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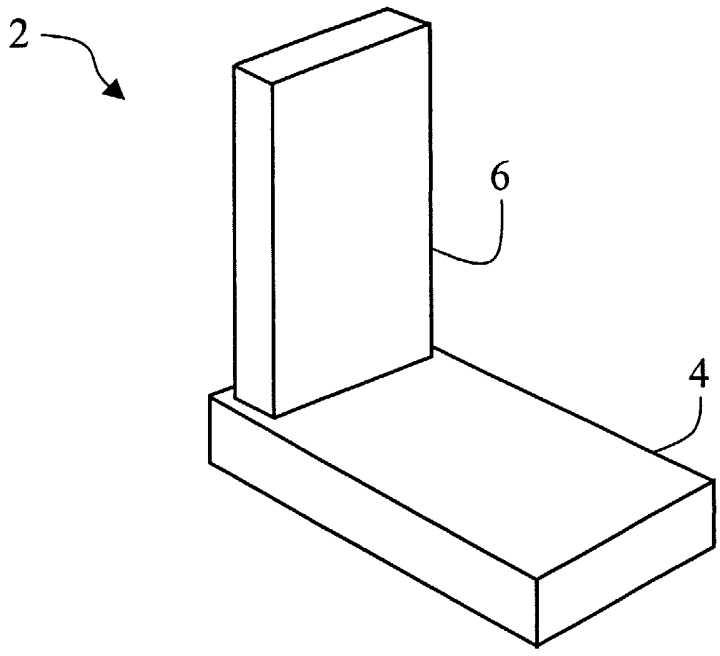
(54) Title: ELECTRONIC CONTENT STORAGE SYSTEM



(57) Abstract: The invention provides an electronic content storage system (2) comprising: an electronic content recording device (4), a removable electronic content storage device (6) decouplably couplable to the recording device (4), wherein the recording device (4) is operable to record the electronic content in the storage device (6) when coupled thereto, and the storage device (6) is couplable to an external display and operable to transmit the content to the display, whereby the content can be played on the display.

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ELECTRONIC CONTENT STORAGE SYSTEM

FIELD OF THE INVENTION

The invention relates to an electronic content storage system, or particular but by no means exclusive application as a removable video storage system and device therefor, for enabling video recording and playback on a television or computer by means of a portable storage device.

BACKGROUND OF THE INVENTION

Conventional removable-media video recording and playback systems generally fall in two categories. The first category is videocassette recorders that record video content onto removable tape media. The second category comprises videodisc recorders that record video content onto removable disc (CD or DVD) media. Such removable media (tape or CD/DVD discs) are passive storage devices. They have a limited video storage capacity that are not expandable beyond the capacity of the removable medium, and require a compatible player system to permit video content stored on the removable media to be read by the player, and generally suffer system incompatibility problems.

For example, a video cassette tape that was recorded in NTSC, PAL or SECAM video formats, cannot be played on a video cassette player that does not support the same recorded video formats and, although multi-format players are available, the vast majority of players operate in only one format. Another example, video recorded on DVD-R/W or DVD-RAM discs cannot be played on some current generation DVD players, owing to the logical format of real-time rewritable DVD recordings which is incompatible with that of many DVD players.

In addition, existing devices are generally not intended to be used on both computer and television systems and generally suffer cross-platform problems should a user wish to exchange the video content between a television system and a computer system. For example, video recorded on a video cassette tape will require a separate player to permit the viewing on television and still require additional equipment, such as video conversion and PC interface equipment, for viewing on a PC. Also, video recorded on a DVD rewritable disc may, as discussed above, require a separate compatible DVD player to permit the viewing on television, and further require a separate DVD-ROM reader installed on the PC for viewing or exchange of video data on the PC.

In addition, existing removable media systems typically can perform only one operation

(e.g. playing or recording) at any one time.

SUMMARY OF THE INVENTION

The present invention provides, therefore, an electronic content storage system comprising:

an electronic content recording device;

a removable electronic content storage device decouplably couplable to said recording device;

wherein said recording device is operable to record said electronic content in said storage device when coupled thereto, and said storage device is couplable to an external display and operable to transmit said content to said display, whereby said content can be played on said display.

Preferably said display is a television or a personal computer.

Thus, the content can be played directly to the display (most commonly a television) without using the recording device and without significant further processing. That is, the signal provided by the storage device can be received by the display and displayed without the intervention of the recording device. The content would typically comprise audiovisual content (such as television programs, motion pictures, etc.). The removable electronic content storage device will generally be couplable to the recording device by electrical connection, but this could also be accomplished by infra-red or other wireless connection, or via an intermediate computer network, such as the internet.

Preferably said storage device includes a hard disk. Preferably said recording device includes a hard disk.

Thus, by incorporating a hard disk, the storage device can be erased and reused, and can store a large quantity of content. In some embodiments, however, the storage device can include flash memory, a compact disk or DVD, or RAM for storing the content. Indeed, other forms of memory can be employed within the scope of the present invention, the choice depending on the application of the system.

Preferably the storage device has a plurality of output connectors, so that said storage device is couplable with diverse displays having differing input connector types.

Preferably the storage device is operable to output said content in diverse data formats,

so that said storage device is operable to provide said content for playback on diverse displays requiring differing input data formats.

Thus, while the storage device preferably has an AV out, so that the content can be played directly on a television, it is envisaged that alternatives could also be provided, most particularly so that the display can be a personal computer.

Preferably said recording device is also a reading device operable to read content from said storage device for copying to a further storage device.

For example, the further storage device could be coupled to the recording device subsequently, or the recording device could be couplable to a plurality of storage devices simultaneously whereby said content could be copied essentially immediately to the further storage device.

Preferably the storage device includes a video processor, more preferably in the form of a MPEG video decompression device for converting digital compressed video data to analog video signals. The video processor may be included in the disk control device of the hard disk.

The present invention also provides an electronic content storage device comprising:

an interface for coupling said storage device to a recording device to receive said electronic content therefrom;

a storage medium for storing said received electronic content; and

an interface for outputting said electronic content to a display;

wherein said storage device is controllable to output said electronic content to an external display whereby said electronic content can be played on said display when coupled to said external display.

The present invention also provides a method of distributing electronic content comprising:

recording said electronic content by means of an electronic content recording device to a removable electronic content storage device coupled thereto;

decoupling said removable electronic content storage device from said recording device;

coupling said storage device to a display; and

operating said storage device to output said content to said display when

coupled thereto;

whereby said content can be played on said display.

Preferably said display is a television or a personal computer.

BRIEF DESCRIPTION OF THE DRAWING

In order that the present invention may be more clearly ascertained, preferred embodiments will now be described, by way of example, with reference to the accompanying drawing, in which:

Figure 1A is a schematic representation of a removable video disk system according to one embodiment of the present invention;

Figure 1B is a schematic representation of a removable video disk system according to a second embodiment of the present invention;

Figure 1C is a schematic representation of a removable video disk system according to a third embodiment of the present invention;

Figure 2 is a schematic circuit diagram of the removable video disk system of figure 1B;

Figure 3A is a perspective view of the video disk device of figure 1C;

Figure 3B is a further perspective view of the video disk device of figure 1C;

Figure 4A is a set of further views of the video disk device of figure 1C;

Figure 4B is an exploded view of the video disk device of figure 1C;

Figure 5A is a plan view of the video recorder device of figure 1C;

Figure 5B is a side elevation of the video recorder device of figure 1C;

Figure 5C is a perspective view of the video recorder device of figure 1C;

Figure 5D is a rear elevation of the video recorder device of figure 1C;

Figure 5E is an exploded view of the video recorder device of figure 1C;

Figure 6 is a flow chart of the initial setup of the removable video disk system of figure 1B;

Figure 7 is a flow chart of the operation of the removable video disk system of figure 1B;

Figure 8 is a flow chart of the stand-alone operation of an active video disk device of the system of figure 1B connected to a PC; and

Figure 9 is a flow chart of the stand-alone operation of an active video disk device of the system of figure 1B connected to a television.

DETAILED DESCRIPTION OF THE INVENTION

A removable video disk system according to a preferred embodiment of the present

invention is shown generally at 2 in figure 1A. This simple embodiment comprises a video recorder device 4 and a removable active video disk device 6. The video disk device 6 is received into a suitable slot in the top of the recorder device 4; the slot and disk device 6 have complementary electrical contacts so that, when located in the slot, the disk device 6 is electrically coupled to the recorder device 4.

A second preferred embodiment of a removable video disk system is shown generally at 8 in figure 1B. This embodiment comprises a video recorder device 10 and four removable active video disk devices 12a, 12b, 12c and 12d. The video disk devices 12a, 12b, 12c and 12d are received into suitable slots in the top of the recorder device 10 as described above. Video recorder device 10 can record and read multiple video disk devices (12a, 12b, 12c and 12d) at any one time. For example, a user can watch a video from one video disk device while recording a television program on another video disk device, or watch a video from one video disk device while concurrently recording a television program on the same video disk device.

A third preferred embodiment of a removable video disk system is shown generally at 14 in figure 1C. This embodiment comprises a video recorder device 16 with hinged cover 18, and a removable active video disk device 20 located within a recess 22 in the video recorder device 16; the recess 22 is provided with the necessary electrical contacts so that the disk device 20 and recorder device 16 are electrically coupled when the disk device 20 is in the recess. During use (or between uses), the video disk device 20 can be covered—such as to exclude dust—by closing cover 18.

In all three embodiments, the video disk devices (6, 12a, 12b, 12c, 12d and 20) have approximate dimensions of 130 × 85 × 20 mm. Functionally, the three embodiments are essentially identical apart from the number of separate video disk devices that can be accommodated and operated at any one time.

Generally speaking, the recorder device is used to record audiovisual material onto a video disk device. This is done by connecting a suitable source of audiovisual material, such as a television receiver, to an input of the recorder device. The video disk device can then be removed from the recorder device, coupled directly to a television with a video input port, to a computer with a serial bus port or to any other electronic device suitable for playing such content, so that the content can be played through that television, etc., without requiring a player (typically in the prior art in the form of the recorder). In addition, however, the video player device has an AV output so that it can

be used as a player as well as a recorder.

Figure 2 is a schematic block diagram of the logical elements of the system 8 of figure 1B. The video recorder device 10 includes a control keypad 24 and an LCD display 26 to facilitate operation of the system. By means of the keypad 24, a user passes commands to a system micro-controller 28. The recorder device 10 also includes suitable read only memory (ROM) 30 and random access memory (RAM) 32 and a video recording IC 34 (all electrically coupled to the micro-controller 28). The video recording IC 34 has both an AV (audiovisual) In 36 and an AV Out 38 respectively.

The recorder device 10 optionally includes an infra-red sensor so that it can be controlled by means of a remote control.

ROM 30 stores software for controlling the operation of the system micro-controller 28, and RAM 32 provides temporary storage to permit the functioning of the micro-controller 28. The operations performed by the system micro-controller 28 include interpreting and executing commands from the keypad 24, and controlling the flow of video data to and from the video recording IC 34 to the video disk device 20a coupled to system ATAPI bus interface 40.

The video recording IC 34 is a MPEG video compression and decompression device for converting analog video data into digital compressed data and vice versa, and may be included in system micro-controller 28.

System bus interface 40 is connected to the micro-controller 28, for communicating with each of video disk devices 12a, 12b, 12c and 12d.

Each removable video disk device (for example device 12a) includes a ATA 2.5-inch hard disk 42 for storing audiovisual content. The hard disk 42 has a personal computer file system, such as a FAT32 file system. When the video disk device 28 is slotted into the recorder device 10, it communicates with the recorder device 10 by means of its own ATAPI bus interface 44, itself coupled to the hard disk 42. Though not shown in this figure, when the video disk device 30a is slotted into the recorder device 10, this also connects a DC power input port of the disk device 12a so that it can receive DC power from the recorder device 10. The (USB) interfaces 40 and 44 carries control signals and the audiovisual signal for recording to the hard disk 42.

In addition, video disk device 12a has a hard disk micro-controller 46 and a video processor 48 with an AV Out 50 for connection to, for example, a television. The disk device 12a also has a USB serial link interface 52 so that the disk device 12a can be coupled to a PC by means of a USB/1394 connector 54.

The video processor 48 is a MPEG video decompression device for converting digital compressed video data to analog video signals, and may—in some embodiments—included in the micro-controller 46. The serial link interface may alternatively be an IEEE 1394 Firewire interface.

Requisite ROM 56 and RAM 58 are also provided within the disk device 12a, and—so that the disk device 12a can be operated by means of an infra-red remote control—disk device 12a is provided with an infra-red sensor 60 whose output is coupled to micro-controller 46. ROM 56 stores software for controlling the operation of the micro-controller 46, while RAM 58 provides temporary storage to permit the functioning of the micro-controller 46.

The operations performed by the micro-controller 46 include interpreting and executing remote commands from the sensor 60, and controlling the flow of video data read from the hard disk 42 to the video processor 48 and to the serial link interface 52.

Thus, in broad principle the system 8 operates in general terms like a VCR, in that it is coupled to, for example, a television signal by means of AV In 36. The television program, for example, is recorded to the hard disk 42 of the video disk device 12a for later playback. Unlike a VCR, however, the recorder device 10 is not required when the user wishes to play the content: the disk device 12a can be connected directly (by means of AV Out 50 or serial link interface 52) to a display device such as a television, PC or the like.

Figure 3A is a perspective view of a video disk device 70 with its lower end 72 (cf. figure 1C) visible. Disk device 70 is comparable to disk device 20 of figure 1C, though generally illustrative of the various embodiments described above. Lower end 72 has the above mentioned bus interface 44, DC port 74 and AV Out 50. Optionally, lower end 72 may be provided with an eyephone jack so that a user can listen to the audio component of the content recorded on the video disk device 20.

Each side (right side 78, left side 80) of the disk device 70 is provided with a mounting

guide (visible at 82 on side 78 in this figure), comprising an elongate indentation for engaging a corresponding detent in recess 22 of video recorder device 16 (cf. figure 1C).

Figure 3B is a perspective view of video disk device 70 with its upper end 84 visible. Upper end 84 has the above mentioned infra-red sensor 60 and serial link interface 52. The front face 86 of the video disk device 70 is also provided with two LED lamps: standby lamp 88 and processing lamp 90. These indicate the current status of the video disk device 70, that is, whether it is "standing by" for the receipt of a command or "processing" (i.e. carrying out) a command, as will be described in greater detail below.

Figure 4A is a set of further views of the video disk device 20 of figure 1C. The four rows of this figure include, from top to bottom:

- from left to right: view of upper end 84, plan view of front face 86 and view of lower end 72;
- view of right side 78;
- view of rear face 92; and
- perspective view similar to that of figure 3A but with left side 80 (rather than right side 78) visible.

The view of the rear face 92 also shows the two non-slip rubber feet 94a and 94b.

Figure 4B is an exploded view of the video disk device 20 of figure 1C; from top left to bottom right, the components of the video disk device 20 include:

- front face 86;
- hard disk drive 42 incorporating two ICs (micro-controller 46 and video processor 48), bus interface 44, DC port 74, AV Out 50, processing LED lamp 90, standby LED lamp 88, infra-red sensor 60 on PCB 96, with brass spacer inserts 98a, 98b, 98c, and light pipes 100 for conducting light from lamps 90 and 88 through apertures 102 in front face 86;
- chassis spacer 104 including mounting guide 82;
- rear face 92 with screw apertures 106 for screws 108 (with two of three screws visible); and
- rubber feet 94a and 94b.

Figure 5A is a plan view of the video recorder device 16 of figure 1C, showing power button 110, infra-red sensor lens 112, keypad 24, hinged cover 18 with hinges 114.

Figure 5B is a side elevation of the video recorder device of figure 1C, viewed in direction 116. Ventilation holes 118 are provided in this side 120 and in the opposite side (not shown). Figure 5C is a perspective view of the video recorder device of figure 1C, and figure 5D is a rear elevation of the video recorder device of figure 1C. As can be seen in figure 5D, rear face 122 is provided with controls 124 of the tuner (not shown), by means of which the desired television program to be recorded is chosen, DC jack 126 for providing power to the video recorder device 16, RCA connectors 128 for first AV In 36, RCA connectors 130 for second AV In 36, and 6-pin video socket 130 for AV Out 38.

Figure 5E is an exploded view of the video recorder device 16 of figure 1C; from top left to bottom right, the components of the video recorder device 16 include:

- cover 18 with hinges 114, power button 110 with lens 132 and infra-red sensor lens 112;
- middle case component 134 with recess 22 for receiving video disk device 20;
- PCB 136 with switches 138 operated by keypad 24 and infra-red sensor 140 (under infra-red sensor lens 112);
- male connector 142 for the hard disk interface;
- main PCB 144 with controls 124 of tuner 146, DC jack 126, RCA connectors 128 for first AV In 36, RCA connectors 130 for second AV In 36, and 6-pin video socket 130 for AV Out 38; and
- bottom case component 184.

Not shown in this exploded view are micro-controller 28, video recording IC 34 and system bus interface 40 (for coupling video disk device 20 to the video recorder device 16).

Figure 6 is a flow chart illustrating the initial configuring of a video disk device 12a during manufacture. Each new video disk device is connected to a PC (by connecting the IDE connector of the computer to bus interface 44 of the video disk device 12a). The operator runs pre-install video disk installation software, which establishes communication with the hard disk 42 of the video disk device 12a through ATAPI commands via IDE bus interface and protocol.

From the installation software, the operator selects whether to install PC application software onto the removable video disk device 12a. If PC application software is to be

installed, the PC creates and formats an application partition on the hard disk 42 of the video disk 12a for storing PC application software, then transfers the application software to these application partitions on the hard disk 42 of the new video disk 12a.

The PC application software could include, for example, a video editing software that the manufacture wishes to deliver with the video disk device 12a. Thus, the user can thereby edit video content using this editing software supplied on the video disk device 12a while the video disk device 12a is coupled to the user's PC, and later view the edited content on, say, a large television by coupling that video disk device 12a to the television.

After the application partition and the PC application software are installed onto the hard disk device in the video disk (or if no application software was installed), the installation software creates and formats a video data partition in the same hard disk 42 as an area for ultimately storing the user's video data.

This completes the set up, so the video disk device 12a is then disconnected from the PC. The video disk device 12a is then ready to be used by a user.

Figure 7 is a flow chart illustrating the operation of the removable video disk system 8 of figure 1B.

Firstly, a user inserts the video disk device 12a onto the video disk recorder device 10. The connection is via the port of the bus interface 44 in the video disk device, to the port of the system bus interface 40 in the video recorder device 10. As described above, in this embodiment up to four different video disk devices 12a, 12b, 12c and 12d can be connected to video disk recorder device 10 by this method, at any one time.

The system micro-controller 28 in the video disk recorder device 10 then runs a program stored in its ROM 30 to establish bus communication with the removable video disk device 12a connected to the system bus interface 40.

The system micro-controller 28 sends a hard disk inquiry command, and read or write commands in ATAPI format via the system bus interface 40, which is coupled to the interface 44 of the video disk device 12a, which in turn is coupled to the hard disk 42 of the video disk device 12a.

The system micro-controller 28 then polls for user commands from the keypad 24 operated by the user. The system micro-controller 28 then determines if the user command is a disk related operation, such as format video disk, read video disk, or play video disk operation.

If the system micro-controller 28 determines that the command is not a disk-related command, the system controller 28 executes that other (system-related) command and returns to polling for user commands from the keypad 24. The other system related commands mentioned above include the displaying of a menu on a connected television screen, the selection of the menu items, and other system related operations.

If the system micro-controller 28 determines that a command is a disk related command, it executes one of the disk operations as follows.

When the user command is a "format video disk device" operation, the system micro-controller 28 formats the video data partition of the hard disk 42 of the designated video disk device 12a. In order to format the designated hard disk 42, the system micro-controller 28 sends a format hard disk command and the designated video disk device ID in ATAPI format via the system bus interface 40 to the designated hard disk 42. In response, the designated hard disk 42 formats its video data partition. The format video disk operation continues until it is complete. The system micro-controller 28 then returns to polling for further user command from the keypad 24. If no other command is detected, the operation terminates.

When the user command is a "record video disk device" operation, the system micro-controller 28 starts to fetch compressed video data from the video recording device 10 to the hard disk 42 of the designated video disk device 12a. In order to write video data to the designated hard disk 42, the system micro-controller 28 sends a write hard disk command, the compressed video data and the video disk ID in ATAPI format via the system bus interface port 40 to the designated hard disk 42. In response to the write command, the designated hard disk 42 stores the video data in its video data partition. The write operation continues until the end of record operation is complete. The system controller 28 then determines if the user wishes to password protect the written video file to prevent unauthorized access to the video file. If so, the system micro-controller 28 receives the password entered by the user from the keypad 24, stores the password to the video file attributes and updates the file directory of the hard disk 42. The system micro-controller 28 then returns to polling for further user commands from the keypad

24. If no further command is detected, the operation terminates.

When the user command is a "play video disk device" operation, the system micro-controller 28 reads the video file attributes to check if the video file is password protected. If the video file is password protected, the system controller receives the password entered by the user, and compares it with the password stored in the video file attributes to determine whether the user is authorize to play the video file. If the password is correct, the system micro-controller 28 reads the compressed video data from the hard disk 42 of the designated video disk device 12a and sends the compressed video data to the video-recording device 10. In order to read video data from the hard disk 42, the system micro-controller 28 sends a read hard disk command, the video file name and the designated hard disk ID in ATAPI format via the system bus interface 40 to the designated hard disk 42. The designated hard disk 42 then reads the compressed video data from its video data partition, and transfers the compressed video data to the system micro-controller 28 via the system bus interface 40. The system micro-controller 28 then sends the compressed video data to the video recording device 10, which decompresses the compressed video data and converts it into analog video signals for AV Out 38 to a television. The read operation continues until the end of the video file is reached. The system micro-controller 28 then returns to polling for a further user command from the keypad 24. If no further command is detected, the operation terminates.

Figure 8 is a flow chart of the stand-alone operation of the video disk device 12a connecting to a television. This flow-chart illustrates the operation when the video disk device 12a is in a standalone operation (i.e. without using the video recorder device 10), directly connected to the television.

The user connects the video disk device 12a to a television via the AV port connector 50 using standard AV cables. When the video disk device 12a is connected to the television and powered up, the disk micro-controller 46 runs software stored in ROM 56 to execute the following operations.

The micro-controller 46 polls for user commands from the infrared sensor 60 (operated by user by means of a remote control, not shown). The micro-controller 46 then determines if the user command is a play disk operation. If the user command is not a play disk command, the disk control micro-controller 46 performs other system related tasks according to the user command, and returns to the user command polling routine

for commands received from the input sensor 60. The other system related tasks performed by the disk micro-controller 46 include displaying a menu on the television screen and the selection of the menu items. The user selects the menu and its menu items using the aforementioned remote control that sends infrared commands to the input sensor 60.

If the user command is a play disk command, the disk micro-controller 46 reads the video file attributes from the hard disk 42 to check if the video file is password protected. If so, the disk micro- controller 46 receives the password entered by the user by means of the remote control, and compares it with the password stored in the video file attributes to determine whether the user is authorize to play the video file. If the password is correct, the disk micro-controller 46 reads the compressed video data from the hard disk 42 and sends the compressed video data to the video processor 48. In order to read video data from the hard disk 42, the disk micro-controller 46 sends a read hard disk command and the video file name in ATAPI format to the hard disk 42. The hard disk 42 then reads the compressed video data from its video data partition, and transfers the compressed video data to the disk micro-controller 46. The disk micro-controller 46 then sends the compressed video data to the video processor 48, which decompresses the compressed video data and converts it into analog video signals for transmitting to the television via AV Out port 50. The read operation continues until the end of play of the video file is complete. The disk micro-controller 46 then returns to polling for further user command from the input sensor 60. If no further commands are received, the operation terminates.

Figure 9 is a flow chart of the stand-alone operation of the video disk device 12a when connected to a PC or other computer.

The user connects the video disk device 12a to a computer serial port via the serial link interface 52 of the video disk device 12a. The serial port is a USB serial interface; alternatively, however, the serial port could be an IEEE 1394 serial interface.

The disk micro-controller 46 in the video disk device 12a runs a program stored in ROM 56 and establishes bus communication with the computer connected to the serial link interface 52. The disk micro-controller 46 then determines if an application partition has been created in the hard disk 42 of the video disk device 12a. If so, the disk micro-controller 46 instructs the computer to run the PC application software stored in the application partition. If an application partition has not been created, the

disk micro-controller 46 does not instruct the computer to run the PC software application, but rather proceeds immediately to selecting the video disk partition on the hard disk 42.

In order for the computer to read or write data to the hard disk 42 of the video disk device 12a, the computer sends either a read or write command in USB format to the disk micro-controller 46 via the serial link interface 52.

When the computer requests a read operation, the disk micro-controller 46 reads the video file attributes from the hard disk 42 to check if the video file is password protected. If the video file is password protected, the disk micro-controller 46 receives the password entered by the user from the computer, and compares it with the password stored in the video file attributes to determine whether the user is authorize to read the video file. If the password is correct, the disk micro-controller 46 reads the compressed video data from the hard disk 42 and sends the compressed video data to the serial link interface 52. The serial link interface 52 packs the video data in USB format, and sends it to the computer upon request. The read operation continues until the end of read of the video file is complete. The disk micro-controller 46 then returns to wait for further command from the computer. If no further command is detected, the operation terminates.

When the computer requests for a write operation, the computer sends video data in USB format to the serial link interface device. The serial link interface unpack the video data from the computer upon request. The disk micro-controller 46 starts to fetch the video data from the serial link interface. In order to write the video data to the hard disk 42, the disk micro-controller 46 sends a write hard disk command, the video data in ATAPI format to the hard disk 42. In response to the write command, the hard disk 42 stores the video data in its video data partition. The write operation continues until the end of write operation is complete. The disk micro-controller 46 then instructs the computer to determines if the user wishes to password protect the written video file to prevent unauthorized access to the video file. If so, the disk micro-controller 46 receives the password entered by the user from the computer, stores the password to the video file attributes and updates the file directory of the hard disk 42. The disk micro-controller 46 then returns to check for further command from the computer. If no further command is detected, the operation terminates.

The system 8 thus has the advantages that the removable video disk device is compact

but with high video storage capacity and video quality; video recorded on the video disk device does not require a separate player as it can be coupled directly to a television, etc., for viewing; and video recorded on the video disk device does not require a separate PC reader device, and it can exchange data with a PC directly for viewing or editing the video data. By avoiding the need for a player, problems of compatibility between the player and output device, or between recording medium and player, are eliminated.

It is envisaged that each video disk device would have a storage capacity of 120 hours of video, though this can be varied according to the required application and video resolution, etc. Video can be recorded at higher than DVD video quality, but if recorded at lower resolution a greater duration of video content can be recorded.

Further, the system can be controlled to access particular recorded video segments randomly, and content—whether stored on the video recorder device or on a video disk device—can be protected by password to lock-out unauthorized access.

Modifications within the scope of the invention may be readily effected by those skilled in the art. It is to be understood, therefore, that this invention is not limited to the particular embodiments described by way of example hereinabove.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. An electronic content storage system comprising:

an electronic content recording device;

a removable electronic content storage device decouplably couplable to said recording device;

wherein said recording device is operable to record said electronic content in said storage device when coupled thereto, and said storage device is couplable to an external display and operable to transmit said content to said display, whereby said content can be played on said display.

2. A system as claimed in claim 1, wherein said display is a television or a personal computer.

3. A system as claimed in either claim 1 or 2, wherein said storage device includes a hard disk.

4. A system as claimed in any one of the preceding claims, wherein said recording device includes a hard disk.

5. A system as claimed in any one of the preceding claims, wherein said storage device has a plurality of output connectors, so that said storage device is couplable with diverse displays having differing input connector types.

6. A system as claimed in any one of the preceding claims, wherein said storage device is operable to output said content in diverse data formats, so that said storage device is operable to provide said content for playback on diverse displays requiring differing input data formats.

7. A system as claimed in any one of the preceding claims, wherein said recording device is also a reading device operable to read content from said storage device for copying to a further storage device.

8. A system as claimed in any one of the preceding claims, wherein said storage device includes a video processor.

9. A system as claimed in any one of the preceding claims, wherein said storage device

includes a video processor in the form of a MPEG video decompression device for converting digital compressed video data to analog video signals.

10. A system as claimed in claim 1, wherein said storage device includes a hard disk, a hard disk controller, and a video processor included in said disk controller.

11. An electronic content storage device comprising:

an interface for coupling said storage device to a recording device to receive said electronic content therefrom;

a storage medium for storing said received electronic content; and

an interface for outputting said electronic content to a display;

wherein said storage device is controllable to output said electronic content to an external display whereby said electronic content can be played on said display when coupled to said external display.

12. A method of distributing electronic content comprising:

recording said electronic content by means of an electronic content recording device to a removable electronic content storage device coupled thereto;

decoupling said removable electronic content storage device from said recording device;

coupling said storage device to a display; and

operating said storage device to output said content to said display when coupled thereto;

whereby said content can be played on said display.

13. A method as claimed in claim 12, wherein said display is a television or a personal computer.

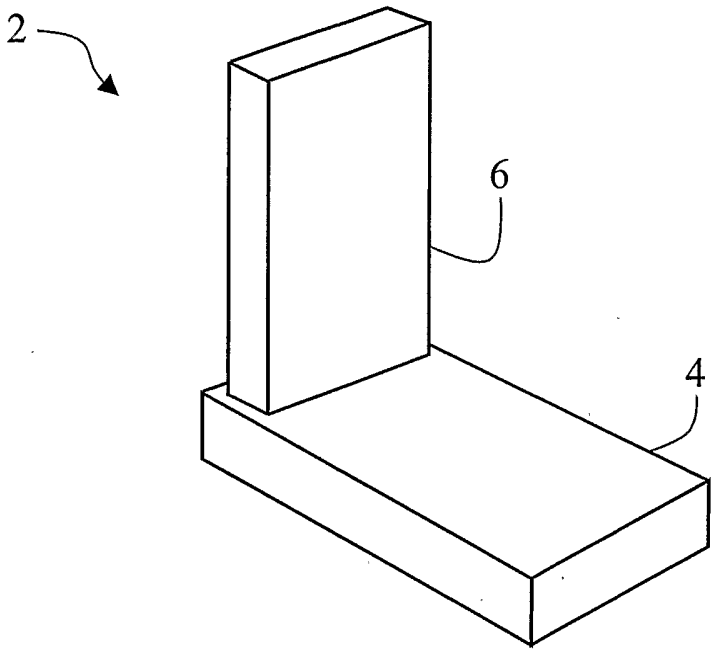


Figure 1A

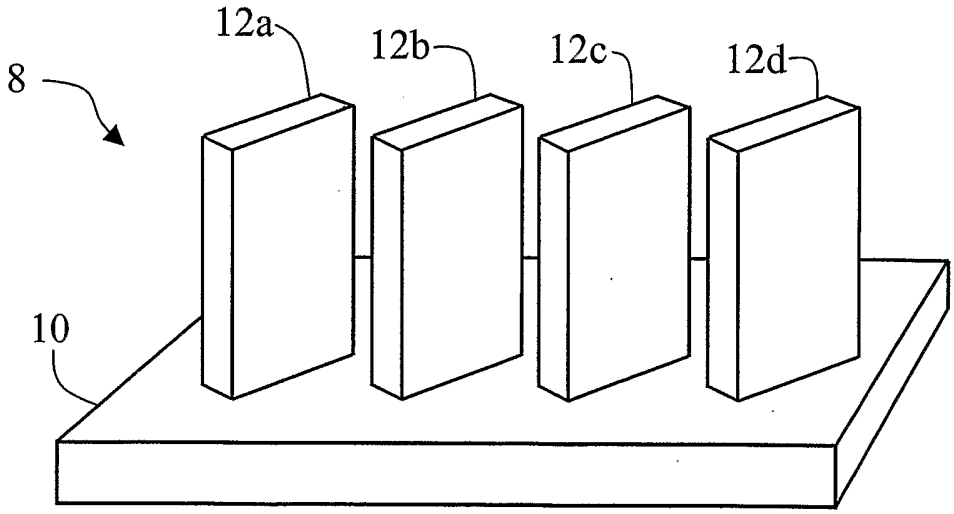


Figure 1B

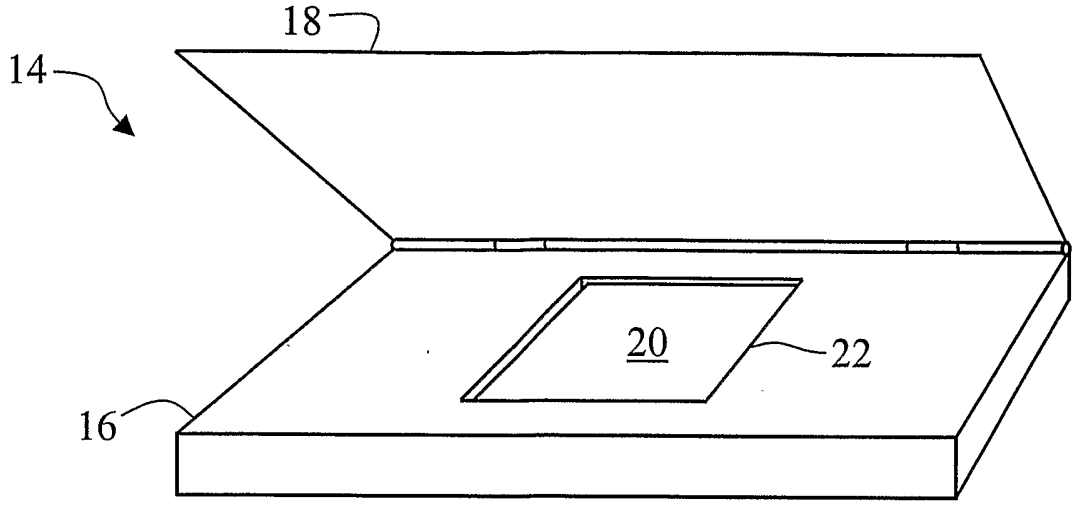


Figure 1C

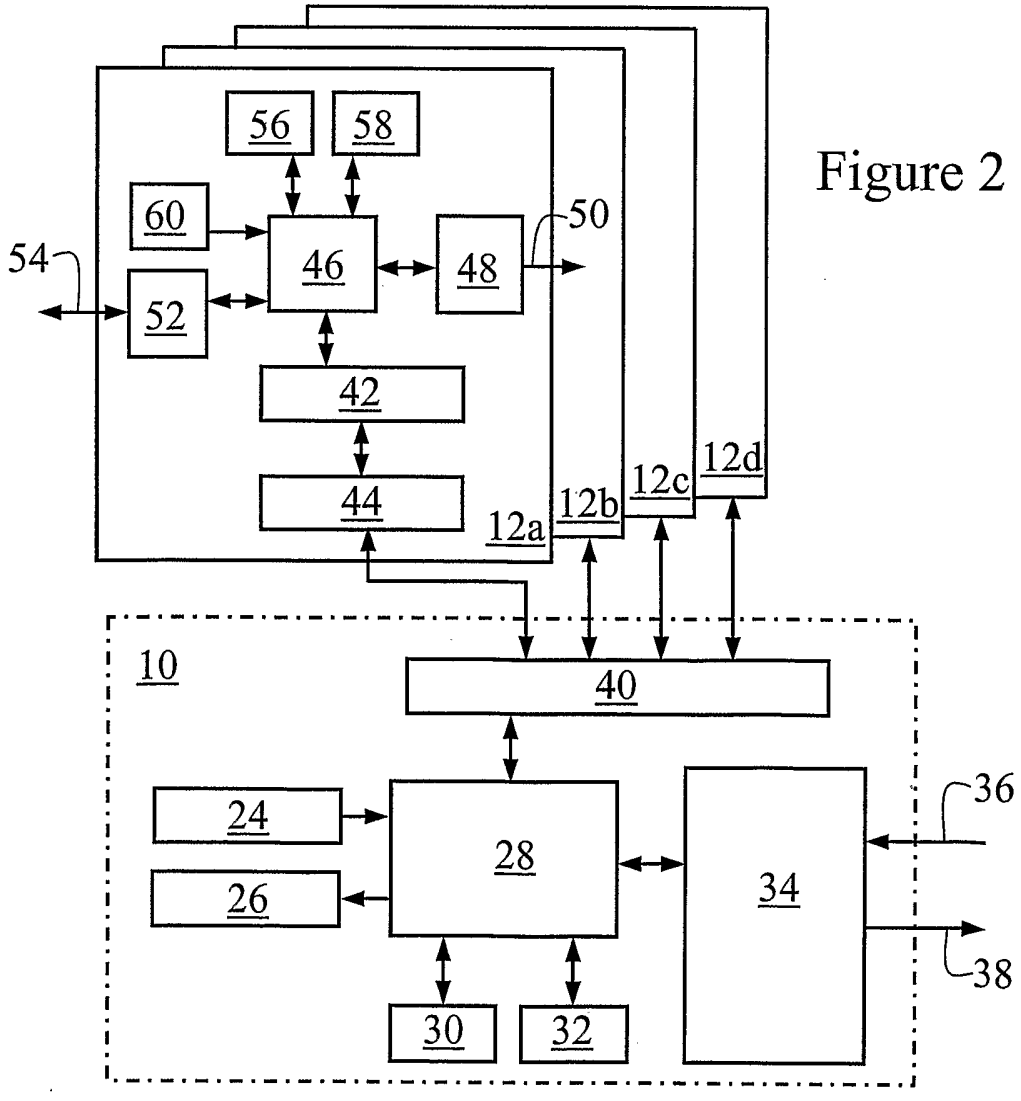


Figure 2

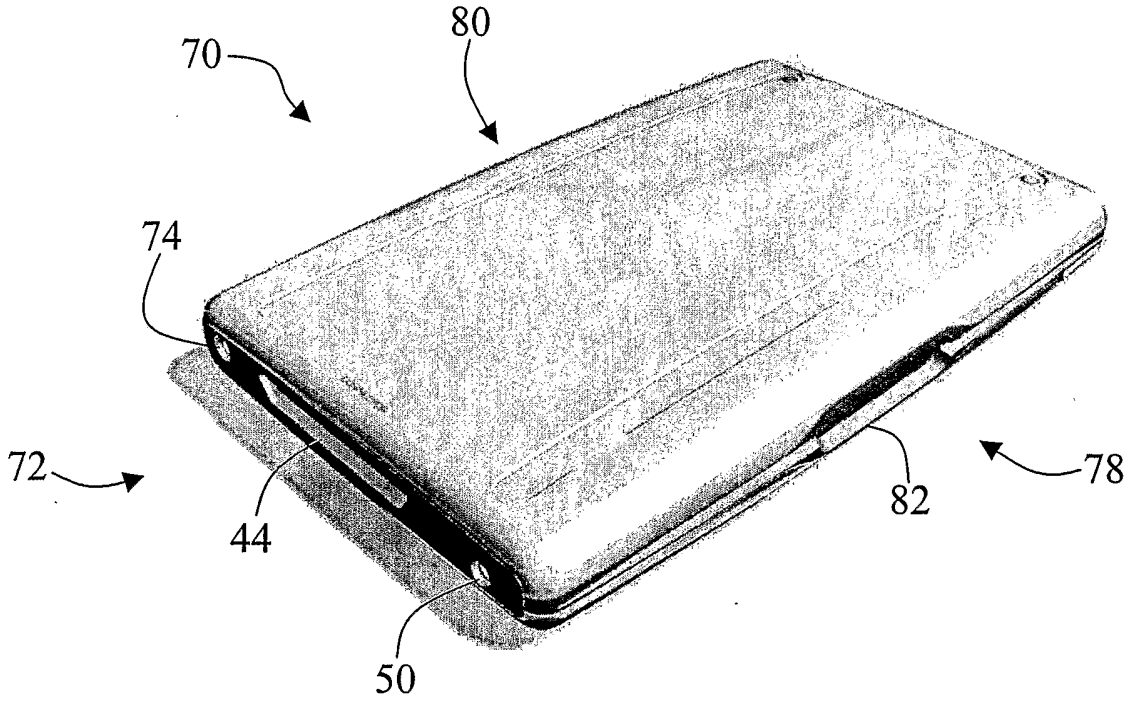


Figure 3A

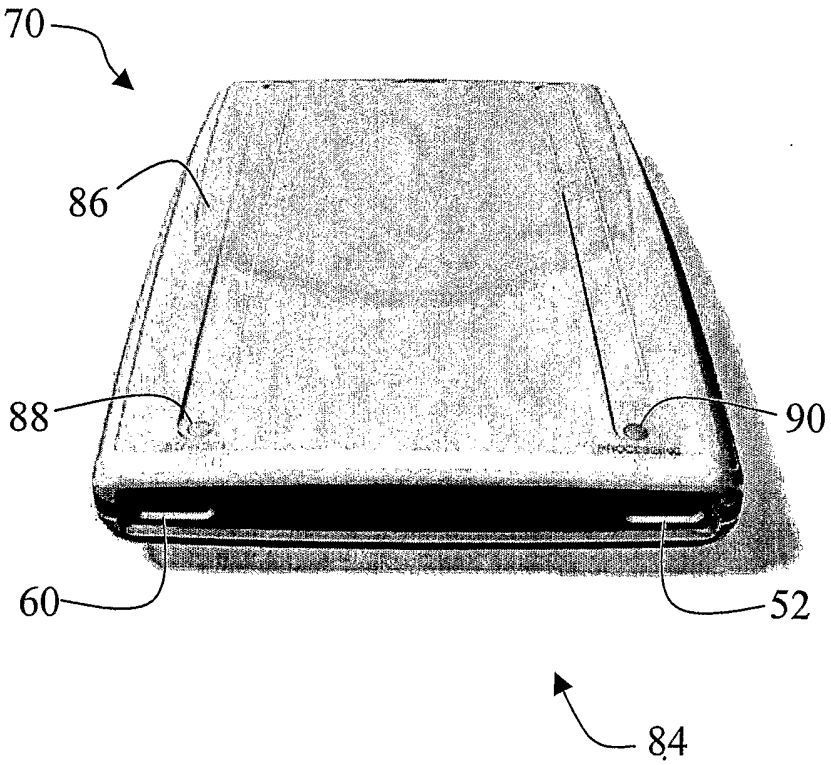


Figure 3B

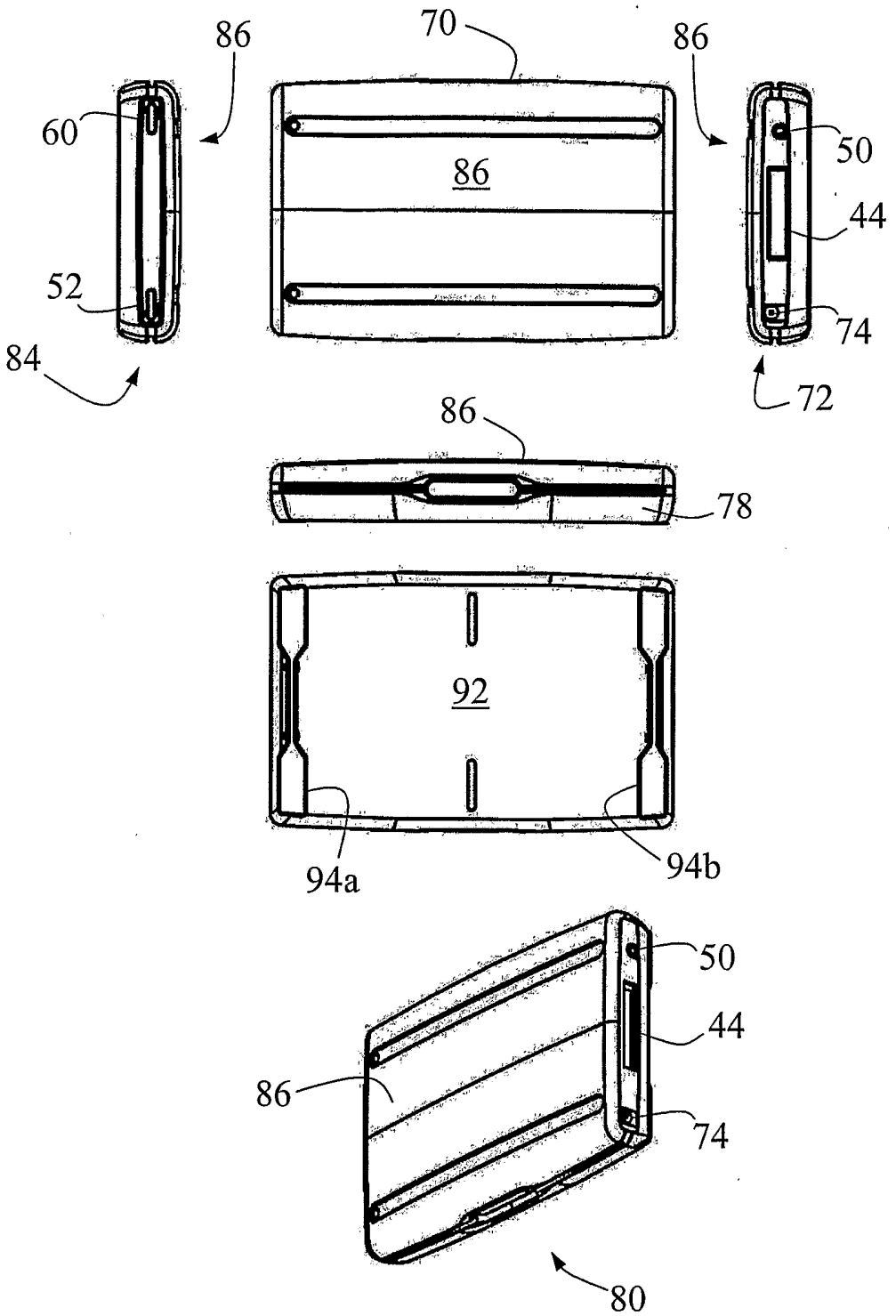
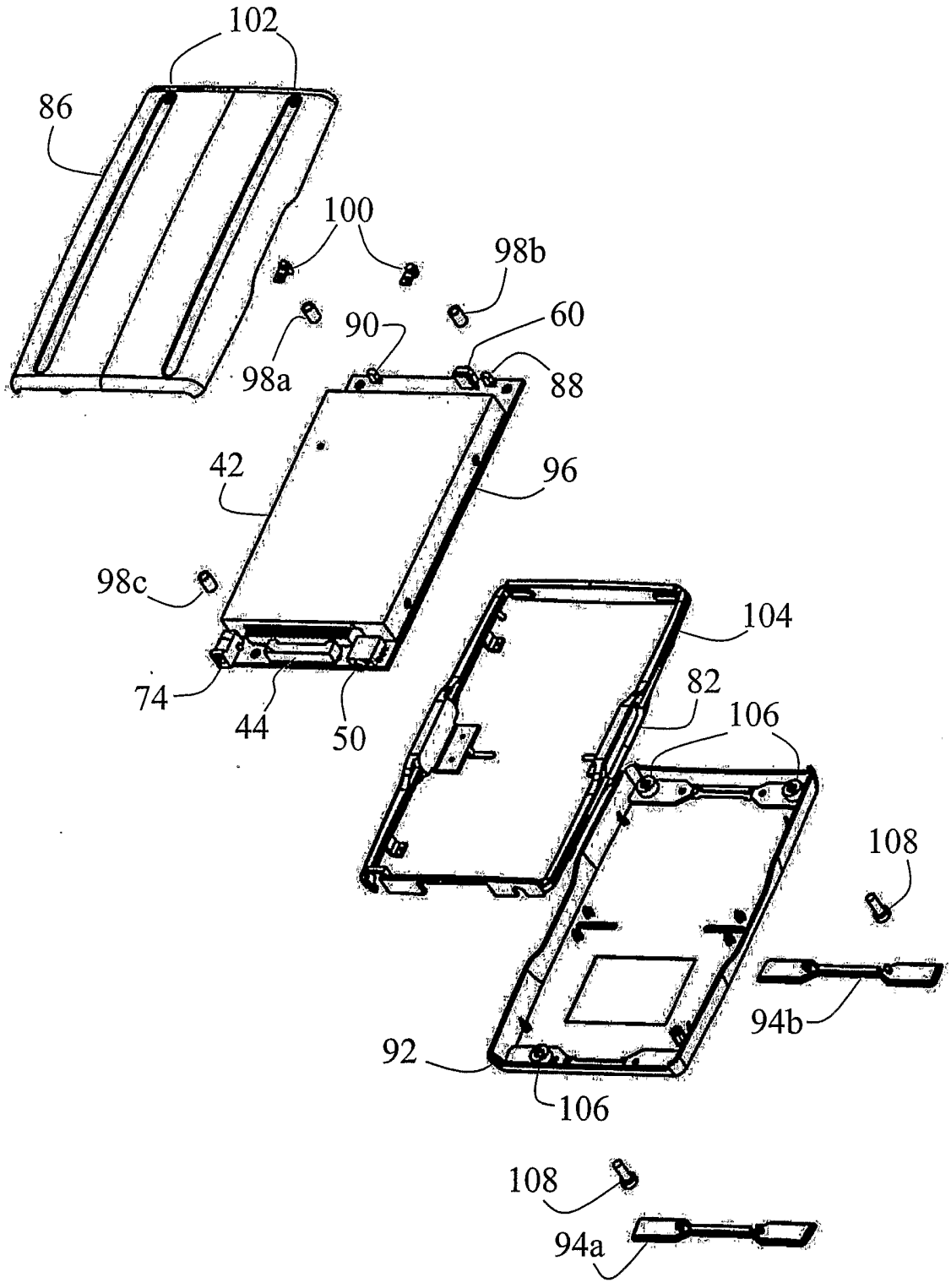


Figure 4A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98b
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98c
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94b
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108
94a

Figure 4B

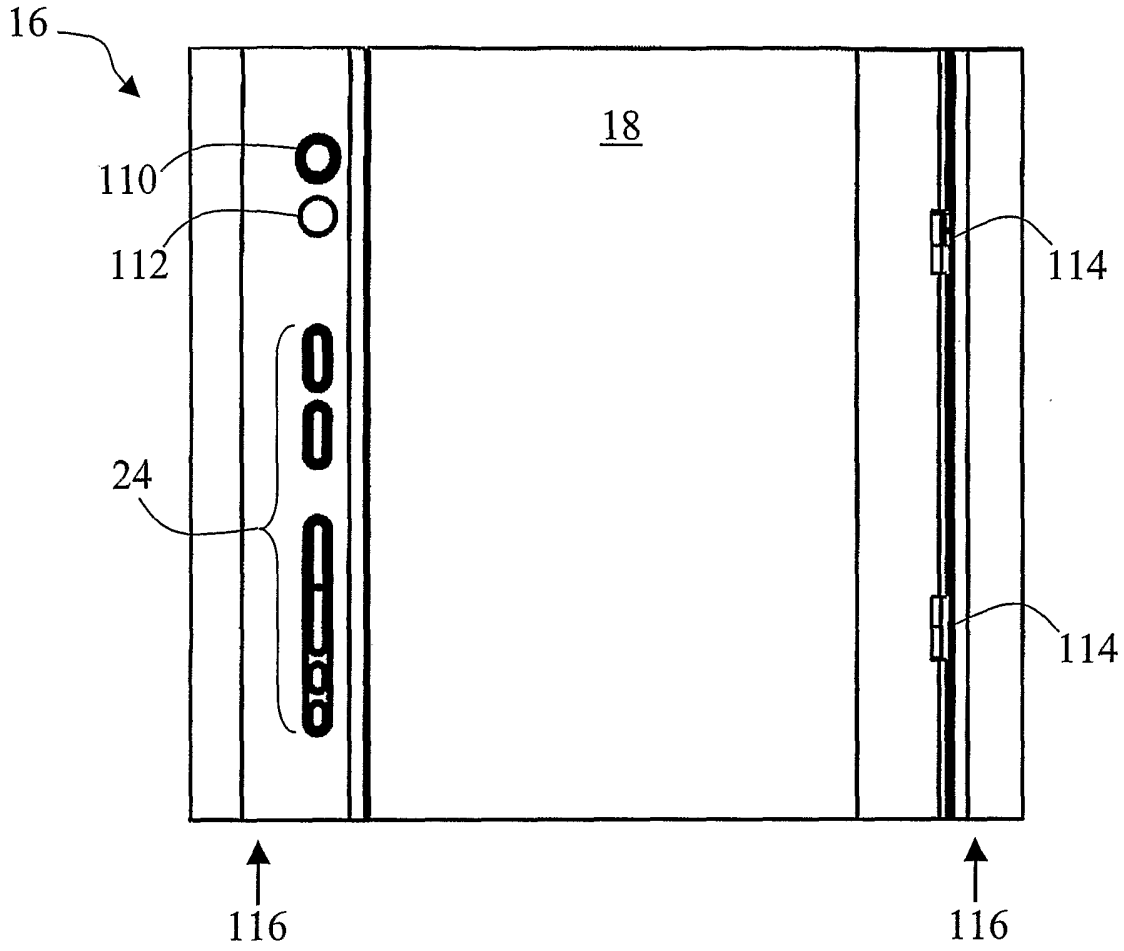

Figure 5A

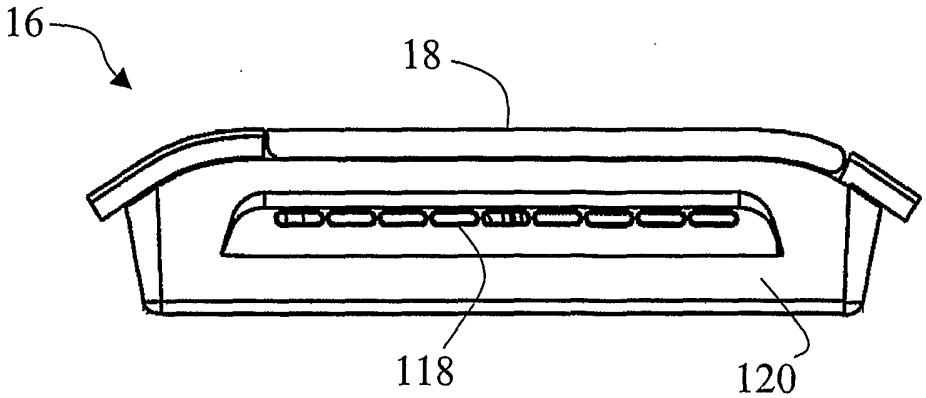

Figure 5B

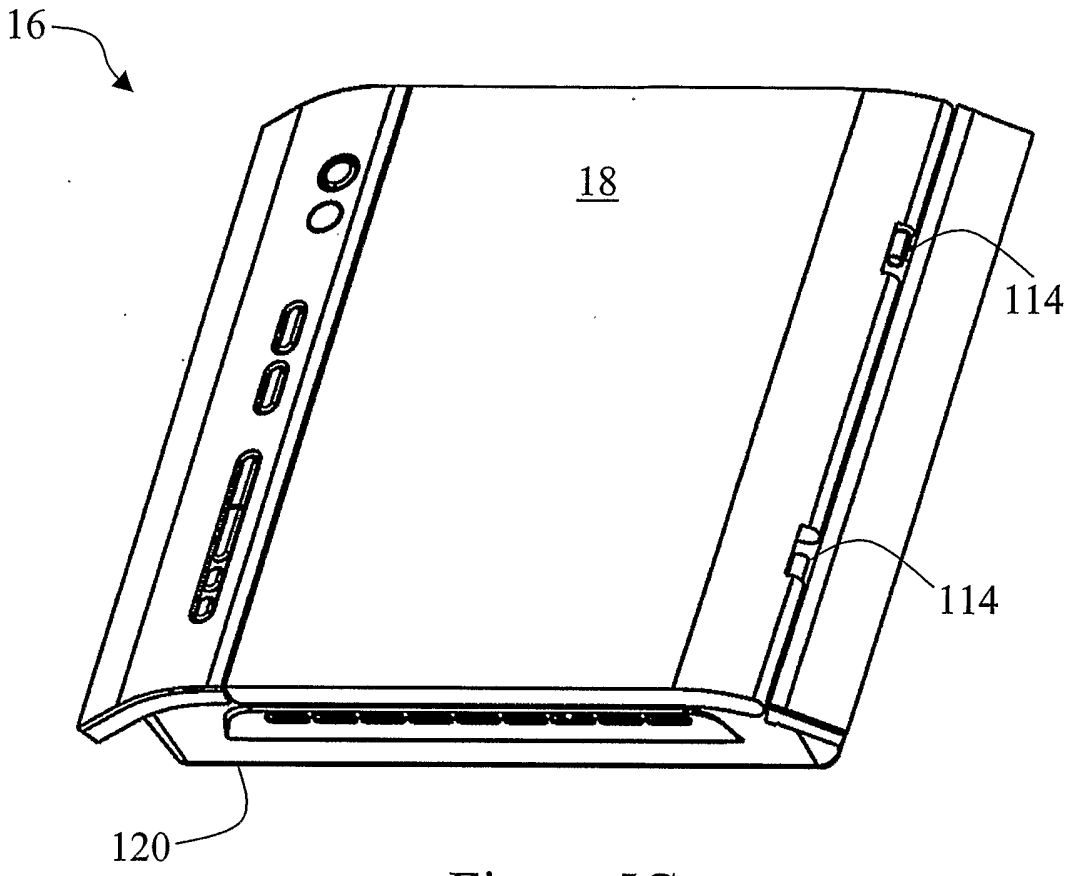

Figure 5C

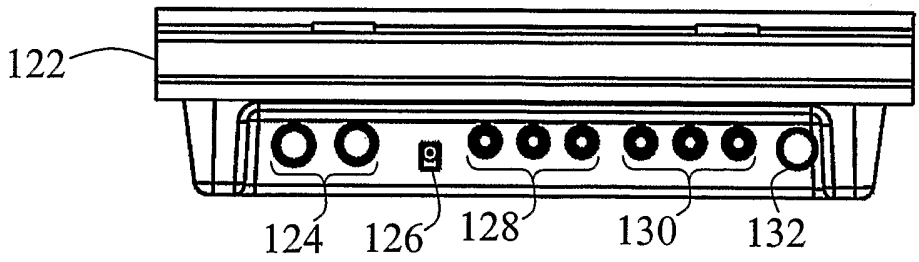

Figure 5D

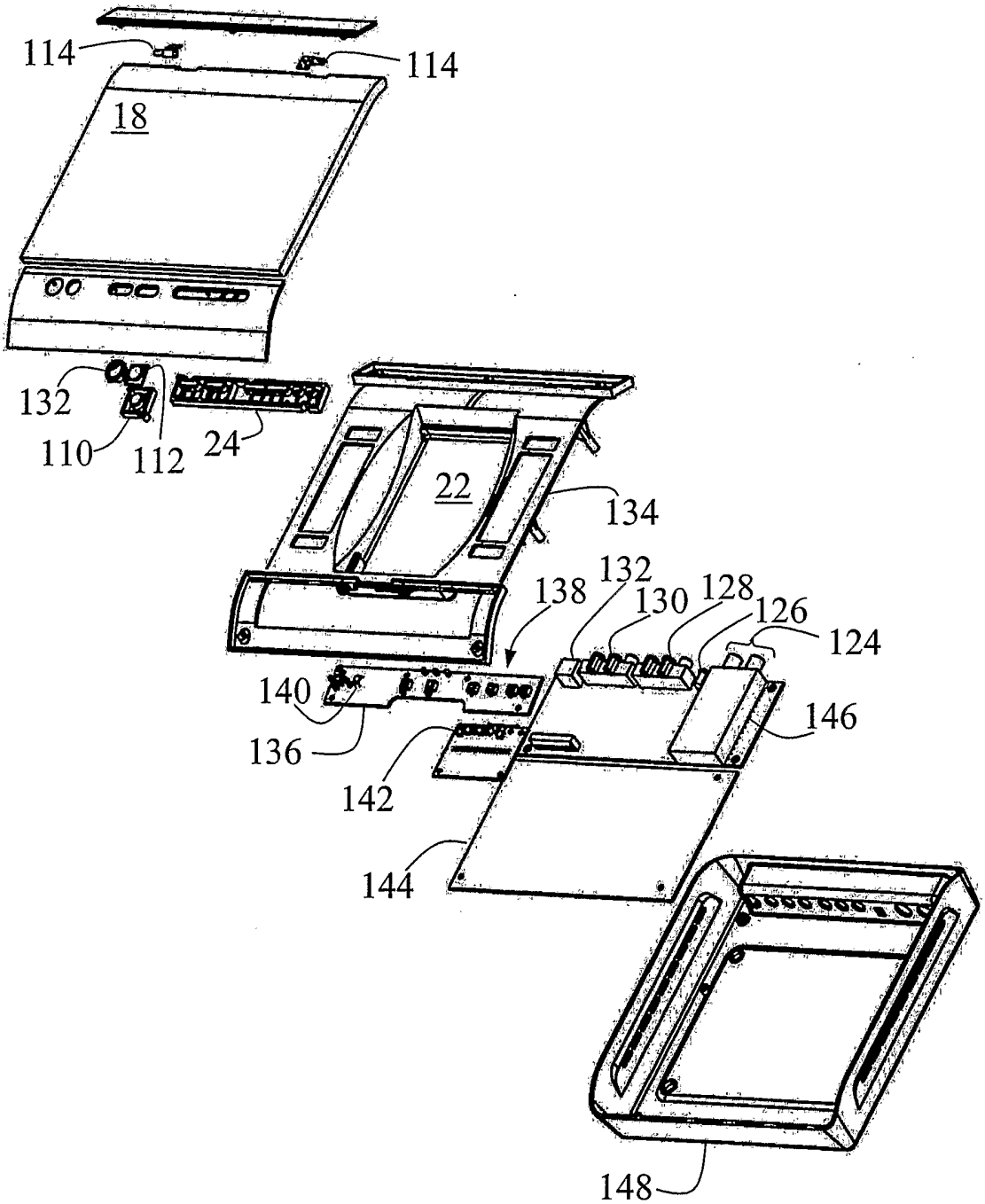
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Figure 5E

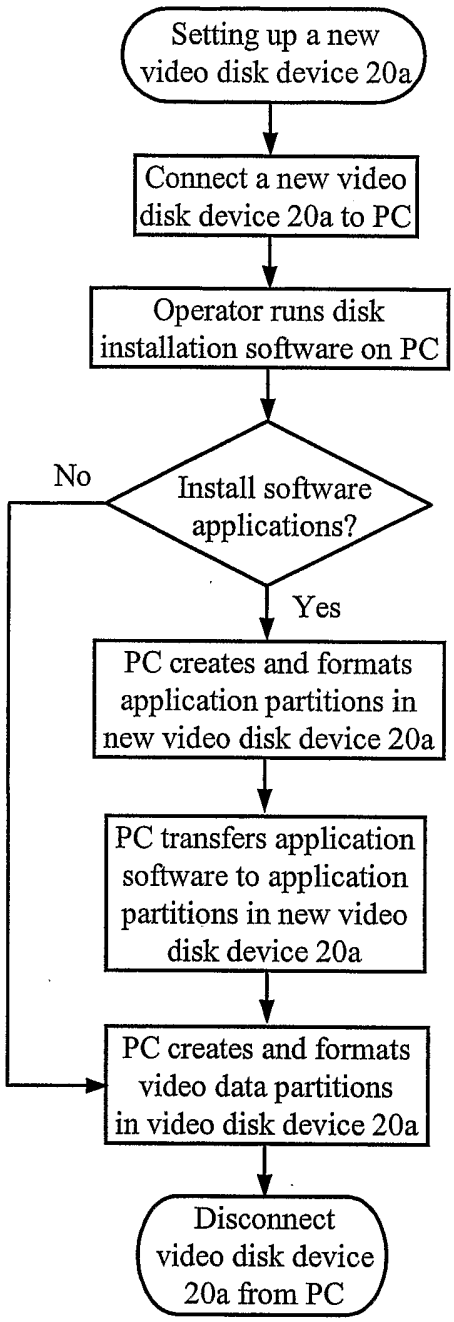

Setting up a new video disk device 20a
Connect a new video disk device 20a to PC
Operator runs disk installation software on PC
Install software applications?
No
Yes
PC creates and formats application partitions in new video disk device 20a
PC transfers application software to application partitions in new video disk device 20a
PC creates and formats video data partitions in video disk device 20a
Disconnect video disk device 20a from PC

Figure 6

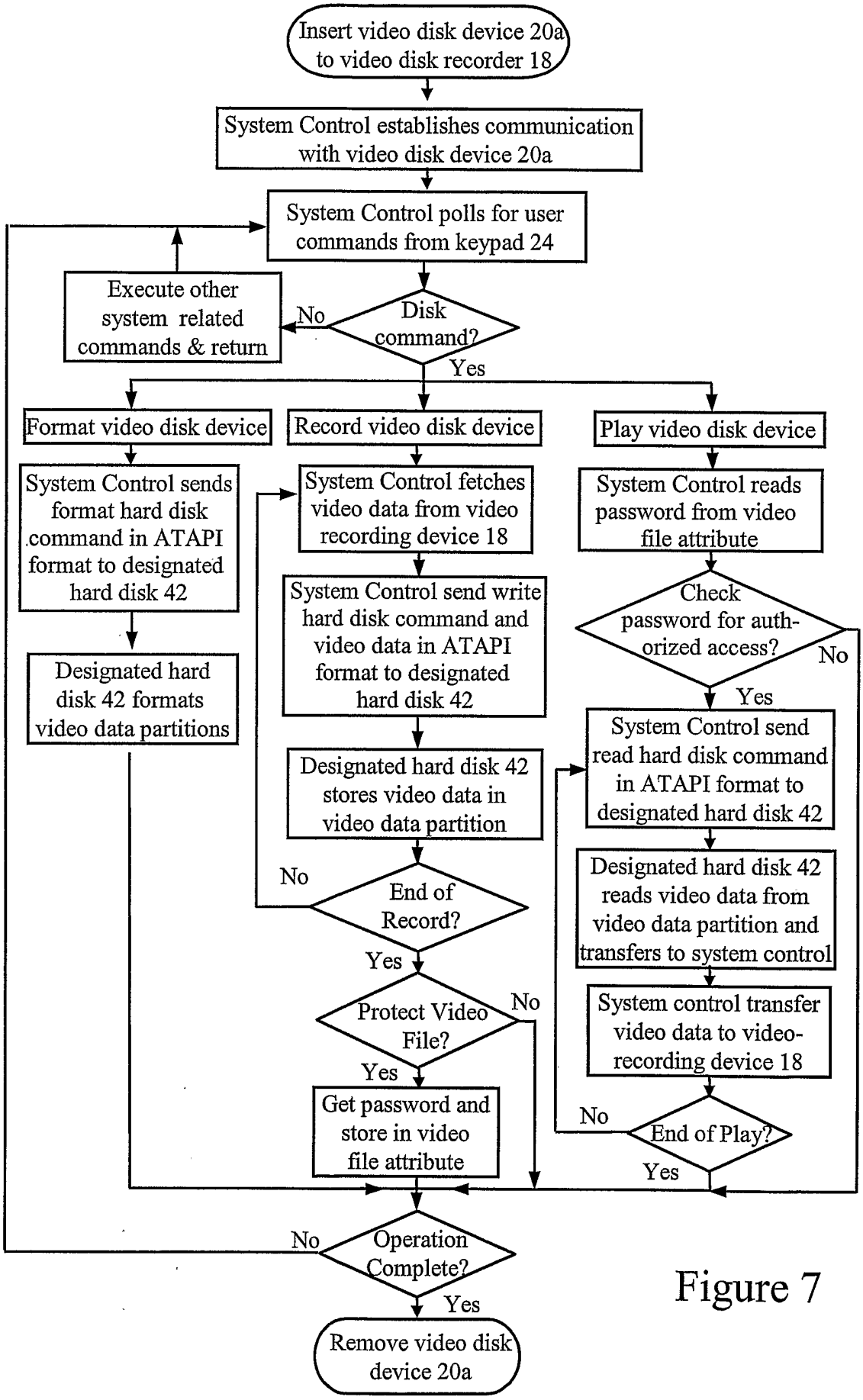
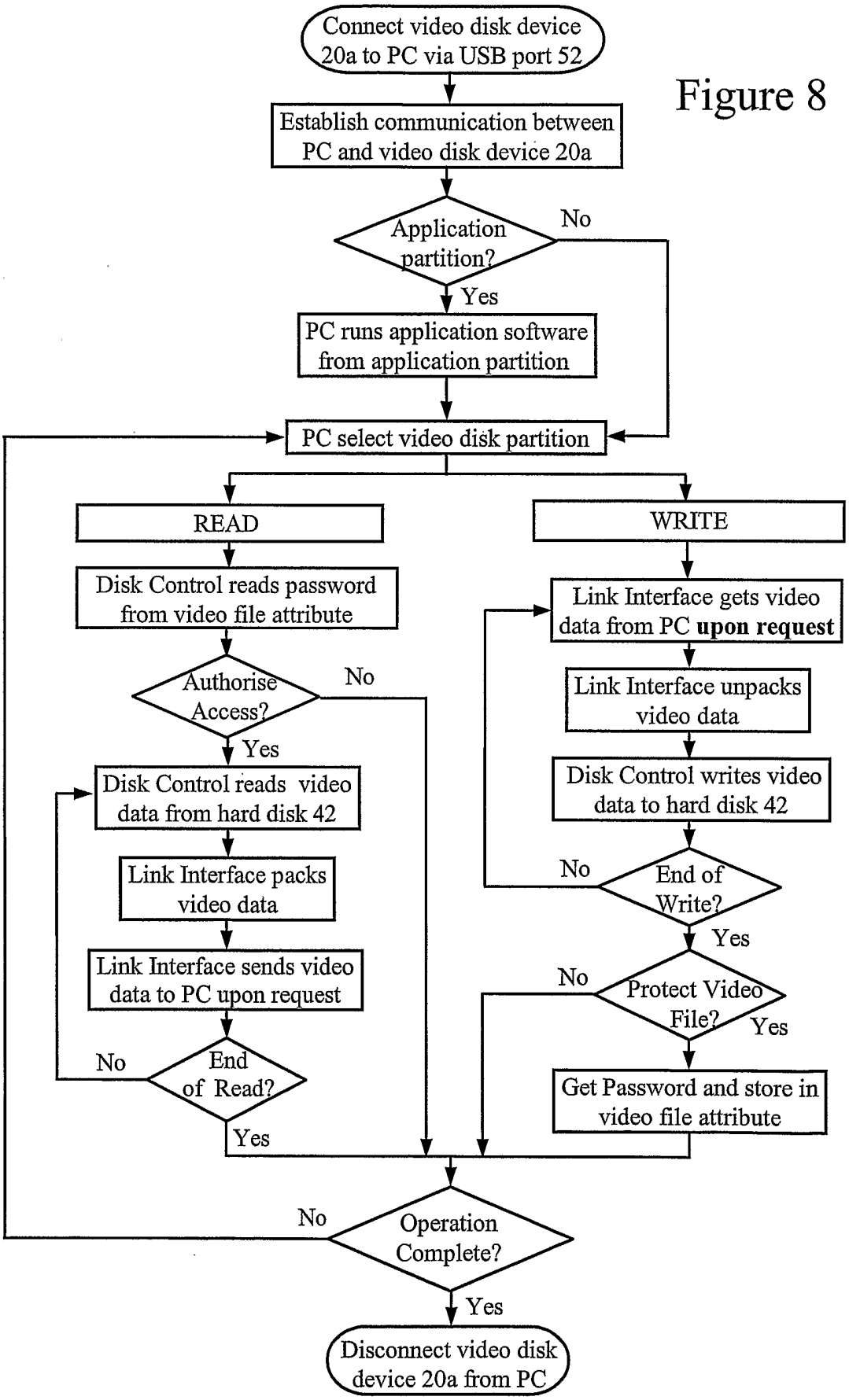

Insert video disk device 20a to video disk recorder 18
System Control establishes communication with video disk device 20a
System Control polls for user commands from keypad 24
Disk command?
No
Execute other system related commands & return
Yes
Format video disk device
Record video disk device
Play video disk device
System Control sends format hard disk command in ATAPI format to designated hard disk 42
Designated hard disk 42 formats video data partitions
System Control fetches video data from video recording device 18
System Control send write hard disk command and video data in ATAPI format to designated hard disk 42
Designated hard disk 42 stores video data in video data partition
End of Record?
No
Yes
Protect Video File?
No
Yes
Get password and store in video file attribute
System Control reads password from video file attribute
Check password for auth-orized access?
No
Yes
System Control send read hard disk command in ATAPI format to designated hard disk 42
Designated hard disk 42 reads video data from video data partition and transfers to system control
System control transfer video data to video-recording device 18
End of Play?
No
Yes
Operation Complete?
No
Yes
Remove video disk device 20a

Figure 7

Figure 8


Connect video disk device 20a to PC via USB port 52
Establish communication between PC and video disk device 20a
Application partition?
No
Yes
PC runs application software from application partition
PC select video disk partition
READ
Disk Control reads password from video file attribute
Authorise Access?
No
Yes
Disk Control reads video data from hard disk 42
Link Interface packs video data
Link Interface sends video data to PC upon request
End of Read?
No
Yes
WRITE
Link Interface gets video data from PC upon request
Link Interface unpacks video data
Disk Control writes video data to hard disk 42
End of Write?
No
Yes
Protect Video File?
No
Yes
Get Password and store in video file attribute
Operation Complete?
No
Yes
Disconnect video disk device 20a from PC

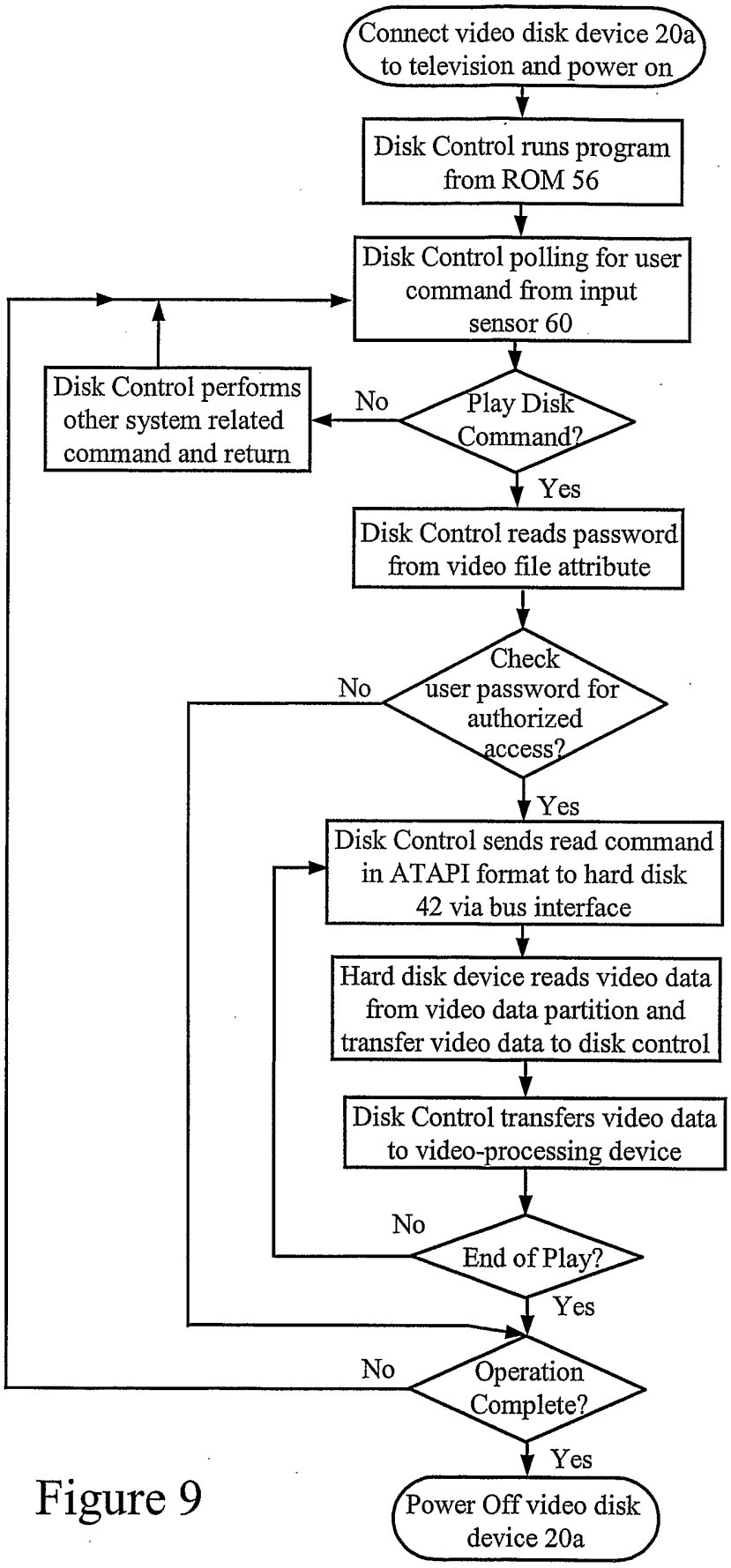

Connect video disk device 20a to television and power on
Disk Control runs program from ROM 56
Disk Control polling for user command from input sensor 60
Play Disk Command?
No
Disk Control performs other system related command and return
Yes
Disk Control reads password from video file attribute
Check user password for authorized access?
No
Yes
Disk Control sends read command in ATAPI format to hard disk 42 via bus interface
Hard disk device reads video data from video data partition and transfer video data to disk control
Disk Control transfers video data to video-processing device
End of Play?
No
Yes
Operation Complete?
No
Yes
Power Off video disk device 20a

Figure 9

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SG02/00267

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. [7]: G06F 13/38

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
WPAT, USPTO (removable, video, interface)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1139224 A2 (SCM Microsystems Limited) 4 October 2001 Whole Document	1-13
A	US 5734781 A (Cantone) 31 March 1998 Whole Document	9

☐ Further documents are listed in the continuation of Box C ☒ See patent family annex

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
28 January 2003	31 JAN 2003
Name and mailing address of the ISA/AU	Authorized officer
AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. (02) 6285 3929	**R.H. STOPFORD** Telephone No : (02) 6283 2177

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/SG02/00267

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member
EP	1139224	NONE
US	5734781	NONE

END OF ANNEX