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<td>Title</td>
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<td>Applicant(s)</td>
<td>Konami Australia Pty Ltd</td>
</tr>
<tr>
<td>Inventor(s)</td>
<td>Crosby, Gerard</td>
</tr>
<tr>
<td>Agent / Attorney</td>
<td>Wallington-Dummer, Suite 1005 Level 10 37 Bligh Street, Sydney, NSW, 2000</td>
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<td>Related Art</td>
<td>US 5,987,605 A (HILL et al.) 16 November 1999</td>
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<td>US 6,565,443 B1 (JOHNSON et al.) 20 May 2003</td>
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Title: STORAGE SYSTEM FOR A GAMING MACHINE

Abstract: A system for storage of game enabling data for electronic gaming machines; said system including a data storage medium prepared with formatting adapted to prevent unauthorized use of copying. In a particularly preferred form the system utilizes transfer of a boot sector from a first predetermined location to a second predetermined location.
STORAGE SYSTEM FOR A GAMING MACHINE

The present invention relates to a data storage system for gaming machines and, more particularly to a system and method for securing digital data coded for the operation of such machines.

BACKGROUND

Gaming or poker machines have become a major source of amusement and diversion in such places as clubs, hotels and casinos in many parts of the world.

Traditionally such machines were mechanical devices where a number of reels marked with a plurality of numbers or symbols could be made to spin randomly by the application of some mechanical input. If the subsequent patterns of numbers or symbols displayed on the reels, when these returned to a rest state, corresponded to predetermined patterns, the machine would provide a prize or payout. Generally such gaming machines have come to be regulated by government authorities as to their number and in the manner in which the machines must return a percentage of the monetary turnover to the players.

The introduction of electronics, computers and electronic graphical displays, has allowed a continual increase in the complexity and variations of gaming
machines and games while maintaining the basic concept of the traditional machine.

Machines and games that offer novel and stimulating variations on the basic game theme and environment are eagerly sought by the gaming industry and there is consequently intense competition between machine manufacturers to innovate.

The development of a novel game and the rendering of a new game into the computer source code necessary for generating both alphanumeric and video imagery on an electronic gaming machine constitute a considerable investment. The code to drive a game sequence is resident in the memory of a machine and any ability to extract such code for unauthorized use, for example by introducing the code and game into machines other than those of the code owner is highly undesirable.

It is an object of the present invention to address or at least ameliorate some of the above disadvantages.

BRIEF DESCRIPTION OF INVENTION

Accordingly, in a first broad form of the invention, there is provided a system for prevention of unauthorized use or copying of game enabling data stored on data storage medium; said system including formatting of said data storage medium according to a proprietary formatting protocol specific to a manufacturer of electronic gaming machines; said proprietary protocol including moving location of a boot sector of said data storage medium, from a first storage location determined
at manufacture of said data storage medium, to a second storage location predetermined by said manufacturer of electronic gaming machines.

Preferably, said data storage medium is adapted for connection to control modules of selected ones of said gaming machines.

Preferably, said data storage medium is a Compact Flash card.

Preferably, said data storage medium is a PCMCIA card.

Preferably, said formatting protocol is specific to said selected ones of said gaming machines.

Preferably, said formatting protocol is specific to a game played on said gaming machines.

Preferably, said control module includes an EPROM adapted to access data on said data storage medium in accordance with said formatting protocol.

Preferably, said second storage location predetermined by said manufacturer of said gaming machines is located on said medium at other than a first data sector of said data storage medium.

Preferably, said electronic gaming machines are slot machines for the playing of games of chance for money.

Preferably, said game enabling data includes video imaging data for display on said gaming machine display means.

In another broad form of the invention, there is provided a method for securing against unauthorized use or copying game enabling data for a gaming machine; said method including the steps of:
a. preparing a data storage medium formatting protocol for specific use in selected ones of a manufacturer's gaming machines,
b. formatting said data storage medium according to said formatting protocol,
c. providing control means for said gaming machines including an EPROM storing said formatting protocol,
d. writing game enabling data to said data storage medium according to said formatting protocol, and

wherein said formatting protocol includes moving location of a boot sector of said data storage medium, from a first storage location determined at manufacture of said data storage medium, to a second storage location predetermined by said manufacturer of electronic gaming machines.

Preferably, said data storage medium is a Compact Flash card.
Preferably, said data storage medium is a PCMCIA card.
Preferably, said formatting includes locating a boot sector of said data storage medium in a data sector other than a first data sector.

In another broad form of the invention, there is provided a method of securing a digital storage medium against unauthorized copying or use of electronic gaming machine game enabling data; said method comprising moving a boot sector of said medium from a first location on said medium predetermined at manufacture of said medium to a second location on said
medium predetermined according to a formatting protocol specific to a manufacturer of said electronic gaming machine. Preferably, the method further includes storing in a controller to which said medium is to be connected, the location of said second location thereby to allow said controller to access game enabling data stored on said medium. Preferably, said second location is located within a contents portion of said medium.

In a further broad form of the invention, there is provided a gaming machine incorporating prevention of unauthorized copying of use of game enabling data stored on a removable medium; said removable medium in electronic communication with a game controller of said gaming machine, thereby to communicate instructions as to operation of said gaming machine to said controller; said removable medium incorporating a first predetermined location and a second predetermined location; said removable medium formatted according to a protocol specific to a manufacturer of said gaming machine; said formatting designating said second predetermined location as a boot sector information replacing boot sector information located at manufacture of said removable medium at said first predetermined location. Preferably, said first predetermined location contained boot sector information available to a plurality of third parties.

Preferably, after said formatting specific to said manufacturer, said second predetermined location contains boot
sector information which is proprietary to said manufacturer of said gaming machine.

Preferably, said boot sector information comprises a look up table.

Preferably, said medium includes an onboard controller for directing storage of data via said look up table.

**BRIEF DESCRIPTION OF DRAWINGS**

Embodiments of the present invention will now be described with reference to the accompanying drawings wherein:

- Figure 1 is a schematic representation of a gaming machine incorporating a preferred embodiment of a storage system according to the invention.
- Figure 2 is a flow diagram of the preparation of data for the storage system of figure 1.
- Fig. 3A shows a medium before application of an embodiment of the present invention,
- Fig. 3B shows the medium of Fig 3A after application of method of the method of preferred embodiment of the present invention,
- Fig. 3C illustrates a file access table suitable for use with the medium of figs. 3A, 3B, and
- Fig. 4 illustrates diagrammatically the major components of a logic unit of a gaming machine in communication with a medium to which an embodiment of the present invention has been applied.
DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Typically an electronic gaming machine may have as part of its control system a main board carrying a microprocessor unit and one or more EPROMs (Electronic Programmable Read Only Memory chips) which provide for those operation of the machine not directly associated with the display of a game. As well the machine will incorporate a data storage facility which may take a number of forms, including disc drives, which provides the specific graphical and, where appropriate, alphanumerical data for the display of the game offered on the machine.

A convenient data storage medium for the storage of data as digital code for a game in an electronic gaming machine is a Compact Flash (CF) card or PCMCIA Card. Flash cards or PCMCIA cards (Personal Computer Memory Card International Association) are small solid state devices available in a number of sizes and data storage capacities. For the data stored on such a card to be accessed and used, the card must be interfaced with a suitable microprocessor, such as that of a personal computer (PC) via a card reading device. Data may likewise be written to the card by a microprocessor device such as a PC.

The writing to, and retrieval from, a data storage medium occurs according to a specific protocol or format and data storage media must be prepared or "formatted" for this purpose. Typically cards are formatted during
manufacture according to a proprietary protocol such as for example FAT32 or NTFS.

Formatting of any digital data storage medium refers to the arrangement, or addresses, at which various types of data are located in the storage medium. A particular function of formatting is to allow an accessing microprocessor to “find” the boot sector (or index) of the storage medium. Typically the boot sector, or at least the pointer to the boot sector (the Master Boot Record), is located in the first data sector of the data storage medium; thus for hard drives it is the first sector of a logical drive, such as C or D, while on a floppy disk, it is located on side 0, cylinder 0, sector 1.

On start-up a processor will “look” for the boot sector or pointer at these locations. Processors which expect to locate the boot sector or pointer at this first location will not be able to do so if a storage medium has been formatted in a non-standard way. Without access to the boot sector, no executable programs stored in the medium can be run and no data can be extracted.

With reference to the schematic representation of Figure 1, a preferred embodiment of the present invention includes a gaming machine 10 which is provided with a control module 20. Control module 20 includes a microprocessor unit 21 and one or more EPROM chips 22. Also
provided in control module 20 is a docking port (not shown) for a Compact Flash or PCMCIA card 24.

Card 24 at least contains all the data required for the playing of a game on gaming machine 10 including the video imaging data for display means 25. The formatting of card 24 according to the invention, is not by means of any publicly available proprietary protocol but according to a protocol or protocols specific to the manufacturer of the gaming machine. Thus a particular formatting protocol may be used by the manufacturer for all flash cards intended for the manufacturer's gaming machines or selected formatting protocols may be specific to particular games, or to a particular range of machines.

A gaming machine prior to installation for use, is provided with data written to one of its EPROM chips incorporating the formatting protocol. The method which may be employed is shown in the flow diagram of Figure 2. This protocol is compatible with that used in formatting the Flash or PCMCIA card 24 intended to be used for that machine. Thus at start up, the gaming machine processor will "look" for the boot sector of the card 24 in the appropriate location according to the formatting protocol.

By this means the use of a card 24 in a non-compatible machine is prevented and the extracting of the game flash data from the card 24 and the writing of that data to
commercially available flash cards for use in unauthorized machines is prevented.

By way of specific example and with reference to fig. 3 there is illustrated a medium 50, in this instance in the form of a compact flash (CF) card. In the instance of fig. 3A the medium 50 is formatted in accordance with a widely available format. By way of example the FAT format from Microsoft Corporation wherein the boot sector 51 of medium 50 which comprises a file access table 52 placed at a first predetermined location 53. The file access table contains pointers P1, P2... to locations of data in the contents portion 54 of medium 50. In the case where medium 50 comprises a compact flash card the card includes a basic controller 55 which orchestrates the population of the file access table as in when data is written to or read from the compact flash card.

In this particular instance the contents portion 54 of medium 50 contains game enabling data comprising graphics and sound information used for providing graphical displays on display 25 of gaming machine 10.

With reference to fig. 3B the medium 50 is rendered copy resistant by moving boot sector 51 at the first predetermined location to a second predetermined location 56 in contents portion 54. Most preferably, at the same time, data in the first predetermined location 53 is erased.
or otherwise altered so that it no longer functions as a boot sector.

In use the data in contents portion 54 can be read by a microprocessor 21 only if it is provided with information as to the second predetermined location 56. In this instance, as shown in fig. 4, this information as to the location of the second predetermined location 56 can be provided by storing the information at a memory location 56A within ROM 57.

In particular forms, the data in contents portion 54 can comprise code for the implementation of a game on gaming machine 10.

It will be appreciated that if an unauthorized party obtains a copy of the contents of at least contents portion 54 of the medium 50, it will not be possible for that party to read the contents without first knowing the location of second predetermined location 56 containing the file access table 52. That information is not readily or easily discernible from the medium 50 itself nor from ROM 57.

The initial formatting of medium 50 can be performed utilizing widely available tools from companies such as Microsoft Corporation. The creation of the second predetermined location within the contents portion can be carried out using the same tools, for example utilising the C++ language.
The above describes only some embodiments of the present invention and modifications, obvious to those skilled in the art, can be made thereto without departing from the scope and spirit of the present invention.
CLAIMS

1. A system for prevention of unauthorized use or copying of game enabling data stored on data storage medium; said system including formatting of said data storage medium according to a proprietary formatting protocol specific to a manufacturer of electronic gaming machines; said proprietary protocol including moving location of a boot sector of said data storage medium, from a first storage location determined at manufacture of said data storage medium, to a second storage location predetermined by said manufacturer of electronic gaming machines.

2. The system of claim 1 wherein said data storage medium is adapted for connection to control modules of selected ones of said gaming machines.

3. The system of claim 1 or 2 wherein said data storage medium is a Compact Flash card.

4. The system of claim 1 or 2 wherein said data storage medium is a PCMCIA card.

5. The system of any one of claims 1 to 4 wherein said formatting protocol is specific to said selected ones of said gaming machines.

6. The system of any one of claims 1 to 5 wherein said formatting protocol is specific to a game played on said gaming machines.
7. The system of any one of claims 2 to 6 wherein said control module includes an EPROM adapted to access data on said data storage medium in accordance with said formatting protocol.

8. The system of any one of claims 5 to 8 wherein said second storage location predetermined by said manufacturer of said gaming machines is located on said medium at other than a first data sector of said data storage medium.

9. The system of any one of claims 1 to 8 wherein said electronic gaming machines are slot machines for the playing of games of chance for money.

10. The system of any one of claims 1 to 9 wherein said game enabling data includes video imaging data for display on said gaming machine display means.

11. A method for securing against unauthorized use or copying game enabling data for a gaming machine; said method including the steps of:

   a. preparing a data storage medium formatting protocol for specific use in selected ones of a manufacturer's gaming machines,

   b. formatting said data storage medium according to said formatting protocol,

   c. providing control means for said gaming machines including an EPROM storing said formatting protocol,
d. writing game enabling data to said data storage medium according to said formatting protocol, and
wherein said formatting protocol includes moving location of a boot sector of said data storage medium, from a first storage location determined at manufacture of said data storage medium, to a second storage location predetermined by said manufacturer of electronic gaming machines.

12. The method of claim 11 wherein said data storage medium is a Compact Flash card.

13. The method of claim 11 wherein said data storage medium is a PCMCIA card.

14. The method of any one of claims 11 to 13 wherein said formatting includes locating a boot sector of said data storage medium in a data sector other than a first data sector.

15. A method of securing a digital storage medium against unauthorized copying or use of electronic gaming machine game enabling data; said method comprising moving a boot sector of said medium from a first location on said medium predetermined at manufacture of said medium to a second location on said medium predetermined according to a formatting protocol specific to a manufacturer of said electronic gaming machine.
16. The method of claim 15 further including storing in a controller to which said medium is to be connected, the location of said second location thereby to allow said controller to access game enabling data stored on said medium.

17. The method of claim 16 wherein said second location is located within a contents portion of said medium.

18. A medium as hereinbefore particularly described with reference to Fig. 3.

19. A method of securing a medium against copying data therefrom as hereinbefore particularly described with reference to Fig. 3A and Fig. 3B.

20. A method of securing a flash memory device against copying data therefrom as hereinbefore particularly described with reference to Fig. 3A and Fig. 3B.

21. A gaming machine incorporating prevention of unauthorized copying of use of game enabling data stored on a removable medium; said removable medium in electronic communication with a game controller of said gaming machine, thereby to communicate instructions as to operation of said gaming machine to said controller; said removable medium incorporating a first predetermined location and a second predetermined location; said removable medium
formatted according to a protocol specific to a manufacturer of said gaming machine; said formatting designating said second predetermined location as a boot sector information replacing boot sector information located at manufacture of said removable medium at said first predetermined location.

22. The gaming machine of claim 21 wherein said first predetermined location contained boot sector information available to a plurality of third parties.

23. The gaming machine of claim 21 or claim 22 wherein, after said formatting specific to said manufacturer, said second predetermined location contains boot sector information which is proprietary to said manufacturer of said gaming machine.

24. The gaming machine of any one of claims 21 to 23 wherein said boot sector information comprises a look up table.

25. The gaming machine of claim 24 wherein said medium includes an onboard controller for directing storage of data via said look up table.
Fig. 1

Fig. 2
The case of normal CF: PC can read the contents through the index.

The case of protected CF: PC will try to refer to the index but cannot read the contents because there is not index at the specific location.

It can be copied.

It cannot be copied.