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(54) Title: RFID SECURITY DEVICE FOR OPTICAL DISC

(57) Abstract: An optical disc has a security feature in the form of and RFID tag that communicates with a voltage controlled optical modifier layer in the optical disc. In the presence of an interrogation signal, the RFID tag allows the optical disc to be used normally by outputting a voltage to the optical modifier layer. In the absence of an interrogation signal, the optical modifier layer prevents a laser from reading from or writing on the optical disc. Other embodiments are also disclosed.

RFID SECURITY DEVICE FOR OPTICAL DISC

The present invention relates to security devices for optical discs.

Theft of intellectual property is a very prominent topic in the entertainment industries. Technologies to copy audio and video recordings have plagued the industry for many years. The advent of digital recordings has, in the eyes of the entertainment industries, exacerbated the problem. In the past, analogue copies got progressively worse such that eventually any copies made from the previous copy were worthless. Digital copies, each of which is just as pristine and precise as the previous copy, remove the previous limitation on repetitive copying.

While the creation of illegal copies is troublesome to the entertainment industry, equally troubling is the theft of authorized copies of the works from retail outlets, jukeboxes, and the like. Shoplifting and similar theft account for extensive lost revenue for the entertainment industry. Optical discs, such as CDs and DVDs, because of their relatively small size, are easy targets for such theft and account for a substantial portion of those losses.

Still other security concerns surround optical discs. Where the disc contains sensitive information, the loss and subsequent accessing of a disc may create problems for the person or entity whose information may be on the disc. Such

information could be financial information, personal information, or confidential government information.

Thus, there remains a need for a device or technique that helps ensure that optical discs may not be read unless used in an authorized disc reader or cannot be used until after their use has been authorized.

The present invention uses a specially created optical disc. The optical disc may comprise a base layer, an aluminium layer with data carrying pits, a voltage controlled optical modifier layer, a covering layer, and a radio frequency identification (RFID) tag. The RFID tag is associated with the voltage controlled optical modifier layer such that when the RFID tag is in the presence of an appropriate electromagnetic field, the RFID tag sends instructions to the voltage controlled optical modifier layer to control the ability of an optical reader to read data on the disc.

The instructions to the voltage controlled optical modifier layer may be designed to render the optical modifier layer transparent such that the data carrying pits may be read, or may render the layer opaque such that the data carrying pits may not be read. Furthermore, the instructions and the optical modifier layer may be designed such that once the layer has been changed the layer remains that way. The RFID tag may be responsive to different protocols or commands such that the RFID tag causes the voltage controlled optical modifier layer to behave differently depending on the protocol or command received.

In an exemplary embodiment, the voltage controlled optical modifier layer may be formed from a liquid crystal material or other material that changes its refractive index in the presence or absence of a voltage.

The present invention has several uses, such as a security device for optical discs having sensitive information. The information may only be readable by an optical disc player that includes the appropriate type of RFID interrogator. The present invention may be used in a jukebox system such that the disc is rendered opaque unless used in an authorized jukebox. The present invention may be used as an electronic article surveillance (EAS) device in retail environments where unless the optical disc is interrogated at a cash register, the disc is unreadable. After interrogation during a sales transaction, the optical modifier layer may be instructed to become transparent such that the disc may be used normally. The present invention may also be used in pay per play activities, and software authentication and payment over a network schemes.

An alternate embodiment may combine an all optical portion of an optical disc with the RFID tag for the same security purposes. If the all optical portion is not properly interrogated by a laser, the optical disc may be illegible.

Those skilled in the art will appreciate the scope of the present invention and realize additional aspects thereof after reading the following detailed description

of the preferred embodiments in association with the accompanying drawing figures.

The accompanying drawing figures incorporated in and forming a part of this specification illustrate several aspects of the invention, and together with the description serve to explain the principles of the invention.

Figure 1 illustrates an optical disc with an RFID tag disposed thereon;

Figure 2 illustrates a cross-sectional view of the optical disc, taken along line 2-2 of Figure 1;

Figure 3 illustrates a simplified disc player with an RFID interrogator;

Figure 4 illustrates a flow chart generally outlining an exemplary use of the present invention;

Figure 5 illustrates a flow chart outlining use of the present invention with optical discs containing sensitive information;

Figure 6 illustrates a flow chart outlining use of the present invention for software authentication and payment via a network;

Figure 7 illustrates a flow chart outlining use of the present invention in a pay per play activity;

Figure 8 illustrates a flow chart outlining use of the present invention in a jukebox activity;

Figure 9 illustrates a flow chart outlining use of the present invention in a retail anti-theft activity; and

Figure 10 illustrates an optical disc with an all optical portion for security purposes.

The embodiments set forth below represent the necessary information to enable those skilled in the art to practice the invention and illustrate the best mode of practicing the invention. Upon reading the following description in light of the accompanying drawing figures, those skilled in the art will understand the concepts of the invention and will recognize applications of these concepts not particularly addressed herein. It should be understood that these concepts and applications fall within the scope of the disclosure and the accompanying claims.

The present invention is well suited for use with optical discs, such as an optical disc 10 illustrated in Figure 1. The optical disc 10 comprises a centre hole 12, a non-information bearing centre annulus 14, and an information bearing annulus

16, as is well understood. The optical disc 10 may be a compact disc, a DVD, a mini disc, or the like, but is designed to store information or executable applications on the optical disc 10 for later recovery and usage by a data processing device such as a computer or audio/visual player. The optical disc 10 may further have a radio frequency identification (RFID) tag 18 positioned somewhere on the optical disc 10.

The RFID tag 18 may be comparable to the MICROINSERT or ONETAG chips previously sold by the assignee of the present invention. These devices are embodiments of U.S. Patent Application Serial Numbers 09/618,505, filed 18 July 2000 and 09/678,271, filed 03 October 2000, both of which are hereby incorporated by reference in their entireties. These RFID tags 18 are capable of interaction with Intermec's INTELLITAG interrogators, and have been expounded upon in several commonly owned applications, such as U.S. Patent Application Serial Numbers 10/125,786 and 10/125,783, both filed 18 April 2002, both of which are hereby incorporated by reference in their entireties. The ONETAG and the MICROINSERT chips embody both an active and a passive sort of transponder, and both types are contemplated for use in the present invention. The RFID tag 18 may be operative at any number of frequencies, but specifically contemplated are bands centred around 125 kHz, 13.56 MHz, 915 MHz, and 2450 MHz.

In an exemplary embodiment, the RFID tag 18 is positioned on the non-information bearing centre annulus 14 and uses an antenna 19 associated with

the optical disc 10 according to the teachings of U.S. Patent Application Serial Number 10/131,576, filed 24 April 2002, which is hereby incorporated by reference in its entirety. Other antennas 19 may also be used, such as a coil antenna for low frequencies, a dipole antenna, a patch antenna, an F antenna, or the like as needed or desired. The coupling to the antenna 19 may be through any appropriate means such as electric, electromagnetic, magnetic, electrostatic, or the like using appropriate elements such as capacitive or inductive reactive elements.

The optical disc 10 is illustrated in cross-sectional form in Figure 2, wherein it can be seen that the optical disc 10 begins with a central polycarbonate layer 20, covered with an aluminium layer 22 having data carrying pits (not illustrated) thereon. In the event that the optical disc 10 is a double-sided DVD (illustrated), the aluminium layer 22 may be present on both sides of the polycarbonate layer 20. Associated with the aluminium layer 22 is a voltage controlled optical modifier layer 24. The voltage controlled optical modifier layer 24 is operatively connected to an output voltage provided by the RFID tag 18. The voltage controlled optical modifier layer 24 may, in an exemplary embodiment, be a liquid crystal material that scatters or alters the polarization of illumination. An appropriate liquid crystal material comprises a twisted nematic type, which can make the disc either reflective, where the laser beam passes through the liquid crystal material and can read the bits in the aluminium layer 22, or non-reflective, where the layers form a cross polarized filter. Alternatively, materials could be used which change their refractive index such that they defocus an

illuminating laser spot. Other materials could be a controllable mirrored surface behind the optical layer that could control readability. As yet another option, a piezoelectric layer, such as the plastic film Polyvinyl Dienyl Fluoride, could be used that distorts the surface of the optical disc 10 such that an auto-focusing laser cannot track the changes in the surface fast enough. Another option is to include an electro-chromic material so that the monotone colour of the laser is selectively absorbed. An example of such an electro-chromic material is Lutetium di-phthalocyanine.

While a plurality of materials could be used, the desired end result is that the disc is unreadable unless the RFID tag 18 has applied an output voltage to bias the voltage controlled optical modifier layer 24 properly. For more information on this topic, reference is made to Great Britain Patent GB 2,354,834, which is hereby incorporated by reference in its entirety. The RFID tag 18 only produces the proper output voltage when the RFID tag 18 has received the proper authorization from an interrogator 32 (see Figure 3).

Finally, capping the optical disc 10 is a covering layer 26 that protects the optical disc 10 from causal nicks, scratches and the like. Such covering layers are conventional in the industry of optical discs 10, and may be made from a polycarbonate material.

An example of the optical disc 10 in use is illustrated in Figure 3, wherein an optical disc player 28 includes a laser head 30 that reads from and/or writes to

the optical disc 10 as is well understood. The optical disc player 28 further may include an interrogator 32, such as an interrogator sold by INTERMEC or the like. It should be appreciated that while the interrogator 32 is shown inside the optical disc player 28, the interrogator 32 could be a hand held, portable, or stationary unit positioned outside the optical disc player 28.

The optical disc player 28 may have a processor, such as a CPU 34 that controls the interrogator 32 and the laser head 30. The CPU 34 may further communicate to a remote location through a modem 36. Alternatively, or additionally, the interrogator 32 may also have a modem 38 for communication to a remote location. In both instances, the remote location may be connected to a network such as the Internet, the PSTN, or other communication network. The modems 36 and 38 may each be a wireless modem, an ISDN modem, a phone line modem, a cable modem, or the like as needed or desired. The modem 38 may be duplicative in the instance where the interrogator 32 is built into the optical disc reader 28, and is more likely to be present when the interrogator 32 is a distinct entity from the optical disc reader 28.

It should be appreciated that the components of Figure 3 may be further rearranged. For example, a conventional personal computer with a DVD/CDRW drive and an interrogator associated therewith is particularly contemplated for use with the present invention.

A general use of the present invention is illustrated in Figure 4, with particularly contemplated embodiments being presented in Figures 5-9. Initially, an optical disc 10 according to the present invention is placed into an optical disc player 28 (block 100). The optical disc player 28 turns on the laser head 30 (block 102). The voltage controlled optical modifier layer 24 is initially opaque or otherwise diffuses the laser from the laser head 30, and thus the laser is not returned to the laser head 30 for interpretation (block 104).

The interrogator 32 is also turned on and communicates with the RFID tag 18 on the optical disc 10 (block 106). This interrogation may occur concurrently with the initial use of the laser, before the laser head 30 is turned on, or subsequently as needed or desired. In response to the presence of an interrogation signal from the interrogator 32, the RFID tag 18 outputs a voltage to the voltage controlled optical modifier layer 24 (block 108).

The voltage applied to the voltage controlled optical modifier layer 24 causes the characteristics of the voltage controlled optical modifier layer 24 to change (block 110) such that the pits in the aluminium layer 22 are now readable by the laser. The laser head 30 now gets a return signal from the laser bouncing off the pits in the aluminium layer 22 (block 112). The return signal is demodulated and interpreted as is conventional, and the optical disc player 28 provides the signal to an output device for playback or the like as needed or desired. Note that it is possible that the optical disc player 28 will always get a return signal at the laser head 30 if the interrogation signal is sent at the appropriate time.

Variations on this process include requiring a continuous interrogation signal from the interrogator 32 such that if the interrogation signal is ever absent, the optical disc 10 becomes unreadable again.

Alternatively, the voltage controlled optical modifier layer 24 may remain modified for a predetermined amount of time corresponding to a single playing of the contents of the optical disc 10, or other time frame as needed or desired. In an exemplary embodiment of this concept, the RFID tag 18 may be associated with a capacitor (not shown) that the RFID tag 18 charges to a known threshold voltage. The threshold voltage is applied to the voltage controlled optical modifier layer 24 and kept in a condition that allows the optical disc 10 to be read. A resistor or other mechanism may be used to slowly discharge the capacitor over time. In a preferred embodiment, the rate of discharge is selected so that a predefined time elapses before the voltage controlled optical modifier layer 24 changes to a state in which the optical disc 10 is not readable. As another option, the RFID tag 18 may store enough charge in a capacitor to drive a low energy clock device that counts cycles until a predetermined time period has elapsed, at which time the RFID tag 18 may discharge the capacitor or otherwise modify the behaviour of the voltage controlled optical modifier layer 24. As yet another option, if the optical disc 10 included a photo-voltaic layer (as illustrated in Figure 10), the use of the laser could remove charge from the layer. Thus, after a number of usages of the optical disc 10, the layer would be discharged and the optical disc 10 would be unreadable. A filter could be used to insure that the laser, and not sunlight,

discharged the photo-voltaic layer. Still other time delay discharge mechanisms could be used as needed or desired.

As yet another option, the presence of a proper interrogation signal may cause the RFID tag 18 to instruct the voltage controlled optical modifier layer 24 to change permanently such that no further interrogation is required to use the optical disc 10. These concepts will be explored in greater detail below with respect to Figures 5-9.

The embodiment disclosed in Figure 5 is appropriate for any situation where an optical disc 10 contains or will contain sensitive or confidential information. Such situations include personal information, financial information, and/or military or government information. Initially, the optical disc 10 is placed into an optical disc player 28 (block 150). The optical disc 10 is initially non-useable by the optical disc player 28. Specifically, the optical disc player 28 may not read the optical disc 10 nor write to the optical disc 10 (block 152). The user may then introduce an interrogation signal through an interrogator 32 (block 154). The interrogator 32 may be integral with the optical disc player 28 or an external device, such as a battery powered key held near the optical disc player 28 and sending the interrogation signal through the walls of the optical disc player 28 to the RFID tag 18. With the presence of the interrogation signal, the RFID tag 18 outputs a voltage and changes the optical qualities of the voltage controlled optical modifier layer 24 (block 156).

If the optical disc 10 is a write once, read only, or read-write disc, these abilities are enabled in the presence of the interrogation signal (block 158). In the event that the optical disc 10 is a write once disc, a memory (not shown) may be used to track whether or not the disc has been written on. The memory may interface with the RFID tag 18 such that the optical disc 10 may not have another write command executed thereon.

Figure 6 illustrates an embodiment wherein software is authenticated and paid for via a network, such as the Internet. In this embodiment, the optical disc player 28 or the interrogator 32 may have a connection to a remote location, such as modems 36 and/or 38 or network connections. An optical disc 10 is inserted into the optical disc player 28 (block 200). The optical disc player 28 turns on the laser head 30 and fails to detect a return signal (block 202). The CPU 34 may detect this failed return signal and generate a command that a connection be made to a remote location over the network (block 204) so that an authorization to use the optical disc 10 may be secured. The address or contact information for the remote location may be located on a portion of the optical disc 10 that is not occluded by the voltage controlled optical modifier layer 24. Alternatively, the optical disc player 28 and/or interrogator 32 may connect automatically to a particular remote location. The remote location may query the CPU 34 or other device to determine what sort of command triggered the activation of the optical disc player 28. If the command was an installation command or a play command, the process may continue. If, however, the command was a copy command, the process may terminate.

The remote location initiates a payment transaction (block 206). Thus, payment information may be secured from the individual trying to use the optical disc 10. Payment information may be secured through a credit card reader, manual entry through a keyboard, or other appropriate means as needed or desired. Payment may be made on a pay per use schedule, a pay per installation schedule, or other schedule as needed or desired. Upon satisfaction that payment has been secured, the remote location may send a signal to the interrogator 32 to generate an appropriate interrogation signal (block 208). This signal may be routed through the CPU 34 or directly to the interrogator 32 as needed or desired and depending on the existence of the modem 38. The interrogation signal is generated, and the RFID tag 18 receives the interrogation signal (block 210). The voltage controlled optical modifier layer 24 changes and the laser head 30 generates a return signal (block 212). The installation or playing of the contents of the optical disc 10 may proceed (block 214).

In a similar vein, the present invention may be used to authorize pay per view movies or other pay per play activities. This is illustrated in Figure 7. The process is very similar in that the optical disc 10 is inserted into the optical disc player 28 (block 250). The optical disc player 28 turns on the laser head 30 with a command to read the optical disc 10 and receives no return signal (block 252). Recognizing the absence of a return signal, the CPU 34 or other entity establishes a remote connection (block 254). The address or contact information for the remote location may be located on a portion of the optical

disc 10 that is not occluded by the voltage controlled optical modifier layer 24. Alternatively, the optical disc player 28 and/or interrogator 32 may connect automatically to a particular remote location.

Once in communication with the remote location, a payment transaction may be initiated (block 256) to authorize a single playing of the content on the optical disc 10. The remote location may query the CPU 34 to see if the user is in fact trying to play the optical disc 10 or copy the optical disc 10. If the latter, the payment transaction may be cancelled or never initiated. In this manner, copying may be hindered.

Once payment is secured, the remote location may authorize the interrogation signal (block 258). Payment information may be secured through a credit card reader, manual entry through a keyboard, or other appropriate means as needed or desired. Payment may be made on a pay per use schedule, a pay per installation schedule, or other schedule as needed or desired. The interrogator 32 generates the interrogation signal, which is received by the RFID tag 18 on the optical disc 10 (block 260). The RFID tag 18 outputs the needed voltage to change the properties of the voltage controlled optical modifier layer 24, and the laser may now generate a return signal that is received by the laser head 30 (block 262). The content on the optical disc 10 may then be played (block 264). A memory associated with the CPU 34, the interrogator 32, or the RFID tag 18 may track when it is appropriate for the voltage output by the RFID

tag 18 to change such that the optical disc 10 is no longer readable, i.e., after one playing of the content.

Still another embodiment is illustrated in Figure 8, wherein a jukebox (not specifically illustrated) or similar playing device may contain a plurality of optical discs 10 with content thereon. Each of these optical discs 10 represents an investment, which if stolen would financially injure the jukebox operator. For the purposes of this embodiment, the jukebox is analogous to the optical disc player 28, as the jukebox would contain an optical disc player 28 to function. To help prevent such theft, the present invention is useful. The optical discs 10 are placed in the jukebox (block 300). The jukebox may generate the desired interrogation signal throughout the jukebox (block 302). Alternatively, the interrogation signal may be limited to the area in and around the optical disc player 28 within the jukebox. In either event, the optical discs 10 play normally (block 304) while within the jukebox. At some point, an optical disc 10 may be removed from the jukebox, and thus removed from the presence of the interrogation signal (block 306). In the absence of the interrogation signal, the RFID tag 18 on the optical disc 10 does not generate the needed output voltage to change the optical qualities of the voltage controlled optical modifier layer 24, and thus the optical disc 10 no longer plays (block 308). While this does not prevent theft, it removes the incentive for the theft because the thief no longer has a usable optical disc 10, nor will anyone buy such a non-functioning optical disc 10.

Another embodiment is illustrated in Figure 9. This embodiment is directed to helping reduce or prevent theft in a retail environment. This embodiment requires that the voltage controlled optical modifier layer 24 be stable at two different states. The first state causes the aluminium layer 22 to be illegible. The second state allows the aluminium layer 22 to be legible. More information on bi-stable materials may be found in the previously incorporated '834 British patent. Either state should be able to be maintained absent a signal from the RFID tag 18, but a signal from the RFID tag 18 may cause the voltage controlled optical modifier layer 24 to transition between these two states. The use of this two state voltage controlled optical modifier layer 24 begins when the optical disc 10 is put in the first illegible state (block 350). This may be done during manufacturing, arrival at a retail environment, or other time as needed or desired.

A consumer purchases the optical disc 10 at an authorized location (block 352). This may entail picking the optical disc 10 off a rack in a store and approaching a cash register location or similar activity as is well understood. The clerk at the retail establishment secures payment for the optical disc 10 (block 354). Payment may be made through any conventional technique such as cash, check, credit card, debit card, or the like. The clerk then subjects the optical disc 10 to an interrogation signal generated proximate the authorized location (block 356). The interrogation signal may be generated by a portable, handheld interrogator 32, or the interrogator 32 may be integrated into a point of sale device such as a cash register or the like as needed or desired.

The RFID tag 18 receives the interrogation signal and outputs a voltage to the voltage controlled optical modifier layer 24 (block 358). The voltage controlled optical modifier layer 24 changes to the second, legible state (block 360), and the consumer may use the optical disc 10 normally (block 362). The voltage controlled optical modifier layer 24 stays in the second legible state indefinitely.

The present invention is not limited to simply changing the voltage controlled optical modifier layer 24 as described with respect to Figure 8, but may also be combined with an electronic article surveillance (EAS) function, stock control, or logistics. If, for example, the RFID tag 18 operates at a centre frequency of 13.56 MHz, when the interrogation signal is sent to the RFID tag 18 in block 356 to make the disc legible, a flag may also be set in the memory of the RFID tag 18. This flag may indicate that the optical disc 10 has been legitimately purchased. Still other flags may be set, or incorporated into the first flag. The other flags may indicate from whence the optical disc 10 was purchased as well as timestamp. Scanners at the store exit will sound an alarm if an RFID tag 18 with the incorrect flag is detected. Such scanners and flag setting are common in the EAS art. This adds to the security and also helps prevent theft where a product is taken from the shelves and then taken directly to a refund station, with a claim that the receipt has been lost. The dual security measures may be a powerful deterrent to theft.

Note that the embodiment of Figure 9 may also be used in other non-retail establishments, such as a library for example, and need not be restricted to retail establishments. Further, while this embodiment does not prevent theft of the optical discs 10 per se, it does remove the incentive for the theft as the optical disc 10 is worthless if the interrogation signal has not been applied to change the voltage controlled optical modifier layer 24 to its second, legible state.

Numerous variations to the concept are possible. For example, the concept may also be applied to optical memory cards, such as those used by the United States Department of Defence. Another option is the all-optical tag/disc 50 as illustrated in Figure 10. Such an optical disc 50 is similar to an optical disc 10 in that it contains a centre hole 52, a non-information bearing annulus 54, and an information bearing annulus 56. An RFID tag 18 may be positioned on the optical disc 50 as previously described and connected to a voltage controlled optical modifier layer 24 as previously described. Further, the RFID tag 18 may be connected to a photo-voltaic area 58 of amorphous silicon or a polymeric semiconductor. Alternatively, the photo-voltaic area 58 may be a pyro-electric area. To use the optical disc 50, an optical disc writer must first attempt to write a specified code to the photo-voltaic area 58, producing a voltage which powers up the RFID tag 18. The modulation of the laser provides a data input to the RFID tag 18, which, if correct, allows the RFID tag 18 to either clear the voltage controlled optical modifier layer 24 temporarily for reading, or by using the bi-state stable material discussed above, permanently enables the use of the

optical disc 50. This technique may be used by itself or in conjunction with an interrogation signal as needed or desired for flexibility in assigning security protocols or the like.

Note further that while in general the presence or absence of an interrogation signal has been used to trigger the RFID tag 18 to send the voltage signal to the voltage controlled optical modifier layer 24, it is also possible that the RFID tag 18 may be interrogated and respond in a normal fashion until the interrogator 32 sends a predefined data sequence which causes the RFID tag 18 to accept commands. After receipt and acknowledgment of this predefined data sequence, the interrogator 32 may send a command to the RFID tag 18 to provide the desired output voltage that causes the change in the voltage controlled optical modifier layer 24.

Note that while the present discussion has been phrased in terms of disabling an entire optical disc 10, it is possible that only a portion of the optical disc 10 may be disabled to achieve the same results. For example, disabling the country code and index information on a DVD may make the DVD unreadable and achieve the same results.

Those skilled in the art will recognize improvements and modifications to the preferred embodiments of the present invention. All such improvements and modifications are considered within the scope of the concepts disclosed herein and the claims that follow.

CLAIMS:

1. An optical disc, comprising:

an RFID tag having a voltage output, said RFID tag responsive to a signal such that said voltage output changes based on the presence or absence of the said signal;

a content layer adapted to have content encoded thereon; and

a voltage controlled optical modifier layer associated with said content layer and said RFID tag such that said voltage controlled optical modifier layer may prevent at least a portion of said content layer from being utilized by an optical disc player unless said signal has been applied to said RFID tag and said RFID tag has provided an appropriate voltage signal at the voltage output to the voltage controlled optical modifier layer.

2. The optical disc of claim 1, wherein said optical disc comprises an optical memory card.

3. The optical disc of claim 1, wherein said voltage controlled optical layer comprises a material selected from the group consisting of: a liquid crystal material; a piezoelectric material, and a controllable mirrored surface.

4. The optical disc of claim 1, wherein said RFID tag is responsive to a predefined data sequence before changing the output voltage.

5. The optical disc of claim 1, wherein said voltage controlled optical modifier layer comprises a material that is stable in two states, one state in which the content layer is legible and one state in which the content layer is illegible.

6. The optical disc of claim 1, wherein said optical disc comprises a disc selected from the group consisting of: a DVD, an audio CD, a software CD, a CDRW, and a CD write once.

7. The optical disc of claim 1, wherein said RFID tag is responsive on a frequency band around a centre frequency selected from the group consisting of: 125 kHz, 13.56 MHz, 915 MHz, and 2450 MHz.

8. The optical disc of claim 1, wherein upon receipt of the appropriate interrogation signal, the RFID tag outputs a voltage which causes said voltage controlled optical modifier layer to change to a second state indefinitely such that said content layer is legible.

9. The optical disc of claim 1, wherein said content layer comprises content providing data for connecting to a remote location that is accessible independently of whether an appropriate signal is present.

10. The optical disc of claim 1, wherein said voltage controlled optical modifier layer causes said content layer to be legible for a predetermined amount of time after exposure to the appropriate interrogation signal.

11. The optical disc of claim 1, wherein said RFID tag is responsive to an interrogation signal generated by an interrogator.

12. A method of controlling use of an optical disc, comprising:

installing an RFID tag on the optical disc;

interrogating the optical disc with a predefined signal;

generating an output voltage from said RFID tag; and

directing said output voltage to a voltage controlled optical modifier layer such that the optical characteristics of said optical modifier layer change to allow content to be read from a content layer.

13. The method of claim 12, wherein interrogating the optical disc comprises interrogating the optical disc with an interrogator integrated into an optical disc player.

14. The method of claim 12, wherein interrogating the optical disc comprises interrogating the optical disc with an interrogator that operates as a unit independent of an optical disc player.

15. The method of claim 12, further comprising contacting a remote location to secure permission to send the predefined interrogation signal.

16. The method of claim 15, wherein contacting a remote location comprises contacting a remote location with an interrogator.

17. The method of claim 15, wherein contacting a remote location comprises contacting a remote location with an optical disc player.

18. The method of claim 12, further comprising reading the optical disc with an optical disc player.

19. The method of claim 12, further comprising writing to the optical disc with an optical disc player.

20. The method of claim 12, further comprising installing software from the optical disc.

21. The method of claim 12, further comprising installing the optical disc in a jukebox.

22. The method of claim 12, further comprising storing sensitive information on the optical disc and precluding access thereto except in the presence of the predefined signal.

23. The method of claim 12, further comprising allowing access to audio content on the optical disc in the presence of the predefined signal.

24. The method of claim 23, further comprising denying access to the audio content on the optical disc in the absence of the predefined signal.

25. The method of claim 12, further comprising allowing access to video content on the optical disc in the presence of the predefined signal.

26. The method of claim 25, further comprising denying access to the video content on the optical disc in the absence of the predefined signal.

27. The method of claim 12, wherein directing said output voltage to a voltage controlled optical modifier layer such that the optical characteristics of the optical modifier layer change to allow content to be read from a content layer comprises changing a state of a dual state optical modifier layer from a first state to a second state and wherein said optical modifier layer remains in said second state indefinitely.

28. The method of claim 12, wherein directing said output voltage to a voltage controlled optical modifier layer such that the optical characteristics of the optical modifier layer change to allow content to be read from a content layer comprises changing a refractive index of a liquid crystal material.

29. The method of claim 12, wherein directing said output voltage to a voltage controlled optical modifier layer such that the optical characteristics of the optical modifier layer change to allow content to be read from a content layer comprises changing the reflective qualities of a mirrored surface.

30. The method of claim 12, wherein directing said output voltage to a voltage controlled optical modifier layer such that the optical characteristics of the optical modifier layer change to allow content to be read from a content layer comprises changing a shape of a piezoelectric material.

31. The method of claim 12, wherein interrogating the optical disc with a predefined signal comprises interrogating the optical disc in a retail environment during a payment transaction.

32. The method of claim 12, wherein interrogating the optical disc with a predefined signal comprises interrogating the optical disc with a predefined interrogation signal after securing payment from a consumer desiring to purchase access to content on the optical disc.

33. A method of protecting information on an optical disc, comprising:

associating the optical disc with an RFID tag and a voltage controlled optical modifier layer; and

controlling said optical modifier layer with said RFID tag such that at least a portion of a content layer on the optical disc is inaccessible in the absence of a predefined signal.

34. The method of claim 33, wherein controlling said optical modifier layer comprises changing a refractive index of said optical modifier layer with an output voltage of said RFID tag such that a laser cannot read from or write to said content layer.

35. The method of claim 33, wherein controlling said optical modifier layer comprises controlling a material selected from the group consisting of: a liquid crystal material, a piezoelectric material, and a controllable mirrored material.

36. The method of claim 33, further comprising interrogating the optical disc with said predefined signal.

37. The method of claim 36, wherein interrogating the optical disc comprises interrogating the optical disc with an interrogator integrated into an optical disc player.

38. The method of claim 36, wherein interrogating the optical disc comprises interrogating the optical disc with an interrogator distinct from an optical disc player.

39. The method of claim 36, further comprising securing permission to generate the predefined signal from a remote location.

40. The method of claim 33, further comprising allowing access to the content layer of the optical disc for a predetermined amount of time after exposure to the predefined signal.

41. A method of controlling software on an optical disc, comprising:

storing software on an optical disc as content; and

precluding reading at least a portion of content from the optical disc in the absence of a predefined signal to an RFID tag associated with the optical disc.

42. The method of claim 41, further comprising generating said predefined signal proximate the optical disc.

43. The method of claim 42, further comprising contacting a remote location prior to generating said predefined signal.

44. The method of claim 43, wherein contacting a remote location comprises contacting a remote location over a network.

45 The method of claim 43, wherein contacting a remote location further comprising initiating a payment transaction prior to generating said predefined signal.

46. The method of claim 41, wherein precluding reading content from the optical disc in the absence of a predefined signal to an RFID tag associated with the optical disc comprises preventing an optical disc reader from accessing the content by hindering the optical disc reader from securing a return signal from a surface of the optical disc.

47. The method of claim 46, wherein hindering the optical disc reader from securing a return signal from a surface of the optical disc comprises using a material selected from the group consisting of: a liquid crystal material, a controllable mirrored material, and a piezoelectric material.

48. The method of claim 46, further comprising, upon receipt of the predefined signal, generating an output voltage with the RFID tag.

49. The method of claim 48, further comprising using the output voltage of the RFID tag to change a quality of a voltage controlled optical modifier layer on the optical disc such that the disc is readable by an optical disc reader.

50. A method of controlling content on an optical disc, comprising:

storing content on an optical disc; and

precluding reading at least a portion of content from the optical disc in the absence of a predefined signal to an RFID tag associated with the optical disc.

51. The method of claim 50, further comprising generating said predefined signal proximate the optical disc.

52. The method of claim 51, further comprising contacting a remote location prior to generating said predefined signal.

53. The method of claim 52, wherein contacting a remote location comprises contacting a remote location over a network.

54. The method of claim 52, wherein contacting a remote location further comprises initiating a payment transaction prior to generating said predefined signal.

55. The method of claim 50, wherein precluding reading content from the optical disc in the absence of a predefined signal to an RFID tag associated with the optical disc comprises preventing an optical disc reader from accessing the content by hindering the optical disc reader from securing a return signal from a surface of the optical disc.

56. The method of claim 55, wherein hindering the optical disc reader from securing a return signal from a surface of the optical disc comprises using a material selected from the group consisting of: a liquid crystal material, a controllable mirrored material, and a piezoelectric material.

57. The method of claim 55, further comprising, upon receipt of said predefined signal, generating an output voltage with the RFID tag.

58. The method of claim 57, further comprising using said output voltage of the RFID tag to change a quality of a voltage controlled optical modifier layer on the optical disc such that the disc is readable by an optical disc reader.

59. The method of claim 50, wherein storing content on the optical disc comprises storing video content on a DVD.

60. The method of claim 50, wherein precluding reading content from the optical disc in the absence of a predefined interrogation signal to an RFID tag associated with the optical disc comprises selectively allowing pay per view access to the content after securing permission from a remote location.

61. A method of inhibiting theft at a jukebox, comprising:

associating an optical disc with an RFID tag that controls an optical modifier layer on said optical disc;

installing said optical disc in a jukebox; and

interrogating said RFID tag with a predefined signal such that said RFID tag causes the optical modifier layer to make said optical disc legible to an optical disc reader associated with the jukebox.

62. The method of claim 61, wherein associating an optical disc with an RFID tag that controls an optical modifier layer on said optical disc comprises associating an RFID tag that operates at a frequency centred around the frequencies selected from the group consisting of: 125 kHz, 13.56 MHz, 915 MHz, and 2450 MHz.

63. The method of claim 61, further comprising causing said optical modifier layer to make said optical disc illegible to an optical disc reader in the absence of said predefined signal.

64. The method of claim 63, wherein causing said optical modifier layer to make said optical disc illegible to an optical disc reader in the absence of said predefined signal comprises causing an optical modifier layer selected from a material in the group consisting of: a piezoelectric layer, a liquid crystal layer, and a controllable mirrored layer to make the optical disc illegible.

65. The method of claim 61, wherein associating an optical disc with an RFID tag that controls an optical modifier layer on said optical disc comprises controlling said optical modifier layer with an output voltage from said RFID tag.

66. A method of inhibiting theft in a retail establishment, comprising:

associating an optical disc with an RFID tag that controls an optical modifier layer on the optical disc;

causing the optical modifier layer to exist in a first state that renders at least a portion of the optical disc illegible to an optical disc reader; and

selectively modifying the optical modifier layer to a second state in which the optical disc is legible to an optical disc reader after a consumer has paid for the optical disc.

67. The method of claim 66, wherein said selectively modifying comprises sending a signal to the RFID tag on the optical disc.

68. The method of claim 67, wherein sending a signal to the RFID tag on the optical disc comprises sending an interrogation signal from an interrogator integrated into a point of sale device.

69. The method of claim 67, wherein sending a signal to the RFID tag on the optical disc comprises sending an interrogation signal from a portable

interrogator associated with a sales clerk responsible for handling collection of payment for the optical disc.

70. The method of claim 66, wherein sending a signal comprises sending an interrogation signal at a frequency centred around the frequencies selected from the group consisting of: 125 kHz, 13.56 MHz, 915 MHz, and 2450 MHz.

71. The method of claim 66, further comprising setting a flag in memory associated with the RFID tag.

72. The method of claim 71, wherein setting a flag in memory associated with the RFID tag comprises indicating that the optical disc was legitimately purchased.

73. The method of claim 72, further comprising storing in memory an indication of from whence the optical disc was legitimately purchased and a timestamp.

74. An optical device, comprising:

a content bearing medium having an edge;

a photo-voltaic area proximate the edge;

a voltage controlled optical modifier layer associated with the content bearing medium; and

a chip associated with the photo-voltaic area such that after an optical disc writer attempts to write a predefined interrogation signal on the photo-voltaic area, the chip produces an output voltage that causes the voltage controlled optical modifier layer to allow the content bearing medium to be accessed.

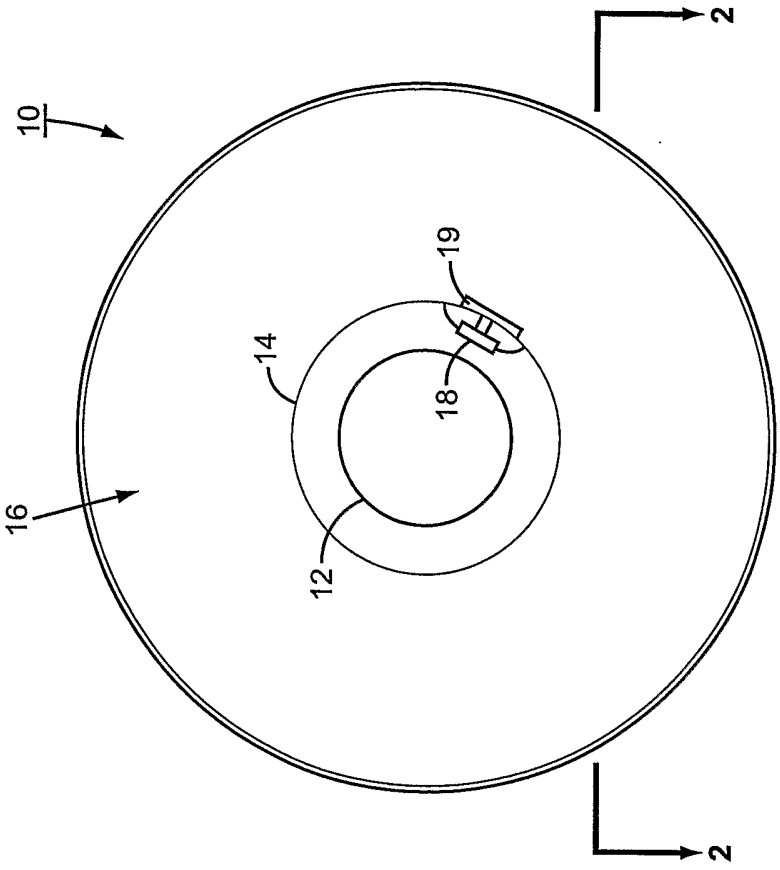

FIG. 1

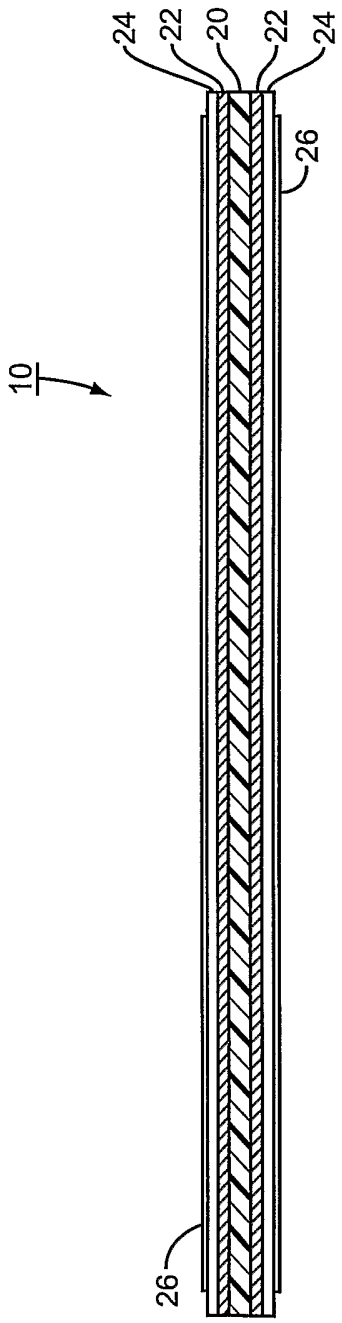

FIG. 2

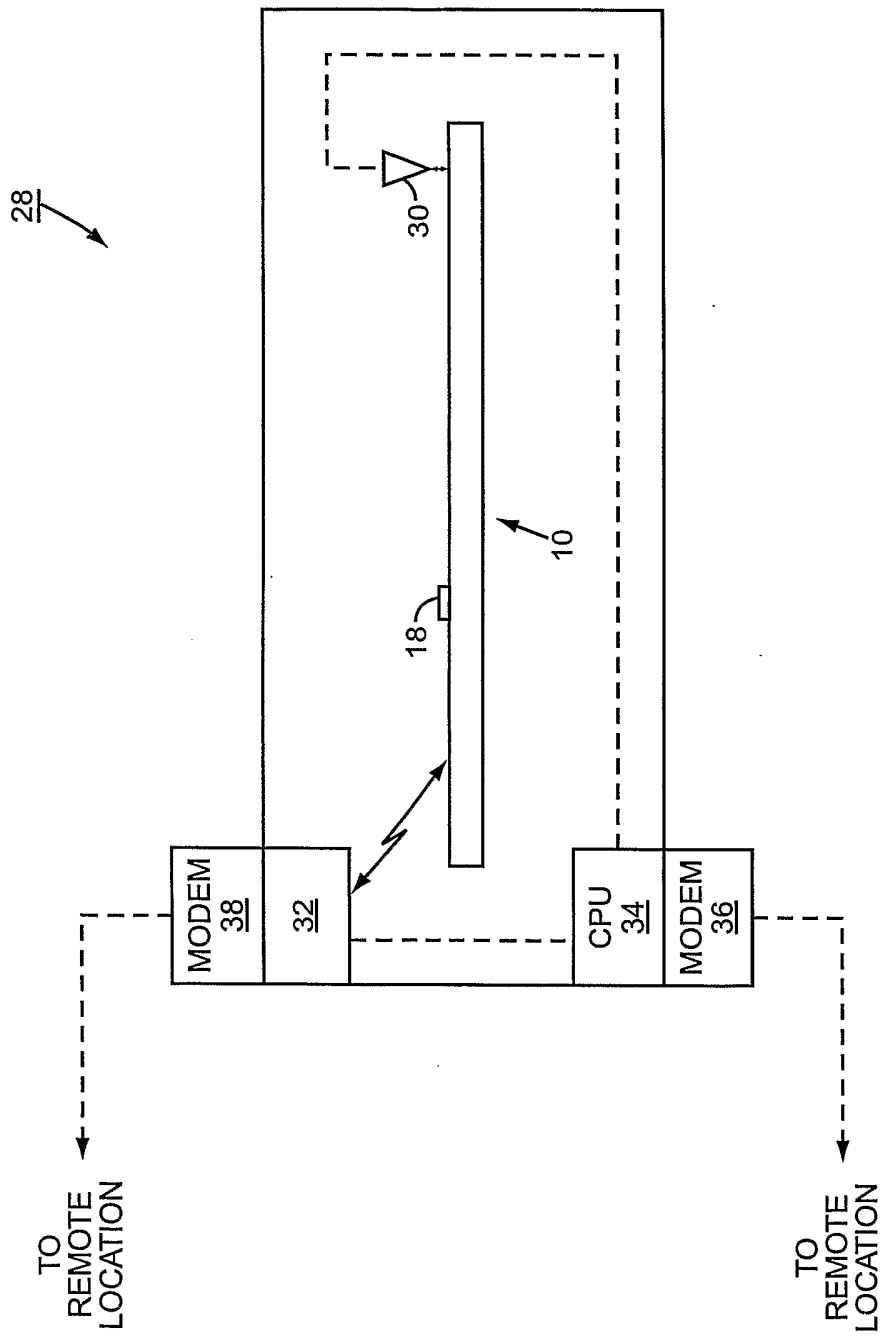
28
30
10
18
MODEM
38
32
CPU
34
MODEM
36
TO
REMOTE
LOCATION
TO
REMOTE
LOCATION

FIG. 3

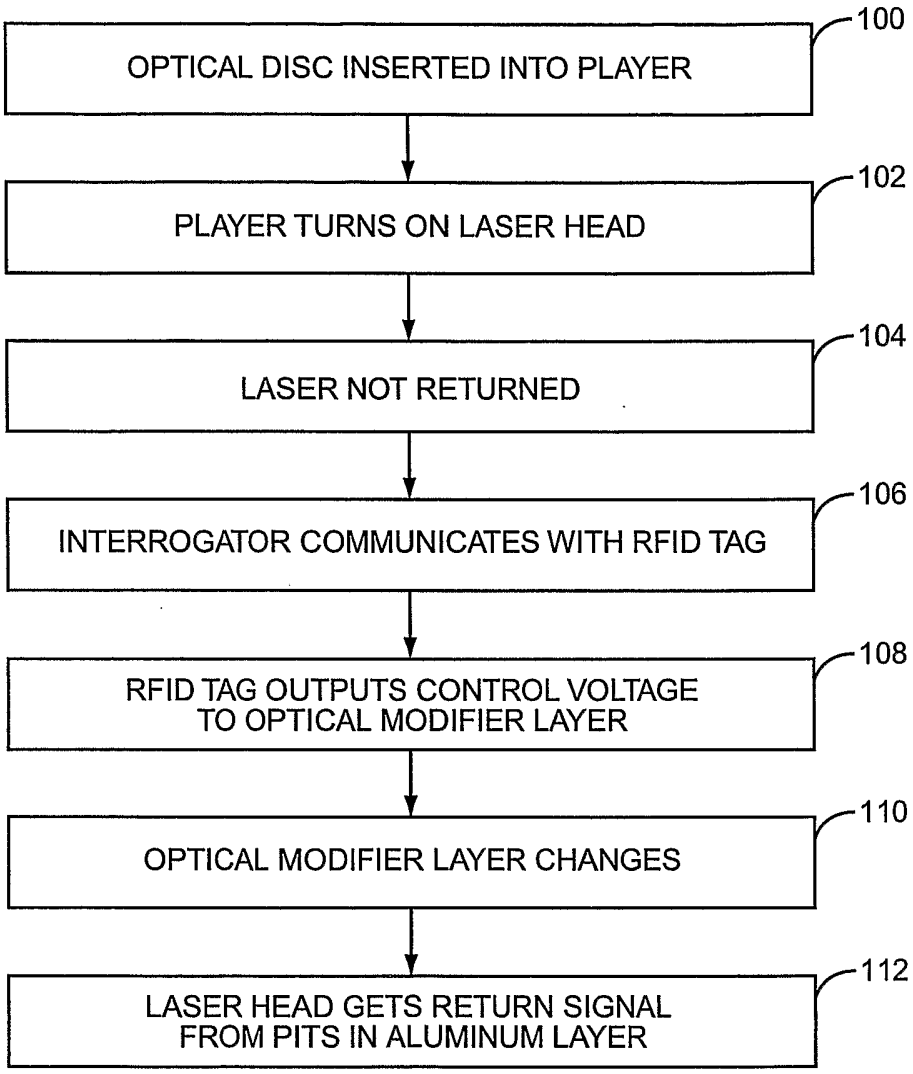
OPTICAL DISC INSERTED INTO PLAYER
100
PLAYER TURNS ON LASER HEAD
102
LASER NOT RETURNED
104
INTERROGATOR COMMUNICATES WITH RFID TAG
106
RFID TAG OUTPUTS CONTROL VOLTAGE TO OPTICAL MODIFIER LAYER
108
OPTICAL MODIFIER LAYER CHANGES
110
LASER HEAD GETS RETURN SIGNAL FROM PITS IN ALUMINUM LAYER
112

FIG. 4

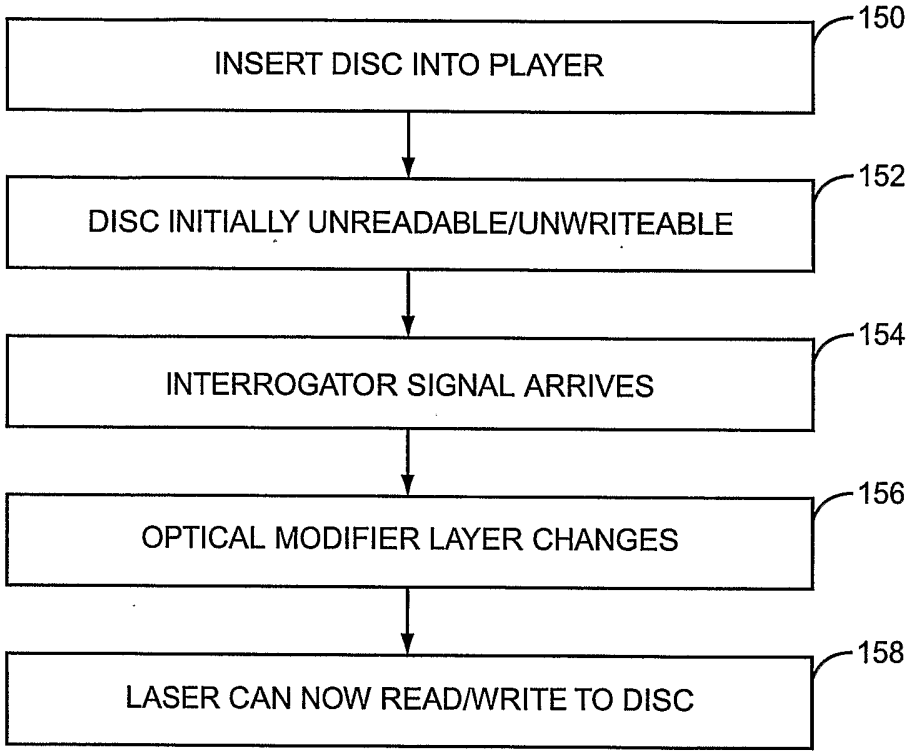
INSERT DISC INTO PLAYER
150
DISC INITIALLY UNREADABLE/UNWRITEABLE
152
INTERROGATOR SIGNAL ARRIVES
154
OPTICAL MODIFIER LAYER CHANGES
156
LASER CAN NOW READ/WRITE TO DISC
158

FIG. 5

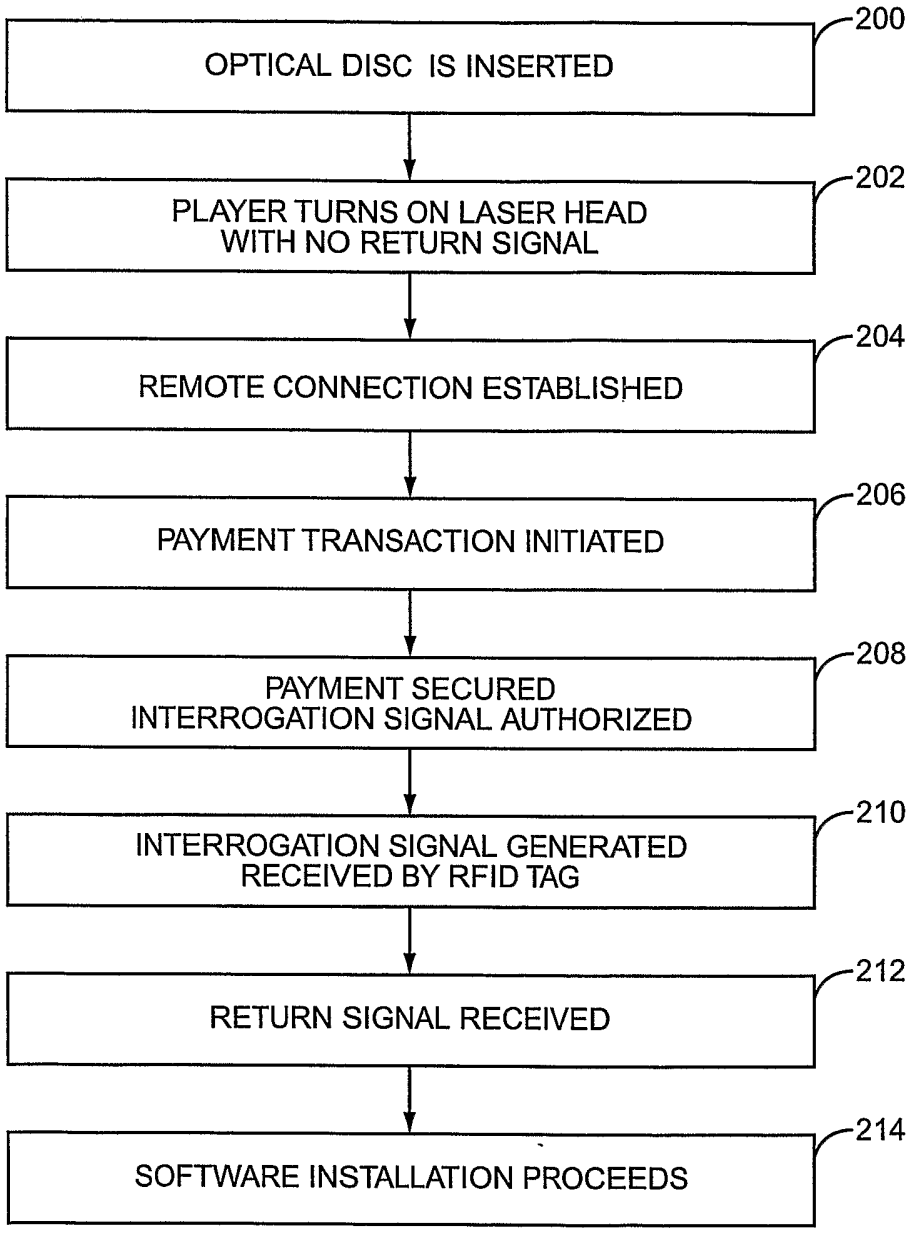
OPTICAL DISC IS INSERTED
200
PLAYER TURNS ON LASER HEAD WITH NO RETURN SIGNAL
202
REMOTE CONNECTION ESTABLISHED
204
PAYMENT TRANSACTION INITIATED
206
PAYMENT SECURED INTERROGATION SIGNAL AUTHORIZED
208
INTERROGATION SIGNAL GENERATED RECEIVED BY RFID TAG
210
RETURN SIGNAL RECEIVED
212
SOFTWARE INSTALLATION PROCEEDS
214

FIG. 6

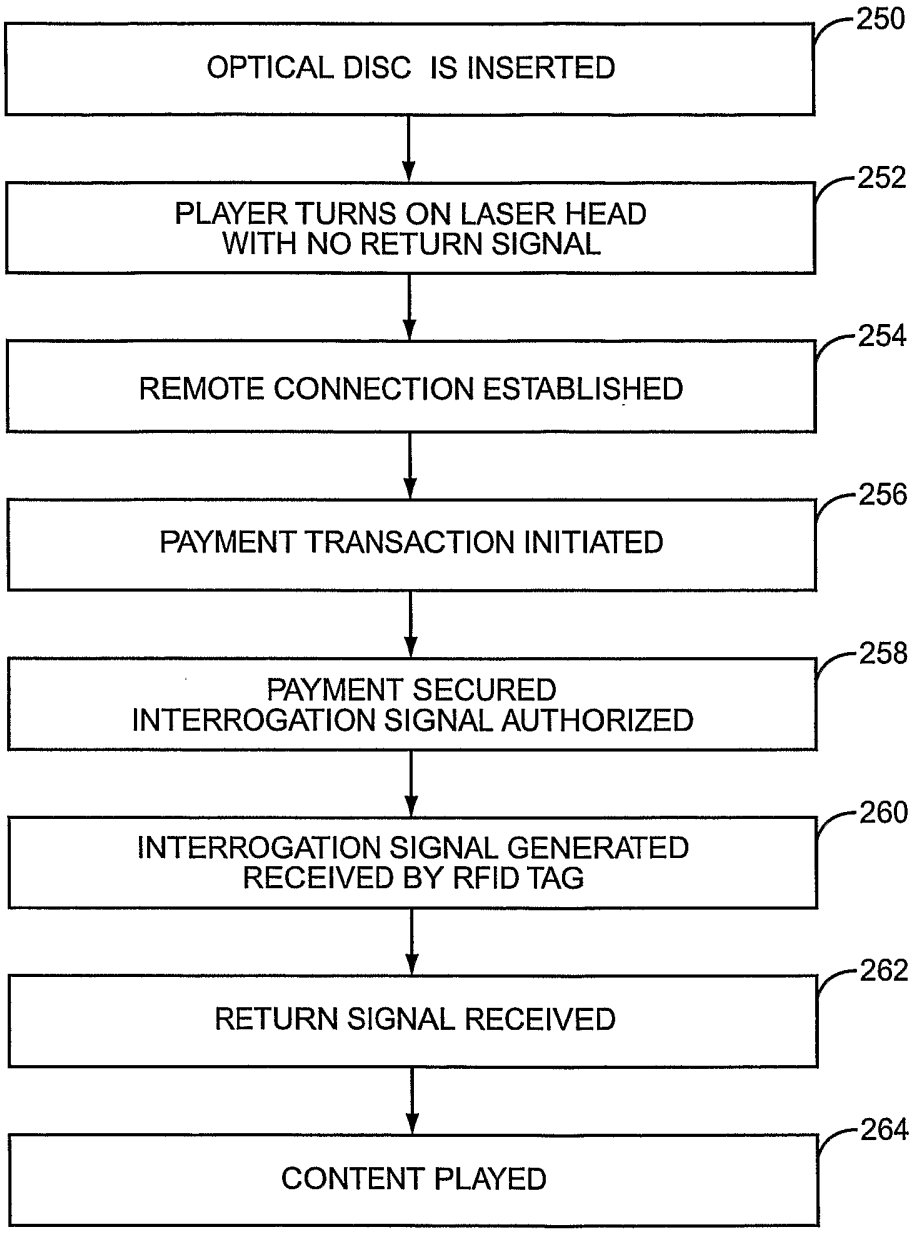
OPTICAL DISC IS INSERTED
250
PLAYER TURNS ON LASER HEAD
WITH NO RETURN SIGNAL
252
REMOTE CONNECTION ESTABLISHED
254
PAYMENT TRANSACTION INITIATED
256
PAYMENT SECURED
INTERROGATION SIGNAL AUTHORIZED
258
INTERROGATION SIGNAL GENERATED
RECEIVED BY RFID TAG
260
RETURN SIGNAL RECEIVED
262
CONTENT PLAYED
264

FIG. 7

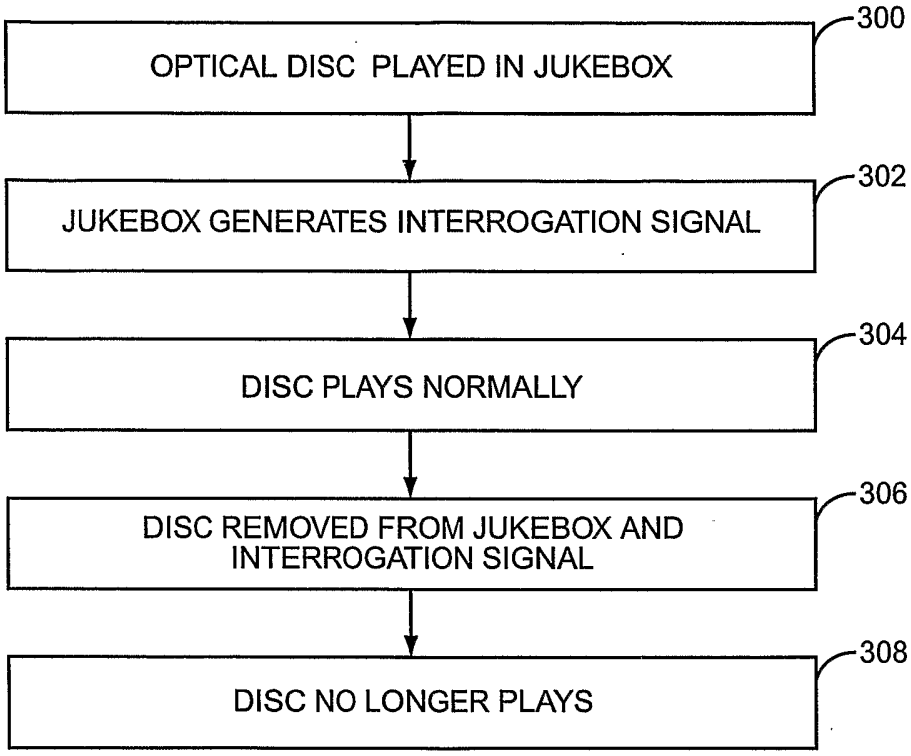
OPTICAL DISC PLAYED IN JUKEBOX
300
JUKEBOX GENERATES INTERROGATION SIGNAL
302
DISC PLAYS NORMALLY
304
DISC REMOVED FROM JUKEBOX AND INTERROGATION SIGNAL
306
DISC NO LONGER PLAYS
308

FIG. 8

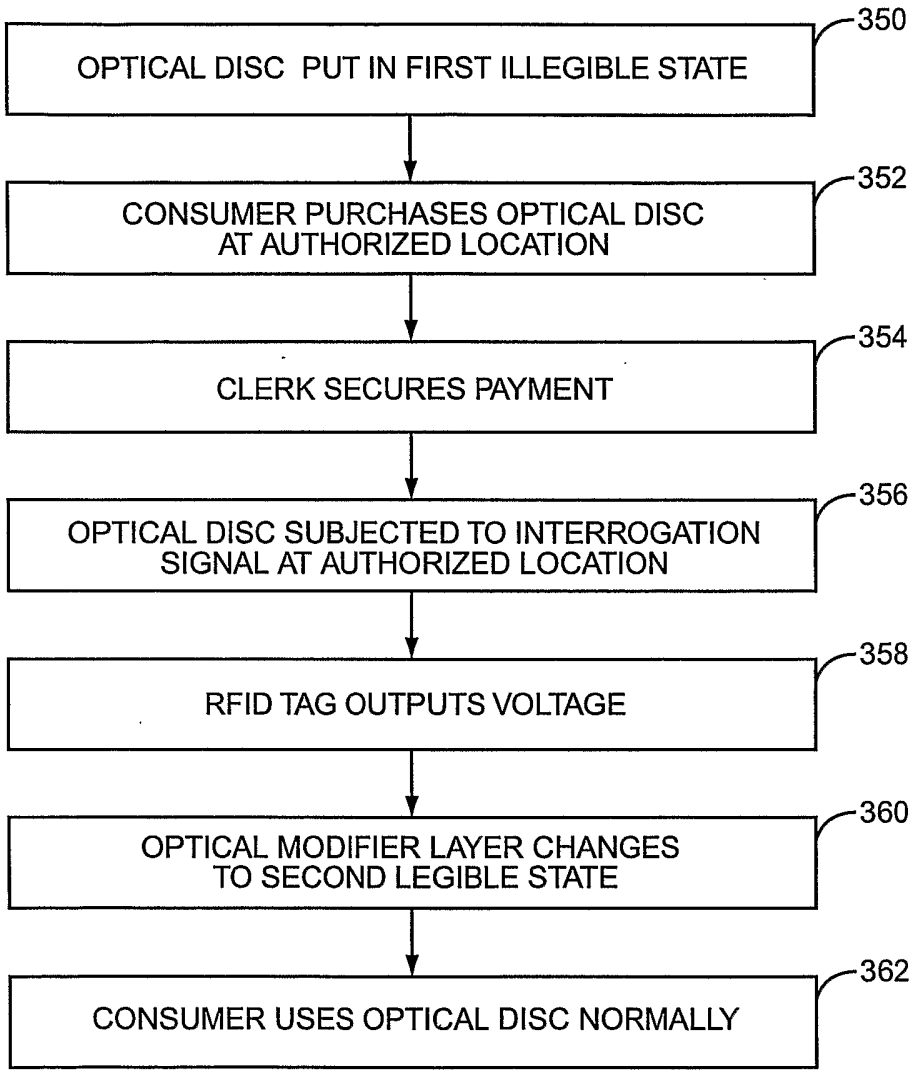
OPTICAL DISC PUT IN FIRST ILLEGIBLE STATE
350
CONSUMER PURCHASES OPTICAL DISC AT AUTHORIZED LOCATION
352
CLERK SECURES PAYMENT
354
OPTICAL DISC SUBJECTED TO INTERROGATION SIGNAL AT AUTHORIZED LOCATION
356
RFID TAG OUTPUTS VOLTAGE
358
OPTICAL MODIFIER LAYER CHANGES TO SECOND LEGIBLE STATE
360
CONSUMER USES OPTICAL DISC NORMALLY
362

FIG. 9

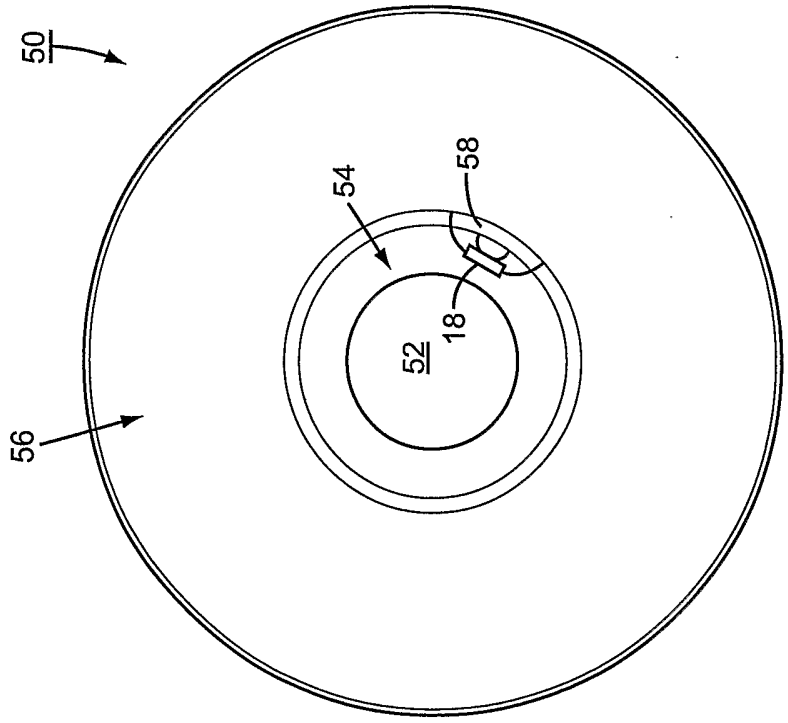

FIG. 10