(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 275 763 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
15.11.2023 Bulletin 2023/46

(21) Application number: **23166179.4**

(22) Date of filing: **31.03.2023**

(51) International Patent Classification (IPC):
A62B 35/00 *(2006.01)*

(52) Cooperative Patent Classification (CPC):
A62B 35/0068; A62B 35/0056; E04G 21/3276

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
KH MA MD TN

(30) Priority: **09.05.2022 SE 2250558**

(71) Applicant: **CWL Patent AB**
792 22 Mora (SE)

(72) Inventor: **Fröderberg, Andreas**
792 33 Mora (SE)

(74) Representative: **Ehrner & Delmar Patentbyrå AB**
Götgatan 78
118 30 Stockholm (SE)

(54) **END FASTENING DEVICE FOR FALL PROTECTION SYSTEM**

(57) The invention relates to an end fastening device (500) for fastening an end of a safety wire (200) to a roof equipment (300), the end fastening device (500) comprising: a fastening means (502) for fastening the end fastening device (500) to the roof equipment (300); a first channel (510) configured to receive and hold a first end section (210) of the safety wire (200); a second channel (520) configured to receive and hold a second end section (220) of the safety wire (200); and a locking member (530) configured to lock the first end section (210) in the first channel (510) and/or the second end section (220) in the second channel (520). Furthermore, the invention also relates to a fall protection system.

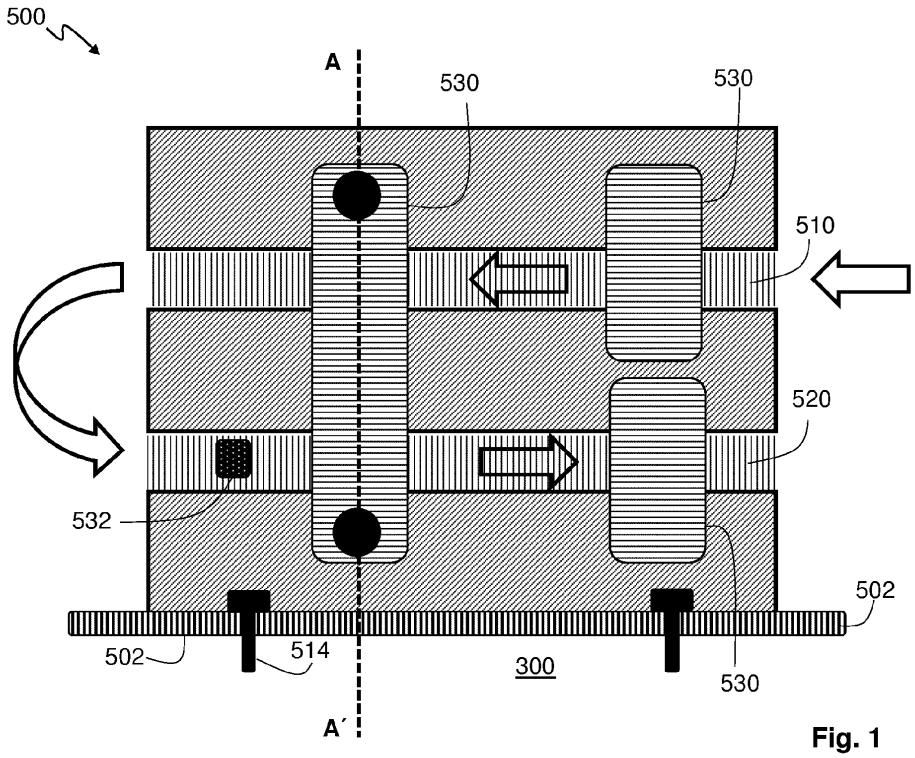


Fig. 1

EP 4 275 763 A1

Description

Technical Field

[0001] The invention relates to an end fastening device for a fall protection system.

Background

[0002] Different fastening devices for fastening or attaching a safety wire to a roof equipment of a roof are provided on the market. Such a fastening device may comprise one or more fastening means for fastening the fastening device to a roof equipment and a holder for holding a section of a safety wire. Examples of roof equipment are ladders, snow fences, safety equipment and solar panels.

[0003] The mentioned fastening devices are generally part of fall protection systems which are required to fulfil safety requirements stipulated by government authorities or industrial standards.

Summary

[0004] An objective of embodiments of the invention is to provide a solution which mitigates or solves the drawbacks and problems of conventional solutions.

[0005] Another objective of embodiments of the invention is to provide a solution having a compact design for fastening a safety wire to a roof equipment.

[0006] The above and further objectives are solved by the subject matter of the independent claims. Further advantageous embodiments of the invention can be found in the dependent claims.

[0007] According to a first aspect of the invention, the above mentioned and other objectives are achieved with an end fastening device for fastening an end of a safety wire to a roof equipment, the end fastening device comprising:

a fastening means for fastening the end fastening device to the roof equipment;
a first channel configured to receive and hold a first end section of the safety wire;
a second channel configured to receive and hold a second end section of the safety wire; and
a locking member configured to lock the first end section in the first channel and/or the second end section in the second channel.

[0008] The first channel and the second channel may in embodiments be arranged in parallel to each other in a vertical plane, a horizontal plane or in an intermediate plane between vertical and horizontal depending on the layout of the end fastening device.

[0009] The end fastening device according to the first aspect provides a secure and simple solution for securing an end section of a safety wire to a roof equipment.

[0010] In an embodiment of an end fastening device according to the first aspect, the first channel and the second channel are not connected to each other.

[0011] Thereby, easier installation/insertion of the safety wire in the end fastening device is possible.

[0012] In an embodiment of an end fastening device according to the first aspect, the locking member is a locking plate extending at least partially over the first channel and/or the second channel.

[0013] Thereby, easier installation of the safety wire in the end fastening device is possible. Further, a more secure installation of the safety wire in the end fastening device is also provided.

[0014] In an embodiment of an end fastening device according to the first aspect, the locking member comprises locking means arranged towards the first end section in the first channel and/or the second end section in the second channel.

[0015] In an embodiment of an end fastening device according to the first aspect, the first channel and/or the second channel comprises a curved section configured to receive and hold the first end section.

[0016] Thereby, more secure installation of the safety wire in the end fastening device is also provided.

[0017] In an embodiment of an end fastening device according to the first aspect, the first channel and/or the second channel has an opening directed towards the locking member.

[0018] In an embodiment of an end fastening device according to the first aspect, the opening extends in parallel to an extension direction of the first end section and/or the second end section of the safety wire.

[0019] In an embodiment of an end fastening device according to the first aspect, the first channel and the second channel extends in parallel to each other.

[0020] In an embodiment of an end fastening device according to the first aspect, the first channel and the second channel extends at different vertical distances in relation to the roof equipment or the roof.

[0021] In an embodiment of an end fastening device according to the first aspect, the first channel and the second channel extends at the same vertical distance in relation to the roof equipment or the roof.

[0022] In an embodiment of an end fastening device according to the first aspect, a distance between the first channel and the second channel is dependent on a diameter of the safety wire.

[0023] According to a second aspect of the invention, the above mentioned and other objectives are achieved with a fall protection system for a roof, the fall protection system comprising a safety wire fastened to a roof equipment or a roof by means of an end fastening device according to any embodiment of the first aspect.

[0024] In an embodiment of a fall protection system according to the second aspect, the roof equipment is one or more in a group comprising: walkway, roof ladder, facade ladder, and ridge rail.

[0025] Further applications and advantages of the em-

bodiments of the invention will be apparent from the following detailed description.

Brief Description of the Drawings

[0026] The appended drawings are intended to clarify and explain different embodiments of the invention, in which:

- Figs. 1 and 2 illustrate an end fastening device shown in a side view and in a cross-sectional view according to embodiments of the invention;
- Fig. 3 shows an example of a first and/or a second channel according to embodiments of the invention;
- Figs. 4 to 6 show a fastening device in different states according to embodiments of the invention;
- Figs. 7 to 9 show a fastening device in different states according to embodiments of the invention;
- Fig. 10 shows a fastening device in a side view according to embodiments of the invention;
- Figs. 11 and 12 show a fastening device with fastening means according to embodiments of the invention; and
- Fig. 13 shows a fall protection system according to embodiments of the invention.

Detailed Description

[0027] Figs. 1 and 2 illustrate an end fastening device 500 for fastening an end of a safety wire 200 to a roof equipment 300 shown in a side view in Fig. 1 and in a cross-sectional view along line A-A' in Fig. 2 according to embodiments of the invention. The end fastening device 500 herein disclosed comprises a fastening means 502 for fastening the end fastening device 500 to the roof equipment 300. The end fastening device 500 further comprises a first channel 510 configured to receive and hold a first end section 210 of the safety wire 200, and further comprises a second channel 520 configured to receive and hold a second end section 220 of the safety wire 200. The end fastening device 500 also comprises locking member 530 configured to lock the first end section 210 in the first channel 510 and/or the second end section 220 in the second channel 520. It is noted that the first end section 210 and the second 210 end sections are separate and different end sections of the safety wire 200. Further, the fastening means 502 may be attached to the roof equipment 300 by means of attachment means 514 such as bolts, screws, etc.

[0028] In embodiments of the invention for simplified installation of the safety wire 200 in the end fastening device 500, the first channel 510 and the second channel 520 are not connected to each other as shown in Fig. 1. Hence, they form two independent and separate parallel channels without any interconnection therebetween.

[0029] As disclosed in Fig. 2 the first channel 510 and/or the second channel 520 has an opening 542 directed toward the locking member 530. It is noted that the channels in these cases may have a shape of an inner cylinder cut in part in its middle section along its extension. Therefore, the opening 542 in such cases extends in parallel to an extension direction of the first end section 210 and/or the second end section 220 of the safety wire 200. For locking the safety wire in the end fastening device 500 a locking plate acting as a locking member 530 extends at least partially over the first channel 510 and/or the second channel 520. Hence, the locking member 530 may comprise one or more locking plates for locking the safety wire 200. The locking plate may be attached to and to act upon the security wire 200 in the first 510 and second 520 channels by means of fixing means 516 for fixing the locking plate.

[0030] Also, for more securing locking of the safety wire 200 the locking member 530 may comprise locking means 532 arranged towards the first end section 210 in the first channel 510 and/or the second end section 220 in the second channel 510. The locking means 532 may be protrusions dimensioned for the locking function.

[0031] Moreover, Fig. 3 shows an example of a first 510 and/or a second 520 channel in which the first channel 510 and/or the second channel 520 comprises a curved section 512 configured to receive and hold the first end section 210. The curved section 512 will, due to its shape, act as a partially locking means of the safety wire. The curvature of the curved section 512 will determine the locking force applied on the safety wire in the extension direction ED. However, the locking force has to be balanced with the how easy or difficult it will be to thread the safety wire through the curved section 512. Naturally, it will be easier from an installation perspective if the curved section 512 comprises and opening as previously described.

[0032] In embodiments of the invention, the first channel 510 and the second channel 520 extends in parallel to each other. Two main cases may be considered. In a first case the first channel 510 and the second channel 520 extends at different vertical distances in relation to the roof equipment 300 or the roof 600. In a second case the first channel 510 and the second channel 520 extends at the same vertical distance in relation to the roof equipment 300 or the roof 600 which is however not shown in the Figs. Another consideration is the distance between the first channel 510 and the second channel 520. It has been shown that for secure fastening of the wire the mentioned distance is dependent on a diameter of the safety wire 200 since the safety wire 200 will be bent or folded when passing from the first channel 510 to the second channel 520 or vice versa.

[0033] Figs. 4 to 6 show a fastening device 100 for fastening a safety wire 200 to a roof equipment 300 in three different states according to embodiments of the invention. The fastening device 100 is in non-engaged state in Fig. 4, in semi-engaged state in Fig. 5 and in fully engaged state in Fig. 6.

[0034] The fastening device 100 comprises a fastening means 102 for fastening the fastening device 100 to the

roof equipment 300. Such fastening means 102 may be any means known in the art for fastening different parts to each other, e.g., bolts, screws and adhesive. The fastening device 100 further comprises a first part 110 comprising a first member 112 and a first engagement means 114, 114', and a second part 120 comprising a second member 122 and a second engagement means 124, 124'. The first member 112 and the second member 122 when attached to each other together form a holder 132 for receiving and holding a section of the safety wire 200.

[0035] Further, the first engagement means 114, 114' and the second engagement means 124, 124' of the fastening device 100 are configured to engage with each other to lock the first part 110 in relation to the second part 120, or vice versa, in a direction parallel to an extension direction ED of the safety wire 200 in the holder 132. Hence, the first part 110 and the second part 120 when fully attached and engaged with each other will not be able to move in relation to each other in a direction in parallel to the extension direction ED of the safety wire 200 in the holder 132. Thereby, the safety wire 200 will be firmly held in the holder formed by the first part 110 and the second part 120.

[0036] In embodiments of the invention, the first engagement means 114, 114' comprises a protruding section and the second engagement means 124, 124' comprises a corresponding slit for engaging with the protruding section, and/or vice versa. Hence, the first engagement means 114, 114' may comprises one or more protruding sections and one or more corresponding slits and/or the second engagement means 124, 124' may comprises one or more protruding sections and one or more corresponding slits. The corresponding slit is formed and configured to receive the protruding section.

[0037] In the shown example in Figs. 4 to 6, the protruding section and the corresponding slit extend in parallel to the extension direction of the safety wire 200 in the holder 132. As also shown in Figs. 4 to 6, the first part 110 comprises a first attachment means 116 and the second part 120 comprises a second attachment means 126. The first attachment means 116 and the second attachment means 126 are configured to cooperatively attach the first part 110 to the second part 120, or vice versa. The engagement means will make the first part 110 attached to the second part 120 when fully engaged but the attachment means will make the attachment event more secure so as to make the holder firmly hold the wire section. In the disclosed example, the first attachment means 116 and the second attachment means 126 are through holes which e.g., together with screws or bolts makes the first part 110 attached to the second part 120.

[0038] For improved locking of the safety wire 200 in the holder 132, the inner surface of the holder 132 may comprise a locking means 136 for locking the safety wire 200 in the holder 132 in the extension direction ED of the safety wire 200. The locking means 136 may e.g., be protrusions arranged at an inner surface 134 of the holder 132 to engage with the section of the safety wire 200. The locking protrusions are dimensioned so as to provided locking properties of the safety wire 200 in the holder 132 and at the same time to not make installation of the safety wire 200 in the holder 132 difficult by providing enough space in the holder 132 for the safety wire 200. In this respect, the locking means 136 may be arranged in the first member 112.

[0039] Figs. 7 to 9 show a fastening device 100 for fastening a safety wire 200 to a roof equipment 300 in three different states according to further embodiments of the invention. The fastening device 100 is in non-engaged state in Fig. 7, in semi-engaged state in Fig. 8 and in fully engaged state in Fig. 9.

[0040] The fastening device 100 in Figs. 7 to 9 differs from the example disclosed in the previous Figs. in that a major part of the protruding section(s) and the corresponding slit(s) extend perpendicular to the extension direction of the safety wire 200 in the holder 132. More specifically, the protruding sections and the corresponding slits form a plurality of teeth having a wider tip section which corresponds to a smaller tip section of the corresponding slits. The teeth and the slits are arranged to engage and lock each other to form a part of the inner surface of the holder 132. Thereby, a very secure engagement is provided.

[0041] From the previous Figs. it may also be noted that according to embodiments of the invention, the protruding section(s) and the corresponding slit(s) are arranged along a radius of the inner surface of the holder 132. In other words, the protruding section(s) and the corresponding slit(s) together form at least a part of the inner surface of the holder when the engagement means are fully engaged with each other. This means a very compact solution for fastening the safety wire 200 to the roof equipment 300.

[0042] Moreover, in designs of the herein disclosed fastening device 100, the first engagement means 114, 114' may be arranged in the first member 112, and the second engagement means 124, 124' may be arranged in the second member 122. Also, the holder 132 may have a cylindric inner shape for enclosing and holding the section 202 of the safety wire 200 as shown in the Figs.

[0043] The fastening means 102 is in Fig. 7 exemplified as a flat member coupled to the second part 120. The fastening means 102 further comprises a through hole 102' through which a bolt connection may be arranged for fastening to roof equipment 300.

[0044] Fig. 10 shows a fastening device 100 in a side view according to embodiments of the invention. The area in which the engagement means of the parts meet is marked as interface area in Fig. 10. The holder 132 in the form of a cylinder is also clearly shown in Fig. 10. Moreover, it may also be noted that the first intermediate member 118 and the second intermediate member 128 are substantially flat. It may further be noted that a distance d may be formed between the first 118 and second

128 intermediate member when first 110 and second 120 parts are engaged with each other. The distance d will be fully or partially reduced in case first 116 and second 126 attachment means are employed.

[0045] Figs. 11 and 12 show a fastening device 100 with different configurations of the fastening means 102 according to embodiments of the invention. According to exemplary general geometries that may be applied, the first attachment means 116 may be arranged at a first intermediate member 118 of the first part 110, and the first intermediate member 118 is in turn attached to the first member 112. Further, the second attachment means 126 may be arranged at a second intermediate member 128 of the second part 120, and the second intermediate member 128 is in turn arranged between the second member 122 and the fastening means 102 as illustrated in Fig. 11.

[0046] Further, Figs. 11 and 12 show when the second part 120 comprises a fastening member 142 at which the fastening means 102 is arranged. In the example shown in Fig. 11, the fastening member 142 is angled in relation to the second intermediate member 128 and connected thereto while the fastening member 142 in Fig. 12 form a part of the second part 120.

[0047] As aforementioned, the fastening means 102 may be any suitable means for fastening the fastening device 100 to the roof equipment 300. The fastening means 102 in Fig. 11 may be directly bolted or screwed at the roof equipment 300. In other examples as shown in Fig. 12 the fastening means 102 may comprise a part enclosing a section of the roof equipment 300 and thereon be attached.

[0048] For even more flexible mounting the fastening device 100 may comprise a hinged or pivot mechanism or axle 150 so that the fastening device 100 can be pivoted in relation to the roof equipment 300 when mounted thereon. The pivot axle 150 may be arranged at the location where the fastening means connects to the second part 120 as shown in Fig. 11 or arranged at the fastening means where it meets the roof equipment 300 as shown in Fig. 12. Other configurations of the pivot mechanism are naturally possible within the scope of the appended claims. By having the pivot axle, the fastening device 100 may be mounted in relation to the roof equipment 300 in different angles so as to adapt the mounting angle between the fastening device 100 and the roof equipment 300. The pivot mechanism may therefore also comprise locking mechanism so that the mounting angle can be varied in discrete steps or continuously depending on the application.

[0049] Fig. 13 shows a fall protection system 400 for a roof according to embodiments of the invention. The fall protection system 400 comprises a roof equipment 300 and a safety wire 200 fastened to the roof equipment 300 by means of a fastening device 100 and/or an end fastening device 500 according to embodiments of the invention. As disclosed the fastening device 100 and the end fastening device 500 act as anchor points for the safety wire 200 in a personal fall protection system 400. In case a person is coupled to the fall protection system 400 one or more of the mentioned anchor points will hinder the person from falling off the roof 600 of which only an illustrative section is shown in Fig. 13. The person may be coupled to the safety wire 200 by means of a so-called glider 210 running along the safety wire 200.

[0050] The roof equipment 300 may be any suitable roof equipment such as walkway, roof ladder, facade ladder, and ridge rail.

[0051] Finally, it should be understood that the invention is not limited to the embodiments described above, but also relates to and incorporates all embodiments within the scope of the appended independent claims.

Claims

1. An end fastening device (500) for fastening an end of a safety wire (200) to a roof equipment or a roof, the end fastening device (500) comprising:

   a fastening means (502) for fastening the end fastening device (500) to the roof equipment (300) or the roof (600);
   a first channel (510) configured to receive and hold a first end section (210) of the safety wire (200);
   a second channel (520) configured to receive and hold a second end section (220) of the safety wire (200); and
   a locking member (530) configured to lock the first end section (210) in the first channel (510) and/or the second end section (220) in the second channel (520).

2. The end fastening device (500) according to claim 1, wherein the first channel (510) and the second channel (520) are not connected to each other.

3. The end fastening device (500) according to claim 1 or 2, wherein the locking member (530) is a locking plate extending at least partially over the first channel (510) and/or the second channel (520).

4. The end fastening device (500) according to claim 3, wherein the locking member (530) comprises locking means (532) arranged towards the first end section (210) in the first channel (510) and/or the second end section (220) in the second channel (510).

5. The end fastening device (500) according to any one of the preceding claims, wherein the first channel (510) and/or the second channel (520) comprises a curved section (512) configured to receive and hold the first end section (210).

6. The end fastening device (500) according to any one

of the preceding claims, wherein the first channel (510) and/or the second channel (520) has an opening (542) directed towards the locking member (530).

7. The end fastening device (500) according to claim 6, wherein the opening (542) extends in parallel to an extension direction of the first end section (210) and/or the second end section (220) of the safety wire (200).

8. The end fastening device (500) according to any one of the preceding claims, wherein the first channel (510) and the second channel (520) extends in parallel to each other.

9. The end fastening device (500) according to claim 8, wherein the first channel (510) and the second channel (520) extends at different vertical distances in relation to the roof equipment (300) or the roof (600).

10. The end fastening device (500) according to claim 8, wherein the first channel (510) and the second channel (520) extends at the same vertical distance in relation to the roof equipment (300) or the roof (600).

11. The end fastening device (500) according to any one of the preceding claims, wherein a distance between the first channel (510) and the second channel (520) is dependent on a diameter of the safety wire (200).

12. A fall protection system (400) for a roof, the fall protection system (400) comprising a safety wire (200) fastened to a roof equipment (300) or a roof (600) by means of an end fastening device (500) according to any one of the preceding claims.

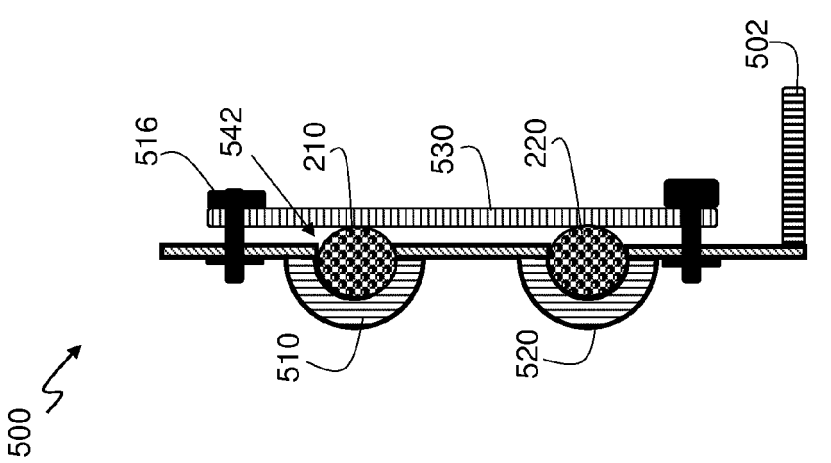

502
300
516
542
210
530
220
510
520
500

Fig. 2

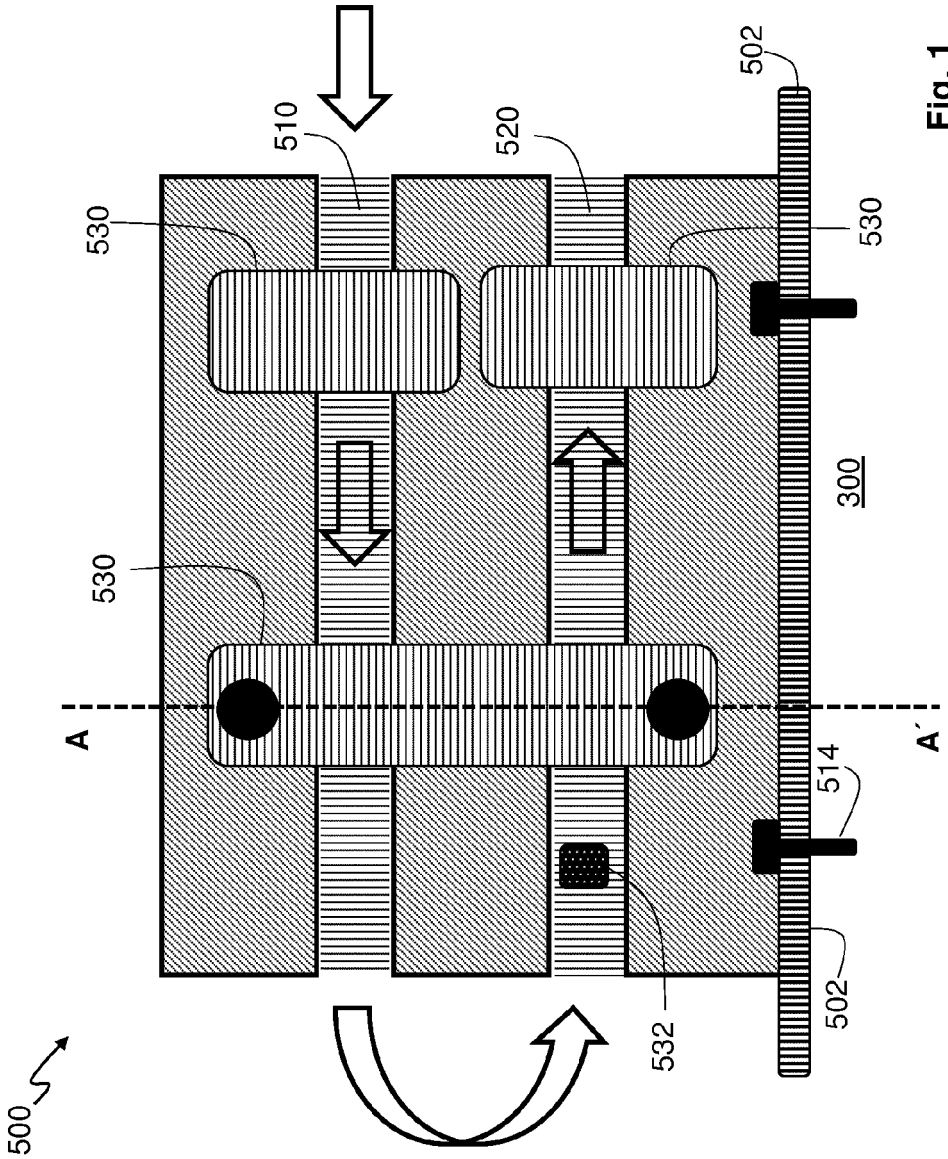

502
510
520
530
530
300
530
A
A´
514
502
532
500

Fig. 1

Fig. 3

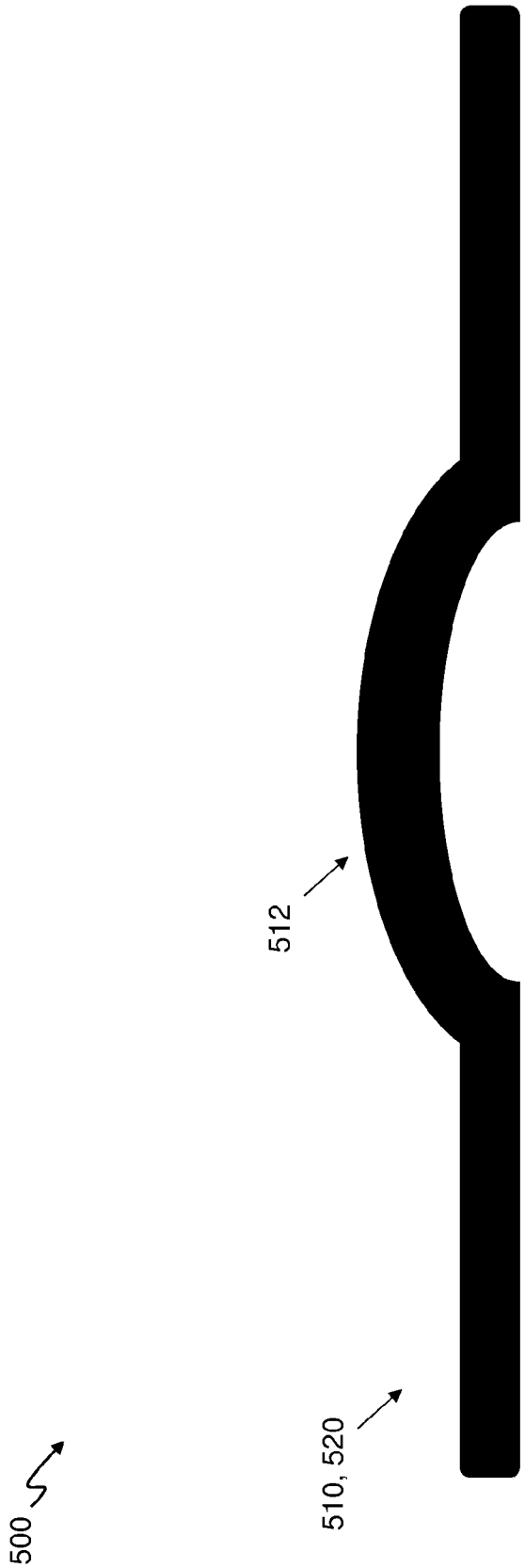


Fig. 4

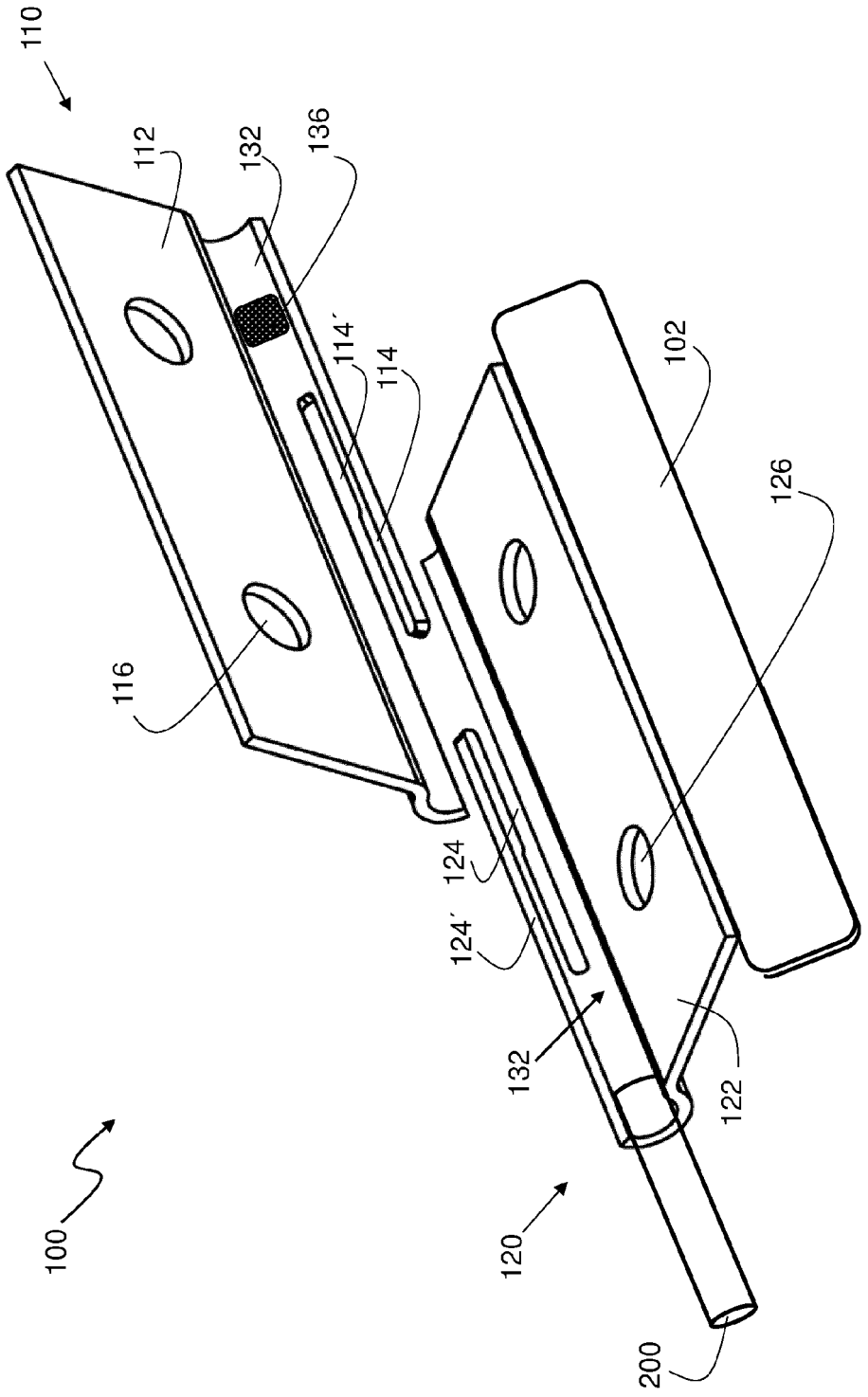


Fig. 5

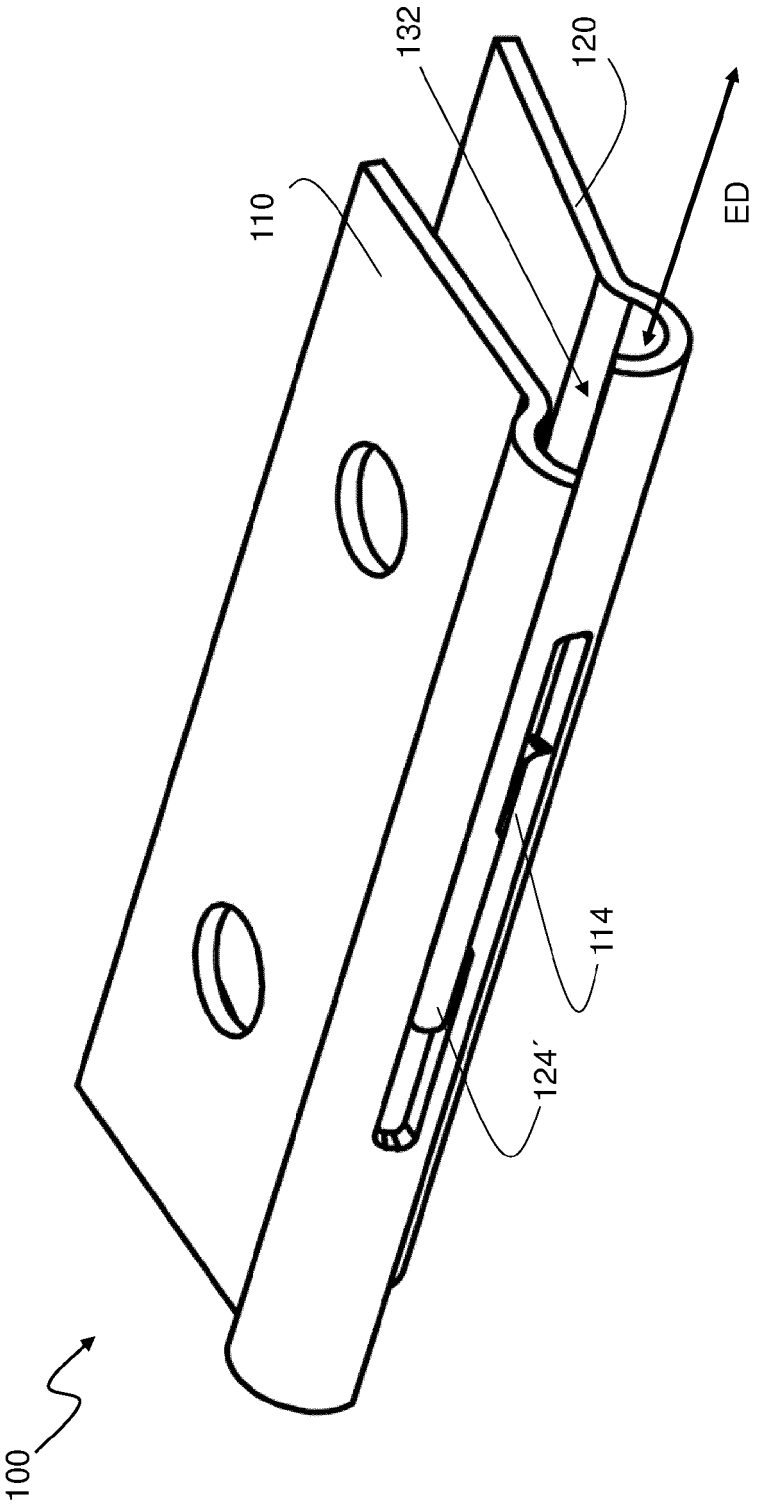
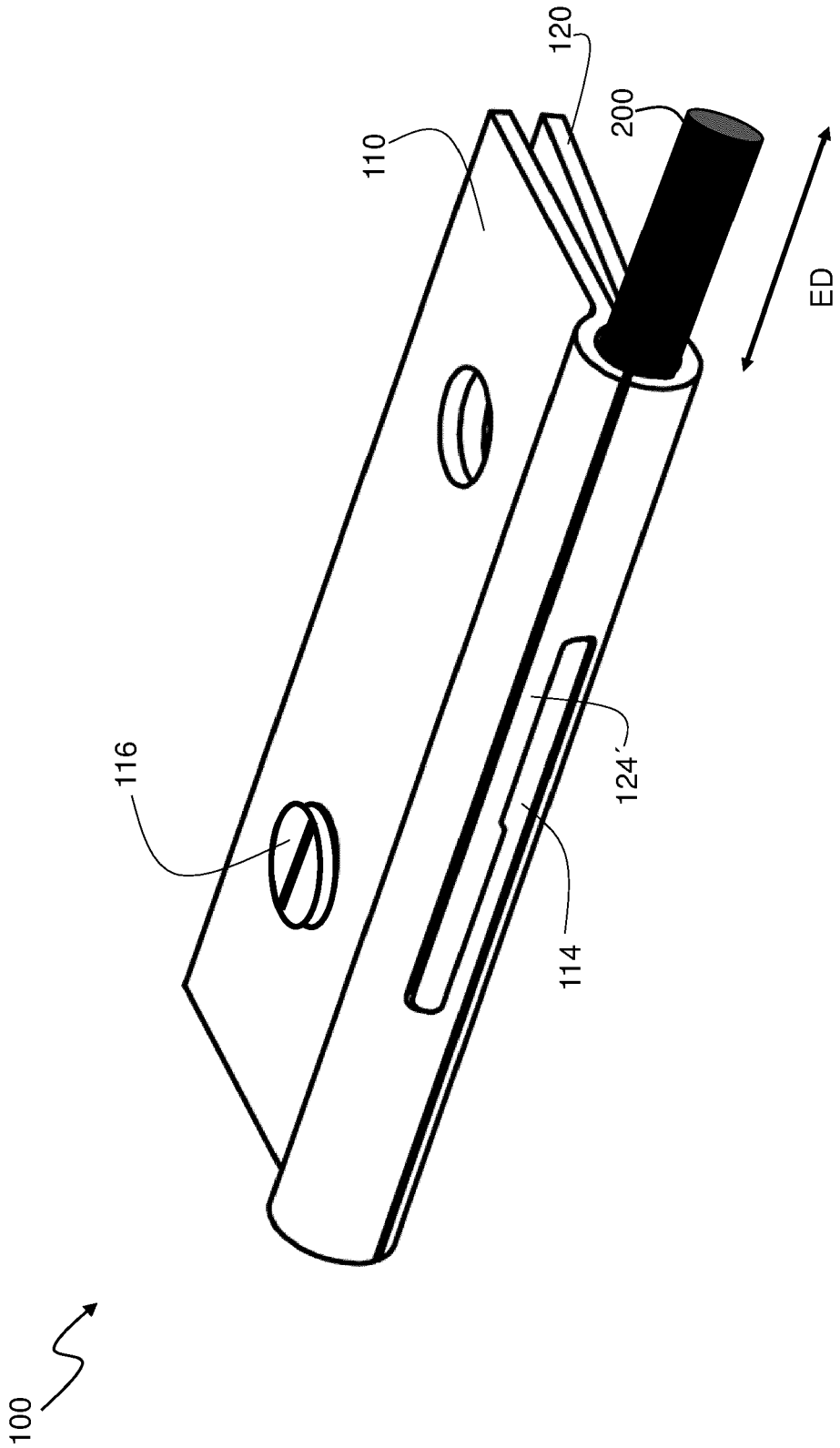


Fig. 6



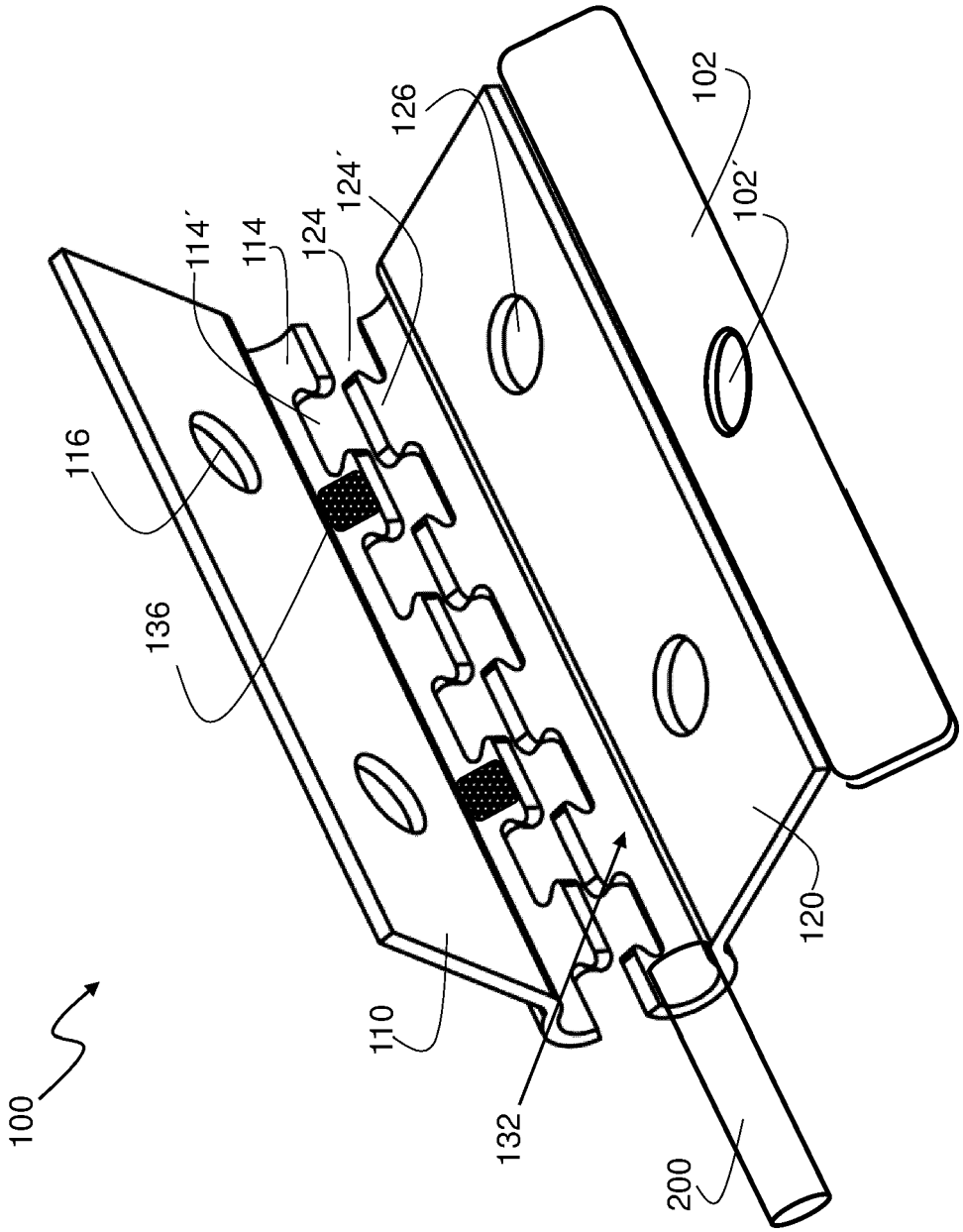


Fig. 7

Fig. 8

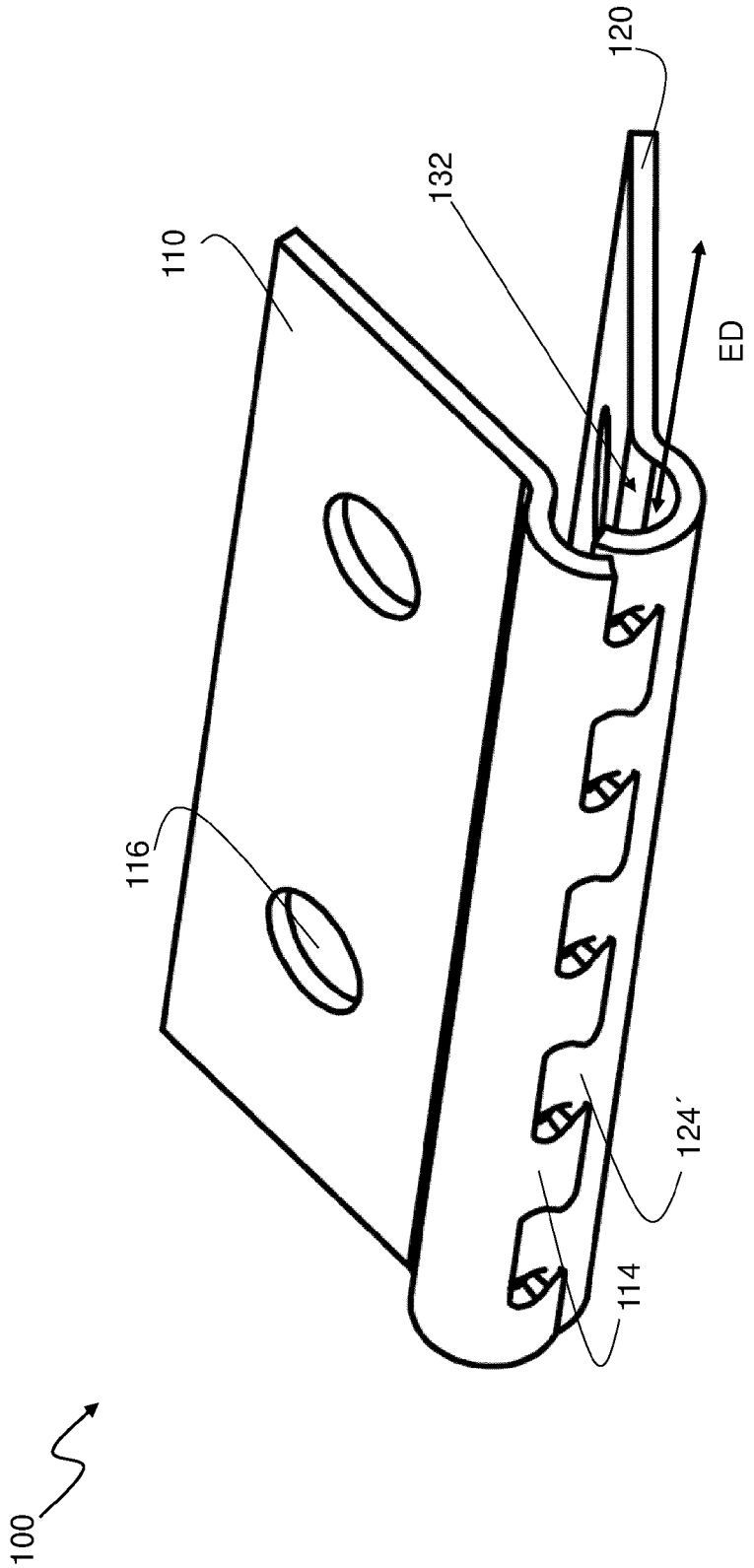


Fig. 9

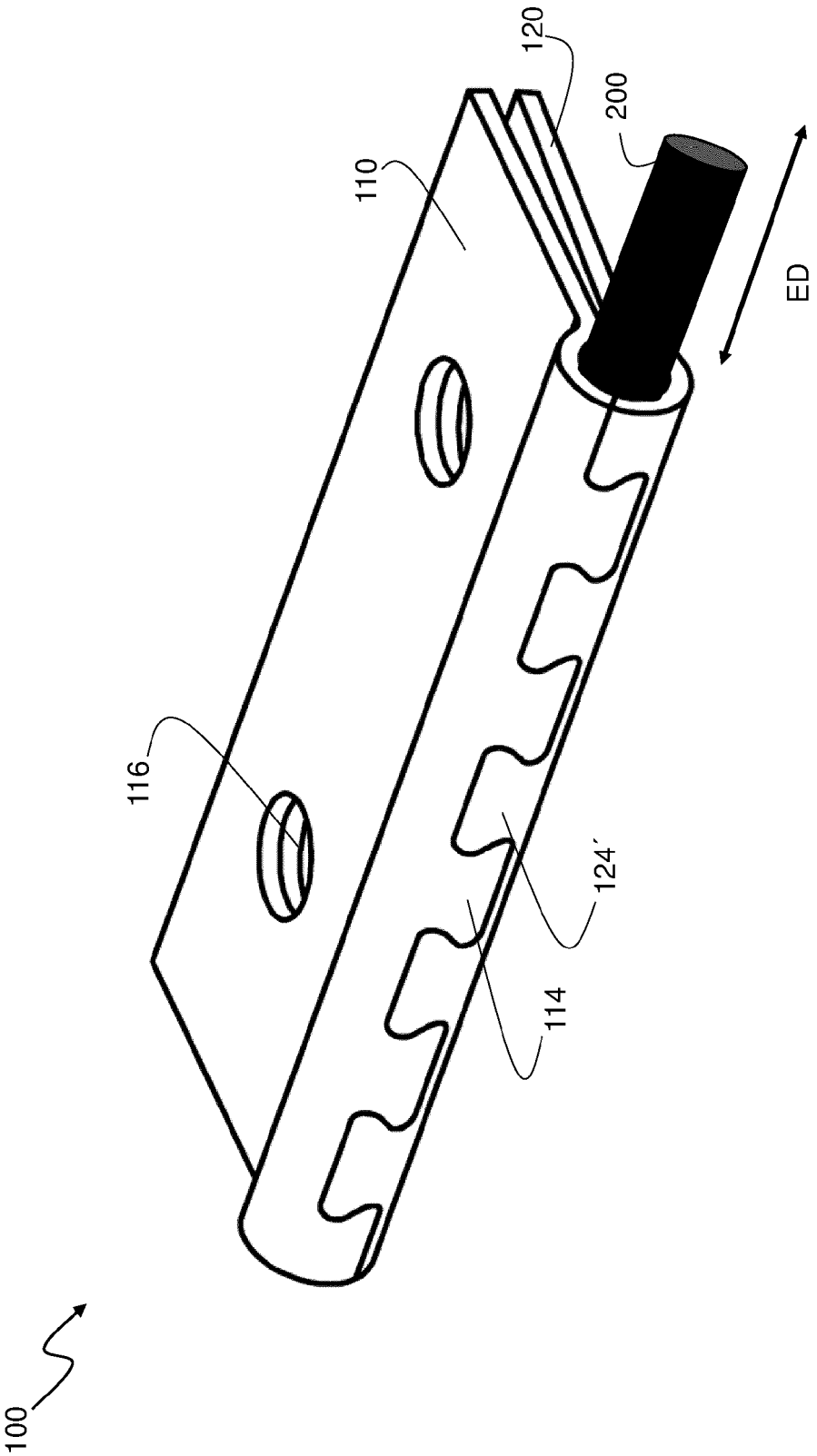
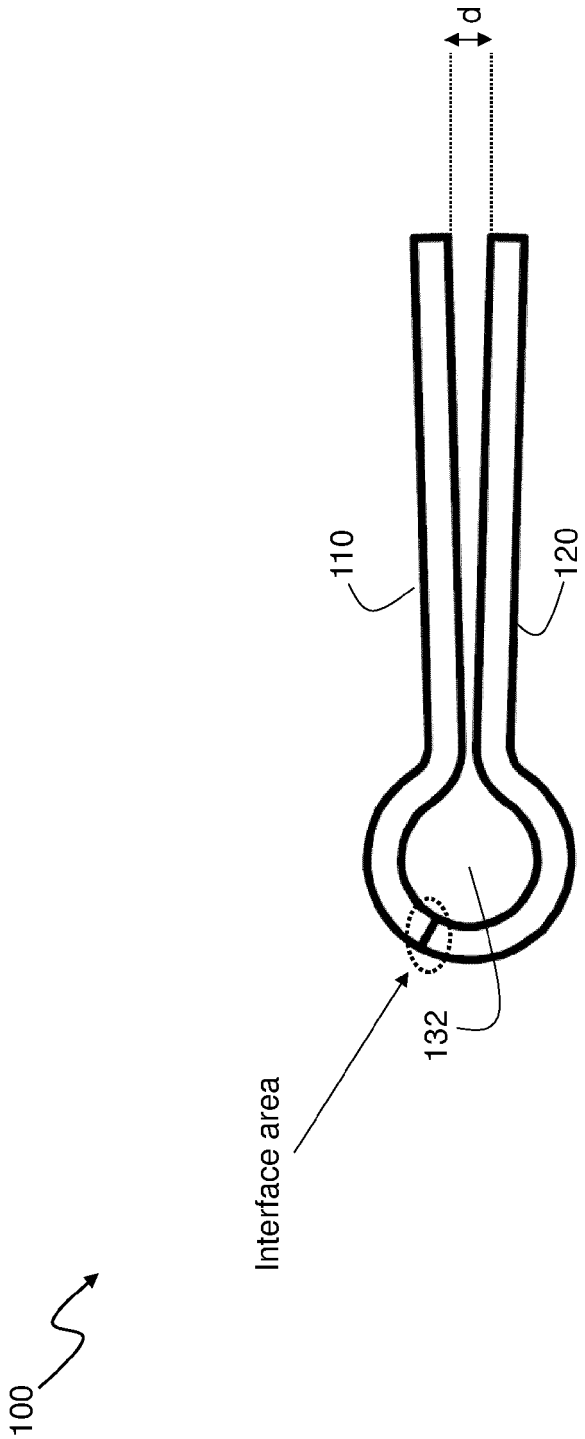


Fig. 10



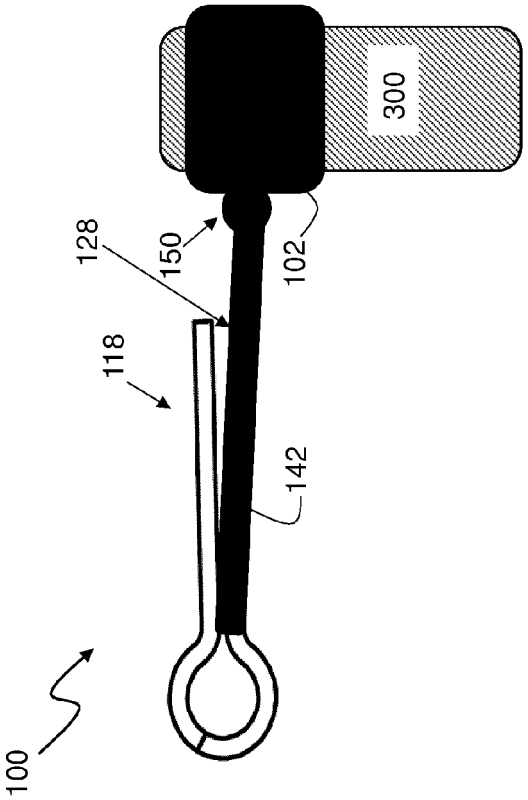


Fig. 12

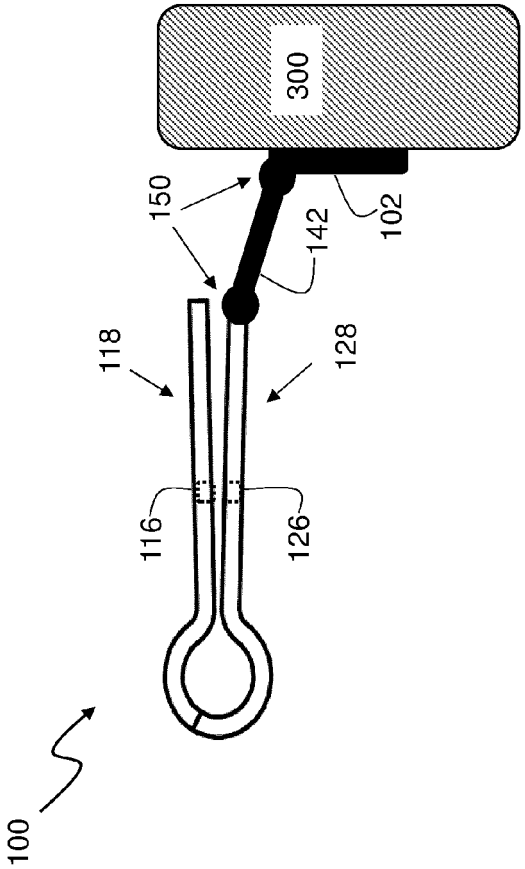
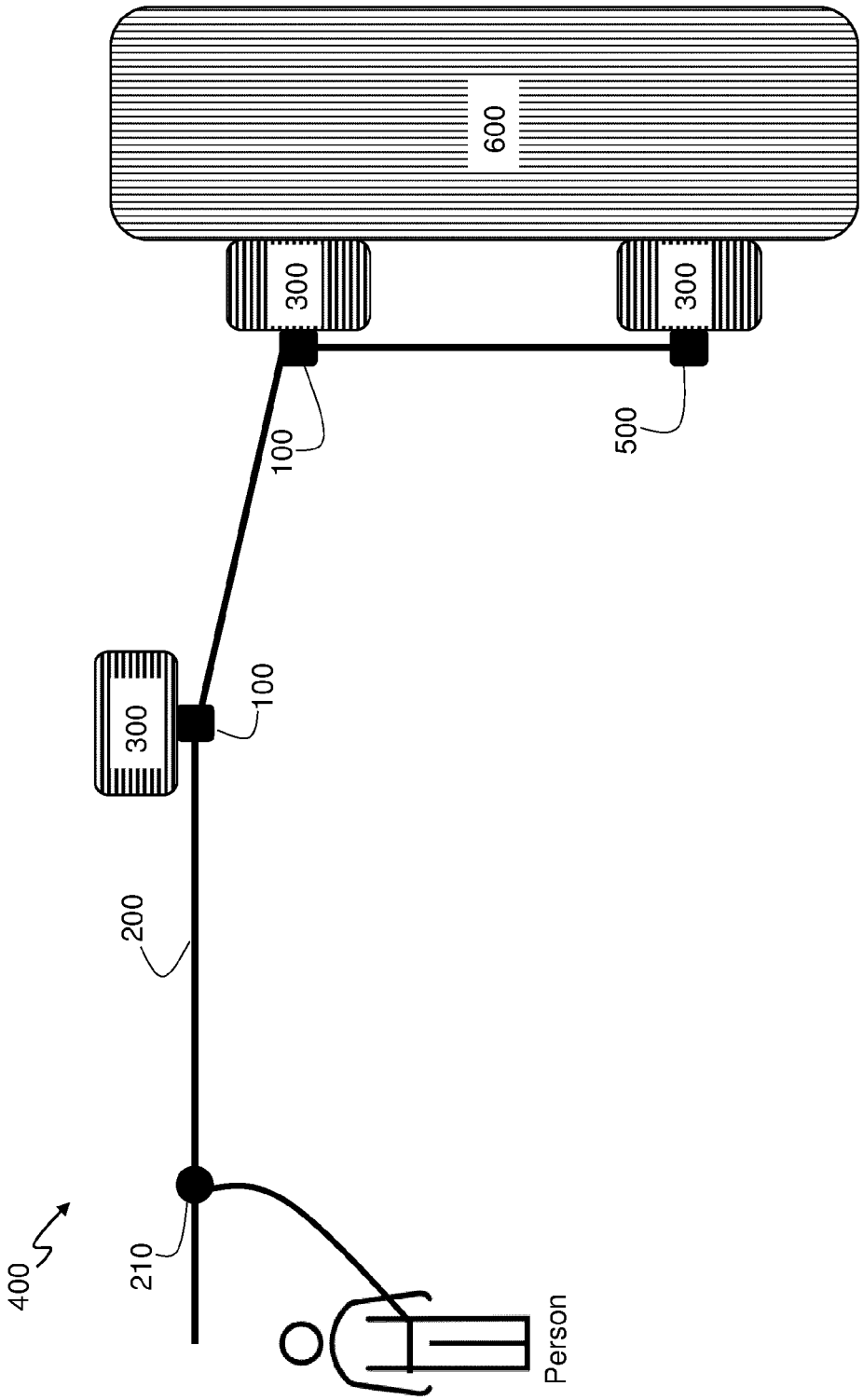


Fig. 11

Fig. 13



Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 23 16 6179

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	IT BI20 110 010 A1 (GAMBA DAVIDE) 5 April 2013 (2013-04-05) * abstract; figures *	1-12	INV. A62B35/00
A	GB 2 466 460 A (CENTRAL HIGH RISE LTD [GB]) 23 June 2010 (2010-06-23) * page 8, line 31 - page 9, line 12; figures *	1-12	
A	WO 2009/022910 A1 (SAFEWAY GMBH [CH]; BERLEE ANTHONIE BERNARDUS [NL] ET AL.) 19 February 2009 (2009-02-19) * page 8, line 31 - page 9, line 14; figures *	1-12	
			TECHNICAL FIELDS SEARCHED (IPC)
			A62B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	25 August 2023	Vervenne, Koen

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 23 16 6179

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

25-08-2023

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
IT BI20110010 A1	05-04-2013		
GB 2466460 A	23-06-2010	EP 2361121 A2	31-08-2011
		GB 2466460 A	23-06-2010
		WO 2010072525 A2	01-07-2010
WO 2009022910 A1	19-02-2009	CA 2696548 A1	19-02-2009
		EP 2167758 A1	31-03-2010
		NL 2000814 C2	23-02-2009
		US 2011005150 A1	13-01-2011
		WO 2009022910 A1	19-02-2009
		WO 2009035318 A1	19-03-2009

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82