVD medium **800** containing a "standard" secure container **801**. In this example, the "standard" container provides all of the functionality (if desired) of the FIG. **7** container, but may offer additional and/or more extensive rights management and/or content use capabilities than available on the "DVD only" container (e.g., the capacity to operate with various different platforms that use secure nodes).

[**0296**] FIG. **9** shows a more complex example of DVD medium **800** having a standard container **901** that provides

all of the functionality (if desired) of the FIG. **7** container, and that can function in concert with other standard containers **902** located either on the same DVD medium or imported from another remote secure node or network. In this example, standard container **902** may include a supplementary control object **904** which applies to content object **903** of standard container **901**. Also in this example, container **902** may provide an additional rule(s) such as, for example, a rule permitting/extending rights to allow up to a certain number (e.g., five) copies of the content available on DVD **900**. This arrangement, for example, provides added flexibility in controlling rights management of DVD content between multiple platforms via access through "backchannels" such as via a set-top box or other hardware having bi-directional communications capabilities with other networks or computers.

Additional Use of a DVD Disk with a Secure Container

[**0297**] FIG. **10** illustrates the use of a "new" DVD disk—i.e., one that includes a special DVD secure container in the medium. This container may, in one example, be used or two possible use scenarios: a first situation in which the disk is used on an "old" player (DVD appliance, i.e., a DVD appliance that is not equipped with a secure node to provide rights management in accordance with the present invention; and a second situation in which the disk is used on a "new" player—i.e., a DVD appliance which is equipped with a secure node to provide rights management in accordance with the present invention. In this example, a secure node within the "new" player is configured with the necessary capabilities to process other copy protection information such as, for example, CGMA control codes and data scrambling formats developed and proposed principally by Matsushita.

[**0298**] For example, in the situation shown in FIG. **10**, the "new" player (which incorporates a secure node in accordance with the present invention) can recognize the presence of a secure container on the disk. The player may then load the special DVD secure container from the disk into the resident secure node. The secure node opens the container, and implements and/or enforces appropriate rules and usage consequences associated with the content by applying rules from the control object. These rules are extremely flexible. In one example, the rules may, for example, call for use of other protection mechanisms (such as, for example, CGMA protection codes and Matsushita data scrambling) which can be found in the content (or property) portion of the container.

[**0299**] In another example shown in FIG. **10**, the special DVD container on the disk still allows the "old" player to use to a predetermined limited amount content material which may be used in accordance with conventional practices.

Example Use of a DVD Disk with No Secure Container

[**0300**] Referring now to FIG. **11**, a further scenario is discussed. FIG. **11** illustrates use of an "old" DVD disk with two possible use examples: a first example in which the disk is used on an "old" player—i.e., a DVD appliance that is not equipped with a secure node for providing rights management in accordance with the present invention—and a second example in which the disk is used on a "new" player (i.e., equipped with a secure node).

[**0301**] In the first case, the "old" player will play the DVD content in a conventional manner. In the second scenario, the "new" player will recognize that the disk does not have a container stored in the medium. It therefore constructs a "virtual" container in resident memory of the appliance. To do this, it constructs a container content object, and also constructs a control object containing the appropriate rules. In one particular example, the only applicable rule it need apply is to "do CGMA"—but in other examples, additional and/or different rules could be employed. The virtual container is then provided to the secure node within the "new" player for implementing management of use rights in accordance with the present invention. Although not shown in FIGS. **10** and **11**, use of "external references" may also be provided in both virtual and non-virtual containers used in the DVD context.

Example Illustrative Arrangements for Sharing, Brokering and Combining Rights when Operating in at Least Occasionally Connected Scenarios

[**0302**] As described above, the rights management resources of several different devices and/or other systems can be flexibly combined in diverse logical and/or physical relationships, resulting for example in greater and/or differing rights. Such rights management resource combinations can be effected through connection to one or more remote rights authorities. FIGS. **12-14** show some non-limiting examples of how rights authorities can be used in various contexts.

[**0303**] For example, FIG. **12** shows a rights authority broker **1000** connected to a local area network (LAN) **1002**. LAN **1002** may connect to wide area network if desired. LAN **1002** provides connectivity between rights authority broker **1000** and any number of appliances such as for example a player **50**, a personal computer **60**, a CD "tower" type server **1004**. In the example shown, LAN **1002** includes a modem pool (and/or network protocol server, not shown) **1006** that allows a laptop computer **1008** to connect to the rights authority broker **1000** via dial-up lines **1010**. Alternatively, laptop **1008** could communicate with rights authority broker **1000** using other network and/or communication means, such as the Internet and/or other Wide Area Networks (WANs). A disk player **50**A may be coupled to laptop **1008** at the laptop location. In accordance with the teachings above, any or all of devices shown in FIG. **12** may include one or more secure nodes **72**.

[**0304**] Rights authority broker **1000** may act as an arbiter and/or negotiator of rights. For example, laptop **1008** and associated player **50**A may have only limited usage rights when operating in a stand-alone configuration. However, when laptop **1008** connects to rights authority broker **1000** via modem pool **1006** and LAN **1002** and/or by other communication means, the laptop may acquire different and/or expanded rights to use disks **100** (e.g., availability of different content portions, different pricing, different extraction and/or redistribution rights, etc.) Similarly, player **50**, equipment **60** and equipment **1004** may be provided with an enhanced and/or different set of disk usage rights through communication with rights authority broker **1000** over LAN **1002**. Communication to and from rights authority broker **1000** is preferably secured through use of containers of the type disclosed in the above-referenced Ginter et al. patent specification.

[**0305**] FIG. **13** shows another example use of a rights authority broker **1000** within a home environment. In this

example, the laptop computer **1008** may be connected to a home-based rights authority broker **1000** via a high speed serial IEEE 1394 bus and/or by other electronic communication means. In addition, rights authority broker **1000** can connect with any or all of:

[**0306**] a high definition television **1100**,

[**0307**] one or more loudspeakers **1102** or other audio transducers,

[**0308**] one or more personal computers **60**,

[**0309**] one or more set-top boxes **1030**,

[**0310**] one or more disk players **50**,

[**0311**] one or more other rights authority brokers **1000**A-**1000**N and

[**0312**] any other home or consumer equipment or appliances.

[**0313**] Any or all of the equipment listed above may include a secure node **72**.

[**0314**] FIG. **14** shows another example use of a rights authority broker **1000**. In this example, rights authority broker **1000** is connected to a network **1020** such as a LAN, a WAN, the Internet, etc. Network **1020** may provide connectivity between rights authority broker **1000** and any or all of the following equipment:

[**0315**] one or more connected or occasionally connected disk players **50**A, **50**B;

[**0316**] one more networked computers **1022**;

[**0317**] one or more disk reader towers/servers **1004**;

[**0318**] one or more laptop computers **1008**;

[**0319**] one or more Commerce Utility Systems such as a rights and permissions clearinghouse **1024** (see Shear et al., "Trusted Infrastructure . . . " specification referenced above);

[**0320**] one or more satellite or other communications uplinks **1026**;

[**0321**] one or more cable television head-ends **1028**;

[**0322**] one or more set-top boxes **1030** (which may be connected to satellite downlinks **1032** and/or disk players **50**C);

[**0323**] one or more personal computer equipment **60**;

[**0324**] one or more portable disk players **1034** (which may be connected through other equipment, directly, and/or occasionally unconnected;

[**0325**] one or more other rights authority brokers **1000**A-**1000**N; and

[**0326**] any other desired equipment.

[**0327**] Any or all of the above-mentioned equipment may include one or more secure nodes **72**. Rights authority broker **1000** can distribute and/or combine rights for use by any or all of the other components shown in FIG. **14**. For example, rights authority broker **100** can supply further secure rights management resources to equipment connected to the broker via network **1020**. Multiple equipment shown in FIG. **14** can participate and work together in a permanently or temporarily connected network **1020** to share the rights management for a single node. Rights associated with parties and/or groups using and/or controlling such multiple devices and/or other systems can be employed according to underlying rights related rules and controls. As one example, rights available through a corporate executive's laptop computer **1008** might be combined with or substituted for, in some manner, the rights of one or more subordinate corporate employees when their computing or other devices **60** are coupled to network **1020** in a temporary networking relationship. In general, this aspect of the invention allows distributed rights management for DVD or otherwise packaged and delivered content that is protected by a distributed, peer-to-peer rights management. Such a distributed rights management can operate whether the DVD appliance or other content usage device is participating in a permanently or temporarily connected network **1020**, and whether or not the relationships among the devices and/or other systems participating in the distributed rights management arrangement are relating temporarily or have a more permanent operating relationship.

[**0328**] For example, laptop computer **1008** may have different rights available depending on the context in which that device is operating. For example, in a general corporate environment such as shown in FIG. **12**, the laptop **1008** may have one set of rights. However, the same laptop **1008** may be given a different set of rights when connected to a more general network **1020** in collaboration with specified individuals and/or groups in a corporation. The same laptop **1008** may be given a still different set of rights when connected in a general home environment such as shown by example in FIG. **13**. The same laptop **1008** could be given still different rights when connected in still other environments such as, by way of non-limiting example:

[**0329**] a home environment in collaboration with specified individuals and/or groups,

[**0330**] a retail environment,

[**0331**] a classroom setting as a student,

[**0332**] a classroom setting in collaboration with an instructor, in a library environment,

[**0333**] on a factory floor,

[**0334**] on a factory floor in collaboration with equipment enabled to perform proprietary functions, and so on.

[**0335**] As one more particular example, coupling a limited resource device arrangement such as a DVD appliance **50** shown in FIG. **14** with an inexpensive network computer (NC) **1022** may allow an augmenting (or replacing) of rights management capabilities and/or specific rights of parties and/or devices by permitting rights management to be a result of a combination of some or all of the rights and/or rights management capabilities of the DVD appliance and those of an Network or Personal Computer (NC or PC). Such rights may be further augmented, or otherwise modified or replaced by the availability of rights management capabilities provided by a trusted (secure) remote network rights authority **1000**.

[**0336**] The same device, in this example a DVD appliance **50**, can thus support different arrays, e.g., degrees, of rights management capabilities, in disconnected and connected

arrangements and may further allow available rights to result from the availability of rights and/or rights management capabilities resulting from the combination of rights management devices and/or other systems. This may include one or more combinations of some or all of the rights available through the use of a "less" secure and/or resource poor device or system which are augmented, replaced, or otherwise modified through connection with a device or system that is "more" or "differently" secure and/or resource rich and/or possesses differing or different rights, wherein such connection employs rights and/or management capabilities of either and/or both devices as defined by rights related rules and controls that describe a shared rights management arrangement.

[0337] In the latter case, connectivity to a logically and/or physically remote rights management capability can expand (by, for example, increasing the available secure rights management resources) and/or change the character of the rights available to the user of the DVD appliance **50** or a DVD appliance when such device is coupled with an NC **1022**, personal computer **60**, and/or remote rights authority **1000**. In this rights augmentation scenario, additional content portions may be available, pricing may change, redistribution rights may change (e.g., be expanded), content extraction rights may be increased, etc.

[0338] Such "networking rights management" can allow for a combination of rights management resources of plural devices and/or other systems in diverse logical and/or physical relationships, resulting in either greater or differing rights through the enhanced resources provided by connectivity with one or more "remote" rights authorities. Further, while providing for increased and/or differing rights management capability and/or rights, such a connectivity based rights management arrangement can support multi-locational content availability, by providing for seamless integration of remotely available content, for example, content stored in remote, Internet world wide web-based, database supported content repositories, with locally available content on one or more DVD discs **100**.

[0339] In this instance, a user may experience not only increased or differing rights but may be able to use to both local DVD content and supplementing content (i.e., content that is more current from a time standpoint, more costly, more diverse, or complementary in some other fashion, etc.). In such an instance, a DVD appliance **50** and/or a user of a DVD appliance (or other device or system connected to such appliance) may have the same rights, differing, and/or different rights applied to locally and remotely available content, and portions of local and remotely available content may themselves be subject to differing or different rights when used by a user and/or appliance. This arrangement can support an overall, profound increase in user content opportunities that are seamlessly integrated and efficiently available to users in a single content searching and/or usage activity.

[0340] Such a rights augmenting remote authority **1000** may be directly coupled to a DVD appliance **50** and/or other device by modem (see item **1006** in FIG. **12**) and/or directly or indirectly coupled through the use of an I/O interface, such as a serial **1394** compatible controller (e.g., by communicating between a 1394 enabled DVD appliance and a local personal computer that functions as a smart synchronous or asynchronous information communications interface to such one or more remote authorities, including a local PC **60** or NC **1022** that serves as a local rights management authority augmenting and/or supplying the rights management in a DVD appliance) and/or by other digital communication means such as wired and/or wireless network connections.

[0341] Rights provided to, purchased, or otherwise acquired by a participant and/or participant DVD appliance **50** or other system can be exchanged among such peer-to-peer relating devices and/or other systems so long as they participate in a permanently or temporarily connected network. **1020**. In such a case, rights may be bartered, sold, for currency, otherwise exchanged for value, and/or loaned so long as such devices and/or other systems participate in a rights management system, for example, such as the Virtual Distribution Environment described in Ginter, et al., and employ rights transfer and other rights management capabilities described therein. For example, this aspect of the present invention allows parties to exchange games or movies in which they have purchased rights. Continuing the example, an individual might buy some of a neighbor's usage rights to watch a movie, or transfer to another party credit received from a game publisher for the successful superdistribution of the game to several acquaintances, where such credit is transferred (exchanged) to a friend to buy some of the friend's rights to play a different game a certain number of times, etc.

Example Virtual Rights Process

[0342] FIGS. **15A-15C** shows an example of a process in which rights management components of two or more appliances or other devices establish a virtual rights machine environment associated with an event, operation and/or other action. The process may be initiated in a number of ways. In one example, an appliance user (and/or computer software acting on behalf of a user, group of users, and/or automated system for performing actions) performs an action with a first appliance (e.g., requesting the appliance to display the contents of a secure container, extract a portion of a content element, run a protected computer program, authorize a work flow process step, initiate an operation on a machine tool, play a song, etc.) that results in the activation of a rights management component associated with such first appliance (FIG. **15A**, block **1500**). In other examples, the process may get started in response to an automatically generated event (e.g., based on a time of day or the like), a random or pseudo-random event, and/or a combination of such events with a user-initiated event.

[0343] Once the process begins, a rights management component such as a secure node **72** (for example, an SPE and/or HPE as disclosed in Ginter et al.) determines which rights associated with such first appliance, if any, the user has available with respect to such an action (FIG. **15A**, block **1502**). The rights management component also determines the coordinating and/or cooperating rights associated with such an action available to the user located in whole or in part on other appliances (FIG. **15A**, block **1502**).

[0344] In one example, these steps may be performed by securely delivering a request to a rights authority server **1000** that identifies the first appliance, the nature of the proposed action, and other information required or desired by such a rights authority server. Such other information may include, for example:

[0345] the date and time of the request,

[0346] the identity of the user,

[0347] the nature of the network connection,

[0348] the acceptable latency of a response, etc.), and/or

[0349] any other information.

[0350] In response to such a request, the rights authority server **1000** may return a list (or other appropriate structure) to the first appliance. This list may, for example, contain the identities of other appliances that do, or may, have rights and/or rights related information relevant to such a proposed action.

[0351] In another embodiment, the first appliance may communicate (e.g., poll) a network with requests to other appliances that do, or may, have rights and/or rights related information relevant to such proposed action. Polling may be desirable in cases where the number of appliances is relatively small and/or changes infrequently. Polling may also be useful, for example, in cases where functions of a rights authority server **1000** are distributed across several appliances.

[0352] The rights management component associated with the first appliance may then, in this example, check the security level(s) (and/or types) of devices and/or users of other appliances that do, or may, have rights and/or rights related information relevant to such an action (FIG. **15**A, block **1506**). This step may, for example, be performed in accordance with the security level(s) and/or device type management techniques disclosed in Sibert and Van Wie, and the user rights, secure name services and secure communications techniques disclosed in Ginter et al. Device and/or user security level determination may be based, for example, in whole or in part on device and/or user class.

[0353] The rights management component may then make a decision as to whether each of the other appliance devices and/or users have a sufficient security level to cooperate in forming the set of rights and/or rights related information associated with such an action (FIG. **15**A, block **1508**). As each appliance is evaluated, some devices and/or users may have sufficient security levels, and others may not. In this example, if a sufficient security level is not available ("No" exit to decision block **1508**), the rights management component may create an audit record (for example, an audit record of the form disclosed in Ginter et al.) (FIG. **15**A, block **1510**), and may end the process (FIG. **15**A, block **1512**). Such audit record may be for either immediate transmission to a responsible authority and/or for local storage and later transmission, for example. The audit recording step may include, as one example, incrementing a counter that records security level failures (such as the counters associated with summary services in Ginter et al.)

[0354] If the devices and/or users provide the requisite security level ("Yes" exit to block **1508**), the rights management component in this example may make a further determination based on the device and/or user class(es) and/or other configuration and/or characteristics (FIG. **15**B, block **1514**). Such determination may be based on any number of factors such as for example:

[0355] the device is accessible only through a network interface that has insufficient throughput;

[0356] devices in such a class typically have insufficient resources to perform the action, or relevant portion of the action, at all or with acceptable performance, quality, or other characteristics;

[0357] the user class is inappropriate due to various conditions (e.g., age, security clearance, citizenship, jurisdiction, or any other class-based or other user characteristic); and/or

[0358] other factors.

[0359] In one example, decision block **1514** may be performed in part by presenting a choice to the user that the user declines.

[0360] If processes within the rights management component determines that such device and/or user class(es) are inappropriate("No" exit to block **1514**), the rights management component may write an audit record if required or desired (FIG. **15**B, block **1516**) and the process may end (FIG. **15**B, block **1518**).

[0361] If, on the other hand, the rights management component determines that the device and/or user classes are appropriate to proceed ("Yes" exit to block **1514**), the rights management component may determine the rights and resources available for performing the action on the first appliance and the other appliances acting together (FIG. **15**B, block **1520**). This step may be performed, for example, using any or all of the method processing techniques disclosed in Ginter et al. For example, method functions may include event processing capabilities that formulate a request to each relevant appliance that describes, in whole or in part, information related to the action, or portion of the action, potentially suitable for processing, in whole or in part, by such appliance. In this example, such requests, and associated responses, may be managed using the reciprocal method techniques disclosed in Ginter et al. If such interaction requires additional information, or results in ambiguity, the rights management component may, for example, communicate with the user and allow them to make a choice, such as making a choice among various available, functionally different options, and/or the rights management component may engage in a negotiation (for example, using the negotiation techniques disclosed in Ginter et al.) concerning resources, rights and/or rights related information.

[0362] The rights management component next determines whether there are sufficient rights and/or resources available to perform the requested action (FIG. **15**B, decision block **1522**). If there are insufficient rights and/or resources available to perform the action ("No" exit to block **1522**), the rights management component may write an audit record (FIG. **15**B, block **1524**), and end the process (FIG. **15**B, block **1526**).

[0363] In this example, if sufficient rights and/or resources are available ("Yes" exit to block **1522**), the rights management component may make a decision regarding whether additional events should be processed in order to complete the overall action (FIG. **15**B, block **1528**). For example, it may not be desirable to perform only part of the overall action if the necessary rights and/or resources are not available to complete the action. If more events are necessary and/or desired ("Yes" exit to block **1528**), the rights management component may repeat blocks **1520**, **1522** (and potentially perform blocks **1524**, **1526**) for each such event.

[0364] If sufficient rights and/or resources are available for each of the events ("No" exit to block **1528**), the rights management component may, if desired or required, present a user with a choice concerning the available alternatives for rights and/or resources for performing the action (FIG. **15**B, block **1530**). Alternatively and/or in addition, the rights management component may rely on user preference information (and/or defaults) to "automatically" make such a determination on behalf of the user (for example, based on the overall cost, performance, quality, etc.). In another embodiment, the user's class, or classes, may be used to filter or otherwise aid in selecting among available options. In still another embodiment, artificial intelligence (including, for example, expert systems techniques) may be used to aid in the selection among alternatives. In another embodiment, a mixture of any or all of the foregoing (and/or other) techniques may be used in the selection process.

[0365] If there are no acceptable alternatives for rights and/or resources, or because of other negative aspects of the selection process (e.g., a user presses a "Cancel" button in a graphical user interface, a user interaction process exceeds the available time to make such a selection, etc.), ("No" exit to block **1530**) the rights management component may write an audit record (FIG. **15**B, block **1532**), and end the process (FIG. **15**B, block **1534**).

[0366] On the other hand, if a selection process identifies one or more acceptable sets of rights and/or resources for performing the action and the decision to proceed is affirmative ("Yes" exit to block **1530**), the rights management component may perform the proposed action using the first appliance alone or in combination with any additional appliances (e.g., a rights authority **1000**, or any other connected appliance) based on the selected rights and/or resources (FIG. **15**C, block **1536**). Such cooperative implementation of the proposed actions may include for example:

[0367] performing some or all of the action with the first appliance;

[0368] performing some or all of the action with one or more appliances other than the first appliance (e.g., a rights authority **1000** and/or some other appliance);

[0369] performing part of the action with the first appliance and part of the action with one or more other appliances; or

[0370] any combination of these.

[0371] For example, this step may be performed using the event processing techniques disclosed in Ginter et al.

[0372] As one illustrative example, the first appliance may have all of the resources necessary to perform a particular task (e.g., read certain information from an optical disk), but may lack the rights necessary to do so. In such an instance, the first appliance may obtain the additional rights it requires to perform the task through the steps described above. In another illustrative example, the first appliance may have all of the rights required to perform a particular task, but it may not have the resources to do so. For example, the first appliance may not have sufficient hardware and/or software resources available to it for accessing, processing or otherwise using information in certain ways. In this example, step **1536** may be performed in whole or in part by some other appliance or appliances based in whole or in part on rights supplied by the first appliance. In still another example, the first appliance may lack both rights and resources necessary to perform a certain action, and may rely on one or more additional appliances to supply such resources and rights.

[0373] In this example, the rights management component may, upon completion of the action, write one or more audit records (FIG. **15**C, block **1538**), and the process may end (FIG. **15**C, block **1540**).

[0374] An arrangement has been described which adequately satisfies current entertainment industry requirements for a low cost, mass-produceable digital video disk or other high capacity disc copy protection scheme but which also provides enhanced, extensible rights management capabilities for more advanced and/or secure platforms and for cooperative rights management between devices of lessor, greater, and/or differing rights resources. While the invention has been described in connection with what is presently considered to be the most practical and preferred embodiment, it is to be understood that the invention is not to be limited to the disclosed embodiment, but on the contrary, is intended to cover various modifications and equivalent arrangements included within the spirit and scope of the invention.

We claim:

1. An electronic appliance for accessing or otherwise using protected information stored on a storage medium, the electronic appliance comprising:

a disk drive configured to read the protected information from the storage medium; and

a protected processing environment communicatively coupled to the disk drive, the protected processing environment being configured to (a) access a control set associated with the protected information, the control set including two or more controls specifying one or more permitted uses of the protected information, the control set including at least (i) a first control requiring for its application one or more capabilities of the electronic appliance, and (ii) a second control that does not require, for its application, said one or more capabilities, (b) determine that the electronic appliance has the one or more capabilities, and (c) selectively permit the electronic appliance to access or otherwise use the protected information in accordance with at least the first control.

2. The electronic appliance of claim 1, in which the protected processing environment is configured to obtain identification information of the protected information stored on the storage medium, and in which the protected processing environment is coupled to a network, and is configured to obtain the control set from a remote site over the network based at least in part on the identification information.

3. The electronic appliance of claim 2, in which the remote site comprises a rights clearinghouse.

4. The electronic appliance of claim 1, in which the one or more capabilities includes a capability to enforce a condition associated with a permitted use specified by the first control.

5. The electronic appliance of claim 4, in which the permitted use specified by the first control comprises copying the protected information, and in which the condition specifies a predefined number of copies that may be made.

6. The electronic appliance of claim 5, in which the predefined number is greater than one, and in which the second control specifies that copying the protected information is permitted only one time.

7. The electronic appliance of claim 4, in which the condition comprises a requirement that auditing information be collected regarding the permitted use specified by the first control.

8. The electronic appliance of claim 4, in which the condition comprises a requirement that a user of the electronic appliance possess certain identity information.

9. The electronic appliance of claim 8, in which the identity information comprises a digital certificate attesting to the user's identity or membership in a class.

10. The electronic appliance of claim 4, in which the condition comprises a requirement that a user of the electronic appliance make a payment.

11. The electronic appliance of claim 1, in which the one or more capabilities includes having a network connection.

12. The electronic appliance of claim 1, in which the protected processing environment comprises one or more decryption keys, and in which the protected processing environment is further configured to use the one or more decryption keys to decrypt the protected information.

13. The electronic appliance of claim 12, in which said use of the one or more decryption keys to decrypt the protected information comprises using the one or more decryption keys to decrypt one or more encrypted content decryption keys and using the one or more content decryption keys to decrypt the protected information.

14. The electronic appliance of claim 1, in which the protected processing environment comprises a secure processing unit, the secure processing unit comprising a microprocessor and memory storing one or more cryptographic keys for use in decrypting one or more encrypted content decryption keys stored on the storage medium.

15. The electronic appliance of claim 1, in which the control set includes one or more controls selected from a group consisting of: a control that prohibits copying of the protected information, a control that allows the protected information to be copied only once, a control that allows the protected information to be copied multiple times, a control that allows a user or a class of users to play the protected information, and a control that allows a user or a class of users to extract or excerpt at least a part of the protected information.

16. The electronic appliance of claim 1, in which the first control specifies that the protected information can only be released to one or more types of devices.

17. The electronic appliance of claim 16, in which the one or more types of devices includes devices that are not configured to copy the protected information.

18. The electronic appliance of claim 16, in which the one or more types of devices includes devices that are configured to enforce at least part of the control set.

19. The electronic appliance of claim 1, in which the electronic appliance comprises a DVD player.

20. The electronic appliance of claim 1, in which the electronic appliance comprises a computer.

21. A method of accessing or otherwise using protected information, the method comprising:

receiving a request from a user of an electronic appliance to access or otherwise use protected information;

using a protected processing environment of the electronic appliance to access a control set associated with the protected information, the control set including two or more controls specifying one or more permitted uses of the protected information, the control set including at least (i) a first control requiring, for its application, one or more capabilities of the electronic appliance, and (ii) a second control that does not require, for its application, said one or more capabilities;

determining that the electronic appliance is capable of applying the first control; and

using the protected processing environment to selectively grant or deny the request in accordance with at least the first control.

22. The method of claim 21, in which the one or more capabilities include a capability to enforce a condition associated with a permitted use specified by the first control.

23. The method of claim 22, in which the permitted use specified by the first control comprises copying the protected information, and in which the condition specifies a predefined number of copies that may be made.

24. The method of claim 23, in which the request comprises a request to copy the protected information, the method further comprising:

determining that the protected information has not been copied said predefined number of times;

making a copy of the protected information; and

storing an indication that the protected information has been copied.

25. The method of claim 23, in which the predefined number is greater than one, and in which the request comprises a request to copy the protected information, the method further comprising:

determining that the protected information has not been copied said predefined number of times; and

making a copy of the protected information.

26. The method of claim 22, in which the condition comprises collecting auditing information regarding the permitted use specified by the first control.

27. The method of claim 22, in which the condition comprises verifying that the user possesses certain identity information, the method further comprising:

obtaining the identity information;

wherein the step of using the protected processing environment to selectively grant or deny the request is further based at least in part on the identity information.

28. The method of claim 27, in which the identity information comprises a digital certificate attesting to the user's identity or a class to which the user belongs.

29. The method of claim 22, in which the condition comprises determining that the user has made a payment.

30. The method of claim 21, in which the step of using the protected processing environment of the electronic appliance to access a control set includes obtaining the control set from a remote site over a telecommunications network.

31. The method of claim 21, in which the protected processing environment comprises one or more decryption keys, the method further comprising:

using the one or more decryption keys to decrypt the protected information.

32. The method of claim 31, in which the protected processing environment includes a secure processing unit having internal memory, in which the step of using the one or more decryption keys to decrypt the protected information includes retrieving the one or more decryption keys from the internal memory of the secure processing unit.

33. The method of claim 31, in which the step of using the one or more decryption keys to decrypt the protected information includes using the one or more decryption keys to decrypt one or more content keys stored on a storage medium containing the protected information, and using the one or more content keys to decrypt the protected information.

34. The method of claim 21, in which the control set includes one or more controls selected from a group consisting of: a control that prohibits copying of the protected information, a control that allows the protected information to be copied only once, and a control that allows the protected information to be copied multiple times.

35. The method of claim 21, in which the control set includes one or more controls selected from a group consisting of: a control that allows a user or a class of users to play the protected information, and a control that allows a user or a class of users to extract or excerpt at least a part of the protected information.

36. The method of claim 21, in which the control set includes two or more controls selected from a group consisting of: a control that prohibits copying of the protected information, a control that allows the protected information to be copied only once, a control that allows the protected information to be copied multiple times, a control that allows a user or a class of users to play the protected information, and a control that allows a user or a class of users to extract or excerpt at least a part of the protected information.

37. The method of claim 21, in which the first control specifies that the protected information can only be released to devices that are not configured to copy the protected information.

38. The method of claim 21, in which the first control specifies that copies of the protected information be degraded in quality.

39. A method performed by an electronic appliance, the method comprising:

receiving a removable storage medium in a drive of the electronic appliance, the removable storage medium containing a protected content item and a control set comprising at least two controls, each of said at least two controls specifying one or more permitted or prohibited uses of the protected content item;

parsing the control set;

disregarding at least one control that the electronic appliance is unable to enforce; and

in response to a request to access the protected content item, responding to the request in accordance with at least one control that the electronic appliance is able to enforce.

40. The method of claim 39, in which the request comprises a request to copy the protected content item, and in which the at least one control that the electronic appliance is able to enforce comprises a control specifying that copying is prohibited, and in which the step of responding to the request comprises denying the request.

41. The method of claim 39, in which the request comprises a request to copy the protected content item, and in which the at least one control that the electronic appliance is able to enforce comprises a control specifying that the protected content item can be copied only a predefined number of times, the method further comprising:

determining that the protected content item has not been copied said predefined number of times; and

making a copy of the protected content item.

42. The method of claim 41, in which the predefined number is greater than one.

43. The method of claim 39, in which the at least one control that the electronic appliance is unable to enforce comprises a control that requires auditing.

44. The method of claim 39, in which the at least one control that the electronic appliance is unable to enforce includes a condition that the electronic appliance is unable to enforce.

45. The method of claim 39, in which the at least one control that the electronic appliance is unable to enforce comprises a control that the electronic appliance is unable to interpret.

46. A method performed by an electronic appliance, the method comprising:

receiving a protected content item and a control set comprising at least two controls, each of the at least two controls specifying one or more permitted or prohibited uses of the protected content item, the control set including a first control that the electronic appliance is unable to enforce and a second control that the electronic appliance is able to enforce;

receiving a request from a user of the electronic appliance to use the protected content item; and

responding to the request in accordance with at least the second control.

47. The method of claim 46, in which the request comprises a request to copy the protected content item, and in which the second control comprises a control specifying that copying is prohibited, and in which the step of responding to the request comprises denying the request.

48. The method of claim 46, in which the request comprises a request to copy the protected content item, and in which the second control comprises a control specifying that the protected content item can be copied only a predefined number of times, the method further comprising:

determining that the protected content item has not been copied said predefined number of times;

making a copy of the protected content item; and

storing an indication that the protected content item has been copied.

49. The method of claim 48, in which the predefined number is greater than one.

50. The method of claim 46, in which the first control comprises a control that requires auditing.

51. The method of claim 46, in which the first control specifies a condition associated with a permitted use of the protected content item, and in which the electronic appliance is unable to enforce the condition.

52. The method of claim 46, in which the first control comprises a control that the electronic appliance is unable to interpret.

53. The method of claim 51, further comprising:

receiving an additional request from the user of the electronic appliance to make the permitted use of the protected content with which the condition is associated;

determining that the electronic appliance is unable to enforce the condition; and

denying the request.

54. A method performed by an electronic appliance, the method comprising:

receiving a protected content item and a control set comprising at least two controls, each of the at least two controls specifying one or more permitted or prohibited uses of the protected content item;

receiving a first request from a user of the electronic appliance to make a use of the protected content item that is specified in a control that the electronic appliance is unable to enforce; and

denying the first request.

55. The method of claim 54, further comprising:

receiving a second request from a user of the electronic appliance to make a use of the protected content item that is specified in a control that the electronic appliance is able to enforce; and

granting the request.

56. A method performed by an electronic appliance, the method comprising:

receiving a protected content item and a control set specifying one or more permitted uses of the protected content item;

receiving a request to make a requested use of the protected content item;

parsing the control set;

determining that the control set includes a control permitting the requested use, but that the control set further includes a condition associated with the requested use;

determining that the electronic appliance is unable to enforce the condition; and

denying the request.

57. The method of claim 56, in which the request comprises a request to make at least a second copy of the protected content item, and in which the electronic appliance is not configured to maintain a count of copies.

58. The method of claim 56, in which the request comprises a request to play the protected content item, and in which the condition comprises collecting auditing information associated with playing the protected content item.

59. The method of claim 56, in which the condition comprises collecting auditing information.

60. The method of claim 56, in which the condition comprises collecting a payment.

61. The method of claim 56, in which the condition comprises verifying identity information of a user of the electronic appliance.

62. An electronic appliance comprising:

an input for receiving protected digital information;

a user interface for receiving a request from a user of the electronic appliance to make a requested use of the protected digital information;

hardware and/or software configured to: (a) access a control set associated with the protected digital information, the control set including at least (i) a first control specifying a first permitted use of the protected digital information, and (ii) a second control specifying a second permitted use of the protected digital information and a condition associated with the second permitted use, wherein the electronic appliance is not configured to enforce the condition; (b) determine whether the requested use corresponds to the first permitted use or the second permitted use; (c) grant the request in accordance with at least the first control if the requested use corresponds to the first permitted use; and (d) deny the request if the requested use corresponds to the second permitted use; and

an output for presenting the protected digital information to the user.

63. The electronic appliance of claim 62, in which the condition comprises collecting auditing information.

64. The electronic appliance of claim 62, in which the condition comprises collecting a payment from the user.

65. The electronic appliance of claim 62, in which the condition comprises verifying identity information of the user.

66. The electronic appliance of claim 62, in which the condition comprises a limit on a number of times the second permitted use can be made.

67. The electronic appliance of claim 66, in which the second permitted use comprises copying the protected digital information.

68. An electronic appliance comprising:

an input for receiving protected digital information;

a user interface for receiving a request from a user of the electronic appliance to use the protected digital information;

a rights management component configured to (a) access a control set associated with the protected digital information, the control set including two or more controls specifying one or more permitted uses of the protected digital information, the control set including at least (i) a first control requiring, for its application, one or more capabilities of the electronic appliance, and (ii) a second control that does not require, for its application, said one or more capabilities, (b) determine that the electronic appliance has the one or more capabilities, and (c) selectively permit the user to use the protected digital information in accordance with at least the first control; and

an output for presenting the protected digital information to the user.

69. The electronic appliance of claim 68, in which the one or more capabilities include a capability to enforce a condition associated with a permitted use specified by the first control.

70. The electronic appliance of claim 69, in which the permitted use specified by the first control comprises copying the protected digital information, and the condition comprises a limit on a number of copies that may be made.

71. The electronic appliance of claim 70, in which the limit is greater than one.

72. The electronic appliance of claim 71, in which the rights management component is further configured to: determine that the protected digital information has not been copied said predefined number of times; permit the user to make a copy of the protected digital information;

and store an indication that the protected digital information has been copied.

73. The electronic appliance of claim 71, in which the second control specifies that copying the protected digital information is permitted, and further specifies a condition that the protected digital information may only be copied once, wherein the one or more capabilities include a capability to maintain a count of copies.

74. The electronic appliance of claim 69, in which the condition comprises collecting auditing information regarding the permitted use specified by the first control.

75. The electronic appliance of claim 69, in which the condition comprises collecting a payment from the user.

76. The electronic appliance of claim 69, in which the condition comprises verifying identity information of the user.

77. The electronic appliance of claim 69, in which the condition comprises a limit on a number of times the permitted use specified by the first control can be made.

78. The electronic appliance of claim 76, in which the identity information comprises a digital certificate attesting to the user's identity or membership in a class.

79. The electronic appliance of claim 68, in which the control set includes one or more controls selected from a group consisting of: a control that allows a user or a class of users to play the protected digital information, and a control that allows a user or a class of users to extract or excerpt at least a part of the protected digital information.

80. The electronic appliance of claim 68, in which the control set includes two or more controls selected from a group consisting of: a control that prohibits copying of the protected digital information, a control that allows the protected digital information to be copied only once, a control that allows the protected digital information to be copied multiple times, a control that allows a user or a class of users to play the protected digital information, and a control that allows a user or a class of users to extract or excerpt at least a part of the protected digital information.

81. The electronic appliance of claim 68, in which the electronic appliance is coupled to a network, and is configured to obtain the control set from a remote site over the network.

82. The electronic appliance of claim 68, in which the electronic appliance comprises one or more decryption keys, and in which the electronic appliance is further configured to use the one or more decryption keys to decrypt the protected digital information.

83. The electronic appliance of claim 68, in which the control set includes a control specifying that the protected digital information can only be released to one or more types of devices.

84. The electronic appliance of claim 83, in which the one or more types of devices includes devices that are not configured to copy the protected digital information.

85. The electronic appliance of claim 83, in which the one or more types of devices includes devices that are configured to enforce at least part of the control set.

86. The electronic appliance of claim 68, in which the control set includes a control specifying that the protected digital information be fingerprinted prior to release by the electronic appliance.

87. The electronic appliance of claim 68, in which the control set includes a control specifying that copies of the protected digital information be degraded in quality.

88. The electronic appliance of claim 68, in which the rights management component comprises a secure processing unit comprising a microprocessor and memory storing one or more cryptographic keys for use in decrypting the protected digital information.

89. A system comprising:

a control set for governing use of protected digital information, the control set including two or more subsets of rights management rules, the two or more subsets being based, at least in part, on one or more electronic appliance capabilities related to complying with rights management rules; and

an electronic appliance adapted to apply the control set to govern use of the protected digital information, the electronic appliance including a processor adapted to (a) make a selection of at least one of the two or more subsets of rights management rules, the selection being based at least in part on one or more capabilities of the electronic appliance, and (b) use at least a part of the protected digital information in accordance with the selection of rights management rules.

90. The system of claim 89, in which the control set includes a first subset of rights management rules corresponding to capabilities of a disk player.

91. The system of claim 90, in which the first subset of rights management rules includes one or more rules relating to copying the protected digital information.

92. The system of claim 90, in which the control set includes a second subset of rights management rules corresponding to capabilities of a networked computer.

93. The system of claim 92, in which the second subset of rights management rules includes one or more rules relating to auditing use of the protected digital information.

94. The system of claim 89, in which the control set and the protected digital information are stored on a portable storage medium, and in which the electronic appliance is configured to read the protected digital information and the control set from the portable storage medium.

95. The system of claim 89, in which the electronic appliance is coupled to a network and is adapted to access the control set through the network.

96. The system of claim 89, in which the two or more subsets of rights management rules include a first subset for electronic appliances that are not connected to a network, and a second subset for electronic appliances that are connected to a network.

97. The system of claim 96, in which the second subset enables more extensive use of the protected digital information than the first subset.

98. The system of claim 89, in which the processor is configured to obtain identification information of a user of the electronic appliance, and in which the selection of at least one of the two or more subsets of rights management rules is further based at least in part on the identification information.

99. A method of governing use of protected digital information by an electronic appliance, the method comprising:

determining one or more capabilities of the electronic appliance in complying with rights management rules included in a control set; and

using a subset of the rights management rules included in the control set to govern use of the protected digital information by the electronic appliance, the subset of rights management rules corresponding to capabilities of the electronic appliance in complying therewith.

100. The method of claim 99, in which the electronic appliance comprises a disk player and in which the subset of the rights management rules includes one or more rights management rules that the disk player is able to enforce.

101. The method of claim 100, in which the one or more rights management rules that the disk player is able to enforce include one or more rules relating to copying the protected digital information.

102. The method of claim 100, in which the control set further includes a second subset of rights management rules that the disk player is unable to enforce.

103. The method of claim 102, in which the second subset of rights management rules includes one or more rules requiring use of the protected digital information to be audited.

104. The method of claim 99, which the electronic appliance comprises a networked computer.

105. The method of claim 99, further comprising:

receiving the protected digital information; and

separately receiving the control set over a telecommunications network to which the electronic appliance is communicatively coupled.

106. The method of claim 99, in which determining one or more capabilities of the electronic appliance includes determining whether the electronic appliance is connected to a network.

107. The method of claim 99, in which the control set includes at least two subsets of rights management rules, the at least two subsets including a first subset for appliances that are capable of being connected to a network, and a second subset for appliances that are not capable of being connected to a network.

108. The method of claim 107, in which the second subset enables more extensive use of the protected digital information than the first subset.

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