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(54) MEMORY MODULE WITH AUDIO PLAYBACK MODE

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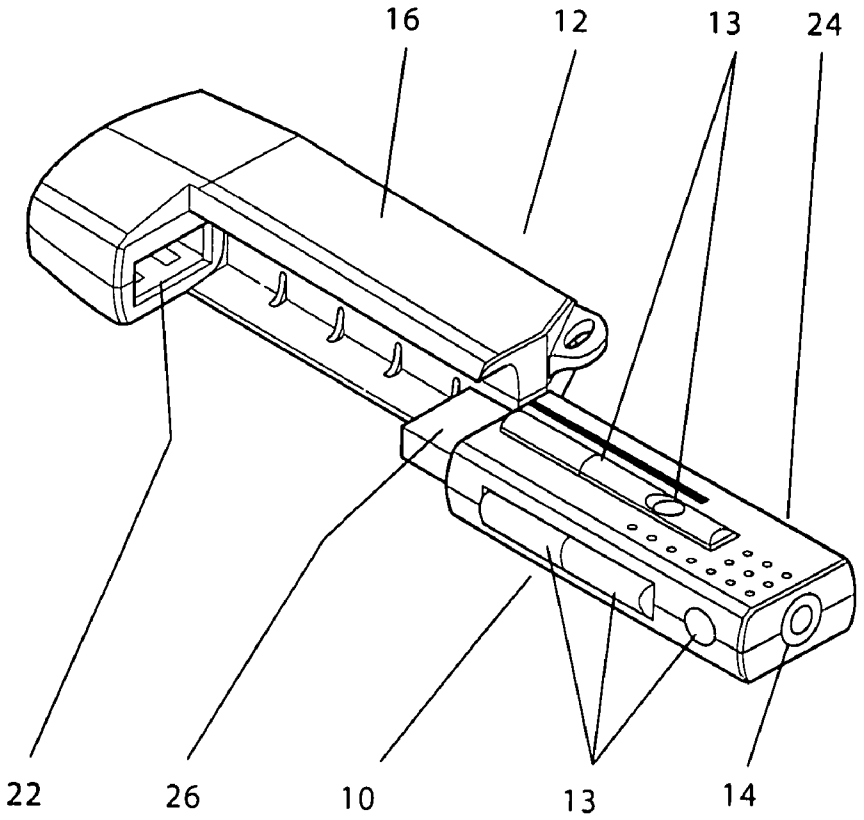
(57) **ABSTRACT**

A memory module with a playback mode for audio signals through a playback port, and having an input port for input of both analogue and data signals as well as power, the power being from a separate power source. The input port may be a USB or IEEE1394 port and may be used with a battery pack and cradle having a female socket for receiving therein the connector. The input port includes at least four terminals being: ground, power, and two differential data terminals; the differential data terminals carrying signals at frequencies in the range of from 1 to 480 MHz. The input port is also for passing power from the battery pack and cradle to the memory module.



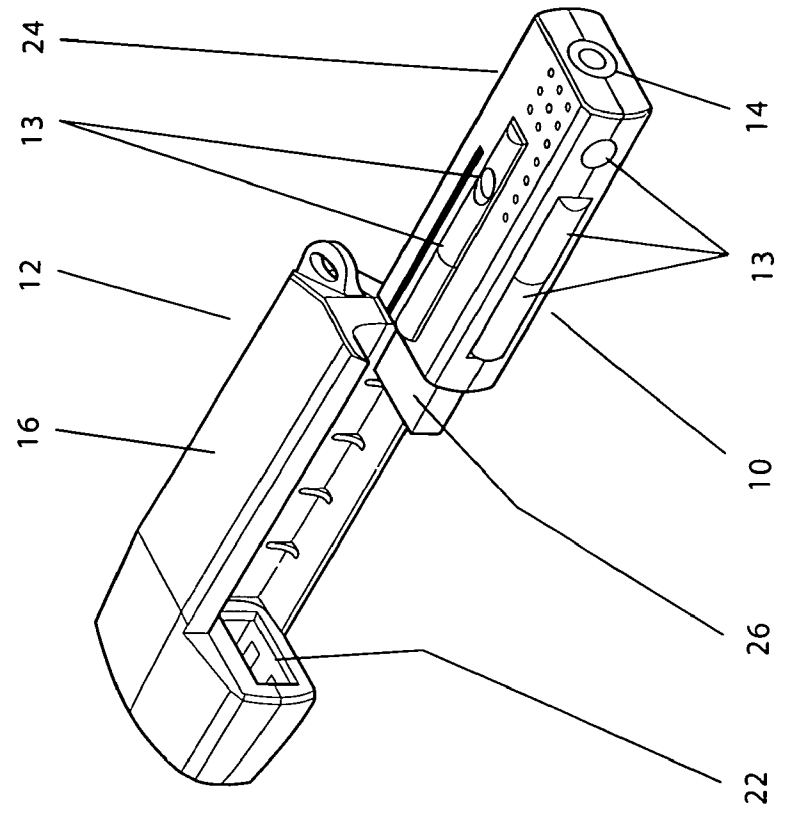


Figure 2

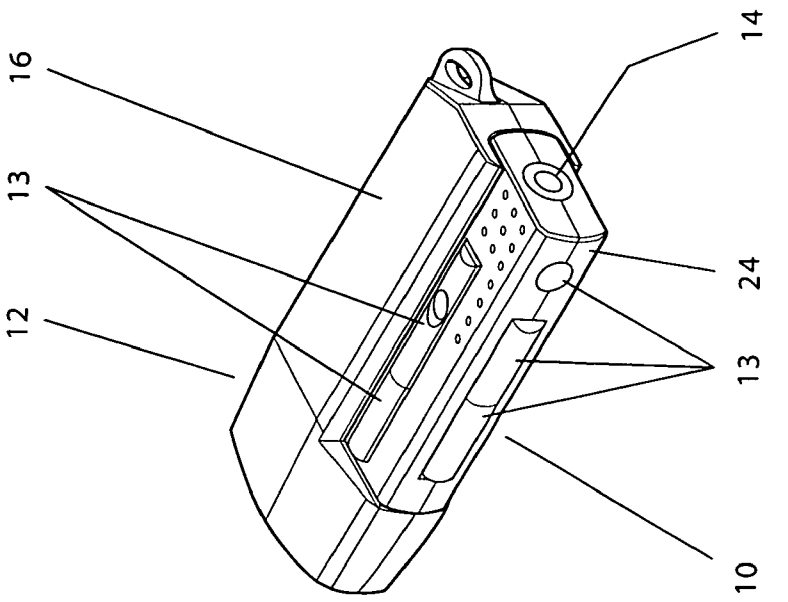


Figure 1

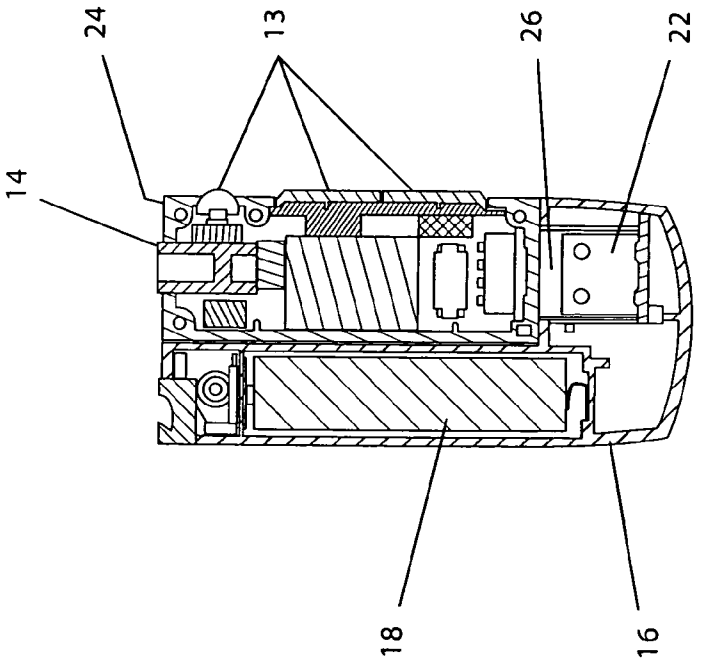


Figure 4

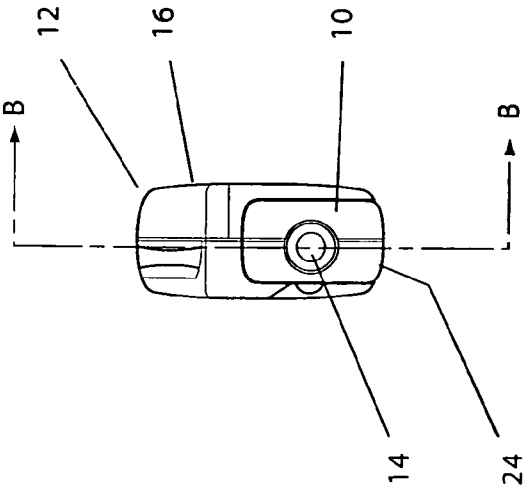


Figure 3

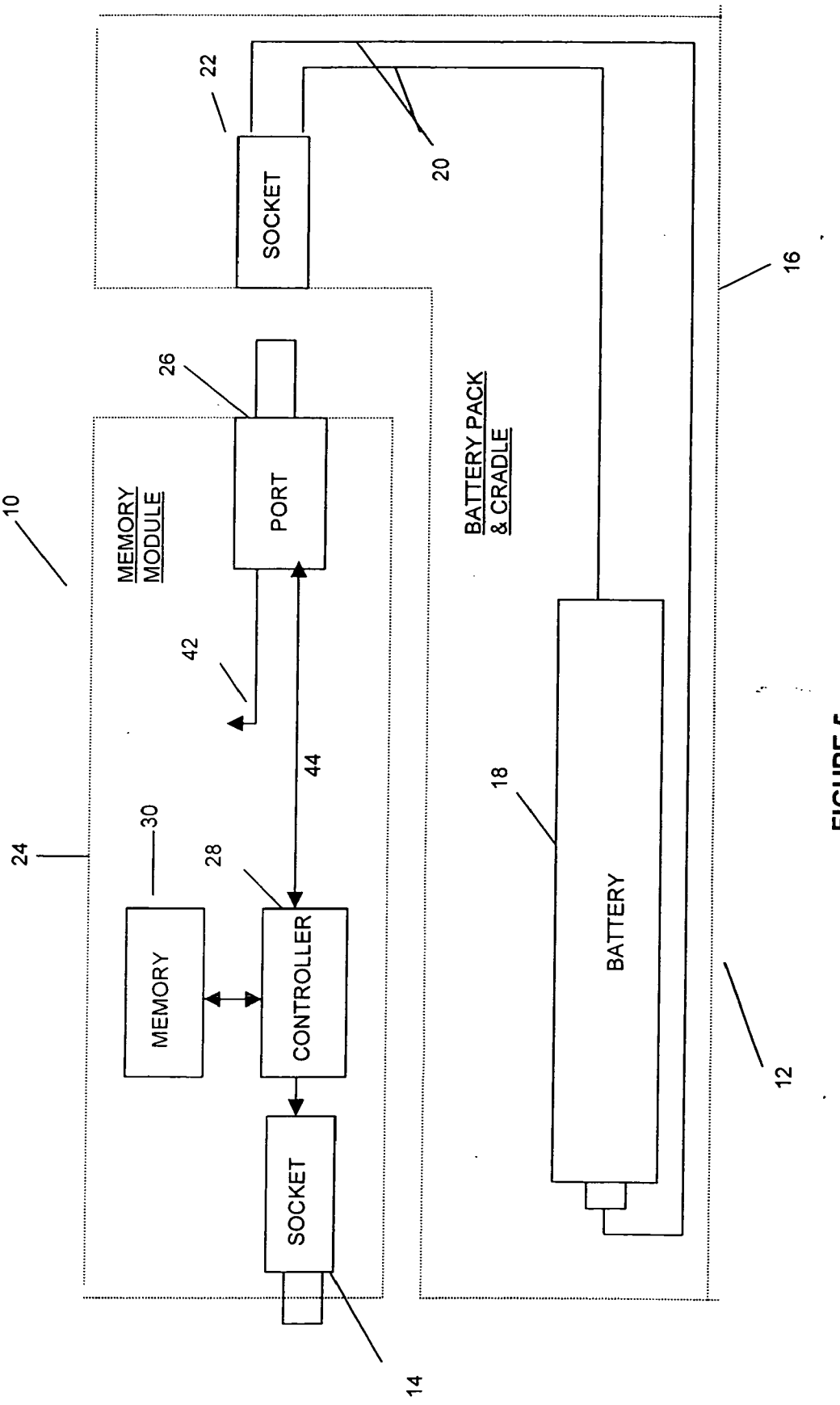

22
SOCKET
20
16
26
PORT
BATTERY PACK
& CRADLE
10
MEMORY
MODULE
42
44
18
30
24
28
MEMORY
CONTROLLER
BATTERY
SOCKET
12
14

FIGURE 5

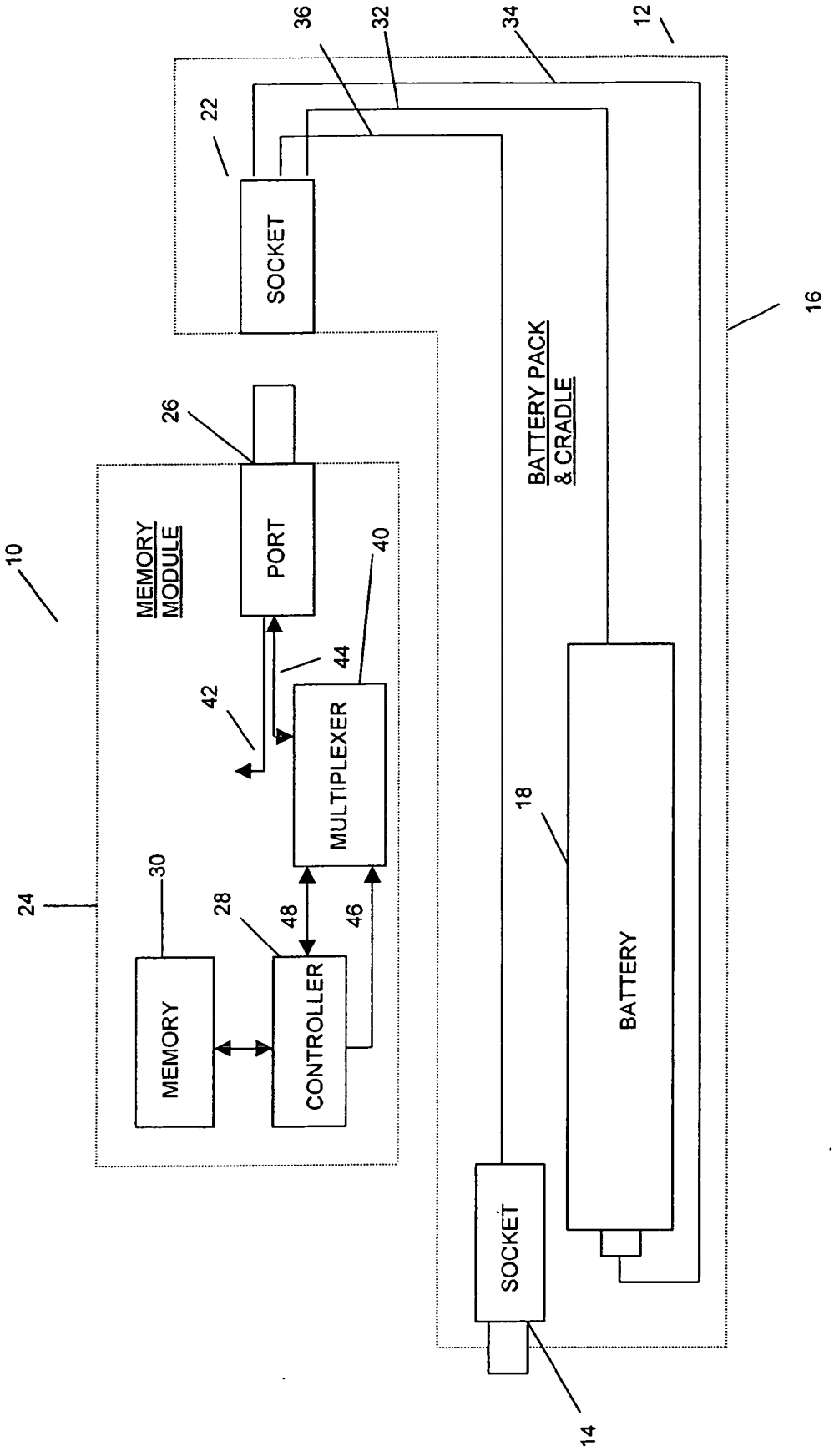

36
32
34
12
22
SOCKET
16
BATTERY PACK
& CRADLE
26
PORT
10
MEMORY
MODULE
40
44
42
MULTIPLEXER
18
30
24
28
48
46
MEMORY
CONTROLLER
BATTERY
SOCKET
14

FIGURE 6

MEMORY MODULE WITH AUDIO PLAYBACK MODE

RELATED APPLICATION DATA

[0001] This application is a divisional of U.S. patent application Ser. No. 10/100,351 filed Mar. 18, 2002, the contents of which are incorporated herein by reference as if explicitly set forth.

BACKGROUND TO THE INVENTION

[0002] At present there are a range of memory modules in use. An example of such memory modules is MP3 players. These require a cable to enable them to be connected to a user's computer to enable the transfer of music from the computer to the player. Such cables may be an RS-232 cable, USB cable or an IEEE1394 cable. Presently, two different high-speed cables are achieving consumer acceptance—USB 1.1 and 2.0, and IEEE1394. The IEEE1394 is known as "Firewire". With these, differential data lines are used to transmit data at speeds of up to 480 MHz. Any playback or output will be through a separate connection port. As such, the input lines and the output lines are mutually exclusive and the input lines serve no purpose during playback, and the playback lines serve no function during download.

SUMMARY OF THE INVENTION

[0003] According to one aspect of the invention, provided is a memory module with a playback mode for audio signals through a playback port, and having an input port for input of both analogue and data signals as well as power, the power being from a separate power source. The input port may be a USB or IEEE1394 port and may be used with a battery pack and cradle having a female socket for receiving therein the input port. The input port includes at least four terminals including: ground, power, and at least two differential data terminals; the differential data terminals carrying signals at frequencies in the range of from 1 to 480 MHz. The input port is also for passing power from the battery pack and cradle to the memory module.

[0004] As can be seen from the figures, the cradle **12** has a generally L-shaped configuration. The female data connector or socket **22** is formed in the short arm of the generally L-shaped configuration, while the compartment in the cradle **12** in which the battery **18** is located is formed in the long arm of the generally L-shaped configuration. As can be seen from **FIGS. 1 and 4**, the memory module and cradle are situated in a side-by-side configuration when the memory module and the cradle are assembled with the male **26** and female **22** data connectors engaged, with the compartment in which the battery **18** is located being alongside the memory module **10**.

[0005] The memory module may include a controller circuit and an earphone socket. Alternatively, the connector is used for audio output through an earphone socket fitted to the battery pack and cradle, the audio signals being passed to the earphone socket by the differential data lines of the input port.

[0006] There may be further included a multiplexing circuit so that the memory module knows in which of a plurality of modes it is to operate. The plurality of modes may include audio and data in which case audio is replay only and data is download and replay. The multiplexing circuit selects between the output of a USB transceiver and an audio preamplifier.

[0007] The multiplexing circuit may be electronically operated by using a voltage level between a ground line and a power line, the voltage level being different when the memory module is fitted to a computer to when it is fitted to the battery pack and cradle. Alternatively, it may be mechanically operated by a physical switch for a user to operate to switch between data and audio modes.

[0008] Alternatively, the multiplexing circuit is mechanically operated by a mechanical switch including a finger fitted to the battery pack and cradle and a switch on the memory module such that whenever the memory module is fitted to battery pack and cradle the finger contacts the switch to switch the memory module to audio mode and, in the absence of the finger, the memory module will automatically be in data mode.

DESCRIPTION OF THE DRAWINGS

[0009] In order that the invention may be clearly understood and readily put into practical effect there shall now be described by way of non-limitative example only preferred embodiments of the present invention, the description being with reference to the accompanying illustrative drawings in which:

[0010] **FIG. 1** is a front perspective view from above of a first embodiment fitted to a battery cradle;

[0011] **FIG. 2** is a view corresponding to **FIG. 1** just prior to being fitted to the battery cradle;

[0012] **FIG. 3** is an end view of the first embodiment fitted to the battery cradle;

[0013] **FIG. 4** is a cross-sectional view along the lines and in the direction of arrows B-B on **FIG. 3**;

[0014] **FIG. 5** is a schematic block diagram of the first embodiment just prior to engagement in the battery cradle; and

[0015] **FIG. 6** is a view corresponding to **FIG. 5** of a second embodiment.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0016] To first refer to FIGS. **1** to **5**, there is shown a memory module **10** adapted to be used with a computer (not shown) and is intended to be able to be used as a recording and playback module. For operation remote from the computer it is used with a mating battery pack and cradle **12**.

[0017] The module **10** has functional controls **13** of a known type to control the playback of data stored in the module **10**. That data may be audio and/or video and/or other storable data. For audio functions a headphone socket **14** is provided to enable a user to use the module **10** when fitted to the battery pack and cradle **12** without requiring other external reproduction devices.

[0018] The battery pack and cradle **12** has a cover **16** in which is releasably held a battery **18**. The battery is connected to power lines **20** that are connected to a female socket **22**.

[0019] The memory module **10** has a housing **24** in which the headphone socket **14** is fitted. Also fitted in housing **24** is a connector port **26** for data and power transfer. This may be a USB or IEEE 1394 port. From the port **26** power **42** is passed to the required components of the memory module **10** in the known manner. Those components are of a known category and operation. Data **44** is passed to and from a controller circuit **28** and then to non-volatile memory **30**. The controller circuit **28** is connected to the earphone socket **14**.

[0020] When it is intended to download data to the module **10**, it is removed from the battery pack and cradle **12** and connector **26** is connected directly to the user's computer's USB or IEEE1394 port ("port"). Power for the module is provided from the port **26** via the computer's port. When the user wants to use the module **10** in playback mode when connected to their computer, the port **26** is used to playback the data using the computer rather than the earphone socket **14**.

[0021] The second embodiment of **FIG. 6** shows where the port **26** is used for the audio output through the earphone socket **14**, which in this case is fitted to cover **16**. The port **26** and socket **22** each has at least four terminals each of which is connected to a separate line that are: ground **32**, power **34** (+5 V), D+**36** and D−**38** being the differential data lines. The data lines **36**, **38** carry signals at frequencies in the range of from 1 to 480 MHz. Only the one line is shown representing the two data lines **36**, **38** (audio left and right channels) for a USB port. An IEEE1394 port will have four data lines, and these are also represented by the single line **36**,**38**.

[0022] Controller circuit **28** includes a multiplexing circuit **40** so that module **10** knows in which mode it is to operate—audio **46** or data **48**. As can be seen, audio **46** is one way (playback) and data **48** is two way (download or input and playback or output). The circuit **40** selects between the output of the USB transceiver and audio preamplifier. It may be electronically or mechanically operated. For example, it may be electronic by using the voltage level between the ground **32** and the power line **34**. As the voltage at the power line **34** is higher when connected to a computer than when connected to the battery pack, the controller circuit **28** can easily determine to which of a computer or battery pack the module is connected by measuring the voltage at power line **34**.

[0023] The selection may be mechanical by having a physical switch for a user to operate to switch between data and audio (playback) modes. A mechanical switch may also be automatically operated by a finger fitted to cover **16** and that operates a physical switch on housing **24** whenever the module is fitted to battery pack and cradle **12** and switches the module to audio (playback) mode. In the absence of such a finger, the module will automatically be in data mode. Alternatively, the module **10** may be in audio (playback) mode in the absence of the finger.

[0024] The present invention therefore provides a memory module able to be connected directly to the user's computer for download and playback, and for use remote from the computer by using a battery pack and cradle for playback using an earphone socket. This is different to present memory modules where they are either a storage device that has no playback capability and cannot be operated separately from their "master" machine (computer, PDA, or the like); or are a device such as an MP3 player where cables are required to connect the player to a computer for the downloading of the music to be stored on the player. The USB port of an MP3 players is used solely for data transfer during the downloading of the music. To give a reasonable playback time MP3 players have an in-built battery compartment in which batteries are located. That makes them rather large and prevents direct coupling with machines such as computers, PDAs, and so forth.

[0025] Whilst there has been described in the foregoing description a preferred embodiment of the present invention, it will be understood by those skilled in the technology that many variations or modifications in details of design, construction or operation may be made without departing from the present invention.

[0026] The present invention extends to all features disclosed either individually or in all possible permutations and combinations.

1. A playback device, comprising:

a data connector port for both data transfer and audio playback;

memory for storing audio data received via the connector port; and

functional controls to control the playback of audio data stored in the memory, wherein, when in an audio playback mode, the data connector port is used to play back audio data.

2. A playback device as claimed in claim 1, wherein the connector port is a USB or IEEE 1394 connector port.

3. A playback device as claimed in claim 2, wherein the connector port is a male connector port.

4. A playback device as claimed in claim 3, further comprising an earphone socket.

5. A playback device as claimed in claim 2, wherein the audio playback is provided on data lines in the connector port.

6. A playback device as claimed in claim 2, wherein, in the audio playback mode, the playback device is capable of receiving power via a power line in the connector port.

7. A playback device as claimed in claim 1, further comprising a multiplexing circuit coupled to the connector port and that selects between the output of a data transceiver and an audio output circuit.

8. A playback device as claimed in claim 7, wherein the multiplexing circuit is electronically operated by detecting a voltage level between a ground line and a power line in the connector port.

9. A playback device as claimed in claim 7, wherein the multiplexing circuit is mechanically operated by a physical switch for a user to operate to switch between data and audio modes.

10. A playback device as claimed in claim 7 wherein the audio output circuit is an audio preamplifier.

11. A playback device as claimed in claim 5, further comprising a multiplexing circuit coupled to the data lines and that selects between the output of a data transceiver and an audio output circuit.

12. A playback device as claimed in claim 11, wherein the multiplexing circuit is electronically operated by detecting a voltage level between a ground line and a power line in the connector port.

13. A playback device as claimed in claim 1, wherein the audio playback is provided on data lines in the connector port.

14. A playback device as claimed in claim 1, wherein, in the audio playback mode, the playback device is capable of receiving power via a power line in the connector port.

15. A playback device as claimed in claim 3, wherein the audio playback is provided on data lines in the connector port.

16. A playback device as claimed in claim 3, wherein, in the audio playback mode, the playback device is capable of receiving power via a power line in the connector port.

17. A playback device as claimed in claim 13, further comprising a multiplexing circuit coupled to the data lines and that selects between the output of a data transceiver and an audio output circuit.

18. A playback device as claimed in claim 17 wherein the audio output circuit is an audio preamplifier.

19. A playback device as claimed in claim 15, further comprising a multiplexing circuit coupled to the data lines and that selects between the output of a data transceiver and an audio output circuit.

20. A playback device as claimed in claim 19 wherein the audio output circuit is an audio preamplifier.

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