(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 213 793 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
12.06.2002 Bulletin 2002/24

(51) Int Cl.[7]: **H01R 9/03**

(21) Application number: **01402801.3**

(22) Date of filing: **29.10.2001**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE TR
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **27.10.2000 IT MI002327**

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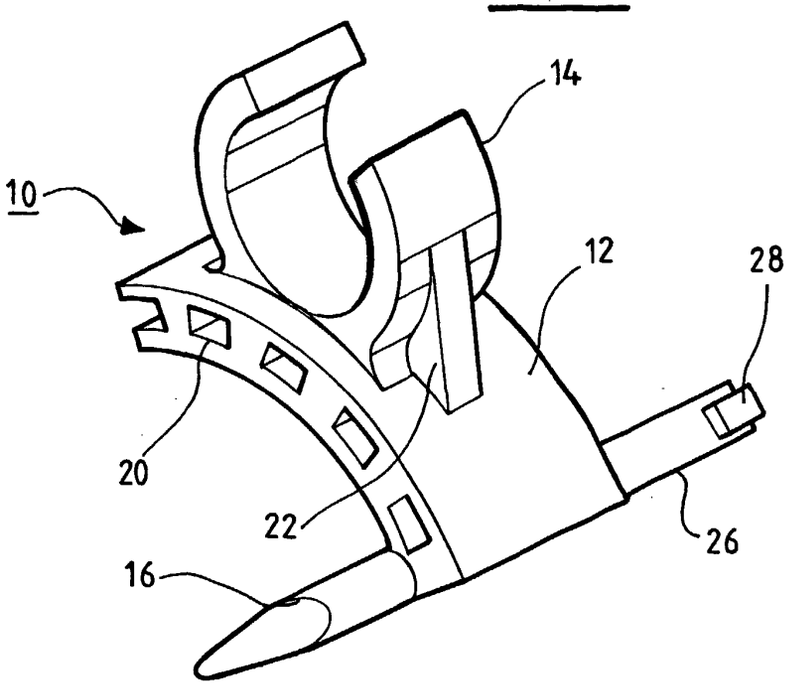
(54) Clamp for electrical cables

(57) This invention relates to a clamp element (10, 10') for making a junction between at least one phase conductor of a main cable and at least one branch cable, said element (10, 10') comprising a base support (12, 12') with means (14, 14') for receiving said branch cable and an elongate member (16, 16') projecting from said base support (12),
the clamp element (10, 10') being **characterized in that** said elongate member (16, 16') is substantially parallel to the axis of said means (14, 14') for receiving said branch cable, so that it can be inserted underneath the sheath of said main cable, between one phase conductor and the adjacent phase conductor.

FIG_1



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Description

[0001] The present invention relates to electrical cables and in particular branch junctions for electrical cables. Still more particularly it relates to a clamp element used to clamp in position the branches in branch junctions for electrical cables.

[0002] As is known, there are many cases in which it is necessary to connect the phase conductors of a main cable with the phase conductors of a branch cable. A typical case is when electrical power is to be carried to a building (or group of buildings) by tapping it off from a main cable.

[0003] Currently known ways of making these branch junctions are complicated, dangerous, lengthy, inconvenient and unsafe from the point of view of protecting the environment. In practice it is necessary to interrupt the flow of electrical power in the main cable, remove the outer insulating sheath and manually strip a certain length of the cables (or phase conductors) from which the branches are to be taken. The stripped lengths are connected to their respective branches with clamp-type devices. The insulation of the main cable must be renewed at the location where the insulating sheath has been removed by means of insulating resin and/or tapes.

[0004] Another disadvantage with this known solution is that it is impossible to check the junction for efficiency once the insulating resin and/or tape has been applied. Indeed, if the junction partially or totally fails the only option is to cut the main cable where the junction was made and make a new junction with a different device.

[0005] When making branch junctions it is a known practice to use clamp elements for attaching the branch cables to the main cable in such a way that the axes of the branch cables are essentially parallel to that of the main cable at the junction.

[0006] Known clamp elements comprise a sharp member for pushing between one phase conductor and another of the main cable.

[0007] The principal problem with these clamp elements is that during the insertion of such elements the insulation of the various phase conductors of the main cable could be damaged, exposing electrically conducting parts of the phase conductors. It will be readily understood that this situation is highly dangerous for the electrician, especially if the main cable is live. Moreover, because of the stripping of the insulation, the junction may not be completely efficient. And in any case the insulation of the phase conductors must be renewed with resin, gel or silicone compounds and this renewal operation is time-consuming, costly and requires trained personnel.

[0008] Another problem with known solutions is that it is often difficult, if not actually impossible, to attach the clamp elements when working in cramped conditions (such as in holes in the ground) and the main cable is in contact with the ground.

[0009] The main object of the present invention is to provide a novel clamp element that does not damage the insulation of the phase conductors of the main cable and that can therefore be used safely by the electrician.

[0010] It is another object of the present invention to provide a novel clamp element that is simple to install, even in cramped working conditions.

[0011] It is yet another object of the present invention to provide a novel clamp element that can if required be removed and easily reused.

[0012] These objects, as well as others, are achieved with a clamp element for making a junction between at least one phase conductor of a main cable and at least one branch cable, said element comprising a base support with means for receiving said branch cable and an elongate member projecting from said base support,
the clamp element being **characterized in that**said elongate member is substantially parallel to the axis of said means for receiving said branch cable, so that it can be inserted underneath the sheath of said main cable, between one phase conductor and the adjacent phase conductor.

[0013] The idea on which the present invention is based is to make use of the depression or gap defined between two phase conductors and the outer insulating sheath of the main cable. As the elongate member of the damp is substantially parallel to the axis of the means for receiving the branch cable, it is easily installed within this gap.

[0014] Advantageously, the elongate member comprises at least one sharp extremity, either conical or frustoconical.

[0015] The clamp according to the invention may further comprise means for securing it to the main cable. Such means can comprise a strap, a projection and a protuberance on said projection to make a channel for the strap. This allows secure attachment of the clamp to the main cable. Advantageously, the projection continues in the opposite direction to that of the elongate member.

[0016] In an alternative embodiment of the means for securing the clamp to the main cable, such means comprise a cavity in the base support for insertion of the strap.

[0017] In a preferred embodiment, the means for receiving the branch cable comprise a clip.

[0018] In another embodiment of the clamp of the present invention, the clamp is provided with a centering protuberance projecting from the base support.

[0019] The clamp may be made of plastic material.

[0020] There now follows a detailed description of the present invention, given purely by way of non-restrictive example. It should be read with reference to the accompanying illustrative sheets of drawings.

?? Fig. 1 is a perspective view of a first embodiment of the clamp element according to the present invention;

?? Fig. 2 is a cross-sectional schematic view of a main cable provided with four clamp elements according to Fig. 1;

?? Fig. 3 is a partial longitudinal cross-sectional view of Fig. 2 illustrating how the clamp is held in place;

?? Fig. 4 is a partial longitudinal cross-sectional view of Fig. 2 illustrating another embodiment for holding the clamp in place;

?? Fig. 5 is a perspective view of a second embodiment of the clamp element according to the present invention;

?? Fig. 6 is a cross-sectional schematic view of a main cable provided with one clamp element according to Fig. 5;

?? Fig. 7 is a partial longitudinal cross-sectional view of Fig. 6;

?? Fig. 8 shows two clamp elements of Fig. 5 with a distance piece;

?? Fig. 9 shows a connector fixed in position using the clamping elements of Fig. 5.

[0021] Fig. 1 shows a first embodiment of the clamp element 10 according to the invention. The element 10 comprises a preferably curved base support 12, a clip 14 fixed to or integral with said base support 12 and an elongate member 16, also fixed to or integral with said base support 12.

[0022] The base support 12 comprises a plate curved so as to essentially match the curvature of the main cable 40 to which it will be fitted. For convenience, the base support 12 is made of a lightweight, inexpensive and electrically non-conducting material such as a plastic material and the entire element 10 can be produced as a molding, in which case the base support 12 contains holes or openings 20.

[0023] The clip 14, in the embodiment seen in Fig. 1 to 4, comprises a split cylinder (or ring) with an opening for the forced insertion of a branch cable (not shown). The clip 14 and the base support 12 are made in one piece and stiffeners 22 are provided. If desired, it would also be acceptable to have a clip 14 comprising a closed cylinder, but in that case, care would be required to thread the branch cable through the hole of the closed cylinder.

[0024] The elongate member 16 of the element 10 in the first embodiment is in the form of a pointed or sharp pin whose axis is essentially parallel to the axis of the clip 14. It is of no significance whether the point or sharp end of the elongate member 16 is conical or bevel-cut. The elongate member 16 is also made in one piece with the base support 12. The elongate member 16 is designed to be pushed into the empty space defined between two phase conductors 42 of the main cable 40 and the sheath 44 of the main cable 40, as shown in Fig. 2.

[0025] More precisely, before connecting the phase conductors 42 of a main cable 40 to individual branch cables, a part of the sheath 44 over a predetermined length of cable 40 is removed, and the clamps 10 are installed so that their respective elongate members 16 are inserted into the empty spaces defined between two phase conductors 42 of the main cable 40 and the sheath 44 of the main cable 40. It will thus be understood that once the clamps 10 are installed, their elongate members 16 are covered by the sheath 44 of the cable 40.

[0026] The dimensions in cross section of the elongate member 16 are preferably such as to fit into the abovementioned space or interval with slight pressure. The elasticity of the sheath 44 of the main cable 40 and of the insulation of the phase conductors 42 will keep the element 10 in position.

[0027] In order to lock a number of clamp elements 10 together it is convenient to use a strap 24 or the like. In the embodiment seen in Fig. 3, the strap 24 is applied around the outside of the element 10 using a projection 26 that continues in the opposite direction to the elongate member 16 and lies in the groove between two phase conductors 42 of the main cable 40, without being covered by the sheath 44. In practice a sort of channel 38 is made for the strap 24 by means of a protuberance 28 on the projection 26. The use of the strap 24 is convenient because it fastens the clamp elements 10 to the main cable and ensures that when the main cable and/or branches are moved about, the clamp elements 10 cannot be detached and fall to the ground.

[0028] In another particularly convenient and compact embodiment shown in Fig. 4, the strap 24 sits in an internal cavity 36 formed in the base support 12. The advantage in favor of this solution is that the various clamp elements can be positioned on the strap 24 (as in a necklace) and will not run the risk of falling off when handled by the electrician.

[0029] It will now be obvious how the clamp element 10 in the first embodiment is used. To make the branch junction, a certain length of insulating sheath 44 is removed from the main cable 40 and the elongate members 16 of the various clamp elements are pushed in underneath the sheath 44, into the space between two phase conductors 42. The strap 24 is then fastened around the elements 10. The branches are then inserted into the respective clips 14, and thereafter, the electrical connection (not shown) is made.

[0030] The embodiment seen in Figs. 5 to 9 makes use of the same inventive principle (elongate member parallel to the axis of the receiving means for the branch cable) but differs considerably in its structure from the clamp element 10 of the first embodiment.

[0031] As before, the clamp element 10' seen in Figs. 5 and 6 comprises a curved base support 12' and an elongate member 16' designed to be inserted underneath the sheath 44 of the main cable 40, between two phase conductors. The curved base support 12' defines a cavity 14' for receiving the branch cable 46. In the present case the elongate member 16' comprises two

elongate members 16A and 16B whose shape is frustoconical or pointed (conical or bevel-cut).

[0032] Integral with the base support 12' is a centering protuberance 30. The protuberance 30 is designed to engage with a corresponding hole in a connector, for example the connector 32 seen in Fig. 9. Typically, a pair of elements 10' in accordance with the second embodiment can be placed on the main cable 40 on each side of the length of this cable where the outer sheath 44 has been removed; in such a case, the clamp elements 10' are maintained at a certain distance from each other using a special distance piece 34 (Fig. 8).

[0033] Using a pair of elements 10' as seen in Fig. 8 can be preferred for convenience, and for reasons of stability. The elements 10' are then kept at the appropriate distance by the distance pieces 34 (which can also be removed before installing the connector 32).

[0034] As with the first embodiment, it will now be obvious how the clamp element 10' in accordance with the second embodiment is used. To make the branch junction, a certain length of insulating sheath 44 is removed from the main cable 40 and the elongate members 16' of the various clamp elements are inserted underneath the sheath 44, in the space between two phase conductors 42. The distance between two opposite clamp elements 10' is preferably controlled/adjusted by means of the distance piece 34. Finally a special connector 32 with means for creating the electrical contact between the phase conductors 42 of the main cable 40 and the corresponding branches 46 is fitted.

[0035] The protuberance 30 is generally used only for one of the clamp elements 10' or one of the pairs of clamp elements 10', especially the one to be located near the neutral phase of the main cable 40. In such a case, it provides easy location of the neutral phase, as well as easy and non-faulty connection when only one hole in the connector 32, i.e. a hole located near the connection of the neutral phase, can cooperate with protuberance 30.

[0036] The chief advantage of the clamp element according to the present invention is that it causes no damage at all to the insulation of the phase conductors of the main cable. This means greater safety for the electrician and more efficient, economical and safe junctions. The virtual impossibility of damaging the insulation of the phase conductors of the main cable also makes it unnecessary to renew this insulation with resins, mastic or silicone substances.

[0037] A similar embodiment as shown in Fig. 3 (i.e. use of projection 26 and protuberance 28) can also be applied to the embodiment of the clamp of the invention of Figs. 5 to 7.

[0038] Similarly, a protuberance 30 as shown in the embodiment of Figs. 5 to 7 can also be used in the clamp of Figs. 1 to 4.

[0039] It will be obvious that, in light of the above description, those skilled in the art will realize that numerous variants, modifications, adaptations and substitutions of parts with other functionally equivalent parts are possible. All these variants, modifications, adaptations and substitutions are however to be considered as falling within the scope of protection defined solely by the accompanying claims.

Claims

1. Clamp element (10, 10') for making a junction between at least one phase conductor (42) of a main cable (40) and at least one branch cable (46), said element (10, 10') comprising a base support (12, 12') with means (14, 14') for receiving said branch cable (46) and an elongate member (16, 16') projecting from said base support (12),
the clamp element (10, 10') being **characterized in that** said elongate member (16, 16') is substantially parallel to the axis of said means (14, 14') for receiving said branch cable (46), so that it can be inserted underneath the sheath of said main cable (40), between one phase conductor (42) and the adjacent phase conductor (42).

2. Clamp element (10, 10') according to claim 1, **characterized in that** said elongate member (16, 16') comprises at least one sharp extremity either conical or frustoconical.

3. Clamp element (10, 10') according to anyone of claims 1 or 2, **characterized in that** it further comprises means (24, 26, 28) for securing it to the main cable (40).

4. Clamp element (10, 10') according to claim 3, **characterized in that** said means (24, 26, 28) for securing it to the main cable comprise a strap (24).

5. Clamp element (10, 10') according to anyone of claims 3 or 4, **characterized in that** said means (24, 26, 28) for securing it to the main cable comprise a projection (26).

6. Clamp element (10, 10') according to claim 5, **characterized in that** said means (24, 26, 28) for securing it to the main cable comprise a protuberance (28) on said projection (26) to make a channel for the strap (24).

7. Clamp element (10, 10') according to anyone of claims 5 or 6, **characterized in that** said projection (26) continues in the opposite direction to that of the elongate member (16).

8. Clamp element (10) according to anyone of claims 4 to 7, **characterized in that** said means (24, 26, 28) for securing it to the main cable comprise a cavity in the base support (12) for insertion of the strap

(24).

9. Clamp element (10) according to anyone of claims 1 to 8, **characterized in that** said means for receiving said branch cable comprise a clip (14).

10. Clamp element (10, 10') according to anyone of claims 1 to 9, **characterized in that** it also includes a centering protuberance (30) projecting from said base support (12).

11. Clamp element (10, 10') according to anyone of claims 1 to 10, **characterized in that** it is made of a plastic material.

FIG_1

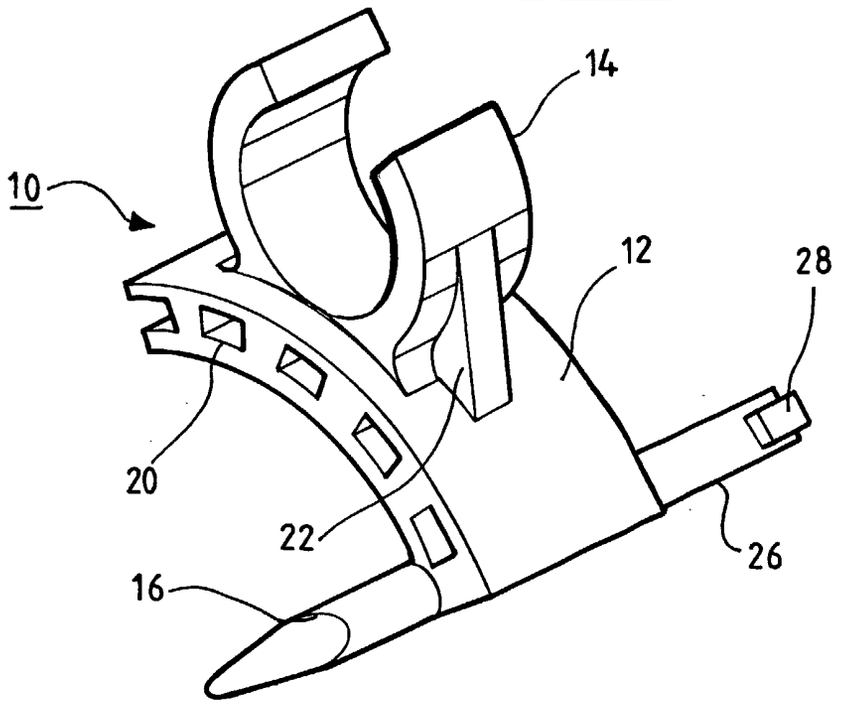

FIG_5

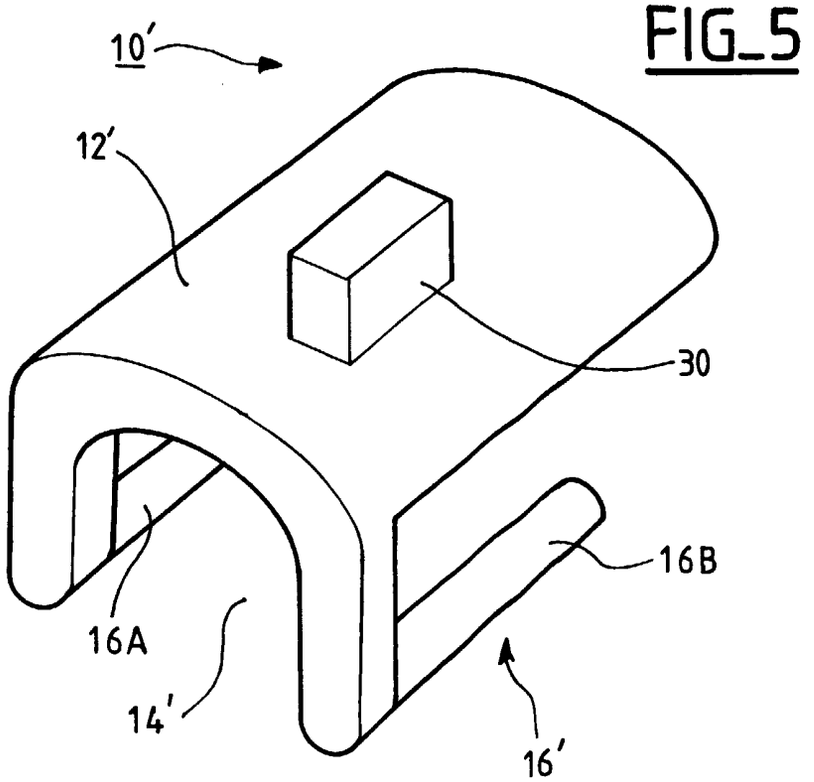

FIG_2

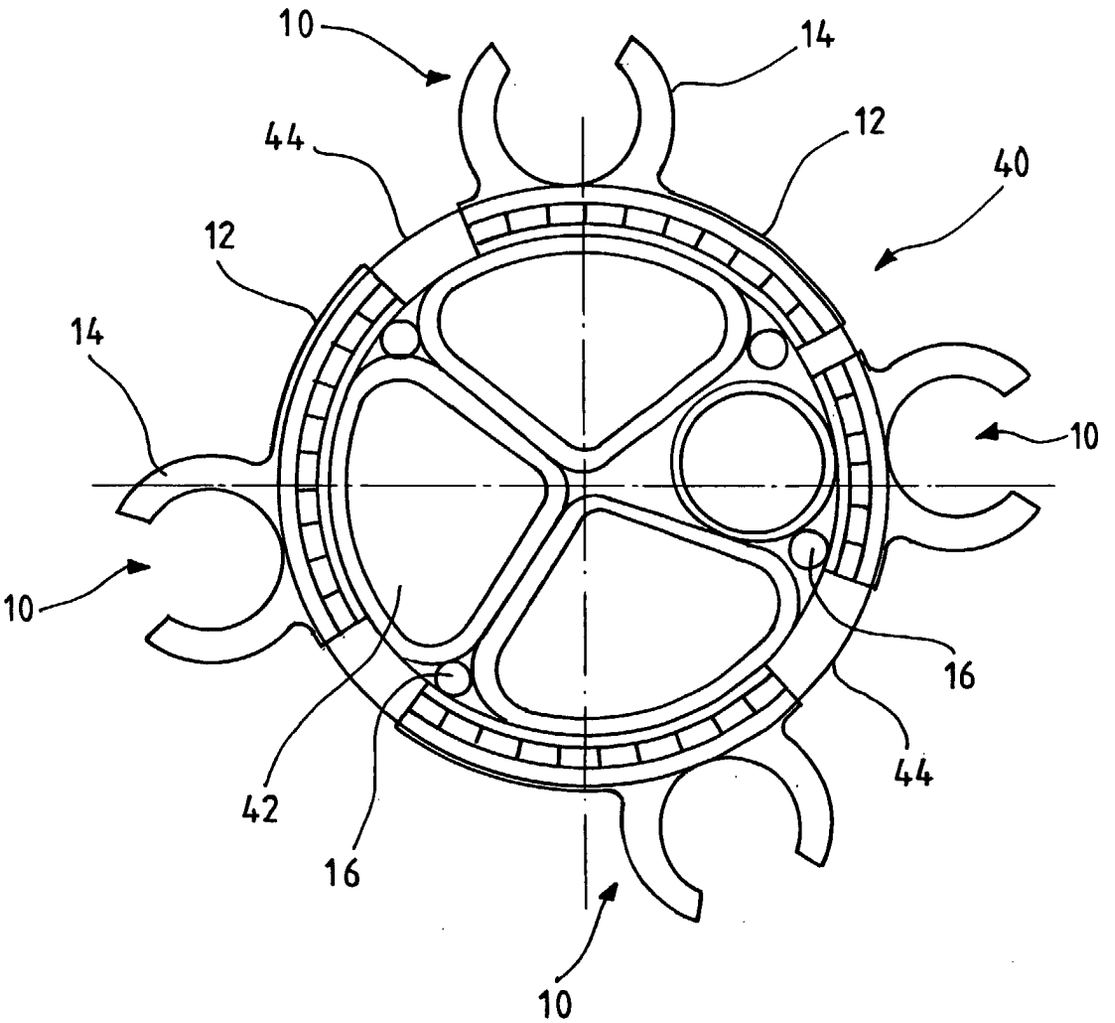

FIG_3

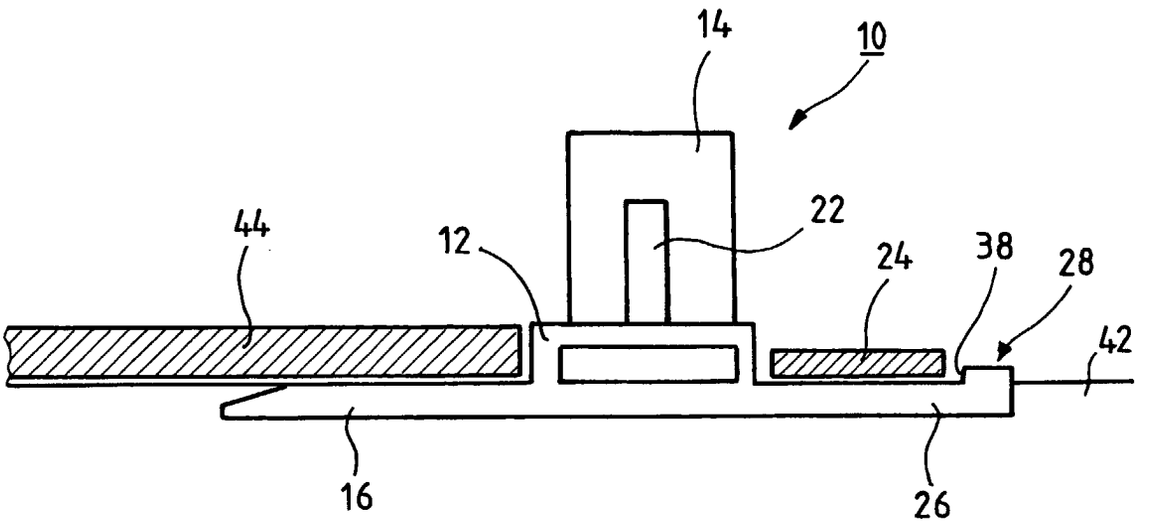

FIG_4

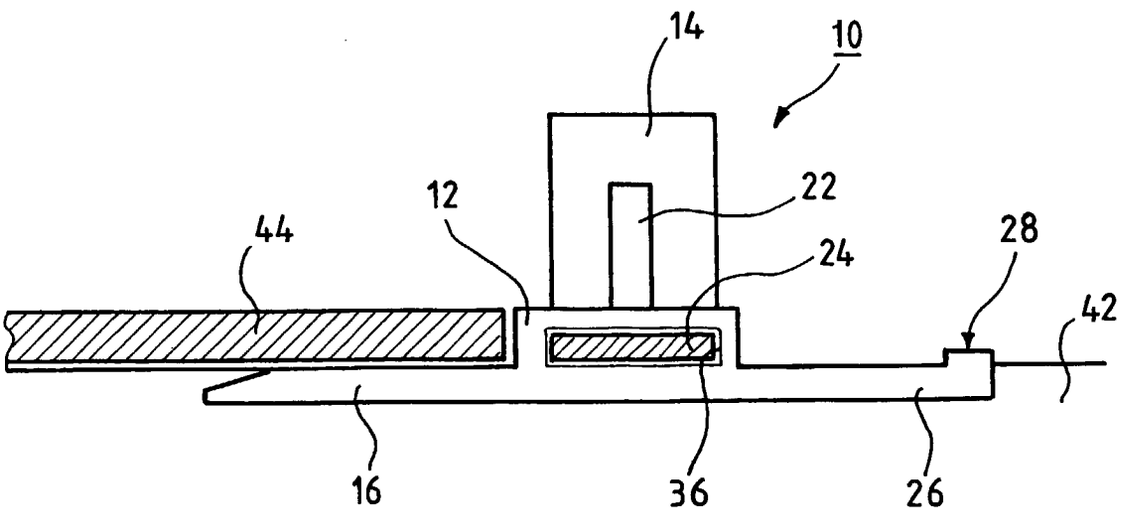

FIG_6

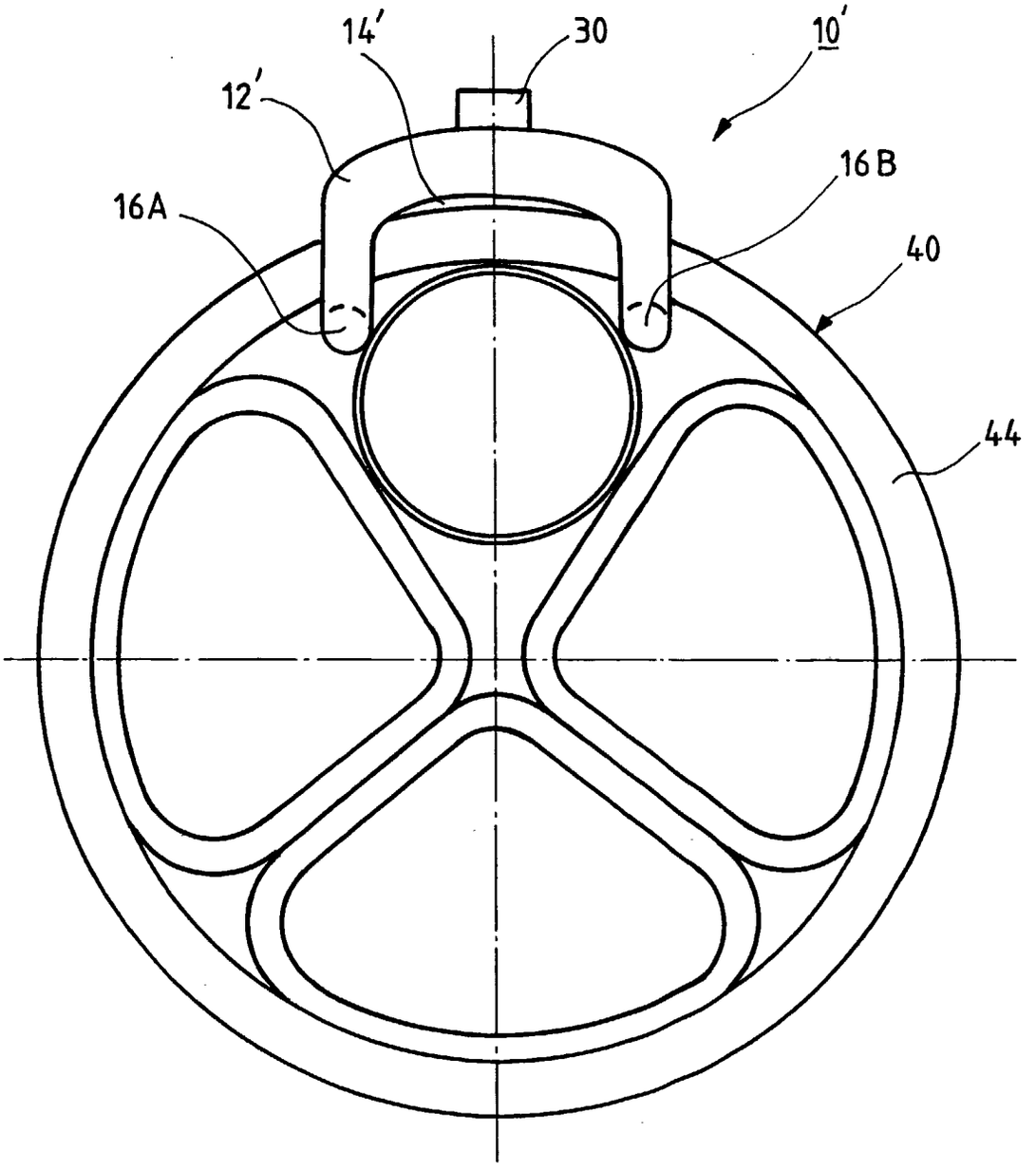

FIG_7

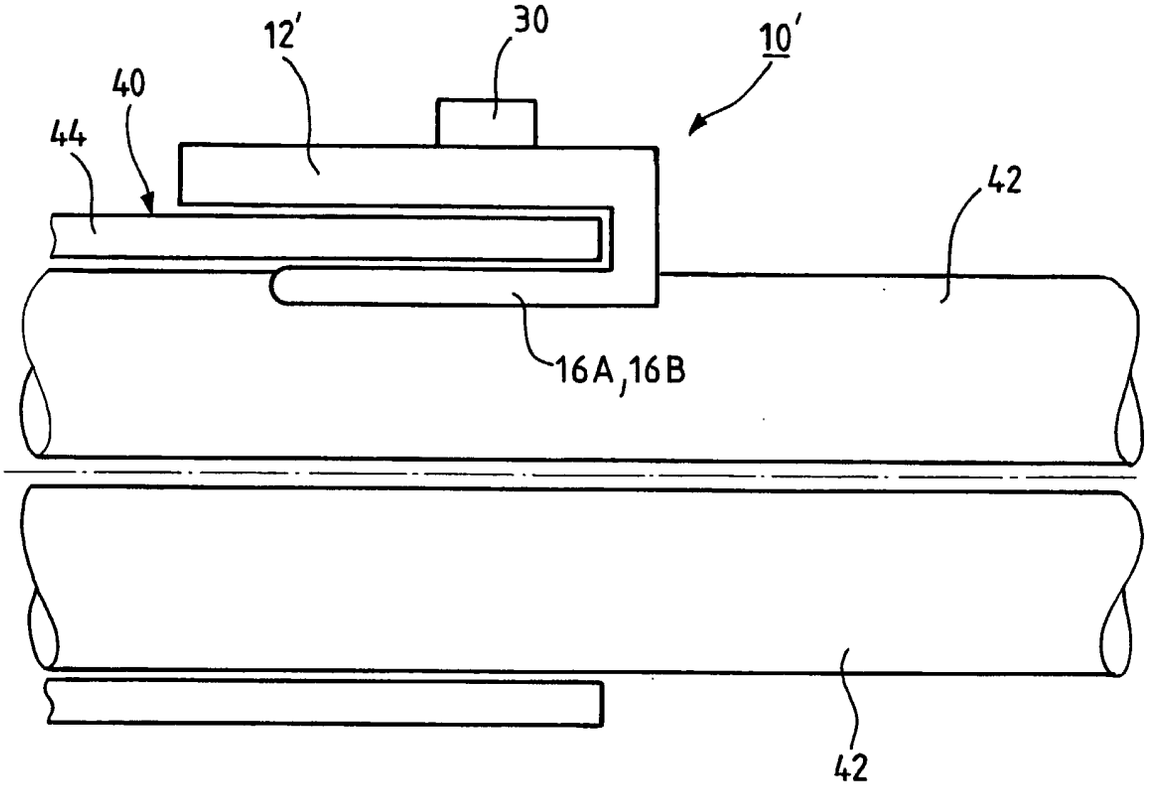

FIG_8

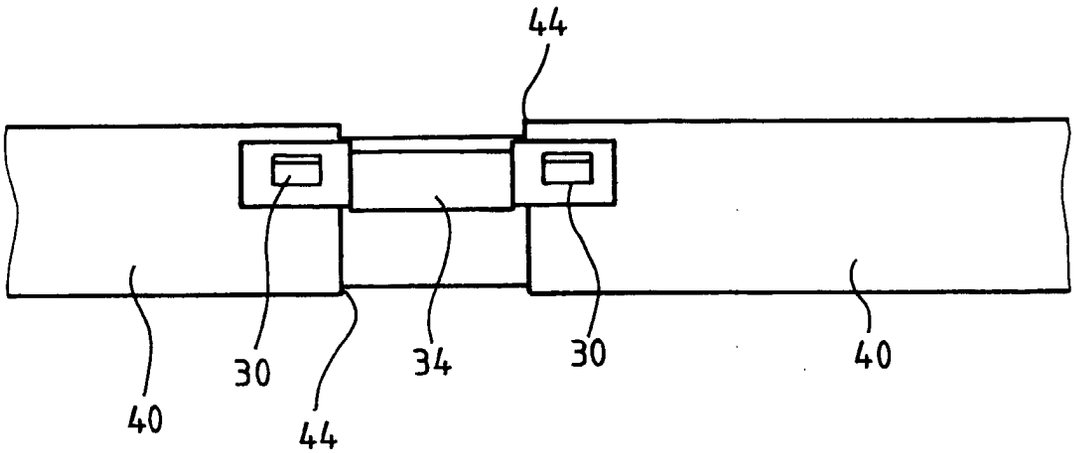

FIG_9