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(54) Product dispensing system.

(57) A pusher (2) is urged by a tensator spring (16) towards one end of a stack of packs in order to dispense them. Movement of the pusher (2) in the opposite direction is prevented. The pusher (2) is connected via a belt (15) to a drum (17) carrying magnets (21) which actuate a reed switch (8) generating a signal representing the distance through which the pusher (2) moves when one or more packs are dispensed, this distance being proportional to the number of packs dispensed.

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PRODUCT DISPENSING SYSTEM

This invention relates to a system for dispensing packed products, in which a signal representing the number of packs dispensed is generated, e.g. for accounting purposes.

Vending machines are known in which there are a plurality of article dispensing columns and the number of articles dispensed is automatically counted by detecting the number of times each column is put into a vending mode. However, it is possible that, when a column is in a vending mode, no article or more than one article is in fact dispensed (owing to a fault in the delivery mechanism); or an article could be removed from a column without that column being in the vending mode.

Vending machines are also known in which packs stand on individual sensors which detect when a pack has been removed. Here the data obtained could easily be corrupted by placing other items on the sensors when the packs are removed.

The present invention provides a product dispensing system comprising a receptacle for containing a stack of packs, a pusher for acting on one end of the stack, means for urging the pusher towards the pack in order to dispense packs, means for preventing movement of the pusher away from the pack, and means for measuring the distance through which the pusher moves when one or more packs are dispensed and generating a signal representing the said distance.

The said distance is of course proportional to the number of packs dispensed. The signal generated can thus be used for accounting purposes to record the packs dispensed, whether by monetary value, number, or weight, for example.

In a preferred embodiment, a plurality of receptacles for containing packs of various products may be provided, each with its own measuring means.

The signals from the measuring means can be used to cause a microprocessor to record or to transmit to a central data store a signal representing the type of product, the quantity dispensed, and its value, as well as any other information useful for stock control, e.g. date and time. At the same time, the microprocessor can send a signal to an electronic sign associated with the receptacle, showing the individual price of the pack dispensed. The microprocessor or the data store can be connected to a visual display unit and/or a printer, so that the total quantities of products sold over a given trading period, the total values thereof, and other items of information, can be accessed.

In a preferred embodiment the measuring means comprises an elongate, preferably endless, element arranged to move with the pusher and to drive a rotary member, preferably via a gear train, means being provided for generating a signal representing the angle of rotation of the rotary member.

The means for preventing movement of the pusher away from the pack preferably comprises a pawl which cooperates with a ratchet connected, directly or indirectly, to the rotary member. To allow re-stocking of the receptacle with packs, the pawl can be released

from cooperation with the ratchet, preferably by releasing means which operate automatically when the receptacle is removed from its dispensing position. Means may also be provided to prevent the pusher moving towards the pack during restocking; this means may again be automatically operated when the receptacle is removed from its dispensing position and may comprise a second pawl acting on the ratchet (or another ratchet).

Preferably, the receptacle is locked in the dispensing position by a locking device whose actuating establishes a connection between the measuring means and a microprocessor.

The invention will be described further, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a diagrammatic section through a unit for dispensing packed products and recording the quantity and value of products dispensed;

Figure 2 is a plan view of part of the unit;

Figure 3 is a block diagram of the data handling system of the unit;

Figure 4 is a fragmentary vertical section through part of the unit;

Figure 5 is a fragmentary horizontal section through the part shown in Figure 4;

Figure 6 is a plan view on line VI-VI in Figure 4

Figure 7 is a sectional view of a magnet drum assembly, taken on line VII-VII in Figure 4;

Figures 8 and 9 are top and bottom end views of the magnet drum assembly;

Figure 10 is a section on line X-X in Figure 4, showing a ratchet mechanism in a first position; and

Figure 11 is similar to Figure 10, but showing the ratchet mechanism in a second position.

The product dispensing unit illustrated comprises a housing 31 accommodating an electronics drawer 32, two removable drawers 11 in which product carrying cassettes or carriers 33 are removably mounted side by side, and a cash drawer or till 34. The drawers 32 and 11 are locked in the position shown, by means of a common lock (not shown). A lock 37 on the till 34 can also be used to secure a pilfer-proof panel 38 when the unit is not in use for dispensing products.

At the rear of each carrier 33 there is a sales detector 39, to be described below, which detects the removal of packs 41 from the carrier 33 and transmits data to a microprocessor 42 in the electronics drawer 32. Separate input channels of the microprocessor correspond to the separate sales detectors 39 and hence to separate horizontal stacks of product packs 41. The microprocessor 42 is programmed according to the value and size of the packs 41 by means of a keyboard 43. The price of the packs 41 in each stack may be displayed on a panel on the front of each carrier 33. The drawer 32 also carries a printer 46 for printing out data accumulated in the microprocessor 42 and a power storage unit 47 to provide a back-up power supply (e.g. for 7 days) if mains power is cut off.

Within each carrier 33 (see Figure 4), which may be adapted to suit the product size, the stack of packs is acted on by a pusher 2. A tensator spring 16 mounted on a pusher 2 is connected to the front of the carrier 33 and applies pressure to the stack so that, when a pack is removed, the stack is automatically pushed forwards by the pusher 2, i.e. the process known as "pack facing" is automatically carried out. A non-return mechanism to be described below prevents re-insertion of a pack or manipulation of the pusher 2. The linear movement of the pusher 2 is transmitted by a toothed belt 15 (passing round an idler pulley 14) to a pulley 18 rigid with a gear 22 meshing with a gear 23 on a magnet drum 7 mounted on a spindle 6. The belt tension is adjustable by means of a screw 61 acting on a lever arm 62 carrying the pulley 14.

The magnet drum 7 houses four equispaced magnets 21 in slots on its circumference (see Figure 7). A 2.5:1 ratio exists between the drum 7 and the input gear 22, which ensures that an adequate number of magnetic flux changes occur across a juxtaposed reed switch 8, as the pusher 2 moves. The reed switch 8 is mounted on an arm 63 (Figure 1) which is fixed in the housing 31 of the unit and projects through an aperture 64 (Figure 5) ina rear wall of the carrier 33. The resulting switching pulses are transmitted to the microprocessor 42, which converts them into stock movements per channel, i.e. number of packs removed from each carrier 33. The pusher 2 and associated belt 15 and gearing are moved by the force of the spring 16, which must therefore exert sufficient force to overcome frictional forces on these parts.

A speed governor is incorporated to control the acceleration of the pusher and the speed of the magnet drum 7. The drum speed is controlled so that a substantially constant pulse width is transmitted to the microprocessor 42 regardless of the size of the pack or the number of packs removed. The constant pulse facility allows the microprocessor to access each sales detector channel, interrogating for product movement, and movement verification, with a controlled time constant.

In the embodiment illustrated the governor comprises a fan 5 carried by a spindle 3. A gear 17 rigid with the fan 5 engages with a 60-tooth spur gear 10 forming part of a directional clutch on the magnet drum 7. The gear 10 has recesses or apertures 10a which receive axial protuberances 26 on the drum 7; the end faces 26a (Figure 8) of the protuberances 26 slope in the circumferential direction of the gear 10 so that the gear 10 and drum 7 are locked together only in one direction of rotation. A spring 20 retained by a collar 27 urges the gear 10 towards the drum 7. The fan 5 is driven by the magnet drum 7 with a speed ratio of 5:1 and has the desirable characteristic of providing no resistance until the pusher 2 is in motion.

When a carrier 33 is drawn out to allow re-stocking and the pusher 2 is pushed back by the new packs inserted, the above-described clutch is disengaged (the gear 10 moving up a small distance against the action of the spring 20, to disengage the holes 10a from the sloping end faces 26a) so that the fan 5 is not driven, thereby eliminating speed control during re-stocking, thus preventing excessive force being applied to the pusher. There is the additional advantage of reducing wear within the gear train.

Double acting ratchet pawls 13 engage between a ratchet 28 on the magnet drum 7 and a pawl actuator 9. The function of one pawl is to prevent rotation of the magnet drum when pressure is applied to the pusher 2, either directly or via the product. This is an important facility when in the sales dispensing mode, to prevent accidental or deliberate corruption of accounting data by pulsing of the reed-switch 8. The other pawl permits rotation of the magnet drum 7 when pressure is applied to the pusher 2, thus permitting the pusher to be returned to the back of the carrier 33 for reloading of stock. At the same time it prevents the pusher moving forward by action of the tensator spring 16, thus facilitating re-stocking.

The engagement and disengagement of the two opposing pawls 13 is under control of the pawl actuator 9, which is controlled by an actuating bar 12 mounted pivotally transversely at the back of the drawer 11 holding the carrier 33. The pivotal movement of the bar 12 is controlled by cam guides within the dispenser housing 31 arranged in parallel with guides for the drawer 11. The bar 12 has on its ends pegs 12a which engage in those cam guides and control the pivotal movement of the bar which in turn controls the movement of the pawl actuators 9 when the drawer 11 is moved out for reloading of stock or right back for dispensing: thus

(a) when the drawer 11 is right back, the pawl 13 is engaged (Figure 10) that prevents rotation of the magnet drum 7 when return pressure is applied to the pusher 2, and

(b) when the carrier tray 11 is moved out for reloading, the pawl 13 is engaged (Figure 11) that permits the pusher 2 to be returned and prevents its forward movement by action of the tensator spring 16.

The product dispensing system described above has a number of advantageous features and may be provided with further advantageous features, as outlined below.

The microprocessor 42 may be programmed to evaluate total sales value and quantity per product dispensing channel (carrier 33). It may be programmed to provide a self-teaching facility for product size (and possibly weight), so as to automatically take account of a change in pack size. It may also count stock input.

The signals from the reed switches 8 trigger accounting by the microprocessor 42. All channels (cassettes) may be accessed simultaneously. Display of sales information (e.g. price of pack removed) during a transaction may be provided on the front of the electronics drawer 32, e.g. as a digital display 48. The printer 46 may print out cumulative sales information as a hard copy record of transactions for stock audit. Remote printing may be provided as well or instead.

Remote system programming or interrogation of accounting features can be provided via an optional data transfer interface 49, and the microprocessor can access both local and remote sales detectors, e.g. up to 100 channels.

The microprocessor 42 may control an audible alarm for each transaction (i.e. removal of a pack) or an optional speech synthesis output 51 for supplying information during transactions. An optional headsign 52 (preferably illuminated) may display interchangeable static messages or processor controlled moving or static messages, e.g. time of day. Digital price per dispensing channel may be set on the keyboard 43 and displayed on panels on the drawers 11.

When the unit is operational, any number of packs 41, from single or multiple channels, may be removed simultaneously and the relevant sales data will be automatically logged by the sales detectors 39 and the microprocessor 42. When the unit is unlocked for re-stocking, the microprocessor may be interrogated or programmed, by means of the keyboard 43, when the electronics drawer 32 is slid out.

A sales detector as described above may be incorporated in a coin-operated or non-coin-operated machine of mechanical, electrical, or electronic type, typically used for vending, and data can be transmitted to an accounting and stock control processor which may be incorporated within, or remote from, the machine.

Claims:-

1. A product dispensing system comprising a receptacle (33) for containing a stack of packs, a pusher (2) acting on one end of the stack, means for urging the pusher (2) towards the pack in order to dispense packs, means for preventing movement of the pusher (2) away from the pack, and means for measuring the distance through which the pusher (2) moves when one or more packs are dispensed and generating a signal representing the said distance.

2. A system as claimed in claim 1, in which the measuring means comprises an elongate element (15) arranged to move with the pusher (2) and to drive a rotary member (7), means being provided for generating a signal representing the angle of rotation of the rotary member (7).

3.A system as claimed in claim 2, in which the signal generating means comprises a switch (8) actuated by the rotary member (7).

4. A system as claimed in claim 3, in which the switch (8) is a reed switch actuated by magnets (21) on the rotary member (7).

5. A system as claimed in any of claims 2 to 4, in which the rotary member (7) is connected to a speed governor.

6. A system as claimed in claim 5, in which the connection is by means of a one-way clutch.

7. A system as claimed in claim 5 or 6, in which the speed governor comprises a fan (5).

8. A system as claimed in any of claims 2 to 7, in which the means for preventing movement of the pusher (2) away from the pack comprises a pawl (13) which cooperates with a ratchet (28) connected to the rotary member (7).

9. A signal as claimed in claim 8, including means for releasing the pawl (13) from cooperation with the ratchet (28), to allow movement of the pusher (2) away from the pack.

10. A system as claimed in claim 9, in which the said releasing means is arranged to release the pawl automatically when the receptacle (33) is removed from its dispensing position.

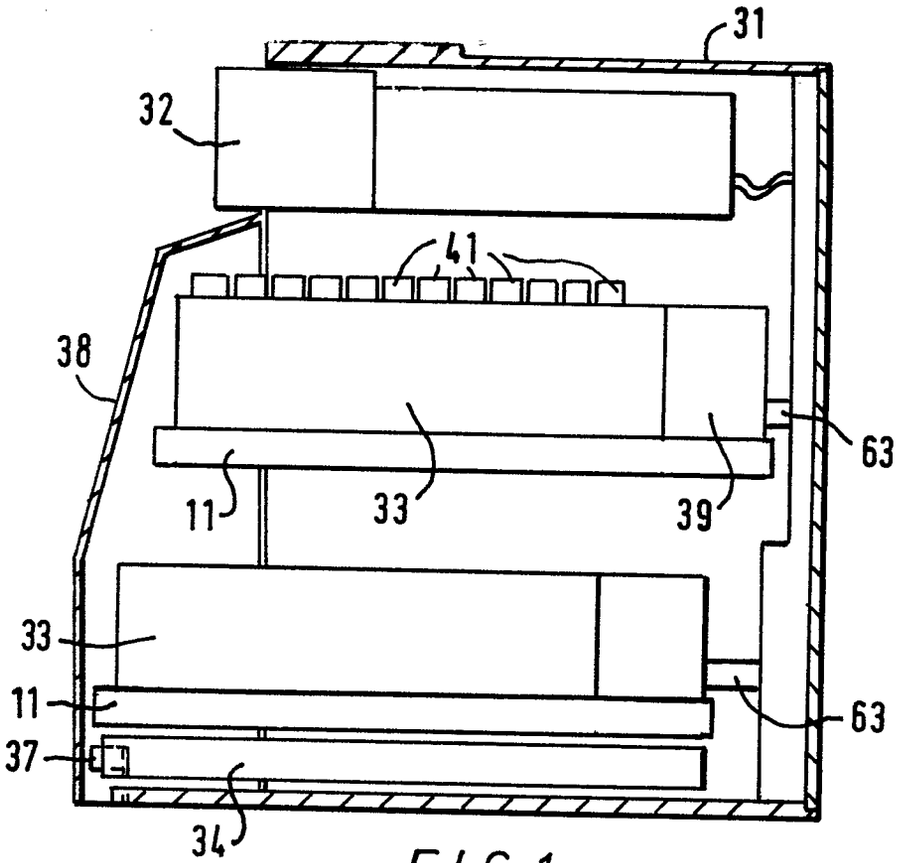


FIG.1.

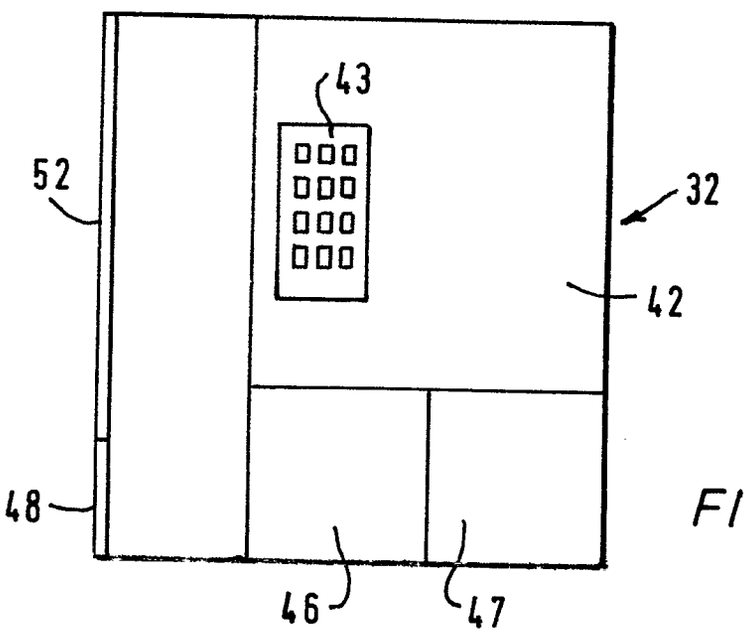


FIG.2.

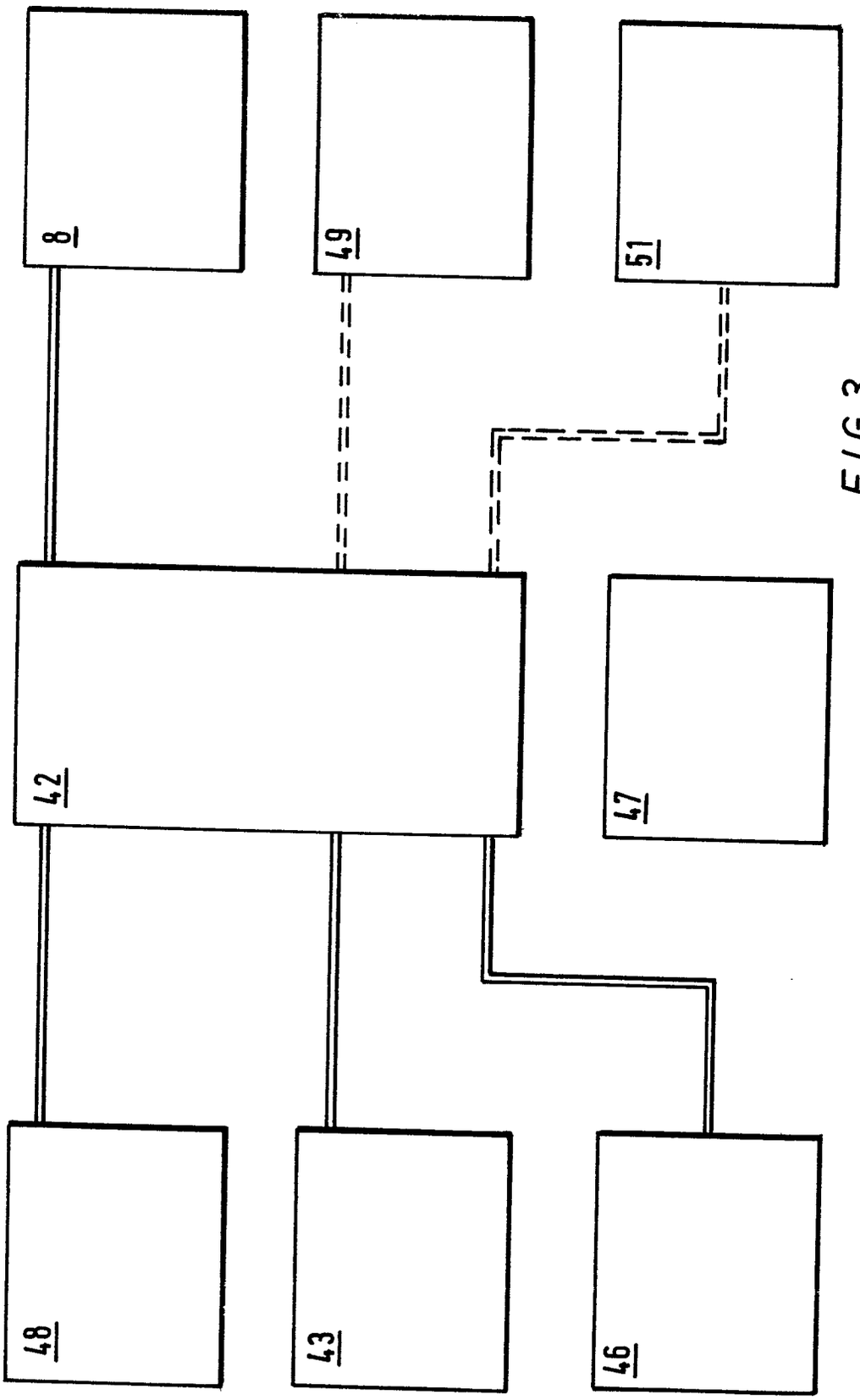
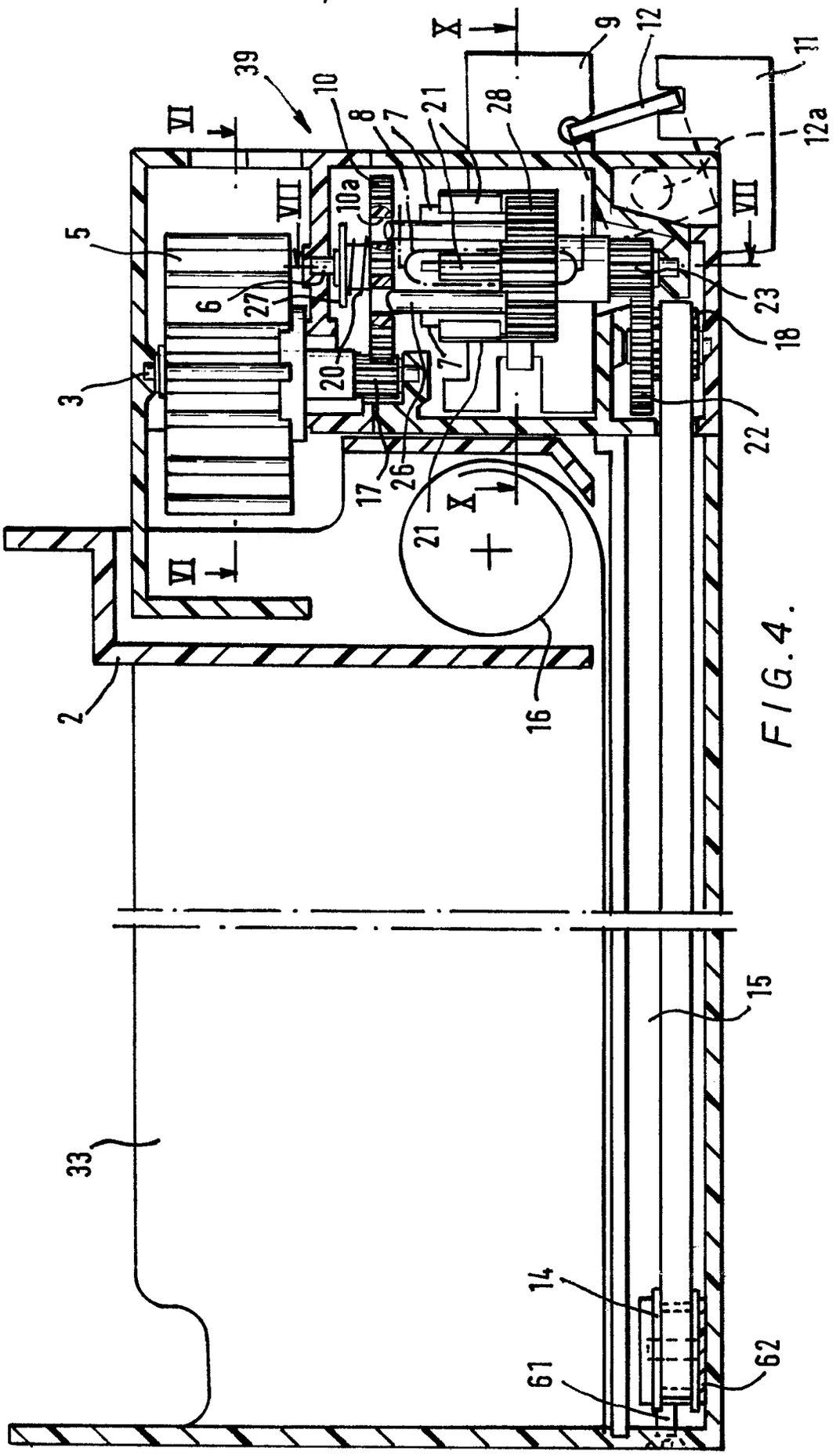


FIG.3.


X
9
12
11
39
10
VI
8
7
21
28
12a
VII
10a
5
6
27
3
20
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18
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17
26
21
X
VI
2
16
15
33
14
61
62

FIG.4.

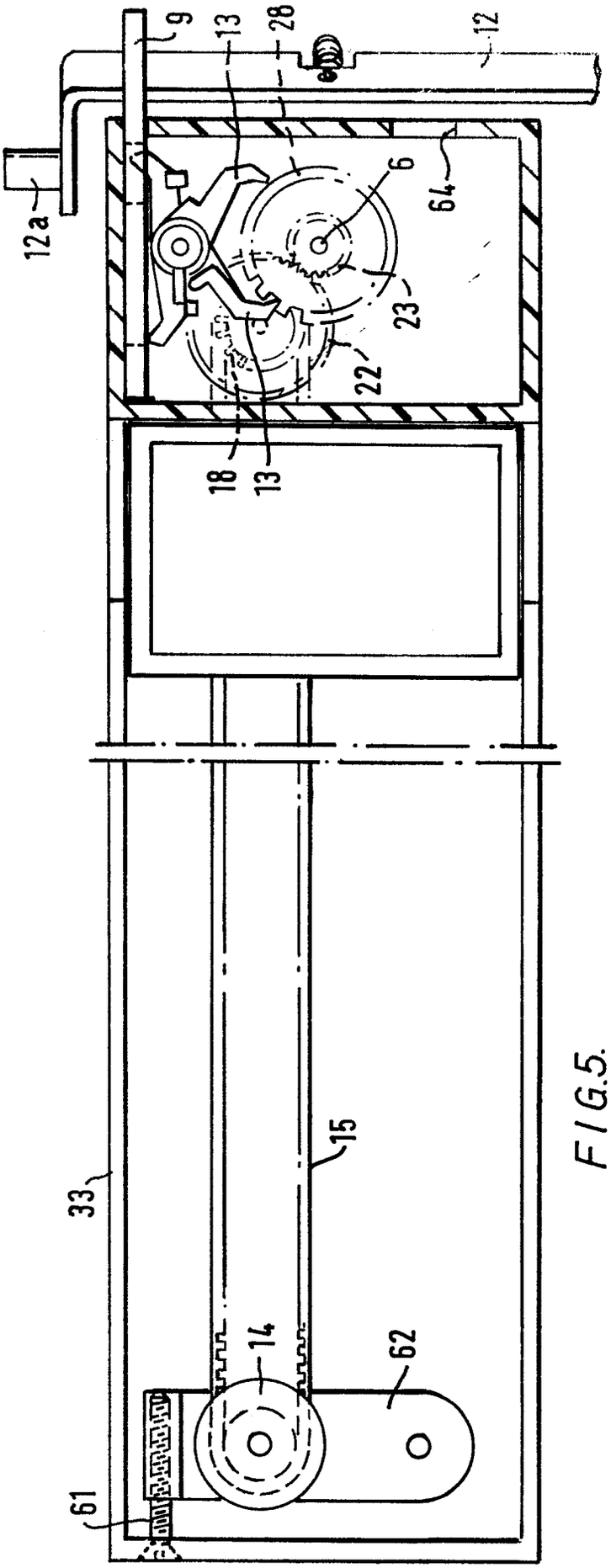

FIG.5.

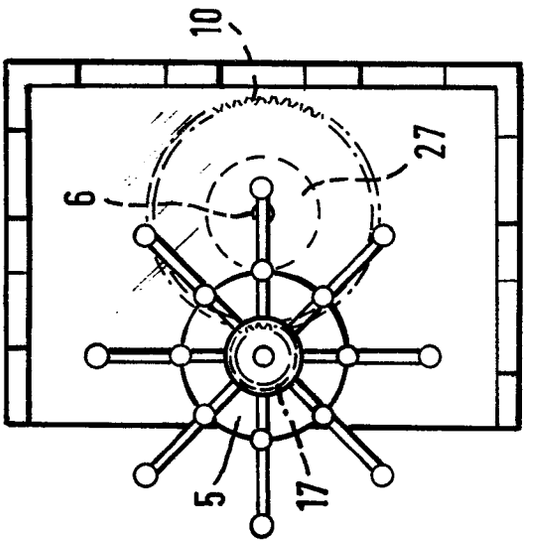

FIG.6.

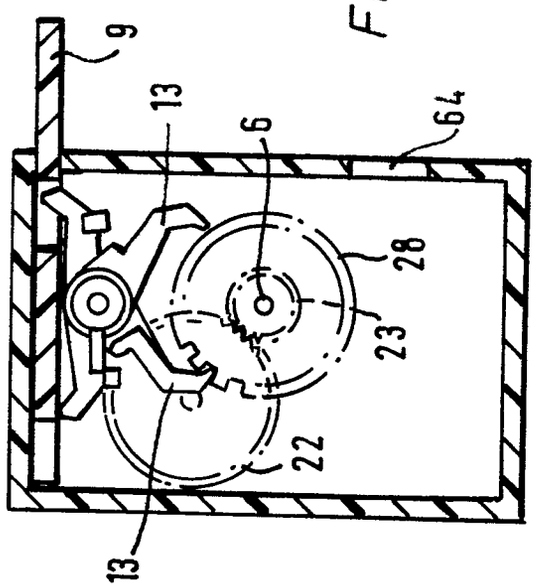

FIG.10.

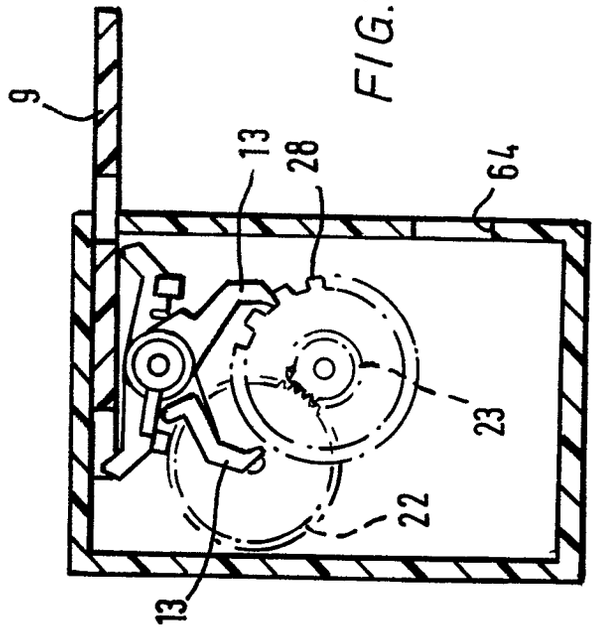

FIG.11.

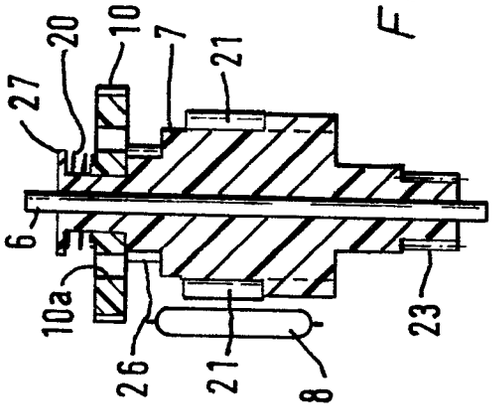

FIG.7.

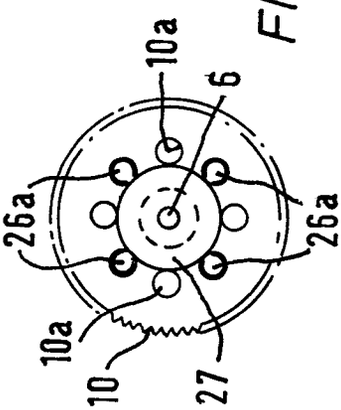

FIG.8.

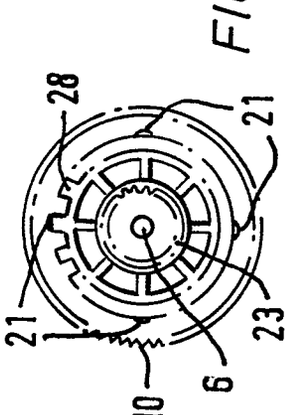

FIG.9.