



(51) International Patent Classification:
G02B 6/44 (2006.01)

(21) International Application Number:
PCT/EP2010/051411

(22) International Filing Date:
5 February 2010 (05.02.2010)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
09001853.2 10 February 2009 (10.02.2009) EP

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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
- of inventorship (Rule 4.17(iv))

[Continued on next page]

(54) Title: INSERT FOR AN OPTICAL FIBER ASSEMBLY AND OPTICAL FIBER ASSEMBLY USING SUCH AN INSERT

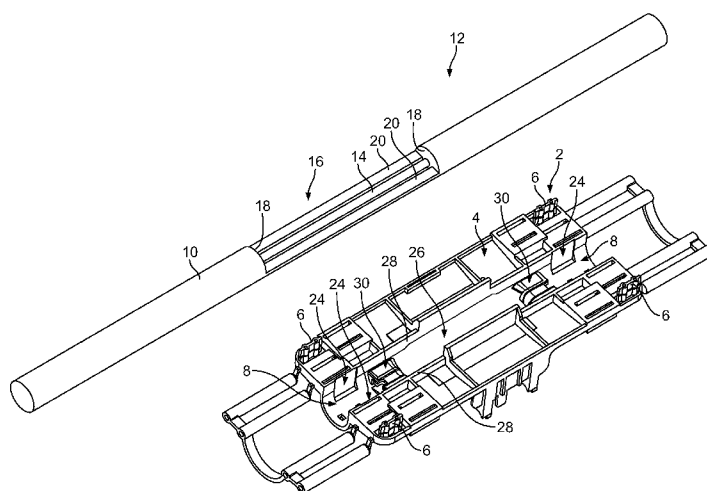


Fig. 1

(57) Abstract: The present invention relates to an insert for an optical fiber assembly reliably retaining an optical cable by preventing an axial and rotational movement thereof and further to an optical fiber assembly using such an insert. The insert is provided for guiding a part of the optical cable (12) which comprises at least one optical fiber element (14) and being accommodated in a housing of the optical fiber assembly, wherein said part of the optical cable (12) has a cut-out portion (16) in which a jacket (10) of said optical cable (12) is partially removed, thereby exposing said at least one optical fiber element (14). The insert (2) comprises an optical cable guidance means (8) for guiding said optical cable (12) across the insert (2); a recess (26) surrounding the exposed optical fiber element (12) and form fit means (32, 34) for suppressing an axial and rotational movement of the optical cable (12), wherein said form fit means (32, 34) are adapted to abut against surfaces of said jacket in the cut-out portion (16).



Published:

— *with international search report (Art. 21(3))*

INSERT FOR AN OPTICAL FIBER ASSEMBLY AND OPTICAL FIBER ASSEMBLY USING SUCH AN INSERT

The present invention relates to an insert for guiding a part of an optical cable
5 comprising at least one optical fiber element as defined in the preamble of claim 1.

Such an insert is generally provided in a housing of an optical fiber assembly, wherein
said housing is sealed by sealing means against environmental influences. Said insert
comprises an optical cable guidance means for guiding the optical cable across the insert and
a recess for providing an access to an optical fiber element. For this purpose, the jacket of the
10 optical cable is partially removed, thereby exposing at least one optical fiber element in the
cut-out portion of the optical cable.

In general, when a user is connected to an optical cable, a few or even one optical
fiber element comprised in the optical cable needs to be spliced, that is the optical fiber
element needs to be connected to a further optical fiber element coming from the user side by
15 a method of splicing. The thus obtained splice is stored in the housing, preferably on the
insert.

The optical cable has normally a jacket surrounding the optical fiber element. A
single optical fiber element or a group of optical fiber elements forming part of said cable may
likewise be surrounded by a separate jacket. In case of plural groups said optical fiber
20 element has likewise a jacket. In case of plural groups of optical fiber elements, each of them
may have a separate jacket, which is at last surrounded by the jacket of the optical cable.

For splicing the optical fiber element, the part of the optical cable which should
provide access to the optical fiber element to be spliced is provided with the cut-out portion
by partially removing the cable jacket, wherein said part of the optical cable is guided and
25 retained by the insert. The optical fiber element exposed in the cut-out portion is accessible
through the recess formed in the insert and surrounding the exposed optical fiber element.

In order to stationary retain the at least one spliced optical fiber element in the
housing of the optical fiber assembly, the insert interacts with means for retaining the at least
one splice. Further, to prevent a shifting of the spliced optical fiber element held by the insert
30 or a tray connected to the insert, not only the splice needs to be retained, but also the optical
cable will be held by the insert. For this purpose, the optical cable is normally attached to the
insert by means of cable strip or the like.

The present invention aims to provide an insert for an optical fiber assembly which retains a part of an optical cable having a cut-out portion in a reliable manner. A further object of the present invention is to provide an optical fiber assembly providing the same effects.

5 For achieving said objectives, the present invention proposes an insert as defined in claim 1 and an optical fiber assembly as specified in claim 7. The inventive insert comprises a form fit means for suppressing an axial and rotational movement of the optical cable, wherein said form fit means are adapted to abut against the surfaces of the cable jacket formed in the cut-out portion.

10 With the present invention, an insert can be provided which reliably prevents an axial and rotational movement of the optical cable at the insert substantially with the aid of form fitting means. Since the cable jacket needs to be cutout for providing an access to at least one optical fiber comprised in the optical cable, the surfaces of the cut-out portion formed in the cable jacket are used as abutment faces which interact with corresponding abutment faces
15 of form fit means provided with the inventive insert. Particularly, by partially removing the cable jacket, the thus formed jacket surfaces defining the cut-out portion are arranged adjacent to the optical fiber element and extend on the one hand in the running direction of the optical fiber element and extending parallel thereto (parallel surfaces) and on the other hand usually in the radial direction of the optical cable (radial surfaces). By providing
20 abutment faces with the insert which abuts the parallel surfaces extending in the running direction adjacent to the optical fiber element, a rotational movement of the optical cable can be avoided. By providing further abutment faces by the insert abutting at least one radial surface an axial movement of the optical cable can be prevented in at least one direction of the running direction of the optical cable. In case of spaced abutment faces provided by the
25 insert which abuts both radial surfaces at both end sides of the lower surfaces, an axial movement of the optical cable in both direction of its running direction can be reliably prevented.

Further preferred embodiments of the present invention are subject to the dependent claims.

30 The present invention will now be described in further detail by referring to a preferred embodiment depicted in the accompanying drawings. In these drawings:

Fig. 1 shows a perspective rear side view of the embodiment together with a cable to be received in said embodiment;

Fig. 2 shows an enlarged view of a section of the embodiment shown in Fig.2; and

Fig. 3 shows a perspective top view of the embodiment.

5 In the figures, reference numeral 2 identifies an insert which is adapted to be inserted into a housing (not shown). The optical cable assembly which can be obtained by using the insert according to the invention will be described at the end of this specific description.

The insert 2 has a flat insert base 4, the lower side thereof (compare fig. 1) being projected by posts 6 for supporting the insert 2 against the base of a housing element. In the
10 middle of the forward and rearward end of the insert base 4 there are provided optical cable guide means 8 adapted to receive the jacket 10 of an optical cable identified with reference numerals 12 surrounding the lower optical fiber elements 14.

As evident from fig. 1, the optical cable 12 is provided with a cut-out portion 16 which has been provided by partially removing the jacket 10 of the optical cable 12. In the
15 shown embodiment said cut-out portion 16 is provided between two essentially semi-circular side surfaces 18 and two parallel surfaces 20 which extend parallel to the running direction of the optical fiber elements 14. The uncut, i.e. normal length of the optical cable 12 has a circular cross sectional shape. The optical cable guide means 8 each comprise a semicircular shell 22 adopted to receive and partially surround the jacket 10 of the optical cable 12
20 adjacent to the cut-out portion 16. Each of said semicircular shells 22, comprises two lateral openings 24 adapted to receive cable fixation means like T-wraps or hose clamps.

Between the optical cable guide means 8 there is provided a rectangular recess 26 recessed within the insert base 4. On the long side of this recess 26 there are provided longitudinal rims 28 projecting the lower side of the inset base 4 and providing lateral
25 guidance for the optical cable 12 in the cut-out portion 16. In the present embodiment, the longitudinal rims 28 have a distance essentially corresponding to the diameter and thus the maximum thickness of the optical cable 12 in the cut-out portion 16.

Between the optical guidance means 8, i.e. the semicircular shell 22 and the end of the recess 26 in longitudinal direction there are provided cross links 30 which extend transverse
30 to the running direction of the optical cable 12 and bridges the space provided between the longitudinal rims 28.

The lower side of the each cross link 30 provides first abutment section 32, which is considered to form the first form fit means which are adapted to cooperate with the two parallel surfaces 20 thereby preventing tilting of the optical cable 12 relative to said insert 2 (cp. Fig. 2). Abutment of those first form fit means 32 against the lower side of the cross link 30 is assisted by the cable fixation introduced through the lateral openings 24 and forcing the optical cable 12 towards the upper side of the insert.

Between said abutment section 32 and the inner cylindrical surface of the semicircular shell 22 there is provided a second form fit means 34, provided by wall sections 36a, b, c each of them lying in a single plane, for axially positioning the cut-out portion 16 within the insert 2. In accordance with the shape of the side surfaces 18, which strictly extend in radial direction of the optical fibre 12, wall sections 36a, b, c, project in a right angle from the abutment section 32 and the cylindrical surface of the semicircular shell 22, respectively. The form fit means 34 can likewise be provided by a unitary wall instead of wall section 36 a, b, c. In the present case, the surface 36 is divided into segments as the plane providing this surface is projected by a movable insert of the injection molding mold for making the embodiment.

When providing the cut-out portion 16, the distance between the opposing side surfaces 18 is to be selected such, that this distance essentially corresponds to the distance of the two second form fit means 34.

After inserting the cut-out portion 16 within the insert 2 such, that this cut-out portion 16 is available through the recess 26, a selected optical fibre element 14 can be pulled out from the optical cable 12 in a reliable manner in which the cable 12 and all remaining optical fibre elements 16 provided in the optical cable 12 is held in place (cp. Fig. 3).

Such pulling operation may e.g. be necessary to splice a selected or plural selected optical fibre elements 14 and connect the same to another optical fibre cable coming e.g. from the user side. In the course of such splicing, a splice will be fixed to both ends of the selected optical fibre elements thereby connecting the same to allow optical signals to be transmitted between both fibre elements. On a general basis, the splice i.e. the splice member, also serves to hold the selected cable in place, which may be arranged in a loop on the insert 2. For holding the splice member, there are provided splice holding means 38 recessed in the insert base 4.

The specific design of the embodiment which facilitates pulling out of selected optical fibre elements 14 from the optical cable 12 are described: reference is made to Fig. 2 showing

details of the first and second form fit means 32, 34. The bottom side of crosslink 30 is in fact divided by a central groove 40 extending in the running direction of the optical cable 12 and forming two identical abutment faces 42 each being provided between said groove 40 and the longitudinal rim 28. Adjacent to the second form fit means 34, the groove 40 has a concave surface 41 which is shaped parallel to the longitudinal extension of the optical cable 12. Towards the recess 26, the concave shape 41 in longitudinal direction of the groove 40 is bent upwardly thereby merging into a convex bent element 44 which projects the upper side of the insert base 6 in a constantly smoothly curved manner to a bent of approximately 180° and also, projects from the recess 26 in longitudinal direction of the optical cable 12 (compare Fig. 3). The bent element 44 protrudes in the running direction of the optical fiber elements 14, i.e. it extends parallel to the longitudinal direction of the recess 26.

Adjacent to the groove 40, and in longitudinal extension of the running direction of the optical cable 12, both abutment faces 42 are likewise curved in a convex manner thereby providing a smoothly curved rim merging to the recess 26. The entire contour between the abutment faces 42 and a distal end 46 of the bend element 44 is smoothly curved. The distal end 46 of the bend element 44 extends essentially parallel to the plane of the insert base 4 and parallel to a loop holding member 48 which is connected to the outer circumferential surface of the semicircular shell 22 and in alignment with the distal end 46.

Those loop holding members 48 form part of a loop receiving arrangement 50 provided on the upper side of the insert base 4 and comprising lateral loop holding members 52 positioned in the middle of the insert base 4 in longitudinal direction and at the lateral rim thereof.

Fig. 3 also shows a bar 54 extending across the recess 26 and being provided with a slot 56. This bar 54 has a lower surface adjacent to the parallel surfaces 20 of the cut-out portion 16 and in parallel with those parallel surfaces 20. Thus, the bar 54 may assist positioning of the cut-out portion 16 in a rotational free manner. The ultimate purpose of bar 54 is to hold all optical fibre elements 14 within a remaining groove formed by the jacket 10.

For splicing an individual optical fibre element selected from the optical fibre elements 14, the respective optical fibre element is selected and passed through slot 56. Then, an appropriate length of the selected optical fibre element is prepared by pulling this optical fibre element out of the optical cable 12. In the course of this pulling operation, the selected optical fibre element will be guided by the bend element 44. In case of a pulling action

essentially parallel to the running direction of the optical fibre elements 14, the selected optical fibre element will be guided within groove 40. In case of pulling the selected optical fibre element essentially perpendicular to the plane receiving insert base 4, i.e. in the plane of the running direction of the optical fibre elements 14 but essentially perpendicular thereto, there is sufficient smooth guiding of the selected optical fibre element. This guiding prevents the optical fibre element from sliding along sharp edges and from being damaged upon the pulling out performance. In case the selected optical fibre element is by error is pulled out in a direction angular to the running direction of the remaining optical fibre elements 14, the entirely smooth surface of the lower side of the crosslink 30 and the transition of said crosslink 30 towards the recess 26 prevents damage of the optical fibre.

After complete pulling out of the selected fibre element, the same is cut and spliced. The excessive length of the selected fibre element and possibly any excessive length of a optical fibre cable coming from a user and being connected to the selected optical fibre element is received in the loop holding arrangement 50. Thus, the loop will run between the bend element 44 and the semicircular shell 22. Storing of the loop will not contribute to the height of the insert 2. Additionally, in case of need of splicing a further optical fibre element and selecting the same by pulling this optical fibre element out from the optical cable 12, pulling action of this further selected optical fibre element will not interfere with any loop of other optical fibre elements already stored in the insert.

For a complete description, in particular of the embodiment as depicted in Fig. 3, it should be mentioned that there are provided cable jacket termination units 58 formed as separate elements adapted to receive and hold the terminal end of a jacket of an optical fibre cable from a user. Those jacket termination units 58 are received in openings recessed in the insert base 4 and held therein by snapping mechanisms. The insert 2 prepared in the above-mentioned way will be incorporated into a housing which provides ports for all optical cables being fed into the housing. This housing is adapted to hermetically seal those optical cables to avoid entry of water and/or humidity into the housing.

CLAIMS

1. An insert (2) for guiding a part of an optical cable (12) comprising at least one optical fiber element (14) and accommodated in a housing of an optical fiber assembly, said part of the optical cable (12) has a cut-out portion (16) in which a jacket (10) of said optical
5 cable (12) is partially removed, thereby exposing said at least one optical fiber element (14), wherein said insert (2) comprises
an optical cable guidance means (8) for guiding said optical cable (12) across the insert (2); and
a recess (26) surrounding the exposed optical fiber element (12),
10 **characterized by**
form fit means (32, 34) for suppressing an axial and rotational movement of the optical cable (12), wherein said form fit means (32, 34) are adapted to abut against surfaces (18, 22) of said jacket (10) in the cut-out portion (16).
2. The insert (2) according to claim 1, **characterized in** that said form fit means (32, 34)
15 comprises a crosslink (30) having on its lower side an abutment section (32) adapted to interact with parallel surfaces (20) of the jacket (10) in the cut-out portion (16), wherein said parallel surfaces (20) partially surround the optical fiber element (14) in the running direction of the optical fiber element (14).
3. The insert (2) according to claims 1 or 2, **characterized in** that said form fit means (34)
20 further comprises at least one wall section (36a, 36b, 36c) adapted to interact with a side surface (18) of the jacket (10) in the cut-out portion (16), wherein said side surface (18) defines one end of the cut-out portion (16) in retaining direction of the optical fiber element (14).
4. The insert (2) according to claims 2 or 3, **characterized in** that said abutment section
25 (32) is comprised of two abutment faces (42) divided by a groove (40).
5. The insert (2) according to any of the claims 2 to 4, **characterized in** that a surface plane of said wall section (36a, 36b, 36c) intersects with a surface plane of said crosslink (30).
6. The insert (2) according to any of the preceding claims, **characterized in** that said insert (2) further comprises a hold-down device (54) for holding remaining optical fiber

elements (14), wherein said hold-down device (54) crosses the recess (26) and forms an abutment face adapted to interact with the parallel surfaces (20) of the cable jacket (10) in the cut-out portion (16), thereby suppressing a rotational movement of the optical cable (12), and has a slot (56) for separating an optical fiber element (14) from the cut-out
5 portion (16).

7. An optical fiber assembly according to any of the preceding claims, **characterized in** that said recess (26) is defined between longitudinal rims (28) extending in the longitudinal direction of said recess (26) and providing guidance of the cut out portion (16).
8. An optical fiber assembly for an optical cable comprising a housing with a housing lower
10 body and a housing upper body enclosing an insert according to any of the preceding claims and sealing means for sealing the housing.

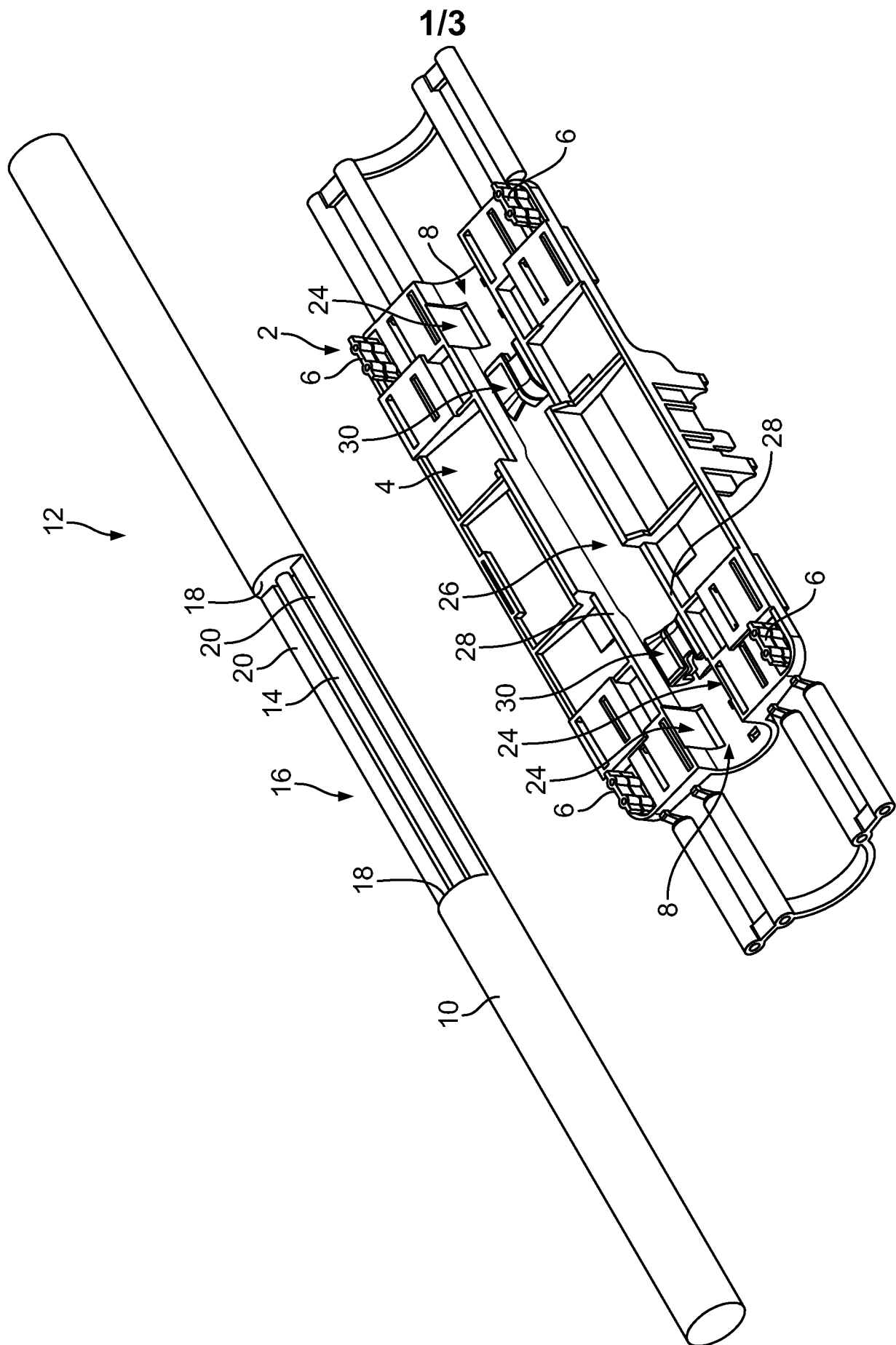


Fig. 1

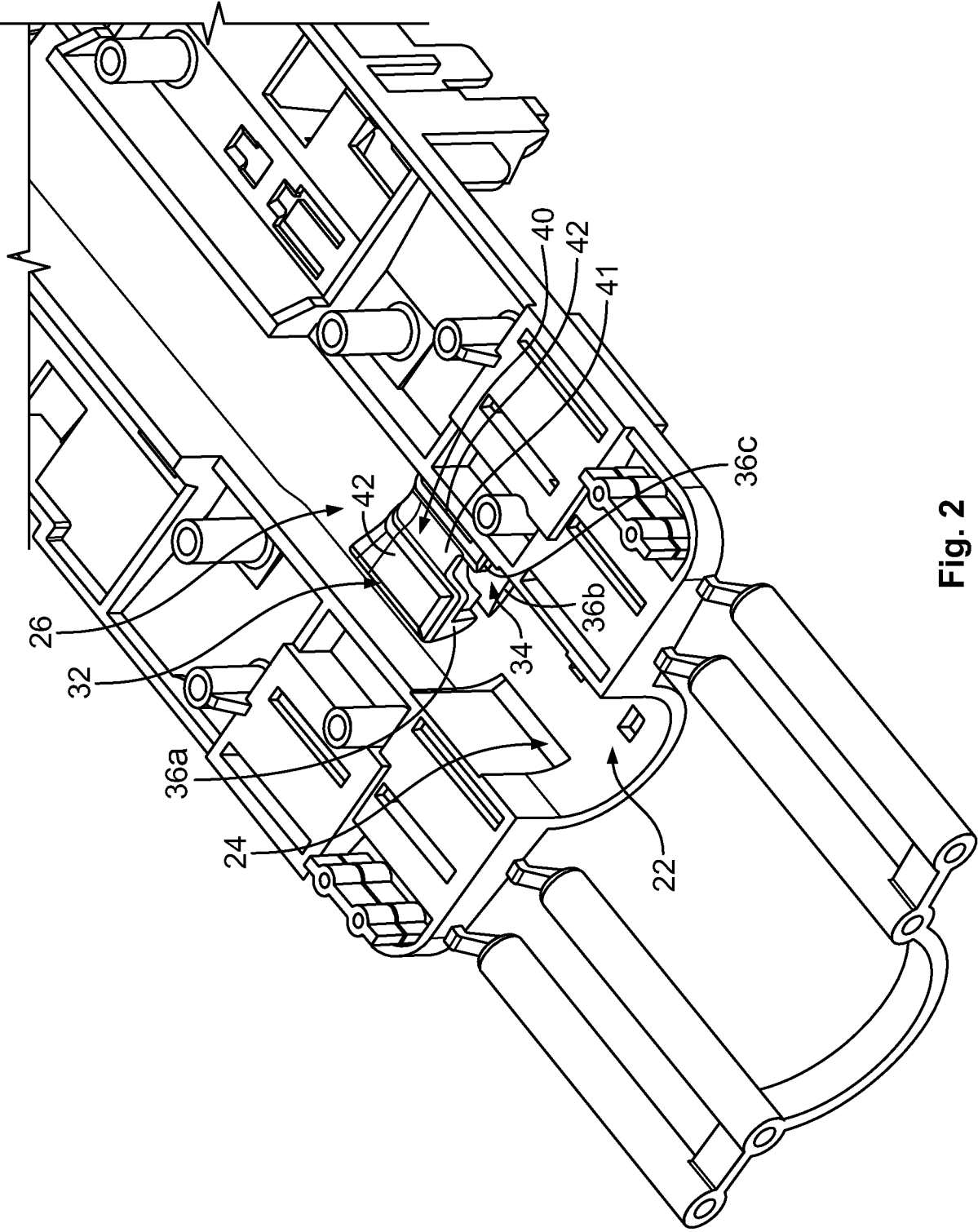


Fig. 2

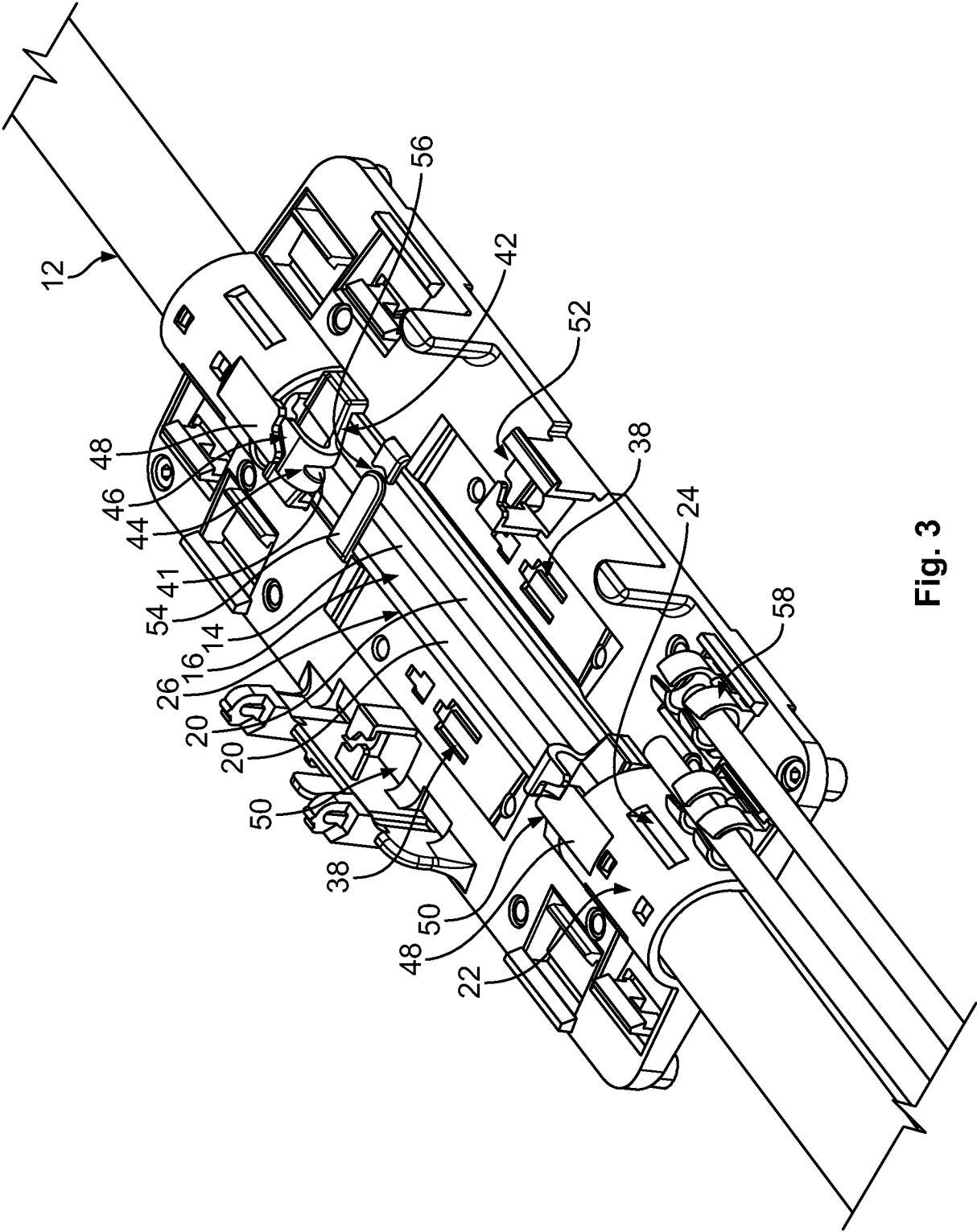


Fig. 3

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2010/051411

A. CLASSIFICATION OF SUBJECT MATTER

INV. G02B6/44
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G02B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X,P	WO 2009/029258 A1 (TYCO ELECTRONICS CORP [US]; MULLANEY JULIAN [US]; THOMPSON JUSTIN EVER) 5 March 2009 (2009-03-05) abstract; figures -----	1
A	FR 2 917 182 A1 (FREE SOC PAR ACTIONS SIMPLIFIE [FR]) 12 December 2008 (2008-12-12) figures 2,3 -----	1

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
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Date of the actual completion of the international search

17 May 2010

Date of mailing of the international search report

27/05/2010

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2010/051411

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2009029258 A1	05-03-2009	AU 2008293976 A1 US 2009060445 A1	05-03-2009 05-03-2009
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