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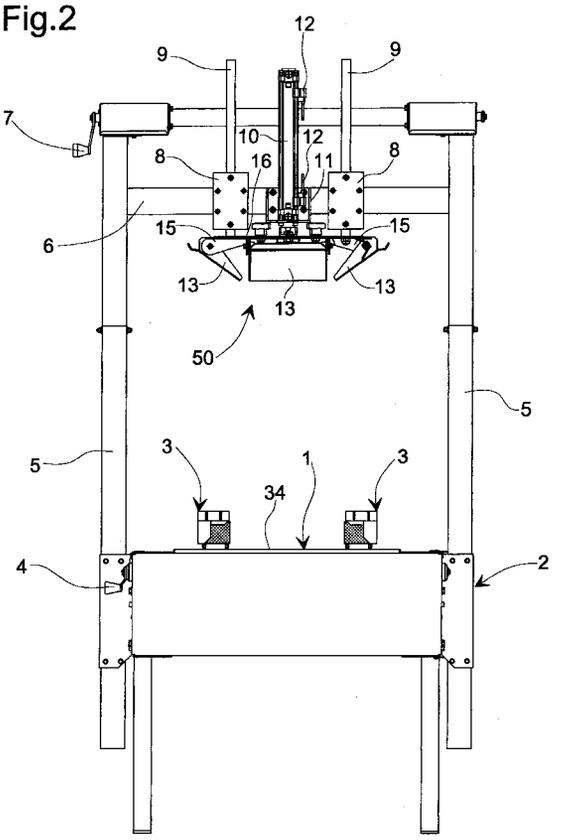
(54) Machine for opening wide the upper flaps of parallelepiped boxes

(57) In a machine comprising a base (2) with support surface (1) for parallelepiped boxes and a pair of drive belts that can be motorised (3) positioned at the two sides of said support surface (1) and which can be brought adjustably closer to each other until they engage with the sides of the boxes, a wide opening device (50) is provided, which is positioned above said support surface (1) and can be commanded to descend continuously from a raised rest position to encounter the upper flaps of a box placed in a preset position on said support surface (1) and cause their rotation to a opened position. The wide opening device (50) comprises four wide opening elements (13, 15) which can be put in an adjustable position above respective flaps of the box and each wide opening element (13, 15) comprises a fixed arm (15) adjustably fastened to a support plate (16) and a mobile arm (13) normally placed in an oblique position under said fixed arm (15) and pivoted to it so that it first encounters the flap to be opened and, after coming up against the below edge of the box, be forced by said edge to rotate towards a horizontal position for the complete wide opening of the flap encountered. Elastic means (18) stress the mobile arm (13) in said oblique position.

Fig.2



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Description

[0001] The present invention refers to a machine for opening wide the upper flaps of parallelepiped boxes.

[0002] In the packaging sector common use is made of parallelepiped cardboard boxes with foldable upper flaps, which are filled with the articles to be packaged and then closed and sealed with adhesive tape affixed to the top and bottom of the box.

[0003] To fill the boxes it is essential that the boxes be placed in the filling position with the upper flaps wide opened. Instead this is not the state in which they are when they leave the forming machine.

[0004] The object of the present invention is now to make a machine that enables the upper flaps of the boxes to be opened wide easily and effectively before the boxes are filled.

[0005] In accordance with the invention this object is achieved with a machine for opening wide the upper flaps of parallelepiped boxes, characterised in that it comprises a base with support surface for the boxes, a pair of drive belts that can be motorised which can be placed at the two sides of said support surface and can be brought close to each other and adjusted so that they engage with the sides of the boxes, and a wide opening device placed above said support surface and that can be commanded to descend continuously from a raised rest position until it encounters the upper flaps of a box placed in a preset position on said support surface and cause them to rotate to a wide opened position.

[0006] In particular the wide opening device comprises four wide opening elements available in an adjustable position above the respective flaps of the box and each wide opening element comprises a fixed arm adjustably fastened to a support plate and a mobile arm normally placed in an oblique position under said fixed arm and pivoted to it so as to first encounter the flap to be wide opened and, after arriving against the below-lying edge of the box, be forced by said edge to rotate against the action of a spring towards a horizontal position for the complete wide opening of the flap encountered.

[0007] An embodiment of the present invention is illustrated as non-limiting example in the enclosed drawings, in which:

- Figure 1 shows in a side view, in the position awaiting a box, a machine for opening wide the flaps of parallelepiped boxes that uses a flap wide opening device in accordance with the present invention;
- Figure 2 shows the same machine in a front view, again in said waiting position;
- Figure 3 shows the plan of the same machine from above;
- Figure 4 shows an enlarged representation of the wide opening device, seen as in Figure 2;
- Figure 5 shows the machine in a side view at the moment a box enters;
- Figures 6 and 7 show the machine in a front view and in a side view with the box in working position;
- Figure 8 shows the machine in a front view with the wide opening device which, descending, has started to push the upper flaps of the box outwards;
- Figure 9 shows the machine in a front view with the wide opening device which, after having encountered the resistance of the upper edge of the box, pushes the flaps outwards even further;
- Figure 9a shows an enlarged detail of the wide opening device in the position of Figure 9;
- Figure 10 shows the machine in a front view with the wide opening device which, continuing its descent, has brought the flaps to a horizontal position;
- Figure 11 shows the machine in a front view with the wide opening device that has completed the descent and the wide opening of the flaps of the box;
- Figure 12 shows the machine in a front view with the wide opening device, which, having left the box, has returned to its rest position.

[0008] The machine shown in the drawings comprises a base frame 2 in which a succession of idle rollers 34 defines in a manner that is in itself known a support surface 1 for boxes which, during operation, follow on from right to left looking at Figures 1 and 3.

[0009] At the two sides of the support surface 1 two belt conveyors 3 that can be motorised are provided, that can be brought nearer or further away by means of a suitable mechanical device, in itself known, by acting on a handle 4 (Fig.2).

[0010] From the base framework 2 two fixed columns 5 extend upwards inside which vertical branches of a supporting frame 6 are guided that supports a wide opening group or divaricator 50 that can be raised or lowered by means of the use of a suitable mechanical device, in itself known, by acting on a handle 7 (Fig.2).

[0011] As shown more clearly in Fig. 4, the wide opening group 50 is held to the frame 6 at the centre by means of two blocks 8 fixed with screws to the frame itself. The blocks 8 are intended to guide rods 9 respectively that enable the wide opening group 50 to move vertically and they prevent it from making any rotations during the descent and the ascent.

[0012] A cylinder 10, fixed to the frame 6 by means of an angle bar 11, is fitted with magnetic control sensors 12 and is intended for the descent of a plate 16 that acts as support for four fixed arms 15 positioned in line with respective perpendicular sides of the plate 16 and connected to it so that they can be adjusted by means of handwheels 17 cooperating with elongated slots 30 of the plate 16 (Fig. 3). Mobile arms 13 are pivoted in pivots 14 on the fixed arms 15 and are normally kept in the rest position of Fig. 4 by the respective springs 18 wound around the pivots 14; the rest position is defined by the abutment between respective cooperating parts 32 and 33 of the mobile and fixed arms 13 and 15.

[0013] By effect of the above-described structure the

machine illustrated in the drawings operates in the following manner on a parallelepiped cardboard box 19 that has upper flaps 20 open and in a vertical position, as shown in Fig. 5, on a sliding surface 21 that precedes the support surface 1.

[0014] As first operation, it is necessary to act on the handle 4 to adjust the distance of the two conveyor belts 3 so as to obtain a driving engagement with the sides of the box, as shown in Fig. 6.

[0015] In addition the handle 7 has to be acted on to adjust the height of the frame 6 so as to bring the wide opening group 50 closer to the upper level of the box without interfering with the extremity of the upper flaps 20 and the mobile arms 13 of the opener (Figs. 6 and 7).

[0016] Another adjustment to be made on the machine is the registration of a device for stopping the box (not better specified here) in accordance with its length, so that once it has been stopped, it is centred in relation to the wide opening group (Fig. 7).

[0017] Finally the position of the mobile arms 13 has to be adjusted in accordance with the length and width of the box by acting on the handwheels 17 and making the fixed arms 15 slide in relation to the support plate 16 until the required measurement is reached. The internal ends of the mobile arms 13 will have to be positioned at least one centimetre inside the respective flaps 20 of the box. The handwheels 17 also enable one or more wide opening elements (mobile arms 13 and fixed arms 15) to be removed without using a spanner.

[0018] Once the adjustments required have been made, the conveyor belts 3 are motorised to make the box 19 advance until it stops in the preset position (Fig. 7).

[0019] With the box stopped the wide opening group 50 starts descending, which comes about without continuity under the command of the cylinder 10 and with the guide of the rods 9.

[0020] The mobile arms 13 descend and encounter the flaps 20 of the box (Fig. 8) causing it to rotate around the respective horizontal conjunction lines between the flaps themselves and the upper edge of the box. The springs 18 in this phase prevent the rotation of the mobile arms 13, which could otherwise cause the flaps to be pressed before they are opened.

[0021] Continuing in their descent the mobile arms 13 go to rest on the upper edge of the box encountering a resistance that overcomes that of the springs 18 and causes the rotation of the mobile arms 13 around their pivots 14 (Figs. 9 and 9a) with consequent further wide opening of the flaps of the box.

[0022] Continuing further on their descent the mobile arms 13 reach the maximum rotation angle defined by the contact with the fixed arms 15 on which they are pivoted, thus bringing the flaps 20 of the box to the maximum preset wide opening (Fig. 10). Further pressure on the edge of the box, obtained by suitably adjusting the stroke of the cylinder 10, slightly squashes the edge of the box with the intention of limiting the return of the flaps 20 to their natural position (Fig. 11).

[0023] At this point the cylinder 10 commands the wide opening device 50 to return upwards, leaving the box 19 and leaving the flaps 20, by effect of the natural elasticity of the cardboard, to partially return towards their starting position, guaranteeing however a minimum permanent wide opening of approximately 30° (Fig. 12).

[0024] Immediately after, the box 19 is commanded to leave the machine, which is thus ready for a successive wide opening cycle.

Claims

1. Machine for wide opening the upper flaps of parallelepiped boxes, **characterised in that** it comprises a base (2) with support surface (1) for the boxes, a couple of drive belts (3) that can be motorised which are placed at the two sides of said support surface (1) and can be brought closer to each other with adjustment so that they engage with the sides of the boxes, and a wide opening device (50) placed above said support surface (1) and that can be commanded to descend continuously from a raised rest position until it encounters the upper flaps of a box positioned in a preset position on said support surface (1) and cause their rotation in a wide opened position.

2. Machine according to claim 1, **characterised in that** said wide opening device (50) comprises four wide opening elements (13, 15) which ca be placed in an adjustable position above respective flaps of the box.

3. Machine according to claim 2, **characterised in that** each wide opening element (13, 15) comprises a fixed arm (15) adjustably fastened to a support plate (16) and a mobile arm (13) normally positioned obliquely under said fixed arm (15) and pivoted to it so as to first encounter the flap to be wide opened and, after having come up against the lower edge of the box, be forced by said edge to rotate towards a horizontal position for the complete wide opening of the flap encountered.

4. Machine according to claim 3, **characterised in that** said wide opening element (13, 15) comprises elastic means (18) suitable for holding said mobile arm (13) pliably in said oblique position.

5. Machine according to claim 3, **characterised in that** the down stroke of the wide opening device (50) is fixed so that it forces said mobile arm (13) to slightly press the edge of the box so as to limit the return of the flap towards its natural position.

6. Machine according to any of the previous claims, **characterised in that** it comprises means (7) for adjustably fixing said rest position of the wide opening device (50).

Fig.1

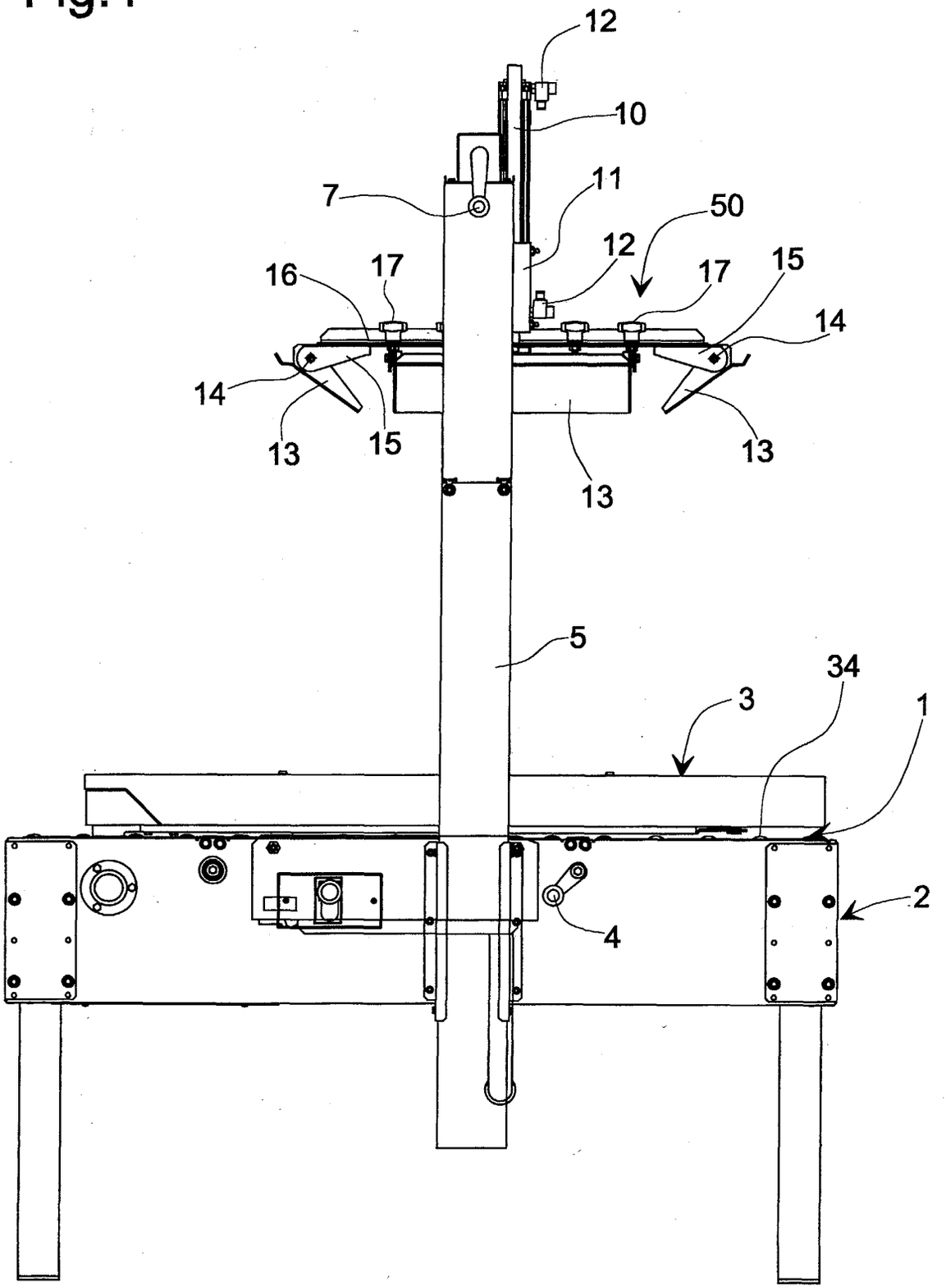
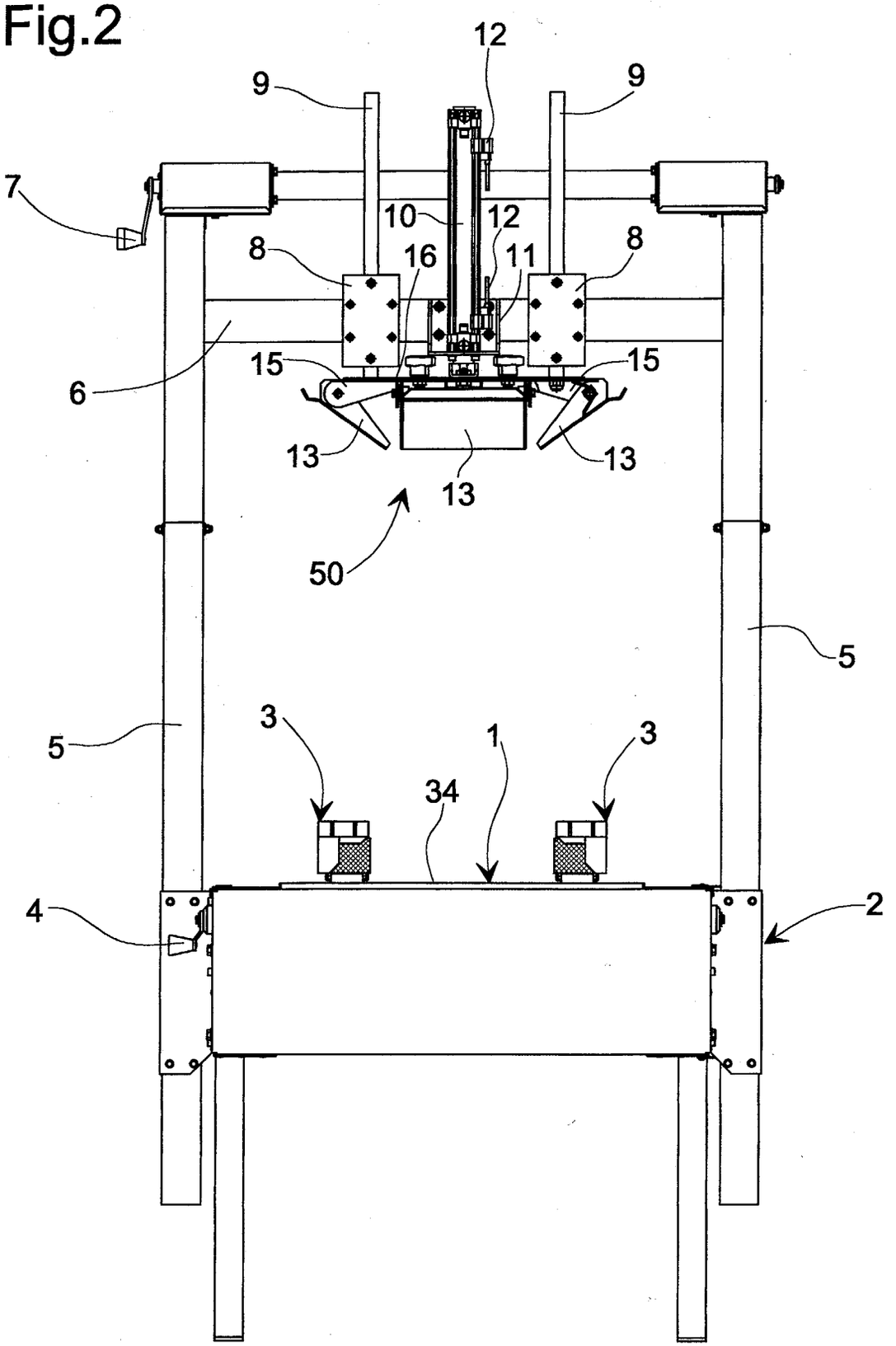


Fig.2



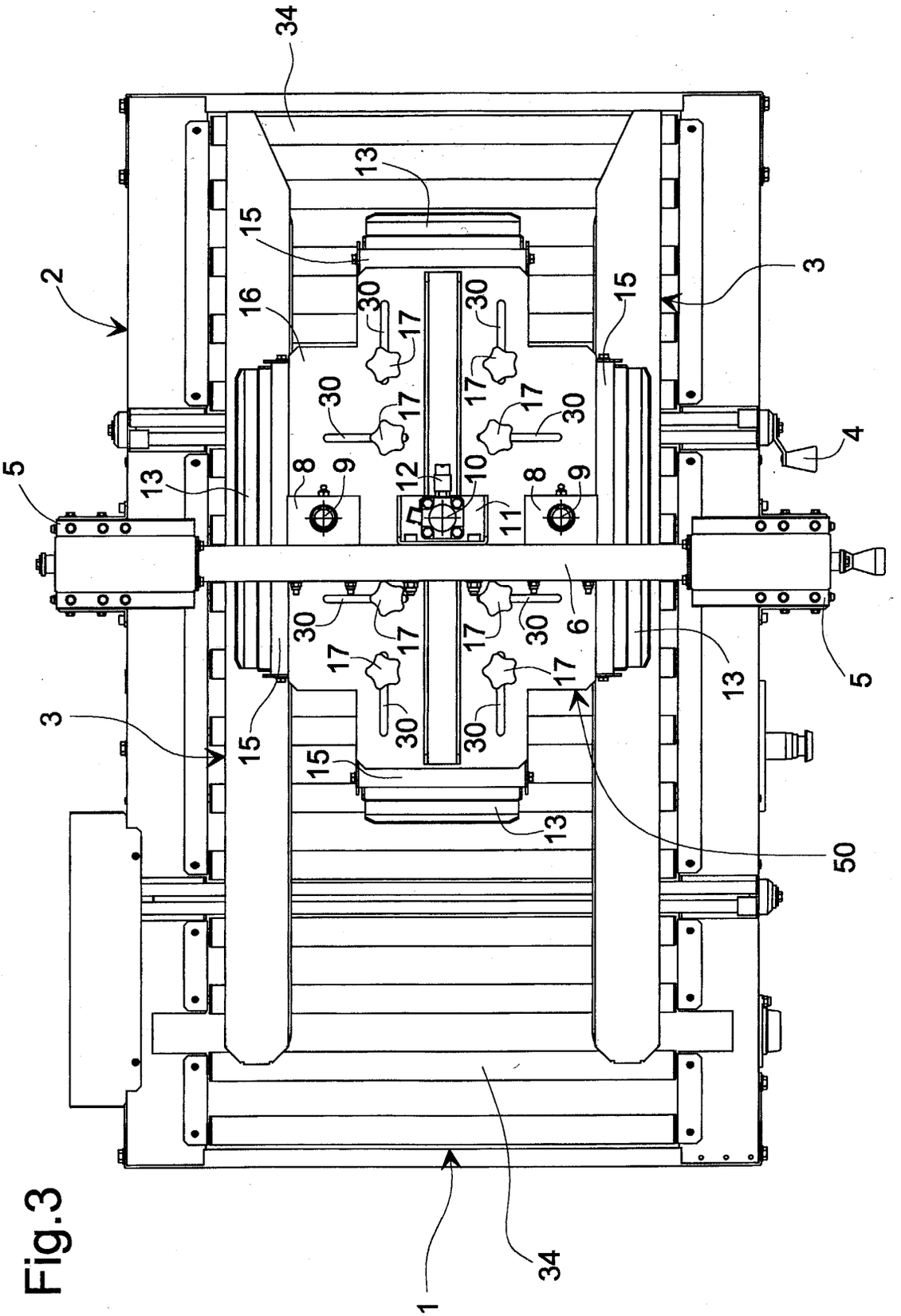


Fig.3

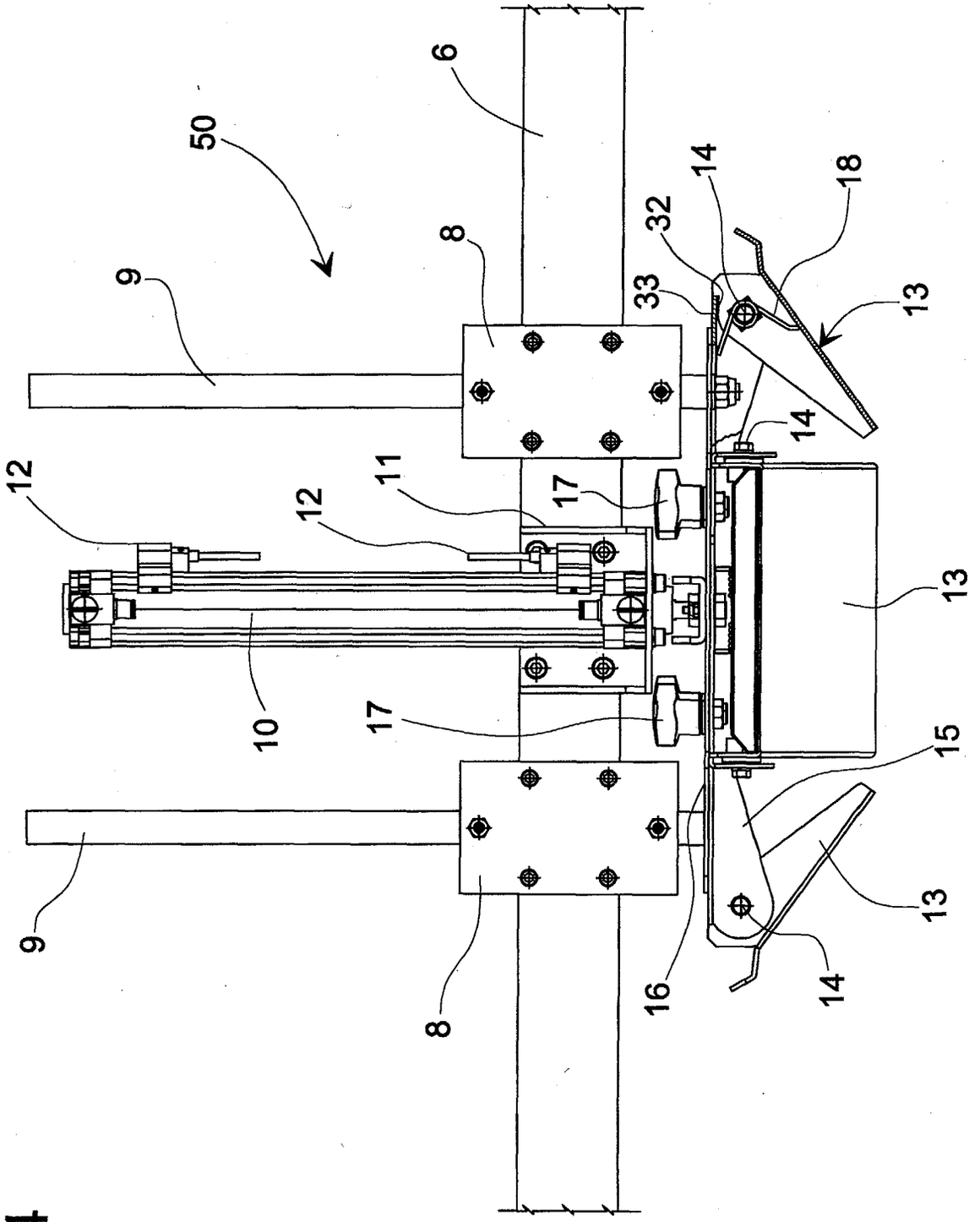


Fig.4

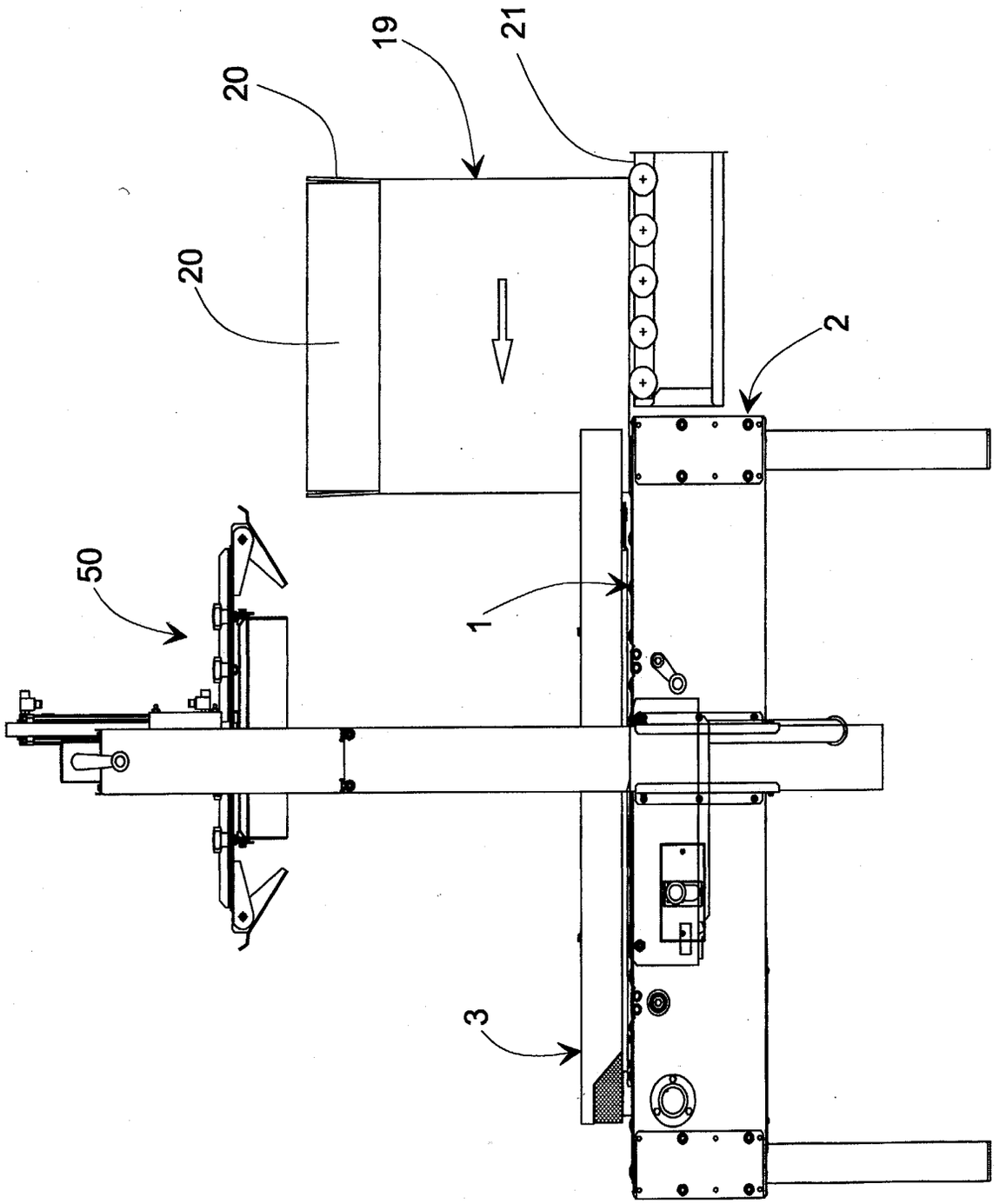


Fig.5

Fig.6

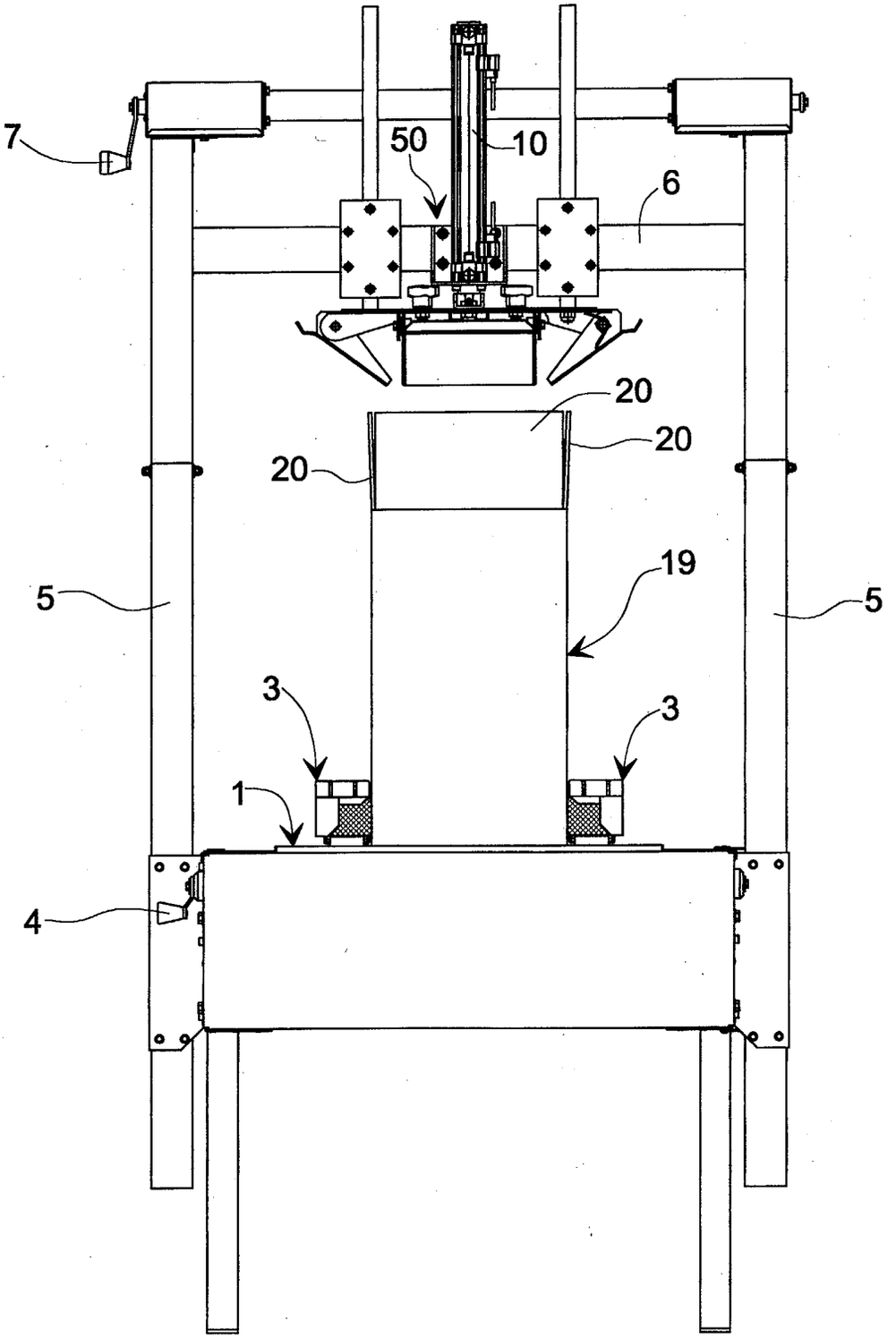


Fig.7

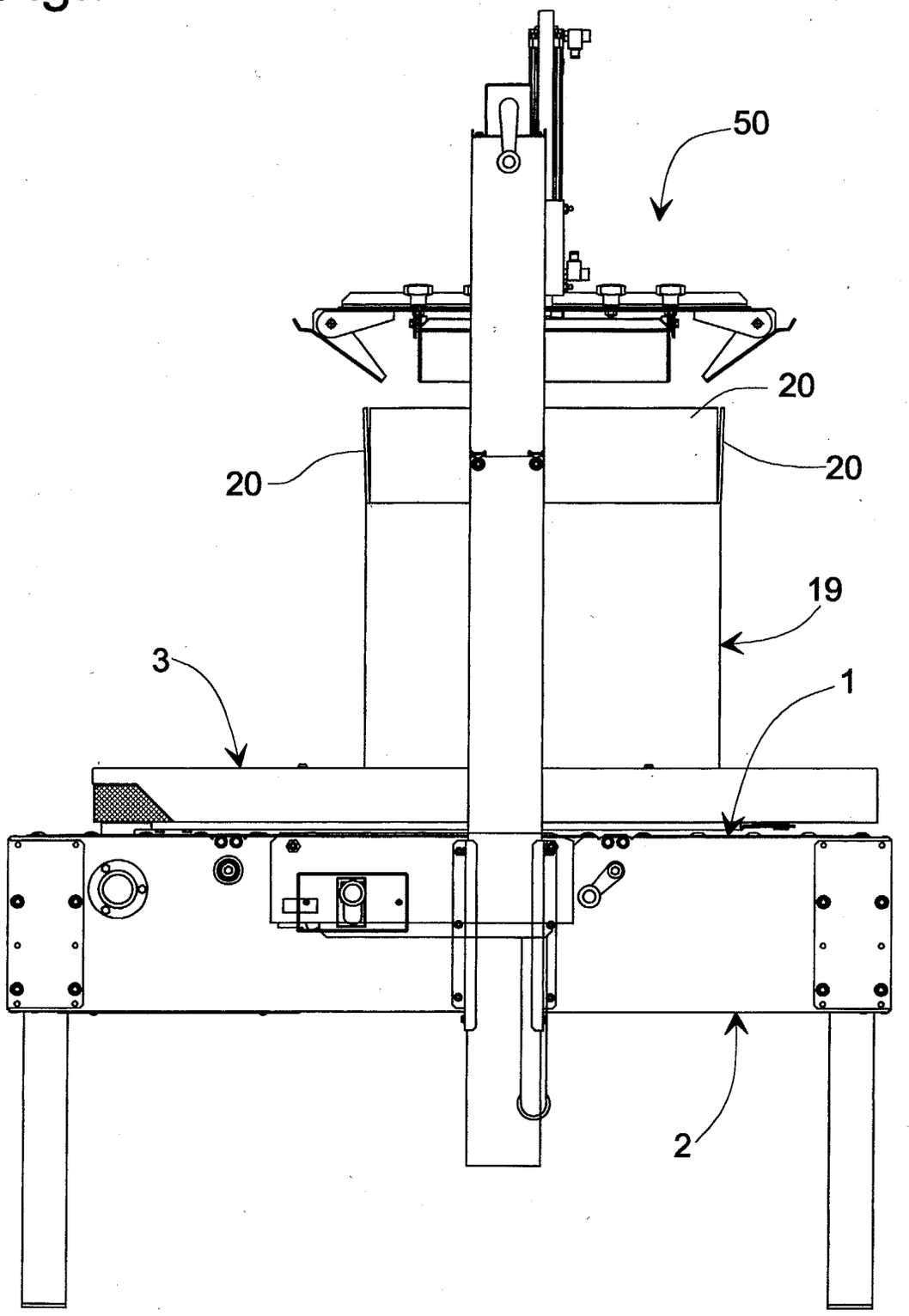


Fig.8

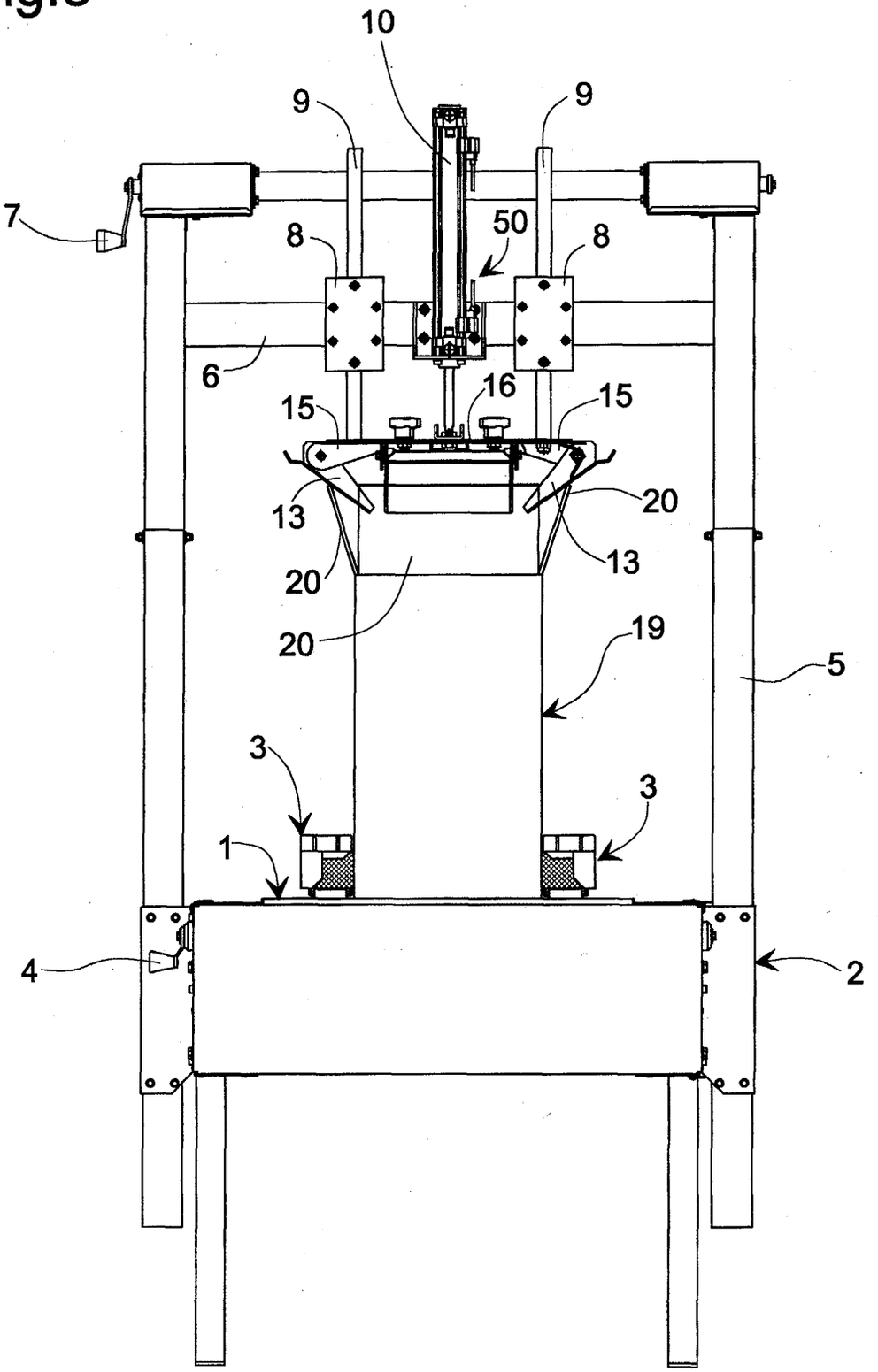


Fig.9

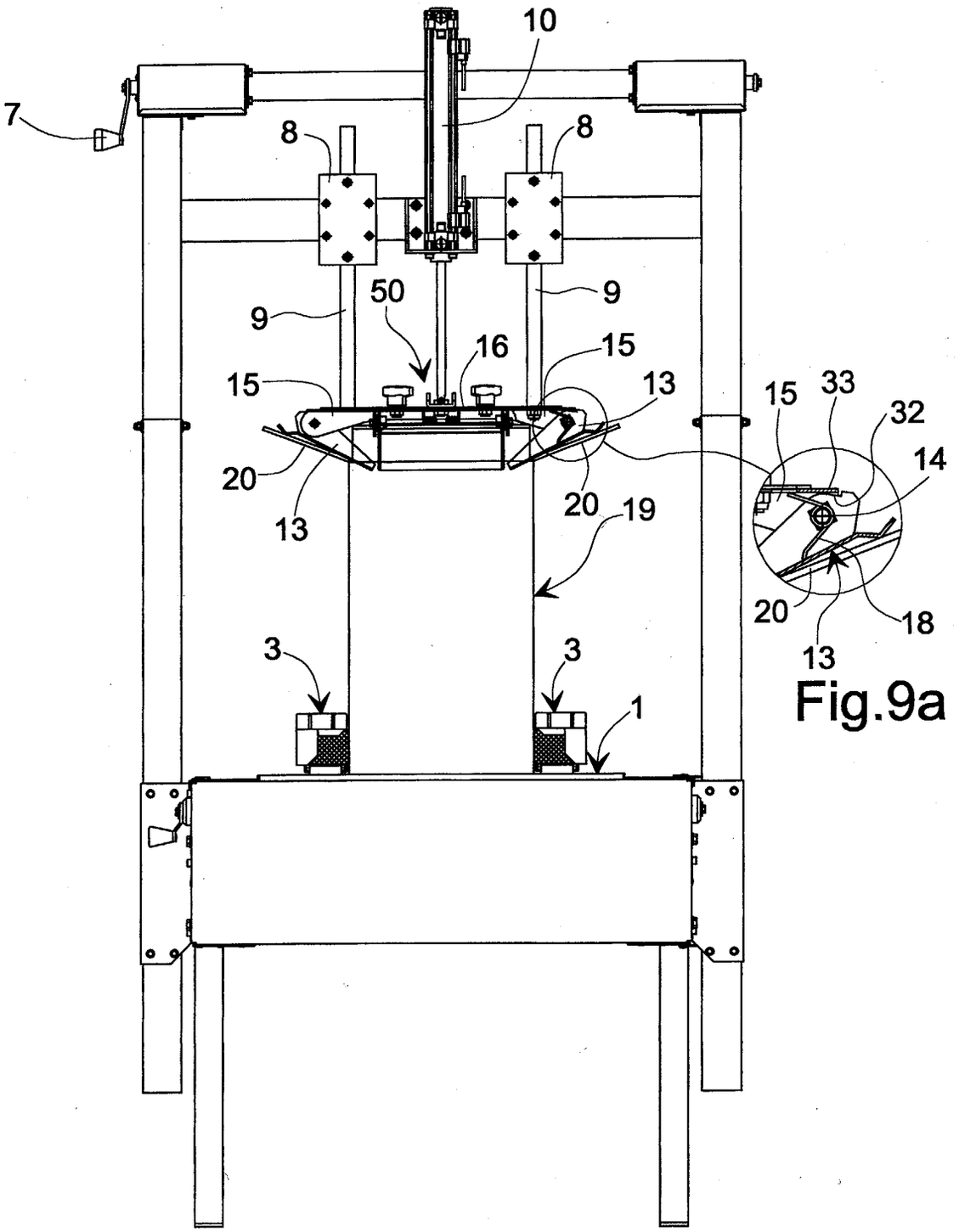


Fig.9a

Fig.10

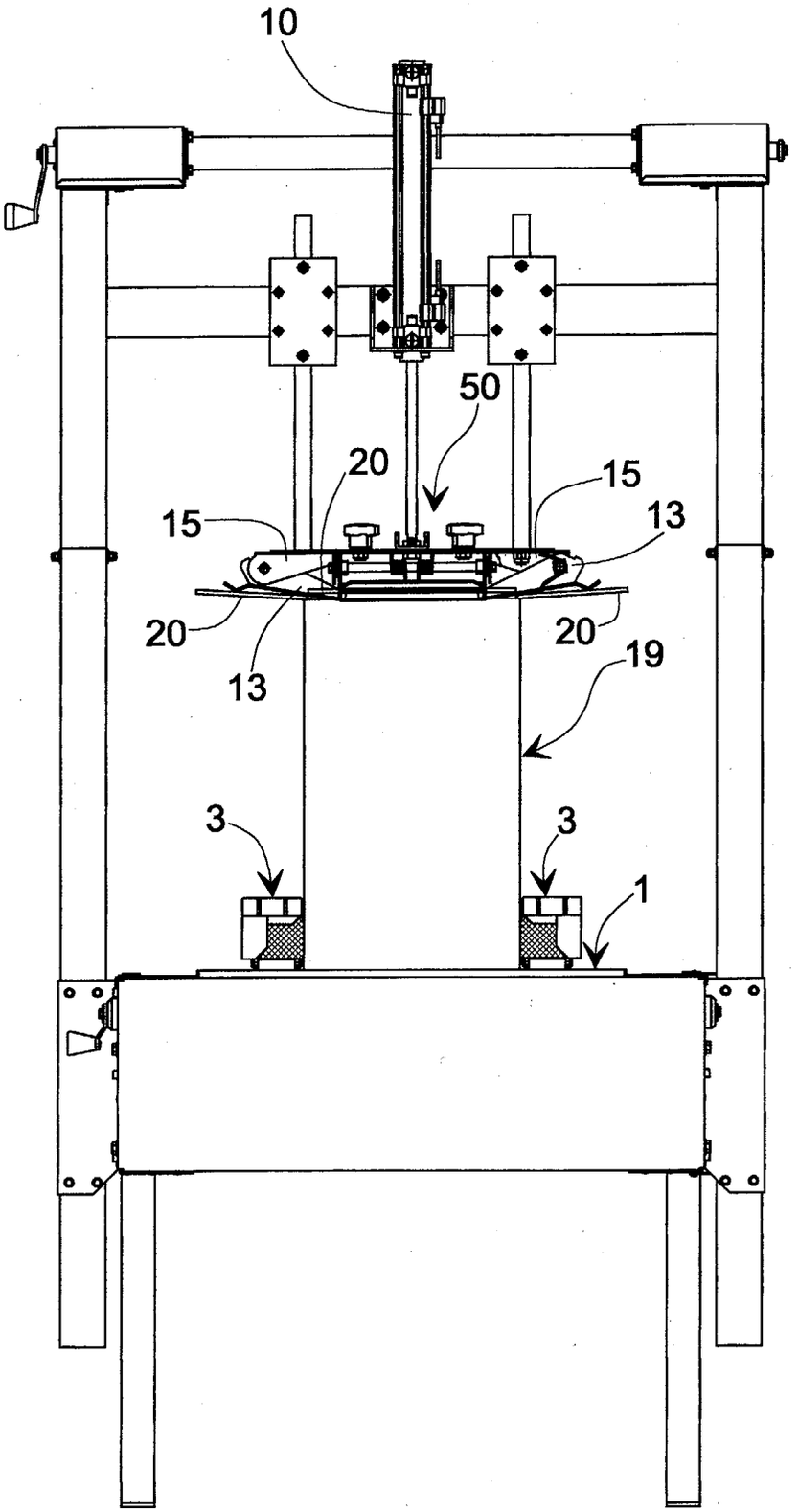


Fig.11

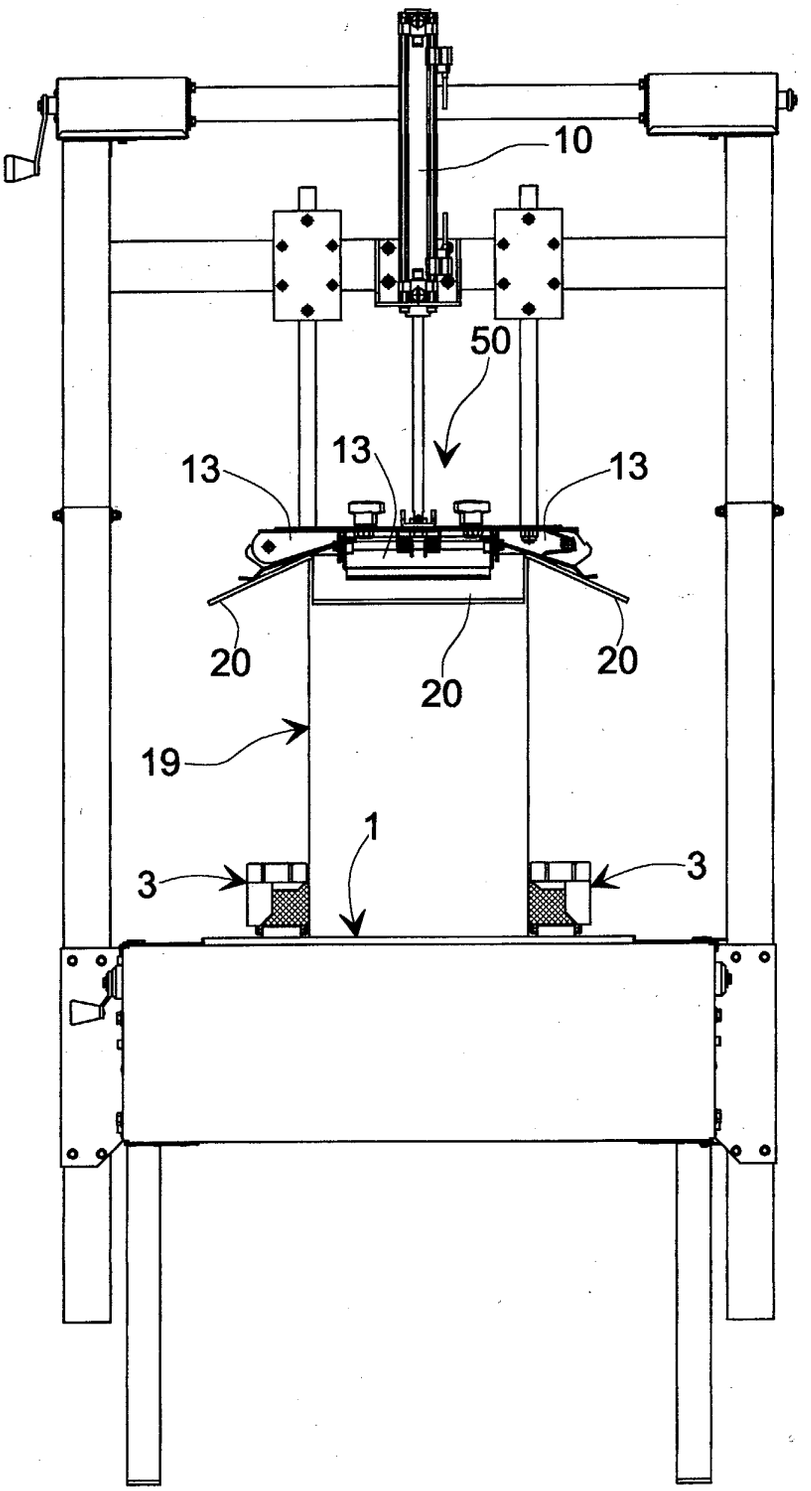
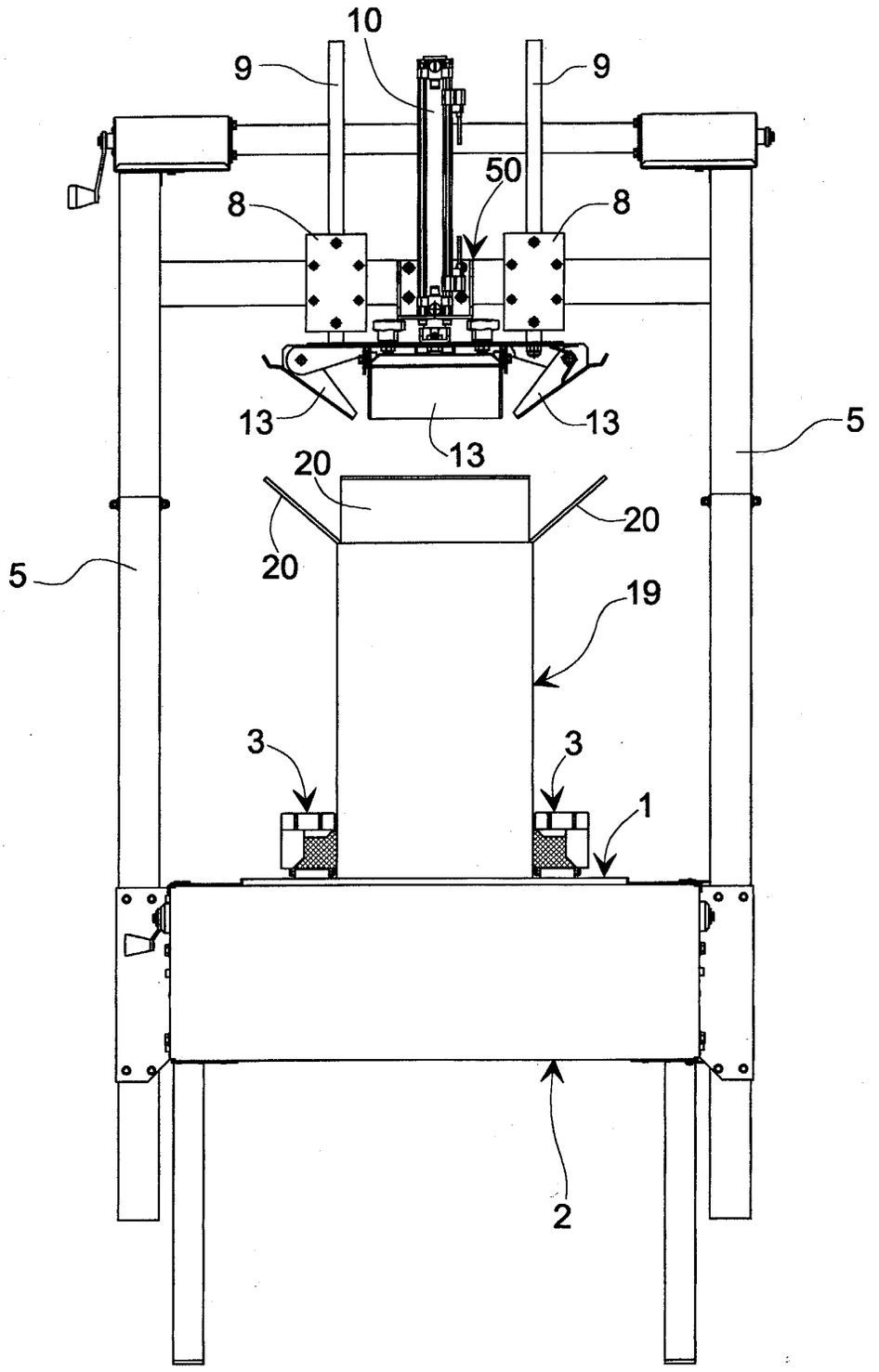


Fig.12



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EUROPEAN SEARCH REPORT

Application Number
EP 03 07 9203

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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	16 April 2004	Damiani, A

CATEGORY OF CITED DOCUMENTS

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