May 14, 1957 J. W. BATCHELDER 2,792,031

CONTAINER CONVEYING AND POSITIONING MACHINE FOR A PACKAGING APPARATUS

Filed May 25, 1954 8 Sheets-Sheet 1

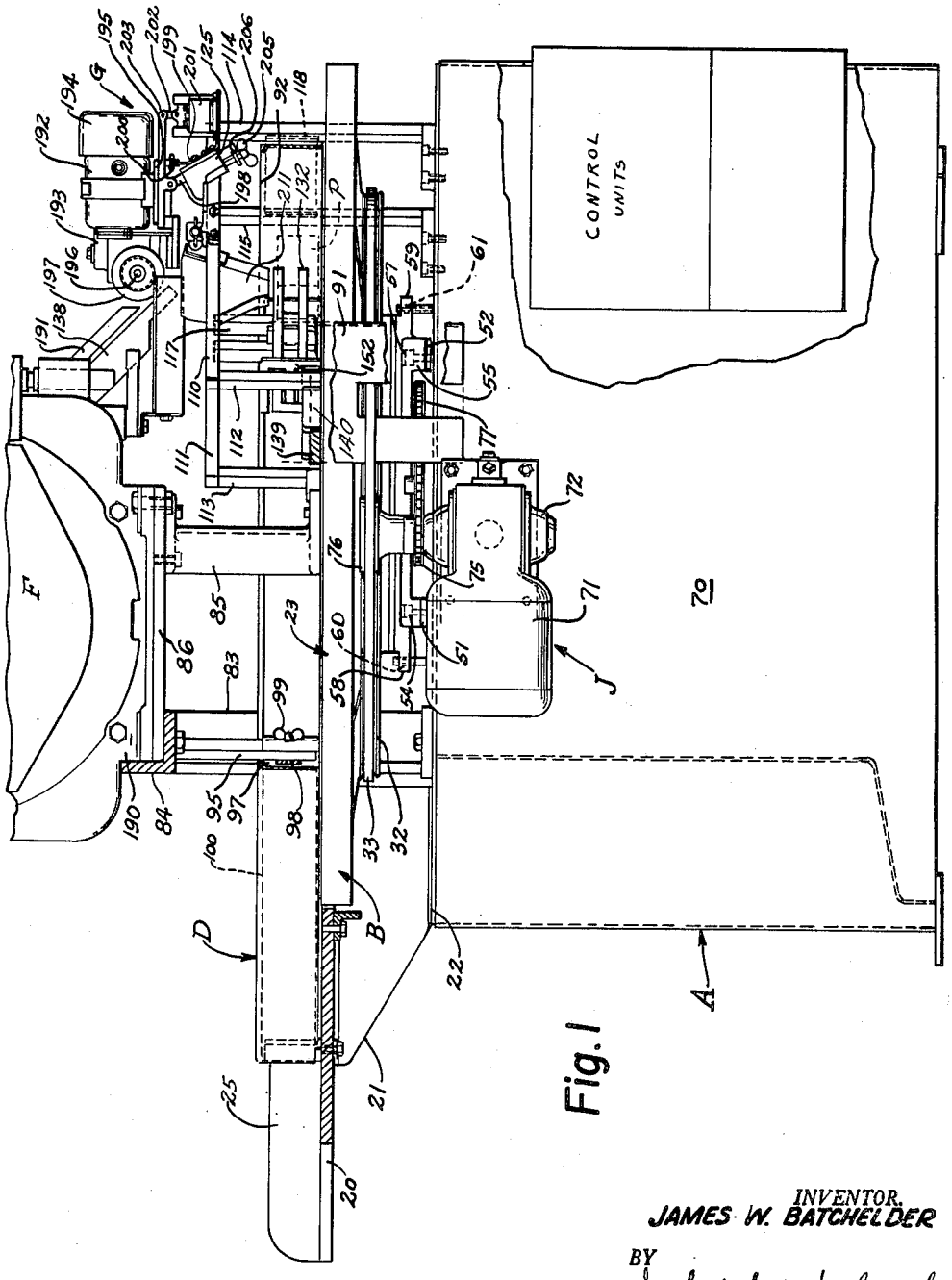

Fig. 1

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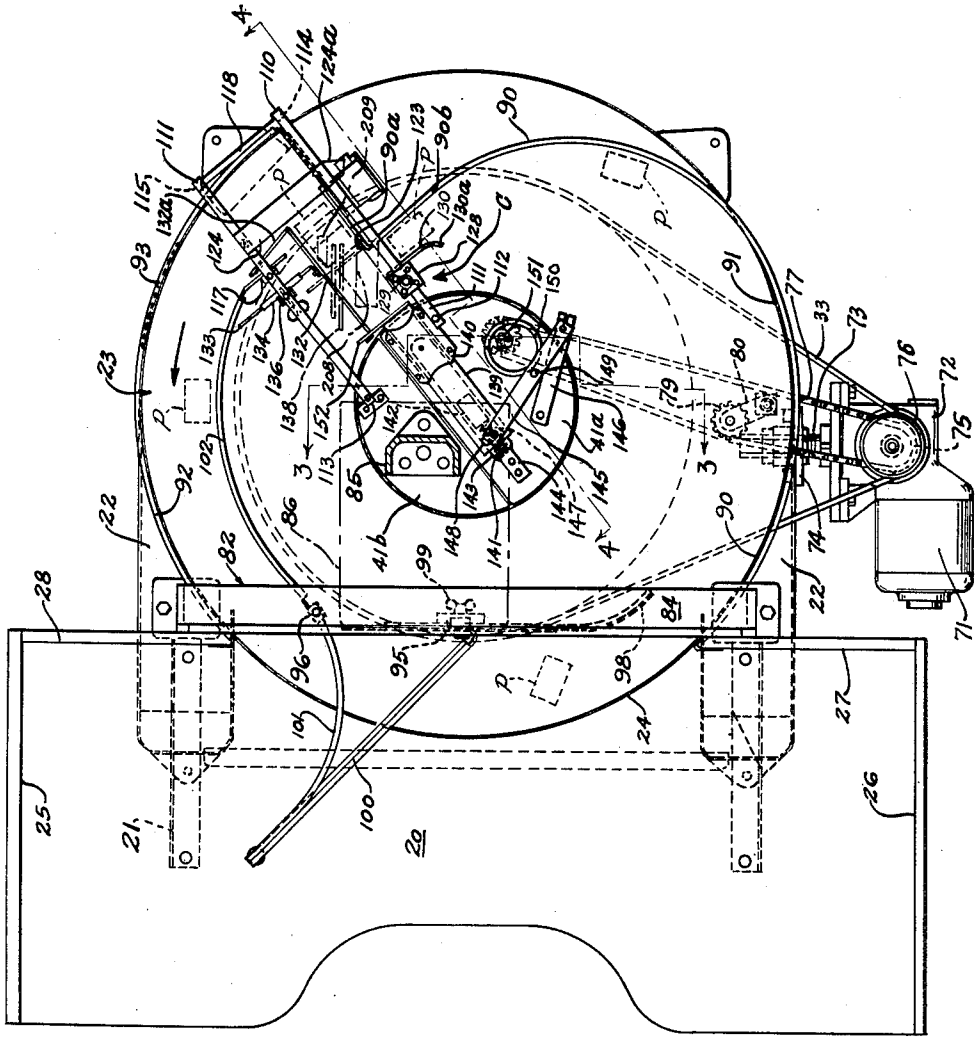

Fig. 2

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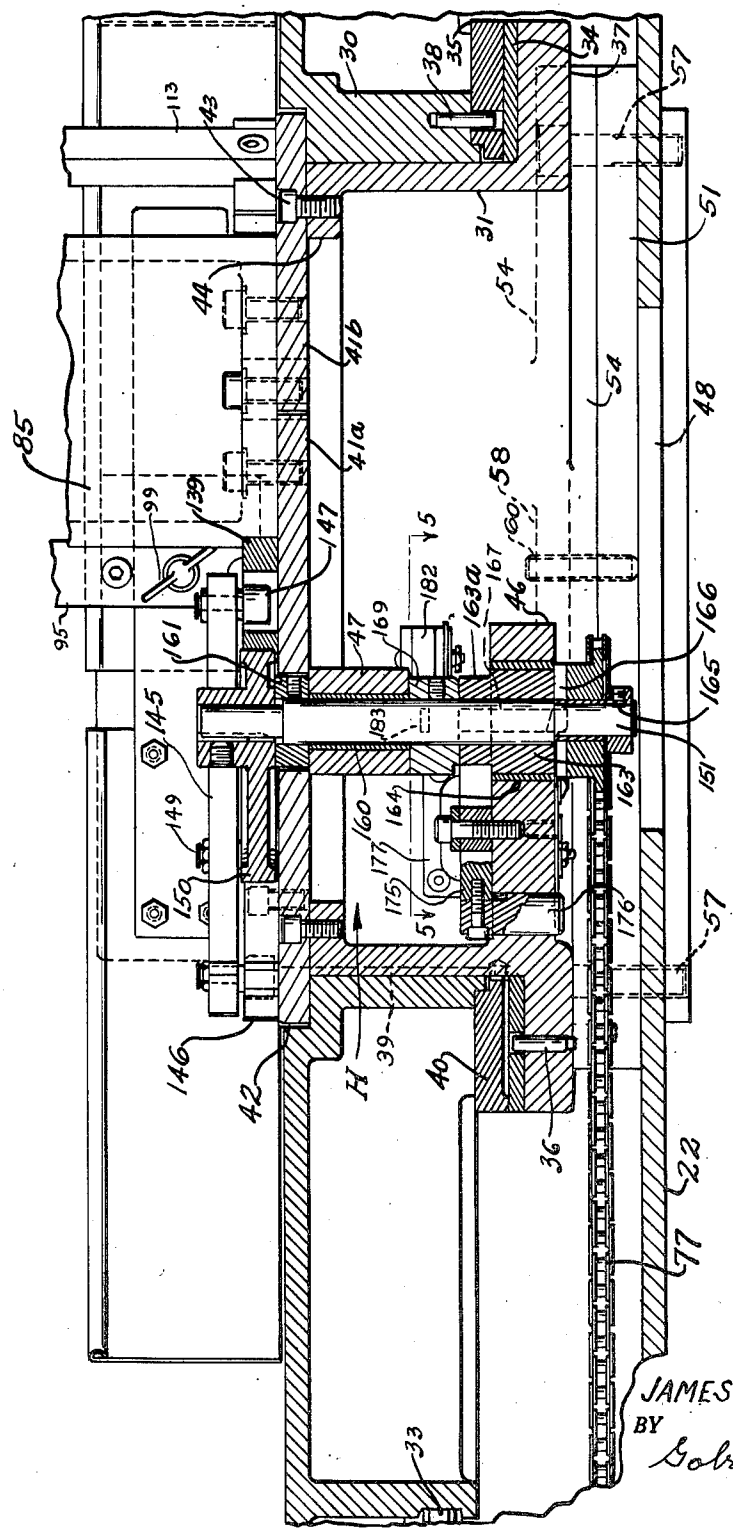

Fig. 3

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CONTAINER CONVEYING AND POSITIONING MACHINE FOR A PACKAGING APPARATUS

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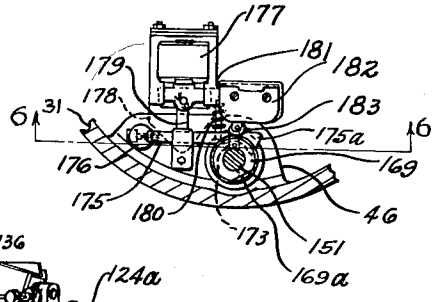
Fig. 5



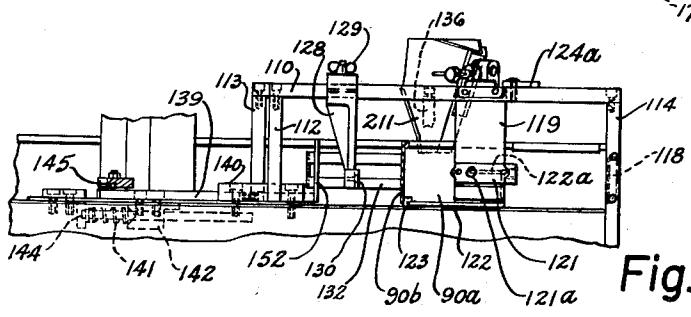


Fig. 4

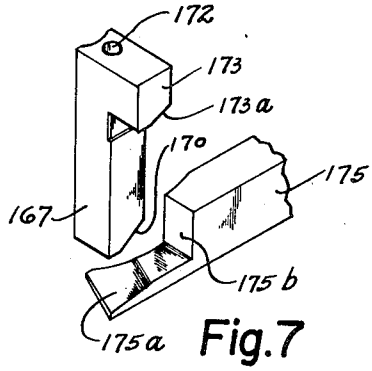


Fig. 7

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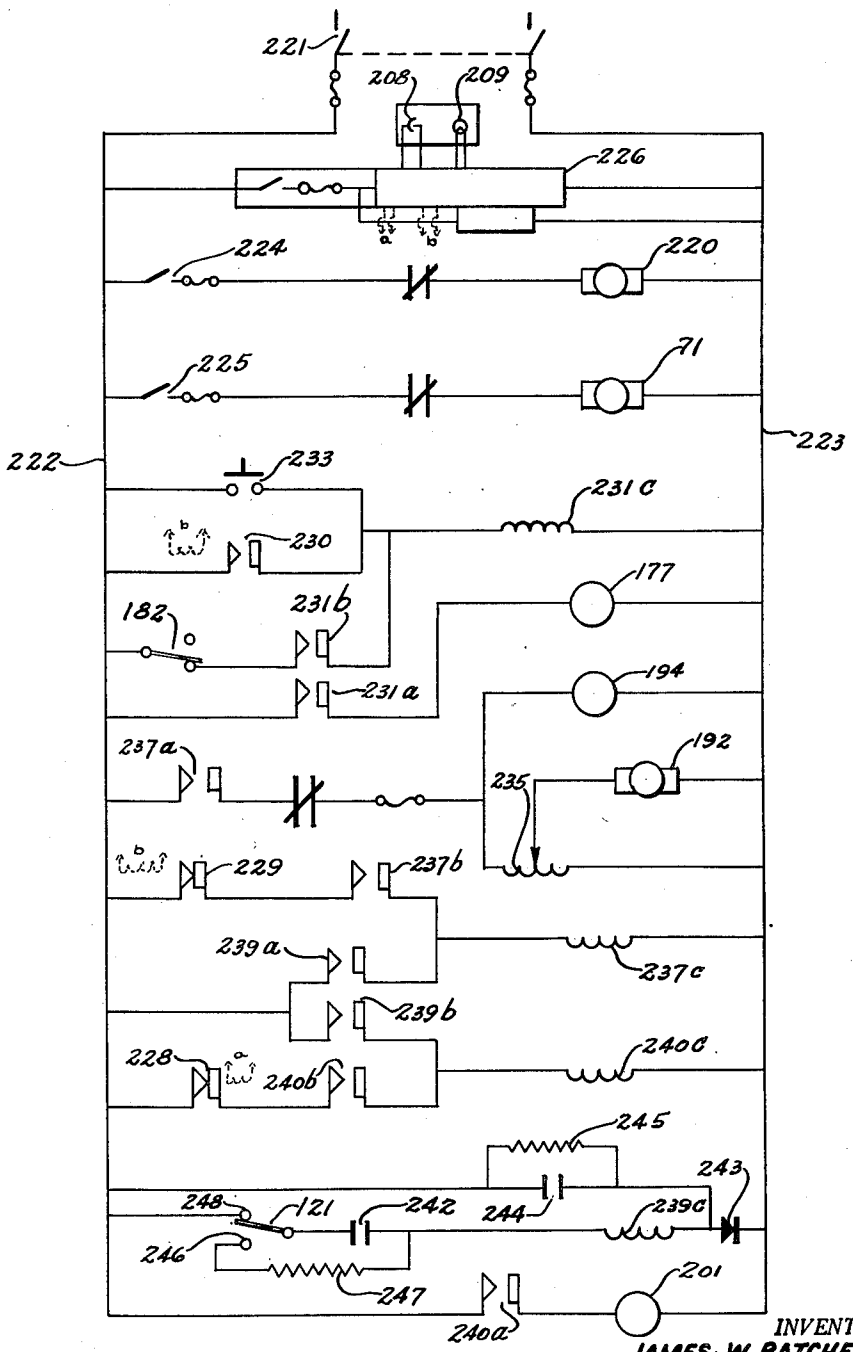

Fig.8

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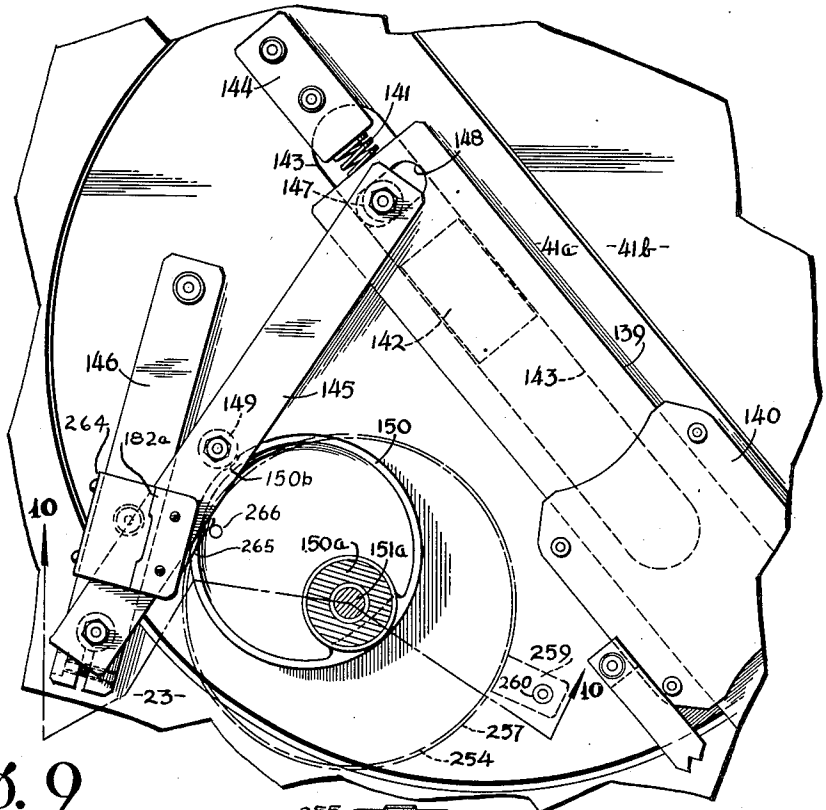

Fig. 9

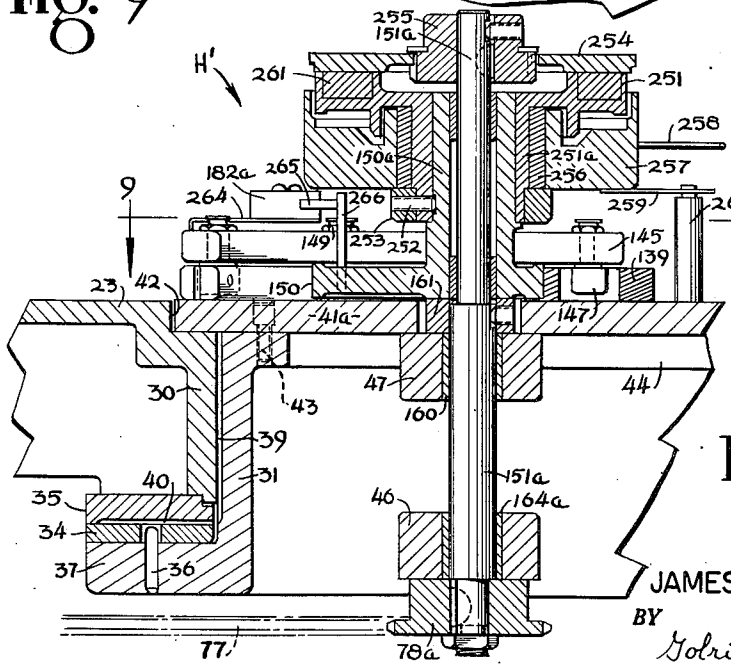

Fig. 10

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CONTAINER CONVEYING AND POSITIONING MACHINE FOR A PACKAGING APPARATUS

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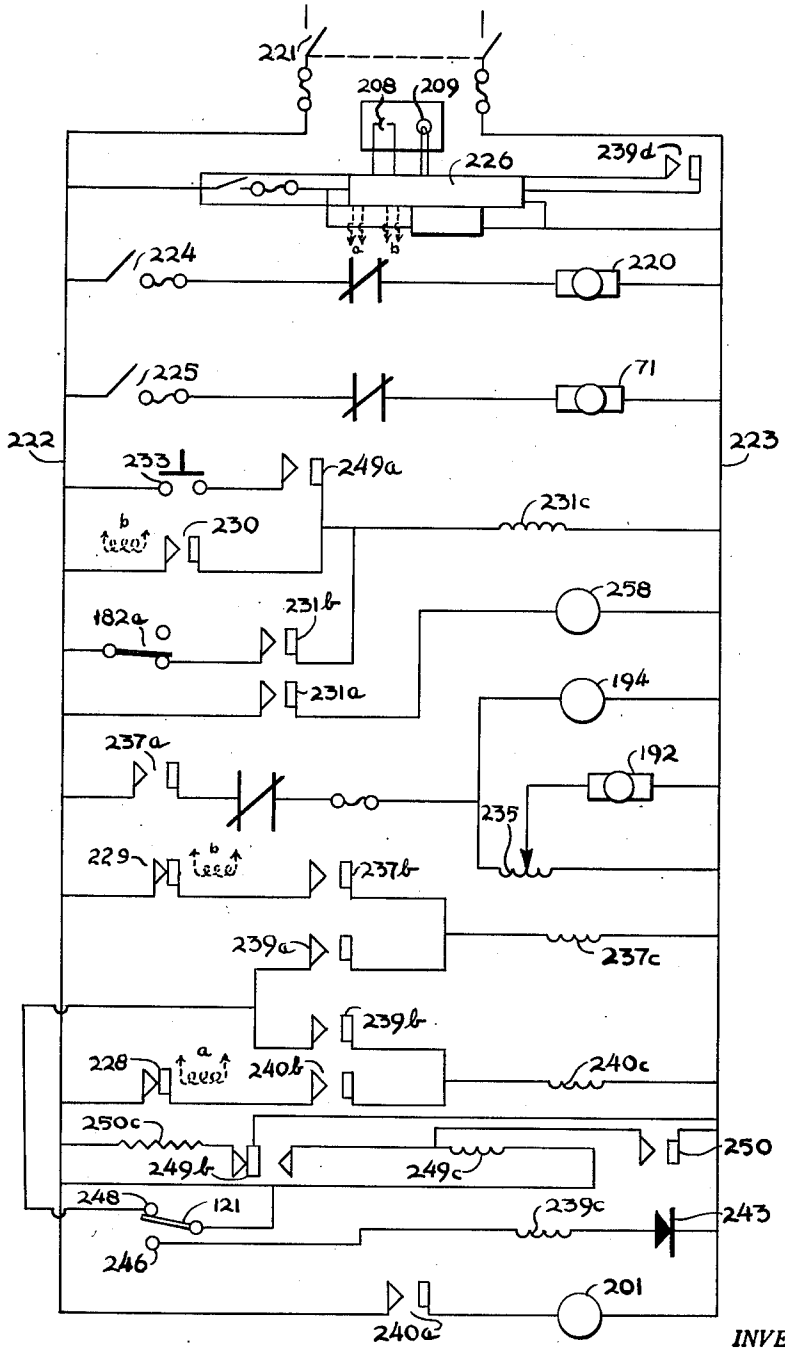

Fig. 11

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CONTAINER CONVEYING AND POSITIONING MACHINE FOR A PACKAGING APPARATUS

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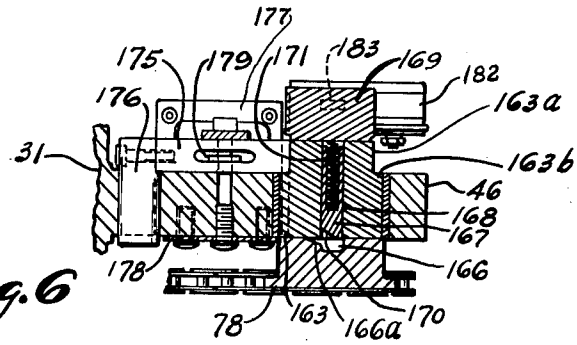

Fig. 6

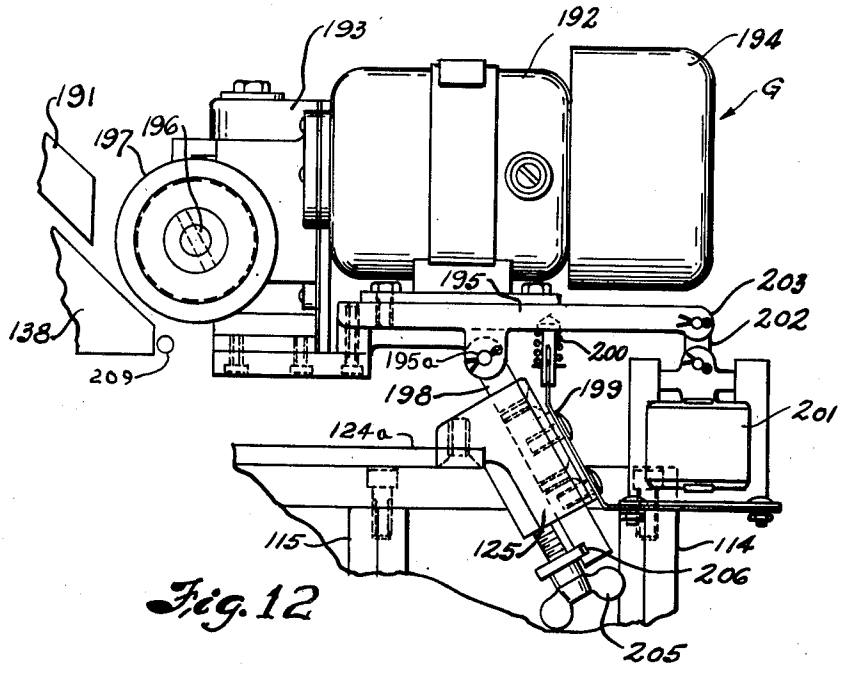

Fig. 12

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United States Patent Office 2,792,031 Patented May 14, 1957

2,792,031

CONTAINER CONVEYING AND POSITIONING MACHINE FOR A PACKAGING APPARATUS

James W. Batchelder, Ascutney, Vt.

Application May 25, 1954, Serial No. 432,219

20 Claims. (Cl. 141—153)

The present invention relates to a package filling apparatus, for example, an apparatus for filling screws, nuts, rivets and other items into containers, and more particularly to a container conveying and positioning mechanism in such an apparatus. This application is a continuation-in-part of copending application Serial No. 369,161, filed July 20, 1953.

The invention will be described and discussed in terms of screws to be packaged in boxes, although the invention may readily be adapted for handling certain other containers, such as cans and jars or the like. Accordingly, the machine of the present invention is described in conjunction with, but is not necessarily restricted to use with, means for feeding screws adapted to receive screws in bulk and deliver them in controlled flow to a box filling station of a packaging apparatus wherein an electric screw counting device is provided including a count totalizer adapted to be set at an exact desired count for sending a signal to a flow stopping device to shut off the flow at desired count. The machine of this invention includes a continuously moving endless conveying surface, for example, a rotary type table, for conveying empty boxes from a box feed point such as an operator's table to the box filling station of the machine and from the filling station to a discharge point, all in an orderly fashion. A box escapement mechanism is provided above the conveying surface for receiving and delivering empty boxes successively to the filling station and for expelling filled boxes therefrom when the final count to each is attained. The machine is substantially entirely automatic, requiring operator attention only for supplying the rotary table or other conveyor with empty boxes and for removal of filled boxes discharged therefrom.

Though not herein shown, conveyor means may be used in conjunction with this invention for delivery of boxes to and removal from the feed and discharge points of the rotary table.

A principal object of the invention is the provision of an apparatus including means for conveying boxes to and orienting them in a box filling station to receive screws delivered thereto for packaging and for removing filled boxes from the filling station to a discharge point automatically.

Other objects and advantages of the invention will appear from the following description and the drawings, wherein:

Fig. 1 is a side elevation of the apparatus with certain parts shown in fragmentary form and certain others broken away for the sake of clarity;

Fig. 2 is a plan view of the rotary table type box conveying machine;

Fig. 3 is a fragmentary section taken substantially along the staggered line 3—3 in Fig. 2 through the supporting pivot post of the rotary table, with certain parts broken away;

Fig. 4 is a fragmentary view taken as indicated by the line 4—4 in Fig. 2 to show in side elevation certain

elements of a box escapement mechanism associated with the rotary table;

Fig. 5 is a fragmentary plan view of a single revolution clutch mechanism for the box escapement taken along the line 5—5 in Fig. 3;

Fig. 6 is a vertical partial section taken along the line 6—6 of Fig. 5;

Fig. 7 is a perspective view of the clutch key and clutch latch bar shown separated from other clutch elements;

Fig. 8 is a control circuit diagram;

Fig. 9 is a partial plan view of the table center post showing a modification of the single revolution clutch means, viewed from the line 9—9 in Fig. 10;

Fig. 10 is an irregular vertical section through the clutch taken approximately along the staggered line 10—10 in Fig. 9;

Fig. 11 is a modification of the circuit of Fig. 8; and

Fig. 12 is a detailed view of a flow control regulating mechanism.

The general organization of the apparatus of this invention may best be seen in Figs. 1 and 2 as comprising a supporting base or pedestal A; a rotary table type packaging or box feeding mechanism B including a box escapement and positioning mechanism C for locating boxes individually and successively at a box filling station; an operator's table D for receiving empty boxes being loaded to the box feeding mechanism and filled boxes discharged therefrom; and mechanism for delivering the screws to be packed at the filling station on the table in controlled, counted flow including a feeding machine F of the track discharge type and screw counting and flow control mechanism G.

The operator's table D at one side of the apparatus comprises an extended plate 20 mounted by brackets 21 to the top plate 22 of the pedestal A to provide a horizontal box handling surface level with the surface of the circular rotary box conveyor table 23 of the box feeding mechanism B. The inward side of the horizontal plate 20 is arcuately recessed at 24 to conform with and receive the traveling edge of the circular or annular rotating conveyor table 23, and lateral curb members 25, 26 and inner edge curb members 27, 28 terminating at recess 24 partially enclose the working surface of table D.

The rotary table 23, which in its counter-clockwise rotation provides an annular box conveying surface for transporting boxes or other upwardly open containers or packaging units P, shown by dashed outlines in the drawings, from the table D to the box positioning mechanism C and back to the table D, as may be seen in Figs. 3, 9, and 10, has on its under side a cylindrical hub structure 30 journalled about a hollow table pivot post 31 supported by the top plate 22 of the pedestal, while a cylindrical flange 32 concentric with the hub forms a pulley for the driving V-belt 33. Suitable thrust bearing means, for supporting the weight of the rotary table 23, is provided by flat rings 34 and 35 secured respectively by pins 36 to the outwardly extending bottom flange 37 on the pivot post and by pins 38 to the end of the table hub. Longitudinal grooves 39 in the pivot post extending down to the bearing rings and radial grooves 40 extending radially into the bearing face of the upper ring 35 may be provided for lubrication.

A flat circular pivot post cap plate (for convenience in assembly and maintenance such as cap plate being split into two segments 41*a*, 41*b*), extending radially into the circular recess 42 about the hub opening of the rotary table, is secured to the upper end of the pivot post by bolts 43 threaded into the inwardly extending flange 44 thereof. Within and adjacent the bottom end of the pivot post there is provided an integral inwardly extending plate 46, and likewise near the upper end, a lug

47 for supporting a clutch structure H hereinafter described for the operation of the box escapement mechanism. For access to the under side of the pivot post the pedestal top plate 22 is apertured at 48.

To facilitate changing of the endless V-belt, the rotary table pivot post 31 is supported at opposite sides by a pair of parallel spacer bars 51, 52 resting on pedestal top plate 22, which bars normally support the entire weight of the pivot post and other structures bearing thereon. Across the bottom of the pivot post there is provided on opposite sides corresponding foot formations 54, 55 laterally projecting beyond flange 37 to bear on the spacer bars, and the pivot post 31 is normally secured to the upper member 22 of the pedestal by bolts or machine screws 57 passed through the projecting ends of these feet, the spacer bars and the top plate of the pedestal. However, at a position corresponding to the mid-length of each of these feet 54 and 55, flange 37 is provided with outwardly and extending lugs 58 and 59 threaded to receive vertical socket head set screws 60 and 61 spaced from the feet. Thus upon removal of the securing screws 57, and turning say the set screw 60 down to bear upon the top plate 22 of the pedestal and so take up the weight of the pivot post, the spacer bar 51 may be slid out from beneath the pivot post. By similar manipulation the other spacer bar may be removed after replacement of the first.

Thus when change of the endless V-belt 33 is necessary, the belt may be passed under the set screw at one side of the pivot post, the set screw turned down to take up the weight of the pivot post and annexed structures, the spacer bar removed to permit advancing the belt into the space under and between the spacer bars. The spacer bar may then be replaced and the set screw released. The second spacer bar may be removed at the opposite side in a similar manner, the V-belt then advanced into the space between the second spacer bar and its set screw, so that after replacement of the second spacer bar and release of its set screw, the new belt is then located about the pivot post for final connection.

At one side of the apparatus on the lateral plate member 70 of the pedestal, there is mounted a box feeding mechanism power assembly J comprising an electric motor 71 and speed reduction unit 72 adjustably mounted by means of a slide member 73 extending from the base of the power unit into a supporting slideway member 74 secured to the pedestal. On the vertically extending shaft of the reduction unit 72 there are keyed a V-belt driving pulley 76 and a chain sprocket 75 which drive respectively the rotary table 23 through V-belt 33, and the escapement mechanism C through the sprocket chain 77 on the sprocket wheel 78 of the clutch mechanism H. An idler sprocket wheel 79 is carried on an arm 80 bolted to the top plate 22 at selected position by a single bolt for taking up slack in chain 77 after the tension of V-belt 33 is adjusted by setting the position of power assembly J relative to slideway member 74.

An inverted U-shaped yoke member 82, the vertical legs 83 of which are fixed to and supported by the top plate 22 of the pedestal A, provides a horizontal beam 84 spanning the portion of the rotary table 23 let into the operator's table D. With vertical post 85 secured to pivot cap plate 41*b*, beam 84 provides support for the base plate 86 mounting above the table, the mechanism F for feeding screws, and also serves to support box guiding vanes. One guide plate 90 extends from table D arcuately about one side of the rotary table 23 curving inwardly to the escapement mechanism C, being supported at one end by curb member 27 of the operator's table, laterally by a curved plate 91 secured to and extending upwardly from the pedestal and at the inner end by the escapement structure C.

A second guide plate 92 extends around the edge of the rotary table 23 from the outer end of the escapement mechanism C back to the operator's table, being supported at one end by structural members of the escapement, laterally by a plate 93 extending upward from the pedestal, and at the other end by the inner curb member 28 of the operator's table. A pair of posts 95, 96 extending downwardly from the beam portion 84 of the yoke member 82 toward the table, support a horizontal slideway 97 wherein the guide plate or strip 98 is slidably adjustably secured by wing nut 99. The curved end portion of 98, being spaced from plate 90, provides a box entrance to the rotary table adapted to direct the boxes into proximity to plate 90. The ends of a straight guide member 100, which extends obliquely outwardly onto the operator's table are secured to post 95 and to the table plate 20, while a curved guide plate or strip 101 extends outwardly between and is secured to the second vertical post 96 and guide 100 to deflect to one side of table D boxes discharging from the rotary table in the channel formed by plate 102 secured to post 96 and the escapement mechanism structure in spaced relation to the discharge guide plate 92 at the periphery of the table.

The box escapement or positioning mechanism C may best be seen in Figs. 2 and 4, and in Fig. 3 for the clutch mechanism H thereof. A parallel pair of bars 110 and 111, supported at inner ends by posts 112 and 113, secured to the pivot cap plates 41*a* and 41*b*, and at their outer ends by bracket posts 114 and 115 extending upwardly outside the periphery of the rotary table from the top plate 22 of the pedestal, form a bridge mounting other components above and at one side of the rotary table. Thus, ends of the spaced inner and outer box discharge guide members 102 and 92 are secured respectively to the post 117 depending from bar 111 and to the horizontal spacing strut 118 between bracket posts 114—115, while plate 119 dependent from bar 110 provides an attachment for the radially outwardly bent inner end 90*a* of the arcuate box guide member 90. A micro-switch 121 bracketed to the outside face of plate 119 has its actuating button 121*a* bearing upon the upper arm 122*a* of a U-shaped switch trigger 122 pivotally secured along its yoke portion to plate 119 with its free end 123 projecting through an aperture in guide member end 90*a*. Outwardly of the position of plate 119, a plate 124 secured atop and transversely to bars 110 and 111 provides a support projection at 124*a* for the slide block 125 of the screw flow control mechanism mounting hereinafter described.

A bracket post 128 depending downwardly from the bar 110, whereon its upper end is adjustably slideably mounted and set by wing nut 129, carries a finger or guide strip 130 disposed generally parallel to the straight end portion 90*b* of the guide 90 to form a box orienting entrance of the escapement, while the free finger end 130*a* curves away from the guide 90 to funnel boxes carried by the rotary table into the escapement entrance. This structure, involving elements 128, 129, 130 and 90, omitted in Fig. 1 for clarity of representation of other structure, is apparent from Figs. 2 and 4. Opposite and at right angles to this entrance, a box stop 132, extending parallel to the end portion 90*a* of guide member 90, is adjustably mounted for movement toward and away from the escapement entrance by a laterally extending bar or arm 133 slideably mounted in a horizontal slideway 134 carried on the post 136 dependent from bar 111.

The box stop 132 and the portion 90*a* of guide 90 thus provide a radially directed channel or path—adjustable in width for the accommodation of various size box runs—along which boxes may be moved, in a manner to be explained, from the escapement entrance to a position beyond the inwardly reflected stop end 132*a*, whence the boxes are carried on the perimeter of the rotating table into the box discharge channel leading back to the table D. The space between the vertical faces of 90*a* and 132 beyond the micro-switch trigger end 123 defines a box filling station beneath the screw feeder machine discharge track, the downward projection of which in Fig. 2 is partially outlined by dashed-dotted lines 138,

with the projected position of a photoelectric counting cell 208 and light source 209 similarly outlined.

As may be seen in Figs. 2, 3, and 9, a box pusher arm 139 is slidably mounted on the top face of the pivot post cap structure by a guide bridge 140 of inverted channel shape bolted to the plate 41*a* for longitudinal reciprocation radially of the rotating table in pushing a box, carried by the rotary table through the escapement entrance to stop against 132, outwardly into the box filling station. The arm is urged outwardly by the force of a compression spring 141 interposed between the block 142 depending from the bottom of the pusher arm into the slot 143 in the plate 41*a* and the L-shaped bracket 144 depending into the end of the slot. A lever 145, pivotally supported at one end by a support arm 146 bolted to the plate 41*a* and carrying at its other end a roller 147 projecting into the pusher bar slot 148, carries near its mid-point a cam following roller 149 bearing against the edge of a circular eccentric cam 150 secured to the upper end of the shaft 151 propecting upward through the plate 41*a* from the from the clutch mechanism H. Hence, as the eccentric cam in rotating through one revolution recedes from and advances toward the lever, the pusher bar slides outwardly under the force of the compression spring and is again cammed inwardly to retracted position.

On the working end of pusher arm 139 there is affixed a transverse vertical plate 152 for engaging a substantial lateral box area. Preferably the box stop 132 is slotted or formed of coplanar metal strips, with a laterally projecting portion of the plate 152 slotted, allowing mutual interprojection thereof at right angles to prevent snagging of a box corner therebetween.

The general arrangement of the clutch mechanism H, a single revolution clutch, is seen in Fig. 3 and in the details thereof appearing in Figs. 5 and 6. The clutch shaft 151 is journalled by a sleeve bearing 160 in the cast lug 47 on the pivot post wall and is vertically supported thereon by the collar 161 secured thereto within an aperture in the plate 41*a* beneath cam 150, while the lower end of the shaft passes through and is pinned to a collar 163 journalled in bearing 164 in the support plate 46 projecting inwardly from the lower end of the pivot post. The lower end of the shaft 151, projecting through the collar 163, carries the continuously driven counterclockwise rotating sprocket wheel 78 held thereon by an end collar 165, the sprocket wheel hub face adjacent collar 163 being provided with a plurality of radial slots 166 for engagement by the end of a clutch key or pin 167, longitudinally slideable in a keyway slot 168 cut in the collar 163 to drive the shaft as hereinafter described.

Between the reduced upper end 163*a* of collar 163 and the lug 47, a switch cam collar 169 with a flat 169*a* thereon is secured to the shaft by a set screw. The leading edge 166*a* of each slot 166 in the hub of sprocket wheel 78 and corresponding edge 170 on the key end insure clutch engagement when the pin is free to move downwardly under the bias of compression spring 171 disposed in key bore 172 and bearing against the bottom of collar 169. At the upper end of the key a laterally extending head 173 propects radially from the reduced collar portion 163*a* above the collar shoulder 163*b*, the under side of the projecting key head being beveled at 173*a* on the edge toward the direction of rotation. A clutch actuating arm 175 pivotally mounted at one end to plate 46 by a pivot pin 176 is shaped at its free end to provide a beveled edge 175*a* and inward thereof a shoulder 175*b* which respectively serve to lift the key out of engaged position by knifing inwardly under the beveled edge 173*a* of the key head and to engage the head 173 to stop the shaft after a single turn.

A solenoid 177 secured by a bracket plate 178 to the clutch support plate 46, with its armature connected to the clutch actuating arm 175 by a pivot link member 179, upon energization withdraws the clutch arm from beneath the key to permit engagement of the clutch The compression spring 180 interposed between the bracket 181 and the clutch actuating arm biases the arm toward clutch disengaging position, so that upon de-energization of the solenoid the actuating arm is moved into position in readiness to wedge under the head 173 and lift the key from clutch engaged position as it completes a revolution. The solenoid release micro-switch 182 mounted on the solenoid, with a roller 183 on its actuating button bearing upon the cam collar 169, is actuated shortly after the clutch engages by passage of the cam collar flat 169*a* to de-energize the solenoid and release clutch arm 175. To this end, the cam flat 169*a* is angularly positioned relative to the clutch pin in a rotationally lagging position, so that when the shaft comes to a stop with the clutch pin against shoulder 175*b*, the micro-switch roller 183 bears on a cylindrical portion of collar 169 ahead of the flat.

As may be seen from Fig. 1, the feeding machine F for feeding screws is mounted above the rotary table upon a horizontal plate 86. This feeding machine, shown in drawings only in fragmentary portion since its specific structure is per se no part of the present invention, may be any machine having a hopper adapted to receive a large bulk of the screws and having a track type outlet wherein the screws are aligned in soldiered, oriented fashion for individual successive discharge, and adapted for stoppage of the screw discharge by merely blocking screws on the track without stopping the entire machine. The machine may be, for example, such as that described in my co-pending application Serial. No. 293,303, filed June 16, 1952, wherein an inclined vibratory track appears in various modifications adapted to handle diverse objects. Here in the drawings the feeder F is fragmentarily represented only by the base portion 190 and discharge track 138 comprising a pair of spaced members between which screws are discharged in soldiered manner with the heads supported on the top edge of the track members and the shanks suspended therebetween. Above the track 138 there is provided a holding bar 191 in adjustably spaced relation to the track for preventing the screws from riding over each other in their progress down the track. The holding member as here appears terminates a short distance above the end of the track, which is positioned directly above the box filling station, as indicated by the dash-dot lines in Fig. 2.

The screw counting and flow control mechanism for regulating the discharge of screws from the track includes a variable speed electric track motor 192, a speed reduction unit 193 and an electric brake 194 for the motor, supported as a unit upon a common base 195. Adjacent and above the end of the feeding track 138, the output shaft 196 of the speed reducer carries a rubber-tired feed control wheel 197 disposed with its plane of rotation in the plane of motion of the screws down the feed track. The base plate 195 of the assembly is pivoted at 195*a* to a slide member 198 adjustable in the slide block 125 carried by the transverse bar 124 on the escapement mechanism C, so that the assembly may be tilted about a horizontal pivot axis transverse to the plane of the track to swing the control wheel 197 away from or against screws on the track. To urge the track motor assembly and control wheel normally toward the track, between a bracket plate 199 on the slide member 198 and the bottom of the motor assembly base plate 195 a helical compression spring 200 is operatively disposed. Also carried by the bracket plate 199 is a solenoid 201 having its armature connected through the pivot link 202 to the outer end 203 of the track assembly base plate. Thus by the bias of the compression spring the track assembly is normally urged to bring the control wheel to bear upon the heads of the screws passing over the end of the feed track to initiate a controlled trickle flow with the wheel slowly turning and to stop the screw flow when the control wheel is stationary, while the assembly may be drawn away from the feed track

against the bias of the spring upon energization of the solenoid to permit free flow of screws.

For adjustment of position of the track control wheel **197** relative to the track for varying sizes of screws, the track motor assembly may be adjusted by moving the slide member **198** in the slide block **125**, as, for example, by a wing nut **205** threaded into the slide block with axis parallel to the slide and having a head flange **206** engaged in a slot **207** in the slide member. Beneath the control wheel **197** a photoelectric cell **208** and light source **209** directed to the cell are mounted on opposite sides of the track so that screws discharged therefrom and dropping into a box in the box filling station below will interrupt the light beam to produce a counting signal for a count totalizer. The cell and light source may be mounted on the end of the track, the base plate of the track motor assembly or upon the structural members of the box escapement feeding mechanism C, depending upon the design features used in these several structures. If desired a chute or funnel structure **211** may be mounted below the feed track to guide the screws or other counted objects into a container located at the filling station.

The driving unit J for continuously driving the rotary table and the clutch sprocket wheel **78** and the driving units **220** of the feeder machine F may be switched on and off by a master control switch **221** in the lines **222**, **223** or by individual switches **224**, **225** in conventional manner at the beginning and end of a working period or screw packaging run, as shown in Fig. 8 representing a control system hereinafter described integrating the operation of the box escapement mechanism C and of the screw flow control assembly G whereby automatic operation is provided.

An electronic or electromechanical counting and totalizing unit **226** is provided into which are fed the signals generated by screws interrupting the light beam to the photo cell **208** in dropping to a box in a filling station. Such totalizer is adapted to be set at a desired final screw count per count cycle (i. e. per box) to develop a first output impulse or signal at a point in the count a selected number previous to the final count and a second signal or impulse at the selected final count. The first impulse through one relay *"a"* in the unit opens the normally closed relay switch contacts **228**, and the second or final count impulse, through a second relay *"b,"* simultaneously opens the normally closed relay switch contacts **229** and closes the normally open relay switch contacts **230** for the purposes hereinafter described. Upon attaining the desired final or lot count for which the unit is preset, the totalizer automatically resets itself to zero for another lot of the same count, that is the unit is "self-clearing." Since the totalizer **226** of the control system and its components may be of conventional design and are not per se in their particular structure part of the invention here claimed, no wiring diagram or detailed description is given for that unit, but only the operating characteristics required therein.

Operation of the escapement mechanism is controlled through a clutch solenoid relay having the switch contacts **231***a* thereof in series with clutch solenoid **177** across lines **222**, **223**, and second switch contacts **231***b* for self holding in series with the normally open clutch micro-switch **182** and the relay coil **231***c* across the lines **222**, **223**. A normally open starting switch **233**, as a push-button switch, and the normally open relay switch contacts **230** are connected in parallel between line **222** and a point between coil **231***c* and holding contacts **231***b*. Hence, if micro-switch **182** is of the normally open type and held closed by the cylindrical surface of cam collar **169**, upon momentary closing of the starting switch **233**, the relay coil **231***c* is energized to close the relay holding switch **231***b* and the solenoid swtich **231***a*. Thus solenoid **177** is energized to permit engagement of the clutch H. The transit of the cam flat **169***a* past the switch roller **183**, after the shaft starts to rotate, briefly opens and then closes the micro-switch **182**, thereby de-energizing the relay coil **231***c* to cause opening of the solenoid switch **231***a* and the self-holding switch **231***b*, de-energizing the clutch solenoid **177** to release clutch arm **175**. Hence upon completion of a single turn of the shaft **151**, the clutch arm disengages the clutch. Such clutch cycle causes a single turn of cam **150** and a single stroke or reciprocation of pusher arm **139**, thereby feeding a box into the filling station.

When switch **230** is closed by the final count impulse produced by totalizing unit **226** after the desired number of objects has passed into a box in the filling station, the same cycle of clutch control operations is repeated to actuate the escapement mechanism, automatically feeding an empty box into position at the filling station while expelling the previously filled box therefrom.

Controls for the motor **192**, electric brake **194** and solenoid **201** include means energizing solenoid **201** on receipt of a signal from micro-switch **121** when actuated by complete passage of a box by its trigger arm **122**, thereby to draw the screw flow control wheel **197** away from the tracks and to permit rapid screw flow; to simultaneously release the motor brake **194** and start the motor **192** before the wheel comes into track engagement; to cut off current flow to solenoid **201** on receipt of the aforementioned first impulse from the totalizer, so that under bias of spring **200** the slowly turning control wheel **197** is swung into contact with screw heads on the track to initiate trickle flow beneath the wheel; and to cut off power to motor **192** and actuate motor brake **194** upon receipt of the said second totalizer output signal to stop the wheel rotation and hence the trickle flow at exact final count. Preferably there is provided a motor speed control means, such as the variable auto-transformer **235** whereby the speed of rotation of wheel **197** may be preset in accordance with a particular size of screw being fed, or for the time required for operations of the apparatus.

As here shown the electrically controlled brake **194** and motor **192** are effectively in parallel with each other for operation as a unit, so that as current is supplied to start the motor, the brake is electrically-solenoidally-disengaged, the brake being spring engaged when current to the motor, and therefore to the brake solenoid, is cut off.

In series across the lines **222**, **223** with the brake-motor combination there is the normally open relay contact switch **237***a* closed by motor relay coil **237***c*, the motor relay including the relay self-holding switch **237***b* in series with the relay coil and with the normally closed switch **229**, across lines **222**, **223**. Another normally open relay switch **239***a*—simultaneously closed with switch **239***b* by energization of relay coil **239***c* as will be explained—is connected from coil **237***c* to line **222**, that is in parallel with the series switches **229** and **237***b*. Hence upon momentary closing of **239***a*, coil **237***c* is energized to close relay holding switch **237***b* keeping the relay energized and closing **237***a* to start motor **192** and release brake **194**. The opening of relay switch **229**, occurring simultaneously with the closing of switch **230** to actuate the escapement upon final count signal as above explained, de-energizes coil **237***c* to release an open relay holding switch **237***b* and motor control switch **237***a*, thereby cutting off current to the motor **192** and brake **194** to stop wheel **197**.

The solenoid **201**, for drawing the control wheel unit away from the feed track, is connected in series with the normally open relay operated switch **240***a* across the lines **222**, **223**, while the relay coil **240***c* therefor is connected across the lines **222**, **223**, in series with the relay holding switch **240***b* (closed by the coil with main switch **240***a*) and the normally closed relay switch **228**. The relay switch **239***b* is connected in parallel with the series switches **228** and **240***b* from the coil **240***c* to line **222**, so that upon closing of **239***b* along with **239***a* by energization of coil **239***c*, the relay coil **240***e* is energized to close **240***a* and **240***b*, thereby keeping solenoid **201** energized

and the control wheel **197** drawn away from the track to allow free flow, until **228** is opened upon the first output signal from the totalizer. With **228** opened **240***a* opens to de-energize the solenoid **201**, permitting the wheel **197**, now rotating, by the bias of the spring **200** to swing into engagement with objects on the track to initiate trickle flow.

The micro-switch **121** which serves as a box actuated trigger to start free flow of screws from the track to the filling station is a single-pole double throw switch, the arm of which is connected through capacitor **242**, relay coil **239***c* and selenium rectifier **243** to line **223**.

A capacitor **244** and resistor **245** in parallel are connected from a point between coil **239***c* and rectifier **243** to **222**, for ripple smoothing of the half-wave power rectifier circuit. One point **246** of switch **121** is connected by resistor **247** to capacitor **242**, so that as a box first engages switch **121**, the switch arm is thrown to contact **246** to discharge **242**. When the box has passed the switch, and therefore is positioned in the filling station, the switch arm returns to normal contact with switch point **248** connected to line **222**. Thereupon current flows through relay coil **239***c* until capacitor **242** is charged, the time being determined by the chosen values of the circuit elements involved. The current through coil **239***c* closes simultaneously the relay switches **239***a* and **239***b*, which of course open with the diminishing charging current. As previously explained, closing of **239***b* causes solenoid **201** to withdraw the control wheel **197** from the engaged position where it withholds flow on the feeder track, and the closing of **239***a* causes release of brake **194** and starting of motor **192**.

In summary, at the start of a box filling run with the turntable motor **71** and hopper feeder motors **222** running, closing starting switch **233** momentarily actuates the single cycle clutch mechanism to position a box at the filling station. The box, in tripping micro-switch **121**, causes closing of relay switches **239***b* and **239***a* to tilt the control wheel **197** from the track to start free counted flow of screws, and to start the rotation of control **197**. At the chosen number before desired final count, the totalizer first output or "warning" signal causes relay switch **228** to open thereby effecting release of the rotating control wheel to trickle flow position. At final count, the second output signal of the totalizer opens relay switch **229** thereby cutting off motor **192** and engaging brake **194** to stop flow at exact count; and also closes switch **230** to initiate the escapement single clutch mechanism for repetition of the cycle.

As long as boxes are present on the rotating table the above described composite cycle of operations continues until the last box is filled. When the second output signal of the totalizer corresponding to the final count for the last box actuates the clutch, a single stroke of the pusher arm follows, but since no box is thereby impelled into the filling station to trip the trigger arm **123** to actuate switch **121**, switches **239***a, b* remain open, the control wheel **197** remains braked and in engaged position, and no flow of screws ensues to cause photocell signals. Hence no further output signals of the totalizer are developed to actuate either the flow control mechanism G or the clutch mechanism H, so that the operation thereof is automatically stopped. When a new supply of boxes is fed into the apparatus, the starting switch **223** in the circuit energizing the solenoid **177** must be closed to start the automatic feeding of the boxes. In the event that the supply of screws in the feeder machine is exhausted, since no photocell signals are fed to the totalizer, no output signals are developed, and the unfilled box remains in fiilling position until the hopper feeder is filled.

An electromagnetic type clutch H' is shown in Figs. 9 and 10 mounted above the cam **150**, similar reference numerals being used for elements similar to those in the previously described clutch mechanism H. Here the clutch input shaft **151***a*, journalled by sleeve bearings **160** and **164***a* in the upper and lower lugs **47** and **46** cast on the interior of the post **31** and supported on lug **47** by a set screw held collar **161**, is continuously driven by sprocket chain **77** through sprocket wheel **78***a* secured on the reduced and threaded lower end of the shaft by a key and nut. The round cam **150** here has an upwardly extending integral hollow cylindrical eccentric hub post **150***a* into which are fitted upper and lower sleeve bearings whereby the cam is journalled on the reduced upper part of the clutch shaft **151***a*, the cam being vertically supported on collar **161**.

A notch **150***b* located in the camming surface diametrically opposite the hub post serves as a detent notch receiving the cam follower roll **149** to stop the cam at a definite position as hereinafter described.

A rotor disk **251**, having a downwardly extending hollow hub **251***a* slip fitted on the upper end of the cam post **150***a* and vertically supported by a shoulder on the latter, is held in place by a set screw **252** threaded through collar **253** fitted on the reduced lower end of the cam post and through the hub **251***a* to bear upon a flat of the cam post **150***a*. The collar **253** supports certain elements hereinafter described. A ferromagnetic armature disk **254** is mounted on the upper end of shaft **151***a* for rotation therewith, but with some axial play, through an externally splined member **255** fixed on the shaft by a key and set screw and engaging internal splines in a central aperture of the armature disk. To limit upward movement of the armature and keep it in splined engagement with member **255**, the latter is provided with a split ring in a groove located above the splines. An annular stationary electromagnetic field member **257**, of which the electromagnet coil leads **258** are shown but not the winding itself, has a sleeve bearing **256** pressed into its central aperture for support on the hub **251***a* of the rotor between collar **253** and the disk part of the rotor. The field structure is held against rotation by a laterally extending arm **259** perforated near its outer end to fit the end of an anchor pin **260** on plate **41***a*. The hub portion **257***a* of the field is extended up slightly short of the rotor disk and an upwardly extending rim flange external to the rotor periphery may be provided to help localize the magnetic field resulting when the field coil is energized to produce a strong attracting force on the armature disk and hence a strong normal force increasing the frictional force developed between the upper surface of the rotor and armature to drive the cam. The upper surface of the rotor is here shown with two spaced concentric annular flanges forming a recess for a material **261** having a high coefficient of friction with respect to the armature material, which increases the frictional forces developed between armature and rotor. When the coil is de-energized the armature disk merely slides on the rotor disk.

A normally closed microswitch **182***a*, mounted above the box escapement actuating arm **145** by an inverted L-bracket **264** secured to the support arm **146** with its switch actuating arm **265** projecting into the path swept by a vertical pin **266** on the cam, is opened by pressure of the pin. With the clutch field coil **258** replacing the clutch solenoid **177** of Fig. 8, as shown in Fig. 11, then after the field coil is energized and the friction clutch constituted of rotor **251** and armature **254** are engaged, the cam is driven through a single rotation terminated by pin **266** opening the microswitch **182***a* to deenergize the relay coil **231***c* and open switches **231***a*, **231***b*, thereby de-energizing the clutch coil or winding. The cam follower roller **149** in dropping into the notch **150***b* on the cam surface is sufficient to stop the cam at a position where pin **266** still bears on the actuating arm **265** to hold the switch **182***a* open, and to maintain the cam at such position despite continual sliding friction forces developed by the armature bearing under its own weight upon the rotor.

For use with the clutch H' just described the control

circuit of Fig. 8 is modified in certain respects as shown in Fig. 11. Except as otherwise noted, the circuit of Fig. 11 and its functions is identical with that of Fig. 8. A slight modification not pertaining necessarily to the clutch control is also shown and will be first described.

With respect to Fig. 8 the counting and totalizer mechanism **226**, into which the photoelectric count impulses developed in the photoelectric head elements **208—209** were fed, on reaching final count not only developed an output impulse to energize the relay coil *"b"* for operation of the switches **229** and **230** but also automatically reset itself to zero count. Hence, if by wear or maladjustment of the screw flow control mechanism or any other adventitious cause screws were permitted to escape the control wheel **197** before replacement of a filled box by a succeeding empty one, not only would the prior box receive more than its set count, but also the count to the succeeding box would be correspondingly reduced. To avoid any possibility of such occurrence, the totalizer **226** in Fig. 11 does not automatically reset itself to zero at final count but has a zero reset circuit which resets upon closure of the switch contacts **239***d*. These latter contacts are incorporated as additional elements in the previously described relay comprised of contacts **239***a*, **239***b* and relay coil **239***c*. Thus, when **239***d* is closed simultaneously with **239***a* and **239***b* upon energization of **239***c* effected upon tripping of the microswitch **121** by a box passing into the filling station, the counter is reset to zero, that is, after an empty box is positioned to receive screws from the track. Hence each box necessarily must receive its full count of screws despite any overcount to a preceding box.

The clutch solenoid of Fig. 8 is here replaced by the clutch field coil or winding **258** and the normally open clutch solenoid microswitch **182** by microswitch **182***a* biased to normally closed position. Switch **231***a* and field coil **258** are shown in Fig. 11 in series directly across lines **222** and **223**; however, where the inductance of **258** is high as would usually be the case in an electromagnet having a large number of turns for strong armature attracting force, it would be preferable to put these elements in series across the output of a rectifying unit providing a suitable D. C. voltage, the input of the rectifier being across **222** and **223**.

Where the relative positioning of pin **266** and notch **150***b* is such that switch **182***a* is held open while the cam is stationary, as above described, the relay contacts **230** may be a delayed opening device, or the internal circuit of totalizer **226** may be such that the impulse closing **230** after final count is reached is maintained until the clutch gets under way. Thus after a final count impulse closes **230** to energize relay coil **231***c* for closing **231***a* and **231***b*, thereby engaging the clutch and allowing **182***a* to close as the clutch gets under way, the contacts **231***b* become effective in keeping **231***c* energized before **230** opens, so that **231***a* is closed and the clutch kept engaged until **182***a* is opened by pin **266**. Hence as pin **266** opens switch **182***a* to effect clutch disengagement cam follower **149** engages notch **150***b* to stop the cam rotation with the cam at definite position.

The relay contacts **230** connected as shown in Fig. 11 may be of the usual instant release type for opening immediately after the final count signal current to relay coil *"b"* ceases. In such case the cam stop notch **150***b* and pin **266** are spaced so that when cam follower roll **149** engages the notch, the pin **266** has already passed out of contact with the actuating arm **265**. Thus, at the last part of the single clutch rotation switch **182***a* is opened and then permitted to close again and to remain closed while the cam is stopped. In this case, after pin **266** contacts arm **265** to open **182***a* with consequent de-energization of relay coil **231***c* and of field coil **258**, the inertia of the driven clutch and cam elements carries the cam slightly forward until cam follower roll **149** engages the cam notch to stop the cam at definite position where **182***a* is again closed. Therefore a momentary closing of **230** by final count impulse is sufficient for proper operation since upon energization of coil **231***c*, the self holding contact **231***b* is effective to keep **231***a* closed and field coil **258** energized.

The branch of Fig. 8 which involved the escapement mechanism microswitch **121** and relay coil **239***c* for control of switches **239***a* and **239***b* is also modified. Microswitch contact **248** and the joined contacts of **239***a* and **239***b* are connected together rather than to line **222**, and the second microswitch contact **246** is connected to one end of the relay coil **239***c*, the other end of which is connected through a rectifier unit **243** to line **223**. The box microswitch arm **121** is here connected to line **222**. The relay comprised of elements **239***a, b, c, d* is a slow release relay. Hence after the box microswitch arm is moved momentarily by a box transit to contact **246** to energize coil **239***c* thereby closing switches **239***a, b,* and *c,* the latter switches remain closed even after return of switch arm **121** to **248**. Therefore the relay coils **237***c* and **240***c* are energized for starting track motor **192**, release of track motor brake **194** and withdrawal of the track wheel from screw blocking relation with the tracks by track solenoid **201**, after a box is in position for filling.

To delay feeding of the first box to the filling position and hence delay tripping of box microswitch **121** until the counter-totalizer **226**—where electronic—has warmed up for proper operation, a relay operated switch **249***a* normally open, is in series with starting switch **233** and relay coil **231***c* across lines **222** and **223**. An additional relay coil **249***c* is connected in series with a time delay switch **250** across the lines **222** and **223** for actuation of the switch **249***a* and the double pole switch **249***b*. The arm of **249***b* is connected to line **223** while one of its contacts is connected between relay coil **249***c* and the time delay switch **250**, the other contact to which the relay arm is normally biased being connected through the time delay heating resistance coil **250***c* to line **222**. When main line switch **221** is closed at the beginning of operations, although the rotary table motor **71** and feeder motor **220** may be immediately started, closure of box escapement start switch **233** is of no avail, until the heating of time delay heating resistance coil causes delayed closure of time delay switch **250** to energize relay coil **249***c*. Energization of **249***c* of course closes relay switch **249***a* so that clutch starting switch may function to initiate the feeding of the first of a run of boxes; and also swings the arm of switch **249***b* from its normal contact to its second or relay holding contact, so that **249***a* remains closed and the time delay switch is permitted to open and remain open as long as the main switch **221** is on.

In setting up the apparatus for a run handling particular screw and box sizes, the guide finger **130** is set relative to vane portion **90***b* to provide an entrance opening to the box escapement mechanism of proper size, and the box stop **132** is adjusted relative to **90***b* so that the trigger arm end **123** is tripped by passage of a box into the filling station. The position of screw flow control mechanism G is adjusted by wing nut **205** on the slide block to bring the control wheel **197** into proper spacing from track **138** for the size of screw or other object being packaged. The screw counting totalizer is of course set for the desired final count.

In operation of the apparatus, the hopper of feeder machine F is bulk loaded with screws as required, and the driving mechanism thereof is turned on along with the rotary table driving unit J for continuous operation during a work period or the duration of the packaging run with given screw or box sizes. Then empty boxes are either deposited on the rotary table by conveyor means or loaded upon the operator's table open side up and manually pushed indiscriminately as to orientation onto that portion of the rotary table projecting outwardly into the area of the table D. The boxes are carried by the rotating table between the guide plates or strip members

90—98, coming to bear against the inwardly curving guide member 90, so that with continued advancing motion the boxes are directed by the member 90 toward the entrance of the escapement mechanism, into which the first of the boxes, of course, passes to stop against the box-stop 132. The tendency of the remaining boxes is therefore to line up in serial position behind this first box.

The starting switch 223 is closed to initiate the operation of the escapement mechanism C and the counted screw flow control mechanism G with their automatic controls for carrying out the previously described operational cycles in repeated manner. As the filled boxes are successively expelled from the filling station onto the outer portion of the rotating table, they are carried back and directed onto the operator's table D by guide members 92, 102 and 100. Thus the only attention required of the operator when the apparatus is functioning is to supply empty boxes to the rotating table, remove the filled boxes from table D, and where the run of screws exceeds the hopper capacity of feeder machine F, to bulk load screws as required.

The advantages of the invention as above described and as shown in the drawings are susceptible of use in various ways. Thus the apparatus as a whole may be used with means for delivery of empty boxes to the entrance of the turntable and removal of filled boxes from the discharge outlet such as gravity feed chutes, moving belts or other conveyor means. The box or container conveying table, its escapement mechanism and controls may be adapted for use in conjunction with other apparatus for delivering material or objects to be packaged to the container filling station and controlling the flow of such material to the containers.

For example, where objects are to be packaged individually, a magazine arranged to release one object at a time may discharge to the container filling station; or where granular solids or other material is to be packaged in units of desired weight or volume, a suitable weighing or measuring apparatus may deliver successive batches to containers located at the filling station. In such cases, photoelectric or other means may be mounted adjacent the discharge path to sense the completed transit of each batch and develop a signal or impulse closing switch 230 to initiate the container escapement mechanism cycle. The container switch 121 may then serve to control the release, from the material measuring apparatus to a container at filling position, of a pre-measured batch of material, the various material feed control elements 192, 194, 201, 228, 229, 235, 237*a–c*, 239*a–c*, 240*a–c* in Fig. 8 for example, being modified or replaced by elements adapted for integrating the operation of the particular material feed or measuring apparatus contemplated with the conveyor and container escapement machine and controls.

I claim:

1. In a container filling apparatus, a container conveying, feeding and positioning mechanism comprising a rotatably mounted circular table providing a container conveying surface; means for continuously driving the rotary table; means mounted adjacent the rotary table providing a discharge surface in edgewise arcuate conformity and proximity to the edge of the rotating table for receiving containers discharging from said rotary table; a container positioning and escapement means including a channel structure extending generally radially outwardly above the said rotary table having a container inlet near one end thereof, a container outlet at the other end thereof, said inlet and outlet being disposed in opposite sides of said channel structure with the inlet toward the approaching surface of the rotary table, a pusher arm reciprocable within said channel to move a container from a position within said channel at said inlet to a portion of said channel intermediate said inlet and outlet providing a container filling station, said intermediate portion being disposed relative to the rotary table to restrain a container therein from movement with said rotary table until expelled therefrom to a position opposite the outlet by a following container moved by said arm, and means for intermittently operating said pusher arm through a single reciprocation cycle; and fixed guide means mounted above the rotary table extending in the direction of rotation to the inlet of said channel structure and from the said outlet to said discharge surface to guide into said inlet containers fed onto said rotary table and to guide onto said discharge surface containers leaving said outlet.

2. In a container filling apparatus, a container conveying, feeding and positioning mechanism comprising a rotatably mounted circular table providing a container conveying surface; means for continuously driving the rotary table; means mounted adjacent the rotary table providing feed and discharge surfaces in edgewise arcuate conformity and proximity to the edge of the rotating table for receiving containers feeding to and discharging from said rotary table; a container positioning and escapement means including a channel structure adjustable in width extending generally radially outwardly above the said rotary table having a container inlet adjustable in width near one end thereof, a container outlet at the other end thereof, said inlet and outlet being disposed in opposite sides of said channel structure, a pusher arm reciprocable within said channel to move a container from a position within said channel at said inlet to a portion of said channel intermediate said inlet and outlet providing a container filling station, said intermediate portion being disposed relative to the rotary table to restrain a container therein from movement with said rotary table until expelled therefrom to a position opposite the outlet by a following container moved by said arm, and means for intermittently operating said pusher arm through a single reciprocation cycle; and fixed guide means mounted above the rotary table extending in the direction of rotation from the said feed surface to the inlet of said channel structure and from the said outlet to said discharge surface to guide into said inlet containers fed onto said rotary table from the feed surface and to guide onto said discharge surface containers leaving said outlet.

3. In a container filling apparatus, a container conveying, feeding and positioning mechanism comprising a rotatably mounted circular table providing a container conveying surface; a motor and means drivingly connecting the table thereto for continuously driving the rotary table; means mounted adjacent the rotary table providing a discharge surface in edgewise proximity to an edge portion of the rotating table for receiving containers discharging from said rotary table; a container positioning and escapement means including a channel structure extending generally radially outwardly above the said rotary table having a container inlet near one end thereof, a container outlet at the other end thereof, said inlet and outlet being disposed in opposite sides of said channel structure, and a pusher arm reciprocable within said channel to move a container from a position within said channel at said inlet to a portion of said channel intermediate said inlet and outlet providing a container filling station, said intermediate portion being disposed relative to the rotary table to restrain a container therein from movement with said rotary table until expelled therefrom to a position opposite the outlet by a following container moved by said arm; operating means for intermittently operating said pusher arm through a single reciprocation cycle, said operating means including a shaft, means interposed between said shaft and said pusher arm for converting rotational movement of the shaft into a reciprocating motion of said bar, a single rotation clutch on said shaft having a driving clutch member continuously driven by said motor, and control means for engaging said clutch; and fixed guide means mounted above the rotary table extending in the direc-

tion of rotation to the inlet of said channel structure and from the said outlet to said discharge surface to guide into said inlet containers fed onto said rotary table to guide onto said discharge surface containers leaving said outlet.

4. In a container filling apparatus, a container conveying, feeding and positioning mechanism comprising a base having a vertical post thereon; a circular table providing an annular container conveying surface and having a downwardly extending hollow hub journalled on and rotatably mounting said table to said post; means including a motor for continuously driving the rotary table; means mounted adjacent the rotary table providing feed and discharge surfaces in edgewise arcuate conformity and proximity to the edge of the rotating table for receiving containers feeding to and discharging from said rotary table; a container positioning and escapement means including a channel structure extending generally radially outwardly from said post above the said rotary table having a container inlet near one end thereof, a container outlet at the other end thereof, said inlet and outlet being disposed in opposite sides of said channel structure, and a pusher arm reciprocable within said channel to move a container from a position within said channel at said inlet to a portion of said channel intermediate said inlet and outlet, said intermediate portion being disposed relative to the rotary table to restrain a container therein from movement with said rotary table until expelled therefrom to a position opposite the outlet by a following container moved by said arm; and means including a rotary cam for intermittently operating said pusher arm through a single reciprocation cycle, a cam shaft mounted in said post, a single rotation clutch on the shaft having a driving clutch member continuously driven by said motor, and control means for engaging said clutch; and fixed guide means mounted above the rotary table extending in the direction of rotation from the said feed surface to the inlet of said channel structure and from the said outlet to said discharge surface to guide into said inlet containers fed onto said rotary table from the feed surface and to guide onto said discharge surface containers leaving said outlet.

5. A mechanism as described in claim 4 wherein a continuous belt provides a driving connection from said motor to said hub, and wherein said post is mounted and normally supported on said base by a pair of interposed laterally spaced removable spacer members, said post being threaded and provided with screws spaced from each said member and adapted to bear on said base for removing the weight of said post alternately from each to permit removal thereof in positioning a belt about said hub.

6. In a container filling apparatus, a container conveying, feeding and positioning mechanism comprising a rotatably mounted circular table providing a container conveying surface; means for continuously driving the rotary table; a fixed table mounted adjacent the rotary table with an edge portion arcuately conformed and in proximity to an edge portion of the rotating table providing surfaces for receiving containers feeding to and discharging from said rotary table; a container positioning and escapement means including a channel structure extending radially outwardly above the said rotary table having a container inlet near one end thereof, a container outlet at the other end thereof, said inlet and outlet being disposed in opposite sides of said channel structure, a pusher arm reciprocable within said channel to move a container from a position within said channel at said inlet to a portion of said channel intermediate said inlet and outlet, said intermediate portion being disposed relative to the rotary table to restrain a container therein from movement with said rotary table until expelled therefrom to a position opposite the outlet by a following container moved by said arm, and means for intermittently operating said pusher arm through a single reciprocation cycle; a fixed guide mounted above the rotary table extending from the container feeding surface of the fixed table to the inlet of said channel structure to guide into said inlet containers carried on said rotary table; a second fixed guide spaced from the first and projecting from said feeding surface over the rotary table to provide an entrance to the rotary table; and additional spaced fixed guide members mounted above the said rotary table extending from said channel outlet back to said discharge surface of the fixed table forming a container discharge channel to said discharge receiving surface.

7. In a container filling apparatus including means for dispensing material to be packaged in controlled quantity to successive containers, a machine for conveying, feeding and positioning a container at a filling station comprising: a rotatably mounted circular table providing a container conveying surface; means for continuously driving the rotary table; means mounted adjacent to and providing feed and discharge surfaces in edgewise proximity with the rotating table for receiving containers feeding to and discharging from the rotary table; and a container positioning and escapement means including a channel structure extending outwardly from the center of and above the rotary table having on opposite sides thereof a container inlet and a container outlet spaced from the inlet, the inlet being in the channel side toward the direction of approach of the moving table surface and the portion of the channel intermediate the inlet and outlet providing a container filling station wherein a container is restrained from movement with the table, stationary guide means mounted above the rotary table leading in the direction of table motion from the said feed surface to said inlet to soldier and guide containers from said feed surface into the channel at said inlet, a pusher arm reciprocable within said channel to move a container from a position in the channel at said inlet into the filling station and thereby expel a preceding container from said station to a free position opposite said outlet, and means for intermittently operating said arm through a single reciprocation cycle.

8. In a container filling apparatus including dispensing means for dispensing material to be packaged in controlled quantity to successive containers, a machine for conveying, feeding and positioning containers at a filling station comprising: means providing an endless continually movable container conveying surface; means for continuously driving the conveying surface; means mounted adjacent the conveying surface providing feed and discharge surfaces in edgewise proximity thereto for receiving containers feeding to and discharging from the conveyor surface; and a container positioning and escapement means located on the path of the conveying surface from said feed to discharge surface including a channel structure above the conveyor surface and extending transverse to the direction of movement of the conveying surface, said channel having on opposite sides thereof a container inlet and a container outlet spaced from the inlet, the container inlet being in the channel side toward the direction of approach of the conveying surface and the portion of the channel intermediate the inlet and outlet providing a container filling station restraining a container therein from movement with the conveying surface, a stationary guide member mounted above the conveying surface including a portion reaching obliquely across the conveyor path to said inlet for engaging containers carried on the conveying surface and soldiering them into said channel inlet, a pusher arm reciprocable within said channel to move a container from a position in the channel at said inlet into the filling station and thereby expel a preceding container from said station to a free position opposite said outlet, guide means mounted above said conveying surface for directing to said discharge surface a container carried through said channel outlet by the conveying surface, and means

for intermittently operating said arm through a single reciprocation cycle.

9. A machine as described in claim 8 wherein said channel structure is adjustable in width and in spacing of said inlet and outlet for accommodation of a particular size of container to be handled.

10. A machine as described in claim 8 wherein said escapement mechanism includes trigger means actuated by passage of a container into said station and adapted to originate a signal for initiating feed of material to the container.

11. A machine as described in claim 10, wherein the means for operating said arm include control means initiating said cycle in response to a signal supplied by said dispensing means after dispensing material to a container.

12. In a container filling apparatus including dispensing means for dispensing material to be packaged in controlled quantity to successive containers, a machine for conveying, feeding and positioning containers at a filling station comprising: means providing an endless continually movable container conveying surface; means for continuously driving the conveying surface; means mounted adjacent the conveying surface providing feed and discharge surfaces in edgewise proximity thereto for receiving containers feeding to and discharging from the conveyor surface; and a container positioning and escapement means located on the path of the conveying surface from said feed to discharge surface including a channel structure above the conveyor surface and extending transverse to the direction of movement of the conveying surface, said channel having on opposite sides thereof a container inlet and a container outlet spaced from the inlet, the container inlet being in the channel side toward the direction of approach of the conveying surface and the portion of the channel intermediate the inlet and outlet providing a container filling station restraining a container therein from movement with the conveying surface, a stationary guide member mounted above the conveying surface including a portion reaching obliquely across the conveyor path to said inlet for engaging containers carried on the conveying surface and soldiering them into said channel inlet, a pusher arm reciprocable within said channel to move a container from a position in the channel at said inlet into the filling station and thereby expel a preceding container from said station to a free position opposite said outlet, guide means mounted above said conveying surface for directing to said discharge surface a container carried through said channel outlet by the conveying surface, and means for intermittently operating said arm through a single reciprocation cycle; the last said means including a spring biasing the pusher arm in one direction, a lever arm with one end secured to a fixed pivot and the other end engaged with the pusher arm by a slideable pivot connection, a rotary cam acting on the lever arm to drive said arms in a direction opposite to the bias of said spring, and a single rotation clutch with a continuously rotating driving clutch member and an opposed driven clutch member rotationally secured to said cam.

13. A machine as described in claim 12, wherein electrically powered means control the engagement of said clutch and initiate the engagement in response to an influence external of the clutch, said means including a switch tripped by a rotating element driven through a single rotation of said clutch for limiting clutch engagement to a single rotation of the cam; and wherein there is provided a stop member engageable with a rotating element driven by the clutch for stopping the cam at definite position after disengagement of the clutch, said stop member being disengageable upon engagement of the clutch.

14. A machine as described in claim 12, wherein electrically powered means control the engagement of said clutch and initiate the engagement in response to an influence external of the clutch, said means including a switch tripped by a rotating element driven through a single rotation of said clutch for limiting clutch engagement to a single rotation of the cam; and wherein said lever arm and cam are provided respectively with a cam follower and follower receiving formation adapted to stop the cam at definite position after disengagement of the clutch.

15. A machine as described in claim 12, wherein the cam is journalled on a continuously driven shaft and the clutch is an electromagnetic clutch comprising of a rotor disk secured to a hub portion of the cam and perpendicular to the shaft as a driven clutch element, a ferromagnetic armature disk loosely splined to said shaft on one side of the rotor disk, and a fixed electromagnet on the other side of the rotor disk for drawing the armature into driving engagement therewith.

16. A machine as described in claim 15 including a relay having normally open switch contacts in series with said electromagnet across a suitable power source for controlling energization of the electromagnet, said relay also having self-holding switch contacts in series with the relay solenoid, switch means adapted for closure by an influence external of said clutch in series with the relay solenoid across a power source for energization of the relay, and a switch in series with said self-holding contacts of the relay, the series-connected switch and self-holding contacts being in parallel with the said switch means, said switch being subject to the actuating influence of an element driven by said clutch to open at a terminal portion of a reciprocation of said pusher arm whereby closure of said switch means is effective to engage said clutch and initiate a single reciprocation of said pusher arm terminated by opening of said switch.

17. A machine as described in claim 12, wherein the cam is journalled on a continuously driven shaft and the clutch is an electromagnetic clutch comprising of a rotor disk secured to a hub portion of the cam and perpendicular to the shaft as a driven clutch element, a ferromagnetic armature disk loosely splined to said shaft on one side of the rotor disk, a fixed electromagnet on the other side of the rotor disk for drawing the armature disk into driving engagement therewith, and electrical means controlling energization of said electromagnet and initiating energization for clutch engagement in response to an influence external to the clutch, said means including a switch tripped by an element carried by said cam for limiting clutch engagement to a single rotation of the cam.

18. In a container filling apparatus including dispensing means for dispensing material to be packaged in controlled quantity to successive containers, said dispensing means being adapted to deliver material to each container in response to an externally developed signal and to initiate another signal upon completed delivery, a machine for conveying, feeding and positioning containers successively at a filling station as described in claim 12, said machine including: a switch mounted at said channel with an actuating element disposed to be tripped by passage of a container into said filling station for developing the first said signal; and electrically powered means controlling the engagement of said clutch and initiating the engagement thereof in response to the second said signal.

19. A machine as described in claim 18 including a stop member engageable with a rotating element driven by the clutch for stopping the cam at definite position after clutch disengagement, said stop member being disengageable upon clutch engagement, and including in said electrically powered means a switch tripped by an element driven by said clutch for limiting clutch engagement to a single rotation of the cam.

20. A cyclically operating single-rotation clutch adapted to engagement in response to an external influence comprising: a continuously driven input shaft, an output member including a driven clutch disk and journalled on the input shaft, a driving clutch disk opposed thereto and rotationally fixed to the input shaft, one of said disks

being ferromagnetic and axially movable into engagement with the other disk, an electromagnet on the other side of said other disk from the movable disk for drawing the disks into engagement, a relay having normally open contacts in series with said electromagnet across a suitable power source for controlling energization of the electromagnet, said relay also having self-holding contacts in series with the solenoid of said relay, first switch means adapted for closure by said external influence in series with the relay solenoid across a power source for energization of the relay, and second switch means in series with said self-holding contacts of the relay, the second switch means and self-holding contacts being a series branch in parallel with the said first switch means, said second switch means being subject to the actuating influence of an element driven by said clutch to open at a terminal portion of a single clutch rotation whereby closure of said first switch means is effective to engage said clutch and initiate a single clutch rotation terminated by opening of said second switch means.

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