United States Patent [19]

Collins

[11] **3,768,618**

[45] **Oct. 30, 1973**

[54] **COIN-REJECTING DEVICE**

[75] Inventor: **Terence John Collins**, Redhill, England

[73] Assignee: **Tiltman Langley Limited**, Surrey, England

[22] Filed: **Sept. 17, 1971**

[21] Appl. No.: **181,315**

[30] **Foreign Application Priority Data**

Sept. 3, 1970 Great Britain 42,261/70

[52] **U.S. Cl.** **194/102**

[51] **Int. Cl.** **G07f 3/02**

[58] **Field of Search** ..... 194/102, 1 E, DIG. 19, 194/DIG. 1 D, 15, DIG. 17, DIG. 7, DIG. 15, DIG. 20

[56] **References Cited**

UNITED STATES PATENTS

2,014,506	4/1934	Potche	194/102
1,229,741	6/1917	Garcia	194/DIG. 4
2,569,486	10/1951	Mills	194/DIG. 19
2,246,590	6/1941	Hoyt	194/9 T
1,217,103	2/1917	Osmun	194/DIG. 7
1,204,911	11/1916	Thompson	194/DIG. 7

FOREIGN PATENTS OR APPLICATIONS

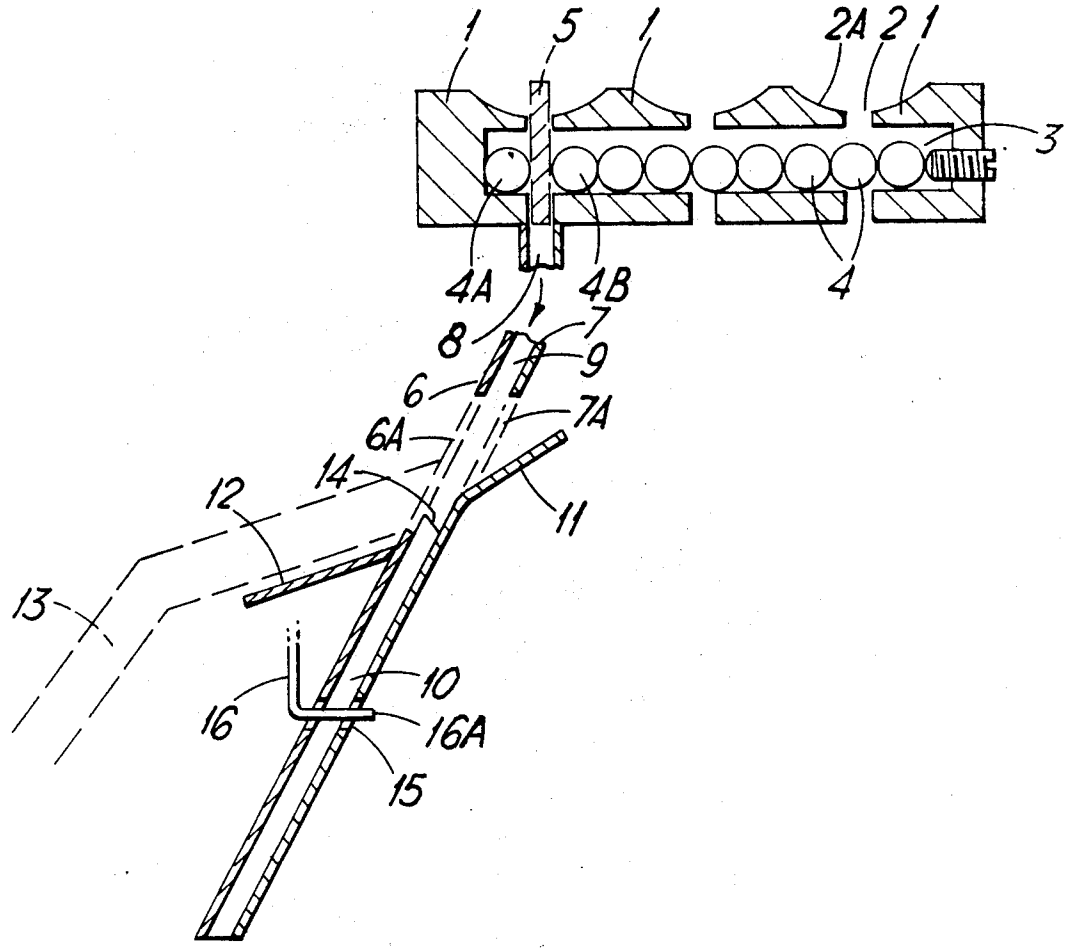
871,249	6/1961	Great Britain	194/102

Primary Examiner—Samuel F. Coleman
Assistant Examiner—H. Grant Skaggs, Jr.
Attorney—Nelson H. Shapiro et al.

[57] **ABSTRACT**

The invention described is of coin-rejecting means and secondary features associated therewith; the rejecting means is of the type in which the coin after slot insertion passes down a chute which is inclined in two planes so that the coin leans against one wall. In that wall is a window of which the other margin is so spaced from the floor of the chute that a coin of insufficient diameter topples through the window and as a result is rejected; whilst a coin which is of acceptable diameter but is unacceptably thin drops down into a channel of the floor and thus drops clear of the upper margin of the window this again resulting in rejection. The invention further includes means whereby a second coin slotted too hastily after a first is refused admission through the slot; means whereby coins passing operationally through the chute can be held back until the function of a first coin of a sequence has been completed; and means whereby a coin jammed in a chute may be ejected for recovery.

2 Claims, 5 Drawing Figures



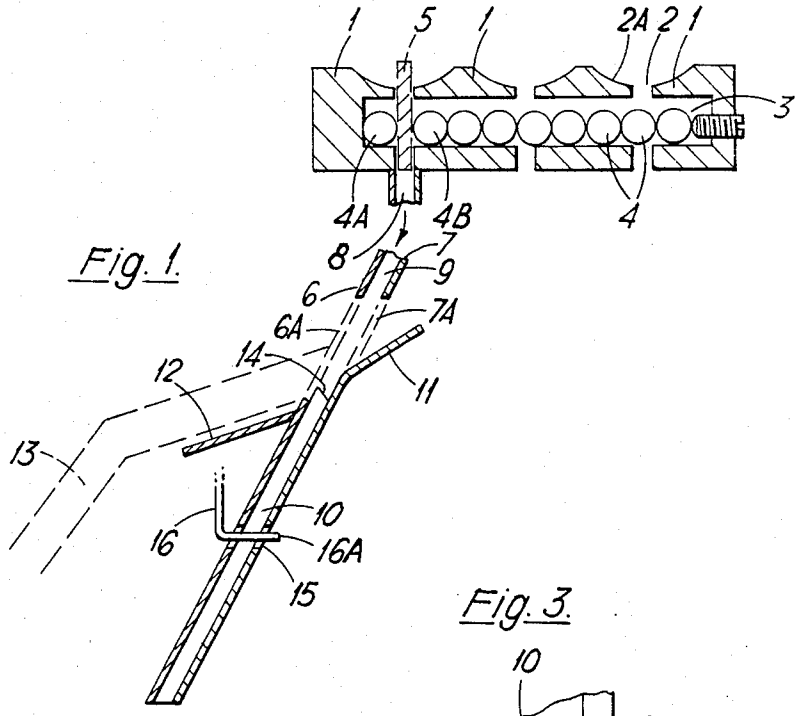


Fig. 1.

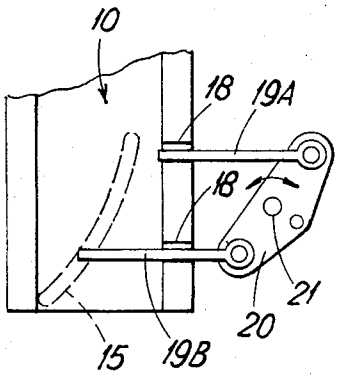


Fig. 3.

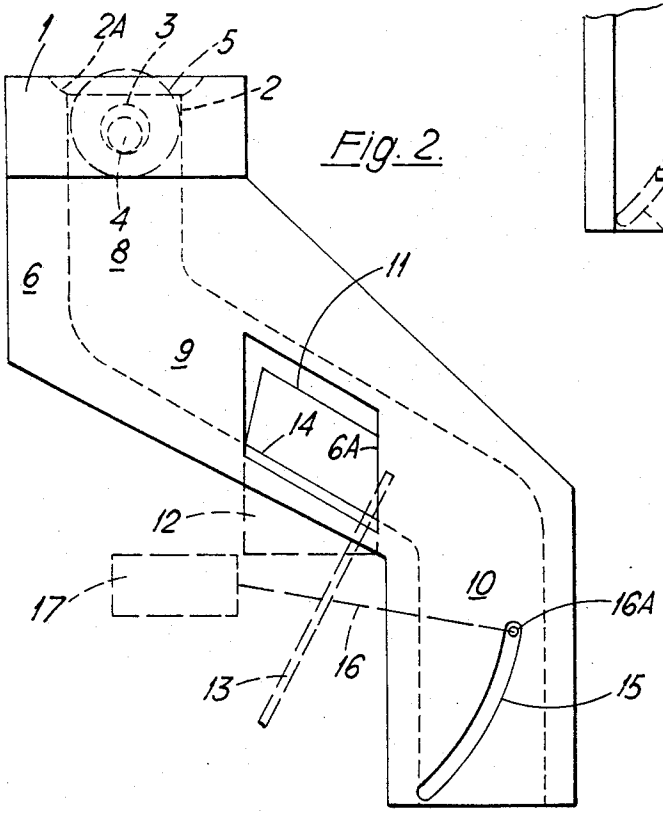


Fig. 2.

Fig. 4.

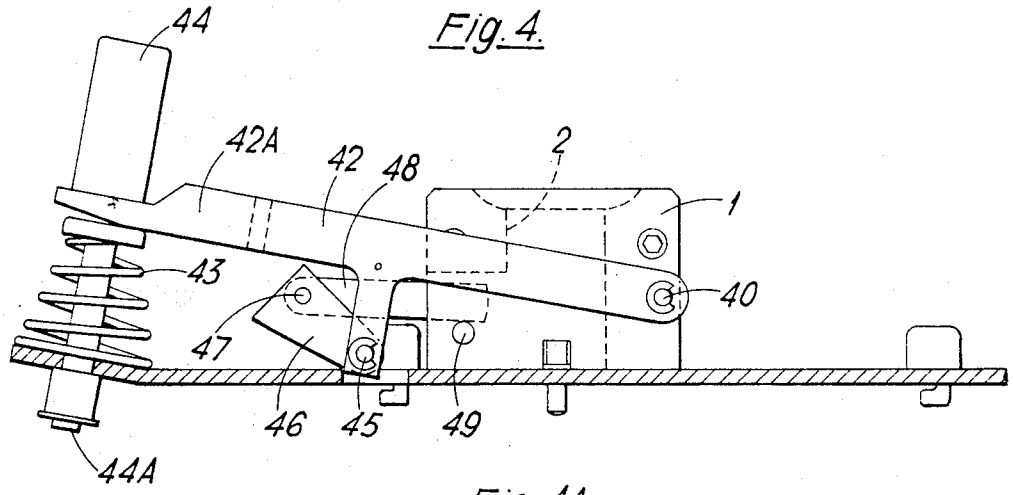
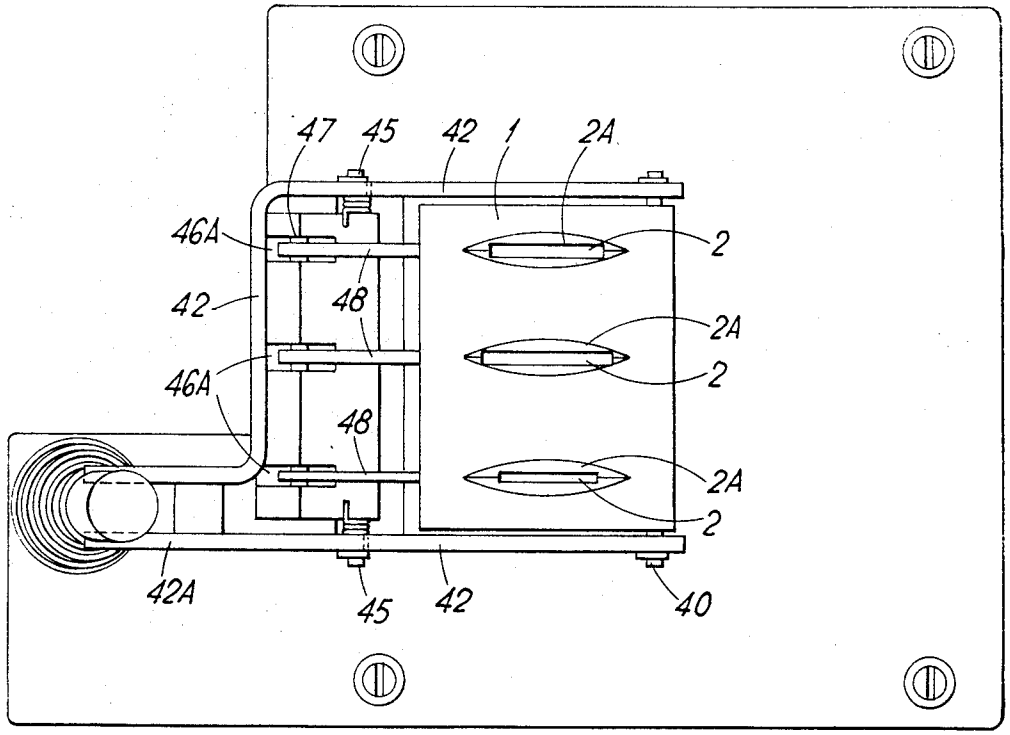

44
42A
42
48
2
1
43
40
47
46
45
49
44A

Fig. 4A.


47
45
42
1
2A
46A
2
42
48
2A
46A
2
48
2A
2
42A
45
42
40

COIN-REJECTING DEVICE

This invention relates to a device for use in connection with coin-released mechanism, coin-counting, coin value changing, or kindred mechanisms (or their equivalents using tokens), such as will be referred hereinafter as "coin operated machine." The invention resides in a coin-rejecting device, and secondary features. That is to say its main purpose is to monitor inserted coins as to their dimensions and if required other characteristics with a view to rejecting or returning coins which fail to conform to permissable requirements. The device of the invention is particularly well adapted for use in situations in which more than one value of coin is to be handled; for example in coin-released fare-paying mechanism (whether ticket-issuing or turnstile) in which two or perhaps three different coins are acceptable. Typically the invention resides in mechanisms which will differentiate between but still accept a penny coin, a fivepenny or shilling, or a tenpenny coin or florin; or in U.S. currency a nickel, a dime, or a quarter; or mechanism which will accept various non-currency tokens. In this specification, it is assumed that the word "coin" applies to a piece of legal currency or a token of similar nature, which may have been purchased in exchange for legal currency.

Apart from the element of human error which arises in the use of coins, for example the very elementary error of attempting to insert a coin into a wrong slot, there is a regretable, but nevertheless prevalent, element of attempted cheating. The use of counterfeit or spurious coins, or of special techniques, has to be considered when providing for the monitoring of coins. For example, counterfeit or lower value coins may include pieces of low intrinsic value such as ferrous pieces; there may obviously by monitored magnetically. Other substitutes may be, for example, dimensionally fairly accurate but lacking in density — for example plastics counters or tokens. In yet another field of cheating is to use a counterfeit piece and to insert it in the slot with "spin" to conceal its defects; the monitoring provision should be able to abate that hazard. Another and quite different type of problem arises, when the leader of a party, for example a family, inserts a sequence of coins (maybe completely honestly) to get a sequence of tickets for his party. For example, let us assume that there is a three-slot arrangement for three values, and our party leader, a leader of a party of four people, inserts a miscellany of coins of the appropriate total value to procure four tickets; it is desirable that the mechanism which monitors the coins as "pieces," will also retain coins following closely one after another, until the function of the first coin in that sequence has been performed. The present invention affords means to achieve the required result of treating each coin as it were on its own merits, irrespective of the fact that a following coin or sequence of coins, has been "stacked" immediately behind, in what is known as a "buffer" stop. This aspect of the invention is especially relevant to the case of passenger turnstiles which are coin-released, in which case it is socially quite natural for the leader of a family or other party not only to put in the money but then to lead his party through the turnstile. It requires but little imaginating, to apprehend the consequences if, when the leader has gone through there is a holdup behind. Such a hold up (or a loss to the operator) could be caused if one of his later coin-insertions had been defective and detected too late; or could be caused if as a result of "stacking" of coins in buffer storage in one of the slots, the release paid for were to occur prematurely.

Another problem confronting the designer of coin-operated mechanisms is, when two or more species or denominations of coin are to be accepted, of coping with the insertion of two coins of different denomination simultaneously or practially simultaneously. If, for example, the user inserts a fivepenny piece and a tenpenny piece almost simultaneously there can be difficulty at the operation point. The invention affords means to prevent simultaneous coin insertion by preventing premature entry through the slot, such prevention being tantamount to temporary "rejection."

It is to deal with problems of this nature of which the foregoing are merely examples, that the present invention aims. Whatever means are employed, should be extremely reliable, accurate in response, and cheap to make and maintain. The invention has such objects in view. Whilst it is applicable to single-species coin mechanism, it is particularly well adapted to multiple species because, by its physical nature, it is in such a physical form that a plurality of slots and chutes can be marshalled side by side, in close and compact proximity.

It is known in the art, to provide coin rejection for coins of unacceptably small diameter, by using a downwardly inclined chute with a sloping wall having a window in it such that a too-small coin (as to diameter) running down the floor of the chute and leaning on the wall, tilts through the window and is thus rejected. It is also known to monitor too small a thickness by various feeler devices: and further it is of course common to provide a slot such as to prevent entry of a coin of excessive diameter or thickness. In the present device use is made of the inclined chute and sloping wall, to monitor both the diameter and thickness, and cause automatic rejection of an unacceptable coin by these standards, without moving parts.

It has also been proposed in a multi-slot coin machine to provide a series of channelled balls so dimensioned and having sunk/ clearance that only one coin can be entered through a slot at a time.

According to the present invention there is provided a coin-rejecting device for coin-operated machines in which the maximum diameter and maximum thickness of an inserted coin is limited by the dimensions of a rectangular slot, in which there is provided means simultaneously for monitoring both the diameter and thickness of a coin such means comprising a chute defined by side walls and of such internal cross-section as to pass the coin which chute constitutes a path inclined for the gravitational passage therethrough of the coin and also inclined in a second plane so that the coin leans against one of the walls of the chute in so passing whilst supported by the floor of the chute, such one wall having formed therein a window beneath which the floor of the chute is formed as a channel of tapered cross-section the dimensions and taper of which are such that an unacceptably thin coin descends into the channel so that its uppermost point clears the upper margin of the window and the coin (being inclined as the chute is inclined) topples through the window whereupon it is rejected through a rejection outlet, and the floor is also so formed that an acceptably thick coin

of unacceptably small diameter will similarly topple through the window and be rejected.

Further, mechanism having a plurality of such devices may have a plurality of differently dimensioned slots arrayed parallel one to another for the acceptance of different coins, each slot leading to a chute having the features of claim 1, the plurality of chutes being arranged side-by-side with like inclinations and sharing a common rejected coin outlet. In such construction, there may be provided in a path of which the centre line is spaced below the plane in which the slots lie by less than half the length of the smallest slot a plurality of spherical elements movably arranged in the path which is parallel with the plane of the slots, such elements collectively offering a space between adjacent elements greater than the width of the largest slot and such that, when the space is momentarily occupied by a coin passing through it in descent from a slot, the other slots are obstructed by the elements, so that only one coin at a time can be inserted into the machine. Again, in plural-slot mechanism as above described, the invention provides if required, slot-clearing coin-recovery means to facilitate removal of a coin which has partially penetrated a slot, comprising an externally-accessible key pivotally connected through a link to a group of sliding bars one of each slot, the link connection being such that operation of the key causes all the bars to slide across the outlets from all the slots, any one bar thus wedging a partially penetrated coin back up through its slot so that it becomes accessible for removal from the machine.

According to a further feature of the invention there may be provided a detent device comprising a rocker of which the two alternative ends can intercept and stop a coin which rocker is actuated into one or other of its positions by feed-back control from such a device as a turnstile (or other coin controlled apparatus) so that a following coin required to be held in buffer storage after insertion is held back until the controlling effect of the leading coin on the controlled apparatus has been fully achieved.

The invention in its full form is illustrated, by way of example, in the accompanying diagrammatic drawings. In these:

FIG. 1 is a part-section elevation taken in a plane approximately including the axes of inserted coins

FIG. 2 is a diagrammatic elevation at right angles to that of FIG. 1

FIG. 3 is a scrap view to illustrate a way of controlling a buffer store of coins.

FIG. 4 illustrates, by sectional elevation, a slot-clearing device according to a secondary inventive feature, and FIG. 4A is a plan view of the same.

In the drawings there is indicated a gang of three coin slots and chutes. These are to a large extent identical, only differing in the dimensions of coins each will accept. The gang may therefore be made up as an assembly of units; only one such unit is fully illustrated, the others would except dimensionally be substantially the same and applicability can readily be arranged in close juxtaposition, if required sharing a single rejection chute.

Each slot and chute unit comprises a top block 1 in which is the coin slot 2, preferably topped by a shallow lead-in depression 2A. Each slot 2, by its rectangular dimensions, serves as a "no-go" gauge to reject (by way of refusing entry to) a coin of excessive diameter or excessive thickness, or one which is badly misshapen. The slots are, virtually, all in one plane.

In the block 1 is a bore 3 which is transverse to the slots 2 and substantially parallel with their common plane. In the bore 3 is provided a line of steel balls 4. These are loose, their movement in the bore 3 being limited to the extent of a gap which corresponds to the maximum coin thickness involved. The balls are so dimensioned that, providing no other coin has already been entered in a slot, an inserted coin will nudge apart two of the balls such as 4A, 4B (the further balls then all being positioned in or nearly in contact with their neighbours or with the ends of the bore) and pass between those two. At 5 in FIG. 1 a coin is to be seen, indicated in broken line with cross-hatching, occupying the gap between the two balls 4A, 4B all the other balls being closed up. Whilst the coin 5 is as shown, full entry into another slot of a further coin is prevented. Thus only one coin at a time has access to the gang of slots.

Each slot 1 leads down into a respective chute. Each chute is formed basically of two flat parallel walls 6, 7, spaced apart by a suitable dimension to guide the appropriate coin. If there be a bend between the slot 1 and its chute, the width of the chute round such bend will of course be slightly increased to clear the coin.

The general form of a chute is to be seen in FIG. 2. Each chute at its upper end is directed vertically downwards (as viewed in FIG. 2) for a centain distance, at 8, then it is inclined as at 9, and finally is again vertical at 10. But the chute as a whole once clear of its slot, lies in a plane which is sloped from the vertical as seen edgewise as in FIG. 1. It follows that a coin passing down the chute leans against the wall 7. In the inclined part 9 of the chute the coin runs or slides gravitationally on the floor of the chute which includes a track 14. In the wall 7 is formed a window 7A outside of which is a guide plate 11. Opposite the window 7A, in the wall 6, is an escape window 6A. From the external sill of window 6A is a sloped shelf 12, and associated with this a guide plate 13.

An inserted coin falls through 8 into the inclined part 9 of the chute and is now supported edgewise on floor of which the track 14 forms a part of which it rolls or slides. The distance between the track 14 and upper margin of window 7A is precisely determined so that if the coin be of less than permissible diameter, it tilts through the window 7A, against the plate 11. Being now at an angle of inclination at which track 14 will no longer retain the coin, it slides over the sill of window 6A and falls through the escape window, down the shelf 12 (being guided also, edgewise, by plate 13) and thence the coin falls to a "returned coin" tray. The combination of the track 14 and window 11 therefore constitutes a means of gauging the coin for under-size of diameter. The track 14 at least when it passes the windows 6A and 7A,is bevelled as can be seen in FIG. 1; this is a means of gauging for under-thickness of the coin, because the coin will descend below the uppermost level of the track by reason of the channel effect of the level 14 of the floor and therefore its upper margin will come below the upper margin of the window 7A, with the same rejection effect as if the coin were under-diametered. Evidently the dimensions, especially of the track 14 and window 7A, are highly critical in checking that the coin is not less than the required criteria as to diameter and thickness. The chute may also

have known characteristics to cater for other deviations from acceptability.

For example, there may be a curved kink between part 8 and 9 of the chute to defeat cheating by inserting a spinning coin or one suspended by a thread.

When the coin has passed the "oversize" gauging of the slot itself and the "undersize" gauging of window 7A it proceeds down part 9 of the chute, until it falls down part 10. The walls 6 and 7 of part 10 have in them arcuate slots 15 through which extends the tail 16A of a light stiff wire 16 which operates a microswitch indicated at 17. A coin descending through 10 depresses the tail 16A and operates the microswitch 17; by circuiting which is not part of the invention the operation to be controlled by the coin, is initiated, e.g., the release of a turnstile.

To cater for the buffer storage of coins in a chute, a device is provided as illustrated diagrammatically in FIG. 3. In this are seen part of the chute including the vertical part 10 in which in the slot 15. Through a wall (which may be any wall) of the chute are two holes 18 in which slide with adequote clearance, two pins 19A, 19B which are pivotted to a rocking lever 20 pivotally mounting at 21. The lever 20 is actuated by a solenoid so that the intrusion of one or other of the pins 19A or 19B and retraction of the other, is caused by the movement (e.g., turnstile rotation) of the thing controlled by the switch 17. Thus if there is a buffer store of coins in the chute, the leading coin is released only if pin 19B is retracted but simultaneously the following coins above is retained by pin 19A. The pins are reversed only when the operation is completed and thus may properly be re-commenced. It follows that the chute 10, above the slots 15, may be full of coins but this store will only descend one at a time, when the operational functions of the leading coin has been completed. It is assumed that the chute 10 is made of adequote length for any expected buffer storage requirement.

The mechanism may be used for one or more coins and with almost any purpose of coin-release mechanism. Obviously, other known monitoring devices such as magnets to reject spurious ferrous coins, weighing devices, devices to detect holes, and so on may be included in combination with the above-described devices.

Turning now to FIGS. 4 and 4A there can be seen three slots 2 with their depression guide 2A, the slots being shown in broken line in FIG. 4. Pivotted at 40 to the slot block 1 is a frame-like structure 42 with an accessible extension 42A, urged upwardly by a compression spring 43 and having a forked end engaging beneath a knob 44 on a slidingly supported rod 44A surrounded by the spring 43. Finger pressure on the knob 44 depresses the frame 42 about its pivot at 40. The knob 44 and the frame 42 can be considered collectively as an externally accessible key. To lugs of the structure 42 are pivotted at the axis 45 a link plate 46 having three slots 46A in which lie, pivotted on an axis 47, three pusher elements 48. The elements 48 are guided for their longitudinal movement on a rod 49 fixed in the block 1. The block 1 has three channels through which pass the three elements, freely both to move longitudinally and to rock slightly on the rod 49. The inner ends of the elements 48, when moved in by the link 46, lie across and below the slots 2; and their ends may be somewhat tapered so that if, when moving in, an element 48 contacts a coin from below, it lifts that coin upwards in its slot, thereby making it easy to pick up in the guide 2A and recover from the slot. Thus if a coin is held up in any slot, the user simply depresses the knob 44 and that coin is raised up. The slot-clearing device of FIGS. 4 and 4A may of course be used in connection with any number of slots.

I claim:

1. A coin rejecting device for coin-operated machines in which the maximum diameter and maximum thickness of an inserted coin is limited by the dimensions of a rectangular slot, there being a plurality of such slots arranged parallel one to another and differently dimensioned for the acceptance of different coins, and in which there is provided means for simultaneously monitoring both the diameter and thickness of a coin inserted in any slot, such means comprising, for each slot, a chute defined by side walls and of such internal cross-section as to pass the coin, which chute constitutes a path inclined for the gravitational passage therethrough of the coin and also inclined in a second plane so that the coin leans against one of the walls of the chute in so passing while supported by the floor of the chute, such one wall having formed therein a window beneath which the floor of the chute is formed as a channel of tapered cross-section the dimensions and taper of which are such that an unacceptably thin coin descends into the channel so that its uppermost point clears the upper margin of the window and the coin, being inclined as the chute is inclined, topples through the window, whereupon it is rejected through a rejection outlet, and the floor is also so formed that an acceptably thick coin of unacceptably small diameter will similarly topple through the window and be rejected, the plurality of chutes being arranged side by side with the inclinations parallel, the slots being in a common plane, there being provided in a path, of which the centre line is spaced below the plane in which the slots lie by less than half the length of the smallest slot, a plurality of spherical elements movably arranged in the path which is parallel with the plane of the slots, such elements collectively offering a space between adjacent elements greater than the width of the largest slot and such that, when this space is momentarily occupied by a coin passing through it in descent from a slot, the other slots are obstructed by the elements, so that only one coin at a time can be inserted into the machine, and there being provided slot-clearing coin-recovery means to facilitate removal of a coin which has partially penetrated a slot, comprising an externally accessible key pivotally connected through a link to a group of sliding bars one to each slot, the link connection being such that operation of the key causes all the bars to slide across the outlets from all the slots, any one bar thus wedging a partially penetrated coin back up through its slot so that it becomes accessible for removal from the machine.

2. A mechanism according to claim 1, further comprising, for each chute, a detent device consisting of a rocker with two alternatively operating ends one at a time of which is interposed in the coin path to intercept a following coin which closely follows a leading coin in a consecutive series, which rocker is actuated from one operational position to the other by feed-back control from the coin-operated device so that the following coin is held in buffer storage until the controlling effect of the leading coin has been achieved.

* * * * *