

EUROPEAN PATENT APPLICATION

Application number: **90301875.2**

Int. Cl.⁵ **G07D 1/00**

Date of filing: **21.02.90**

Priority: **28.02.89 GB 8904568**

Date of publication of application:
05.09.90 Bulletin 90/36

Designated Contracting States:
CH DE ES FR GB LI SE

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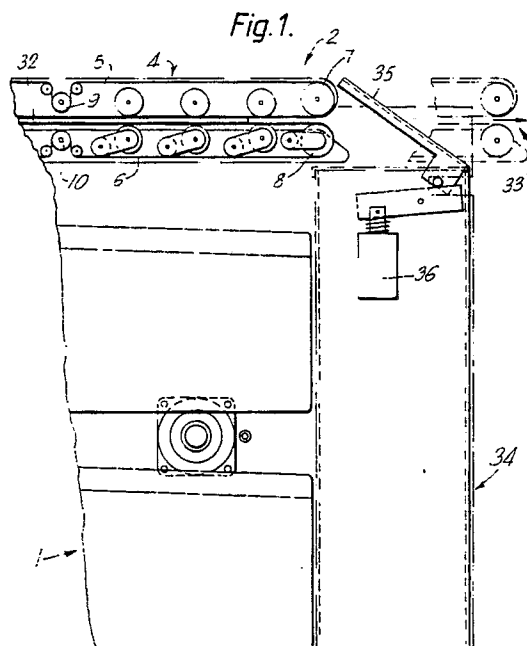
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Article handling apparatus.

Article handling apparatus comprises an article transport system (2) mounted to a housing (1) having an article dispense outlet (33) towards which articles are fed by the transport system. An article reject position is associated, in use, with a reject store (34); a control system (15,22,36) is provided for actuating the transport system and a lid (35) of a store in the reject position, the reject position being

adjacent to the transport system upstream of the dispense outlet such that when an article is to be rejected. The control system causes the lid (35) of a store in the reject position to open into the path of articles being transported towards the dispense outlet so that the transport system delivers the rejected article into the store.



Article Handling Apparatus

The invention relates to article handling apparatus and in particular article dispensing apparatus such as sheet and banknote dispensers.

A wide variety of article dispensing apparatus has been developed for automatically dispensing quantities of articles in response to customer requests. For various reasons, it may be necessary to prevent articles from being dispensed during a dispense operation. For example, in the case of sheet dispensing apparatus it may be detected by the apparatus that more than one sheet has been extracted simultaneously from a store or that a miscount situation has occurred. Other reasons include failure of a user's identification to be validated, the validation step taking place during the preparation of a set of articles for dispensing, or that for some reason the user does not take the dispensed articles from a dispense outlet.

For these reasons, article dispensing apparatus conventionally includes an article reject position in which rejected articles can be stored. In the case of articles which comprise documents of value such as banknotes and the like, it is important that this reject position is secure and that rejected sheets are accurately fed to the reject position and cannot be retrieved by unauthorised personnel. In the past, this has been difficult to achieve since it is conventional to provide a diverter in the article feed path which is actuated to divert articles along a subsidiary feed path to the reject position when necessary. An example of such apparatus is described in US-A-4095781. Not only does this mean that the rejected articles are processed in another part of the apparatus which might be accessible to an unauthorised user, it also adds to the risk of jamming.

To deal with this problem and in accordance with one aspect of the present invention, we provide article handling apparatus comprising an article transport system mounted to a housing having an article dispense outlet towards which articles are fed by the transport system; an article reject position associated, in use, with a reject store; and control means for actuating the transport system and a lid of a store in the reject position, the reject position being adjacent to the transport system upstream of the dispense outlet such that when an article is to be rejected, the control means causes the lid of a store in the reject position to open into the path of articles being transported towards the dispense outlet so that the transport system delivers the rejected article into the store.

In contrast to the known dispensing apparatus described above, this new apparatus selectively interposes the lid of the store into the path of

articles being fed by the transport system so that rejected articles are delivered directly to the store without the need for further transport systems. The invention also avoids the problems of certain known apparatus which rely on chutes and the like to deliver articles to the reject store where these articles could "hang up" in the chute.

As soon as the reject operation is completed, the control means will cause the lid to close thereby permitting further articles to be fed to the dispense outlet.

In one example, the control means includes a lid motor and coupling means which engages, in use, the lid of a store at the reject position. In the preferred example, the control means includes a solenoid operated lid actuator. Both these have the advantage that movement of the lid is achieved by a separately controlled actuator from the remainder of the transport system so that an additional security feature is added since the lid cannot be moved without operation of the motor or solenoid.

Preferably, the apparatus further comprises sensing means to determine when the lid of the store is in a closed position. This enables the incorrect feeding of articles into the store to be determined since in that situation the lid will not shut. This also enables a full store condition to be sensed.

In the preferred arrangement, the article transport system is movably mounted to the housing such that during a dispense operation, the transport system moves over the reject position thereby preventing the lid of a store in the reject position from opening.

In this connection, we provide in accordance with a second aspect of the present article handling apparatus comprising a housing; an article transport system movably mounted to the housing, the housing having a dispense outlet towards which articles are fed by the transport system; and an article reject position associated, in use, with a reject store having a lid which can open to permit access to the store, wherein during a dispense operation the transport system moves over the reject position thereby preventing the lid of the store from opening.

This can be achieved indirectly via a coupling mechanism but is preferably achieved by the transport system being positioned directly over the lid.

Preferably, the sheet transport system is similar to that described in our copending European patent application of even date claiming priority from British Patent application No.8904569.4, the contents of which are incorporated herein by reference.

An example of article dispensing apparatus according to the invention will now be described with reference to the accompanying drawings, in which:-

Figure 1 is a partial, schematic view of the apparatus;

Figure 2 is an exploded view of the transport system;

Figures 3A and 3B are a partial schematic side view and a partial view on arrow B respectively of the store;

Figure 4 is a view similar to Figure 3A but in the unlocked position;

Figure 5 is a perspective view of the store when located in the apparatus; and

Figures 6A to 6C illustrate the lid locking mechanism in three positions.

The apparatus shown in the drawings comprises a support housing including main side plates 1 (part of one of which is shown in the drawing), the support housing supporting a carriage 2 by means not shown such that the carriage can move to and fro between the main side plates 1 in the directions A (Figure 2). The carriage comprises a pair of side plates 3 (one of which is shown in Figure 2) suspended between the main side plates 1 with a sheet conveying system 4 mounted between the side plates 3.

The sheet conveying system 4 (primarily shown in Figure 2) comprises a pair of belts 5, 6 entrained around idler rollers 7, 8 respectively and drive rollers 9, 10. The belts 5, 6 define a sheet feed path 11 with adjacent surfaces of the belts being urged together via the idler rollers 8 which are spring biased towards the idler rollers 7.

The drive roller 10 is non-rotatably mounted to a shaft 11 carrying a drive gear 12, the shaft 11 being rotatably mounted between the carriage side plates 3. A second shaft 13 is also rotatably mounted between the carriage side plates 3 and carries non-rotatably a gear 14 which is meshed with the gear 12 and the drive roller 9.

A first drive system is provided for causing the to and fro movement of the carriage 2. This first drive system comprises a drive motor 15 coupled via pulleys 16 and a toothed drive belt 17 to a pulley 18 rotatably mounted to a side plate 1. A toothed drive belt 20 is entrained around the pulley 18 and another pulley 19 also mounted to the side plate 1 and carries a bracket 21 which is coupled with one of the carriage side plates 3 through a slot in the main side plate 1 (not shown).

Movement of the sheet conveying system 4 is controlled by a second drive system including a drive motor 22 coupled via pulleys 23 and belts 24 to a drive pulley 25 rotatably mounted to the side plate 1 opposite to that to which the first drive system is connected. A toothed belt 26 is entrained around the drive pulley 25 and around an idler

wheel 27 rotatably mounted to the same side plate 1 as the drive wheel 25. In addition, the toothed drive belt 26 is entrained around pulleys 28, 29 rotatably mounted to a side plate 3 of the carriage and around a pulley 30 non-rotatably mounted to the shaft 13. The pitch circle diameter of the pulley 30 is the same of that of the pulley 9.

If the motor 15 is held stationary, actuation of the motor 22 in the direction of the arrow 31 will cause movement of the belts 5, 6 such that a sheet held at the point P between the belts will move to the right, as seen in the drawings.

With the motor 22 stopped and the motor 15 actuated, the carriage 2 will be moved to the right or to the left depending on the direction of rotation of the motor 15.

In operation, a stack of sheets is held stationary at a position 32 by means not shown. The stack of sheets may have been generated in any conventional manner but in the preferred apparatus has been generated by a system similar to that described in our copending European patent application mentioned above and incorporated herein by reference. With the motor 22 held stationary and hence the pulley 25 stationary, the motor 15 is actuated to cause the carriage 2 to move to the left as seen in Figures 1 and 2. This movement will cause the pulleys 28 - 30 mounted to the carriage to move to the left and hence rotate since the belt 26 is stationary. This will cause the shaft 13 to rotate and hence the belts 5, 6 will undergo a caterpillar track action such that both portions of the belts defining the feed path 11 will remain stationary and effectively the belts 5, 6 self-feed onto the stack 32. Since there is no relative, linear movement between the stack 32 and the belts 5, 6 the problem of scuffing will not occur. Once the stack 32 is firmly gripped between the belts 5, 6 it can be wound towards the right as seen in the drawings by rotation of motor 22. The carriage 2 can now be advanced to the right by rotating motor 15 (to the position shown in dashed lines in Figure 1) and thereafter the motor 22 can be rotated to dispense the stack to the right through a dispense outlet 33. The stack of notes remain stationary when motor 15 rotates. The stack of notes and the carriage can only move in unison if the two motors are driven in unison, other progress has to be made in a series of steps related to the transport length of the carriage.

During the initial stacking operation, the apparatus checks in a conventional manner that the correct number of sheets have been stacked. If an incorrect number is detected then the apparatus will pass the stack 32 to a reject store 34. The reject store 34 is positioned under the path of the carriage 2 upstream of the dispense outlet 33. The reject store 34 has a lid 35 which can pivot be-

tween an open position, shown by solid lines in Figure 1, and a closed position shown by dashed lines in Figure 1.

The construction of the store 34 and the method of operating the lid will be described later below.

When the apparatus wishes to reject a stack of notes, the lid 35 is opened by actuating a solenoid 36 while the transport system 2 is in its fully left-shifted position. Once the lid 35 has opened, the carriage 2 moves to the right to the position shown in the drawing following which the belts 3, 4 are driven to carry the stack of notes to the right where they are delivered directly into the store 34. It will be seen that there is no requirement for additional intervening chutes or transport systems.

After the reject operation, the carriage 2 moves to the left to allow the lid 35 to be closed.

When the apparatus is not in use, as well as during a dispense operation, the carriage 2 is moved to the right so that it overlies the lid 35 thereby further blocking the possibility of the lid being opened by unauthorised personnel.

The store 34 is illustrated in more detail in Figures 5 to 6. As can be seen in Figure 3A, the lid 35 is hinged at 37 to a main body 38 of the store. The lid 35 has a depending lug 39 having a hole 40 into which a locking member 41 engages. The locking member 41 forms part of a locking mechanism which also includes a cylindrical barrel 42 in which a pin 43 is free to slide but is urged to the left, as seen in Figure 3A, by a compression spring 44. The locking member 41 is part of a plate 45 which is rigidly fixed to the pin 43 so if the pin were moved to the right, the locking member 41 would disengage from the lug 39 allowing the lid 35 to be lifted.

A cylindrical brass collar 46 is provided about a stepped down portion of the pin 43 along which it is free to slide. This collar 46 is urged to the left, as seen in Figure 3A, by a light compression spring 47 such that it is restrained at the shoulder formed at the stepped-down portion of the pin 43.

As can be seen most clearly in Figure 3B, a slide plate 48, known as the tamper indicating slide, is provided which is free to slide laterally on pins 49 securely fixed to the body 38 but omitted from Figure 3A for clarity. The pins 49 are received in respective slots 50 formed in the plate 48. The plate 48 has a pair of holes 51, 52 which communicate, as seen in Figure 3B. The larger hole 51 has sufficient clearance for the brass collar 46 to pass through whilst the smaller hole 52 is a snug fit around the stepped down portion of the pin 43 along which the collar 46 slides.

The plate 48 has a pair of depending arms 53, 54 each of which can be moved into alignment with a window 55 in the wall of the body 38 so that they

can be viewed. The arm 53 is painted green and the arm 54 red.

A lock 56 operable by a key 57 is provided in the wall of the body 38 to allow an arm 58 to be operated. As can be seen in Figure 3B, when the arm 58 is rotated in a clockwise direction, the plate 48 will slide to the right. The plate is urged to the left, as seen in Figure 3B by a compression spring 59 acting against a wall of the body 38. However, in the position shown in Figure 3B, the plate 48 is restrained from movement to the right by the brass collar 46 which is inserted in the hole 51 under the action of the compression spring 47.

The lock 56 stays in this "tamper set" or "primed" condition after the key 57 is removed. The green arm 53 will be visible through the window 55 and the lid 35 is held shut by engagement of the locking member 41 in the hole 40. The position of the plate 48 in this condition is also shown in Figure 6A.

In this primed condition, the store 34 can be inserted into the main apparatus shown in Figures 1 and 2. The store is inserted until it engages an actuation button 60 mounted to a wall 1 of the apparatus. Further motion of the store will cause the lid 35 to be unlocked, "fire" the plate 48 and leave the store in the inserted condition as illustrated in Figure 4. The store can be held in this condition by spring clips (not shown) of the main apparatus.

As can be seen in Figure 4, once the store 34 has been fully inserted, the locking member 41 has been pushed clear of the lug 39 allowing the lid 35 to be raised or lowered at will. The brass collar 46 is also clear of the hole 51 in the plate 48 allowing the plate 48 to be able to slide to the left, as seen in Figure 3B until it rests with the cusps of the holes 51, 52 resting on the shank of the stepped-down portion of the pin 43 (Figure 6B).

The store 34 remains in this condition (Figure 4) during normal operation of the sheet dispensing machine, the lid 35 being raised and lowered as required. The actuation button 60 shrouds the barrel 42 so that it is impossible to insert or otherwise jam the pin 43 from retracting under the influence of the spring 44 when the store is removed.

As can be seen in Figure 4, the pin 43 engages a pin 61 slidably mounted in the button 60 so that the pin 61 is depressed thereby actuating a microswitch 62 which indicates to a microprocessor (not shown) that the store 34 is present in the machine.

Upon removal of the store 34, the pin 43 retracts and the plate 48 pushes back the brass collar 46 against the light spring 47. When the step in diameter in the pin 43 is reached, the plate 48 drops down further such that the edge of the hole 52 rests snugly against the portion of the pin 43

along which the brass collar 46 slides. The store is now locked as shown in Figure 6C. In this condition, the red flag 54 will appear at the right hand edge of the window 55 and the pin 43 cannot be pushed in again because the shoulder on the pin is restrained in the smaller diameter circle of the hole 52. The store 34 cannot now be opened until the key 57 is inserted whereupon the tamper set condition (Figure 6A) will be resumed.

The method by which the lid 35 of the store 34 is actuated can best be seen in Figure 5. In this drawing, the store 34 is shown mounted between the main side plates 1 of the apparatus. A pin 64 is fixed to a depending flange 65 of the lid 35 and protrudes through a slot 66 in one of the walls 1. A see-saw lever 67 is mounted to the same wall 1 via a pivot 68 and pivotal movement of the lever 67 is controlled by the solenoid 36 having a pusher member 69 pivotally connected to the lever 67. In the rest position, when the solenoid 36 is not actuated, a compression spring 70 urges the lever 67 to pivot in a clockwise direction, as seen in Figure 5, so that part of the lever 67 will engage and actuate a microswitch 71 acting as a lid closed sensor since in this position the lid 35 will be in its closed position.

When the solenoid 36 is actuated, the member 69 is urged into the solenoid against the action of the compression spring 70 thereby engaging the pin 64 and causing the lid 35 to open. In addition, this movement will cause a microswitch 72 to actuate which acts as a "lid open" sensor.

The microswitches 71, 72 enable the microprocessor to check whether the lid is open or shut and this has the effect of being able to check that the store is not overflowing with notes (with the result that the lid will not shut) and to check that the lid is raised fully when notes are to be rejected.

Claims

1. Article handling apparatus comprising an article transport system (2) mounted to a housing (1) having an article dispense outlet (33) towards which articles are fed by the transport system; an article reject position associated, in use, with a reject store (34); and control means (15,22,36) for actuating the transport system and a lid (35) of a store in the reject position, the reject position being adjacent to the transport system upstream of the dispense outlet such that when an article is to be rejected, the control means causes the lid (35) of a store in the reject position to open into the path of articles being transported towards the dispense outlet so that the transport system delivers the rejected article into the store.

2. Apparatus according to claim 1, wherein the

article transport system (2) is movably mounted to the housing such that during a dispense operation, the transport system moves over the reject position thereby preventing the lid of a store in the reject position from opening.

3. Article handling apparatus comprising a housing (1); an article transport system (2) movably mounted to the housing, the housing having a dispense outlet (33) towards which articles are fed by the transport system; and an article reject position associated, in use, with a reject store (34) having a lid (35) which can open to permit access to the store, wherein during a dispense operation the transport system moves over the reject position thereby preventing the lid of the store from opening.

4. Apparatus according to claim 3, wherein the transport system is positioned directly over the lid during a dispense operation.

5. Apparatus according to claim 1 or claim 2, wherein the control means includes a solenoid operated lid actuator.

6. Apparatus according to any of the preceding claims, further comprising sensing means (71) to determine when the lid of the store is in a closed position.

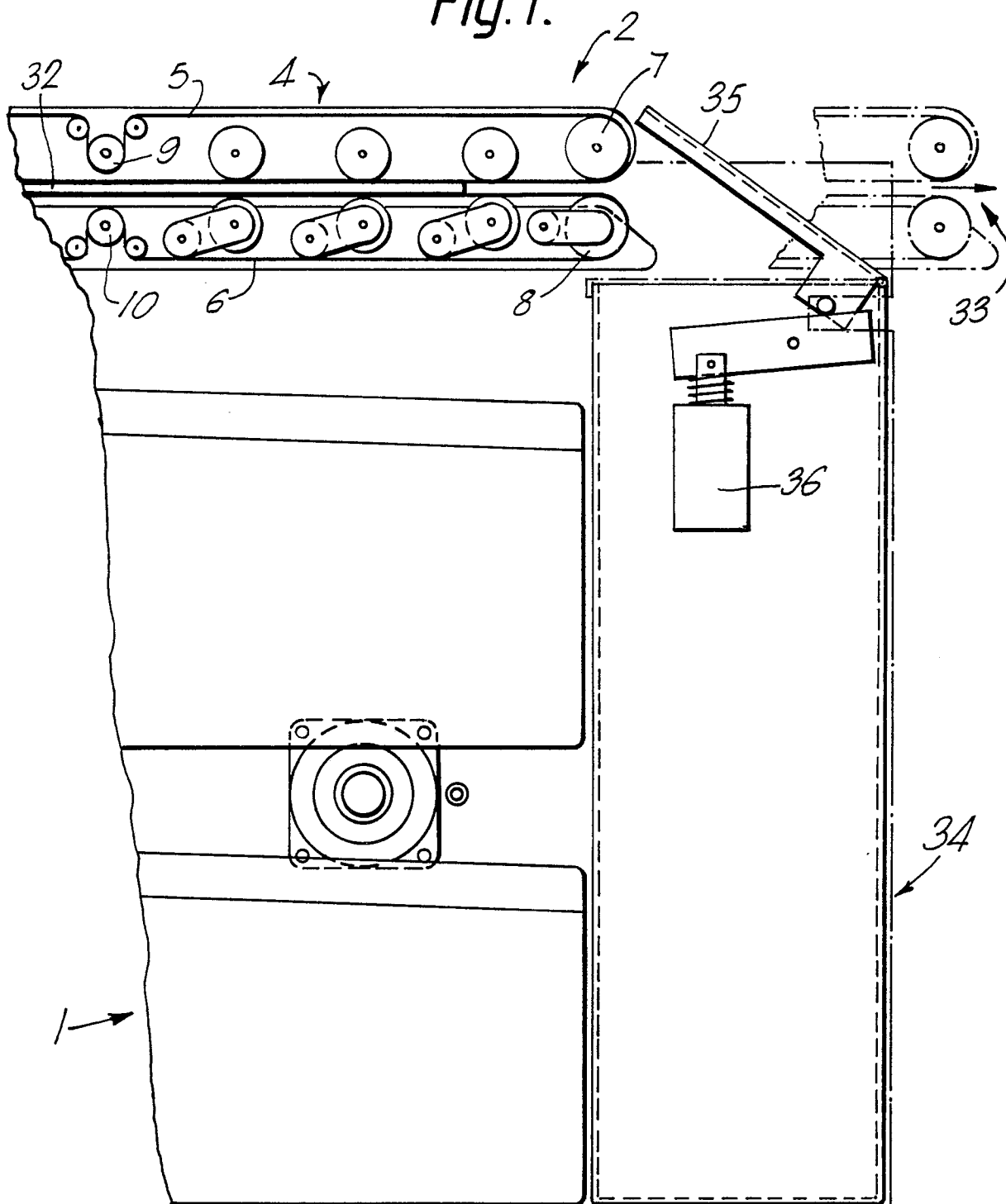
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Fig. 1.



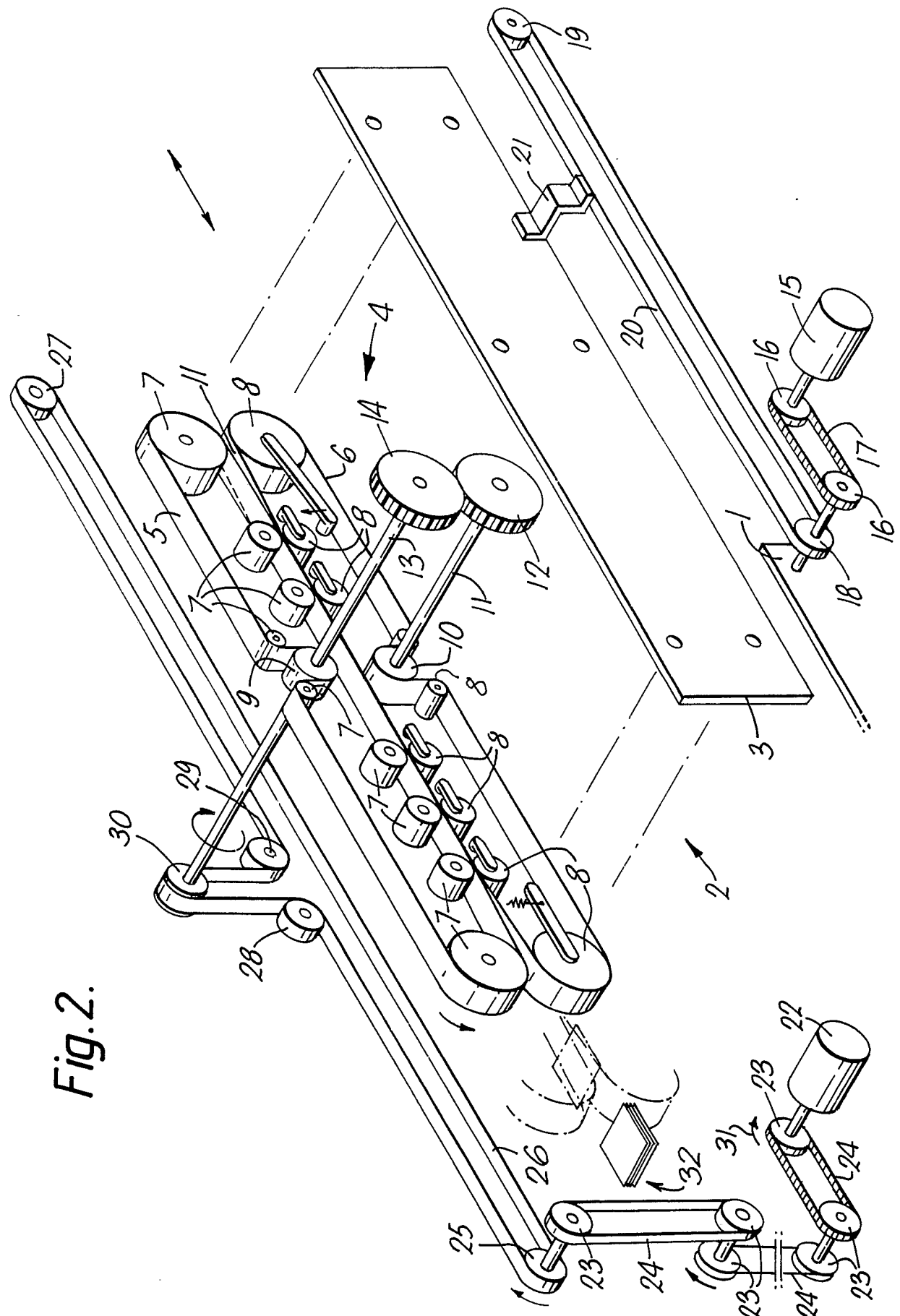


Fig.2.

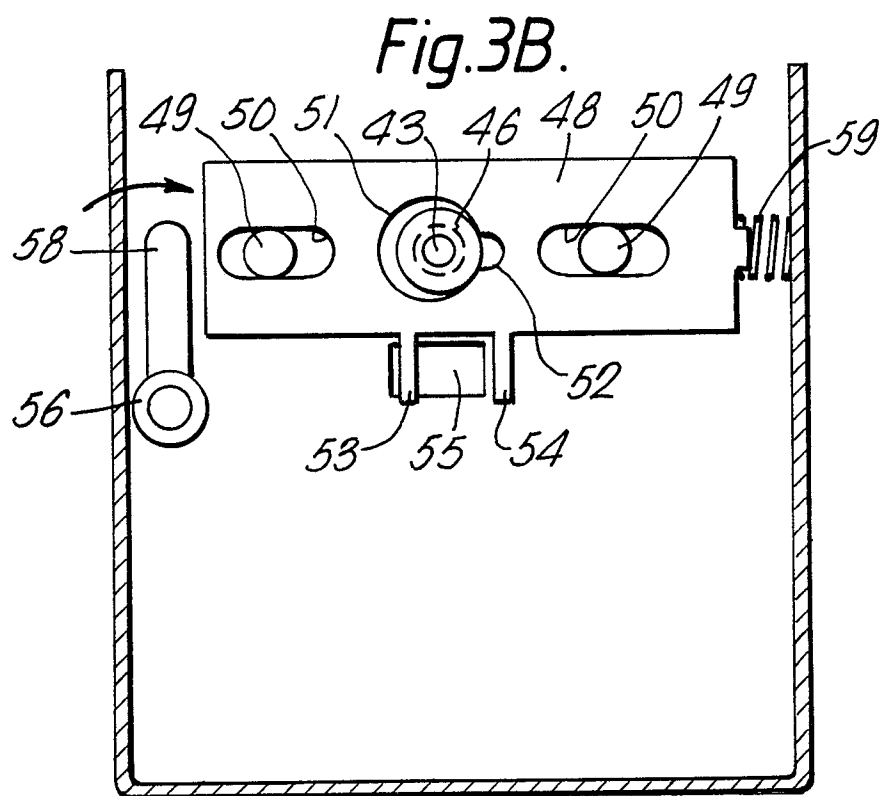
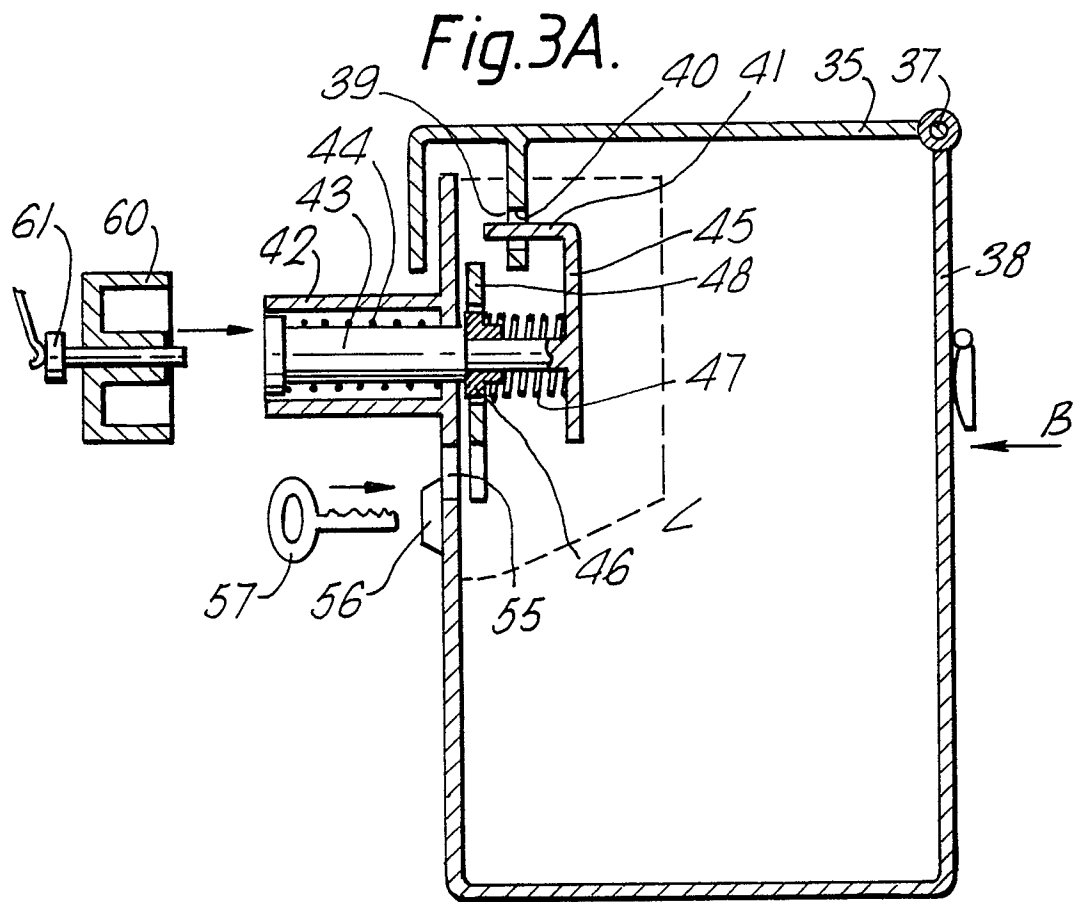


Fig.4.

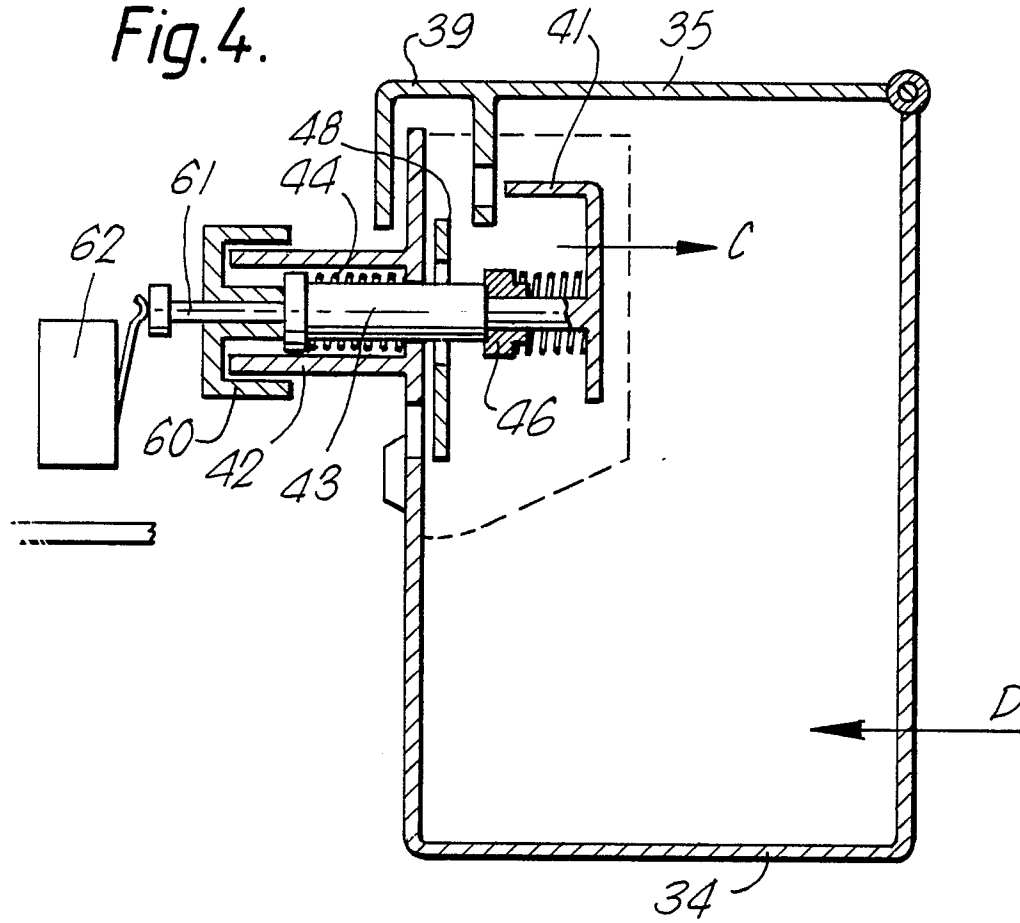


Fig.6A.

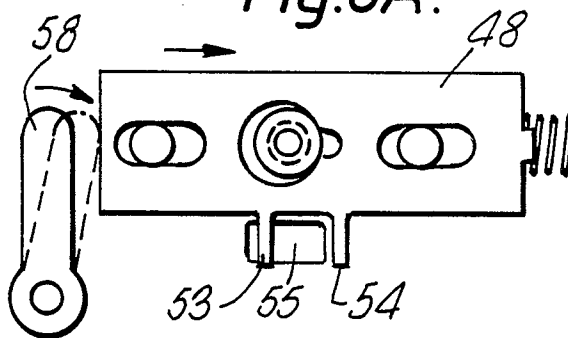


Fig.6B.

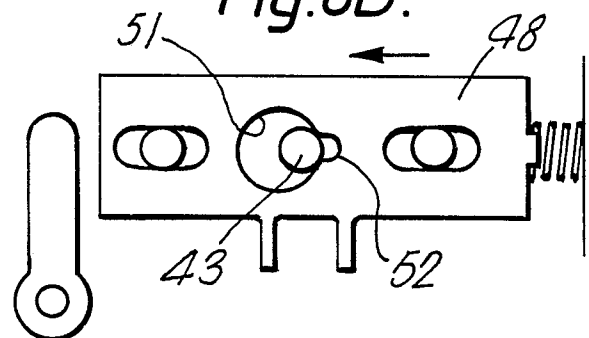


Fig.6C.

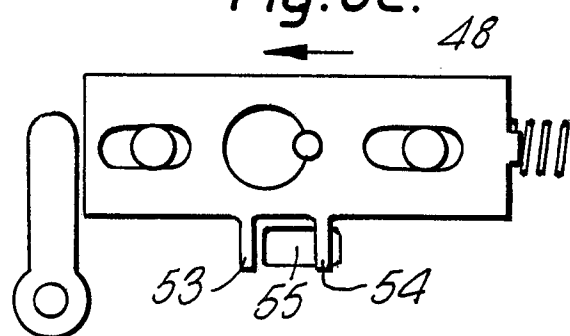
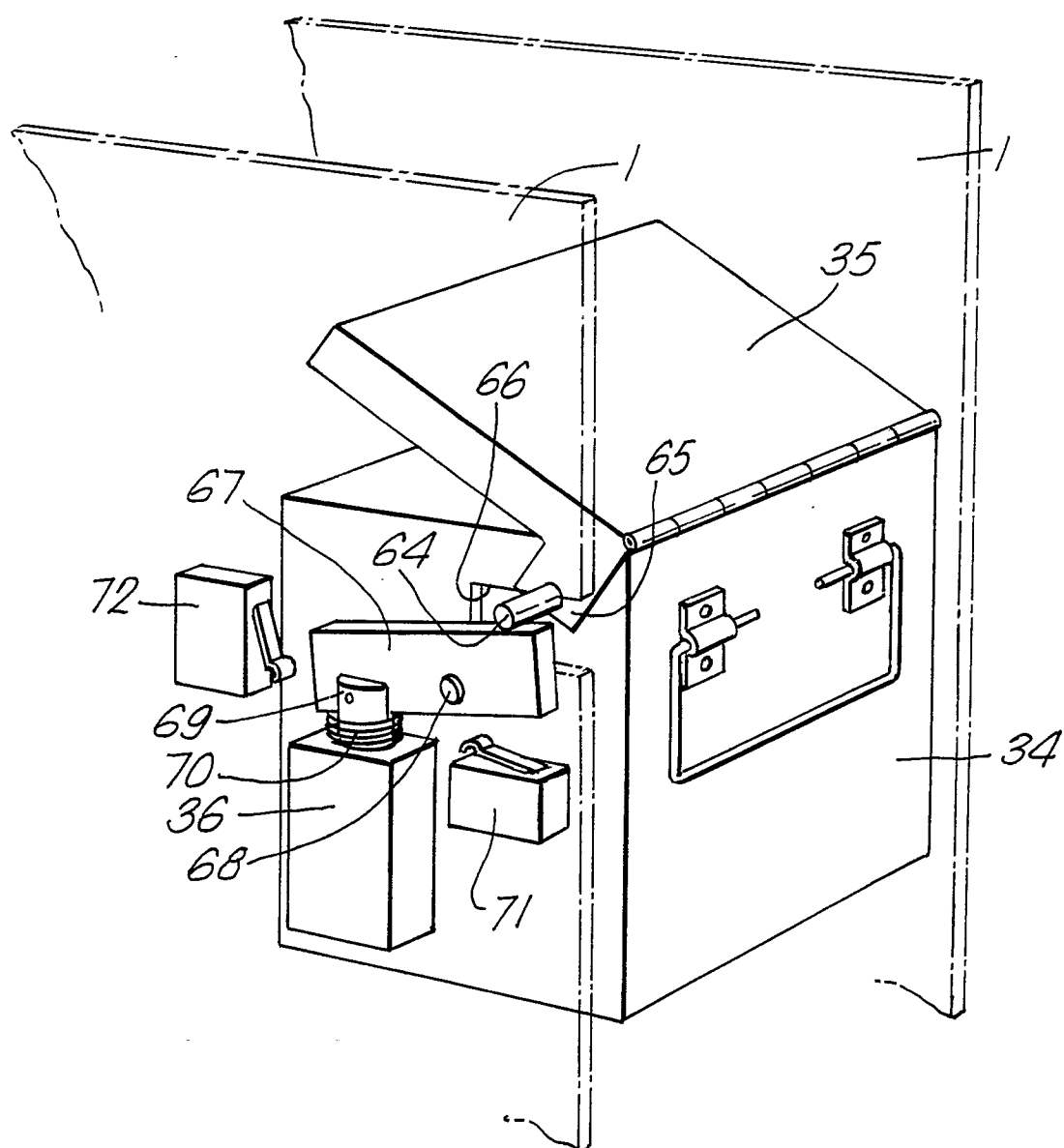


Fig. 5.





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 90 30 1875

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.5)
X	US-A-4 095 781 (KISTNER) * Abstract; column 11, lines 46-64; column 12, lines 29-48 * -----	1-5,7	G 07 D 1/00
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			G 07 D
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 29-05-1990	Examiner TACCOEN J-F.P.L.
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			