



(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:

14.01.2004 Bulletin 2004/03

(51) Int Cl.7: H01R 4/24, H01R 12/08

(21) Application number: 03254215.1

(22) Date of filing: 02.07.2003

(84) Designated Contracting States:

AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IT LI LU MC NL PT RO SE SI SK TR

Designated Extension States:

AL LT LV MK

(30) Priority: 08.07.2002 CN 02123895

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(54) Device for connecting cables

(57) A connecting device for securely connecting cables comprises a first cable, a male coupling, a male terminal assembly, a second cable, a female coupling, and a female terminal assembly. The first and second cables are threadably secured to the male and female

couplings respectively. The female coupling comprises a forward recess and a sealing ring therein. Once the male and female couplings are coupled, a sealing structure is formed as a projection of the male coupling is urged against the ring and the recess. The device is simple in structure, waterproof, and reliable.

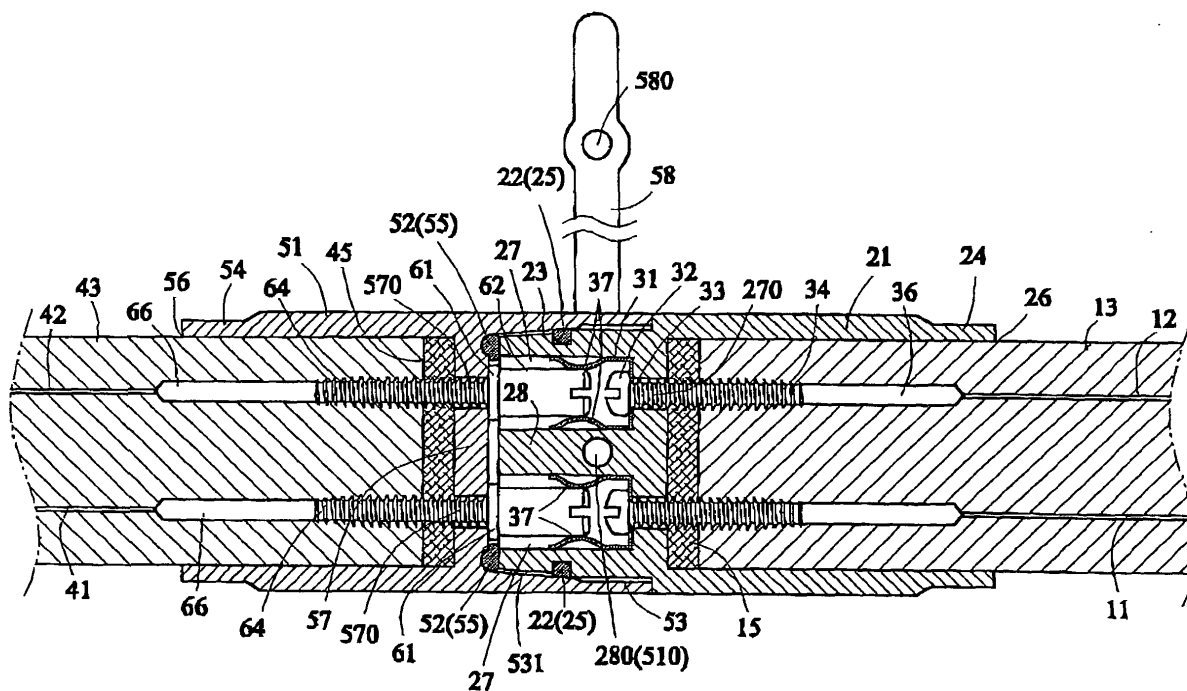


FIG. 3

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to connecting devices and more particularly to such a device for reliably connecting a pair of cables.

2. Description of Related Art

[0002] A conventional cable connecting device is shown in FIGS. 10, 11 and 12. It comprises a male coupling 1, a female coupling 2, a male fastening element 3, a female fastening element 4, a plastic shield of first cable 5, a plastic shield of second cable 6, a first coupling 7, a second coupling 8, and a union 9, wherein a securing force of the inner peripheral ridges 1b exerted on the plastic shield of first cable 5 is vertical and not sufficient, hence, such securing is not reliable. Further, a tensile strength of the cables is not sufficient in a practical use. Likewise, a securing force between the female coupling 2 and the plastic shield of second cable 6 is not reliable. Furthermore, the well-known cable connecting device consists of many loose parts (e.g., the male coupling 1, the female coupling 2, the male fastening element 3, the female fastening element 4, the plastic shield of first cable 5, the plastic shield of second cable 6, the first coupling 7, the second coupling 8, and the union 9) that have to be assembled by the user. Hence, it is expensive to produce and time consuming to assemble. Moreover, the prior art is not waterproof. In detail, water can penetrate through gaps between the inner peripheral ridges 1b of the male coupling 1 and the plastic shield of first cable 5. Also, moisture generated by the penetrated water will cause short circuit or rust in the male fastening element 3. This also occurs between the female coupling 2 and the plastic shield of second cable 6. In addition, the first coupling 7, the second coupling 8, and the union 9 are threaded parts. Hence, they are susceptible to being disengaged from the male coupling 1 and the female coupling 2. That is, the securing between the male coupling 1 and the female coupling 2 is not reliable. This in turn deteriorates the water penetration problem as well as significantly decreases the tensile strength of the cables. Thus improvement exists.

SUMMARY OF THE INVENTION

[0003] It is an object of the present invention to provide a device for connecting cables wherein at least one waterproof means is provided. For enhancing a waterproofing between the male coupling and the first cable and between the female coupling and the second cable.

[0004] It is another object of the present invention to provide an external force applied in the same direction as that of a tensility of the device, hence, a tensile

strength of the invention is advantageous over the prior art.

[0005] It is further object of the present invention to provide a reliable coupling between a male coupling and a female coupling.

[0006] It is still further object of the present invention to provide less constituent components to simplify an assembly and reduce a manufacturing cost.

[0007] The above and other objects, features and advantages of the present invention will become apparent from the following detailed description taken with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008]

FIG. 1 is a perspective view of a first preferred embodiment of a device for connecting cables according to the invention;

FIGS. 2A and 2B are exploded views of the FIG. 1 device;

FIGS. 3 and 4 are cross-sectional views taken along lines A-A and B-B of FIG. 1 respectively;

FIG. 5 is a perspective view of a second preferred embodiment of a device for connecting cables according to the invention;

FIG. 6 is an exploded view of the FIG. 5 device;

FIG. 7 is a cross-sectional view taken along line C-C of FIG. 5;

FIG. 8 is a perspective view of a third preferred embodiment of a device for connecting cables according to the invention;

FIG. 9 is an exploded perspective view of the FIG. 8 device; and

FIGS. 10, 11, and 12 are cross-sectional views of a conventional device for connecting cables before assembled, after assembled, and secured respectively.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0009] Referring to FIGS. 1 to 4, there is shown a first preferred embodiment of a device for connecting cables constructed in accordance with the invention. The device comprises a first cable 10, a male coupling 20, a male terminal assembly 30, a second cable 40, a female coupling 50, and a female terminal assembly 60. Each of above components will now be described in detail below.

[0010] The first cable 10 is formed by extruding process and comprises a pair of parallel conductors 11, 12 and a shield 13 enclosed the conductors 11, 12. The male coupling 20 comprises a first shell 21, a first sealing ring 22, a flange 24 in the rear end of the first shell 21, a space 26 within the first shell 21 for passing the first cable 10, a projection 23 in the forward end of the

first shell 21, a peripheral groove 25 around the projection 23 with the first sealing ring 22 fastened around, two parallel channels 27 (see FIGS. 3 and 4) within the projection 23, two lengthwise apertures 270 extended from the channels 27 into the space 26 (see FIGS. 2A and 3), a rib 28 between the channels 27, and a hole 280 (see FIG. 4) through the first shell 21.

[0011] As shown in FIG. 2A, the male terminal assembly 30 comprises two pairs of male terminals 31 and first bolts 32 both placed in the channels 27 of the first shell 21. The male terminal 31 is formed of metal and is substantially shaped as a cup. The male terminal 31 comprises a hole 33 provided in the bottom for permitting the first bolt 32 to pass through, two opposite first elastic wings 35, and two opposite second elastic wings 37 between the first elastic wings 35 as shown in FIG. 3, the first bolts 32 are inserted through the apertures 270 to contact the conductors 11, 12 respectively with threads 34 secured to the shield 13 of the first cable 10. The first cable 10 is in turn secured in the space 26 of the first shell 21. Thus, an external force may be applied in the same direction as that of a tensility of the device. Also, the male terminals 31 are secured in the channels 27.

[0012] Likewise, the second cable 40 is formed by extruding process and comprises a pair of parallel conductors 41, 42 and a shield 43 enclosed the conductors 41, 42. The female coupling 50 comprises a second shell 51, a second sealing ring 52, a flange 54 in the rear end of the second shell 51, a space 56 (see FIG. 3) within the second shell 51 for passing the second cable 40, a recess 53 in the forward end of the second shell 51, two parallel apertures 570 extended from an inner wall 57 of the recess 53 into the space 56, a peripheral groove 55 (see FIG. 3) at a junction of the recess 53 and the wall 57 with the second sealing ring 52 fastened around, two holes 510 on a top and a bottom of the second shell 51 respectively, a clip 58 extended from the second shell 51, and a stud 580 near the open end of the clip 58 inserted into the holes 510 for fastening.

[0013] As seen in FIGS. 2B and 3, the female terminal assembly 60 comprises a pair of second bolts 61. An elongate head 62 of the bolt 61 is formed as a contact. The second bolts 61 are inserted through the apertures 570 to contact the conductors 41, 42 respectively with threads 64 secured to the shield 43 of the second cable 40. The second cable 40 is in turn secured in the space 56 of the second shell 51. Thus, an external force may be applied in the same direction as that of a tensility of the device.

[0014] As best seen from FIGS. 3 and 4, in an assembly of the male coupling 20 and the female coupling 50, the projection 23 of the first shell 21 is inserted into the recess 53 of the second shell 51. Heads 62 of the second bolts 61 are inserted through the channels 27 of the first shell 21 to be fastened by the elastic wings 35, 37. At the same time, a first sealing structure is formed as the projection 23 of the first shell 21 is pressed around the second sealing ring 52. Further, a second sealing

structure is formed as inner surface of the recess 53 of the second shell 51 is pressed against the first sealing ring 22. This configuration can increase quality and prolong a useful life of the device.

[0015] Referring to FIG. 3 specifically, it is seen that a force of the projection 23 of the first shell 21 exerted on the second sealing ring 52 is axially. Hence, the first sealing structure is reliable. Further, first bolts 32 are driven to secure to the shield 13 of the first cable 10. A diameter of the thread 34 is larger than that of either conductor 11 or 12. Thus, the thread 34 can secure to the shield 13 so that an external force may be applied in the same direction as that of a tensility of the device. Also, the shield 13 is slightly enlarged as the insertion of the thread 34. This in turn to cause the shield 13 to tightly engage with an inner surface of the space 26 of the first shell 21. Likewise, a tight engagement between the second bolt 61 and the space 56 of the second shell 51 is effected.

[0016] Referring to FIG. 4 specifically, the stud 580 of the female coupling 50 is inserted into the holes 510 of the second shell 51 and the hole 280 of the first shell 21 for securing the male coupling 20 and the female coupling 50 together. This in turn enhances two sealing structures.

[0017] As shown in FIG. 3, it is noted that the elastic wings 35, 37 are provided for clamping the head 62 of the second bolt 61 in order to secure to the male terminal 31. Further, a forward extension 36 may be formed in the thread 34 for facilitating an insertion of the first bolt 32 into the shield 13 of the first cable 10 for securing. The extension 36 can press against the conductors 11, 12 to a maximum degree for further enhancing a fastening. Likewise, a forward extension 66 having the same characteristics may be formed in the thread 64. Furthermore, a sharp point may be formed in the open end of the extension 36 of the first bolt 32 for facilitating an insertion of the first bolt 32 into the shield 13 of the first cable 10 for securing. Such sharp point effects a more precise insertion of the first bolt 32 into the shield 13. Likewise, a sharp point may be formed in the extension 66 of the second bolt 61. Moreover, the recess 53 of the second shell 51 has a flat or tapered inner surface. In a case that it is a flat inner surface a first tapered surface 531 and a continuous second tapered surface are formed within the recess 53. In brief, the second sealing structure of the invention aims at pressing the recess of the second shell 51 against the first sealing ring 22. In addition, a waterproof member 15 formed of a kind of elastic or rubber material, such as EVA foam or silicone rubber can be provided inside the space 26. The first cable 10 is urged against the waterproof member 15 as the first bolt 32 is secured to the shield 13 of the first cable 10. Also, the waterproof member 15 is urged against a bottom of the space 26. This can effect a waterproofing between the male coupling 20 and the first cable 10. Likewise, a waterproof member 45 can be provided inside the space 56 doing the same function same

as the waterproof member 15, as mentioned above. This also can effect a waterproofing between the female coupling 50 and the second cable 20.

[0018] Referring to FIGS. 5 to 7, there is shown a second preferred embodiment of the invention. The differences between the first and the second preferred embodiments are detailed below. In the male coupling 20 the hole 280 (see FIG. 3) in the first preferred embodiment is eliminated. Top and bottom recessed portions 211 are formed. Finally, a tab 212 is formed in each of the top and bottom recessed portions 211. In the second shell 51, the holes 510, the clip 58, and the stud 580 (see FIG. 3) in the first embodiment are also eliminated. Top and bottom protrusions 511 are formed for matingly securing to the top and the bottom recessed portions 211 respectively. A slit 512 is formed in each of the top and bottom protrusions 511. Finally, a slanted surface 513 is formed on an inner surface of each of the top and bottom protrusions 511 in front of the slit 512.

[0019] In an assembly of the male coupling 20 and the female coupling 50, the projection 23 of the first shell 21 is inserted into the recess 53 of the second shell 51 and the protrusions 511 of the second shell 51 are secured onto the recessed portions 211 as the slanted surfaces 513 are passed through the tabs 212 to cause the tabs 212 to insert in the slits 512. Such fastening is simple and quick. Further, components are simplified. Note that a shape of either protrusion 511 or recessed portion 211 may be a V shape configuration. Further, a straight or curved side can be formed in the junction of bifurcation of the V shape configuration.

[0020] Referring to FIGS. 8 and 9, there is shown a third preferred embodiment of the invention. The differences between the second and the third preferred embodiments are detailed below. In the first shell 21 top and bottom recessed portions 213 having a shape of about a portion of oval are formed. A tab 214 is formed in each of the top and bottom recessed portions 213. Finally, a slanted surface 215 is formed on the front top of the tab 214. In the second shell 51, top and bottom protrusions 515 are formed for matingly securing to the top and the bottom recessed portions 213 respectively. Finally, a hole 516 is formed in each of the top and bottom protrusions 515.

[0021] In an assembly of the male coupling 20 and the female coupling 50, the projection 23 of the first shell 21 is inserted into the recess 53 of the second shell 51 and the protrusions 515 of the second shell 51 are secured onto the recessed portions 213 of the first shell 21 as the forward ends of the protrusions 515 are passed through the slanted surfaces 215 to cause the tabs 214 to be easily inserted in the holes 516. Such fastening is also simple and quick.

[0022] As shown in FIG. 8, the forward end of either protrusion 515 may be formed as a straight line 517 or a curved one. As such, a gap is formed between the flat end 517 and the recessed portion 213 after the protrusions 515 is secured onto the recessed portions 213.

Hence, a user can use a tool to insert in the gap for disengaging the protrusions 515 from the recessed portions 213. Moreover, a curved trough 518 is formed on a portion of periphery of each protrusion 515 so that the trough 518 and the recessed portion 213 can form an oval after the protrusions 515 is secured onto the recessed portions 213. This is aesthetic.

[0023] Note that in FIG. 4 a section of either the male coupling 20 or the female coupling 50 is a rectangle if that of the first cable 10 or the second cable 40 is a rectangle. This is also true in the second and third embodiments. Likewise, a section of either the male coupling 20 or the female coupling 50 is an oval or circle if that of the first cable 10 or the second cable 40 is an oval or circle. This is also true in the second and third embodiments.

[0024] While the invention herein disclosed has been described by means of specific embodiments, numerous modifications and variations could be made thereto by those skilled in the art without departing from the scope and spirit of the invention set forth in the claims.

Claims

1. A cable connecting device comprising:

a first cable (10) comprising a pair of first conductors (11, 12) and a first shield (13) enclosed the first conductors (11, 12) ;

a male coupling (20) comprising a first shell (21), a first flange (24) in a rear end of the first shell (21), a first space (26) within the first shell (21) for passing the first cable (10), a projection (23) in a forward end of the first shell (21), a peripheral first groove (25) around the projection (23) with a first sealing ring (22) fastened around, two parallel channels (27) provided within the projection (23), a pair of lengthwise first apertures (270) each respective extended from the channel (27) into the first space (26); a male terminal assembly (30) comprising two pairs of male terminals (31) and first threaded bolts (32) both placed in the channels (27), the first threaded bolts (32) being inserted through the first apertures (270) to contact the first conductors (11, 12) respectively to threadedly secure to the first shield (13), the first cable (10) being secured in the first space (26), and the male terminals (31) being secured in the channels (27);

a second cable (40) comprising a pair of second conductors (41, 42) and a second shield (43) enclosed the second conductors (41, 42);

a female coupling (50) comprising a second shell (51), a second flange (54) in a rear end of the second shell (51), a second space (56) within the second shell (51) for passing the second

cable (40), a recess (53) in a forward end of the second shell (51), two parallel second apertures (570) extended from an inner wall (57) of the recess (53) into the second space (56), a peripheral second groove (55) at a junction of the recess (53) and the inner wall (57) of the recess (53) with a second sealing ring (52) fastened around, and
 a female terminal assembly (60) comprising a pair of second threaded bolts (61) each being inserted through the second apertures (570) to contact the second conductors (41, 42) to threadedly secure to the second shield (43), and the second cable (40) being secured in the second space (56);

wherein in an assembly of the male and the female couplings (20, 50), the projection (23) of the male coupling (20) is inserted into the recess (53) of the female coupling (50), the female terminal assembly (60) is inserted through the respective channel (27) to be fastened by the male terminal assembly (30), a first sealing structure is formed as the projection (23) is pressed around the second sealing ring (52), a second sealing structure is formed as an inner surface of the recess (53) is pressed against the first sealing ring (22).

2. The cable connecting device of claim 1, wherein a female coupling (50) further comprises two second holes (510) each provided on a top and a bottom of the second shell (511) respectively, a clip (58) extended from the second shell (52), and a stud (580) near an open end of the clip (58) inserted into the second holes (510) for fastening, and a hole (280) is through the first shell (21), the stud (580) is inserted into the second and the first holes (280, 510) for securing the male and the female couplings (20, 50) together.
3. The cable connecting device of claim 1, wherein the male terminal assembly (30) further comprises two opposite first elastic wings (35) and two second elastic wings (37) between the first elastic wings (35).
4. The cable connecting device of claim 1, wherein each of the first threaded bolts (32) comprises a first extension (36) having a sharp end and a thread (34), and each of the second threaded bolts (61) comprises a second extension (66) having a sharp end and a thread (64).
5. The cable connecting device of claim 1, wherein the recess (53) comprises a first tapered surface (531) and a continuous second tapered surface therein.
6. The cable connecting device of claim 1, further

comprising a first waterproof member (15) within the first space (26) being urged against a bottom of the first space (26) by the first cable (10) and a second waterproof member (45) within the second space (56) being urged against a bottom of the second space (56) by the second cable (20).

7. The cable connecting device of claim 5, wherein each of the waterproof members (15, 45) is formed of plastic or rubber elastic material, such as an EVA foam or a silicone rubber.

8. A cable connecting device comprising:

a first cable (10) comprising a pair of parallel first conductors (11, 12) and a first shield (13) enclosed the first conductors (11, 12);

a male coupling (20) comprising a first shell (21), a first flange (24) in a rear end of the first shell (21), a first space (26) within the first shell (21) for passing the first cable (10), a projection (23) in a forward end of the first shell, a peripheral first groove (25) around the projection (23) with a first sealing ring (22) fastened around, two parallel channels (27) provided within the projection (23), a pair of lengthwise first apertures (270) each extended from the respective channel (27) into the first space (26), a rib (28) between the channels (27), top and bottom recessed portions (211), and a tab (212) in each of the top and the bottom recessed portions (211);

a male terminal assembly (30) comprising two pairs of male terminals (31) and first threaded bolts (32) both placed in the channels (27), the first threaded bolts (32) being inserted through the first apertures (270) to contact the first conductors (11, 12) respectively to threadedly secure to the first shield (13), the first cable (10) being secured in the first space (26), and the male terminals (31) being secured in the channels (27);

a second cable (40) comprising a pair of parallel second conductors (41, 42) and a second shield (43) enclosed the second conductors (41, 42);

a female coupling (50) comprising a second shell (51), a second flange (54) in a rear end of the second shell (51), a second space (56) within the second shell (51) for passing the second cable (40), a recess (53) in a forward end of the second shell (51), two parallel second apertures (570) extended from an inner wall (57) of the recess (53) into the second space (56), a peripheral second groove (55) at a junction of the recess (53) and the inner wall (57) of the recess (53) with a second sealing ring (52) fastened around, top and bottom protrusions

(511), and a slit (512) in each of the top and bottom protrusions (511); and

a female terminal assembly (60) comprising a pair of second threaded bolts (61) each being inserted through the second apertures (570) to contact the second conductors (41), (42) to threadedly secure to the second shield (43), and the second cable (40) being secured in the second space (56);

wherein in an assembly of the male and the female couplings (20, 50), the projection (23) of the male coupling (20) is inserted into the recess (53) of the female coupling (50), the female terminal assembly (60) is inserted through the respective channel (27) to be fastened by the male terminal assembly (30), a first sealing structure is formed as the projection (23) is pressed around the second sealing ring (52), a second sealing structure is formed as an inner surface of the recess (53) is pressed against the first sealing ring (22), and the top and the bottom protrusions (511) are matingly secured onto the top and the bottom recessed portions (211) as the top and the bottom protrusions (511) are passed through the tabs (212) to cause the tabs (212) to insert in the slits (512).

9. The cable connecting device of claim 8, wherein the male terminal assembly (30) further comprises two opposite second elastic wings (37) between the first elastic wings (35).
10. The cable connecting device of claim 8, wherein each of the first threaded bolts (32) comprises a first extension (36) having a sharp end and a thread (34), and each of the second threaded bolts (61) comprises a second extension (66) having a sharp end and a thread (64).
11. The cable connecting device of claim 8, wherein the recess (53) comprises a first tapered surface (531) and a continuous second tapered surface therein.
12. The cable connecting device of claim 8, further comprising a first waterproof member (15) within the first space (26) being urged against a bottom of the first space (26) by the first cable (10) and a second waterproof member (45) within the second space (56) being urged against a bottom of the second space (56) by the second cable (20).
13. The cable connecting device of claim 12, wherein each of the waterproof members (15, 45) is formed of plastic or rubber elastic material, such as an EVA foam or a silicone rubber.
14. The cable connecting device of claim 8, wherein a section of either the male or the female coupling

(20, 50) is a rectangle, oval, or circle as that of the first or the second cable.

15. The cable connecting device of claim 8, wherein a shape of each of the top and the bottom protrusions (511) or each of the top and the bottom recessed portions (211) is a V shape configuration having a straight or curved bottom.
16. The cable connecting device of claim 8, wherein a shape of each of the top and the bottom protrusions (515) and that of a corresponding one of the top and the bottom recessed portions (213) is an oval in combination.
17. The cable connecting device of claim 8, wherein each of the top and bottom protrusions (511, 515) comprises a slanted surface on an inner surface in front of the slit (512, 516).
18. The cable connecting device of claim 8, wherein each of the top and bottom recessed portions (211, 213) comprises a slanted surface on an inner surface in front of the slit.
19. The cable connecting device of claim 8, wherein each of the tabs (212, 214) comprises a slanted top surface.
20. A cable connecting device comprising:
 - a first cable (10) comprising a pair of parallel first conductors (11, 12) and a first shield (13) enclosed the first conductors (11, 12);
 - a male coupling (20) comprising a first shell (21), a first flange (24) in a rear end of the first shell (21), a first space (26) within the first shell (21) for passing the first cable (10), a projection (23) in a forward end of the first shell, a peripheral first groove (25) around the projection (23) with a first sealing ring (22) fastened around, two parallel channels (27) provided within the projection (23), a pair of lengthwise first apertures (270) each extended from the respective channel (27) into the first space (26), a rib (28) between the channels (27), top and bottom recessed portions (213), and a tab (214) in each of the top and the bottom recessed portions (213);
 - a male terminal assembly (30) comprising two pairs of male terminals (31) and first threaded bolts (32) both placed in the channels (27), the first threaded bolts (32) being inserted through the first apertures (270) to contact the first conductors (11, 12) respectively to threadedly secure to the first shield (13), the first cable (10) being secured in the first space (26), and the male terminals (31) being secured in the chan-

nels (27);

a second cable (40) comprising a pair of parallel second conductors (41, 42) and a second shield (43) enclosed the second conductors (41, 42);

a female coupling (50) comprising a second shell (51), a second flange (54) in a rear end of the second shell (51), a second space (56) within the second shell (51) for passing the second cable (40), a recess (53) in a forward end of the second shell (51), two parallel second apertures (570) extended from an inner wall (57) of the recess (53) into the second space (56), a peripheral second groove (55) at a junction of the recess (53) and the inner wall (57) of the recess (53) with a second sealing ring (52) fastened around, top and bottom protrusions (515) having a front flat end (517), and a hole (516) in each of the top and bottom protrusions (515);

and

a female terminal assembly (60) comprising a pair of second threaded bolts (61) each being inserted through the second apertures (570) to contact the second conductors (41,42) to threadedly secure to the second shield (43); and the second cable (40) being secured in the second space (56);

wherein in an assembly of the male and the female couplings (20, 50), the projection (23) of the male coupling (20) is inserted into the recess (53) of the female coupling (50), the female terminal assembly (60) is inserted through the respective channel (27) to be fastened by the male terminal assembly (30), a first sealing structure is formed as the projection (23) is pressed around the second sealing ring (52), a second sealing structure is formed as an inner surface of the recess (53) is pressed against the first sealing ring (22), and the top and the bottom protrusions (515) are matingly secured onto the top and the bottom recessed portions (213) to have a gap formed between the flat end (517) and the bottom recessed portions (213) as the top and the bottom protrusions (515) are passed through the tabs (214) to cause the tabs (214) to insert in the hole (516).

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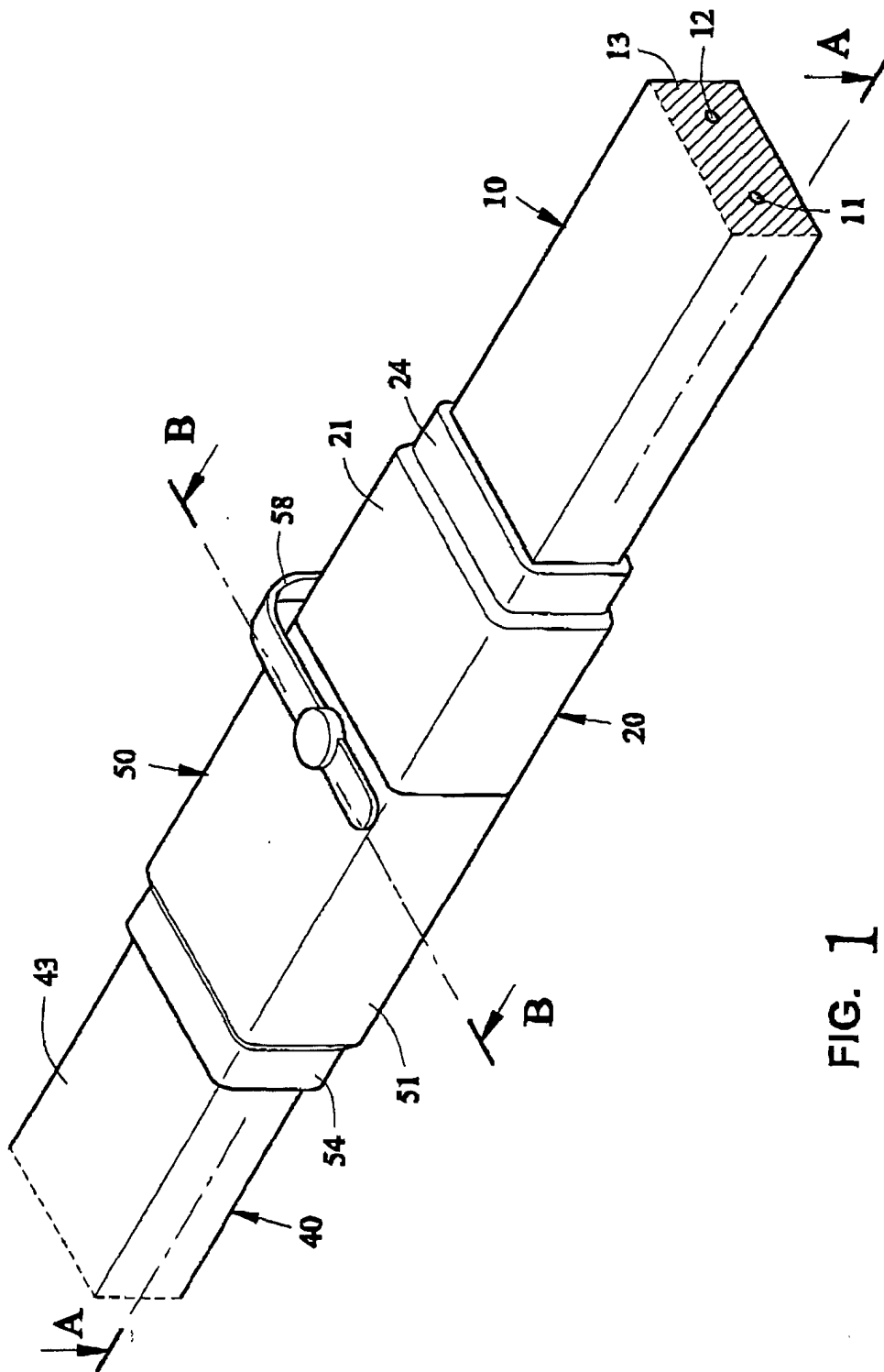


FIG. 1

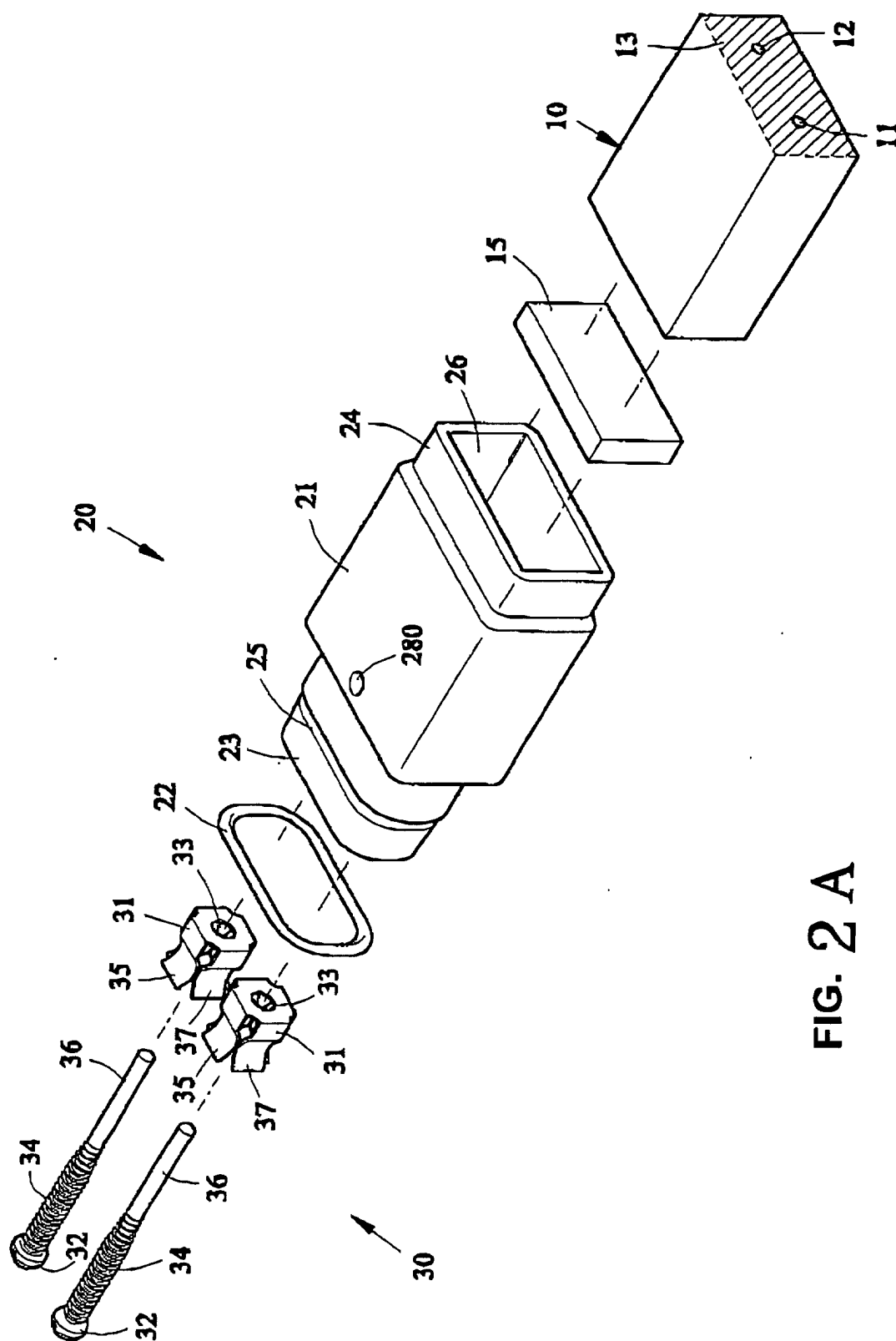


FIG. 2 A

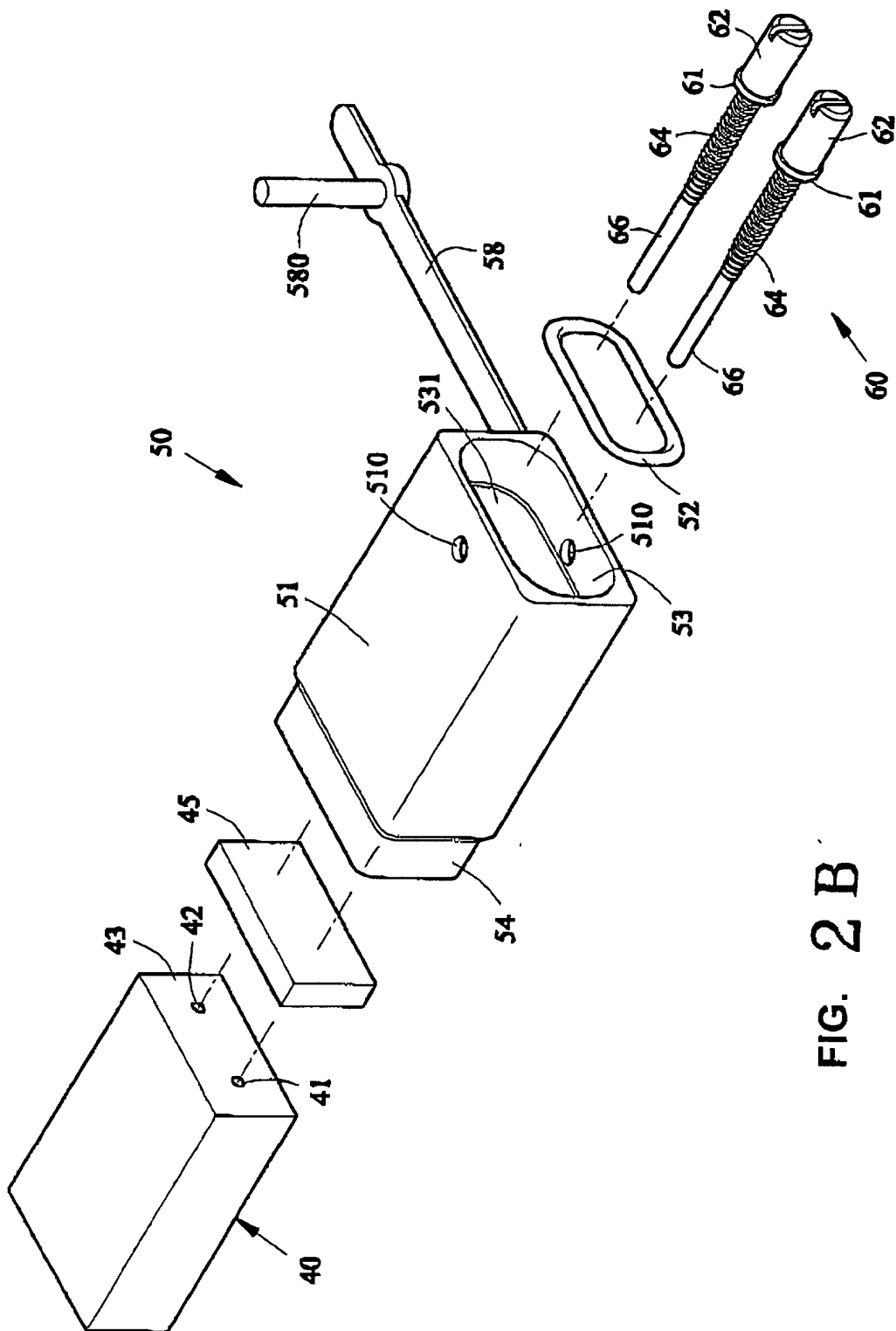


FIG. 2 B

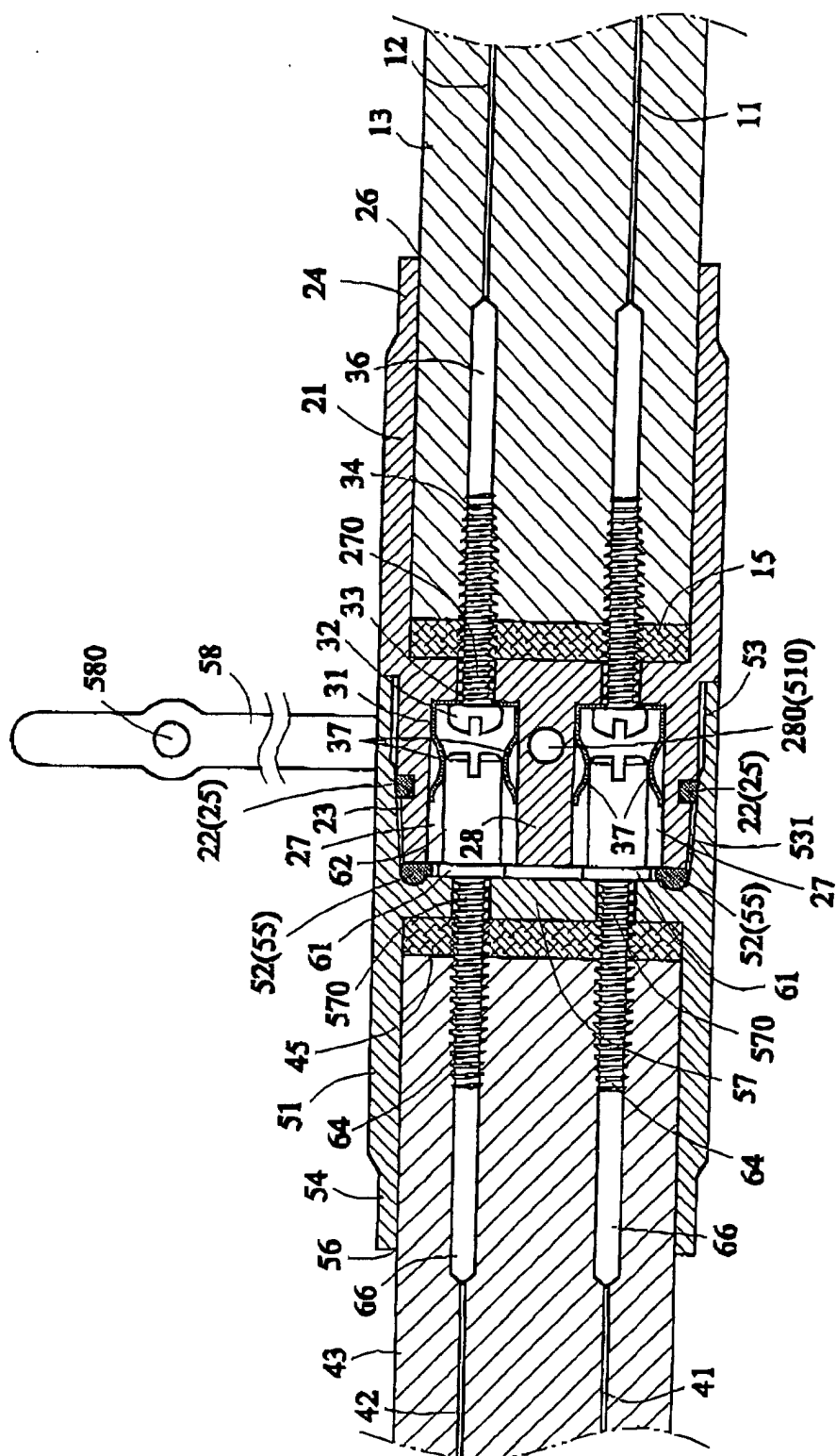


FIG. 3

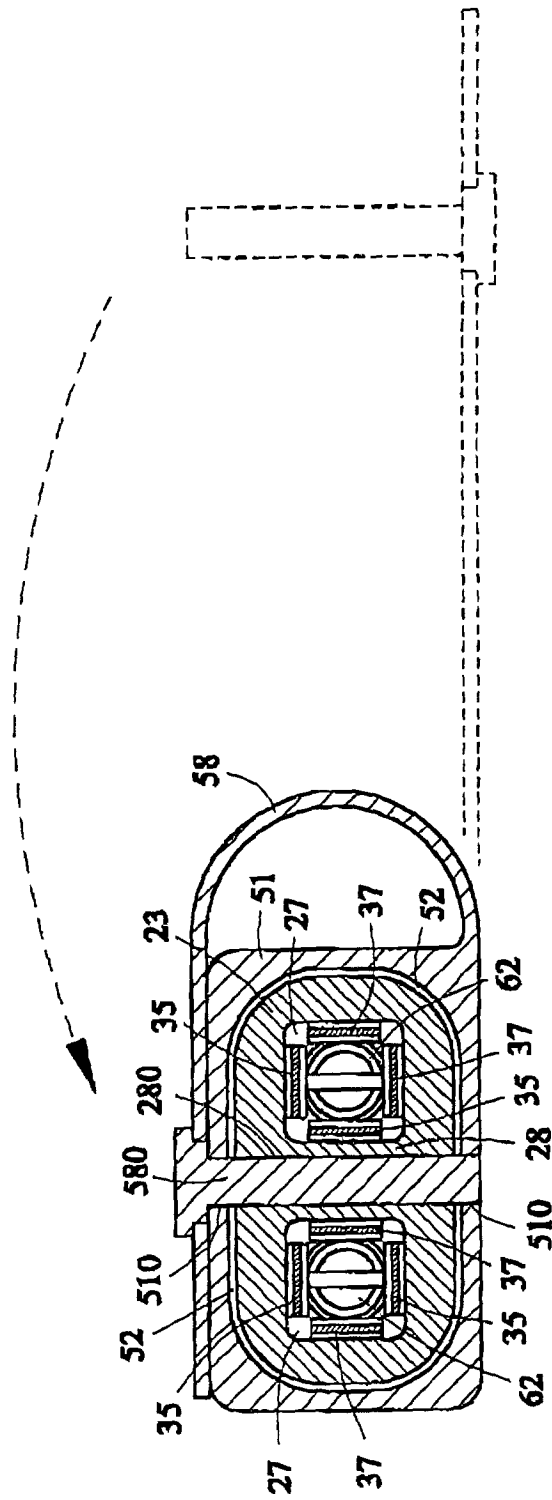


FIG. 4

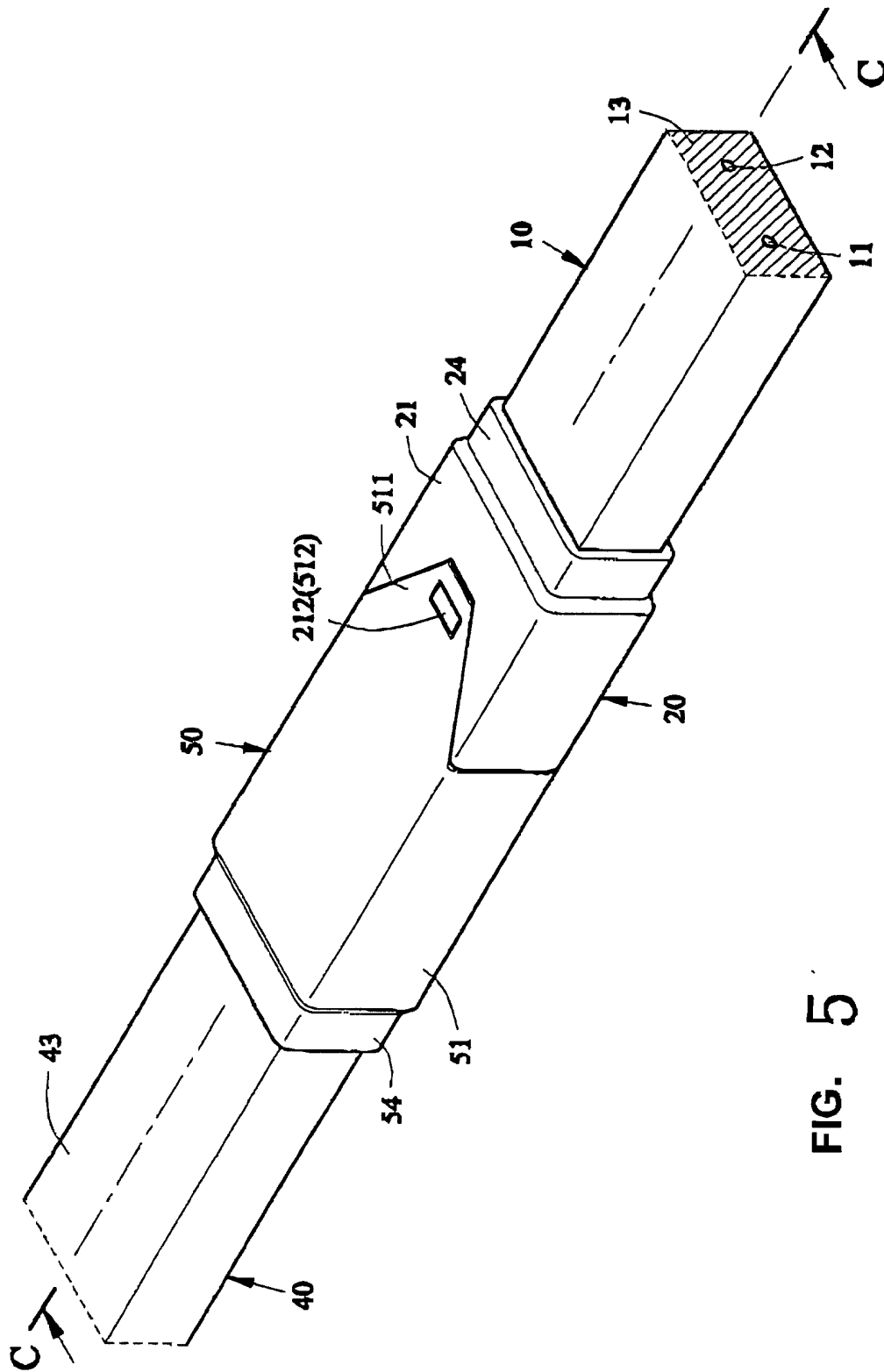


FIG. 5

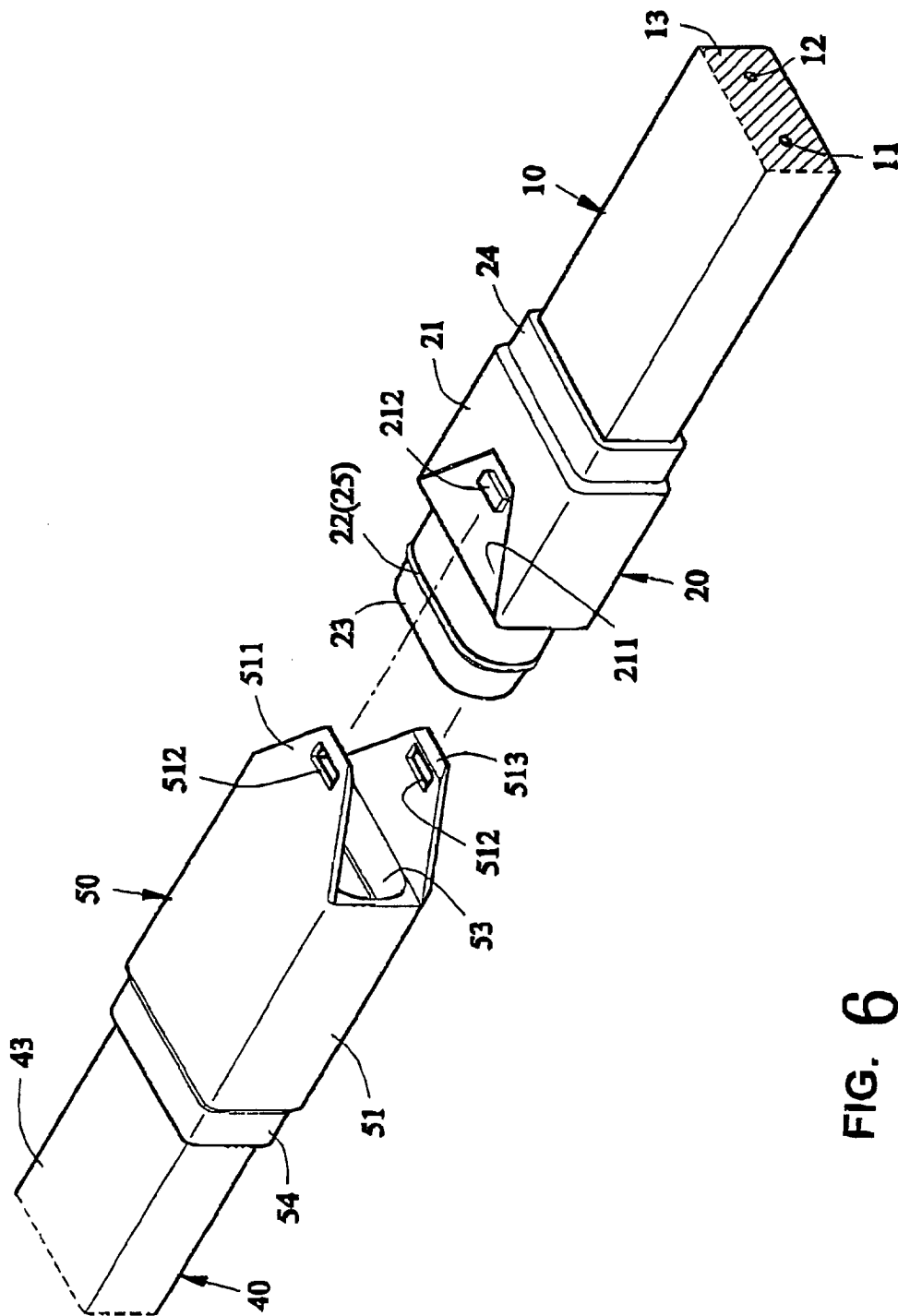


FIG. 6

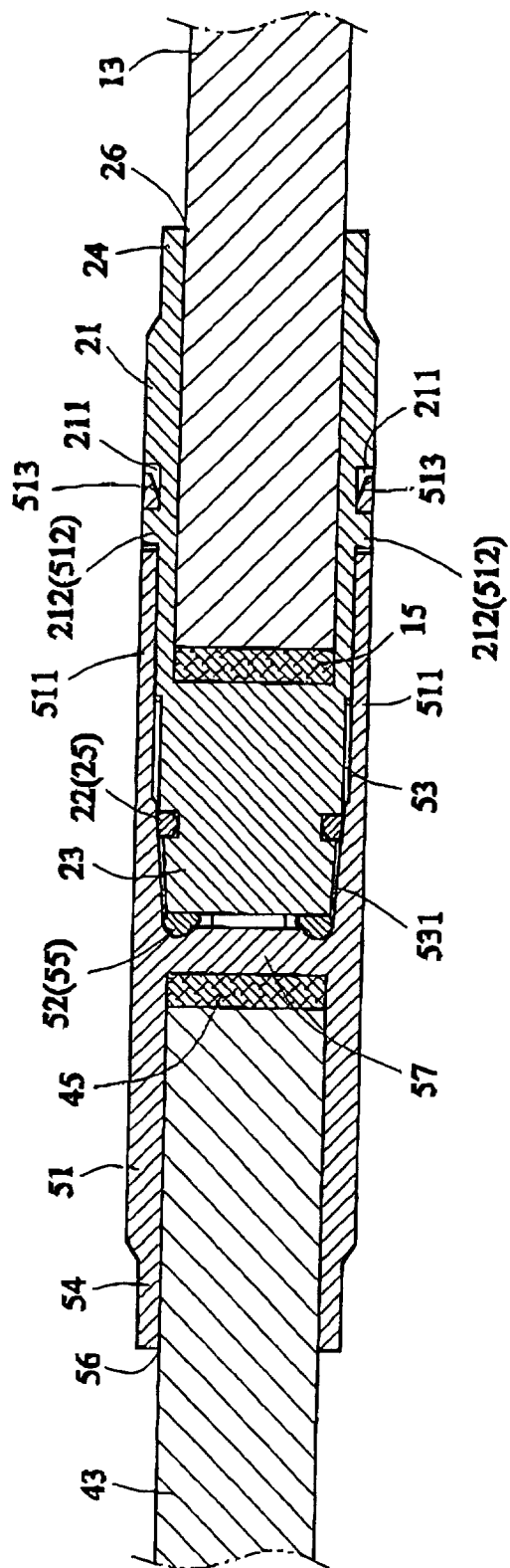


FIG. 7

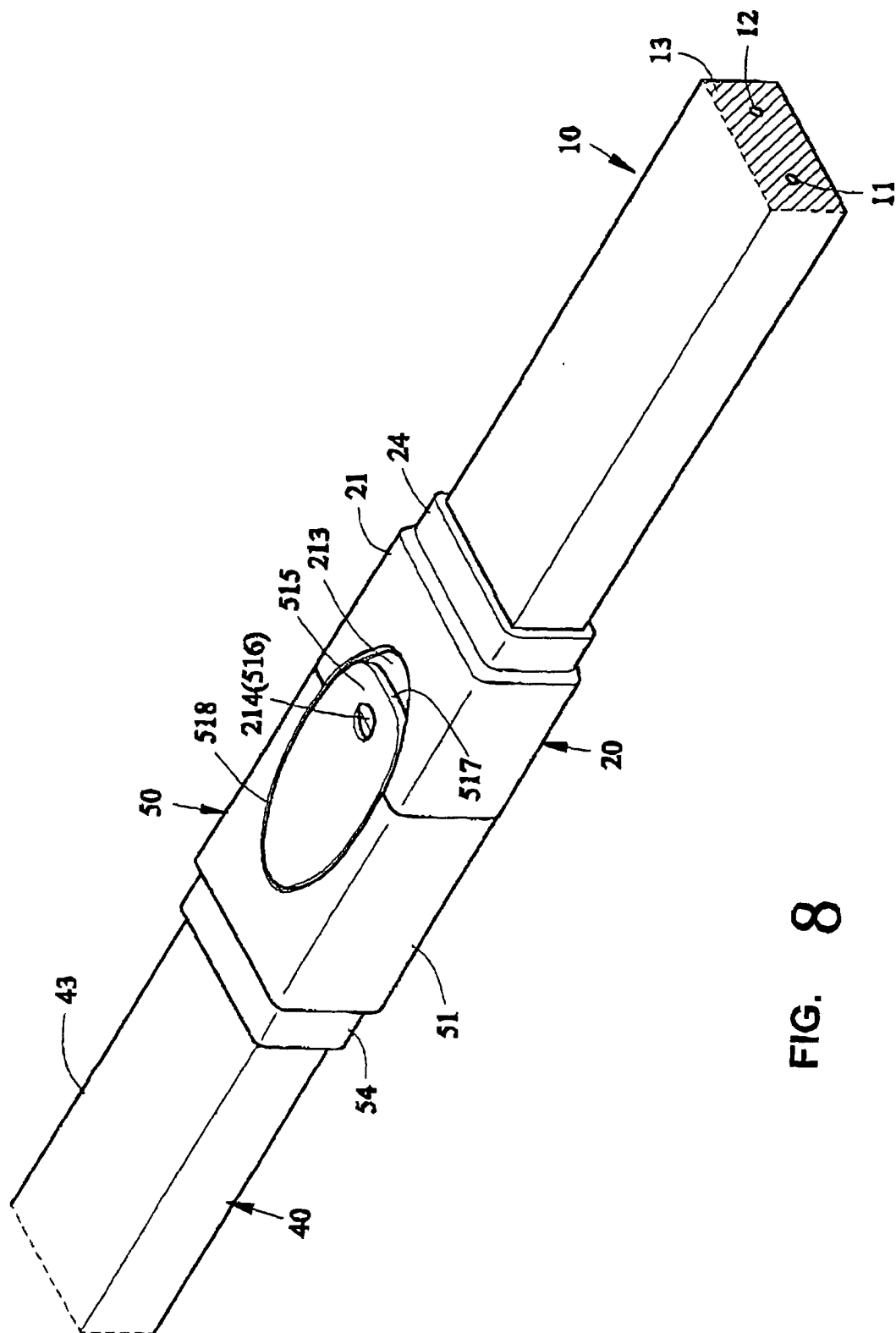


FIG. 8

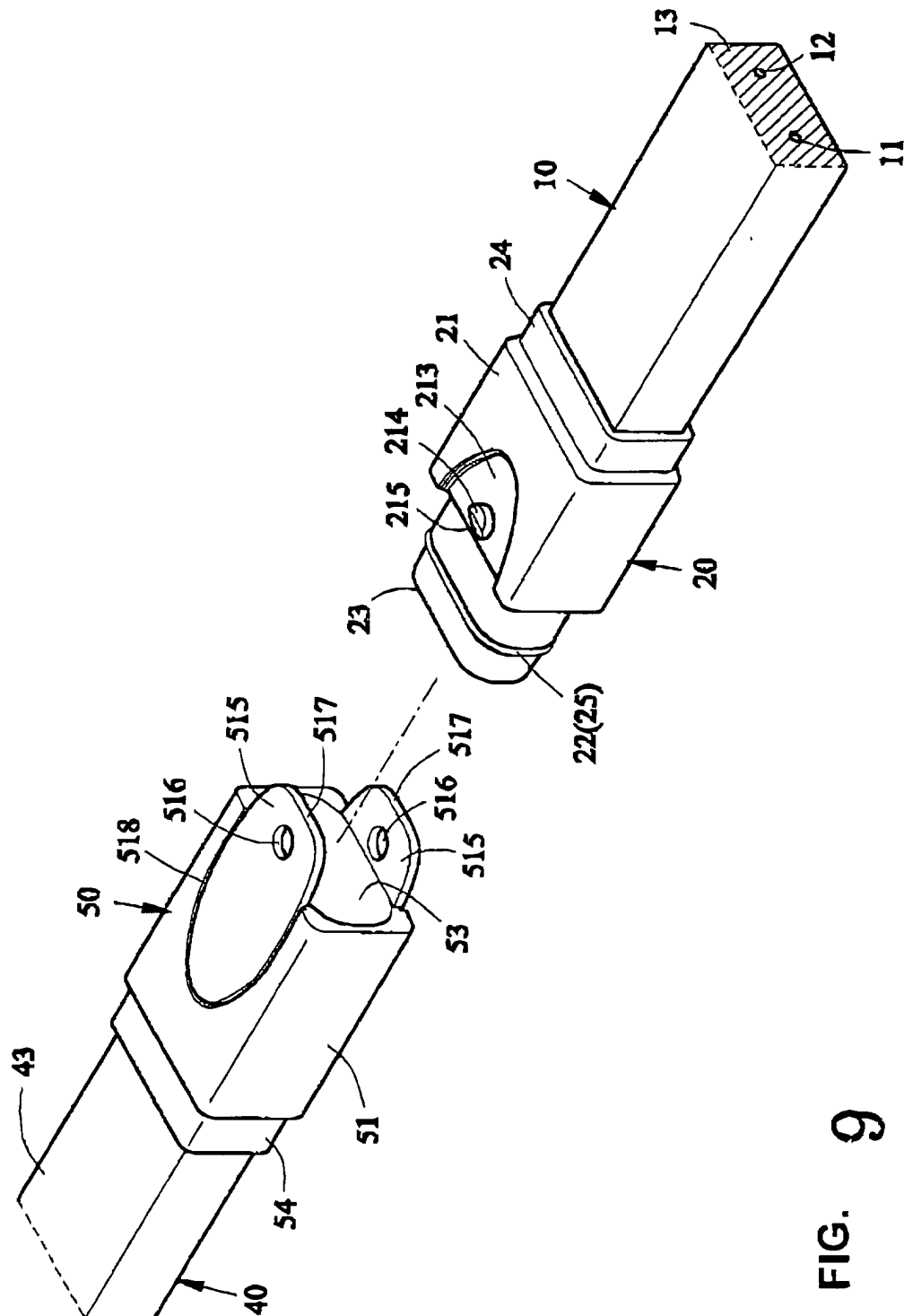


FIG. 9

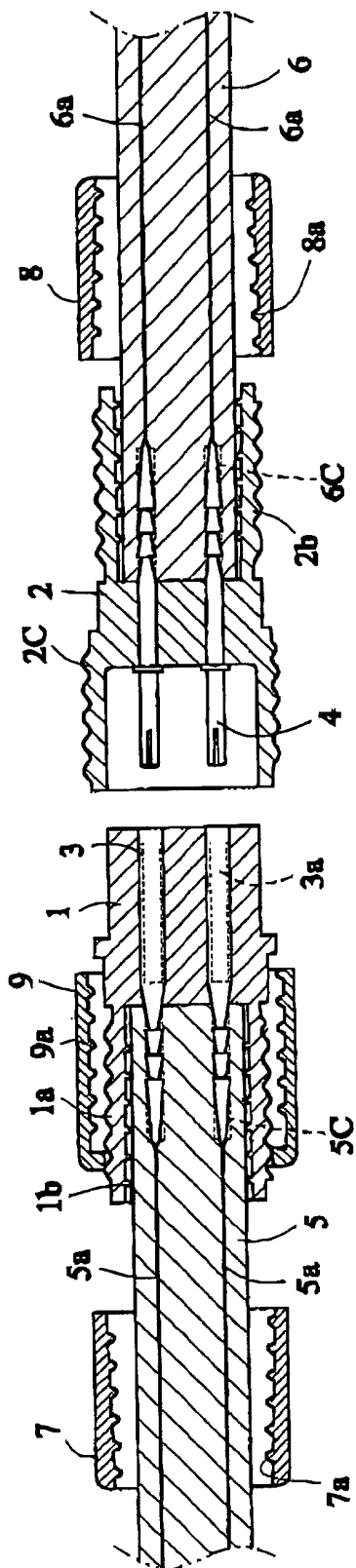


FIG. 10

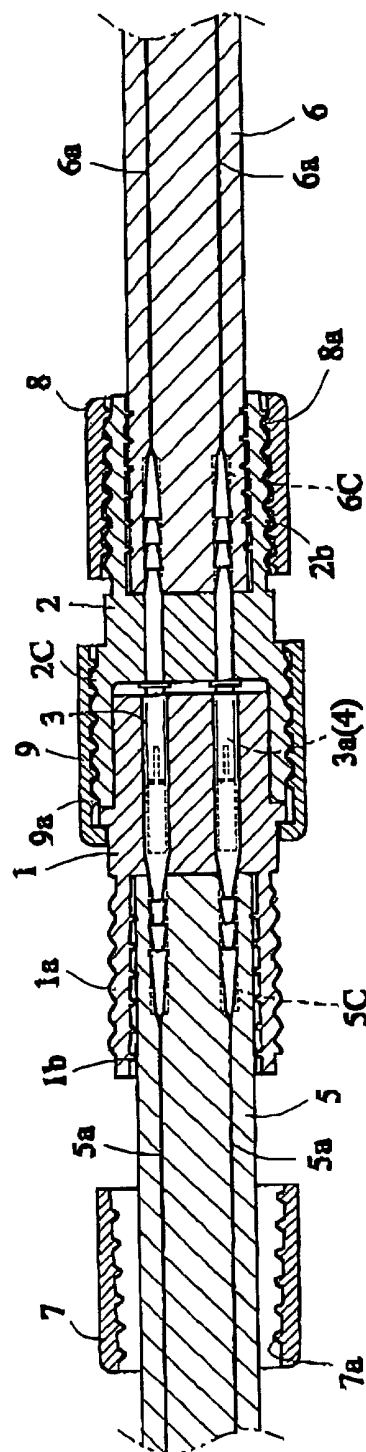


FIG. 11

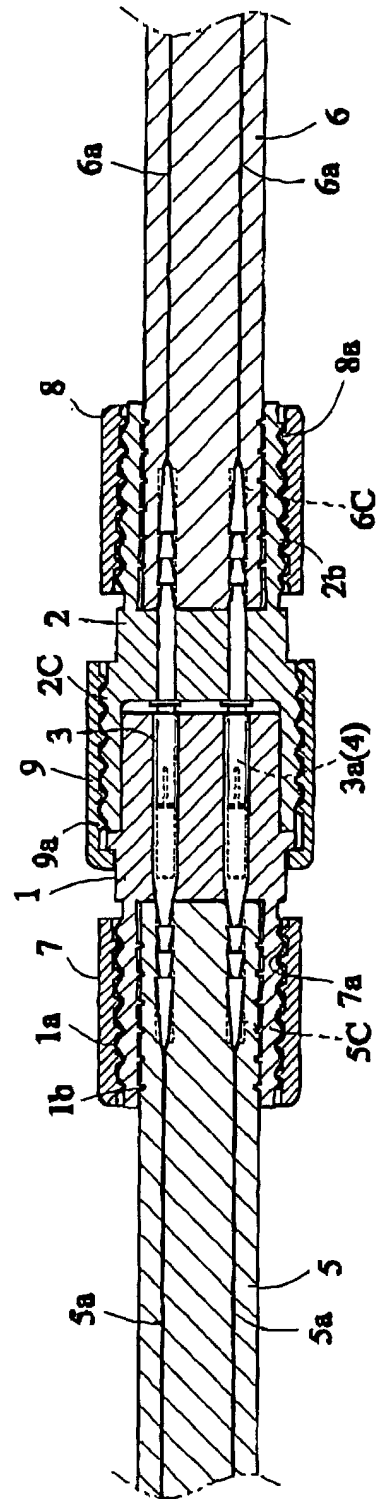


FIG. 1 2