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(54) **Support device for a feeder of rods with a bent end for feeding a welding station and corresponding feeder**

(57) Support device for a feeder of rods with a bent end for feeding a welding station. The device comprises rod (4) supporting means (2) capable of movably supporting said rod (4) with respect to said support device (1). The supporting means (2) are pivotally mounted between a supporting position of said rod (4) and a with-

drawn position. When the bent end (5) passes by said device (1), the supporting means (2) move from said supporting position towards said withdrawn position enabling the passing of said bent end (5). The invention further proposes a feeder (13) of rods (4) with a bent bent end (5) with a plurality of support devices (1).

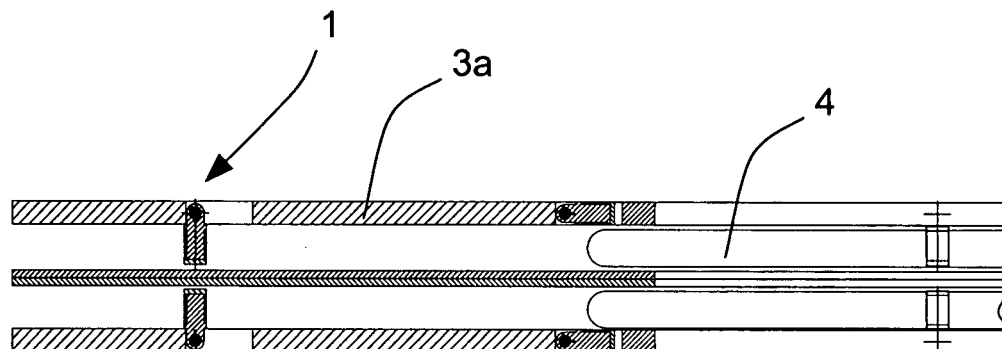


FIG.6

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Description

Field of the invention

[0001] The invention relates to a support device for a feeder of rods with a bent end for feeding a welding station comprising rod supporting means capable of movably supporting said rod with respect to said support device.

[0002] Also, the invention relates to a feeder of rods with a bent end for feeding a welding station of a framework of a reinforced concrete structural element.

State of the art

[0003] With the object of improving the quality of reinforced concrete structures, in recent years, the technical requirements that the frameworks of these structures have to fulfill have become increasingly more demanding. Although traditionally, these frameworks are produced on site, it is becoming increasingly more popular for them to be produced industrially and then delivered subsequently to the site when they are needed. This trend, as well as improving the quality, considerably reduces labour costs and therefore building costs.

[0004] In this context, welding machines are known for welding rods together. For example, machines are known for welding reticular, flat, grill structures, known in the field as an electro-welded mesh. The electro-welded mesh consists of a grid of longitudinal and transverse rods welded together. In known welding machines, the longitudinal rods are supplied to a welding station continually from reels, while the transverse rods, at the time of welding, are fed to the welding station in their definitive position within the welded wire mesh. In other words, transverse to the longitudinal rods, cut at a predetermined length.

[0005] Nevertheless, these machines are not suitable for welding frameworks intended for producing reinforced concrete structural elements such as beams, joists or pillars that also have embedding ends. In other words, these frameworks are made up of a plurality of longitudinal rods that are joined to a plurality of transverse rods that define the cross section of the framework, forming a three-dimensional structure, for example, like a parallelepiped. In this type of structures, the longitudinal rods are bent at the tip thereof forming a bent end to improve the embedding of the framework in the concrete structure. These bent ends hinder the feeding of said longitudinal rods to the welding station, whereby it is very complicated to continually produce frameworks of this type in an industrial machine.

Disclosure of the invention

[0006] The aim of the invention is to overcome this drawback. This purpose is achieved by means of a support device for a feeder of rods with a bent end, **characterized in that** said supporting means are pivotally

mounted between a supporting position of said rod and a withdrawn position, such that when said bent end passes by said device, said supporting means move from said supporting position towards said withdrawn position enabling the passing of said bent end.

[0007] In the invention, during the feeding of the longitudinal rods to a welding station, the device is at rest, whereas the longitudinal rods advance towards the welding station in the feeding direction in order the respective welding to be performed. Thanks to this arrangement, the masses to be moved in the welding station are reduced.

[0008] Furthermore, although the pivoting action of the supporting means of the device can be produced in very different ways, it is particularly convenient that the pivoting be produced in as simple and energy-efficient way as possible. So, preferably said bent end moves said supporting means from said supporting position to said withdrawn position. This avoids having to use any means for detecting the passage of the bent end and additional control and driving means for withdrawing the supporting means when the rod end passes.

[0009] Preferably the support device further comprises return means to said supporting position after the passing of said bent end, and particularly preferably these return means are elastic means.

[0010] Preferably, said supporting means comprise a roller rotatably mounted on its own axis, such that said rod moves with respect to said device by means of a rolling movement. Thanks to this arrangement, frictional losses are reduced during the movement of the rod with respect to the support device.

[0011] As already mentioned, the invention also raises the problem of how to feed a welding bridge for welding frameworks, avoiding unnecessary process interruptions, so that framework production can be industrialised. So, the invention also proposes a feeder of rods with a bent end for feeding a welding station of a framework of a reinforced concrete structural element. The framework comprises at least one transverse container rod that defines the limits of the cross section of said framework and a plurality of longitudinal rods, arranged inside said cross section, the feeder comprising a plurality of support devices according to the invention for supporting said longitudinal rods that can move with respect to said support devices. Thanks to the plurality of support devices, several of said longitudinal rods can be supported in a pre-welding position, so that they are introduced into the welding bridge, ready for welding.

[0012] Also, preferably the feeder comprises a frame and driving means and said support devices are movably mounted with respect to said frame by means of said driving means. Moreover, the feeder preferably comprises guiding means to guide said support devices. So, the machine is particularly efficient from the point of view of electricity consumption, because the only element that moves during the feeding is the actual framework, whereas, during the framework welding process, the feeder is

stationery with respect to the welding station. Furthermore, preferably the driving means have associated control means that act upon said driving means and make it possible to regulate the final position of the support devices with respect to the framework. So, if it is necessary to modify the type of framework to be produced, the support devices only need to be moved to their new position, without having to change any tools.

[0013] Moreover, the feeder according to the invention makes it possible to feed both the longitudinal rods of the framework, and the transverse rods or stirrups. Before starting the welding process, an operator loads the feeder with all the transverse rods needed to complete the framework, as will be appreciated later. During the welding process, the feeder individually supplies the transverse rod that has to be welded. As the framework advances, it must be guaranteed that the transverse rods that do not have to be welded yet, do not move with the longitudinal rods advancing towards the welding station. So, preferably, the feeder comprises spacers to maintain the separation between said longitudinal rods and said transverse rods during the feeding operation.

[0014] Preferably the feeder comprises positioning means for said transverse rods into a stand-by position and said positioning means comprises sensors for locating the position of said transverse rods.

Brief description of the drawings

[0015] Other advantages and characteristics of the invention are appreciated from the following description, wherein, some preferable embodiments of the invention are described in a non-limiting fashion, with reference to the accompanying drawings, wherein:

Fig. 1, a schematic side view of a feeder of rods with a bent end, which comprises a plurality of support devices according to the invention.

Fig. 2, a top plan schematic view of Figure 1, partially cut.

Fig. 3, a front schematic view of the feeder in Figure 1

Fig. 4, a schematic cut of the feeder along line IV-IV in Figure 1.

Fig. 5, an enlarged detail of a first embodiment of the support device according to the invention, mounted in the feeder.

Fig. 6, a top plan view, partially cut along the central plane of the device according to Figure 5.

Fig. 7, an enlarged front view of the devices in Figure 5.

Fig. 8, a top plan view of a second embodiment of the support device according to the invention, mounted in the feeder.

Fig. 9, a cross-section of the device in Figure 8.

Fig. 10, a side view of an enlarged detail of positioning means for the transverse rod s.

Fig. 11, an enlarged detail over the rod arrangement in Figure 3.

Detailed description of some embodiments of the invention

[0016] Figures 1 to 4 show a general view of a feeder 13 of rods 4, 6 to a welding station 15 for producing the framework of a reinforced concrete structural element. In the interest of simplicity, welding station 15 is indicated in Figures 1 and 2 by a square illustrated with dotted lines.

[0017] Moreover, in this invention, the term "reinforced concrete structural element" is understood to be any reinforced concrete element that does not have exclusively a flat grid frame. Examples of these structural elements are pillars, beams, joists or others. Also, the general term of rod 4, 6 relates both to the bars and the wires that may make up the framework of the structural element. These bars or wires are drawn or corrugated. Also, it is worth mentioning that in the art, the transverse rods 6 are also known as stirrups.

[0018] This way, the framework is made up of a plurality of transverse rods 6 that define the limits of the cross section of the framework. In turn, longitudinal rods 4 are arranged inside these transverse rods 6. Furthermore, the top longitudinal rods 4 in the framework are movably supported in the direction of arrow A in Figure 1 over a plurality of support devices 1 integrated in strips 3a of feeder 13.

[0019] Feeder 13 shown in the figures, enables the feeding of eight longitudinal rods 4, using four strips 3a at the top with devices 1 and four strips 3b at the bottom of the framework which, in this case, do not comprise devices 1. The figures show the case of feeding rods 4, 6 for a rectangular section framework with just four longitudinal rods 4.

[0020] These top strips 3a with the support devices 1 are joined by tubes 28 to a frame made up of two first cross beams 16 and two transoms 26. The frame can be moved vertically in the direction of the double arrow B in Figures 3 and 4, guided by the first guiding means 18 and driven by first driving means 17, consisting of a motor and chain drive. This way, the height of strips 3a can be positioned correctly and consequently support devices 1 on which longitudinal rods 4 rest.

[0021] Also, bottom strips 3b are also joined to frame 14 via tubes 28.

[0022] Moreover, strips 3a, 3b are horizontally movable with respect to frame 14 in the direction of the double arrow C in Figures 3 and 4, via tubes 28. In the particular case of top strips 3a, under each cross beams 16, feeder 13 comprises second guiding means 20, so that tubes 28 are horizontally movable with respect to frame 14. Bottom strips 3b also comprise second guiding means 20 for the horizontal movement thereof. Tubes 28 and strips 3a, 3b are driven by second driving means 19 made up of motors and spindles. Outermost top strips 3a, as well as outermost bottom strips 3b, are joined by threaded bushings 30 to the spindle consisting of two threaded sections 27a, 27b in opposite directions. These spindles, pass through tubes 28 of central strips 3a, 3b via through

holes 29 to prevent being driven. This way, by driving the respective second driving means 19, outer strips 3a, 3b move closer together and further apart from one another simultaneously and symmetrically, while central strips 3a, 3b remain static. Also this arrangement enables to save on the number of necessary motors and guides.

[0023] Furthermore, as can be seen in Figure 2, top and bottom central strips 3a, 3b are assigned their respective second driving means 19 and guiding means 20 like the ones already described in the preceding paragraph, so they can be activated independently. The link between tubes 28 of said central strips 3a, 3b and their respective spindles is already produced as already explained above. Thanks to the fact that the movement of central strips 3a, 3b is independent, it is possible to create rectangular section frames with one single intermediary longitudinal rod 4 in the centre of the framework.

[0024] Finally, strips 3a, 3b can also move together in the feeding direction of welding station 15, indicated by double arrow D in Figure 2. To produce this movement, third driving means 21 are provided enabling to move all strips 3a, 3b on third guiding means 22. This means that the distance from feeder 13 to welding station 15 can be reduced or increased conveniently during the loading and unloading tasks.

[0025] In a welding machine that has to work with the minimum possible interruption time, two feeders 13 would be provided that could be moved sideways to the welding machine 15. This way, while one feeder 13 was busy with the welding process for the framework, the other one, that would be moved sideways, could be loaded by an operator with the necessary rods 4, 6.

[0026] It is also worth mentioning that in the invention, strips 3a, 3b, and therefore support devices 1 are positioned automatically. Particularly, when making a framework, preprogrammed control means activate driving means 17, 19, 21 to move strips 3a, 3b, to the position of longitudinal rods 4 corresponding to their definitive position in the framework.

[0027] Focusing now on the detail of strip 3a in Figures 5 to 7, an explanation is provided below of how support device 1 according to the invention is operated.

[0028] In top strips 3a a plurality of devices 1 according to the invention are mounted to support longitudinal rods 4. In other words, devices 1 are integrated in the body of strips 3a. Nevertheless, these devices 1 could also be independent integral units threaded with strips 3a.

[0029] Moreover, as mentioned above, these support devices 1 are preferably mounted in top strips 3a, because they have to support rods 4 with the bent ends 5 facing downwards. On the contrary, when rods 4 have their bent ends 5 pointing upward, bent end 5 does not normally interfere with the point of support of rod 4.

[0030] Support devices 1 comprise supporting means 2 in the form of rollers 7 that pivot around axis 8 between a supporting position and a withdrawn position. By means of rollers 7 that are rotatable on their own axis, the force needed to move longitudinal rods 4 in the direction of the

welding bridge is reduced. In Figures 5 and 6, from right to left can be appreciated, a first support device 1 in supporting position of rod 4, a central device 1 when it is removed by bent end 5 of rod 4 to its withdrawn position and finally, a device 1 on the left having returned to its supporting position after bent end 5 of rod 4 has passed by.

[0031] Furthermore, the pivoting action of supporting means 2 around axis 8 can be performed in various ways, such as for example, by a pneumatic driver. However, with a view to simplifying device 1 as much as possible, and reducing the energy consumption of the welding machine, supporting means 2 of device 1 move from the supporting position, to the withdrawn position by pivoting around axis 8 when they are moved away by bent end 5, as can be seen to the right of Figures 5 and 6. In turn, when bent end 5 has passed device 1, return means 9 return supporting means 2 to their rest position, in other words, the supporting position. Preferably these return means 9 are elastic means, which in this embodiment consist of a torsion spring. These return means 9 must be dimensioned so that the turning torque around axis 8 caused by rod 4 when sliding over supporting means 2 does not make supporting means 2 pivot involuntarily.

[0032] Figures 8 and 9 illustrate a second embodiment of support device 1. In this embodiment supporting means 2 also pivot around an axis 8 between the supporting position of longitudinal rod 4 and the withdrawn position. Also these means 2 have an arm 11 that rotates integrally with supporting means 2 during the pivoting action. In order to guarantee the return to the support position, elastic return means 9 are provided which, in this case, consist of an extension spring that extends between end 12 of arm 11 away from axis 8, and a fixed point 10 on strip 3a.

[0033] As can be seen in Figures 1 and 2, to make a complete framework in an automated process, initially, an operator has loaded feeder 13 with all the rods 4 and 6 necessary for producing the structure. In other words, in the example shown, the operator has arranged four longitudinal rods 4 in strips 3a and 3b and, furthermore, all the transverse rods 6 that are needed to be able to produce the framework. Then, he has placed feeder 13 in front of welding station 15. Then, in order to weld the framework, longitudinal rods 4 gradually advance towards welding station 15 by means of a dragging mechanism, not shown, that pulls the framework in feeding direction A. The advance of the framework corresponds to its pitch, the pitch being defined as the distance between consecutive transverse rods. In order to prevent all the waiting transverse rods 6 from being welded, they advance together with longitudinal rods 4 of the framework, and the invention provides spacers 25 that can be seen in detail in Figure 11 on which the transverse rods needed for the whole framework are arranged. In other words, in this area of feeder 13 a reservoir of transverse rods is formed 6. Each time that the framework advances, transverse rods 6 to be welded are kept stationary with

respect to feeder 13.

[0034] Moreover, feeder 13 provides positioning means 23 that are responsible for separating the transverse rod 6 that must be welded in each pitch of the framework and position it so that welding station 15 can proceed to position it definitively and then weld it. These positioning means 23 consist of a pneumatic cylinder which, by means of sensors 24, locates in the reservoir of rods 6, the position of the following transverse rods 6 that must be welded in the next step. These sensors 24 can be, for example, an inductive sensor. However, any detection technique can be applied to detect which is the following transverse rod 6 that has to be moved towards welding station 15. For example, Figure 2 shows the stroke of positioning means 23. Dotted lines illustrate these means 23 to the left at the front of frame 14. The right-hand side of this figure show the maximum stroke that they perform to position the corresponding transverse rod 6.

[0035] Furthermore, as shown in Figure 3, the height and width of positioning means 23 can also be regulated by means of corresponding guides and driving means to adapt to the sizes of the framework to be welded.

Claims

1. Support device for a feeder of rods with a bent end for feeding a welding station comprising rod (4) supporting means (2) capable of movably supporting said rod (4) with respect to said support device (1), **characterized in that** said supporting means (2) are pivotally mounted between a supporting position of said rod (4) and a withdrawn position, such that when said bent end (5) passes by said device (1), said supporting means (2) move from said supporting position towards said withdrawn position enabling the passing of said bent end (5).
2. Support device according to claim 1, **characterized in that** said bent end (5) moves said supporting means (2) from said supporting position to said withdrawn position.
3. Support device according to claim 1 or 2, **characterized in that** it further comprises return means (9) to said supporting position after the passing of said bent end (5).
4. Support device according to claim 3, **characterized in that** said return means (9) are elastic means.
5. Support device according to any of the claims 1 to 4, **characterized in that** said supporting means (2) comprise a roller (7) rotatably mounted on its own axis, such that said rod (4) moves with respect to said device (1) by means of a rolling movement.
6. Feeder of rods with a bent end for feeding a welding station of a framework of a reinforced concrete structural element, wherein said framework comprises
 - [a] at least one transverse container rod (6) that defines the limits of the cross section of said framework and
 - [b] a plurality of longitudinal rods (4), arranged inside said cross section, and wherein said feeder comprises a plurality of support devices (1) according to any of claims 1 to 5.
7. Feeder according to claim 6, **characterized in that** it comprises a frame (14) and driving means (17, 19, 21) and **in that** said support devices (1) are movably mounted with respect to said frame (14) by means of said driving means (17, 19, 21).
8. Feeder according to claims 6 or 7, **characterized in that** it comprises guiding means (18, 20, 22) to guide said support devices (1).
9. Feeder according to any of the claims 6 to 8, **characterized in that** it comprises spacers (25) to maintain the separation between said longitudinal rods (4) and said transverse rods (6) during the feeding operation.
10. Feeder according to any of the claims 6 to 9, **characterized in that** it comprises positioning means (23) for said transverse rods (9) into a stand-by position.
11. Feeder according to claim 10, **characterized in that** said positioning means (23) comprises sensors (24) for locating the position of said transverse rods (6).

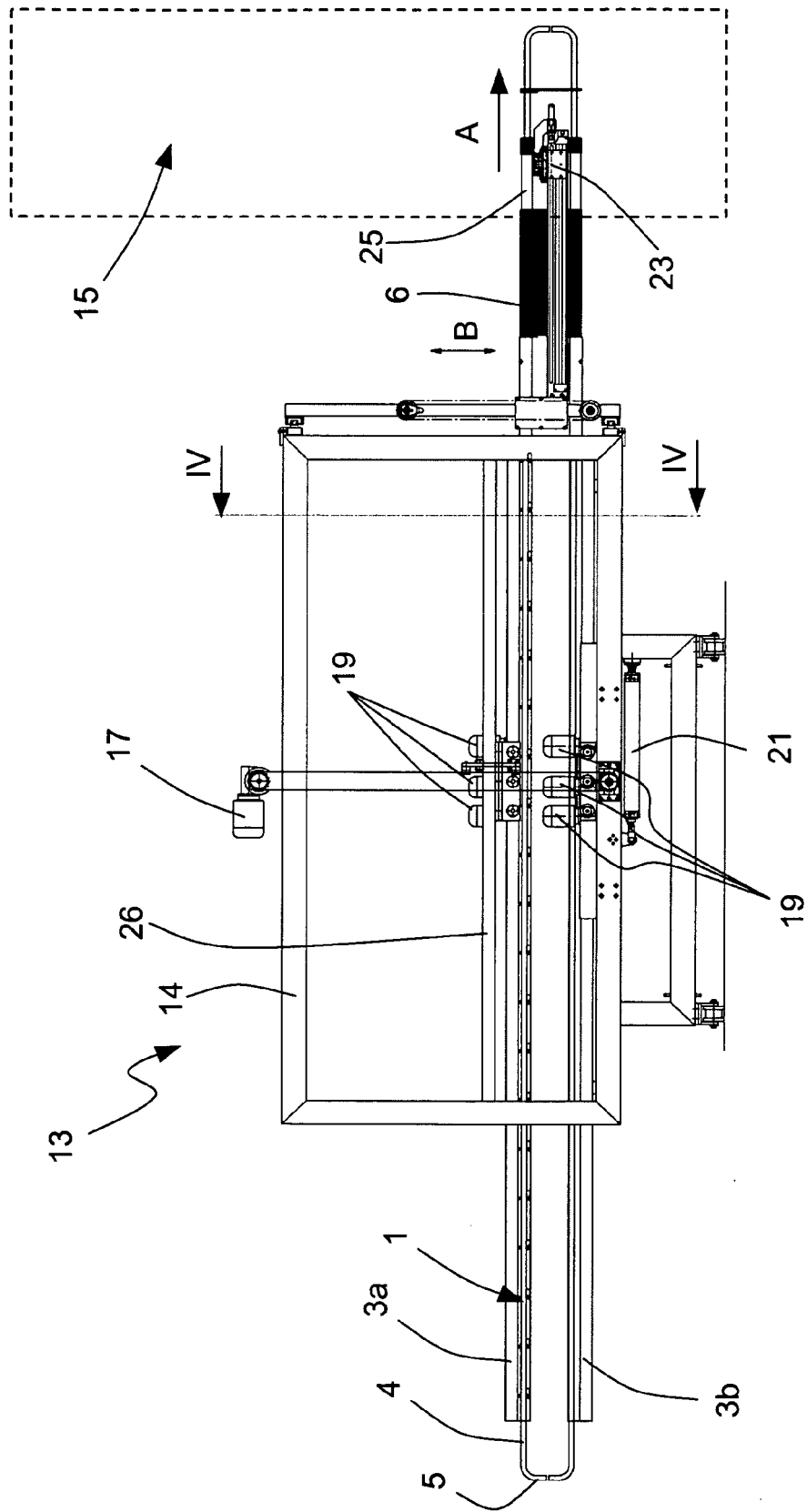


FIG. 1

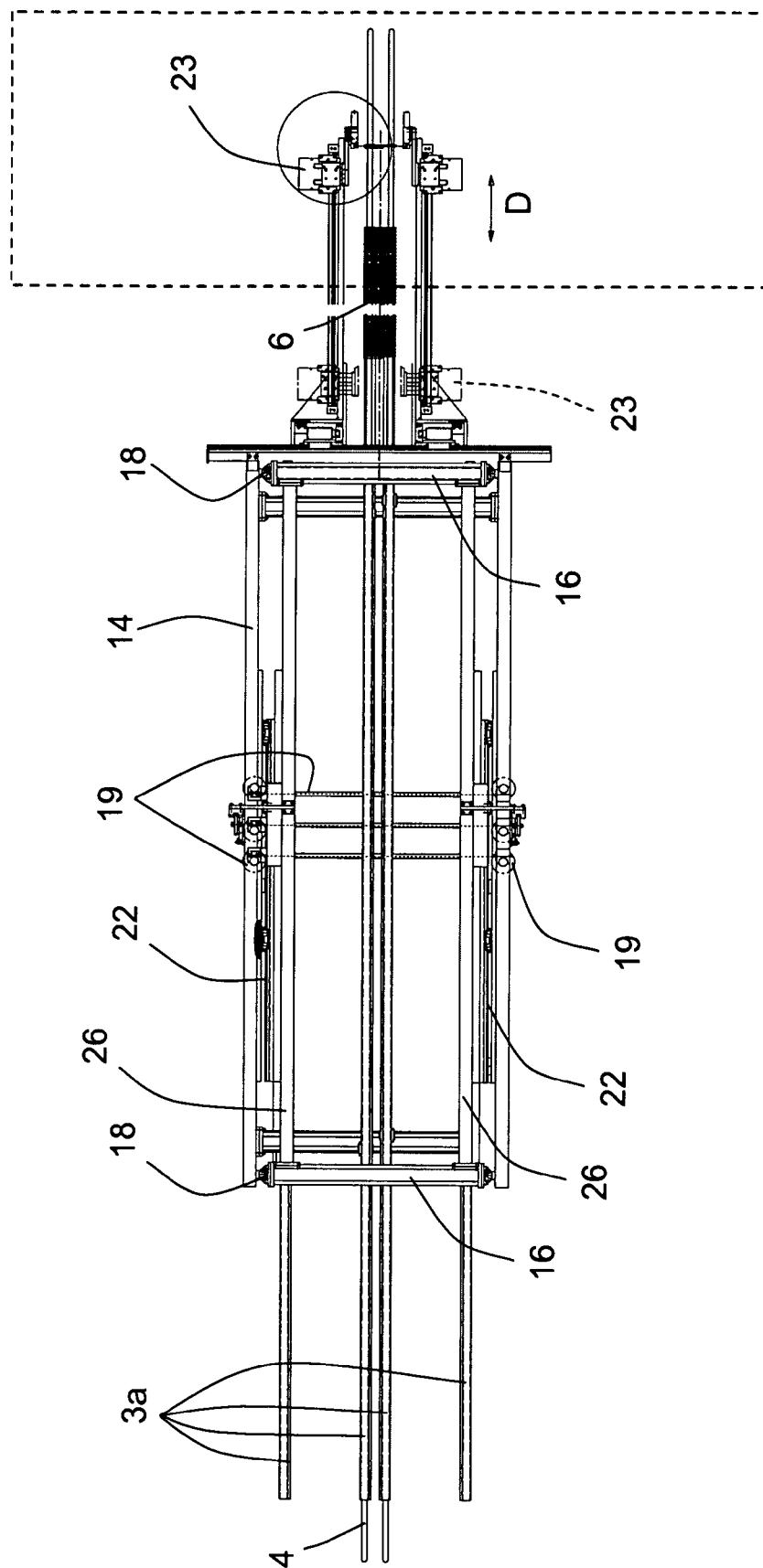
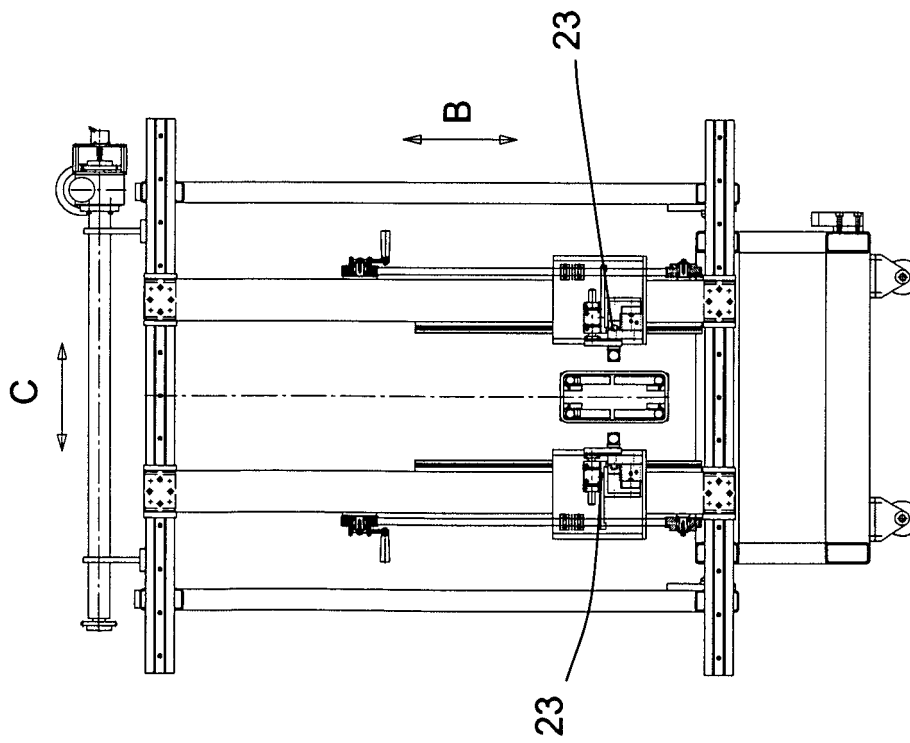
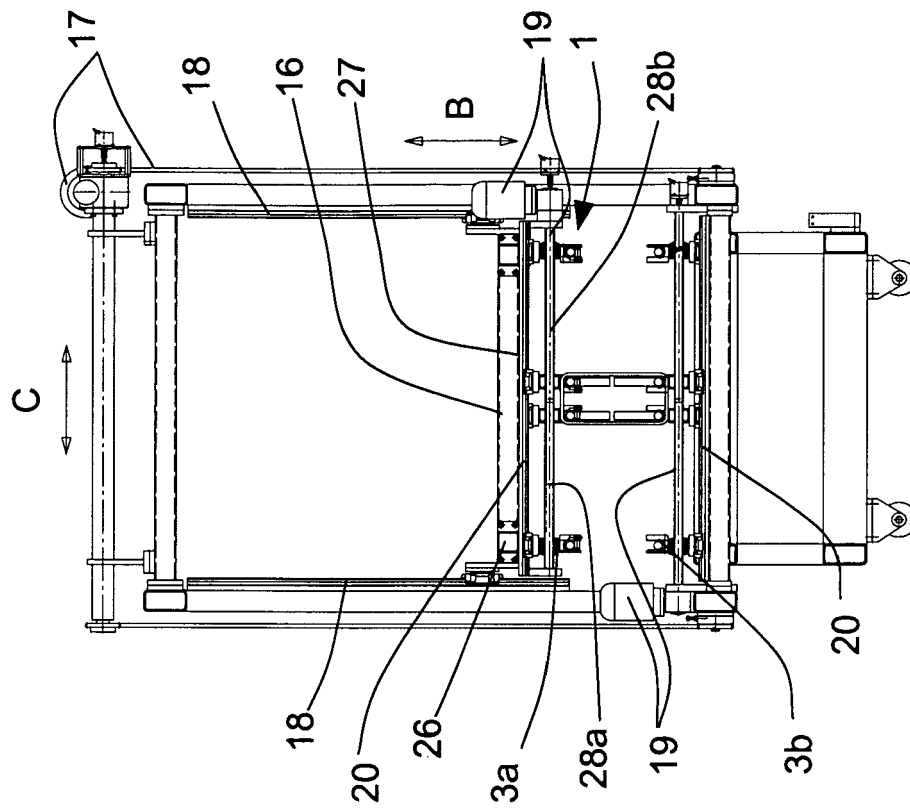
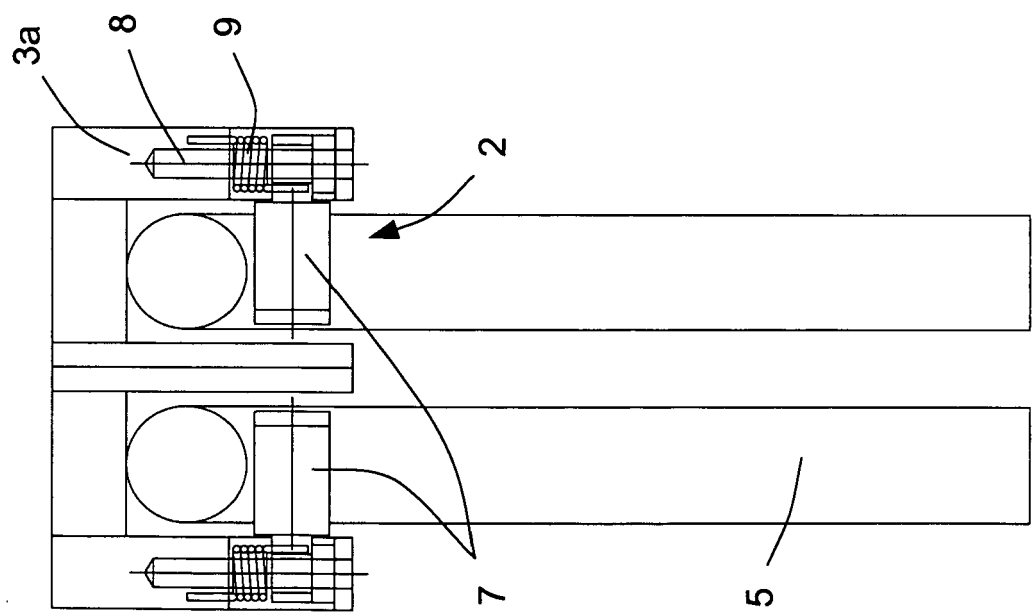
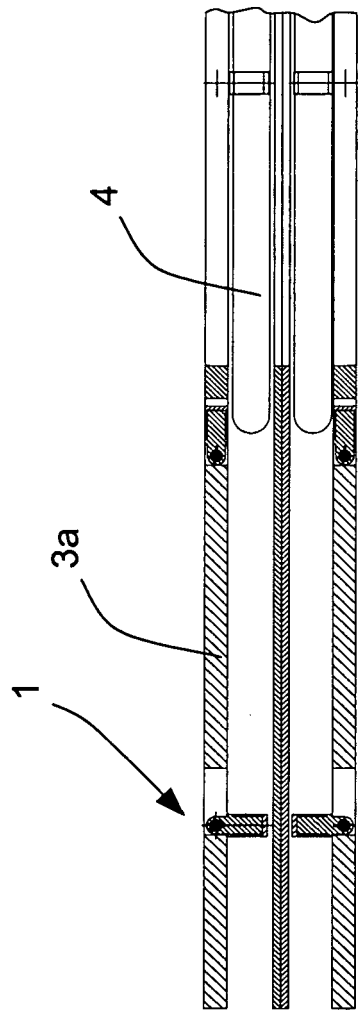
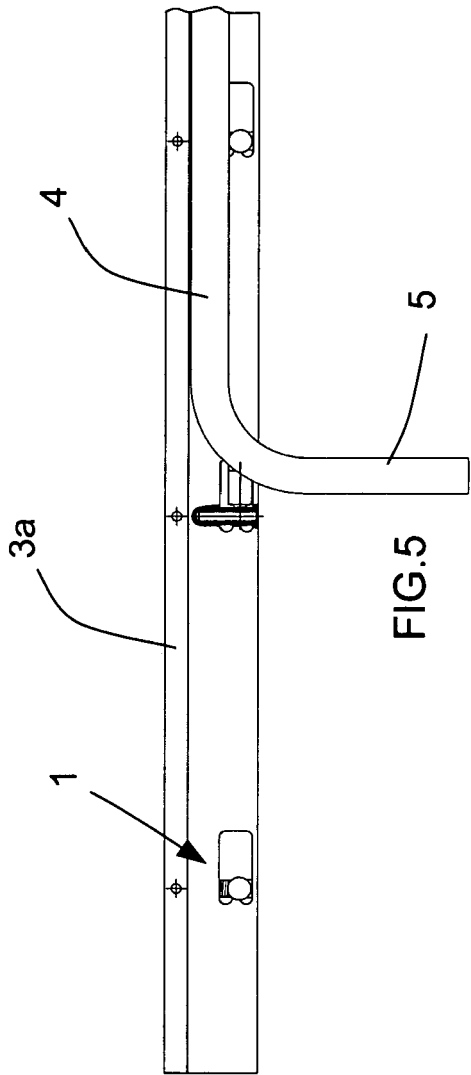
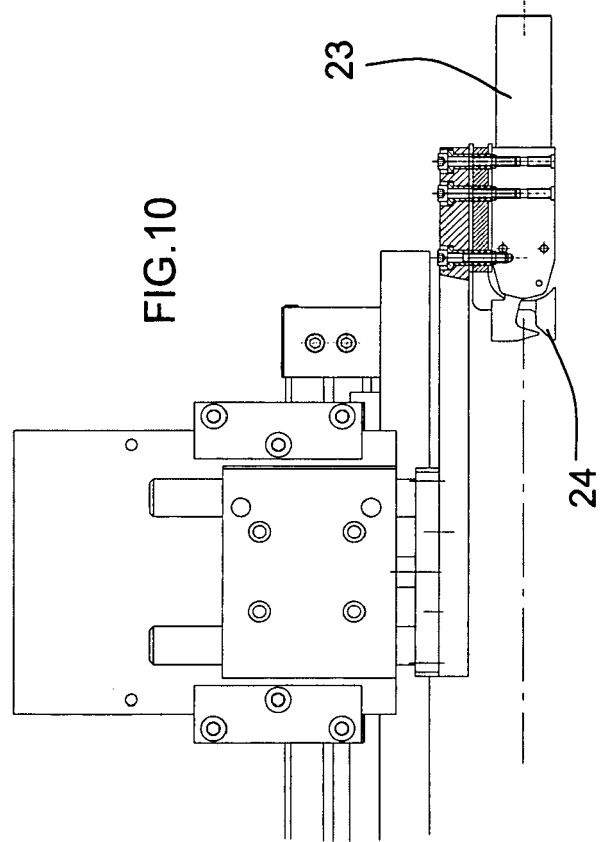
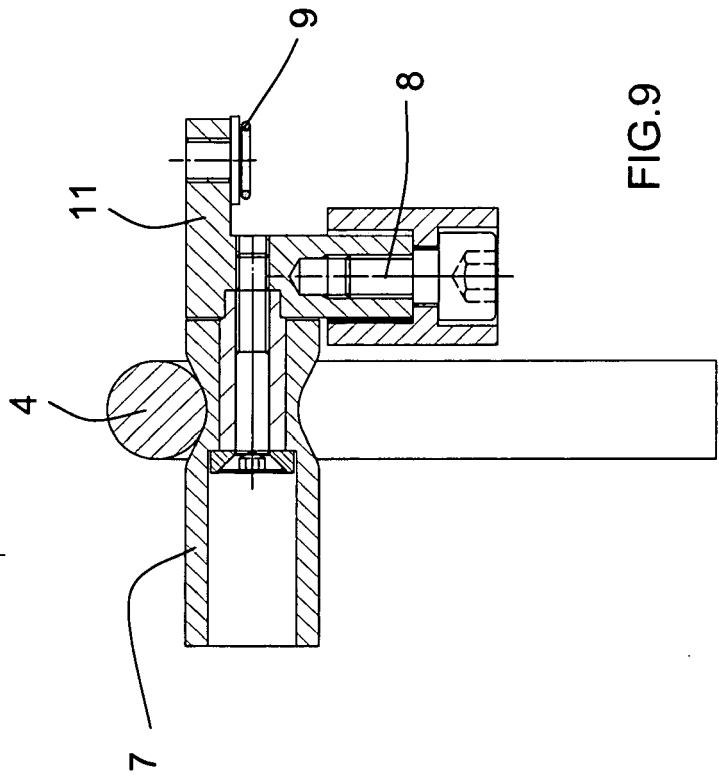
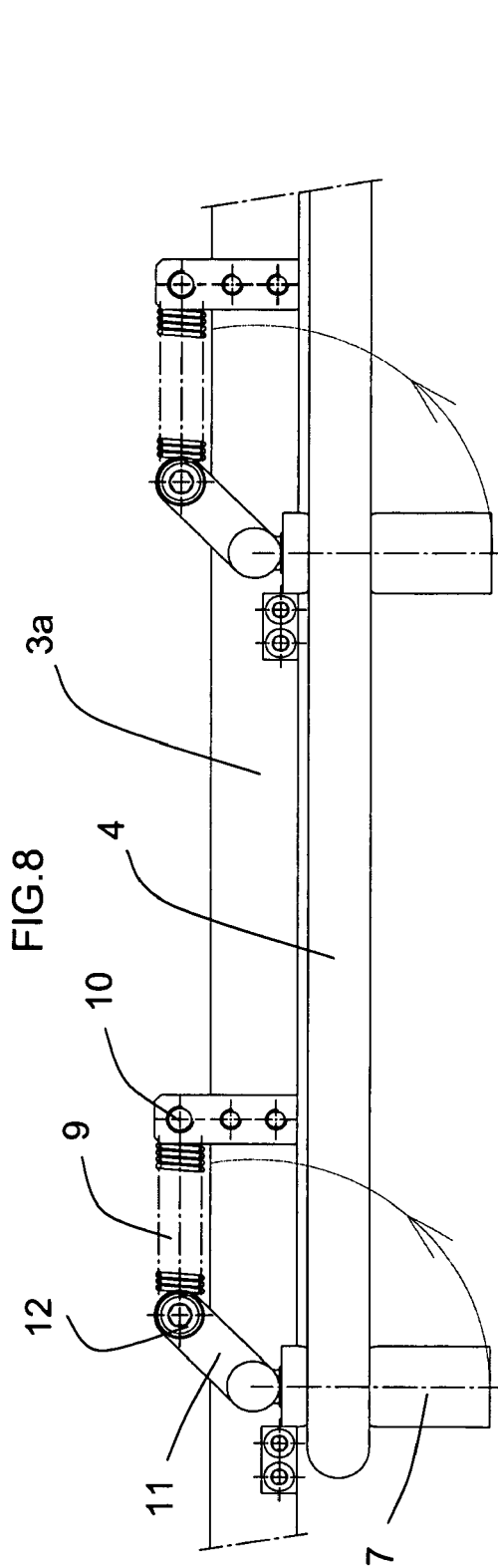


FIG. 2







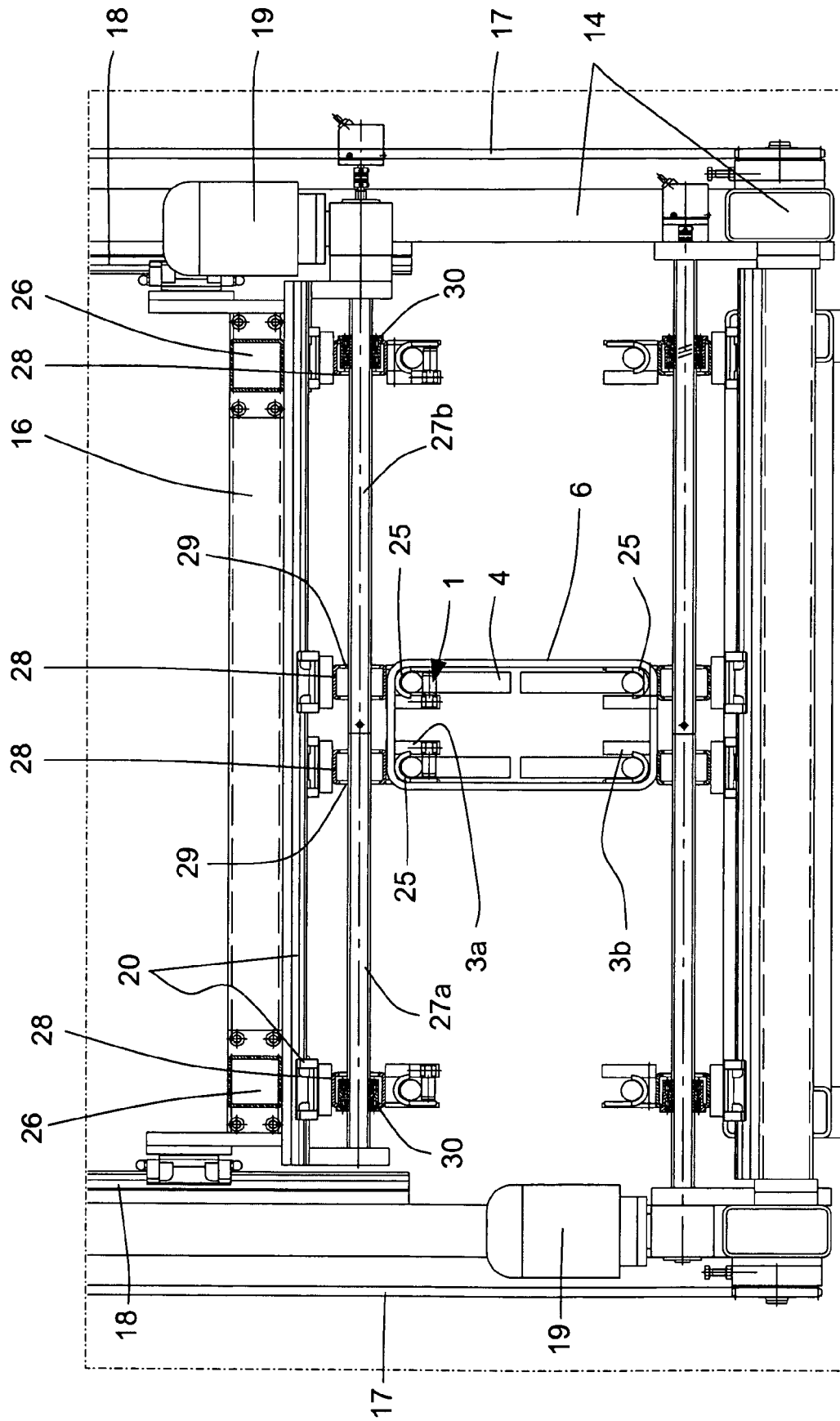


FIG.11



EUROPEAN SEARCH REPORT

Application Number
EP 09 38 0034

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	WO 87/05544 A (LAFON GUY [FR]; MANUARDI ROBERT [FR]) 24 September 1987 (1987-09-24) * page 11, lines 13-25; figures 5,12,13,23-25 *	1-4,6-11	INV. B21F23/00 B21F27/12 ADD. B21F27/14
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			TECHNICAL FIELDS SEARCHED (IPC)
			B21F
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 24 June 2009	Examiner Augé, Marc
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24-06-2009

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