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Machine for counting and checking paper money of any size, even though overlapped, slave to a computer.

A machine for continuously counting and checking bills, even though overlapped, suitable for banking institutions (fig. 1) is involved.

Its feeder device essentially comprises a loading hopper for bills (1', 1'' and 1''', fig. 4) and a device that takes them, sending them, by means of drive belts (30, fig. 2), to the successive process machine.

In feeder (1, fig. 4), the bills are taken crosswise and sent longitudinally with respect to their longitudinal axis.

Photocells (33, fig. 2), a thickness gage (34) and bill dimension detector (35) are provided on the sides of said belts (30, fig. 2).

Downstream from the drive belts of the feeder (30, fig. 2) there are provided other belts (44, fig. 2) to transfer the counterfeit bills into a suitable pocket (6) and the authentic bills in a second pocket (5) equipped to send the bills inside the machine or at the disposal of the client.

The machine includes a computer with printer (4, fig. 1) in which the client introduces additional data by video (3) and keyboard (3').

It can process bills of size, even mixed. It makes use only of electromechanical and electronic technology.

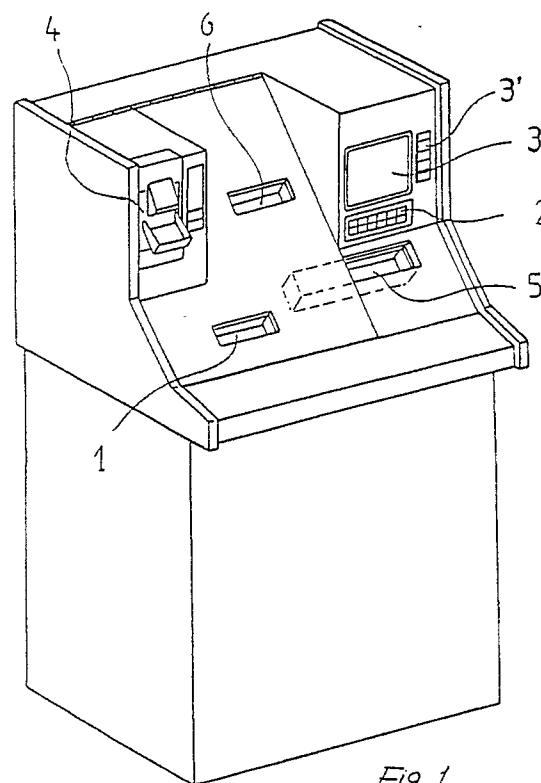
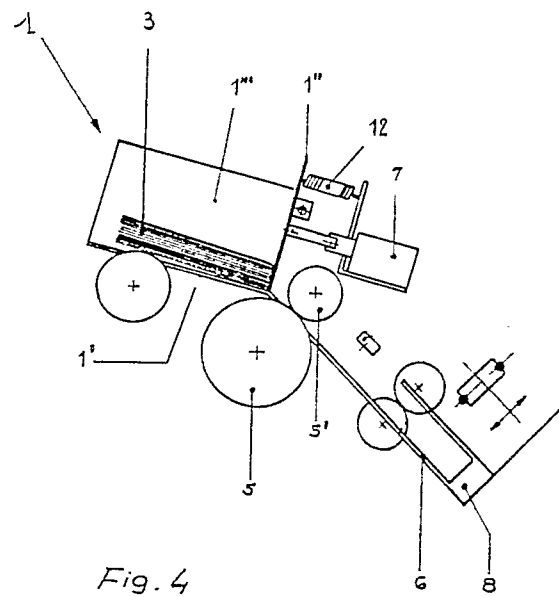
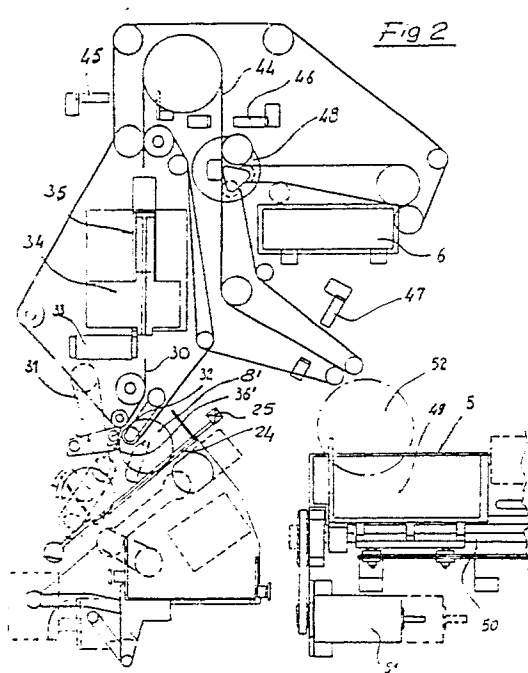


Fig. 1

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Machine for counting and checking paper money of any size, even though overlapped, slave to a computer

The object of this invention is a machine for counting and checking paper money of any size, even though overlapped.

As is known, in automatic banking circles, the need is keenly felt for mechanizing the service of operations of depositing in the checking account by the user who intends to deposit bills of different size, even mixed up.

It is also known that now there exists in commerce machines able to check the authenticity of bills and count them.

However, such machines are able to operate, at least each time, with previous suitable adjustments, only on bills of a single size.

The object of this invention is to eliminate the above regretted limitation by achieving a machine for checking and counting bills, which is able to operate on bills of any size, even overlapped.

Within the framework of said object, a particular aim of this invention is to achieve a machine for counting and checking bills, which is able to identify the value of each individual bill counted and checked, adding it up and verifying its agreement with what has been previously indicated by the client by a suitable keyboard.

Another aim of this invention is to achieve a machine for counting and checking bills, which is able to provide the client a final and legal receipt of what has been deposited.

The present machine, in substance, is able, by analyzing, bill by bill, to give the user who punches the machine only the total of the amount, by identifying and analyzing all the bills introduced by the user. The machine in question is characterized by the characterizing part of claim 1.

Further characteristics and advantages of the machine for counting and checking bills, which constitutes the object of this patent, will be better understood with the help of the following description in a preferred embodiment of the machine, illustrated, purely by way of indication in the various figures of the accompanying drawings, in which:

In figure 1 is shown, diagrammatically, an outside view of such a machine.

In figure 2 is represented, still diagrammatically, an elevation of the essential operating parts of the machine.

In figure 3, 3a is represented the device able to detect the dimensions of the bills.

In figure 4 is shown, in particular, the feeder device.

In figure 5 is illustrated the perspective view of the feeder device.

In figures 6 and 7 the same feeder device is represented in side and partial top view.

In figure 8 is illustrated a diagrammatic rear view of the feeder device.

In figure 9 is shown the possibility of tilting the same device with respect to the elements for longitudinal driving of the bills.

With particular reference to the numerical symbols of the various figures of the accompanying drawings, the machine for counting and checking bills, under discussion, comprises a feed device 1 (fig. 1 and 4), consisting of a box-shaped body, open in the front and upward, on bottom 1' of which the client places the bills to be deposited.

The feed devices traditionally used on said machines can be formally reduced to two specific types, depending on whether they perform the removal of the bills in the crosswise or longitudinal direction from a stack of bills placed on a suitable support structure called loading hopper.

Generally, those that operate in the crosswise direction are more reliable and faster since the bills exhibit, in the crosswise direction, a greater rigidity and smaller dimensions. However, for the process machine a feeding in the longitudinal direction is generally preferable, which facilitates the operation of the sensors.

From the technological viewpoint, existing feeders can be distinguished basically into two groups: those that use exclusively electromechanical principles and those that also resort to pneumatic aids; the latter are generally more reliable but complicated and bulky.

The aim of the inventor was to achieve a machine with an electromechanical bills feeder with great reliability, which is characterized by capability of taking bills from the feed hopper in the crosswise direction and then sending them to the process machine in the longitudinal direction. In this way, a device is obtained that combines the advantages of all the solutions now known.

Another aim of this invention is to achieve a machine in which the bill feeder is able to be stopped automatically if a bill interferes with the mechanism for driving the bill to be fed. Said object, as well as the above-mentioned objects and others, which can possibly be shown better below, are achieved by a feeder with an improved structure, for feeding the machine for counting and checking bills in general, characterized by the fact of comprising essentially the following elements, graphically diagrammed in figures 4 to 9:

1) of a loading hopper consisting essentially of a chute, more or less inclined, able to support

the incoming bills and to convey them in an orderly way by using the force of gravity, friction and suitable vibration.

2) Suitable elements for generating the vibrations indicated in 1).

3) a mobile wall approximately orthogonal to chute mentioned in 1) able to assume two positions that can be defined as "closed" and "open."

In the "closed" position it acts as a stop against which the incoming bills rest sideways and are aligned, promoted by the vibration mentioned under 2).

The open position allows the advance of the bill that is under the stack; this bill thus comes in contact with the successive driving elements.

4) A driving system, consisting, for example, of an electromagnet 7 (fig. 4) and a counterspring 12, able to control the mobile wall.

5) A system of motor-driven rollers 2, covered with rubbery material with a high friction coefficient, with suitably machined surface, able to push the bills forward, and a system of counterrollers 5, 5', prevented from rotating in the direction of advance of the bills, able to prevent the advance of bills that are possibly overlapped. Such prevention ceases when the bottom bill has passed, so that all the bills, in sequence, are advanced.

6) A chute 6 on which the bills, which have passed between the rollers mentioned in 5), run one at a time to be stopped against a stop 8 orthogonal to said chute.

7) Specific elements, in this case motor-driven eccentric rollers 19 (fig. 8), able to promote and accelerate the descent of the bill along chute 6 and its being stopped and aligned against stop 8.

8) Sensors able to detect the arrival and satisfactory stopping and aligning of the bill against the stop.

9) Sensors able to detect the possible presence of successive bills (besides the one in the phase of descent and alignment) in abnormal position.

10) A mobile element carrying a driving system consisting of motor-driven belts and pulleys. This element, thanks to a suitable drive system, is able to carry one (or more) drive belts in contact with the bill after the bill is stopped, aligned against the stop, so as to drive it away in the direction orthogonal to the original direction and therefore in the longitudinal direction with respect to the bill itself.

11) An electrical/electronic system that coordinates the driving of all the motor-driven elements on the basis of a programming received and the signals received from the sensors, so as to assure a correct functioning of the system with crosswise sequential removal of the bills from the hopper and their being sent in the longitudinal

direction to the process machine.

In case of abnormal positioning of bills, detected by sensors, the checking system can see to stopping the feeder and optionally sending an alarm to the operator.

With particular reference to the numerical symbols of the various figures of the accompanying drawings, the feeder with improved structure, for feeding the machine for checking and/or counting the bills in question, comprises a chute 1' (fig. 4), provided with side walls 1'', mounted on shoulders 9 (fig. 7) between which are placed crosspieces 10 carrying horizontal plates 11.

On one of said plates is hinged a wall 1'' (fig. 4), almost tangent to said chute, able to restrict the stack of bills and whose relative position, with respect to the chute itself, can be suitably adjusted.

More precisely, this wall is kept in restricting position by a return spring 12 and is able to rotate to allow the passage of the bills by the action of a lever arm, jointed to the mobile armature of an electromagnet 7. In turn, chute 1' is provided with suitable slots for the tangential passage of two series of eccentrics 13 and 13' (fig. 5), mounted on an equal number of shafts 14 and 14', placed in rotation by a gear motor 15 by means of suitable transmission elements.

Downstream from said chute there are provided lower roller 16 (fig. 5), with suitably machined surface, and a series of upper disks 17 (fig. 5) rotating in the same direction.

In substance, said series of eccentrics see to arranging the stack of bills correctly on the chute, pushing the bills against mobile wall 1'' by gravity, vibration or friction.

Then, electromagnet 7 moves the wall into open position and said roller 16 sees to conveying the lower bill of the stack along back chute 8 (fig. 8) while disks 17 (fig. 5) see to blocking the descent of the remaining bills.

On said back chute is provided another series of eccentrics 19 (fig. 8), mounted on a shaft 20 and moved by their own motor 22 (fig. 5) by means of a transmission group 21 (fig. 6).

The latter eccentrics can impart to the bill, coming from the chute, a position that causes it to rest sideways, on a base stop 8 (fig. 8).

A pulley 23 (fig. 7), mounted on an appendage 24, and able to come in contact with the chute itself, works with chute 18 (fig. 8).

More precisely, this appendage is mounted orthogonally on an arm 25, hinged at one end and shaped, on its opposite end, like a rack, engaged by a ratchet 26 moved in partial rotation by a motor 26 (fig. 6).

In turn, said pulley carries a belt 27 (fig. 8) stretched from a second pulley 28, suitably motor-driven.

There are also provided two lower photocells, or sensors 54 (fig. 8), able to verify that the bill, to be fed to the general processing machine, is perfectly aligned, in the longitudinal direction, with the gripping element of the machine, and an upper photocell 29 able to detect the possible presence of a second bill, in the phase of descending from the feeder.

In practice, when the bill to be transferred from the checking and/or counting machine is in the provided position, said pair of photocells stop the movement of the series of eccentrics and of drive elements 16 (fig. 4) and 17 (fig. 5).

At the same time, pulley 23 (fig. 7) moves downward so that belt 27, driven by pulley 28, transfers the bill to the input of the machine.

Vice versa, if a second bill is present on rear chute 18, said photocell stops the functioning of the device.

It is also appropriate to point out that the operating part of the device is hinged on the chute carrying the elements for longitudinal driving of the bills to be able to be tilted with respect to the chute (fig. 8).

This arrangement, in substance, facilitates possible interventions aimed at removing obstacles (overlapped bills or the like) that have stopped the machine.

From what has been said above and from observation of the various figures of the accompanying drawings, there are seen the best functionality and practicality of use, which characterize the feeder with improved structure for feeding the machine for checking and/or counting bills, constituting the object of this invention.

To guarantee the correct gripping of belts 30 (fig. 2) on the bill a further guide element 31 can be provided, having a curved front portion 31', in whose center is an idle roller 32.

Said belts form a closed circuit, driving the individual bills upward and running on the side of a photocell 33 and inside, respectively, a thickness gage 34, and a dimension detector 35.

In particular, the photocell performs the traditional functions of checking the authenticity of the bill and its state of preservation, while the thickness gage detects the possible passage of bills that are joined and/or carrying foreign bodies (staples or clips or the like); the dimension detector, in turn, by measuring the length and width of the bill is able to establish its value.

Said thickness gage 34 essentially comprises a shaft 36 (fig. 3), provided with a pair of collars 37, on which an equal number of elastomer collars 38 lie, mounted on a second shaft 39, able to move upward.

Above these elastomer collars are placed feeler elements 40, mounted coaxially with substan-

tially tapered bodies 41, housed in corresponding tapered seats and kept resting on the latter by the action of elastic opposing means.

In substance, if the thickness of a bill, passing between collars 37 and 38 exceeds the distance provided between the feelers and rollers 38, the fact is indicated to the memory of a central processor which, on the basis of a preventive program, will establish the successive route for the bill.

Further, even in the presence of paper clips on the bill, the possibility of raising the tapered body allows it normal passage into the device.

Dimension detector group 35 comprises, essentially, two rows, side by side and with staggered center distances, of point light sources 42 (fig. 3a), opposite which are placed an equal number of photodiodes or the like 43.

Said group, in practice, by measuring the length and width of the bill that passes between said sources and photodiodes is able to establish its value, communicating it to said memory.

Downstream from said detector group, the bills are put into a second pair of drive belts 44 (fig. 2), which run between counting photocells 45, 46 and 47 and beside an exchange mechanism 48.

The latter, as a function of the data sent to the computer, respectively conveys the counterfeit or irreconcilable bills to a reject pocket 6, open in the front of the machine, and the authentic bills to a suitably equipped collection pocket 5.

This pocket, in particular, is provided with a longitudinal wall 49, able to tilt upward, and able to move along a volute 50, moved in rotation by a gear motor 51.

The pocket, in practice, in relation to the requests of the client, can leave the bills within reach of the client, so he can remove them, or move them to the left and leave the bills inside the machine.

Further, above this pocket is preferably provided a motor-driven wheel 52, provided peripherally with a plurality of more or less spiral tongues able to take the individual bills, left by the drive belts, and transfer them correctly, with superposed arrangement, into the pocket.

In the front part of the present machine are also provided a keyboard 2 that can be used by the client to send data to the computer, a video 3 with keyboard 3' able to provide data to the client, and also the output of a printer 4.

In substance, the machine, after having verified the sum placed by the client in the feeder pocket and after having checked both the authenticity of the bills and the agreement with the number punched in by the client, informs the latter, by video, of the possibility of depositing said sum in the checking account or withdrawing it again.

In the first case, the machine collects the bills

lying in mobile pocket 5, leaving a correct receipt by means of said printer.

It is also well to point out that said computer is able to manage all the operating kinematic mechanisms and the related operating sensors.

From what has disclosed above and from observation of the various figures of the accompanying drawings, the great functionality and practicality of use are evident, which characterize the machine for counting and checking bills, constituting the object of the present patent.

Obviously, this machine was described and illustrated above by way of indicative and non-limiting example, and for the sole purpose of demonstrating the practical feasibility and general characteristics of this invention, in which all those variants and modifications within the scope of one skilled in the art can be made and can come within the framework of the innovative concepts disclosed above.

Claims

1. Machine for counting and checking bills of any size, even overlapped, characterized by comprising: a feeder device (1, fig.1) for introduction and perfect arrangement of a stack of bills (3, fig. 4) to be counted and checked, a data keyboard (2, fig. 1) that can be used by the client to send data to the computer, a video (3) with related keyboard (3'), able to request and provide information to the client, a printer (4), an opening (5) for removing authentic bills; an opening (6) for removing counterfeit or irreconcilable bills; said printer being slaved to the programmed computer so as to be able to request from the client, by video (3) and data keyboard (2, fig. 1), the introduction of comparison data.

2. Machine according to claim 1, wherein said feeder device (1, fig. 4) comprises: a box-shape body (1', 1'', 1''') with inclined bottom in which is placed the stack of bills (3) to be counted and checked; elements (7, 12) able to cause the vibration action on the package of bills (3) arranged sideways against a wall (1''') of said box-shaped body, elements (5, 5') being provided able to allow the passage of an individual bill, that is conveyed downward, to a stop (8) made at the base of a vertical wall, with which a tiltable element cooperates, able to push the bill parallel to its longitudinal axis between pairs of drive belts (30, fig. 2), able to transfer it to the input of the specific machine provided for its processing.

3. Machine according to claims 1 and 2, wherein said feeder (1) exhibits said chute (1', fig. 4) mounted on shoulders (9, fig. 7) between which are placed crosspieces (10) carrying horizontal

plates (11), on one of which is hinged a wall (1''), almost tangent to the chute and able to restrain a stack of bills; the arrangement of this wall with respect to the chute being able to be suitably adjusted.

4. Machine according to the preceding claims, wherein in said feeder, wall (1', fig. 4), able to restrict the stack of bills (3), is replaced by another mobile structural element, with generally rototranslatory movement, able to allow the advance of one or more bills from the bottom of the stack.

5. Machine according to the preceding claims, wherein in said feeder said wall is kept in position for restricting the stack of bills (3, fig. 4) by a return spring (12) and able to rotate to allow the passage of the bills by the action of a lever arm, jointed to the armature of an electromagnet (7).

6. Machine according to the preceding claims, wherein in said feeder the mobile structural element, mentioned in claim 2) and 3), is driven by an electromechanical motorization system.

7. Machine according to the preceding claims, wherein in the already cited feeder said chute (1', fig. 7) is provided with slots for tangential passage of two series of eccentrics 13 and 13', fig. 5), mounted on an equal number of shafts 14 and 14') placed in rotation by a motor (15) by means of transmission elements; there being provided downstream from the chute a lower roller (16), with machined surface, and a series of upper disks (17), rotating in the same direction.

8. Machine according to the preceding claims, wherein in said feeder to said chute are connected elements such as eccentrics, electromagnets, tangential belts and equivalent means, able to push the bills by the effect of vibrations, friction and force of gravity.

9. Machine according to the preceding claims, wherein in said feeder on said chute (18, fig. 8) is provided a series of eccentrics (19), mounted on a shaft (20) and moved by their own motor (22, fig. 5) by means of transmission group (21, fig. 6); the latter eccentrics being able to impart to the bill, coming from the above-mentioned chute, a position that brings it to rest, sideways, on a base stop (8, fig. 8).

10. Machine according to the preceding claims, wherein in said feeder the pushing effect on the bill is obtained by sliding of the elements with slight friction and/or by vibrations.

11. Machine according to the preceding claims, wherein in said feeder a pulley (23), mounted on an appendage (24) and able to come in contact with the chute, works with said chute (18, fig. 8); this appendage being mounted orthogonally on an arm (25), hinged at one end and dimensioned, on the opposite end, like a rack, engaged by a ratchet (26), moved in partial rotation by a motor; said

pulley in turn carrying a belt (27) stretched from a second pulley (28).

12. Machine according to the preceding claims, wherein in said feeder the mobile element mentioned in claim 11 can come in contact with the bill and move away from it by rototranslatory movements obtained by driving and motorization.

13. Machine according to the preceding claims, wherein said feeder comprises two lower photocells or sensors (28, fig. 8), able to detect that the bill to be fed to the general processing machine is perfectly aligned, longitudinally, with gripping elements of the machine, and an upper photocell (29), able to detect the possible presence of a second bill, in the phase of descending from the feeder.

14. Machine according to the preceding claims, wherein in said feeder the alignment of the bill and/or the presence of other bills and their possible abnormal position are detected by a system of sensors.

15. Machine according to the preceding claims, wherein the operating part of said feeder, between said shoulders (9, fig. 7), is hinged on the chute carrying the elements for longitudinal driving of the bills.

16. Machine according to the preceding claims, wherein in said feeder the mechanism can be opened and/or removed, in whole or in part, to facilitate the operations of maintenance and/or removal of causes of possible accidents, such as abnormal, torn, folded bills, etc.

17. Machine for counting and checking bills, as in one or more of the preceding claims, wherein the above-mentioned belts form a closed circuit, driving the individual bills upward and running alongside a photocell and inside a thickness gage and a dimension detector; in particular, a photocell (33, fig. 2) performs the traditional functions of checking the authenticity of the bill and its state of preservation, while thickness gage (34) detects the possible passage of bills that are joined and/or carrying foreign bodies (staples or clips or the like); dimension detector (35), by measuring the length and width of the bill, is able to establish its value.

18. Machine for counting and checking bills, as in one or more of the preceding claims, wherein said thickness gage (34, fig. 2) essentially comprises a shaft (36, fig. 3), provided with a pair of collars (37), on which an equal number of elastomer collars (38) lie, mounted on a second shaft (39), able to move upward; above these elastomer collars are placed feeler elements (40), mounted coaxially with substantially tapered bodies (41), housed in corresponding tapered seats and kept resting on the latter by the action of elastic opposing means.

19. Machine for counting and checking bills, as in one or more of the preceding claims, wherein

said dimension detector group (35, fig. 3) comprises, essentially, two rows, side by side and with staggered center distances, of point light sources (42, fig. 3a), opposite which are placed an equal number of photodiodes or the like (43); the bills are made to run between these light sources and photodiodes.

20. Machine for counting and checking bills, as in one or more of the preceding claims, wherein downstream from said detector group (35, fig. 2), the bills are put between pairs of drive belts (44), which run between counting photocells (45, 46 and 47) and beside an exchange mechanism (48), which, as a function of the data sent to the computer, respectively conveys the counterfeit or irreconcilable bills to a reject pocket (6, fig. 1), open in the front of the machine, and the authentic bills to a suitable equipped collection pocket (5, fig. 1).

21. Machine for counting and checking bills, as in one or more of the preceding claims, wherein said pocket is provided with a longitudinal wall (49, fig. 2), able to tilt upward and able to move along a volute (50), put in rotation by a gear motor (51), further, above this pocket is preferably provided a motor-driven wheel (52), provided peripherally with a plurality of more or less spiral tongues able to take the individual bills, left by the drive belts, and transfer them correctly, with superposed arrangement, into the pocket.

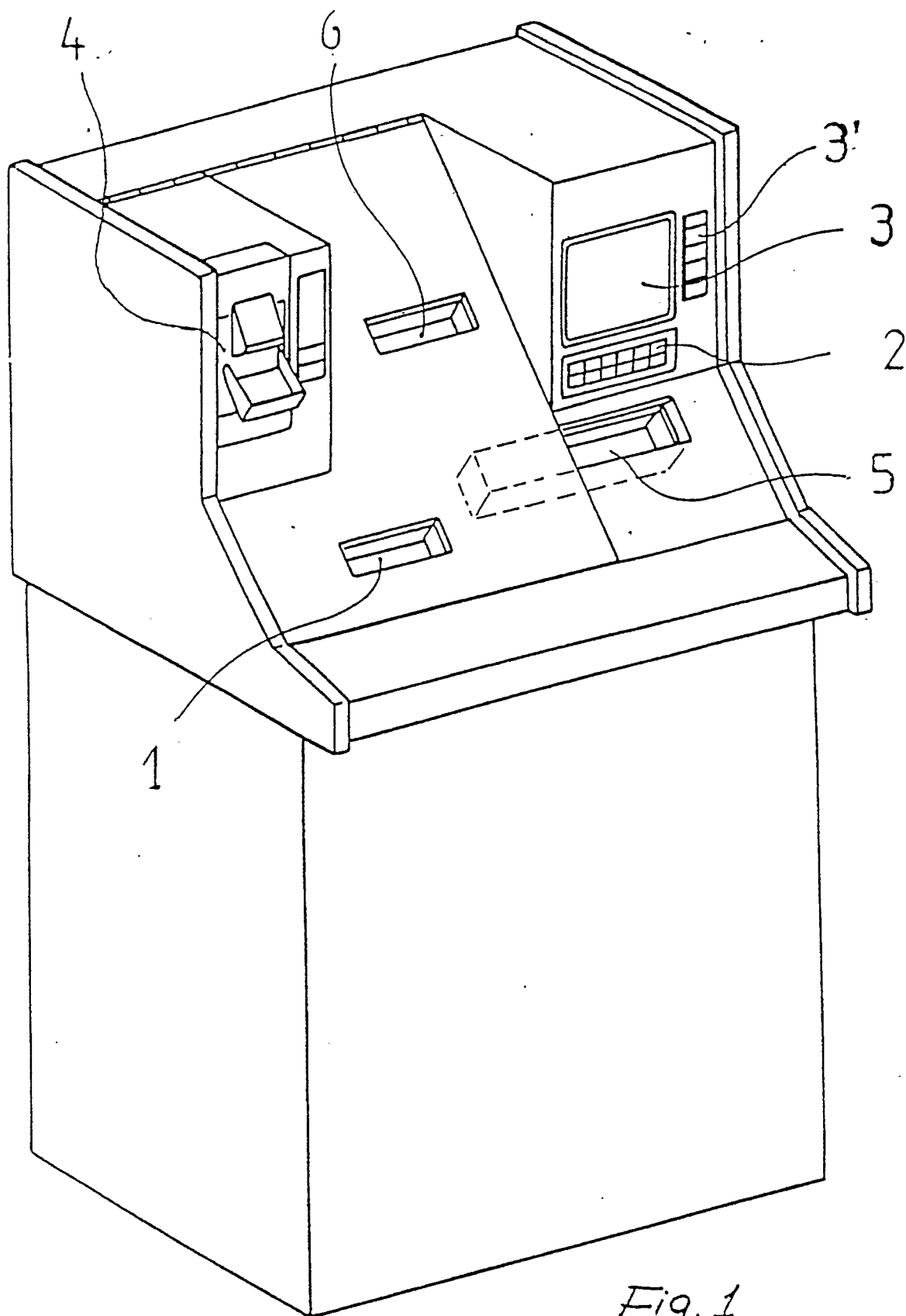
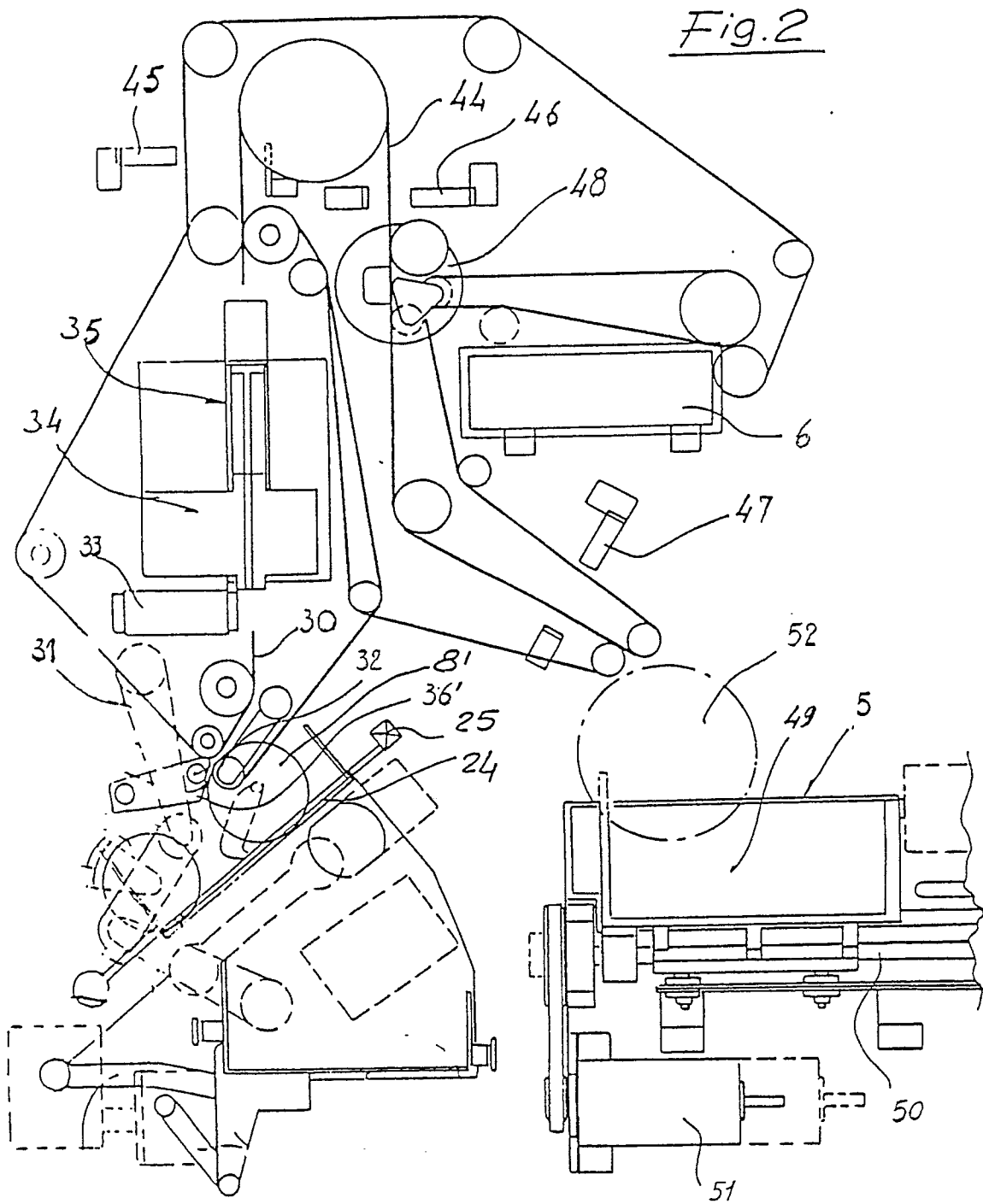
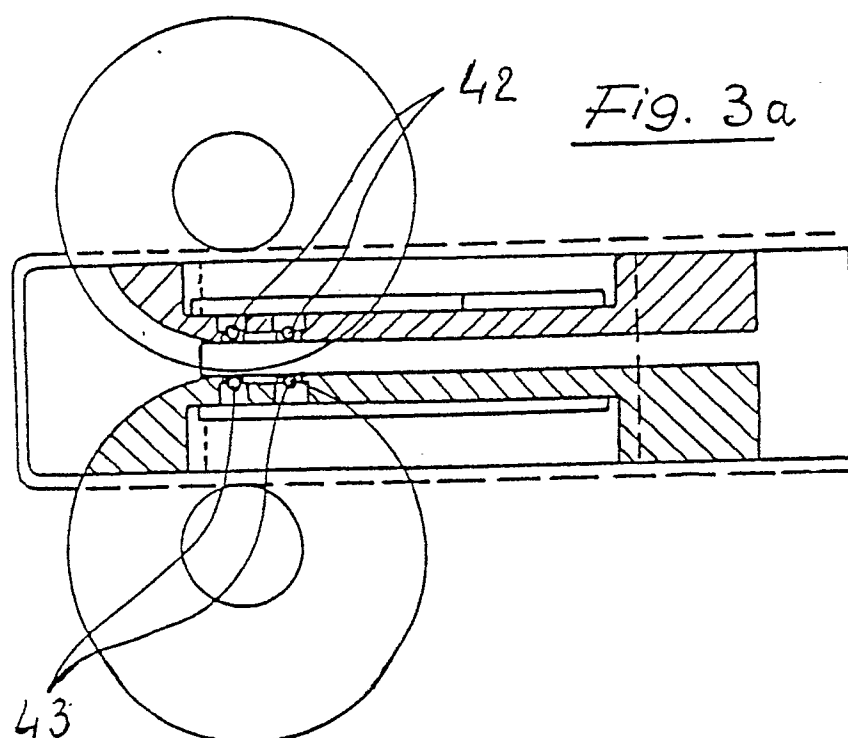
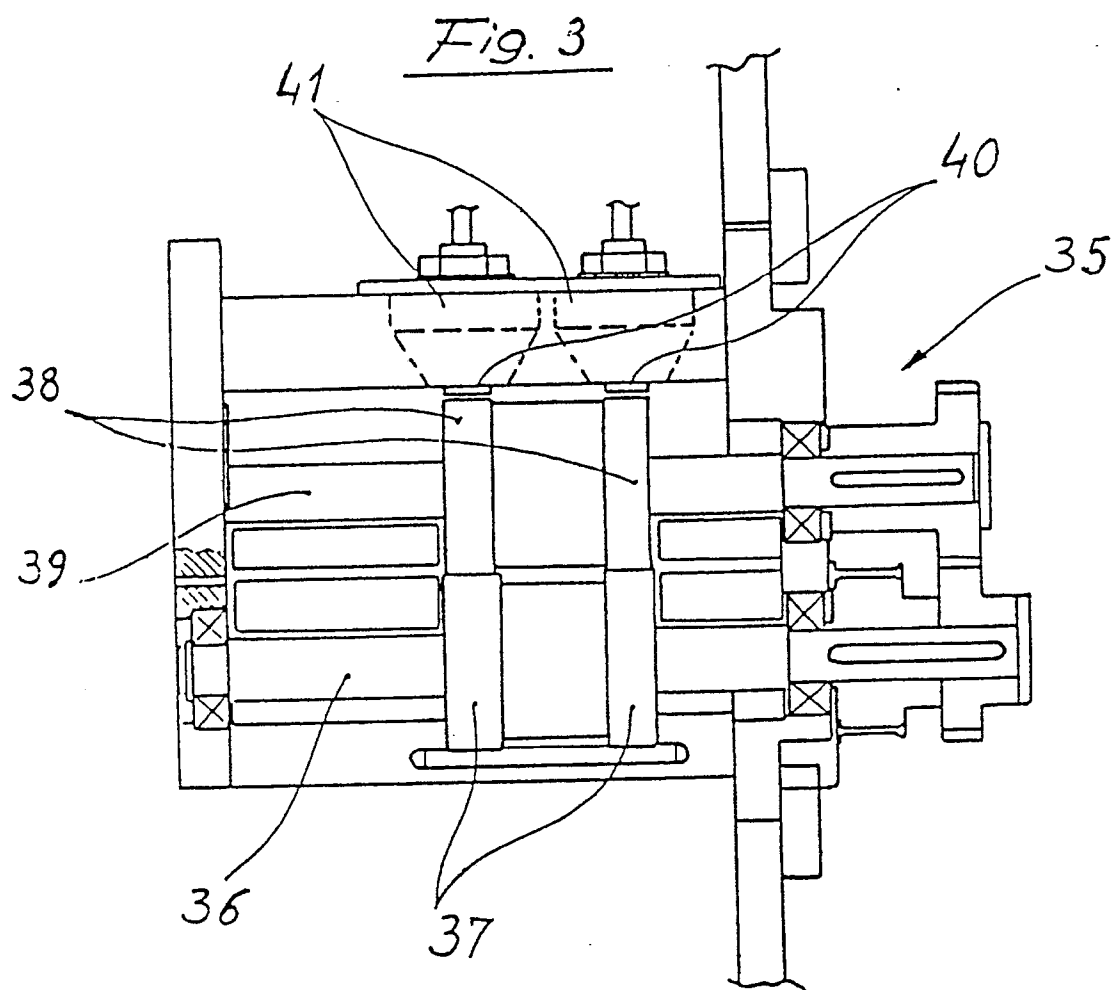
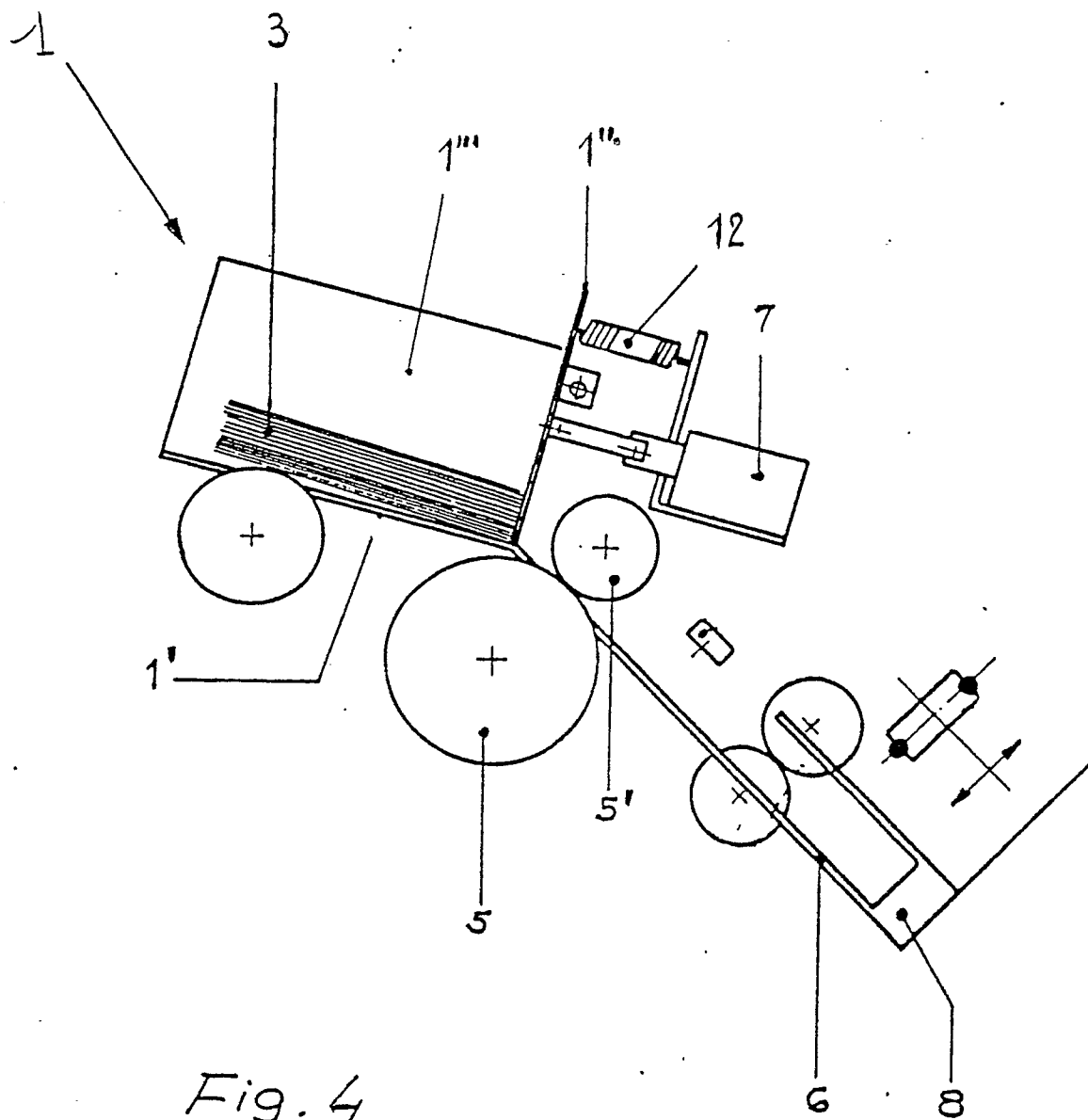


Fig. 1







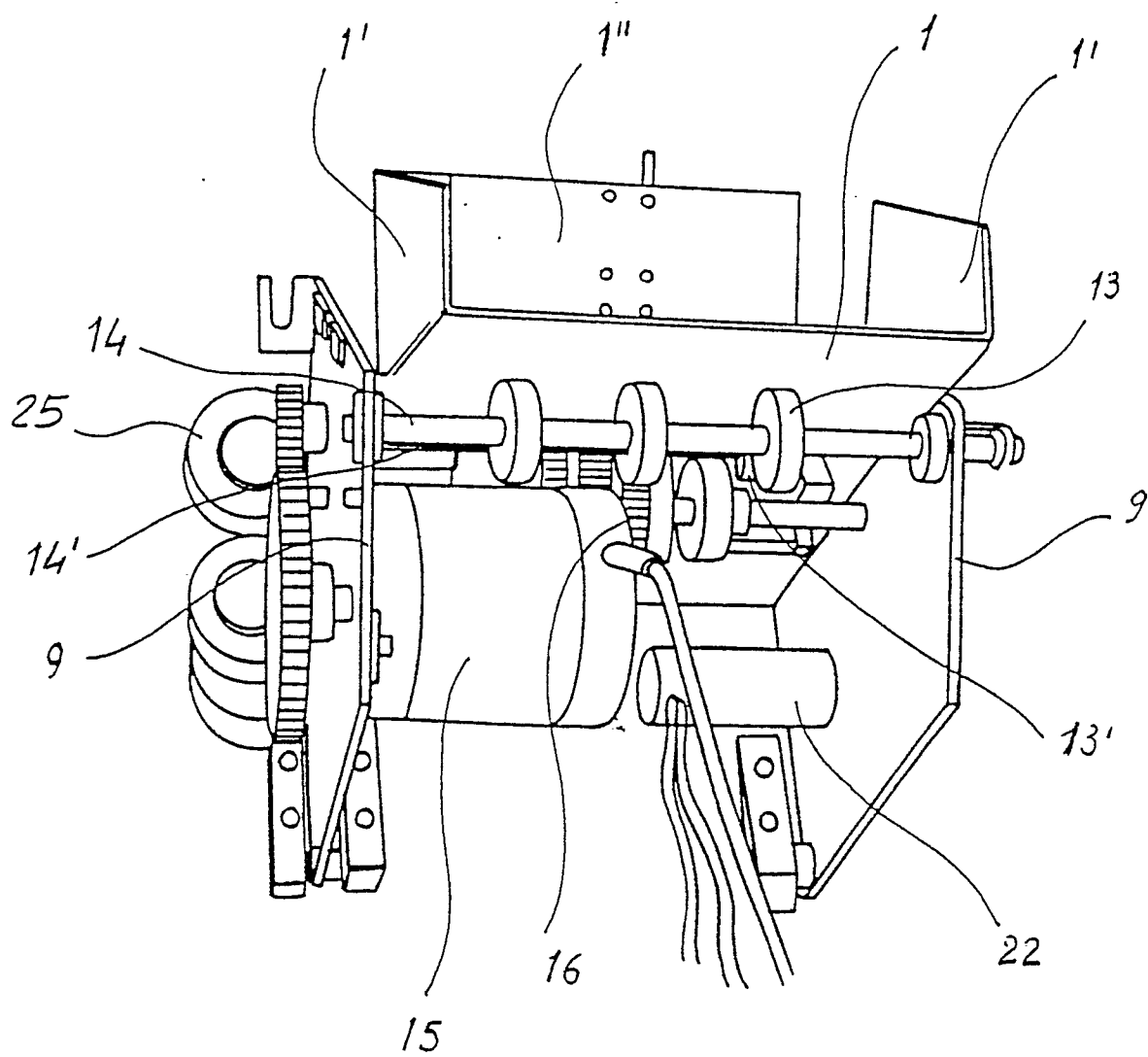


Fig. 5

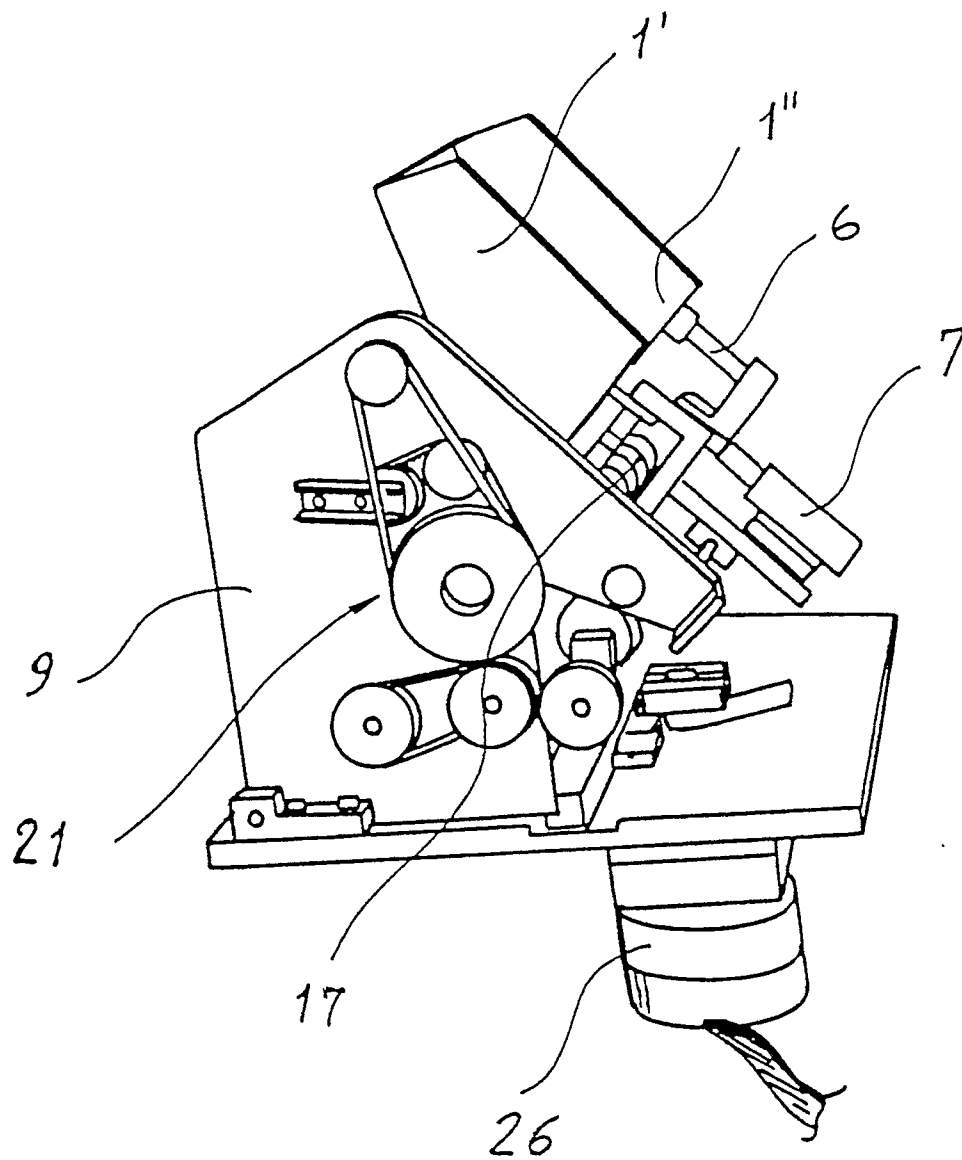


Fig. 6

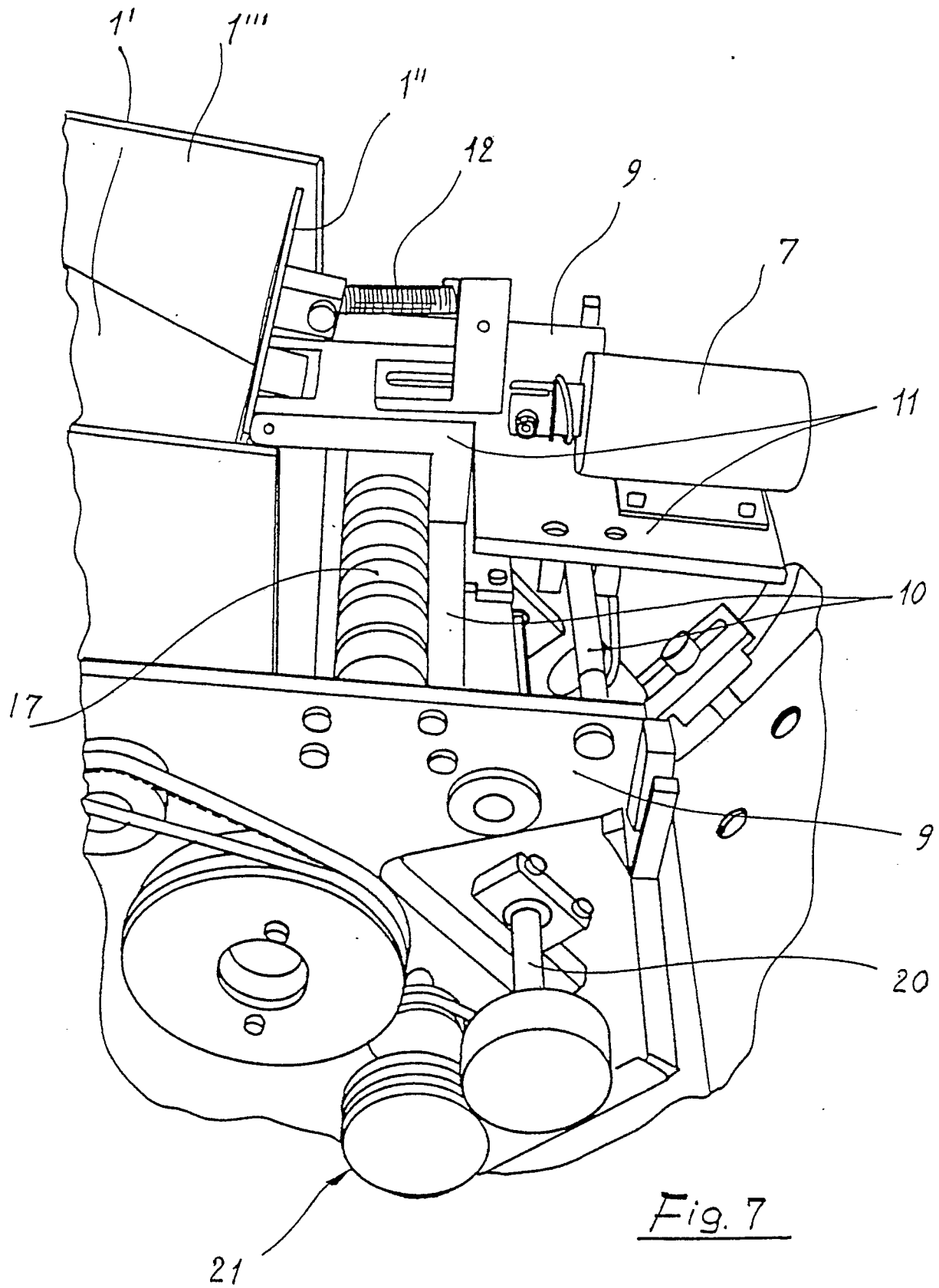


Fig. 7

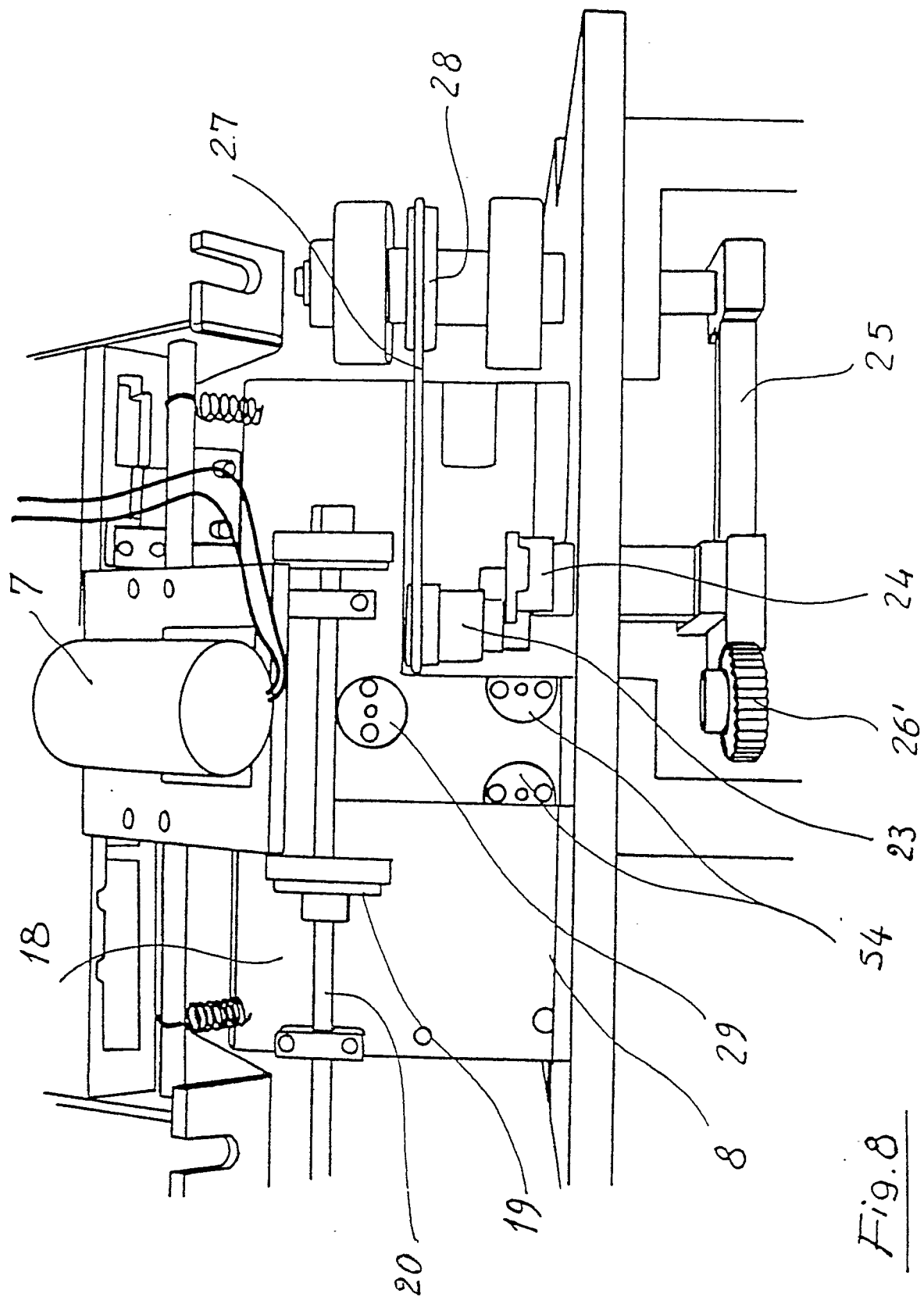


Fig. 8

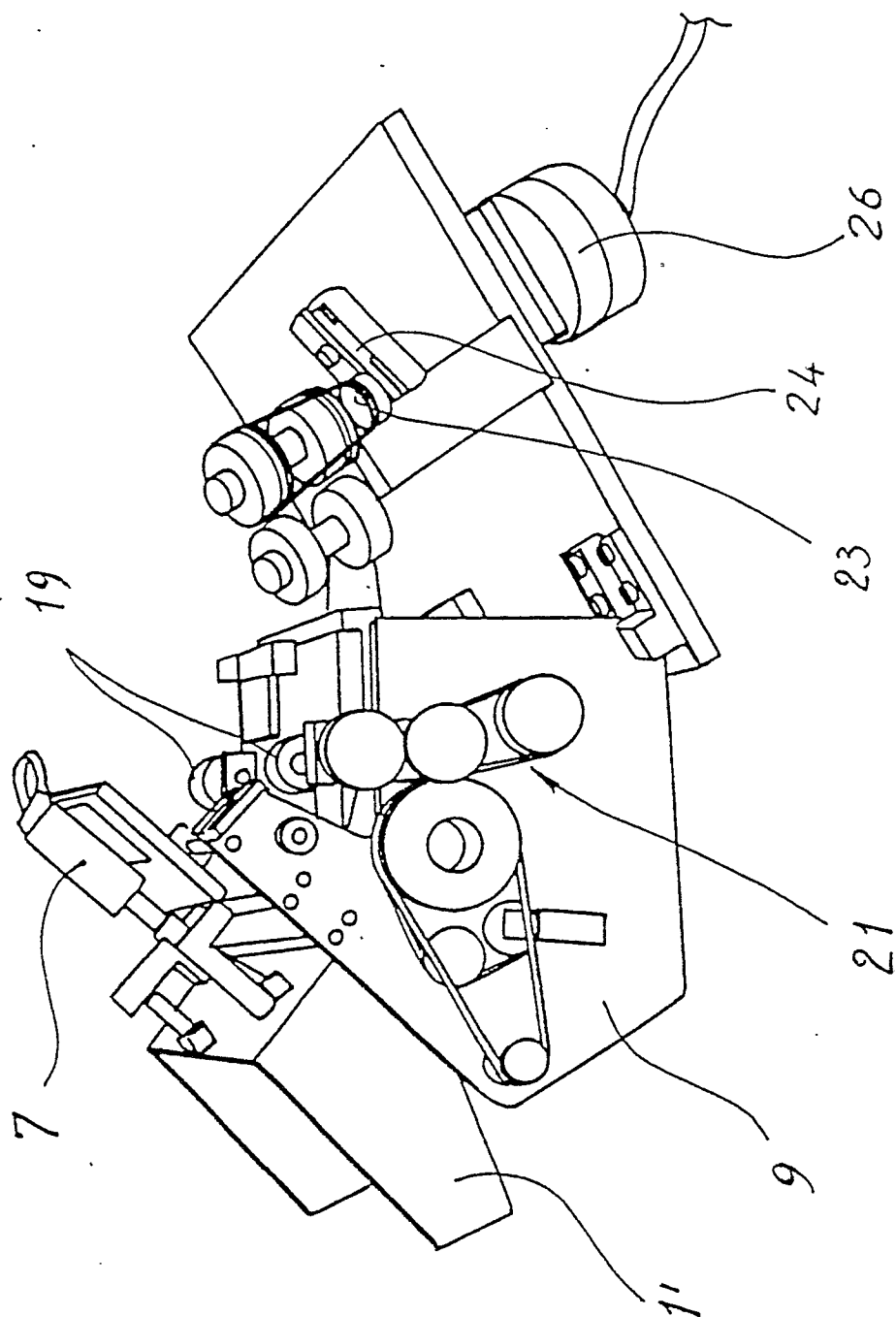


Fig. 9