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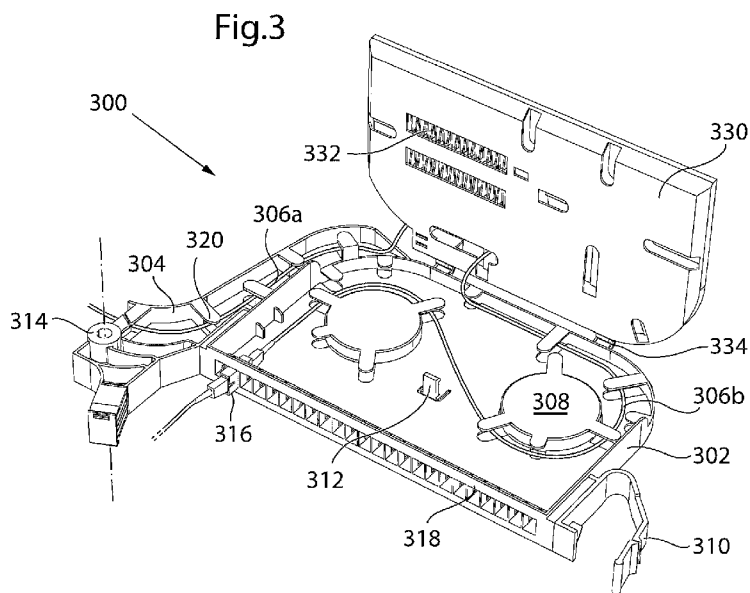
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(54) Title: SPLICING AND TERMINATION MODULE



(57) Abstract: An arrangement for handling optical fibres in access points. A fibre management unit 300 is provided which is adapted to enable splicing and termination of one or more optical fibres 306a, 306b. The fibre management unit 300 comprises splicing means 332 and terminating means 316 and the fibre management unit 300 is pivotably arranged around an axis of a fibre management rack. The axis is substantially parallel with a normal through the main propagation plane of the fibre management unit 300. By arranging fibre management units in racks pivotably, the optical fibres are easier to access e.g. for service, repairation, or incremental installations.

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SPICING AND TERMINATION MODULE

Technical field

[0001] The present invention relates generally to handling of optical fibres in communication networks. Especially, it relates to devices for enabling termination of optical fibres in racks or cabinets.

Background art

[0002] With the emergence of communication networks, fibre optic cables are often applied. For fibre distribution in a fibre optic network the equipment are based on mainly two different solutions; pre-terminated with stub cable or with splice trays for splicing in field. The solutions are not topology specific but are valid both for point-to-point network (P2P) with dedicated fibres and for passive optical network (PON) with partially shared fibres.

For the pre-terminated solutions the equipment are prepared with factory installed cables and connectors. Fibres are routed inside the equipment from the cable and terminated to the adapter panel without splicing. This solution is typically used in Optical Distribution Frames (ODF) and in Fibre Distribution Hubs (FDH) in PON applications.

[0003] A communication network 100 with optical fibres is illustrated in FIGURE 1. In such a communication network 100, data is typically distributed in partially shared fibres to Fibre Distribution Hubs 102, e.g. optical splitters, from which dedicated fibres distributes the data to subscribers and users 104. Optical communication networks 100 data may also distribute data in dedicated fibres via Fibre Access Terminals 106 to subscribers and users 108.

[0004] In solutions for in-field splicing the cables are installed to the equipments and spliced in splice trays for storing and protection. The fibres are routed to splice trays where spliced to pigtails or fan-outs which are routed and terminated to the

adapter panel. The same solution is also used without connection fields as splice points. Apart from being used in same applications as mentioned above, ODF and FDH, the in-field solution is used in all kinds of equipment for splicing and terminating fibres, as cabinets, closures and rack systems.

[0005] To install equipment pre-terminated with stub cable, external splice boxes are needed for splicing the stub cables to the network cables. When using outdoor cabinets it could even be necessary with adding manholes for splice box installation. Extra equipment is increasing the material and civil works cost. Furthermore, there is no chance to change solutions, e.g. when cables are already factory installed, and therefore high precision is also required in the planning and design phase to be able to use pre-terminated solutions. Likewise, is the opportunity for incremental installation of subscriber fibres limited. Moreover, if fibres are accidentally damaged inside the pre-terminated equipment the possibility to repair fibres with fusion splice is limited, because no splice trays for storing and protecting fibre splice sleeves are included and no space allocated for adding any.

[0006] When splicing fibres in field, the equipment requires allocated space for the splice trays and for fibre routing to and from the splice trays, resulting in larger footprints and lower packaging density. Moreover, the fibres are typically routed to and from splice trays and adapter panels, leaving the fibres unprotected with a potential risk of accidental damage or interruption of service.

[0007] Maintenance work, if fibres are damaged, requires handling of splice trays to access fibre splice sleeves. Moving the splice trays increase the risk of disturbing installed cables or even damaging further fibres.

[0008] It is thus generally a problem to handle termination and/ or splicing of optical fibres in a flexible and effective manner without introducing additional costs.

Summary of invention

[0009] It would be desirable to facilitate handling of optical fibres in optical communication networks. It is an object of the invention to address at least some of the issues outlined above. Further, it is an object of the invention to provide a mechanism which achieves termination or splicing of optical fibres in a flexible way. These objects may be met by a method and apparatus according to the attached independent claims.

[0010] According to one aspect a fibre management unit is provided which is adapted to enable splicing and termination of one or more optical fibres. The fibre management unit comprises splicing means and terminating means and the fibre management unit is pivotably arranged around an axis of a fibre management rack. The axis is substantially parallel with a normal through the main propagation plane of the fibre management unit.

The fibre management unit may comprise a termination part wherein the terminating means are arranged, and a splicing part wherein the splicing means are arranged. Moreover, may the fibre management unit have a mounting arm arranged at a short side or a long side of any of the termination part the splicing part. The mounting arm may comprise pivoting means adapted to achieve the pivotability of the fibre management unit. Furthermore, may the termination part and the splicing part be arranged foldable in relation to each other. The termination means and the splicing means may alternatively be arranged in one and the same part, which is pivotable around the axis described above.

[0011] According to another aspect a fibre management unit is provided which is adapted to enable termination of one or more optical fibres. The fibre management unit comprises terminating means, and the fibre management unit is pivotably arranged around an axis of a fibre management rack. The axis is substantially parallel with a normal through the main propagation plane of the fibre management

unit

The fibre management unit may comprise a termination part wherein the terminating means are arranged. Moreover, may the fibre management unit have a mounting arm arranged at a short side or a long side of the termination part. The mounting arm may comprise pivoting means adapted to achieve the pivotability of the fibre management unit. By including the functionality of an Optical Distribution Frame (ODF) in a splice tray a multi function unit with high packaging density may be created.

[0012] Furthermore, by providing the termination part with a pivotable mounting arm the module may be pivoted around an axis from an operation position into a service position which facilitates the access to the optical fibres, e.g. for service and incremental installations. Moreover, by providing the termination part with splicing means in a separate splicing part, a flexible multi function unit may be achieved.

Brief description of drawings

[0013] The invention is now described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is an environmental view illustrating a communications network in accordance with prior art.

Figure 2 is a schematic view illustrating a fibre management unit, according to an embodiment.

Figure 3 is a schematic view illustrating a fibre management unit, according to another embodiment.

Figure 4 is a schematic view illustrating a fibre management unit, according to another embodiment.

Figure 5 is a schematic view illustrating a fibre management unit, according to another embodiment.

Figure 6 is a schematic view illustrating a cabinet with a fibre management unit, according to yet another embodiment.

Detailed description

[0014] Briefly described, the present invention provides a solution for making the management of optical fibres in access points easier accessible and more flexible.

[0015] With reference to FIGURE 2, a fibre management unit 200 according to an embodiment will now be described, the figure schematically illustrating the fibre management unit 200.

[0016] The fibre management unit 200 comprises a termination part 202 and a mounting arm 204. The termination part 202 according to this embodiment is adapted to enable termination of one or more optical fibres 206, and is designed as a tray. Furthermore, connection means (not shown) arranged at a short side of the termination module 202, the connection means being adapted to connect the termination part 202 with the mounting arm 204. The mounting arm 204 is provided with pivoting means 214, e.g. performed as a cylinder with a hole, the pivoting means 214, being adapted to achieve the fibre management unit 200 to be pivoted around an axis (illustrated with a dotted line) parallel with a normal through the main propagation plane of the termination part 202. Furthermore, the mounting arm 204 comprises fibre guiding means 220 adapted to guide the incoming fibre 206 into the termination part 200. The termination part 202 comprises also fibre guiding means 208 which guides the incoming fibre 206 through the termination part 202 to termination means 218. In this embodiment the termination means 218 are designed as an adapter panel with a plurality of rectangular openings, which facilitates connectors (not referred to) of the fibres to be

fixed to the termination part 202. Furthermore the termination means 218 facilitates external fibres 216 to be connected to the terminated fibres 206. The termination part comprises a unit locking means 210 designed as a snap-lock mechanism. This unit locking means 210 is adapted to releasably fix the termination part 202 in an operation position. Typically, the fibre management unit 200 is arranged in a mounting rack.

[0017] By providing the mounting arm 204 with pivoting means 214, the fibre management unit 200 can be swung out into a service position, which gives access to the termination module 202 and the optical fibres 206, e.g. for incremental installation or service of the optical fibres 206.

[0018] Moreover, it is to be noted that the skilled person realises that the components of the described termination part 202 and the mounting arm 204 may be designed alternatively within the inventive concept. For instance, termination part 202 and the mounting arm 204 may be integrated in one unit. Typically, the mounting arms 204 are mounted in cabinets or racks before being delivered, and the termination modules 202 are connected to the mounting arms 204 in field when installed. However, the combined unit, described above, may have alternatively designed rotation means 214, which enables the combined units to be installed when needed. Such a combined unit will be further defined in an embodiment below.

[0019] Furthermore, the fibre management unit 200 may be provided with a second unit locking means (not referred to), which facilitates the fibre management unit to be releasably fixed in a service position. The functionality of such a second unit locking mechanism may be integrated in the pivoting means 214, and achieves that the fibre management unit is stable when service is performed.

[0020] With reference to FIGURE 3, a fibre management unit 300 according to an embodiment will now be described, the figure schematically illustrating the fibre management unit 300 in a service position.

[0021] This embodiment is based on the one above, and the elements 302, 304, 308, 310, 314, 316, 318, and 320 correspond to the elements 202, 204, 208, 210, 214, 216, 218, and 220, respectively. The elements 302, 304, 308, 310, 314, 316, 318, and 320 will therefore not be further discussed in accordance with this embodiment.

[0022] However, the fibre management unit 300 comprises in addition a splicing part 330 on which splicing means 332 adapted for splicing incoming fibres 306a into fibres 306b to be terminated in the termination part 302. The splicing part 332 is foldable arranged at the termination part 302. Folding means 334 are arranged at the long side of the termination part 302 and connects the splicing part 330 with the termination part 302. In the figure the fibre splicing part 330 is folded in a service position, which facilitates access to the fibres 306b. Furthermore, a part locking means 312 is arranged along a long side of the termination part 302 to releasably fix the splicing part 330 to the termination part 302 in an operation position. In this embodiment the unit locking means 312 is implemented as a snap-lock mechanism.

[0023] With reference to FIGURE 4, a fibre management unit 400 according to an embodiment will now be described, the figure schematically illustrating the fibre management unit 400 in an operation position.

[0024] This embodiment is based on the one above, and the elements 402, 404, 406a, 406b, 410, 414, 420, 430, 432, and 434 corresponds to the elements 302, 304, 306a, 306b, 310, 314, 320, 330, 332, and 334, respectively. The elements 402, 404, 406a, 406b, 410, 414, 420, 430, and 434 will therefore not be further discussed in accordance with this embodiment. The splicing means 432 is

illustrated in the figure, and is implemented as fastening means adapted to support the fibres 406a, 406b when spliced.

[0025] It is to be noted that the termination units 200, 300, 400 according to the embodiments above may be designed different within the inventive concept. For instance, may the termination means 218, 318, 418 be arranged on a short side of the termination units 202, 302, 402. In that case, the short sides and the long sides are changed and the short side of the termination units 202, 302, 402 faces an operator performing termination of the fibres 206, 306b, 406b. Furthermore, the splicing layer 330, 430 is not limited to be folded along a long side, it may be arranged to be folded along any suitable side.

[0026] With reference to FIGURE 5, a fibre management unit 500 according to an embodiment will now be described, the figure schematically illustrating the fibre management unit 500.

[0027] This embodiment is based on the ones above. However, the fibre management unit 500 does not comprise a special mounting arm. The mechanism of such a mounting arm is instead implemented in a termination part (not referred to in figure). A pivoting means 514 is arranged at a corner of the termination part, and may be implemented as a hole or a cylinder. Racks, closures or cabinets adapted to comprise fibre management units 514, typically comprise means for mounting the fibre management units 514, e.g. a vertical rod or pin. Furthermore, the pivoting means 514 may be provided with a slit to facilitate the fibre management unit 500 to be mounted in the racks, closures, or cabinets. To facilitate access to the connectors when mounted, the connectors may be arranged at a distance from the pivoting means 514.

[0028] Furthermore, it is to be understood that the fibre management unit 500 according to this embodiment also comprises additional means providing functionality, such as e.g. termination means, splicing means and fibre guiding

means. However, such means is already described in the embodiments above. This embodiment is merely directed to illustrate that the pivoting means 514 may be integrated in the termination means.

With reference to FIGURE 6, schematically illustrating a cabinet 600 for managing optical fibres, the functionality of a fibre management unit will now be described in accordance with an embodiment

[0029] The cabinet 600 comprises a plurality of fibre management units (not referred to), where each fibre management unit comprises a termination part 602, a mounting arm 604, and a splicing part 630.

[0030] In the described embodiment the fibre management units are arranged in a cabinet 600. However, the fibre management units may alternatively be arranged in any racks or closures suitable therefore, within the inventive concept. Furthermore, even if a fibre management unit with both termination part 602 and splicing part 630 is illustrated in the figure, any termination unit of the above described embodiments may be arranged in the manner described.

[0031] By arranging optical fibres in pivotable fibre management units as described in the embodiments above, the fibres may be easier to access, e.g. for service, reparation, and incremental installations. Furthermore, the fibres may not need to have additional lengths to enable access to them. Moreover, by arranging splicing means and termination means in combined fibre management higher packaging density may be achieved, which may result in higher capacity or smaller installations.

[0032] Furthermore, it is to be understood that a skilled person realises how to combine characterising features of the above described embodiments, when designing a fibre management unit. For instance, he/ she may design it with separate parts for termination and splicing or with one or more combined units.

Moreover, he/ she may select suitable pivoting means, and unit locking means, and fibre guiding means. The fibre management units according to the above described embodiments may also be provided with protection means (not referred to) adapted to protect the optical fibres from being exposed to dirt and/ or from being damaged. Such a protective means may typically be implemented as a lid or cover, releasably covering the fibre management units. However, for simplicity reasons, any means or functionality which is not necessary for the understanding of the proposed enabling of the terminating services has been omitted in the figures, and will not be discussed in any further detail in this description.

[0033] The invention is generally defined by the following independent claims.

Abbreviations

FDH	Fiber Distribution Hub
ODF	Optical Distribution Frame
PON	Passive Optical Network
P2P	Point-to-point Network

CLAIMS

- 1) A fibre management unit (300, 400) adapted to enable splicing and termination of one or more optical fibres, the fibre management unit (300, 400) comprising splicing means (332, 432) and terminating means (318, 418), wherein the fibre management unit (300, 400) is pivotably arranged around an axis of a fibre management rack, the axis being substantially parallel with a normal through the main propagation plane of the fibre management unit (300, 400).
- 2) The fibre management unit (300, 400) according to claim 1, further comprising:
 - a termination part (302, 402) wherein the terminating means (318, 418) are arranged,
 - a splicing part (330, 430) wherein the splicing means (332, 432) are arranged, and
 - a mounting arm (304, 404) arranged at a short side or a long side of the termination part (302, 402), or arranged at a short or a long side of the splicing part (330, 430), the mounting arm (304, 404) comprising pivoting means (314, 414) adapted to achieve the pivotability of the fibre management unit (300, 400).
- 3) The fibre management unit (300, 400) according to claim 2, wherein any of the termination part (302, 402) and the splicing part (330, 430) is releasably connectable to the mounting arm (304, 404), or any of the termination part

(302, 402) and the splicing part (330, 430) is integrated with the mounting arm (304, 404).

- 4) The fibre management unit (300, 400) according to claim 2, when the mounting arm (304, 404) is releasably connectable, wherein the mounting arm (304, 404) further comprises a support adapted to support at least a part of the bottom side of the termination part (302, 402) or the splicing part (330, 430) when connected to the mounting arm (304, 404).
- 5) The fibre management unit (300, 400) according to any of claim 2 to 4, wherein the termination part (302, 402) is foldable arranged in relation to the splicing part (330, 430) along a long side of termination part (302, 402), or a short side of the termination part (302, 402).
- 6) The fibre management unit (300, 400) according to any of claim 2 to 5, wherein any of the termination part (302, 402) or the splicing part (330, 430) comprises part locking means (312) adapted to releasably fix the splicing part (330, 430) in relation to the termination part (302, 402).
- 7) The fibre management unit (300, 400) according to any of claims 1 to 6, further comprising a first unit locking means (310, 410) adapted to releasably fix the fibre management unit (300, 400) in an operation position.
- 8) The fibre management unit (300, 400) according to claim 7, wherein the first unit locking means (310, 410) is designed as a snap-lock mechanism, arranged on a short side or a long side of the termination part (302, 402) or the splicing part (330, 430).
- 9) The fibre management unit (300, 400) according to any of claims 1 to 8, further comprising a second unit locking means adapted to releasably fix the fibre management unit (300, 400) in a service position.

- 10) The fibre management unit (300, 400) according to claim 9, wherein the second unit locking means is integrated in the pivoting means (314, 414).
- 11) A fibre management unit (200, 300, 400) adapted to enable termination of one or more optical fibres, the fibre management unit (200, 300, 400) comprising terminating means (218, 318, 418), wherein the fibre management unit (200, 300, 400) is pivotably arranged around an axis of a fibre management rack, the axis being substantially parallel with a normal through the main propagation plane of the fibre management unit (200, 300, 400).
- 12) The fibre management unit (200, 300, 400) according to claim 11, further comprising:
- a termination part (202, 302, 402) wherein the terminating means (218, 318, 418) are arranged,
 - a mounting arm (204, 304, 404) arranged at a short side or a long side of the termination part (202, 302, 402), the mounting arm (204, 304, 404) comprising pivoting means (214, 314, 414) adapted to achieve the pivotability of the fibre management unit (200, 300, 400).
- 13) The fibre management unit (200, 300, 400) according to claim 12, wherein the termination part (202, 302, 402) is releasably connectable to the mounting arm (204, 304, 404), or integrated with the mounting arm (204, 304, 404).
- 14) The fibre management unit (200, 300, 400) according to claim 12, when the mounting arm (204, 304, 404) is releasably connectable, wherein the mounting arm (204, 304, 404) further comprises a support adapted to support at least a part of the bottom side of the termination part (202, 302, 402) when connected to the mounting arm (204, 304, 404).

- 15) The fibre management unit (200, 300, 400) according to any of claims 11 to 14, further comprising a first unit locking means (210, 310, 410) adapted to releasably fix the fibre management unit (200, 300, 400) in an operation position.
- 16) The fibre management unit (200, 300, 400) according to claim 15, wherein the first unit locking means (210, 310, 410) is designed as a snap-lock mechanism, arranged on a short side or a long side of the termination part (202, 302, 402).
- 17) The fibre management unit (200, 300, 400) according to any of claims 11 to 16, further comprising a second unit locking means adapted to releasably fix the fibre management unit (200, 300, 400) in a service position.
- 18) The fibre management unit (200, 300, 400) according to claim 17, wherein the second unit locking means is integrated in the pivoting means (214, 314, 414).
- 19) A fibre management rack (600) comprising one or more fibre management units (200, 300, 400) according to any of claim 1 to 18.

Fig.1

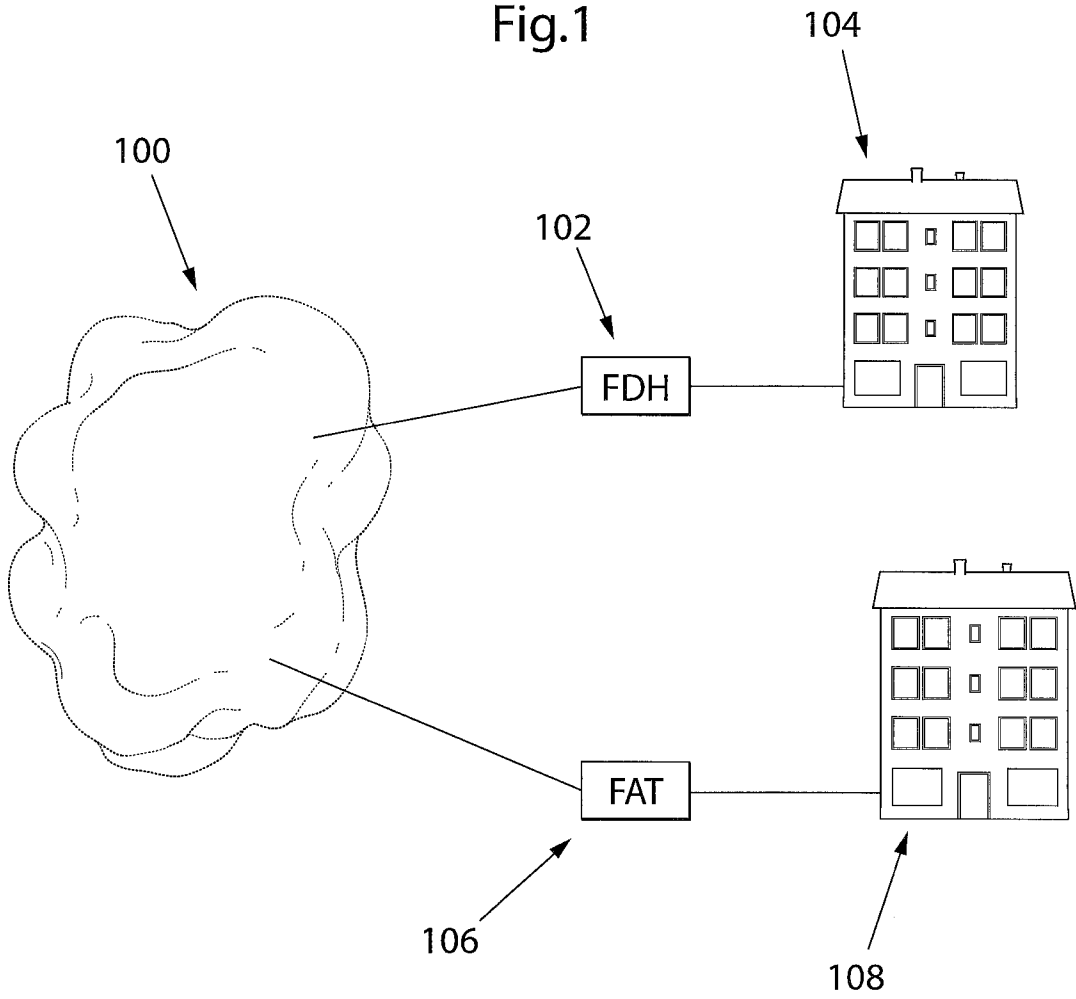


Fig.2

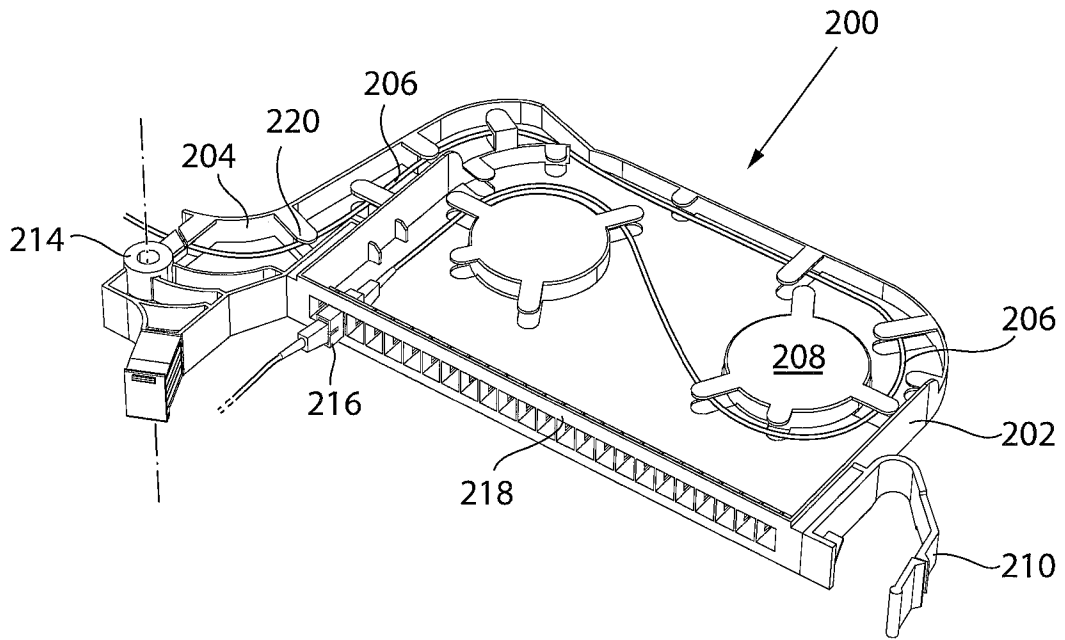


Fig.3

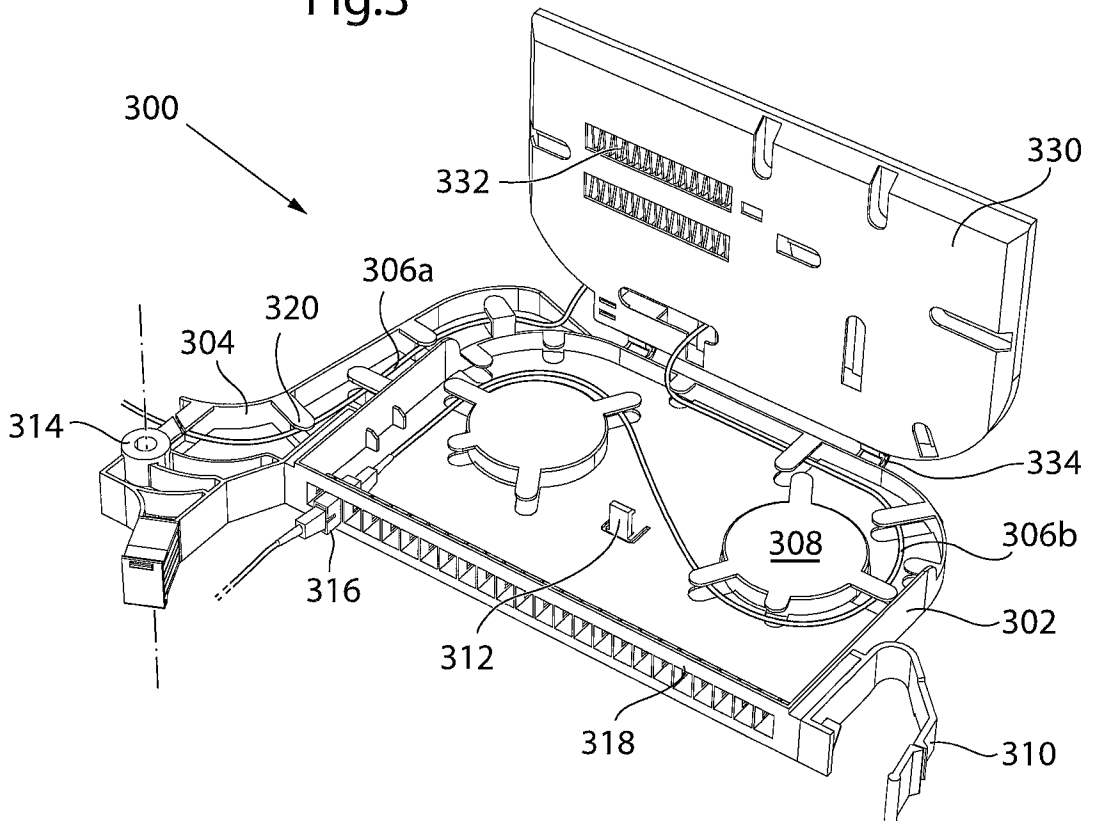


Fig.4

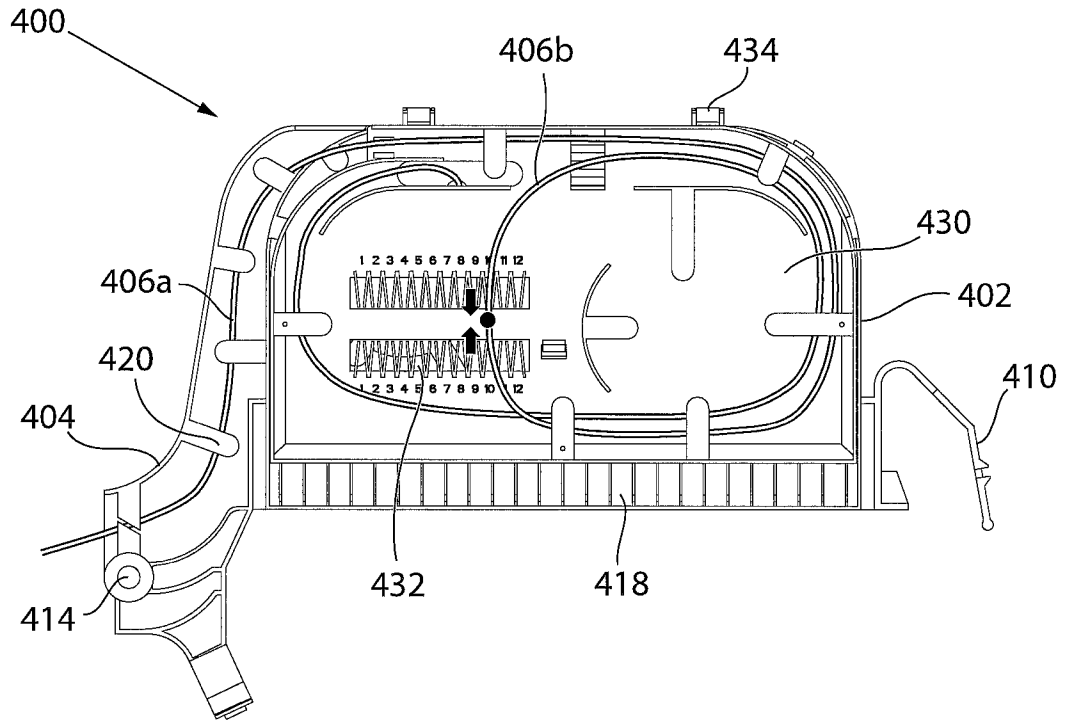


Fig.5

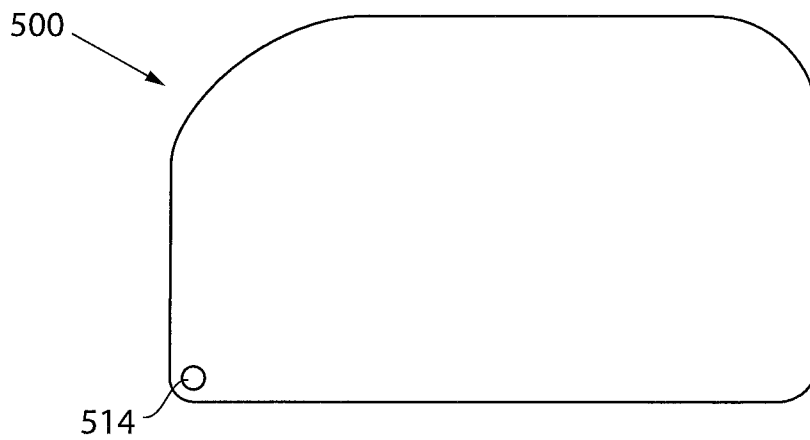
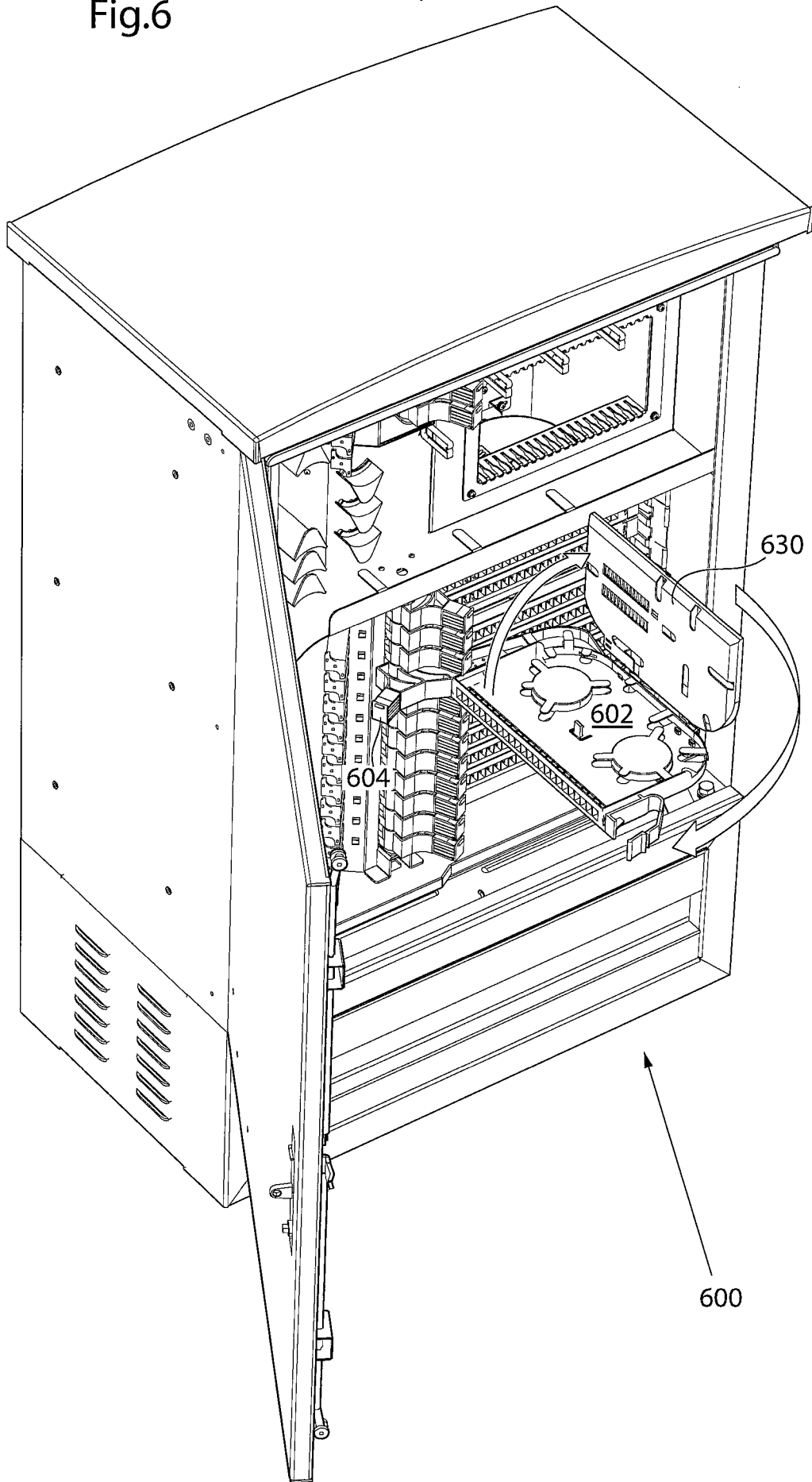


Fig.6

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INTERNATIONAL SEARCH REPORT

International application No.
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A. CLASSIFICATION OF SUBJECT MATTER
IPC: see extra sheet
 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)
IPC:G02B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
SE, DK, FI, NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 7460758 B2 (XIN XIN), 7 December 2006 (2006-12-07); column 3, line 4 - column 5, line 11; figures 1-5 -- -----	1-19

Further documents are listed in the continuation of Box C. See patent family annex.

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/SE2010/050648

US	7460758 B2	02/12/2008	CA	2547487 A1	03/12/2006
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