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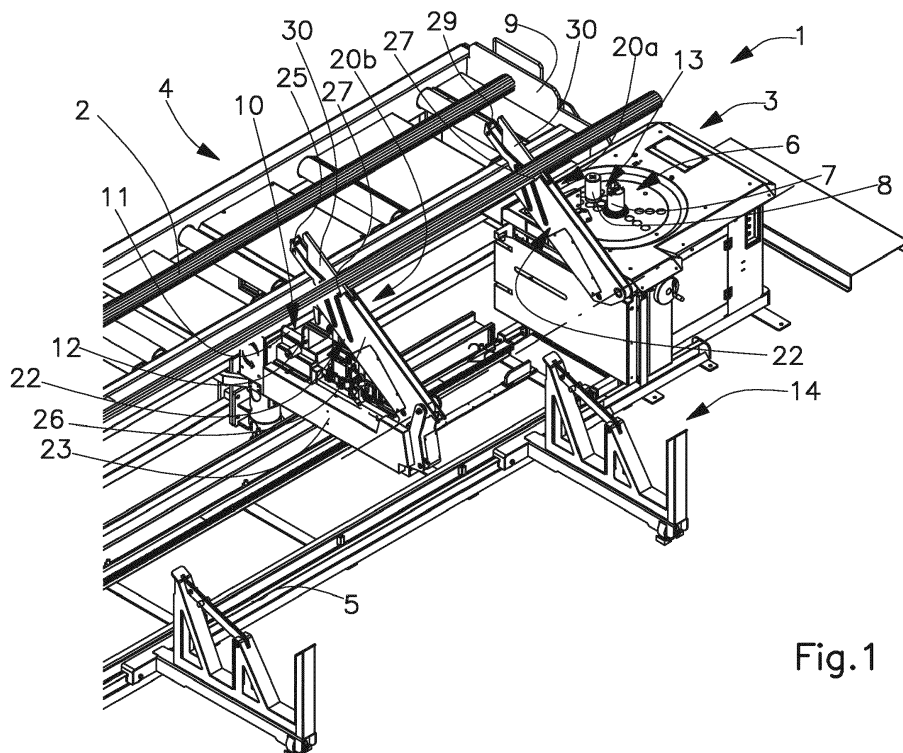
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(54) DEVICE FOR LOADING AND UNLOADING BARS

(57) The apparatus for loading and unloading bars works in combination with an apparatus for bending said bars (2) comprising at least one bend unit (3); a feed unit (4) of said bars (2) arranged laterally to said bend unit (3) and a stock (14) for collecting the bent bars. The device comprises a ramp (21) for feeding said bars (2) to the bend unit (3) and a tilting arm (22) mobile between a lowered position, underlying said bend unit (3), and a raised inclined position for unloading said bars (2). The

tilting arm (22) comprises a load portion (25) separated from an unload portion (26) by means of a shoulder (27). An auxiliary unloading arm (30) is associated with the tilting arm (22) and is mobile between a disengagement position and an operative position in which the upper surface of said auxiliary unloading arm (30) is substantially aligned with the upper surface of said unload portion (26) of the tilting arm (22).

**Fig.1****EP 3 031 543 A1**

Description

Technical Field

[0001] The present invention concerns a loading and unloading device for use in apparatuses for bending bar-shaped metal profiles, in particular iron rods for reinforced concrete.

Background Art

[0002] In the field of the manufacturing of bar-shaped profiles, such as for example rods for longitudinal reinforcements for reinforced concrete products, it is known the use of apparatuses which subject the rods to a suitable series of bending steps. More in particular, bending apparatuses are currently known which allow to manufacture a large amount of different products such as profiles, closed or open stirrups, polygonal bent shapes and the like.

[0003] Such apparatuses usually comprise at least one bend unit, carrying a bending head having suitable bending tools, in particular a central mandrel, an eccentric bending pin and an abutment which prevents the rod being worked to move.

[0004] The bars to be bent are fed to the bending apparatus by a cutting machine which performs the cutting of the same bars at a pre-established measure. Generally the cut bars to be bent are transported on a roller conveyor placed close to the bending station or however carried, by different means, close to said bending station; the bars, cut to measure, are then fed by hand or automatically to a manufacturing zone.

[0005] A specific problem that arises in the considered field is the need of loading the bars to be bent between tools of the bending head and subsequently to unload the bent bars inside a suitable compartment of a collecting stock, generally placed at the side of the bend unit.

[0006] Moreover, there exist often the need of collecting, along with the bent bars, a predetermined number of straight bars for the same supply, for example for creating a floor or a crossbar. In this case, the cut bars are not sent to the bending apparatus but picked up from the production line and brought to a different zone of the plant. This generally means logistic problems and a limit to the productiveness of the plant, because of the obvious need of manpower. As a matter of facts, the straight bars and the bent bars for the same element must be grouped before the shipping. Generally, this operation is complex and expensive, as it requires the availability of a suitable zone in which different operators must classify the different groups of bars, all relatively similar, for example by reading the previously applied tags for grouping the straight bars and the bent bars belonging to the same element; the operators must then use suitable raising means, involving also considerable risks from the safety point of view.

Disclosure

[0007] The task of the present invention is to solve the cited problems, by providing a device which allows to perform, in an optimal way, the loading and the unloading of bar-shaped profiles, such as iron rods for reinforced concrete, in particular allowing to work both on straight and bent bars.

[0008] Within such task, it is a further scope of the present invention to provide a device which allows to easily group the straight bars and the bent bars belonging to a single supply.

[0009] A further scope of the invention is to provide a device which allows to increase the productiveness of the plant.

[0010] A further scope of the invention is to provide a loading and unloading device of the bars of simple assembly, of versatile and reliable use, as well as relatively economic cost.

[0011] The cited scopes are reached, according to the present invention, by the loading and unloading device for bar-shaped profiles, in particular iron rods for reinforced concrete, according to claim 1, as well as by the method for feeding the bars according to claim 7.

[0012] According to the invention, the device for loading and unloading bars combined with an apparatus for bending said bars comprises at least one auxiliary unloading arm mobile on a vertical plane between a lowered disengagement position, arranged below a zone of insertion of the bars between the folding tools of said apparatus for folding bars, and a raised operative position in which the upper surface of said auxiliary unloading arm is inclined so as to define a sliding plane for said bars to a collecting stock, bypassing the bending step.

[0013] This allows to pick up one or more straight bars, preventing them to reach the bending apparatus, and transferring them directly to the collecting stock, for being advantageously grouped with the bent bars belonging to the same element.

[0014] Preferably, said auxiliary unloading arm is associated with a tilting arm pivoted laterally to a bend unit of said apparatus and mobile between a lowered position, underlying said bend unit, and a raised inclined position for unloading said bars, said tilting arm comprising a load portion separated from an unload portion by means of a shoulder.

[0015] Preferably, said auxiliary unloading arm is mobile with respect to said tilting arm between a disengagement position and an operative position in which the upper surface of said auxiliary unloading arm is substantially aligned with the upper surface of said unload portion of the tilting arm so as to define said sliding plane of the bars into said collecting stock.

[0016] The feeding method for the bars according to the invention provides to operate at least one auxiliary unloading arm between a lowered disengagement position, arranged below an insertion zone of the bars between the bending tools of said apparatus for bending

bars, and a raised operative position in which the upper surface of said auxiliary unloading arm is inclined so as to define a sliding plane of said bars into a collecting zone, bypassing the bending step.

Description of Drawings

[0017] Details of the invention shall be more apparent from the detailed description of a preferred embodiment of the device for loading and unloading bar-shaped profiles according to the invention, in particular iron rods for reinforced concrete illustrated for indicative purposes in the attached drawings, wherein:

figure 1 shows a perspective view of an apparatus for bending bar-shaped profiles provided with the device for loading and unloading said bar-shaped profiles according to the invention;

figures 2 to 8 show a lateral view of the apparatus shown in figure 1 in subsequent working steps of said loading and unloading device.

Best Mode

[0018] With reference to such figures, the apparatus for bending bar-shaped metal profiles 2, for example rods obtained by cutting from bars or rolls, has been indicated as a whole with 1. In the following, for the sake of simplicity, such metal profiles will be indicated with the term "bars".

[0019] The apparatus 1 is provided with at least one bend unit 3 served by a feed line or by a feed bench 4 of the bars 2 cut to measure, preferably constituted by a suitably motorized roller conveyor. The bend unit 3 is fixed or mounted on rails 5 arranged side by side to the roller conveyor 4, as it is shown in the drawings, so as to be displaced as necessary in a different position with respect to the same roller conveyor. The bend unit 3 is constituted, in substantially known manner, by a bending head 6 comprising suitable bending tools, for example a central mandrel or a template and a bending pin, mounted in rotatable manner about the axis of the central mandrel, to perform the bending of a portion of the bar 2 interposed between the central mandrel and the eccentric pin 8. In substance, the bending of the bar 2 is performed by virtue of the angular rotation of the eccentric pin about the axis of the central mandrel.

[0020] The roller conveyor 4 defines a roller plane on which the bars 2 are arranged with axis orthogonal to the axis of the same rolls. More precisely, the bars 2 are longitudinally translated in direction of a stop position delimited for example by a fixed abutment 9, substantially at the bending station.

[0021] At one side of the roller conveyor 4, at its end part, a channel 10 is shaped for picking up the bars 2 to be simultaneously fed to the bending head 6; the channel 10 for pick up of the bars is substantially parallel and coplanar to the roller conveyor 4. Such pick up channel

10 of the bars is made up for example of a plurality of idle rolls 11, embossed at a side of the roller conveyor 4 through supports 12 that shape as well the external bank of the pick up channel 10. The pick up channel 10 is substantially arranged in intermediate position between the roller conveyor 4 and the bend unit 3 of the apparatus; more precisely, the pick up channel 10 is interposed between the roller conveyor 4 and the zone 13 of insertion of the bars between the bending tools of the bend unit 3.

[0022] A device 20 is associated with the bending apparatus 1 and is predisposed to perform the loading of the bars 2 to be bent inside the above mentioned zone 13 of insertion between the bending tools of the bend unit 3 and the unloading of the bent bars in a suitable compartment of an exit stock 14. The device 20 comprises at least one load and unload unit comprising a ramp 21 preferably fixed, for loading the bars 2 to be bent in the zone 13 of insertion between the bending tools of the bend unit 3 and an arm 22 tilting on a vertical plane transverse to the roller conveyor 4 for unloading the bent bars 2.

[0023] In the illustrated case, the device 20 comprises a first load and unload unit 20a associated with the framework of the bend unit 3, upstream of the bending head 6 according to the feed direction of the bars 2, and a second load and unload unit 20b carried by a crossbar 23 fixed in embossed manner, in a suitably adjustable position, to the framework of the roller conveyor 4. The cited load and unload units 20a, 20b are shaped in similar manner and are predisposed to be operated in synchronous manner, as it is specified in the following. Obviously, according to the exigencies, it is possible to provide that the device 20 has a different number of load and unload units.

[0024] The ramp 21, preferably fixed, substantially shapes an upper inclined surface 24, preferably flat, predisposed to allow the rolling of the bars 2 by virtue of the force of gravity from an upper position into a lower position, at which the same bars 2 are introduced in the zone 13 of insertion between the bending tools of the bend unit 3, that is are engaged in the central passage portion corresponding to the zone comprised between the central mandrel and the eccentric bending pin of the bending head.

[0025] The tilting arm 22 comprises a load portion 25 that extends beyond unload portion 26. More precisely, the load portion 25 is separated from the load portion 26 by means of a shoulder 27 predisposed to prevent the rolling towards the unload portion 26 of the bars 2 in support on the load portion 25.

[0026] The tilting arm 22 is pivoted to the fixed structure at an axis 28. A motor member or an actuator of known type, not shown in the drawings, operates the alternated operation in rotation of the tilting arm 22 from a lower position substantially horizontal to a raised inclined position. At the lower position, the load portion 25 is in a zone below the pick up channel 10. Further to the rotation of the tilting arm 22 about the axis 28, the load portion 25 is predisposed to raise itself with respect to the plane

of the channel 10 of pick up until the cited raised portion, raising the bars 2 above the slide 21 preferably fixed. By continuing the raising of the arm 22, the bars reach by gravity the shoulder 27. In such

[0027] raised intermediate configuration, the above mentioned load position 25 is predisposed to arrange in a way substantially parallel to the inclined surface 24 of the ramp 21 preferably fixed. During the raising of the tilting arm 22, the bars 2 which have been bent in the preceding working cycle are unloaded and, as it was previously said, the bars 2 which shall be bent in the subsequent working cycle are raised, by the same movement. The subsequent lowering of the tilting arm 22 is predisposed to bring the bars 2 in contact with the inclined surface 24 of the ramp 21 preferably fixed, on which the bars 2 slide until falling in the zone 13 of insertion between the bending tools.

[0028] An auxiliary unloading arm 30 is associated with the tilting arm 22 in mobile manner between a disengagement position and an operative position in which it is possible to perform the direct unloading of the bars into the collecting stock 14, thus bypassing the bending step.

[0029] In the illustrated case, the tilting arm 22 has box-like shape, for example by means of a double plate or a U-profile, and has an upper opening 29 at the load portion 25. The auxiliary unloading arm 30 is housed inside the tilting arm 22 and is mobile, upon command of suitable actuating means, between a disengagement position retracted inside the same tilting arm 22 and an extracted working position in which the auxiliary unloading arm 30 is protruding through the above mentioned upper opening 29 so as to fill the shoulder 27 of the tilting arm 22. In substance, in the extracted working position, the upper surface of the auxiliary unloading arm 30 is aligned with the upper surface of the unload portion 26 of the tilting arm 22 so as to define a single sliding plane of the bars 2 into the collecting stock 14, bypassing the bending step.

[0030] It is possible to provide that the auxiliary unloading arm 30 is differently shaped, while performing the same function. In particular, it is possible to provide that the auxiliary unloading arm 30 is carried in rotatable manner, upon command of suitable actuator means, on a vertical plane placed side by side with the rotation plane of the tilting arm 22. The auxiliary unloading arm 30 can be pivoted on the fixed structure which supports the tilting arm 22, in particular on the same pivot 28, or on the same tilting arm 22. In this case the cited actuating means operate the angular alternated rotation of the auxiliary unloading arm 30 between a disengagement lowered position and a raised operative position in which the upper surface of the auxiliary unloading arm 30 is aligned with the upper surface of the unload portion 26 of the tilting arm 22.

[0031] The functioning of the device for loading and unloading bars according to the invention is described in the following.

[0032] The bars 2 to be bent in each working cycle are selected by hand and transversely from the roller con-

veyor 4 to the pick up channel 10, at which the tilting arm 22 works. The tilting arm 22, by means of the load portion 25, brings the same bars 2 to the bending head 6 of the bend unit 3 (Fig. 2). During this step, the tilting arm 22 of the loading and unloading device 20 is arranged in the lowered position, with the load portion 25 underlying the height of the rolls of the pick up channel 10 on which are placed in stocking the bars 2 to be bent during the working cycle.

[0033] Then the angular rotation of the tilting arm 22 towards the upper inclined position is operated. The tilting arm 22 raises above the pick up channel 10 so as to reach upwards the bars 2 stocked therein and to pick them up (Fig. 3). By the effect of the inclination reached by the tilting arm 22, the raised bars 2 slide on the load portion 25 reaching in abutment the shoulder 27. In this raised intermediate configuration, the load portion 25 is spaced in substantially parallel manner from the preferably fixed slide 21.

[0034] Then the tilting arm 22 is operated in rotation in opposite direction, that is, towards its lowered position that is back towards the lowered position (Fig. 4). During this lowering movement, the bars 2, arranged on the load portion 25 against the shoulder 27, reach the preferably fixed slide 21 and arrive in support on it while the tilting arm 22 continues its downward stroke. The bars 2 in support on the inclined surface 24 of the preferably fixed slide 21 slide in the zone 13 of insertion between the bending tools, to start, in known manner, the bending cycle (Fig. 5).

[0035] Once the bending has occurred, the bent bars 2 are again taken over by the loading and unloading device 20. More precisely, the tilting arm 22 is again raised from the lowered inactive configuration to the raised configuration. Further to such raising the bent bars 2 are picked up at the zone 13 of insertion between the bending tools and taken over by the tilting arm 22 at the inclined unload portion 26. Once picked up, the bent bars 2 slide along an unload portion 26 for reaching a predetermined compartment of the collecting stock 14 (Fig. 6). The collecting stock 14 can be divided in more than one compartment, possibly selectable for different supplies.

[0036] It is to be observed that during the above mentioned rotation of the tilting arm 22 from the inactive lowered configuration to the raised configuration, in which the bent bars 2 slide into the collecting stock 14, the same tilting arm 22 provides to pick up from the pick up channel 10 a subsequent group of bars 2 stocked therein, to start the subsequent bending cycle.

[0037] Obviously, in case the loading and unloading device 20, as it is illustrated, is provided with a plurality of loading and unloading units 20a, 20b, suitably spaced, the described functioning is carried out in synchronism by both the above mentioned units.

[0038] To direct one or more bars 2, predisposed in the pick up channel 10, into the predetermined compartment of the collecting stock 14, bypassing the bending step, the auxiliary unloading arm 30 is operated. In par-

particular, the auxiliary unloading arm 30 is displaced from the disengagement position to the operative position in which the upper surface of the same auxiliary unloading arm 30 is aligned with the upper surface of the unload portion 26 of the tilting arm 22 so as to define a single sliding plane of the bars 2 into the collecting stock 14, as it can be seen in Fig. 7 in which it is shown the unloading of a bundle of bars. Therefore, the rotation of the tilting arm 22 in the inclined raised position makes the bars 2, picked up from the pick up channel 10, directly slide into the collecting stock 14 (Fig. 8).

[0039] The device according to the invention reaches therefore the scope of allowing to perform in an optimal manner the loading and the unloading of bar-shaped profiles, in particular iron rods for reinforced concrete, in an apparatus for bending such bars.

[0040] In particular, the device according to the invention allows the straight bars to directly slide into the collecting stock, bypassing the bending step. It is to be observed that these straight bars can be tied in bundles and tagged before the transferring into the collecting warehouse.

[0041] This allows to optimize the logistics of the working site supply. In practice, the device according to the invention allows to group into the collecting stock both the straight bars and the shaped bars destined to the same structural element; in this way the bars remain grouped and therefore easy to tie, for example by an iron wire, and to tag as they are unloaded into the collecting warehouse.

[0042] It is possible for example to collect the whole supply intended for the manufacturing of a same structural element, such as a beam or a floor, having already grouped and identified the working groups, that is the different bars, straight and shaped, which serve for a prefixed reinforcement, with the precise indication for their positioning.

[0043] In practice, the embodiment of the invention, the materials used, as well as the shape and dimensions, may vary depending on the requirements.

[0044] Should the technical characteristics mentioned in the claims be followed by reference signs, such reference signs were included for the sole purpose of increasing the understanding of the claims and thus they shall not be deemed limiting the scope of the element identified by such reference signs by way of example.

Claims

1. Device for loading and unloading bars combined with an apparatus for bending said bars comprising at least one bend unit (3); a feed unit (4) of said bars (2) arranged at one side of said bend unit (3) and predisposed to feed said bars (2) in a longitudinal direction; a stock (14) for collecting the bars, **characterized in that** said device comprises

- a ramp (21) for feeding said bars (2) to said bend unit (3);

- a tilting arm (22) pivoted laterally to said bend unit (3) and mobile between a lowered position, underlying said bend unit (3), and a raised position inclined for unloading said bars (2), said tilting arm (22) comprising a load portion (25) separated from an unload portion (26) by means of a shoulder (27);

- an auxiliary unloading arm (30) associated with said tilting arm (22) and mobile with respect to this latter between a disengagement position and an operative position in which an upper surface of said auxiliary unloading arm (30) is substantially aligned with the upper surface of said unload portion (26) of the tilting arm (22) so as to define a sliding plane of said bars (2) into said collecting stock (14), bypassing the step of bending.

2. Device according to claim 1, **characterized in that** said tilting arm (22) is predisposed to intercept by means of said load portion (25) one or more bars (2) to be bent prearranged in a pickup channel (10) of said feed unit (4) and to bring said one or more bars (2) to be bent in a raised inclined position over said ramp (21) in which said one or more bars (2) to be bent slide in abutment against said shoulder (27).

3. Device according to claim 1 or 2, **characterized in that** said auxiliary unloading arm (30) is mobile between a said disengagement position, retracted substantially at said unload portion (26) of the tilting arm (22), and a said operative position extracted with respect to said load portion (25) of the tilting arm (22) to fill said shoulder (27).

4. Device according to claim 3, **characterized in that** said tilting arm (22) is box-like-shaped and said auxiliary unloading arm (30) is housed in sliding manner inside the same tilting arm (22) so as to be protruding, in said operative extracted position, through an upper opening (29) obtained at said load portion (25).

5. Device according to one of the preceding claims, **characterized in that** said ramp (21) is arranged on a vertical plane transversal to said feed unit (4) for transferring said bars (2) to be bent to a zone (13) of insertion of the bars (2) between the bending tools of said bend unit (3).

6. Device according to one of the preceding claims, **characterized in that** it comprises at least one first loading/unloading unit (20a) arranged close to said bend unit (3) and a second loading/unloading unit (20b) embossed with respect to said feed unit (4), in a position spaced from said first loading/unloading unit (20a), said loading/unloading units (20a, 20b)

being respectively provided with a said ramp (21), a said tilting arm (22) and a said auxiliary unloading arm (30) and being predisposed to be operated in a synchronous manner.

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7. Method for feeding bars in an apparatus for bending said bars comprising at least one bend unit (3); a feed unit (4) of said bars (2) arranged at the side of said bend unit (3) and predisposed to feed said bars (2) in a longitudinal direction; a stock (14) for collecting the bars, **characterized in that** it provides the steps of

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- operating at least one auxiliary unloading arm (30) between a lowered disengagement position, arranged beneath a zone (13) for the insertion of the bars (2) between bending tools of said apparatus for bending bars, and a raised operating position in which the upper surface of said auxiliary unloading arm (30) is inclined so as to define a sliding plane for said bars (2) towards a collecting stock (14), bypassing the step of bending.

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8. Method according to claim 7, **characterized in that** it provides the steps of

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- feeding said bars (2) to a pickup channel (10) of said feed unit (4);
 - operating the angular rotation of a tilting arm (22), pivoted laterally to said bend unit (3), from a lowered position underlying said pick up channel (10) to a raised inclined position, for picking up said bars (2) from said channel (10) and unload the same bars (2) in said zone (13) of insertion of the bars (2) between the bending tools, to perform said bending step;
 - alternatively operating said auxiliary unloading arm (30) to pick up and unload said bars (2) into said collecting stock (14), bypassing the bending step.

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9. Method according to claim 8, **characterized in that** it provides the further step of

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- operating the angular rotation of said tilting arm (22) from said raised position to said lowered position, to transfer said bars (2) picked up from said channel (10) to a ramp (21) predisposed to feed the same bars (2) to said zone (13) of insertion of the bars (2) between the bending tools.

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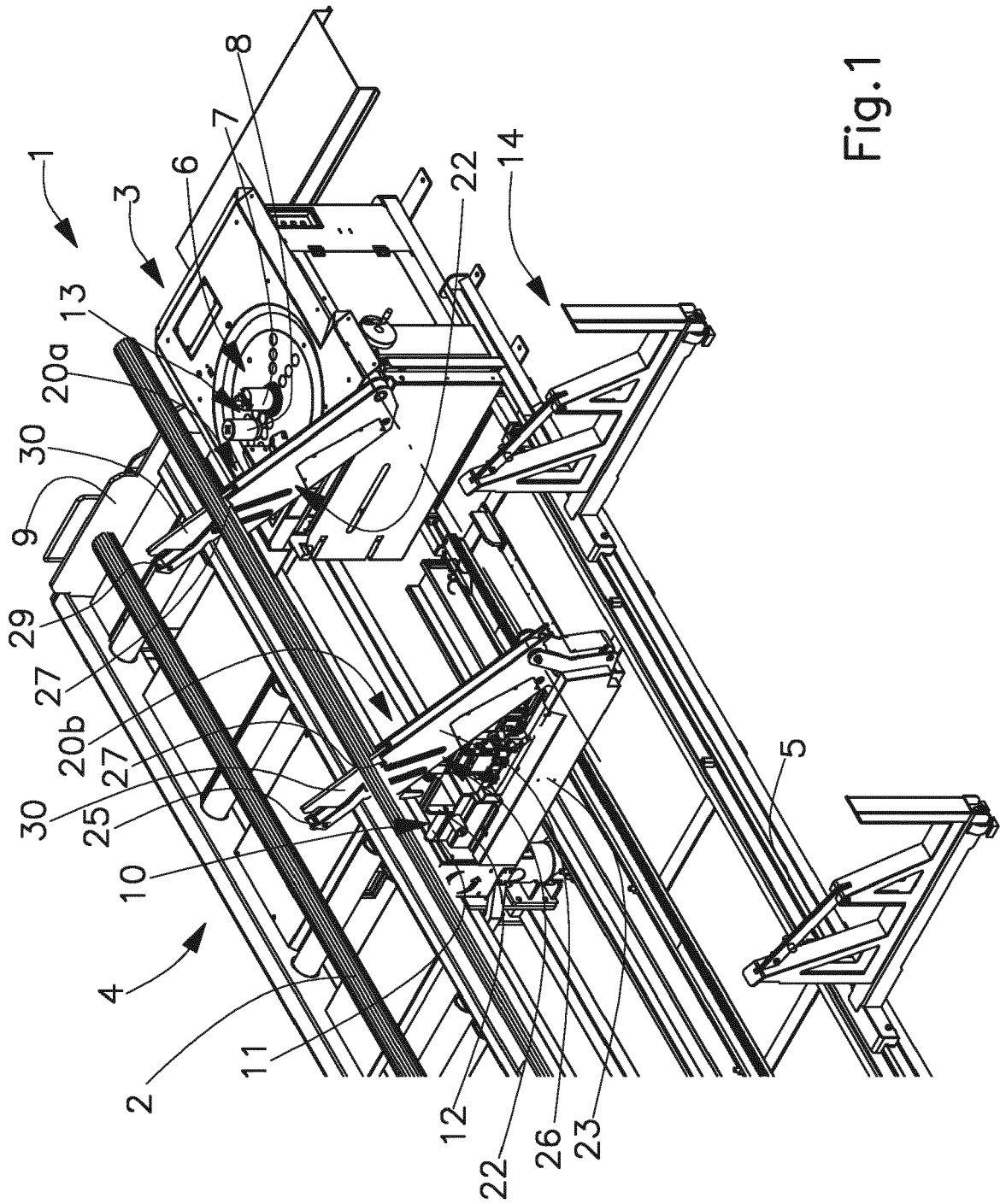


Fig.1

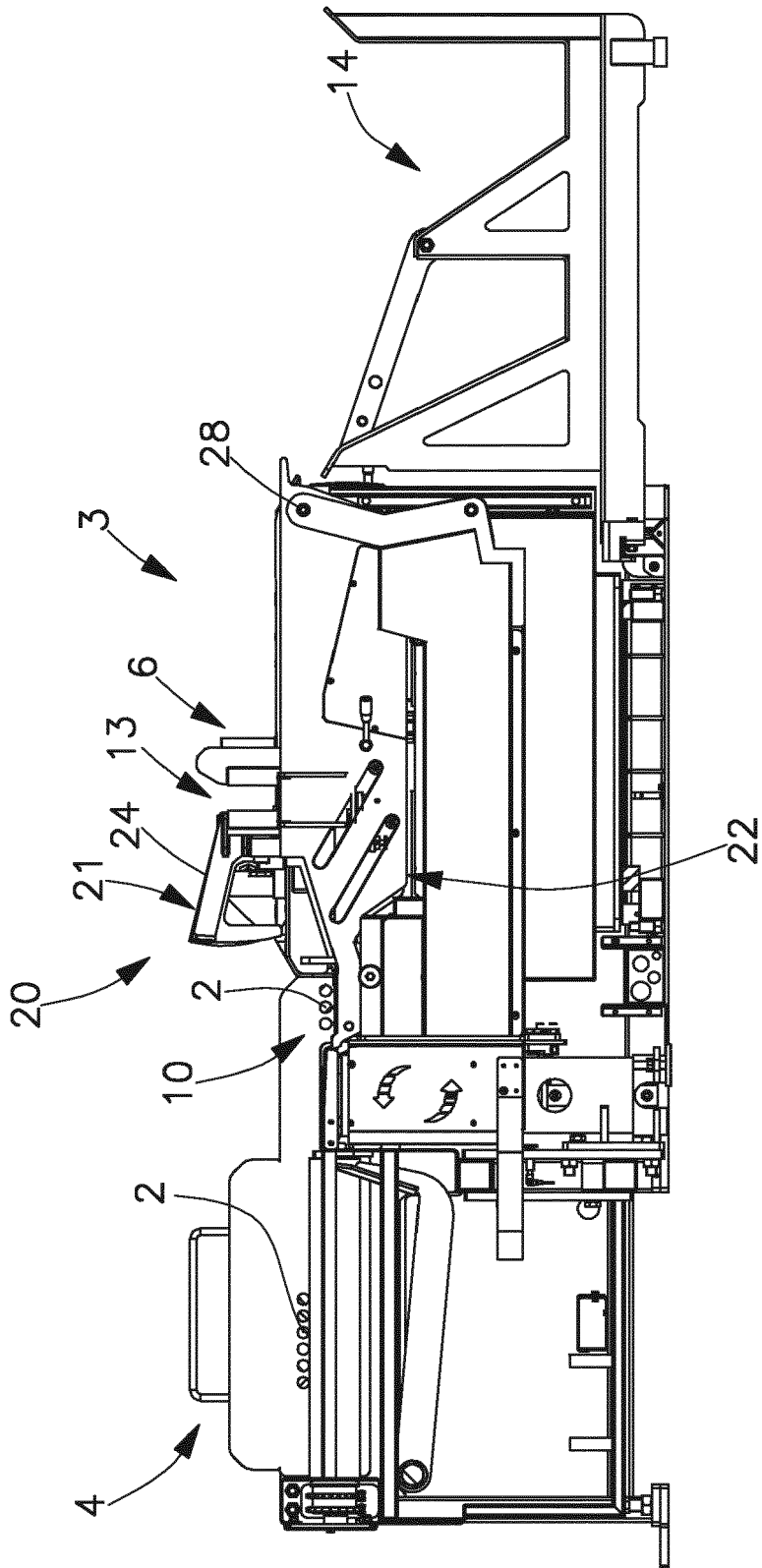


Fig.2

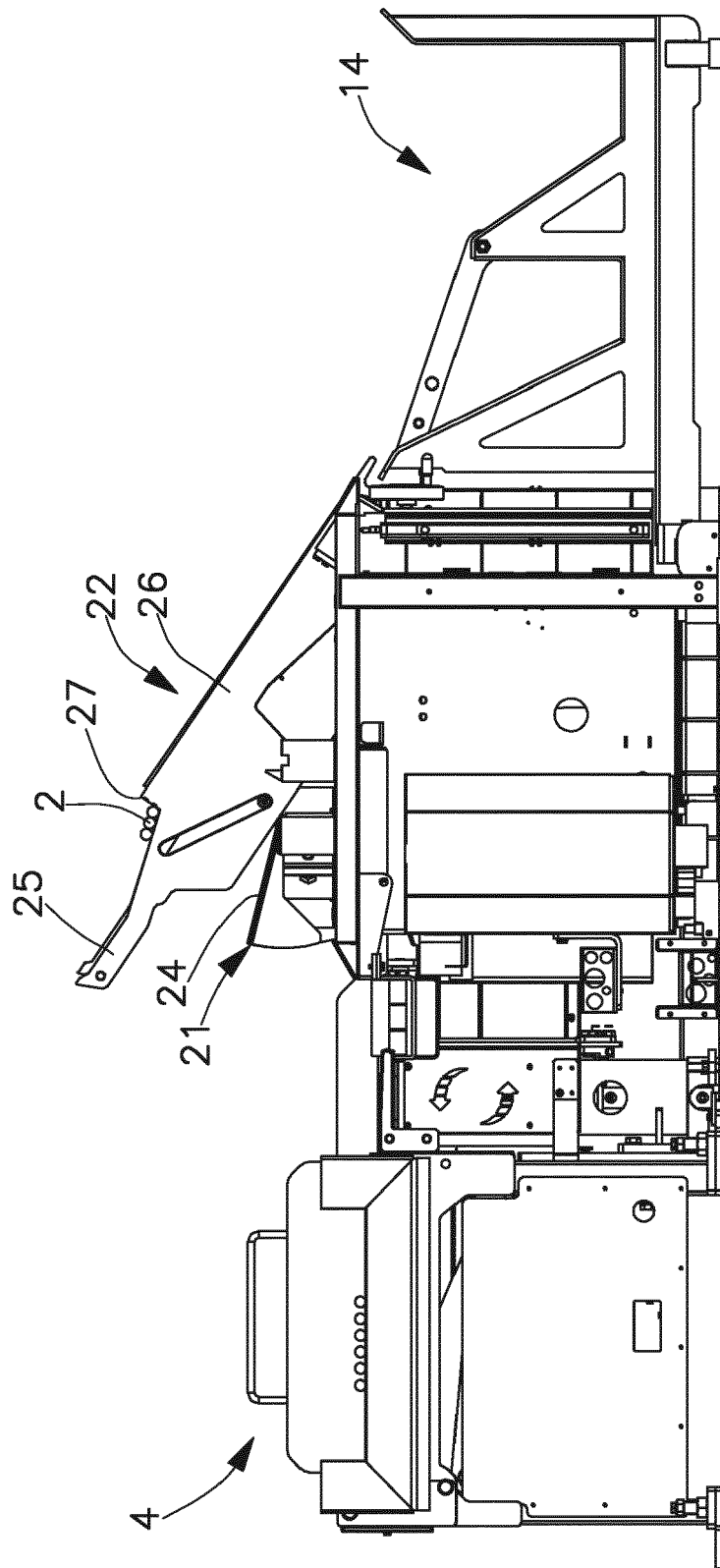


Fig.3

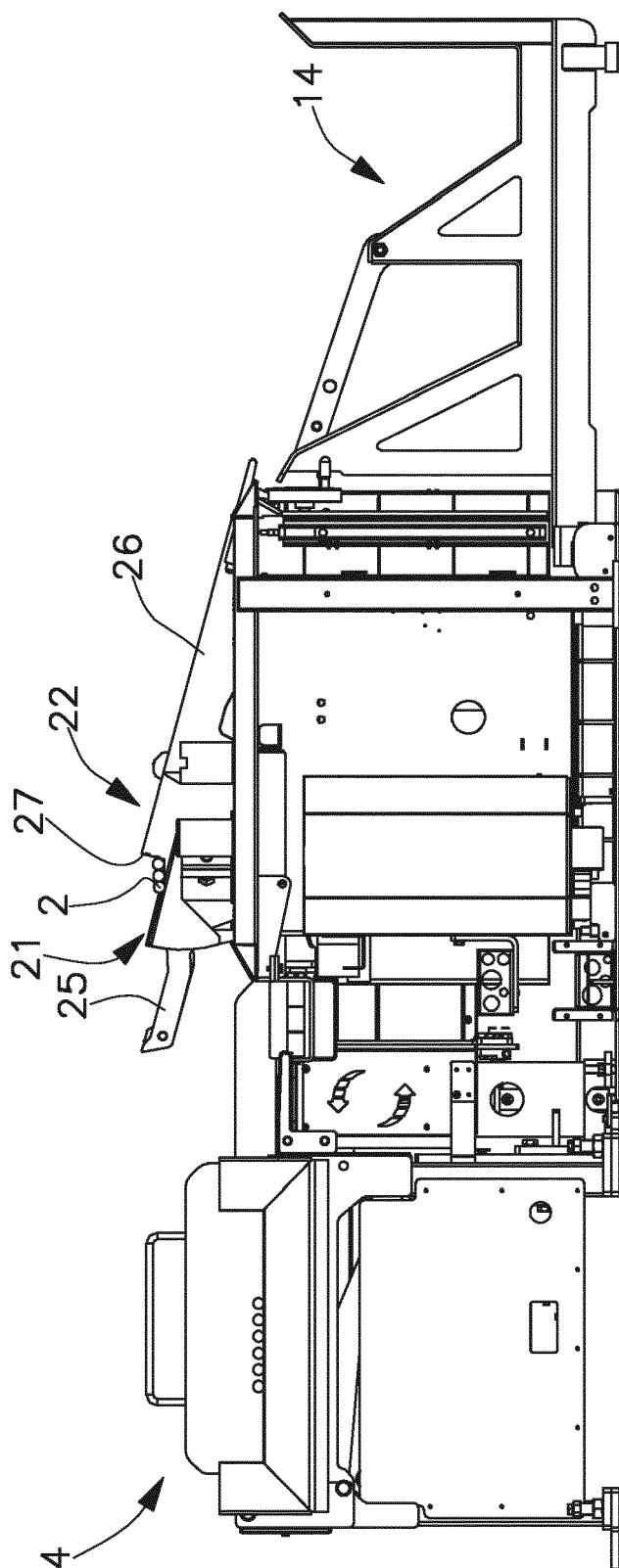


Fig. 4

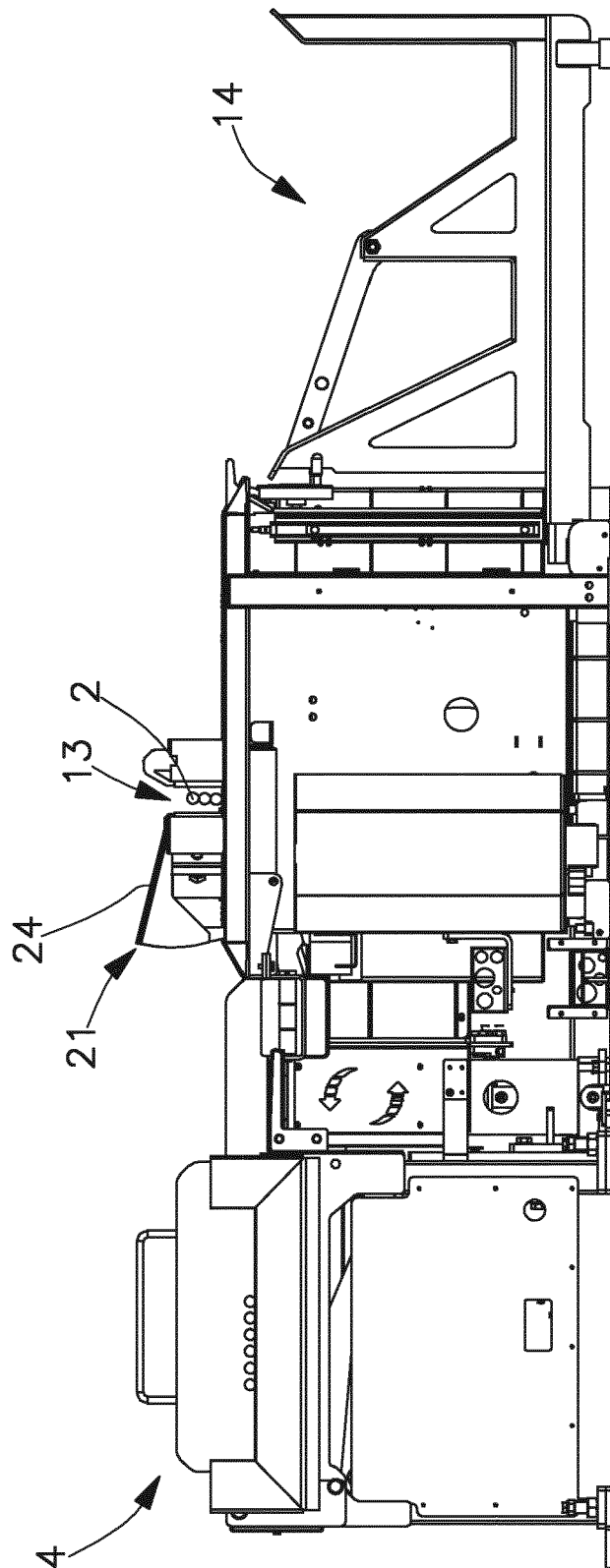


Fig.5

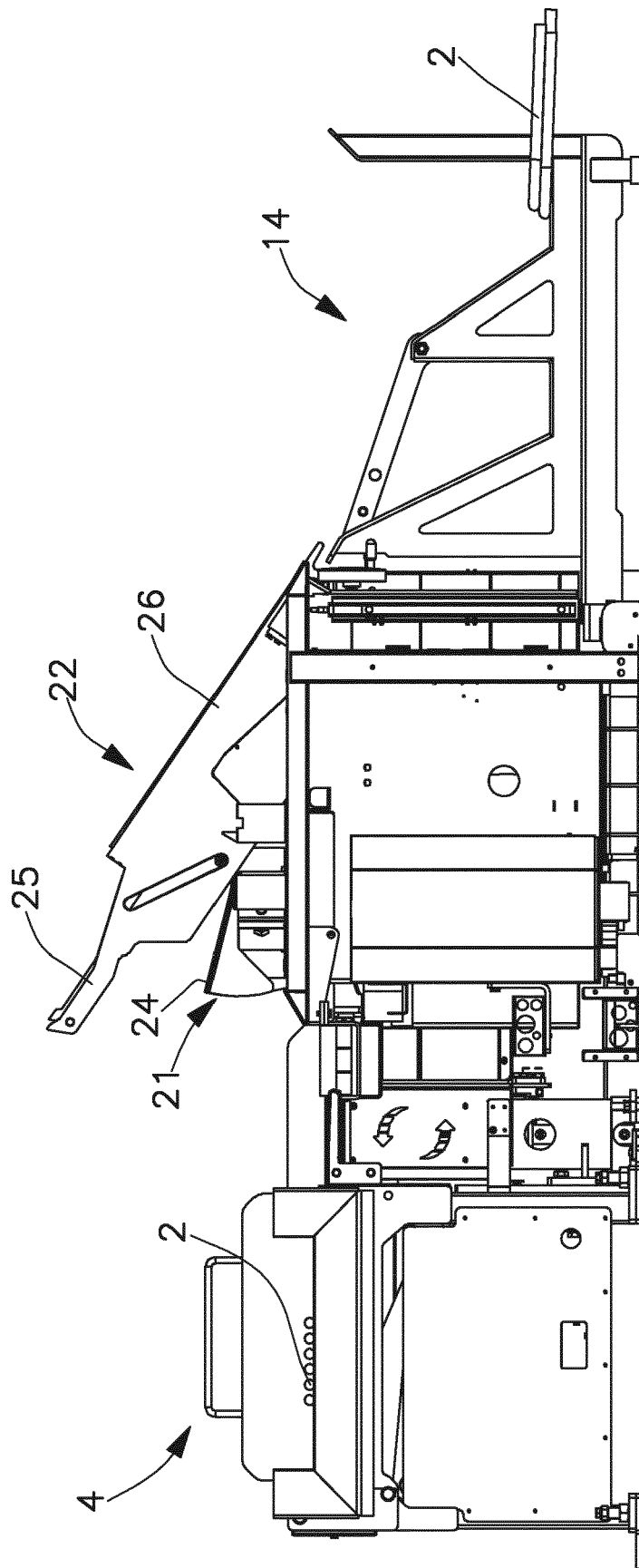


Fig. 6

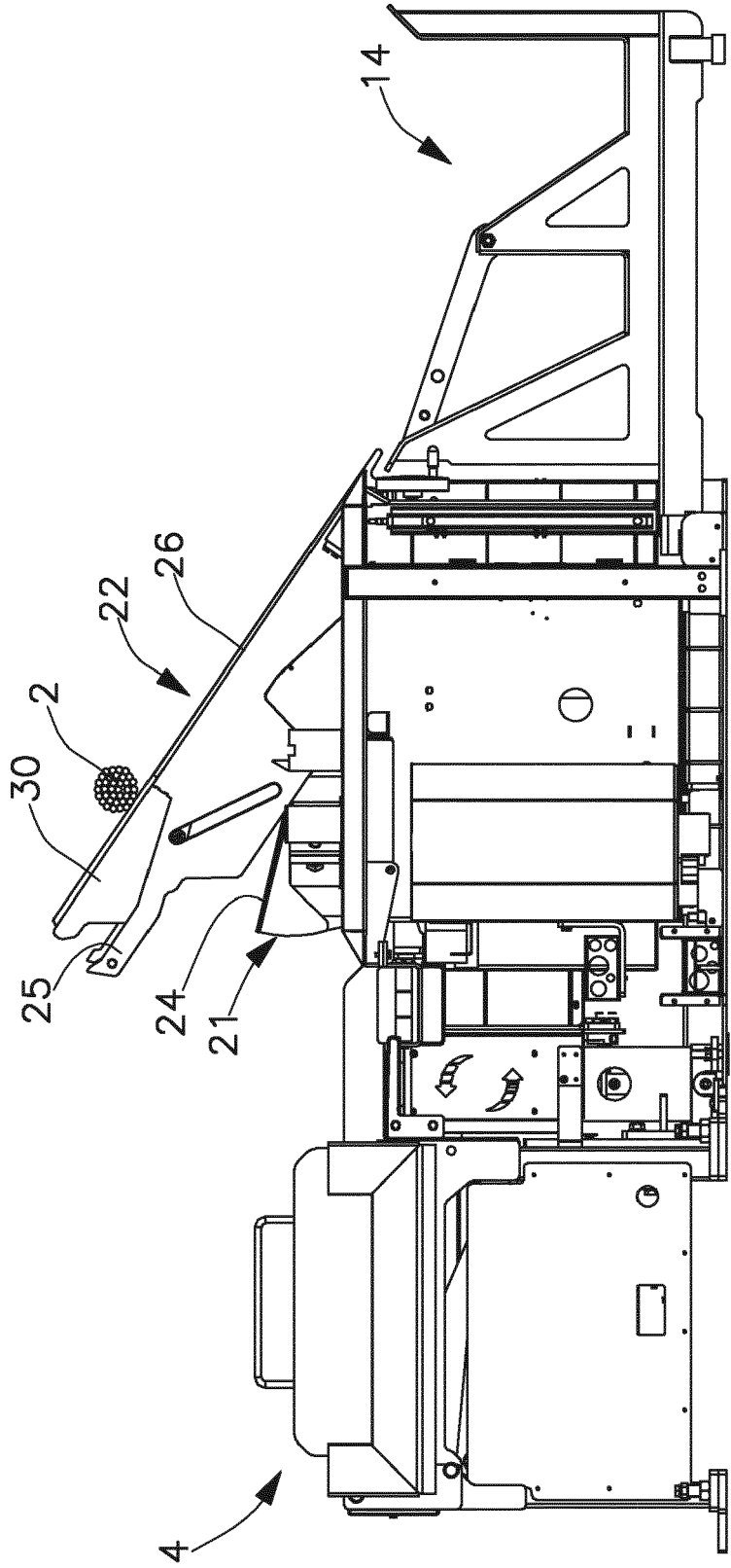


Fig. 7

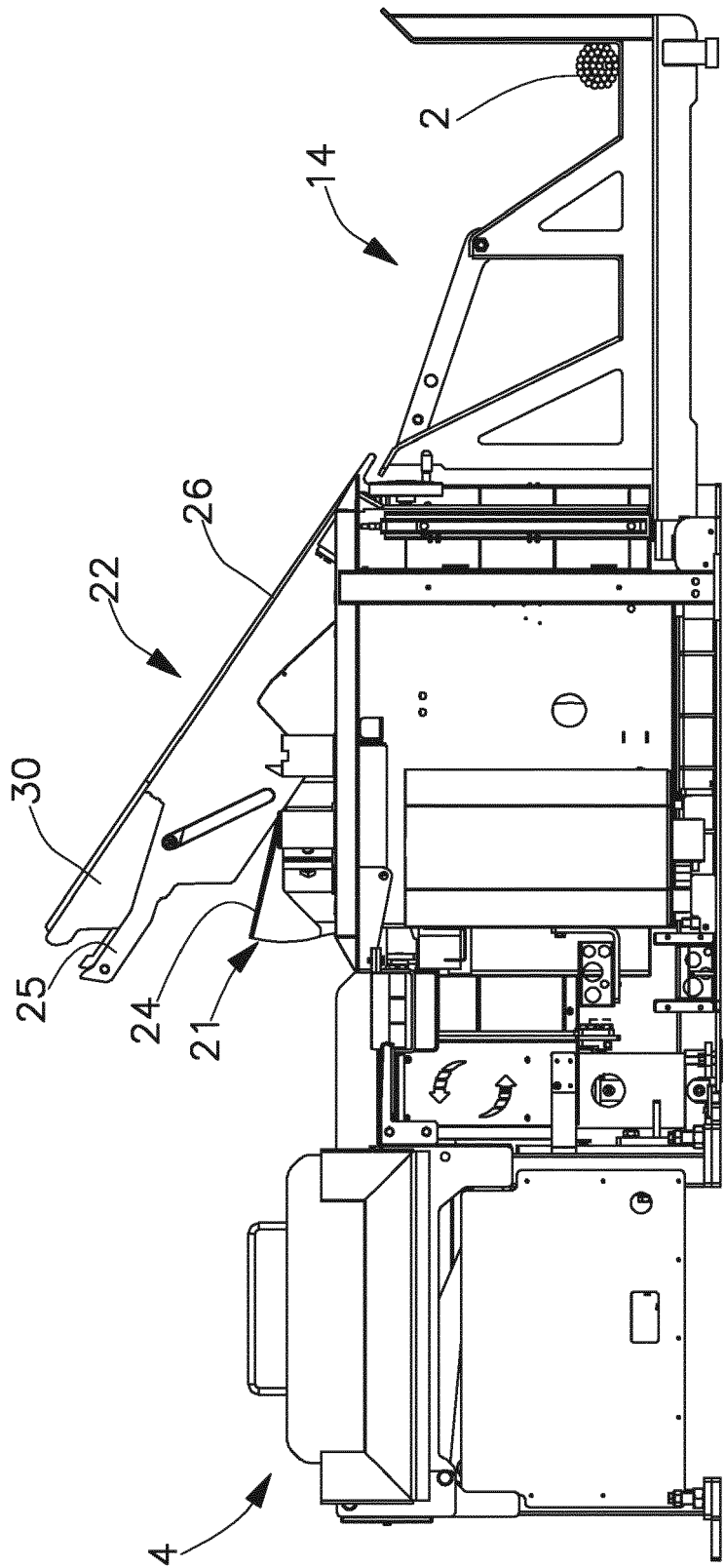


Fig.8



EUROPEAN SEARCH REPORT

Application Number
EP 15 19 9655

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DOCUMENTS CONSIDERED TO BE RELEVANT			
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The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
Munich		2 May 2016	Knecht, Frank
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82