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(54) Apparatus and method for forming cigars

(57) The invention relates to an apparatus and method for forming a cigar from a bunch (20) and a wrapper (19), wherein the apparatus comprises feed means (1) for feeding a bunch to a rolling location (2), transport means (3) for transporting a wrapper to the rolling location, a rolling device (4) at the rolling location for rolling the wrapper around the bunch, and drive means (41) for driving the transport means, wherein the transport means comprise at least two carrier arms (7) which are driven rotatably around a rotation axis (6) and provided on their outer ends with suction means (8) for holding the wrapper with suction force during transport.

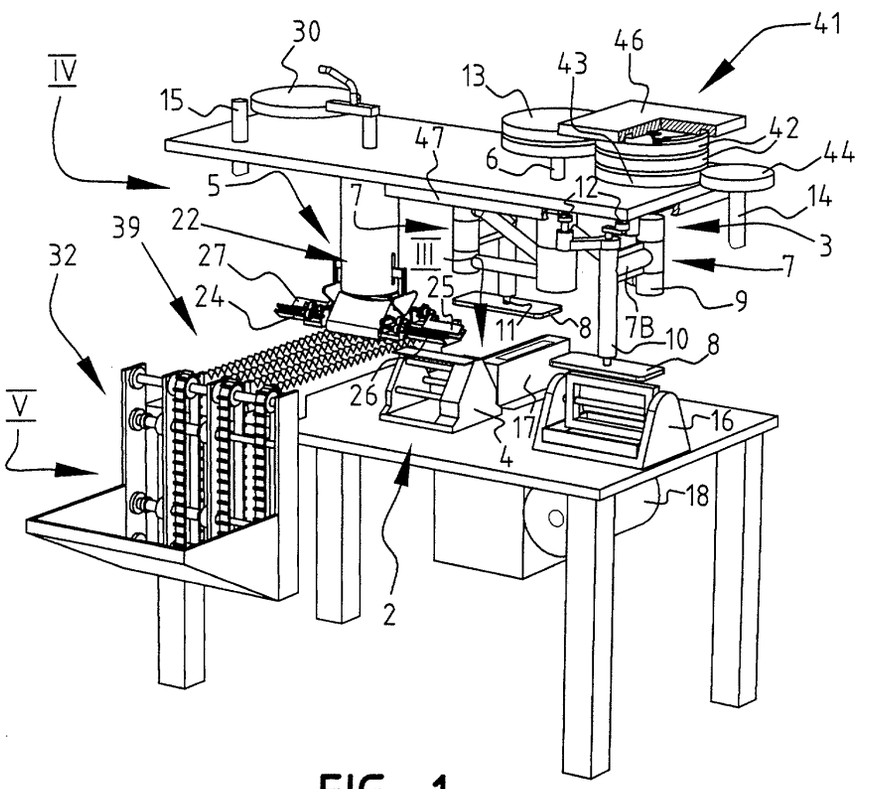

FIG. 1

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Description

[0001] The present invention relates to an apparatus for forming a cigar from a bunch and a wrapper, comprising feed means for feeding a bunch to a rolling location, transport means for transporting a wrapper to the rolling location, a rolling device at the rolling location for rolling the wrapper around the bunch, and drive means for driving the transport means, wherein the transport means comprise at least two carrier arms which is driven rotatably around a rotation axis and provided on their outer ends with suction means for holding the wrapper with suction force during transport. The invention also relates to a method as according to the preamble of claim 16.

[0002] Such an apparatus and method is for example from DE 3215 197 A. The apparatus is provided with two carrier arms, which are driven synchronically around a rotation shaft. Through the use of two carrier arms two cigars can be formed in one cycle of the apparatus.

[0003] The object of the present invention is to provide an improved apparatus and method for forming a cigar from a bunch and a wrapper. A further object of the present invention is to provide an apparatus with which a greater productivity can be obtained, while not detracting from the flexibility of the machine, i.e. conversion to another product model. A further object is to provide an improved apparatus and method with which it is possible to manufacture a wide range of cigar types.

[0004] To this end the apparatus is characterized according to the invention in that.

[0005] The carrier arms are drivable independently of each other around the rotation axis so that it is possible to accelerate and decelerate the carrier arms relative to each other. An apparatus is hereby obtained which can be deployed with greater flexibility. The wrapper to be rolled has its own characteristic form for each type of bunch. Depending on the form of the wrapper, not only will the suction means have to occupy a particular position and orientation on the carrier arm during the rolling, but the carrier arm will also have to be driven at a determined (varying) angular speed. Now that the two carrier arms can be controlled independently in respect of speed, different types of bunch can be rolled without major modifications of the apparatus herein being necessary, such as displacement of the wrapper supply, and use can be made of rotation glueing.

[0006] According to a preferred embodiment the drive means comprise a drive shaft and a gear transmission provided with means for generating a phase difference between each carrier arm and the drive shaft. The means for generating a phase difference can for instance comprise cam means and a curve disc co-acting therewith. The curve is adapted such that the wrapper can be rolled around the bunch at the desired overrolling speed during a part of the cycle of the apparatus, while the other carrier arm can transport a subsequent wrapper to the rolling device without therein coming into contact with the first carrier arm. When a different type of cigar has to be formed, only the curve disc has to be replaced so that a different control of the speeds of the carrier arms is obtained.

[0007] Each carrier arm is preferably an articulated arm. Although the carrier arms rotate on the same rotation axis, the outer ends thereof can be controlled independently of each other in respect of position and orientation.

[0008] According to a preferred embodiment the transport means further comprise at least one disc provided with at least one curve in which cam means mounted on the carrier arm run for the purpose of determining the position and orientation of the suction means relative to the rotation axis. There is preferably only one disc provided, this provided with two curves, wherein the one curve serves to determine the position of the suction means and the other curve serves to determine the orientation of the suction means.

[0009] The apparatus is preferably provided with discharge means for discharging a wrapped bunch cigar from the rolling location. In order to further increase the productivity of the apparatus, the feed means for feeding the bunch to the rolling location and the discharge means for discharging the wrapped bunch are combined in one gripping device which comprises at least two grippers. It is hereby possible to simultaneously feed a bunch to the rolling location and to discharge a wrapped bunch.

[0010] The gripping device preferably comprises a rotation axis, wherein the grippers are arranged for rotation about the rotation axis. The grippers are driven rotatably to feed a bunch to the rolling location and to discharge a wrapped bunch therefrom.

[0011] According to the preferred embodiment the gripping device comprises two pairs of grippers on either side. This results in a further increase in productivity. The feed of a bunch and discharge of a wrapped bunch can be combined at both the feed/discharge location and the rolling location, thus saving time.

[0012] Each gripper is arranged for pivoting around the pivot axis at right angles to the rotation axis, so that in a single rotation movement a bunch can be picked up and a wrapped bunch set down, or a bunch can be set down and a wrapped bunch removed without the grippers herein colliding with each other. From a structural viewpoint a rotating movement is preferred here to a linear movement.

[0013] The feed means for feeding the bunches to the rolling location can further comprise a supply system, which supply system comprises at least three endless conveyor belts disposed parallel to each other for supporting the bunches, wherein two of the three conveyor belts are arranged displaceably in the direction toward each other. The supply system can thus be adjusted to the length of the bunch, which depends on the type of cigar that is going to be formed.

[0014] One of the outer conveyor belts is preferably a non-displaceable conveyor belt. This non-displaceable conveyor belt is placed on the side of the gripping device so that a fixed reference point is obtained for the bunches to be picked up.

[0015] The other outer conveyor belt is preferably connected to a first spindle provided with coarse screw thread and the middle conveyor belt is connected to a second spindle provided with fine screw thread, wherein the spindles lie mutually in line. Through rotation of the spindles the outer conveyor belt will be displaced over a greater distance than the middle conveyor belt.

[0016] When the coarse screw thread has a pitch that is twice as large as the fine screw thread a centring of the middle conveyor belt is ensured.

[0017] The invention further relates to a method for forming a cigar as according to the claims 16-21.

[0018] The present invention will be further elucidated with reference to the annexed drawings. In the drawings:

Figure 1 shows a perspective view of the apparatus according to a preferred embodiment of the invention;
Figures 1A and 1B show details of figure 1;
Figure 2 shows a top view of the apparatus of figure 1;
Figure 3 is a detail view as according to arrow III in figure 1;
Figure 4 is a detail view as according to arrow IV in figure 1;
Figure 5 is a detail view as according to arrow V in figure 1;
Figure 6 shows a cross-section through a part of the apparatus of figure 1;
Figure 7 shows a top view as according to arrow VII in figure 6; and
Figure 8 shows a cross-section through a part of the apparatus which is omitted in figure 6 for the sake of clarity.

[0019] Figure 1 shows in perspective a preferred embodiment of an apparatus for forming a cigar from a bunch 20 and a wrapper 19 according to the invention. The apparatus comprises feed means 1 for feeding bunch 20 to a rolling location 2, transport means 3 for transporting a wrapper 19 to rolling location 2, a rolling device 4 at rolling location 2 for rolling a wrapper 19 around bunch 20, and discharge means 5 for discharging a wrapped bunch. The apparatus is further provided with drive means 41 for driving transport means 3. Transport means 3 comprise two carrier arms 7 which are driven rotatably around a rotation shaft 6 and which are each provided on a free outer end with a suction box 8 for holding a wrapper 19 with suction force during transport. Each carrier arm 7 is an articulated arm and therefore consists of a first arm part 7a and a second arm part 7b connected pivotally thereto. A vertical rod 10 is mounted on the end of the second arm part 7b remote from hinge 9. Extending through rod 10 is a rotation shaft 11 which bears on the one side the suction box 8 and on the other side is provided with cam means 12. Located above carrier arms 7 is a disc 47 provided with two curves 53 (see also fig. 6) in which the cam means 12 mounted on carrier arms 7 run in order to determine the position and the orientation of suction boxes 8 in relation to rotation shaft 6.

[0020] Two toothed wheels 13 are arranged above carrier arms 7. Each toothed wheel 13 is in contact with a further toothed wheel 42. Located in turn under these toothed wheels 42 is a toothed wheel 43 which is driven by a drive gear 44 mounted on a drive shaft 14. Toothed wheels 13,42,43,44 form part of a gear transmission for driving the carrier arms 7. The gear transmission is provided with means for generating a phase difference between each carrier arm 7 and the drive shaft 14. In the shown apparatus these means comprise cam means 45 and a disc 46 co-acting therewith and provided with one curve 52 (see fig. 1A). The driving of carrier arms 7 is further elucidated below with reference to figures 6-8.

[0021] Further indicated in figure 1 with reference 16 is a glueing device where the wrapper 19, which is being held fast by suction box 8, is provided with the desired glued seam before being rolled round the bunch 20. Wrappers 19 are supplied to the apparatus at 17 and picked up by a suction box 8 to be transported to the rolling location 2. The feed of wrappers 19 can for instance take place by means of a long foil strip with individual wrappers 19 thereon, wherein the foil strip is supplied from a supply roll 18 to the feed position 17. At feed position 17 the wrapper 19 is sucked away from the foil strip by suction box 8 and the foil strip is transported further to provide a following wrapper 19 to the other suction box 8. An enlarged view hereof is shown in figure 3.

[0022] A gripping device 22 is provided for feeding the bunch 20 to the rolling location 2 and discharging the wrapped bunch cigar 21. Gripping device 22 comprises a rotation shaft 23 which is arranged parallel to the rotation shaft 6 of the transport means for wrappers 19. Two pairs of grippers 24, 25, 26 and 27 are arranged on either side for rotation on rotation shaft 22. Each gripper 24, 25, 26, 27 is arranged for pivoting about a pivot axis 48 at right angles to the rotation shaft 23 of gripping device 22. Each gripper 24, 25, 26, 27 is provided with a cam 28 which co-acts with a curve plate 29 which can be driven parallel to the rotation shaft 23 of gripping device 22. Driving of curve plates 29, rotation around rotation shaft 23 and pivoting movement relative to pivot axis 48 takes place on the top side, as shown in figure 1, by means of a disc 30 provided with a curve (not shown). The disc 30 with curve is driven by means of drive shaft 15 and a motor (not shown). The driving with curve disc 30 and curve plates 29 ensure the correct movement of grippers 24, 25, 26, 27 of gripping device 22.

[0023] The feed means 1 for feeding the bunches 20 to the rolling location further comprise a supply system 32 which comprises three endless conveyor belts 33 disposed parallel to each other for supporting the bunches 20. Conveyor belts 33 are each provided with ribs 34 for carrying along bunches 20. Two of the three conveyor belts 33, i.e. the left-hand and the middle conveyor belt 33 in figure 5, are arranged for displacement toward each other. The right-hand conveyor belt 33 is a non-displaceable conveyor belt 33 and on the side of rolling location 2. This ensures that one outer end of each bunch 20 is always situated at the same point in relation to the gripping device, irrespective of the length of bunch 20. The left-hand conveyor belt 33 is connected to a first spindle 35 provided with coarse screw thread. The middle conveyor belt is connected to a second spindle 36 provided with fine screw thread. The spindle 35 with coarse screw thread is placed in line with spindle 36 with fine screw thread such that, when screw spindle 35 is rotated, screw spindle 36 is co-rotated. Spindle 35 and 36 together form a spindle assembly. A belt 37 is arranged between the two spindle assemblies. One of the spindle assemblies is or can be coupled to a handle 38 for rotating both spindle assemblies. When handle 38 is rotated the left-hand conveyor belt 33 will be displaced over a greater distance than the middle conveyor belt 33. When the ratio of the pitch of spindle 35 and that of spindle 36 amounts to 2:1, this ensures that the middle conveyor belt 33 is centred relative to the outer conveyor belts 33. The adjustment of conveyor belts 33 is necessary to adequately support different bunches 20 of different lengths during feed thereof to the rolling location 2.

[0024] Figure 6 shows in more detail the driving of carrier arms 7 and suction boxes 8. Figure 7 shows a top view. It must further be noted that for the sake of clarity in figure 6 a part of the apparatus has been omitted at the position indicated with arrow VIII. This part is shown in cross-section in figure 8.

[0025] Figure 6 shows clearly that the drive gear 44 drives the lower toothed wheel 43. The drive shaft 14 on which the drive gear is mounted rotates uniformly. The two toothed wheels 42 provided with slotted holes 50 are located above toothed wheel 43. Situated on the top side of toothed wheels 42,43 are two pairs of pivot arms 49, each provided with a cam 45. In the case of each pair there are rods 51 extending from the ends of the pivot arms 49 through the slotted holes in toothed wheels 42. For both pairs it is the case that the rod 51 is coupled on the one side of pivot arms 49 to the lower toothed wheel 43. On the other side of pivot arms 49 the rod 51 is coupled to either the middle or to the upper toothed wheel 42. The upper toothed wheel 42 drives the upper toothed wheel 13 for the one carrier arm 7 and the middle toothed wheel 42 drives the lower toothed wheel 13 for the other carrier arm 7. Cams 45 run in a curve 52 in disc 46. The curve brings about variation in the angle between pivot arms 49. A phase difference is hereby obtained between drive shaft 14 on the one hand and carrier arm 7 on the other. Carrier arms 7 can each be given their own phase difference since a pair of pivot arms 49 is provided for each carrier arm 7.

[0026] The whole process for forming a cigar will be explained below. From supply system 32 bunches 20 are transferred onto a conveyor belt system 39, which consists of a number of sawtooth-like transporting strips 40 which are disposed parallel to each other and which are drivable independently of each other in transporting direction and in a direction transversely thereof. By driving the transporting strips 40 alternately or two by two up and downward and back and forth the bunches 20 are carried individually and correctly centred to gripping device 22.

[0027] Having arrived at the gripping device 22, a bunch 20 is picked up from the feed position while a wrapped bunch 21 is simultaneously removed from rolling location 2 on the other side of rotation arm 22. Grippers 24,25 are pivoted away while grippers 27 and 26 respectively are pivoted to the position which has just been vacated. Gripper 27 sets down a wrapped bunch 21 at the vacated discharge location, while gripper 26 simultaneously delivers a subsequent bunch 20 to rolling location 2 on the other side of rotation shaft 23. The grippers are then rotated through 180°, whereafter the process can take place again from the beginning. The wrapped bunches 21 are carried off elsewhere where they are made to length and are shaped, i.e. the outer end is finished by turning. The cigars are then ready for use.

[0028] In the other part of the apparatus the suction box 8, which is connected to arm 7a, is positioned above the feed location for wrappers 19. A wrapper 19 is sucked away from the carrier foil by suction force. The carrier arm assembly rotates to the right, the suction box 8 moves over the glueing device 16 where an adhesive edge is applied to wrapper 19. The carrier arm assembly then rotates further to the right to rolling device 4. A finished bunch 20 is already present here, set down by a gripper of gripping device 22. Rolling of the wrapper 19 around bunch 20 in rolling device 4 takes place while gripper arm part 7b is rotated to the right about rotation shaft 6 with the desired accelerations and decelerations. The other carrier arm 7 has meanwhile picked up a subsequent wrapper 19 from feed location 17 and carried it along the glueing device 16. During rolling of wrapper 19 the arm part 7b thus rotates to the right, and the position and orientation of suction box 8 is controlled as desired by the cam means 12 in the curves of disc 47.

[0029] The particular feature of the invention is that with only two curve discs 46,47 an apparatus is obtained which can be used very flexibly and which forms cigars with high productivity. Carrier arms 7 can rotate on the same rotation shaft 6 independently of each other in respect of speed, acceleration or deceleration, while the position and orientation of suction boxes 8, which are mounted on carrier arms 7, are determined by only one

disc provided with two curves. The speed and acceleration or deceleration of carrier arms 7 is likewise determined by only one disc provided with only one curve for both carrier arms 7, this however such that the one carrier arm 7 can be given a determined speed and acceleration or deceleration independently of the other carrier arm 7.

Claims

1. Apparatus for forming a cigar from a bunch and a wrapper, comprising feed means for feeding a bunch to a rolling location, transport means for transporting a wrapper to the rolling location, a rolling device at the rolling location for rolling the wrapper around the bunch, and drive means for driving the transport means, wherein the transport means comprise at least two carrier arms which are driven rotatably around a rotation axis and provided on their outer ends with suction means for holding the wrapper with suction force during transport, **characterized in that** the carrier arms are drivable independently of each other around the rotation axis.

2. Apparatus as claimed in claim 1, wherein the drive means comprise a drive shaft and a gear transmission provided with means for generating a phase difference between each carrier arm and the drive shaft.

3. Apparatus as claimed in claim 2, wherein the means for generating a phase difference comprise cam means and a curve disc co-acting therewith.

4. Apparatus as claimed in any of the foregoing claims, wherein each carrier arm is an articulated arm.

5. Apparatus as claimed in claim 4, wherein the transport means further comprise at least one disc provided with at least one curve in which cam means mounted on the carrier arms run for the purpose of determining the position and the orientation of the suction means relative to the rotation axis.

6. Apparatus as claimed in any of the foregoing claims, further comprising discharge means for discharging a wrapped bunch from the rolling location.

7. Apparatus as claimed in claim 6, wherein the feed means for feeding the bunch to the rolling location and the discharge means for discharging the wrapped bunch are combined in one gripping device which comprises at least two grippers.

8. Apparatus as claimed in claim 7, wherein the gripping device comprises a rotation axis and wherein the grippers are arranged for rotation about the rotation axis.

9. Apparatus as claimed in claim 8, wherein the gripping device comprises two pairs of grippers on either side.

10. Apparatus as claimed in claim 9, wherein each gripper is arranged for pivoting around a pivot axis at right angles to the rotation axis.

11. Apparatus as claimed in any of the foregoing claims, wherein the feed means for feeding the bunches to the rolling location further comprise a supply system which comprises at least three endless conveyor belts disposed parallel to each other for supporting the bunches, wherein two of the three conveyor belts are arranged displaceably in a direction toward each other.

12. Apparatus as claimed in claim 11, wherein one of the outer conveyor belts is a non-displaceable conveyor belt.

13. Apparatus as claimed in claim 12 wherein the other outer conveyor belt is connected to a first spindle provided with coarse screw thread and wherein the middle conveyor belt is connected to a second spindle provided with fine screw thread, and wherein the spindles lie mutually in line.

14. Apparatus as claimed in claim 13, wherein the coarse screw thread has a pitch that is twice as large as the fine screw thread.

15. Gripping device as claimed in any of the claims 7-10.

16. Method for forming a cigar from a bunch and a wrapper, comprising the steps of:

    - feeding a bunch to a rolling location,
    - transporting a wrapper to the rolling location,
    - rolling the wrapper around the bunch at the rolling location, and
    - discharging a wrapped bunch, wherein for the purpose of transporting and rolling a wrapper use is made of a carrier arm which is provided on its outer end with suction means, **characterized in that** during the rolling around a bunch of a wrapper supported by a first carrier arm a subsequent wrapper supported by a second carrier arm is transported to the rolling location.

17. Method as claimed in claim 16, wherein the speeds of the carrier arms are controlled independently of each other.

18. Method as claimed in claim 16 or 17, wherein the position and orientation of the suction means are controlled independently of each other.

19. Method as claimed in any of the claims 16-18, wherein during the feeding of a bunch from the feed location to the rolling location a wrapped bunch is simultaneously discharged from the rolling location to the discharge position.

20. Method as claimed in claim 19, wherein during the removal of a wrapped bunch from the rolling location, a bunch is simultaneously picked up from the feed location, whereafter an already fed bunch is set down at the rolling location and the bunch already removed from the rolling location is simultaneously set down for discharge at the position of the bunch that has just been picked up.

21. Method as claimed in any of the claims 16-20, wherein a wrapper is provided with glue during transport of the wrapper.

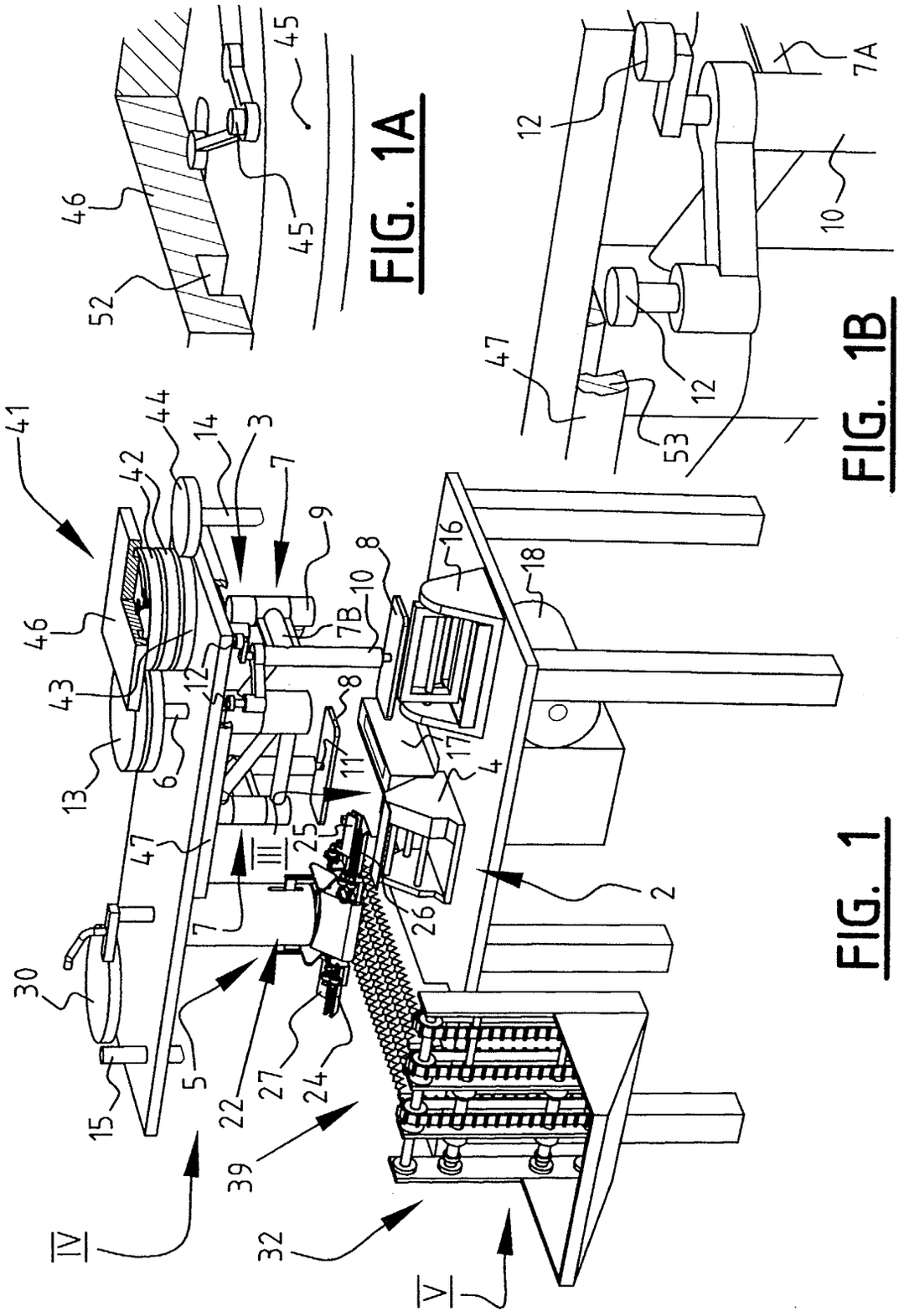

FIG. 1A

FIG. 1B

FIG. 1

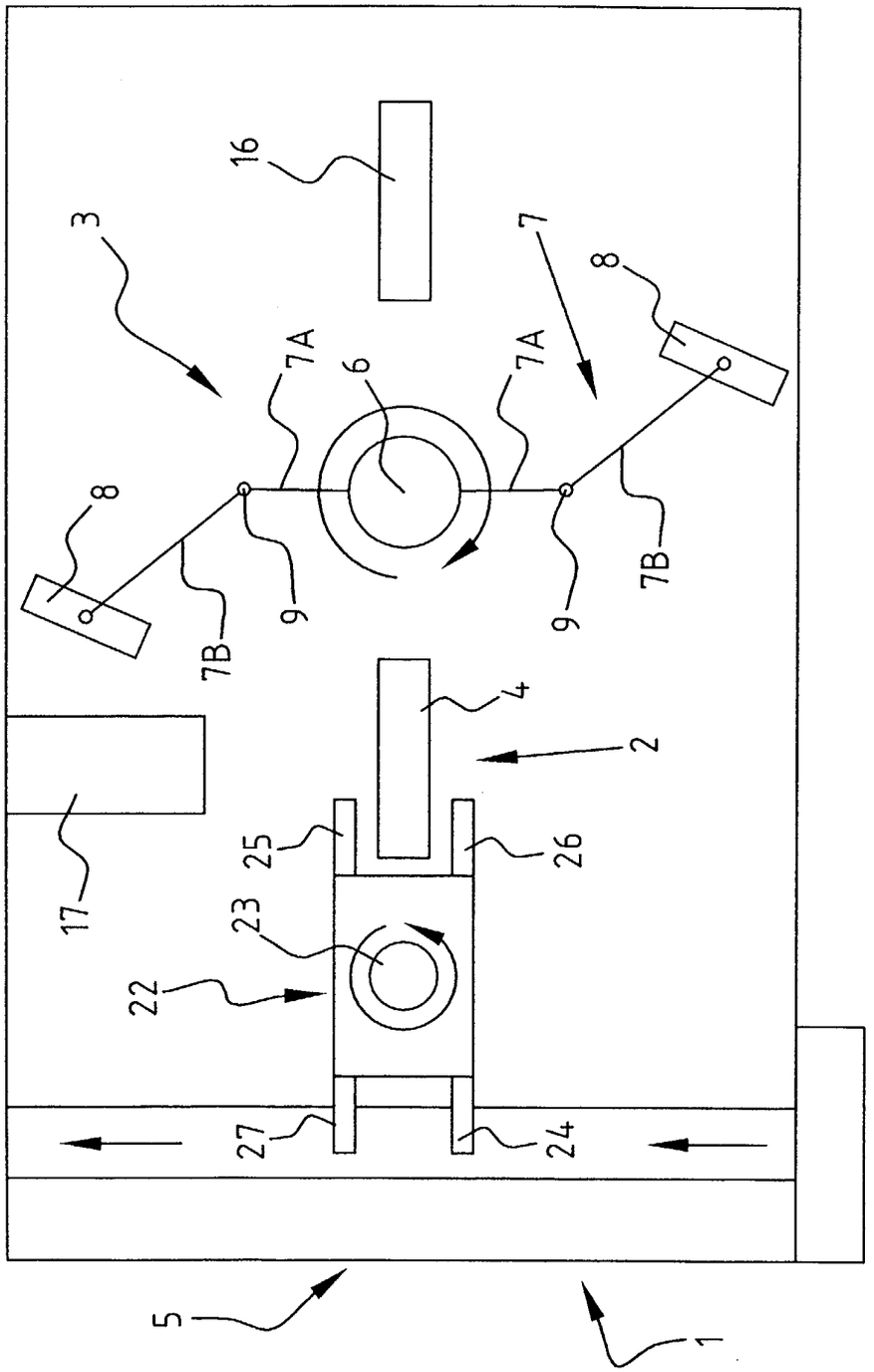

FIG. 2

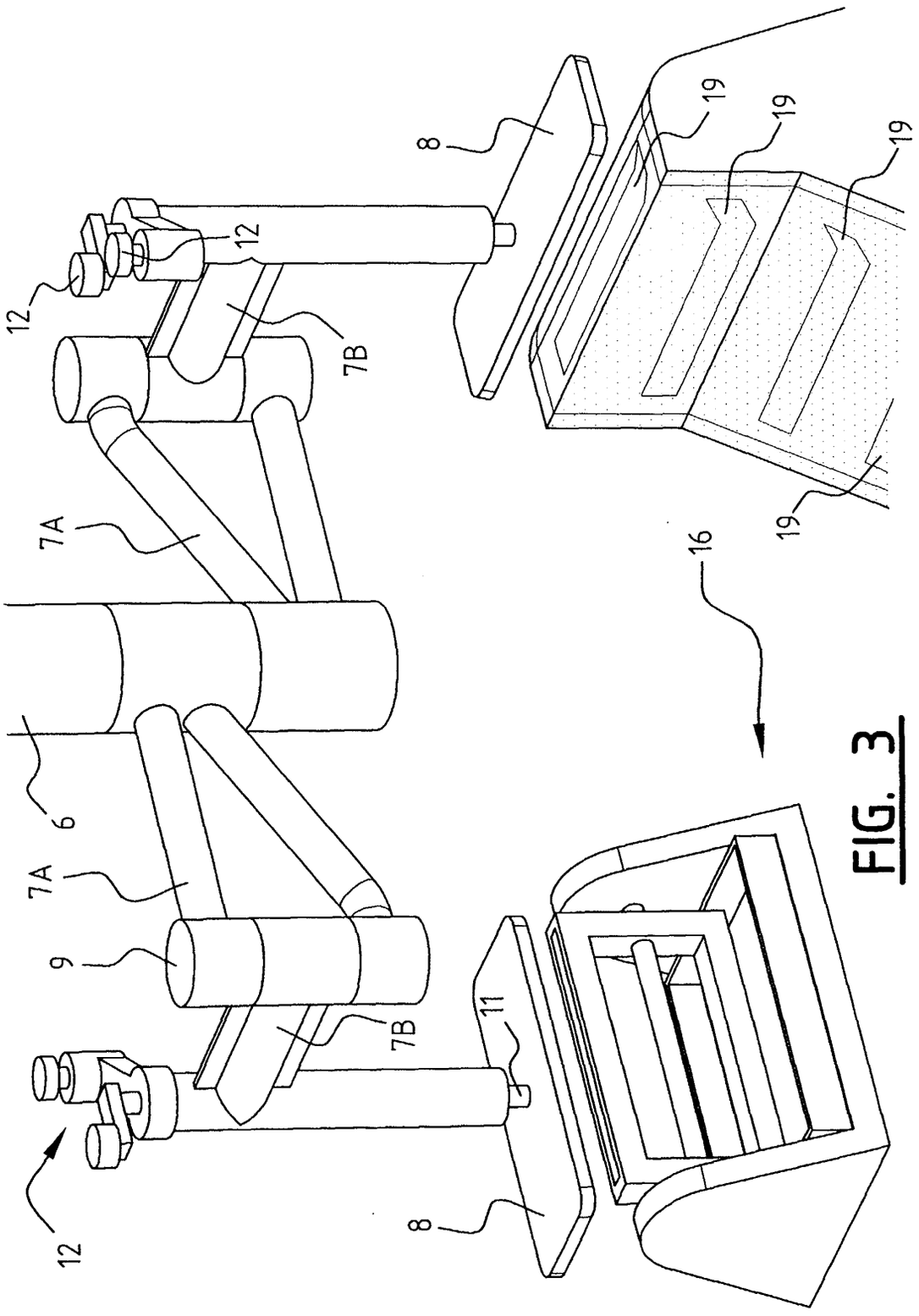

FIG. 3

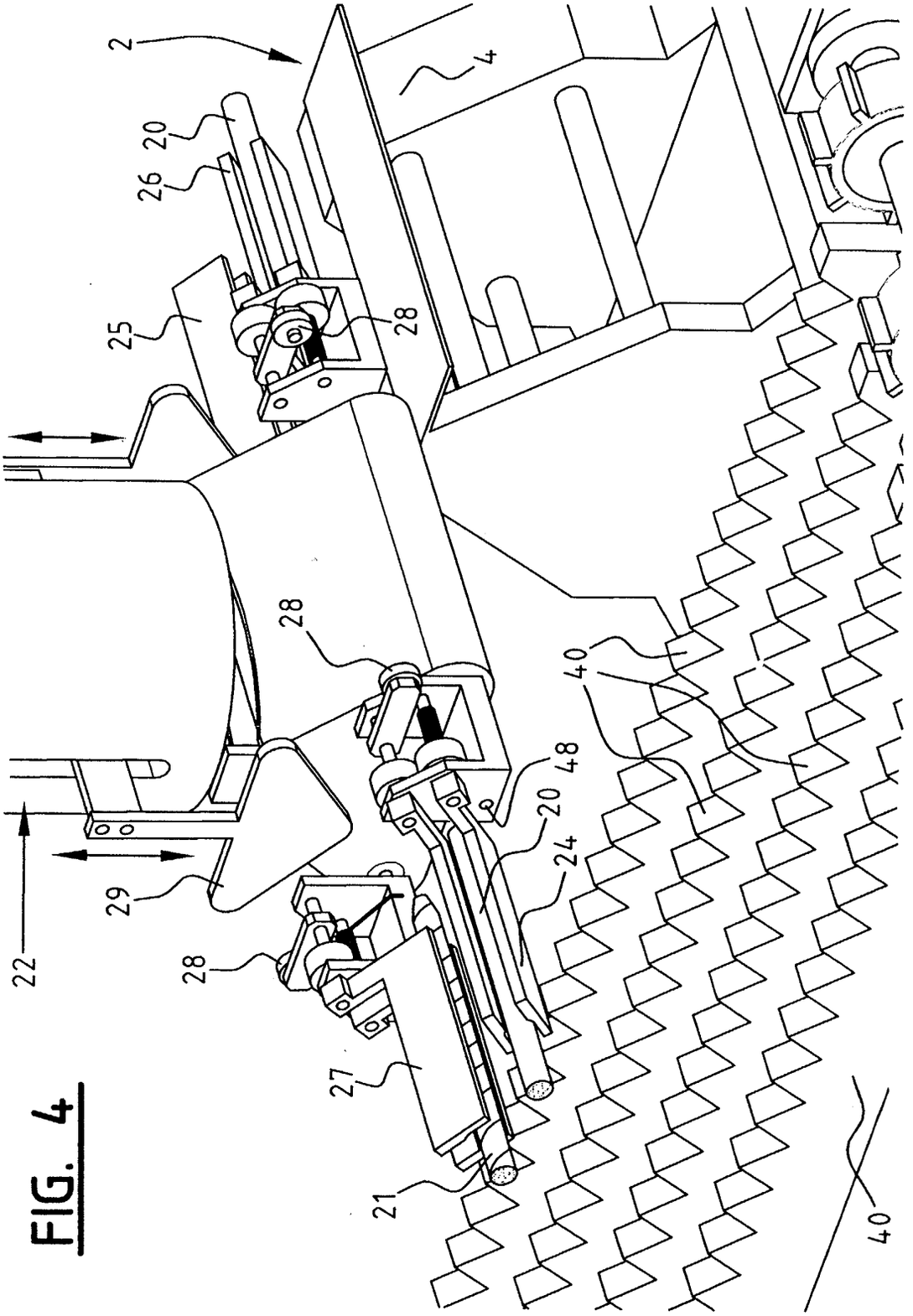

FIG. 4

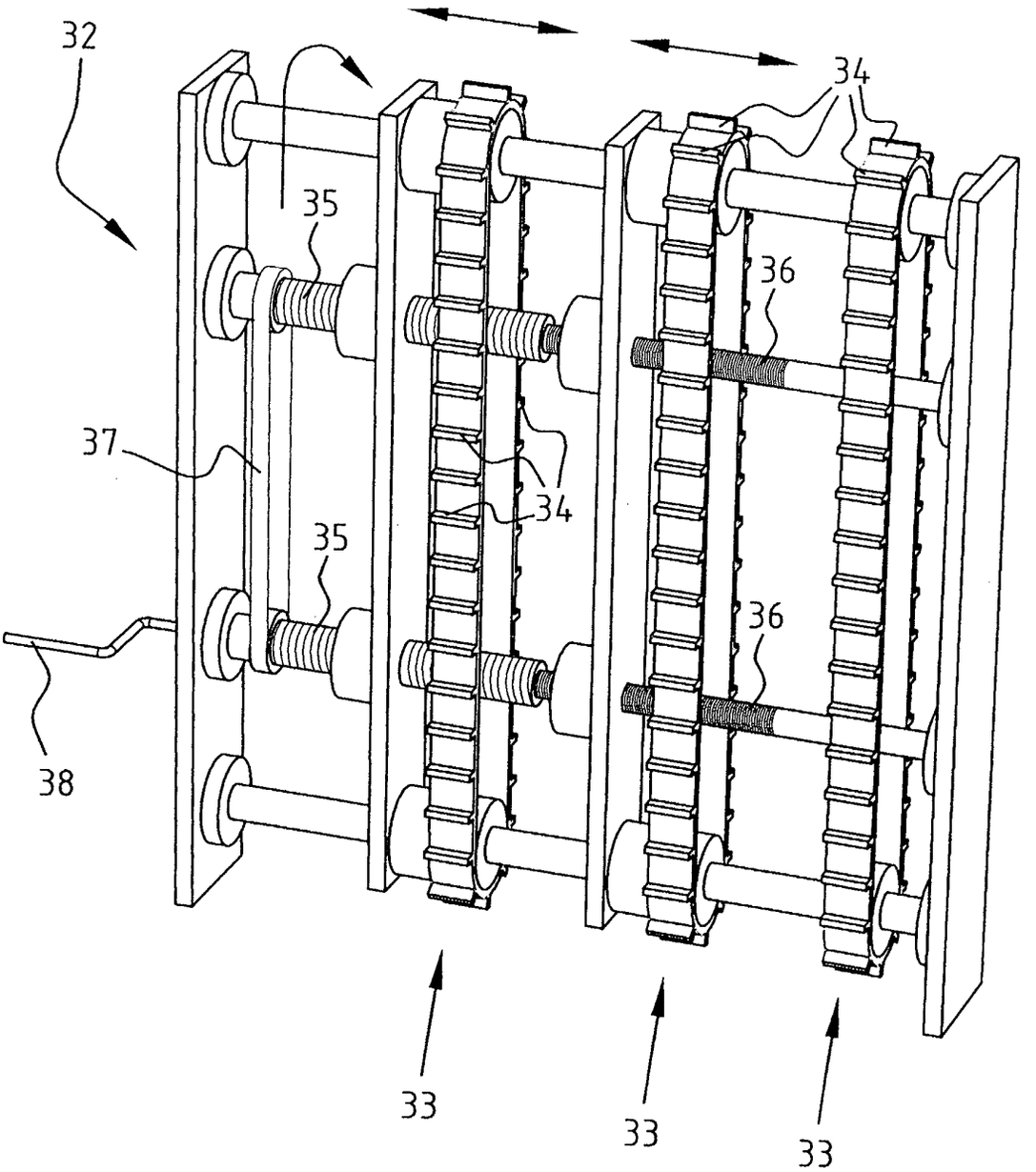

FIG. 5

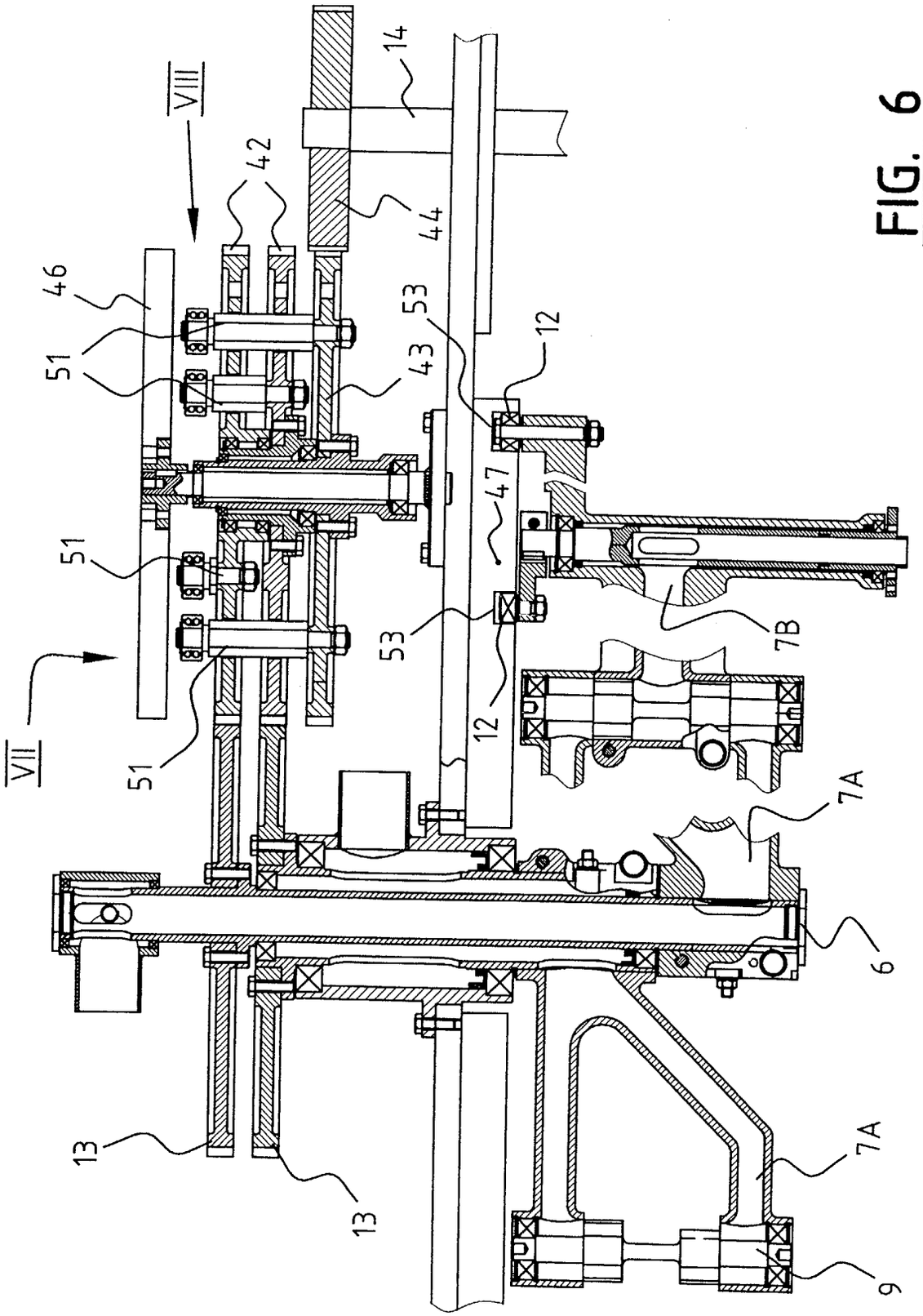

FIG. 6

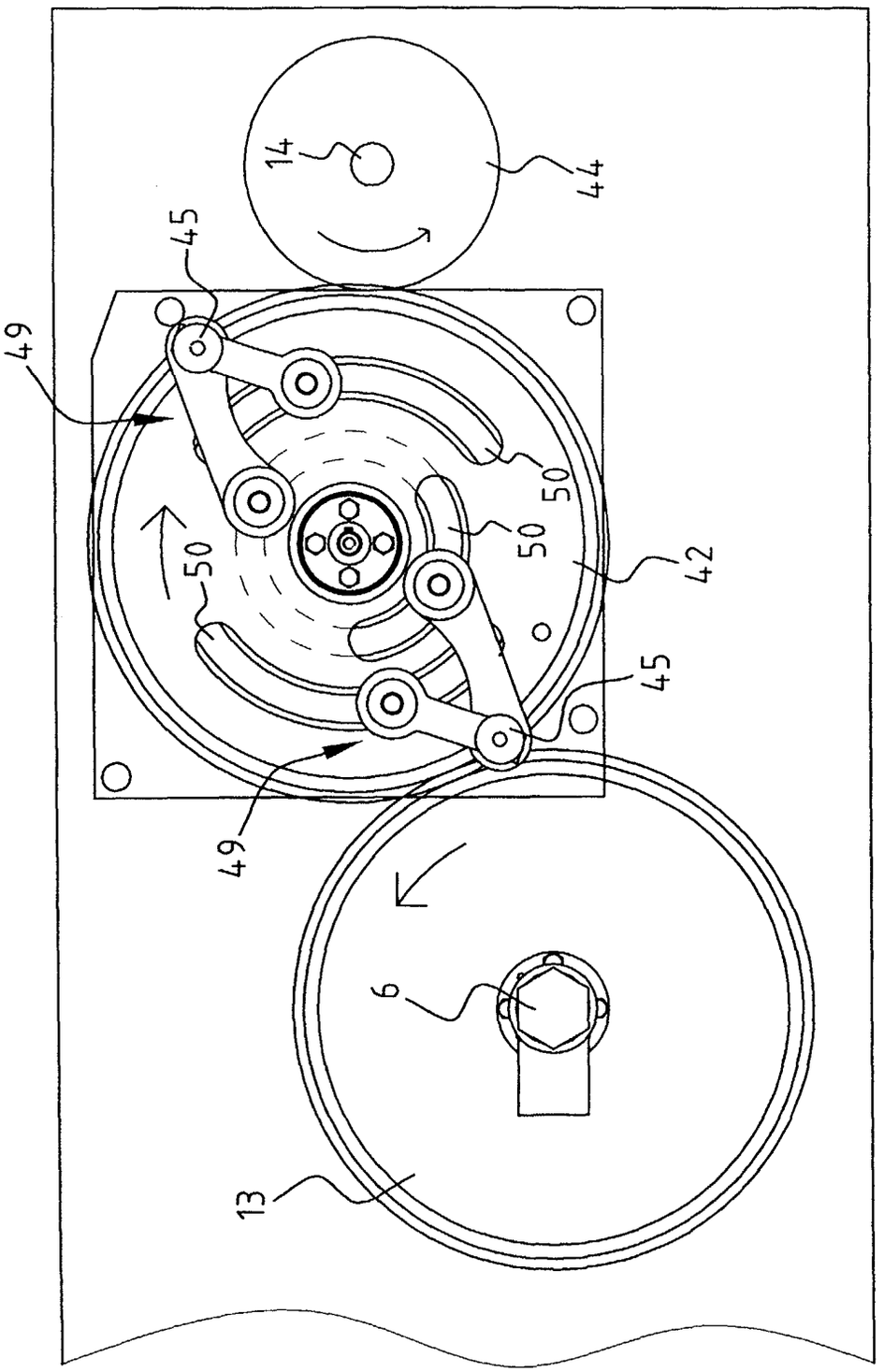

FIG. 7

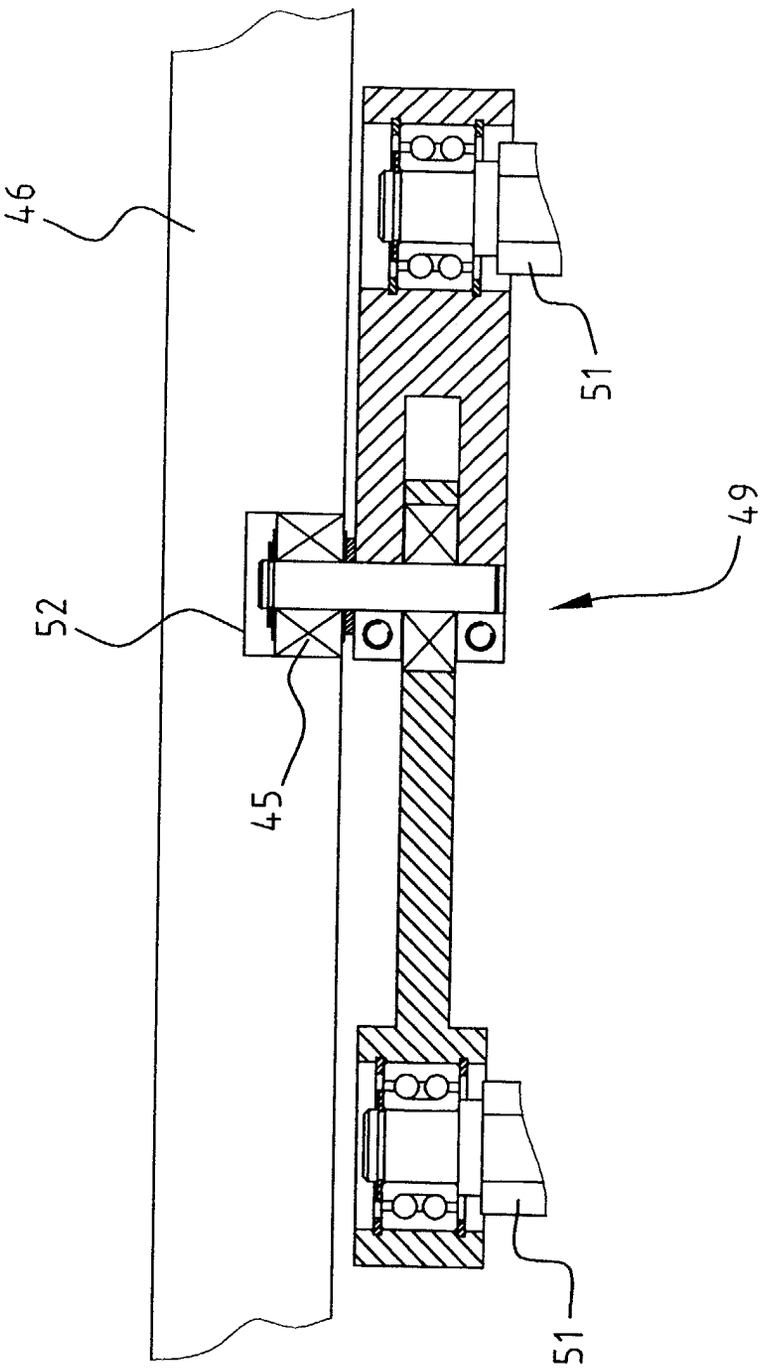

FIG. 8

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 03 07 7676

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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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
The Hague	13 November 2003	Riegel, R

CATEGORY OF CITED DOCUMENTS

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 03 07 7676

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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13-11-2003

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