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(54) Title: OPTICAL FIBER SPLICE CLOSURE WITH SPLIT COVER

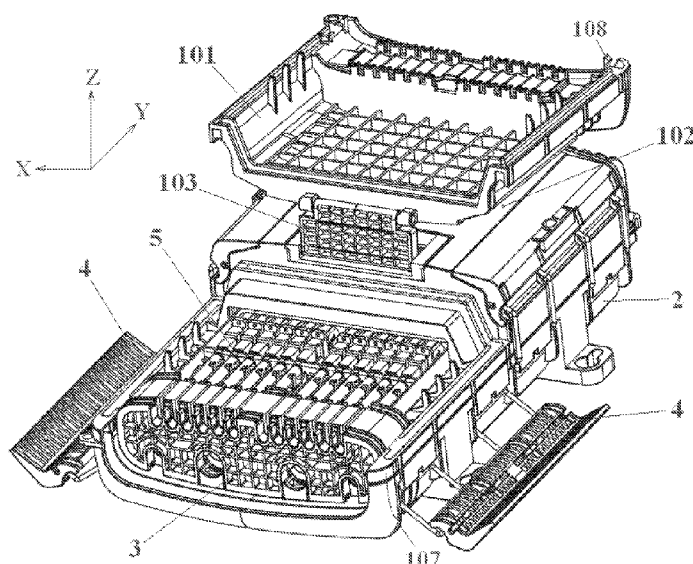


Fig. 3

(57) Abstract: The present invention discloses an optical fiber splice closure comprising a housing for receiving a splice unit. The housing has a base and a cover. The cover comprises at least one sub-cover unit, and the at least one sub-cover unit is constructed to be opened individually so as to expose at least one local operation area as necessary. Accordingly, when an operation is to be performed only on an operation area covered by a sub-cover unit, and the operator can perform this operation only by opening the sub-cover unit, without opening the whole cover. Thereby, the operator can simply and quickly complete this operation. In this way, electronic elements, optical elements and communication circuits on other operation areas are still covered and protected by the cover.

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OPTICAL FIBER SPLICE CLOSURE WITH SPLIT COVER**CROSS-REFERENCE TO RELATED APPLICATION**

5 This application claims the benefit of Chinese Patent Application No.201010228 104.X filed on July 13, 2010 in the State Intellectual Property Office of China, the whole disclosure of which is incorporated herein by reference.

BACKGROUND OF THE INVENTION**10 Field of the Invention**

 The present invention relates to an optical fiber splice closure, more particularly, relates to an optical fiber splice closure having an improved cover.

Description of the Related Art

15 The conventional optical fiber splice closure generally comprises a base and a cover, for example, the base and the cover each may be an integrately molded piece. The inner space of the optical fiber splice closure often is divided into a plurality of different operation areas, such as a splice fiber connection area, a main fiber splicing area, and a redundant fiber winding area. After all operations on these areas have been finished, the cover is closed to
20 seal the optical fiber splice closure. But, in some cases, it is necessary to reopen the cover to perform an operation, and then close the cover again after accomplishing this operation.

 However, after the optical fiber splice closure is closed at the first time, it needs to often perform the splice fiber connection operation because new splice fibers need be connected. At this time, the cover must be reopened to expose the whole inner space of the
25 optical fiber splice closure. Once the whole inner space of the optical fiber splice closure is exposed, all electronic elements, optical elements and communication circuits are also

exposed. Therefore, there is a risk that electronic elements, optical elements and communication circuits that are not related to the splice fiber connection operation may be accidentally touched and damaged.

5 SUMMARY OF THE INVENTION

The present invention has been made to overcome or alleviate at least one aspect of the above mentioned disadvantages.

Accordingly, it is an object of the present invention to provide an optical fiber splice closure which can effectively protect electronic elements, optical elements and
10 communication circuits therein.

According to an aspect of the present invention, there is provided an optical fiber splice closure comprising a housing for receiving a splice unit. The housing has a base and a cover. The cover comprises at least one sub-cover unit, and the at least one sub-cover unit is able to be opened individually so as to expose at least one local operation area according to a
15 practical requirement.

In an exemplary embodiment according to the present invention, the cover consists of a plurality of sub-cover units.

In another exemplary embodiment according to the present invention, the plurality of sub-cover units each is connected to the base in a rotatable manner or in an interference fit
20 manner.

In another exemplary embodiment according to the present invention, some of the plurality of sub-cover units are connected to the base in a rotatable manner or in an interference fit manner, and the other are connected with the adjacent sub-cover units in a rotatable manner or in an interference fit manner.

25 In another exemplary embodiment according to the present invention, the cover consists of a base cover unit and at least one sub-cover unit, and the at least one sub-cover

unit covers a local opening/openings in the base cover unit.

In another exemplary embodiment according to the present invention, the at least one sub-cover unit is connected to the base cover unit in a rotatable manner or in an interference fit manner, and the base cover unit is connected to the base in a rotatable manner or in an interference fit manner.

In another exemplary embodiment according to the present invention, the cover comprises a front sub-cover unit and a rear sub-cover unit.

In another exemplary embodiment according to the present invention, the front and rear sub-cover units are able to rotate about an axis in a width direction of the optical fiber splice closure.

In another exemplary embodiment according to the present invention, the rear end of the front sub-cover units and the front end of the rear sub-cover unit are connected each other by a hinge or a pivot; and the rear end of the rear sub-cover unit is connected with an end of the base by a hinge or a pivot.

In another exemplary embodiment according to the present invention, a hook is formed at the front end of the front sub-cover unit, when only the front sub-cover unit is opened, the front sub-cover unit can be held in an opened state by engaging the hook with a slot in the rear sub-cover unit.

In another exemplary embodiment according to the present invention, the rear sub-cover unit is formed with elongated bars extending forwardly at both sides thereof, and the front sub-cover unit is formed with clasps at the front end thereof; when the clasps of the front sub-cover unit are engaged with recesses in the elongated bars of the rear sub-cover unit, the front and rear sub-cover units are connected together and can be opened together.

In another exemplary embodiment according to the present invention, the front and rear sub-cover units are able to rotate about an axis in a length direction of the optical fiber splice closure.

In another exemplary embodiment according to the present invention, a side of the front sub-cover unit is rotatably connected with a side of the base by a hinge or a pivot; and a side of the rear sub-cover units is rotatably connected with a side of the base by a hinge or a pivot.

5 In another exemplary embodiment according to the present invention, latches are provided at both sides of the base and rotatably connected with both sides of the base by hinges or pivots; and the latches can engage with both sides of the front and rear sub-cover units.

In another exemplary embodiment according to the present invention, the front
10 sub-cover unit is able to rotate about an axis in a length direction of the optical fiber splice closure, and the rear sub-cover unit is able to rotate about an axis in a width direction of the optical fiber splice closure.

In another exemplary embodiment according to the present invention, one side of the front sub-cover unit is connected with one side of the base by a hinge or a pivot; and the rear
15 end of the rear sub-cover unit is connected with the rear end of the base by a hinge or a pivot.

In another exemplary embodiment according to the present invention, the front sub-cover unit for covering a splice fiber connection area on the splice unit.

In various exemplary embodiments of the present invention, the cover comprises at
20 least one sub-cover unit, therefore, when an operation is to be performed only on an operation area covered by a sub-cover unit, and operator can perform this operation only by opening the sub-cover unit, without opening the whole cover. Accordingly, the operator can simply and quickly complete this operation. In this way, electronic elements, optical elements and communication circuits on other operation areas are still covered and protected
25 by the cover.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other features of the present invention will become more apparent by describing in detail exemplary embodiments thereof with reference to the accompanying drawings, in which:

5 Fig. 1 is a perspective view of an optical fiber splice closure according to a first exemplary embodiment of the present invention;

Fig.2 is a perspective view shows the cover of the optical fiber splice closure shown in Fig.1;

Fig.3 shows the optical fiber splice closure according to the first exemplary
10 embodiment of the present invention when only the front sub-cover unit is opened;

Fig.4a shows a cross section view of the optical fiber splice closure of Fig.3;

Fig.4b shows an enlarged view of a portion indicated by a circle of Fig.4a;

Fig.5a shows the optical fiber splice closure according to the first exemplary
embodiment of the present invention when the front sub-cover unit and the rear sub-cover
15 unit both are opened;

Fig.5b shows an enlarged view of a portion indicated by a circle of Fig.5a;

Fig.6 is an illustrative view of an optical fiber splice closure according to a second
exemplary embodiment of the present invention, wherein only the front sub-cover unit is
opened;

20 Fig.7 shows the optical fiber splice closure according to the second exemplary
embodiment of the present invention when the front sub-cover unit and the rear sub-cover
unit both are opened; and

Fig.8 is a schematic view of an optical fiber splice closure according to a third
exemplary embodiment of the present invention.

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DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS OF THE

IVENTION

Exemplary embodiments of the present disclosure will be described hereinafter in detail with reference to the attached drawings, wherein the like reference numerals refer to the like elements. The present disclosure may, however, be embodied in many different forms and
5 should not be construed as being limited to the embodiment set forth herein; rather, these embodiments are provided so that the present disclosure will be thorough and complete, and will fully convey the concept of the disclosure to those skilled in the art.

[The First Embodiment]

Fig. 1 is a perspective view of an optical fiber splice closure according to a first
10 exemplary embodiment of the present invention. As shown in Fig.1, the optical fiber splice closure has a housing mainly comprising a base 2 and a cover 1.

The optical fiber splice closure has a length direction Y, a width direction X perpendicular to the length direction, and a height direction Z orthogonal to the length and width directions Y and X, as shown in Fig. 1.

15 Fig.3 shows the optical fiber splice closure according to the first exemplary embodiment of the present invention when only the front sub-cover unit 101 is opened.

Referring to Fig.3, a splice unit 5 is received in the housing of the optical fiber splice closure. The splice unit 5 is divided into a plurality of operation areas, such as a splice fiber connection area, a main fiber splicing area, and a redundant fiber winding area. In an
20 exemplary embodiment of the present invention, an elastic seal block 3 is provided at ports of the housing for sealing the ports.

Fig.2 is a perspective view shows the cover of the optical fiber splice closure shown in Fig.1. In this embodiment, the cover 1 comprises a front sub-cover unit 101 and a rear sub-cover unit 102.

25 Please refer to Figs.2 and 3, the rear end of the front sub-cover unit 101 is rotatably connected with the front end of the rear sub-cover unit 102 by, for example, a hinge or a

pivot.

Fig.5a shows the optical fiber splice closure according to the first exemplary embodiment of the present invention when the front sub-cover unit 101 and the rear sub-cover unit 102 both are opened.

5 Referring to Figs.3 and 5a, the front and rear sub-cover units 101, 102 both are able to rotate about an axis in the width direction X of the optical fiber splice closure to an opened state or a closed state.

In the first embodiment of the present invention, although the front sub-cover unit 101 is rotatably connected with the rear sub-cover unit 102, and the rear sub-cover unit 102 is
10 rotatably connected with the base 2, the present invention is not limited to this, the front sub-cover unit 101 may be connected with the rear sub-cover unit 102 by, for example, a snapping manner or an interference fit manner, and the rear sub-cover unit 102 also may be connected with the base 2 by, for example, a snapping manner or an interference fit manner.

In the first embodiment shown in Figs.3 and 5a, latches 4 are provided at both sides of
15 the base 2 for holding the front sub-cover unit 101 or the rear sub-cover unit 102 in the closed state.

Fig.4a shows a cross section view of the optical fiber splice closure of Fig.3; and Fig.4b shows an enlarged view of a portion indicated by a circle of Fig.4a. In an exemplary embodiment of the present invention, at least one hook 104 is formed at the front end of the
20 front sub-cover unit 101, and at least one slot is formed in the rear end of the rear sub-cover unit 102. In this way, when only the front sub-cover unit 101 is opened and overlapped over the rear sub-cover unit 102, the hook 104 of the front sub-cover unit 101 is hooked in and engaged with the slot of the rear sub-cover unit 102 to stably hold the front sub-cover unit 101 in the opened state.

25 Fig.5b shows an enlarged view of a portion indicated by a circle of Fig.5a. Please refer to Figs.2, 3 and 5b, in an exemplary embodiment of the present invention, the rear sub-cover

unit 102 is formed with elongated bars 107 extending forwardly at both sides thereof. The elongated bars 107 have recesses formed therein, and the front sub-cover unit 101 is formed with clasps 108 at the front end thereof. In this way, when the clasps 108 of the front sub-cover unit 101 are engaged with recesses in the elongated bars 107 of the rear sub-cover unit 102, the front and rear sub-cover units 101, 102 are engaged together and can be opened or closed together as one piece.

In an exemplary embodiment of the present invention, as shown in Figs. 1-5, the front sub-cover unit 101 covers the splice fiber connection area, and the rear sub-cover unit 102 covers the main fiber splicing area and the redundant fiber winding area. Accordingly, after the optical fiber splice closure is closed, and when the splice fiber connection operation is needed to be performed, the operator can only open the front sub-cover unit 101 and remain the rear sub-cover unit 102 in the closed state, as shown in Fig.3. In this way, the operator can simply and quickly complete the splice fiber connection operation and will not touch or damage electronic elements, optical elements or communication circuits that are not related to the splice fiber connection operation and still covered by the rear sub-cover unit 102.

Hereinafter, the primary operation process of the optical fiber splice closure of the present invention will be described in detail with reference to accompanying drawings.

a) At the first time of assembling the optical fiber splice closure, as shown in Fig.5a, the front sub-cover unit 101 and the rear sub-cover unit 102 are engaged together by the clasps 108 and are opened together to expose the whole inner space of the housing;

b) After the front sub-cover unit 101 and the rear sub-cover unit 102 are opened together, the operator performs all initial operations, such as the splice fiber connection operation, the main fiber splicing operation and the redundant fiber winding operation, on the splice unit 5;

c) When all operations on the splice unit 5 have been finished, the operator closes the front sub-cover unit 101 and the rear sub-cover unit 102 together and locks the front

sub-cover unit 101 and the rear sub-cover unit 102 in the closed state by latches 4, as shown in Fig. 1;

d) After closing and locking the front sub-cover unit 101 and the rear sub-cover unit 102, when it needs to add new fiber user terminals, the operator opens only the front sub-cover unit 101 to expose the splice fiber connection area and remains the rear sub-cover unit 102 in the closed state to prevent the other areas, which are covered by the rear sub-cover unit 102, from being exposed, as shown in Fig.3. Accordingly, the operator can complete the splice fiber connection operation on the exposed splice fiber connection area.

[The Second Embodiment]

Fig.6 is a perspective view of an optical fiber splice closure according to a second exemplary embodiment of the present invention, wherein only the front sub-cover unit 101 is opened; and Fig.7 shows the optical fiber splice closure according to the second exemplary embodiment of the present invention when the front sub-cover unit 101 and the rear sub-cover unit 102 both are opened.

In optical fiber splice closure according to the first embodiment shown in Figs. 1-5, the front and rear sub-cover units 101, 102 are opened by rotating about an axis in the width direction X of the optical fiber splice closure.

While in the optical fiber splice closure according to the second embodiment shown in Figs.6-7, the front and rear sub-cover units 101, 102 can be opened by rotating about an axis in a length direction Y of the optical fiber splice closure.

In an exemplary embodiment of the present invention, although it is not shown, a side of the front sub-cover unit 101 is rotatably connected with a side of the base 2 by, for example, a hinge or a pivot; and a side of the rear sub-cover units 102 is rotatably connected with a side of the base 2 by, for example, a hinge or a pivot.

In the exemplary embodiment shown in Figs.6-7, latches 4 are rotatably connected with both sides of the base 2 by hinges or pivots. When the latch 4 at one side of the base 2

engages with one side of the front or rear sub-cover units 101, 102 and the latch 4 at the other side of the base 2 disengages with the other side of the front or rear sub-cover units 101, 102, the front or rear sub-cover units 101, 102 can be opened and rotated along with the latch 4 at the one side of the base 2.

5 In the second embodiment of the present invention, although the latches 4 are rotatably connected with the base 2, the present invention is not limited to this, the latches 4 may be connected with the base 2 in, for example, a snapping manner or an interference fit manner.

Similarly with the first embodiment, as shown in Fig.7, in the second embodiment, during the first time of assembling the optical fiber splice closure, the front sub-cover unit 101 and the rear sub-cover unit 102 are engaged with each other and are opened together. 10 After assembled, when it needs to add new fiber user terminals, only the front sub-cover unit 101 is opened, and the rear sub-cover unit 102 is remained in the closed state to prevent the other areas from being exposed, as shown in Fig.6.

[The Third Embodiment]

15 Fig.8 is an schematic view of an optical fiber splice closure according to a third exemplary embodiment of the present invention.

As shown in Fig.8, the cover 1 consists of a base cover unit 10 and two sub-cover units 11, 12. The two sub-cover units 11, 12 covers two openings 11', 12' in the base cover unit 10.

20 In an exemplary embodiment of the present invention, the two sub-cover units 11, 12 each is rotatably connected with the base cover unit 10 by, for example, a hinge or a pivot (not shown), and the base cover unit 10 is rotatably connected with the base of the housing by, for example, a hinge or a pivot (not shown). But the present invention is not limited to this, the two sub-cover units 11, 12 each may be connected with the base cover unit 10 by, 25 for example, a snapping manner or an interference fit manner, and the base cover unit 10 may be rotatably connected with the base of the housing by, for example, a snapping manner

or an interference fit manner.

In the exemplary embodiment shown in Fig.8, although the cover 1 comprises two sub-cover units 11, 12, but the cover 1 may comprise one, three, four or more sub-cover units as necessary.

5 In the third embodiment, during the first time of assembling the optical fiber splice closure, the two sub-cover units 11, 12 cover the two openings 11', 12' in the base cover unit 10 and are opened with the base cover unit 10 together. After assembled, when it needs to add new fiber user terminals, only the sub-cover unit 11 is opened, and the sub-cover unit 12 and the base cover unit 10 are remained in the closed state.

10

[Other Embodiments]

In the first exemplary embodiment shown in Figs. 1-5, the front sub-cover unit 101 and the rear sub-cover unit 102 both are opened or closed by rotating about the axis in the width direction X of the optical fiber splice closure. In the second exemplary embodiment shown in Figs.6-7, the front sub-cover unit 101 and the rear sub-cover unit 102 both are opened or closed by rotating about the axis in the length direction Y of the optical fiber splice closure. But the present invention is not limited to this, in other exemplary embodiments, one of the front and rear sub-cover units 101, 102 may be opened or closed by rotating about the axis in the width direction X of the optical fiber splice closure, and the other may be opened or closed by rotating about the axis in the length direction Y of the optical fiber splice closure. For example, a side of the front sub-cover unit 101 is rotatably connected with a side of the base 2 by a hinge or a pivot, and the rear end of the rear sub-cover unit 102 is rotatably connected with the rear end of the base 2 by a hinge or a pivot.

25 In the first exemplary embodiment shown in Figs. 1-5, the cover 1 only comprises two sub-cover units 101 and 102, but the present invention is not limited to this, the cover 1 may comprise three, four or more sub-cover units as necessary. For example, the cover 1 may

comprise a front sub-cover unit, a rear sub-cover unit, and a middle sub-cover unit between the front sub-cover unit and the rear sub-cover unit.

Although several exemplary embodiments have been shown and described, it would be appreciated by those skilled in the art that various changes or modifications may be made in these embodiments without departing from the principles and spirit of the disclosure, the scope of which is defined in the claims and their equivalents.

What is claimed is,

1. An optical fiber splice closure comprising a housing for receiving a splice unit (5),
the housing having a base (2) and a cover (1),
wherein the cover (1) comprises at least one sub-cover unit which is constructed to be
5 opened individually so as to expose at least one operation area as necessary.
2. The optical fiber splice closure according to claim 1, wherein the cover (1) consists
of a plurality of sub-cover units (101, 102).
- 10 3. The optical fiber splice closure according to claim 2, wherein each of the plurality of
sub-cover units (101, 102) is connected to the base (2) in a rotatable manner or in an
interference fit manner.
4. The optical fiber splice closure according to claim 2, wherein some of the plurality
15 of sub-cover units (101, 102) are connected to the base (2) in a rotatable manner or in an
interference fit manner, and the others are connected with the adjacent sub-cover units in a
rotatable manner or in an interference fit manner.
5. The optical fiber splice closure according to claim 1, wherein the cover (1) consists
20 of a base cover unit (10) and at least one sub-cover unit (11, 12), and the at least one
sub-cover unit (11, 12) is constructed to cover openings (11', 12') on the base cover unit
(10).
6. The optical fiber splice closure according to claim 5, wherein the at least one
25 sub-cover unit (11, 12) is connected to the base cover unit (10) in a rotatable manner or in an
interference fit manner, and the base cover unit (10) is connected to the base (2) in a

rotatable manner or in an interference fit manner.

7. The optical fiber splice closure according to claim 2, wherein the cover (1) comprises a front sub-cover unit (101) and a rear sub-cover unit (102).

5

8. The optical fiber splice closure according to claim 7, wherein the front and rear sub-cover units (101, 102) are constructed to rotate about an axis in a width direction (X) of the optical fiber splice closure.

10 9. The optical fiber splice closure according to claim 8, wherein the rear end of the front sub-cover units (101) and the front end of the rear sub-cover unit (102) are rotatably connected to each other; and wherein the rear end of the rear sub-cover unit (102) is rotatably connected with an end of the base (2).

15

10. The optical fiber splice closure according to claim 9, wherein a hook (104) is formed at the front end of the front sub-cover unit (101), when only the front sub-cover unit (101) is opened, the front sub-cover unit (101) is held in an opened state by engaging the hook (104) with a slot in the rear sub-cover unit (102).

20

11. The optical fiber splice closure according to claim 9, wherein the rear sub-cover unit (102) is formed with elongated bars (107) extending forwardly at both sides thereof, and the front sub-cover unit (101) is formed with clasps (108) at the front end thereof;

25 when the clasps (108) of the front sub-cover unit (101) are engaged with the recesses in the elongated bars (107) of the rear sub-cover unit (102), the front and rear sub-cover units (101,

102) are connected together and opened together.

12. The optical fiber splice closure according to claim 7, wherein the front and rear sub-cover units (101, 102) are constructed to rotate about an axis in a length direction (Y) of the optical fiber splice closure.

13. The optical fiber splice closure according to claim 12, wherein a side of the front sub-cover unit (101) is rotatably connected with a side of the base (2); and wherein a side of the rear sub-cover units (102) is rotatably connected with a side of the base (2).

14. The optical fiber splice closure according to claim 12, wherein latches (4) are provided at both sides of the base (2) and rotatably connected with both sides of the base (2) to engage with both sides of the front and rear sub-cover units (101, 102).

15. The optical fiber splice closure according to claim 7, wherein the front sub-cover unit (101) is constructed to rotate about an axis in a length direction (Y) of the optical fiber splice closure, and the rear sub-cover unit (102) is constructed to rotate about an axis in a width direction (X) of the optical fiber splice closure.

16. The optical fiber splice closure according to claim 15, wherein one side of the front sub-cover unit (101) is rotatably connected with one side of the base (2); and wherein the rear end of the rear sub-cover unit (102) is rotatably connected with the rear end

of the base (2).

17. The optical fiber splice closure according to claim 16, wherein the front sub-cover unit (101) is constructed to cover a splice fiber connection area on the splice unit (5).

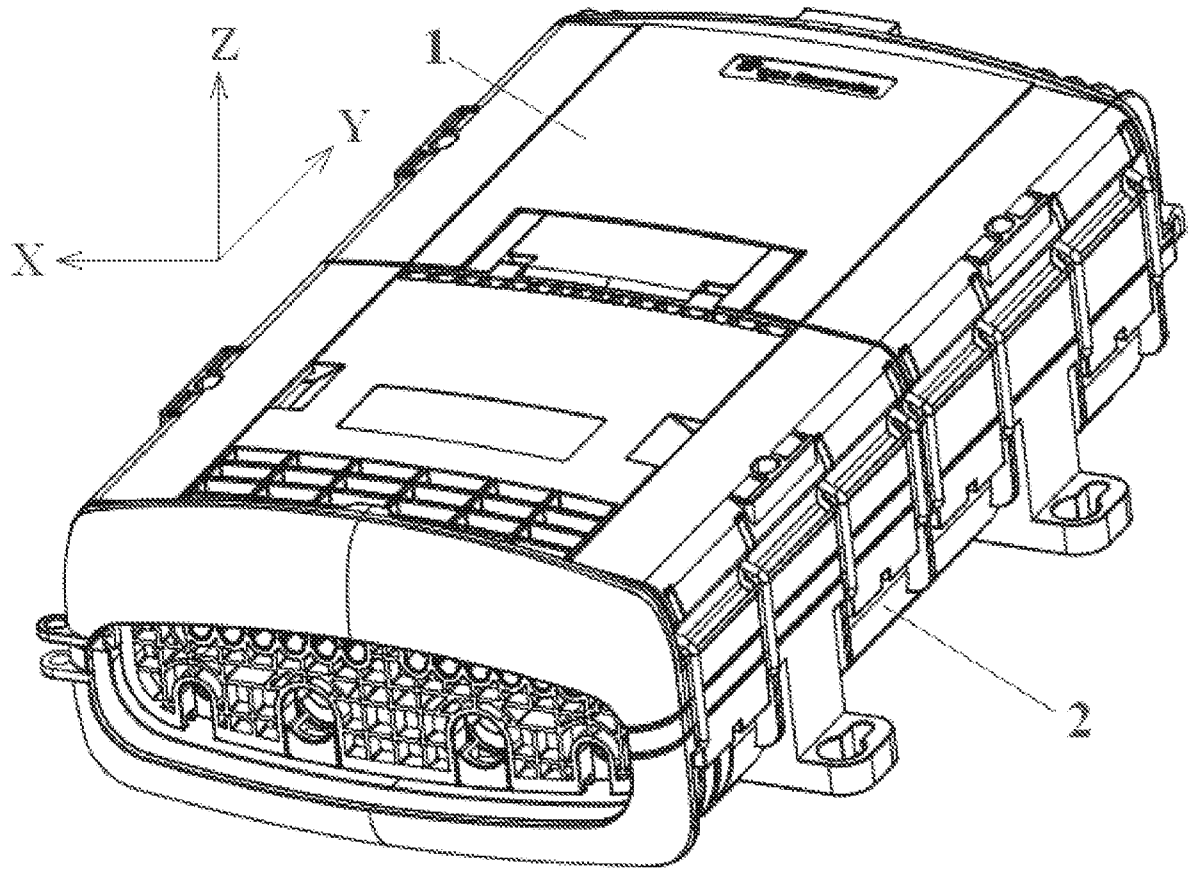


Fig. 1

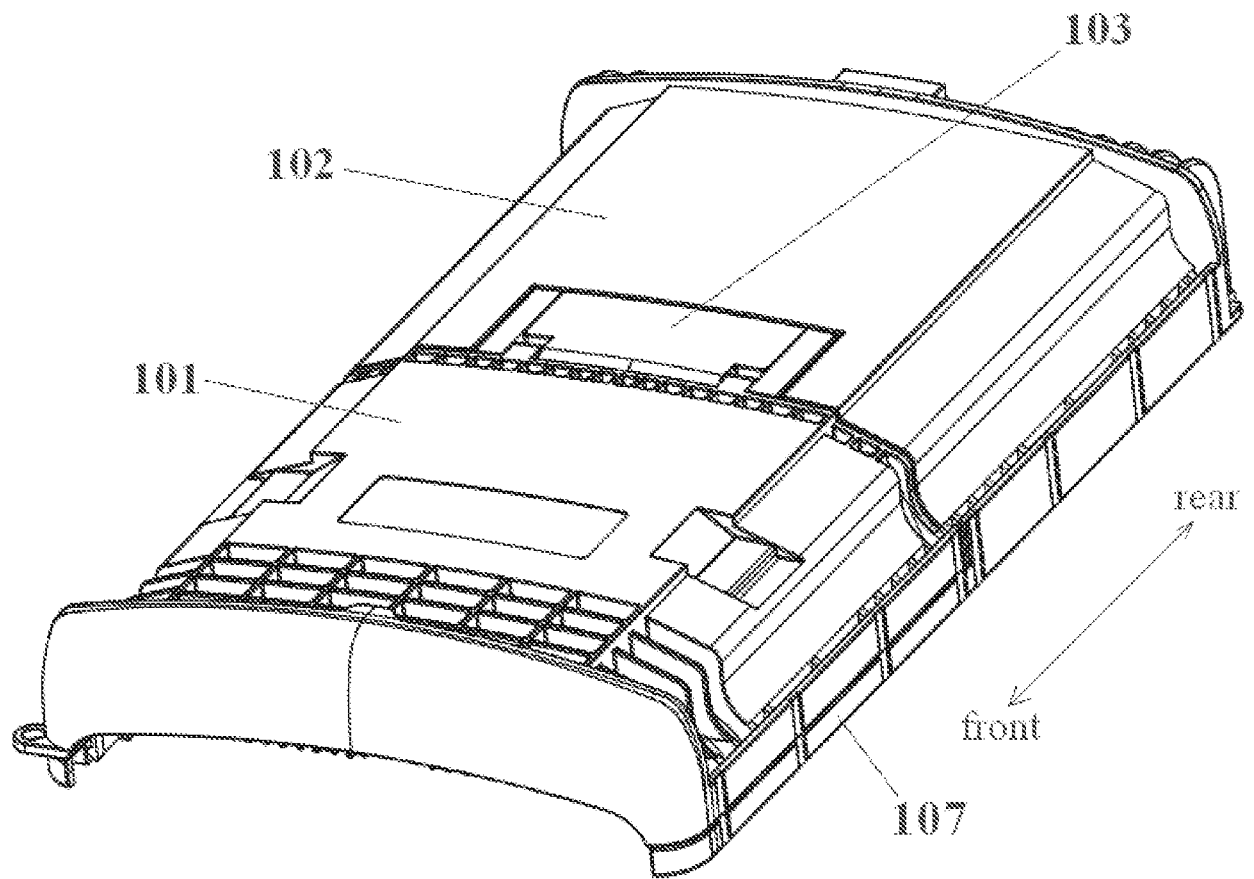


Fig. 2

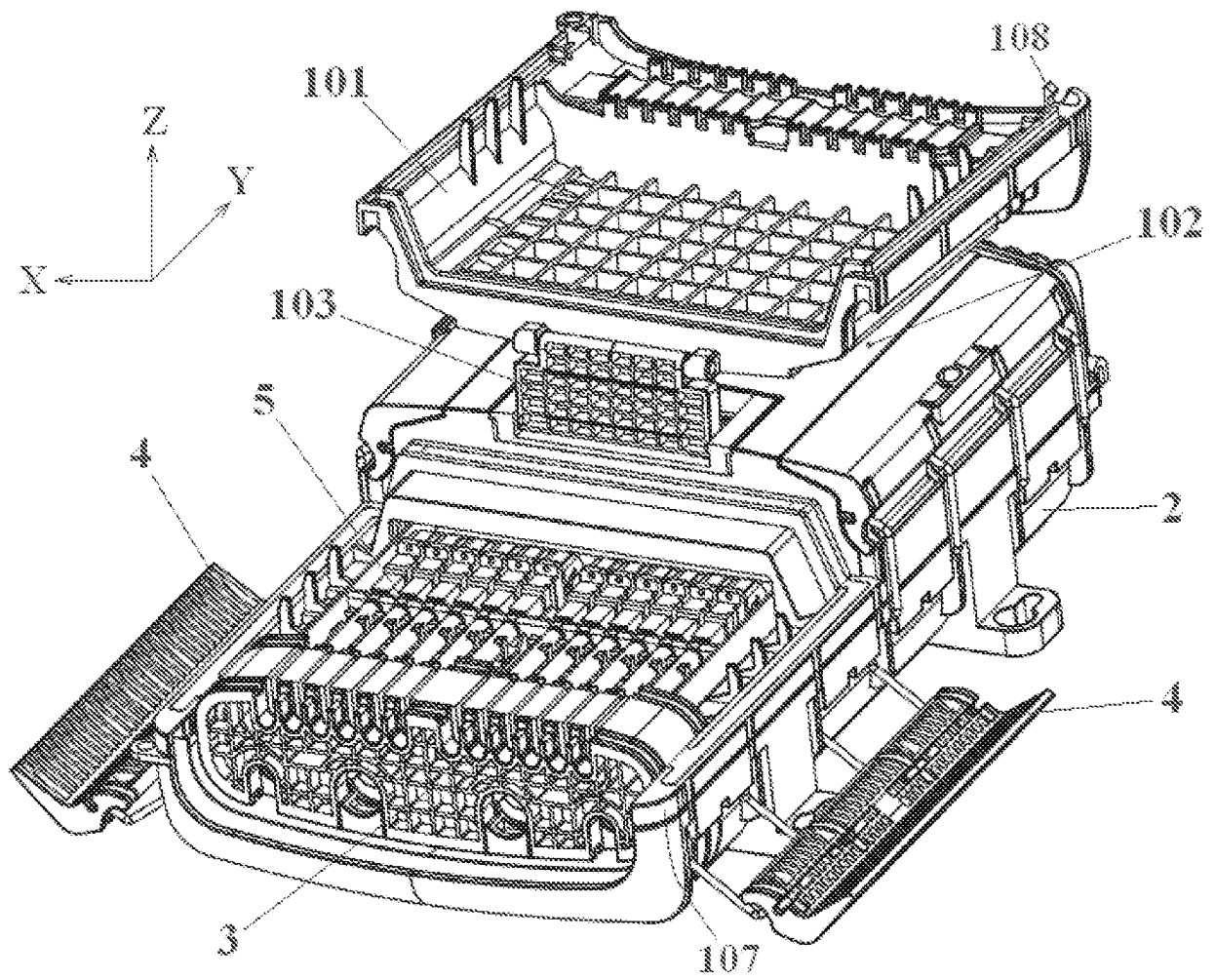


Fig. 3

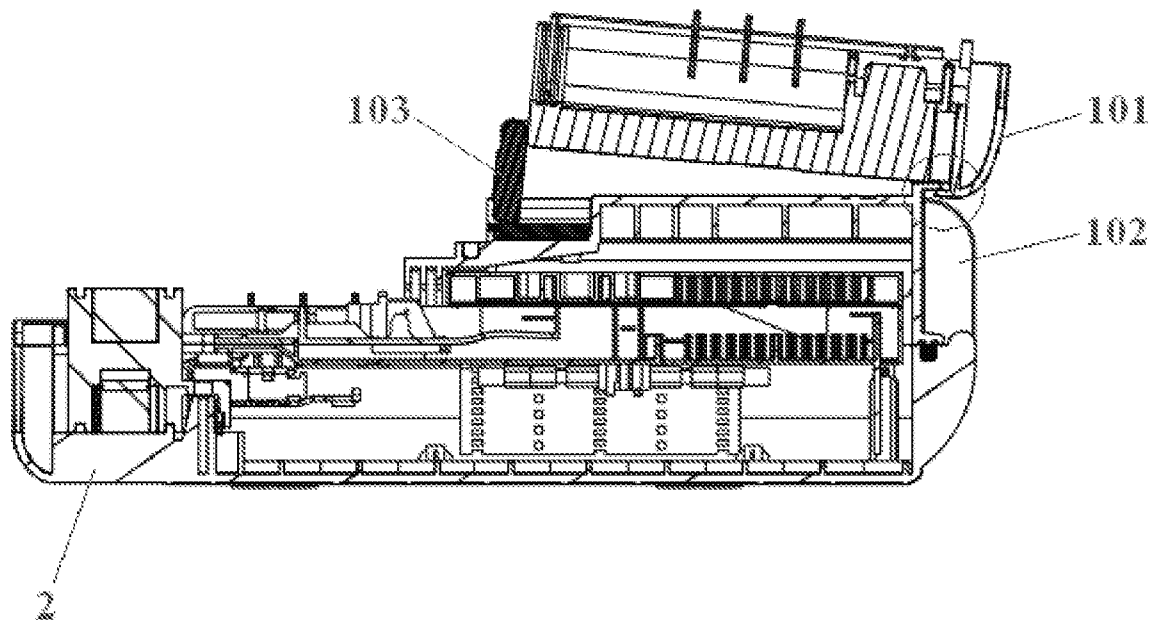


Fig. 4a

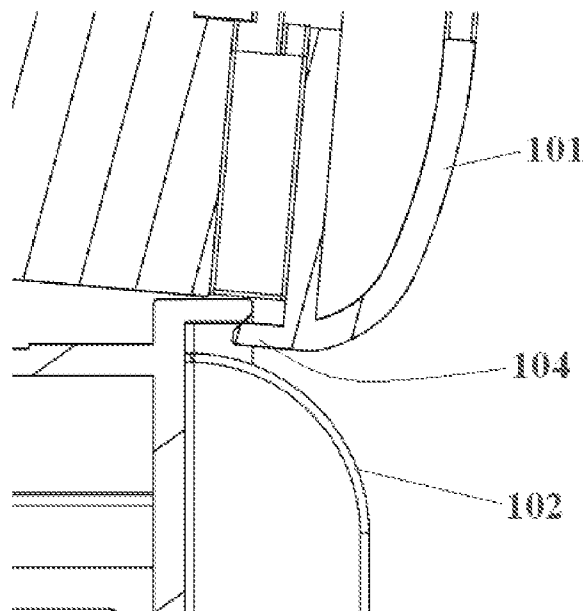


Fig. 4b

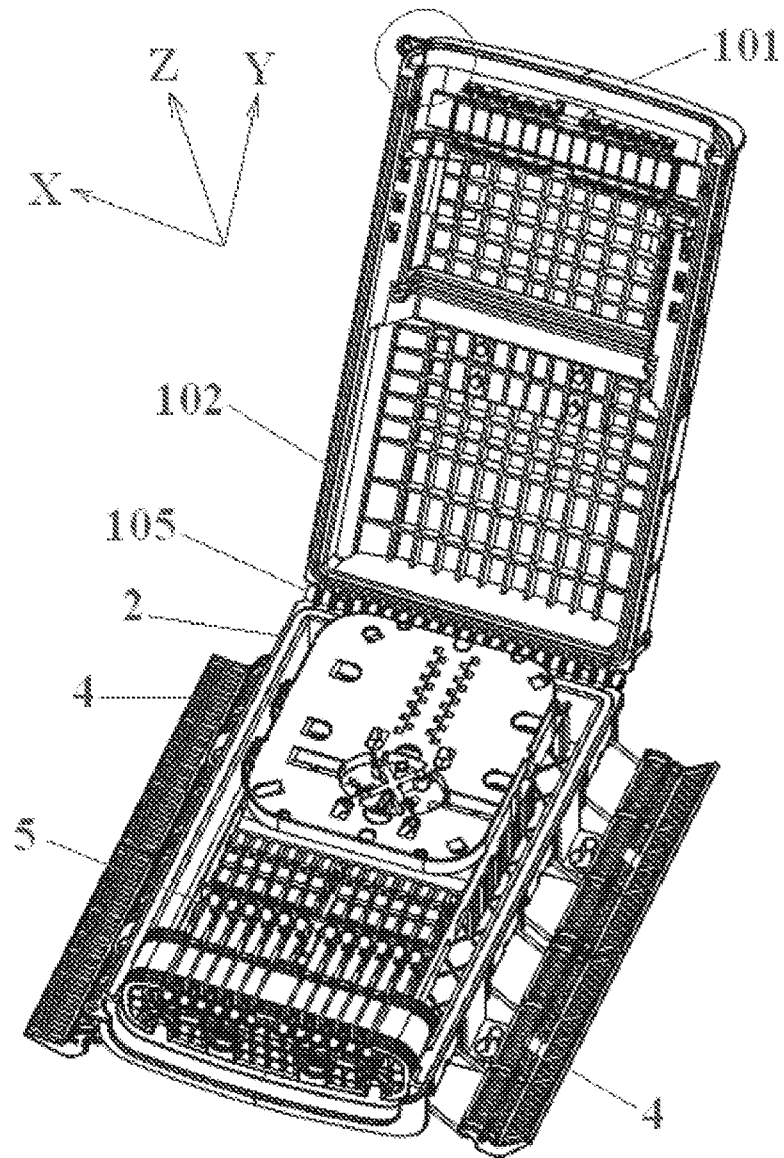


Fig. 5a

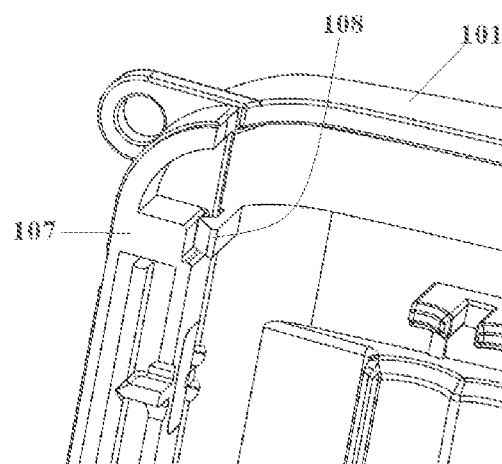


Fig. 5b

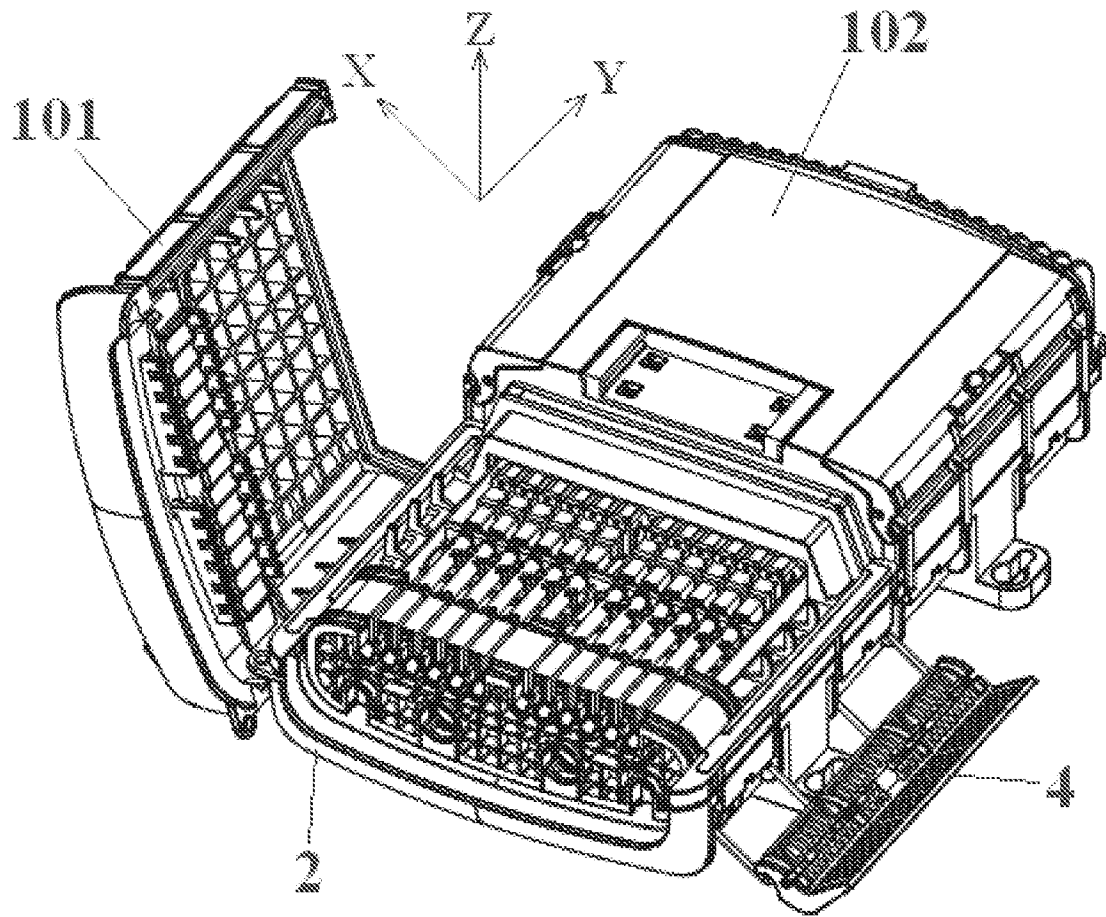


Fig. 6

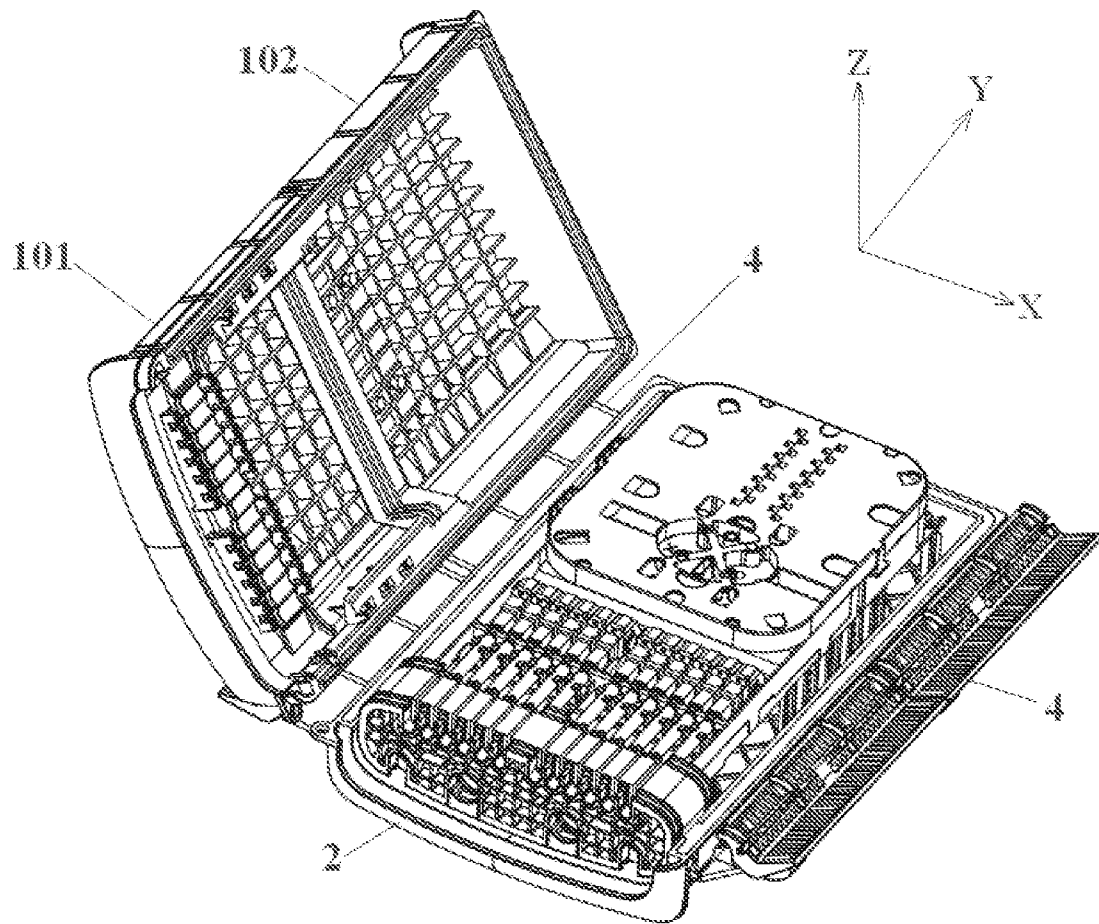


Fig. 7

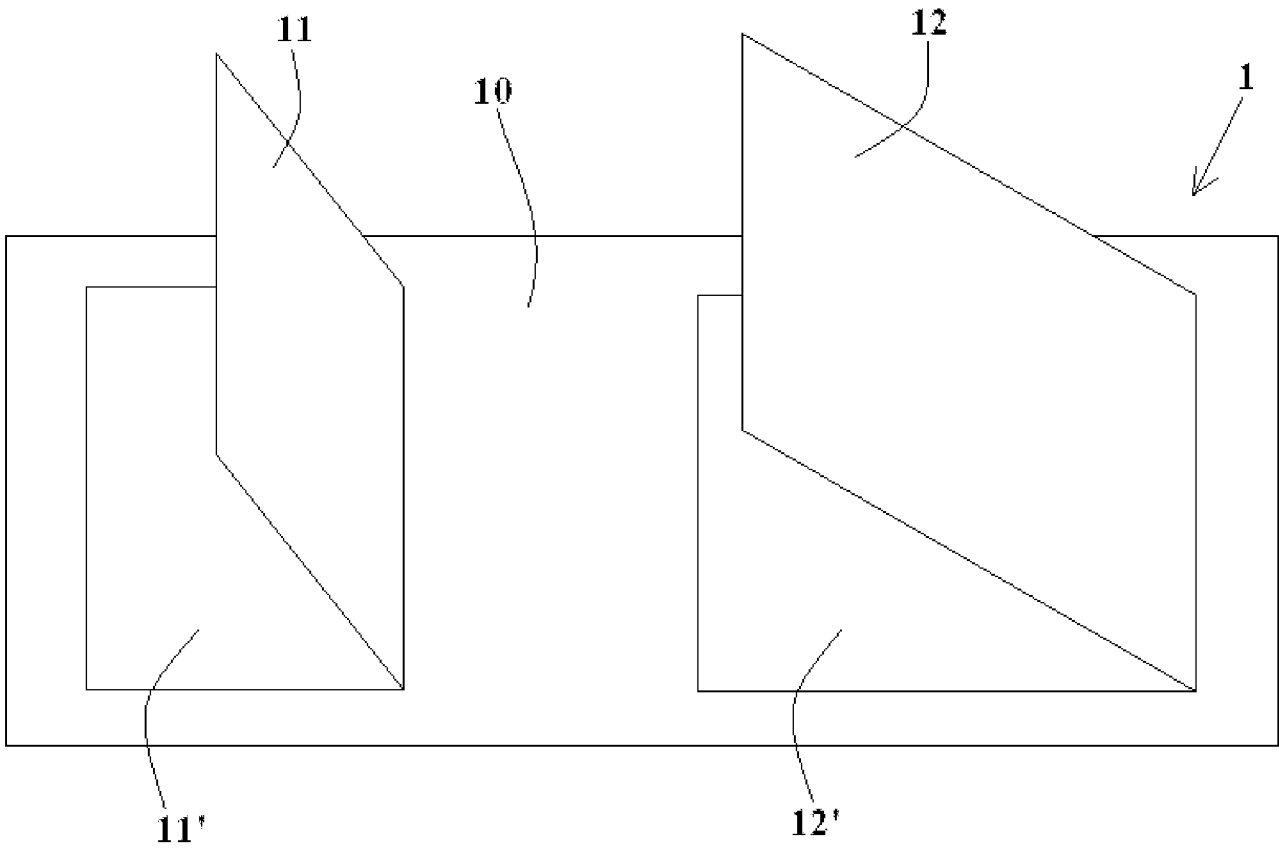


Fig. 8

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference TO-00359 PCT	FOR FURTHER ACTION SEE FORM PCT/ISA/220 as well as where applicable, item 5 below.	
International application No. PCT/IB2011/053110	International filing date (day/month/year) 12/07/2011	(Earliest) Priority Date (day/month/year) 13/07/2010
Applicant TYCO ELECTRONICS (SHANGHAI) CO. LTD.		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 4 sheets.



It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of:



the international application in the language in which it was filed



a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b))

- b. ☐

This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6E>s(a)).

- c. ☐

With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☐

Certain claims were found unsearchable (See Box No. II)

3. ☐

Unity of invention is lacking (see Box No III)

4. With regard to the **title**,



the text is approved as submitted by the applicant



the text has been established by this Authority to read as follows:

OPTICAL FIBER SPLICE CLOSURE WITH SPLIT COVER

5. With regard to the **abstract**,



the text is approved as submitted by the applicant



the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority

6. With regard to the **drawings**,

- a. the figure of the **drawings** to be published with the abstract is Figure No. 3



as suggested by the applicant



as selected by this Authority, because the applicant failed to suggest a figure



as selected by this Authority, because this figure better characterizes the invention

- b. ☐

none of the figures is to be published with the abstract

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2011/053110

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 , WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	wo 2006/096839 AI (CHANNELL COMMERCIAL CORP [US] ; BURKE EDWARD J [US] ; GWILLIM ROBERT [US] 14 September 2006 (2006-09-14) abstract; figure 4 paragraph [0002] paragraphs [0040] - [0042] paragraphs [0047] - [0048] paragraph [0061] -----	1-7
X	US 2009/060439 AI (COX TERRY DEAN [US] ET AL) 5 March 2009 (2009-03-05) abstract; figures 21-24 paragraphs [0033] - [0035] paragraphs [0103] - [0104] ----- - / - -	1,7-16



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"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.
"&" document member of the same patent family

Date of the actual completion of the international search

24 November 2011

Date of mailing of the international search report

02/12/2011

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Authorized officer

Hyl I a , Winfried

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2011/053110

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 434 944 A (KERRY JOHN [GB] ET AL) 18 July 1995 (1995-07-18) abstract; figures 1, 4a, b, 8b column 12, lines 7-34, 48-57 -----	1-3, 7, 17
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X, P	CN 201 570 820 U (YAXIN WANG) 1 September 2010 (2010-09-01) abstract; figures 1, 2 -----	1-8, 12, 13

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2011/053110

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