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Frahm et al.

[11] **3,822,713**

[45] **July 9, 1974**

[54] **COIN DELIVERY MACHINE**

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[21] Appl. No.: **266,704**

[52] **U.S. Cl.** **133/2**

[51] **Int. Cl.** **G07d 1/02**

[58] **Field of Search** 133/2, 4

[56] **References Cited**

UNITED STATES PATENTS

2,774,298	12/1956	Placke et al.	133/2
2,893,406	7/1959	Buchholz et al.	133/2

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Attorney, Agent, or Firm—Kenneth S. Goldfarb

[57] **ABSTRACT**

A coin delivery machine has an electronic system operating through a matrix to control the mechanism for dispensing coins from the coin magazine and the controls are operated from a keyboard simulating that of an office calculating machine.

6 Claims, 15 Drawing Figures

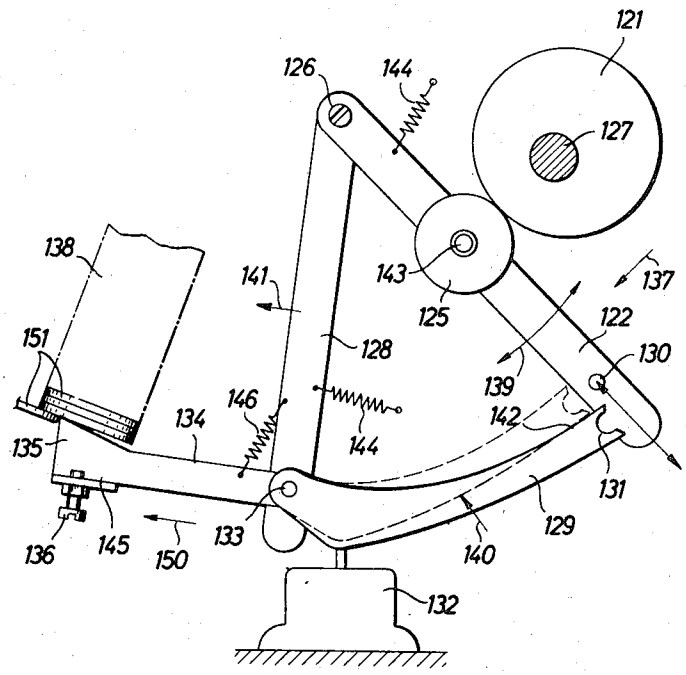
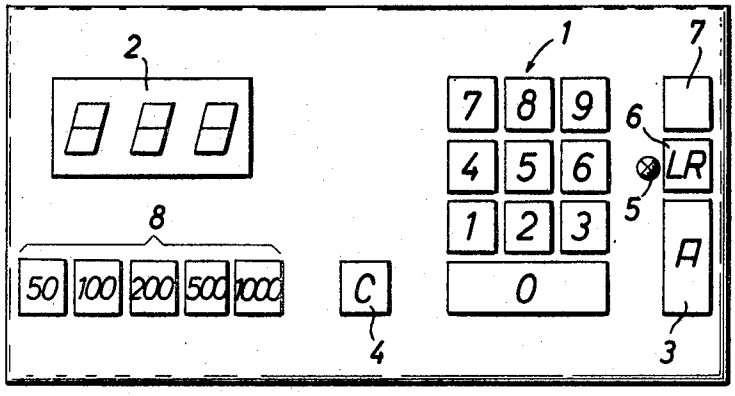


FIG. 1



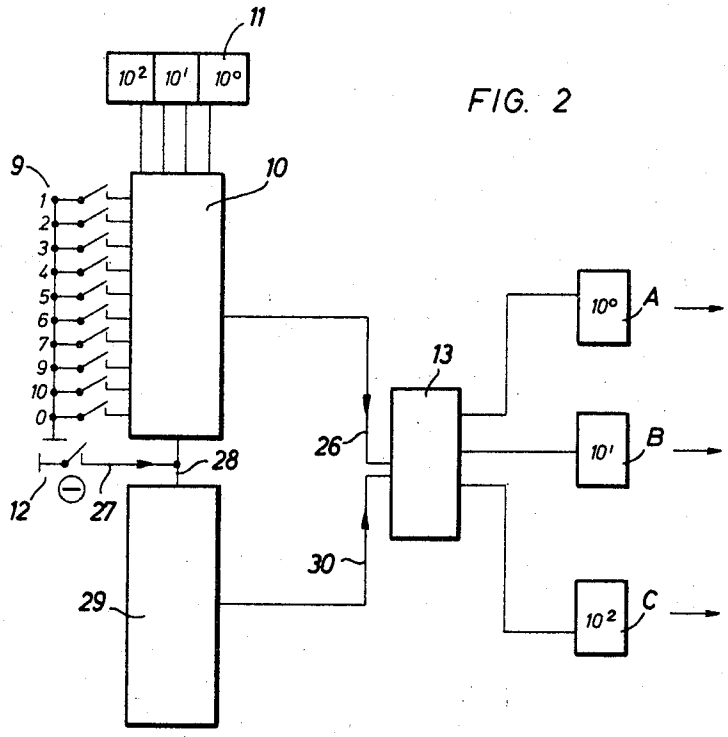


FIG. 2

FIG. 4

M 1,23
— S
D

FIG. 5

2,00
1,23
0,77

FIG. 6

M = 1,23
S = 0,00
D = 1,23

FIG. 7

0,00
1,23
8,77

FIG. 3

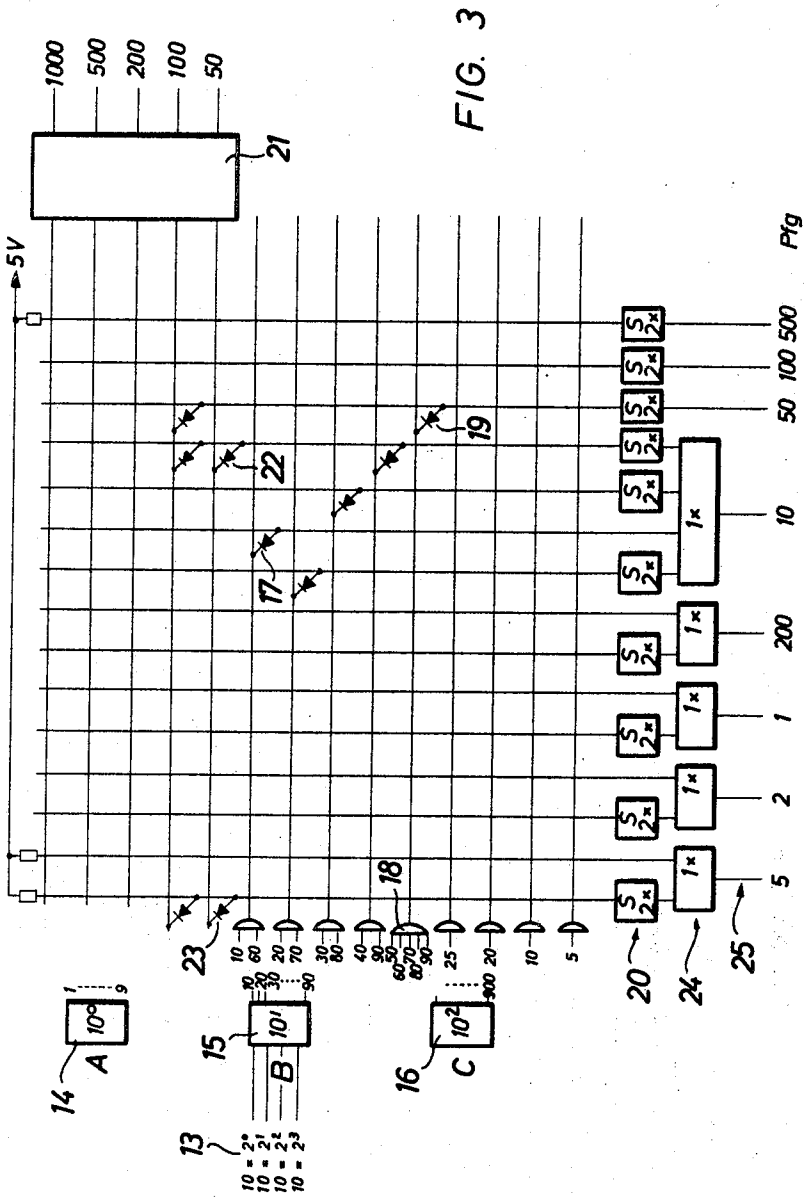

1000
500
200
100
50
21
5V
Pfg
500
100
50
10
200
1
2
5
22
19
17
18
23
20
24
25
14
A
15
B
16
C
13
10 = 2⁰
10 = 2¹
10 = 2²
10 = 2³
1×
2×

FIG. 8

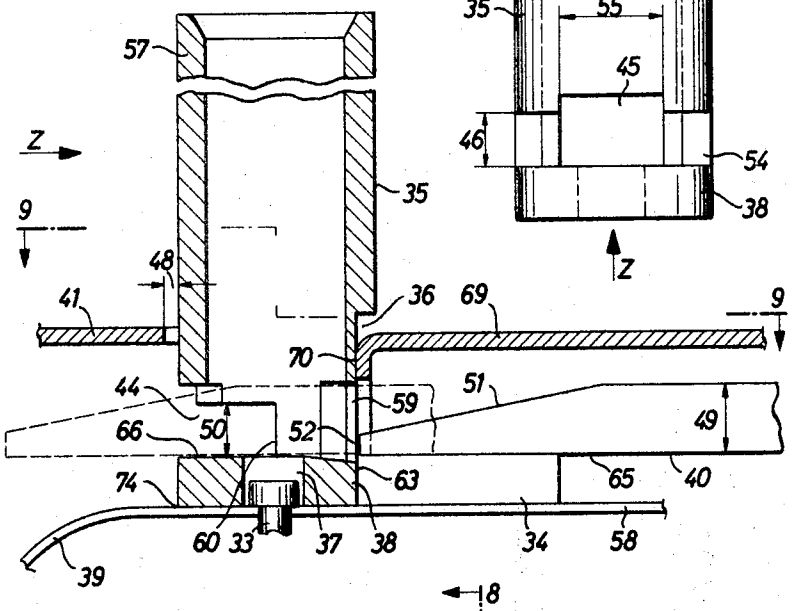


FIG. 10

FIG. 9

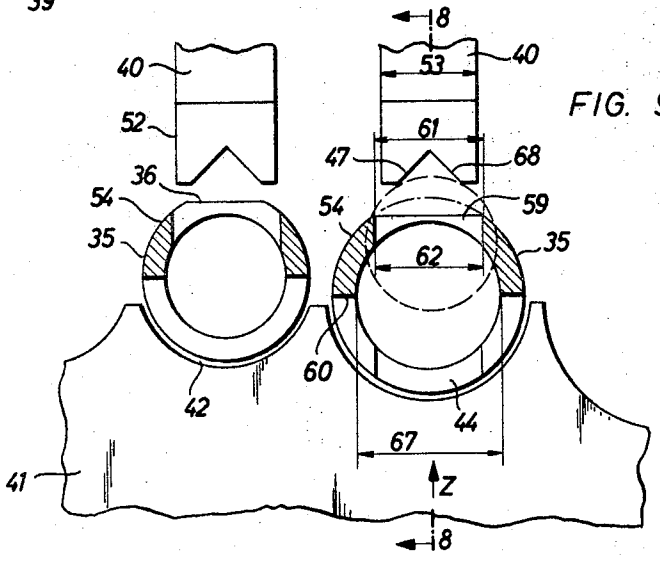
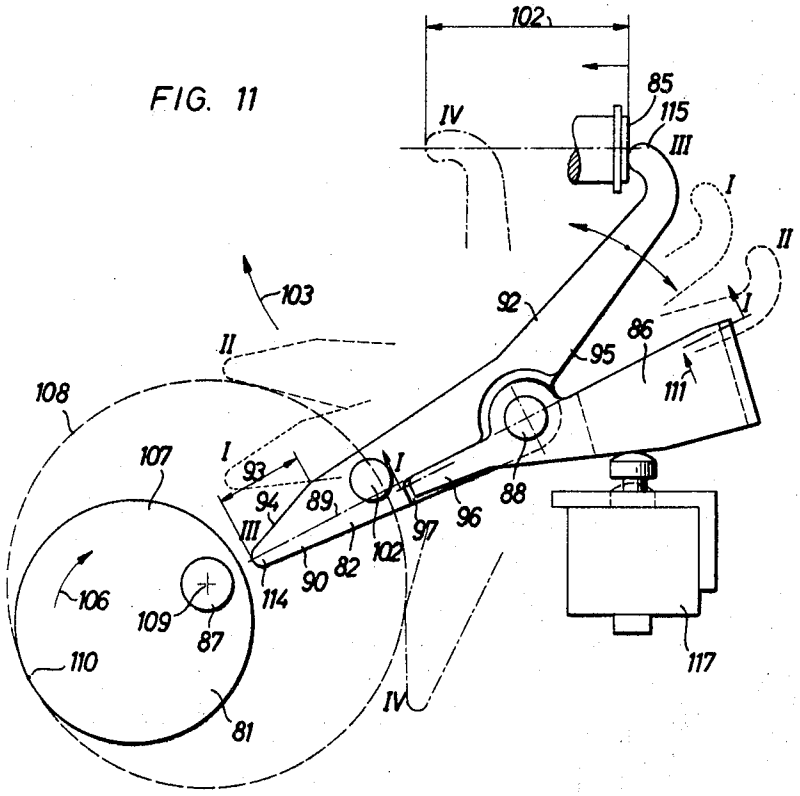


FIG. 11


102
85
115
IV
III
I
II
103
92
95
86
111
108
107
93
94
89
88
96
97
82
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106
109
87
110
81
117

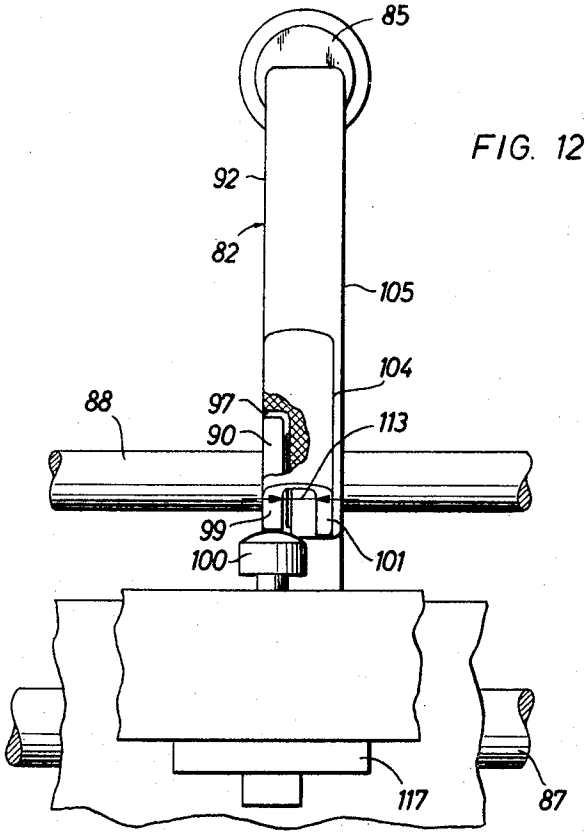

85
92
82
105
104
88
97
90
113
99
100
101
117
87

FIG. 12

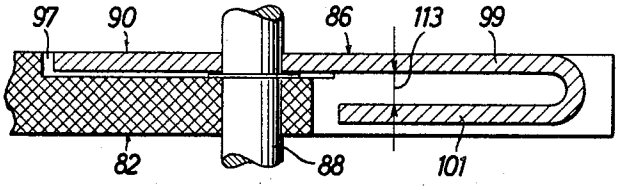

97
90
86
113
99
82
88
101

FIG. 13

FIG. 14

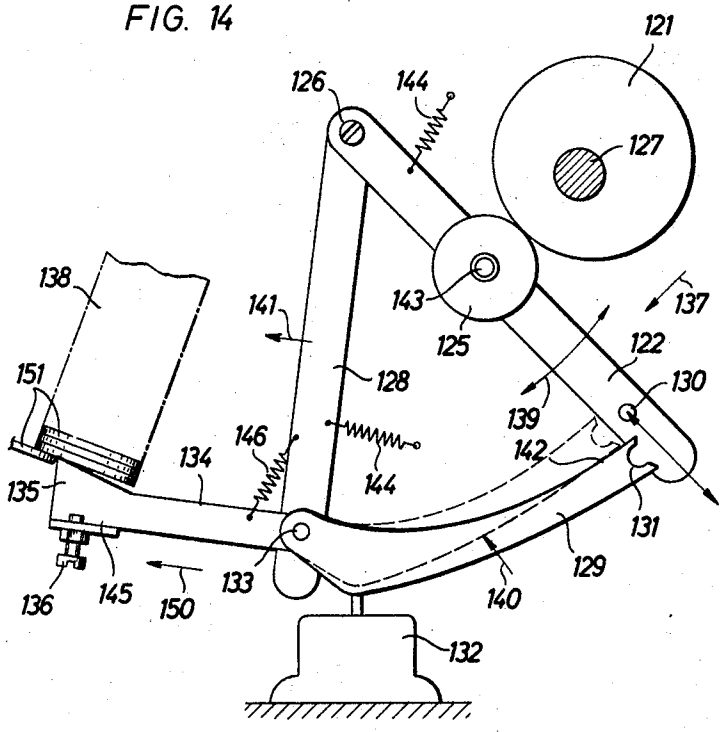
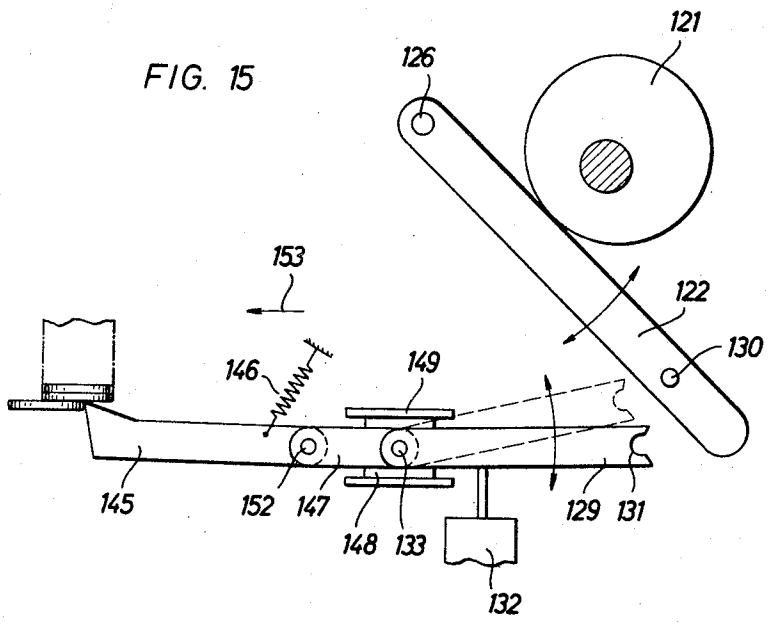

121
126
144
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138
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143
137
125
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151
128
139
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150
140
132

FIG. 15



COIN DELIVERY MACHINE

This invention relates to an automatic coin delivery machine having a magazine and a coin ejection device.

Known automatic coin delivery machines employ magnets which are controlled through a large keyboard and mechanical-electrical switches, normal leaf spring contacts being used.

Known appliances have the disadvantage that, because of the large keyboard, specially trained personnel are required and use cannot be made of personnel who are merely familiar with office machines, for example calculating machines, which have much smaller keyboards with a different layout.

A further disadvantage resides in the fact that known appliances are liable to comparatively early breakdown before they have had an adequate length of service because of the premature burning out of the electrical contacts. These machines also did not allow for monetary amounts to be changed and differential amounts to be catered for.

There are also coin delivery appliances in which a control of the amount registered is possible by holding down the appropriate key in the depressed condition until the full amount has been registered on the keyboard, so that a correction by cancellation is possible before the final release takes place. These appliances have however the disadvantage that because of the small stroke of the depressed keys, and the large number of these keys it is difficult to supervise the operation readily and control tends not to be reliable.

A further drawback of these known appliances is to be traced to the fact that the contacts can rebound, a situation which may result in more than a single tripping action and consequently the dispensing of false amounts.

The primary object of the invention is to provide an automatic machine of the kind set forth which has a number of useful possibilities, namely not only to dispense monetary amounts, to calculate differences in amounts and to dispense these differential amounts, but also to convert money into coins, this further requirement being fulfilled without using special equipment or by using only small modifications of existing coin systems.

This object is achieved by the provision of an automatic coin dispensing machine having a magazine and a coin ejection device, characterised by control means for said coin ejection device comprising an electronic system and keyboard for operating said system in coded fashion through a matrix.

Advantageously, in implementing the invention, the said keyboard comprises the minimum number of keys arranged in a layout simulating an office calculating machine.

The invention has, inter alia, the advantage over machines of the prior art that because it is largely of an electronic nature there is an absence of contact-recoil which ab initio precludes defective operation of the coin dispensing. Faults can certainly arise in electronic apparatus during the assembly of the latter but these can usually be compensated by routine controls in the manufacturing, whereby the apparatus delivered to the customer can be guaranteed fault-free electronically and therefore in operation. Thus the appliance of this invention does not produce a faulty operation because

of contact recoil nor is it liable to breakdown because of burning out of contacts.

A further advantage of the invention is that as far as the exchange system is concerned the time consumed in the operation is very small because often coins of different value can be ejected simultaneously.

The invention also relates to a particular form of construction of a magazine which is used in the coin dispensing machines.

There are in existence appliances in which there is a magazine catering for all types of coin. These are however, of large size and difficult to change, particularly where storage magazines have to be held ready for use to allow for rapid replacement of coin-exhausted magazines when the apparatus is in use.

A further disadvantage to be added to this is that frequently a change in the magazine is required prematurely when the number of coins in just one single holder, has fallen below the necessary reserve.

A further defect is to be found in the fact that the tubes required for individual coins are open at the top, and frequently facing forwards so that there is particular difficulty in replenishing them with coins, whilst if extreme care is not taken in this filling, coins may drop out of the opening or jam.

Difficulty is also experienced in the fact that when there is a change in the particular currency system but only a single coin of varied diameter is involved whilst the other coins remain the same, nevertheless all the supply magazines have to be replaced as a whole.

A further feature of the invention is to provide a magazine for automatic coin dispensing machines which avoids these various shortcomings and caters for versatile use for different currencies and thus different types of coin.

This object is met in the present invention by the fact that the coin magazine comprises a number of hollow cylindrical coin tubes or the like with an internal diameter corresponding to the types of coin concerned, these tubes or the like being associated with the coin ejection means of the machine.

This arrangement has the advantage that coin holders or tubes can be individually replaced, when the supply of coins within is exhausted, by filled holders, this replacement being easier and more convenient because the weight of each individual tube or holder is only a fraction of the weight of a complete, filled magazine.

Furthermore the replenishment of individual coin tubes or holders, without these being replaced, is at any time simple and can be performed readily and effectively by dropping the appropriate coins from above, and exhaustive tests have indicated that even under most advantageous conditions jamming or holding of individual coins in an inclined position does not occur. This is brought about by the fact that advantageously the inner surface of the tube or holder is smooth and is cylindrical completely from top to bottom.

A further advantage of this cylindrical formation prevents too many coins being placed in the tube at any one time by the attendant. First of all such a pile of coins cannot stick in the upper mouth of the tube so that the latter caters for foolproof charging and prevention of jamming. This is not the case with the usual coin magazines because these often have slots running from top to bottom which admit the insertion of stacks of coins from above but when they are released and dropped they tend to jam and not drop into the re-

quired horizontal position. It has been found by experiment that, with the smooth cylindrical internal surface of the tube in the present invention a number of coins, even if not arranged in a perfect stack, can be dropped into the tube and will be self-orientating into a stack of parallel coins. Should a falling coin take up an oblique position and, for example, an already horizontally disposed coin remain hanging to the latter because of the embossment on the latter, the next falling coin will knock the inclined coin and thus bring it into the horizontal position by gravity and detach the adhered coin.

The circular cylindrical smooth inner surface of the coin tube has the further advantage that it allows comparatively large tolerances between the outer diameter of the particular type of coin concerned and the inner diameter of the tube itself, without this involving jamming during the operation of the device. Yet another advantage is the fact that one and the same coin tube can be used for quite different types of coin of different countries without modification, provided of course, the outer diameter of the coins concerned are within the comparatively large tolerances indicated above. In the case of known types of coin magazines with the openings or longitudinal slots over the height of the magazine it was necessary to use much closer tolerances because a smaller size guideway was necessary and consequently there was always a possibility of jamming should larger tolerances be used.

The invention is also concerned with devices for ejecting at least one coin at a time from an automatic coin dispensing machine, this having an electrical or mechanical operating system.

A further object of the invention is in fact to provide an ejection device which is of simple construction and is reliable in operation.

To this end in accordance with the invention at least one continuously rotating driving disc or the like is provided in the machine and operates a coupling lever or the like for ejecting at least one coin, or for performing a lost motion stroke, under the dictation of a control mechanism.

The invention has the advantage that reliable dispensing of coins is guaranteed whilst using an apparatus which is of simple construction and is of reliable operation.

A number of embodiments of the invention are illustrated by way of example in the accompanying drawings in which:

FIG. 1 shows a keyboard,

FIG. 2 shows part of the electronic layout from zero to three powers of 10,

FIG. 3 illustrates the remaining part of the electronic layout,

FIGS. 4 to 7 are sums illustrating the establishment of the difference and the actual coin delivery,

FIG. 8 is a partial vertical section through a magazine and the mounting thereof on an automatic coin delivery machine, this section being taken on the line 8 — 8 of FIG. 9,

FIG. 9 is a partial horizontal section through the apparatus on the line 9 — 9 of FIG. 8,

FIG. 10 is a part plan view of the appliance seen in the direction of arrow Z of FIGS. 8 and 9,

FIG. 11 is a plan view of the coin discharge device,

FIG. 12 is a side view of the device illustrated in FIG. 11,

FIG. 13 is a partial section through the device, taken on the line I — I of FIG. 11,

FIG. 14 illustrates the principle of construction of modified embodiments of the coin discharge device and

FIG. 15 is a modified embodiment similar to FIG. 14.

The automatic coin delivery machine is built to cater for three possibilities:

1. It is required to pay out an amount made up of different coins.
2. It is required to subtract from money paid in the amount to be paid out and to deliver the difference in the form of coins.
3. It is required to convert a paid-in amount into coins and pay these out.

First of all, as regards (1) above. The amount of money to be paid is tapped out on the tens keyboard 1 seen in FIG. 1. This amount immediately appears on the check indicator panel 2. When the operator has checked that this amount is correct, the release key 3 can be operated and the sum to be paid out will be deposited as coins in the delivery tray. Should the operator have made a mistake or if the customer wishes to make an additional purchase a variation of the amount can be made before the coins are actually delivered, and this is done by erasing the amount by operating the correction key 4 and tapping out the correct or fresh amount on the keyboard 1.

To cater for quick operation the following procedure is prescribed:

If after a period of use one of the coin storage tubes is emptied to a predetermined minimum number of coins, the operator's attention is drawn to this by the illumination of a "lock release lamp 5" which indicates to him that the coin tube concerned must be replenished. Nevertheless to allow for uninterrupted completion of the transaction the operator will as a general rule still continue to obtain coins from this particular coin tube when the control lamp lights up a second time, because the controls are so arranged that there will always be a certain reserve of coins in the tube.

In addition to the control lamp 5 there is also a lock-release key 6 to guard against faulty coin delivery, and this key has to be operated every time the control lamp 5 is illuminated before the release key 3 can be operated.

As regards (2) above, when it is a question of paying out the "remainder" of a subtraction sum, the amount to be paid is tapped on the keyboard 1, as shown at the indicator 2 and, if found correct, is transferred to an electronic memory (not shown in FIG. 1) by operation of the minus key 7. At the same time the indication on panel 2 is automatically extinguished. The amount paid by the customer which is usually above the amount to be paid, is then tapped out on keyboard 1 and appears on indicator panel 2. When this checks the release key 3 is then pressed and then coinage corresponding to the "remainder" is deposited in the delivery tray and the signal on indicator at panel 2 is extinguished.

In regard to (3) above. Where it is a question of a pure "change" procedure one of the five change keys 8, which have the appropriate amounts marked on them, e.g. 50, 100, 200, 500 and 1,000, is depressed and the relevant amount is issued in the form of coins.

Because of the electronic nature of the appliance as a whole, a minimum number of coins will be delivered. The overall arrangement of the keyboard is so chosen as to correspond to the arrangement of the keys in the most popular forms of office machines, for example calculating machines and the like, so that the normal user will find it congenial to operate. Thus the tens board **1** is a 100 percent reproduction of the usual office machine, as are the arrangement of the correction key **4** and the release key **3**, which lie on the two sides of the keyboard **1** separate from the latter, which experience has shown facilitates operation. This has the advantage that only a very small amount of training is required for a person X familiar with the operation of a normal office machine and a calculating machine in particular, to be able to use the coin delivery appliance of this invention without wearisome revision of training.

The electronics of the machine of this invention are illustrated in FIGS. **2** and **3**, the block layout diagram being applicable to all three instances set out above.

The description of the electronic means to be given hereafter by way of example will deal first of all with the payout of a "difference" or "remainder". In FIG. **2** the the switch set **9** corresponds to the tens keyboard **1** of FIG. **1**. After the amount to be paid out, for example DM. 1.23, is tapped out this amount is stored in memory **10** through the agency of the switch set **9** and at the same time indicated at the control panel **11**. This value is also applied through conduit **26** to the input of the subtractor **13**. By operation of the minus key **12** the value stored in memory **10** is transmitted through conductor **28** to memory **29**, i.e., is stored in this and is applied through conductor **30** to the input of the subtractor **13**. The value in memory **10** and the same value at indicator **11** are simultaneously extinguished. The amount paid by the customer, for example DM **2** is then registered on keyboard **1** and transmitted through the switch set **9** to memory **10** and indicated at panel **11**. The differential amounts of DM 2 and DM 1.25 are then applied side by side at the subtractor **13** for the calculation to take place.

To explain this the subtraction is illustrated in FIGS. **4** to **7**. In FIG. **4** the amount put in as minuend M moves to the subtrahend S as indicated by the downwardly-directed arrow **26**. This is illustrated for example in FIG. **5** as a simple numerical calculation. The minuend M (e.g. DM2) is then applied electronically and finally the difference D (e.g., DM 0.77) between the minuend and the subtrahend is calculated.

The principle in the normal payout of money is that the minuend M is held, that is to say is not moved downwards, whilst the subtrahend is equal to zero, so that the minuend appears as the value of coinage to be paid out as the apparent result of the subtraction.

It is apparent from these considerations that in basic principle both when calculating a differential figure and when purely paying out money there has to be a differential calculation, the value itself being signalled in the first case and in the second case the original minuend M is moved to become the subtrahend, and the true minuend M produced. In each case, as indicated, there is a subtraction; in the first case it is a true subtraction and in the other case — namely when there is an actual pay-out — the figure is contrasted with zero and the original figure consequently retained, as for example is illustrated by the sum in FIG. **6**.

As will be appreciated from FIG. **7**, given the procedure described above a very rapid subtraction operation will be carried out in particular instances (namely when the customer pays DM 10), as will be explained in more detail in the following example. If, say, an amount of DM 1.23 to be paid out is tapped out on the keys and fed to memory **29** by operation of minus key **12**, and no further value shifted into memory **10**, and on the contrary the release key **3** operated, the differences from DM 1.23, that is to say DM 8.77 appears and this is involved with the particular nature of the electronic system, because the difference between DM 10 and DM 1.23 is established automatically in the subtractor 13. In this case it is not necessary to regard the amount DM 10 actually paid by the customer so that as indicated above there is an accelerated payout of the difference.

Naturally the case is different when the customer pays DM 20. In this event the operator must either pay out DM 10 as a ticket whilst the difference from DM 10 is automatically reproduced, or DM 20 must be registered in the subtractor **13**. In FIG. **3**, in which the coding procedure which can be used in the invention is illustrated, the tens values from the subtractor **13** are converted into binary values. The values of the coins to be delivered are present decimally coded at the outputs of all three decades **14, 15, 16**. Pairs are calculated each time from these values, namely from 10, 6; 20, 70; 30, 80; 40, 90; and multiple values of 50, 60, 70, 80, 90 at **18** and individual values 25; 20; 10; 5.

These individual values 25 to 5 are required to take into account currencies for the 25 value as a basic value of the coins which will fit the apparatus to international use. The point of the present invention lies in the fact that this enables the result aimed at to be fulfilled with a minimum number of electronic connections and a minimum number of coins. Thus for example the value 25 to be paid out is arrived at using conductor **25** and conductor **10** and not for example conductor **25** and the pair 10, 60, and this caters for a minimum use of circuitry.

Reference will now be made to the method whereby the 60 value as applies particularly in Germany, is produced. The pair 10, 60 are first operated whereby the 10 pfennig piece is registered, by means of diode **17**. Then the 50 actuated at the adding device **18** so that the 50 pfennig piece is registered through diode **19**, this producing the 60.

The memory **20** shown in FIG. **3** is to deliver one type of coin in repeated sequence. The number of times this occurs is indicated by the appropriate symbol which is marked in the drawing. These symbols are 2_x, 3_x etc. The memory **20** is programmed so that when a predetermined impulse is received thereby it will produce a corresponding number of allocations. The function of the memory **20** is to see that the appropriate number of coins are signalled by the electronic system, for example once, three times or four times, whilst the electronic system **24** has the function of releasing the control conductors **25** for operation of the magnets, and thus delivery of coins only when it has been determined for which decade the amount is appropriate, e.g. for 1, 10 or 100. The electronic unit **24** to a certain extent represents a lock which is only released by operation of the key **3** when, for example, a 1 is tapped out, and it determines whether this requires a unitary, a ten or a hundred decade.

A pure exchange operation will now be described by way of example. The rate of exchange is registered by operating one of the keys **8**, for example that marked **50**, so that when the release key **3** is operated the amount concerned will be dispensed in coins. For this reason the memory **21** seen in FIG. **3** is connected to the matrix and the transmission itself takes place again through the coding at the moment the matrix comes into action. The procedure which then follows is that the 10 pfennig piece is issued four times through diode **22** and the 5 pfennig piece twice through diode **23**. The reason for this is that the 10 pfennig piece cannot be paid out five times but only four times at a maximum.

This arrangement means a substantial simplification of the electronics and a saving of time. The 10 pfennig piece is paid out four times and the 5 pfennig piece twice and these operations can to some extent be overlapped in that during the period a 10 pfennig piece is issued the 5 pfennig piece can twice be delivered. It is typical of the present invention that a great deal of time is saved by simultaneous payout of different coins, and for this purpose a number of coin chutes are arranged parallel to one another in the machine. In the example which has just been referred to one chute has been used four times and the other used twice. Should a chute be used five times this would means a longer period for delivering coins and it is an aim of the invention to avoid this.

When the machine of the present invention is used for example for the U.S.A. there is a substantial saving in time because this country, using a five coin system, offers considerable scope in rapid coin delivery by using eight coin holders in accordance with the invention. The whole amount can be paid out in a single rotation in that a plurality of parallel coin chutes can be operated simultaneously.

A magazine proposed in accordance with an embodiment of the invention and intended for individual types of coin comprises a number of coin tubes **35**. The number of these tubes depends on the particular coin system being used, but in general eight coin tubes, of different diameter will suffice for the various coinage systems used throughout the world.

Each coin tube **35** comprises a cylindrical part **56** and a coin insertion part **57**, together with a bottom **38**. This latter is provided with a central hole **37** to enable the coin tube **35** to be mounted on a mandrel **33** on the magazine plate **58**.

The bottom **38** of the tube is connected through two webs **54** with the cylindrical part **56** of the coin tube **35**. An insertion slot **59** is open at the insertion side of the tube. Moreover at the opposite side of tube **35** is a coin discharge slot **45** this being located above the bottom of the tube, and this also extends to the two webs **54**. The edges **60** of the webs defining the slot **44** are so spaced in relation to the diameter of the coin tube that coins located in the tube can readily be ejected; this is achieved by making the coin outlet slot equal to one half the internal diameter of the tube.

The coin tube is reduced at **36** at the coin delivery end thereof, and this reduced portion has a width corresponding to that of the insertion slot **59**.

The reduced portion **36** is provided to enable the tube **35**, filled with coins, to be supplied and mounted in foolproof fashion on the coin discharge device so that both the insertion slot **59** and the delivery slot **44** are accurately positioned in register with the slide **40** of the discharge device. To provide for this an abutment rib **34** is provided on the magazine plate **58** with the edge **63** thereof spaced from the mandrel **33** to an amount which will allow the hole **37** to be fitted readily over the mandrel when the coin tube is mounted and the rebate **36** is applied against the abutment edge **63** to establish the tube **35** in the correct rotary position. This can be effected without the attendant having to inspect the fitting closely, because the edge **70** of the leading wall **69** will sit flush with the abutment edge **63**. It is sufficient only to tip the coin tube backwards from a slightly forwardly-inclined position into the upright position to register the rebate **36** with the leading edge **70**.

The slide **40** for pushing out the lowermost coin of the stack comes into action against the tube **35** through the agency of a lateral pressing force closely adjacent the bottom of this tube, and because of the very small lever arm applied between the slide **40** and the edge **64** there is only a very small turning moment applied, if any at all, and this is compensated by the weight of the coins disposed in the tube and bearing against the bottom **38** of the latter. In addition the end face **65** of slide **40** slides over the upper surface **66** of the bottom **38** and thereby additionally holds the tube against tipping. This means that no additional means are required to fasten the coin tube to the appliance.

It is desirable that the slide **40** shall have dimensions which will cater, without change, for all types of coin to be expelled, and for this purpose has a chamfer **51** at its leading part. The leading edge **52** is of a height which is less than the thickness of the thinnest coin involved. The width **53** of the slide **40** is also suited to the smallest coin diameter. This width **53** must be that much smaller than the inner diameter **67** of the smallest coin tube that sufficient room shall be left for the web **54**, as the means of connection between the cylindrical part **56** and the tube bottom **38**, to guarantee rigidity.

The height of mandrel **33**, projecting above the surface of the magazine plate **38** must be less than the height of the abutment rib **34** to allow the slide **40** to pass without obstruction over the surface **66** of bottom **38**.

To ensure that when the slide **40** expels a coin only the lowest of the coins resting on the bottom **38** is discharged, and that no second coin goes with it, the height of the coin discharge slot **44** must only be slightly more than the thickness of the coin to be discharged. To cater for simple operation of all the side-by-side slides for expelling the individual coins the strokes of these are desirably the same and of a length corresponding to the largest coin which has to be discharged. The slides which have to deal with the smaller coins are arranged to move through the two slots above the bottom **38** of the tube **35**. To llow for this, despite the comparatively small height of the slot **44**, as is seen from FIG. **10**, an upwardly-directed recess **45** is provided in the wall of tube **35** in the middle zone of this slot **44**, and this recess is of a width **55** corresponding to that of the insertion slot **59**. Nevertheless only the lowermost coin is ejected even in the case of small coins because the width **55** of this recess is less than the diameter of the smallest coin.

Use of this recess **45** is not necessary in the case of coin tubes **35** for large coins because, having regard to

the larger coin tube diameter and to the greater thickness of the coins and thus the greater height of the discharge slot, the corresponding slide **40** does not project forwardly through the coin discharge slot **44** sufficiently far for the height of the discharge to provide enough space for the bevel **51** of slide **40.**

The slot formation described is also of particular advantage because in altering the coin system, and particularly when the thickness of the coin is changed, only the height of the semi-circular slot **44** has to be varied by simple filing or other working by maintenance personnel to be ready for immediate re-use.

The arrangement of a single comparatively small hole in the bottom **38** of the tube **35** not only has the advantage of allowing for the coin tube to be threaded on to it but is also an attribute as regards the filling up with coins because a coin cannot drop out when this happens as would be the case when for example a slot were arranged in the bottom of the tube instead of a round hole.

The simple circular cylindrical form of coin tube is also an advantage in transport and handling, which it makes convenient.

A wedge-shaped recess **47** is provided in the leading edge **52** of the slide and this caters for automatic centering of the coins during the discharge operation and is of particular advantage having regard to the comparatively large lateral play of the coins inside the coin tube. If for example a coin has adopted the laterally displaced position in the coin tube **45** illustrated in FIG. **9,** a turning moment will be applied to the coin during the ejection procedure from the relevant flank **68** of the wedge recess **47** and this will automatically center the coin, that is to say it will become symmetrically disposed in recess **47** and all successive coins will be exactly centered in this way. This has the advantage that the lower part of the tube, particularly the webs **54** and predominantly the edges thereof facing the coins are levelled up. Further there is provided more particularly for transporting the machine, which takes place with the slides in the rest position and when there is no positive retention of these slides, an additional wall **41** at the discharge side for holding the coins back over the complete battery of tubes **35,** this having appropriate part-circular openings **42** which are suited to the various diameters of coin tubes **35** and have a certain amount of play **48** in relation to the outer surfaces of these tubes. This prevents a forward tipping of the tubes.

For the same reason the front wall **69** of housing **43** is elevated to some extent in the region of the abutment rib **34** above slides **40** and this provides a raised engagement surface for the rebate **36** corresponding to the height of the front wall **69.**

The discharge device used in the automatic coin delivery machine comprises a circular driving disc **81** which is firmly keyed eccentrically on a driving shaft **87** which is continuously rotated by means not shown in the drawing.

Disposed obliquely above shaft **87** is a spindle **88** on which a coupling lever **82** is mounted for free rotary movement. This lever **82** is of bellcrank form and has two arms **91, 92.** One lever arm **91** is of a non-symmetrical form, relatively to its longitudinal axis **89,** and has a lower edge **90** which extends rectilinearly over the complete length of the arm, whilst the other edge **94** is inclined obliquely so that the arm is of wedge form in the area **93** at which it cooperates with the driving disc **81.** The lever **82** is made of plastic material and is therefore comparatively light in weight and it has a metallic weight **102** fastened in a hole in the arm **91** of lever **82** to bias this lever arm downwards. The other arm **92** of lever **82** has a nose **84** at the free end and this co-acts with the rear end **85** of the ejector **83.** Also freely mounted on spindle **88** is a rocking lever **86** with a thin underweighted arm **96.** This latter fits into a corresponding recess **97** at the surface **95** of lever **82** so that the aforesaid surface **95** is flush with the front face of rocking lever **86,** as is clearly shown in FIG. **12.** This enables sufficient space for insulation of the individual coupling levers, and the corresponding rocking levers, on a single lever spindle to cater for a multiple assembly of ejector device. The weight-biased arm **98** is of U-shape in longitudinal cross section and one arm **99** of the U bears against the middle of a plunger head **100** of a control arrangement **117.**

The free limb **101** of the U-section arm **98** has a clearance **113** on the active limb **99** of the U so that when the rocking lever moves the free limb **101** does not make contact with the plunger head **100.** On the other hand this ejector **82** needs only to be sufficient for the outer surface **104** of the free limb **101** of the U not to project beyond the rear surface **105** of coupling lever **82.**

The operation of the device is as follows:

With the driving disc **81** continuously rotating in the direction of arrow **106** the outer edge **107** of the disc contacts the lever arm **91** and this is turned from the rest position I indicated in dotted line in FIG. **11** in the direction of arrow **103,** whereby the underweight arm **96** of rocking lever **86** leaves recess **97.** The coupling lever **82** performs a lost motion until reaching the idle stroke position II which is shown in chain lines in FIG. **11.** The large circle **108** indicated in chain line represents the path of point **110** of outer edge **107** of disc **81** which is most remote from the rotary axis **109** of the driving shaft.

To enable the device to perform an operative stroke the plunger head **100** is projected up by the control unit **117** from the position illustrated in chain line in FIG. **11** into the projected position whereby the rocking lever **86** is turned in the direction of arrow **111** and the effective lever arm **91** of coupling lever **82,** following the pivoting movement of lever **86,** reaches the coupling position **3** which is shown in full line in FIG. **11.** This movement may occur because the effective arm **91** is overweighted relatively to the other lever arm because of the positioning of weight **102.** In this position coupling lever **82,** with drive disc **81** rotates the outer edge **107** and can act on the upper edge **94** of the lever arm **91,** and during the further rotation of lever **82** can reach the limit position IV indicated in chain line and thereby project the coin or coins from the ejector **83.** The operative stroke of nose **84** is indicated by arrows in FIG. **11.**

In the embodiment illustrated in FIG. **14** the discharge device consists of a circular driving disc **121** which is eccentrically keyed to a driving shaft **127** and this latter is continuously rotated by a drive unit which is not shown in the drawing. A coupling lever **122** is arranged alongside shaft **127** and can be rocked on a pivot pin **126** fast with the frame of the machine. Mounted at the central part of this lever by means of a pin **143** is a roller **125** which is urged by a tension

spring 144, engaging the lever 122, against the outer periphery of disc 121.

A pawl lever 128 of similar length to lever 122 is also freely mounted on pivot 126 and this carries at its free end a pin 133 rockably mounting pawl 129. The rocking movement of this pawl is effected from the control unit by a magnet 132. The coupling pawl 129 has a recess 131 at the free end thereof and when the pawl is operated by the magnet this brings the recess either opposite to a coupling pin 130 provided on coupling lever 132 or into an idle position in which the free end 142 moves freely past the pin 130. Also mounted on pin 133 on which the pawl lever 128 is pivoted is ejector arm 134 with a nose 135 which can be adjusted by an abutment screw 136 so that, when the ejector arm is operated to eject coins it will knock out one or more coins simultaneously. Ejector arm 134 is biassed against the coin stack 138 by an associated tension spring 146 which is secured at its other to the pawl lever 128.

This device operates as follows. A continuous rotary movement of the driving disc 121 in the direction of arrow 137 applies rocking movements in the directions of double arrow 139 to the coupling lever 122. During the outward swing of lever 122 in the clockwise direction the coupling pin 130 enters recess 131, if the coupling pawl has been rocked in the direction of arrow 140 into the upper position (shown in dotted lines) by the control magnet 132, so that the pin 133 on the coupling pawl 129 turns the pawl lever 128 in the direction of arrow 141 against the action of tension spring 144 and thereby moves the arm 134 in the direction of arrow 150. As a result the nose 135 expels the coin 151. A tension spring 146 presses the ejector nose from below against the bottom non-ejected coin 151 in the stack 138 in such a way as to ensure that at all times there will be a coin in the path of this nose.

In the embodiment of FIG. 15 the coupling pawl 129 is rockably mounted at one end on a carriage 148 by means of a pin 133. Carriage 148 is guided for ready horizontal movement in a crank 149. Also engaged at pin 133 is a crank lever which at the other end has a pin 152 engaging the ejector arm 34.

In this embodiment one end of the tension spring 146 acting on ejector arm 134 is anchored to the machine frame whilst the other end of this spring engages the arm 134.

In this arrangement the operation is as follows. When, similarly to the arrangement in the first embodiment, the coupling pawl 129 has been brought into its chain line upper position by an operative movement applied thereto by control magnet 132, when the coupling lever 122 is rocked in the clockwise direction, the coupling pin 130 engages in the recess 131 of coupling pawl 129 and the slide 148 will move in the direction of arrow 153. As a result the ejector arm 134 will be moved, by virtue of the action of pin 152, in the direction of arrow 153 and one or more coins will thereby be ejected.

We claim:

1. An automatic coin dispensing machine having a coin magazine and a coin ejection device, a control means for said coin ejection device comprising an electronic system, and a keyboard for operating said system in coded fashion through a matrix, said magazine comprising a member of hollow cylindrical coin holders in the form of tubes of inner diameters corresponding to the diameters of the particular coins to be held therein, each said holder comprising a cylindrical body portion, a coin insertion portion, and a bottom protion with a central opening for mounting the holder on a mandrel upstanding from a magazine plate, and coin ejector slides coacting with said coin holders to eject the lowest coin or coins in said holder at any time, each said slide having a tapered leading portion with a tip of a height less than the thickness of the smallest coin to be dealt with, an outwardly diverging triangular shaped slot opening onto the leading edge, and a width less than that of the smallest coin holder inner diameter.

2. A coin dispensing machine according to claim 1, in which the coin ejection device comprises at least one continuously-rotatable driving disc, an ejector, and a coupling lever adapted for discontinuous operation by said driving disc to apply a coin ejector motion to said ejector.

3. A coin dispensing machine according to claim 2 in which the driving disc is eccentrically mounted and the coupling lever is of bellcrank form, the arm thereof cooperating with the driving disc being of non-symmetrical form relative to its longitudinal axis and being weightbiased at the end nearest said disc.

4. A coin dispensing machine according to claim 3 in which the coin ejection device further includes a rocking lever which is operable by the control means of the machine for engagement with said coupling lever and has a recess conforming in shape and size with the associated part of the latter.

5. An automatic coin dispensing machine having a coin magazine, a coin ejection device control means for said coin ejection device comprising an electronic system, and a keyboard for operating said system in coded fashion through a matrix, said coin ejection device comprising at least one continuously rotatable driving disc, an ejector, and a coupling lever adapted for discontinuous operation by said driving disc to apply a coin ejector motion to said ejector and a pawl member for operatively connecting said coupling lever to an ejector arm to expel a coin from said magazine, this pawl member being pivotable by magnetic means governed by the control means of the machine to bring said pawl member into or out of engagement with the coupling lever, said pawl member being pivotally mounted at one end on a pivot on a pawl lever itself pivotally mounted on the same axis as the coupling lever and the ejector arm is also mounted on said pivot, while the pawl member is provided at its other end with a notch for accommodation of a pin on the coupling lever, and said ejector arm having a nose of pointed sharpened form for action on the coins in the associated coin holder, and an adjusting screw provided to set this nose for the ejection of one or more coins at any one time from said holder.

6. An automatic coin dispensing machine having a coin magazine, a coin ejection device, control means for said coin ejection device comprises an electronic system, and a keyboard for operating said system in coded fashion through a matrix, said coin ejection device comprising at least one continuously-rotatable driving disc, an ejection, and a coupling lever adapted for discontinuous operation by said driving disc to apply a coin ejecting motion to said ejector, a pawl member for operatively connecting said coupling lever to an ejector arm to expel a coin from said magazine, this pawl member being pivotable by magnetic means governed by the control means of the machine to bring said pawl member into or out of engagement with the coupling lever, and said pawl member being pivoted to a sliding lever mounted on a carriage slidable in a crank.

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