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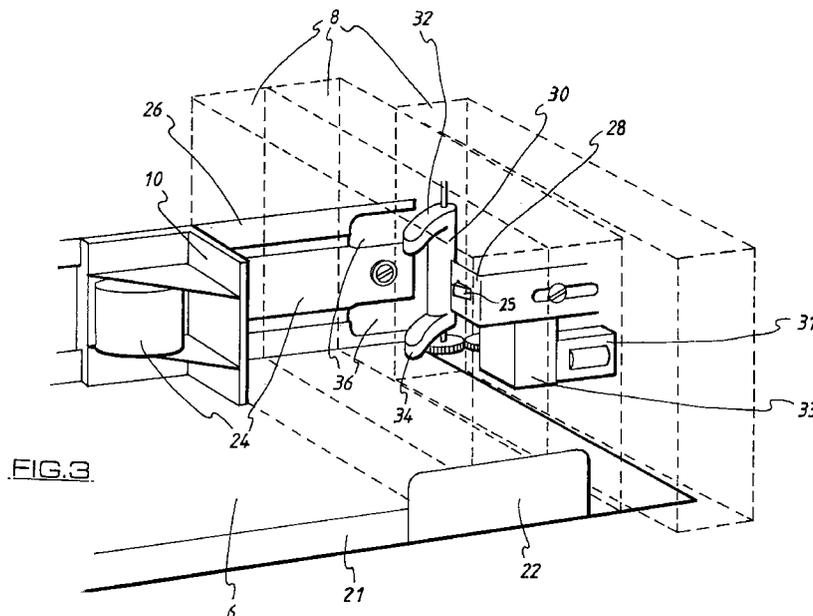
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(54) Vending machine

(57) A vending machine comprises a plurality of horizontal supports (6) mounted within a housing (2). Each support is adapted to carry a horizontally disposed stack of items (8) to be dispensed one by one, and has means (10) for urging a respective stack against an abutment (28) at one end thereof. A guide means (21,22) is provided on each support (6) for

retaining all but the next-to-be-dispensed item in line with the stack. Also, each support (6) has a paddle (30) capable of rotating through a position where it engages the next-to-be-dispensed item, and pushing it out of line with the rest of the stack past the abutment (28) so that it falls off the support (6) and is then dispensed.



Description

This invention relates to a vending machine, and more particularly to a vending machine of the type typically required for occasional use, such as are used to dispense packets of items such as condoms or sanitary towels.

The type of vending machine at which the invention is directed is often located in remote areas where there may be no ready access to a mains electricity supply. A machine which is electrically operated, as opposed to a mechanical configuration, therefore requires a battery. Accordingly, the power consumption of the machine should be minimised.

The machines may also be required to offer a wide range of products whilst occupying a limited volume as they are often situated in areas where space is restricted.

Packets are commonly held in such vending machines in a few vertical stacks. When the machine is operated the lowermost packet in a stack is pulled out from the pile and dispensed to the user. The packets remaining in the stack then fall under gravity to occupy the space left by the dispensed packet. However, the weight of the stack means that the packet at the base thereof may be damaged and a considerable force is necessary to remove it when the stack is substantially full. Accordingly, a significant amount of energy is used to provide the requisite force. Also if a machine is to offer several different products, the width of the machine becomes substantial.

The present invention provides a vending machine comprising a housing, control and money handling means for receiving cash or tokens and initiating the release of a selected item, and a plurality of substantially horizontal supports mounted within the housing, each adapted to carry a horizontally disposed stack of items to be dispensed one by one, and having means for urging a respective stack against an abutment at one end thereof, which end is adjacent a channel down which a dispensed item falls and which leads to an outlet of the machine, guide means for retaining all but the next-to-be-dispensed item in line with the stack, and a paddle capable of rotating through a position where it engages the next-to-be-dispensed item, and pushing it out of line with the rest of the stack past the abutment so that it falls into the channel. A sensor may be provided at the one end of each horizontal support, which sensor is adapted to detect the presence or absence of a next-to-be-dispensed item thereagainst, and output a signal indicating said presence or absence to the control means.

As a substantial force is not required to retain the items aligned in a horizontal stack, the force applied by the paddle to the end packet does not need to be large to push it out of line with the rest of the stack. Accordingly, a relatively small amount of energy is required. The use of a rotary paddle arrangement, which is pref-

erably mounted adjacent each shelf, also minimises the energy used in each vending operation.

The apparatus of the invention is also advantageous as each paddle does not need to be maintained in contact with a respective stack all the time and only a single item needs to be moved in the vending operation by means of energy from the power source of the apparatus.

An embodiment of the invention will now be described by way of example and with reference to the accompanying drawings wherein:

Figure 1 is a perspective view of a vending machine according to the invention;

Figure 2 is a perspective view of a dispensing mechanism for adoption in the vending machine of Figure 1;

Figure 3 is a perspective view of the dispensing mechanism of Figure 2, showing an intermediate position in the dispensing operation;

Figure 4 is a flow chart representing a method of operation of the vending machine of Figure 1.

The vending machine illustrated in Figure 1 comprises a housing 2 with a door 4. The door can be securely locked to the body of the housing. The machine contains several horizontal supports or shelves 6. The products 8 are biased towards the right hand side of the machine (in the orientation shown in the Figure) by sliding blocks 10. An electronic coin handling and control unit 12 is disposed on the inner surface of the door 4. The location of a shallow unit in this position maximises the volume available in the housing 2 for holding products. A selection and display panel is provided on the outer surface of the door 4.

The unit 12 can be entirely conventional and so will not be described here in detail. Inserted coins are checked for validity and value. Accepted coins are retained and their accumulated value stored, whilst invalid coins are returned to the user. Once sufficient value has accumulated, the unit 12 will allow the dispensation of a product to be initiated.

The user makes a selection via the unit 12, and if available, a corresponding product 8 is released from the right hand end of the appropriate shelf 6 by a dispensing mechanism (described below). The product then falls down a vertical channel 14, past a tamper prevention flap 16 into a chamber 18. It may then be removed by the user through an aperture in the door 4 after pushing back the flap 20. The flaps 16 and 20 are arranged so that when the flap 20 is pushed back, it is not possible to reach past the flap 16. The shelves 6 are mounted within the housing 2 in such a manner that their height may be adjusted in small increments so that a wide range of packets can be accommodated. It also allows a number of shelves to be adjusted to hold the same product, or each hold a different sized packet, for example. Packets are arranged on the shelves with their

shortest dimension along the line of the shelf to maximise the number of packets that may be stored on each shelf.

An upstanding lip 21 is provided along the front edge of each shelf to align the products. Its position across the shelf may also be adjusted to accommodate different sizes of packet.

In addition, an upstanding tab 22 is provided at the end of each lip 21 near the right hand end of the shelf. Its location along the shelf relative to the lip is adjustable according to the width of the packets, so that only the end packet is able to move outwardly from the back wall of the housing. In other words, only a single packet can be dispensed at a time from a shelf because the others are held by the lip 21 and tab 22.

If small packets are to be dispensed, the shelves may be configured to hold two parallel rows of packets, one behind the other, which can be released into the channel 14 under the control of the unit 12.

The number of types of product that the machine could handle, may be substantially increased by providing the vertical channel 14 centrally within the housing 2. Thus products may be dispensed into the channel from either side.

An embodiment of a dispensing mechanism in accordance with the invention is shown in Figure 2. Such a mechanism is disposed at one end of each shelf in the vending machine. Three packets 8 are represented by dashed lines in the Figure.

In the illustrated orientation of the arrangement, the block 10 is urged from left to right by a known constant force spring 24. The block is slidably mounted against the bracket 16 by means of a "dovetail" type engagement. It is able to move smoothly along the bracket whilst accurately held with its pushing surface perpendicular to the direction of sliding.

An abutment 28 is disposed at the right hand edge of the shelf 6. Thus the packets 8 are urged with a constant pressure against the abutment by the block 10, and are confined in a horizontal stack therebetween. The surface provided by the abutment for engaging the end packet of the stack is flat to ensure that the end packet is held in alignment with the rest of the stack, even though it does not contact the lip 21 or the tab 22. A microswitch 25 is mounted on this surface, the operation of which is discussed below. The longitudinal position of the abutment with respect to the shelf is adjustable by temporarily loosening a screw 27, which passes through a slot 29 in the abutment. Its position may be adjusted, together with that of the tab 22 to ensure only a single packet is dispensed at a time.

A paddle assembly 30 is rotatably mounted adjacent to the end of the shelf 6. It is driven, under the control of the unit 12, by an electric motor 31 via a reduction gear box 33. The paddle configuration shown in Figure 2 has two fingers 32 and 34 (dotted) which pass through the slots 36 in the bracket 26, and above and below the abutment 28, respectively, when the paddle is rotated in

the direction of arrow A. A product is dispensed from the shelf by rotating the paddle through one complete turn in this direction, and an intermediate position is shown in Figure 3.

After the fingers 32 and 34 pass through the slots 36, they engage the rear surface of the packet at the end of the shelf, and then push it forwards, away from the bracket 26. As the paddle 30 continues to rotate, it pushes the packet past the abutment 28. The horizontal stack can then advance along the shelf, pushing the end pack over the right hand edge of the shelf. It then falls down the vertical channel 14 as discussed above.

The products likely to be dispensed from this machine are light and supplied in rigid packets. Therefore, the tension in the spring 24 need not be great to retain the packets on the shelf, and as a consequence of these factors, the power required by the paddle is not large. The upper surfaces of the shelves are preferably designed to be smooth and to minimise any friction with the products. In addition to minimising the energy consumption of the dispensing mechanism, these considerations also reduce the likelihood of any products being damaged.

Although the paddle is shown with two fingers 32 and 34 in Figure 2, other configurations may be adopted as appropriate. The fingers are illustrated as being slightly curved and this shape has been found to be advantageous and to dispense the packets in a predictable manner.

The microswitch 25 provided on the abutment 28 is biased towards the raised position shown in Figure 3. The contacts of the microswitch are either open or closed when it is in the raised position, and are in the opposite state when the switch is depressed. When one or more packets 8 are present on the shelf 6, the microswitch is depressed by the end packet as shown in Figure 2. If a packet is pushed off the end of the shelf 6, the switch briefly moves to the raised position, until the next packet in the stack is pushed thereagainst by the block 10. This brief switching of the microswitch is detected by the control unit 12 to confirm that a packet has been successfully released from the shelf. Energisation of the respective motor 31 is stimulated by the control unit for a predetermined period of time after the detection of the switching signal to rotate the paddle 30 to a predetermined position clear of the space above the shelf 6.

If there are no packets on a shelf, the block 10 is held near the end of the shelf against a stop (not shown) by its spring 24. The stop is positioned such that the block is spaced from the microswitch 25 in its raised position. Accordingly, if a microswitch is constantly in the raised position, the control unit 12 can determine that the corresponding shelf is empty. If another shelf holds a stack of the same product, the unit 12 then checks the corresponding microswitch. Otherwise, the unit informs the user the product is not available via the display panel and awaits further input, such as a refund request, further cash or selection of another product. If

there is no input after a predetermined time, say fifteen seconds, then the user's cash is automatically refunded.

In an alternative embodiment of the invention to the microswitch-based configuration, a detector 38 (see Figure 1) is provided near the foot of the channel 14, below the lowermost shelf, to sense when a packet passes through the channel. When a user requests a particular product, the respective motor 31 is activated, and the corresponding paddle rotates dislodging a packet into the channel 14. If the detector senses that a packet has been dispensed, it initiates the stopping of the active motor. It is preferable for the paddle to return to its initial position, as shown in Figure 2, for example. The packets take different times to fall from different shelves to the height of the detector. The paddle may therefore be rotated to its original position by operating the motor for a predetermined time following the detection of a packet, taking into account the time taken for the packet to fall from a given shelf. If a packet is not sensed by the detector after a certain period of motor operation, two seconds for example, then this indicates that the particular shelf is empty.

An advantage of this arrangement is that the overall control can be relatively simple. Thus it does not have to sense directly whether there is stock available. It does this by waiting to see if an item is dispensed down the channel. Also the functioning of the paddles does not have to be highly accurate; it is sufficient for them to make at least one approximately complete revolution.

Figure 4 is a flow chart representing a preferred sequence of operation of a dispensing machine of the invention incorporating the microswitch-based control system. The use of an electronic control unit allows such a sequence to be readily altered as appropriate, whilst also requiring minimal power in operation.

Claims

1. A vending machine comprising a housing (2), control and money handling means (12) for receiving cash or tokens and initiating the release of a selected item, and a plurality of substantially horizontal supports (6) mounted within the housing (2), each adapted to carry a horizontally disposed stack of items (8) to be dispensed one by one, and having means (10, 24) for urging a respective stack against an abutment (28) at one end thereof, which end is adjacent a channel (14) down which a dispensed item (8) falls and which leads to an outlet (20) of the machine, guide means (21, 22) for retaining all but the next-to-be-dispensed item in line with the stack, and a paddle (30) capable of rotating through a position where it engages the next-to-be-dispensed item (8), and pushing it out of line with the rest of the stack past the abutment (28) so that it falls into the channel (14).
2. A machine according to Claim 1 in which each paddle (30) is driven by an electric motor (31).
3. A machine according to Claim 1 or Claim 2 which is battery-powered.
4. A machine according to any preceding Claim in which a portion of the channel (14) extends upright adjacent one side wall of the housing (2).
5. A machine according to any preceding Claim in which a sensor (25) is provided at the one end of each horizontal support (6), which sensor is adapted to detect the presence or absence of the next-to-be-dispensed item (8) thereagainst, and output a signal indicating said presence or absence to the control means (12).
6. A machine according to Claim 5 in which the sensor (25) is adapted to detect the dispensation of an adjacent item (8) and the control means (12) is adapted to stimulate rotation of the respective paddle (30) for a predetermined period of time after said detection of dispensation to move the paddle (30) clear of the stack.
7. A machine according to any of Claims 1 to 4 in which a detector (38) is provided in the channel (14) below the lowermost support (6) to detect whether an item (8) has been dispensed and output a signal representative thereof to the control means (12).
8. A machine according to Claim 7 in which the control means (12) is adapted to stimulate rotation of the respective paddle (30) for a predetermined period of time after said detection of dispensation to move the paddle (30) clear of the stack.
9. A machine according to any preceding Claim in which the heights of the supports (6) relative to the housing (2) are adjustable.
10. A machine according to any preceding Claim in which the urging means comprises a constant force spring (24).

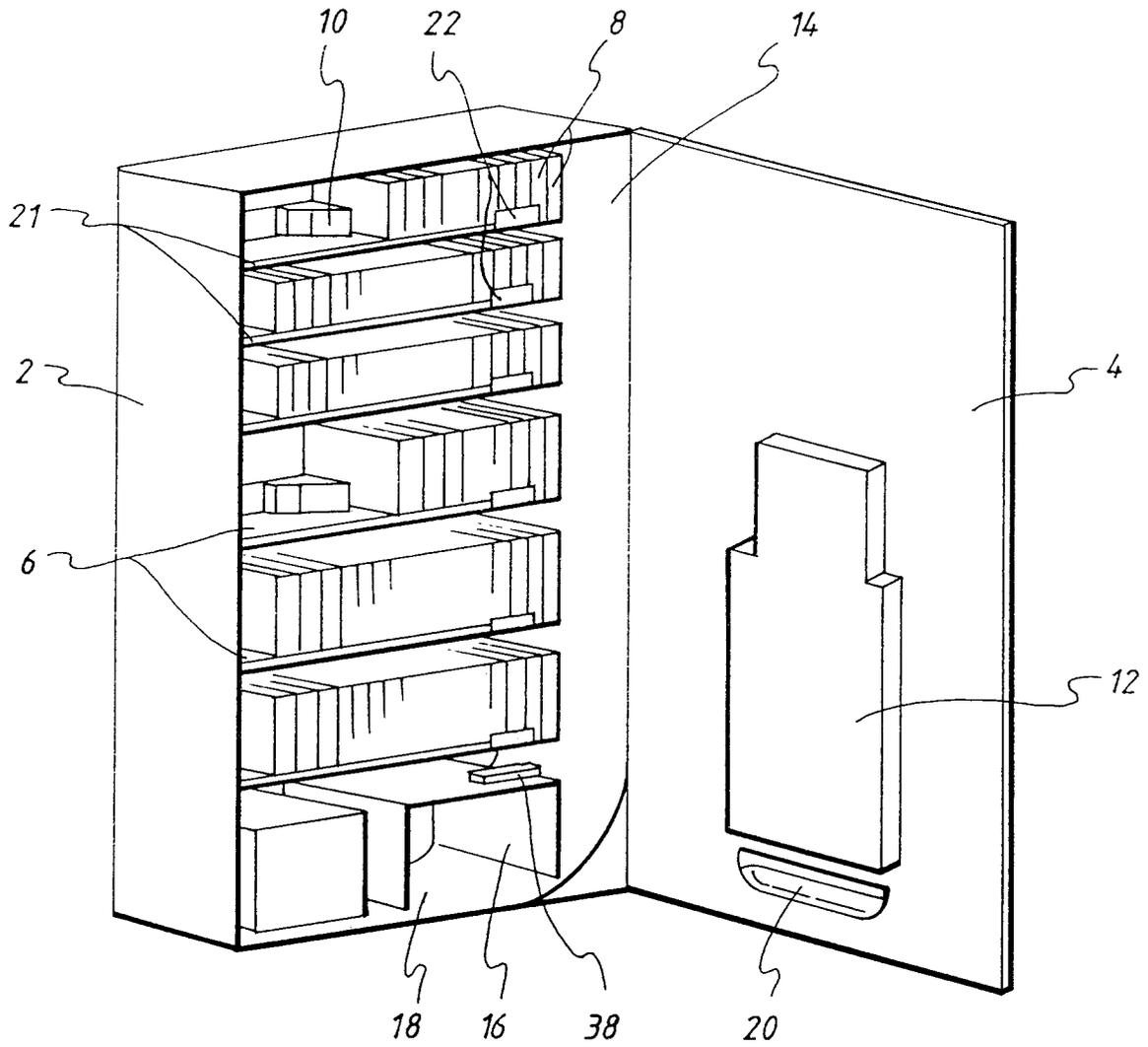


FIG.1

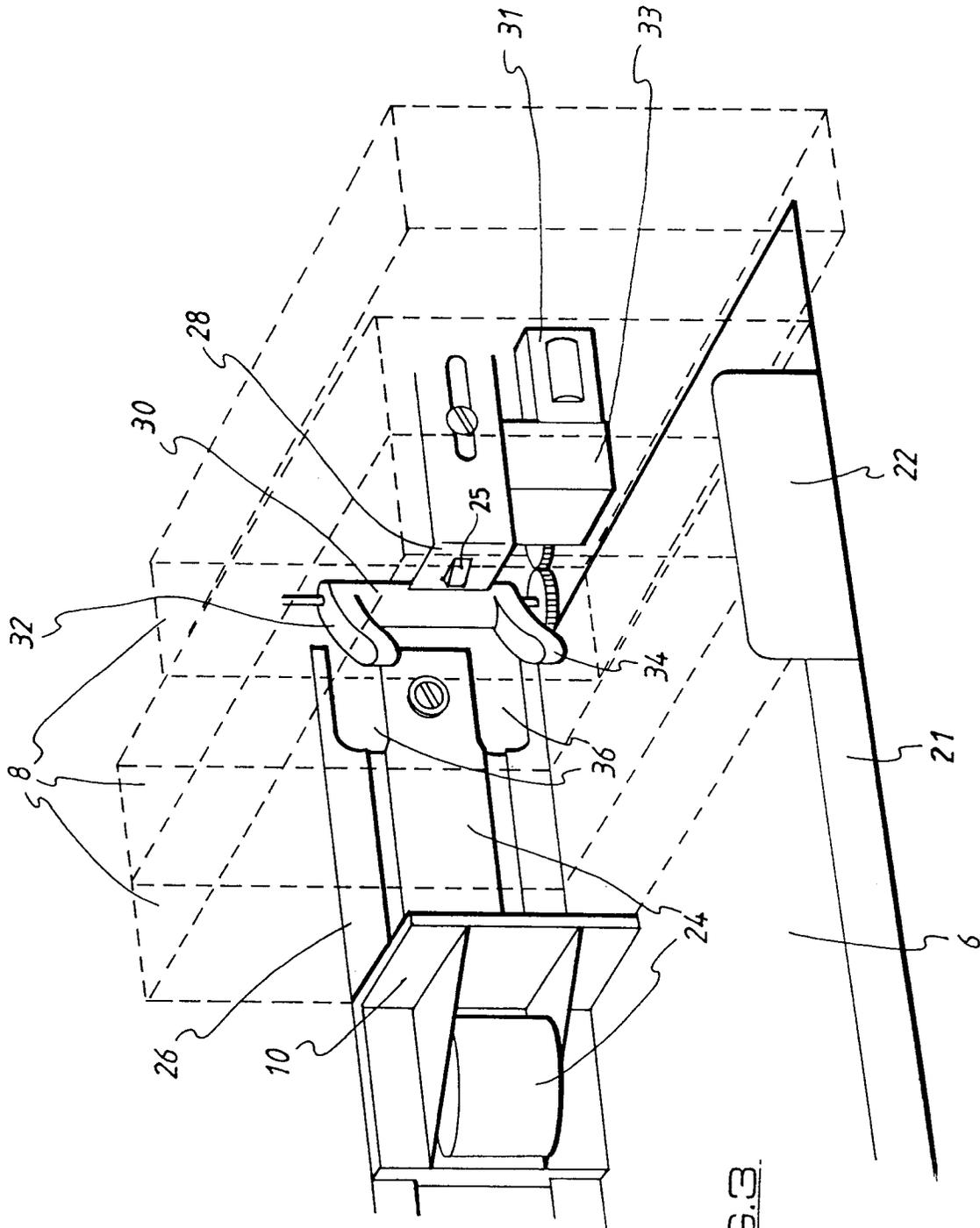
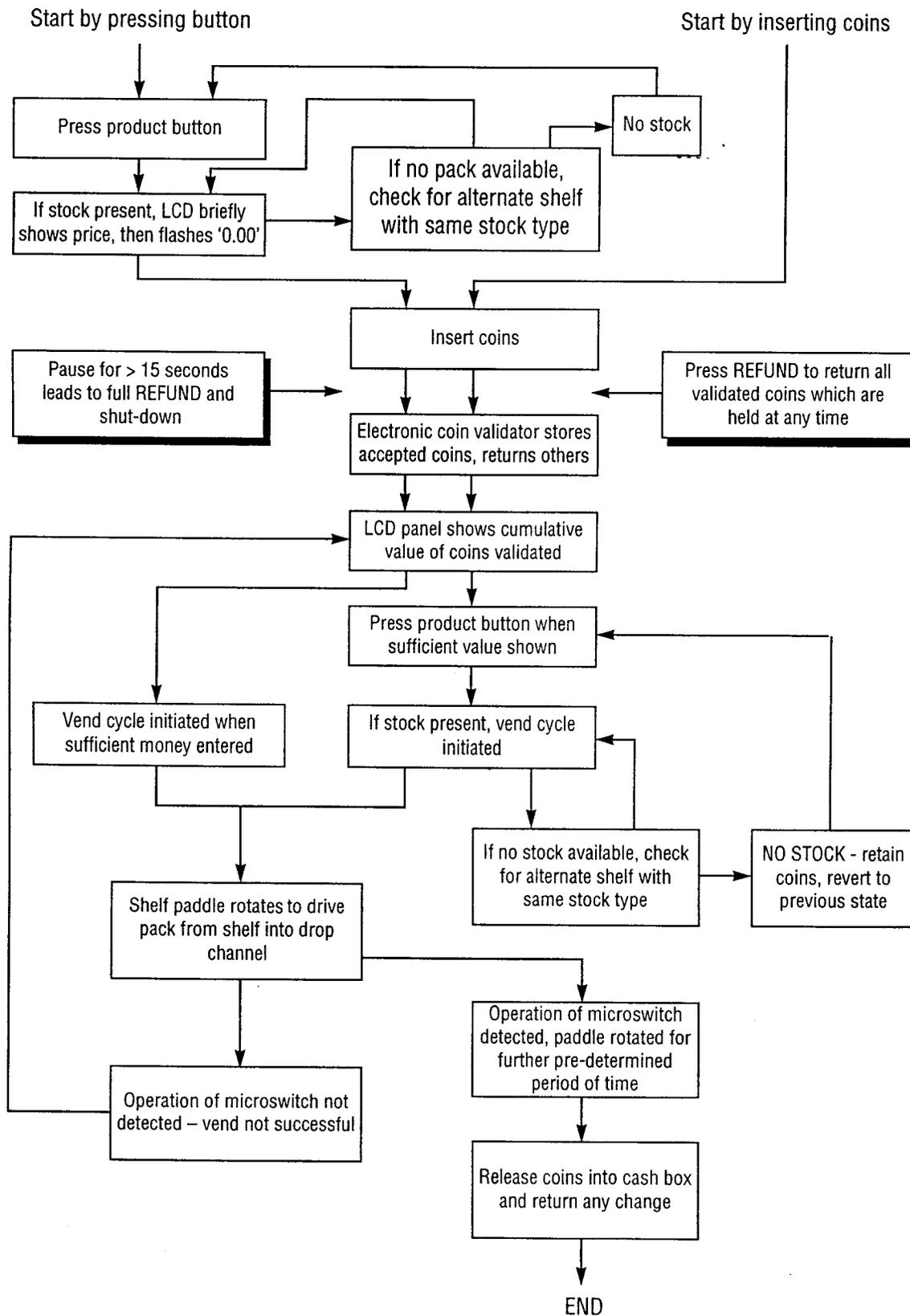


FIG. 3





European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 96 30 5835

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.6)
X	US 2 537 300 A (RELIABLE METAL ENGINEERING CO) 9 January 1951	1,4,10	G07F11/42
Y	* claim 1; figures 4-6 * ---	2,3,5-9	
Y	DE 20 54 373 A (SEITZ AUTOMATEN GMBH) 10 May 1972	2,3,5-9	
A	* claim 1; figure 1 * ---	1,4,10	
A	WO 88 04086 A (BERGSTEN CURT ARNE) 2 June 1988	1-10	
A	* claim 1; figure 1 * ---	1-10	
A	DE 38 24 214 A (HAENDLER METALL & MASCH) 18 January 1990	1-10	
A	* claim 1; figure 1 * ---	1-10	
A	US 3 908 859 A (HOHMANN ROBERT C) 30 September 1975	1-10	TECHNICAL FIELDS SEARCHED (Int.Cl.6) G07F
A	* claim 1; figure 1 * -----	1-10	
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 11 February 1997	Examiner Kirsten, K
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- & : member of the same patent family, corresponding document	

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