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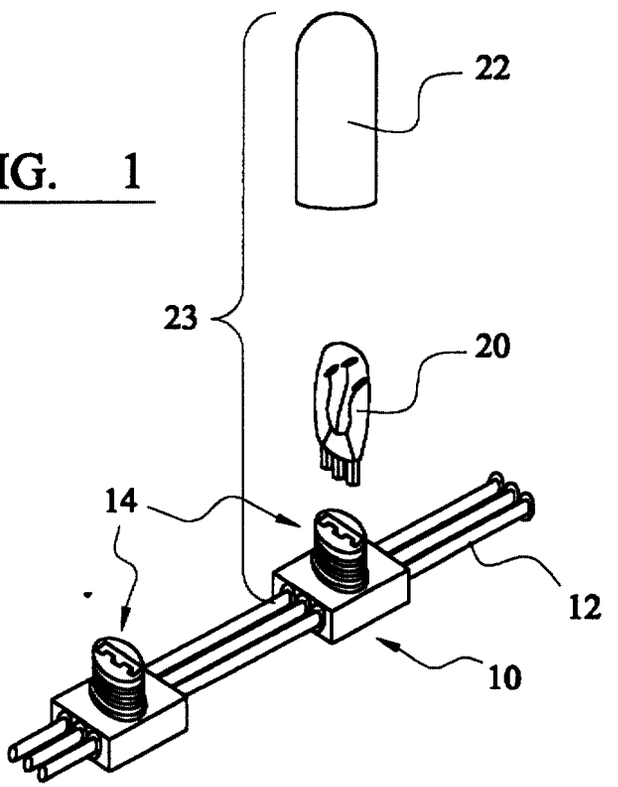
(54) Lighting system

(57) A lighting system (10) comprises a conduit (12) of at least two wires within a plastic cladding (13) and a number of lights (23) each comprising a lamp holder (14) attached to and in electrical contact with the wires of the conduit. The electrical connection means of each holder comprises pins (34, 36) of two different types, such that in a three wire system it is the subsequent orientation of the holder (14) with respect to the conduit (12) which will determine which pair of wires of the three wires is connected.

FIG. 1



EP 1 103 755 A2

Description

[0001] The present invention relates to a lighting system particularly, though not exclusively, for outdoor use in applications such as festive lights, street illumination, illumination of building exteriors and architectural features.

[0002] Conventional outdoor lights usually comprise either one of two types, according to whether the lamps making up the system are connected with two wires, in which case the lamps are usually constantly illuminated, or more than two wires, in which case the lamps may be illuminated according to a predetermined sequence to provide more interesting effects.

[0003] A flexible, waterproof lighting system for such purposes is currently available which comprises very small lamps wired in parallel and embedded within a solid flexible plastic cylinder of indeterminate length. Such a system is used with a controller which causes the lights either to be constantly illuminated, or to be illuminated intermittently in a particular sequence. One disadvantage of such a system is that it is not possible to change the lamps, and whilst the parallel wiring ensures that should one lamp fail the remainder will continue to be illuminated, should too many lamps fail the pleasing aesthetic effect would be lost. Furthermore, the colour is determined by the colour of the plastic, and this system does not therefore provide for more than one colour within each section.

[0004] It is therefore the aim of the present invention to solve problems with conventional lighting systems, whether referred to herein or otherwise.

[0005] According to a first aspect of the present invention there is provided a lighting system comprising a plurality of lights, each comprising an assembly including a lamp and a lamp holder, and having connection means to an electrical conduit for connecting said lights together and to a controller for controlling the illumination of the lamps, individual lights or groups of lights being capable of selective illumination according to a predetermined sequence or randomly at least a part of each assembly being accessible from outside the electrical conduit.

[0006] The lights conveniently include a cover, which is either transparent or one of a variety of different colours. The cover may take the form of a lens, to focus the light emitted from the incandescent element thus enhancing and diffusing its brightness.

[0007] The electrical conduit preferably includes at least two separate wires, more preferably three or four, within a waterproof external cladding such as flexible plastic tubing. The cladding conveniently includes a number of internal channels within which each wire runs and is electrically isolated from its neighbouring wires. In a three wire system, two of the wires are live and one neutral at any one instant.

[0008] During the assembly of the system, by arranging for the connection means of each lamp holder to connect with a selected pair of wires out of three or more wires, it is possible to achieve the random or sequenced intermittent illumination of the prior art system described above, whilst maintaining the versatility of being able to access the lamps individually from the exterior of the conduit, either to change them or to change the colour of the cover or lens.

[0009] Preferably, each holder has both means for making connection with the electrical conduit, and means for receiving the lamp.

[0010] Preferably, the holder also includes means for receiving the cover.

[0011] Conveniently, the holder comprises two initially separate parts which are joined together around the electrical conduit at the required position. Preferably, the first part includes means for holding the electrical conduit during the joining process, and may also include electrical connection means which, when the two parts are joined together, makes electrical connection with the selected pair of wires of the conduit.

[0012] Conveniently, the first and second parts are made of rigid plastics material.

[0013] Said electrical connection means may comprise a pair of metal pins, one end of each pair of pins being sharpened so as to pierce the plastic cladding of the electrical conduit and bite into the wire when the two parts of the holder are joined together around the conduit.

[0014] Conveniently, the orientation of the holder with respect to the conduit determines which pair of wires the holder will be electrically connected to during assembly. For a three wire system, there are two alternative orientations allowing groups of two lights to be addressed separately from other groups of two lights. However, for a four wire system there may be more than two alternative orientations and/or two or more different pin types, whereby groups of three lights may be addressed separately from other groups of three lights.

[0015] According to a second aspect of the present invention there is provided a light for use as part of a lighting system having electrical conduit means with more than two wires for connecting a number of such lights together and to a controller for controlling the illumination of the lights, each light including a lamp received within a lamp holder, the lamp holder being capable of making electrical connection to a selected wire or pair of wires of said electrical conduit means from the exterior of the conduit means.

[0016] According to a third aspect of the present invention there is provided a holder for a lamp, the holder including electrical connection means for connecting a lamp inserted within the holder to a selected wire or pair of wires within an electrical conduit.

[0017] According to a fourth aspect of the present invention there is provided a method of connecting a number of lights to each other and to a controller using an electrical conduit having at least two wires, the method comprising connecting each light to a selected wire

or pair of said wires from the exterior of the conduit.

[0018] Preferably, this is achieved by providing means within the light assembly by which the wires of the conduit may be accessed from outside of the conduit, such as for example means for piercing the conduit where the latter includes a flexible cladding layer. More preferably, the method includes altering the orientation of the lamp holder relative to the conduit to determine which pair of wires within the conduit become electrically connected to the lamp assembly.

[0019] According to a fifth aspect of the present invention there is provided a light comprising a lamp and a lamp holder, the lamp holder having means for connecting with at least two wires of an electrical conduit having wires surrounded by a cladding by piercing said cladding.

[0020] Any feature of any aspect of any invention or embodiment described herein may be combined with any other feature of any aspect of any invention or embodiment described herein.

[0021] Embodiments of the present invention will now be described, by way of example only, with reference to the accompanying drawings, in which:-

Figure 1 illustrates schematically two of the lamp assemblies of the present invention attached to the conduit, one lamp assembly being shown exploded into its component parts,

Figure 1a through 1c illustrate a two-wire variant of the arrangement shown in figure 1,

Figure 2 illustrates the covers (caps) for use with the lamps,

Figure 3 is a plan view of the holder of a single assembly attached to a section of conduit,

Figure 4 illustrates an embodiment in which the conduit is contained within a rigid housing and lenses are used in place of caps,

Figures 5 and 5a illustrate front and side views respectively of a first type of pin for use within the lamp holder,

Figures 6 and 6a illustrate front and side views respectively of a second type of pin for use within the lamp holder,

Figure 7 illustrates in side view a first part of the lamp holder,

Figure 7A illustrates the electrical conduit in cross section,

Figures 8 and 8A illustrates in plan views from opposite directions the first part of the lamp holder, (in Figure 8A the flange is omitted from the view for clarity)

Figure 8B illustrates in plan view a second part of the lamp holder,

Figure 8C illustrates the second part of Figure 8B in the view along arrow A, and

Figures 9 and 9a illustrate in side and plan view a cap for use with the lamps.

[0022] Referring to Figures 1 through 4 of the drawings, a lighting system 10 according to the present invention comprises a multi-wire electrical conduit 12 which comprises a flexible, waterproof plastic cladding 13 within which is embedded three or more wires 16, 17, 18 such that each is electrically isolated from its neighbouring wire(s), and a number of lights 23 each having a lamp holder 14 attached to and in electrical contact with the conduit 12 at intervals therealong. Each lamp holder 14 is designed to receive a lamp 20 which for example may be a 24V/40mA/3W wedge lamp. A cover in the form of a cap 22 is selected from a range of different colours and is simply pushed over the holder/lamp assembly, to make the light unit waterproof, but this may be replaced by a lens type cover, which may also be provided in a range of different colours, such as 24 in Figure 4.

[0023] The lighting system, which comprises an indeterminate length of conduit with any number of lights 23 attached thereto, and a controller (not shown) in electrical contact with the conduit, may be used in the form shown in Figure 1, or may be disposed within a housing 26 with only the cover or lens 24 of each light protruding from the housing.

[0024] The same basic arrangement can be used with a conduit 12' having two wires instead of three, as shown in figures 1A through 1C. Such an arrangement comprises the holder 14' which is welded to the two-wire conduit as shown.

[0025] Referring now to Figures 5 through 8C, each holder 14 comprises two parts - a first part 30 as shown in Figures 7 through 8A, and a second part 32 shown in Figure 8B, the two parts being welded together around conduit 12 at the desired location. Two pins 34, 36 are disposed within slots 38, 40 respectively in the first part 30, for the purpose of making electrical connection between a selected pair of the three wires 16, 17, 18 in conduit 12 and the lamp 20.

[0026] Referring in particular to Figure 7, the first part 30 of holder 14 has at one end a threaded neck portion 30a, with the lamp 20 being received within the interior of the neck portion by pushing the lamp in the direction of arrow X. At the opposite end from the neck portion there is a square or rectangular flange 30b, with two or more step portions therebetween. An O-ring 30c provides means whereby the cap 22 or lens 24 may be

sealed in a watertight manner to the holder 30, thereby rendering the holder and lamp assembly waterproof.

[0027] Within the flange portion there is provided a series of three grooves 30d each of which will, in the assembled light, receive a wire of the electrical conduit which is in cross section the shape shown in Figure 7A. The second portion 32 has matching grooves 32d which, when the two parts are welded together, form a profile which surrounds and retains the conduit 12. Second part 32 has two lugs 32a which are arrange to fit within two mating recesses within first part 30 to aid in location prior to welding.

[0028] Those portions 30e of the first part that surround the grooves 30d protrude out from the face of the flange, and form engagement faces which will be welded to the corresponding regions of the second part 32. Four welding beads 30f are provided for this purpose.

[0029] Referring to Figures 5 and 6, the metal pins are of two types. The first type 34 shown in Figure 5 & 5A has two legs 34a, 34b which make electrical contact with the lamp 20, and a sharpened portion 34c offset from centre. The second type 36 shown in Figures 6 & 6A also has two legs 36a, 36b for making electrical contact with the lamp 20, but in this type of pin the sharpened portion 36c is central with respect to the two legs. Thus, in each lamp holder a first type of pin 34 and a second type of pin 36 are inserted in slots 38, 40 respectively and it is the subsequent orientation of the holder with respect to the conduit 12 which will determine which pair of wires of the three wires are contacted by the sharpened portions 34c, 36c which cut through the cladding 13 of the conduit 12 and bite into their respective wires during the welding process.

[0030] It will be seen that by changing this orientation by 180 degrees, the same lamp holder with the same pair of pins 34, 36 can be made to contact either wire pair 16,17 or wire pair 17,18, such that individual lights or groups of lights can be lit separately from other lights or groups of lights by utilising the controller to switch the power from one wire pair to the other in a sequenced or random fashion.

[0031] In order to attach a lamp holder 14 onto the conduit 12, the neck portion 30a of the first part 30 is inserted into the hole on the bed of a welding machine such that the grooves 30d are exposed, the conduit 12 is laid across and into the grooves 30d, the second part 32 is laid on top of the first part 30 and the conduit, locating the lugs 32a within their respective mating recesses in part 30, and the whole assembly is welded together using conventional methods and apparatus for welding plastics, for example sonic welding at approximately 70lbs per square inch. During this process, the sharpened portions 34c, 36c of pins 34, 36 are pushed through the cladding 13 into a particular one of two possible wire pairs, according to the orientation of the part 30 with respect to the conduit.

[0032] Thus, it can be seen that the present invention enables lights to be attached to selected pairs of wires within an encased conduit from the exterior of the conduit, in such a manner that the lights may be operated to provide random or sequenced (e.g. chasing) effects, thereby providing enhanced display possibilities whilst retaining good accessibility of the lights for the purpose of replacement or changing the colour.

[0033] The reader's attention is directed to all papers and documents which are filed concurrently with or previous to this specification in connection with this application and which are open to public inspection with this specification, and the contents of all such papers and documents are incorporated herein by reference.

[0034] All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive.

[0035] Each feature disclosed in this specification (including any accompanying claims, abstract and drawings), may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each feature disclosed is one example only of a generic series of equivalent or similar features.

[0036] The invention is not restricted to the details of the foregoing embodiment(s). The invention extend to any novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any method or process so disclosed.

Claims

1. A lighting system comprising a plurality of lights, each comprising an assembly including a lamp and a lamp holder, and having connection means to an electrical conduit for connecting said lights together and to a controller for controlling the illumination of the lamps, individual lights or groups of lights being capable of selective illumination according to a predetermined sequence or randomly at least a part of lamp assembly being accessible from outside the electrical conduit.

2. A lighting system according to claim 1 wherein the lights preferably include a cover, which is either transparent or one of a variety of different colours.

3. A lighting system according to claim 2 wherein the cover comprises a lens.

4. A lighting system according to any of the preceding claims wherein the conduit includes at least two wires.

5. A lighting system according to claim 4 wherein the conduit includes three or four wires.

6. A lighting system according to claim 4 or claim 5 wherein the wires are surrounded by a waterproof external cladding.

7. A lighting system according to claim 5 or claim 6 wherein the connection means of each lamp holder connects with a selected pair of wires out of three or more wires.

8. A lighting system according to any of the preceding claims wherein the holder comprises two initially separate parts which are joined together around the electrical conduit at the required position.

9. A lighting system according to claim 8 wherein the first part includes means for holding the electrical conduit during the joining process, and may also include electrical connection means which, when the two parts are joined together, makes electrical connection with the selected pair of wires of the conduit.

10. A lighting system according to claim 9 wherein the first and second parts are made of rigid plastics material.

11. A lighting system according to any of the preceding claims wherein the electrical connection means comprisesa pair of metal pins, one end of each pair of pins being sharpened so as to pierce the plastic cladding of the electrical conduit and bite into the wire when the two parts of the holder are joined together around the conduit.

12. A lighting system according to any of claims 7 to 11 wherein the orientation of the holder with respect to the conduit determines which pair of wires the holder will be electrically connected to.

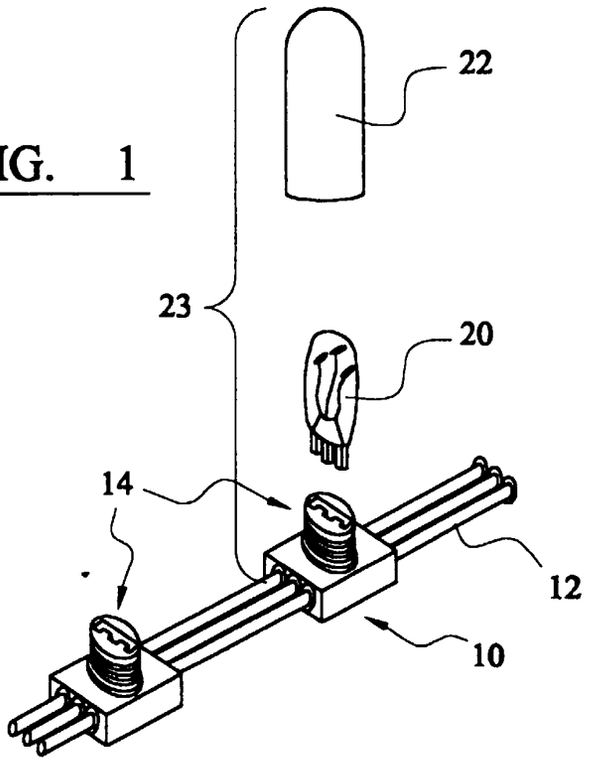
13. A light for use as part of a lighting system having electrical conduit means with more than two wires for connecting a number of such lights together and to a controller for controlling the illumination of the lights, each light including a lamp received within a lamp holder, the lamp holder being capable of making electrical connection to a selected wire or pair of wires of said electrical conduit means from the exterior of the conduit means.

14. A holder for a lamp, the holder including electrical connection means for connecting a lamp inserted within the holder to a selected wire or pair of wires within an electrical conduit.

15. A method of connecting a number of lights to each other and to a controller using an electrical conduit having more at least two wires, the method comprising connecting each light to a selected wire or pair of said wires from the exterior of the conduit.

16. A light comprising a lamp and a lamp holder, the lamp holder having means for connecting with at least two wires of an electrical conduit having wires surrounded by a cladding by piercing said cladding.

FIG. 1



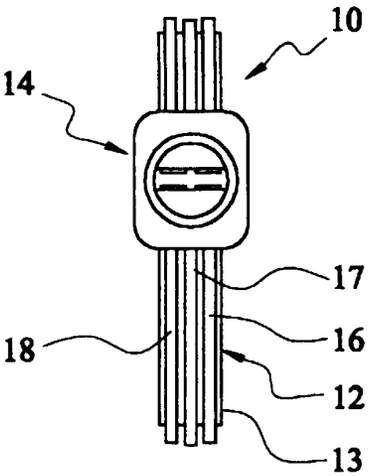


FIG. 3

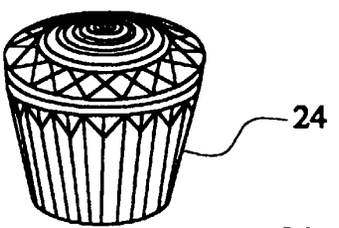


FIG. 4A

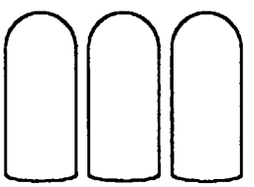


FIG. 2

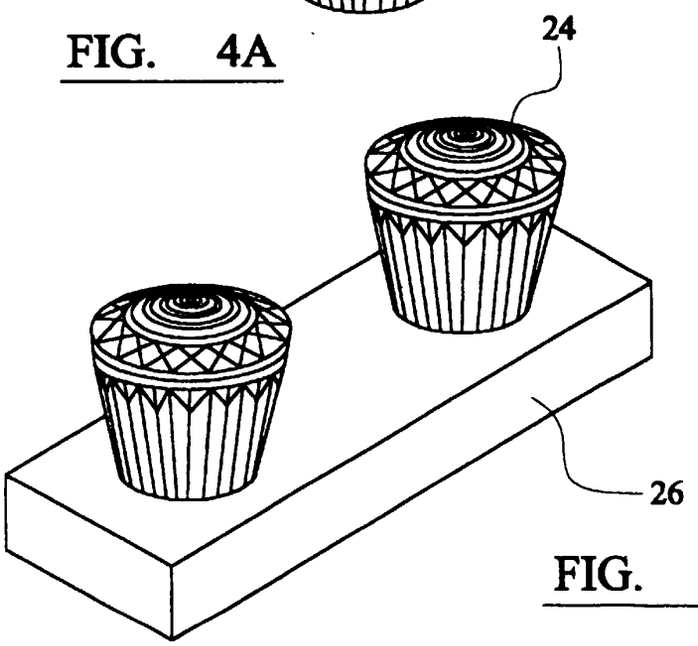


FIG. 4

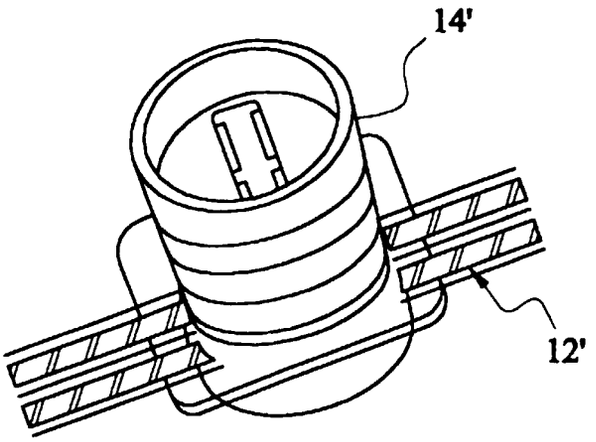


FIG. 1A

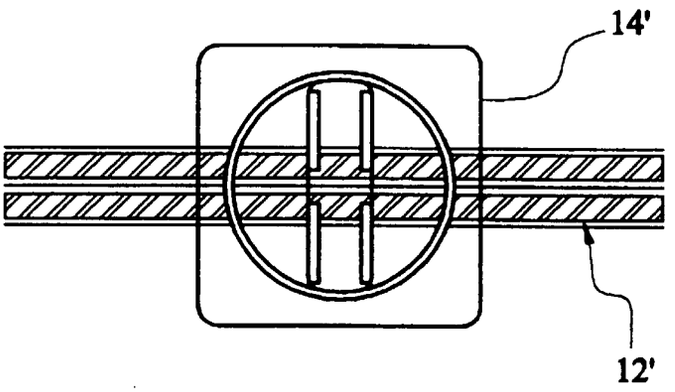


FIG. 1B

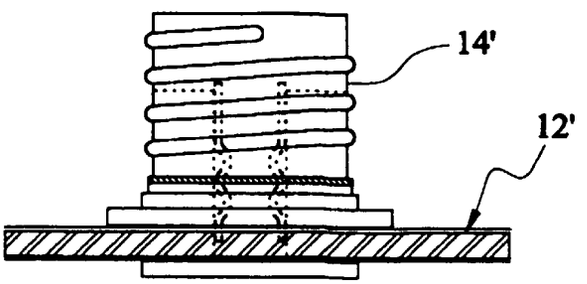


FIG. 1C

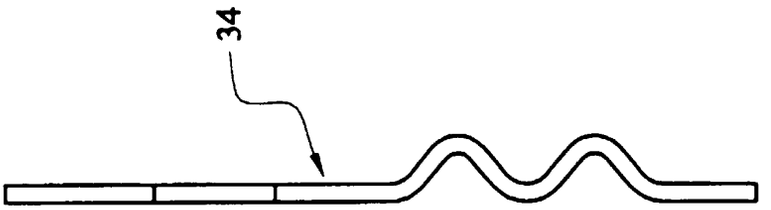


FIG. 5A

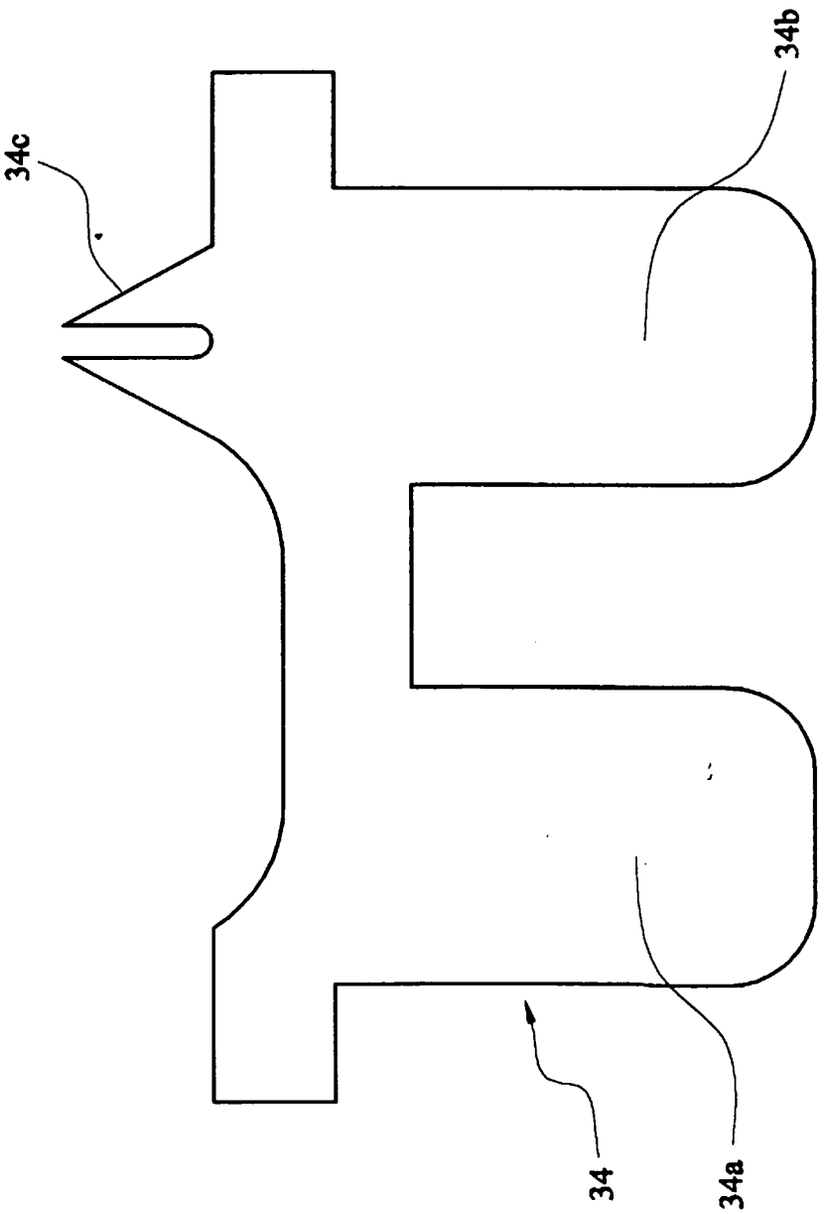


FIG. 5

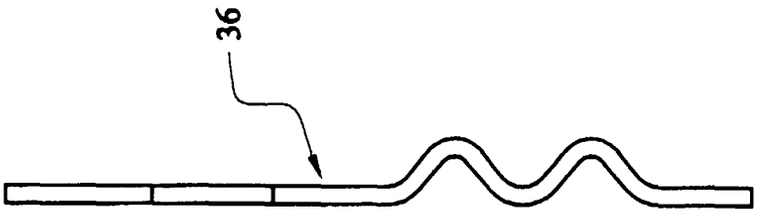


FIG. 6A

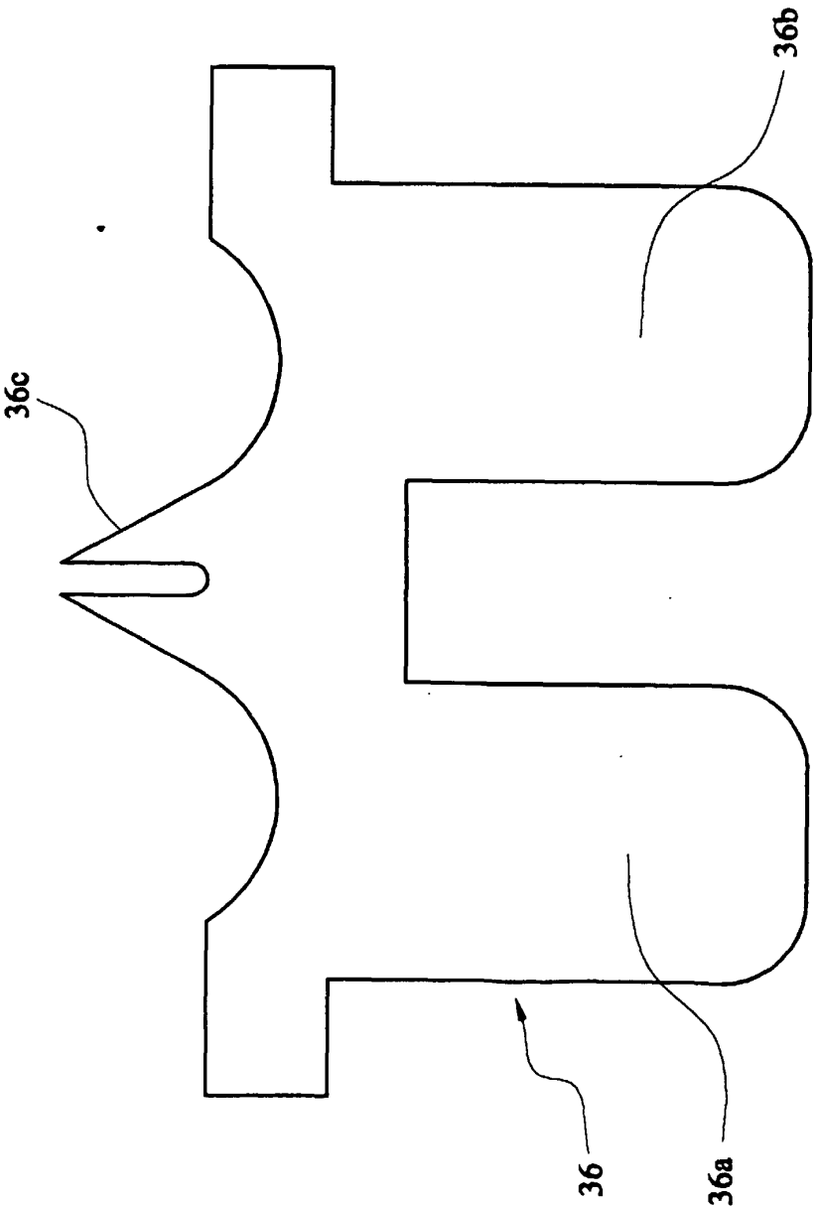


FIG. 6

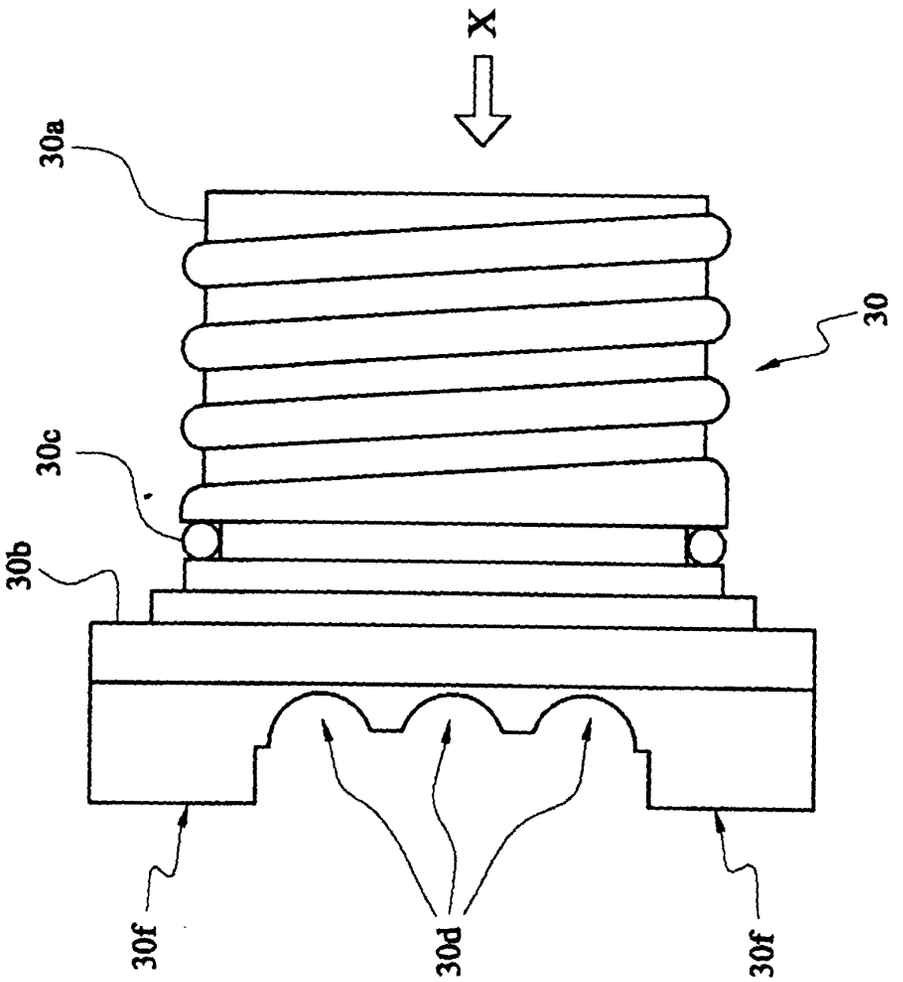


FIG. 7

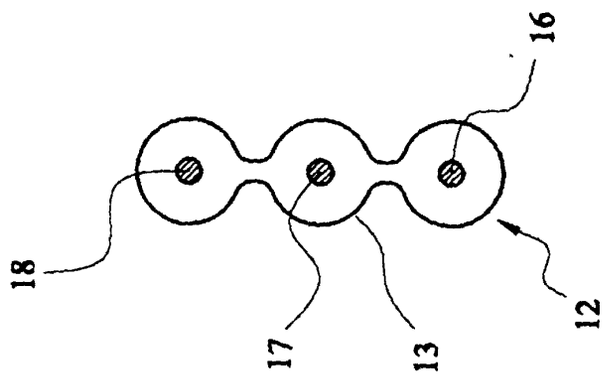


FIG. 7A

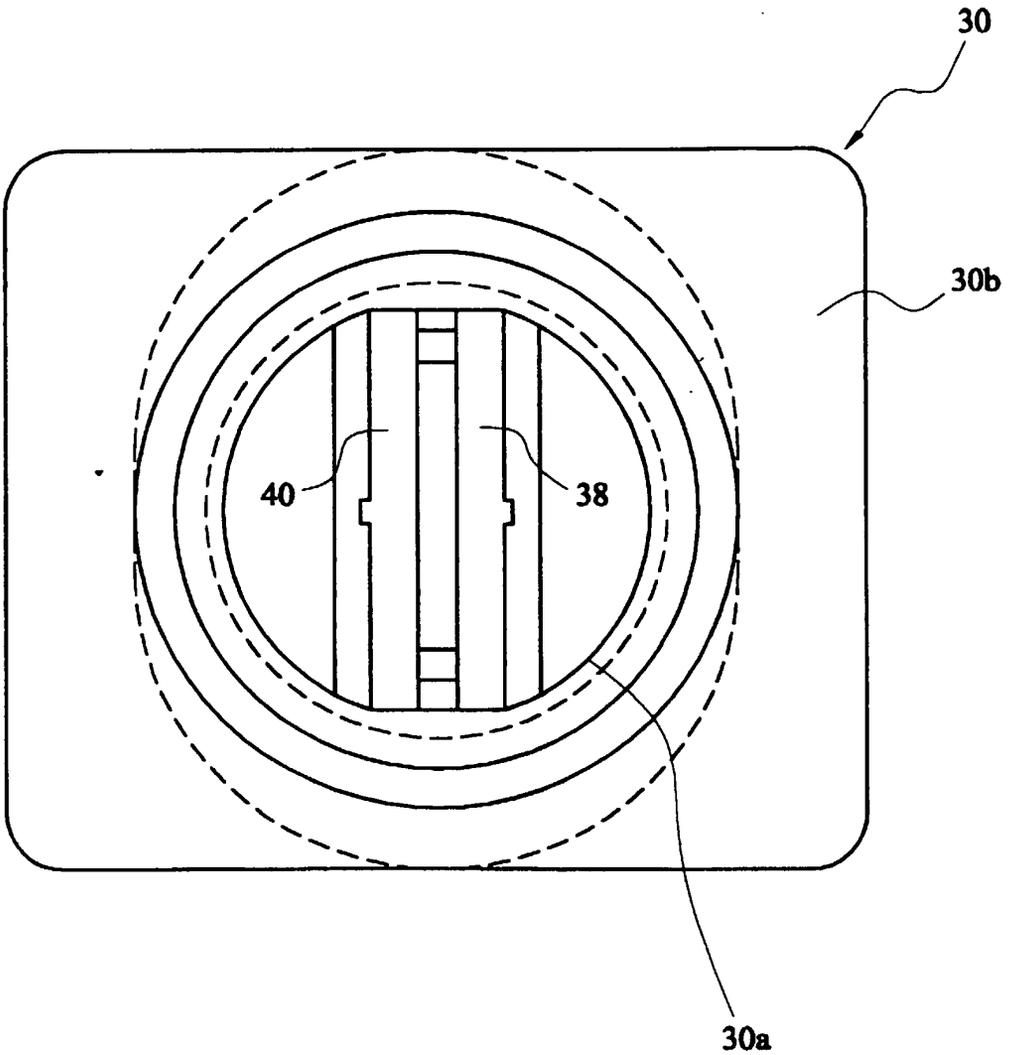


FIG. 8

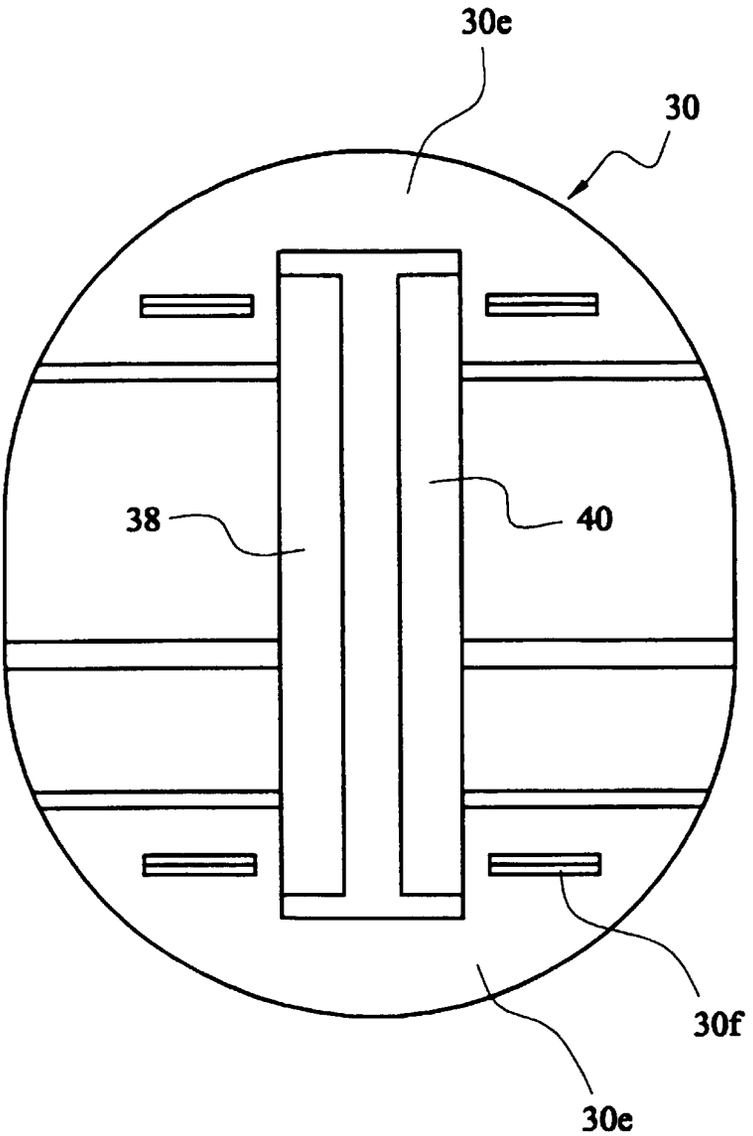


FIG. 8A

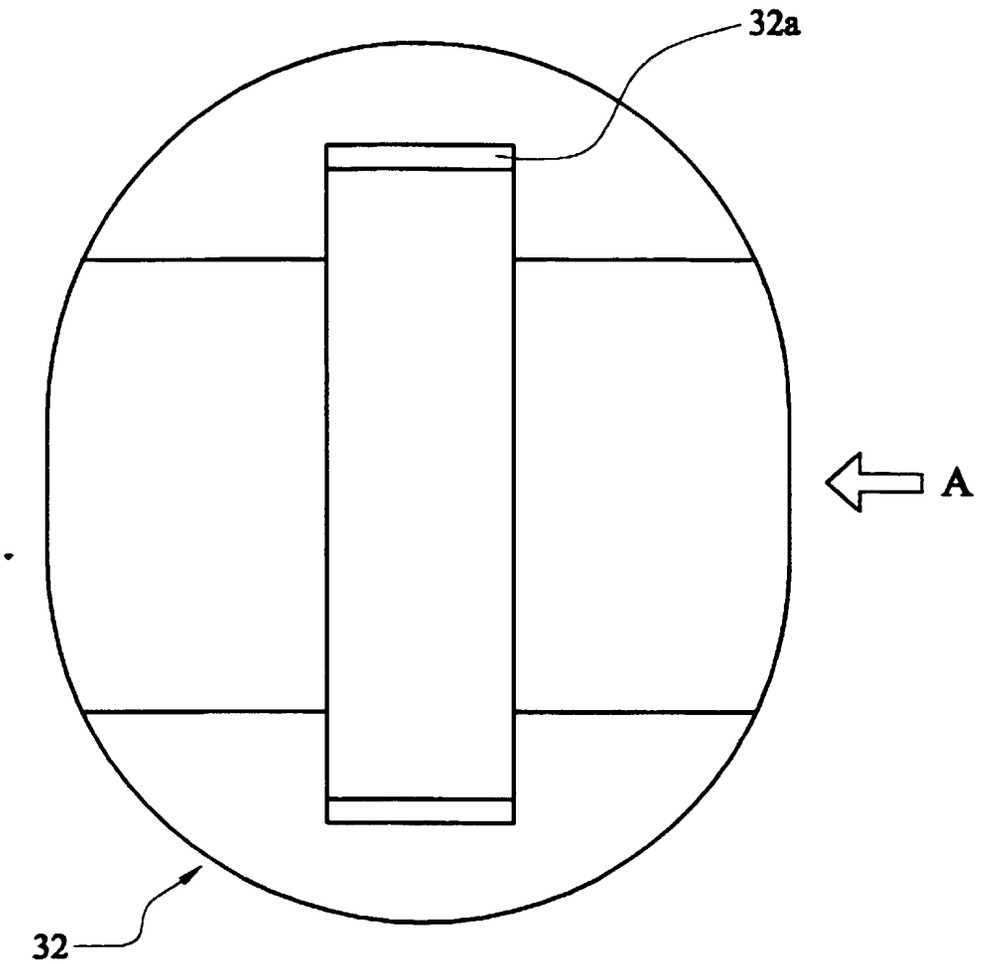


FIG. 8B

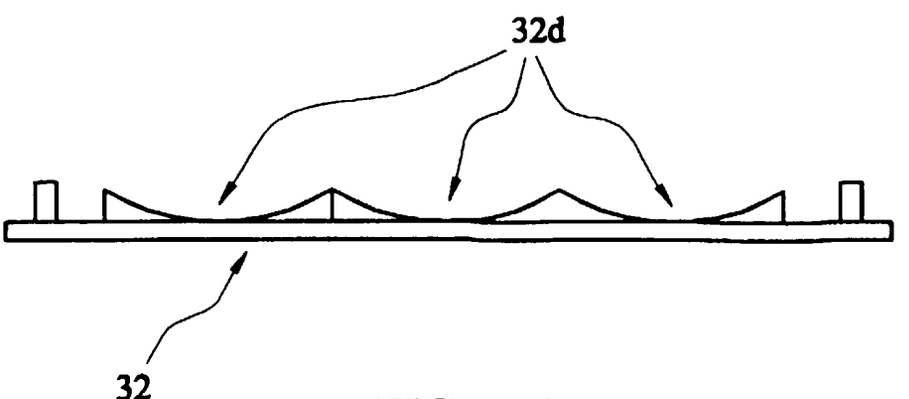


FIG. 8C

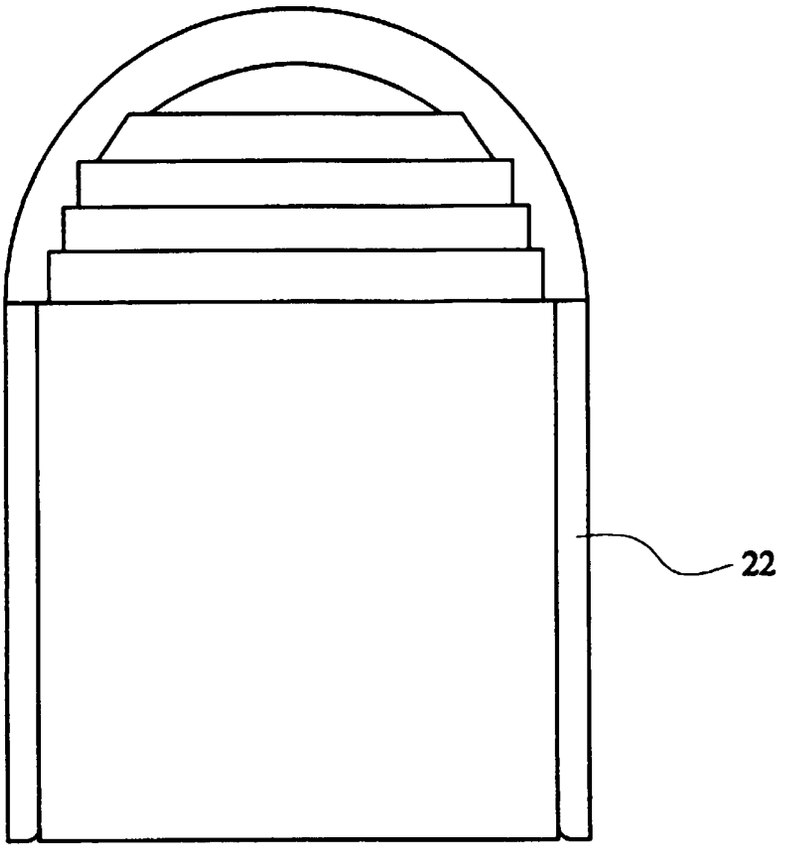


FIG. 9

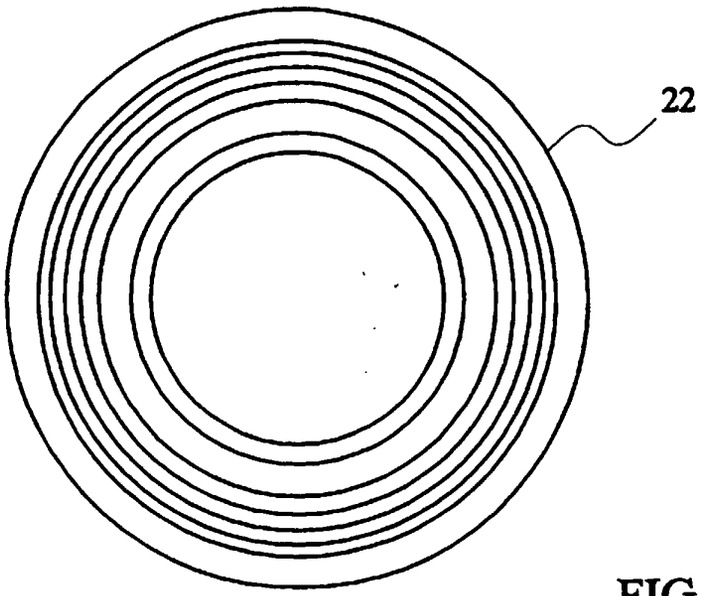


FIG. 9A