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(54) **An improved pivot hinge fitting and a roof window comprising such a hinge fitting**

(57) The pivot hinge fitting comprises a frame hinge part (100) having a base plate (101) and a guidance including a guide block (130), and a sash hinge part (200) having a base plate (201). The frame hinge part (100) is adapted to be connected to a frame structure and the sash hinge part (200) to be connected to a sash structure by means of fastening means. The pivot hinge fitting includes a plurality of reinforcement elements including at least one reinforcement element adapted to cooperate with the fastening means. In particular, a reinforcement element in the form of a reinforcement plate (260) is connected to the base plate (201) of the sash hinge part (200), the reinforcement plate (260) being provided with an aperture adapted to receive supplemental fastening means displaced from the base plate (201) of the sash hinge part (200).

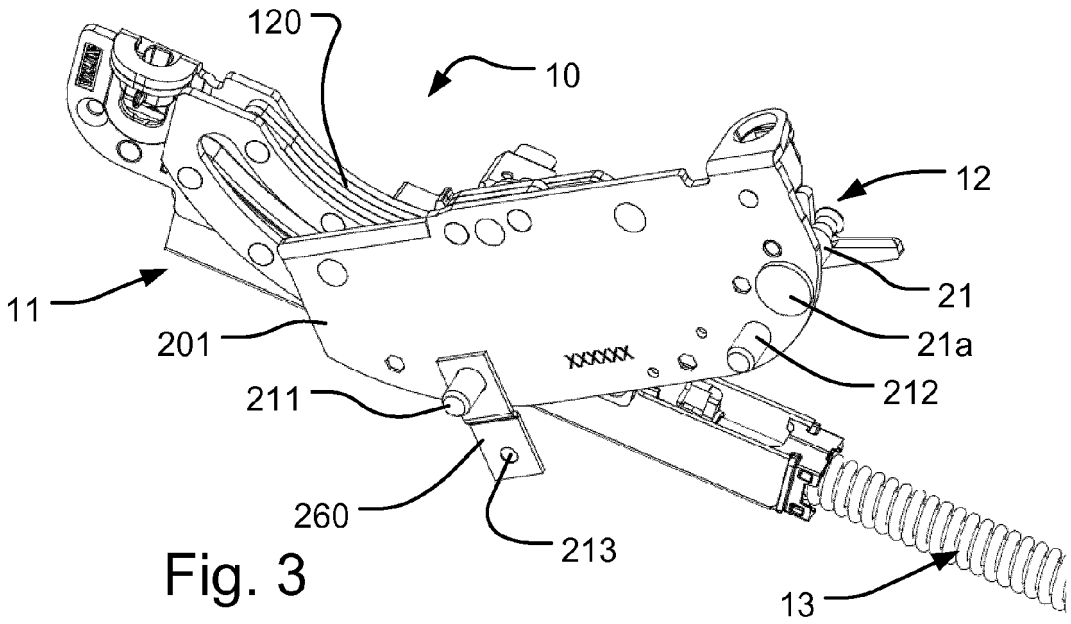



Fig. 3

EP 2 770 146 A1

## Description

**[0001]** The present invention relates to a pivot hinge fitting comprising a frame hinge part having a base plate and a guidance including a guide block, and a sash hinge part having a base plate, the frame hinge part being adapted to be connected to a frame structure and the sash hinge part being adapted to be connected to a sash structure by means of fastening means. The invention furthermore relates to a roof window comprising such a hinge fitting.

**[0002]** Such pivot hinge fittings are well known in the art, examples being shown in, e.g., international published applications Nos. WO 85/02646 and WO 99/28581.

**[0003]** The pivot hinge fitting is traditionally of a relatively complex design as the structure comprises a large number of metal parts, possibly supplemented by a few parts of a plastic material. As a result, the hinge fitting is able to withstand the forces to which it is exposed in use; however, the costs relating to manufacture and assembly of the hinge fitting are considerable. Furthermore, the hinge fitting should be maintained by lubricating the metal parts occasionally.

**[0004]** One attempt at reducing the complexity and diminish the need for maintenance is described in WO 01/31155. In this document, a hinge fitting is disclosed, of which the first hinge part to a large extent is made of a hard wearing plastics material, the base plate being integrally formed with guide members. Optionally, the second hinge part including the slide rail is made from a similar material as well.

**[0005]** One example of alleviating the above disadvantages is described in Applicant's European patent No. 1 781 833, which provides for a simple yet reliable design.

**[0006]** In some fields of application, the pivot hinge fitting is subjected to larger than average loads. As the space available at the site of the pivot hinge fitting is limited, and as there is a general desire to optimize the material utilized, the option of merely choosing heavier material is not viable or sound from a manufacturing point of view.

**[0007]** On this background it is an object of the present invention to provide a pivot hinge fitting which has improved properties as regards the distribution and transfer of loads, but is simple and cost-effective to manufacture and assemble.

**[0008]** In a first aspect, this object is achieved by a pivot hinge fitting of the kind mentioned in the introduction and which is furthermore characterized in that the pivot hinge fitting includes a plurality of reinforcement elements including at least one reinforcement element adapted to cooperate with the fastening means.

**[0009]** Thereby a pivot hinge fitting is provided, in which at least some of the load that the pivot hinge fitting is subjected to is distributed and transferred to the structures connected by the pivot hinge fitting via the reinforcement elements connected to the fastening means.

**[0010]** In a second aspect, a roof window comprising such a pivot hinge fitting is provided.

**[0011]** Presently preferred embodiments and further advantages will be apparent from the following detailed description and the dependent claims.

**[0012]** The invention will be described in more detail below by means of a non-limiting example of an embodiment and with reference to the schematic drawing, in which

Fig. 1 shows a perspective view of a roof window according to the invention;
Fig. 2 shows a partial perspective view of an embodiment of a roof window, seen from the inside;
Fig. 3 shows a partial perspective view of a detail of the roof window of the embodiment shown in Fig. 2;
Fig. 4 shows a view corresponding to Fig. 3, with some parts removed;
Fig. 5 shows a view corresponding to Fig. 3, seen from another angle;
Fig. 6 shows a view as in Fig. 5, on a larger scale, and from a slightly different angle;
Fig. 7 shows a view corresponding to Fig. 5, with some parts removed;
Fig. 8 shows a perspective view of other details of an embodiment of the roof window according to the invention;
Fig. 9 shows a partial view of the details of Fig. 8, on a larger scale;
Fig. 10 shows a cross-sectional views of the details of Fig. 9; and
Fig. 11 shows a perspective view of one of the details of Fig. 9.

**[0013]** In the embodiment of the window shown in Fig. 1, the window comprises a sash 2 and a window frame 1. The window is intended to be built into a surface, which is inclined with respect to the horizontal. At a position between the top and centre of the window, there is a hinge connection between the frame 1 and the sash 2 carrying a glazing in the form of a pane 3. The hinge connection will be described in further detail below. In a manner known per se, the frame 1 and sash 2 is each formed by four members of which one frame side member 1a and one sash side member 2a are indicated. The sash 2 is openable with respect to the frame 1, as the sash 2 may be moved from a closed position, in which e.g. the sash side member 2a is substantially parallel with the frame side member 1a, to an open position, in which the sash side member 2a forms an angle with the frame side member 1 a. During this movement the sash 2 rotates about a hinge axis $\alpha$ situated at the hinge connection.

**[0014]** The hinge connection comprises a set of hinges of a structure substantially as traditionally utilized in pivot windows. Details of such pivot hinges are disclosed in EP 1 038 083 B1 and EP 1 781 883 B1, the contents of which are incorporated herein by reference. However, certain adaptations forming part of the present invention

have been carried out; this will be described in detail below. In principle, each hinge fitting of the set of hinges thus comprises a pivot hinge fitting at either side of the roof window, including a frame hinge part 100 having a base plate 101 with a guidance 121, and a sash hinge part 200 having a base plate 201 and a slide rail 220. During operation of the pivot hinge fitting, the slide rail 220 of the sash hinge part slides in the guidance of the frame hinge part 100 in a manner known as such. The guide means of the frame hinge part 100 comprise a guide block 130 and guide parts 120 inserted between a base plate 101 and a top plate 110. The top plate 110 of the frame hinge part 100 is connected to the base plate 101 by means of a number of rivets, and furthermore a lever spring 125, not described in detail, as this is standard procedure in such pivot hinge fittings. Correspondingly, the other hinge part, i.e. the sash hinge part 200 comprises a base plate 201 on which the slide rail 220 is rotatably connected.

**[0015]** For assisting the movement of the sash 2 from the closed position to an open position, a lifting device generally designated 10 is mounted between the sash 2 and the frame 1. Referring now to Figs 2 to 8, the lifting device 10 in the shown embodiment comprises includes a sash part 12 and a frame part 11 including a spring arrangement 13 and a lifting arm 14 acting between the frame 1 and the sash 2 to provide a spring bias and assist the movement of the sash. As shown, the spring arrangement 13 is received in a longitudinally extending recess 10a in the frame side member 1a and the frame part 11 of the lifting device 10 in a frame part receiving recess 10b. A corresponding lifting device may be provided at each side of the roof window.

**[0016]** In the position shown in Fig. 1, the window is in an open position, in which the sash 2 is still influenced by the lifting device 10. As will be described in further detail below, with the present invention it is possible to open the sash further to a further extent, to an opening angle beyond the angle shown in Fig. 1, in which the lifting device 10 does not participate in the opening movement, but is ready for re-engagement with the sash, when the sash reaches substantially the same opening angle. In the embodiment shown, the lifting arm 14 is affected by a spring bias up until the predefined opening angle, the effect of the spring bias being halted at the predefined opening angle, and the lifting arm 14 is provided with open reception means for engagement means on the sash side member. The halting of the spring bias may for instance be provided by the spring assuming its relaxed position, or by providing a stop. As the reception means are open, the engagement means on the sash side member may be received at any time.

**[0017]** Other details of the lifting device, including the spring arrangement 13 comprises a spring, or two springs, as is described in further detail in Applicant's above-mentioned European patent No. 0 733 146 B1, the contents of which are hereby incorporated by reference.

**[0018]** The operation of the lifting device when installed in the embodiment of the roof window is as follows:

**[0019]** From a closed position, the user operates the operating device of the window. The operating device may be a handle (not shown) connected with the sash bottom member. The bias of the lifting device 10 is transmitted to the lifting arm 14. The lifting arm 14 exerts a moment on the sash 1, and in combination with the force, and hence moment, exerted by the user operating the operating device, the moment resulting from the weight of the sash 1 and pane 3 is overcome. During this movement, the sledge 15 and the lifting arm 14 are displaced along the sledge guidance 16. All in all, this operation entails that the sash 1 is moved from a closed position to an open position as represented by Fig. 1, in which the sash plane forms an opening angle with the frame plane. Closing the window from the open position entails the opposite movements of the sash 1 and relevant parts of the lifting device. It is possible to position the sash 2 in a number of arbitrary opening positions, in which the sash 2 is held stable relative to the frame 1. Up to the predefined opening angle, in which the lifting arm 14 has reached its stable releasing and receiving position, the lifting arm 14 follows the movement of the sash 2. Opening the window further, the sash 2 is moved out of engagement with the lifting arm 2, but may still be positioned in further arbitrary opening positions.

**[0020]** In Fig. 2, the lifting device 10 assumes substantially the same position as shown in Fig. 1. The lifting arm 14 of the lifting device 10 is at a first end 141 connected to the frame part 11 and its opposite, other end 142 is releasably connected with the sash 2 via the sash part 12 of the lifting device 10. In the position shown in Fig. 2, the lifting arm 14 assumes a stable releasing and receiving position at a predefined opening angle. In the embodiment shown, this predefined opening angle is approximately 45°. In principle, the predefined opening angle to be defined by the lifting arm 14 may assume any suitable value making it possible to obtain a sufficient opening and at the same time reliable operation of the lifting device. Advantageously, the predefined opening angle defined by the lifting arm 14 lies in the range 20° to 80°, preferably 30° to 60°, more preferably 35° to 50°. Depending on the length of the lifting arm 14 and the dimensions of the hinge connection itself, the sash 2 and window frame 1, and the position of the hinge connection, this predefined opening angle has a correlation to the angle formed between a general length direction of the lifting arm 14 and the frame side member 1 a in the stable releasing and receiving position.

**[0021]** In the embodiment shown, the first end 141 of the lifting arm 14 is rotatably connected to a spring-biased sledge 15 accommodated in a sledge guidance 16 connected to the frame side member 2a, and the opposite, second end 142 includes open reception means, which are here constituted by a fork or cradle 143 adapted to be connected to an engagement means connected to the sash side member 1 a. The engagement means of

the sash part 12, which in turn is connected to the sash side member 1a in its mounted position, has the form of a rivet 21 connected to a sash hinge part 200 of a hinge fitting of said set of hinges. The sledge guidance 16 is, in the embodiment shown connected to the frame hinge part 100 by means of fastening means such as rivets. As shown, the sledge 15 itself is mounted in a runner 17 fitting slidingly into the sledge guidance 16. The lifting arm 14 is spring-biased towards the stable releasing and receiving position at the predefined opening angle by means of a wire spring 150. The wire spring 150 has the function of keeping the lifting arm 14 in the correct position at all times. To this end, the wire spring 150 may as indicated be mounted with a slight inclination to force the lifting arm 14 in the direction of the sash. In this manner, secure engagement of the lifting arm 14 with the rivet 21 is ensured. Furthermore, a holding clip 160 adapted to accommodate fastening means for a side frame cladding is connected to the base plate 101 of the frame hinge part 100.

**[0022]** In the embodiment shown, the rivet 21 constituting the engagement means is connected to the base plate 201 of the sash hinge part 200. The rivet 21 is formed with such dimensions that it is able to transmit the load properly into the sash hinge part 200 and further into the sash structure itself. In order to reinforce the engagement between the rivet 21 and the base plate 201 of the sash hinge part 200, the rivet is formed with a collar-like structure in that the rivet 21 is inserted from the back side of the base plate 201 (cf. Fig. 3) and abuts against the back side with a first collar part 21 a. Following this, a second collar part 21 b is formed at the front side of the base plate 201 as shown most clearly in Fig. 6.

**[0023]** As indicated in Fig. 1, the hinge axis $\alpha$ is located between a centre axis and the top of the roof window, preferably in the interval 1/3 to 2/3 of the distance between the centre axis and the top, most preferred substantially at 1/2 of the distance between the centre axis and the top.

**[0024]** A further aspect of the present invention is conceived in response to the recognition that a pivot hinge fitting as described in the above is subjected to a larger load than other hinges. In order to meet the requirements, a number of precautions are foreseen in the embodiments shown and described:

**[0025]** As shown in for instance Figs 2, 4 and 6, the base plate 101 of the frame hinge part 100 is provided with a distance bushing 170 adapted to abut the frame side member 1 a, viz. in the frame part receiving recess 10b.

**[0026]** In order to make the pivot hinge of the present invention able to withstand larger forces, partly due to the position of the hinge, partly due to its function to transmit the load from the sash to the frame via the lifting arm, a number of measures have been taken to reinforce the pivot hinge and to secure that the load is transmitted safely to the sash and frame structures.

**[0027]** A first measure will be described with particular reference to Figs 9 to 11, in which the base plate 101 of the frame hinge part comprises a reinforcing element 180 adapted to support the guide block 130 of the frame hinge part 100. As shown, the reinforcing element 180 is received in a recess 131 in the guide block; the guide block 130 is formed with a corresponding recess in the other side as well, cf. Fig. 11. This makes it possible to utilize one and the same guide block in the left-hand and the right-hand hinge part. The reinforcement element 180 may be provided as a separate element connected to the base plate 101, for instance a rivet, but in a presently preferred embodiment, the reinforcement element 180 is provided as a part formed by the material of the base plate itself as shown in the cross-sectional view of Fig. 10. The deformation of the material to provide the reinforcement element 180 may be provided in any suitable manner, for instance by punching or embossing the base plate 101.

**[0028]** Moreover, a reinforcement plate 260 (cf. Fig. 3) is connected to the base plate 201 of the sash hinge part 200. The base plate 201 of the sash hinge part 200 is in a manner known per se provided with a number of spigots 211 and 212 on its back side to be inserted into corresponding bores in the sash side member. Additional separate fastening means such as screws may be present as well to be introduced through the base plate 201 and connected to the sash side member. Alternatively, only separate fastening means may be utilized. However, all of these fastening means are located within the contours of the base plate 201 itself. In particular, the spigots 211 and 212 are virtually located along the same longitudinal position of the sash side member. This is usually not a disadvantage, as any load subjected to for instance the pane will be safely transmitted to the sash structure via the sash hinge part 200. However, in some applications, for instance in such windows in which the hinge axis is located at a position between the top and the centre, forces from for instance a sudden impact may cause a local load which in the worst case will lead to splitting of the sash member. This is particularly pronounced in frame and sash structures made of wood, in which the direction of the grains or streak direction is often more or less parallel with the length direction or the frame and sash members. In order to counteract such disadvantageous load distribution, the pivot hinge in the embodiment shown is provided with additional fastening means displaced from the base plate 201, and the reinforcement plate 260 is thus provided with an aperture 213 adapted to receive supplemental fastening means displaced from the base plate 201 of the sash hinge part 200. The supplemental fastening means introduced through the displaced aperture 213 is thus positioned in another grain than the spigots 211 and 212 located within the contour of the base plate.

**[0029]** Also the frame hinge part 100 is provided with a spigot 111, and the spigot 111 together with the connection between the frame hinge part 100 and the sledge guidance 16 of the above embodiment transfer the load

that the frame hinge part 100 is subjected to, further into the frame structure. The sledge guidance 16 and other parts of the lifting device, such as the spring arrangement 13 is as described in the above received in the longitudinally extending recess 10a in the frame side member 1 a and the frame part 11 of the lifting device 10 in the frame part receiving recess 10b. This provides for a satisfying distribution and transfer of the load into the frame structure.

**[0030]** Further embodiments include the following itemized list:

A. A roof window, wherein the predefined opening angle defined by the lifting arm lies in the range 20° to 80°, preferably 30° to 60°, more preferably 35° to 50°.

B. A roof window, wherein the hinge axis ($\alpha$) is located between a centre axis and the top of the roof window, preferably in the interval 1/3 to 2/3 of the distance between the centre axis and the top, most preferred substantially at 1/2 of the distance between the centre axis and the top.

**[0031]** It should be noted that the above description of presently preferred embodiments serves only as an example, and that a person skilled in the art will know that numerous variations are possible without deviating from the scope of the claims.

## Claims

1. A pivot hinge fitting comprising a frame hinge part (100) having a base plate (101) and a guidance including a guide block (130), and a sash hinge part (200) having a base plate (201), the frame hinge part (100) being adapted to be connected to a frame structure and the sash hinge part (200) being adapted to be connected to a sash structure by means of fastening means, **characterized in that** the pivot hinge fitting includes a plurality of reinforcement elements including at least one reinforcement element adapted to cooperate with the fastening means.

2. A pivot hinge fitting according to claim 1, wherein a reinforcement element in the form of a reinforcement plate (260) is connected to the base plate (201) of the sash hinge part (200), the reinforcement plate (260) being provided with an aperture adapted to receive supplemental fastening means displaced from the base plate (201) of the sash hinge part (200).

3. A pivot hinge fitting according to any one of claims 1 and 2, wherein the base plate (101) of the frame hinge part (100) comprises a reinforcing element (180) adapted to support the guide block (130) of the frame hinge part (100).

4. A pivot hinge fitting according to claim 3, wherein the reinforcement element (180) is formed as a part formed by the material of the base plate itself.

5. A pivot hinge fitting according to any one of claims 3 and 4, wherein the guide block (130) is provided with a recess (131) adapted to receive the reinforcing element (180).

6. A pivot hinge fitting according to claim 5, wherein the guide block (130) is formed with a corresponding recess in the other side as well.

7. A roof window comprising:

a frame (1) having a top member, a bottom member and two side members (1 a) defining a frame plane,

a sash (2) having a top member, a bottom member and two side members (2a), said sash carrying a pane (3) and defining a sash plane, the sash being connected with the frame by means of a set of hinges (100, 200) defining a hinge axis of the window,

**characterized in that** said each set of hinges comprises a pivot hinge fitting (100, 200) including a plurality of reinforcement elements including at least one reinforcement element adapted to cooperate with the fastening means.

8. A roof window according to claim 7, wherein the roof window further comprises a lifting device (10) including a lifting arm (14) adapted to act between the frame and the sash to provide a spring bias and assist the movement of the sash, and wherein the lifting arm (14) of the lifting device (10) is releasably connected with the sash (2), and that the lifting arm is adapted to assume a stable releasing and receiving position at a predefined opening angle.

9. A roof window according to claim 8, wherein the lifting arm (14) is affected by a spring bias up until the predefined opening angle, the effect of the spring bias being halted at the predefined opening angle, and the lifting arm (14) being provided with open reception means for engagement means (21) on the sash side member.

10. A roof window according to claim 9, wherein the spring bias is provided in that the lifting arm (14) has a first end (141) rotatably connected to a spring-biased sledge (15) connected to a frame side member (1 a) and an opposite, second end (142) including a fork or cradle (143) adapted to be connected to the engagement means (21) connected to the sash side member.

11. A roof window according to claim 10, wherein the

engagement means has the form of a rivet (21) connected to the sash hinge part (200) of the pivot hinge fitting, preferably to the base plate (201) of the sash hinge part (200).

**12.** A roof window according to claim 10 or 11, wherein the sledge (15) is accommodated in a sledge guidance (16) connected to the frame hinge part (100) of a hinge fitting of said set of hinges, preferably in a runner (17).

**13.** A roof window according to any one of claims 10 to 13, wherein the lifting arm (14) is spring-biased towards the stable releasing and receiving position at the predefined opening angle by means of a wire spring (150).

**14.** A roof window according to any one of claims 7 to 13, wherein the base plate (101) of the frame hinge part (100) is provided with a distance bushing (170) adapted to abut the frame side member (1 a).

**15.** A roof window according to any one of claims 7 to 14, wherein a lifting device (10) is provided at each side of the roof window.

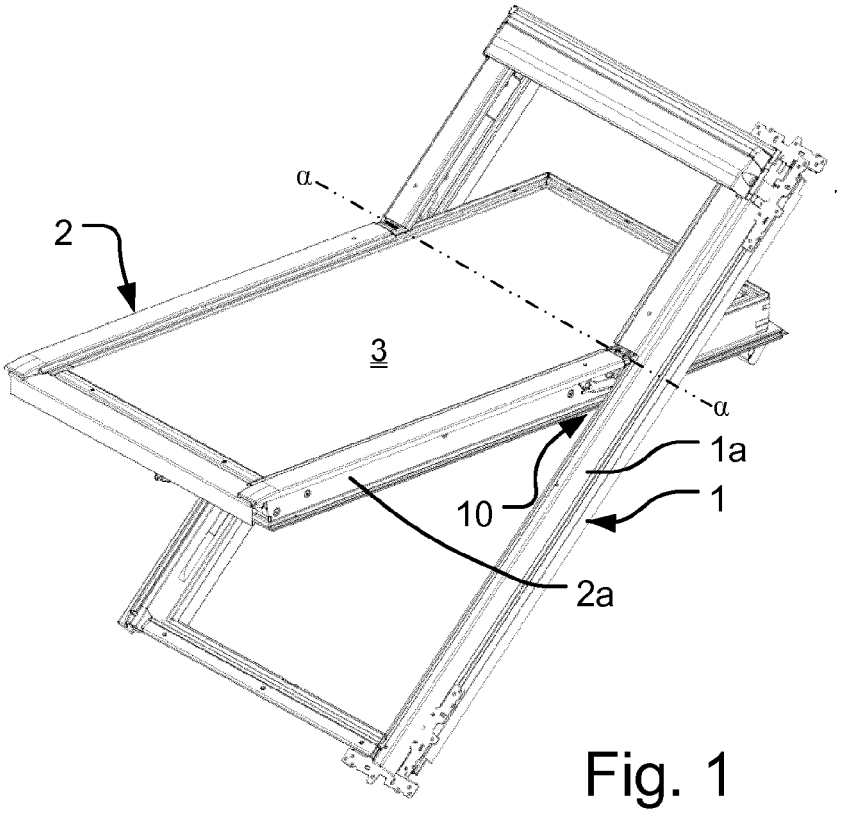



Fig. 1

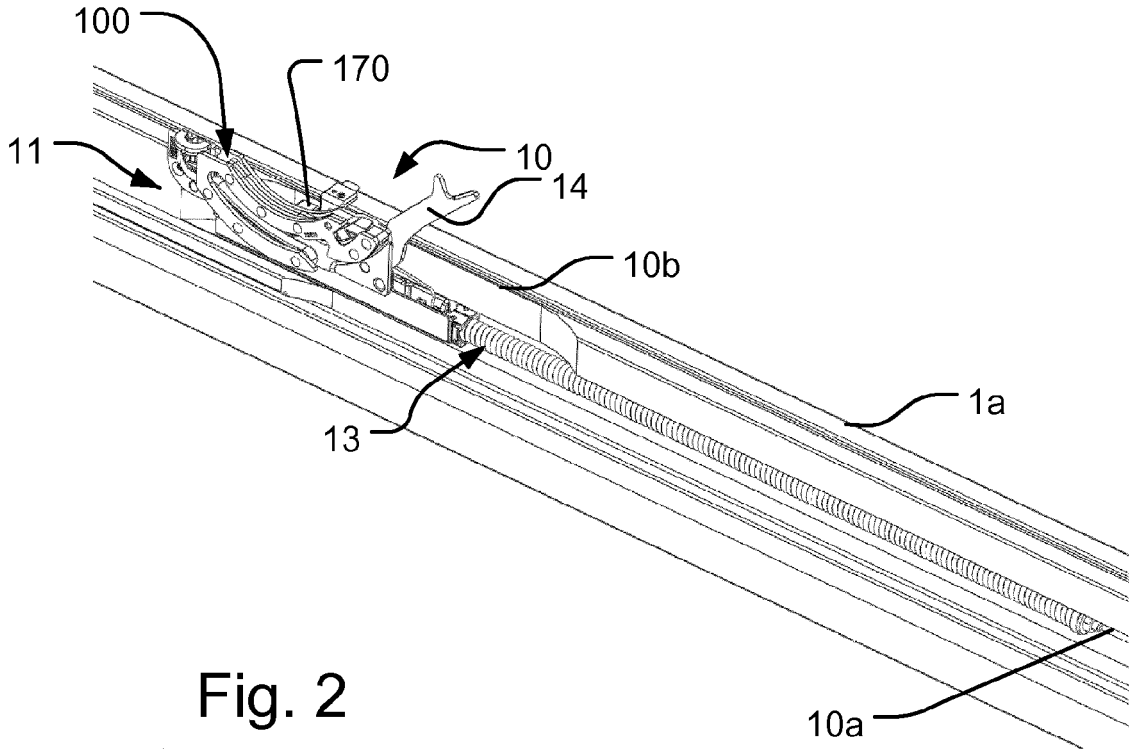
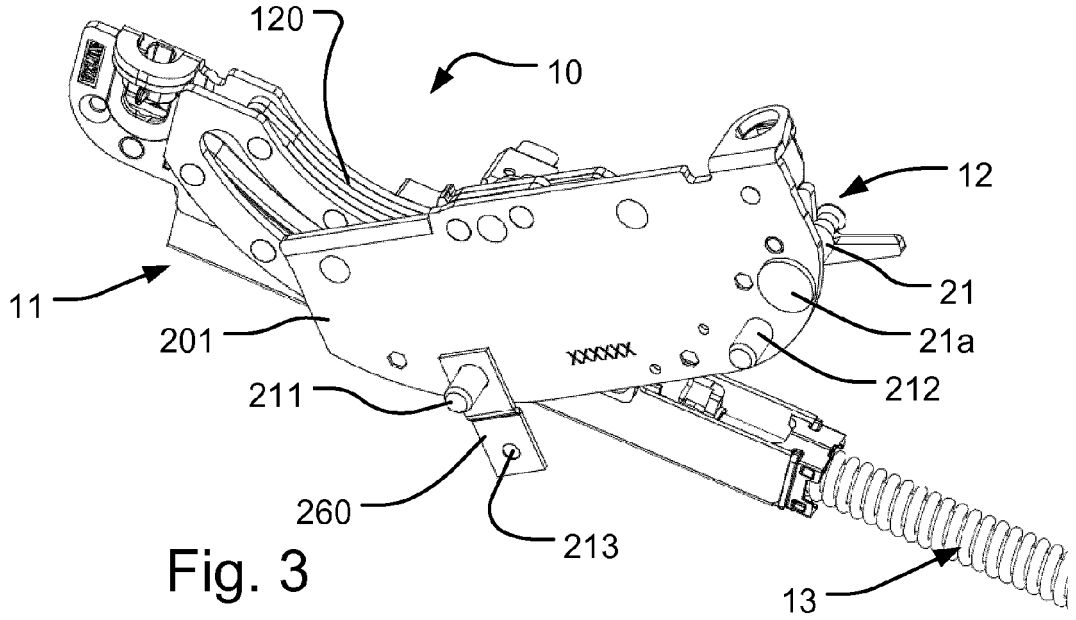



Fig. 2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13

Fig. 3

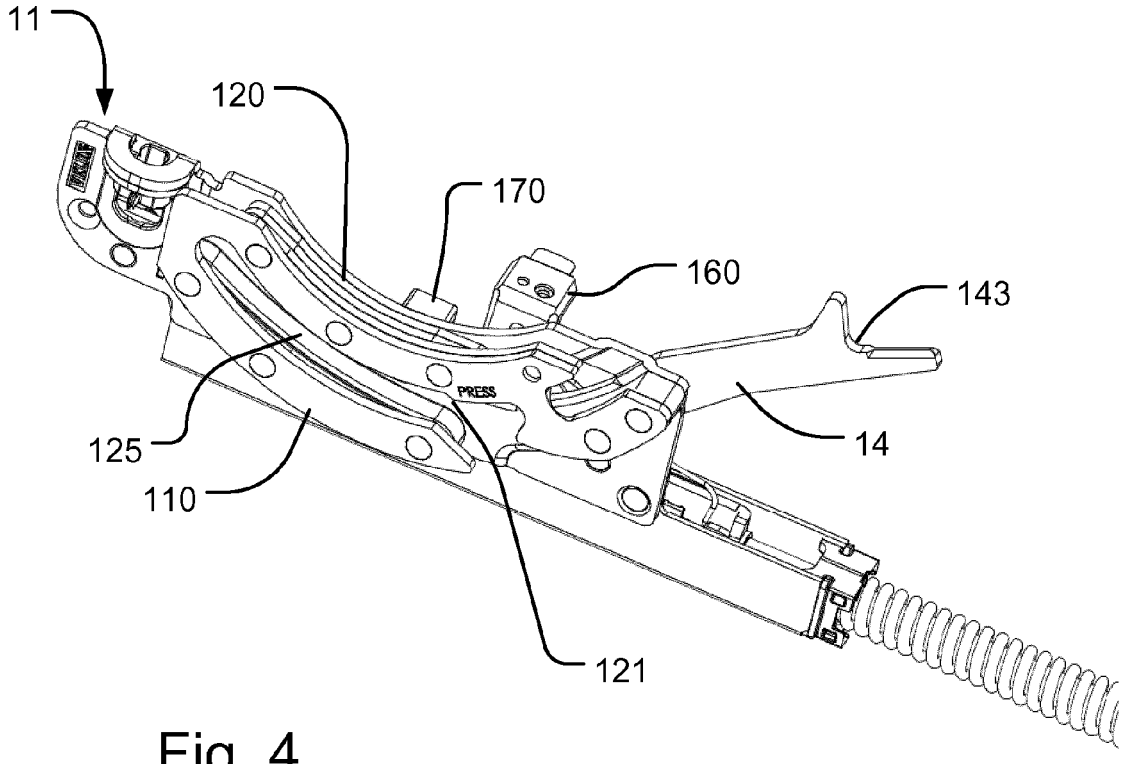
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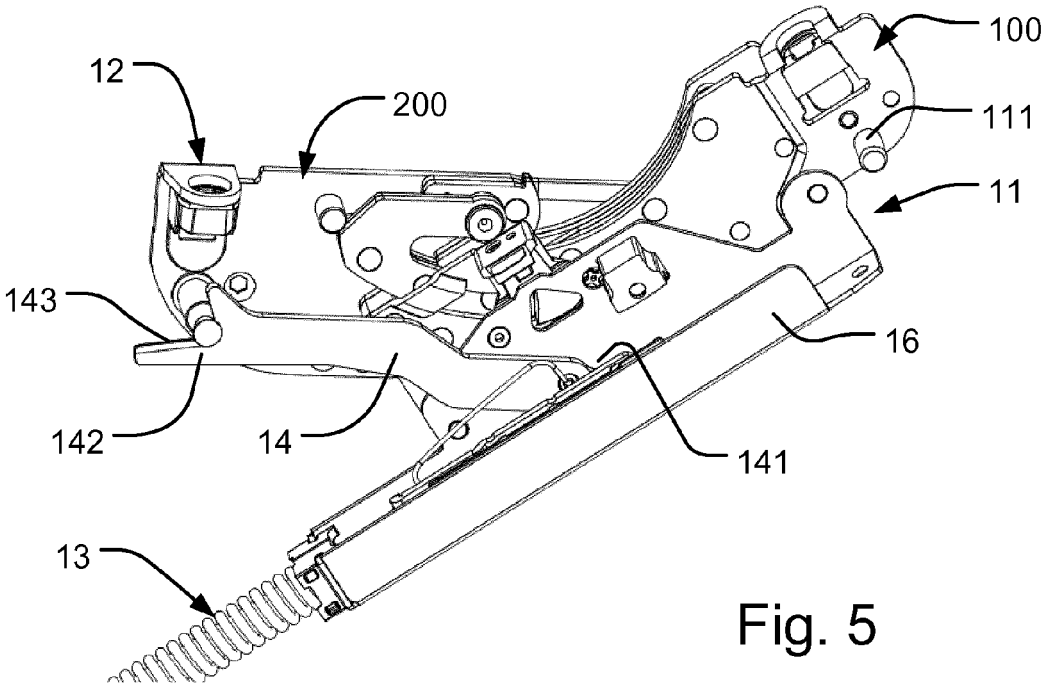
Fig. 4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13

Fig. 5

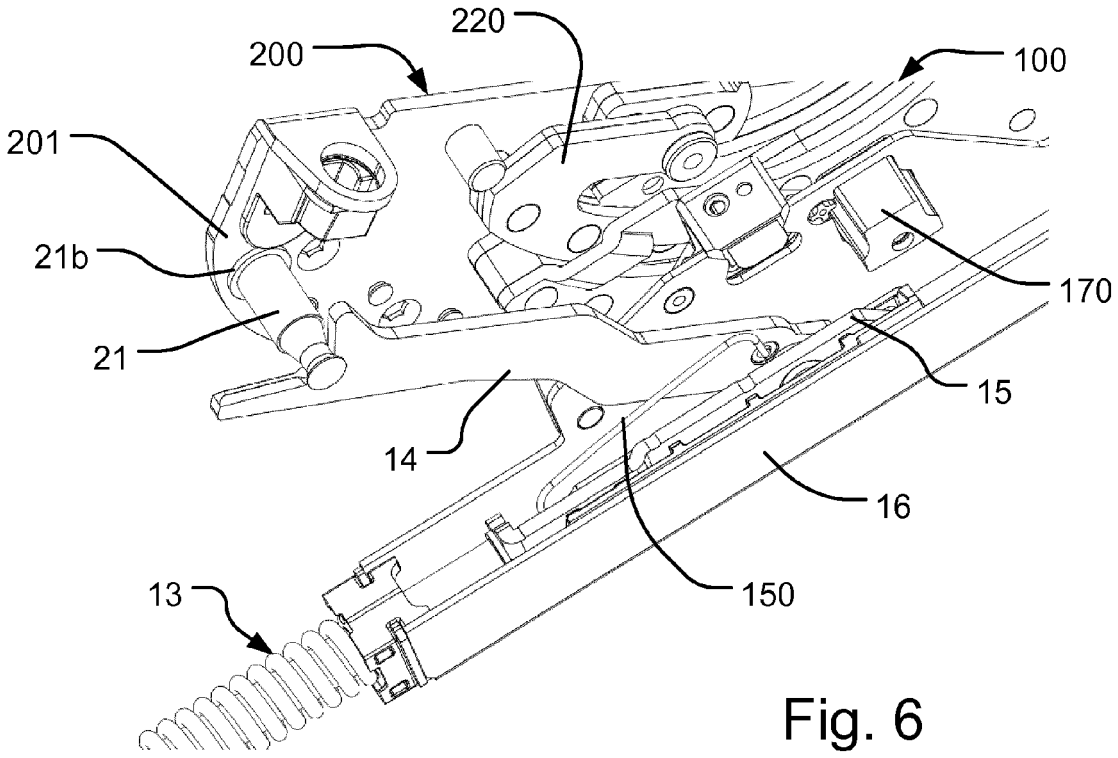
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Fig. 6

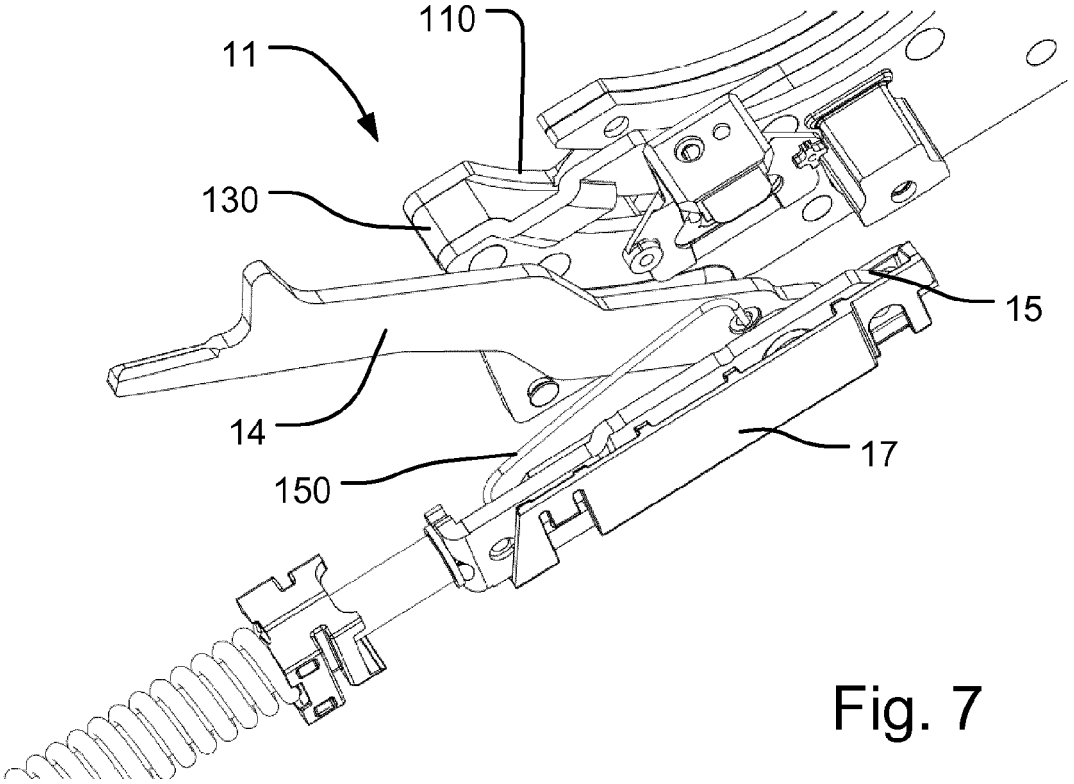


Fig. 7

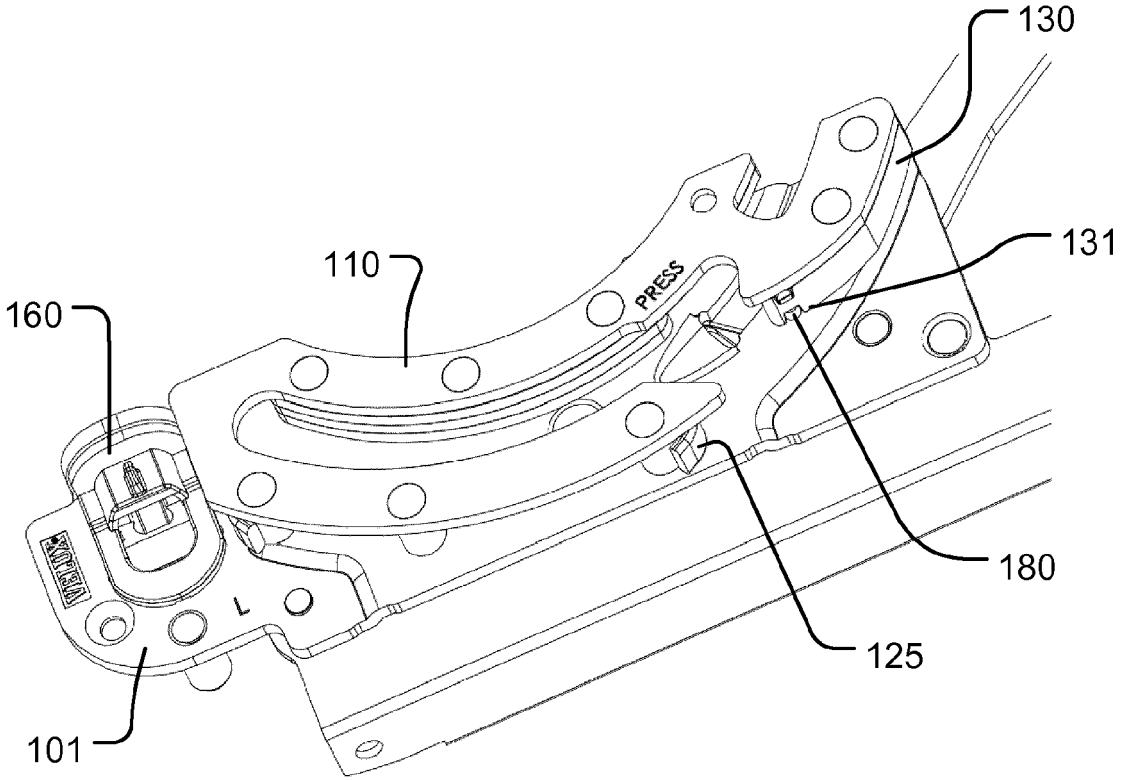


Fig. 8

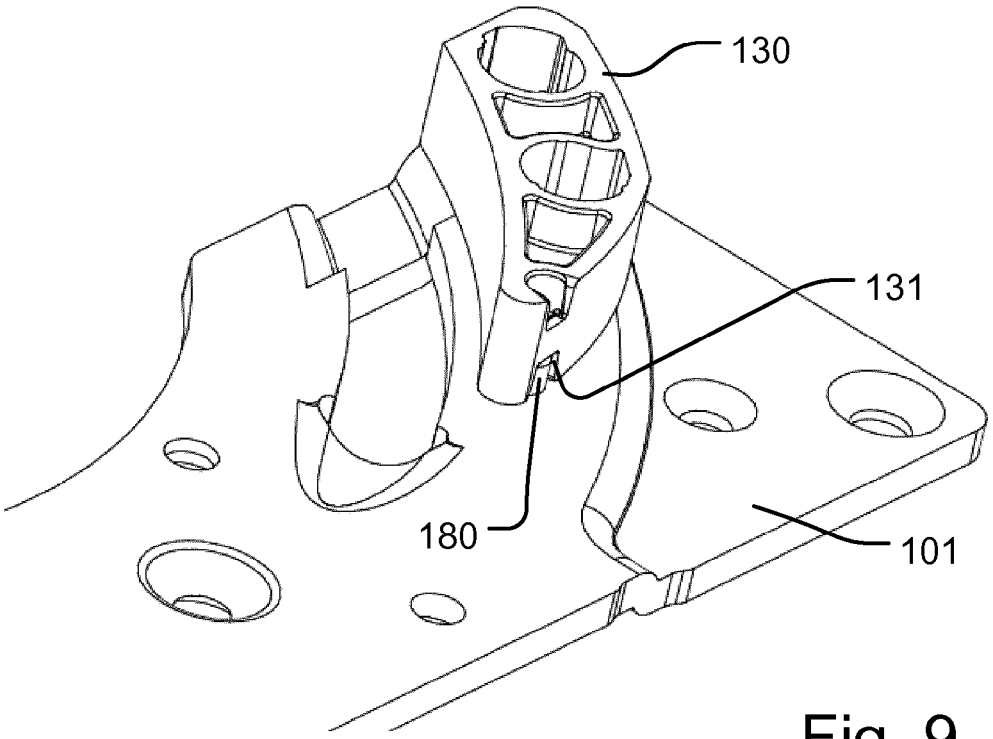


Fig. 9

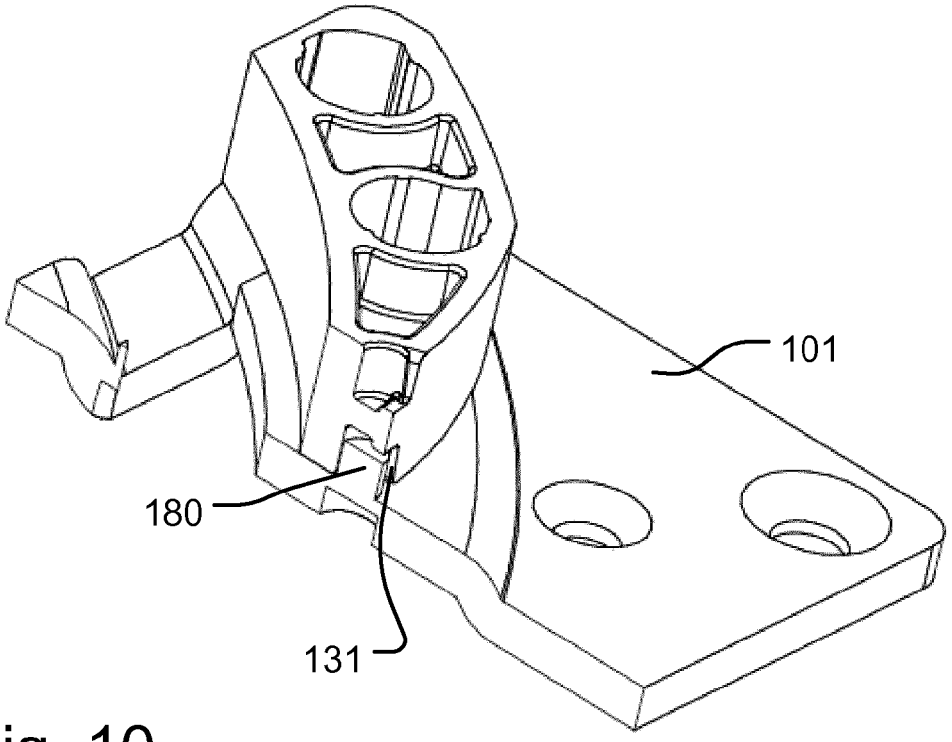


Fig. 10

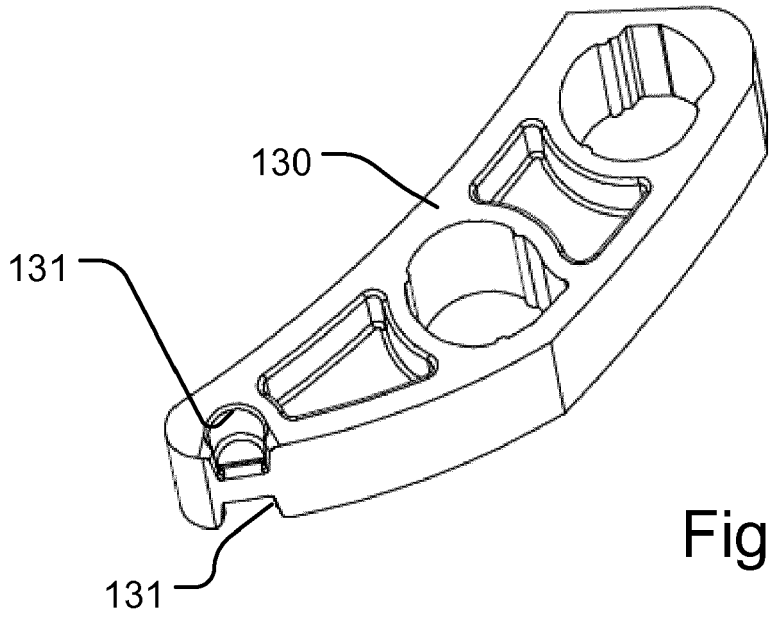


Fig. 11

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# EUROPEAN SEARCH REPORT

Application Number
EP 13 19 9396

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (IPC) |
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| X | WO 2010/005330 A2 (FAKRO PP SPOLKA ZOO [PL]; FLOREK RYSZARD [PL])<br>14 January 2010 (2010-01-14) | 1,2,7 | INV.<br>E05D1/04<br>E05D5/04 |
| Y | * page 3, paragraph 1 * | 3-6,8,9 | E05D7/084 |
| A | * figures * | 14 | E04D13/035 |
| | ----- | | |
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| | ----- | | |
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| | ----- | | |

TECHNICAL FIELDS SEARCHED (IPC)
E05D
E04D

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| The Hague | 13 June 2014 | Van Kessel, Jeroen |

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