



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
02.08.2017 Bulletin 2017/31

(51) Int Cl.:
E04H 12/00 ^(2006.01) **E01F 9/60** ^(2016.01)
E04H 12/22 ^(2006.01)

(21) Application number: **17154026.3**

(22) Date of filing: **31.01.2017**

(84) Designated Contracting States:
**AL 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 RS SE SI SK SM TR**
Designated Extension States:
BA ME
Designated Validation States:
MA MD

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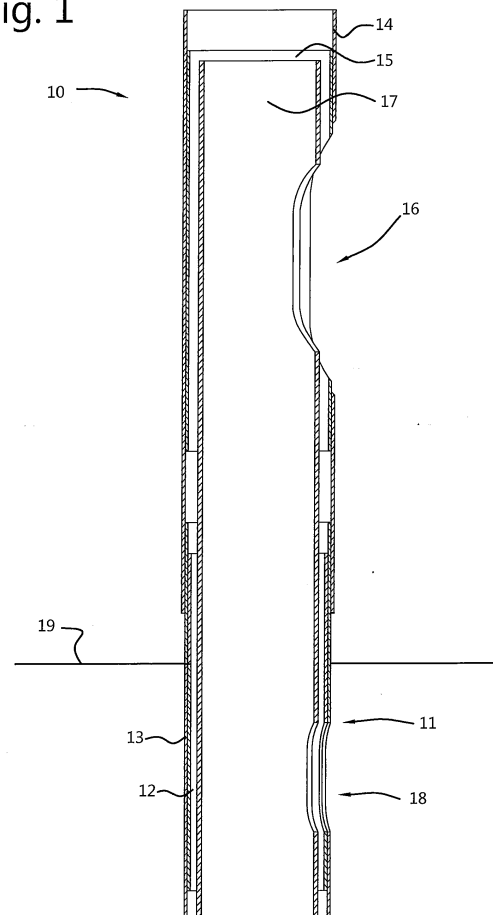
(30) Priority: **01.02.2016 NL 1041704**

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(54) **UTILITY POLE**

(57) Utility pole (10; 100; 1000), preferably a traffic light pole or a street lighting pole, comprising: a ground protector (11; 110; 1100) for securing the utility pole with respect to the ground; an outer tube (14; 140; 1400) arranged at least partially on the ground protector and extending from the ground protector; an assembly area (210; 2100) provided inside the utility pole in/at which an electrical cabinet holding electrical components of the utility pole can be arranged/mounted; a reinforcement tube (15; 150; 1200) arranged at least partially inside the outer tube and surrounding the assembly area; an insulation member (17; 170; 1300) arranged inside the outer tube surrounding at least the assembly area and which is adapted to insulate the assembly area from the outer tube; and a service opening (16; 160; 1600) reaching through the outer tube, the reinforcement tube and the insulation member and providing an access to the assembly area from the outside of the utility pole.

Fig. 1



Description

Field of the invention

[0001] The present invention relates to a utility pole and to the use of such a utility pole as a traffic light pole, a street lighting pole or a traffic sign support pole with internal cabling.

Technical background

[0002] A variety of different kinds of utility poles are known in the art, e.g. traffic light poles, street lighting poles, etc. Such utility poles usually comprise a so-called ground protector at the bottom of the utility pole for securing the utility pole with respect to the ground. For this purpose, the ground protector can be inserted at least partially into the ground or can comprise a flange or a base portion for mounting the utility pole directly on the ground. The known utility poles usually comprise an outer tube (e.g. a lighting column) which is at least partially arranged onto the ground protector and which extends up to the top of the utility pole where a carrier for electrical installations of the utility pole (e.g. traffic lights, street lights, etc.) can be arranged.

[0003] A power supply of the utility pole is usually provided by electric cables led into the utility pole via a cable hole provided in the ground protector. Such a cable hole can be provided at the bottom side and/or in a sidewall of the ground protector. From the cable hole, the electric cables are usually led to an electrical cabinet in which electrical components (e.g. switchboards, control units, fuse systems, etc.) are arranged and which have to be connected to the electric cables of the power supply.

[0004] A service hatch opening or mast opening covered by a service hatch cover is usually provided in the utility pole near the electrical cabinet providing access to the electrical cabinet such that an electrician or an engineer is able to put the utility pole into operation and to maintain the utility pole.

[0005] In order to improve the stability of the utility pole, an inner reinforcement tube is usually arranged within the outer tube surrounding at least the area where the service opening and the service hatch cover are located.

[0006] The ground protector is commonly pre-installed at the manufacturing plant. The complete system is then transported to the intended location and mounted. Installation concerns inserting the column with the ground protector into the ground or mounting the flange or base portion to the surface. Optionally, even if uncommon, the utility poles can be installed by inserting the ground protector either into the flange or the base portion mounted onto the ground or by inserting the ground protector into the ground, and leaving a certain length extending from the ground surface. Then, the outer tube together with the inner reinforcement tube is slipped over the ground protector (*i.e.* over the part of the ground protector extending from the ground surface) such that the installed

outer tube does not touch the ground.

[0007] At least the outer tube and the inner reinforcement tube of these known utility poles are often made of an electrically conductive metallic material (e.g. aluminum, aluminum alloy, steel, etc.). Thus, during putting such utility poles into operation or maintaining such utility poles, there is a risk that an electrician working on the electronics through the service opening inadvertently touches the inner reinforcement tube with an electrified cable and thereby electrifying the outer tube and potentially getting an electric shock. For this reason, connecting such utility poles for the first time or maintaining such utility poles requires a specially trained electrician, which is expensive and time consuming. Moreover, during installation and service the column has to be decoupled from the electric power supply by an authorized authority, with associated costs. Finally, in the case of damage of the utility pole, e.g. through impact with a vehicle, an inadvertent electrical connection may occur between the internal electric cabling and the exterior metallic shell (tube). Human contact with the utility pole may then result in a harmful situation.

[0008] Therefore, it is an object of the present invention to provide a utility pole, which can be put into operation and can be maintained in a safer way, in particular by a not specially trained electrician.

[0009] This and other objects, which become apparent upon reading the following description, are solved by the subject-matter of the independent claims. The dependent claims refer to preferred embodiments of the invention.

Summary of the invention

[0010] According to the invention, a utility pole, preferably a traffic light pole or a street lighting pole, comprises:

- a ground protector for securing the utility pole with respect to the ground;
- an outer tube arranged at least partially on the ground protector and extending from the ground protector;
- an assembly area provided inside the utility pole in/at which an electrical cabinet holding electrical components of the utility pole can be arranged/mounted;
- a reinforcement tube arranged at least partially inside the outer tube and surrounding the assembly area;
- an insulation member arranged inside the outer tube surrounding at least the assembly area and which is adapted to insulate the assembly area from the outer tube; and
- a service opening reaching through the outer tube, the reinforcement tube and the insulation member and providing access to the assembly area from the outside of the utility pole.

[0011] In the context of the present invention, the term

"ground protector" has to be understood as any assembly with which the utility pole can be secured with respect to the ground. In practice, two ground protectors are commonly used, namely a ground protector which is inserted into a flange or a base portion mounted onto the ground or by inserting the ground protector into the ground, and leaving a certain length extending from the ground surface.

[0012] The ground protector preferably comprises a base tube (e.g. an inner root column) and an insulation tube (e.g. an outer insulating piece) surrounding the base tube and preferably being press fit onto the base tube, wherein the insulation tube extends further than the base tube in longitudinal directions of the utility pole. Using such an electrical insulated ground protector, a "double" electrical insulation can be provided with the present invention, i.e. an insulation from stray current by means of the insulation tube of the ground protector and an insulation to ensure safety of a person working on the electrical cabinet through the service opening or upon collision by means of the insulating member.

[0013] In the context of the present invention, the term "assembly area" has to be understood as any area comprising an assembly rail or any other suitable mounting means for mounting the electrical cabinet holding the electrical components of the utility pole. By means of the service opening, which can be covered by a service hatch cover, access to the electrical cabinet can be provided such that an electrician is able to put the utility pole into operation and to maintain the utility pole.

[0014] In the context of the present invention, term "reinforcement tube" has to be understood as any structure (a separate tube or a structure integrally provided with another part) suitable to reinforce the area around the assembly area, which is weakened in its stability due to the service opening. The reinforcement tube (if provided as separate part) is usually inserted and expanded against the inner wall of the outer tube in order to provide a respective reinforcement of this area. The reinforcement tube is usually made of a metallic material (e.g. aluminum, aluminum alloy, steel, etc.), wherein the reinforcement tube is usually not (but can be) provided over the entire height of the utility pole, but only a certain length above and below the service opening. Depending on the respective requirements, it is possible to provide the outer tube with a wall having a thicker wall thickness in the area around the service opening, i.e. to provide the reinforcement tube not as a separate part, but as integral part of the outer tube. Moreover, the reinforcement tube can also be provided by means of an extended/lengthened ground protector (i.e. as an integral part of the ground protector).

[0015] The insulation member is preferably provided:

- in the form of a separate inner insulation tube which is arranged within in the ground protector (i.e. in the inner root column of the ground protector), in the reinforcement tube and in the outer tube, wherein it

is preferred that the inner insulation tube extends from a level above the service opening down through the entire ground protector and rests near the bottom side of the ground protector (e.g. near the outer piece of the ground protector);

- in the form of a reinforcement tube comprising an insulating layer/cover, at least at its outer surface; thus, such a layered/covered reinforcement tube serves two purposes, namely to provide a respective reinforcement of the area around the service opening and by means of the insulating layer/cover to provide a respective electrical insulation; and/or
- in the form of an extended/lengthened ground protector which extends up to a position above the service opening; thus, such a ground protector provides the technical functions of a ground protector and by means of its extended part of a layered/covered reinforcement tube (i.e. a respective reinforcement of the area around the service opening is provided and by means of the outer insulating piece, a respective electrical insulation is provided).

[0016] It is preferred that the insulation member is provided on the inside of the reinforcement tube, or alternatively that the insulation member is arranged between the outer tube and the reinforcement tube, wherein it is further preferred that the insulation member extends from the ground protector to a position above the service opening.

[0017] The ground protector can further comprise a bottom flange portion for securing the utility pole directly on the ground (i.e. instead of inserting the ground protector into the ground).

[0018] Preferably, the reinforcement tube is covered with the insulation member, wherein the insulation member is preferably crimped onto the reinforcement tube, and wherein an insulation ring is preferably provided on each of the opposed end faces of the reinforcement tube.

[0019] It is further preferred that the area surrounding the service opening is provided with an electrically insulating portion (e.g. an insulating collar, a layer of plastic material or a respective web of a non-conductive composite material). By means of such an insulating portion, any electrically conductive surface present at the service opening, e.g. resulting when cutting the service opening into the utility pole can be electrical insulated.

[0020] Preferably, the electrically insulating portion is provided by the insulation member extending further to a center of the service opening than both the outer tube and the reinforcement tube and/or by an insulation collar circumferentially arranged on and preferably slipped over the area surrounding the service opening. With other words, it is preferred that also at the edge of the service opening no electrical conductive surfaces are present. This is achieved by arranging an insulation collar onto the edge of the service opening and/or by providing the respective opening of an insulated part smaller than the respective openings of the electrical conductive parts.

[0021] The utility pole preferably comprises additionally: a service hatch cover to cover the service opening, wherein the service hatch cover is preferably detachably provided on the service opening such that fastening elements of the service hatch cover contact only the electrically insulating portion and/or wherein the service hatch cover is made of an insulating material and/or wherein the service hatch cover comprises an insulating cover at least on a side facing the assembly area. By means of such an electrical insulated service hatch cover, it can be further ensured that at least the outer tube of the utility pole cannot be electrified also in case an electrified cable contacts the service hatch cover.

[0022] Preferably, the outer surfaces of the reinforcement tube and/or of the insulation member are provided with longitudinally extending ribs/fins. By means of such ribs/fins a good connection between the reinforcement tube and the insulation member can be ensured. In this respect, it is further preferred that the ribs/fins of the outer surface of the reinforcement tube or of the extended ground protector have a smooth surface such that the insulating member (e.g. an insulation layer or cover) would not rupture when sliding onto the reinforcement tube). Notably, such longitudinally extending ribs/fins on the reinforcement tube and/or the ground protector are optional in all embodiments of the present invention.

[0023] The insulation member and/or the insulation portion and/or the insulation ring(s) are preferably made of a plastic material (e.g. a high density Polyethylene (HDPE)) or any other non-conducting material providing a respective insulation. Moreover, it is further preferred that the plastic material of these parts is somewhat elastic such that it can be deformed in case of a collision, i.e. such that these parts bend and do not break in case of a collision. Thereby, the electrical insulation can be maintained also in case of a collision.

[0024] It is further preferred that the insulation member extends basically from the lower end of the ground protector to well above the reinforcement tube.

[0025] The electrical components are preferably arranged in an electrical cabinet arranged in or mounted at the assembly area, wherein the electrical components preferably are connected with electrical cables which extend over at least a part of the utility pole, preferably extending out of the ground protector and/or to an upper electrical component, like a street lighting or a traffic light preferably arranged at an upper part of the outer tube by means of a carrier, which preferably comprises a connector element made of an electrically insulating material in order to electrical insulate the outer tube from the upper electrical components. By means of such a carrier (in particular by means of the insulating connector element) the utility pole can also be electrically insulated from the top side and not only with respect to the electrical cabinet arranged at the service opening.

[0026] The present invention further relates to a use of a utility pole as described above as a lighting pole or a traffic light pole.

Description of the preferred embodiments

[0027] In the following, the invention is described exemplarily with reference to the enclosed figures, in which:

Figure 1 is a schematic cross-sectional view of a utility pole according to a first preferred embodiment of the invention;

Figure 2 is a schematic cross-sectional view of a utility pole according to a second preferred embodiment of the invention

Figure 3 is a schematic view of a reinforcement tube used in a utility pole according to the second embodiment of the invention;

Figure 4 is a schematic cross-sectional view of a utility pole according to a third preferred embodiment of the invention;

Figure 5 is a schematic view of the utility pole shown in figure 4;

Figure 6 is a schematic cross-sectional view of a utility pole mounted into a flange/base portion;

Figure 7 is a schematic view of a first service hatch cover preferably used in a utility pole according to the invention;

Figure 8 is a schematic view of a second service hatch cover preferably used in a utility pole according to the invention;

Figure 9 is a schematic view of a flexible isolation shield preferably used in a utility pole according to the invention;

Figure 10 is a schematic view of the flexible isolation shield shown in figure 9 arranged in a utility pole;

Figure 11 is a schematic view of an insulation collar preferably used in a utility pole according to the invention;

Figure 12 is a schematic view of the insulation collar shown in figure 11 in a mounted condition; and

Figure 13 is a schematic cross-sectional view of a carrier at which the electrical installations of the utility pole can be mounted.

[0028] Figure 1 is a schematic cross-sectional view of a utility pole 10 according to a first preferred embodiment of the invention. Notably, the utility poles shown in the figures have been simplified such that the schematic structures and all functional parts of the entire utility poles can be shown in one respective figure.

[0029] At the lower side, the utility pole 10 comprises a ground protector 11, which in turn comprises an inner root column 12 and an outer piece 13 surrounding the inner root column 12. The inner root column 12 is usually made of a metallic material (e.g. aluminum, aluminum alloy, steel, etc.) providing a sufficient stability of the inner root column 12. The outer piece 13 is made of an electrically insulating material (e.g. a plastic material, like a high density Polyethylene (HDPE)) providing an electrical insulation of the inner root column 12 with respect to a stray current corrosion. The outer piece 13 can be pro-

vided as a separate tube into which the inner root column 12 can be inserted, preferably by press fit, or can be provided as coating of the inner root column 12, *i.e.* as an outer layer of the inner root column 12.

[0030] The ground protector 11, *i.e.* the inner root column 12 and the outer piece 13, can comprise a bottom wall with a cable hole or can be provided without a bottom wall such that the electric cables of the power supply (not shown) can be led into the utility pole 10 via the bottom side. In addition or alternatively, a cable hole 18 can be provided in the sidewall of the ground protector 10.

[0031] It is further preferred that the outer piece 13 completely surrounds/covers the outer surface of the inner root column 12, wherein it is preferred that in a longitudinal direction of the utility pole 10, the outer piece 13 extends beyond the inner root column 12 as shown in figure 1. In other embodiments, it is also possible that the outer piece 13 surrounds/covers the outer surface of the inner root column 12 only partially, in particular, only at the sections of the inner root column 12 placed in the ground and having otherwise contact to the other parts of the utility pole 10.

[0032] At the upper side, the utility pole 10 comprises an outer tube 14 (*e.g.* a lighting column) which is at least partially arranged onto the ground protector 11 and which extends up to the top of the utility pole 10 where a carrier for electrical installations of the utility pole 10 (*e.g.* traffic lights, street lights, etc.) can be arranged (*cf.* figure 13). As shown in figure 1, it is preferred that the outer tube 14 is arranged at the outer surface of the ground protector 11, *i.e.* at the outer surface of the outer piece 13 of the ground protector 11. The outer tube 14 is made of a metallic material (*e.g.* aluminum, aluminum alloy, steel, etc.) providing a sufficient stability of the outer tube 14.

[0033] Within the outer tube 14, a reinforcement tube 15 is arranged at least at a height where a service (hatch) opening 16 is located. The reinforcement tube 15 is usually inserted into and expanded against the inner wall of the outer tube 14 in order to provide a respective reinforcement of this area. The reinforcement tube 15 is made of a metallic material (*e.g.* aluminum, aluminum alloy, steel, etc.), wherein the reinforcement tube 15 is usually not provided over the entire height of the utility pole 10, but only a certain length above and below the service opening 16 reinforcing this area which is weakened in its stability due to the presence of the service opening 16. Depending on the respective requirements, it is also possible to provide the outer tube 14 with a wall having a thicker wall thickness in the area around the service opening 16, *i.e.* to provide the reinforcement tube 15 not as a separate part, but as integral part of the outer tube 14. Moreover, the outer surface of the reinforcement tube 15 is optionally provided with longitudinal ribs/fins in order to ensure a good connection between the reinforcement tube 15 and the outer tube 14.

[0034] By means of the service opening 16, which can be covered by a service hatch cover (*cf.* figures 7 and 8), access to an electrical cabinet (not shown) can be

provided such that an electrician is able to put the utility pole 10 into operation and to maintain the utility pole 10. Near the service opening 16, an assembly area is provided comprising an assembly rail or any other suitable mounting means for mounting the electrical cabinet holding the electrical components of the utility pole 10.

[0035] The utility pole 10 further comprises an insulation member, here in the form of an inner tube 17 which is arranged in the inner root column 12 of the ground protector 11, in the reinforcement tube 15 and in the outer tube 14. In the preferred embodiment, the inner tube 17 extends downwards from a level above the service opening 16 through the entire ground protector 11 and rests near the bottom side of the outer piece 13 of the ground protector 11. It is further preferred that the inner tube 17 is not arranged press fit in the inner root column 12, in the reinforcement tube 15 or in the outer tube 14. However, depending on the respective requirements and structure of the utility pole 10, the inner tube 17 can also be arranged press fit either in the reinforcement tube 15 or in the inner root column 12. In this embodiment, the assembly area providing an assembly rail or another suitable mounting means for mounting the electrical cabinet is provided within the inner tube 17.

[0036] The inner tube 17 can be made of any suitable material (*e.g.* a plastic material, like a high density Polyethylene (HDPE)) electrically insulating the electrical cabinet from the metallic materials of the inner root column 12, the outer tube 14 and the reinforcement tube 15. Moreover, it is further preferred that the material of the inner tube 17 is somewhat elastic such that it can be deformed in case of a collision, *i.e.* such that the inner tube 17 bends, but does not break, in case of a collision and electrical insulation is maintained.

[0037] As can be taken from figure 1, the service opening 16 reaches through the outer tube 14, the reinforcement tube 15 and the inner tube 17. In this respect, it is preferred that the respective opening in the inner tube 17 is smaller than the openings in the outer tube 14 and the reinforcement tube 15 so that the inner tube 17 extends further to a center of the service opening 16 than both the outer tube 14 and the reinforcement tube 15. Thereby, any unintended contact of an electrified cable with the electrically conductive outer tube 14 or the reinforcement tube 15 can be further avoided.

[0038] Depending on the stability requirements, the inner tube 17 can be further provided with horizontal walls comprising a respective cable hole for the electrical cables. Moreover, in principle, it is also possible to provide the outer tube 14, the reinforcement tube 15 or the inner root column 12 with respective horizontal walls at least at these locations where the respective walls do not overlap within the utility pole 10. In the preferred embodiment, the utility pole 10, and thus the respective tubes, have a round cross-sectional shape. However, also other cross-sectional shapes are possible (*e.g.* squared, rectangular, oval, etc.). This applies for all embodiments of the invention.

[0039] The utility pole 10 can be installed, for example, by placing the inner tube 17 into the ground (*i.e.* into a provided hole in the ground), wherein the electrical cabinet can already be mounted onto the assembly rail or mounting means of the inner tube 17.

[0040] Subsequently, the electric cabinet can be connected with the electric cables of the power supply (not shown) which can be led into the inner tube 17 via the bottom side of the inner tube 17 which is provided with a respective cable hole or without a bottom wall. Then, the ground protector 11 can be slipped over the inner tube 17 until the bottom side of the ground protector 11 is placed near the bottom wall of the inner tube 17 and a certain length of the ground protector 11 still extends from the ground surface (*cf.* reference sign 19) as shown in figure 1.

[0041] Finally, the outer tube 14 together with the reinforcement tube 15 can be slipped over the inner tube 17 and the outer piece 13 of the ground protector 11, until the arrangement shown in figure 1 is reached, *i.e.* the outer tube 14 is placed (preferably by means of a press fit connection) at the outer surface of the outer piece 13 of the ground protector 11, wherein the outer tube 14 does not touch the ground.

[0042] As a result, an electrician can connect the utility pole 10 to the power grid, without being at risk of electrocution due to the inner tube 17 which electrically insulates the electric cabinet from the rest of the utility pole 10. Moreover, the utility pole 10, according to the first preferred embodiment, can be produced with standard production methods, *i.e.* without the need of substantially modifying the production of the parts of the utility pole 10. In practice, building-up the utility pole 10 is much simpler, since the ground protector 11 and the outer tube 14 together with the reinforcement tube 15 can be slipped over the inner tube 17 which is already connected to the power grid. Notably, by means of the inner tube 17, an electrical insulation along the entire lower part of the utility pole 10 can be provided. This is in particular of advantage in case a collision damages the utility pole 10, since the outer tube 14 and the ground protector 11 will still be electrically insulated from the power source. Therefore, by means of the utility pole 10, a "double" electrical insulation can be provided, *i.e.* an insulation from stray current by means of the outer piece 13 of the ground protector 11 and insulation to ensure safety of a person working on the electrical cabinet through the service opening 16 or upon collision by means of the inner tube 17.

[0043] Figure 2 is a schematic cross-sectional view of a utility pole 100 according to a second preferred embodiment of the invention.

At the lower side, the utility pole 100 also comprises a ground protector 110, which in turn comprises an inner root column 120 and an outer piece 130. The ground protector 110 of the second embodiment is similar to the ground protector 11 of the first embodiment such that it is referred to the above explanations.

[0044] At the upper side, the utility pole 100 also comprises an outer tube 140 (*e.g.* a lighting column) which is at least partially arranged onto the ground protector 110 and which extends up to the top of the utility pole 100 where a carrier for electrical installations of the utility pole 100 (*e.g.* traffic lights, lights, etc.) can be arranged (*cf.* figure 13). As shown in figure 2, it is preferred that the outer tube 140 is arranged at the outer surface of the ground protector 110, *i.e.* at the outer surface of the outer piece 130 of the ground protector 110. The outer tube 140 is made of a metallic material (*e.g.* aluminum, aluminum alloy, steel, etc.) providing a sufficient stability of the outer tube 140.

[0045] In contrast to the first embodiment, the second embodiment does preferably not comprise a separate inner tube 17 as insulation member, but a reinforcement tube 150 layered or covered, at least at its outer surface, by an electrically insulating material 170. Thus, the reinforcement tube 150 of the second embodiment serves two purposes, namely to provide a respective reinforcement of the area around the service opening 160 and by means of the insulating layer 170 to electrically insulate the electrical cabinet from the metallic materials of the inner root column 120 and the outer tube 140 of the utility pole 100.

[0046] The insulating layer 170 of the reinforcement tube 150 can be made of any suitable material (*e.g.* a plastic material, like a high density Polyethylene (HDPE)) electrically insulating the electrical cabinet from the metallic materials of the inner root column 120 and the outer tube 140. It is preferred that the insulating layer 170 of the reinforcement tube 150 is crimped onto the reinforcement tube 150 (*e.g.* like a shrink sleeve). Also here, the outer surface of the reinforcement tube 150 may optionally comprise longitudinal ribs/fins (having preferably a smooth surface such that the insulating layer or cover would not rupture when sliding onto the reinforcement tube 150) to ensure a good connection between the outer tube 140 and the reinforcement tube 150. As can be taken from figure 2, at the top and bottom side of the reinforcement tube 150, the insulating layer 170 is provided with two end rings 200 in order to ensure a full electrical insulation by the insulating layer 170.

[0047] Figure 3 is a schematic view of the reinforcement tube 150 shown in figure 2. As can be taken from figure 3, the reinforcement tube 150 comprises an assembly area with an assembly rail 210 for mounting the electrical cabinet within the reinforcement tube 150.

[0048] The further parts of the utility pole 100 are similar to the corresponding parts of the utility pole 10 shown in figure 1. Therefore, with respect to the further details referring to these parts, it is referred to the above-explanations.

[0049] The utility pole 100 can be installed quite similar to the known utility poles, *i.e.* by inserting the ground protector 110 either into a flange or a base portion mounted onto the ground (*cf.* figure 6) or by inserting the ground protector 110 into the ground, and leaving a certain length

extending from the ground surface (*cf.* figure 2). Then, the outer tube 140 together with the layered/covered reinforcement tube 150 is slipped over the ground protector 110 (*i.e.* over the part of the ground protector 110 extending from the ground surface 190), such that the installed outer tube 140 does not touch the ground.

[0050] As a result, an electrician can connect the utility pole 100 to the power grid, without being at risk of electrocution due to the insulating layer 170 of the reinforcement tube 150 which electrically insulates the electric cabinet from the rest of the utility pole 100. Also the utility pole 100, according to the second preferred embodiment, can be produced with standard production methods, *i.e.* without the need of substantially modifying the production of the parts of the utility pole 100. Starting point for providing the reinforcement tube 150 with an insulating layer 170 is a commonly known reinforcement tube already with its integrated assembly rail 210 for mounting the electrical cabinet. Thus, standard components can be used for providing the utility pole 100. Also here, by means of the utility pole 100, a "double" electrical insulation can be provided, *i.e.* an insulation from stray current by means of the outer piece 130 of the ground protector 110 and insulation to ensure safety of a person working on the electrical cabinet through the service opening 160 or upon collision by means of the insulating layer 170 of the reinforcement tube 150.

[0051] Figure 4 is a schematic cross-sectional view of a utility pole 1000 according to a third preferred embodiment of the invention.

[0052] At the lower side, the utility pole 1000 comprises a ground protector 1100, which in turn comprises an inner root column 1200 and an outer piece 1300. In contrast to the first and second embodiments, the ground protector 1100 of the third embodiment is extended/lengthened up to a position above the service opening 1600. With other words, the ground protector 1100 of the third embodiment provides the technical functions of the ground protectors 11, 110 of the first and second embodiments and of the layered reinforcement tube 150 of the second embodiment. The reinforcement tube is thus provided by the inner root column 1200 of the ground protector 1100 and the insulation member is provided by the outer piece 1300 of the ground protector 1100. Thus, in the third embodiment, no separate reinforcement tube 15, 150 is needed, since a respective reinforcement is provided by means of the extended ground protector 1100 placed at the inner surface of the outer tube 1400, preferably by press fit.

[0053] As explained above, the inner root column 1200 is usually made of a metallic material (*e.g.* aluminum, aluminum alloy, steel, etc.) providing a sufficient stability of the inner root column 1200. The outer piece 1300 is made of an electrically insulating material (*e.g.* a plastic material, like a high density Polyethylene (HDPE)) providing an electrical insulation of the inner root column 1200 with respect to a stray current corrosion and due to the elongation also an electrical insulation of the outer

tube 1400 from the electrical cabinet. The outer piece 1300 can be provided as a separate tube into which the inner root column 1200 can be inserted, preferably by press fit.

[0054] Moreover, as can be taken from figure 5, it is preferred that the inner root column optionally comprises longitudinal ribs/fins 2200 to ensure a good connection between the inner root column 1200 and the outer piece 1300. Such longitudinal ribs/fins 2200 can be provided between any respective tubes of the utility poles 10, 100, 1000 as appropriate. As can also be taken from figure 5, the inner root column 1200 comprises an assembly area with an assembly rail 2100 for mounting the electrical cabinet within the inner root column 1200.

[0055] In this embodiment, the service opening 1600 reaches through the outer tube 1400, the inner root column 1200 and the outer piece 1300. In this respect, it is preferred that the respective opening in the outer piece 1300 is smaller than the openings in the outer tube 1400 and the inner root column 1200 so that the outer piece 1300 extends further to a center of the service opening 1600 than both the outer tube 1400 and the inner root column 1200. Thereby, any unintended contact of an electrified cable with the electrically conductive outer tube 1400 or the inner root column 1200 15 can be further avoided. An additional connection may be made between the outer piece 1300 and outer tube 1400 with connecting elements (not shown). These connecting elements may be made of non-conductive, electrically insulating material (*e.g.* a plastic material). These fastening elements may for instance be tacks, rivets or screws.

[0056] The further parts of the utility pole 1000 are similar to the corresponding parts of the utility poles 10, 100 shown in figures 1 and 2. Therefore, with respect to the further details concerning these parts, it is referred to the above explanations.

[0057] The utility pole 1000 can be provided, for example, by a method comprising at least the following steps: providing an inner root column 1200 (without cable holes); cutting the inner root column 1200 to a desired length; sliding the inner root column 1200 into the outer piece 1300; parting the upper end of the assembly with a lathe; providing the required cable holes and the service opening 1600.

[0058] Also the utility pole 1000 can be installed quite similar to the known utility poles, *i.e.* by inserting the ground protector 1100 either into a flange or a base portion mounted onto the ground (*cf.* figure 6) or by inserting the ground protector 1100 into the ground, and leaving a certain length extending from the ground surface (*cf.* figure 4). Then, the outer tube 1400 (without a respective reinforcement tube) is slipped over the ground protector 1100 (*i.e.* over the part of the ground protector 1100 extending from the ground surface 1900), such that the installed outer tube 1400 does not touch the ground and the upper side of the ground protector 1100 is placed above the service opening 1600.

[0059] As a result, an electrician can connect the utility

pole 1000 to the power grid, without being at risk of electrocution due to the outer piece 1200 of the extended ground protector 1100 which electrically insulates the electric cabinet from the outer tube 1400. Also here, by means of the utility pole 1000, a "double" electrical insulation can be provided, i.e. an insulation from stray current and insulation to ensure safety of a person working on the electrical cabinet through the service opening 1600 or upon collision both provided by means of the outer piece 1300 of the ground protector 1100. Moreover, since the extended ground protector 1100 provides the technical functions of a ground protector and of the insulated reinforcement tube 150, a simpler construction of the utility pole 1000 is provided comprising fewer parts compared to the first and second embodiments.

[0060] Figure 6 is a schematic cross-sectional view of a utility pole 100 mounted into a flange/base portion 230 mounted onto the ground, wherein between the outer piece 130 and the flange/base portion 230, an intermediate aluminum tube 240 is arranged. All above-described embodiments of the utility poles 10, 100, 1000 can be mounted into such a flange/base portion 230 instead of inserting the ground protector 11, 110, 1100 into the ground. Also when using such a flange/base portion 230, an insulation between the electrical cabinets and the outside of the utility poles 10, 100, 1000 can be provided to ensure safety of a person working on the electrical cabinet through the service opening 16, 160, 1600.

[0061] Figures 7 and 8 are schematic views of service hatch covers 40, 50 preferably used to cover the service openings 16, 160, 1600 of the utility poles 10, 100, 1000.

[0062] The service hatch cover 40 shown in figure 7 is entirely made of an electrically insulating material (e.g. a plastic material, like polyvinyl chloride (PVC)) with sufficient mechanical stability. The service hatch cover 40 comprises respective fastening elements 41 (e.g. hook like elements) for engaging with the inner surface near the service openings 16, 160, 1600 of the utility poles 10, 100, 1000. The service hatch cover 40 is preferably used in the utility poles 100, 1000 according to the second and third embodiments of the invention. This is because, in these embodiments, it is in principle possible that the fastening elements 41 have contact with the inner surface of the reinforcement tube 150 or with the extended part of the inner root column 1200. Since both are made of an electrically conductive metallic material and since the electric cabinet or the electric cables can be in contact with these surfaces, it could be possible that the fastening elements 41 have an unintended electric contact. However, since the service hatch cover 40 is made of an electrically insulating material, at least the outer tubes 140, 400 are not electrified in such a case. Also in the utility pole 10 according to the first embodiment of the invention, it might be possible that an electrified cable has contact to the service hatch cover 40 such that also here a respective risk can be avoided by using the service hatch cover 40.

[0063] The service hatch cover 50 shown in figure 8 is

in principle a conventional service hatch cover made of a metallic material (e.g. aluminum, aluminum alloy, steel, etc.) comprising similar fastening elements 51 as the service hatch cover 40. The fastening elements (not shown) of the service hatch cover 50 may be provided with sealing rings and/or a sealing layer on the inside of the service hatch cover 50 to ensure the service hatch cover is waterproof. This sealing layer may be for example made from self-adhesive rubber. The service hatch cover 50 comprises an electrical insulation layer 52 (e.g. a layer of plastic material or a respective web of a non-conductive composite material) on the inside of the service hatch cover 50, thereby electrically insulating the outer surface of the service hatch cover 50 from the inside of the utility poles 10, 100, 1000. For the same reasons as explained-above, such a service hatch cover 50 is preferably used in the utility poles 10, 100, 1000. Alternatively or in addition, a flexible isolation shield 53, as shown in figures 9 and 10, can be used for covering the service opening 16, 160, 1600 of a utility pole 10, 100, 1000 (i.e. such a flexible isolation shield 53 may "replace" the shown insulating layer 52 on the inner surface of the service hatch cover 50). The flexible isolation shield 53 may comprise or consist of a suitable insulating material, e.g. plastic material, and may comprise a pull cord 54 such that the flexible isolation shield 53 can be pulled out of the service opening 16, 160, 1600. As shown in figure 10, due to the flexibility of the flexible isolation shield 53 it rests on the inner surface of the utility pole 10, 100, 1000 covering thereby the service opening 16, 160, 1600 such that no cable may contact the service hatch cover 50. Such a flexible isolation shield 53 can be used in all embodiments of the present invention.

[0064] It is further preferred that the fastening elements 41, 51 of the service hatch covers 40, 50 are such provided that these have only contact with electrically non-conductive parts, e.g. only with the respective insulation members.

[0065] Figures 11 and 12 are schematic views of an insulation collar 60 which can be circumferentially arranged on and preferably slipped over the area surrounding a service opening 16, 160, 1600 of a utility pole 10, 100, 1000.

[0066] As can be taken from figure 11, the insulation collar 60 comprises groove 61 in which a corresponding wall section of the service opening 16, 160, 1600 can be arranged, as shown in figures 2 and 12. For this purpose, it is preferred that the insulation collar 60 is made of an elastic plastic material. Such an insulation collar 60 is preferably used in the utility pole 100 (cf. figures 2 and 3) in which a reinforcement tube 150 having an insulating layer is used as an insulation member. That is because the service opening 160 is cut out of the reinforcement tube 150 such that the edge of the reinforcement tube 150 might not be covered by an insulation layer any more. In order to provide a respective insulation also on this edge, the insulation collar 60 can be arranged onto this edge, thereby ensuring that no unintended electrical con-

tact may occur.

[0067] Figure 13 is a schematic view of a carrier 70 for joining an arm 71, which holds the electrical installations of the utility pole 10, 100, 1000 (e.g. traffic lights, lights, etc.), with the outer tube 14, 40, 400. As can be taken from figure 13, between the arm 71 and the outer tube 14, 40, 400, a connector element 72 is arranged for adapting/reducing the cross-section of the outer tube 14, 140, 1400 such that the arm 71 can be inserted by means of a press-fit connection. The connector element 72 is preferably made of a plastic material (e.g. a high density Polyethylene (HDPE)) which preferably electrically insulating the outer tube 14, 140, 1400 from the arm 71 holding the electrical installations of the utility pole 10, 100, 1000. As a result, by means of such a carrier 70 (in particular by means of the connector element 72) the utility pole 10, 100, 1000 can also be electrically insulated from the top side and not only with respect to the electrical cabinet. Alternatively, instead of mounting the arm 71 directly at the outer tube 14, 140, 1400, it is also possible to mount the arm 71 by means of the connector element 72 at an additional arm or rod extending from the utility pole 10, 100, 1000.

[0068] It should be clear to a skilled person that the embodiments shown in the figures are only preferred embodiments, but that, however, also other designs of a utility pole having more or less parts can be used, as long as these are within the scope of the following claims. Moreover, the technical features and technical functions of the above-described preferred embodiments are freely combinable and do not only refer to the embodiments in which context these technical features and technical functions have been described.

Claims

1. Utility pole (10; 100; 1000), preferably a traffic light pole or a street lighting pole, comprising:

- a ground protector (11; 110; 1100) for securing the utility pole (10; 100; 1000) with respect to the ground;
- an outer tube (14; 140; 1400) arranged at least partially on the ground protector (11; 110; 1100) and extending from the ground protector (11; 110; 1100);
- an assembly area (210; 2100) provided inside the utility pole (10; 100; 1000) in/at which an electrical cabinet holding electrical components of the utility pole (10; 100; 1000) can be arranged/mounted;
- a reinforcement tube (15; 150; 1200) arranged at least partially inside the outer tube (14; 140; 1400) and surrounding the assembly area (210; 2100);
- an insulation member (17; 170; 1300) arranged inside the outer tube (14; 140; 1400) surround-

ing at least the assembly area (210; 2100) and which is adapted to insulate the assembly area (210; 2100) from the outer tube (14; 140; 1400); and

- a service opening (16; 160; 1600) reaching through the outer tube (14; 140; 1400), the reinforcement tube (15; 150; 1200) and the insulation member (17; 170; 1300) and providing an access to the assembly area (210; 2100) from the outside of the utility pole (10; 100; 1000).

2. Utility pole (10; 100; 1000) according to claim 1, wherein the insulation member (170; 1300) is arranged between the outer tube (140; 1400) and the reinforcement tube (150; 1200), or wherein the insulation member (17) is provided on the inside of the reinforcement tube (15).
3. Utility pole (10; 100; 1000) according to claims 1 or 2, wherein the insulation member (17; 1200) extends from the ground protector (11; 1100) to a position above the service opening (16; 1600).
4. Utility pole (10; 100; 1000) according to any one of the preceding claims, wherein the ground protector (11; 110; 1100) comprises a base tube (12; 120; 1200) and an insulation tube (13; 130; 1300) surrounding the base tube (12; 120; 1200) and preferably being press fit onto the base tube (12; 120; 1200), wherein the insulation tube (13; 130; 1300) extends further than the base tube (12; 120; 1200) in longitudinal directions of the utility pole (10; 100; 1000), wherein both the base tube (1200) and the insulation tube (1300) may extend to a position above the service opening (1600) to form the reinforcement tube (1200) and the insulation member (1300).
5. Utility pole (10; 100; 1000) according to any one of the preceding claims, wherein the ground protector (11; 110; 1100) further comprises a bottom flange portion (230) for securing the utility pole (10; 100; 1000) on the ground.
6. Utility pole (10; 100; 1000) according to any one of the preceding claims, wherein the reinforcement tube (150) is covered with the insulation member (170), wherein the insulation member (170) is preferably crimped onto the reinforcement tube (150), and wherein an insulation ring (200) is preferably provided on each of the opposed end faces of the reinforcement tube (150).
7. Utility pole (10; 100; 1000) according to any one of the preceding claims, wherein the reinforcement tube (15; 150) is press fit into the outer tube (14; 140).
8. Utility pole (10; 100; 1000) according to any one of

the preceding claims, wherein the area surrounding the service opening (16; 160; 1600) is provided with an electrically insulating portion.

9. Utility pole (10; 100; 1000) according to claim 8, wherein the electrically insulating portion is provided by the insulation member (17; 1300) extending further to a center of the service opening (16; 1600) than both the outer tube (14; 1400) and the reinforcement tube (15; 1200) and/or by an insulation collar (60) circumferentially arranged on and preferably slipped over the area surrounding the service opening (16; 160; 1600) and/or by a flexible isolation shield (53) arranged within the utility pole (10; 100; 1000). 5 10 15
10. Utility pole (10; 100; 1000) according to any one of the preceding claims, further comprising a service hatch cover (40; 50) covering the service opening (16; 160; 1600), wherein the service hatch cover (40; 50) is preferably detachably provided on the service opening (16; 160; 1600) such that fastening elements (41; 51) of the service hatch cover (40; 50) contact only the electrically insulating portion and/or wherein the service hatch cover (40) is made of an insulating material and/or wherein the service hatch cover (50) comprises an insulating cover (52) at least on a side facing the assembly area (210; 2100). 20 25
11. Utility pole (10; 100; 1000) according to any one of the preceding claims, wherein the outer surfaces of the reinforcement tube (15; 150) and/or of the insulation member are provided with longitudinally extending ribs (2200). 30 35
12. Utility pole (10; 100; 1000) according to any one of the preceding claims, wherein the insulation member (17; 150; 1300) and/or the insulation portion (60) and/or the insulation ring (200) is made of a plastic material, preferably of a high density Polyethylene (HDPE), wherein the plastic material is preferably flexible. 40
13. Utility pole (10; 100; 1000) according to any one of the preceding claims, wherein the insulation member (17; 150; 1300) extends over the entire height of the utility pole (10; 100; 1000). 45
14. Utility pole (10; 100; 1000) according to any one of the preceding claims, wherein electrical components are arranged in an electrical cabinet arranged in or mounted at the assembly area (210; 2100), wherein the electrical components preferably are connected with electrical cables which extend over at least a part of the utility pole (10; 100; 1000), preferably extending out of the ground protector (11; 110; 1100) and/or to an upper electrical component, like a street lighting or a traffic light preferably arranged at an 50 55

upper part of the outer tube (14; 140; 1400) by means of a carrier (70).

15. Use of a Utility pole (10; 100; 1000) according to any one of the preceding claims as a street lighting pole, a traffic light pole or a traffic sign support pole.

Fig. 1

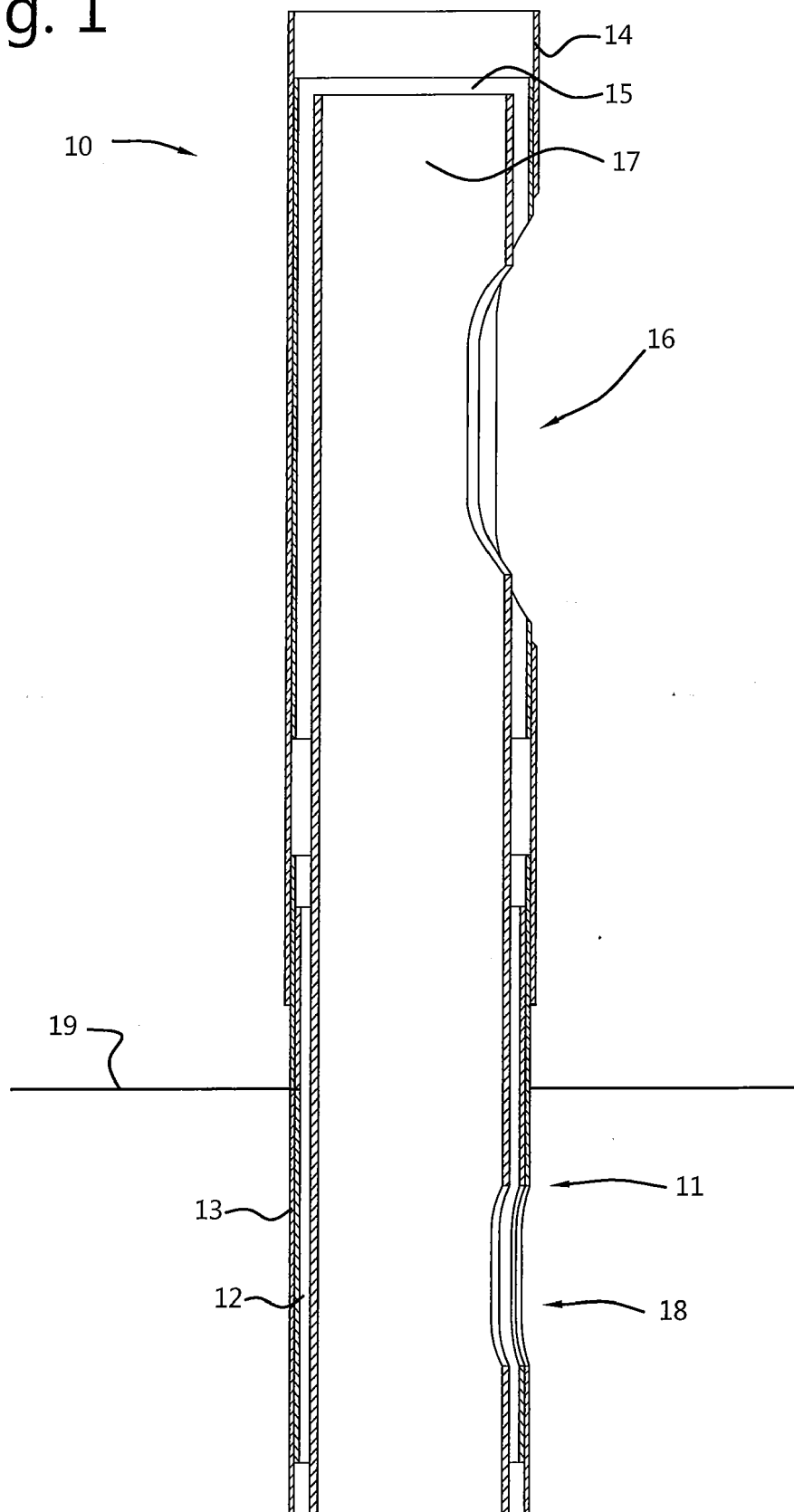


Fig. 2

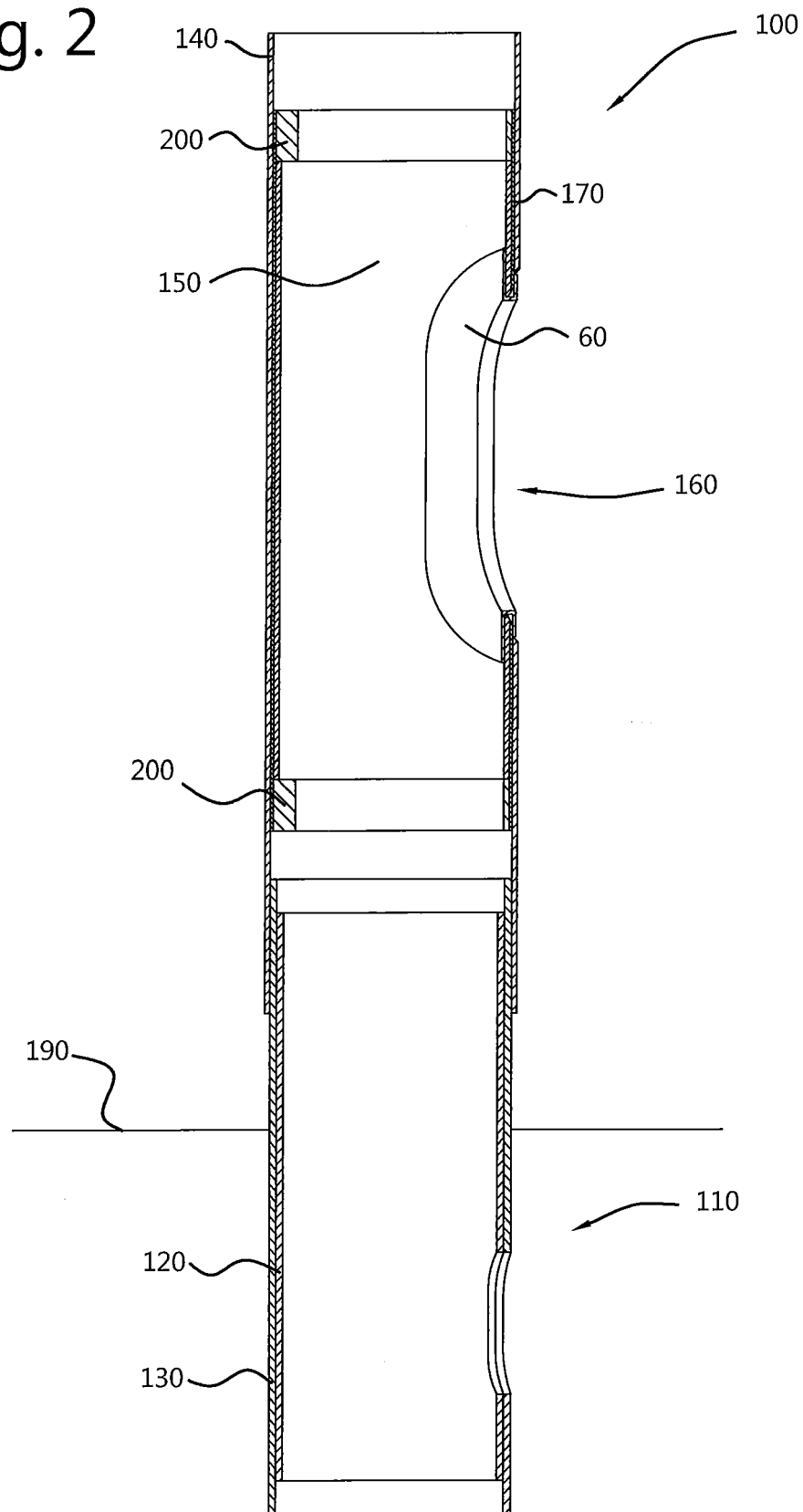


Fig. 3

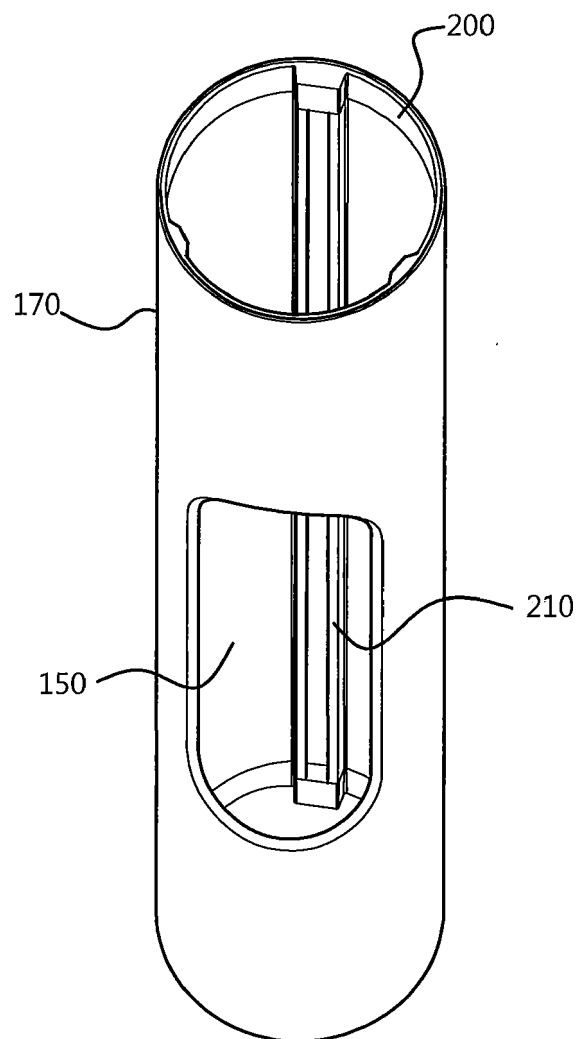


Fig. 4

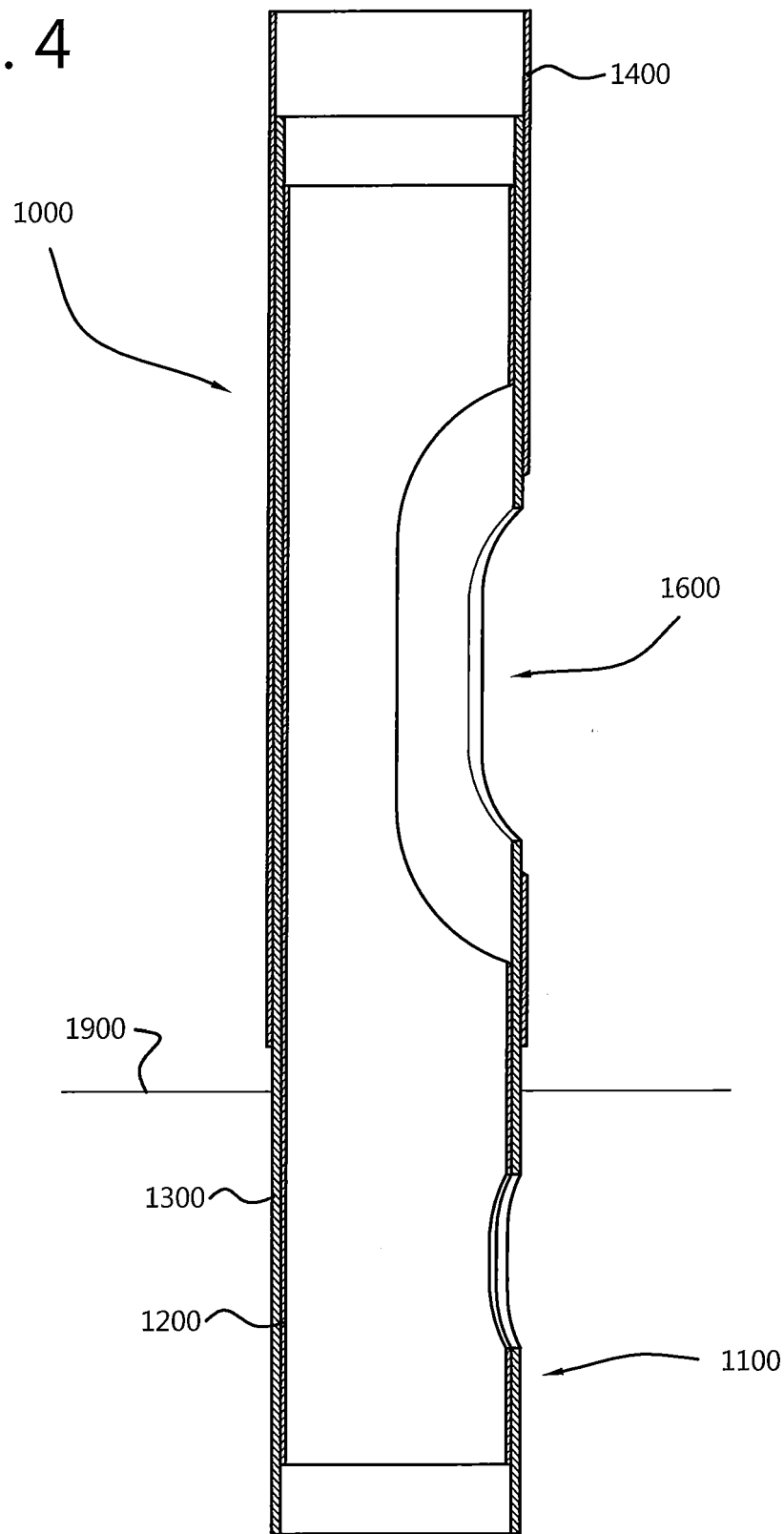


Fig. 5

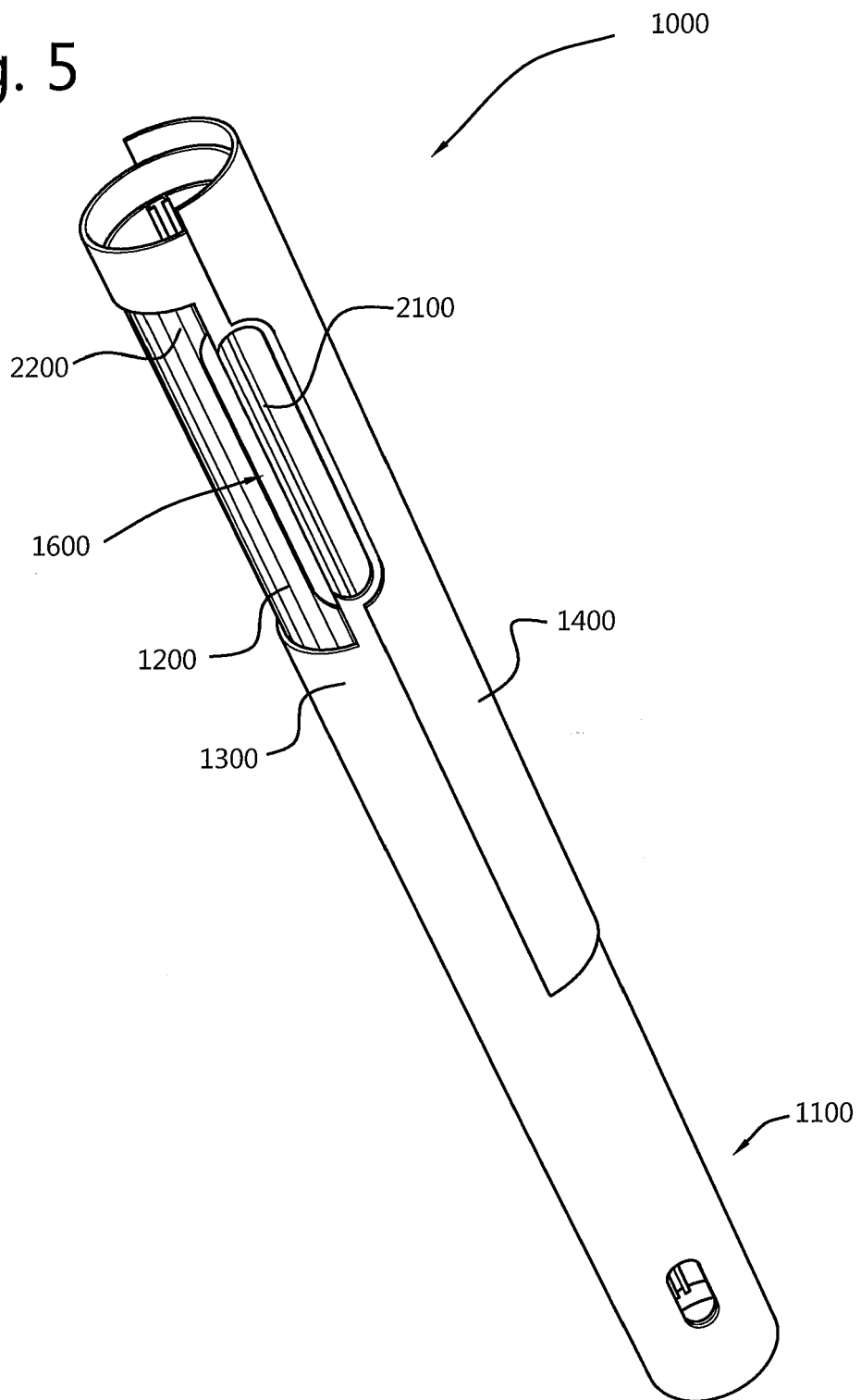


Fig. 6

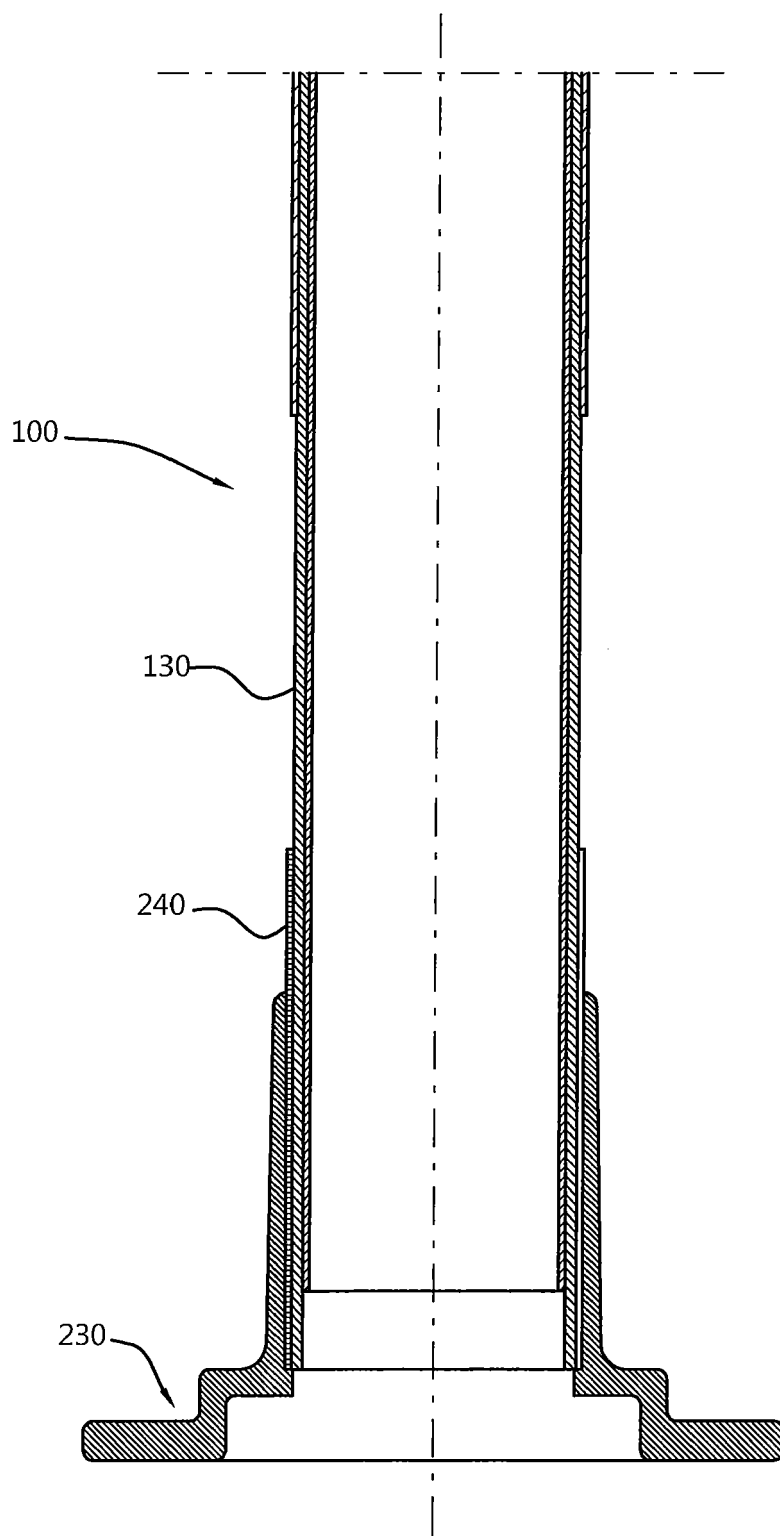


Fig. 7a

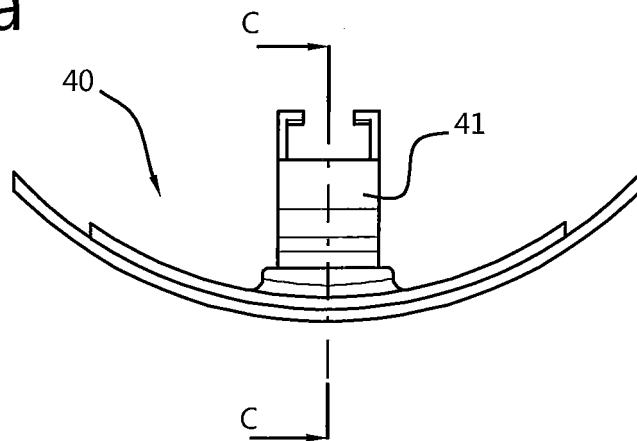


Fig. 7b

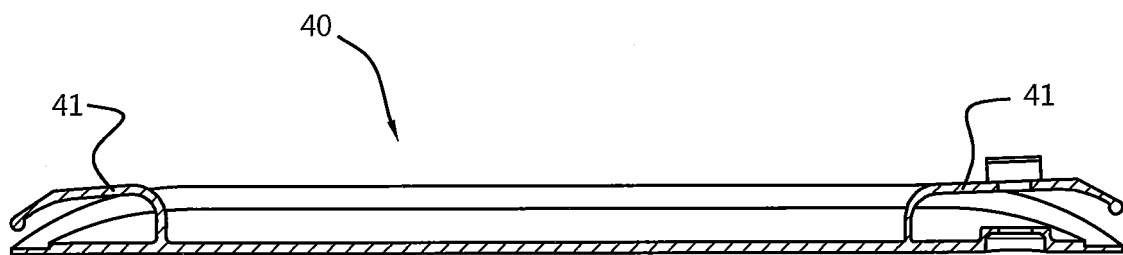


Fig. 7c

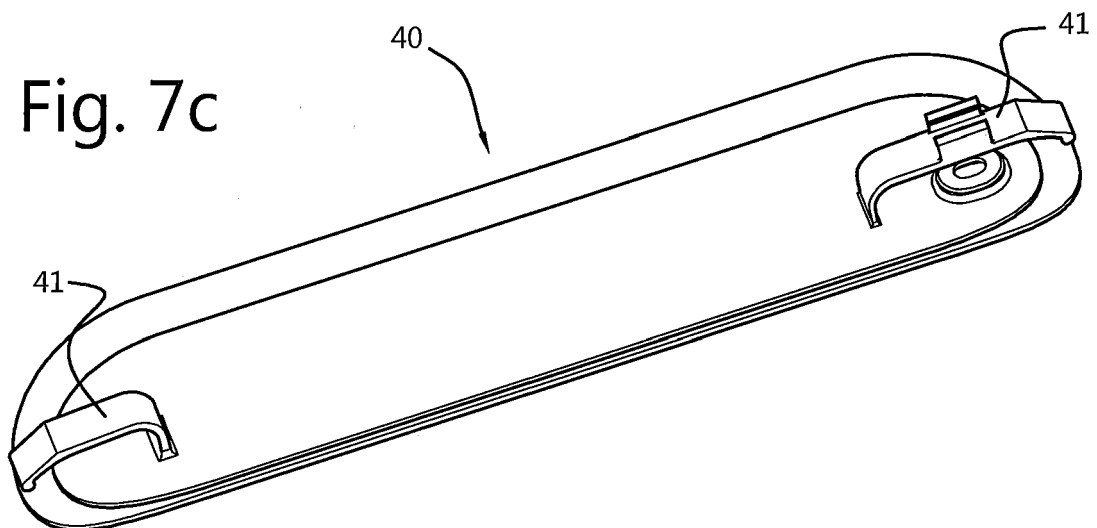


Fig. 8a

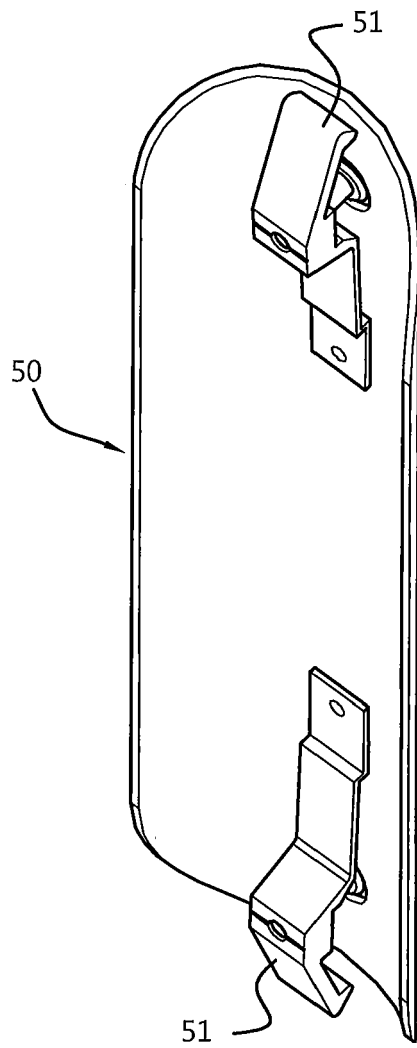


Fig. 8b

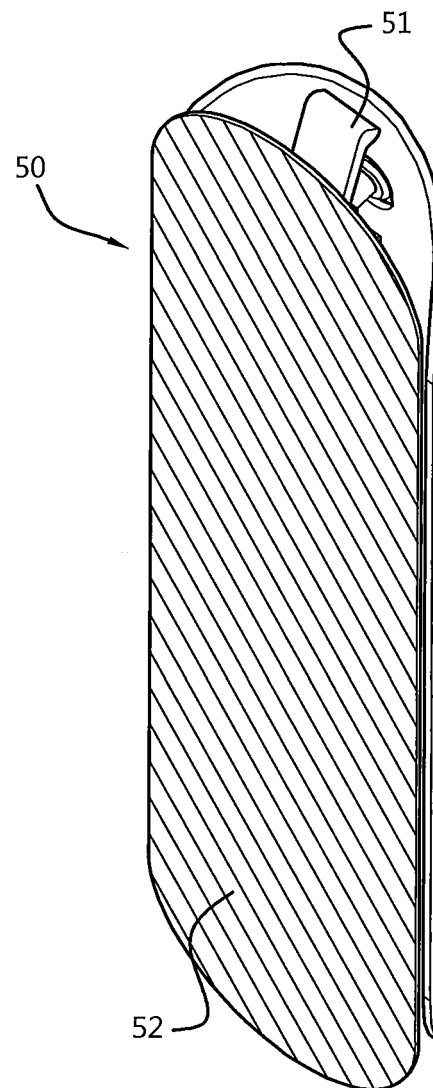


Fig. 9

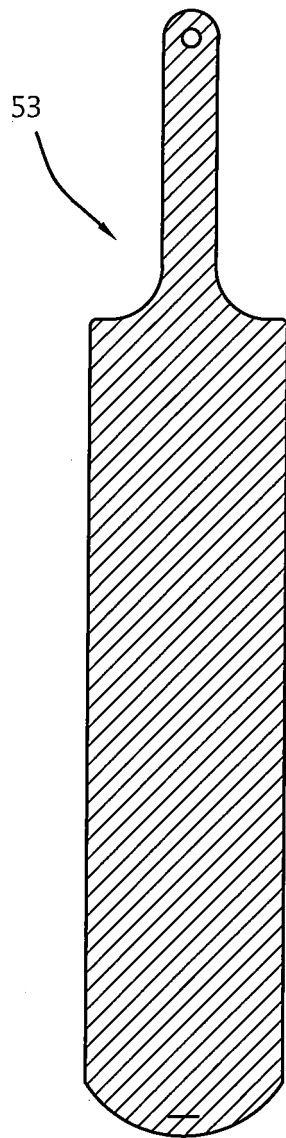


Fig. 10

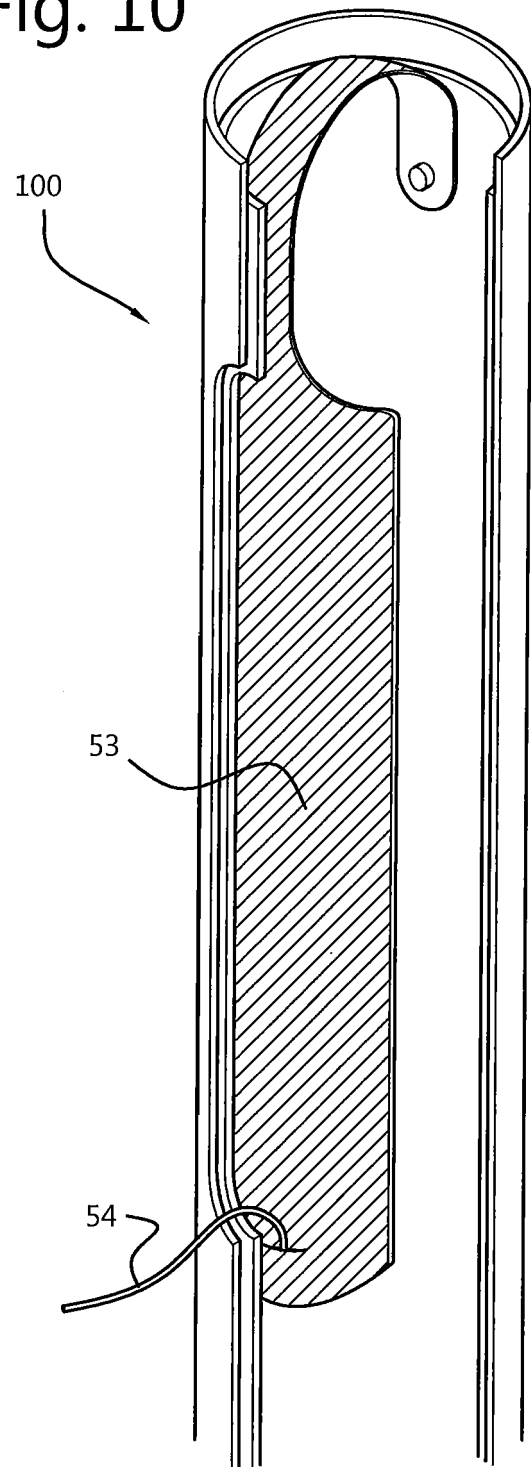


Fig. 11

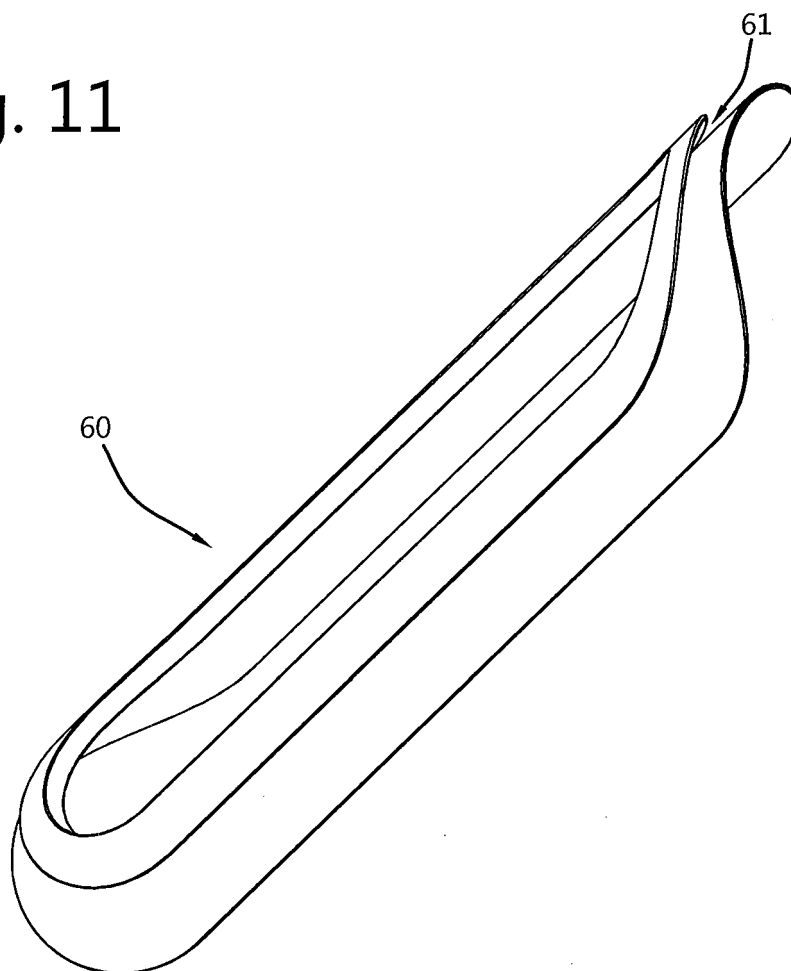


Fig. 12

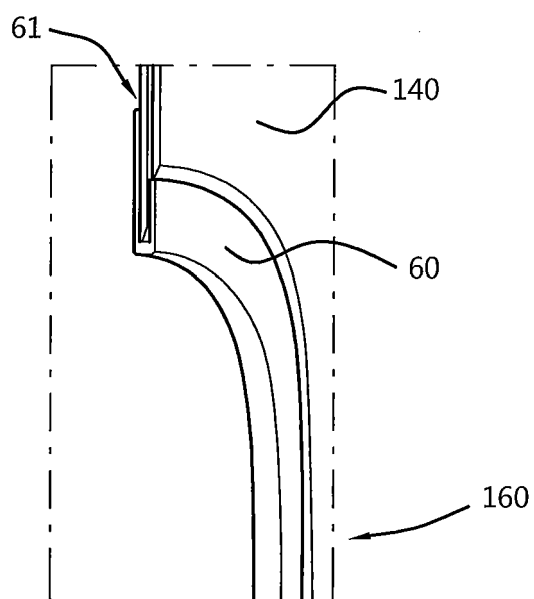


Fig. 13a

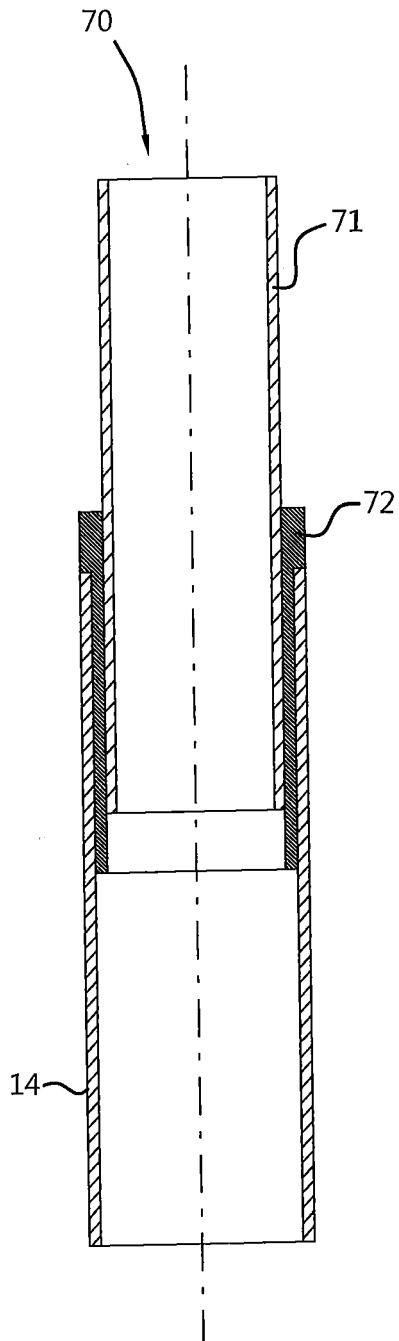
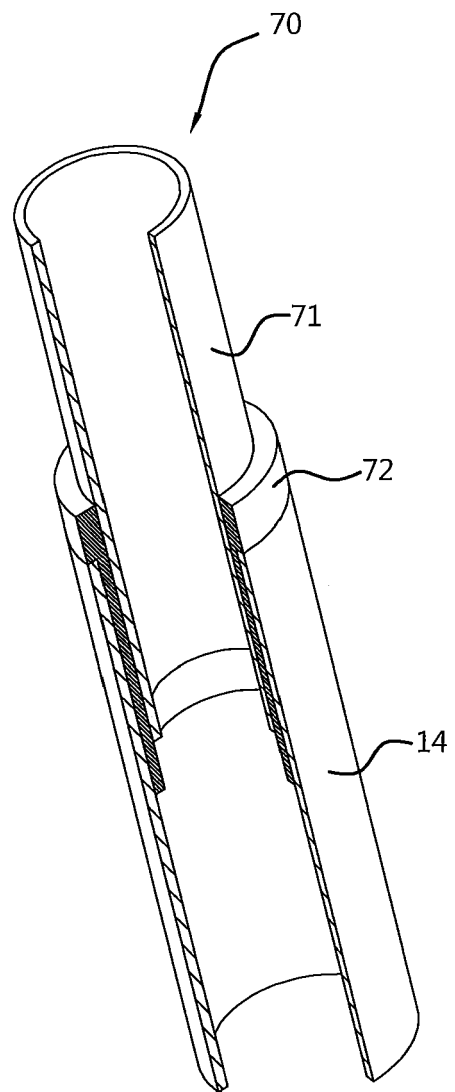


Fig. 13b





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Application Number
EP 17 15 4026

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Y	* page 1, lines 1-2; figures 1-3 *	1,2,14	
A		4,11,13	
Y	----- US 6 303 857 B1 (GINSBURG THOMAS A [US]) 16 October 2001 (2001-10-16)	1,2,14	
A	* column 4, lines 22-23 * * column 5, lines 41-46; figure 3 *	3-13,15	
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			E04H E01F
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 21 June 2017	Examiner Decker, Robert
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82