



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
30.12.2009 Bulletin 2009/53

(51) Int Cl.:
F21S 4/00 (2006.01) **F21V 21/00** (2006.01)
F21W 121/00 (2006.01) **F21Y 101/02** (2006.01)

(21) Application number: **09007936.9**

(22) Date of filing: **17.06.2009**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK TR

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(30) Priority: **27.06.2008 IT MI20081182**

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(54) **Illumination comprising an improved supporting structure**

(57) There is provided an illumination (1) for decorative purposes comprising a supporting structure (2) suitable to support at least one lighting unit (3) such as a LED and comprising at least one pipe (4) having at least

one outer layer (5) made of polymeric material, realizing the outer surface of said pipe (4), and a metal layer (6) made of metallic material, and preferably realized by a pex-al-pex multilayer pipe. Electrical cables (9) can be positioned outside the pipes (4).

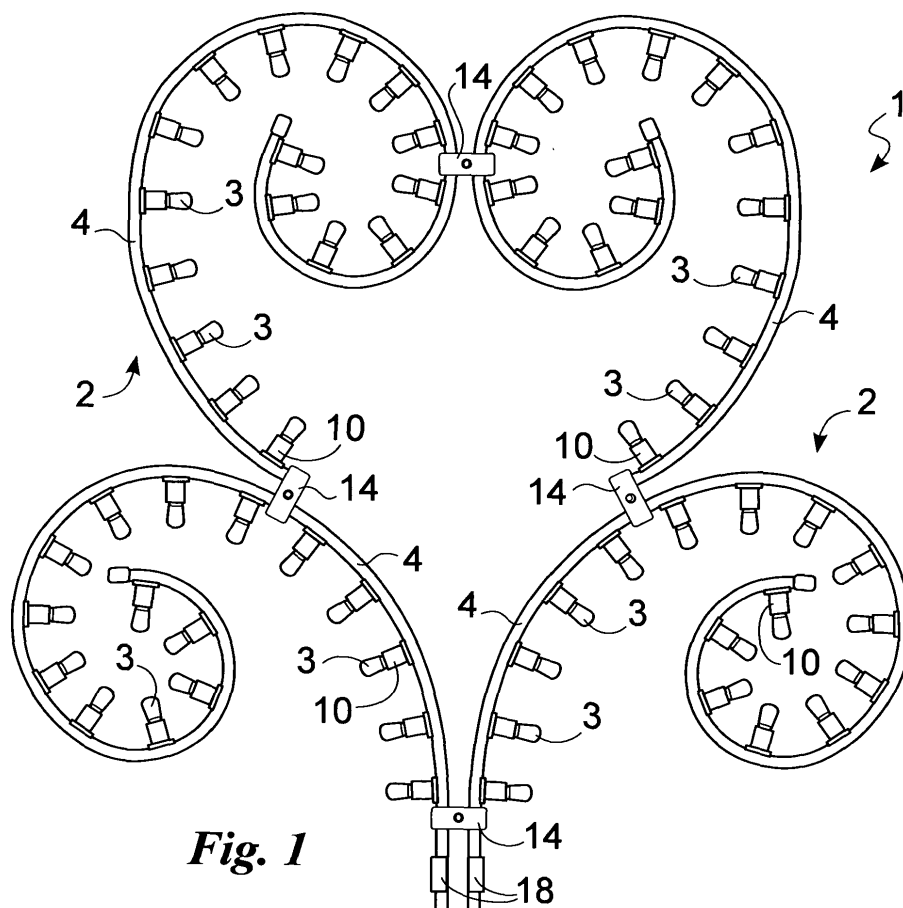


Fig. 1

Description

[0001] The present invention relates to an illumination comprising a supporting structure of the type described in the preamble of Claim 1.

[0002] Illuminations realized by a supporting structure which supports a plurality of low voltage electrical light bulbs are currently known.

[0003] These are used to produce decorations, in particular in festive periods, along roads, in squares and in other public and private places.

[0004] In particular, illuminations have shapes and structures that vary according to the festival and the subject represented.

[0005] The supporting structures of illuminations are commonly made of wood.

[0006] In fact, wood is easily machined using small automatic or manual tools. In particular, a plurality of wooden segments are mutually bonded, forming the supporting structure on which light bulbs or the like are positioned.

[0007] The aforesaid prior art has some important drawbacks.

[0008] In fact, configuration of said wooden structures requires lengthy and at times imprecise work, due to possible problems with bonding agents and mechanical limitations in their use.

[0009] Moreover, prior art structures are not able to support illuminations having very large dimensions, for example illuminations extending transversely across the entire road, and which are connected to the ground at the end of the road.

[0010] A further drawback of prior art, and in particular of wooden structures, is given by the fact that these are inflammable and located in proximity of the electrical connections of the lighting units. Any damage to the insulation of the electrical connections, which are frequent as these are subjected to external agents and events, can therefore cause this structure to catch fire.

[0011] Prior art supporting structures can also be made of metal.

[0012] However, these structures have the considerable drawback of conducting electrical current and can therefore cause accidents if they are damaged and touched by persons or animals.

[0013] In this situation the technical aim of the present invention is to devise an illumination comprising a supporting structure capable of substantially overcoming the aforesaid drawbacks.

[0014] Within said technical aim, an important object of the invention is to obtain an illumination comprising a supporting structure that is simple to fashion.

[0015] Another important object of the invention is to produce an illumination comprising a supporting structure that can withstand high mechanical and physical loads.

[0016] A further object of the invention is to produce an illumination comprising a supporting structure that is

not inflammable and does not conduct electrical current.

[0017] The technical aim and the objects specified are achieved by an illumination comprising a supporting structure as described in claim 1.

[0018] Preferred embodiments of the invention are shown by way of example in the accompanying drawings. In particular:

Fig. 1 shows an overall view of the illumination according to the invention;

Fig. 2 shows a view of a detail of the illumination according to the invention;

Fig. 3 shows a second detail of the illumination according to the invention;

Fig. 4a shows a first example of a further detail of the illumination according to the invention;

Fig. 4b shows a second example of a further detail of the illumination according to the invention;

Fig. 4c shows a third example of a further detail of the illumination according to the invention;

Fig. 4d shows an exploded view of a detail of the illumination according to the invention; and

Fig. 5 shows yet another detail of the illumination according to the invention.

[0019] With reference to the Figures, the illumination according to the invention is indicated as a whole with the number 1.

[0020] It comprises a supporting structure 2 suitable to support at least one lighting unit 3.

[0021] The supporting structure 2 comprises at least one pipe 4 having an outer layer 5 made of polymeric material, realizing the surface of the pipe 4, and a metal layer 6 made of metallic material.

[0022] Moreover, the pipe 4 preferably comprises an inner layer 7, realizing the inner surface of the pipe 4 and is also made of polymeric material. Consequently, the metal layer 6 is enclosed inside the layers 5 and 7 made of polymeric material.

[0023] Moreover, layers of adhesive material 8, suitable to physically connect the metal layer 6 to the layers 5 and 7 made of polymeric material, are preferably positioned between the layers 5 and 7 and the inner layer 6.

[0024] In more detail, the metal layer 6 has a thickness of between 0.1 mm and 2 mm, a diameter of between 1 cm and 3 cm and is made of manually deformable metal, such as in particular aluminium alloys, or copper alloys, brass alloys and the like.

[0025] The layers 5 and 7 made of polymeric material instead have a thickness of between 0.1 mm and 5 mm, a diameter such as to surround the metal layer 6 and are preferably made of Polyethylene, in more detail cross-linked polyethylene (known with the initials PEX).

[0026] The pipe 4 is then preferably of the type realized by pipes known with the term multilayer pipes, and in particular " PEX-AL-PEX" multilayer pipes, used to convey water in buildings and the like and therefore intended for different applications not pertinent to the present use.

[0027] The lighting units 3 are preferably realized by incandescent or gas bulbs or by

[0028] LEDs or the like.

[0029] These are supplied by electrical current by means of electrical cables 9, suitable to convey electrical current or also information, preferably positioned outside the pipes 4.

[0030] In particular, the lighting units 3 are supported by a supporting device 10, as shown in Figs. 4a-4c and 5, suitable to connect to the electrical cables 9, to physically support the lighting units 3 and to connect them electrically to the electrical cables 9.

[0031] The supporting devices 10 can then comprise electrical connections 11, positioned in proximity of the outer surface of the pipes 4 and suitable to electrically connect the device 10 to the electrical cables 9.

[0032] The electrical connections 11 advantageously comprise a plurality of through holes 11a for electrical cables, preferably four, suitable to allow passage of the electrical cables 9 connected to the lighting unit 3 constrained to the supporting device 10.

[0033] The electrical connections 11 are also preferably openable, so as to allow the through holes 11 a to be easily reached. Opening of the electrical connections 11 is advantageously regulated by specific opening means 16 of the electrical connections 11, such as two joints (Fig. 4c) or one joint and one hinge (Fig. 4b). The device 10 is furthermore illustrated in Fig. 4d.

[0034] The supporting devices 10 also comprise a coupling portion 12 positioned on the interface surface with the pipes 4.

[0035] The coupling portion 12 comprises a surface substantially counter-shaped to an angular portion of the pipe 4 and also at least one connector 13, and preferably two connectors 13, suitable to be inserted in specific holes or the like present in the pipes 4, as shown in Fig. 4a.

[0036] The connectors 4, shown in Fig. 4a, advantageously have a conical shape, so as to be inserted simply in the holes and remain constrained thereto.

[0037] Alternatively, the coupling portion 12 can comprise a coupler 15 partly cylindrical and suitable to couple with the outer surface of the pipe 4, as shown in Figs. 4b, 4c and 5.

[0038] The supporting structure 2 can also comprise cable grommet elements 17, suitable to keep cables together and prevent their dispersal, as shown in Fig. 5. The cable grommet elements comprise a coupling element 18, analogous to the coupling portion 12 of the supporting devices 10 and in particular comprising a further coupler 19, analogous to the coupler 15 of the supporting devices 10.

[0039] The cable grommet elements also comprise at least one grommet hole 20, suitable to allow the passage of at least one electrical cable 9.

[0040] The grommet hole 20 is also preferably openable, to allow it to be easily reached. Opening thereof is preferably regulated by second opening means 21, in

particular by two joints or by a hinge or the like.

[0041] Finally, the cable grommet elements 18 are preferably positioned in proximity of the supporting devices 10, as shown in Fig. 5.

5 **[0042]** The supporting structure 2 preferably comprises a plurality of pipes 4.

[0043] Said pipes 4 can be mutually connected by means of specific joining elements 14, shown by way of example in Fig. 3.

10 **[0044]** The joining elements 14 are preferably realized by two portions with mirror symmetry, closable by means of releasable joining means, such as screws and the like, and including two seats counter-shaped to the pipes 4.

15 **[0045]** Furthermore they can be suitable to arrange two pipe 4 portions parallel or perpendicularly.

[0046] The illumination 1 can also comprise second joining elements, not shown, having a first portion suitable to be constrained to a pipe 4 and a second portion suitable to be constrained to the ground or to an external pole or the like.

20 **[0047]** Operation and assembly of the illumination 1, the structure of which is described above, is as follows.

25 **[0048]** Having decided the shape to be produced, the assembler shapes the pipes 4 to produce said shape, either manually or using simple tools. They can also be cut by means of saws or the like.

30 **[0049]** To produce the supporting structure 2 the pipes 4 are mutually connected by means of joining elements 14 or connected to the ground or to other elements by means of the second joining elements.

35 **[0050]** Moreover, the lighting units 3 are also connected to the pipes 4 by means of the coupling portions 12 and in particular of the connectors 13 positioned in the holes in the pipes 4. These latter can be produced before or after positioning of the supporting structure 2.

[0051] The lighting units 3 are also connected to the electrical supply or to a generator or to batteries by means of the electrical cables 9 and the electrical connections present on the supporting devices 10.

40 **[0052]** After assembly the illuminations 1 function substantially in the same manner as conventional illuminations.

[0053] The invention comprises a new process for producing illuminations 1 of the type described.

45 **[0054]** This provides for the production of a supporting structure 2 by means of pipes 4, of the type described previously, and subsequent application of lighting units 3, preferably by means of the described supporting devices 10.

50 **[0055]** The supporting structure 2 can also be produced by means of the described joining elements 14.

[0056] The invention also teaches a new use of a multilayer pipe 4, described previously, to produce a supporting structure 2 for illuminations 1.

55 **[0057]** The invention achieves important advantages.

[0058] In fact, the illumination 1 including the supporting structure 2 can be fashioned manually and simply and can allow the production of arches of dimensions of

over ten metres.

[0059] In fact, the pipes 4 withstand high mechanical loads and have a very low linear weight.

[0060] Moreover, these pipes 4 have external and internal surfaces made of polymeric materials and are therefore resistant to corrosion, for example caused by rain and acid rain, and to other chemical substances.

[0061] Moreover, the pipes 4 are also insulated from electrical current and guaranteed fireproof.

[0062] The invention is susceptible to modifications and variants falling within the inventive concept.

[0063] For example, the electrical cables 9 can be placed inside the pipes 4.

[0064] All the details can be replaced by equivalent elements and the materials, the shapes and dimensions can be any.

Claims

1. An illumination (1) comprising a supporting structure (2) suitable to support at least one lighting unit (3) and **characterized in that**: said supporting structure (2) comprises at least one pipe (4) having at least one outer layer (5) made of polymeric material, realizing the outer surface of said pipe (4), and a metal layer (6) made of metallic material.
2. The illumination (1) according to Claim 1, wherein said pipe (4) comprises an inner layer (7), realizing the inner surface of said pipe (4) and produced in polymeric material.
3. The illumination (1) according to one or more of the preceding claims, comprising at least one layer of adhesive material (8) positioned between said metal layer (6) and said outer layer (5).
4. The illumination (1) according to one or more of claims 2 and 3, comprising a layer of adhesive material (8) positioned between said metal layer (6) and said inner layer (7).
5. The illumination (1) according to one or more of the preceding claims, wherein said metal layer (6) has a thickness of between 0.1 mm and 2 mm and a diameter of between 1 cm and 3 cm.
5. The illumination (1) according to one or more of the preceding claims, wherein said metal layer (6) is made of aluminium alloy.
6. The illumination (1) according to one or more of the preceding claims, wherein said outer (5) and inner (7) layers are made of cross-linked polyethylene.
7. The illumination (1) according to one or more of the preceding claims, wherein said outer (5) and in-

ner (7) layers have a thickness of between 0.1 mm and 5 mm.

8. The illumination (1) according to one or more of the preceding claims, wherein said pipe (4) is a PEX-AL-PEX multilayer pipe.

9. The illumination (1) according to one or more of the preceding claims, comprising at least one supporting device (10), suitable to support said lighting units (3) and comprising a coupling portion (12) positioned on the interface surface with said pipe (4) and having a surface substantially counter-shaped to an angular portion of said pipe (4).

11. The illumination (1) according to one or more of the preceding claims, comprising a plurality of pipes (4) and at least one joining element (14) including two seats counter-shaped to said pipes (4) and suitable to connect two different pipes (4).

12. A process for producing illuminations (1) comprising a supporting structure (2), said process comprising the application of lighting units (3) to said supporting structure (2) and being **characterized in that** said supporting structure (2) is produced by means of at least one pipe (4) having at least one outer layer (5) made of polymeric material, realizing the outer surface of said pipe (4), and a metal layer (6) made of metallic material.

13. The process according to claim 12, wherein said pipe (4) is a PEX-AL-PEX multilayer pipe.

14. The use of multilayer pipe (4) to produce a supporting structure (2) for illuminations (1).

15. The use according to claim 14, wherein said pipe (4) is a PEX-AL-PEX multilayer pipe.

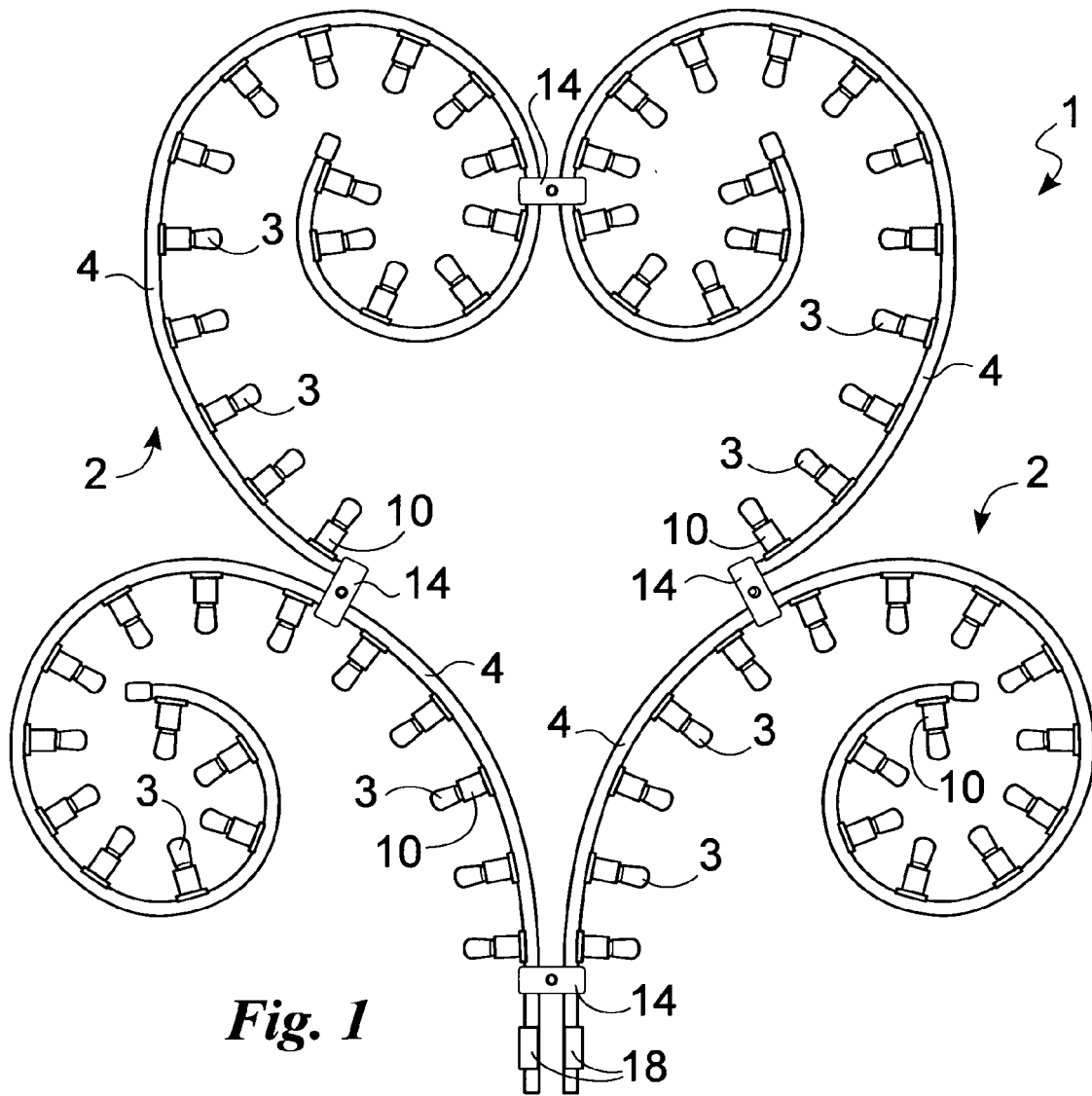


Fig. 1

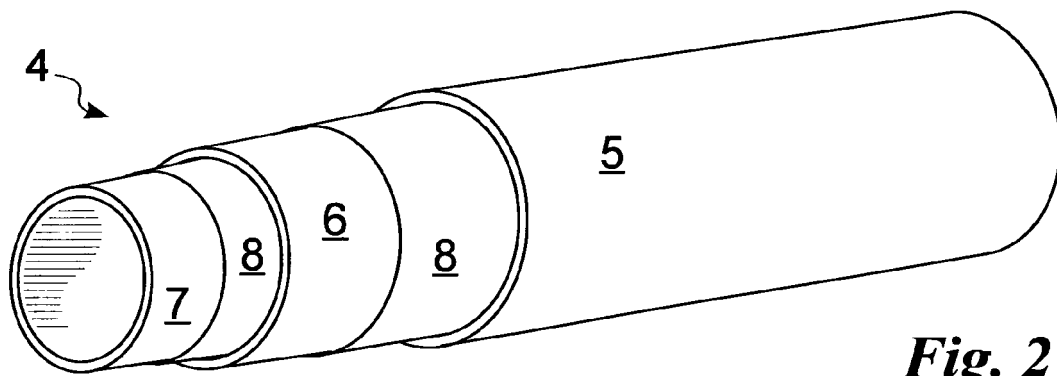
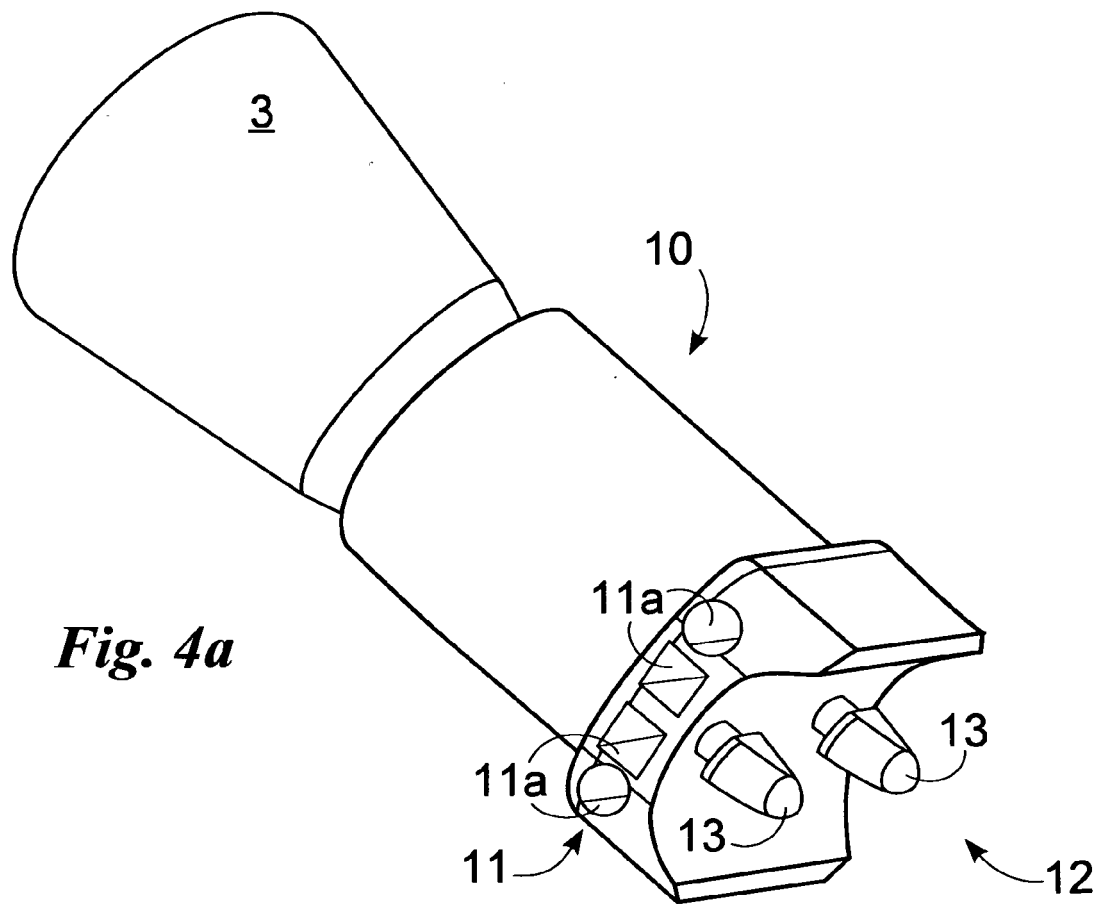
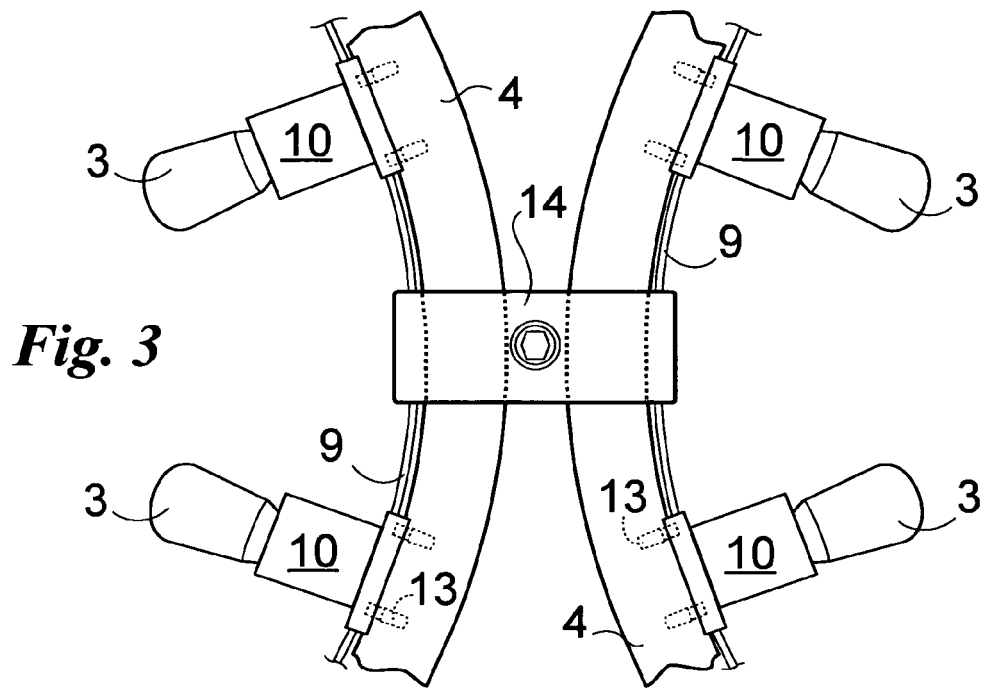


Fig. 2



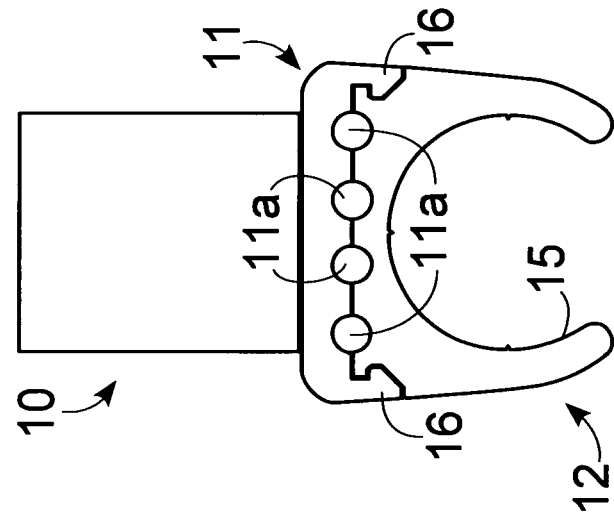


Fig. 4c

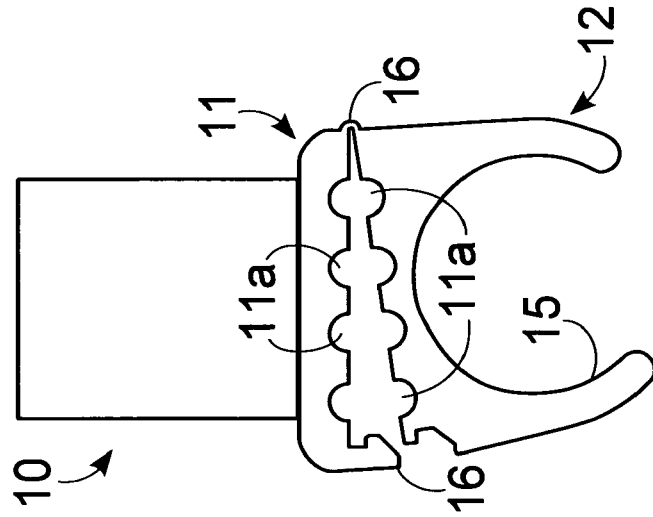


Fig. 4b

