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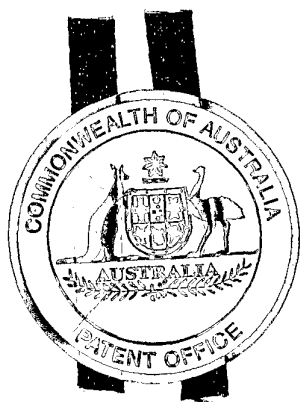


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A handwritten signature in ink, appearing to be "A" or "AM", written over a horizontal line.

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PROVISIONAL SPECIFICATION

Invention Title: Illuminated Articles and Devices

Applicant: Mr Xavier A. Jablonski

The invention is described in the following statement:

Illuminated Articles and Devices

The present invention relates to illuminated articles and devices, and particularly, although not exclusively, to novelty illumination articles and
5 devices.

A number of innovative illuminated novelty devices are described in International Patent Application No. PCT/AU03/00982 filed on 2 August 2003 and entitled "A Novelty Device", the contents of which are incorporated herein by reference.

10 The novelty devices disclosed in that application include a light guide that emits light along its length so as to provide e.g. an illuminated necklace, bracelet or the like. The devices include a control unit having one or more LEDs and a microprocessor for enabling their modulation. Modulation may be in accordance with a preset program stored in the control unit memory and/or in
15 response to detected sound, e.g. music, speech, footsteps or the like. The light may be pulsed, and may be modulated so as to change intensity, pulse frequency or colour.

The devices may be modular in construction, and may comprise e.g. one or more control units (on each of which is mounted a pair of LEDs) and one or
20 more light guides that may be mounted between the LEDs of one or more of the control units. The control units and light guides may be mixed and matched so as to provide devices of different sizes, shapes and colour combinations.

An aim of the present invention is to provide further illumination articles and devices, which, in their various new features, may provide a number of
25 advantages.

Viewed from one aspect, the present invention provides a signal line, the line including a side-emissive light guide extending along at least a part of said line, a light source for illuminating the light guide, and a controller for controlling the light source based upon the signal on the line, e.g. based upon a signal
30 current flowing therein.

The signal line may include suitable electrical conductors/wires along its length for transmitting electrical current from one end of the line to the other.

The signal line may transmit audio signals. It may for example be the line-out of an entertainment system, e.g. of an audio device, e.g. a line-out

cable from a music system. The signal line may for example provide a signal to a loudspeaker, headphones, earphones, or the like. It could also be a line-in line, e.g. a line from a microphone, musical instrument or the like.

When used to transmit e.g. audio signals, the illuminated line can provide
5 a pleasing display that can complement the music or other sounds played.

The line could also be e.g. a signal line associated with a computer or the like, e.g. a data transmission line. In this case, again, the device would provide a novelty aspect through its illumination, and could also provide an information aspect, e.g. its illumination confirming that data is being transferred.
10 The data line could for example be the line of a games controller, e.g. a joystick or games paddle, connected to a games machine, e.g. a video game machine, home game system or the like.

It will be understood that the term "signal line" should be interpreted broadly and covers illuminated cabling, cables, leads and the like which may be
15 of any suitable size, rating and the like, depending on the use to which the line is to be put. Preferably, the signal lines are electrical lines, but they could take other forms, e.g. fibre optic lines.

The controller may control the light source to illuminate the light guide in any suitable manner. It may for example illuminate the light guide constantly or
20 could pulse the light guide in accordance with a preset illumination sequence, e.g. to flash or pulse the line when signals are being transmitted.

In a preferred form, the controller modulates the light based on characteristics of the signal on the electric line. Modulation may for example be carried out in response to signal frequencies and/or intensities, e.g. based on
25 bass and treble signal components. In one preferred embodiment, the controller analyses the frequency spectrum of the signal, and modulates the light source based upon the characteristics of one or more of the frequency components of the signal.

If the signal line transmits data, the light could be modulated for example
30 based on the amount or speed of data transferred. The controller may also analyse or decode the data signal to determine the type of data being transmitted or to determine the meaning of the actual data itself. The controller may then modulate the light source based on the type of data, the value of the data or the like.

When used with a games controller, the controller could for example detect the input, e.g. keys pressed or the like, and may recognise a particular signal as a particular action, e.g. gun firing or movement, and may illuminate the line from the games controller accordingly, e.g. to flash when a gun is fired or a user jumps, but to ignore other movement.

The signal lines will generally transmit analogue signals. The signals could however also be digital.

Modulation of the light in the light guide may for example include a change in the intensity of the light, a change in frequency and/or duration of an illumination pulse, and/or a change in the colour or colours of the light. Modulation may occur in relation to one or more preset programmes stored in the controller, and may be carried out for example in a manner as discussed in PCT/AU/03/00982.

Detection by the controller of a signal on the line may be achieved through circuitry that connects with conductors of the line, e.g. taps into electrical conductors on the line. It could also be through non-contact detectors, e.g. capacitive, magnetic or inductive detectors. Where the signals are used to generate sound, e.g. music, the controller may include a microphone to detect the generated sounds, e.g. from an attached loudspeaker, amplifier or the like, so as to control the lighting accordingly. The controller could also detect e.g. signals on a fibre optic line e.g. by splitting the signal or by including repeater circuitry to intercept and pass on the signal.

The light guide may have a light source at one of its ends only. In this case, the other end may be blocked from transmitting light, may be mirrored to reflect light back down the line, or may allow light to escape from the end. The light guide could alternatively include a light source at both ends. This can provide a longer length of line without light drop off problems, and/or can allow for a greater variety of illumination patterns/displays, e.g. by controlling the light sources at each end differently, and/or by having different coloured light sources at each end that can intermingle along the guide's length.

The light guide may also include light sources at one or more intermediate points along its length. The intermediate sources again may allow for the fabrication of longer length lines without light drop off problems, and/or may allow for a large variety of illumination patterns, including for example

sequential operation of the light sources so that the light appears to be moving along the line.

The intermediate light sources may emit light in one direction down the guide or in two opposing directions. By using two oppositely directed light
5 sources at each location, the spacing between light source locations may be doubled. This can make fabrication and electrical connections simpler. Also, the light from two opposed light sources may blend together in the guide section therebetween.

The signal line may be configured so that light is emitted from the guide
10 only at certain locations along its length, e.g. to produce a number of spot sources of light. This may be achieved for example by shielding the light guide at various points along its length so that the light may not escape along those parts of the guide.

The controller may be self-powered, e.g. by batteries. It may also or
15 alternatively receive power from a device with which the signal line is associated, from mains power, or from the signal line itself.

The signal line may include any suitable connectors for connecting with the input or output of an associated device, e.g. a music player, and could include a phono plug, jack plug, RCA plug, DIN plug or the like at its ends.
20 Electric conductors between the connectors may take any suitable form for the application, and e.g. could be a simple pair of electrical wires, or two pairs of wires for stereo sound, or a shielded wire, e.g. coaxial wire, or the like.

The signal line may be manufactured as a single unitary item, i.e. with the light guide, the controller, the light sources and the signal conductors/leads,
25 all mounted together and sold as a single item. It could then be used in place of e.g. ordinary electric cabling, so as to provide novelty illumination or the like.

Parts of the signal line, e.g. the controller, could alternatively be provided in a device with which the signal line is associated. This would be particularly applicable to a signal line integral with a device. For example, a set of
30 headphones could include an integral illuminated signal line, with the controller for the light source or sources being mounted in one of the earpieces.

Alternatively, the illuminated signal line may be formed from the combination of a standard signal cable and from a light guide attachment, the light guide attachment including the light guide and controller and suitable

connectors for mechanically and/or optically and/or electrically attaching/coupling the guide and controller to the signal cable. This would then allow the attachment to be mounted on existing cabling to convert it into the inventive cabling of the present invention.

5 The light guide attachment may include a coupling adapter at one end that includes connections, e.g. socket and plug parts, for placement between an electrical device and a standard signal cable. In use, the adapter is connected to the device, e.g. through an output or input socket of the device, and the cable is mounted to the adapter.

10 The light guide attachment may also have fasteners, e.g. clips, for attaching to the electric cable along its length.

The light guide may also be separate from the controller, so that different guides and controllers may be interchanged.

15 The light guide light source or sources may take any suitable form, and could be for example small bulbs, e.g. resistive bulbs. In one preferred embodiment, each light source may comprise a light unit of one or more Light Emitting Diodes (LEDs). Thus, the light guide could have a single LED at one end, a single LED at each end, and/or a single LED at one or more positions in between. It could alternatively have two or more LEDs at one end, two or more
20 LEDs at each end, and/or two or more LEDs at each light source position in between. The use of LEDs is particularly advantageous due to their robustness and low power consumption characteristics.

25 The LEDs could provide the same or different output colours from one another, and/or each LED unit itself could emit a number of different light colours, e.g. could include a number of semi-conductor elements within the same housing, each emitting a different colour of light.

30 The controller may take any suitable form, and preferably includes a microprocessor pre-programmed with one or more control regimes, so as to control the illumination of the light guide based on the signal on the line. The controller may also be reprogrammable so as to allow it to be updated with new control regimes, and/or may include a control interface, e.g. buttons or knobs for changing the modulation regime, the light source intensity, the detection sensitivity, signal gain or the like.

Where only one light source is provided, at only one end of the guide, then a single controller may be provided at that end of the line to control it. Where a light source is provided at each end of a guide, then a controller may be provided at each end of the guide to control its associated light source.

- 5 Alternatively, a single controller may be used, and control leads may extend along the guide to the remote light source. Where intermediate light sources are used, control leads may be provided along the length of the wire.

When two or more light sources are used, they may be controlled in the same manner or independently or in groups of commonly controlled light sources.

- 10 The number of light source control leads required will depend on e.g. the wiring configuration and on whether and to what extent the light sources are controlled independently or commonly. For example, the light sources may be wired in parallel using separate control leads for each, or all may be in parallel
- 15 but receive control from the same two leads, or the light sources may be grouped into sets of light sources which each connect with respective group control leads. The light sources could also all be connected in series to receive the same control signal.

20 The light guide may take any suitable form. It may merely comprise a length of a transparent rod, e.g. a transparent polymer. Typically, it will comprise a light guide core and a core cladding and/or an outer jacket or covering.

The guide should be appropriately flexible for its desired use. Thus, where the signal line is to stay in a set position once installed, the guide may be

25 stiff but easily bent. Alternatively, where the line is used as a signal wire for headphones, earphones, a microphone line or the like, the line should be suitably flexible that a user can move without hindrance.

The light guide may e.g. comprise a polymer core surrounded by a polymer cladding, the core and cladding being suitably transparent and/or

30 translucent. Such a light guide may take the form e.g. as described in WO 02/095289 or US5067831, the contents of both of which documents are incorporated herein by reference. The light guide may include a protective outer polymer jacket.

In one preferred embodiment, the light guide may comprise a core of a flexible polymer compound with light scattering particles therein, a cladding of polytetrafluoroethylene (PTFE), e.g. TeflonTM, and a protective jacket of polyvinylchloride (PVC). This may be e.g. as described in WO 02/095289 as is available from Poly Optics Australia Pty Ltd, e.g. under the name of "super side light".

In another possible embodiment, the light guide has a liquid core, e.g. enclosed within a polymer sheath and plugged at both ends with a quartz plug. The liquid core may take any suitable form. In one preferred embodiment, the core liquid is an aqueous solution of salts, e.g. a saline solution. Other liquids are also possible, such as fresh water, distilled water, alcohol or the like. The sheath of the liquid guide may also be made of any suitable material, and is preferably of a suitably transparent or translucent form depending on the required application. It may comprise for example polyvinylchloride (PVC), silicone, polypropylene, or other plastics or rubber materials.

The signal wires and/or LED control wires may extend along the signal line within the light guide itself, e.g. within the guide core, within a cladding of the core, and/or within an outer cover or sheath. Alternatively, the wires may be provided on the outside of the guide. When located within the light guide, the wires are protected from damage. There may also be no need to use separately insulated wires, as the light guide material, e.g. polymer core or the like, may provide sufficient insulation.

More than one light guide could be used in a single signal line, e.g. two parallel light guides could be used. In this case, the signal wires, control wires and the like could run along the sides of the joints between the light guides, although again, they could run within the guides.

The signal line may be made in any suitable manner. Electrical wires may be provided along the length of the guide during production of the light guide or may be run along the length of the guide after it is formed (e.g. with an outer jacket extruded over the wires for protection and to keep them in place). One or more light sources may be butt coupled to one or both ends of a guide. One end of a guide may be mounted in a housing that including the controller, and suitable electrical connections may be made.

In order to provide intermediate light sources, a number of light guides could be coupled end to end, with suitable electrical connections being made at the joints. These light guides could have a light unit at one end, so as to provide a series of intermediate light sources facing in the same direction, or
 5 could have a light unit at each end, so that the intermediate light sources face in opposite directions. A protective unifying layer may be extruded over the coupled guides, and may e.g. hold and protect the signal and/or light control wires.

The signal lines may be of any suitable size and shape. For example, a
 10 guide that is illuminated by a single 5mm round high-intensity red LED might have a length of about 1 m to about 1.5 m, whilst the use of one of these LEDs at each end of the guide might provide a guide of twice this length. Any other suitable LEDs could also be used, and line lengths may be increased by using intermediate LEDs.

15 As said, the illuminated signal line may be provided by attaching a light guide attachment to an existing signal cable. Thus, viewed from another aspect, the present invention provides an attachment for a signal line to provide an illuminated signal line, the attachment including a light guide, one or more light sources and a controller for determining the state of the signal line and for
 20 illuminating the light source or sources in accordance with the detected state of the line.

The present invention also extends to a connector for connecting a light guide with a signal cable for providing an illuminated line, and, viewed from another aspect, the present invention provides a connector for mounting a
 25 signal cable and light guide, the connector including a connection for coupling with the signal cable, a connection for coupling with an external electrical connection that the cable is to couple with, a connection for coupling with the light guide, and a controller for detecting the state of the signal cable and for controlling a light source to light the light guide based on the detected state of
 30 the signal cable.

The present invention further extends to an electrical device having an integral illuminated signal line. Viewed from another aspect, therefore, the present invention provides an electrical device including a signal line, the line including a side-emissive light guide extending along at least a part of the line,

the device including a light source for illuminating the light guide and a controller for controlling the light source based on the state of the signal line.

The present invention is particularly applicable to audio signal lines, and, viewed from a further aspect, the present invention provides an audio signal line
5 for transmitting signals therealong, the line including a side-emissive light guide extending along at least a part of the line, a light source for illuminating the line, and a controller for detecting the signal on the line and for controlling the light source based upon the detected signal.

A lighted cable need not include a signal line, and could merely be a light
10 guide and controller that includes a plug for connecting with the line-out socket of a music device or any other suitable output socket, the cable including a control unit for monitoring the output of the socket and for illuminating the guide accordingly.

Viewed from another aspect, therefore, the present invention provides a
15 novelty strip or line having a light guide and light source and a connector for connecting to a signal output of a device, the line including a controller for monitoring the signal on the signal output and for controlling the light source to illuminate the guide based on the output signal detected.

It should be noted that any of the features mentioned above in relation to
20 any of the above aspects may be combined with any of the other features mentioned above, as appropriate.

Embodiments of the present invention will now be described, by way of example only, with reference to the accompanying drawings. It is to be understood that the particularity of the drawings does not supersede the
25 generality of the preceding description of the invention.

In the drawings:

Figure 1 is a diagram shows an entertainment system utilising a number of illuminated lines in accordance with various embodiments of the present invention;

30 Figure 2 is a diagram of a musical instrument system utilising an illuminated line in accordance with another embodiment of the present invention;

Figure 3 is a diagram of a games console or computer device utilising illuminated lines in accordance with another embodiment of the present invention;

Figure 4 is a schematic drawing of an end of an illuminated line in accordance with one embodiment of the present invention;

Figure 5 is a schematic drawing of an end of an illuminated line in accordance with another embodiment of the present invention;

Figure 6 is a schematic drawing of a pair of headphones utilising an illuminated line in accordance with a further embodiment of the present invention;

Figure 7 is a schematic drawing of an end of an illuminated line in accordance with another embodiment of the present invention;

Figures 8a-8j are cross-sectional views of alternative line arrangements;

Figure 9 is an end view of a signal line in accordance with another embodiment of the present invention, viewed from an end of the line distal from a controller; and

Figure 10 is an end view of a signal line in accordance with a further embodiment of the present invention, viewed from an end of the line distal from a controller.

Figure 1 shows an entertainment system 1, which could be e.g. a hi-fi system, a karaoke machine or the like. The system includes an audio player, e.g. a music player 2, e.g. a CD, DVD, cassette or MP3 player or the like. Attached to the player 2 are peripheral componentry and accessories, such as a microphone 3, a set of loudspeakers 4, and a set of headphones 5.

The componentry/accessories are connected to the music player 2 via a number of electrical signal lines 6 that transmit electrical signals to and/or from the music player 2. The term "signal line" is to be construed broadly, and should be taken to cover for example cables, e.g. audio cables, and to cover long and/or short lengths of cable, cabling, leads and the like.

In accordance with the present invention, one or more of the signal lines 6 are designed to light up based upon the state of the line 6, e.g. based on the current flowing through the lines 6.

Thus, in accordance with the present invention, the lines 6 are provided with side-emissive light guides along all or at least a part of their lengths. These

light guides are illuminated by a suitable light source, e.g. one or more LEDs, the LEDs being controlled by suitable controllers.

The lines may be illuminated fully along their lengths, or at separate points along their length, e.g. so as to provide a row of lights of any suitable design, e.g. points of light or short straight lengths of light. This could be achieved e.g. by masking a sheath of the light guide at suitable points, e.g. by using an opaque outer layer or the like with openings of any desired shape.

The signal lines 6 may remain illuminated with a constant light, may be flashed in accordance with one or more preset programmes, and/or may be modulated in accordance with the music played on the player 2 and/or spoken/sung into the microphone 4.

Light activation may be controlled through a central control unit in the player 2 and/or through separate control units associated with each line 6. These control units/controllers could for example be housed in the player 2, in the microphone 3, in the loudspeakers 4 or in the headphones 5, or could be provided in electrical connections, e.g. jack plugs or other such connections, at the ends of the signal lines 6.

Monitoring of the signals on the lines 6 may either be by tapping directly into signal wires of the lines or may be by a non-contact/non-invasive method e.g. using a capacitive, magnetic or inductive sensor located adjacent to or about the signal wires, or by use of a microphone that picks up a resultant output from a loudspeaker 4 or the like. Generally, the signal wires will be electrical, but the control units may monitor other lines also, e.g. optical fibre signal wires or the like, and may include suitable coupling elements, e.g. to divert a portion of the light or provide a repeater step.

Where the lines 6 are illuminated based on e.g. audio signals or the like transmitted along the lines, the illumination complements the sound output of the entertainment system 1, and provides a pleasing and interesting light show.

The light on the lines 6 may be modulated by splitting the signal on the line 6 into various frequency components, and modulating the light in the guides based on the intensity of these frequency components. For example, the intensity of the light, the frequency and/or duration of light pulses and/or the colour of the light in the guides may be varied based on the signal frequencies or the like.

As well as the signal lines 6, the electrical connection 7 between the earpieces 8 of the headphones 5 (across the headband 9) could also be illuminated to again provide an interesting novelty item. A similar arrangement could apply to a signal line between a pair of loudspeakers 4.

5 Also, as well as illuminating signal lines 6, the system 1 could include an illumination line 10 that does not transmit signals, e.g. is decorative only. This illumination line 10 is adapted to connect with a signal output jack of the player 2, and is illuminated based on a signal output from the jack. Thus, the line 10 includes a light guide, one or more light sources, e.g. a LED or LEDs, one or
10 more light controllers, and a suitable connector. The illumination line 10 can be suitably laid or hung in the environment of the player 2 to provide a pleasing light show.

In a further embodiment, as shown in Fig. 2, an illuminated electric line 6 may be a connection lead for a musical instrument 11, such as an electric
15 guitar. It may for example pass signals from a pick-up in the instrument to an amplifier 12 or the like. Again, the signal line 6 would provide a light show that complements the sound output by the amplifier, e.g. by splitting up the signal into component frequencies and modulating the light in the guides based on these frequencies.

20 The line 6 may be used with other instruments as well, e.g. other stringed instruments, such as violins, or with keyboards or the like. Again, the controller for the light guide lights may be in connectors of the line 6 or in the instrument or amplifier 12.

Fig. 3 shows another embodiment, in which the illuminated signal lines 6
25 are used to connect a games controller 13 with a games console or computing device 14, and to connect the games console or computing device 14 with a display 15, e.g. a computer monitor or television.

In this case, the lines 6 may be illuminated based on the type of command or action indicated by the games controller 13. For example, the
30 lines 6 may flash when a user fires a weapon or makes a particular move, e.g. a type of jump or the like. Different coloured lights may indicate different actions, and the rate of flashing, or light intensity, or the like may be dependent on the speed of firing or movement or type of action or the like.

Again the controllers for controlling the lighting of the lines 6 may be in connectors of the lines 6, or in the games controller 13, games console 14 or display 15.

5 The signal lines 6 may have various different configurations depending on their uses, e.g. depending on the signals passing down the lines, the length of the lines and the like.

One construction of an illuminated signal line 6 is shown in Fig. 4. In this embodiment, the line 6 includes a light guide 16 comprising a core 17, e.g. a transparent polymer, a core cladding 18, e.g. a transparent layer of PTFE, and
10 an outer cover 19, e.g. a transparent sleeve of PVC.

The line 6 also includes a jack plug connection 24 that includes a jack plug 25 and a housing 26 in which is provided a LED 27, as an end light source, and controller circuitry including a microprocessor 28 that controls the LED 27. One or more further intermediate light sources, e.g. LED 29, are provided along
15 the length of the light guide 16, and are also controlled by the microprocessor 28.

In this embodiment, the light guide 16 is made by butt coupling a plurality of light guides 16a, 16b together, e.g. through connectors 30 that also house the intermediate LEDs 29.

20 The line 6 may for example be used with the loudspeakers 4 or headphones 5, and the jack plug 25 may be inserted into a suitable line-out socket on the player 2.

Signals output from the player 2 are received by the jack plug 25 and pass along the length of the electric line 6 through positive and negative signal
25 wires 31 that pass through the jack plug housing 26 and along the light guides 16 within the outer cover 19. Suitable electrical connections are provided by the connectors 30. The other end of the line 6 may include a standard jack plug with which the signal wires 31 connect to provide a connection to the
30 loudspeaker 4 or the like. The signal on the wires 31 can be used by the speakers 4 or headphones 5 as usual, and the illuminated lines 6 can be used as a simple and fun replacement for standard cabling, without requiring any modifications to the original systems.

By providing the wires 31 within the outer cover 19, the wires 31 are protected from damage. Also, the wires 31 need not necessarily be separately insulated, as the outer cover 19 itself may provide the required insulation.

The microprocessor 28 taps into the signal wires 31 and monitors the
 5 signals on the wires 31. It then outputs suitable signals on a set of leads 32 to power the end LED 27 and a set of leads 33 to power the intermediate LEDs 29. The leads 33 connect with LED control wires 34 that extend along the length of the light guide 16 again within the outer cover 19 and through suitable connections in the connectors 30. The control wires 34 are on the opposite side
 10 of the guide 16 to the signal wires 31, and this may assist in reducing interference effects. The control wires 34 connect with the power leads 35 of the intermediate LEDs 29 through suitable connections in the connector 30.

The LEDs 27 and 29 and the microprocessor 28 are powered by
 batteries 36. The high efficiency of the LEDs 27 and 29 means that the
 15 batteries 36 will last a long time before requiring replacement.

The microcontroller 28 will control the signals on the leads 32 and 33 so as to illuminate the LEDs 27 and 29 in any suitable manner, e.g. in accordance with one or more procedures stored in the memory of the microprocessor 28. Thus, the LEDs 27 and 29 may be flashed/pulsed, and may have the durations
 20 of the flashes, the intervals between the flashes and/or the flash intensities controlled based on the various characteristics of the signals on lines 31.

For example, the microprocessor 28 may split the signal on the lines 31 into various frequency components, and may modulate the LEDs 27 and 29 based on these frequency components, e.g. based on their intensities.

25 The LEDs 27 and 29 may be controlled in the same manner, or may be controlled differently. For example, the LED 27 could be controlled based on treble signals, whilst the LED 29 could be controlled based on bass signals, or vice versa.

The LEDs 27 and 29 may be of the same or different kinds, and e.g.
 30 could be of the same or different colours.

The above construction may be modified as required so as to provide an electric line 6 for the microphone 3. In this case, for example, the microprocessor 28 could be in the body of the microphone 3 with a standard jack at the opposite end of the line 6.

The construction may also be modified to provide the line 6 between the guitar 11 and amplifier 12 of Fig. 2, or the lines 6 of Fig. 3 associated with the games console 14.

Where the line 6 is used with the games console 14, the microprocessor 28 may determine which controls of the games controller 13 have been hit, and may modulate the LEDs 27 and 29 based on the associated action, e.g. it may flash based on a weapon fired or a player move, such as a jump, or the like. If there is feedback to the controller 13, then it may light the LEDs 27 and 29 based on a hit on the player or the like.

The microprocessor housing, e.g. socket connection 26 may include an interface for altering the microprocessor control, e.g. by changing between a number of modulation procedures stored in the microprocessor 28 and/or by changing the sensitivity of the microprocessor 28 to the signals on the lines 31 or the like.

The design of Fig. 4 may also be modified to provide the illumination line 10 by removing the electric signal lines 31, so that the jack 25 merely provides a signal to the microprocessor 28, which then illuminates the LEDs 27 and 29 appropriately.

The light guide 16 may take any other suitable form. It should however be suitably flexible for the task in hand. In one preferred embodiment, the light guide 16 may be a "super side light" as made by Poly Optic Australia Pty Ltd.

Other light guide constructions are also possible, e.g. a liquid core surrounded by a PVC sheath and plugged by quartz crystals. The liquid core could for example be a saline solution.

The wires 31 and 34 need not be in the outer cover 19, but could be in the core 17 or in the cladding 18, or completely outside of the guide 16 and affixed to it along its length. They may be adjacent each other, or may be spaced apart. In one possible embodiment, the wires may run centrally within the line 6, and may be surrounded by a light guide 16 of annular cross-section. A light source, such as a ring of LEDs may be provided in the annular guide tube to provide illumination about the whole of the guide.

In one embodiment, the guide 16 has only two light units, one at each end of the guide. Thus, LED 29 in Fig. 4 may be reversed in orientation and provided at the far end of the guide 16, so as to face the LED 27. This then

provides a light guide with a LED at each end. The LEDs may be modulated either together or independently to provide a number of pleasing light patterns. If of different colours, the light from the two LEDs will blend together in the intermediate section of guide 16.

5 The use of LEDs 29 intermediate the ends of the guide 16 helps to ensure uniform light distribution along the guide and facilitates the use of long lengths of guide without loss of illumination quality. It may also allow for added effects, e.g. if the intermediate units are activated in sequence, they may simulate a light running the length of the line.

10 Fig. 5 shows another embodiment of the electric line 6 having a number of variations on the Fig. 4 design. Similar features are given the same reference numerals as in Fig. 4.

 The line 6 of Fig. 5 again includes a light guide 16, LEDs 27 and 29, and a microprocessor controller 28, but in this case, the signal connector is a pair of
15 RCA plugs 37 for providing e.g. stereo sound. Accordingly, there will be four signal wires 31 extending along the length of the light guide 16, so as to provide two signal channels, each having a positive and negative wire.

 Also, instead of using a number of LEDs 29 that face in the same direction along the light guide 16, each connector 30 includes two LEDs 29a,
20 29b, which face in opposite directions. This can then provide sections of the light guide that have opposing LEDs at each end (e.g. the section between the end LED 27 and the first intermediate LED 29a), the light of the two LEDs can blend together in that section to provide pleasing light effects. The use of two LEDs 29a,29b at each LED location also means that the LED locations can be
25 spaced further apart without problems with dimming of the light along the guide 16. This can simplify construction and also wiring connections.

 If all of the LEDs 29a, 29b were to be controlled in the same manner, then the single pair of control wires 34 of Fig. 4 could be used to control them. However, in the present embodiment, the LEDs 29a are controlled in
30 accordance with one of the signal channels, and the LEDs 29b (and LED 27) are controlled in accordance with the other signal channel. This requires the use of two pairs of LED control lines 34, connected to two pairs of control leads 33 from the microprocessor 28, one for each channel.

In either of the above embodiments, instead of providing the controller circuitry, e.g. the microprocessor 28, in the electric line 6 itself, the circuitry may be built into a device with which the line 6 is associated.

Thus, as shown in Fig.6, a set of headphones 5 may house the microprocessor 28 and battery 36 in one of the earpieces 8. The jack plug connector 24 may then be a standard jack plug, and the rest of the system may take the form of either of the above embodiments of Figs. 4 or 5. In the line 6 shown, the stereo wires 31 are shown split into two pairs on opposing sides of the guide 16, and the line 6 uses only the end LED 27, so that no intermediate LEDs 29 or associated control wires 34 are required. The end 38 of the guide 16 distal from the LED 27 may be mirrored to reflect light back along the guide 16.

Clearly, the microprocessor 28 could also control a light guide and associated LED or LEDs for an illuminated electrical connection 7 between the earpieces 8 across the headband 9, as shown in Fig. 1. As the light guide will be relatively short, a single LED may be used, or a pair of LEDs could be used, one at each end of the guide, to provide for extra illumination patterns.

Fig. 8 shows another embodiment of an illuminated electric line 6, which is constructed from an attachment 39 that includes the light guide 16 and a connector 40, and a standard electric cable 41, e.g. a guitar cable as shown in Fig. 2.

The connector 40 has both a jack plug 42 and a jack socket 43. The jack plug 42 fits into the input socket of e.g. a guitar amplifier 12, as shown in Fig. 2, and the jack plug 44 of the standard guitar cable 41 can fit into the jack socket 43 of the attachment, in a piggyback manner. Thus, the standard signals from the guitar pick-up will pass along the cable 41 and into the amplifier 12, whilst the microprocessor 28 will tap into the signals and control the LEDs 27, 29a, 29b in the light guide 16 accordingly.

The light guide 16 and cable 41 are connected together along their lengths by one or more clips 45 that may be e.g. a snap-fit over the cable 41. The clips 45 may also provide a mounting for the LEDs 29a, 29b, and a connection between light guide sections 16a and 16b. The clips 45 may have a circular portion as the light guide coupling and a C-clip portion for connecting to the signal cable 41.

The microprocessor 28 and LEDs 27, 29a, 29b can be powered by batteries 36 as above, and/or may be powered by a mains supply through a suitable adaptor 46.

As can be seen, the light guide 16 includes the LED control wires 34, but
 5 not the signal wires 31, as the cable 41 provides the electrical connection.

This attachment configuration can also be applied to the any of the electric lines 6 of Fig. 1 or Fig. 3, although in some of these cases, signals will be passing in the opposite direction, that is from the jack 44 along the cable 41 to an associated device.

10 As well as those lines discussed above, various other line arrangements are possible. Figs. 8a-8j show cross-sections through a number of such arrangements.

Thus, Figs 8a-8f show light guides 16 of a core 17 and cladding 18 only, with positive and negative signal wires 31a, 31b at various possible locations,
 15 e.g. in the core 17, in the cladding 18, or outside the guide 16, and together or spaced apart. They also show that none, one or both of the wires 31a, 31b may be insulated or not, e.g. depending on the core and cladding materials and on the signals supplied.

Figs. 8g-8i show light guides 16 having a core 17, cladding 18 and
 20 protective jacket 19, with the wires 31 in the protective jacket 19, the jacket 19 providing the insulation for the wires 31. Fig. 8g shows a stereo line with two pairs of wires 31a, 31b, one for each stereo channel.

Fig. 8j shows a line 6 that includes two light guides 16a, 16b running parallel to one another, and connected together by clips or adhesive or the like.
 25 In this particular example, the signal wires 31a, 31b are insulated and are provided outside of the guides 16a, 16b at the junction between the two.

Figs. 9 and 10 show end views of two further illuminated line embodiments. In these embodiments, the lines 6 have light sources at both of their ends, with a controller, e.g. the microprocessor 28 of the above
 30 embodiments, adjacent one of the light sources, and with LED control wires extending along the line to the other light source. The view in the two drawings is of the end of the line that is distal from the microprocessor.

As can be seen in Fig. 9, the light source in this case comprises four separate LEDs 47a-47d, each of which has leads 48a-48d that connect with its

own dedicated pair of control wires 34, the control wires 34 being bunched together and mounted within the outer jacket 19 of the guide 16. The LEDs 47a-47d may be mounted in a suitable coupling unit (not shown) to allow them to butt up against a polished face of the core 17, and the signal wires 31 are
5 also mounted in the jacket 19, opposite to the control wires 34.

Thus, each LED 47a-47d can be controlled independently of the others by the microprocessor 28. The LEDs 47a-47d may be of different colours from one another, and the light guide 16 may be lit by one of the LEDs at a time, or by two or more of the LEDs simultaneously, to provide a number of possible
10 illumination colours.

Fig. 10 shows the end of a line 6 that includes a pair of parallel light guides, with one LED 49a, 49b at the end of each of the guides. The pair of light guides and LEDs are housed within a single protective jacket 19, and the signal wires 31 and LED control wires 34 run within the jacket 19 in the thick
15 portion of the jacket 19 between the two guides. Again, the two LEDs 49a, 49b are controlled independently.

It is to be understood that various alterations, additions and/or modifications may be made to the parts previously described without departing from the ambit of the present invention, and that, in the light of the above
20 teachings, the present invention may be implemented in a variety of manners as would be understood by a person skilled in the art.

For example, in the various embodiments above, it would be possible to have a light source at one end of the light guide only, and e.g. a reflector, such as a silvered mirror, at the other end. In this case, only one controller and no
25 control wires are required.

Other light sources would also be possible, e.g. laser diodes, small resistive bulbs or the like.

The core, cladding and covering materials could be formed of any other suitable materials.

30 Each light source could also comprise more than one LED, so that two or more LEDs could be mounted in one end of a light guide.

The above signal lines will generally transmit analogue signal. It would however also be possible to transmit digital signals, in which case the LEDs could be modulated based on the speed of data transfer or amount of data or

the like, and/or the controller could decode the signals to determine the signals passed, and could then modulate the LEDs based on the data obtained from the decoding.

- 5 The LED controller may tap into the signal lines in any suitable manner, including using non-contact sensors, such as magnetic, inductive or capacitive sensors, or could include a microphone for detecting sounds produced by the device receiving the signals.

- 10 Although the signal lines will generally be electrical lines, they could also take other forms, e.g. they could be fibre optic lines, in which case the LED controller would need to split off a portion of the signal light or act as a repeater.

 The light guides need not extend the full length of the lines. They could also be shielded at various points to define locations where light may or may not escape, and so provide a row of lights or the like.

Claims

1. A signal line, the line including a side-emissive light guide
extending along at least a part of said line, a light source for illuminating the
5 light guide, and a controller for controlling the light source based upon the signal
on the line.
2. The line of claim 1, wherein the line is an audio line.
- 10 3. The line of claim 2, wherein the line includes a connection for
coupling with an audio-out connection of an audio device.
4. The line of claim 3 or 3, wherein the controller splits the audio
signal into separate frequency components, and modulates the light source
15 based on the detected frequency components.
5. The line of claim 1, wherein the line is a data line.
6. The line any preceding claim, wherein the controller controls the
20 light source in accordance with a preset program.
7. The line of any preceding claim, wherein the controller controls the
light source based on variations in a signal on the line.
- 25 8. The line of any preceding claim, wherein the controller modulates
the light source so as to produce any one or more of a change of light intensity,
pulse interval or duration and/or light colour.
9. The line of any preceding claim, wherein the controller detects a
30 signal on the line via an electrical connection.
10. The line of any of claims 1 to 8, wherein the controller detects a
signal on the line through a non-contact detector.

11. The line of any preceding claim, wherein signal wires are provided along the line.
12. The line of claim 11, wherein the signal wires are provided within
5 the light guide.
13. The line of any preceding claim, including two light sources, one at each end of said guide.
- 10 14. The line of any preceding claim, including one or more intermediate light sources spaced along the length of the light guide.
- 15 15. The line of claim 13 or 14, including at least two light sources that emit light of different colour from one another.
- 16 16. The line of claim 13, 14 or 15, wherein at least two of the light sources are controlled independently of one another.
- 20 17. The line of claim 16, wherein one light source is modulated dependent on bass sounds, and another is modulated based on treble sounds.
- 25 18. The line of any one of claims 15 to 17, including control lines that extend along the light guide for controlling the illumination of one or more light sources remote from the controller.
19. The line of any preceding claim, wherein said controller includes a
microprocessor.
20. The line of any preceding claim, wherein a said light source
30 includes an LED.
21. The line of any preceding claim, wherein said light guide includes a flexible polymer core within a flexible outer cladding.

22. The line of any preceding claim, wherein said light guide includes a liquid core and an outer sheath.

23. The line of any preceding claim, including two or more light guides
5 and associated light sources.

24. The line of any preceding claim, including an electric cable and a light guide attachment, the attachment including the light guide, the light source, the controller, and an electrical adaptor for receiving an electrical connector on
10 one end of the electric cable and for providing a connection to a device with which the line is to be associated.

25. The line of any one of claims 1 to 23, wherein the line is integral with an electrical device, and wherein the controller is provided in said device.
15

26. An attachment for a signal cable, the attachment including a side-emissive light guide illuminated by one or more light sources, and a controller for monitoring the signal on the cable and for controlling the light source or sources based on the signal.
20

27. A connector for mounting a signal cable and light guide, the connector including a connection for coupling with the cable, a connection for coupling with an external connection that said cable is to couple with, a connection for coupling with said light guide, and a controller for detecting the
25 signal on said cable and for controlling a light source to light said light guide based on said detected signal.

28. An electrical device including a signal line, the line including a side-emissive light guide extending along at least a part of said line, the device
30 including a light source for illuminating said light guide and a controller for controlling the light source based on the state of said line.

29. An audio signal line for transmitting signals therealong, the line including a side-emissive light guide extending along at least a part of said line,

a light source for illuminating said line, and a controller for detecting the signal on said line and for controlling the light source based upon the detected signal.

30. A novelty illuminated line having a light guide and light source and
5 a connector for connecting to a signal output of a device, the line including a controller for monitoring the signal on the signal output and for controlling the light source to illuminate the guide based on the output signal detected.

10 Dated: 28 November 2003
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Xavier Jablonski

David B Fitzpatrick

Illuminated Devices and Articles

5 A signal line 6, e.g. for a loudspeaker or the like, includes a side-emissive light guide 16 illuminated by one or more LEDs 27, 29. A controller 28, e.g. housed in a jack plug connection 24 of the line 6, monitors the signal on signal wires 31 and modulates the LEDs 27, 29 accordingly through leads 32 and 33 and LED control wires 34. Thus, the electric line 6 may be illuminated so
10 as to e.g. provide a light display to complement audio signals on the wires 31.

[Fig. 3]

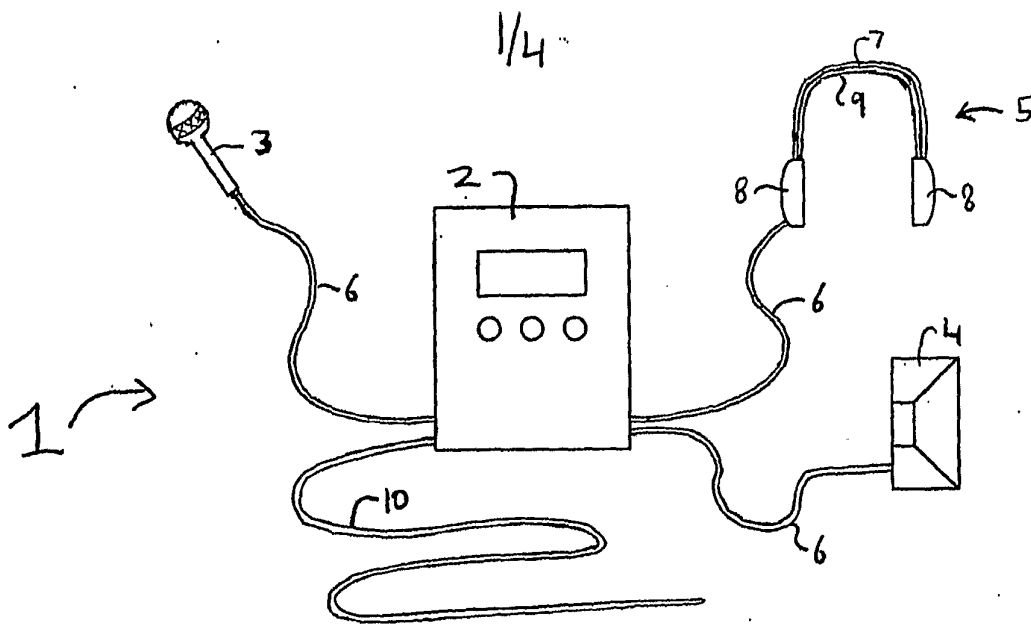


Fig. 1

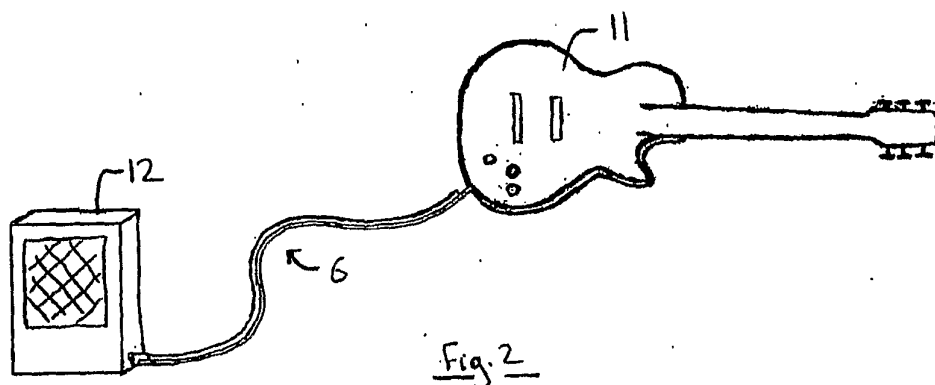


Fig. 2

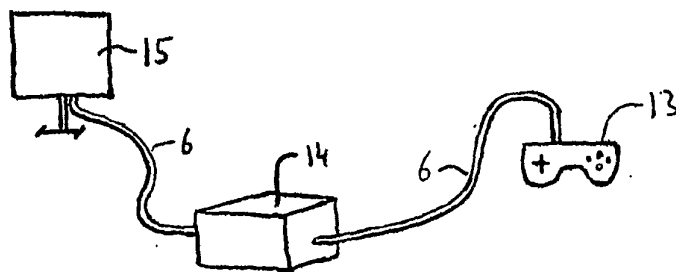


Fig. 3

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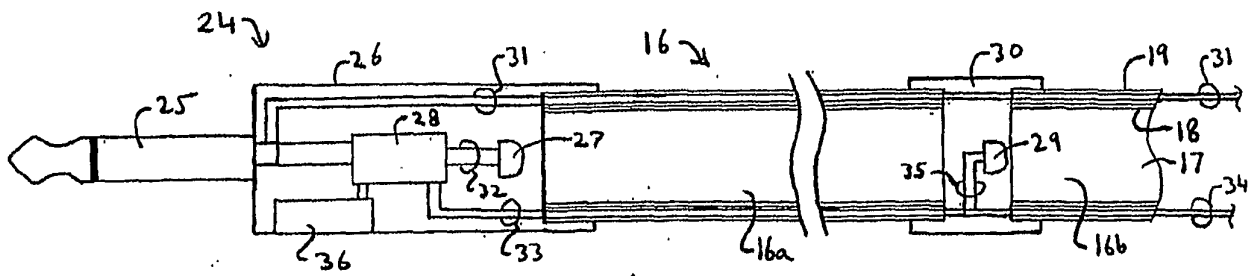


Fig. 4

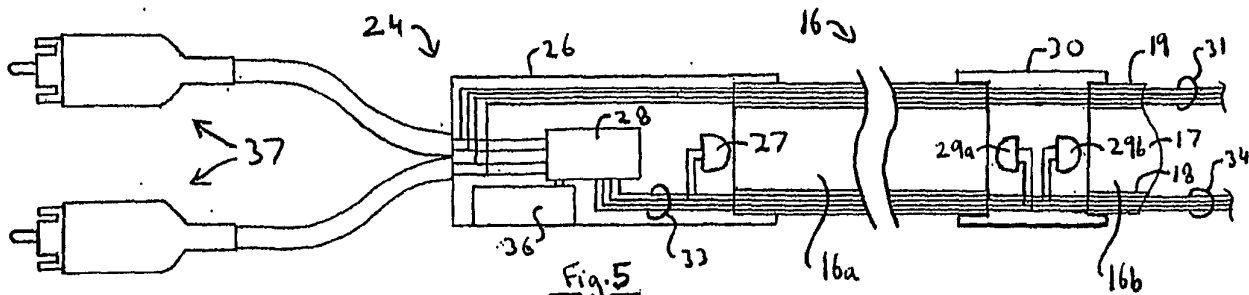


Fig. 5

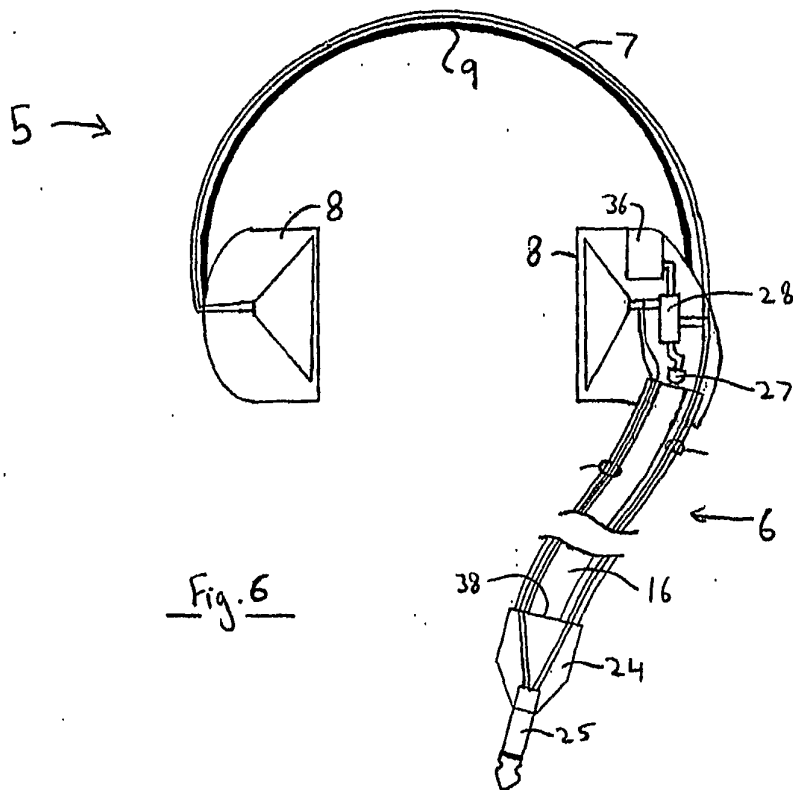


Fig. 6

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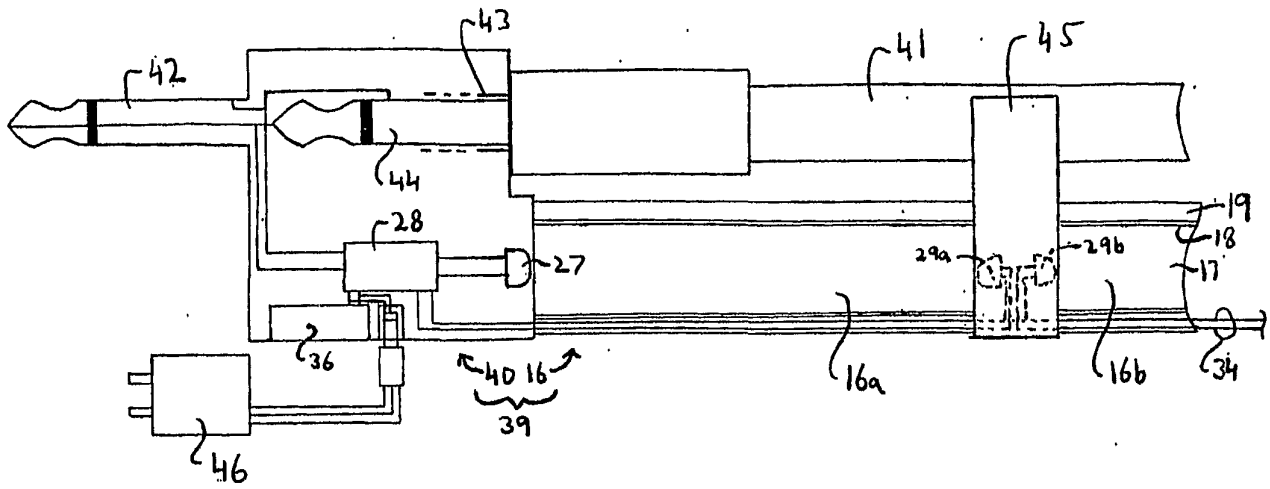
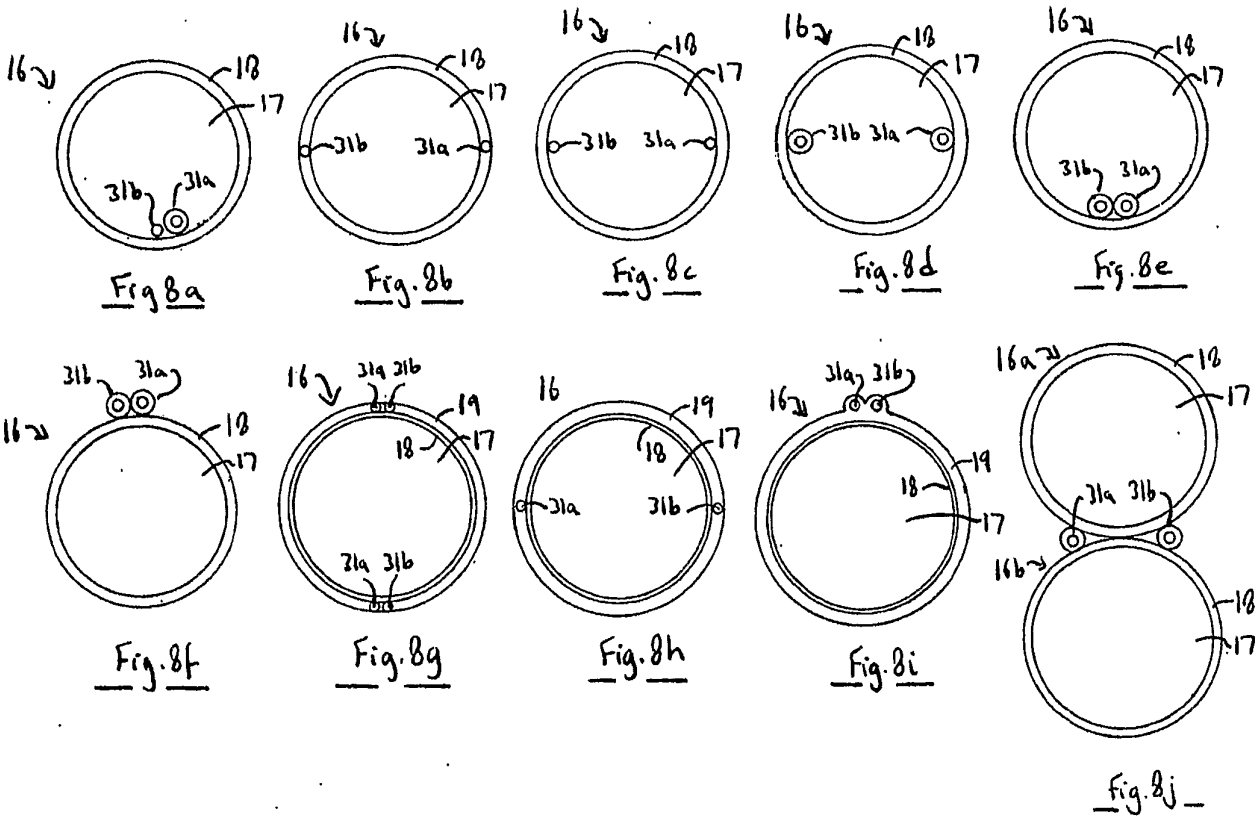


Fig. 7



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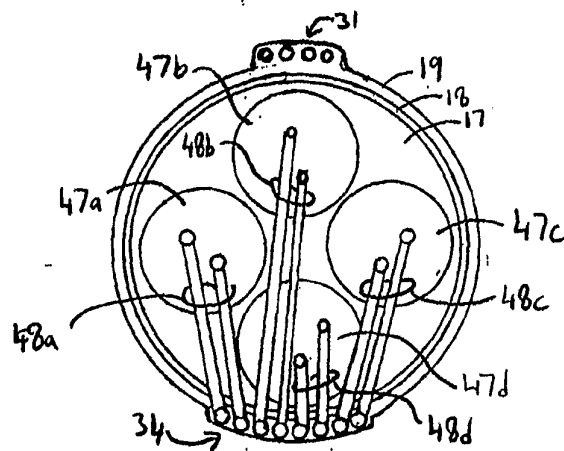


Fig. 9

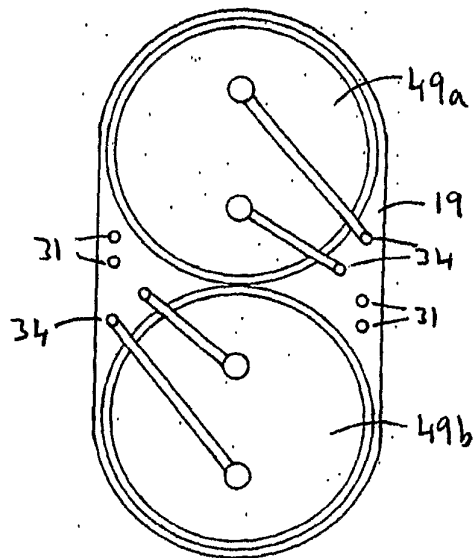


Fig. 10