

A PORTABLE STORAGE DEVICE FOR RECORDING AND PLAYING BACK DATA

Background of the Invention

1. Field of the Invention

5 The present invention relates generally to the recording, storage, and playing back of audio and video data.

2. Description of the Related Art

VHS, VCD and DVD players provide the current standards for connecting to televisions for the playback and recording of audio/video formats. These systems
10 require tape or disk media and a specific recorder/player to encode or decode the various audio/video formats. However, the technology for the media keeps changing and also the encoding and decoding methods keep changing.

It would be desirable to have a recording/playback media incorporating a standard USB interface that would be compatible with consumer electronics products
15 (such as televisions) as well as PC products. It would be desirable for the media to be programmable by the user to allow the flexibility of changing the encoding and decoding of audio/video formats. Such a media would eliminate the incompatibility of media with players and the incompatibility of the audio/video formats the with the player system.

20 In particular, the High-Definition Multimedia Interface (HDMI) Standard is positioned to become the dominant standard in the consumer electronics sector. The HDMI Standard is defined in the "High-Definition Multimedia Interface Specification,



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Informal Version 1.0", published September 4, 2003. It would be especially desirable to provide a media for providing compatibility between this HDMI consumer electronics standard and computer standards such as USB.

Summary of the Invention

The present invention solves the incompatibility problem of media with players and the incompatibility of the audio/video formats with the player system. The present invention allows solid state media to cross the PC boundary to products of the consumer
5 sector, such as television, which use standards such as HDMI.

In general terms, the present invention provides a device for recording and playing back audio/video signals. A portable storage device has mounted thereon a portable storage device connector of a first type adapted to transfer audio/video signals of a first type. A first audio/video system has a first audio/video system connector of
10 the first type for directly connecting to the portable storage device connector to exchange audio/video signals of the first type between the portable storage device and the first audio/video system to record and playback audio/video signals of the first type. A second audio/video system receives audio/video signals of a second type. An interface section has an interface section connector of the first type for directly
15 connecting to the portable storage device. The interface section converts between the audio/video signals of the first and second type, and exchanges the signals of the first and second type between the first audio/video system and the second audio/video system through the interface section connector of the first type and a signal connection between the interface section and the second audio/video system.

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A first aspect of the invention is defined in the appended claim 1.

A second aspect of the invention is defined in the appended claim 20.

A third aspect of the invention is defined in the appended claim 35.

Brief Description of the Drawings

The present invention will be readily understood by the following detailed description in conjunction with the accompanying drawings. To facilitate this description, like reference numerals designate like structural elements.

5 FIGURE 1 shows a device for recording and playing back video signals of the present invention.

FIGURE 2 is a flowchart showing the function of the present invention.

FIGURES 3 and 4 show integral configurations of an interface section integrally combined with a video system and a portable storage device, respectively.

10 FIGURE 5 shows an alternative configuration of the portable storage device for use with HDMI.

Detailed Description of the Preferred Embodiments

A portable storage device for connecting to both a television and a computer for recording and playing back audio and video signals and a method for doing the same are provided. In the following description, numerous specific details are set forth in order
5 to provide a thorough understanding of the present invention. It will be understood, however, to one skilled in the art, that the present invention may be practiced without some or all of these specific details. In other instances, well known process operations have not been described in detail in order not to unnecessarily obscure the present invention.

10 FIGURE 1 shows a device for recording and playing back video signals of the present invention. Mounted to a portable storage device 11 is a portable storage device connector of a first type 13 adapted to transfer video signals of a first type 15. The portable storage device 11 is preferably of a size that can easily fit in the palm of a user's hand and easily fit within the user's pocket for convenient portability. The
15 portable storage device 11 includes a memory section 33, a microcontroller unit 31, an encoder/decoder engine 35, a protocol controller 37, a key matrix 39 and a biometrics based authentication module 41. The memory section 33 can be non-volatile solid-state memory having a storage capacity of at least 8MB. Alternatively, the memory section can be an optical drive such as a hard disk drive or another form of compact data
20 storage.

A first video system 17 has a first video system connector of the first type 19 for directly connecting to the portable storage device connector to exchange video signals

of the first type 15 between the portable storage device 11 and the first video system 17 to record and playback video signals of the first type.

A second video system 21 receives video signals of a second type 23 from an interface section 25. The interface section 25 has an interface section connector of the first type 27 for directly connecting to the connector 13 of the portable storage device 11. The interface section 25 converts between the video signals of the first type 15 and the second type 23. The interface section includes a protocol controller of the first type 43 for translating signals to and from video signals of the first type 15, a protocol controller of the second type 45 for translating signals to and from video signals of the second type 23, and an interface section microcontroller unit 47 for translating or converting between a signals of a first interface protocol type 57 and signals of a second interface protocol type 59. A signal connection 29 delivers the video signals of the second type 23 to and/or from the second video system 21. The signal connection 29 can include an interface section connector of the second type 53 which is directly connected to a second video system connector of the second type 55 for transferring video signals of the second type 23 between the second video system 21 and the interface section 25. Alternatively, rather than using a direct connection, the connectors 53, 55, the interface section 25, and the second video system 21 can be connected via an intervening cable or connected wirelessly using a protocol such as Bluetooth or using infrared.

The interface section 25 can be a physically separate component (encased in a housing separate from the portable storage device 11 and the first and second video

systems 17, 21) or can be integral with the second video system 21. FIGURE 3 shows an example of the interface section 25 integral with the second video system 21.

Alternatively, the interface section 25 can be integral with the portable storage device 11, in which case the portable storage device 11 has connectors of both the first and second type (see FIGURE 4) for connecting to the first and second video systems 17, 21. In a preferred embodiment, the portable storage device 11, when in use, is not in physical or signal communication with both the first and second video systems simultaneously.

The second video system 21 can be in the same room as the first video system 17 or can be in a different room or different building. There is no limitation to the relative locations of the first and second video systems 17, 21 as long as the portable storage device 11 can be transported from the general vicinity of one to the general vicinity of the other.

Note that where video signals are mentioned above, the video signals are typically combined with audio signals in the form of audio/visual signals. Also, the first and second video systems are typically part of an audio/visual system including both audio and video. The invention can also be used with pure audio signals, in which case the first and second video systems 17, 21 can be audio systems.

The function of the present invention is now described with additional reference to FIGURE 2. At step 201, the portable storage device connector 13 is directly connected to the first video system connector 19 of the first video system 17 in order to record video data from the first video system 17. Alternatively, rather than using a

direct physical connection between the connectors 13, 19, the video signals of the first type 15 can be transmitted between the portable storage device 11 and the first video system 17 using an intervening cable or wirelessly using a protocol such as Bluetooth or using infrared.

5 The user triggers the key matrix 39 to send a signal to the microcontroller unit 31 indicating that recording of the video data is to begin. The key matrix 39 can include keys (buttons) for communicating with the microcontroller unit 31 for controlling recording and playback functions.

 The biometrics-based authentication module 41 is coupled to and controlled by
10 the microcontroller unit 31, and controls access to the portable storage device 11. Access to the non-volatile memory 33 of the portable storage device for playback and/or recording is granted to a user provided that the authentication module 41 authenticates the user's identity. Access to the non-volatile memory is denied to the user otherwise. The authentication module 41 can be useful for preventing a user from recording
15 copyrighted material without paying for it. The authentication module 41 can supply biometrics or access code data to the first video system so that copyrighted material can only be recorded by an authorized user. The biometrics-based authentication module 41 can include a thumbprint sensor for acquiring data from the thumbprint of the user or can utilize other types of biometric data.

20 Upon selection of the record function and upon verification of the identity of the user by the authentication module 41, the step 203 is performed whereby video signals of the first type 15 are transferred from the first video system 17 to the portable storage

device 11 through the first video system connector 19 and the portable storage device connector 13. The protocol controller 37 converts the video signals of the first type 15 into a data signal 49. The data signal 49 is fed into the microcontroller unit 31 which routes the data signal 49 for encoding by the encoder/decoder engine 35 built-into the portable storage device 11. Next at step 205, the encoder/decoder engine 35 encodes the video signals into compressed video data 51, which at step 207 is stored in the memory section 33 of the portable storage device. The format of the compressed data can be MPEG 1, MPEG 2, MPEG 4, MP3, MPEG 7 or MPEG 21, for example. The encoder/decoder engine 35 can be programmed through the connector 13 to encode/decode other compressed data formats as well.

At step 209 the portable storage device connector 14 is disconnected from the first video system connector 19. The video and/or audio content is thus stored in the portable storage device 11 and can be conveniently transported to the second video system 21.

At step 211 the portable storage device connector 13 is connected to the second video system 21 via the interface section 25. In one embodiment, the interface section connector 27 can be directly connected to the portable data storage device connector 13. The interface section 25 is then connected to the second video system 21 via the signal connection 29.

The user then triggers the key matrix 39 to send a signal to the microcontroller unit 31 indicating that playback of the video data stored in the memory section 33 is to begin. The biometrics-based authentication module 41 is again used, this time to

prevent unauthorized access to the data stored in the memory section 33. This authorization process can again be used to protect copyrighted material from unauthorized copying.

Upon selection of the playback function and upon verification of the identity of the user by the authentication module 41, the compressed video data 51 is fed into the microcontroller unit 31 which routes the compressed video data 51 for decoding by the encoder/decoder engine 35. At step 213 the compressed video data 51 is decoded back into the data signal 49 by the encoder/decoder engine 35. The protocol controller 37 then converts the data signal 49 back into video signals of the first type 15.

At step 215 the video signals of the first type 15 are passed through the portable storage device connector 13 and the interface section connector 27 of the interface section 25.

At step 217 the interface section 25 converts the video signals of the first type 15 into video signals of a second type 23 by passing the signals through the interface section 25. At step 219 the video signals of the second type are passed to the second video system through the signal connection 29 between the interface section 25 and the second video system 21 for playback by the second video system 21 at step 221.

In a preferred embodiment the first video system 17 is a computer having a USB port. Also, the portable storage device connector 13 is a USB male-type connector, and both the first video system connector 19 and interface connector 27 are USB female-type connectors. The video signals of the first type 15 are USB protocol signals and the

protocol controllers 37, 43 are USB controllers. Alternatively, other connectors and protocols used for computer connections can be used.

When the portable storage device 11 is configured to receive signals from a computer, the device 11 is not limited to receiving audio/video signals. Rather, any type of computer files can be stored to and retrieved from the memory 33 of the device 11. When such files are received, the encoder/decoder engine 35 remains deactivated. In a preferred embodiment the encoder/decoder engine 35 is only activated when recording/playback is initiated using the key matrix 39. Otherwise it is assumed the input/output to/from the portable storage device 11 is in file format that does not need to be encoded or decoded.

Alternatively, the first video system can be a television having an HDMI connector. Then the portable storage device connector 13 is a HDMI connector, the first video system connector 19 and the interface connector 27 are also HDMI connectors. The video signals of the first type 15 are HDMI protocol signals and the protocol controllers 37, 43 are HDMI interfaces. In all of the embodiments using HDMI, other television standards such as RCA or BNC can be used instead.

When the controller is an HDMI interface, the portable storage device can optionally be configured as shown by the HDMI portable storage device 11' in FIGURE 5. As can be seen, the data signal 49 passes directly to/from the encoder/decoder engine 35 rather than being routed through the microcontroller unit 31.

Also, in the embodiment in which the first video system 17 is a computer, the second video system 21 can be a television having an HDMI connector. Then the

second video system connector 55 is an HDMI connector, the video signals of the second type 23 are HDMI protocol signals, the signal connection 29 between the interface section and the second video system connector is comprised of an HDMI connector 53 mounted on the interface section 25 for direct connection to the second video system connector 55, and the interface section 25 converts between the USB and HDMI protocol signals. Additionally, the protocol controllers 37, 43 are USB controllers and the protocol controller 45 is an HDMI interface. For this USB/HDMI configuration, during playback to the television from the portable storage device 10, the USB controller 43 converts the USB signals 15 to USB interface protocol signals 59.

10 Next, the interface section microcontroller unit 47 converts the USB interface protocol signals 59 to HDMI interface protocol signals 57. The HDMI interface 45 then converts the HDMI interface protocol signals 57 to HDMI signals 23. For recording from the television to the portable storage device 10 the process is reversed.

CLAIMS

1. A device for recording and playing back video signals comprising:
 - a portable storage device having:
 - a built-in encoder/decoder engine for encoding video signals into compressed video data and decoding the compressed video data into decoded video signals; and
 - a non-volatile solid-state memory for storing said compressed video data;
 - a portable storage device connector of a first type adapted to transfer video signals of a first type and which is mounted on the portable storage device;
 - a first video system having a first video system connector of the first type for directly connecting to the portable storage device connector to exchange video signals of the first type between the portable storage device and the first video system to record and playback video signals of the first type;
 - a second video system for receiving video signals of a second type; and
 - an interface section having an interface section connector of the first type for directly connecting to the portable storage device, the interface section converting between the video signals of the first and second type, and exchanging the signals of the first and second type between the first video system and the second video system through the interface section connector of the first type and a signal connection between the interface section and the second video system.
2. The device of Claim 1, wherein the video signals of the first type and second type also include audio signals which are recorded and played back by the device.

3. The device of Claim 1, wherein the non-volatile solid-state memory of the portable storage device comprises at least 8MB of memory storage capacity. .
4. The device of Claim 3, wherein the portable storage device further comprises a built-in microcontroller for controlling the solid-state memory and a protocol controller for converting the video data to and from video signals of the first type.
5. The device of Claim 4, wherein the signal connection between the interface section and the second video system further comprises an interface connector of a second type mounted to the interface section for direct connection to a second video system connector mounted to the second video system for exchanging the signals of the second type through the interface section connector of the second type and the second video system connector of the second type.
6. The device of Claim 5, wherein the first video system is a computer and the second video system is a television.
7. The device of Claim 4, wherein:
 - the first video system is a computer;
 - the portable storage device connector is a USB male-type connector;
 - the first video system connector of the first type and interface connector of the first type are USB female-type connectors;
 - the video signals of the first type are USB protocol signals; and
 - the protocol controller is a USB controller.
8. The device of Claim 4, wherein:

the first video system is a television;
the portable storage device connector is a HDMI connector;
the first video system connector of the first type and interface connector of the first type are HDMI connectors;
the video signals of the first type are HDMI protocol signals; and
the protocol controller is a HDMI interface.

9. The device of Claim 7, wherein:

the second video system is a television;
the second video system connector of the second type is an HDMI connector;
the video signals of the second type are HDMI protocol signals;
the signal connection between the interface section and the second video system connector is comprised of an HDMI connector mounted on the interface section for direct connection to the second video system connector; and
the interface section converts between the USB and HDMI protocol signals.

10. The device of Claim 9, wherein the interface section comprises a microcontroller for converting between the USB and HDMI protocol signals and wherein the microcontroller is electrically connected between a USB controller connected to the interface section connector of the first type and an HDMI controller connected to the HDMI connector mounted on the interface section.

11. The device of Claim 4, wherein the interface section is integral with the second video system.

12. The device of Claim 4, wherein the interface section is integral with the portable storage device.
13. The device of Claim 4, wherein the portable storage device 11, when in use, is not in signal communication with both the first and second video systems.
14. The device of Claim 4, wherein the interface section is encased in a housing separate from the portable storage device, the first video system and the second video system.
15. The device of Claim 2 wherein the portable storage device comprises at least 8MB of non-volatile solid-state memory storing the video data in compressed format, a built-in encoder/decoder engine, a built-in microcontroller, and a protocol controller working in cooperation to convert the video data between the compressed format and video signals of the first type, the format of the compressed data selected from the set consisting of: MPEG 1, MPEG 2, MPEG 4, MP3, MPEG 7 and MPEG 21.
16. The device of Claim 15, wherein the built-in encoder/decoder engine is programmable by the computer to encode/decode different compressed data formats.
17. The device of Claim 3, further comprising a biometrics-based authentication module coupled to and controlled by the microcontroller, wherein access to the non-volatile memory is granted to a user provided that the biometrics-based authentication module authenticates the user's identity and wherein access to the non-volatile memory is denied to the user otherwise.

18. The device of Claim 3, wherein the biometrics-based authentication module includes a thumbprint sensor for acquiring data from the thumbprint of the user.
19. The device of Claim 3, further comprising a key matrix coupled to the microcontroller to allow a user to control the recording and playing back of the video signals.
20. A portable storage device for recording and playing back video signals, the portable storage device comprising:
- a built-in encoder/decoder engine for encoding video signals into compressed video data and decoding the compressed video data into decoded video signals;
 - a non-volatile solid-state memory for storing said compressed video data;
 - a portable storage device connector of a first type adapted to transfer video signals of a first type and which is mounted on the portable storage device, the portable storage device connector being for directly connecting to a first video system having a first video system connector of the first type to exchange video signals of the first type between the portable storage device and the first video system to record and playback video signals of the first type; and
 - an interface section having an interface section connector of the first type for directly connecting to the portable storage device, the interface section for converting between the video signals of the first and a second type, and for exchanging the video signals of the first and the second type between the first video system and a second video system through the interface section connector of the first type and a signal connection between the interface section and the second video system, the second video system being for receiving video signals of the second type.

21. The portable storage device of claim 20, wherein the video signals of the first type and second type also include audio signals which are recorded and played back by the device.
22. The portable storage device of claim 20, wherein the non-volatile solid-state memory comprises at least 8MB of memory storage capacity.
23. The portable storage device of claim 22, further comprising a built-in microcontroller for controlling the non-volatile solid-state memory and a protocol controller for converting the video data to and from video signals of the first type.
24. The portable storage device of claim 23, wherein the signal connection between the interface section and the second video system further comprises an interface connector of a second type mounted to the interface section for direct connection to a second video system connector mounted to the second video system for exchanging the signals of the second type through the interface section connector of the second type and the second video system connector of the second type.
25. The portable storage device of claim 24, wherein the interface section comprises a microcontroller for converting between the USB and HDMI protocol signals and wherein the microcontroller is electrically connected between a USB controller connected to the interface section connector of the first type and an HDMI controller connected to the HDMI connector mounted on the interface section.
26. The portable storage device of claim 23, wherein the interface section is integral with the second video system.

27. The portable storage device of claim 23, wherein the interface section is integral with the portable storage device.
28. The portable storage device of claim 23, wherein the portable storage device, when in use, is not in signal communication with both the first and second video systems.
29. The portable storage device of claim 23, wherein the interface section is encased in a housing separate from the portable storage device, the first video system and the second video system.
30. The portable storage device of claim 23, wherein the built-in encoder/decoder engine, the built-in microcontroller, and the protocol controller are operable to work in cooperation to convert the video signals of the first type into compressed video data, the format of the compressed video data being selected from the set consisting of: MPEG 1, MPEG 2, MPEG 4, MP3, MPEG 7 and MPEG 21.
31. The portable storage device of claim 30, wherein the built-in encoder/decoder engine is programmable by a computer to encode/decode different compressed data formats.
32. The portable storage device of claim 23, further comprising a biometrics-based authentication module coupled to and controllable by the microcontroller, wherein access to the non-volatile memory is granted to a user provided that the biometrics-

based authentication module authenticates the user's identity and wherein access to the non-volatile memory is denied to the user otherwise.

33. The portable storage device of claim 32, wherein the biometrics-based authentication module includes a thumbprint sensor for acquiring data from the thumbprint of the user.

34. The portable storage device of claim 23, further comprising a key matrix coupled to the microcontroller to allow a user to control the recording and playing back of the video signals.

35. A method for recording and playing back video signals comprising the steps of:
directly connecting a portable storage device connector of a first type mounted on a portable storage device to a first video system connector of the first type of a first video system;

transferring video signals of the first type from the first video system to the portable storage device through the first video system connector and the portable storage device connector;

encoding the video signals of the first type into compressed video data using an encoder engine built-into the portable storage device;

storing the compressed video data in a memory section of the portable storage device to record the video signals of the first type, the memory section being a non-volatile solid-state memory;

disconnecting the portable storage device connector of the first type from the first video system connector of the first type;

directly connecting the portable storage device connector of the first type mounted on the portable storage device to an interface section connector of the first type of an interface section;

decoding the compressed video data into decoded video signals of the first type using a decoder engine built into the portable storage device;

passing the video signals of the first type through the portable storage device connector of the first type and the interface section connector of the first type into the interface section;

converting the video signals of the first type into video signals of a second type by passing the signals of the first type through the interface section;

passing the video signals of the second type to a second video system through a signal connection between the interface section and the second video system; and

playing back the video signals of the second type on the second video system.

36. The method of Claim 35, wherein the signal connection between the interface section and the second video system comprises an interface connector of a second type mounted to the interface section directly connected to a second video system connector mounted to the second video system for exchanging the signals of the second type through the interface section connector of the second type and the second video system connector of the second type.

37. The method Claim 36, wherein the video signals of the first type and second type also include audio signals which are recorded and played back by the device.

38. The method of Claim 37, wherein the portable storage device comprises at least 8MB of non-volatile solid-state memory storing video data in compressed format and a built-in encoder/decoder engine for compressing and decompressing the video data.

39. The method of Claim 38, wherein the portable storage device further comprises a built-in microcontroller for controlling the solid-state memory and a protocol controller for converting the video data to and from video signals of the first type.

40. The method of Claim 39, wherein the first video system is a computer and the second video system is a television.

41. The method of Claim 40, wherein:
the first video system is a computer;
the portable storage device connector is a USB male-type connector;
the first video system connector of the first type and interface connector of the first type are USB female-type connectors;
the video signals of the first type are USB protocol signals; and
the protocol controller is a USB controller.

42. The method of Claim 39, wherein:
the first video system is a television;
the portable storage device connector is a HDMI connector;
the first video system connector of the first type and interface connector of the first type are HDMI connectors;
the video signals of the first type are HDMI protocol signals; and

the protocol controller is a HDMI interface.

43. The method of Claim 39, wherein:
- the second video system is a television;
 - the second video system connector of the second type is an HDMI connector;
 - the video signals of the second type are HDMI protocol signals;
 - the signal connection between the interface section and the second video system connector is comprised of an HDMI connector mounted on the interface section for direct connection to the second video system connector; and
 - the interface section converts between the USB and HDMI protocol signals.
44. The method of Claim 43, wherein the interface comprises a microcontroller for converting between the USB and HDMI protocol signals and wherein the microcontroller is electrically connected between a USB controller connected to the interface section connector of the first type and an HDMI controller connected to the HDMI connector mounted on the interface section.
45. The method of Claim 39, wherein the interface section is integral with the first video system.
46. The method of Claim 39, wherein the interface section is integral with the portable storage device.
47. The method of Claim 39, wherein the portable storage device 11, when in use, is not in signal communication with both the first and second video systems.

48. The method of Claim 39, wherein the interface section is encased in a housing separate from the portable storage device, the first video system and the second video system.

49. The method of Claim 37 wherein the portable storage device comprises at least 8MB of non-volatile solid-state memory storing the video data in compressed format, a built-in encoder/decoder engine, a built-in microcontroller, and a protocol controller working in cooperation to convert the video data between the compressed format and video signals of the first type, the format of the compressed data selected from the set consisting of: MPEG 1, MPEG 2, MPEG 4, MP3, MPEG 7 and MPEG 21.

50. The method of Claim 49, wherein the built-in encoder/decoder engine is programmable by the computer to encode/decode different compressed data formats.

51. The method of Claim 38, further comprising the step of:
granting a user access to the non-volatile memory based upon authentication of the identity of the user by a biometrics-based authentication module coupled to and controlled by the microcontroller; and
denying the user access to the non-volatile memory otherwise.

52. The method of Claim 51, wherein the biometrics-based authentication module includes a thumbprint sensor for acquiring data from the thumbprint of the user.

53. The method of Claim 39, further comprising the step of controlling the recording and playing back of the video signals using a key matrix coupled to the microcontroller.