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(54) **Device for filling boxes with filled bags**

(57) The invention relates to a device for filling boxes with bags filled with a deformable material, for instance granular or powdery material. According to the invention the device is provided with a frame (4), a device (2) for conveying the boxes arranged in the lower part of the frame, and a device (3) for supplying the filled bags arranged in at the upper part of the frame, the bag

supply device (3) comprising a bag conveyor (8) for conveying and discharging the bags at high speed, and a deflecting mechanism (9) positioned in conveyance direction after the bag conveyor (8) for guiding the bags discharged at high speed by the bag conveyor in the direction of a box on the box conveyor device (2).

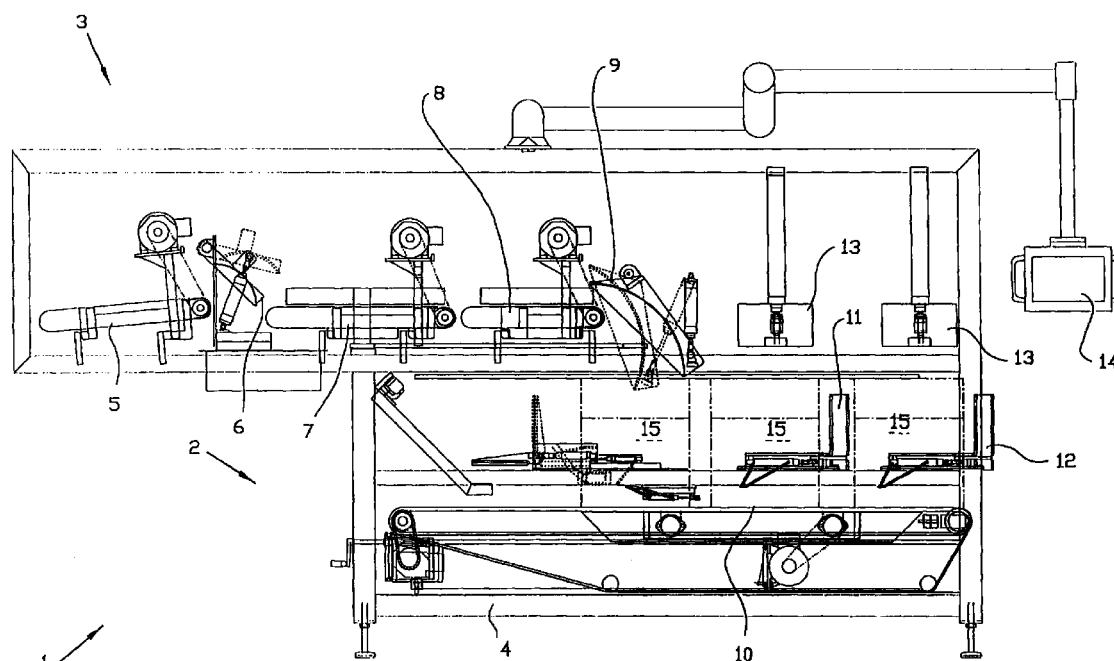


FIG. 1

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Description

[0001] The invention relates to a device for filling boxes with bags filled with a deformable material, for instance granular or powdery material.

[0002] Such devices are known and usually consist of a conveyor for the filled bags, which conveyor ends at a certain location so that the conveyed bags fall of their own accord into a box positioned below it. The boxes can be filled with individual bags or with bags connected to each other like a chain, for instance each time eight connected bags.

[0003] A drawback of such a device is that the filling speed of the boxes is determined by the speed of the conveyor. Said speed may not be too high, because the filled bags could fly over the box as a result of the high speed given to them by the conveyor.

[0004] Another drawback of the known device is that the box cannot be filled well, because all bags fall onto each other and form a kind of pyramid or mountain in the box.

[0005] Yet another drawback of the known device is that it throws all bags into the box, also the for instance torn bags, which should not be packaged along.

[0006] It is an objective of the invention to raise one or more of the above-mentioned drawbacks.

[0007] It is another objective of the invention to provide a relatively simple device with which boxes can be filled quickly and well with filled bags.

[0008] It is yet another objective of the invention to provide a device for filling boxes with filled bags, which is simple to repair and service.

[0009] One or more of these objectives are achieved according to the invention with a device of the kind mentioned in the preamble, comprising a frame, a device for conveying the boxes arranged in the lower part of the frame, and a device for supplying the filled bags arranged in at the upper part of the frame, the bag supply device comprising a bag conveyor for conveying and discharging the bags at high speed, and a deflecting mechanism positioned in conveyance direction after the bag conveyor for guiding the bags discharged at high speed by the bag conveyor in the direction of the box on the box conveyor device.

[0010] In this way it is achieved that the bags can be supplied at high speed, so that they are discharged at a high horizontal speed by the bag conveyor and fly against the deflecting mechanism. The deflecting mechanism subsequently guides the bags in vertical direction, as a result of which the bags always end up in the box. By using the deflecting mechanism the bags can be supplied at high speed, so that filling the boxes can take place at a considerable higher speed than with the conventional devices.

[0011] Preferably the deflecting mechanism can be adjusted in conveyance direction to divide the bags in the box in longitudinal direction. As a result the bags can be introduced better divided into the box, so that a

better filling and/or easier closure of the box is obtained.

[0012] Preferably the deflecting mechanism can be adjusted in transverse direction with respect to the conveyance direction to divide the bags in the box in transverse direction. As a result especially smaller bags can be introduced better divided into the box.

[0013] Preferably the deflecting mechanism can be adjusted here with the help of pneumatic means, preferably with the help of a pneumatic piston. With the help of pneumatic means it is possible to quickly place the deflecting means in another position.

[0014] According to a preferred embodiment an inspection conveyor has been placed in conveyance direction before the bag conveyor, above which inspection conveyor a sensor has been arranged for inspecting the filled bags, preferably an optical sensor, and a rejection mechanism being arranged in conveyance direction after the inspection conveyor in order to remove rejected bags from the device. In this way it is possible to detect bags that should not be packaged, for instance torn bags, the so-called reject, and to remove them from the device. The rejection mechanism is controlled with the help of a sensor.

[0015] Preferably the rejection mechanism comprises a movable screen which can be placed in the conveyance path of a rejected bag in order to remove said bag from the bag conveyor device. The rejected bags are stopped by the screen and not conveyed further to the box. The screen is controlled by the sensor to only stop rejected bags. The rejected bags fall down out of the device, and are discharged there.

[0016] According to a preferred embodiment a buffer conveyor has been arranged in between the inspection conveyor and the bag conveyor in order to buffer the bags supplied by the inspection conveyor. When a full box has to be discharged and a new empty box is being placed under the deflecting device the bags can be buffered on the buffer conveyor, so that they do not fall in between the full and the empty box.

[0017] Preferably the buffer conveyor is adapted to convey the bags at a variable speed. As a result the buffer conveyor can adapt its speed to the necessity to buffer or not.

[0018] Preferably the inspection conveyor has been placed with its discharge end upwardly inclined in order to let the bags discharged by the inspection conveyor end up on the consecutive conveyor.

[0019] According to a preferred embodiment the bag conveyor and/or the inspection conveyor and/or the buffer conveyor are an endless conveyor belt.

[0020] According to a preferred embodiment the box conveyor device has been provided with means to move the boxes intermittently. As a result during standstill of the boxes various treatments can be performed, amongst others of course the filling, but for instance also the closing and sealing of the boxes.

[0021] Preferably the box conveyor device has been provided with means for shaking the boxes. As a result

of the shaking of the boxes the bags are better divided in the box, and especially the contents of the bags is better divided in the box without the bags themselves having to be moved, so that the bags take up less space in the box.

[0022] According to a preferred embodiment the box conveyor device has been provided with a pressing mechanism for pressing filled bags in a filled box. With the help of the pressing mechanism the air between the bags can be pressed out and the bags can be better divided in the box, so that the box can be closed.

[0023] Preferably the box conveyor device comprises a conveyor belt for the boxes.

[0024] According to a preferred embodiment the various conveyors can be driven by electric driving means such as electro motors.

[0025] Preferably the various conveyors, mechanisms and driving means have been interchangeably arranged in the frame. When during operation a defect occurs the defect part can easily be replaced as a result. Also when servicing the device the various parts of the machine can easily be serviced and replaced if necessary.

[0026] Preferably the operation panel has been attached to the device for an operator to be able to manually operate the device. As a result the operator can adjust the machine and if necessary intervene when something goes wrong or the machine breaks down.

[0027] The invention will be elucidated on the basis of an exemplary embodiment, referring to the drawing.

Figure 1 schematically shows the device according to the invention in side view.

Figure 2 shows the deflecting device from the device according to figure 1 at a larger scale.

Figure 3 shows the rejection mechanism from the device according to figure 1 at a larger scale.

Figures 4 and 5 show parts of the box conveyor device at a larger scale.

[0028] Figure 1 shows the device 1 according to the invention in side view. The device consists of a box conveyor device 2 and a bag supply device 3, accommodated in a frame 4, the box conveyor device 2 being placed under the bag supply device 3.

[0029] The bag supply device 3 consists of an inspection conveyor 5, a rejection mechanism 6, a buffer conveyor 7, a bag conveyor 8 and a deflecting mechanism 9, and the bag conveyor device 2 consists of a conveyor belt 10, two box stopping mechanisms 11 and 12, and two pressing mechanisms 13. To the device 1 an operation panel 14 has been attached for an operator. On the conveyor belt of the bag conveyor device 2 boxes 15, indicated by dots, are present. The filled bags themselves are not shown; they can be supplied as sep-

arate bags or as a chain or string of connected bags.

[0030] The figures 2-5 show several parts of the device 1 at a larger scale.

[0031] The deflecting mechanism 9 will be elucidated in the basis of figure 2. The bag conveyor 8 is shown, which comprises an endless conveyor belt 20, which is driven with the help of the motor 21. The motor 21 drives the conveyor belt 20 at high speed, as a result of which the bags leave the conveyor belt 20 at high speed. The bags then fly at high speed against the deflecting means 9. Said mechanism consists of the bent deflecting screen 22 having side plates 23, which are attached swivelling about a swivel axle 24. At the side of the swivel axle 24 a pneumatic cylinder 25 is arranged with one end about swivel axle 26, and with its other end at 27 attached swivelling at a side plate 23. The bags flying from the bag conveyor 8 are stopped by the deflecting plate 22, and guided downwards past the deflecting plate 22, so that they surely end up in the box 15 placed below it. By exciting the pneumatic cylinder 25 it is lengthened, as indicated by dots, and the deflecting plate 22 is brought into another position, as a result of which the bags are guided to another part of the box. The box is better filled as a result. Of course the deflecting plate 22 can also take an intermediate position.

[0032] With the help of the pneumatic cylinder 25 the deflecting plate 22 can be swivelled about the swivel axle 24 in conveyance direction of the bag conveyor 8. Apart from that, the possibility may be provided to swivel or move the deflecting plate 22 in transverse direction, as a result of which the box 15 is filled better in transverse direction. The means necessary to that end, for instance a pneumatic cylinder, are not shown.

[0033] Figure 3 shows the inspection conveyor 5 and the rejection mechanism 6. The inspection conveyor 5 comprises an endless conveyor belt 30, which is driven by an electro motor 31. The conveyor belt 30 is driven at a constant speed, so that the bags present on it have sufficient speed to bridge the distance between the inspection conveyor 5 and the buffer conveyor 7.

[0034] To that end the front end of the inspection conveyor 5 has been placed a little higher, so that the bags leave the conveyor belt 30 with a speed that is oriented a little upwardly inclined.

[0035] Above the inspection conveyor 5 a sensor has been arranged (not shown), for instance at the support of the motor 30, in order to check whether the bags supplied meet the requirements. When this is not the case because a bag is for instance torn or has the wrong size, the rejection mechanism 6 is activated. The rejection mechanism 6 consists of a rejection screen 32 which is attached to the side plates 33, which can be swivelled about a swivel axle 34. A pneumatic cylinder 35 is attached swivelling with one end about a swivel axle 36, and with its other end near 37 attached swivelling at one or both side plates 33. Usually the pneumatic cylinder is in the extended position, as a result of which the rejection screen 32 takes up the position indicated

by dots. When the sensor perceives a rejected bag, the pneumatic cylinder is excited to take up its shortest position in which the rejection screen 32 takes up the position indicated by full lines. The rejected bag then flies against the rejection screen 32 and drop down, so that it cannot end up on the buffer conveyor 7 and can be discharged. Directly after the rejected bag has been discharged, the rejection mechanism returns to the resting position indicated by dots, so that a following non-rejected bag can end up on the buffer conveyor without impediments.

[0036] The buffer conveyor 7 in principle is identical to the bag conveyor 8, but is able to convey the bags supplied from the inspection conveyor 5 further at a strongly variable speed.

[0037] The box conveyor device 2 is more or less conventional in construction. The conveyor belt 10 consists of two adjacent halves, the one half supplying empty boxes from the front of the machine, after which the boxes are transferred one by one onto the other half of the conveyor belt 10, on which the boxes are filled one by one, and again discharged to the front of the machine. The front of the machine is the side where the operation panel 14 has been indicated. During filling the boxes are exposed to vibrations so that the bags supplied are better divided in the boxes with the help of vibrations means that are not shown.

[0038] Figure 4 shows two stopping mechanisms 11 and 12 to stop a box 15. The stopping means 11, 12 comprise two wings 40 which with the help of a pneumatic cylinder 41 and a swivel arm 42 can be swivelled between a position in which the wings 40 stop a box 15, and a position in which the wings 40 are placed on either side of the conveyor belt, so that the box 15 can be conveyed further. The place of the stopping means 11 and 12 can be adjusted, so that the position of the stopped boxes 15 can be adjusted depending on for instance the length of the box.

[0039] The stopping mechanisms 11 and 12 are positioned such that the stopped boxes 15 are positioned at the correct location under a pressing mechanism 13.

[0040] At the location of the stopping mechanism 11 the filled box is still entirely open, and the first pressing mechanism 13 will engage directly onto the filled bags present in the box. The pressing mechanism 13 consists of a pressing plate 50 which is attached to a driving rod 51. The driving rod 51 presses the pressing plate 50 onto the bags in the box 15 with a predetermined maximum force. The pressing plate could perform an up and downward movement. The pressing plate 50 exerts a maximum force, so that the bags do not tear. Subsequently the box 15 is let through by the stopping mechanism 11 until it is stopped by the stopping mechanism 12. In the meantime the box is entirely or partially closed. After that the entirely or partially closed box is pressed again with the help of a second pressing mechanism 13, which works in the same way

as the first pressing mechanism 13. As a result the boxes that are not yet entirely closed or cannot be closed because the filled bags still project too much upwards, can be better closed, so that they can be sealed well and level at the upper side.

[0041] The operation of the device according to the invention has been elucidated above in several steps. Below the operation of the device from beginning to end will be elucidated in the basis of figure 1.

[0042] The bags to be packaged in boxes are supplied by means of a conveyor which is not shown and are transferred to the inspection conveyor 5. There they are checked with the help of a sensor, and subsequently each rejected bag or string of bags is discharged with the help of rejection mechanism 6. Non-rejected bags because of their speed end up on buffer conveyor 7. The buffer conveyor 7 transfers the bags onto the bag conveyor 8, except when with the help of means that are not shown it has been established that a box 15 has been sufficiently filled; in that case the buffer conveyor 7 buffers the bags supplied by the inspection conveyor 5 until a new empty box 15 has been brought into position. Then the buffer conveyor 7 transfers the bags onto the bag conveyor 8, which discharges the bags at high speed as a result of which the bags fly against the deflecting mechanism 9. The deflecting mechanism 9 guides the bags until they end up in the box 15 positioned below it. The deflection mechanism 9 can be adjusted so that the box 15 is filled well. During filling the box 15 is exposed to vibrations in order to better divide the bags in the box. After a box has been sufficiently filled, the box is conveyed further until it is stopped by the stopping mechanism 11. There the bags are pressed in the box with the help of the first pressing mechanism 13. Subsequently the box is further conveyed until it is stopped by the stopping means 12, while simultaneously the box is entirely or partially closed. In the position abutting the stopping mechanism 12 the bags are again pressed with the help of the second pressing mechanism 13, which presses the entirely or partially closed box. Subsequently the boxes are discharged.

[0043] The device according to the invention operates fully automatic, but can be manually operated by an operator with the help of the operation panel 14.

[0044] The device according to the invention is built up such that the various elements can simply be interchanged so that in case of a breakdown each element can quickly be replaced, so that the time the machine cannot be used remains as short as possible.

[0045] The invention has been elucidated in the basis of an exemplary embodiment. It will be understood that the invention is not limited to this. The scope of protection is determined by the following claims.

Claims

1. Device for filling boxes and the like with bags filled

- with a deformable material, for instance granular or powdery material, comprising a frame, a device for conveying the boxes arranged in the lower part of the frame, and a device for supplying the filled bags arranged in at the upper part of the frame, the bag supply device comprising a bag conveyor for conveying and discharging the bags at high speed, and a deflecting mechanism positioned in conveyance direction after the bag conveyor for guiding the bags discharged at high speed by the bag conveyor in the direction of a box on the box conveyor device.
2. Device according to claim 1, the deflecting mechanism in conveyance direction being adjustable to divide the bags in the box in longitudinal direction.
 3. Device according to claim 1 or 2, the deflecting mechanism being adjustable in transverse direction with respect to the conveyance direction to divide the bags in the box in transverse direction.
 4. Device according to claim 2 or 3, the deflecting mechanism being adjustable with the help of pneumatic means, preferably with the help of a pneumatic piston.
 5. Device according to any one of the preceding claims, an inspection conveyor being placed in conveyance direction before the bag conveyor, above which inspection conveyor a sensor has been arranged for inspecting the filled bags, preferably an optical sensor, and a rejection mechanism being arranged in conveyance direction after the inspection conveyor in order to remove the rejected bags from the device.
 6. Device according to claim 5, the rejection mechanism comprising a movable screen which can be placed in the conveyance path of a rejected bag in order to remove said bag from the bag conveyor device.
 7. Device according to claim 5 or 6, a buffer conveyor being arranged in between the inspection conveyor and the bag conveyor in order to buffer the bag supplied by the inspection conveyor.
 8. Device according to claim 7, the buffer conveyor being adapted to convey the bags at a variable speed.
 9. Device according to any one of the claims 5-8, the inspection conveyor being placed with its discharge end upwardly inclined in order to let the bags discharged by the inspection conveyor end up on the consecutive conveyor.
 10. Device according to any one of the preceding claims, the bag conveyor and/or the inspection conveyor and/or the buffer conveyor being an endless conveyor belt.
 11. Device according to any one of the preceding claims, the box conveyor device being provided with means to move the box intermittently.
 12. Device according to any one of the preceding claims, the box conveyor device being provided with means for shaking the boxes.
 13. Device according to any one of the preceding claims, the box conveyor device being provided with a pressing mechanism for pressing the filled bags in a filled box.
 14. Device according to any one of the preceding claims, the box conveyor device comprising a conveyor belt for the boxes.
 15. Device according to any one of the preceding claims, the various conveyors being drivable by electric driving means such as electro motors.
 16. Device according to any one of the preceding claims, the various conveyors, mechanisms and driving means being interchangeably arranged in the frame.
 17. Device according to any one of the preceding claims, the operation panel being attached to the device for an operator to be able to manually operate the device.
 18. Device, comprising one or several of the characterizing measures as described in the description and/or shown in the figures.

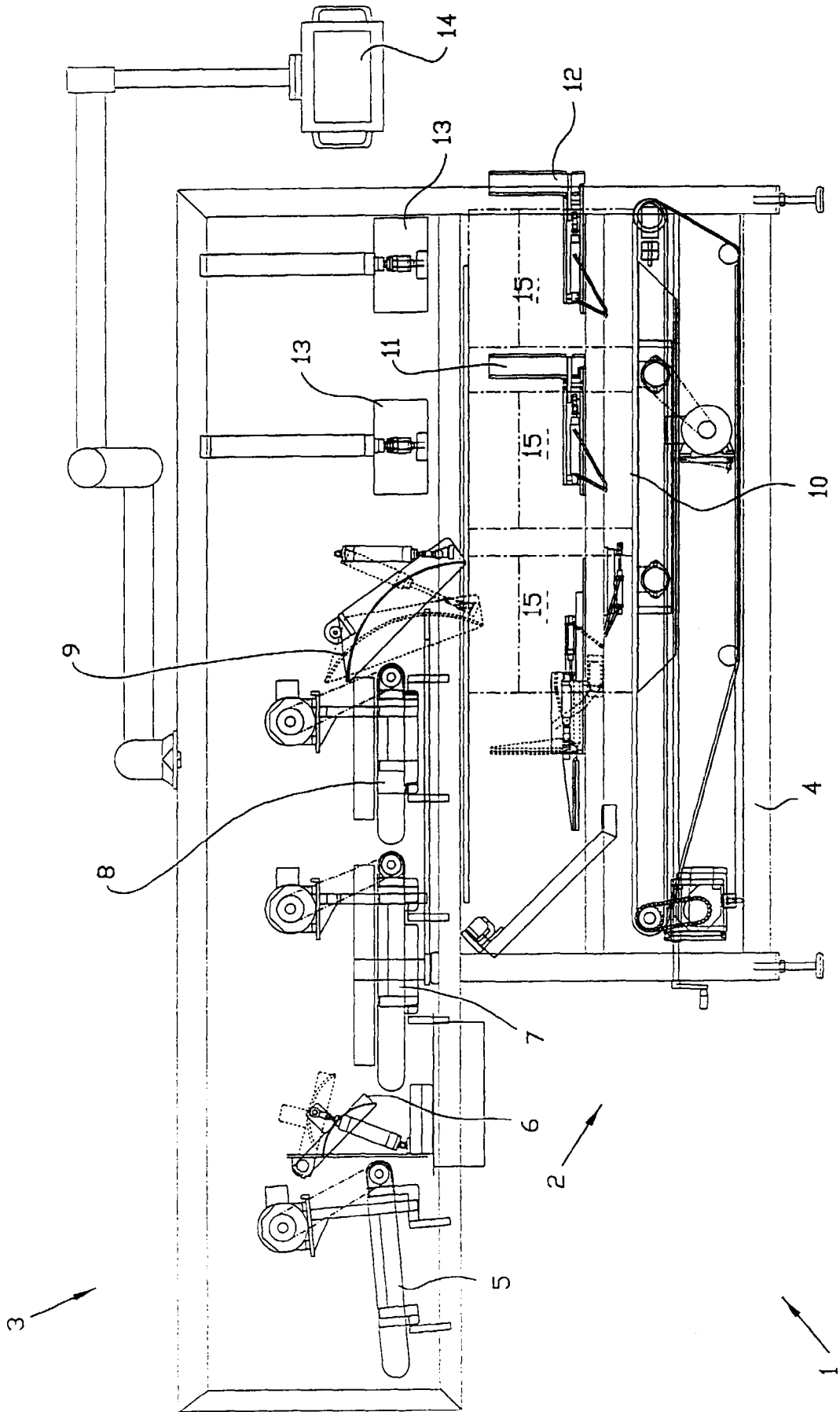


FIG. 1

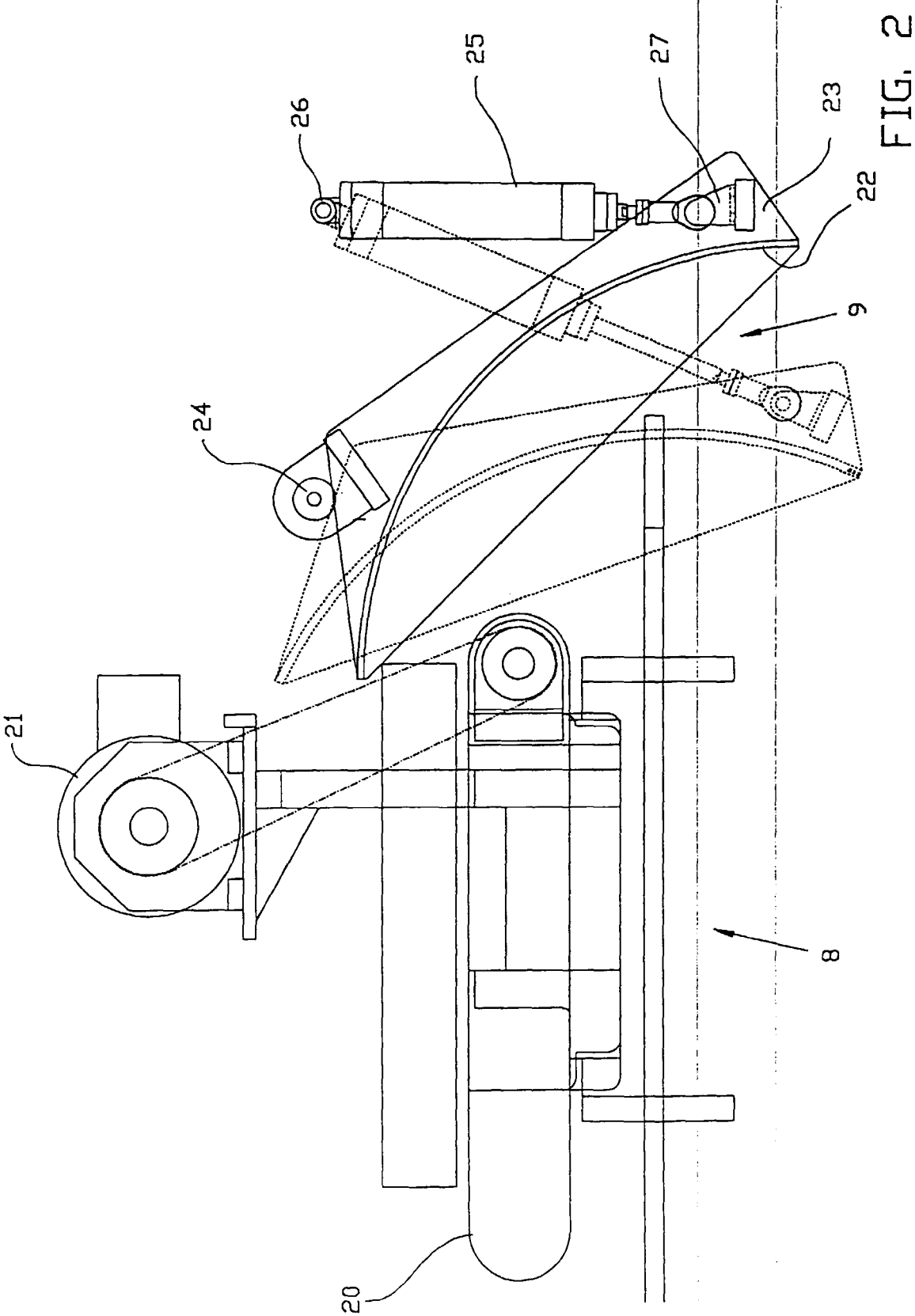


FIG. 2

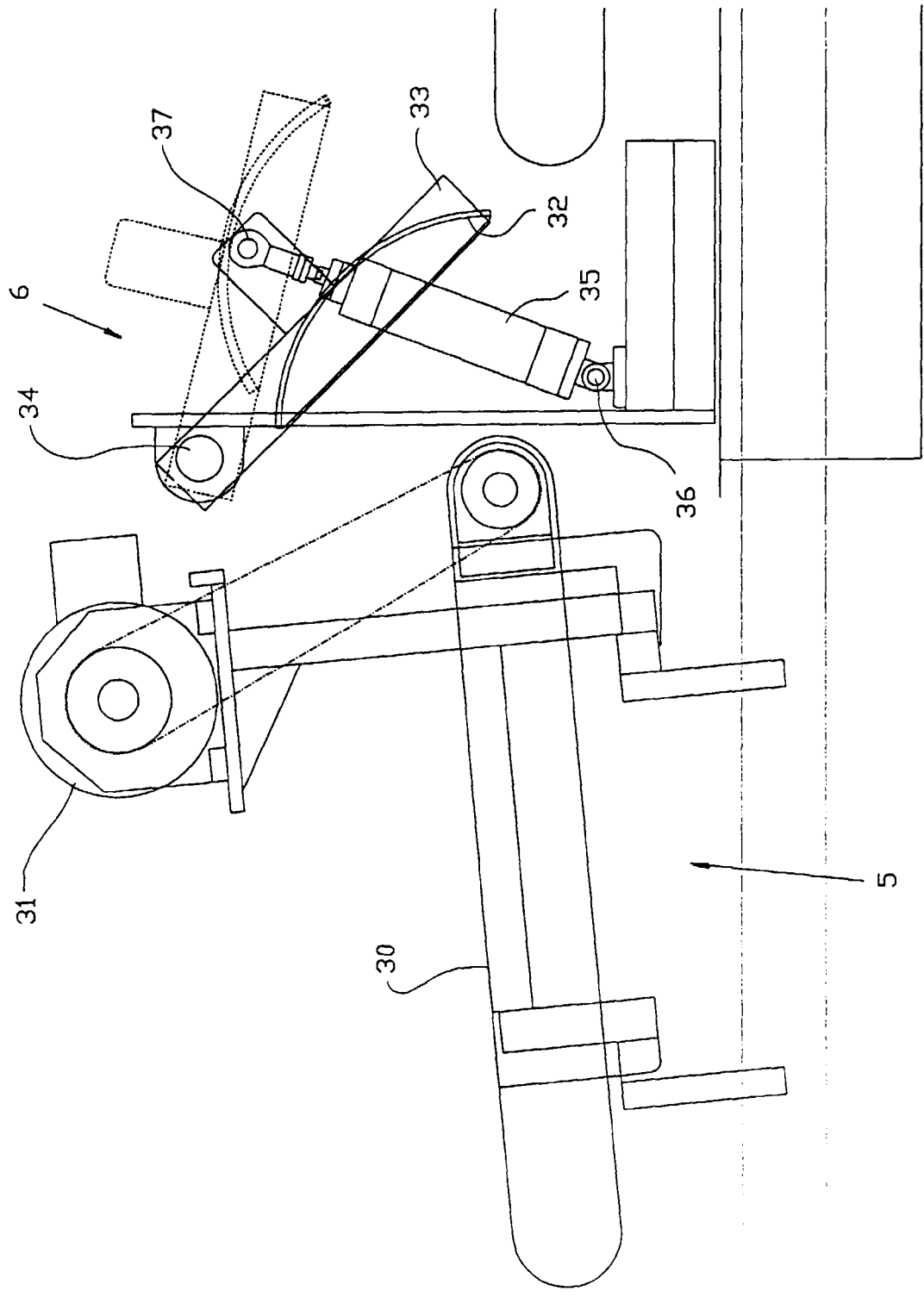


FIG. 3

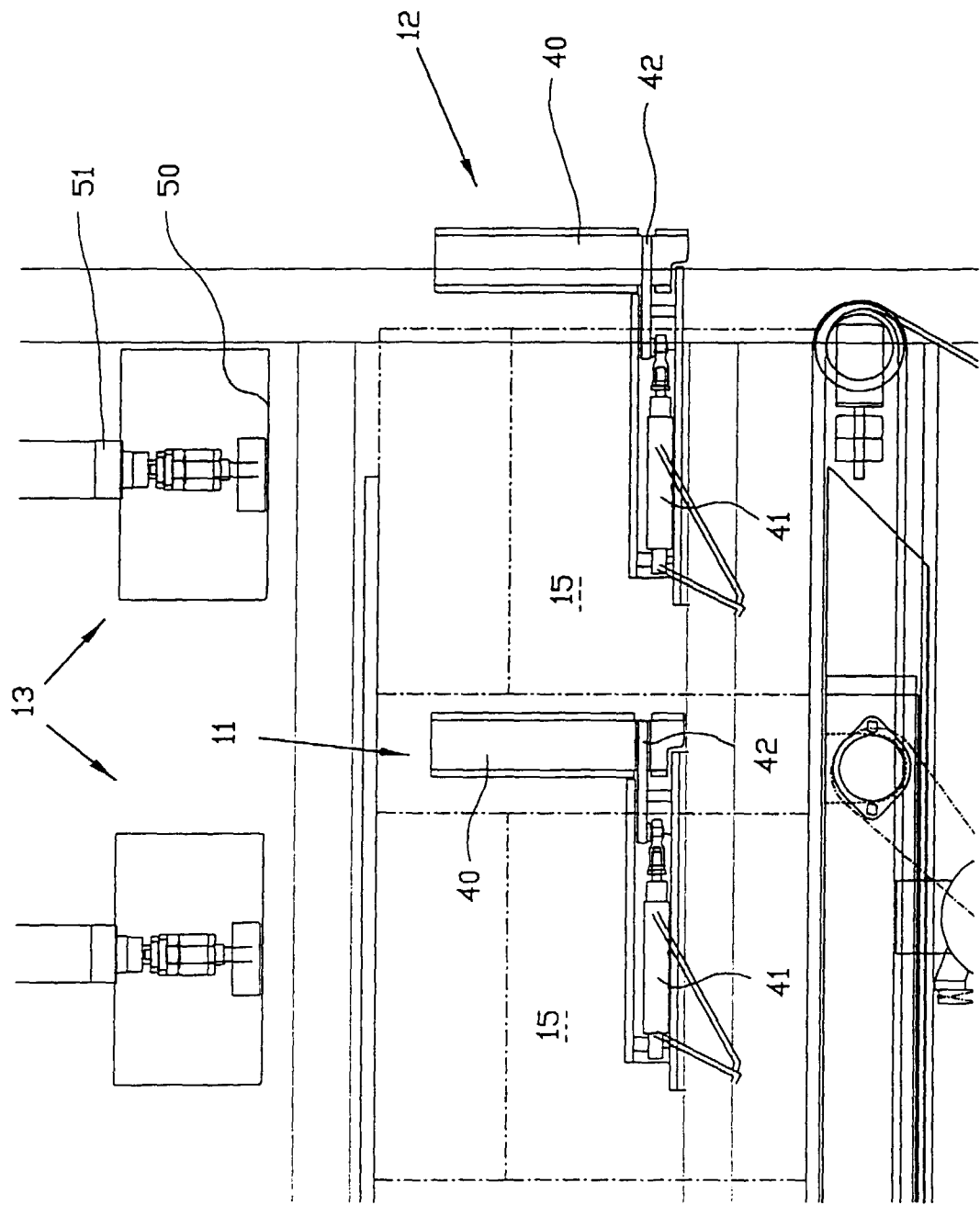


FIG. 4

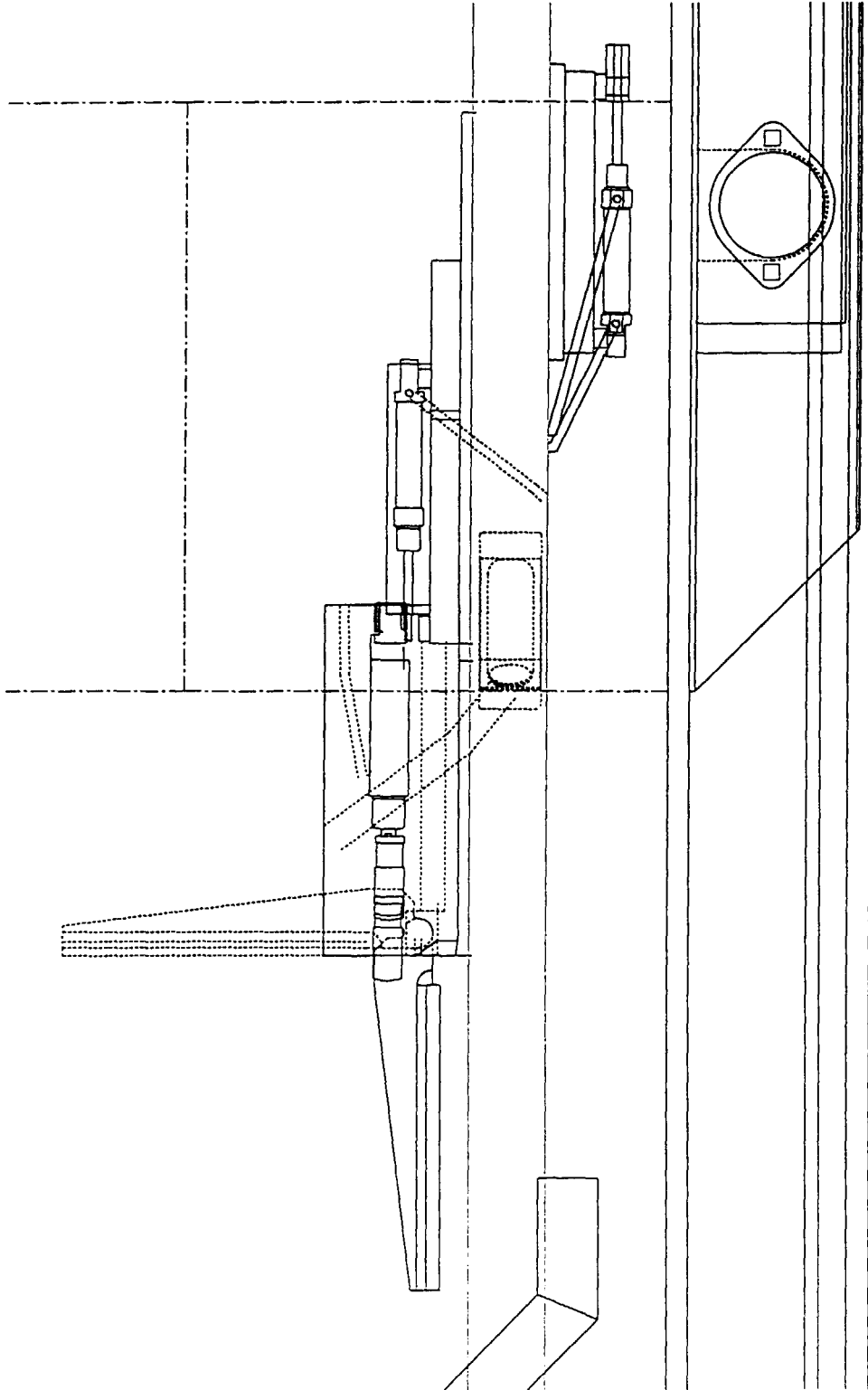


FIG. 5



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EUROPEAN SEARCH REPORT

Application Number
EP 00 20 0232

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Y	* column 5, line 60 - column 8, line 2 * * column 18, line 17 - column 19, line 24; figures 1,10 *	5-7,9, 13-15	
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The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 27 April 2000	Examiner Jagusiak, A
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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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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