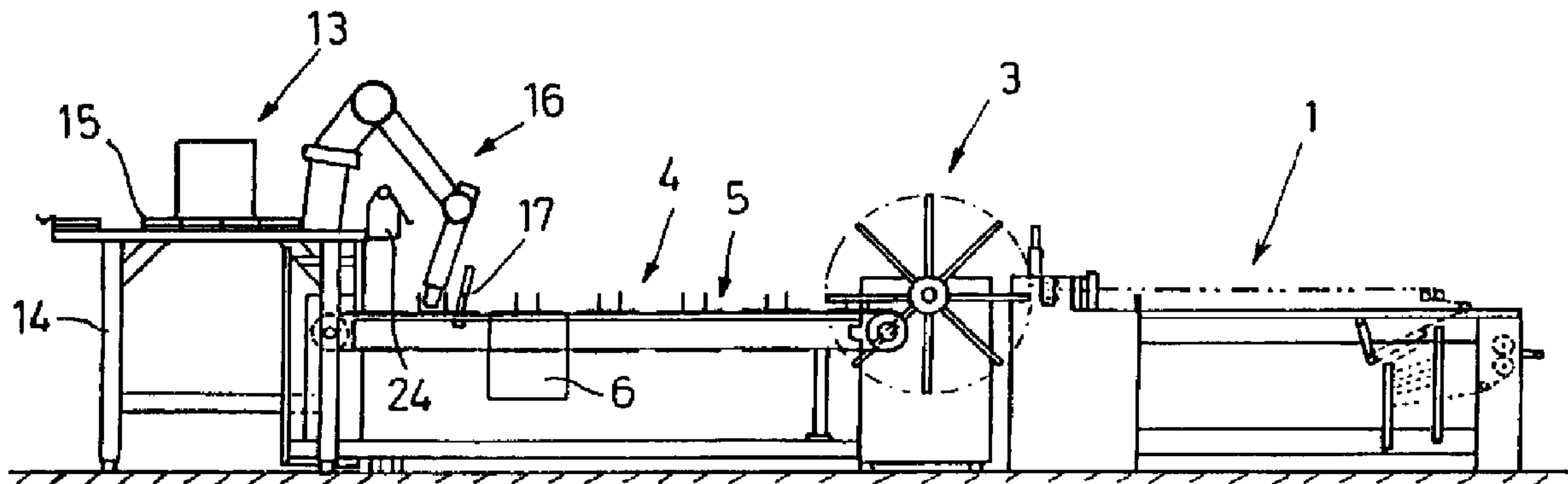




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(54) Titre : DISPOSITIF PERMETTANT DE PRODUIRE ET DE DECHARGER DES PILES DE SACHETS PLASTIQUE,
NOTAMMENT DES SACHETS POUR MACHINES AUTOMATIQUES
(54) Title: DEVICE FOR PRODUCING AND REMOVING STACKS OF PLASTIC BAGS, ESPECIALLY BAGS FOR
AUTOMATIC MACHINES



(57) Abrégé/Abstract:

The invention relates to a device for producing and withdrawing stacks of plastic bags, especially bags for automatic machines, in coordination with a gradually moving pin stack chain (4) from which the bag packages (6) are removed in a simplified and accelerated manner with the aid of a robot (16) that has a multifunctional hand (17) and automatically executes all essential manipulations and/or movements required for the formation and piling of the bag stacks and finally delivers them to an unloading station (62).

(57) Abstract

The invention relates to a device for producing and withdrawing stacks of plastic bags, especially bags for automatic machines, in coordination with a gradually moving pin stack chain (4) from which the bag packages (6) are removed in a simplified and accelerated manner with the aid of a robot (16) that has a multifunctional hand (17) and automatically executes all essential manipulations and/or movements required for the formation and piling of the bag stacks and finally delivers them to an unloading station (62).

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Device for Producing and Removing Stacks of Plastic Bags,
Especially Bags for Automatic Machines

Technical Domain

The present invention relates to a device for producing and removing stacks of plastic bags, especially bags for automatic machines, with a transverse-cut welding station for producing welded seams in a two-layer web of plastic foil and separating the plastic bags from said web of plastic foil, optionally with a punching station for producing stacking holes and a blocking station, as well as a stacking-pin conveyor system with a stacking-pin conveyor belt that moves incrementally, and a removal station that incorporates a robot with a gripper arm that is configured as tongs.

Prior Art

One problem with all bag-manufacturing machines that have an associated and subsidiary collector or stacker device is to so match the performance of the stacker or collector device to the bag-welding machine, which operates continuously, that as far

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as possible there are no or only a few interruptions in the bag-production cycle, when a finished bag is removed from the stacking station and an empty stack device is moved into the stacking station. It is known that the stack of bags can be stabilized by a wire bale when it is being produced. To this end, the stack of bags is either lifted off the stacking pins of the stacking-pin conveyor system and then installed on the arms of the wire bale with the bags lying loosely on top of each other, or else the arms of the wire bale are inserted into groove-like recesses in the stacking pins of the stacking-pin conveyor system and the stack is removed from the stack of bags in this way. Next, the stack of bags must be stabilized by locking washers or rubber plugs that are installed on the arms of the bale. Sometimes, the individual stacks of bags are covered on both sides with strips of paper or paper inserts. The manual removal of the stack of bags and its installation on the wire bale entails comparatively great physical effort on the part of an operator since the repetitious and identical series of movements has to be completed in a very short period of time because of the relatively production speeds that are involved.

If wire bales are not to be used to keep the individual bags together in the stack, the individual plastic bags can be blocked together to form a stack right on the stacking-pin

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conveyor belt, in that the bags are welded to each other by pressure and heat, this being done at specific locations, for example, in an area that is defined by a line of perforations. Certainly, the production of the plastic bags is made much simpler when this is done, especially since removal of the stack of bags from the stacking-pin conveyor system can be effected much better and, finally, it is made much easier to pack the plastic bags into cartons or the like. Nonetheless, the operator still has to check the quality of the packets of bags that have been blocked together and prepare them for packing in a carton, for example.

DE 38 34 115 shows that consideration has already been given to the possibility of automating the removal process in the removal station by using a robot. In the final analysis, however, this has not been done because of the complexity and the costs involved.

EP 0 384 281 A1 describes a device for stacking bags on bales, the stacking device having stack plates that move incrementally, the bags with the bales being stacked on these plates. The bales are stacked on the stack plates by an automatically controlled and driven robot that has a gripper arm. A robot with a gripper arm, evidently arranged as an addition, can

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remove the stack, blocked together by bales and rubber washers,
from the stack plate and place it on a removal conveyor belt.

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Description of the Present Invention

It is the objective of the present invention to create a device of the type referred to in the introduction hereto, which can be used to produce stacks of plastic bags, especially bags for automatic machines, and remove said stacks, and which further simplifies and speeds up the removal and transfer of stacks of bags, so that an operator positioned at an easily accessible machine location can confine his/her activities to checking the quality of the stacks of bags.

According to one aspect of the present invention, there is provided an apparatus for producing bags and delivering bags in stacks, said apparatus comprising: a bag-making machine having a crosscut-welding station for welding seams in a double-layer plastic foil web and separating plastic bags therefrom, and a stamping station for producing stacking holes in said plastic bags; a pin stacking conveyor having a pin stacking chain movable in steps along said bag-making machine whereby stacks of said bags are formed on respective pairs of pins of said chain and said stacks are carried by said chain to an end of said pin stacking conveyor; a single six-axis robot located at said end of said pin stacking conveyor and having a program-controlled multifunctional gripper hand and controlled as a function of movements of said pin stacking chain for all manipulations of each bag stack at said end of say conveyor; and a bracket-fixing and bracket-straightening device located within a range of motion of said hand for orienting wire brackets adapted to engage in holes of said bags, said gripper hand engaging said stacks and inserting the brackets into holes of said stacks and removing said stacks from said

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conveyor for subsequent packaging of said stacks with respective brackets engaged therein.

According to the present invention, the objective has been achieved in that the robot, which can be controlled
5 as a function of the relative movement of the stacking-pin conveyor belt of the stacking-pin conveyor system, is fitted with a multi-function, programmable hand, and is so positioned at the end of the stacking-pin conveyor system that essentially all of the manipulations and/or series of
10 movements required to form and move the stack of bags can be performed. In this connection, it is important that the relative movement of the stacking-pin conveyor in the longitudinal direction and--in order to compensate for track fluctuations--in the transverse direction as well be
15 superimposed for the robot, which is installed so as to be stationary. Using the means according to the present

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invention ensures that the operator need only perform a quality-control function, after which the finished packet of bags can be placed in a carton, for example, by the robot. Since the complete process of forming the stack of bags and moving it can be performed by a single robot, the movement sequences completed by the robot can be monitored very easily by the operator, who can operate or monitor several machines at one and the same time, depending on the type of bag being produced, and do this even at high production speeds.

This applies, in particular, in the event that the robot is arranged essentially at the longitudinal mid-point of the stacking-pin conveyor system and/or the robot is fixed in position in a supporting frame that is arranged above the plane of circulation of the stacking-pin conveyor and behind this. It is preferred that the supporting frame also be configured to accommodate the auxiliary means, e.g., wire bales, locking washers, paper inserts, or the like, and/or a powered, circulating bale feeder and/or a fixing and alignment unit that may be used to form the stacks.

All of the devices required to form and transfer the stack of bags can be mounted very simply and securely on a multi-function hand that has a first clamping rail and a second clamping rail that can be adjusted relative to the first clamping

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rail, if the multifunction hand has a carrier plate, preferably of sandwich-aluminum material, and a cross member that can be moved in guide rails secured on the carrier plate and which is simultaneously configured as a carrier for the upper clamping rail. The carrier plate is also useful for mounting auxiliary devices such as vacuum-operated holding devices and are used for the locking washers, paper inserts, and the like. The holding device for the locking washers can be configured as a vacuum-operated container, and the holding device for the paper inserts can be in the form of a vacuum-operated hopper.

For special purposes, a wire-bale holder can be installed on the front of the multifunction hand, and this can supply wire bales with bag packets to a removal conveyor that is common to a plurality of machines arranged one after the other, and is preferably configured as a high-level conveyor. In this case, the bales can be removed from a bale magazine by alignment-and-feed tongs and passed to the multifunction hand of the robot.

Should it be desired to dispense with blocking the bags with wire bales and locking washers, it is possible to use the robot-controlled multifunction hand that is arranged according to the present invention to remove stacks of bags--blocked together

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by welding--from the stacking-pin conveyor and then place them in a carton within a packaging station.

Another embodiment of the present invention provides that a collector device with a driving belt that circulates incrementally be arranged within the area of movement of the robot within the discharge station and that stack plates, each with a holding element, be secured to this belt at intervals. More expediently, provision is also made such that the driving belt is guided around guide rollers that are preferably arranged in a rectangle, at least one being driven; and in that, in addition, on the side that is proximate to the stacking-pin conveyor system there is a filler station and on the side that is essentially transverse to this there is a monitoring and/or operating station, and on the opposite side of the driving belt there is a discharge station.

Simplified operation is also facilitated in that an uneven number of stack plates are secured to the driving belt, which is configured as a circulating belt, and that the driving belt can move past the individual stations in double increments.

In a concrete embodiment the stack plates are prepared starting from a receiving position for the bag stacks in the filler station, in a starting position that follows at a single increment, in which a wire bale and, optionally, an inner,

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intermediate layer, for example in the form of a paper strip or a sheet of cardboard or the like in the wire bale. can be suspended in the holding element of the carrier plate.

In addition, an outer insert and a rubber plug or the like can optionally be installed on the arms of the wire bale in a finishing position that follows the start position, which can also be used for monitoring. Both the inserts and the rubber plug can be installed manually or, preferably, automatically by the robot.

In this way, a prepared stack plate and a completed stack plate can be moved alternately, in double increments, by the circulating belt as far as a bag-stack discharge position that is associated with the discharge station, within which each completed stack of bags can be removed from the gripper arm of the robot that removes the stack of bags from the stacking-pin conveyor system, and then placed in a packing unit.

Brief Description of the Drawings

The present invention will be described below on the basis of preferred embodiments that are shown in the drawings appended hereto. These drawings show the following:

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- Figure 1: A side view of a bag-producing machine with a stacking-pin conveyor system and a robot with a multifunction hand;
- Figure 2: A plan view of the machine shown in Figure 1;
- Figure 3: A perspective view of a single plastic bag;
- Figure 4: A corresponding drawing of a stack of bags made up of a plurality of plastic bags;
- Figure 5: A side view of a fixing and aligning unit;
- Figure 6: The associated plan view;
- Figure 7: The fixing and aligning unit that works in conjunction with a bale-feed plate;
- Figure 8: A plan view of two identically configured machines arranged next to each other;
- Figure 9: A plan view of two machines identically configured as mirror images of each other, arranged next to each other;
- Figure 10: A front view of the multifunction hand of a robot;
- Figure 11: The associated side view;
- Figure 12: A plan view of a multifunction hand;
- Figure 13: One part of a multifunction hand;
- Figure 14: One part of a transfer device, with a bale magazine and alignment-and-feed tongs between the

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multifunction hand of the robot and the bale magazine;

Figure 15: A plan view of four machines arranged next to each other, with a common conveyor belt configured as a high-level conveyor;

Figure 16: The associated front view;

Figure 17: A plan view of a machine in which the packet of bags is blocked in the area of the stacking-pin conveyor system, with removal within a packaging station;

Figure 18: A plastic bag with blocking points made by welding;

Figure 19: A packaging station at larger scale;

Figure 20: One part of the stacking-pin conveyor system with a collector device;

Figure 21: A cross section through a stack of bags held together by a wire bale, at larger scale.

Ways to Execute the Present Invention

Figure 1 shows a bag-making machine 1 that is configured and equipped to produce plastic bags, in particular so-called machine bags. A web of thermoplastic foil is drawn off a supply roll in a supply station (not shown herein); this can be in the form of a web of tubular foil, for example. Within the

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bag-making machine the web of tubular foil passes over drive rollers and tensioning rollers (not shown herein). A hole-punching device (not shown herein) and a transverse-cut welding device are used to produce the plastic bags 2 (Figure 3) by a method that is described in greater detail below. A transfer device 3 follows the transverse-cut welding device, and this in its turn is followed by a stacking-pin conveyor system 4 that incorporates a stacking-pin conveyor 5 that is driven so as to circulate incrementally. Individual plastic bags are collected on the stacking-pin conveyor to form packets made up of stacks of plastic bags 6, as is shown in Figure 1. A bag stack 6 of this kind is shown in greater detail in Figure 4. Before this is described in greater detail, Figure 3 will be used to show that, as a so-called machine bag, each single plastic bag 2 has an upper tab 8 that extends beyond one end; two holes 9 for suspending the bag are punched in this tab, and tear-off perforations that extend to the upper edge 11 of the tab 11 are associated with these holes 9.

After a stack of bags has been formed on the stacking-pin conveyor 5, at the end of the stacking-pin conveyor system 4 the stack of bags 6 is moved to a discharge station 13. Within the area of the discharge station 13 there is a supporting frame 14, on the top of which there is a carrier plate 15 to which a

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robot 16 with a gripper arm 10 and a gripper hand 17 are fixed in place. The robot 16 has a total of six axes of rotation and using the gripper hand is able to remove the nearest stack of bags 6 from the stacking-pin conveyor and raise it at least as far as the plane of the carrier plate 15 of the supporting frame 14. A plate-type carousel that is driven so as to circulate is arranged on the carrier plate 15; essentially, this comprises four guide rollers 18, of which one is driven, and a driving belt 19 that is routed around these. Carrier plates 21 are secured to the circulating drive belt 19, and a wire bale 23 is clamped to each of these through a clamping element 22 (Figure 7). As the plate carousel turns, the carrier plates 21 with the wire bales 23 move into the area of fixing and alignment unit 24 that is secured to the carrier plate 15 of the supporting frame 14, as is shown in greater detail in Figures 5 to 7. As can be seen, in particular, from Figure 6, the fixing and alignment unit 24 has an elongated arm 25 that comprises at its front end two plates 26 with a clamping element 27 that is arranged on one such plate. The fixing and alignment unit 24 can be so adjusted by an adjusting device (details of which are of no relevance here) that the plates 26 of the one arm pass through the wire bale 23 that is secured to the carrier plate 21 through the clamping element 22. Additional alignment and fixing of the wire bale 23 is achieved

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in conjunction with an additional angle piece 28 with an upper arm 29 and a spring element 32 that rests on a bar 31.

As soon as the wire bale 23 has been secured, the packet of bags 6 that has been removed from the stacking-pin conveyor 5 by the gripper arm 17 of the robot 16 is moved onto the projecting arms of the wire bale, by the suspension holes 9. Should this be desired or necessary, prior to the stack of bags 6 being moved, a paper strip or a paper insert 33 can be placed in the fixing and the alignment unit 24. A supply container for such paper inserts 33 can be installed, for example, on the carrier plate 15 of the carrier frame 14, as is shown in Figure 2. The stack of paper inserts can, of course, also be arranged alongside the carrier frame 14. If necessary, once the stack of bags 6 has been installed on the fixed wire bales 23, a paper strip or a paper insert 33 and finally a locking washer 34 in the form of a rubber plug or the like are installed. These rubber plugs 34 are stored, for example, in a spiral vibrating hopper 35 either on the carrier plate 15 or adjacent to this. As part of a quality-control process, the packet of bags that has been blocked in this way with the wire bales and the locking washers that can be installed by the operator is checked to see that the individual bags are correctly positioned and is then moved away

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either manually or by the gripper hand 17 of the robot 16, and packed, for example, in a carton.

If the robot is arranged in this way, according to the present invention, the layout of the machines does not play any noteworthy role, i.e., in addition to one machine it is possible for two identical machines, or two machines that are arranged so as to be mirror images of each other, to be monitored by one operator, as is shown in Figures 8 and 9.

The configuration of the gripper hand 17 of the robot is a great importance in order to ensure that these demands are satisfied in the best possible way. Figures 10 to 13 show the tong-like gripper arm in the form of a multifunction hand 17 in detail. The multifunction hand is activated by an actuator unit 36 that is secured so as to be able to pivot on an arm of the robot 16 at point 37. The actuator unit 36 is located on an angle piece 38 to which an essentially trapezoidal carrier plate 39 is secured. This carrier plate 25, which is preferably of corrugated aluminum plate, has two guide rails 41 that are spaced apart on its front edge, in each of which a cross member 43 is supported so as to be able to move axially over a guide element 42. In cross section, the cross member 43 incorporates a plurality of T-groove profiles. The guide element 42, on the one

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hand, and a punch 44 of the actuator 36, on the other, are installed in the individual grooves, and on the front edge there is an L-shaped clamping rail 45 and on the underside, angled collector pins 46 that are spaced apart by the same distance as the suspension holes 9 in the plastic bag 2. Finally, there can be wire-bale holders 47 on the multifunction hand 47; the purpose of these holders 47 will be described in detail below. A lower clamping rail 48 is secured at the lower end of the carrier plate 39, and this works in conjunction with the upper clamping rail 31. Both clamping rails can have an elastic covering 49, 51. In the embodiment that is shown, the upper clamping rail 31 is formed from two rail sections. Two vacuum-operated canisters 52 for manipulating the above-discussed locking washers 34, and two vacuum operated hoppers for the above-described paper strips or paper inserts 33 are arranged in pairs on the back of the carrier plate 39. As is shown in Figure 13, the two vacuum canisters 52 are connected to a vacuum (not shown herein) through a system of channels 54. This also applies to the vacuum-operated hopper 53. Alternatively, the two vacuum-operated canisters 52 can perform both functions.

The multifunction hand 17 of the robot 16 works in detail as follows: in order to remove paper strips or paper inserts 33, the

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multifunction hand 17 is moved into the appropriate position by means of the robot control system so that once suction is applied to the vacuum-operated hoppers 53 a paper insert can be removed from the paper magazine. The paper insert is then laid upon the wire bale 23 that is being held in position. To this end, a blast of air is applied to the vacuum-operated hopper 53. Immediately thereafter, a stack of bags is removed from the stacking-pin conveyor system 4 and hung on the correctly oriented wire bale in the fixing and function unit 24. Then a further paper strip or paper insert 33 is picked up by means of the robot or the multifunction hand and installed on the wire bale 23. Finally, the locking washers or rubber plugs 34 are picked up with the help of the vacuum canister either singly or in pairs and pressed onto the arms of the wire bale 23. In the next position of the transport carousel, The packet of bags is checked by the operator, aligned if this is required, and removed from the holder manually, when the rubber plugs are pressed firmly into position once again, after which the packet of bags is deposited in a carton. If necessary, this can also be done automatically by the robot.

Figures 14-16 show an arrangement that differs from the embodiments described above in that here the wire bales 23 are accommodated in a bale magazine 55 (not shown in greater detail

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herein). Between the bale magazine 55 and the robot 16 there is an alignment and feed gripper 56 that is supported so as to be able to pivot about a point shown at 57. With the help of this alignment and feed gripper, wire bales 23 can be removed singly from the bale magazine 55 and moved into such a position that a stack of bags 6 can be positioned on the wire bale 23 with the help of the multifunction hand of the robot 16. Once this has been done, the wire bale is released from the feed and alignment gripper 56 and transferred by the robot 56 to an elevated conveyor belt that is in the form of a high-level conveyor 58. In this way, it is possible to arrange four machines one behind the other, as is shown, for example, in Figure 15, and to have a common drive belt 58 associated with these. Each machine is provided with a dedicated robot 16 and each machine has a dedicated bale magazine. Each bale magazine has a feed, alignment, and fixing gripper 56 that can be adapted to the width of the particular bales. In order that the wire bales can be held securely when being transferred and moved, the wire bale holders 47 that are described above being located on the multifunction hand.

If blocking is not to be effected with wire bales 23, a different procedure is used. In this case, the stack of bags is

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blocked together in the area of the stacking-pin conveyor system 4 in a manner that will be described in greater detail below. The stack of bags that has been blocked together in this way can be deposited in a carton by the robot 16. This procedure is described in greater detail on the basis of Figures 17 to 19. The stack of bags is formed in the station 4.1 of the stacking pin conveyor system 4 in the known manner. In station 4.2, the individual bags are blocked together to form a stack of bags in the known manner with the help of a blocking device, by welding. The blocking can be in the form shown in Figure 18. Using heater plugs, the stack of bags is blocked together in a perforated edge area 59, or more precisely in the area of preferably pre-punched holes 61. Manual or automatic quality control is effected in the stations 4.3, 4.4, and 4.5; details of this process are of no interest here. What is important is that once this quality control has been completed, the stack of bags is removed from the stacking-pin conveyor system 4 by the multifunction hand 17 of the robot 16, and finally moved to a discharge station or to a packaging station 62, where the robot 16 places the packet of bags in a carton 69 that is brought - as indicated by the arrow 63 - from left to right as far as the actual removal position, whereupon the carton is moved in the direction indicated by the arrow 64 and then moved to a removal point as indicated by the

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arrow 65. The manner in which the stack of bags is discharged is shown in greater detail in Figure 19. It can be seen that the packaging station 62 incorporates an elevating platform 66 that can be adjusted for height. In addition, this also has adjustable bulkheads 67, 68 that are hinged on at least one side in order that empty cartons can be slid into the discharge station. Because of the adjustable bulkheads 67, 68, the device can be adapted to accommodate cartons 69 having different dimensions. Within the upper area of the packaging station 62 there is a filler shaft 17 through which intermediate bottoms 73, 74 can be slid into and removed from the filler shaft 71 at the side by an adjuster device 72. The inserted position is shown with respect to the upper intermediate bottom 73, 74, whereas the withdrawn position of the intermediate bottom 73, 74 is shown in the lower position. These intermediate bottoms ensure that when the stack of bags is inserted into the device, it does not have to drop too far. The carton can be raised by the elevating platform 66 for the same purpose, as is shown by the dashed line 9. Finally, release flaps can be arranged at the lower end of the filler shaft 71 in order to make it even simpler to empty the shaft. An arrow 76 indicates a ram that pushes the stack of bags downwards so that any air between the individual bags is expressed, thereby

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ensuring trouble free packaging of the stack of bags into the carton 69.

In Figure 20, the collector device has a filler station 80 that has a receiving station 81 as well as a monitoring and/or operating station 82 and finally the discharge or removal station 13 that is located on the opposite side of the drive belt 19.

In the area of the discharge station 13 there is a packaging device 83 that corresponds to the above described packaging station 62; this has a removal station 84 for the stacks of bags. The packaging units, for example cartons 69, can be delivered to the feed platform 90. The cartons filled with stacks of bags can be moved along an intermediate platform 85 along a roller conveyor 86. Between the packaging station 83 and the stacking-pin conveyor system 4 there is a separate suspension device 87 that incorporates a suspension stand 88 upon which stacks of bags that were not assembled correctly can be hung with the help of the robot 16. To this end, the robot can be controlled by a control device that constitutes part of the stacking-pin conveyor system (not shown herein) for example, a light barrier/photocell or the like.

A stack of bags 6 of the type discussed herein is shown in detail in Figure 21. This consists, on the one hand, of the actual stack of bags 6 that is made up of a plurality of

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individual plastic bags, as well as the inner insert 33 and the outer insert 34. These parts are held together by the wire bale 23 that has already been described, and finally with the rubber plugs 34 or the like. In principle, the stack of bags can be made up of bags that had been blocked together in a manner known per se. In this case, the wire bales are only used for transportation.

The device that is shown in Figure at 20 works as follows:

The robot 16 that is provided with a total of six axes of rotation is capable of removing a stack of bags 6 from the stacking pins of the stacking pin conveyor 5 by means of the multifunction hand 17 and then moving this stack of bags into the receiving position 81 of the filler station 80, where said stack of bags is hung on a stack plate 21 that is provided with the wire bale 23, in a manner described in greater detail below. Flaps that can swing upwards are provided in this area in order to simplify removal of the suspended stack of bags from this stacking-pin conveyor system, so that the packet of bags can be removed in an essentially horizontal position. At the beginning of an operating cycle, a wire bale 23 is first hung in the holding the element of the stack plate 21 that is located there,

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in a start position 89 of the control and/or operating station 82 that follows the starting position 81 in one step of the operating cycle; at the same time, the inner insert 33 is installed on the wire bale. The conveyor 19 is then advanced automatically by two increments. This means that the packet of bags located in the receiving position 81 - described above - moves into a finished position 91 of the control and/or operating station 82, where the operator then installs the outer insert 33 and the rubber plugs 34, as shown in Figure 21. Whereas the starting position 89 shows a prepared stack plate 21, a finished stack plate can be seen in the finished position 91 that follows one increment at a time. After a new stack of bags has been taken from the stacking-pin conveyor system 4, the prepared stack plate and the finished stack plate follow each other in alternation as far as the bag-removal position 84 associated with the discharge station 30, in which the completed stack of bags is removed from the gripper arm 10 or the multifunction hand 17 of the robot 16 and placed in the carton 69. The now empty stack plate in the bag stack removal position 84 that is one increment ahead of a prepared stack plate 21 in an intermediate station 92 is then moved forward two increments as far as a middle, empty position 93 in the area of the stacking-pin conveyor system 4 in

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order that it is once again in the start position 89 after the next two increments.

The present invention is not restricted to the embodiment shown herein, but permits modifications within the context of the claims, so that it is possible for the robot that is used according to the present invention to be used with other types of machinery, for example, shirt packaging machines that similarly produce packets of bags that have to be packaged. In addition, the guide rollers of the plate-type carousel can be replaced by a wheel-shaped or circular plates.

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CLAIMS:

1. An apparatus for producing bags and delivering bags in stacks, said apparatus comprising:

a bag-making machine having a crosscut-welding station for welding seams in a double-layer plastic foil web and separating plastic bags therefrom, and a stamping station for producing stacking holes in said plastic bags;

a pin stacking conveyor having a pin stacking chain movable in steps along said bag-making machine whereby stacks of said bags are formed on respective pairs of pins of said chain and said stacks are carried by said chain to an end of said pin stacking conveyor;

a single six-axis robot located at said end of said pin stacking conveyor and having a program-controlled multifunctional gripper hand and controlled as a function of movements of said pin stacking chain for all manipulations of each bag stack at said end of said conveyor; and

a bracket-fixing and bracket-straightening device located within a range of motion of said hand for orienting wire brackets adapted to engage in holes of said bags, said gripper hand engaging said stacks and inserting the brackets into holes of said stacks and removing said stacks from said conveyor for subsequent packaging of said stacks with respective brackets engaged therein.

2. The apparatus defined in claim 1 wherein said robot is mounted above a rotation plane of the pin-stacking chain on a support frame located downstream of said conveyor and receiving said bracket-fixing and bracket-straightening device and means for applying safety members to said bracket and paper layers to said stacks.

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3. The apparatus defined in claim 1 wherein said multifunctional gripper hand has first and second clamping bars displaceable one toward the other, one of said clamping bars having at a lower end a mounting plate and the other of
5 said clamping bars being fastened on a crossbeam formed with grooves for guide elements mounted on said mounting plate.

4. The apparatus defined in claim 3, further comprising catch pins on said crossbeam angled obliquely forwardly of said hand, said clamping bars having clamping
10 surfaces at least partly provided with an elastic lining.

5. The apparatus defined in claim 4 wherein a holding device operating with negative pressure is provided on a side of said mounting plate for engagement with a safety member applicable to the wire bracket of a stack.

15 6. The apparatus defined in claim 1, further comprising a bracket magazine for supplying the wire brackets to said device.

7. The apparatus defined in claim 1, further comprising a transport belt for delivering the stacks to a
20 packaging machine.

8. The apparatus defined in claim 1, further comprising a boxing station within a range of motion of said gripper hand for receiving cardboard boxes in which said hand deposits said stacks.

25 9. The apparatus defined in claim 1 wherein a collection device is provided within a range of motion of said gripper hand and includes a timed-revolving drive belt on which spaced-apart stacking plates each with a holding element, are fastened.

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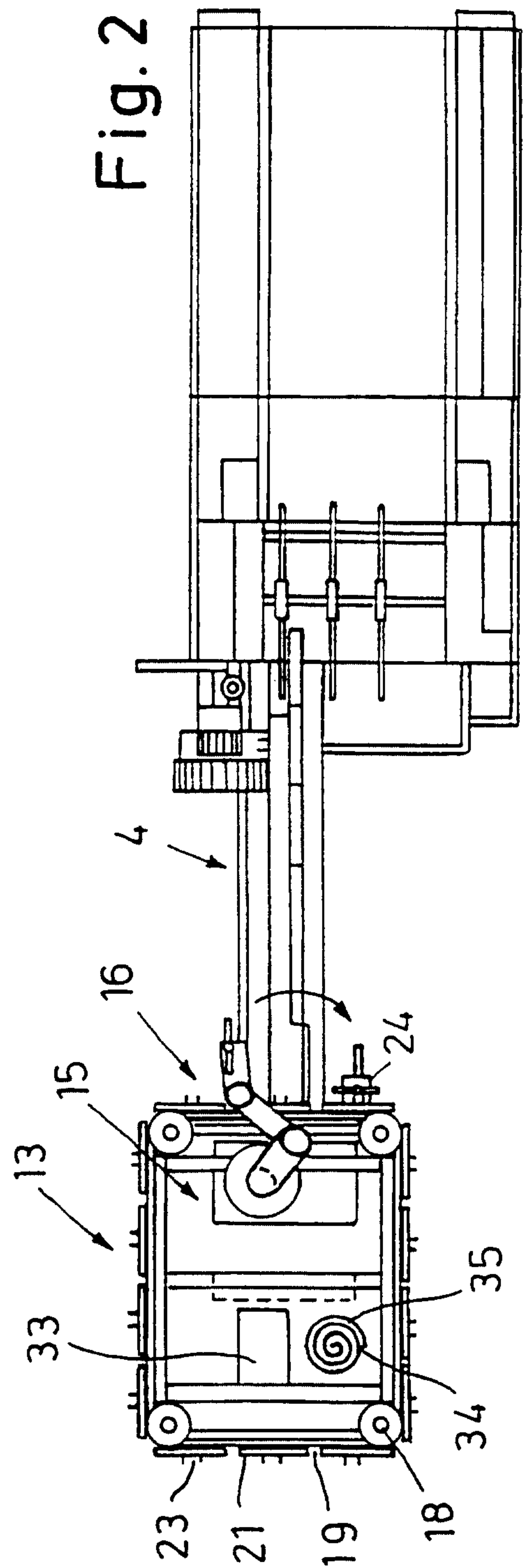
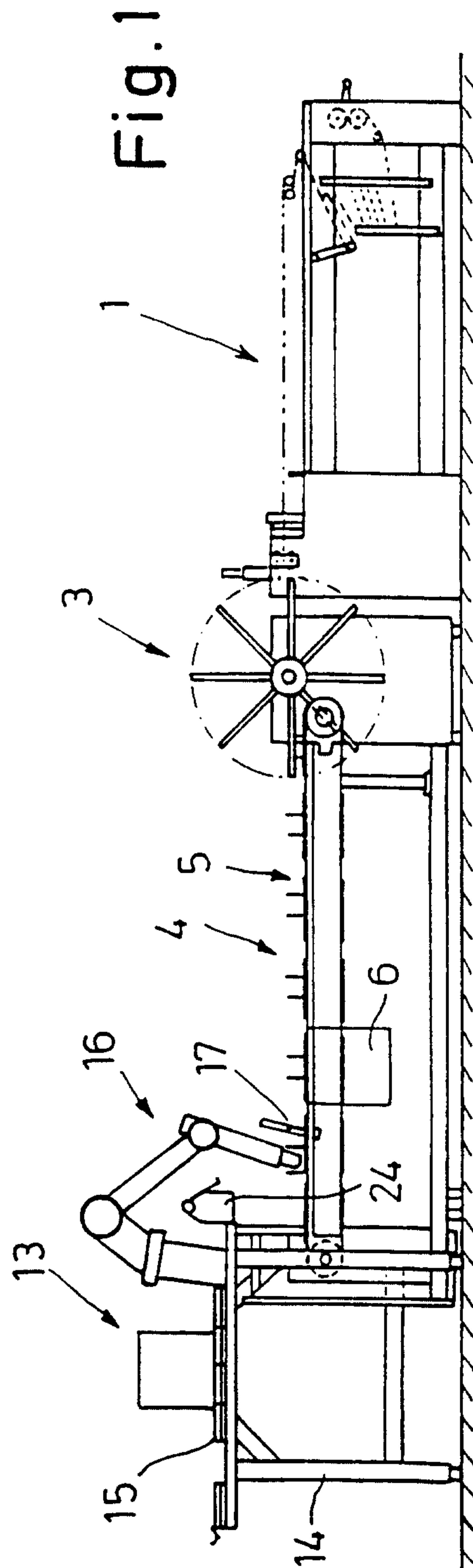
10. The apparatus defined in claim 9 wherein said drive belt is guided about guide rollers located at corners of a rectangle.

11. The apparatus defined in claim 1, further
5 comprising a photoelectric unit on said pin-stacking conveyor for examination of finished bag stacks.

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OTTAWA, CANADA

PATENT AGENTS



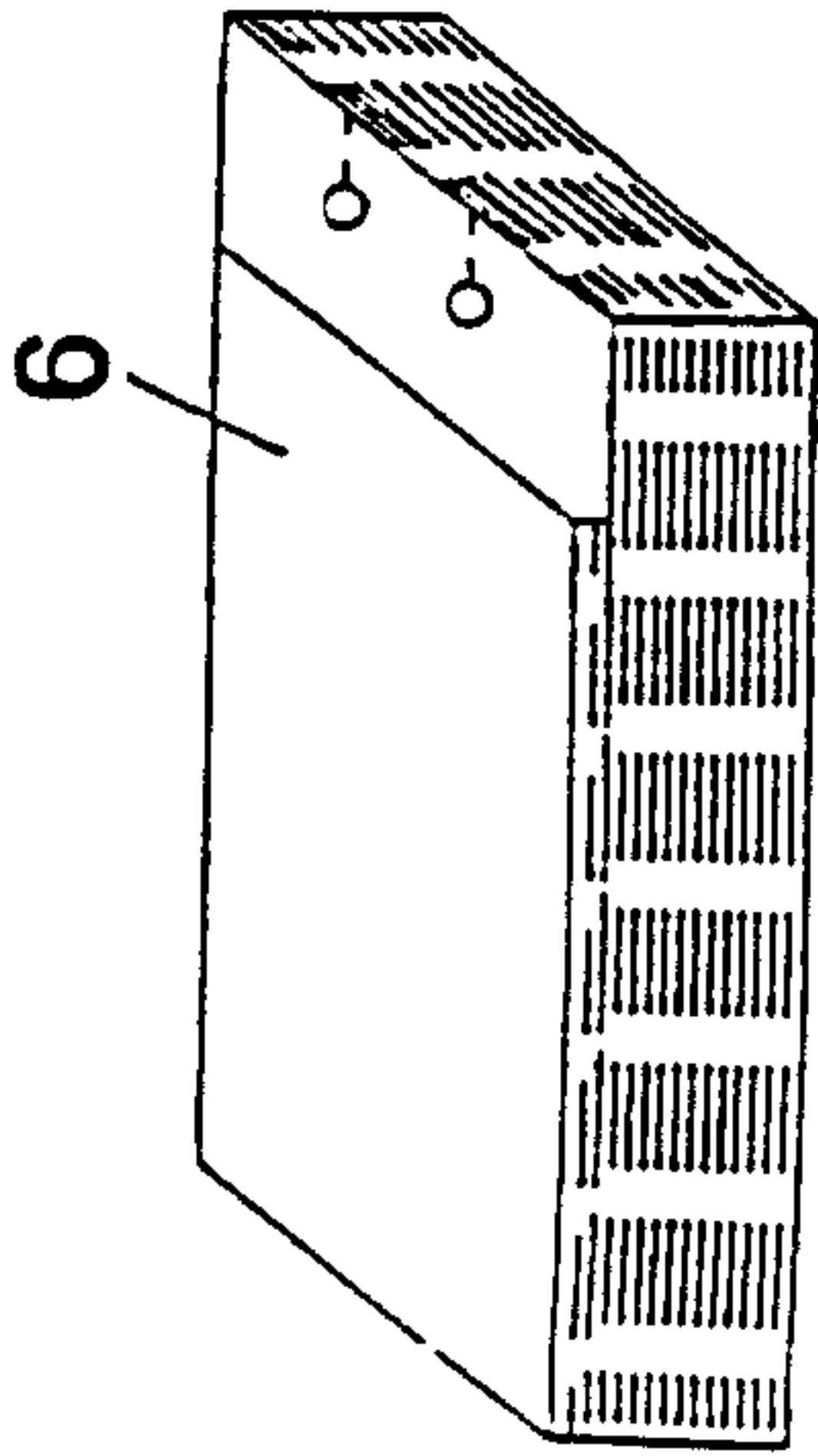


Fig. 4

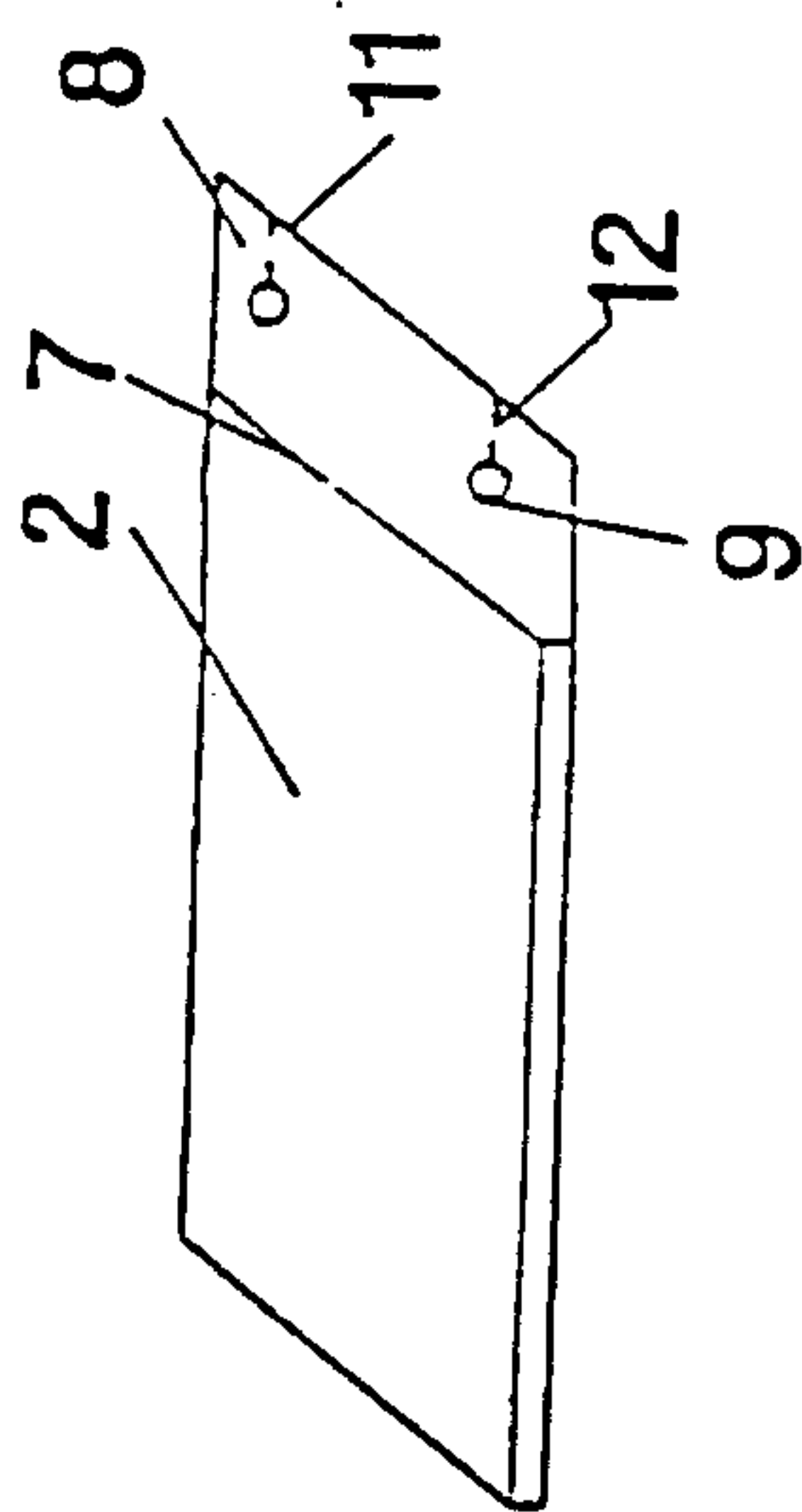


Fig. 3

Fig. 12

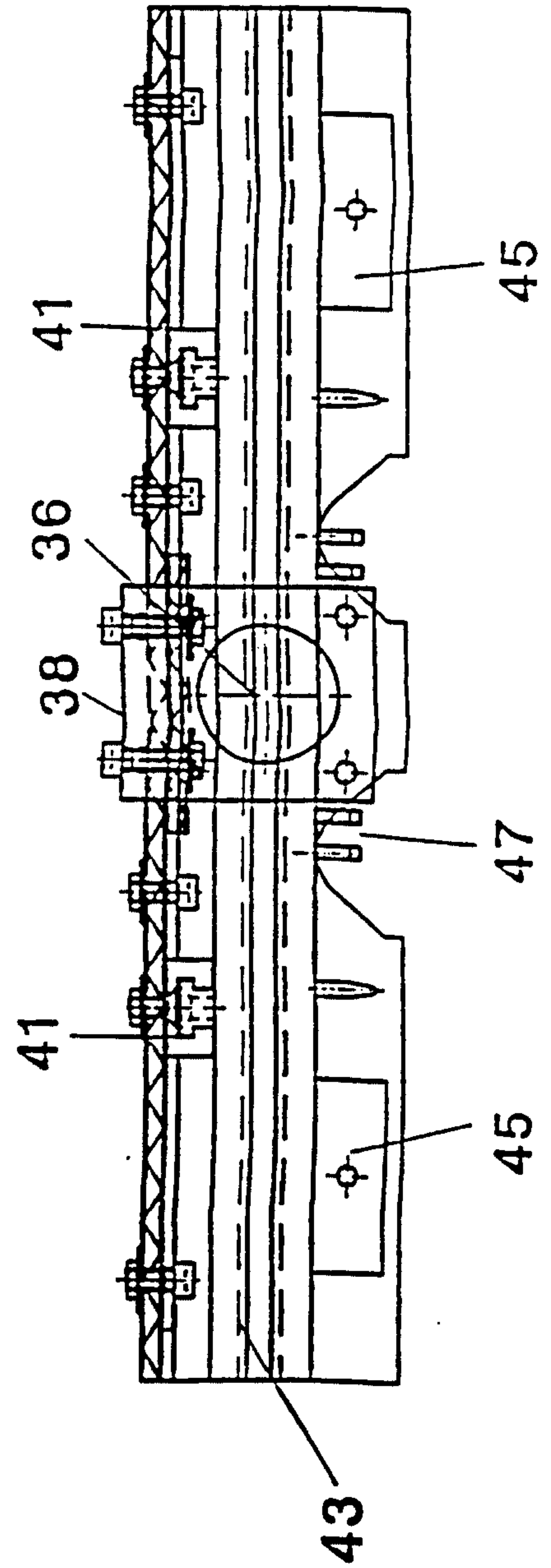
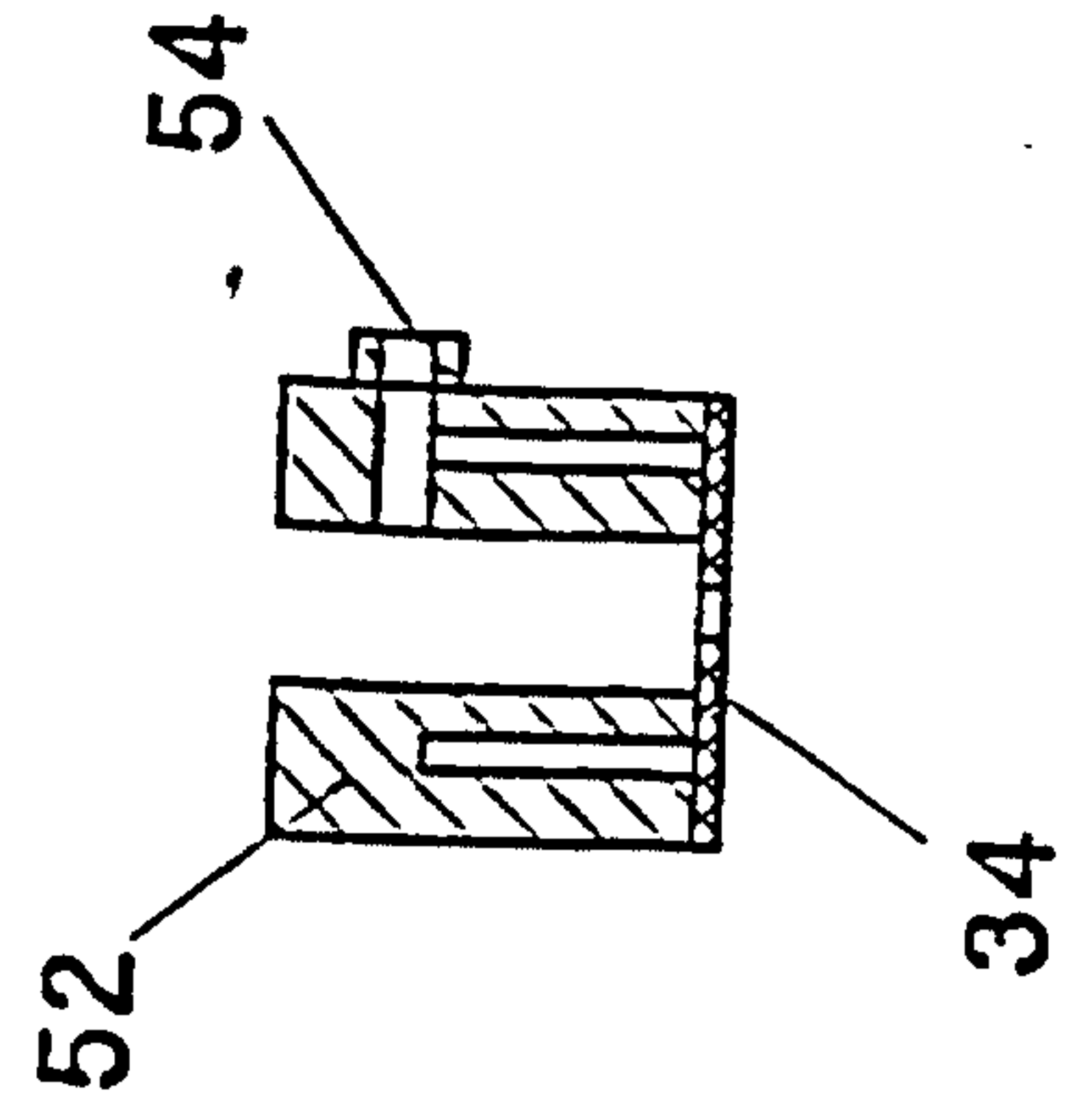


Fig. 13



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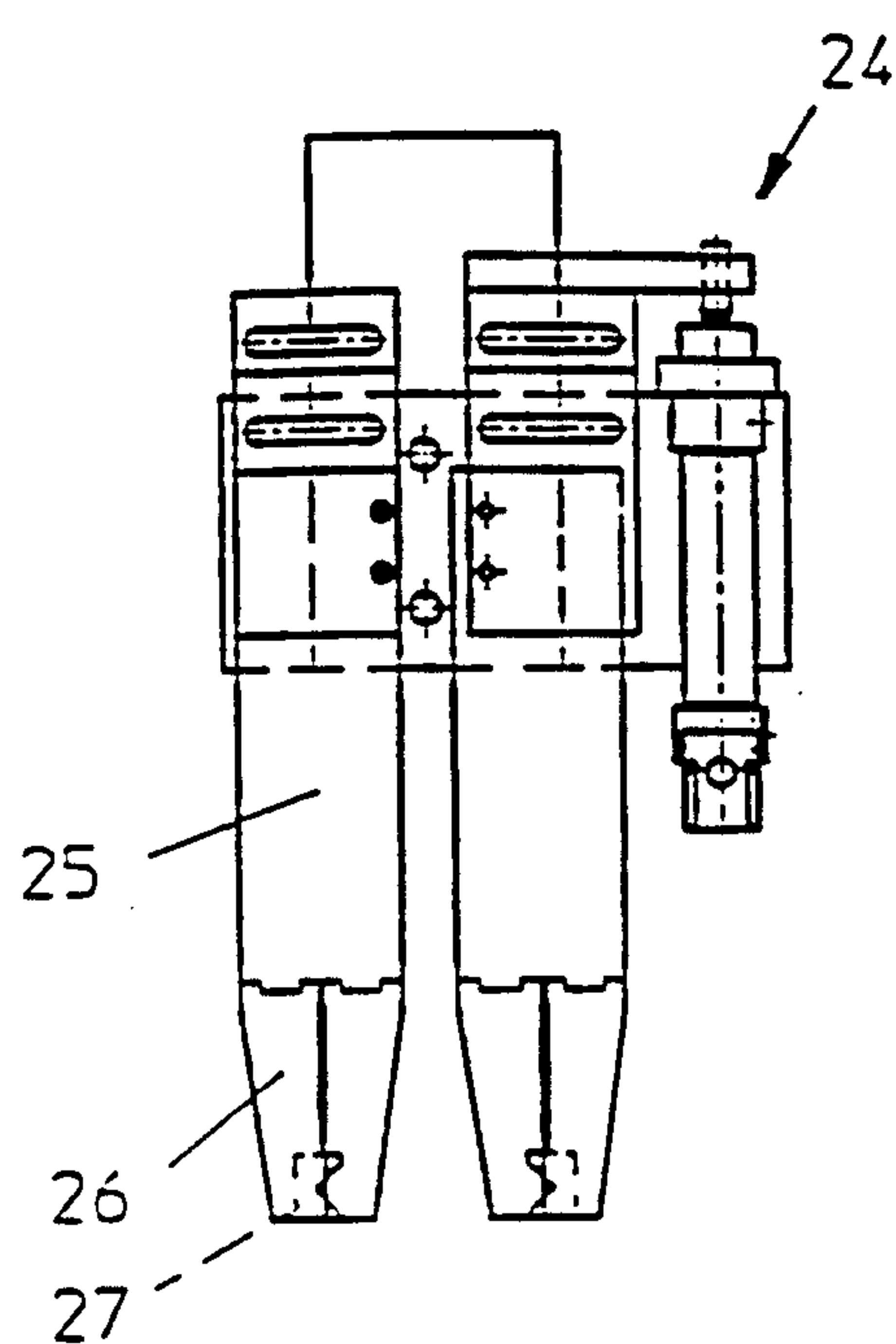


Fig. 6

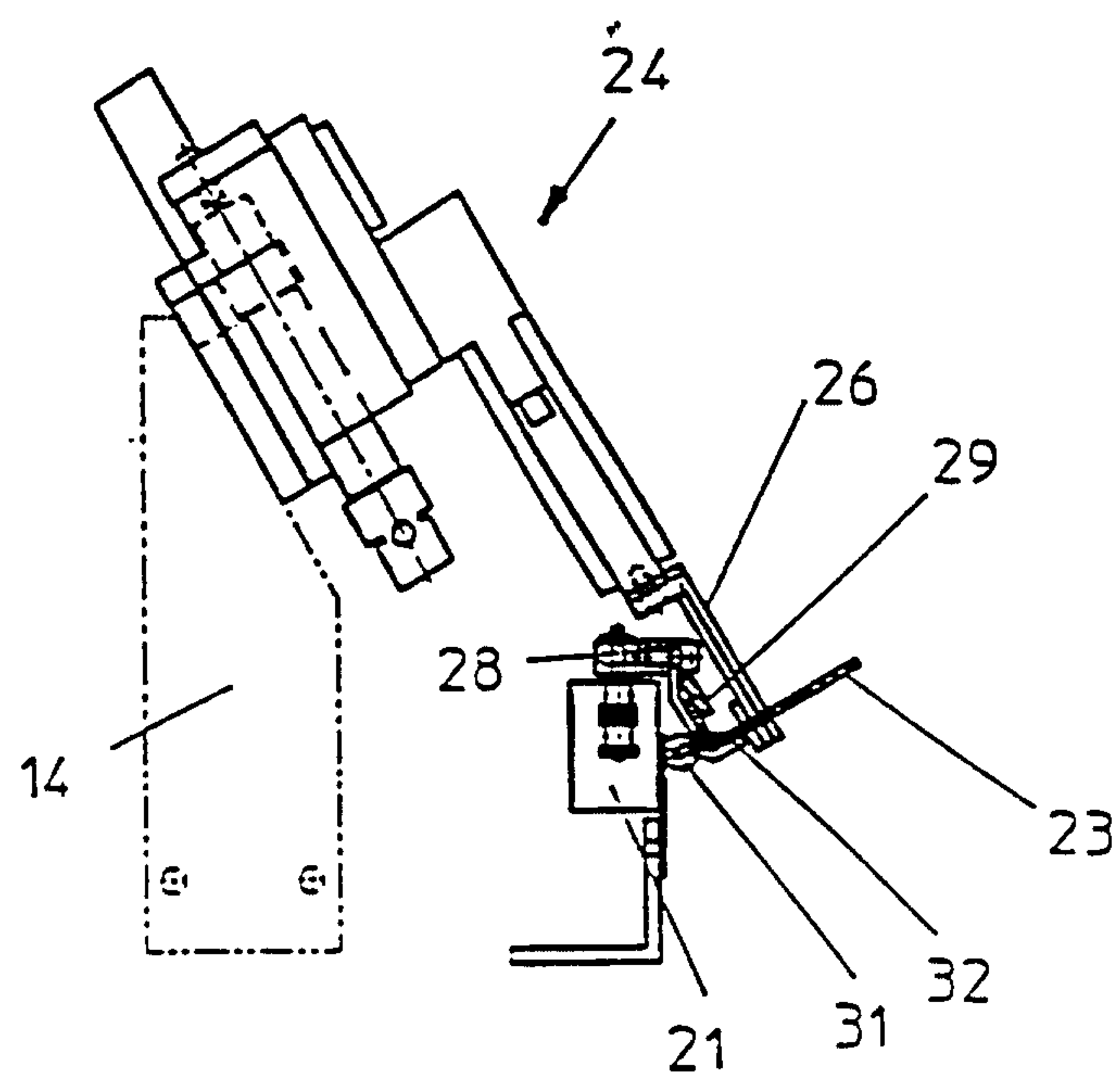


Fig. 5

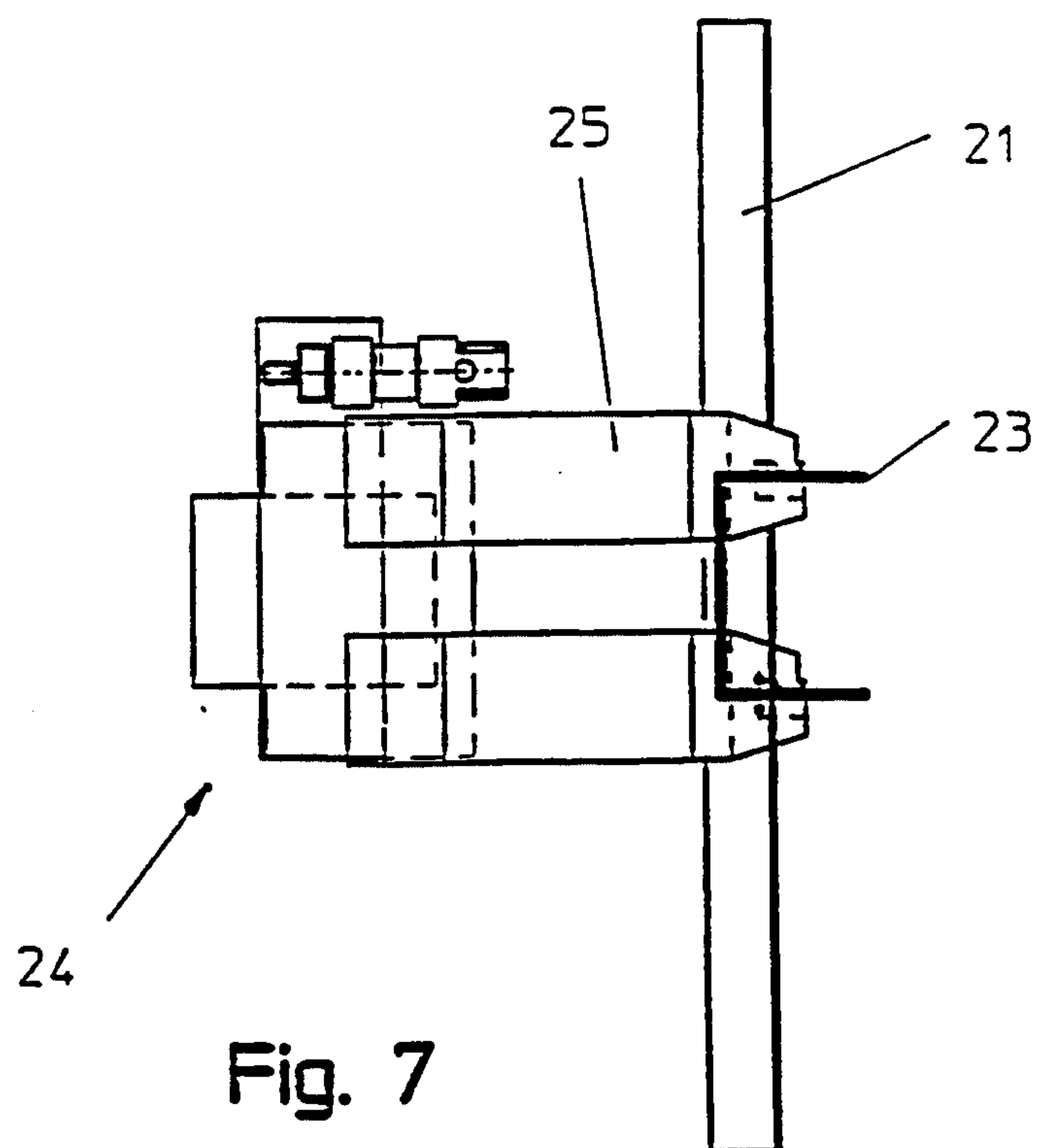


Fig. 7

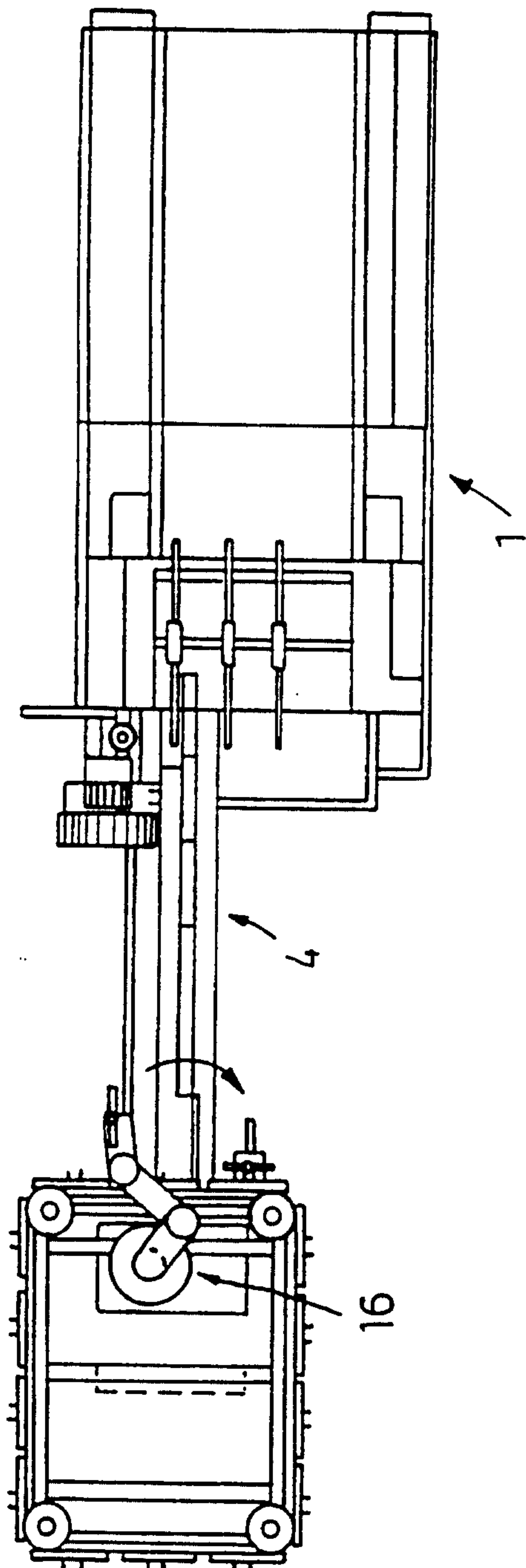
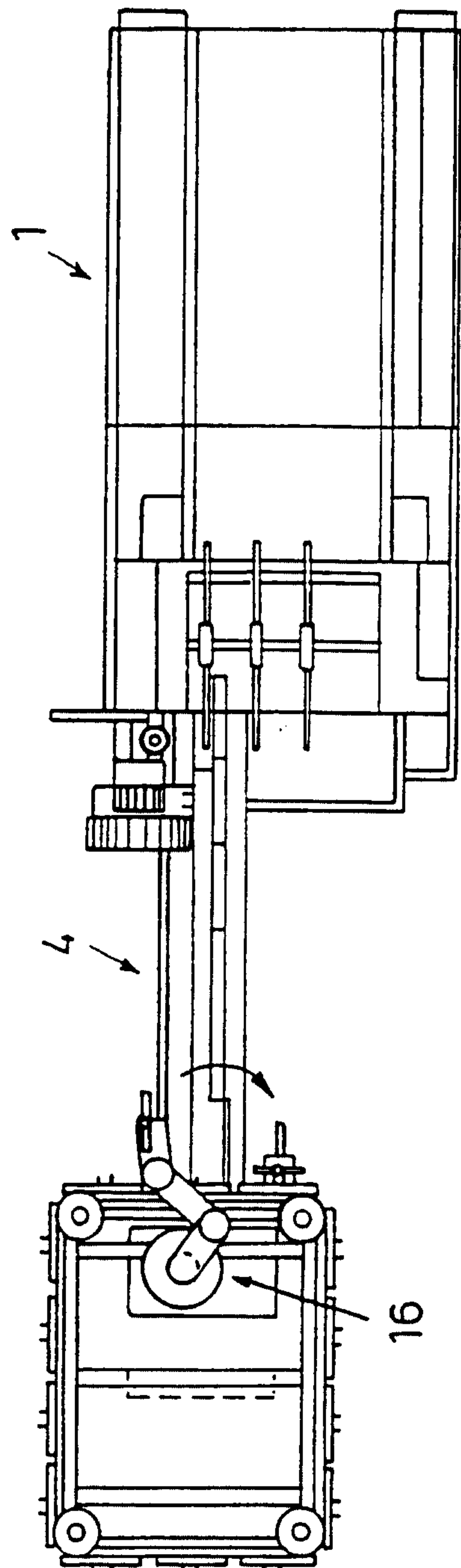
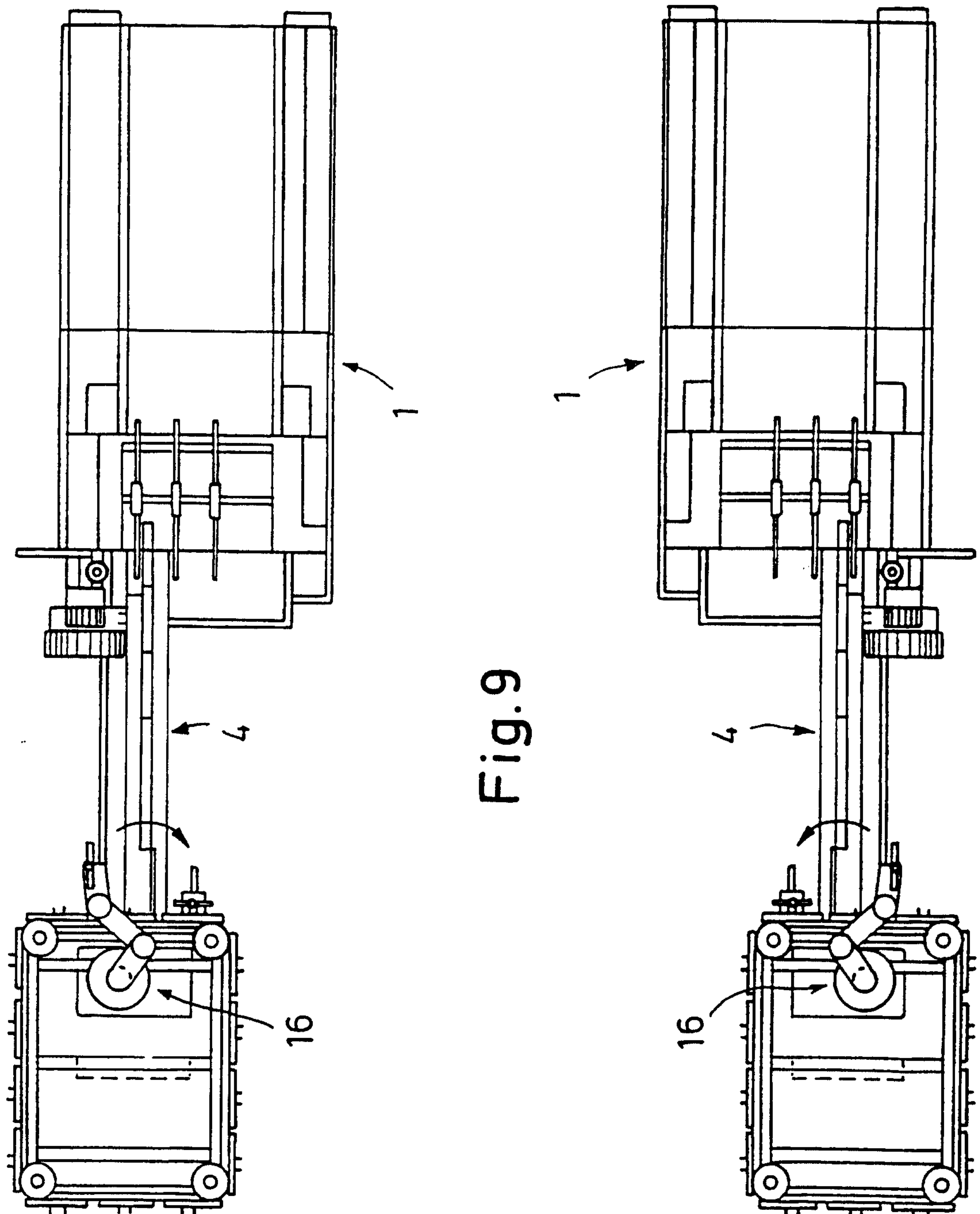


Fig. 8





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Fig.10

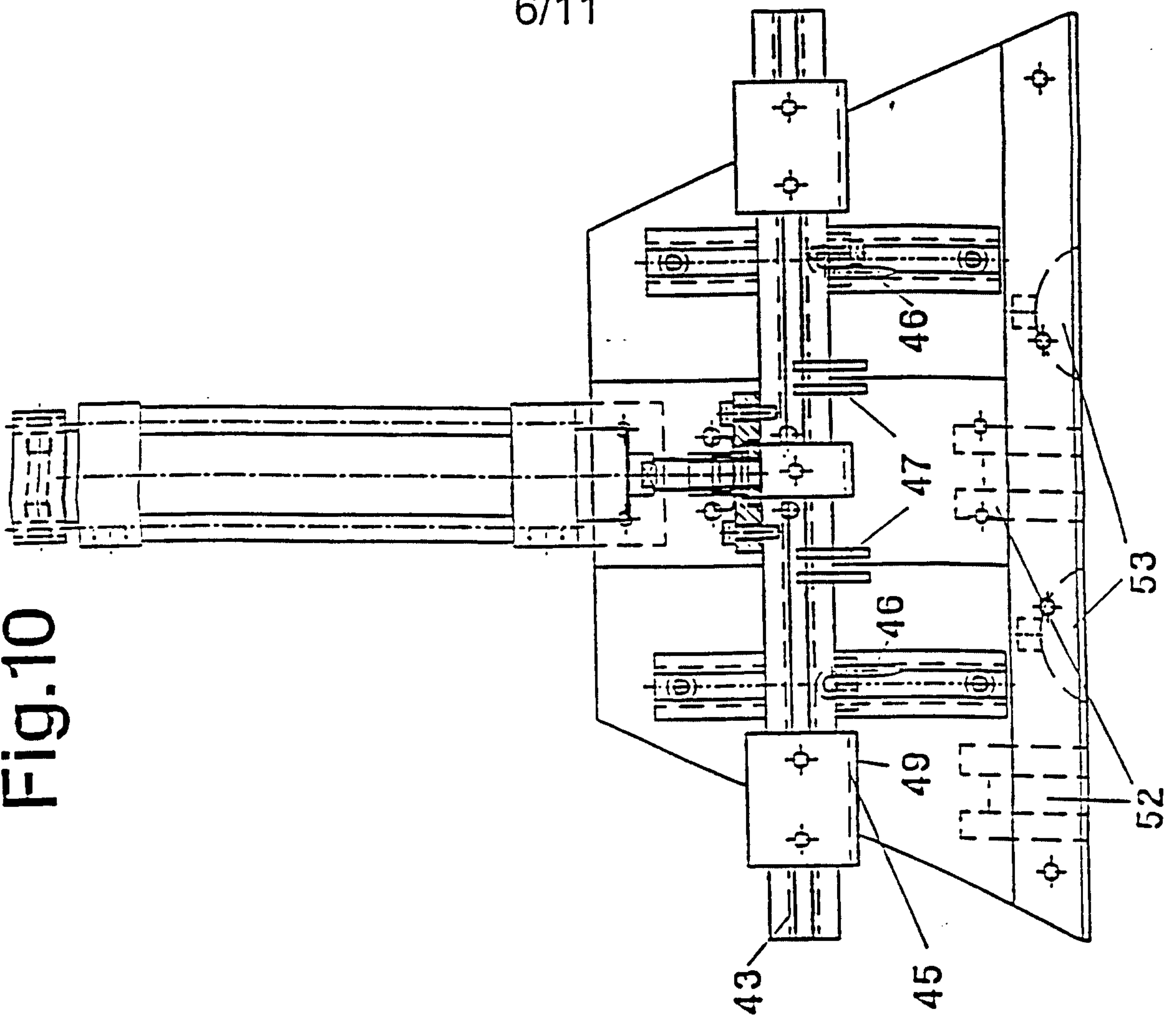
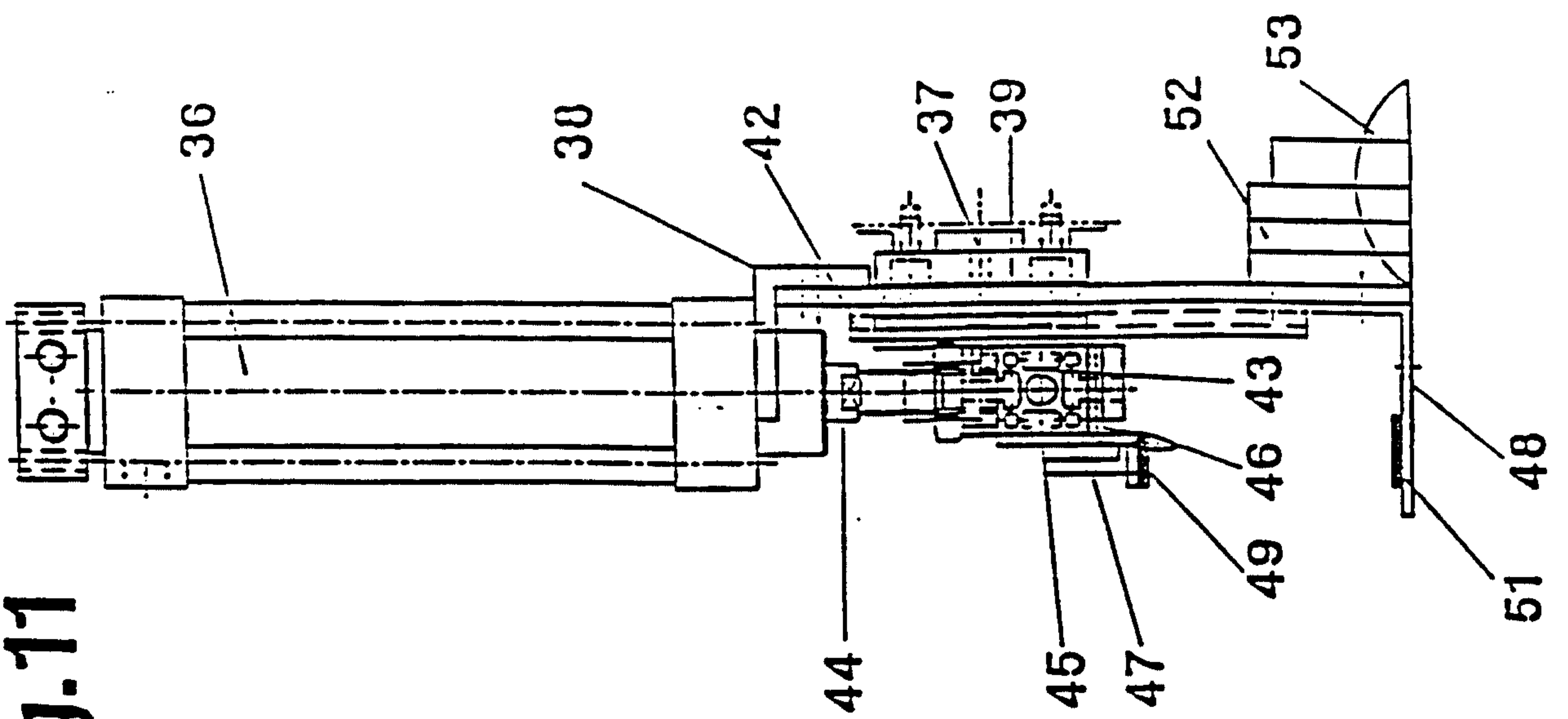
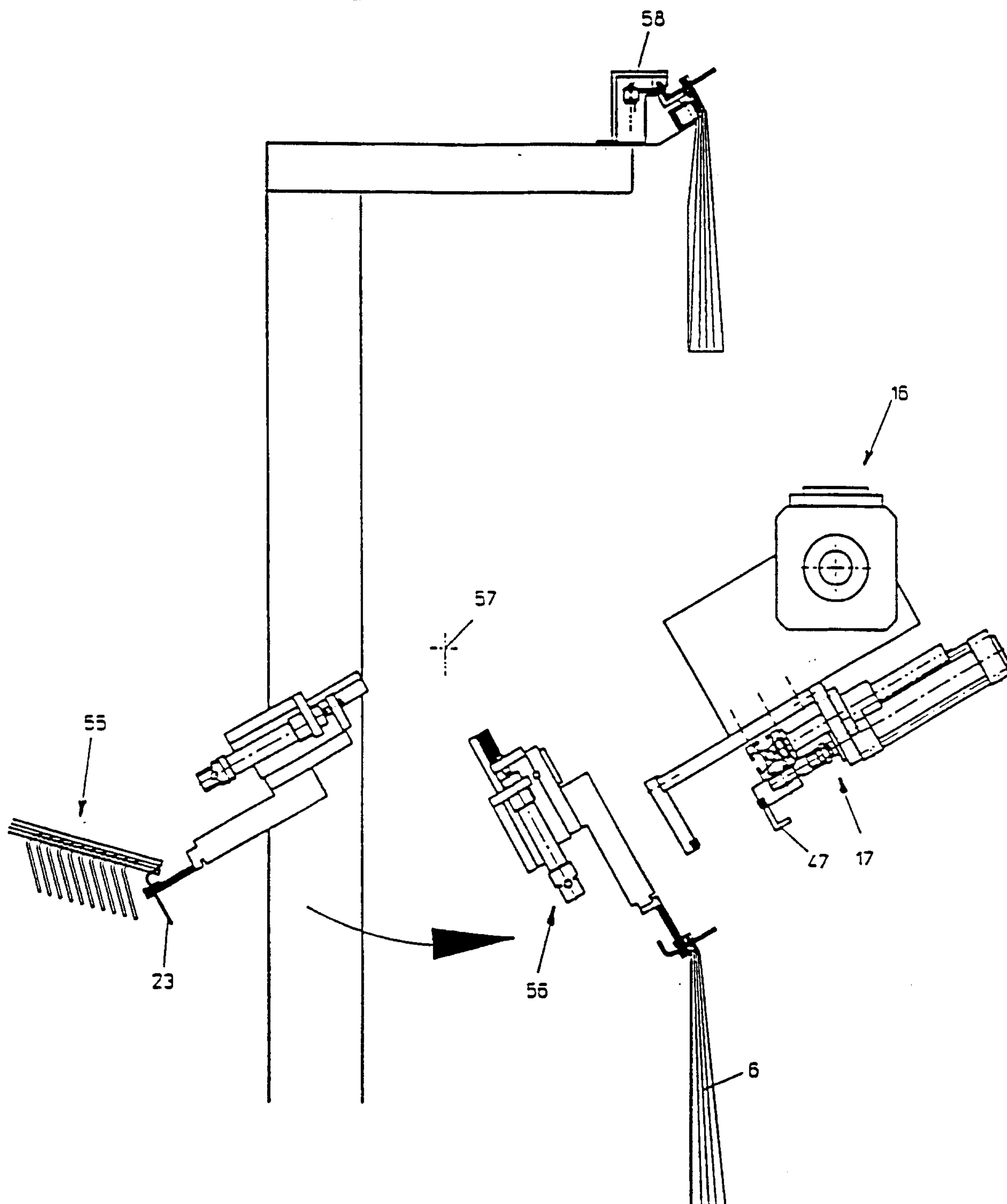


Fig.11



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Fig. 14



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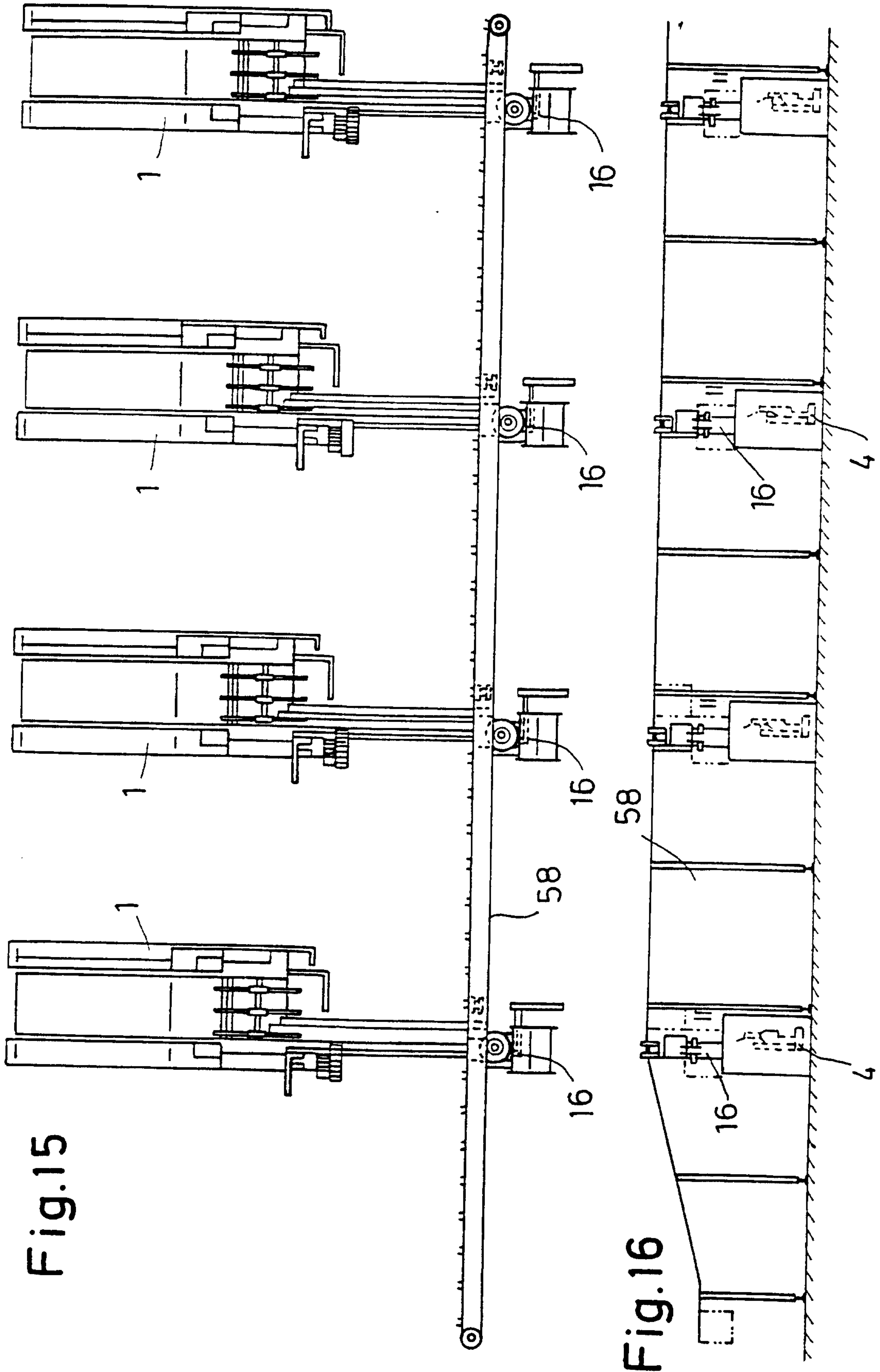


Fig.15

Fig.16

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Fig.17

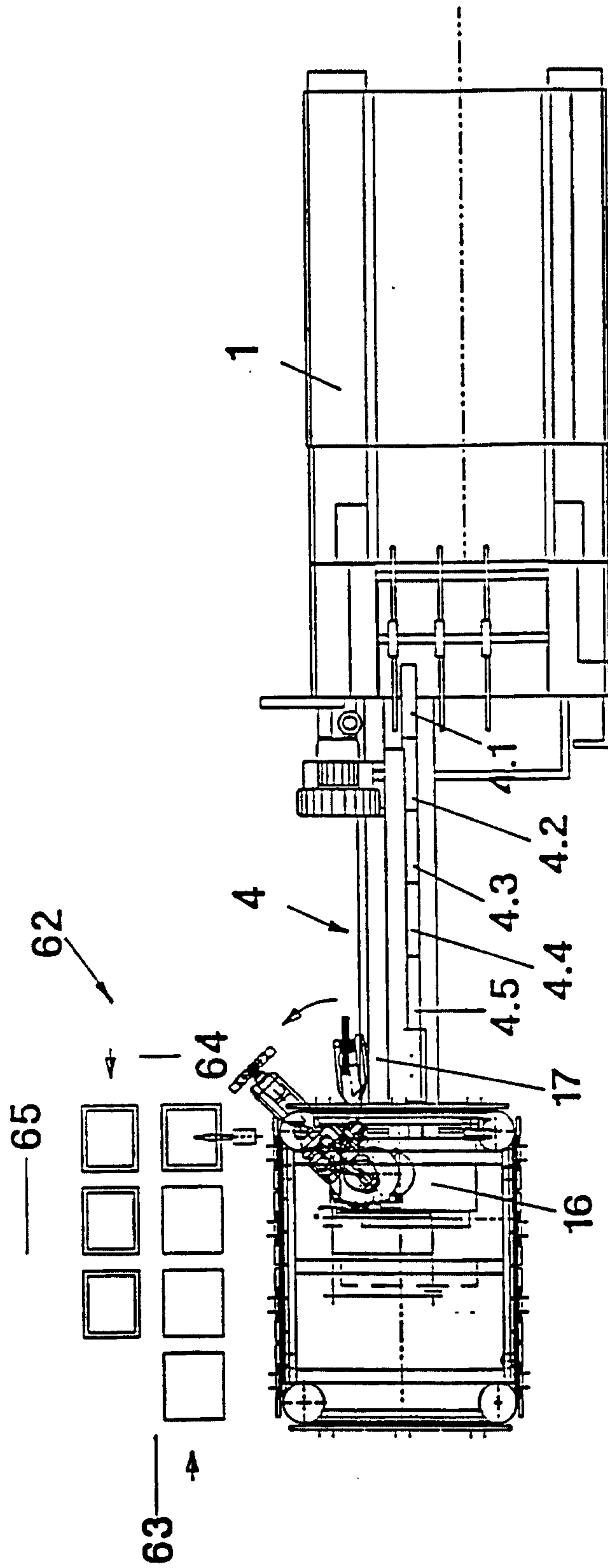
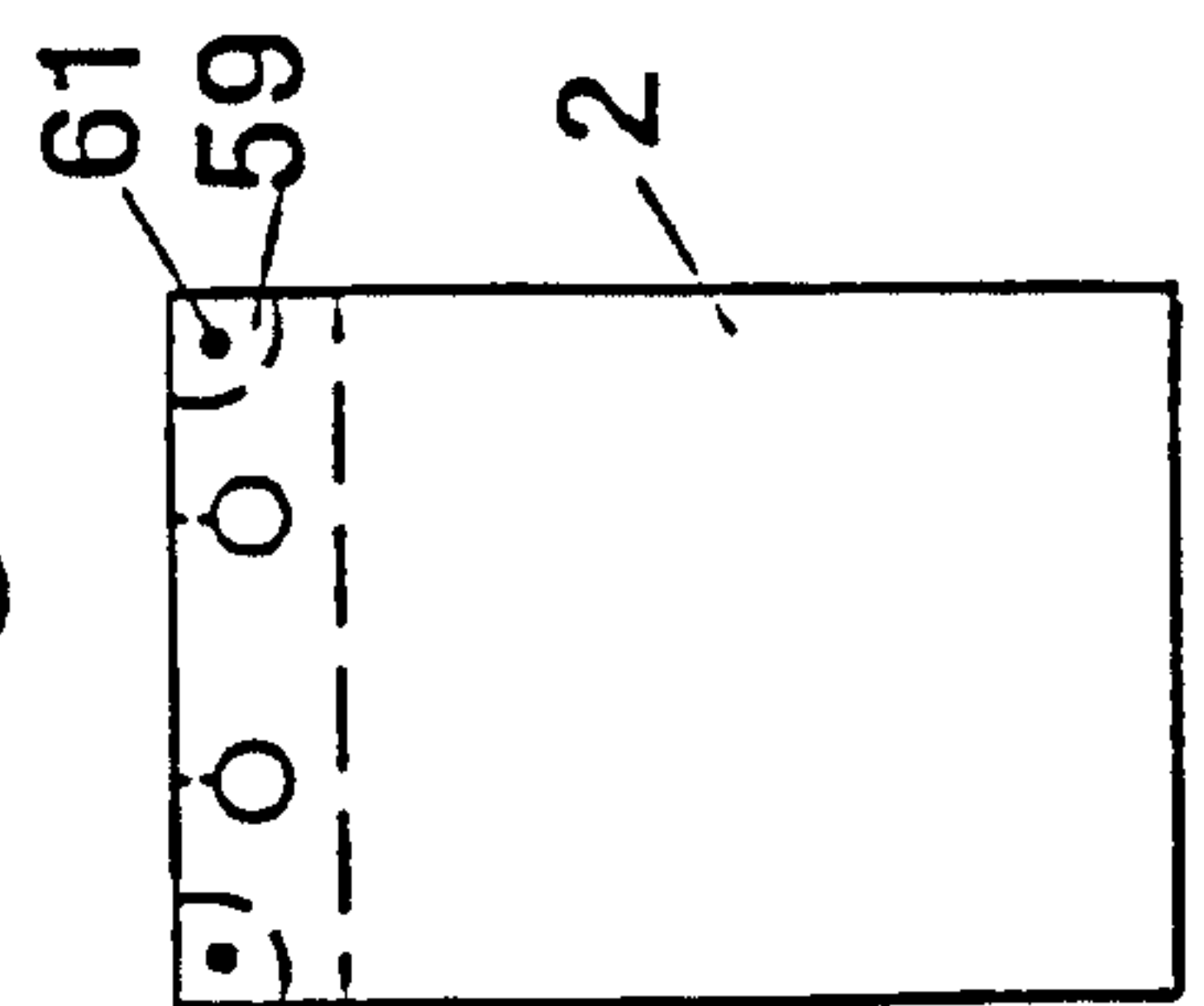
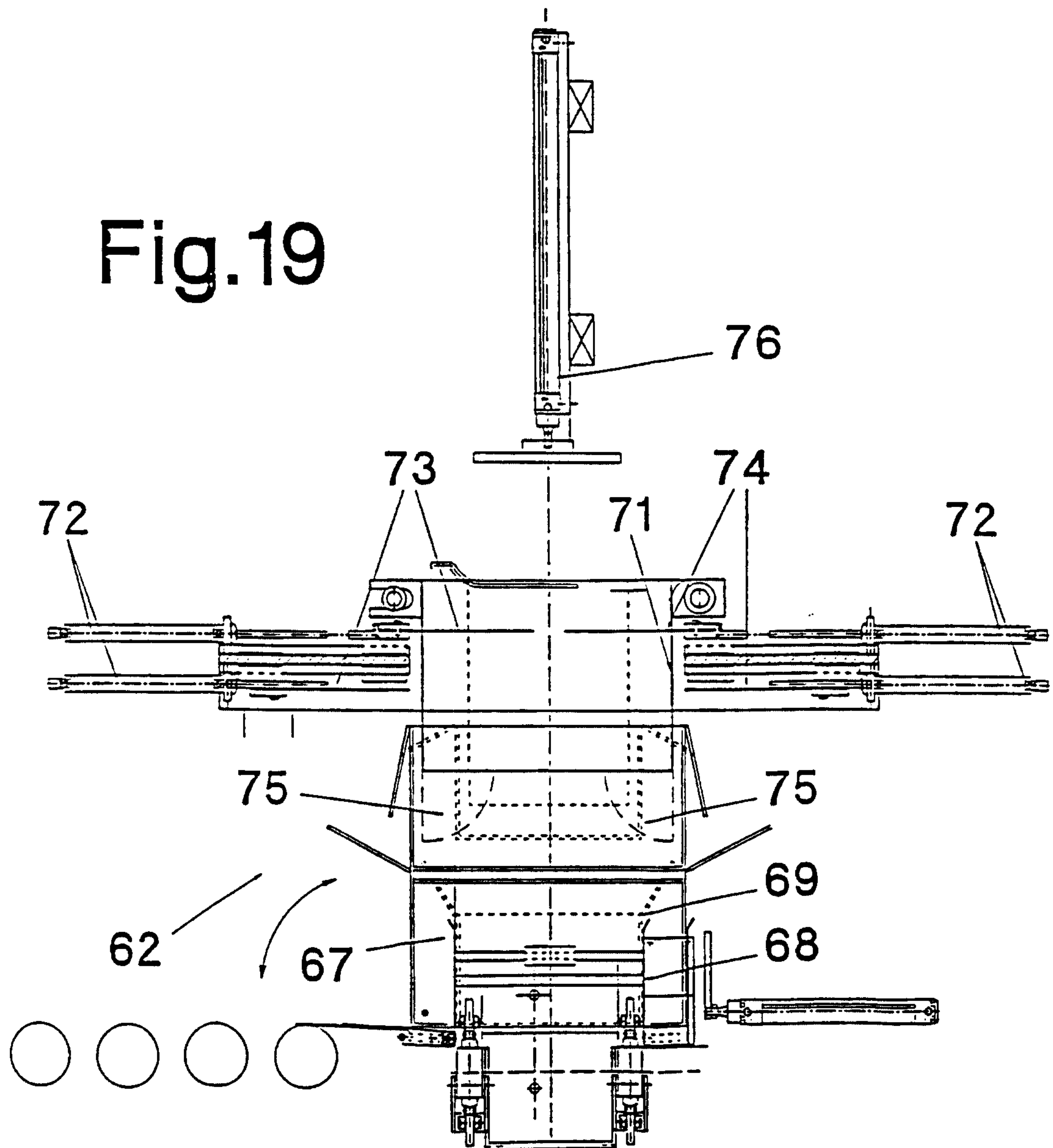


Fig.18



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Fig.19



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