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(54) **Box for branching off conductors of a cable**

(57) The branch box comprises a box plate, an upper first box cover and a lower second box cover. Between the box plate and the first box cover there are means for receiving conductors of a cable. Between the box plate and the second box cover there are means for receiving second conductors which are resiliently connected with an outlet. The outlet is a modular component which is fixed to the branch box. Because of the modular construction, it is possible to easily change the design of the outlet of the box by changing the shape of the outlet.

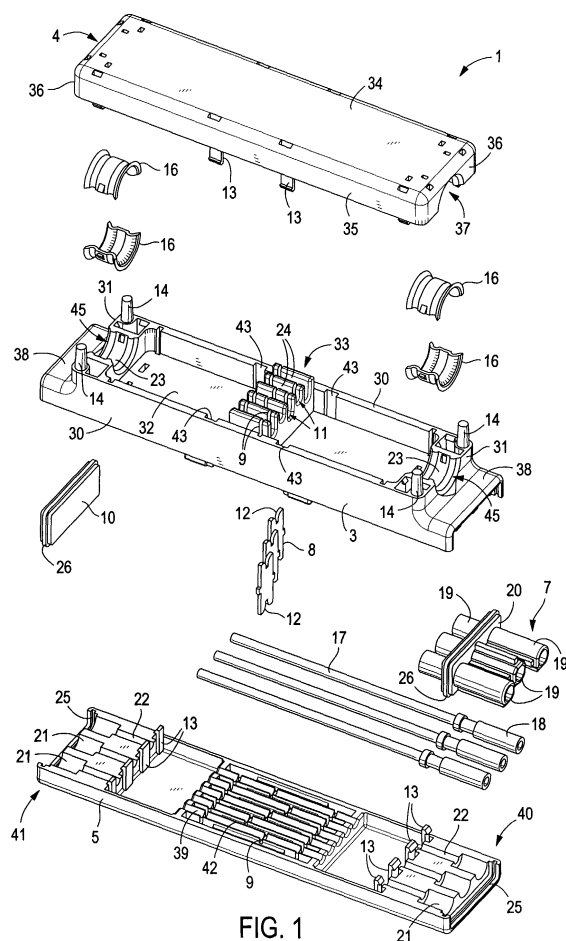


FIG. 1

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Description

[0001] The invention is directed to a box for branching off first conductors of a cable. It is well known to branch off single conductors of a cable of a main current line to conductors of another cables.

[0002] EP 0,697,751 B1 shows a box for branching off first conductors of a ribbon cable to second conductors. The box comprises two branch sockets for one plug belonging to a line to be branched off in each case and having at least one contact element seated in the branch box housing and interacting with a metallic contact sleeve that forms one pole of the branch socket, to make electrical contact with one cable line in the ribbon cable. The two branch sockets are lined up in a row in the plug-in direction with their insertion openings facing away from each other. The disadvantage of the known box is that the construction of the box is precisely determined and the construction is not flexible for different shapes of plugs for connecting with the second conductors.

[0003] US 5,964,620 describes an insulation displacement connector which shows a first and a second chamber for receiving first conductors of a cable and second conductors, whereby penetration contacts protrude from a box plate and electrically connect the first to the second conductors, respectively. However, the described connector is only designed for connecting conductors and does not provide a socket for a plug.

[0004] JP 662,468 describes a box for branching off first conductors of a cable to second conductors of a second cable, whereby a first chamber for receiving the first conductors and a second chamber for receiving the second conductors are provided. The first and the second chamber are constructed of a box plate, an upper first cover and a lower second cover. The upper and the lower second cover are resiliently latched to the base plate. The base plate comprises slots through which penetration contacts protrude. The penetration contacts are electrically connected to the first and the second conductors. Also this box for branching off does not provide any means for plugging in a plug. So the known box is not versatile for connecting different shapes of plugs.

[0005] It is an object of this invention to provide an improved box for branching off first conductors to second conductors which exhibits greater flexibility for plugging in different shapes of plugs.

[0006] The object of this invention has been achieved by providing a box for branching off first conductors to second conductors according to claim 1. Disclosed herein is a box for branching off comprising a first chamber for receiving the first conductors of a cable and a second chamber for receiving the second conductors, whereby in the first chamber recesses for receiving the first conductors are provided, whereby in the second chamber second recesses for receiving the second conductors are provided, whereby penetration contacts protrude from a box plate which divides the first and the second chamber, whereby the penetration contacts are

in contact with the first and the second conductors and the second conductors are connected to an outlet which is a component and fastened to a housing of the box.

[0007] The construction of the outlet as a component shows the advantage that the outlet could be exchanged in production by another outlet for providing connecting means for a different shape of a plug. It is therefore not necessary to produce an entire new box for different plugs, but only the outlet has to be changed in the design. The modular construction of the box is therefore advantageous for producing different types of boxes, whereby for producing boxes for connecting different shapes of plugs only the outlet as a component has to be changed. As a result the costs for providing different kinds of boxes are nearly the same as for producing only one type of box for one type of plug.

[0008] In a preferred embodiment of the invention the box comprises a box plate, an upper first box cover and a lower second box cover. The first box cover and the second box cover are resiliently connected to the box plate. Side walls of the box plate and the first box cover comprise openings for guiding the cable through the first chamber. The resilient connection between the first box cover and the second box cover to the box plate shows the advantage that the mounting of the connectors of the cable is easy.

[0009] Furthermore it is of advantage to provide receiving recesses for receiving the first conductors and providing retaining means for retaining the first conductors in said recesses. This features assure that the conductors are always in the determined positions and therefore the electrically connecting between the penetration contacts and the first conductors is guaranteed.

[0010] In a further preferred embodiment there are second receiving recesses for the second conductors and second retaining means for retaining the second conductors in the second recesses. These features results in the second conductors being precisely retained in a predetermined position and therefore guaranteeing the electrical connection between the second conductors and the penetration contacts. As a result, the electrical connection between the second conductors and the outlet is improved as well.

[0011] In a preferred embodiment of the invention the second conductors are shaped as electrically insulated wire with a solid copper core. First endings of the wires are arranged in the second receiving recesses and the second endings of the conducting cores of the wires are connected to socket contacts which are plugged in the outlet. The plug-in connection between the second conductors and the outlet allows an easy mounting and an easy replacing of the outlet by a differently shaped outlet.

[0012] In a preferred embodiment of the invention the outlet is retained in outlet recesses of the base plate and the second box cover and the outlet comprises first plastic tubes for receiving the endings of the wires and at an outer side the outlet comprises second plastic tubes for

receiving socket contact providing a plug-in contact for plugs. Using contacting sleeves as a contacting element is a well known means for providing a good contact.

[0013] An embodiment of the invention will now be described by way of an example with reference to the accompanying drawings, in which:

Fig. 1 is a perspective view of a first box cover, a box plate and a second box cover,
 Fig. 2 shows the parts of Fig. 1 from below,
 Fig. 3 shows a perspective view of the box plate and a cable with first conductors and
 Fig. 4 shows the mounted box plate with and without the cable.

[0014] Fig. 1 shows a branch box 1 at a pre-assembled stage with a perspective view of the main parts of the branch box 1. The branch box comprises a first box cover 4, a box plate 3 and a second box cover 5. The box plate 3 comprises a plate 32 with a frame 30, whereby the frame 30 comprises at two opposite sides side walls 31. The side walls 31 comprise arcuate recesses 45 which constitute a part of an opening 6 for a cable 27 (Fig. 4). The arcuate recesses 45 show the form of a half-round shell 23. In the middle of the plate 32 a guiding member 33 is arranged comprising five longitudinal grooves 11 which are aligned along the longitudinal axis of the box 1. The grooves 11 are bordered by longitudinal walls 24. The guiding member 33 may be made of plastic and is preferably in one piece with the box plate 3.

[0015] On top of the box plate 3, there the first box cover 4 is arranged, which comprises latching hooks 13 for resiliently connecting the first box cover 4 to the box plate 3. The box plate 3 comprises latching recesses 43 which engage with the latching hooks 13. The first box cover 4 comprises a second plate 34 which is surrounded by a second frame 35. The second frame 35 shows second side walls 36 which are arranged at opposite sides along the axis of the branch box 1. The second side walls 36 comprise second arcuate recesses 37 which are arranged symmetrically to the first arcuate recesses 45 of the first side walls 31. The second arcuate recesses 37 constitute circular half-round shells 23. The half-circular shells 23 are fitted with four suitable half-circular sleeves 16. In an assembled position two half-circular sleeves 16 form a ring for fastening the cable 27 with the box 1.

[0016] The four corners of the frame 30 are provided with retaining pins 14 which get engaged with retaining holes 15 of the first box cover 4 (Fig. 2). From side walls 31 of the box plate 3 cover parts 38 are extending in a parallel plane to the box plate 3.

[0017] Below the box plate 3 a second box cover 5 is shown. The second box cover 5 incorporates in its center second longitudinal grooves 39 for receiving second conductors in the shape of electrically insulated wire 17 with a solid copper core. The wires 17 are depicted above the second box cover 5 comprising at one end a

socket contact 18 which is connected to the wire 17. The socket contacts 18 are made of an electrically conducting material.

[0018] In an assembled branch box 1, the socket contact 18 is stuck in a tube 19. In an assembled position, the tube 19 lies in a tube recess 21. The tube recesses 21 are part of an upper side of the second box cover 5. The tube 19 protrudes from a second end plate 20. An outlet 7 comprises for every socket contact 18 a tube 19 which is held by a second end plate 20. The outlet 7 is a component which is produced individually and assembled with the box plate 3 and the second box cover 5. The modular design of the outlet 7 shows the advantage that the design of the outlet 7 could be changed easily. In the assembled position, the second end plate 20 is positioned in a groove 25 which is part of the second box cover 5 and the box plate 3 in close proximity to the tube recesses 21. The second end plate 20 comprises a rim 26 which is arranged in the assembled position in the groove 25. In an assembled position, the wires 17 are positioned in the respective longitudinal second grooves 39 and in the guiding recesses 22. As depicted in Fig. 1, the second box cover 5 comprises at the opposite side of a first connecting end region 40, which comprises the tube recesses 21 and guiding recesses 22, a second connecting end region 41 which is constructed symmetrically to the first connecting end region 40. The shown embodiment comprises a contact socket 7 only at the first connecting end 40. Depending on the use of the branch, tapping box 1 could also be provided with a second contact socket at the second connecting end region 41. In this embodiment there would also be wires with socket contacts which are retained in the second grooves and positioned in second tubes of a second outlet, respectively. The second grooves 39 are divided by second walls 42.

[0019] In a preferred embodiment one wire 17 could be connected over two socket contacts 18 with two contact sockets 7 which are arranged at opposite connecting end regions 40, 41 of the second box cover 5.

[0020] However, the shown embodiment comprises only one contact socket 7 and at the second connecting end region 41 is provided with an end plate 10 with a rim 26. In an assembled position, the rim 26 engages with a groove 25 of the second box cover 5 and the box plate 3.

[0021] For assembling the second box cover 5 to the box plate 3 there are latching hooks 13 provided at the second box cover 5 and at a lower side of the box plate 3. The second box cover 5 and the box plate 3 comprise latching recesses which get engaged with the latching hooks 13 of the box plate 3 and the second box cover 5 by mounting the second box cover 5 onto the box plate 3.

[0022] In an assembled position penetration contacts 8 are inserted into slots 9 which are provided in the box plate 3 for each longitudinal groove 11. The contacts 8 are made of conductive material. The slots 9 are per-

pendicular to the longitudinal axis of the grooves 11. The penetration contacts 8 comprise at two ends a displacement slot 12 which displaces an insulation of a wire by pushing the wire in the displacement slot 12. Furthermore, the penetration contacts 8 get in contact with the bare copper core of the wire.

[0023] Fig. 2 depicts the parts of the branch tapping box 1 from below. The first box cover 4 comprises the second frame 35 which surrounds the second plate 34. The corners are provided with retaining holes 15 which engage with the retaining pins 14 by assembling the first cover box 4 to the box plate 3. Furthermore, the first cover box 4 is provided with latching hooks 13 which engage by assembling the first cover box to the box plate 3 with corresponding latching recesses which comprised by the box plate 3. The first cover box 4 comprises at two end walls half-circular openings which provide half-circular shells 23 for retaining half-circular sleeves 16.

[0024] The lower side of the box plate 3 comprises at a first and a second connecting end region 40, 41 a symmetrical shape to the connecting ends 40, 41 of the second box cover 5. There are also guiding recesses 22 for receiving the wires 17 and tube recesses 21 which are connected to the guiding recesses 22 for receiving the wires 17 and the tubes 19. The guiding recesses 22 and the tube recesses 21 have the shape of half cylinders.

[0025] The box plate 3 comprises at the two connecting ends 40, 41 a groove 25 for retaining the rims 26 of the end plate 10 and the second end plate 20. The center of the lower side of the box plate 3 comprises a second retaining member 44 with longitudinal third grooves 46 for retaining the wires 17 in the longitudinal axis of the branch box 1. The second retaining member 44 comprises the slots 9 into which the penetration contacts 8 are inserted in the assembled position. In a preferred embodiment the box plate 3, the first box cover 4 and the second box cover 5 are made of an insulating material, particularly plastic.

[0026] Fig. 3 shows an explosive view of the box plate 3 with a cable 27 with insulated conductors 28 which are guided through the branch box 1. The insulating cover of the cable 27 is retained at the entry and at the exit of the box 1 by two half sleeves 16 and fixed with the housing of the box. The cable 27 is fixed at two points with the half sleeves 16. Between the fixing points the insulating layer of the cable 27 is displaced and the conductors 28 which also comprise an insulating layer lie in the longitudinal grooves 11. The single conductors 28 are separated by the walls 24. The insulating layer of the conductors 28 is displaced by the penetration contacts 8 and the penetration contacts 8 are in contact with the copper core of the conductors 28 which are usually wires. The penetration contacts 8 are also in contact with the copper cores of the insulated wires 17. Therefore, there is an electrical contact between the wires 17 and the conductors 28, whereby one wire 17 is in contact with one conductor 28. The conductors 28 are retained

in the longitudinal grooves 11 by the first box cover 4 which comprises retaining means at the lower side for retaining the conductors 28 in the longitudinal grooves 11.

[0027] Fig. 4 shows the assembled branch box 1 with a cable 27 which is guided through the branch box 1 from an upper and a lower point of view. The cable 27 comprises usually five conductors, whereby three conductors guide the phases of the current, one conductor guides the mass potential and one conductor guides a neutral phase. Usually, one would only want to branch off the three phases, therefore the described embodiment only provides three wires 17. If more conductors are to be branched off, only the first and second connecting ends 40, 41 of the base plate 3 and the second box cover 5 have to be shaped in a respective form for receiving five wires 17. Accordingly, the contact socket 7 also has to be changed comprising more or less contact sleeves 19 and more or less outlet sleeves 45.

[0028] The assembled branch tapping box 1 shows shoulders 47 at the two opposite endings, whereby the lower part of the box plate 3 is longer than the upper part of the box plate 3. Accordingly, the first box cover 4 shows a shorter length than the second box cover 5. The branch tapping box 1 shows at the opposite endings a step shape 47, whereby the openings 6 for the cable 27 are arranged at a given distance to the contact socket 7 in closer proximity to a center of the branch tapping box 1. This shape shows the advantage that the latching hooks 13 which are provided at the corners of the first cover box 4 could be formed with a greater cross section in a plane of the base plate 3, because they stick in the box plate 3 at a region at which the wires 17 are arranged which show a smaller diameter than the plug elements 18. In this region there is more space provided for latching the first box cover 4 to the box plate 3. This is of advantage as the latching hooks 13 have to provide the fixing force which is necessary to force the half sleeves 16 against the cable 27 for retaining the cable 27 at the branch tapping box 1. Latching recesses 43 which get engaged with the latching hooks 13 of the corners of the first box cover 4 are arranged beside or between the guiding recesses 22 of the box plate 3.

[0029] For easy changing of differently shaped contact sockets 7, the ending portions which comprise at the box plate 3 and at the second box cover 5 the tube recesses 21 and the guiding recesses 22 are resiliently connected to the box plate 3 and the second box cover 5. For connection, resilient latching members are provided, for example latching hooks and latching recesses.

Bezugszeichenliste

[0030]

- 1 branch box
- 2

3 box plate
 4 first box cover
 5 second box cover
 6 opening
 7 outlet
 8 penetration contact
 9 slot
 10 end plate
 11 groove, longitudinal
 12 displacement slot
 13 latching hook
 14 retaining pin
 15 retaining hole
 16 half sleeve
 17 insulated wire
 18 socket contact
 19 tube
 20 second end plate
 21 tube recess
 22 guiding recess
 23 half-round shell
 24 longitudinal wall
 25 groove
 26 rim
 27 cable
 28 conductors
 29
 30 frame
 31 side wall
 32 plate
 33 guiding member
 34 second plate
 35 second frame
 36 second side walls
 37 second arcuate recess
 38 cover part
 39 second groove
 40 first connecting end
 41 second connecting end
 42 second wall
 43 latching recess
 44 second retaining member
 45 first arcuate recess
 46 third groove
 47 step shape

Claims

1. Box (1) for branching off first conductors (28) of a cable (27) to second conductors (17) comprising a first chamber for receiving the cable (27) and a second chamber for receiving the second conductors (17), whereby in the first chamber recesses (11) are provided for receiving the first conductors (28), whereby in the second chamber second recesses (39) are provided for receiving the second conductors (17), whereby penetration contacts (8) are pro-

vided protruding a box plate (3) which divides the first and second chamber, whereby the penetration contacts (8) are in electrical contact with the first and the second conductors (28, 17), **characterised in that** the second conductors (17) are connected to an outlet (7) and **that** the outlet (7) is a modular component which is fixed to the box (1).

2. Box according to claim 1 **characterised in that** the box (1) comprises the box plate (3), an upper first box cover (4) and a lower second box cover (5), **that** the first box cover (4) and the second box cover (5) are resiliently connected to the box plate (3), **that** the first chamber is arranged between the first box cover (4) and the box plate (3) and **that** the second chamber is arranged between the box plate (3) and the second box cover (5), **that** the box plate (3) and the first box cover (4) comprise openings (6) at two opposite sides for guiding the cable (27) through the first chamber.

3. Box according to claim 2, **characterised in that** the box plate (3) comprises at an upper side the recesses (11) for receiving the first conductors (28) of the cable (27), **that** the first box cover (4) comprises means for retaining the first conductors (28) in the recesses (11), **that** the box plate (3) comprises slots (9), through which the penetration contacts (8) protrude, electrically connecting the first and the second conductors (28, 17).

4. Box according to claim 3, **characterised in that** the box plate (3) comprises at a lower side second receiving recesses (46) for the second conductors (17), **that** the second box cover (5) comprises means for retaining the second conductors (17) in the second recesses (46).

5. Box according to any of the preceding claims, **characterised in that** the second conductors are insulated wires (17), **that** first endings of the wires (17) are arranged in the second receiving recesses (46), that second endings of conducting cores of the wires (17) are connected to socket contacts (18), **that** the socket contacts (18) are plugged in the outlet (7).

6. Box according to claim 5 **characterised in that** the outlet (7) is retained in outlet recesses (21) of the base plate (3) and the second box cover (5), **that** the outlet (7) comprises tubes (19) for receiving the socket contacts (18), **that** the outlet (7) comprise a wall (20) for retaining

the outlet (7) in a groove (25) of the box plate (3) and the second box cover (5).

7. Box according to any one of the claims 2 to 6, **characterised in that** cable openings are provided at side walls (31) of the box plate (3), that the side walls (31) are arranged at a predetermined distance in closer proximity to a centre of the box (1) in comparison to side walls (10, 20) of the second box cover (5).

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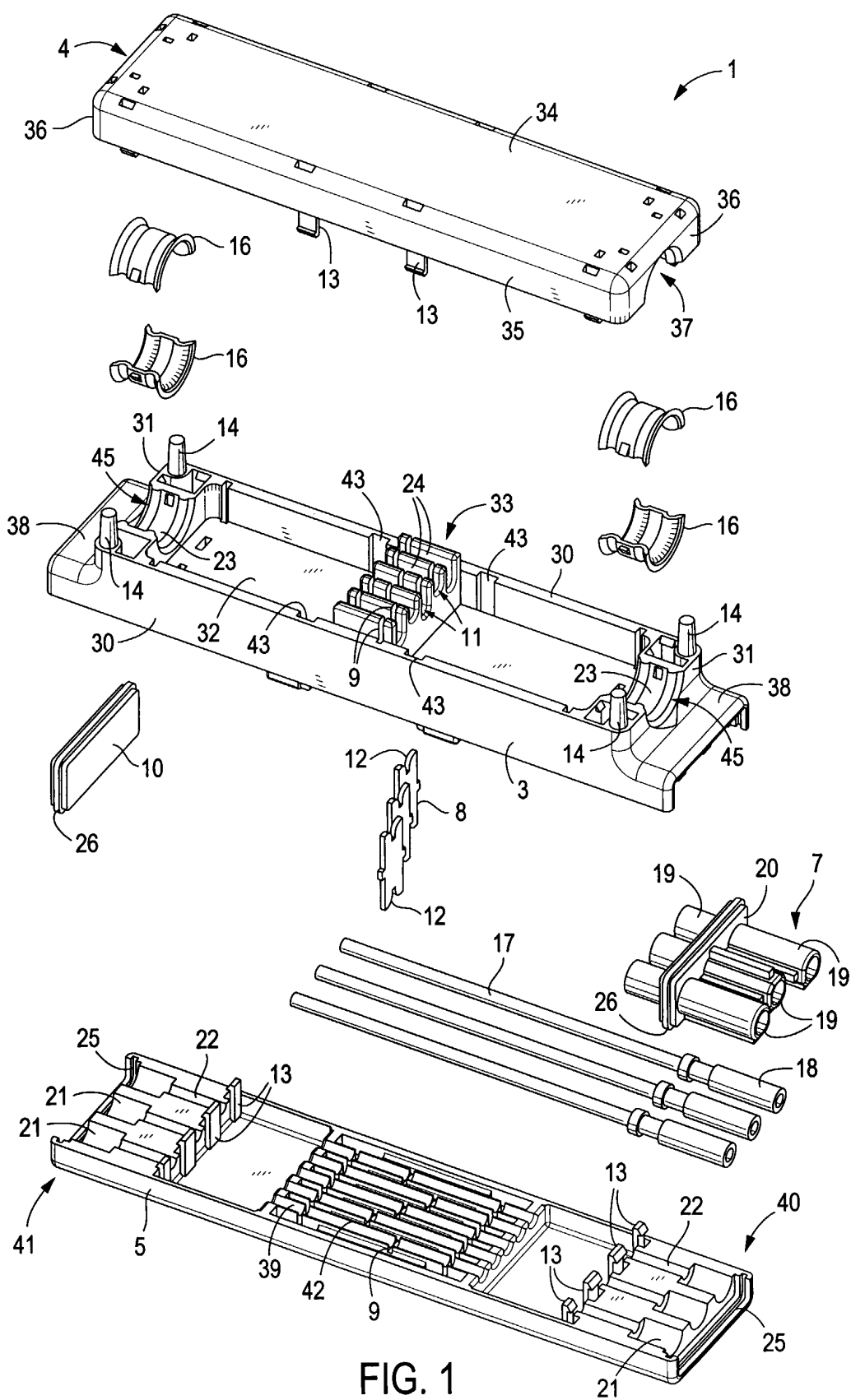


FIG. 1

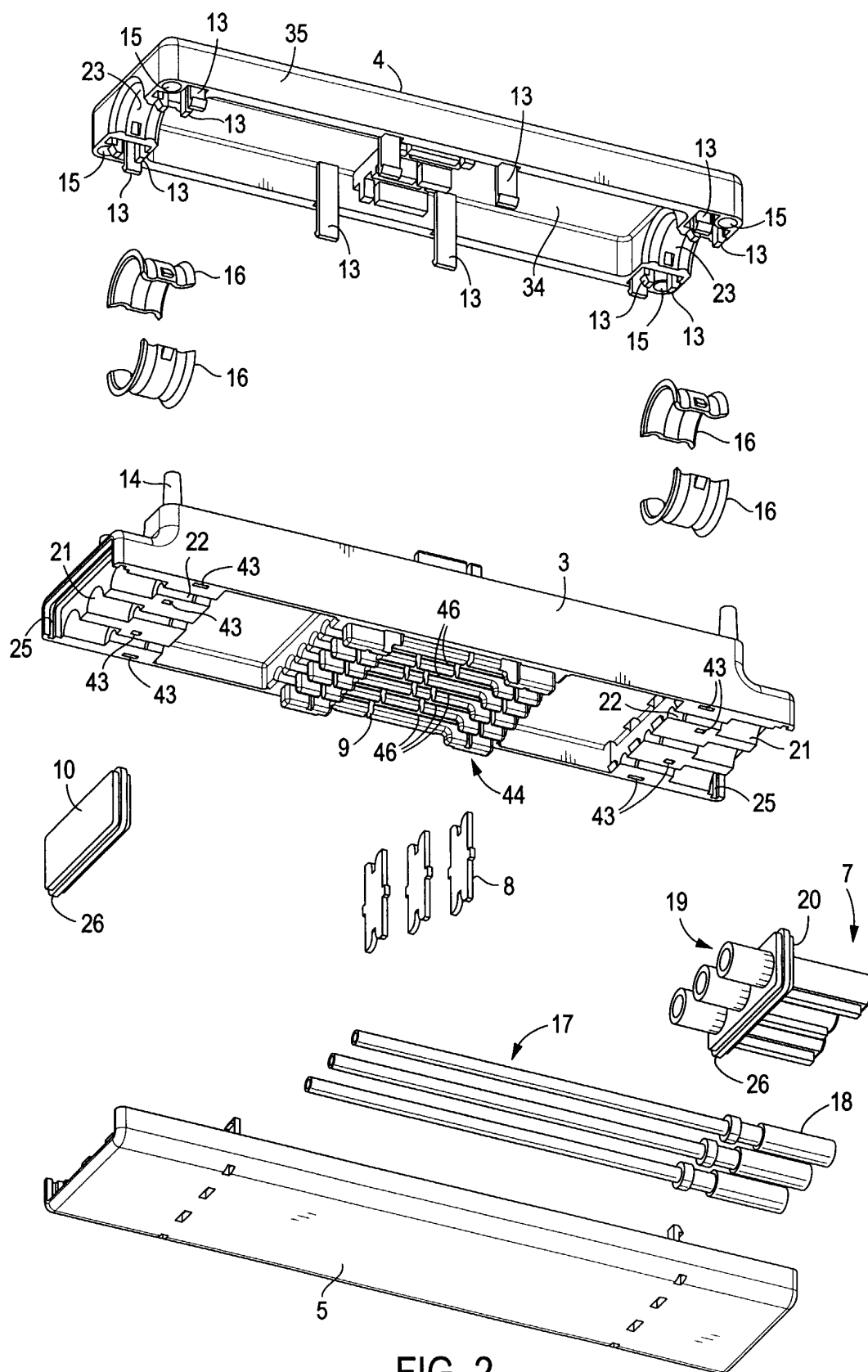
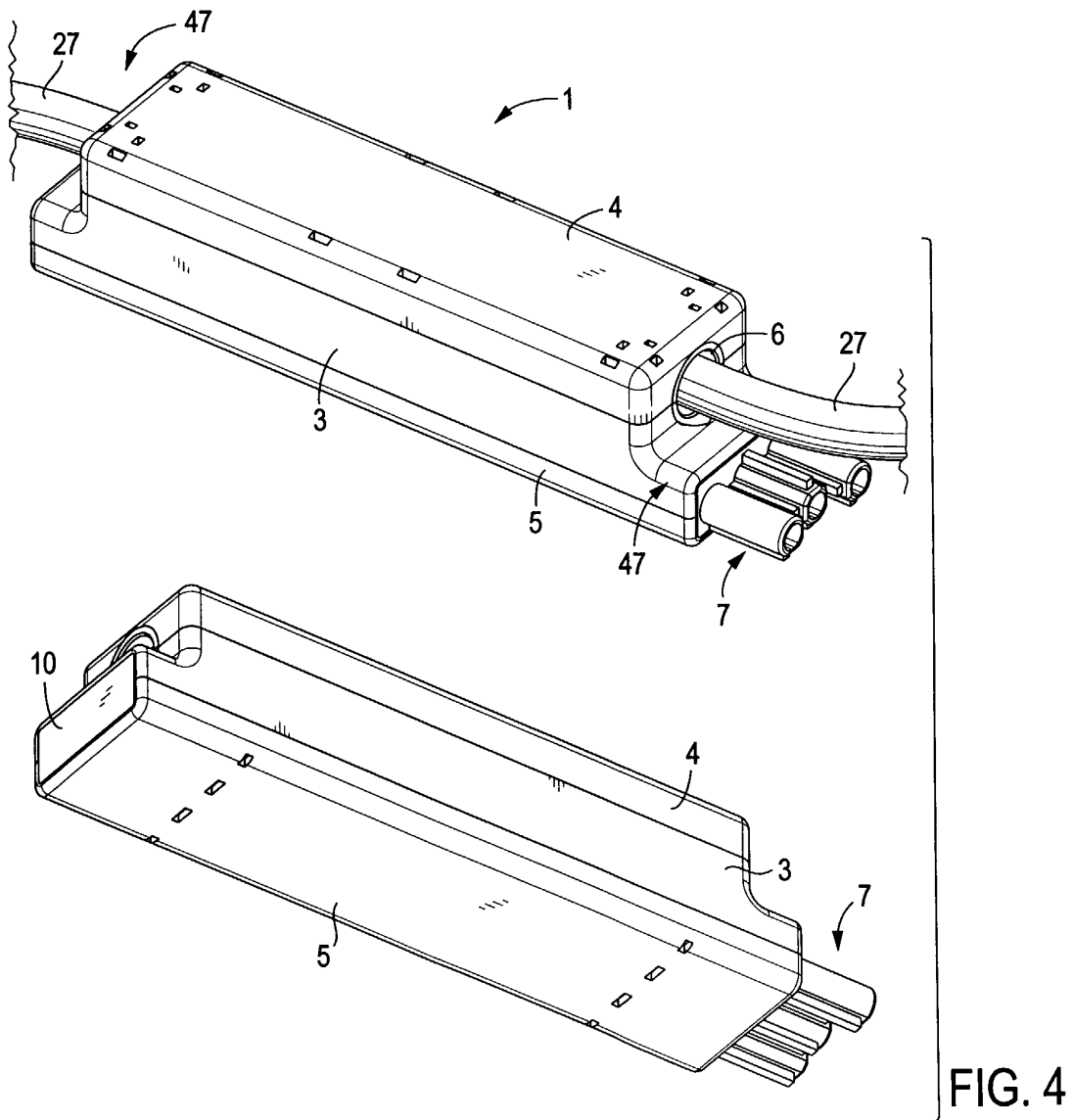
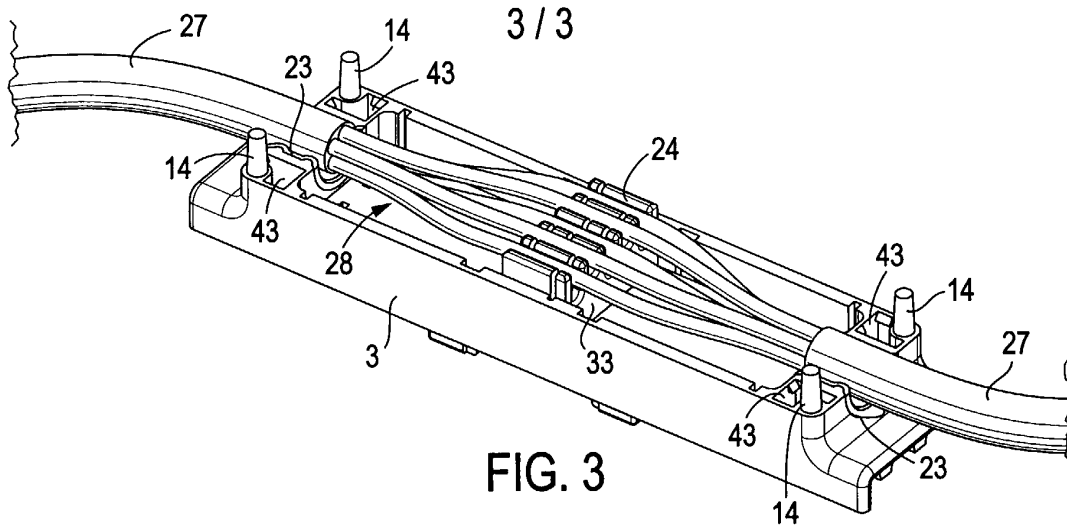


FIG. 2





European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 03 01 0862

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
Y	US 4 552 429 A (G.M. VAN ALST) 12 November 1985 (1985-11-12) * column 4, line 22 - column 5, line 5 *	1,2	H01R9/03 H01R4/24
A	* column 5, line 34 - line 55; figures 1-4 *	3,4	
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A	--- US 6 116 931 A (E.W.MCCLEEREY ET AL) 12 September 2000 (2000-09-12) * column 2, line 48 - column 3, line 18 * * column 4, line 5 - line 37; figures 1,2,7,8 * -----	1	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.7) H01R
Place of search BERLIN		Date of completion of the search 19 September 2003	Examiner Alexatos, G
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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19-09-2003

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