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(54) **Device for transferring bags from a filling station to a conveyor**

(57) A device for transferring bags from a filling station to a conveyor comprises two pairs of grippers (23), co-operating with one another so as to grip the top edge of a bag and capable, upon actuation, of selectively adopting a closed position where they can grip the bag and an open position where they release the bag. The grippers (23) are mounted on a gripper carrying unit (22) attached to a shaft (15) rotatably coupled to a fixed frame (5) with a horizontal axis of rotation. The shaft (15) supporting the unit (22) is operated so as to perform an alternating oscillating movement with an amplitude of 180° by means of a motor (6) and via a cam member (7) and a connecting rod (53). The grippers (23) are mounted on the unit (22) so as to remain parallel with one another during the movement of the unit itself.

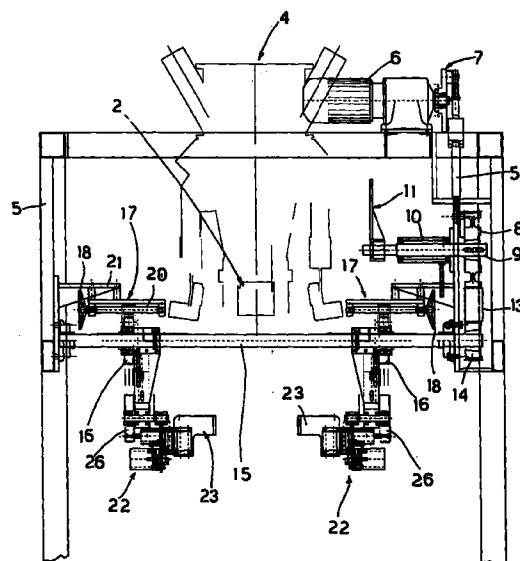


FIG2

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Description

The present invention relates to a device for transferring bags from a filling station to a conveyor. The invention is particularly, but not exclusively, suitable for application in a continuous installation for filling and packaging flexible bags containing granular or powdery material.

In the known installations, the empty bags are supplied to a working station in which they are filled with powdery or granular material, usually supplied by means of a hopper. The filling station is equipped with a device for handling empty bags, which removes the bags one at a time and places them in position below the hopper for filling. The packaging installation furthermore comprises a transfer device, arranged in series, which transports the full bags to a linear conveyor, in general of the belt type, which is capable of transferring the bags to the downstream working stations of the installation.

One drawback of the known installations consists in the considerable dimensions of the transfer device which removes the full bags from the filling station.

Another drawback is that of synchronizing the controls of the various devices operating in the filling station, such as the device which positions the empty bags below the hopper and the device which transfers the full bags to the conveyor for the subsequent operating steps (stitching or sealing).

The aim of the present invention is to overcome the abovementioned drawbacks of the known art by providing a device of simple and economical design which has relatively small dimensions.

One advantage of the present invention consists in the fact that the motor which operates the device can be used for actuating another device located upstream of the filling station, in particular the device intended for placing the empty bags in the filling position.

Another advantage of the present invention is that it allows very secure and reliable gripping of the bags during their transfer from the filling station to the conveyor.

A further advantage of the present invention consists in the possibility of being simply and directly adaptable to bags of different sizes.

These objects and advantages are all achieved by the device in question as characterized by the claims indicated below.

Further characteristic features and advantages of the present invention will become more apparent from the following detailed description of a preferred, but not exclusive, embodiment of the invention itself illustrated merely by means of a non-limiting example in the accompanying figures, in which

- Figure 1 shows a side view of the device in vertical elevation;
- Figure 2 shows a side view, from the left of Figure 1 and on a larger scale, of the upper portion of the

device according to Figure 1, with the grippers closed;

- Figure 3 shows, on a larger scale, a detail of Figure 2 comprising the grippers;
- Figure 4 shows a side view, from the left of Figure 3, with the grippers open;
- Figure 5 shows a sectional view along the plane indicated by V-V in Figure 3;
- Figure 6 shows a side view, from the left and on a larger scale, of the lower portion of the device according to Figure 1; and
- Figure 7 shows, on a larger scale, a detail of Figure 1 with some parts removed for better viewing of others.

With reference to the figures mentioned, 1 denotes in its entirety a device for transferring bags from a filling station 2 to a conveyor 3. In this case, the filling station 2, which is of the known type, comprises a hopper 4 for discharging the filling material (powdery or granular material). Appropriate metering means, of the known type and not shown, are provided for operating and controlling the operation involving filling of each bag. In this example of embodiment, the conveyor 3 is of the belt type and may be used for transporting the bags to a downstream working station in which the bags are closed, for example by stitching or heat-sealing. The device 1 in question comprises a frame 5 on which there is mounted a motor 6 which, via a cam member 7, causes a first toothed pulley 8 to perform an oscillating movement. A connecting rod 53 connects the cam member 7 to the first pulley 8. The first pulley 8 is keyed onto one end of a first shaft 9 with a horizontal axis rotatably coupled to a support 10 integral with the frame 5. The first pulley 8 is operated so as to perform oscillations with an amplitude of 90°. A system of articulated rods, indicated in its entirety at 11, which receives the abovementioned oscillating movement with an amplitude of 90° from the first shaft 9 is connected to the end of the first shaft 9, opposite to the one carrying the first pulley 8.

This rod system 11 operates a device 12 intended for positioning the bags, coming from a known supply line, not shown, in the filling station 2. In this way it is possible to use a single motor (the motor 6, in this case) for operating both positioning of the empty bags in the filling station and removal of the full bags from the station itself. The positioning device 12 constitutes a utility outside the transfer device 1 in question. It is possible to use the movement of the first shaft 9 for actuating other types of utilities outside the transfer device 1. Since a single motor is used for operating several devices having various functions, it is not necessary to provide means for synchronizing several independent driving operations.

The first toothed pulley 8 is connected, by means of a toothed belt drive 13, to a second toothed pulley 14 having a diameter equal to half the diameter of the first

pulley 8. The second pulley 14 is therefore operated by the first pulley 8 so as to perform oscillations having an amplitude of 180°. The second pulley 14 is keyed onto one end of a second shaft 15 rotatably coupled, via suitable bearings, to two first toothed wheels 16. Each first toothed wheel 16 is fixed at the top to a respective screw-type device 17 for adjusting the position, which can be operated by means of a handwheel 18. This positioning device 17 comprises a sliding piece 19 integral with the first toothed wheel 16 and coupled to an endless screw 20, with a horizontal rotating axis, which is pivotably mounted at its opposite ends on a support 21 secured to the frame 5.

The axis of rotation of the second shaft 15 is also horizontal. The first toothed wheel 16 is coaxial with the second shaft 15.

Each first toothed wheel 16 has associated with it a movable unit 22 carrying a pair of grippers 23 which are designed to grip the top edge of a bag and capable of selectively adopting, upon actuation, a closed position (Figures 5 and 3) where they can grip the bag and an open position (Figure 4) where they release the bag. Each gripper carrying unit 22 is equipped with a support 24 integrally secured to the second shaft 15. This support 24 is driven by the second shaft 15 so as to perform oscillations of 180°.

Each pair of grippers 23 is mounted on the respective gripper carrying unit 22 such that, as a result of a rotation of the second shaft 15, the grippers 23 are made to perform a pure translational movement while staying parallel with one another. Below, the connection between a pair of grippers 23 and the second shaft 15, which allows this translational movement to be obtained, is described. The comments made in respect of one pair of grippers 23 also apply to the other pair of grippers 23. The two pairs of grippers 23 are symmetrical with one another relative to a vertical plane. In other embodiments of the invention, it is possible to provide other types of connections by means of which the grippers can move parallel with one another.

Below, a possible variation of designing the gripper carrying unit 22 is described. In the example described now, a third shaft 25 is rotatably coupled, with a horizontal axis of rotation, to one end of the support 24 integral with the second shaft 15. A second toothed wheel 26 connected to the first toothed wheel 16 by means of a toothed belt 27 is mounted coaxially and integrally on a first end of the third shaft. The diameters of the first and second toothed wheels are identical. A sleeve 28 capable of axially sliding on the third shaft 25 is rotatably mounted on a second end of the third shaft 25 opposite to the first one. At the bottom, the sleeve 28 carries a vertical plate 29. A first cylinder 30 is connected on the base side to the plate 29 and on the rod side to the second toothed wheel 26. This first cylinder 30 with a horizontal axis has the function of moving the grippers 23 slightly in a horizontal direction in order to keep the gripped bag taut, as will be explained in more detail

below. Two rotating pivots 31 with a vertical axis spaced from one another are integrally connected to the plate 29. A respective gripper 23 is rotatably coupled to each rotating pivot 31. In the closed position (Figure 5), the grippers 23 have at the ends two respective planar gripping surfaces 32 facing each other, between which an edge portion of the bag to be transferred is gripped.

The operation of opening and closing of the grippers 23 is effected by a second cylinder 33 mounted on the plate 29 and having a horizontal axis. The second cylinder 33 causes a to-and-fro movement of a cam member 34 operationally associated with both grippers 23 and equipped with a profiled track 35. Each gripper 23 has at one end a guided member, in the form of a cylindrical roller, which engages with the inside of the profiled track 35. Each guided member 36 is located at the end of the gripper opposite to the end comprising the abovementioned gripping surface 32.

During the to-and-fro movement of the cam member 34, the guided member 36 is forced to run along the profiled track 35. During the forward movement of the cam member 34, the grippers 23 are guided by the profiled track so as to open and, vice versa, during the return movement they are guided so as to close. In the closed position of the grippers 23, the guided members 36 of each gripper are located in the respective end sections of the profiled track 35 (Figure 5). In the region of these end sections, the profiled track 35 has active surfaces in the form of a plane inclined at such an angle that the gripping force with which a bag is held between the grippers is notably increased. In other words, the particular form of the cam member 34 (clearly seen in Figure 5) has the effect that the thrust acting on the guided member 36 (and thus on the grippers 23) is increased when the grippers are located in the vicinity of their closed position. In this way, the force with which the grippers 23 grip the bag is fairly high and, consequently, the grip is secure.

The movement of the gripper carrying unit 22 is shown in Figure 1. This movement essentially consists in a rotation of 180° during which the grippers 23 and the bag transported by them always remain parallel with respect to one another. The grippers 23 transport the bag to a conveyor which forms part of the transfer device 1 in question and will be described below.

At the bottom, the conveyor has a first mobile conveyor belt 37 fixed to the connecting rod 38 of a four-bar linkage 39 mounted on the lower portion of the frame 5.

The connecting rod 38 is capable of performing a pure translational movement parallel with respect to itself along a vertical plane. A cylinder 40 is hinged to the frame 5 on the rod side and is secured to the first conveyor belt 37 on the base side. By means of the cylinder 40 it is possible to move perform an upward and downward movement of the first conveyor belt 37, as can be seen in Figure 6. The first mobile conveyor belt 37 is coupled in series to a second fixed conveyor belt 42.

A motor 42 causes travel of both the first and the second conveyor belt. This constitutes an advantage compared to the known art in that both the fixed conveyor and the mobile one can be operated by a single motor. The vertical position of the two conveyors 37 and 41 can be regulated by means of a lever 54 which causes rotation of a toothed wheel 55 meshing with a fixed rack 56. 43 denotes walls for lateral confinement of the bags to be transported. At the top, the conveyor of the bags has a belt-type gripping member 44 which is capable of picking up the top edge portion of a bag carried by the abovementioned grippers 23 and transporting the bag itself. The gripping member 44 comprises two jaws 45 which interact with one another and are hinged at an upper end with the possibility of rotation about a horizontal axis. The jaws 45 can, upon actuation, selectively adopt at least one open position and one closed position. The bottom end of the jaws 45 has a gripping surface designed for contact with the bags and consisting, in the case in question, of two endless belts 46 wound on toothed rollers 47. When the jaws 45 are in the closed position, the two endless belts 46 face each other, while, in the open position, they are spaced from one another. The gripping member 44 is positionable heightwise by means of a positioning device 48 composed of three endless-screw translating means 49 which have a horizontal axis and are mounted on the frame 5 and to which the gripping member 44 is attached. The top end of each translating means comprises a wheel 50; the three wheels 50, which have the same diameter, are connected to one another by means of a common belt 51 so that it is sufficient to have a single speed reducer 52 for actuating the three translating means 49 simultaneously.

The mode of operation of the device 1 will be described below.

When a bag has been filled in the filling station 2, the two pairs of grippers 23 grip two opposite edge portions of the bag, after which the system, which during filling held the bag, releases its grip. The upper edge portion of the bag gripped by the pliers is tensioned by means of the movement, away from one another, of the two pairs of holding grippers 23. This operation is effected by means of actuation of the first cylinders 30 which allow the grippers 23 to perform small adjusting movements in a horizontal direction with respect to the gripper carrying unit 22, these movements also being facilitated by the fact that the plate 29 carrying the grippers 23 can move axially along the third shaft 25.

The gripper carrying unit 22 is then made to rotate through 180° so as to move from the filling station 2 to a position where it is located above the first conveyor belt 37. The rotation is effected by actuating the main motor 6 which is connected to the gripper carrying unit 22 by means of a transmission system which transforms the continuous rotation of the shaft of motor 6 into an alternating rotation, with an amplitude of 180°, of the second shaft 15. During this rotation, the grippers 23, as men-

tioned, move while remaining parallel with one another, so that the upper opening of the bag remains horizontal and there is no risk of any product falling out of the bag itself. During this rotation, the first conveyor belt 37 is in a lowered position so as not to hinder the movement of the bag. Once the 180° rotation of the gripper carrying unit 22 has been completed, the first conveyor belt 37 is brought into the upper position where it is aligned with the second conveyor belt 41. The two travelling belts 46 of the upper gripping member 44 are closed above the top edge of the bag. The grippers 23 can then open and thus release their grip on the bag, which is transported to downstream working stations, such as, for example, a station for closing the inlet opening of the bag by heat-sealing or stitching. The gripper carrying unit 22 can return to the filling station 2 for the next working cycle.

The gripper carrying unit 22 is thus capable of carrying out an alternating oscillating movement during which it may selectively adopt a gripping position in which the grippers 23 can grip a bag located in the filling station 2 and a release position in which the grippers 23 can release the bag onto the conveyor 3. During this movement, the grippers 23 remain parallel with one another owing to the fact that the grippers themselves are integral, during rotation, with the second wheel 26 rotatably mounted on the gripper carrying unit 22, the said second wheel 26 being attached to the first wheel 16, which is fixed and coaxial with the second rotating shaft 26, so that a rotation of the gripper carrying unit 22 causes an identical rotation, in the opposite sense, of the second wheel 26 and hence the grippers 23.

The second wheel 26 is forced to rotate owing to the fact that it is connected, via the toothed belt 27, to the first wheel 16 which is secured to the frame 5. In other embodiments of the invention, it is possible to provide other types of mechanisms which allow the grippers gripping the bag to remain parallel with one another during the oscillating movement of the gripper carrying unit.

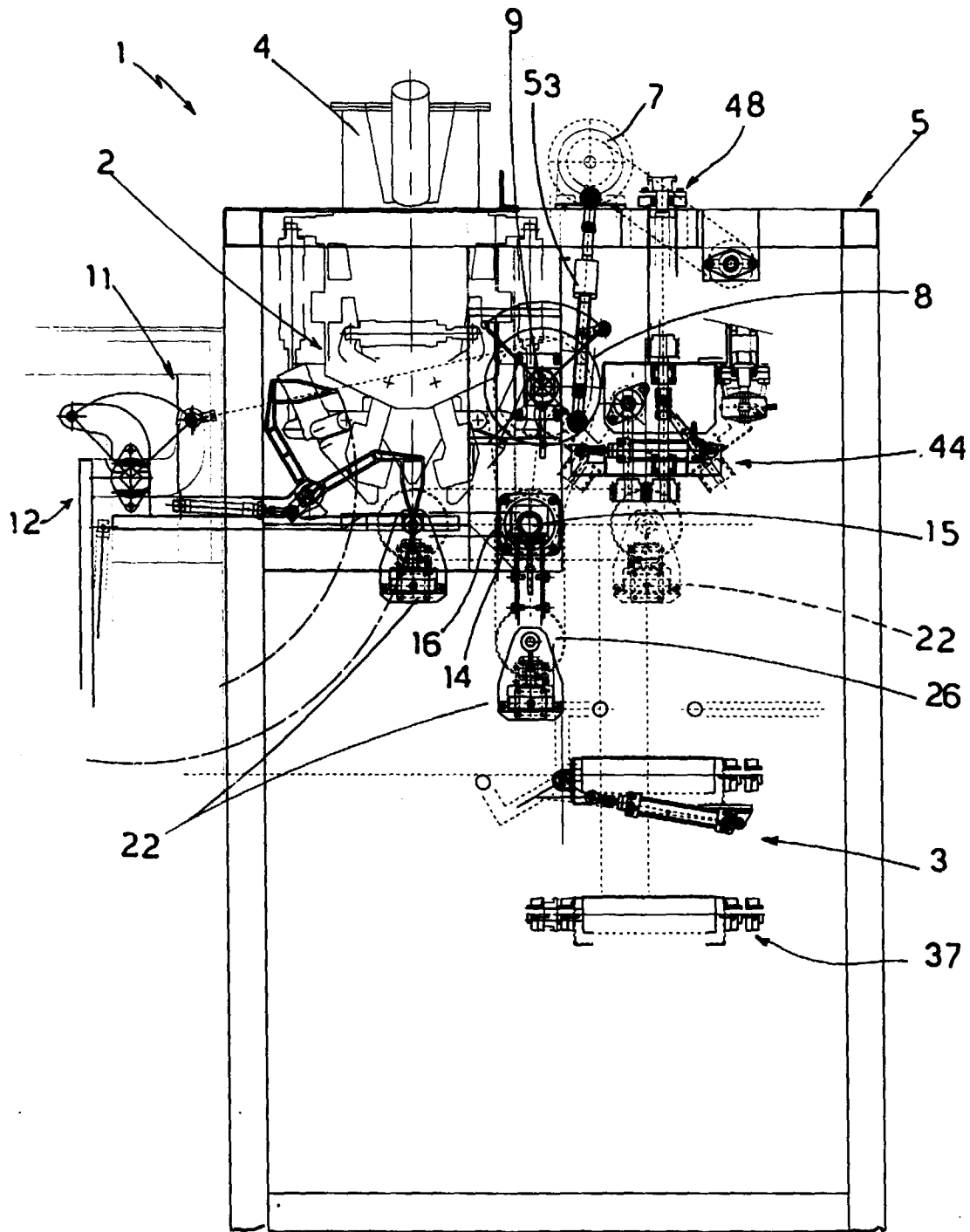
Claims

1. Device for transferring bags from a filling station (2) to a conveyor (3), characterized in that it comprises:
 - a pair of grippers (23) designed to grip the top edge of a bag and capable, upon actuation, of selectively adopting a closed position where they can grip the bag and an open position where they release the bag;
 - a gripper carrying unit (22) attached to a fixed frame (5) and capable of performing an alternating oscillating movement during which they are capable of selectively adopting a gripping position where the grippers (23) can grip a bag located in the filling station (2) and a release position where the grippers (23) can release the bag onto the conveyor (3), the grippers (23)

being mounted on the associated unit (22) such that they remain parallel with one another during the movement of the unit itself.

2. Device according to Claim 1, characterized in that it comprises means (18, 19, 20) for adjusting the mutual distance between the two pairs of grippers (23). 5
3. Device according to any one of the preceding claims, characterized in that the gripper carrying unit (22) is mounted on a rotating shaft (15) with a, preferably, horizontal axis of rotation. 10
4. Device according to Claim 3, characterized in that said rotating shaft (15) is operated so as to perform oscillations having an amplitude of about 180°. 15
5. Device according to Claim 3 or 4, characterized in that the grippers (23) are integral, during rotation, with a rotating wheel (26) rotatably mounted on the gripper carrying unit (22), said wheel (26) being attached to a fixed wheel (16) coaxial with said rotating shaft (15) so that a rotation of the gripper carrying unit (22) causes an identical rotation, in the opposite sense, of the grippers (23). 20
25
6. Device according to one of Claims 3 to 5, characterized in that said rotating shaft (15) receives an oscillating movement from a motor (6) by means of a cam member (7). 30
7. Device according to Claim 6, characterized in that it comprises another rotating shaft (9) connected to the cam member (7) so as to receive from the motor (6) an oscillating movement with an amplitude of, preferably, about 90°, said other rotating shaft (9) being connectable to a utility (12) outside the transfer device (1). 35
40
8. Device according to any one of the preceding claims, characterized in that the grippers (23) are capable, upon actuation, of carrying out small adjusting movements in a horizontal direction with respect to the gripper carrying unit (22). 45
9. Device according to any one of the preceding claims, characterized in that the grippers (23) are operated so as to open and close by means of a cam member (34) movable, upon actuation, and equipped with a profiled track (35) coupled to a guided member (36) integral with the grippers (23). 50
10. Device according to Claim 9, characterized in that the profiled track (35) has an inclined surface formed and arranged so as to increase the thrust acting on the guided member (36) in the vicinity of the closed position of the grippers. 55
11. Device according to any one of the preceding claims, characterized in that it comprises a conveyor belt (37) which is mobile and associated in series with a fixed conveyor belt (41) which, upon actuation, is capable of performing a pure translational downward and upward movement during which it remains always horizontal.
12. Device according to Claim 11, characterized in that the mobile conveyor belt (37) is attached to the connecting rod (38) of a four-bar linkage (39).
13. Device according to any one of the preceding claims, characterized in that it comprises a gripping member (44) capable of gripping the top edge of a bag held by the grippers (23) with the unit (22) in a release position, said gripping member (44) being positionable in a vertical direction.
14. Device according to Claim 13, characterized in that said gripping member (44) comprises two endless counter-rotating belts (46) co-operating with one another, both being preferably coated with a layer of rubber.

FIG. 1



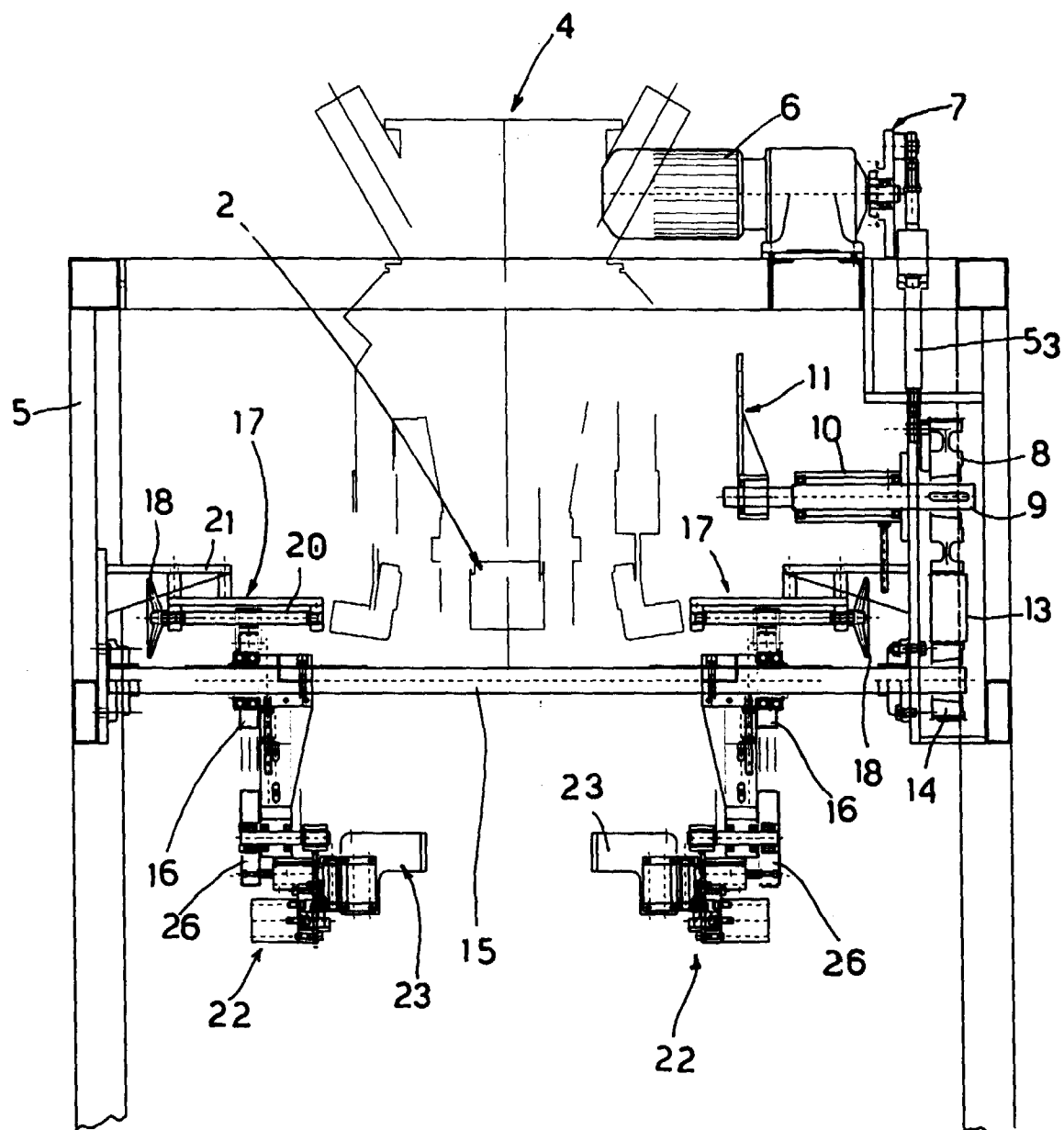


FIG. 2

FIG. 3

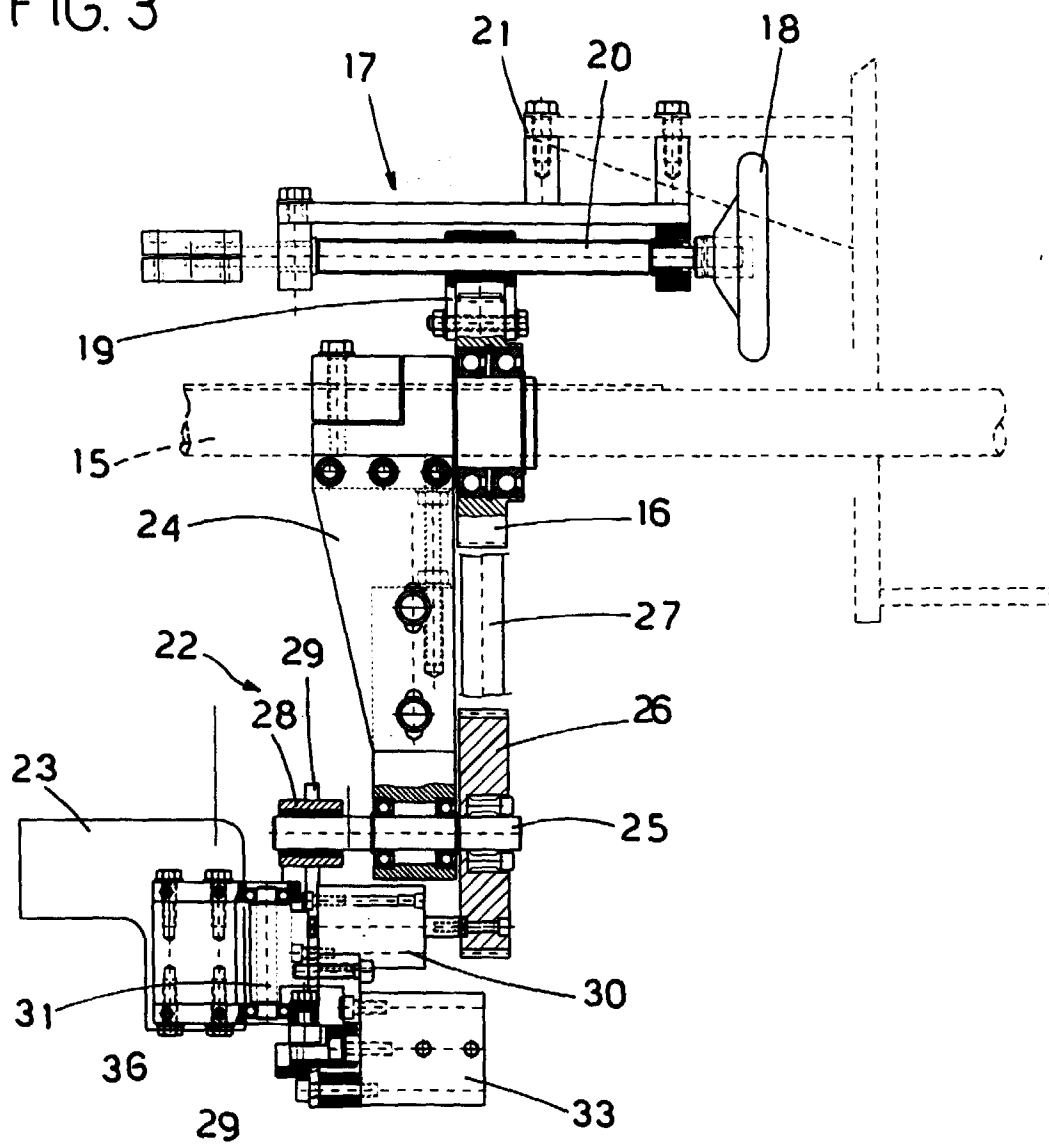


FIG. 5

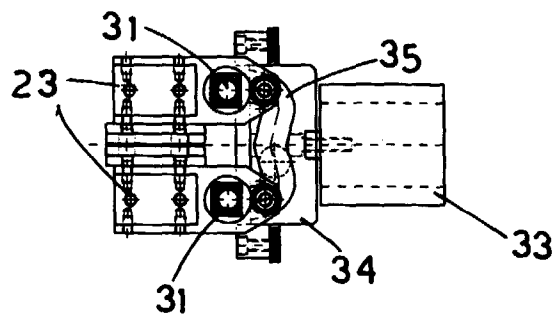
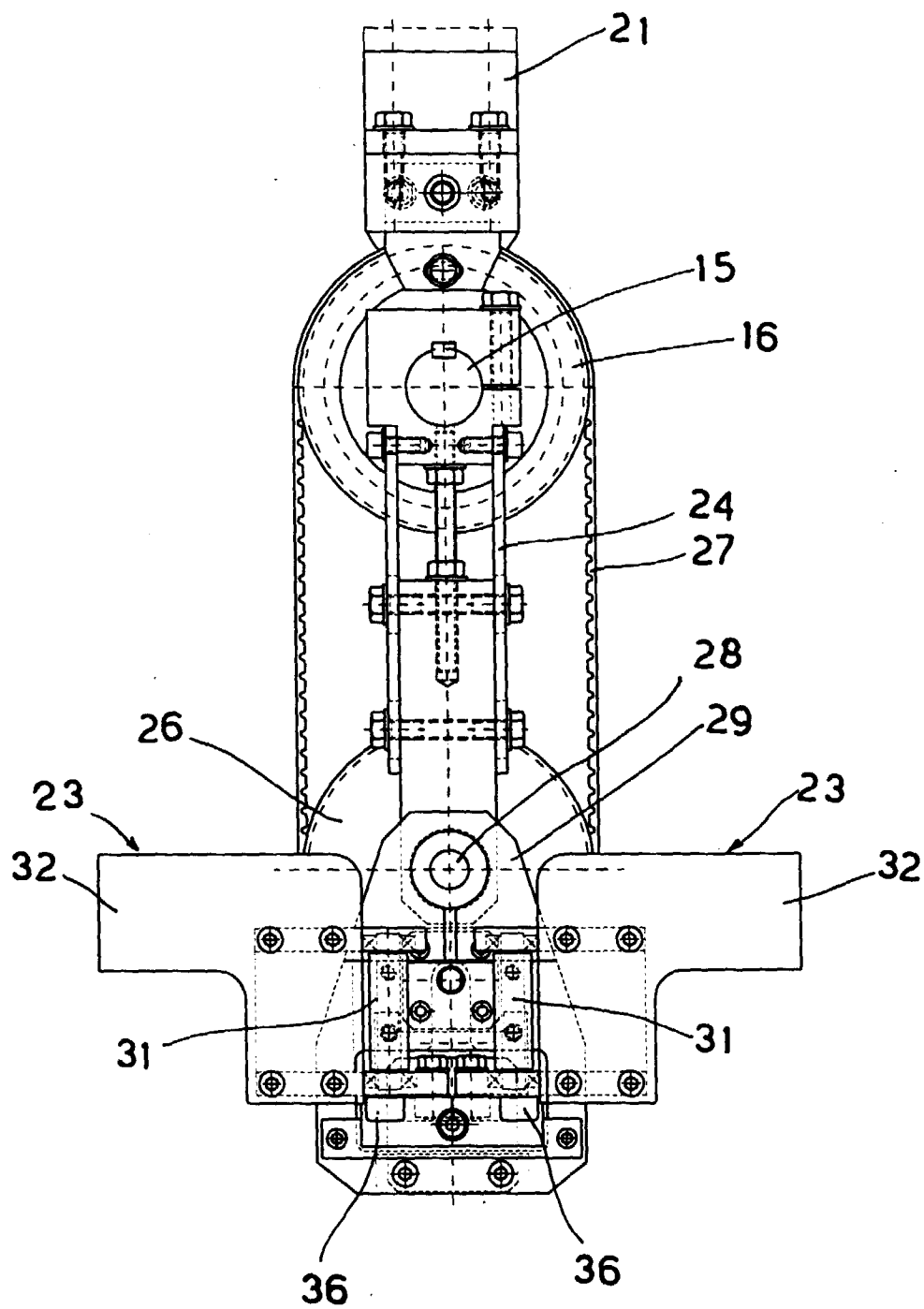


FIG. 4



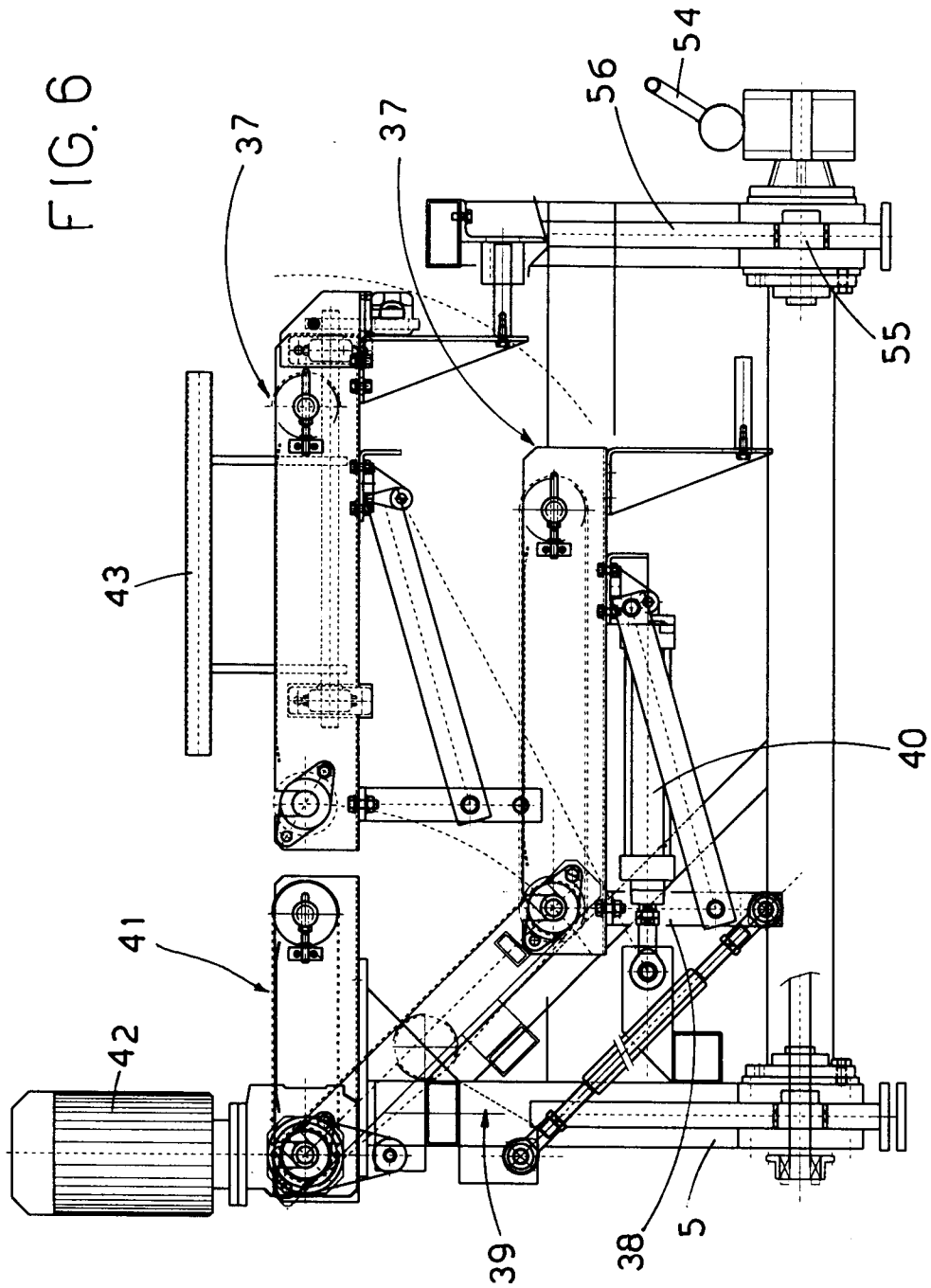


FIG. 7

