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(54) Title: OPTICAL FIBER SPLICE ENCLOSURE WITH ELASTIC SEAL

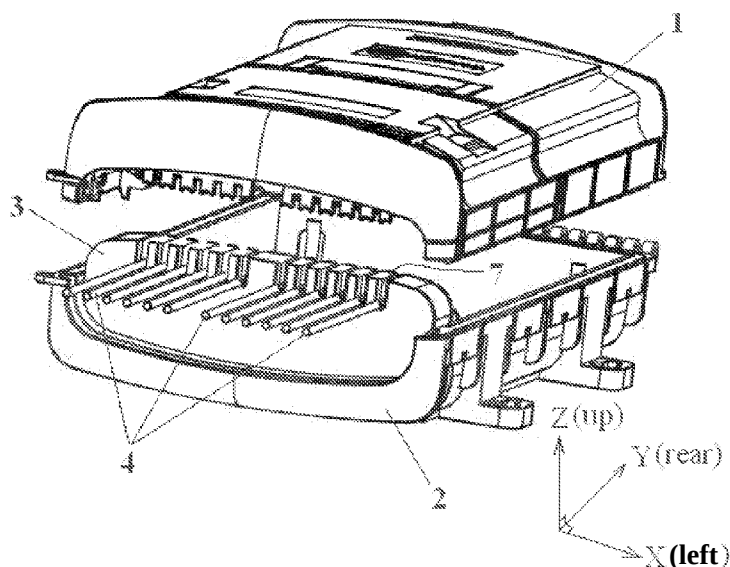


Fig. 1

(57) Abstract: The present invention discloses an optical fiber splice enclosure comprising: a housing (2,3) having a port for optical cables passing therethrough; and an elastic block (3) provided in the port and adapted for wrapping the optical cables (4) therein so as to seal the port of the housing. Accordingly, the optical cables are wrapped and sealed in the elastic block simply by use of the rigid housing of the enclosure to press the elastic block. Therefore, in the field, only by closing the cover of the housing, the optical cables and the port of the enclosure both can be sealed in a water-proof manner.

OPTICAL FIBER SPLICE ENCLOSURE WITH ELASTIC SEAL**CROSS-REFERENCE TO RELATED APPLICATION**

This application claims the benefit of Chinese Patent Application No.2010102281 18.1
5 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**Field of the Invention**

The present invention relates to an optical fiber splice enclosure, more particularly,
relates to an optical fiber splice enclosure having an elastic seal structure.

Description of the Related Art

15 The conventional optical fiber splice enclosure generally has an entrance port and an
exit port for allowing optical cables to pass through. A pair of elastic half-blocks that can be
assembled with each other are disposed in the entrance port or the exit port for seal the
entrance port or the exit port in a water-proof manner. The optical cables are placed between
the pair of elastic half-blocks. When the pair of elastic half-blocks are fitted together by
20 pressure, the optical cables are wrapped and sealed between the pair of elastic half-blocks.

However, in a case of assembling the optical fiber splice enclosure in the field, it is
difficult to fit the pair of elastic half-blocks together due to the limited operation space in the
field, sometimes, for example, it needs special tools to perform this operation.

SUMMARY OF THE INVENTION

25 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 enclosure adapted to be assembled in the field.

According to an aspect of the present invention, there is provided an optical fiber splice enclosure, comprising: a housing having a port for optical cables passing therethrough; and
5 an elastic block provided in the port and adapted for wrapping the optical cables therein so as to seal the port of the housing.

In an exemplary embodiment according to the present invention, the housing comprises a cover and a base detachably connected with the cover.

In another exemplary embodiment according to the present invention, the elastic block
10 having spaced-apart recesses formed at a side of the elastic block for allowing the optical cables to pass therethrough.

In another exemplary embodiment according to the present invention, the recesses are elongated grooves extending inwardly from the side of the elastic block.

In another exemplary embodiment according to the present invention, the housing has a
15 portion for extruding the edge of the elastic block, and the extruding portion is formed with extruding ribs that are spaced apart by dents corresponding to the recesses of the elastic block.

In another exemplary embodiment according to the present invention, a shield wall is formed at outermost side of the port of the housing to hide the recesses of the elastic block
20 and the dents of the housing.

In another exemplary embodiment according to the present invention, the elastic block is integrated with the base.

In another exemplary embodiment according to the present invention, the elastic block is formed as one piece.

25 In another exemplary embodiment according to the present invention, the optical fiber splice enclosure further comprises a second elastic block provided between the elastic block

and the base for allowing second optical cables to pass between the elastic block and the second elastic block.

In another exemplary embodiment according to the present invention, the second elastic block has second grooves facing to the elastic block for allowing optical cables to pass therethrough.

In another exemplary embodiment according to the present invention, the second elastic block is integrated with the base.

In another exemplary embodiment according to the present invention, the optical fiber splice enclosure further comprises at least one elastic element disposed in the elastic block to increase the elastic force of the elastic block.

In another exemplary embodiment according to the present invention, the elastic block is made of gel.

In another exemplary embodiment according to the present invention, the cover has an upper extruding portion, and the base has a lower extruding portion opposite to the upper extruding portion. When closing the cover, the minimum vertical distance between the upper pressing portion and the lower pressing portion is less than the maximum height of the elastic block, the upper extruding portion together with the lower extruding portion exert a vertical stress on the elastic block, and the vertical stress is consequently transformed into a radial stress exerted on the optical cables.

In another exemplary embodiment according to the present invention, the cover has a front extruding portion and a rear extruding portion opposite to the front extruding portion. When closing the cover, the minimum distance between the front pressing portion and the rear pressing portion is less than the maximum width of the elastic block, the front extruding portion together with the rear extruding portion exert a horizontal stress on the elastic block, and the horizontal stress is consequently transformed into an axial stress exerted on the optical cables.

In another exemplary embodiment according to the present invention, at least one of the front extruding portion and the rear extruding portion has an inclined extruding surface.

In various exemplary embodiments of the present invention, the optical cables are wrapped and sealed in the elastic block simply by use of the rigid housing of the enclosure
5 to press the elastic block. Therefore, in the field, only by closing the cover of the housing, the optical cables and the port of the enclosure both can be sealed in a water-proof manner.

BRIEF DESCRIPTION OF THE DRAWINGS

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

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

Fig.2 shows the assembling process of the optical fiber splice enclosure according to
15 the first exemplary embodiment of the present invention;

Fig.3 is a perspective view of an optical fiber splice enclosure according to a second exemplary embodiment of the present invention;

Fig.4 shows a structure of an upper extruding portion of a cover of the optical fiber splice enclosure shown in Fig.3;

20 Fig.5 shows the assembling process of the optical fiber splice enclosure according to the second exemplary embodiment of the present invention;

Fig.6 is a perspective view of an optical fiber splice enclosure according to a third exemplary embodiment of the present invention;

Fig.7 shows the assembling process of the optical fiber splice enclosure according to
25 the third exemplary embodiment of the present invention;

Fig.8 is a perspective view of an elastic block of an optical fiber splice enclosure

according to a fourth exemplary embodiment of the present invention; and

Fig.9 and Fig. 10 show a perspective view of an optical fiber splice enclosure according to a fifth exemplary embodiment of the present invention.

5 **DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS OF THE** **INVENTION**

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
10 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 enclosure according to a first
15 exemplary embodiment of the present invention; and Fig.2 shows the assembling process of the optical fiber splice enclosure according to the first exemplary embodiment of the present invention.

As shown in Fig.1, the optical fiber splice enclosure mainly comprises a housing and a splicing unit (not shown), such as a jumping unit, a melted fiber management unit, a
20 redundant fiber management unit, and the like, received in the housing. The housing comprises a cover 1 and a base 2. In an exemplary embodiment, the cover 1 and the base 2 may be detachably connected with each other.

Referring to Fig.1, the housing further has a port (optical cable entrance and exit port) for allowing optical cables 4 to pass therethrough. An elastic block 3 is disposed in the port
25 to seal the port in a water-proof manner.

For the convenience of description, as shown in Fig.1, the optical fiber splice enclosure

has a width direction X, a length direction Y perpendicular to the width direction X, and a height or vertical direction Z orthogonal to the width direction X and the length direction Y. As shown in Fig.1, the length direction Y is parallel to the axial direction of the optical cables 4, and the width direction X and the height direction Z each is arranged in the radial direction of the optical cables 4.

In the exemplary embodiment shown in Fig. 1 and Fig.2, the elastic block 3 is formed as one piece. The elastic block 3 has spaced-apart recesses 7 formed in an upper side of the elastic block 3 for receiving the optical cables 4 and allowing the optical cables 4 to pass therethrough.

Referring to Figs. 1-2, the recesses 7 are elongated grooves extending inwardly from the upper side of the elastic block 3.

As shown in Fig. 1 and Fig.2, a lower side of the elastic block 3 is not formed with recesses, and is directly attached to the base 2. That is, the elastic block 3 is integrated with the base 2. Accordingly, in the exemplary embodiment of Figs. 1-2, an additional operation to position and fix the elastic block 3 in the base 2 is not necessary any more.

Please be noted that, in other embodiments, the lower side of the elastic block 3 may be formed with recesses like the upper side and is separate from the base 2. In this way, the elastic block 3 may wrap and seal more optical cables 4 than the exemplary embodiment of Figs. 1-2.

Hereinafter, the assembling process of the optical fiber splice enclosure according to the first embodiment will be described in detail with reference to Fig.2.

a) Firstly, as shown in Fig.2, receiving the optical cables 4 in the recesses 7 of the elastic block 3; and

b) Closing the cover 1, and after the cover 1 is closed, the elastic block 3 is pressed by the cover 1 and is elastically deformed to close the recesses 7, and thereby the optical cables 4 are wrapped and sealed in the elastic block 3.

In the first embodiment of the present invention, only by closing the cover 1, the optical cables 4 are wrapped and sealed in the elastic block 3. Therefore, it can improve the assembly efficiency of the optical fiber splice enclosure in the field.

As shown in Fig.2, the cover 1 has an upper pressing portion 1a to press the upper side of the elastic block 3, and the base 2 has a lower pressing portion 2a to press the lower side of the elastic block 3.

In order to press the elastic block 3, in the exemplary embodiment shown in Fig.2, the distance between the upper pressing portion 1a and the lower pressing portion 2a in the vertical direction Z when the cover 1 is closed and engaged with the base 2 is less than the height of the elastic block 3 when the cover 1 is opened and the elastic block 3 is not pressed by the cover 1. In this way, after closing the cover 1, the upper pressing portion 1a together with the lower pressing portion 2a exert a vertical stress on the elastic block 3, and the vertical stress is consequently transformed into a radial stress exerted on the optical cables 4.

Please be noted that, in some exemplary embodiments of the present invention, the cover 1 and the base 2 may be formed by a rigid plastic material to increase the efficiency of extruding the elastic block 3.

[The Second Embodiment]

Fig.3 is a perspective view of an optical fiber splice enclosure according to a second exemplary embodiment of the present invention; and Fig.5 shows the assembling process of the optical fiber splice enclosure according to the second exemplary embodiment of the present invention.

The second embodiment shown in Figs.3-5 is different from the first embodiment of Figs. 1-2 in that the optical fiber splice enclosure of the second embodiment comprises two separate elastic blocks 3a and 3b, instead of an integrated elastic block like the optical fiber splice enclosure of the first embodiment.

As shown in Fig.3 and Fig.5, the optical fiber splice enclosure comprises a first elastic

block 3a and a second elastic block 3b separate from the first elastic block 3a. The first elastic block 3a is located between the cover 1 and the second elastic block 3b, and the second elastic block 3b is located between the first elastic block 3a and the base 2.

Referring to Fig.3 and Fig.5, the first elastic block 3a has first spaced-apart recesses 7a formed in an upper side of the elastic block 3a for receiving first optical cables 4a and allowing the first optical cables 4a to pass therethrough. The first spaced-apart recesses 7a are elongated grooves extending inwardly from the upper side of the first elastic block 3a.

Referring to Fig.3 and Fig.5, the second spaced-apart recesses 7b are formed between the first elastic block 3a and the second elastic block 3b for receiving second optical cables 4b and allowing the second optical cables 4b to pass therethrough.

In an exemplary embodiment of the present invention, as shown in Fig.3, the first spaced-apart recesses 7a have a width smaller than a diameter of the second spaced-apart recesses 7b. In this way, the first spaced-apart recesses 7a may wrap and seal the first optical cables 4a (for example, distribution optical cables) with a diameter smaller than that of the second optical cables 4b (for example, main optical cables).

Please refer to Fig.3, the second spaced-apart recesses 7b consists of a half-circular recesses formed in the lower side of the first elastic block 3a and a half-circular recesses formed in the upper side of the second elastic block 3b.

Referring to Fig.5, the first elastic block 3a and the second elastic block 3b both are separate from the housing of the optical fiber splice enclosure.

Hereinafter, the assembling process of the optical fiber splice enclosure according to the second embodiment will be described in detail with reference to Fig.5.

a) Firstly, as shown in Fig.5, positioning the second optical cables 4b in the second recesses 7b between the first and second elastic blocks 3a and 3b;

b) Secondly, placing the first and second elastic blocks 3a and 3b in the base 2;

c) Thirdly, positing the first optical cables 4a in the first recesses 7a of the first elastic

block 3a; and

d) Closing the cover 1, and after the cover 1 is closed, the first and second elastic blocks 3a and 3b are pressed by the cover 1 and are elastically deformed to close the first and second recesses 7a and 7b, and thereby the first and second optical cables 4a and 4b are wrapped and sealed in the first and second elastic blocks 3a and 3b.

As shown in Fig.5, the cover 1 has an upper pressing portion 1a to press the upper side of the first elastic block 3a, and the base 2 has a lower pressing portion 2a to press the lower side of the second elastic block 3b.

In order to press the first and second elastic blocks 3a and 3b, in the exemplary embodiment shown in Fig.5, the distance between the upper pressing portion 1a and the lower pressing portion 2a in the vertical direction Z when the cover 1 is closed and engaged with the base 2 is less than the height of the first and second elastic blocks 3a and 3b when the cover 1 is opened and the first and second elastic blocks 3a and 3b are not pressed by the cover 1. In this way, after closing the cover 1, the upper extruding portion 1a together with the lower extruding portion 2a exert a vertical stress on the first and second elastic blocks 3a and 3b, and the vertical stress is consequently transformed into a radial stress exerted on the first and second optical cables 4a and 4b.

In an exemplary embodiment of the present invention, the first and second elastic blocks 3a and 3b may be made of gel to improve the seal property. But the present invention is not limited to this, the first and second elastic blocks 3a and 3b may be made of other suitable materials, for example, rubber or gum.

Fig.4 shows a structure of the upper extruding portion 1a of a cover of the optical fiber splice enclosure shown in Fig.3.

As shown in Fig.4, the cover 1 is opened, and the upper pressing portion 1a and the upper side of the first elastic block 3a are exposed.

Referring to Fig.4, in an exemplary embodiment, the upper side of the first elastic

block 3a is formed with elastic ribs 8a that are spaced apart by the first recesses 7a. When the elastic ribs 8a is pressed, the elastic ribs 8a will be deformed to close and seal the first recesses 7a between the elastic ribs 8a.

Similarly, as shown in Fig.4, the upper pressing portion 1a of the cover 1 is formed with pressing ribs 8a' spaced apart by dents 7a'. The dents 7a' of the cover 1 correspond to the first recesses 7a of the first elastic block 3a, and the extruding ribs 8a' of the cover 1 correspond to the elastic ribs 8a of the first elastic block 3a. In this way, when closing the cover 1, the pressing ribs 8a' of the cover 1 press against the elastic ribs 8a of the first elastic block 3a to force the elastic ribs 8a to be deformed toward the first recesses 7a to seal the first recesses 7a.

Please refer to Fig.3 and Fig.4, a shield wall 9 is formed at outermost side of the cover 1. The shield wall 9 has spaced-apart wall plates corresponding to the dents 7a' of the cover 1 and the first recesses 7a of the first elastic block 3a. Accordingly, after the cover 1 is closed, the shield wall 9 will hide the first recesses 7a of the first elastic block 3a and the dents 7a' of the cover 1.

Furthermore, the shield wall 9 can limit and pressure the elastic ribs 8a of the first elastic block 3a from the outer side of the first elastic block 3a.

The wall plates of the shield wall 9 have half-circular recesses at the bottom thereof for fitting with the periphery of the first optical cables 4a.

Although it is not shown, please be noted that the base 2 may has a shield wall like the cover 1.

[The Third Embodiment]

Fig.6 is a perspective view of an optical fiber splice enclosure according to a third exemplary embodiment of the present invention; and Fig.7 shows the assembling process of the optical fiber splice enclosure according to the third exemplary embodiment of the present invention.

The third embodiment shown in Figs.6-7 is different from the second embodiment of Figs.3-5 in that the second elastic block 3b is integrated with the base 2, instead of being separate from the base 2. Accordingly, compared with the second exemplary embodiment of Figs.3-5, an additional operation to position and fix the second elastic block 3b in the base 2 is not necessary any more.

[The Fourth Embodiment]

Fig.8 is a perspective view of an elastic block of an optical fiber splice enclosure according to a fourth exemplary embodiment of the present invention.

As shown in Fig.8, because the seal performance of the elastic block 3 is in direct proportion to the elastic deformation force generated by the elastic block 3, in fourth embodiment, auxiliary elastic elements, such as compression springs 5 and plate-form springs 6, are disposed inside of the elastic block 3 to improve the seal performance of the elastic block 3.

[The Fifth Embodiment]

Fig.9 and Fig. 10 show a perspective view of an optical fiber splice enclosure according to a fifth exemplary embodiment of the present invention.

As shown in Figs.9-10, the cover 1 has a front pressing portion 1a to press the front side of the elastic block 3 and a rear pressing portion 1b to press the rear side of the elastic block 3. The rear pressing portion 1b is opposite to the front pressing portion 1a in the axial direction of the optical cables 4.

In order to press the elastic block 3, in the exemplary embodiment shown in Figs.9-10, the distance between the front pressing portion 1a and the rear pressing portion 1b in the axial direction when the cover 1 is closed and engaged with the base 2 is less than the width of the elastic block 3 in the axial direction when the cover 1 is opened and the elastic block 3 is not pressed by the cover 1. In this way, after closing the cover 1, the front pressing

portion 1f together with the rear pressing portion 1b exert a horizontal stress on the elastic block 3 in the axial direction, and the horizontal stress is consequently transformed into an axial stress exerted on the optical cables 4.

Please be noted that the cover 1 according to the fourth embodiment may also have a left pressing portion to press the left side of the elastic block 3 and a right pressing portion to press the right side of the elastic block 3. In this way, when the cover 1 is closed, the left and right pressing portions pressure the elastic block 3 from the left and right sides in the radial direction of the optical cables 4 to seal the optical cables 4 in the elastic block 3.

In an exemplary embodiment of the present invention, as shown in Figs.9-10, the front pressing portion 1f has an inclined surface facing the elastic block 3, and the rear pressing portion 1b has a vertical surface facing the elastic block 3. But the present invention is not limited to this, the front pressing portion 1f and the rear pressing portion 1b may both have inclined surfaces facing the elastic block 3.

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 enclosure, comprising:

a housing having a port for optical cables passing therethrough; and

5 an elastic block provided in the port and adapted for wrapping the optical cables therein so as to seal the port of the housing.

2. The optical fiber splice enclosure according to claim 1, wherein the housing comprises a cover (1) and a base (2) detachably connected with the cover.

10

3. The optical fiber splice enclosure according to claim 2, wherein the elastic block (3) having spaced-apart recesses (7) formed at a side of the elastic block for allowing the optical cables to pass therethrough.

15 4. The optical fiber splice enclosure according to claim 3, wherein the recesses are elongated grooves extending inwardly from the side of the elastic block.

5. The optical fiber splice enclosure according to claim 4, wherein the housing has a portion for pressing the side of the elastic block (3a), and the pressing portion is formed with
20 pressing ribs (8a') that are spaced apart by dents (7a') corresponding to the recesses (7) of the elastic block (3a).

6. The optical fiber splice enclosure according to claim 5, wherein a shield wall (9) is formed at outermost side of the port of the housing to hide the recesses (7) of the elastic
25 block and the dents (7a') of the housing.

7. The optical fiber splice enclosure according to claim 4, wherein the elastic block is integrated with the base.

8. The optical fiber splice enclosure according to claim 1 or 4, wherein the elastic block
5 (3) is formed as one piece.

9. The optical fiber splice enclosure according to claim 4, further comprises a second elastic block (3b) provided between the elastic block (3a) and the base (2) for allowing second optical cables (4b) to pass between the elastic block (3a) and the second elastic block
10 (3b).

10. The optical fiber splice enclosure according to claim 9, wherein the second elastic block has second grooves (7b) facing to the elastic block for allowing optical cables to pass therethrough.
15

11. The optical fiber splice enclosure according to claim 7, wherein the second elastic block is integrated with the base.

12. The optical fiber splice enclosure according to claim 1, further comprising at least
20 one elastic element (5, 6) disposed in the elastic block to increase the elastic force of the elastic block.

13. The optical fiber splice enclosure according to claim 1, wherein the elastic block is made of gel.
25

14. The optical fiber splice enclosure according to claim 1, wherein

the cover (1) has an upper pressing portion (1a), and the base (2) has a lower pressing portion (2a) opposite to the upper pressing portion (1a); and

when closing the cover (1), the minimum vertical distance between the upper pressing portion (1a) and the lower pressing portion (2a) is less than the maximum height of the

5 elastic block (3), the upper pressing portion (1a) together with the lower pressing portion (2a) exert a vertical stress on the elastic block (3), and the vertical stress is consequently transformed into a radial stress exerted on the optical cables (4).

15. The optical fiber splice enclosure according to claim 1, wherein

10 the cover (1) has a front pressing portion (1f) and a rear pressing portion (1b) opposite to the front pressing portion (1f); and

when closing the cover (1), the minimum distance between the front pressing portion (1f) and the rear pressing portion (1b) is less than the maximum width of the elastic block (3), the front pressing portion (1f) together with the rear pressing portion (1b) exert a horizontal
15 stress on the elastic block (3), and the horizontal stress is consequently transformed into an axial stress exerted on the optical cables (4).

16. The optical fiber splice enclosure according to claim 15, wherein at least one of the front pressing portion (1f) and the rear pressing portion (1b) has an inclined pressing

20 surface.

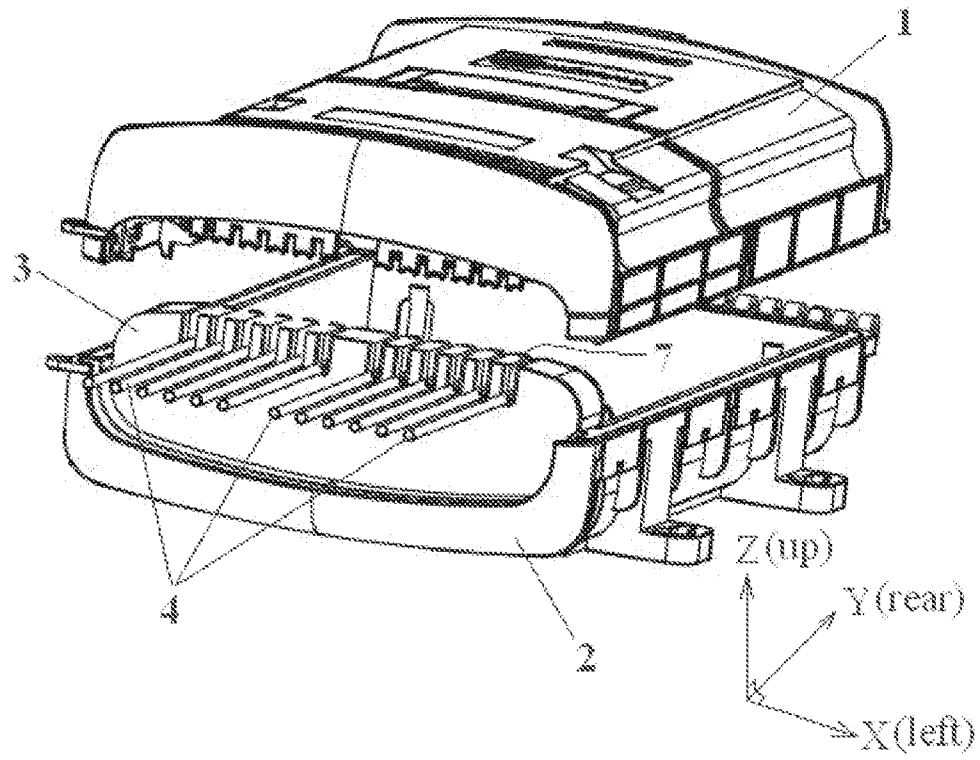


Fig. 1

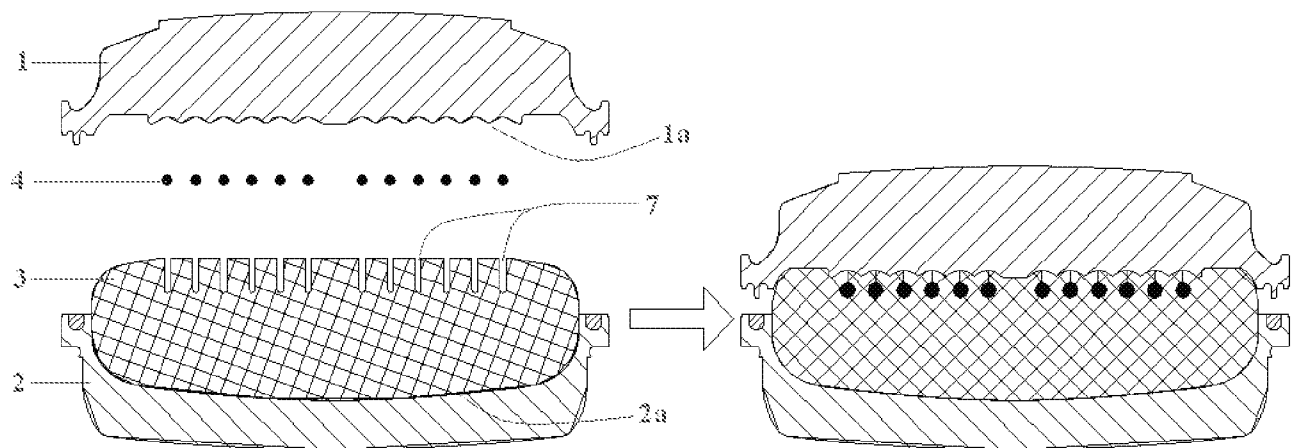


Fig. 2

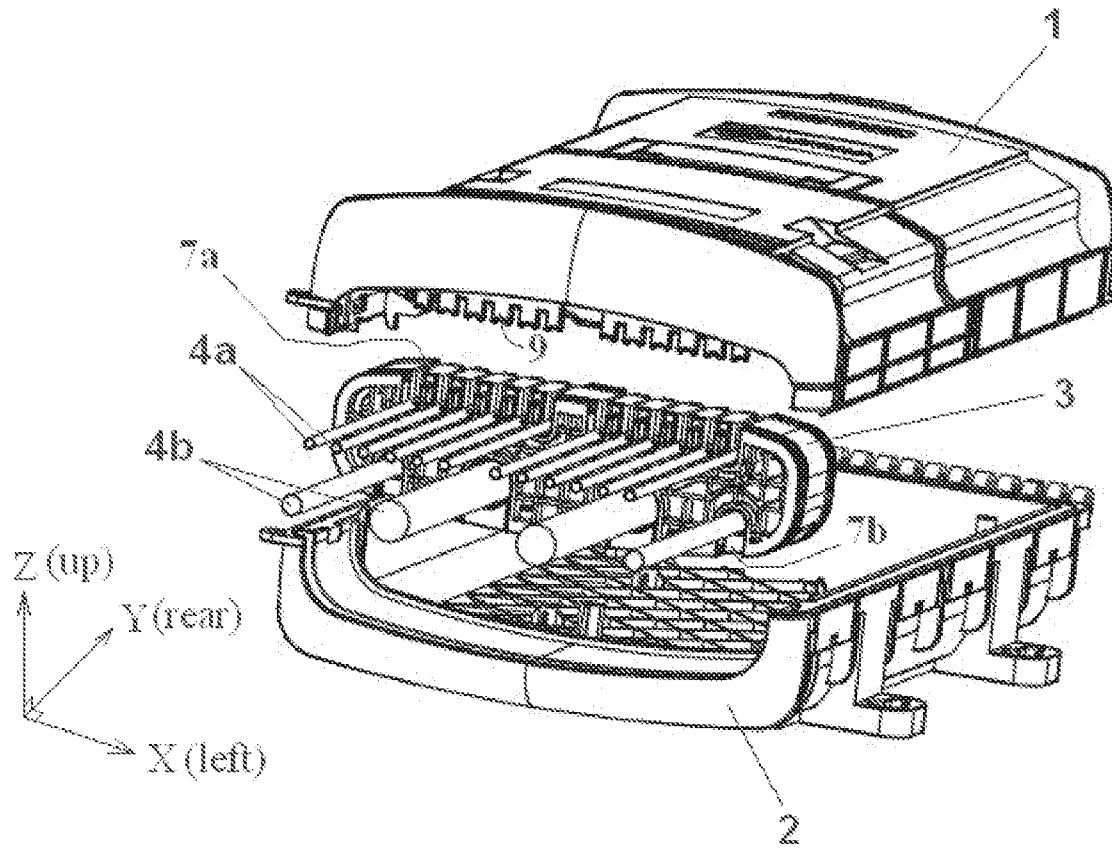


Fig. 3

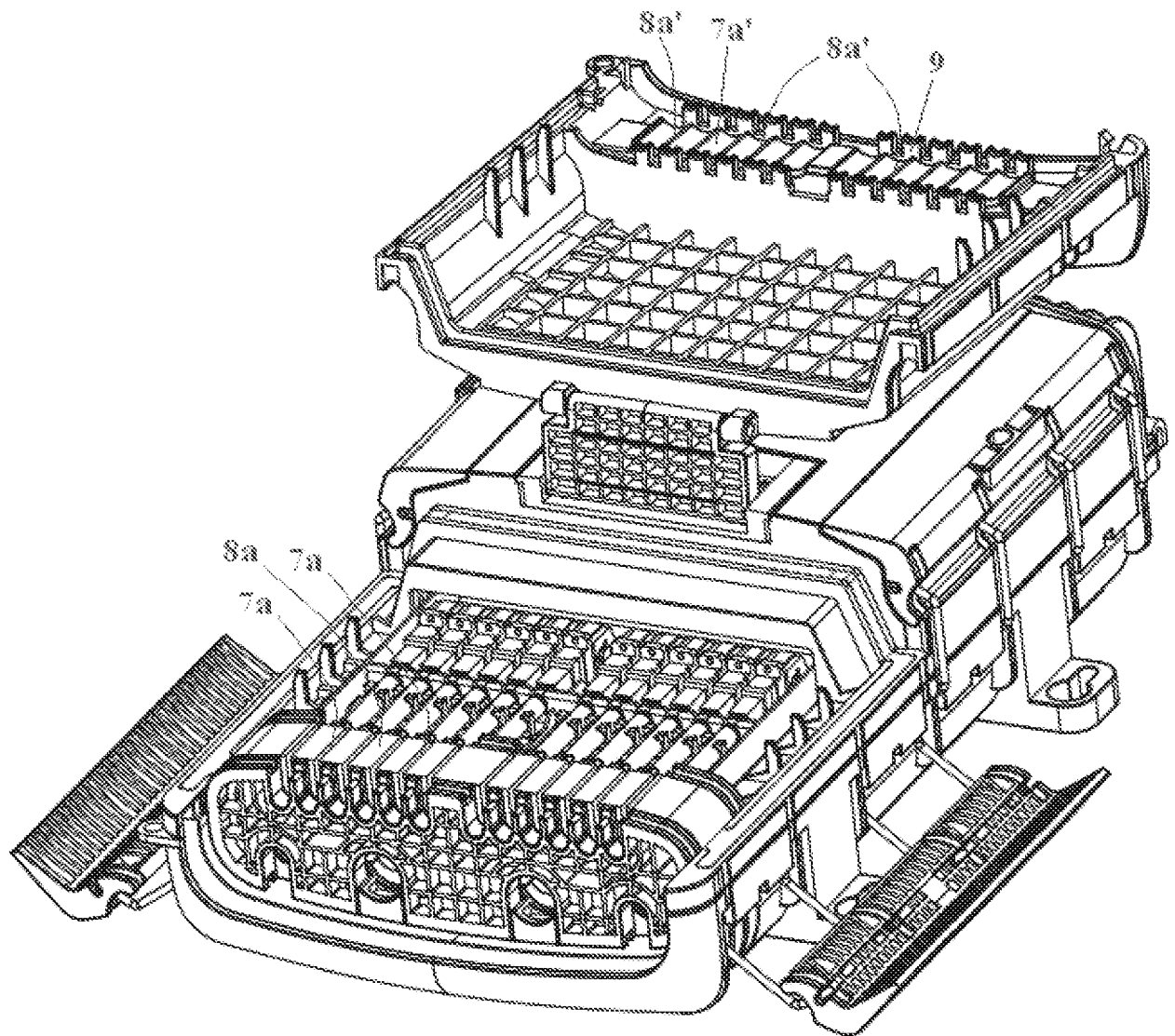


Fig. 4

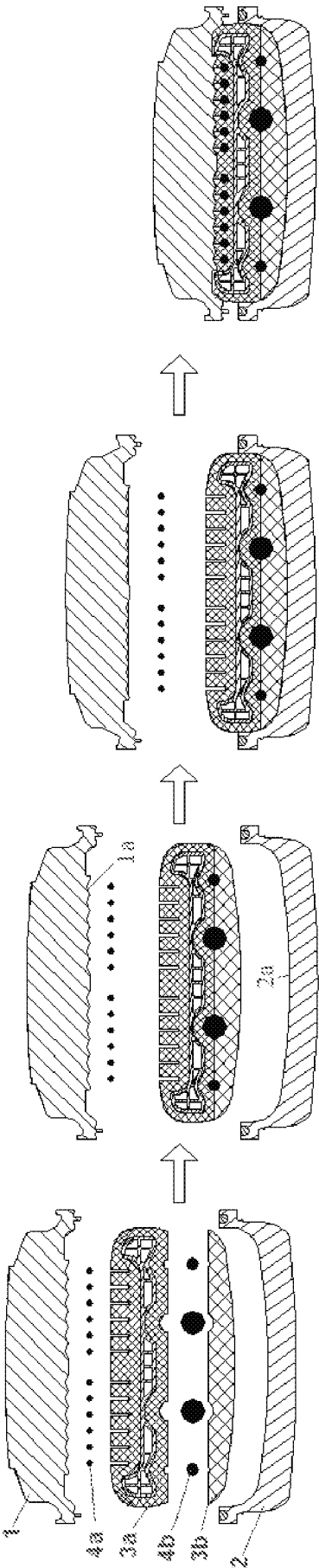


Fig.5

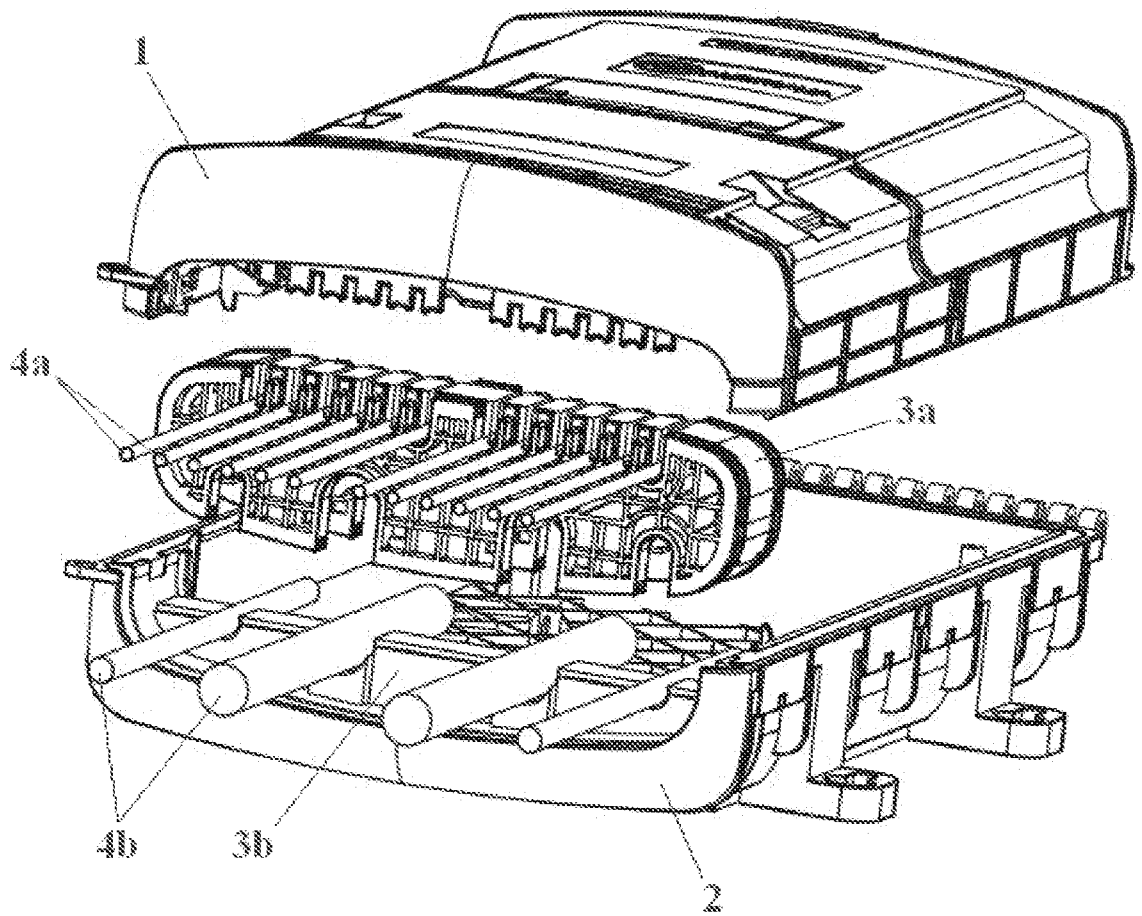


Fig. 6

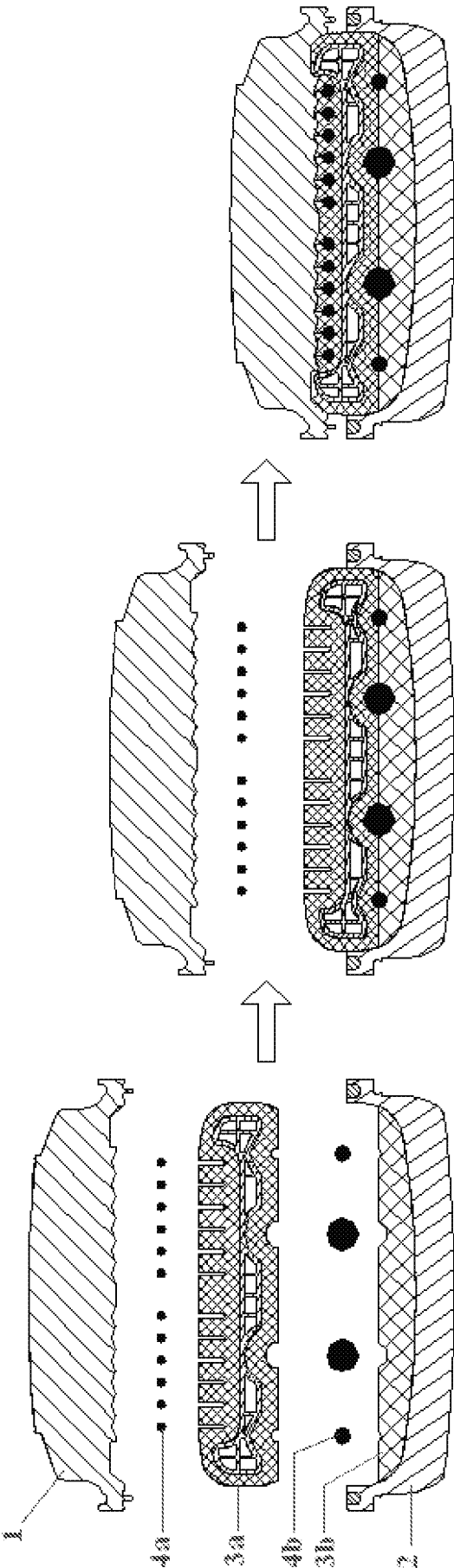


Fig.7

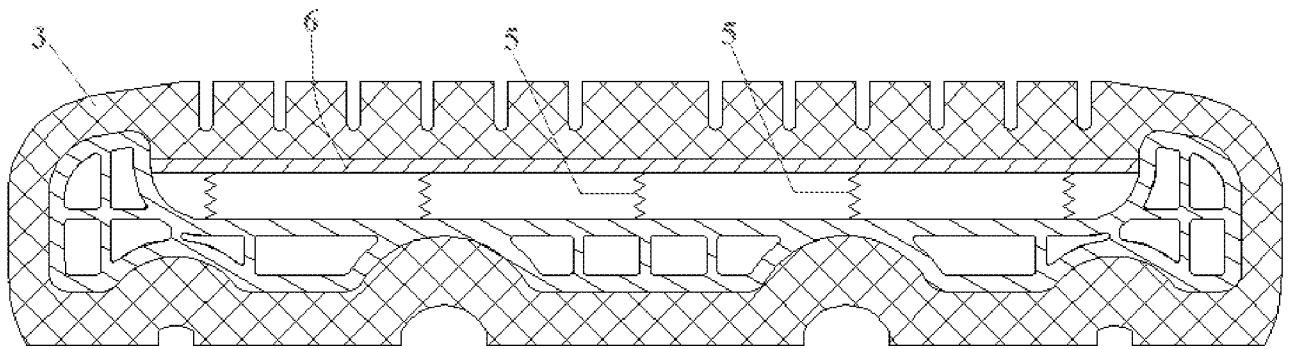


Fig. 8

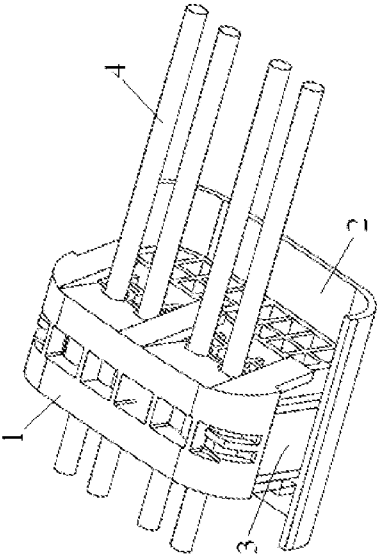


Fig. 9c

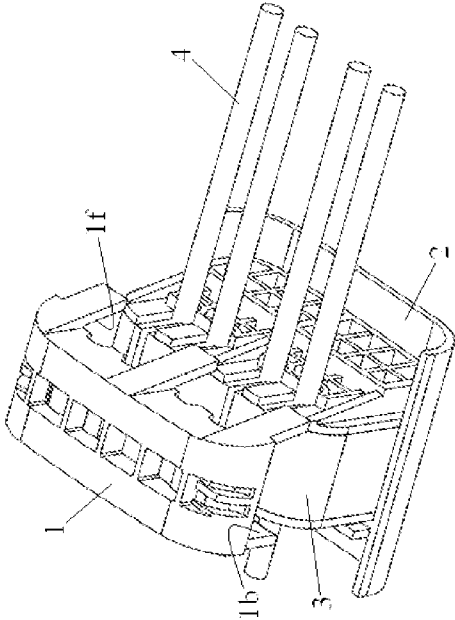


Fig. 9b

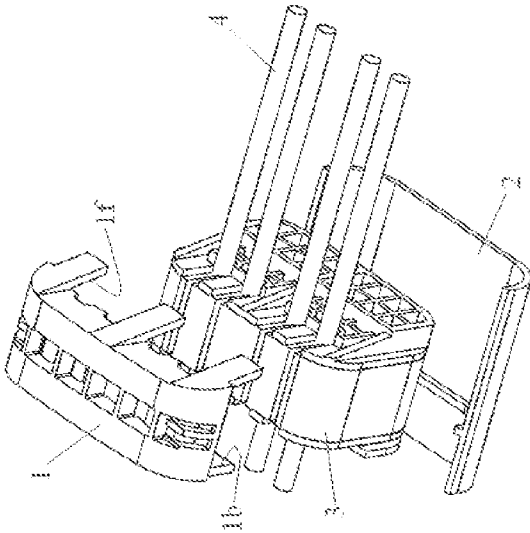


Fig. 9a

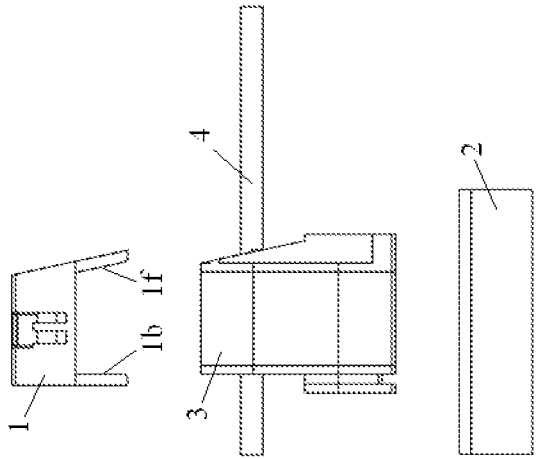


Fig. 10a

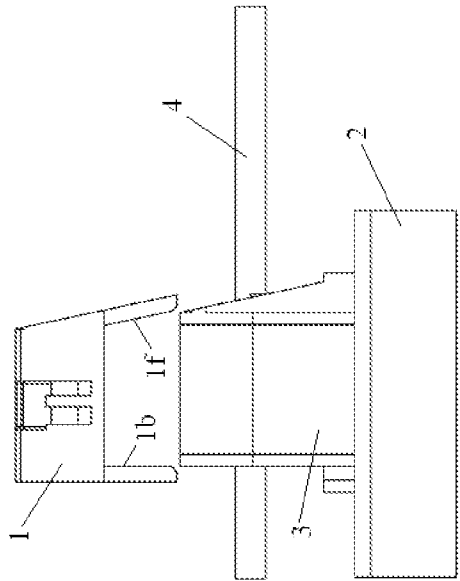


Fig. 10b

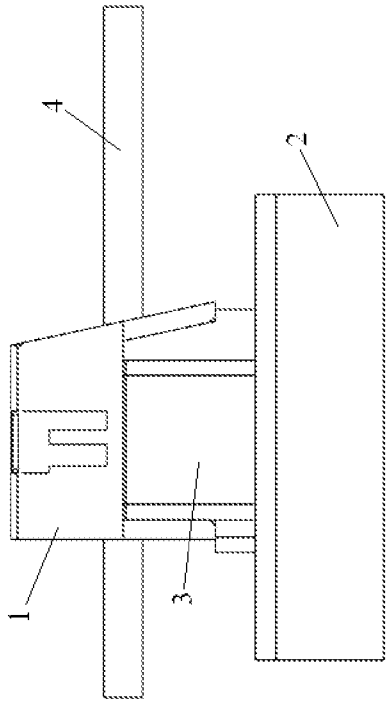


Fig. 10c

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2011/053109

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

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INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2011/053109

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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