Oct. 28, 1958 H. M. ADAMS 2,858,010

ARTICLE ACCUMULATOR

Filed April 2, 1953 3 Sheets-Sheet 1

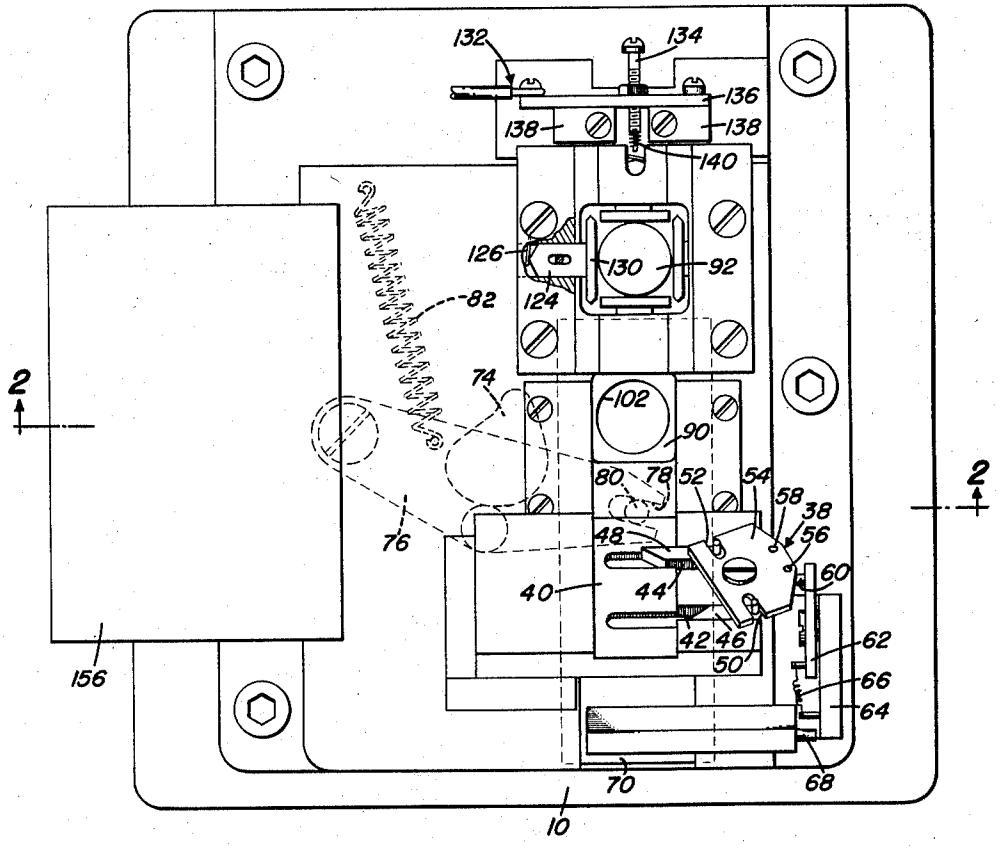


FIG. 1

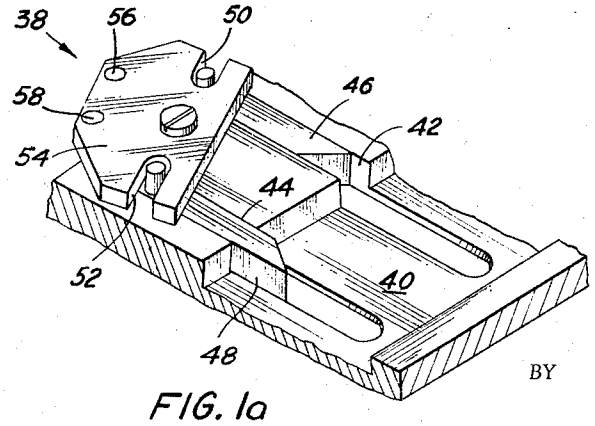


FIG. 1a

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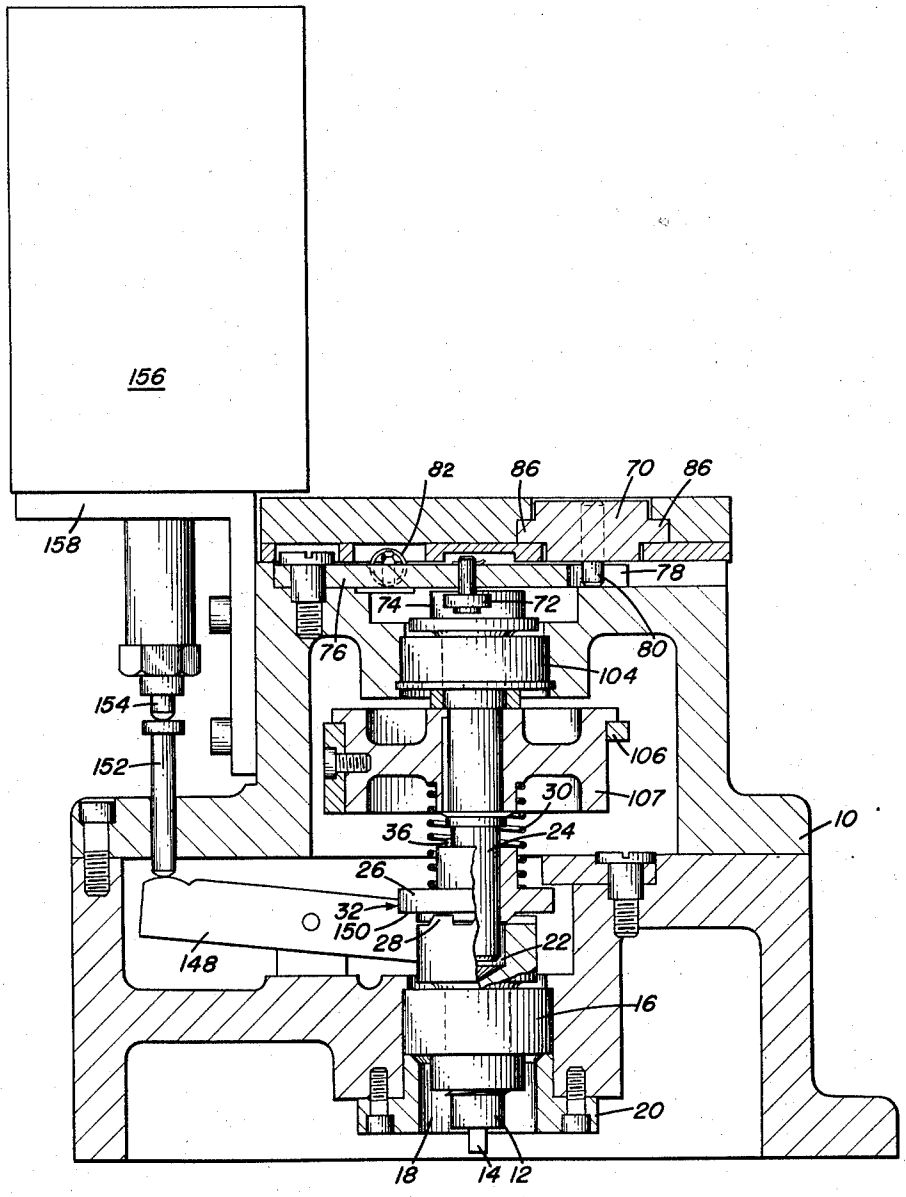


FIG. 2

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FIG. 3

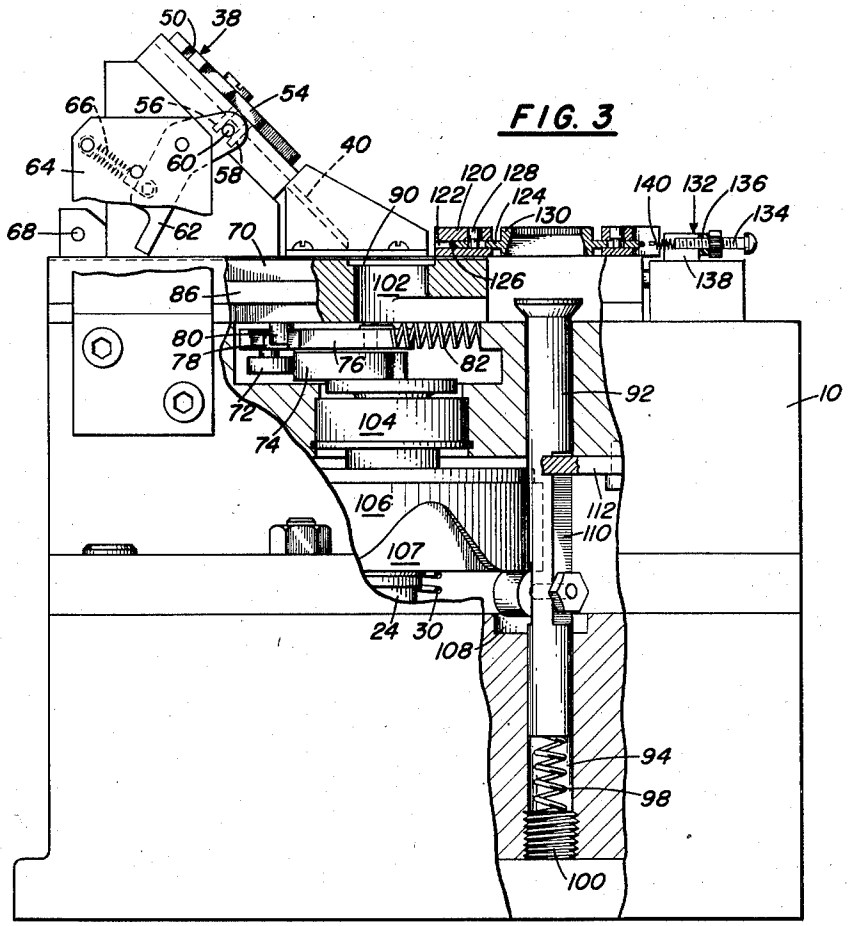
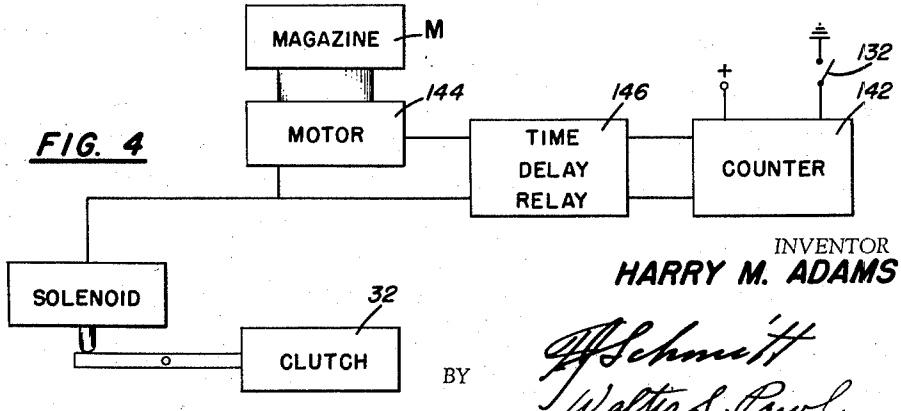


FIG. 4



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ARTICLE ACCUMULATOR

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Application April 2, 1953, Serial No. 346,306

8 Claims. (Cl. 198—40)

This invention relates to devices for feeding articles by mechanical means into a magazine.

Although the accumulator disclosed herein has general application and utility, it has been designed to be used in the process disclosed and claimed in copending application, Serial No. 324,160, filed December 4, 1952 by Robert L. Henry, now Patent No. 2,771,663, patented November 27, 1956.

An object of the invention is to provide means for directing a flow of flat, frangible articles over a plunger that intermittently raises to elevate the article thereover for reception into a magazine or the like, together with means for counting the number of articles so displaced so that when a predetermined number of articles are handled by the plunger, the magazine is moved to another position for further filling. Added to this, it is an object of the invention to prevent the plunger and certain other parts of the accumulator from operating during the time that the magazine is moving from one position to another.

A more specific object of the invention is to provide an article accumulator with a slide that moves a single article into the path of travel of a reciprocating plunger, the latter serving as an elevator to raise the article into an awaiting container, and to provide means located in the path of article travel which guide the article as well as maintain it in exactly the correct position on the plunger, the last mentioned means being used as a trigger for the counting mechanism mentioned above.

Other objects and features will become apparent in following the description of the illustrated form of the invention.

In the drawings:

Fig. 1 is a plan view of the accumulator.

Fig. 1*a* is a perspective view of an escapement device of the accumulator.

Fig. 2 is a sectional view taken substantially on the line 2—2 of Fig. 1 and in the direction of the arrows, some parts being shown in elevation.

Fig. 3 is a side view of the accumulator with portions broken away to show internal structure, and

Fig. 4 is a schematic view showing some of the wiring and mechanical arrangement of the accumulator.

A support 10 is suitably constructed to maintain the working parts of the article accumulator so that the accumulator may be considered a single unit capable of being secured to and operationally integrated with other devices which handle and perform various operations on the articles assembled by the accumulator. Drive shaft 12 is adapted to be actuated by a power source and to illustrate the intended connection thereto, shaft 12 is provided with a key 14 at the lower end thereof. Anti-friction bearing 16 disposed in a bore 18 of support 10 mounts drive shaft 12 for rotation, and means, such as hollow cap 20, maintain the bearing 16 in place on a shoulder within the bore 18. The upper end of shaft 12 has a pilot opening 22 in it to accommodate driven shaft 24, the lower end of which is fitted with a one-way clutch element 26 of the toothed type that is normally in engagement with the teeth 28 on the drive shaft 12 near the pilot opening 22. The clutch element 26, teeth 28, together with spring 30 reacting on clutch element 26 constitute a one-way clutch 32 adapted to releasably couple together the shafts 12 and 24. This function is realized inasmuch as the clutch element 26 is slidable longitudinally on shaft 24, but in precluded from rotating thereon by a key 36 in keyways of element 26 and driven shaft 24.

Attention is now invited to Figs. 1, 1*a* and 3 which show the first use of driven shaft 24 and that is to provide operating force to an escapement device 38 in an inclined article track 40. The track side wall has a pair of spaced guideways 42 and 44, see Fig. 1*a*, in it to accommodate stops 46 and 48 which are slidably disposed therein. Each stop has a pin rising from its upper surface, the pins fitting in slots 50 and 52 that are formed in a rocker 54 carried by the escapement block. Two pins 56 and 58 depend from rocker 54, and a lug 60 on link 62 fits therebetween. The link is pivoted between its ends to a mounting bracket 64, and is biased in one direction by a spring 66 that is connected to the link 62 and bracket 64.

A hammer 68 is fixed to a horizontally reciprocable slide 70 and strikes one end of link 62 causing it to energize spring 66 and actuate the rocker 54 which controls the location of stops 46 and 48 in the track. When the hammer returns, the energized spring returns the link 62 causing the stops 46 and 48 to be actuated again. There is a metering action of articles by the stops as they operate, allowing only a single article to pass through the track 40 for each reciprocation of slide 70. Slide 70 is actuated by rotation of driven shaft 24 through the working of a cam follower 72 on cam 74 which is fixed to the upper end of shaft 24. The follower 72 depends from an arm 76 that is pivoted to a part of support 10, and the arm has a bifurcated end 78 in which a pin 80 rides, the latter being fixed to slide 70. Spring 82 is secured to the arm 76 and a part of the support and functions to keep the follower 72 riding on its cam 74 at all times.

Parallel guides 86 on the sides of slide 70, operable in guideways 87 provided in support 10 constrain the motion of slide 70 and permit only reciprocatory movement of the slide. As described, hammer 68 is located near or at one end of slide 70, and the opposite end of it has an upwardly opening article pocket 90 movable to a position at the discharge end of the track 40 (Fig. 3) to accept single articles as they are allowed, by the escapement 38, to pass through the track. Article pocket 90 has horizontal shoulders (unnumbered) therein to receive and retain an article, and after an article is received in the pocket 90, the slide moves to a position over a means for elevating the article to ultimately push it into the bottom of a magazine M located above the support 10.

The article lifting or elevating means includes a plunger 92 operable in a support bore 94 having its longitudinal axis at right angles to the path of travel of the slide 70. Yielding means, as spring 98, are disposed in bore 94 and seat on the adjustable bore closure 100 and the lower part of the plunger. The spring 98 is normally held under a compression load which upon release, moves the plunger upwardly through an opening 102 in the slide at the bottom of the pocket 90, thereby lifting the article from the pocket. It is appreciated that the actuation of the plunger has to be timed with the operation of slide 70 and, therefore, the shaft 24 is used to govern the instant of release and return of plunger 92.

Directly below an anti-friction bearing 104 that mounts driven shaft 24 for rotation, there is a cam 106 on a cam wheel 107 that is keyed or otherwise fixed to driven shaft 24. A cam follower 108 (Fig. 3) is secured to the plunger 92 and is in contact with the cam 106 thereby

restricting the movement of the plunger **92** to a function of the position of shaft **24**, the same being true of the slide **70** and escapement **38**. An anti-rotation feature is provided for the plunger **92**, and consists of a flat **110** on the shank of the plunger that rides against a part **112** of support **10**.

Guide means are provided on the support **10** at the place where the plunger **92** elevates the articles, the guide means being for the purpose of retaining the article centered on the plunger head. The guide means consist of four identical assemblies, each including a mounting block, as at **120** in Fig. 3, provided with a passage **122** in which the stem **124** of a guide member is movable. A small spring **126** lightly biases the guide member toward the plunger **92**, and a limit pin **128** carried by block **120** and operable in a slot in the stem **124** prevents overtravel in either direction of movement of the guide member. The foot **130** of the guide member has a cam surface on one side that is contacted by an edge of the article as it passes through the nest of four guide assemblies, smoothly displacing the guide members thereof against their springs **126**.

A switch **132** is disposed adjacent to one of the guide assemblies and is actuated (closed) each time that the guide member nearest to it is actuated. Switch **132** consists of a screw **134** carried by an insulating bar **136** fastened to blocks **138** which are secured to support **10**. The inner end of screw **134** supports a spring **140** that is disposed in the passage **122**, and each time that the guide member therein is displaced by an article riding over its cam surface, the guide member, which is grounded to the support **10**, contacts spring **140** thereby closing switch **132**. Upon return of the guide member under consideration, switch **132** is opened. Switch **132** is electrically connected to a counter **142** (Fig. 4) capable of being set manually, and the counter energizes a motor **144** through a time delay relay **146**. Motor **144** may be electrical, or a fluid motor may be substituted in which case an electrically operable valve would receive the impulse from the counter. In either event, the motor **144** through appropriate mechanism rotates the magazine M a few degrees each time that there is an impulse applied to the motor. At the same time that motor **144** is energized, the clutch **32** is disengaged by a lever **148** (Fig. 2) pivoted between its ends to support **10**. One end of the lever **148** has a yoke that contacts the lower surface of flange **150** on clutch element **26**, and the opposite end of the lever is contacted by a push rod **152** carried by the support **10**. The push rod **152** is actuated by the armature **154** of a solenoid **156** mounted on a bracket **158** that is secured to the support **10**. As seen in Fig. 4, solenoid **156** is actuated through an impulse of the counter through appropriate wiring at the same time that the motor **144** is energized.

Operation

As discussed in the referred to copending application, ceramic wafers about one sixteenth of an inch thick and less than a square inch in planform are handled by the accumulator. By mechanical means they are fed into track **40** where they are metered by the described action of the escapement device **38**. However, escapement device **38** is timed with the motion of the slide **70** because the link **62** that operates the stops of the escapement **38** is put in motion by a hammer on the slide **70**. Until the moment that the slide is in such position in its reciprocatory travel that the article pocket **90** is at the discharge end of the track **40**, the escapement device **38** will not operate.

When an article is deposited in pocket **90** the slide, due to the shape of cam **74**, begins to move toward the end of the support **10** that contains plunger **92**. There must be exact timing of the plunger operation and slide **70** because the plunger must pass through the opening **102** in slide **70** that is almost the same size as the plunger head that passes through it. This precise timing is obtained by using the driven shaft **24** to actuate the slide and also release the plunger. Accordingly, as the shaft **24** rotates to reciprocate the slide, the cam **106** rides over plunger follower **108**, holding plunger spring **98** compressed until the slide opening **102** is directly above the plunger **92**. Then, the cam **106** has reached a point where it falls away sharply, releasing the plunger **92** to permit the spring **98** to push it through the article pocket **90**, picking up the article from the pocket. Immediately thereafter and before the slide **70** begins to return, cam **106**, due to its shape, returns the plunger, again compressing spring **98** in preparation of another cycle of operation of the plunger.

The magazine into which the articles are fed will be located above the plunger. It is fed from the bottom to minimize jambing of articles therein, as is the case when articles of the dimensions mentioned herein are gravity fed into a magazine tube only slightly larger than the articles. In addition, the magazine may contain a plurality of article tubes and when one is filled, say it holds one hundred articles, the magazine must be rotated a few degrees to move the next empty magazine tube over the plunger. Thus, the counter **142** is manually set for one hundred articles, whereby when the switch **132** is actuated one hundred times, the counter is triggered sending an impulse, delayed by relay **146**, to the motor **144**. At the same time the escapement and slide are momentarily stopped by the release of clutch **32** through operation of the solenoid **156**. A different setting of the counter **142** completely stops the escapement and slide when all of the magazine tubes are filled.

It is apparent that various modifications may be made without departing from the scope of the following claims.

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

What is claimed is:

1. An accumulator for flat, frangible articles comprising a support, a drive shaft in said support, a driven shaft, a clutch drivingly connecting said shafts, an article slide carried by said support and having an article pocket therein, means connected with said slide and said driven shaft and responsive to rotation of the latter for reciprocating said slide, means timed with the actuation of said slide for lifting an article from the pocket in said slide at one point in the reciprocatory travel of said slide, a guide for the article and carried by said support above said slide, a counter actuated by said guide, and means triggered by said counter for actuating said clutch to disconnect said shafts in response to a selected number of operations of said guide.

2. In an accumulator for articles, a support, a slide mounted on said support and having an article pocket, the pocket having an opening in its bottom, means timed with actuation of said slide for placing a single article in said pocket over said opening, means carried by said support and operatively connected with said slide for reciprocating said slide, a plunger arranged with its axis of translation normal to the path of motion of said slide, means reacting on said plunger constantly urging the plunger in one direction, means timed with the operation of said slide for releasing said plunger at the instant that the plunger is directly below the opening in the bottom of the article pockets so that the plunger lifts the article from said pocket, and movable guide members disposed above said slide to retain the article centered on the plunger after the plunger lifts the article from said pocket, an electrical counter, means operatively connected with one of said guide members for counting the number of times that said plunger elevates an article through said movable guide members, a clutch arranged to disengage said article placing means, and means energized by said counter for actuating said clutch.

3. In an accumulator for articles, a support, a slide mounted on said support and having an article pocket, the pocket having an opening in its bottom, means timed with the actuation of said slide for placing a single article in said pocket over said opening, means carried by said support and operatively connected with said slide for reciprocating said slide, a plunger arranged with its axis of translation normal to the path of motion of said slide, means reacting on said plunger constantly urging the plunger in one direction, means timed with the operation of said slide for releasing said plunger at the instant that the plunger is directly below the opening in the bottom of the article pocket so that the plunger lifts the article from said pocket, guide members carried by said support, at least one of said guide members being movable in a plane parallel to the path of movement of said slide, resilient means opposing the movement of said movable guide member, and a counter actuated by the movement of said movable guide member.

4. An accumulator for placing a plurality of articles into a magazine through an opening in the bottom thereof, said accumulator comprising a support, a inclined track carried thereby, an escapement device controlling the passage of articles over said track, a slide mounted for reciprocatory movement on said support and located at the discharge end of said track, an upwardly opening article pocket in said slide to receive an article when said pocket is at said discharge end of the track, said escapement device including a rocker, means fixed to said slide and engageable with said rocker to actuate the rocker whereby said escapement is actuated at such time that the article pocket is in a predetermined position relative to said track discharge end, said slide having an opening in the bottom of its pocket, a plunger operable through said slide opening to elevate the article in the pocket, and means for actuating said slide and said plunger in timed sequence.

5. An accumulator for placing a plurality of articles into a magazine through an opening in the bottom thereof, said accumulator comprising a support, a inclined track carried thereby, an escapement device controlling the passage of articles over said track, a slide mounted for reciprocatory movement on said support and located at the discharge end of said track, an upwardly opening article pocket in said slide to receive an article when said pocket is at said discharge end of the track, said escapement device including a rocker, means fixed to said slide and engageable with said rocker to actuate the rocker whereby said escapement is actuated at such time that the article pocket is in a predetermined position relative to said track discharge end, said slide having an opening in the bottom of its pocket, a plunger operable through said slide opening to elevate the article in the pocket, and means for actuating said slide and said plunger in timed sequence, including a shaft, means having a cam and a pivoted arm operatively connecting said shaft to said slide, and a different cam and follower operatively connecting said shaft to said plunger.

6. An accumulator for placing a plurality of articles into a magazine through an opening in the bottom thereof, said accumulator comprising a support, a inclined track carrier thereby, an escapement device controlling the passage of articles over said track, a slide mounted for reciprocatory movement on said support and located at the discharge end of said track, an upwardly opening article pocket in said slide to receive an article when said pocket is at said discharge end of the track, said escapement device including a rocker, means fixed to said slide and engageable with said rocker to actuate the rocker whereby said escapement is actuated at such time that the article pocket is in a predetermined position relative to said track discharge end, said slide having an opening in the bottom of its pocket, a plunger operable through said slide opening to elevate the article in the pocket, a shaft mounted for rotation in said support, a cam connected thereto, an arm pivoted to said support, means for imparting motion to said arm from rotation of said cam, means connecting the arm to said slide to reciprocate the latter, a spring constantly biasing said plunger toward said slide, and means on said shaft for holding said plunger in such position as to compress said spring and releasing the plunger when it is aligned with said opening in the slide pocket.

7. The accumulator of claim 6 and; a cam surfaced guide for the article on said plunger disposed above said slide, said guide being displaceable by the article on said plunger as it passes through the guide, a counter connected with said guide and operable thereby, and means responsive to said counter for stopping said escapement device and said slide.

8. In an accumulator for articles, a support, a slide mounted on said support and having an article pocket, the pocket having an opening in its bottom, means timed with the actuation of said slide for placing a single article in said pocket over said opening, means carried by said support and operatively connected with said slide for reciprocating said slide, a plunger arranged with its axis of translation normal to the path of motion of said slide, means timed with the operation of said slide for actuating said plunger at the instant that the opening in the bottom of the article pocket is directly above said plunger so that the plunger lifts the article from said pocket, and movable, spring-urged guide members disposed above said slide to retain the article centered on the plunger after the plunger lifts the article from said pocket.

References Cited in the file of this patent

UNITED STATES PATENTS

740,735	Blake	Oct. 6, 1903
1,467,409	Wilkinson	Sept. 11, 1923
1,958,845	Burns	May 15, 1934