

MEMORY MODULE WITH AUDIO PLAYBACK MODE

Field of the Invention

This invention relates to a memory module with an audio playback mode and refers particularly, though not exclusively, to such a memory module where the one connector port is able to be used for data input and output, both digital and analogue, the analogue including a playback mode.

Background to the Invention

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 – USB1.1 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

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/output port for the output of analog signals and for the input/output of data signals as well as the input of power, the power being from a separate

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.

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.

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.

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.

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

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module to audio mode and, in the absence of the finger, the memory module will automatically be in data mode.

In a further aspect there is provided a media player comprising a memory module having an audio playback mode, the memory module including a non-volatile memory, control circuitry, and a male data connector selected from the group consisting of USB and IEEE 1394; and a cradle including a battery compartment and a female data connector selected from the group consisting of USB and IEEE 1394, the memory module in use receiving power from the cradle when the memory module and the cradle are assembled in a side-by-side configuration with the male and female data connectors engaged.

In a final aspect there is provided a media player comprising a memory module having an audio playback mode, the memory module including a non-volatile memory, control circuitry, and a male data connector selected from the group consisting of USB and IEEE 1394; and a cradle including a battery compartment and a female data connector selected from the group consisting of USB and IEEE 1394; the memory module and cradle being situated in a side-by-side configuration when the memory module and the cradle are assembled with the male and female data connectors engaged.

The cradle may have a generally L-shaped configuration, and the female data connector may be formed in the short arm of the generally L-shaped configuration.

The memory module may include functional controls to control the playback of data stored in the memory module; and may also include an earphone socket. Alternatively, the cradle may include an earphone socket.

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The male data connector may include, coupled to the control circuitry, data terminals, a power terminal and a ground terminal and the memory module in use receives power from the power terminal when the memory module and the cradle are assembled with the male and female data connectors engaged.

The control circuitry may switch between modes of operation of the memory module in response to different voltages being present on the power terminal and the ground terminal.

The modes of operation may include a data mode and a playback mode.

The control circuitry may switch the data terminals between a USB transceiver and an audio preamplifier.

The media player as claimed in any one of claims 24 to 27, wherein the control circuitry switches the data terminals in response to different voltages between the power and ground terminals.

The media player as claimed in any one of claims 24 to 27, wherein the control circuitry switches the data terminals in response to operation of a mechanical switch.

The media player as claimed in claim 29, wherein the mechanical switch is operated by the user or by a finger on the cradle.

The media player as claimed in any one of claims 18 to 30, wherein the battery compartment is formed in the long arm of the generally L-shaped configuration.

Description of the Drawings

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:

Figure 1 is a front perspective view from above of a first embodiment fitted to a battery cradle;

- 5 Figure 2 is a view corresponding to Figure 1 just prior to being fitted to the battery cradle;
Figure 3 is an end view of the first embodiment fitted to the battery cradle;
Figure 4 is a cross-sectional view along the lines and in the direction of arrows B-B on Figure 3;
- 10 Figure 5 is a schematic block diagram of the first embodiment just prior to engagement in the battery cradle; and
Figure 6 is a view corresponding to Figure 5 of a second embodiment.

Description of the Preferred Embodiments

- 15 To first refer to Figures 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.
- 20 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.
- 25 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.
- The memory module 10 has a housing 24 in which the headphone socket 14 is fitted.
- 30 Also fitted in housing 24 is a connector port 26 for data and power transfer. This may be a USB or IEEE1394 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
- 35 earphone socket 14.

5 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
10 computer rather than the earphone socket 14.

The second embodiment of Figure 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
15 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.

20 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
25 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.

30 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
35 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.

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.

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.

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.

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

5 The Claims

1. A memory module with a playback mode for audio signals through a playback port, and having an input/output port for the output of analog signals and for the input/output of data signals as well as the input of power, the power being
10 from a separate power source.
2. A memory module as claimed in claim 1, wherein the input/output port is selected from the group consisting of: a USB port and an IEEE1394 port.
- 15 3. A memory module as claimed in claim 1 or claim 2, wherein the memory module is adapted to be used with and releasably received in a battery pack and cradle having a female socket for receiving therein the input/output port, the battery pack and cradle including the separate power source.
- 20 4. A memory module as claimed in claim 3, wherein the input/output port is also for passing power from the separate power source in the battery pack and cradle to the memory module.
5. A memory module as claimed in any one of claims 1 to 4, further including a
25 controller circuit and an earphone socket.
6. A memory module as claimed in claim 5, wherein the playback port is the earphone socket.
- 30 7. A memory module as claimed in claim 3, wherein the playback port is an earphone socket fitted to the battery pack and cradle, audio signals being able to be passed from the memory module to the earphone socket by means of the input/output port.
- 35 8. A memory module as claimed in any one of claims 1 to 7, wherein the input/output port has at least four terminals including: ground, power, and at least two differential data terminals.

- 5 9. A memory module as claimed in claim 8, wherein the differential data terminals carry signals at frequencies in the range of from 1 to 480 MHz.
10. A memory module as claimed in claim 7, wherein the input/output port has at least four terminals including: ground, power, and at least two differential data terminals, the differential data terminals being for transfer of data to the memory module, and for transferring audio signals to the earphone socket.
- 10 11. A memory module as claimed in any one of claims 1 to 10, wherein there is further included a multiplexing circuit so that the memory module knows in which of a plurality of modes it is to operate.
- 15 12. A memory module as claimed in claim 11, wherein the plurality of modes includes audio and data.
- 20 13. A memory module as claimed in claim 12, wherein audio is replay only, and data is download and replay.
14. A memory module as claimed in any one of claims 11 to 13, wherein the multiplexing circuit selects between the output of a USB transceiver and an audio preamplifier.
- 25 15. A memory module as claimed in claim 11 when appended to claim 3, wherein the multiplexing circuit is 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 connected to the battery pack and cradle to when it is connected to a computer.
- 30 16. A memory module as claimed in claim 11 when appended to claim 3, wherein the multiplexing circuit is mechanically operated by a physical switch for a user to operate to switch between data and audio modes.
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- 5 17. A memory module as claimed in claim 11 when appended to claim 3, wherein
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
10 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.
18. A media player comprising:
a memory module having an audio playback mode, the memory module
15 including a non-volatile memory, control circuitry, and a male data connector
selected from the group consisting of USB and IEEE 1394; and
a cradle including a battery compartment and a female data connector selected
from the group consisting of USB and IEEE 1394, the memory module in use
receiving power from the cradle when the memory module and the cradle are
20 assembled in a side-by-side configuration with the male and female data
connectors engaged.
19. A media player comprising:
a memory module having an audio playback mode, the memory module
25 including a non-volatile memory, control circuitry, and a male data connector
selected from the group consisting of USB and IEEE 1394; and
a cradle including a battery compartment and a female data connector selected
from the group consisting of USB and IEEE 1394;
the memory module and cradle being situated in a side-by-side configuration
30 when the memory module and the cradle are assembled with the male and
female data connectors engaged.
20. The media player as claimed in claim 18 or claim 19, wherein the cradle has a
generally L-shaped configuration and the female data connector is formed in
35 the short arm of the generally L-shaped configuration.

- 5 21. The media player as claimed in any one of claims 18 to 20, wherein the memory module includes functional controls to control the playback of data stored in the memory module.
- 10 22. The media player as claimed in any one of claims 18 to 21, wherein the memory module includes an earphone socket.
23. The media player as claimed in any one of claims 18 to 21, wherein the cradle includes an earphone socket.
- 15 24. The media player as claimed in any one of claims 18 to 22, wherein the male data connector includes, coupled to the control circuitry, data terminals, a power terminal and a ground terminal and the memory module in use receives power from the power terminal when the memory module and the cradle are assembled with the male and female data connectors engaged.
- 20 25. The media player as claimed in any one of claims 18 to 24, wherein the control circuitry switches between modes of operation of the memory module in response to different voltages being present on the power terminal and the ground terminal.
- 25 26. The media player as claimed in claim 25, wherein the modes of operation include a data mode and a playback mode.
- 30 27. The media player as claimed in any one of claims 23 to 26, wherein the control circuitry switches the data terminals between a USB transceiver and an audio preamplifier.
- 35 28. The media player as claimed in any one of claims 24 to 27, wherein the control circuitry switches the data terminals in response to different voltages between the power and ground terminals.

- 5 29. The media player as claimed in any one of claims 24 to 27, wherein the control circuitry switches the data terminals in response to operation of a mechanical switch.
- 10 30. The media player as claimed in claim 29, wherein the mechanical switch is operated by the user or by a finger on the cradle.
31. The media player as claimed in any one of claims 18 to 30, wherein the battery compartment is formed in the long arm of the generally L-shaped configuration.

ABSTRACT**MEMORY MODULE WITH AUDIO PLAYBACK MODE**

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. The memory module may be a component of a media player.

Figure 2