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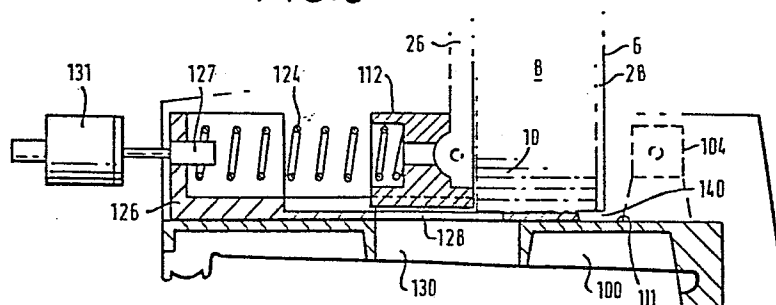
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54 Coin dispenser.

57 A coin storage assembly has a container (6) storing a stack (10) of coins, and a coin slide (126) located underneath the stack (10) and having an aperture (128) for receiving the lowermost coin in the stack (10). The slide (126) can be shifted transversely of the stack (10) to remove the coin in the aperture (128). The next adjacent coin is detained by a modular structure (112) which has been formed separately

from and fitted to the lower end of the container (6). The structure (112) has been selected from a range of structures which are identical except for the depth of their coin-engaging surfaces (132); those designed for use with thinner coins have a surface (132) extending to a lower level with respect to the position at which they are fixed to the container (6).

FIG.8



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COIN DISPENSER

This invention relates to devices for dispensing coins or coin-like objects such as tokens, all of which will be referred to herein, for convenience, as
5 coins.

A common arrangement for dispensing coins comprises a container storing the coins in a stack, and a member such as an arm or slide located beneath an opening at the bottom of the stack, the member being
10 movable transversely and engageable with only the endmost coin of the stack for transporting this coin away from the stack. The endmost coin may lie in a recess and be supported by the member, or lie in an aperture in the member and be supported by a base plate under the member.
15 Usually, the coin which overlies the endmost coin is prevented from being transported with the endmost coin by engagement with the bottom edge of the container. It has been proposed instead (see US-A-3180343 and CH-A-398138, corresponding to GB-A-930925) to provide a large clearance
20 at the bottom of the container and to prevent the coin next to the endmost coin from being withdrawn from the stack by using a resiliently displaceable stop, in order to cater for minor thickness variations due to worn or bent coins. These latter arrangements are, however, not
25 particularly desirable because they are expensive to make,

difficult to assemble and prone to malfunction.

Accordingly, arrangements in which the lower edge of the coin container is used as a fixed stop to prevent dispensing of more than one coin in a single dispensing operation have been found preferable.

One problem with the arrangements discussed above is concerned with the fact that providing separate dispensers adapted for different denominations of coins, with possibly very different thicknesses, is expensive. It would therefore be very desirable to have a single device, or a very small range of devices, which are inexpensive but which can be used reliably for dispensing a large variety of coin denominations. To achieve this, it has been proposed that the various elements of the apparatus should be mounted in an adjustable manner so that they can be set up appropriately for a particular coin denomination. This, however, increases the difficulty of assembly, and produces the risk that the components of the dispenser may come out of adjustment during use, so that the apparatus will require re-adjustment.

US-A-3841341 discloses a coin dispensing arrangement in which several coin containers are mounted on the back wall of a device above a base plate which is mounted to the side walls of the device. The coins in the con-

tainers rest on respective parts of the base plate.

Adapting the device for coins of different thicknesses is achieved by varying the levels of the respective parts, so that in each case a coin-moving arm projects

5 upwardly from the base plate by an amount which corresponds to a predetermined proportion of the coin thickness.

However, this does not necessarily result in the clearance between the bottom of the container and the upper surface of the base plate having an optimum value for effectively

10 ensuring that only one coin at a time is dispensed.

Furthermore, because of the ways in which they are mounted, it would be extremely difficult to ensure that the containers and base plate are consistently positioned accurately with respect to each other.

15 According to one aspect of the invention there is provided a coin dispenser comprising a coin storage structure having a container for storing a stack of coins, and a coin moving means adapted to engage the endmost coin of the stack in order to move the coin trans-

20 versely of the stack, the dispenser comprising a coin stop at a fixed distance from a surface supporting said endmost coin so as to permit movement of the endmost coin by the coin moving means but detain the coin next to said endmost coin, characterised in that the coin

25 stop has been formed separately from, and fitted to, said coin storage structure.

According to another aspect of the invention, there is provided a method of assembling a coin dispenser which comprises a coin storage structure having a container for storing a stack of coins, and a coin moving means arranged to engage the endmost coin in the stack in order to move said coin transversely of the stack, the method being characterised by the step of selecting a coin stop and fitting the selected coin stop to said coin storage structure so that the stop engages the coin adjacent said endmost coin to detain it when the endmost coin is moved by said coin moving means, the coin stop being selected from a range of such stops each sized to suit a respective coin thickness, or range of coin thicknesses.

15 In the preferred embodiment of the invention, a range of coins of different thicknesses can be dispensed using identical dispensing apparatus, with the exception of the coin stop structure. The coin moving means, which may be a slide provided with an aperture, is sized to
20 suit the thinnest coin to be handled. Preferably, the depth of the aperture is smaller than the thickness of the thinnest coin, so that any coin handled by the slide will project upwardly from the aperture. The coin stop structure has a coin stop surface which extends downwardly
25 toward the slide by an amount determined by the thickness of the coins to be handled. Thus, one can provide a

plurality of stop structures which are substantially identical, and which are fitted in the same way and at the same position to the coin storage structure, the only difference being in the amount by which the coin stop
5 surface extends toward the slide.

The stop surface terminates at a position at which the coin in the aperture in the slide can move underneath the surface, but the adjacent coin is stopped by the surface.

10 The stop structure engages the coin at the side thereof from which coins are withdrawn from the stack. Preferably, at the opposite side, there is a gap which is of small, and preferably substantially the same size irrespective of which of the coin stop structures
15 is selected. This prevents coins from accidentally becoming jammed in the gap through which the slide moves at that side of the stack. This arrangement, in which the gap is of a constant and small size irrespective of the thickness of the coins being handled, can be most
20 easily achieved by using a structure different from the coin stop structure (e.g. the container itself) to define the gap. This differs from the arrangement in U.S. Patent No. 3,841,341, in which the size of the gap increases as the thickness of the base decreases, so that the risk
25 of jamming is more serious.

By using a separate coin stop structure to engage the coins at the side from which they are withdrawn,

it is possible to use a hardwearing material at this

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position without significantly increasing the overall cost of the container, which would be necessary if the stop structure were an integral part of the rest of the container.

5 Preferably, the coin stop structure is located in position on the storage structure by inter-engaging surfaces, and may be held in position by a spring, for example a spring which is also used to retract the slide. This avoids the need for careful adjust-
10 ment of the relative positions of the coin stop structure and the storage structure, and also avoids the need for securing them together using screws or by welding, etc.

 The coin stop structure preferably has a
15 curved stop surface. Preferably, the same structure is used for a range of different diameter coins, some of which require different-sized storage structures. Preferably, the curvature of the coin stop surface matches the curvature of the interior of the largest-
20 diameter storage structure.

 Preferably, the depth of the coin stop structure is sufficiently small that the upper end thereof is always at a distance from the surface on which a coin

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received by the slide rests which is smaller than the radius of the smallest coin to be handled.

This ensures that such a smallest coin which is accidentally in a vertical instead of a horizontal

5 orientation will not be presented with a recess into which it might be almost totally received, which could otherwise occur when the coin stop surface of relatively large radius of curvature is used with a coin storage tube of the smallest required diameter.

10 Such a situation could cause a jam at the bottom of the storage structure.

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An arrangement embodying the invention will now be described by way of example with reference to the accompanying drawings, in which:

Figure 1 is a schematic perspective view of
5 a coin storage assembly according to the invention;

Figure 2 is a side elevation showing part of a container of the storage assembly of Figure 1;

Figure 3 is a partial view of another container of the assembly;

10 Figure 4 is an exploded, perspective view showing part of the dispensing mechanism of the container;

Figures 5 and 6 are respectively exploded perspective and transverse sectional views of further
15 parts of the dispensing mechanism; and

Figures 7 and 8 are plan and longitudinal sectional views of the dispensing mechanism.

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Referring to Figures 1 and 2, the coin storage assembly 2 of the present embodiment is positioned beneath a coin separator (not shown). The separator receives from a validator coins which have been
5 tested and found to be genuine, and separates the different denominations of coins in order to deliver them via respective supply passages 4 to the coin storage assembly.

The assembly of the present embodiment comprises
10 a plurality of, and in this particular case four, storage units 6. Each unit 6 has a storage space 8 for storing a stack 10 of coins received from a supply passage 4, a secondary passage 12 which can also receive coins from the supply passage 4, and an
15 additional passage 14.

The stacked coins in the storage space 8 can be dispensed one at a time by a dispensing mechanism generally indicated at 16.

Coins from a supply passage 4 are normally
20 delivered to the storage space 8, but if the storage space is full they are instead delivered to the secondary passage 12, which leads to a cashbox. In the present embodiment, the secondary passages 12 lead to

separate cashboxes. A gate 18 determines whether the coins from a supply passage 4 go to the storage space 8 or the secondary passage 12.

Each additional passage 14 receives coins from
5 a respective separator passage 20. These coins may be of a denomination which the apparatus is not required to dispense, and the coins may be routed by the additional passages 14 to separate cashboxes, or a common cashbox. In the preferred embodiment, one of
10 the additional passages 14 is used to route coins which have been rejected by a validator to an exit slot for retrieval by the user of the apparatus.

Each unit 6 is formed in two longitudinal halves. Figure 2 shows the left-hand half of one of
15 the units. Each half is formed by injection moulding. If desired, the two halves could be formed in a single mould, with the halves linked together by a flexible hinge along the edge 22 so that the halves can be readily closed to form the storage unit 6 after ejection from
20 the mould. The halves are fastened together by screws through bosses 24.

The storage space 8 is formed between an outer wall part 26 and an inner wall part 28. The secondary passage 12 is formed between the inner wall part 28 and
25 a further inner wall 30, and the additional passage 14

between the wall 30 and a rear wall 32.

The storage space 8 is cylindrical, and has a diameter which is slightly greater than that of the coins intended to be stacked in the space.

5 It is intended that the unit 6 be usable with coins of various diameters. However, for coins of substantially different diameters, other units 6, having different diameter storage spaces 8, would be used.

Figure 3 shows part of another such unit 6 having a
10 reduced diameter space 8 for smaller diameter coins.

This can be achieved simply by changing an insert in the injection mould used to form the container units, so that the wall part 26 remains of the same thickness, but wall part 28 becomes thicker. This arrangement
15 ensures that the left-most edges of the coins in the stack 10 (as seen in Figure 2) are always at substantially the same position irrespective of the diameter of the coins; this simplifies the design of the dispensing mechanism.

20 The container unit 6 is secured in position at its top end by a screw through a hole 38 in a mounting structure 40, which has an inclined face engaging a similarly inclined face of a wall 41 of the separator. At its bottom end, the container unit is located by a
25 boss 34 and hook 35 engaging with mating portions of an enclosure case (not shown).

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The coins from the supply passage 4 reach the storage space 8 via an entry 42. The entry 42 comprises a narrow space 44 between a wall 46 of the separator and a ledge 48 at the upper end of the inner wall 28. The shape and size of the space 44 are such that coins can pass through the space only if they are travelling edge-first.

When the stack 10 reaches a certain level (which will be different for coins of different diameters), as shown in Figure 2, the next coin 50 to be delivered through the entry 42 will come to rest on the top of the stack, with its upper edge supported on the ledge 48.

The coin 50 is supported in a generally upright, but inclined orientation with its centre of gravity located over the stack 10. An inwardly-inclined, flat upper edge 54 of the outer wall 26 assists in guiding the coin 50 to this orientation. An inductive sensor 52 is mounted in the separator in such a position that it will be in proximity to the face of the coin 50. The sensor 52 is able to detect the presence of coin 50 which indicates that the storage space 8 is full, which detection is reliable because the position of the last coin to enter the storage space is predetermined by the configuration of the entry 42 in co-operation with the stack 10.

If a coin is now dispensed

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from the stack 10, so that the top of the stack moves down by a distance corresponding to the thickness of the dispensed coin, the upper edge of the coin 50 will no longer be supported by the ledge 48, and the 5 coin will then fall directly face-down on the top of the stack.

The dispensing mechanism 16 is shown in more detail in Figures 4 to 8. A base plate 100 has two upstanding side walls 102, each of which is provided 10 with a pair of inwardly projecting location studs 104.

The container unit 6 has at its lower end two side walls 106. Each of these carries two sets of three location projections 108. The square studs 104 on the insides of each of the side walls 102 of the 15 base plate 100 are each located by a respective set of location projections 108, the three projections contacting three sides of the square stud, so that the base plate 100 is accurately positioned beneath the container unit 6. The base plate 100 is secured in position by 20 screws passing through holes 110. The stack of coins in the container unit 6 will rest on the upper surface 111 of the base plate 100.

A coin stop structure or designator 112 is then inserted between a pair of flanges 114 forming

extensions of the side walls 106 of the container unit 6. The designator 112 has upwardly facing surfaces 116 and downwardly facing surfaces 118 which engage between upper and lower ledges 120 and 122 extending inwardly from the flanges 114 so that the designator 112 is located at a precise vertical position with respect to the container unit 6. A spring 124 is then inserted between the flanges 114, and a slide 126 is then inserted between the base plate 100 and the container unit 6. The

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slide 126 has a projection 127 which locates within the spring 124.

The slide 126 may be provided with a projection (not shown) which engages in a slot (not shown) in the base plate 100 or the container unit 6 to limit the movement of the slide 126 toward the left, the projection being deformable to allow the initial insertion of the slide. However, other means may be provided for holding the slide 126 within the assembly.

10 The spring 124 is under compression, and serves to hold the designator 112 firmly against the wall 26 of the container unit 6, and further acts to bias the slide 126 toward the left as seen in Figures 7 and 8.

15 The slide 126 has an aperture 128 which, in the position of the slide shown in Figures 7 and 8, lies over an aperture 130 in the base plate 100.

A solenoid 131 is provided for pushing the slide 126 to the right as seen in Figures 7 and 8, to bring the aperture 128 beneath the stack 10 of coins in the container unit 6. The lowermost coin in the stack 10 will then enter the aperture 128, which, at the right-hand side thereof, has a height which is less than the thickness of the thinnest coin to be handled by the

mechanism. Accordingly, the coin will project upwardly beyond the upper surface at the right-hand side of the aperture 128. Accordingly, when the energy to the solenoid is terminated so that the spring 124 pushes
5 the slide 126 toward the left, only the lowermost coin in the stack will be engaged and forced to move by the edge of the aperture 128.

The designator 112 is provided to ensure that the next adjacent coin is not also transported to the
10 left by the slide 126, which would result in more than one coin being dispensed, or in jamming of the mechanism. The designator 112 has a concave coin stop surface 132 to engage the second-lowermost coin in the stack 10.

The designator 112 has been selected from a set
15 of designators which are all identical except for the height H of the coin engaging surface 132 (see Figure 5). For thinner coins, a designator having a greater value of H is chosen. The value H is determined such that the clearance between the bottom of the surface 132 and
20 the upper surface 111 of the base plate 100 is greater than the maximum expected thickness of a coin in the container, and less than twice the minimum expected thickness of a coin in the container.

The coin engaging surface 132 has upwardly-extending recesses 134 which receive upwardly-projecting flanges 136 at the left-hand side of the aperture 128 in the slide 126.

- 5 When the energy to the solenoid is released, the sudden movement of the slide 126 toward the left could

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tend to project a coin in the aperture 128 over the top of the surface of the slide at the left-hand side of the aperture 128. The upwardly-extending flanges 136, which extend to a height substantially greater than the top surface of the coin in the aperture 128, prevent this from occurring.

The designator 112 is intended for use with a variety of different coin storage units 6, having different diameter storage spaces 8. The curvature of the coin stop surface 132 is selected to match that of the largest diameter storage space 8. Accordingly, when a unit 6 having a slightly smaller diameter storage space 8 is used, the curvatures will not quite match, as can be seen most clearly from Figure 7.

This is normally of no consequence, because the centre of the coin stop surface 132 is in alignment with the left-hand edge of the storage space 8 and therefore correctly performs the function of preventing the second-lowermost coin from being withdrawn to the left as the slide 126 shifts.

However, the relatively large radius of curvature of the surface 132 results in free space within the storage space 8 adjacent the ends of the surface 132.

It is possible that coins could wedge within this free space, and to prevent that, it is ensured that the upper edge of the surface 132 is at a relatively low level, so that for any of the selectable values of H, the total height of the surface 132 is relatively small, and in particular smaller than the radius of the smallest-diameter coin to be used with the dispensing mechanism.. This means that the free space is small, and jamming of coins will not occur.

10 As indicated in Figure 8, at the opposite side of the storage space 8 from the designator 112, there is a clearance 140 between the bottom of the inner wall 28 and the upper surface 111 of the base plate 100 which is small and independent of the selected designator
15 to avoid jamming of coins in this space.

The slide 126 and designator 112 are made of an acetal homopolymer. The container unit 6 may be made from an engineering resin such as ABS, and the base plate from glass reinforced styrene modified PPO.

20 Coin dispensers suitable for an extremely wide range of coins can be assembled using very few different, interchangeable components. A small range of designators is provided and a suitable one chosen in accordance with coin thickness. A range of container units 6, with
25 different diameter storage spaces 8, is provided, and a

suitable one selected according to coin diameter. A
range of coin slides 126 with different diameter
apertures 128 could also be provided if desired. The
ranges of container units 6 and slides 126 may be
5 extremely small, because close tolerances are not
required so far as diameter is concerned.

CLAIMS:

1. A coin dispenser comprising a coin storage structure (6,100) having a container (6) for storing a stack (10) of coins, and a coin moving means (126) adapted to engage the endmost coin of the stack (10) in order to move the coin transversely of the stack (10), the dispenser comprising a coin stop (112) at a fixed distance from a surface (111) supporting said endmost coin so as to permit movement of the endmost coin by the coin moving means (126) but detain the coin next to said endmost coin, characterised in that the coin stop (112) has been formed separately from, and fitted to, said coin storage structure (6,100).

2. A dispenser as claimed in claim 1, wherein the coin stop (112) and the coin storage structure (6,100) have interengaging surfaces (116,118,120,122) for locating the coin stop (112) at said fixed distance from said surface (111).

3. A dispenser as claimed in claim 1 or claim 2, wherein said supporting surface (111) is a surface of a part (100) of said coin storage structure (6,100), and wherein said part (100) has been formed separately from and attached to said container (6).

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4. A dispenser as claimed in claim 3, wherein said part (100) and said container (6) have inter-engaging portions (104,108) for locating said surface (111) at a fixed position with respect to said container (6).

5. A dispenser as claimed in any preceding claim, wherein there is a clearance under the container (6) through which said coin moving means (126) moves, the clearance at the side of the stack (10) from which coins are withdrawn being defined by said coin stop (112), and the clearance at the opposite side being defined by a surface of said coin storage structure (6,100).

6. A dispenser as claimed in any preceding claim, wherein the coin moving means (126) has an upwardly-projecting stop member (136) which prevents relative lateral movement between the coin moving means (126) and the coin being moved thereby and which is received in a recess (134) in said coin stop (112).

7. A dispenser as claimed in any preceding claim, including biasing means (124) for holding the coin stop (112) in position.

5 8. A dispenser as claimed in claim 7, wherein said biasing means (124) acts to bias the coin moving means (126) to a predetermined position.

9. Dispensing apparatus comprising a plurality
10 of coin dispensers each as claimed in any preceding claim, the dispensers having interchangeable coin stops (112) dimensioned to suit coins of different thicknesses.

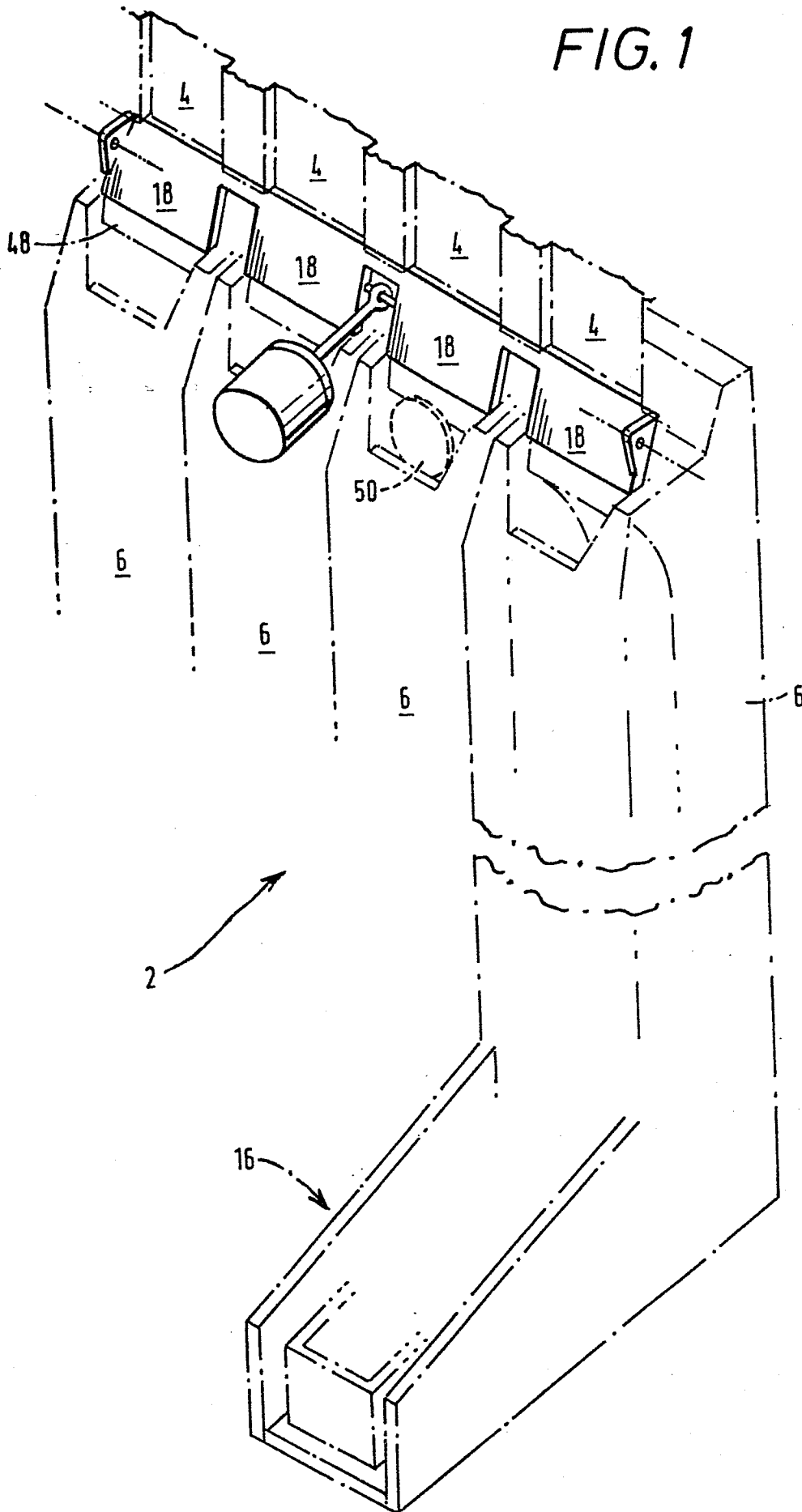
15 10. A method of assembling a coin dispenser which comprises a coin storage structure (6,100) having a container (6) for storing a stack (10) of coins, and a coin moving means (126) arranged to engage the endmost coin in the stack (10) in order to move said coin
20 transversely of the stack (10), the method being characterised by the step of selecting a coin stop (112) and fitting the selected coin stop (112) to said coin storage structure (6,100) so that the stop (112) engages the coin adjacent said endmost coin to detain it when
25 the endmost coin is moved by said coin moving means (126), the coin stop (112) being selected from a range of such

stops each sized to suit a respective coin thickness,
or range of coin thicknesses.

11. A method as claimed in claim 10, including
5 the step of selecting said container (6) from a range of
such containers each sized to suit a respective coin
diameter, or range of coin diameters, the containers (6)
and the coin stops (112) having mounting arrangements
(116,118,120,122) which are such as to allow any one of
10 the coin stops (112) to be fitted to any one of the
containers (6), and which locate the fitted coin stop
(112) at a predetermined position with respect to the
container (6) to which it is fitted.

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FIG. 1



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FIG. 2

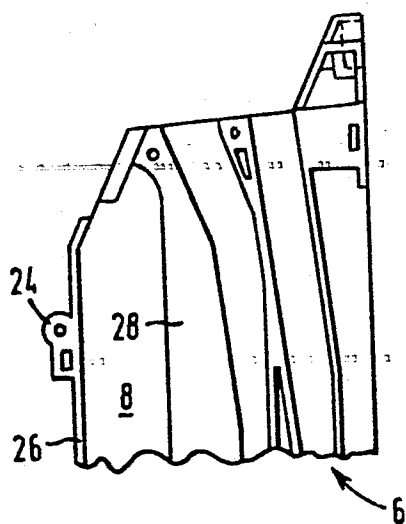
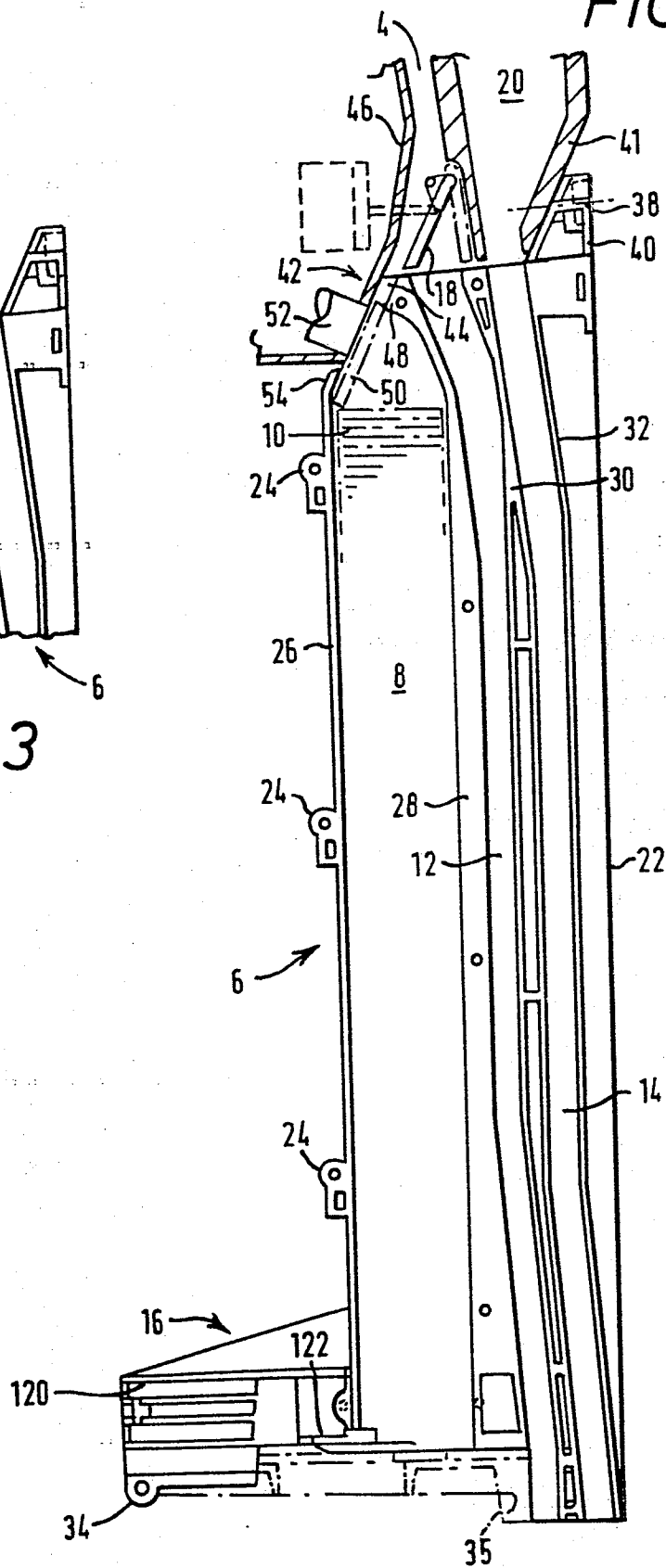


FIG. 3

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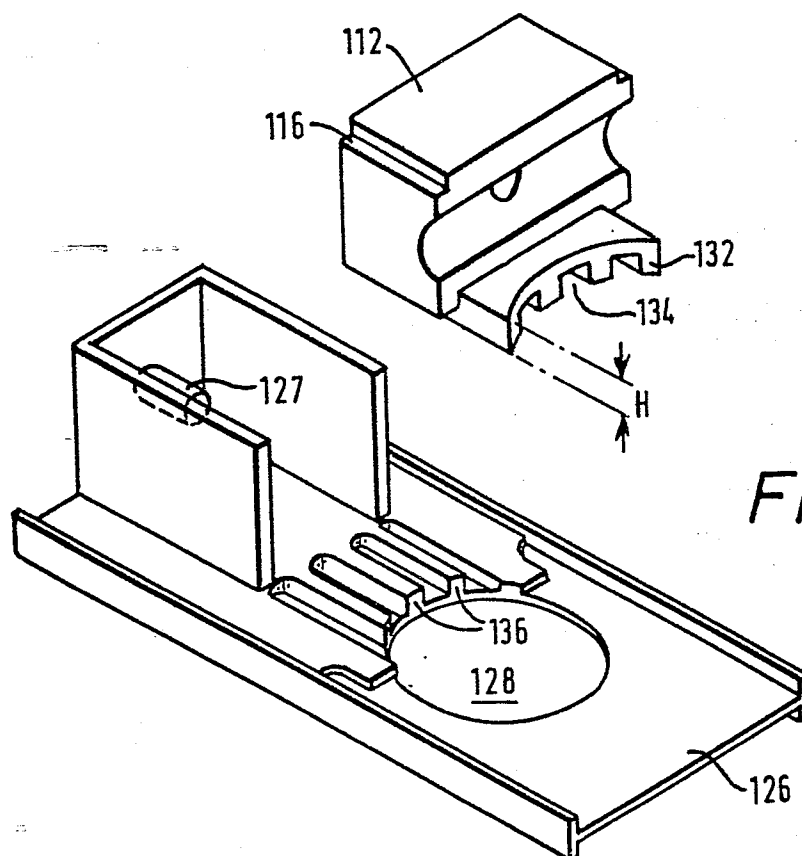


FIG. 5

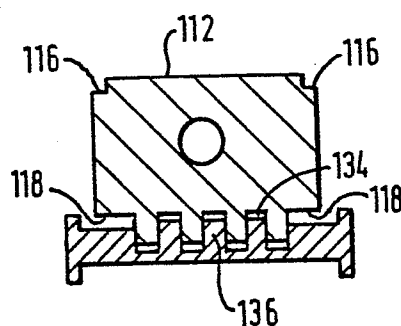


FIG. 6

FIG. 7

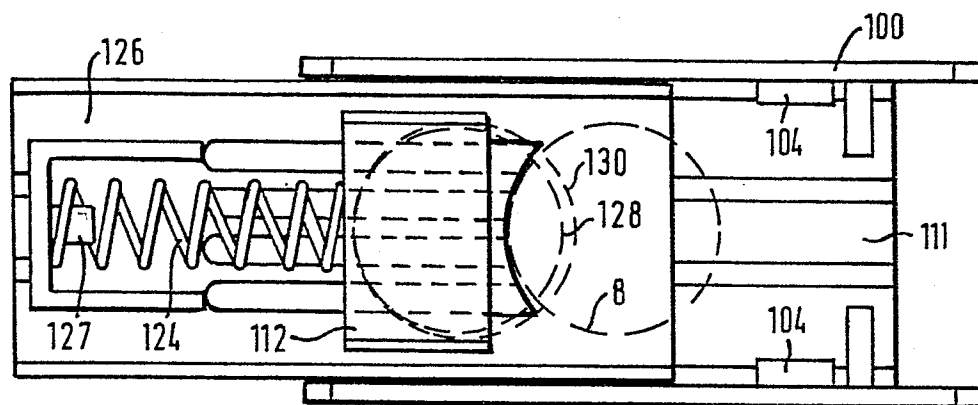
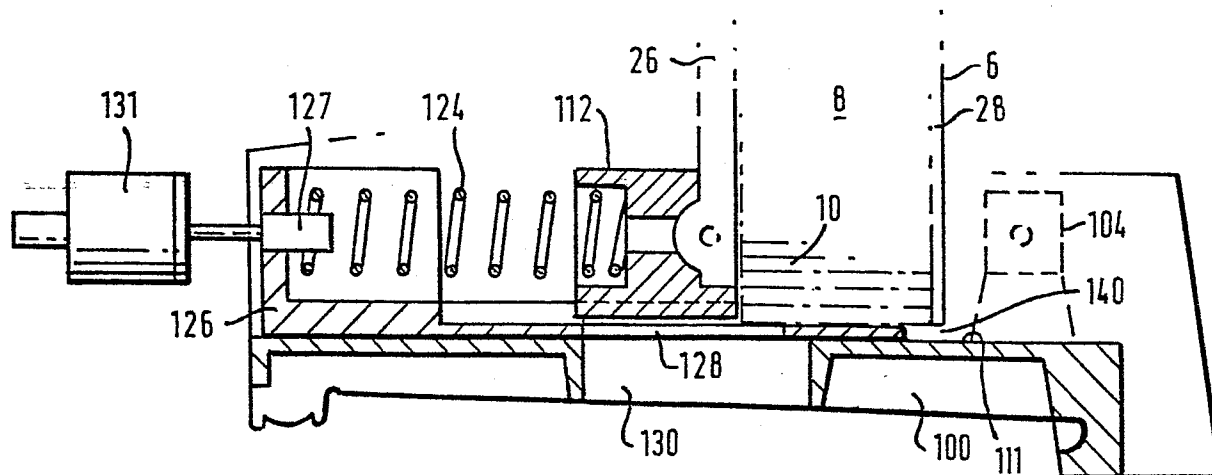


FIG. 8





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. 3)
X	US-A-3 156 247 (SCHULER) * Column 2, line 3 - column 4, line 29; figures *	1	G 07 F 5/24
A		2-5, 7, 8, 10	
Y	DE-A-2 345 468 (PRÜMM) * Page 2, line 19 - page 3, line 35; page 5, line 1 - page 6, line 27; figures 1-3 *	1	
A		2, 5, 7-11	
Y, D	GB-A-1 397 557 (NATIONAL RESEARCH) * Page 1, line 53 - page 2, line 11; page 2, line 55 - page 3, line 18; figures *	1	TECHNICAL FIELDS SEARCHED (Int. Cl. 3)
A, D		2, 3, 5, 7-10	G 07 D G 07 F
A, D	US-A-3 180 343 (GECEWICZ) * Column 3, line 6 - column 5, line 28; figures *	1, 2, 4, 5, 7-11	
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 17-05-1984	Examiner MEYL D.
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			



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. 3)		
A,D	CH-A- 398 138 (NATIONAL REJECTORS) * Page 2, lines 10-50; page 5, line 46 - page 6, line 47; figures *	1,2,7-10			
A	CH-A- 490 716 (MEIER & ALBRECHT) * Column 5, lines 41-63; figure 2 *	1,10			
A	FR-A-1 331 794 (G. STAAR) * Page 1, column 2, line 31 - page 2, column 1, line 12; figures *	1,10			
A	GB-A-1 134 115 (BANNISTER) * Page 1, line 54 - page 2, line 10; figures *	1,10			
A	US-A-2 777 573 (KEEFE) * Figures 30,31 *	1,10			
A	US-A-2 778 368 (JASKOWIAK) * Column 4, lines 31-60; figures *	1,10	TECHNICAL FIELDS SEARCHED (Int. Cl. 3)		
The present search report has been drawn up for all claims					
Place of search THE HAGUE		Date of completion of the search 17-05-1984	Examiner MEYL D.		
<table><tr><td>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</td><td>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</td></tr></table>				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
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				