

July 19, 1955

L. WIMMER ET AL

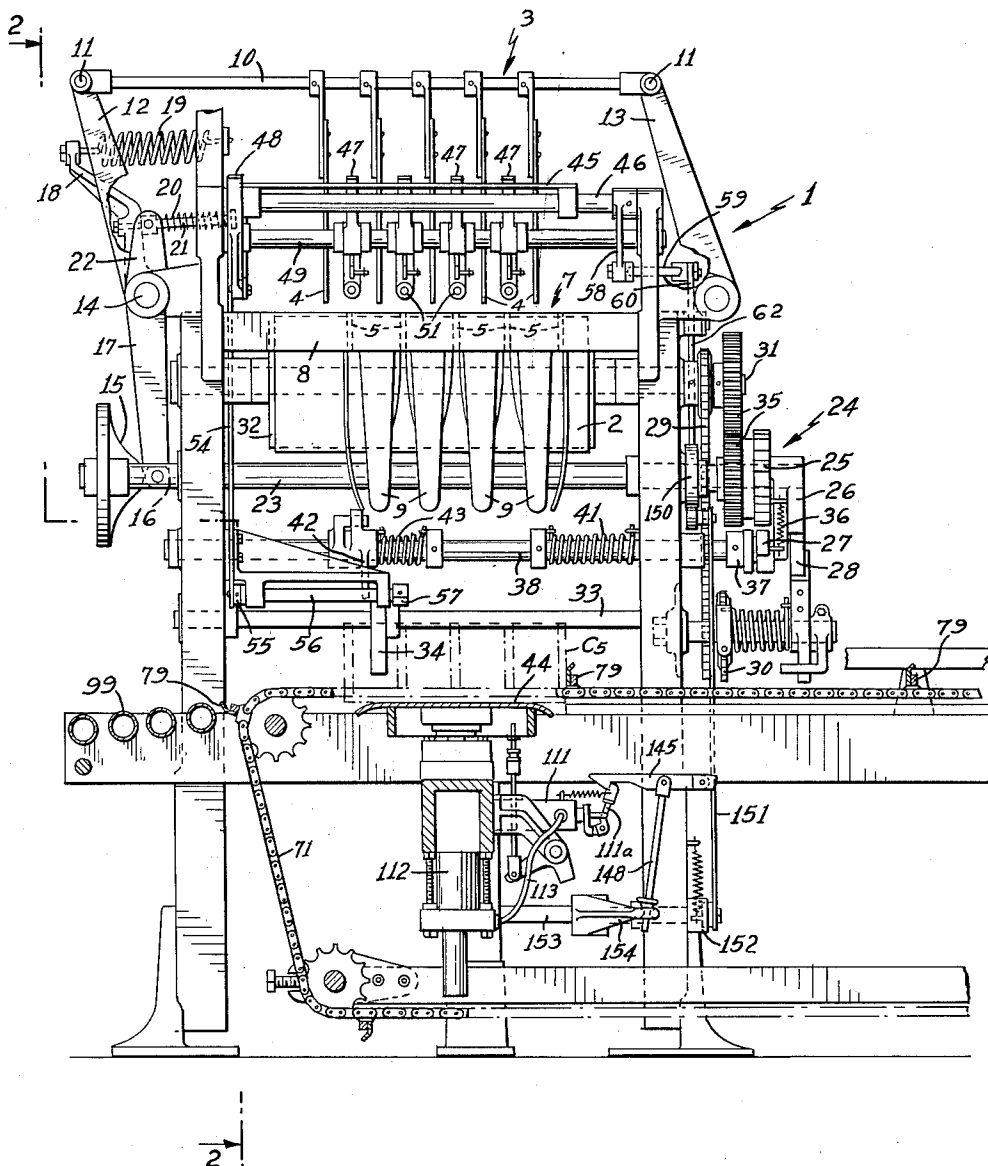
2,713,448

CASE FEEDING MECHANISM FOR PACKING MACHINE

Filed Aug. 3, 1949

10 Sheets-Sheet 1

FIG. 1



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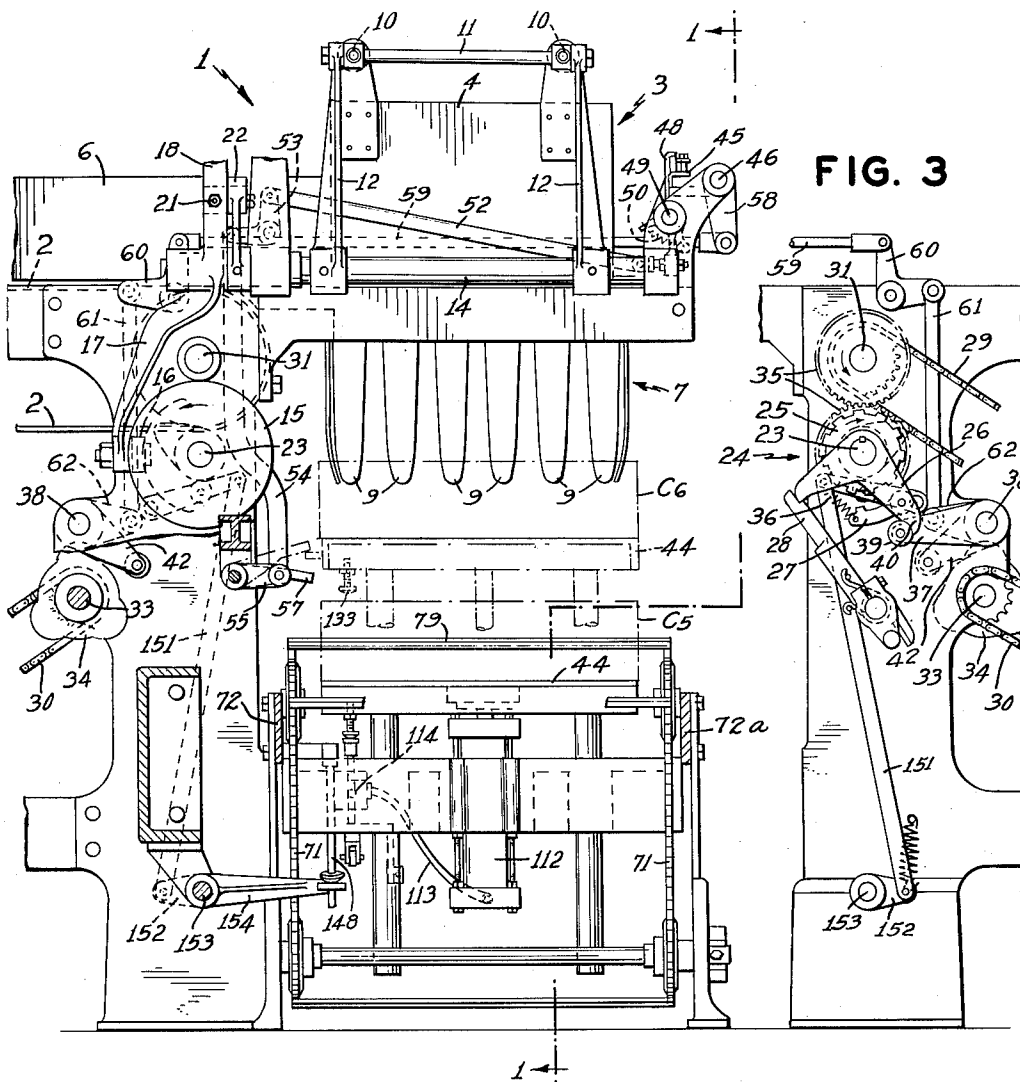
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CASE FEEDING MECHANISM FOR PACKING MACHINE

Filed Aug. 3, 1949

10 Sheets-Sheet 2

FIG. 2



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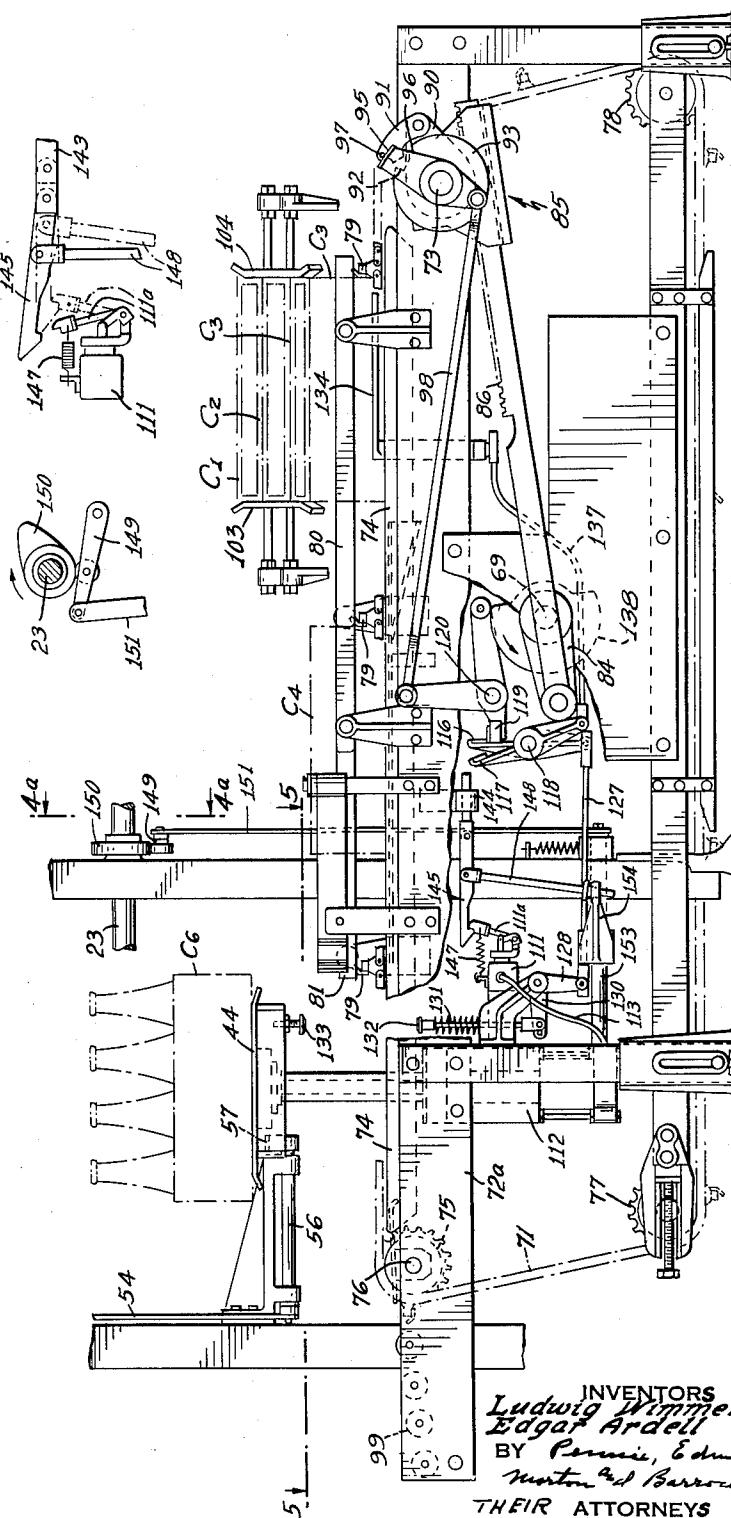
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FIG. 4b

FIG. 4a

FIG. 4



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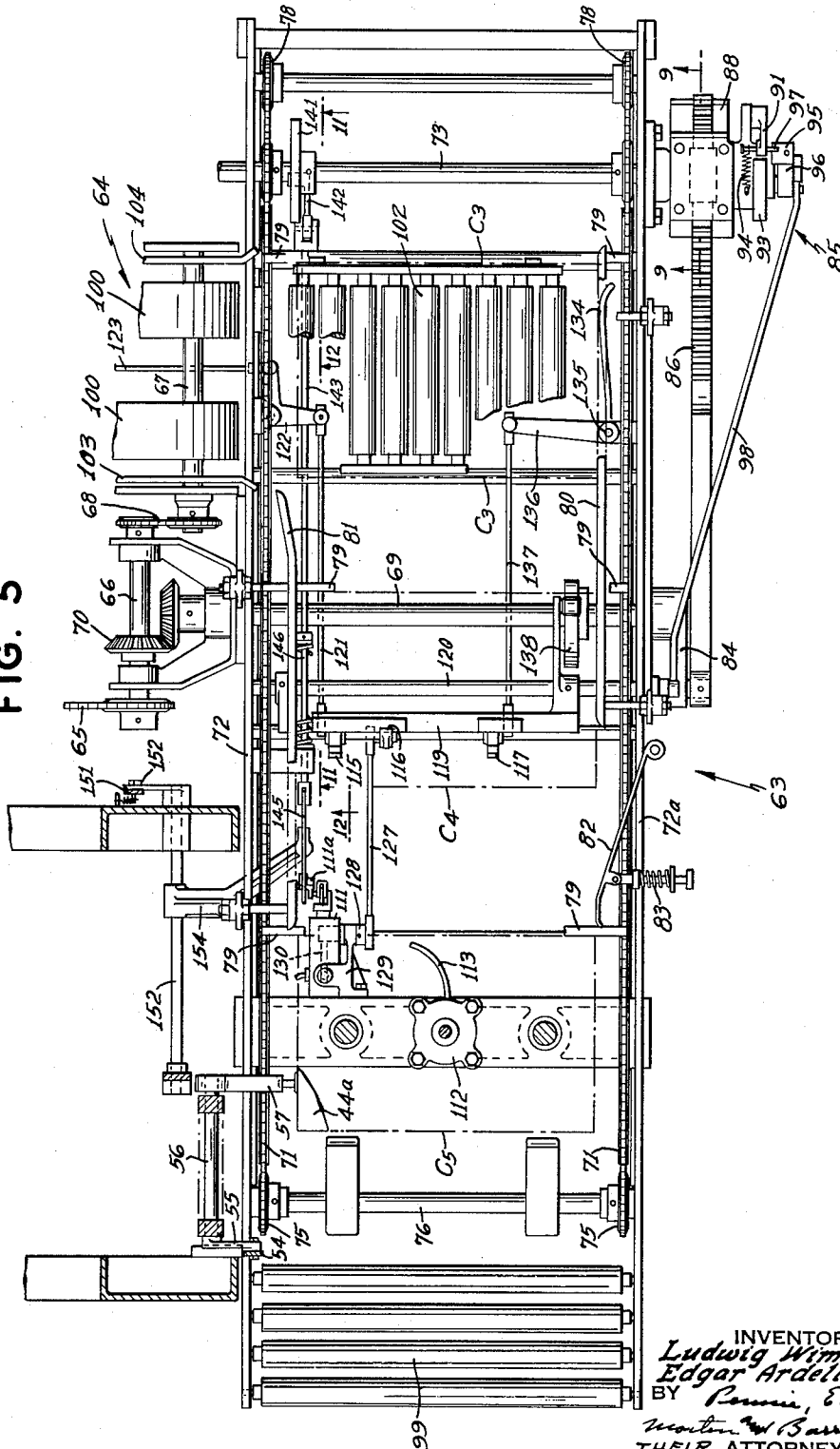
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CASE FEEDING MECHANISM FOR PACKING MACHINE

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FIG. 5



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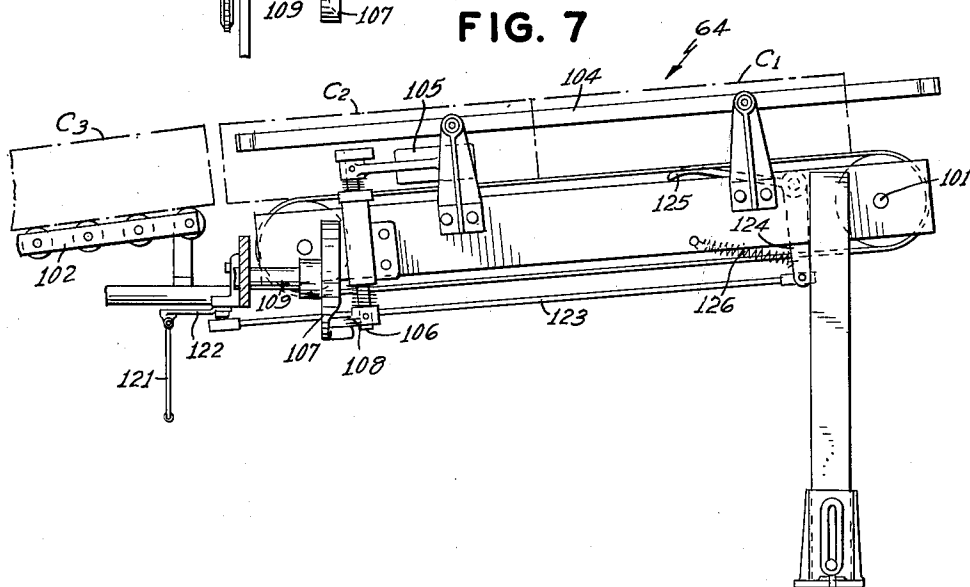
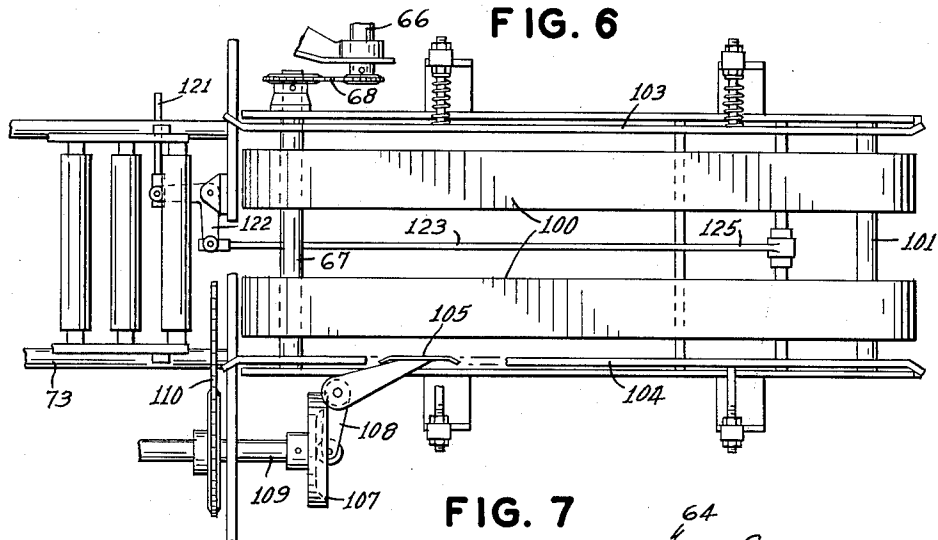
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CASE FEEDING MECHANISM FOR PACKING MACHINE

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CASE FEEDING MECHANISM FOR PACKING MACHINE

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FIG. 8

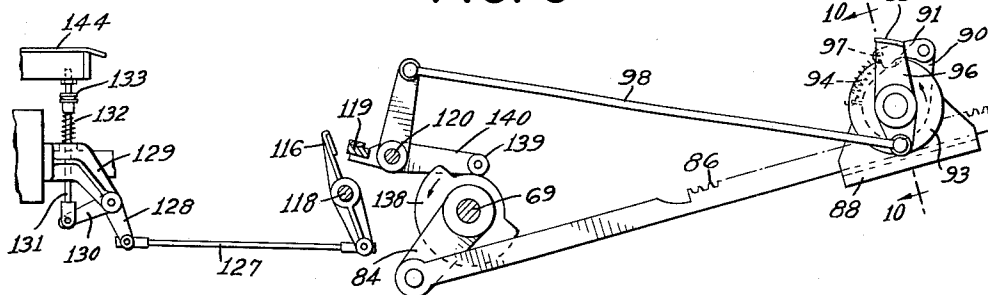


FIG. 9

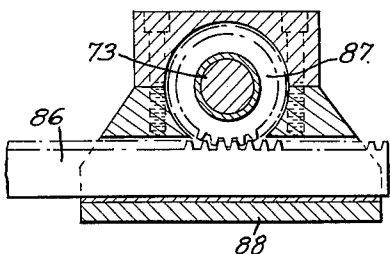


FIG. 10

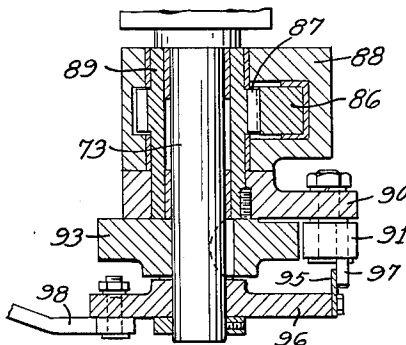


FIG. 11

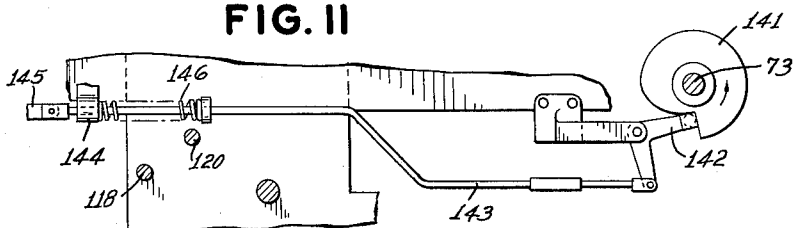
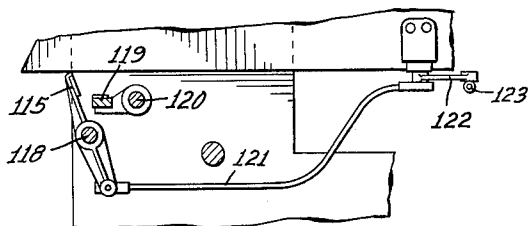


FIG. 12



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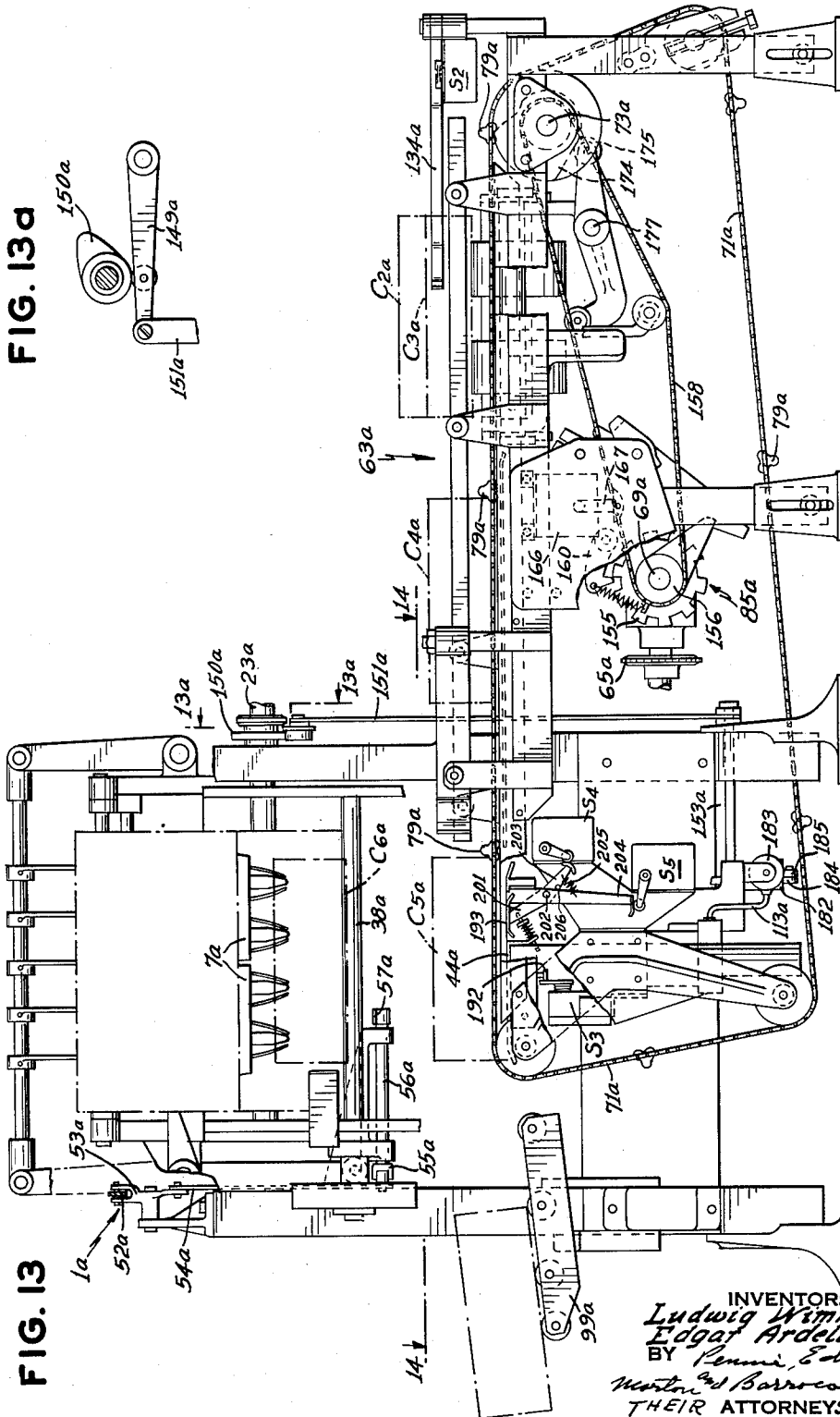
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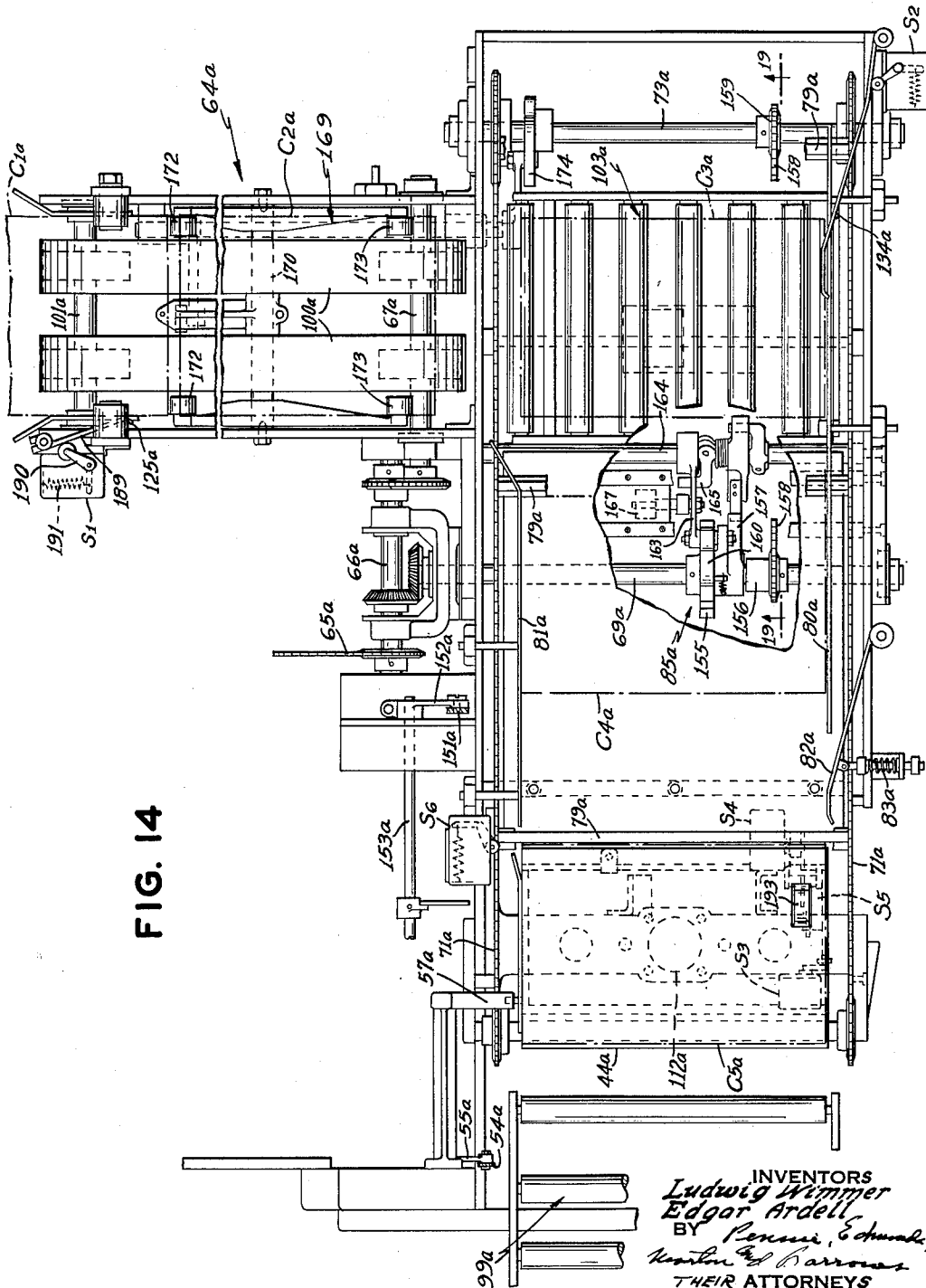
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FIG. 14



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CASE FEEDING MECHANISM FOR PACKING MACHINE

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FIG. 15

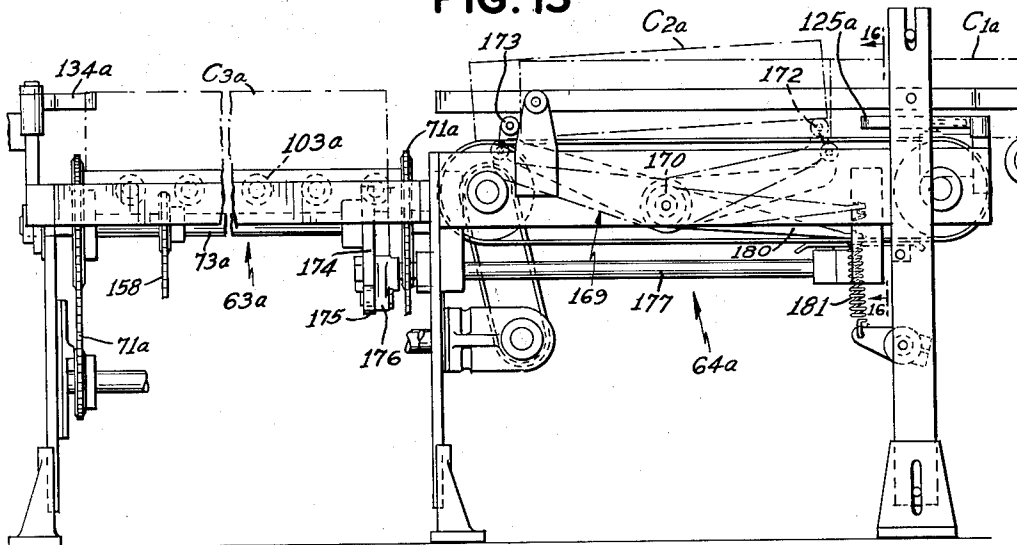


FIG. 18

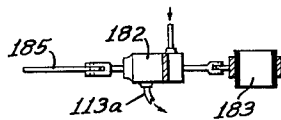


FIG. 16

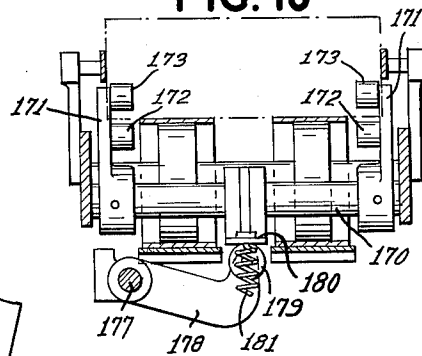
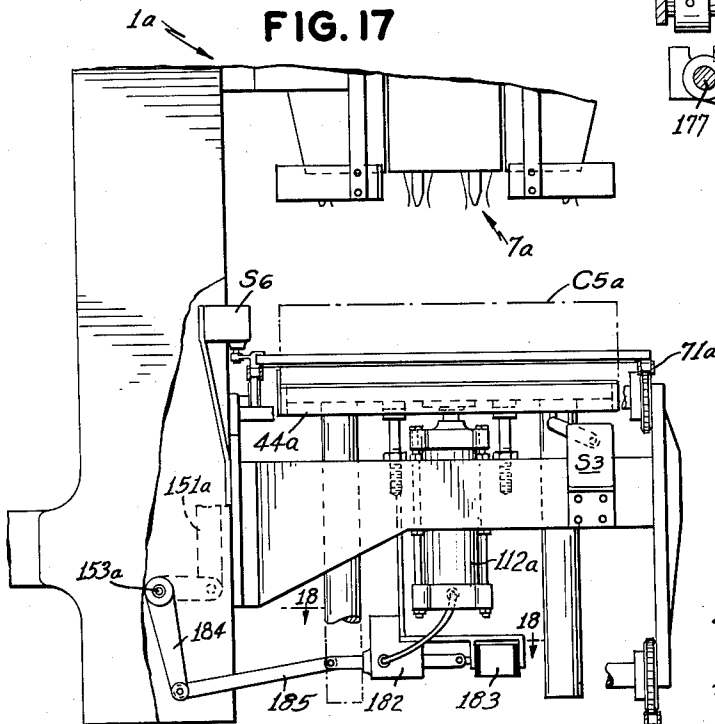


FIG. 17



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CASE FEEDING MECHANISM FOR PACKING MACHINE

Filed Aug. 3, 1949

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FIG. 19

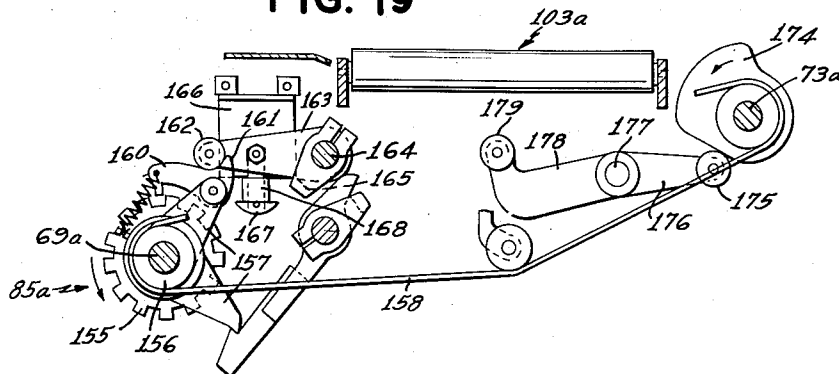


FIG. 20

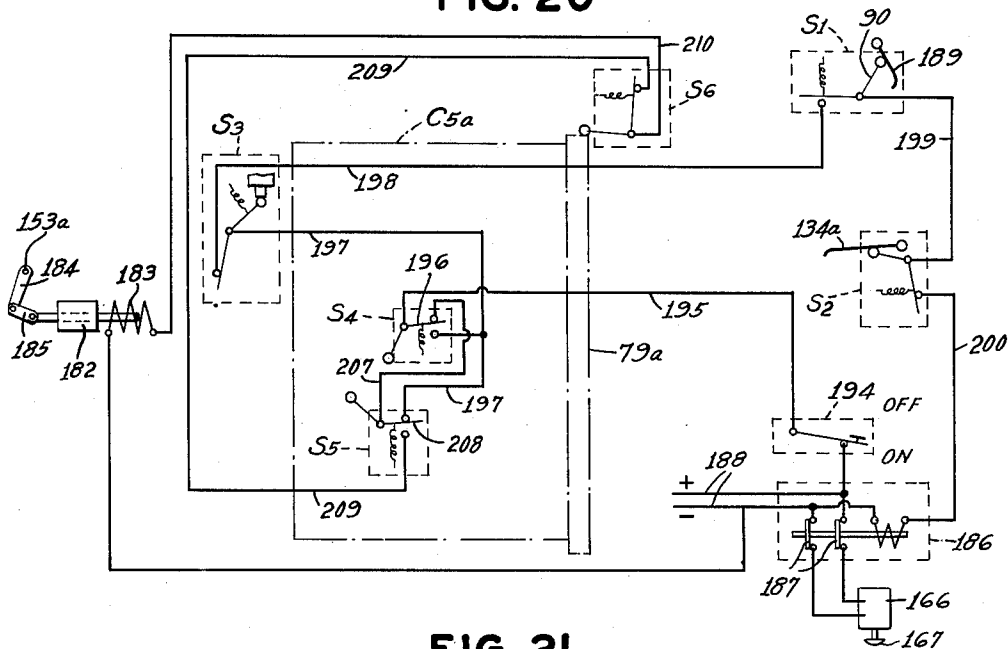
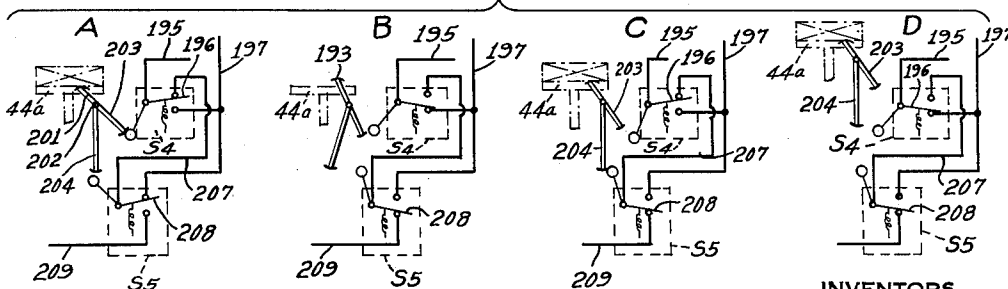


FIG. 21



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2,713,448

CASE FEEDING MECHANISM FOR PACKING MACHINE

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Application August 3, 1949, Serial No. 108,264

15 Claims. (Cl. 226—14)

This invention relates to case feeding mechanism for packing machines and has for its general object to provide an improved case feeding mechanism capable of operating to feed either wooden trays or shipping cases made of corrugated board, or the like.

Articles such as bottles or cans of beverages or food products, also bars of soap, packages of cereal and other square or rectangular articles are commonly packed for shipment in cases made of corrugated board, fiber board, wood or other suitable material. The articles are assembled by suitable mechanism to form a charge corresponding in size to the dimensions of the case, and in one form of packing apparatus the charge is passed by gravity through a charge-directing mechanism into the case. Such directing mechanism is sometimes arranged to handle the charge with all of the articles composing it in contact with one another, and sometimes the mechanism is arranged to direct or guide each one of the articles separately and individually, as is required in packing cell cases, that is, cases which have partitioning devices between the articles to prevent breakage or damage by the usual contact or rubbing during transit.

The aim of the present invention is to provide for the automatic feeding of the successive cases or trays to the loading table of the packing machine so as to obviate the placing of the empty trays or cases on this table by hand.

It is important that the cases be fed successively into accurate registry with the charge directing mechanism of the packing machine and one of the more particular objects of the present invention is to provide a feeding mechanism which is capable of accomplishing such accurate feed or positioning of the cases or trays and which moreover is reliable in operation so that frequent attention or servicing is not required.

Another object of the invention is to provide a case feeding apparatus which will operate without jamming or damaging the cases or articles.

The invention will be illustrated and described as embodied in an apparatus for packing bottles, such, for example, as "Coca-Cola" bottles in wooden trays which have individual cells or compartments for the respective bottles of the charge. It will be understood, however, that the machine is also adapted to handle shipping cases made of other materials as above mentioned and also to pack therein other articles, either round, square or rectangular, also as above indicated.

The invention will be understood by considering the accompanying drawings which show two such embodiments by way of example. In these drawings:

Fig. 1 is an end elevation of a bottle packing machine and part of the case feeding mechanism, the latter being shown in section as indicated by broken line 1—1 of Fig. 2;

Fig. 2 is an elevation of the machine looking from the left of Fig. 1, the lower part being shown in section, as indicated by broken line 2—2 of Fig. 1;

Fig. 3 is a fragmentary side elevation looking from the right of Fig. 1;

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Fig. 4 is a side elevation of the case feeding mechanism looking from the right of Fig. 2, certain parts being shown in different positions and only a small portion of the packing machine being included.

Fig. 4a is a detail section taken on line 4a—4a of Fig. 4;

Fig. 4b is a detail elevation of an air valve and its operating mechanism shown in Fig. 4, but with the valve closed instead of open;

Fig. 5 is a plan view of the case feeding mechanism with the left hand portion shown in horizontal section on line 5—5 of Fig. 4;

Fig. 6 is a plan view of the tray intake or timing section of the machine;

Fig. 7 is an elevation of the mechanism shown in Fig. 6;

Fig. 8 is a side elevation of certain parts shown in Fig. 4 with the parts in a slightly different position;

Fig. 9 is a vertical section taken on line 9—9 of Fig. 5 showing a detail;

Fig. 10 is a vertical section taken on line 10—10 of Fig. 8;

Fig. 11 is a detail vertical section taken on line 11—11 of Fig. 5;

Fig. 12 is a similar section taken on line 12—12 of Fig. 5;

Figs. 13 to 21, inclusive, illustrate a modification of the case feeding and ejecting mechanism, Fig. 13 being a side elevation somewhat similar to Fig. 4;

Fig. 13a is a vertical section of a detail taken on line 13a—13a of Fig. 13;

Fig. 14 is a plan view of the apparatus shown in Fig. 13 with the left hand portion shown in section on line 14—14 of Fig. 13;

Fig. 15 is an end elevation looking from the right of Fig. 14;

Fig. 16 is a vertical section taken on line 16—16 of Fig. 15;

Fig. 17 is an elevation looking from the left of Fig. 13 with the parts of the packing machine shown in fragmentary view;

Fig. 18 is a detail section taken on line 18—18 of Fig. 17;

Fig. 19 is a vertical section taken on line 19—19 of Fig. 14;

Fig. 20 is an electrical diagram; and

Fig. 21 consists of a series of diagrammatic views of two of the switches shown in Fig. 20 and their operating mechanism, showing the parts in four different positions.

Referring first to Figs. 1—5, the bottle packing machine, which is indicated generally by reference numeral 1, is illustrated and described in Patent 2,219,827, W. D. Kimball and Cornelius I. Braren, granted October 29, 1940, and owned by the same assignee as the present application. Reference to that patent may be had for the details of construction of the packing machine, only sufficient illustration and description of this machine being included herein as is necessary for an understanding of the case feeding mechanism of the present invention, and also to describe a change in the construction and operation of the packing machine which is not disclosed in the mentioned patent. This change consists in the utilization of a one-revolution clutch to cause the charge to descend into the case.

Describing the packing machine as briefly as possible, the bottles are advanced on a continuously moving wide belt 2 from left to right as viewed in Fig. 2 into a charge forming and segregating mechanism indicated generally by numeral 3. The charge forming mechanism comprises a series of upright metal plates 4, spaced apart slightly more than the diameter of the bottles and arranged to maintain the bottles in upright position sup-

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ported on a series of rails 5 (Fig. 1) onto which the bottles are moved by the belt 2. The bottles are maintained in rows on belt 2 by means of suitably spacing guide plates which are in line with the plates 4 as shown in Fig. 1, one of these guide plates being indicated by numeral 6 in Fig. 2.

The charge directing mechanism, which is indicated generally by reference numeral 7, comprises the series of rails 5 together with cross bars, one of which is shown at 8 in Fig. 1. These bars have the same spacing as the rails and with them divide the area beneath plates 4 of the charge forming mechanism into a series of square chutes, twenty-four in number, the wooden trays into which the bottles are to be placed being subdivided into twenty-four bottle compartments by suitable wooden partitions, each compartment being arranged in four rows of six each. Secured to and projecting downward from all four walls of each of the twenty-four chutes are spring fingers 9 which serve to guide the bottles into the individual cells of the case.

When a complete charge of bottles has been delivered to the charge forming mechanism 3 between the plates 4 by belt 2, and also when a tray has been elevated into the dot and dash line position shown in Fig. 2 to receive the charge, the plates 4 are bodily shifted to the right (Fig. 1) until they are in vertical alignment with rails 5. This causes the four rows of bottles to be moved laterally off from their respective supporting rails and allowed to descend by gravity through the respective chutes into the tray. Plates 4 then are shifted back to their original position shown in Fig. 1 where the vertical alignment of rails 5 is midway between the plates and the plates are in a horizontal alignment with the respective guides 6 which maintain the bottles in rows on belt 2.

In order to support plates 4 and to impart this shifting motion to them, they are rigidly suspended from a pair of parallel horizontal rods 10 by suitable hangers. Rods 10 in turn are pivoted at their opposite ends to a second pair of shorter horizontal rods 11 which are pivotally mounted at the upper ends of two pairs of parallel rock arms 12 and 13. Rock arms 12 are keyed or pinned at their lower ends to a horizontal rock shaft 14, mounted in brackets on the frame, while the lower ends of rock arms 13 are similarly supported on the opposite side of the machine.

Rock shaft 14 is actuated to cause the bodily shifting of plates 4 by means of a face cam 15 and a cam follower roller 16 mounted at the lower end of an actuating member 17 which is loosely mounted on the left end of rock shaft 14 (Fig. 2). Member 17 has an integral upwardly extending arm 18, to the upper end of which a tension coil spring 19 is attached. The motion of member 17 is transmitted to rock shaft 14 by a yieldable connection including a compression spring 20 which encircles a rod 21, the left end of which is fixed in arm 18. Rod 21 passes slidably through an aperture in a block pivoted at the upper end of a short arm 22 which is fixed to shaft 14 as indicated in Fig. 2. In this way, plates 4 are yieldably actuated in both directions to prevent damage to bottles in the case of a jam.

Operating cam 15 is mounted on the end of a horizontal cam shaft 23 which is intermittently rotated by means of a one-revolution clutch, indicated generally by numeral 24 at the opposite end of the shaft (Figs. 1 and 3). Clutch 24 includes a continuously rotating toothed wheel 25, which constitutes the driving member, and a double armed driven member 26 keyed to shaft 23. One of the arms of member 26 has a dog 27 pivoted at its end, and the other arm engages a back lash preventing latch 28.

Power for operating the machine is supplied through two endless chains 29 and 30 both driven from a common shaft, such driving shaft (not shown) usually being the slow speed shaft of a speed reducer. Chain 29 is

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trained around a sprocket near the right end of a shaft 31 which is parallel with shaft 23 and which constitutes the operating shaft of a driving pulley or drum 32 for the bottle supply belt 2. The second chain 30 is trained round a sprocket on a third parallel shaft 33 to which is fixed a continuously rotating three-lobed cam 34 for resetting the control mechanism of one-revolution clutch 24.

Shafts 31 and 33 rotate at the same speed. The continuously rotating toothed driving wheel 25 of the clutch is driven in the direction shown by the arrow in Fig. 3 by means of suitable gearing 35. It will be understood that the driving dog 27 is biased by means of a tension spring 36 toward toothed wheel 25.

The tripping of the clutch to cause it to make one revolution is done by means of a control arm 37 (Fig. 3) which is pinned to a control shaft 38 and which has a roller 39 to engage the tail portion 40 of driving dog 27. When arm 37 is moved downwardly from the position shown in Fig. 3 tail portion 40 is released and spring 36 causes dog 27 to engage one of the teeth of driving wheel 25 thus imparting rotation to the driven member 26. Control arm 37 and roller 39 are biased downward by means of a coil spring 41 (Fig. 1) on control shaft 38.

As will presently appear, after the clutch control mechanism is tripped to start the one revolution the control is immediately reset so as to prevent more than one revolution. This is done by three-lobed resetting cam 34 which engages a roller at the end of an arm 42 which is mounted on shaft 33 with a yielding connection through coil spring 43 surrounding shaft 33 (Fig. 1). The rocking of control shaft 38 to trip the clutch is controlled by a latching mechanism about to be described which, resisting spring 41, holds the parts in the position shown in Figs. 2 and 3 where the dog 27 is out of engagement with the clutch driving wheel 25. The latching mechanism just referred to is arranged to cause the operation of one-revolution clutch 24 only when a full charge of bottles is within the charge forming mechanism 3 and a table 44, which is vertically movable to raise the tray, is in its upper position as shown in Figs. 2 and 4, ready to receive the charge from the charge directing mechanism 7. The latching mechanism comprises a latch bar 45 which is mounted on collars fixed to a cross shaft 46, together with a series of four bottle actuated latches 47 and a single latch 48 which is actuated by case table 44 through suitable mechanism. Latches 47 and 48 are mounted in line on a common fixed supporting shaft 49 and biased into engagement with latch bar 45, latches 47 being provided with tension springs 50 (Fig. 2) for this purpose.

The lower ends of latches 47 are provided with horizontal projections in the form of screws 51, the headed ends of which project to the left as viewed in Fig. 2 so as to be engaged by the lower portion of the first bottle in each row. Latch 48, instead of having one of these projecting screws, has pivoted to its lower end a link rod 52 whose opposite end is connected to the bell crank lever 53. The other arm of this lever is connected by means of a downwardly extending offset link 54 to an actuating arm 55 on a short rock shaft 56 which is mounted in a suitable bracket attached to the machine frame and has at its opposite end a horizontal projecting finger 57 in the upward path of a short pin projecting from the end of case table 44. The engagement of this pin with finger 57 releases latch 48 from latch bar 45 through the linkage just described.

Shaft 46 of this latch mechanism is provided at its right end as viewed in Fig. 1 with an arm 58 connected through a horizontal link 59 with one arm of a second bell crank lever 60 which is pivoted to the frame above one-revolution clutch 24 (Figs. 2 and 3). A vertical link 61 joins the other arm of lever 60 with a short actuating arm 62 which is pinned to clutch control shaft 38.

The arrangement is such that when latches 47 and 48 are in engagement with latch bar 45 the linkage just described holds control shaft 38 and control arm 37 in the position shown in Fig. 3 where roller 39 engages tail 40 of dog 27 thus holding the clutch 24 in disengaged position, against the action of coil spring 41. Whenever latches 47 and 48 are actuated to release latch bar 45 by the presence of a full charge of bottles in the charge forming mechanism 3 and the arrival of the case table 44 at the top of its movement, the linkage above described allows spring 41 to rock control shaft 38 and arm 37 in the direction to release tail 40 of dog 27 and the clutch 24 is engaged thereby causing shaft 23 to commence rotating.

This causes the discharge of the bottles into the case which is promptly followed by the descent of case table 44 as will presently appear. Consequently, latches 47 and 48 are returned to their latching position almost immediately and as soon thereafter as one of the three lobes of resetting cam 34 moves arm 42 upward again control shaft 38 and arm 37 are latched and held in this position, so that roller 39 will engage the tail 40 of dog 27, at the end of the revolution of shaft 23, and stop the shaft.

This completes the description of the one-revolution clutch-controlled packing machine.

In general arrangement and operation, the case or tray feeding mechanism includes a flight conveyer section 63 (Fig. 5) and an in-feed or case-supply section 64 (Figs. 5, 6 and 7), by which the empty trays are supplied or delivered between the flight bars of section 63 in timed relation to the movement of these bars. Step-by-step operating mechanism is provided to advance the flight conveyer of section 63 to move the trays successively onto elevating table 44, and mechanism is also provided for coordinating the in-feed, the step-by-step operating mechanism and the operating means for elevating table 44 so as to cause the trays to be fed and ejected without jamming and without interruption.

This coordination in the apparatus shown in Figs. 1-12 is entirely by mechanical means, whereas the modified form shown in Figs. 13-21 includes electrically operated coordinating mechanism.

In the operation of the apparatus, the cases are advanced through six case positions indicated by reference characters C₁—C₆ (see Figs. 4, 5 and 7). Upon the lowering of the table 44 the loaded case returns to the same elevation as position C₅ of Fig. 1 and is ejected from the apparatus by the next step advance of endless chains 71. The ejected filled case passes onto an inclined roller conveyer 99, or any other suitable removing conveyer.

The construction and arrangement of the elevating mechanism for table 44 and of the step-by-step control mechanism of the flight conveyer chains 71 is such that each advance of the flight conveyer can take place only after completion of a loading cycle, that is, an up and down movement of the elevating table. Also, the arrangement is such that no advance of the flight conveyer chains can take place unless cases are present at the intake of the machine and on the flight conveyer section 63.

Power for operating flight conveyer sections 64 and in-feed section 63 is supplied from any suitable source by means of an endless chain 65 which drives a short longitudinal shaft 66. Driving shaft 67 of the in-feed section 64 is connected to shaft 66 through a chain 68. Shaft 69 which is the main operating shaft of the flight conveyer section 63 is driven from shaft 66 through beveled gearing 70.

The flight conveyer section 63 comprises a pair of endless chains 71, one mounted adjacent each of the two side frames 72 and 72a. These chains are operated by driving sprockets which are pinned or keyed to a driving shaft 73 at the right end of the apparatus as

shown in Fig. 5. The chains 71 travel toward the left along suitable supporting rails 74 (Fig. 4). At the left end of the machine chains 71 pass over idler sprockets 75 mounted on a cross shaft 76, thence downward around a pair of take-up sprockets 77, thence toward the right end of the machine around another pair of idler sprockets 78 and back to driving shaft 73.

Flight chains 71 carry between them suitably spaced flight bars 79, and the chains are operated intermittently from continuously rotating shaft 69 by step-by-step mechanism 85 (Fig. 4), about to be described, so as to position successive cases over the packing machine elevating table 44, in registry with the charge-directing mechanism 7. The cases move forward between stationary side guide bars 80 and 81. Guide bar 81 is continued up to the edge of table 44 (Fig. 5). Guide bar 80, however, terminates sooner, and a pivoted guide section 82, the front end of which is urged inwardly by a compression spring 83, forces the case against the opposite guide bar 81 so as to produce lateral registry of the case with charge directing mechanism 7 when the case arrives on table 44.

The mechanism 85 for imparting the desired intermittent motion to flight chains 71 is shown in Figs. 4, 5, and 8-10. This mechanism comprises a crank 84 which is keyed to shaft 69 and therefore rotates continuously. Crank 84 has pivoted to its crank pin a rack bar 86 having teeth on its upper surface at its right end portion. The teeth are in continuous engagement with the teeth of a pinion 87 (Fig. 9) which is keyed to operating shaft 73 for driving the flight chains 71. These parts are maintained in operative engagement by means of a suitable housing 88 which is mounted in such a way as to pivot about the center of shaft 73 as the crank rotates. From this it will be understood that the motion of pinion 87 is a continuous oscillation under the driving action of rack bar 86. The arrangement is such that pinion 87 turns through an angle of 360 degrees—one complete revolution—during each stroke of rack bar 86.

Pinion 87 is mounted on and keyed to a short sleeve 89 which, in turn, rotates on an extension of shaft 73. Housing 88 is carried on sleeve 89, and keyed at the outer end of this sleeve is a driving arm 90 which imparts the rotation to shaft 73. A driving pawl 91 is pivoted at the outer end of arm 90 and is constructed and arranged to drivingly engage a notch 92 in a wheel 93 which is keyed to shaft 73 as shown in Fig. 10. Pawl 91 is biased toward wheel 93 by means of a tension spring 94 (Figs. 5 and 8).

It will be understood that whenever pawl 91 is allowed to engage notch 92 of wheel 93 during a stroke of rack 86, shaft 73 will be turned one full revolution. This moves the flight chains forward a distance corresponding to the spacing of flight bars 79, and consequently, moves cases between these various flight bars forward one case position. The control of pawl 91 to cause the step-by-step operating mechanism to advance the flight conveyer chain 71 is accomplished by means of a movable shield segment 95 (Fig. 5) carried at the outer end of a rock arm 96 which turns loosely on the outer end of shaft 73. By engagement with a pin 97 which projects from one side of pawl 91 shield 95 either prevents or permits the engagement of pawl 91 with notch 92 of wheel 93 at each end of the oscillation of arm 90 by the reciprocation of rack 86. The locked-out position is shown in Fig. 4 and the engaging position in Fig. 8. The shifting of shield 95 from one position to the other is by means of a link 98 and the operation of this link will be discussed later on.

The intake end of the machine shown in Figs. 6 and 7 comprises a suitable framework for supporting a pair of endless conveyer belts 100. These, at their left ends, pass around pulleys which are supported on the driving shaft 67, and, on their opposite ends, on pulleys which

are supported on an idler shaft 101. The cases at positions C₁ and C₂ are urged forward towards the left by the friction of belts 100 and also preferably by gravity (Fig. 7). The case at position C₂ is in contact with the case at position C₃ which rests upon an inclined roller table section 102 supporting the first case within flight conveyor section 63. Hence, the advance of cases C₁ and C₂ takes place only when the case at C₃ has moved forward by the action of the step-by-step mechanism.

Cases C₁ and C₂ advance between side guide rails 103 and 104. Guide 103 is preferably yieldably mounted as shown in Fig. 6 to facilitate the operation of a movable checking plate 105 which operates below the opposite guide 104. The function of this plate is to hold back the case at position C₂ while the case at position C₃ is being advanced by the flight conveyor. Plate 105, accordingly, is mounted on the end of an arm which is pinned to a vertical rock shaft 106, this shaft being actuated by means of a cam 107 which cooperates with a cam follower mounted on the end of an arm 108 which is fixed to the lower end of shaft 106. Cam 107 is mounted on a shaft 109 which is chain-connected by a chain 110 to driving shaft 73 of the flight conveyor chain 71.

In the form of the apparatus shown in Figs. 1 to 12, the coordinating mechanism comprises a number of mechanically operated latches for controlling the step-by-step operating mechanism by controlling the position of shield segment 95, together with mechanically operated means for operating an air control valve 111 for an air cylinder 112 which raises and lowers elevating table 44. It will be understood that air under suitable pressure for operating the piston of cylinder 112 is supplied to control valve 111 by means of a pipe (not shown), and when valve 111 is in the open position shown in Fig. 4, the air flows through a connecting pipe 113 to the bottom of cylinder 112 and causes the table 44 to rise from position C₅ to position C₆ (both shown in Fig. 2) in which the tray is ready to receive the bottles from the charge directing mechanism 7.

When air valve operating lever 111a is in the position shown in Fig. 4-B air valve 111 is closed, shutting off the supply of air to cylinder 112 and connecting pipe 113 with an exhaust opening 114 (Fig. 2) so that table 44 can return by gravity to the low position C₅.

The mechanically operated latches just referred to are shown in Fig. 5 at 115, 116 and 117. These latches are all alike and are pivoted to a horizontal cross-shaft 118 (Fig. 4). They have actuating portions below this shaft and latching portions above, all of which engage a common latch bar 119 which is mounted on two short arms that are fixed to a second cross-shaft 120 (Fig. 5) adjacent shaft 118 (see also Figs. 4, 8 and 12).

Latch 115 is controlled by the entering case at position C₁ (Fig. 7) and prevents the advance of flight conveyor chains 71 unless a case is at hand to move into this conveyor. It is actuated by a link 121 (Fig. 12), the right hand of which is connected to a bell crank lever 122, the second arm of this lever being connected by a link 123 (Figs. 6 and 7), and the outer end of this link being connected to an arm 124 which is moved by a detector finger 125 arranged to be engaged and pressed downwardly by the bottom of the case at position C₁. If no case is present, tension spring 126 holds the parts in position to disengage latch 115 from latch bar 119.

Latch 116 is controlled by the position of the case elevating table 44 and prevents the flight conveyor from being advanced when the elevating table is in the up position. Referring to Fig. 8, a link 127 extends toward the left from the lower end of latch 116 and is connected to arm 128 which is pinned to a short cross shaft supported by a bracket 129 (Fig. 5) attached to the machine frame. On the opposite end of this shaft there is a

second arm 130 which is arranged to be actuated by a rod 131 mounted for vertical sliding movement in bracket 129. A compression spring 131 tends to move latch 116 into engagement with latch bar 119. However, when table 44 descends to its lower position C₅, the head of an adjustable actuating screw 133 engages the top of rod 131 and moves the latch to the release position.

The third latch 117 is operated by a case detector 134 which is actuated by the case at position C₃, the first case to be admitted to the flight conveyor section 63. This latch insures that, before the flight conveyor can be advanced a case has properly entered the space in front of a flight bar and guards against a case being prevented from entering by protruding nails or strapping. Detector finger 134 is engaged by the forward side of the case and is supported on a vertical shaft 135, and on the lower end of this shaft there is an arm 136 connected by a link 137 to latch 117 (see Figs. 4 and 5).

Latch bar 119 controls the operation of link 98 which operates to shift the shield segment 95 of the step-by-step operating mechanism from the position shown in Fig. 4 to the position shown in Fig. 8 to cause the step-by-step mechanism to advance flight conveyor chains 71. The mere release of latch bar 119 by all three latches 115, 116, and 117 will not of itself move link 98. This movement is timed by means of a cam 138 fixed to drive shaft 69 (Figs. 4 and 8) and having a cam follower roller 139 which is mounted on the end of an arm 140, also fixed to shaft 120 for latch bar 119. The shape of cam 138 is such that although latch bar 119 has been released by the three latches, shaft 120 will not rock to shift link 98 and shield segment 95 until rack bar 86 is at the left end of its stroke, as viewed in Fig. 8, which places notch 92 of wheel 93 of the step-by-step mechanism substantially opposite the nose of driving dog 91.

When the parts reach this position, link 98 is actuated and shield segment 95 is shifted to the position shown in Fig. 8 whereby the pin 97 on the side of dog 91 has been released by the shield and the dog allowed to drop into engagement with notch 92. This engagement therefore takes place while crank 34 is at a dead center position and the engagement of the dog and notch takes place while the parts are stationary. The flight chains 71 are operated with harmonic motion by the step-by-step mechanism, dog 91 being withdrawn from notch 92 when rack bar 85 has reached a following dead center position after one or more complete revolutions of crank 84.

The apparatus operates in the following sequence. Assuming that the machine is primed with empty cases at position C₁—C₄ (Fig. 4) and with a case that has just been filled with bottles at position C₆, that is, on table 44 which is in elevated position, the next movement which takes place is the descent of this table. This releases latch 116, which is the only one of the three latches which still engages latch bar 119, inasmuch as the cases at positions C₁ and C₃ have, through their detectors, released the other two latches 115 and 117. The release of latch 116 therefore causes the step-by-step operating mechanism to advance flight conveyor chains 71 one step, that is, the space between one pair of flight bars. This ejects the filled case from the platform and positions an empty case upon it at position C₅ (Figs. 1 and 5).

Next, the table 44 rises to position C₆ with the empty tray upon it. To cause this to occur the air valve actuating lever 111a has to be rocked from the closed position (Fig. 4b) to the open (Fig. 4). This is accomplished by the mechanism shown in Fig. 4 and, in detail, in Fig. 11. A spiral cam 141 is fixed to driving shaft 73 or the flight chains 71, which shaft is rotated by the step-by-step mechanism. One arm of a bell crank lever 142 carrying a suitable roller is actuated by cam 141. The other arm of this bell crank lever is connected to a longitudinally

shiftable rod 143, the left end of which slides in a bracket 144 fixed to the machine frame in the vicinity of air valve 111. Pivoted at the forward end of rod 143 as shown in Fig. 4b is a hook member 145. Rod 143 is biased toward the right by means of a compression spring 146 shown in Fig. 11. Actuating arm 111a is biased toward the closed position by means of a tension spring 147.

At the commencement of an advance of flight chains 71, cam 141 is in the position shown in Fig. 11 and rotates in the direction of the arrow. Consequently, during almost the entire rotation of shaft 73 by the step-by-step mechanism, rod 143 is being slowly shifted towards the left. This causes the hook shaped head of member 145 to slide over the top of actuating lever 111a, the hook member being in the horizontal dot and dash position of Fig. 4b during this motion. This engages the hook with the upper end of actuating lever 111a. Then just before the completion of the 360° rotation of shaft 73, the cam follower on bell crank 142 drops off of the high spot of the cam, and rod 143 is quickly jerked toward the right by the action of spring 146, thus opening air valve 111.

The rise of table 44 caused by the opening of air valve 111 starts the packing machine 1 on its cycle of operation which takes place in the manner described at the beginning of this specification. It will be remembered that when table 44 reaches the upper end of its movement, position C₆, the one-revolution clutch 24 of the packing machine is tripped by the lifting of pivoted arm 57 (Fig. 2). Consequently, the packing mechanism operates to cause a charge of bottles to descend into the case and the elevating table 44 is ready to return to its lower position, C₅. In order for this to take place, the air valve 111 has to be closed and this is accomplished by releasing the hooked portion of pivoted member 145 from the actuating lever 111a.

This is done by raising member 145 about its pivot by means of a link 148 which is raised at the proper time by a system of levers and linkage which operatively connect link 148 with a pivoted lever 149 (Fig. 4a) having a roller which is operated by a cam 150 on cam shaft 23 of the bottle packing machine. Arm 149 is connected by means of a link 151 which extends downwardly and at an angle (Fig. 3) to a short arm 152 fixed on a longitudinal shaft 153 (Fig. 5) mounted for rocking movement in brackets on the frame. Fixed on shaft 152 is a crooked arm 154 and the forward end of this arm is connected with the lower end of link 148 which lifts the pivoted hook member 145.

This completes one feeding and packing operation and the cycle now repeats so long as a continuous supply of bottles and empty cases is at hand.

The modified form of apparatus shown in Figs. 13 to 21, inclusive, will now be referred to. The operation of this apparatus is substantially the same as that of the form shown in Figs. 1 to 12, inclusive, the principal difference being that the coordination of the step-by-step operating mechanism 85a for the flight conveyer chain 71a, and the elevating mechanism (air cylinder 112a) for the elevating table 44a is accomplished electrically instead of mechanically.

The various parts of the apparatus shown in Figs. 13 to 21 which are substantially identical with corresponding parts of the apparatus of Figs. 1 to 12, have been given the same reference characters but with the suffix "a" added. Accordingly, the description to follow refers only to the portions of the modified apparatus which differ from those of the preferred form, and it will be understood that the description previously given will otherwise apply to the modified form of apparatus.

Referring to Figs. 13, 14 and 19, the step-by-step mechanism 85a comprises a one-revolution clutch which starts and stops the conveyer chains 71a abruptly instead of imparting harmonic motion to them as is done by the

crank, rack bar and pinion mechanism 85. This one-revolution clutch comprises a toothed wheel 155 which is keyed to main shaft 69a and consequently rotates continuously. Mounted alongside of wheel 155 but turning loosely thereon is a sleeve 156 which, at the end nearest wheel 155, has fixed to it a driven member 157 comprising two projecting lugs or arms. At its opposite end sleeve 156 has fixed to it a sprocket around which passes a chain 158. Chain 158 is driven intermittently, as is about to be described, and imparts the step-by-step motion to conveyer chains 71a since it is trained around a sprocket 159 on driving shaft 73a.

Rotation is imparted to sleeve 156 from wheel 155 by means of a spring biased dog 160 which is at the end of one of the arms of driven member 157. Dog 160 has a tail portion 161 arranged to be engaged by a roller 162 mounted on a control arm 163 which is pivoted on a cross-shaft 164. A stop member 165 limits the downward movement of control arm 163. When arm 163 is in the down position shown in Fig. 19, roller 162 engages tail portion 161 and holds dog 160 withdrawn from wheel 155.

By lifting control arm 163, the dog is released and engages one of the teeth of wheel 165, and sleeve 156 commences to rotate. If arm 163 is again lowered immediately, it will engage tail 161 as soon as sleeve 156 makes one revolution and again withdraw the dog and stop further rotation of the sleeve. This up and down movement is imparted to control arm 163 by means of a solenoid 166. When the solenoid is energized, its armature 167 is raised and carries arm 163 with it, being connected thereto by a link and pin connection 168. The circuit for energizing solenoid 166 is shown in Fig. 20 and will be discussed later on.

The inlet or case-supply section 64a is somewhat different from the corresponding portion of the apparatus shown in Figs. 1 to 12 since it comprises an escapement mechanism, indicated generally by numeral 169. This comprises a horizontally arranged rock shaft 170 (Fig. 16), at the opposite ends of which are fixed double armed levers 171 and 171¹. The arms of these two levers are in alignment laterally, and at the end of each arm is an inwardly projecting pin. On these pins are mounted two pairs of rollers 172 and 173. The construction and arrangement of arms 171 and 171¹ is such that the two pairs of rollers are spaced apart somewhat less than the length of the trays or cases to be fed, and the whole mechanism is rocked back and forth so that when a case comes in from the right of Fig. 15 its forward end strikes the two pairs of rollers 172 which are in their upward position as is held in the position indicated by C_{1a}.

On the next rocking movement of shaft 170, the pair of rollers 172 descends below the bottom of the case allowing the case to slide forward and strike the pair 173 which have been raised simultaneously. On the following rocking movement, the case is tilted by the upward lifting of its rear end by rollers 172 as shown in the position C_{2a}, the forward pair of rollers 173 being lowered to allow the case to be carried forward by the two conveyer belts 100a and delivered to the inclined roller table 103a between a pair of flight bars 79a carried by the flight chains 71a.

This timing of the case between the flight bars is accomplished by mechanism for rocking shaft 170 as follows. A cam 174 (Fig. 13) is mounted on drive shaft 73a and has cooperating with it a roller 175 (Fig. 15) mounted on the end of an arm 176 which is fixed to a shaft 177. On the opposite end of this shaft there is an arm 178 (Fig. 16) having a roller 179 at its inner end which actuates rock shaft 170 by engagement with the outer end of a lever 180 fixed to the center of rock shaft 17. A tension spring 181, also operatively connected to the outer end of lever 180, rocks the escapement mechanism in the opposite direction.

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In this form of the apparatus an air valve 182 for controlling the air supply and exhaust to and from the cylinder 112a which operates elevating table 44a, corresponds to air valve 111 of Fig. 1. However, it is moved to open position by means of a solenoid 183 (Figs. 17, 18 and 20), and to the closed position by the operation of cam 150a (Figs. 13 and 13a) and suitable linkage. This linkage is the same as that previously described and shown in Figs. 1-4a as far as rock shaft 153a (Fig. 17). This rock shaft is provided with a downwardly extending arm 184 which is connected by means of a link 185 with the operating rod of air valve 182. The armature of solenoid 183 is operatively connected to the opposite end of the operating valve of air valve 182 as shown in Figs. 17 and 18.

The solenoid 166 which moves armature 167 to control the one-revolution clutch 85a is energized by means of a magnetically operated switch 186 (Fig. 20). This switch closes a set of contacts 187 when its operating coil is energized thereby energizing solenoid 166 from the supply conductors 188. The circuit (Fig. 20) which controls the energization of the operating coil of magnetic switch 186 includes a number of switches S₁—S₆ and the functions of some of these are the same as those of latches 115, 116 and 117 in the mechanically controlled apparatus. Some of these switches also coordinate the operations of the step-by-step tray advancing mechanism and the raising and lowering of elevating table 44a.

In place of the latch 115 of the mechanically controlled form of apparatus, switch S₁ is arranged on the frame of the apparatus near case position C_{1a} and is operated by means of a lever 189 which is biased into engagement with one side of the case as shown in Fig. 14. When a case is present at this position, switch S₁ is closed, but otherwise remains open. Switches S₁—S₆ are substantially alike in construction. Each includes an appropriate stationary contact, or contacts, and a movable contact arm, all being indicated diagrammatically in Fig. 20. The contact arm is moved by an operating lever having a roller at its end which is engaged by the part which actuates the switch (see lever 190 and the case operating lever 189). Movement of the switch operating lever tensions a spring (for example spring 191) and closes the switch contacts.

Switch S₂ is operated by arm 134a by the case at position C_{3a} and this switch corresponds to latch 117 of the preferred form of apparatus. This switch insures that the case has properly entered the space between the carrier bars and prevents the operation of the apparatus in the event that a case becomes jammed in the guideways due to protruding nails or strapping.

A switch S₃ (Figs. 13 and 20) is closed by a projection 192 on the bottom of elevating table 44a so that this switch is closed only when the case table is in its down position. This prevents the flight chain 71 from being advanced accidentally when the case table is in the up position.

Switch S₆ is located at one side of the flight conveyor and is adapted to be closed by the engagement of its operating lever with the end of the flight bar 79a which has just moved the tray or case onto the elevating table 44a. This switch and switches S₄ and S₅ control the circuit of air valve 183 for the elevating table. Switches S₄ and S₅ are operated through actuating mechanism of particular construction which includes a case detector 193 operating through an opening in case table 44a so that these switches are operated by a combination of the downward movement of table 44a and the presence or absence of a case on the table, as will presently be described in detail.

The circuit connections of switches S₁—S₆ with the operating coil of magnetic switch 186, which controls the energization of the one-revolution clutch solenoid 186, and with the operating coil of solenoid 183, which

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opens the air valve 182 to raise the elevating table 44a, are shown in Fig. 20. It is assumed that the apparatus is primed with cases, that is, cases are present at position C_{1a}, C_{2a}, C_{3a}, C_{4a} and C_{5a}, that is, on the case table 44a, and that this table has descended from the up position to the down position with the tray filled with bottles, air valve 182 having just been closed by the operation of cam 150a and the linkage, previously described, which is connected with the operating rod of this air valve.

From one of the supply conductors 188 a circuit may be traced through the contacts of a manually operated shut-off switch 194, through a conductor 195 to the movable switch contact 196 of switch S₄, thence through the upper stationary contact of this switch to the upper contact of switch S₄ and conductor 207 to the movable contact 208 of switch S₅, thence through the upper contact of this switch to a conductor 197. Conductor 197 leads to the contacts of switch S₃, thence through a conductor 198 through the contacts of switch S₁, conductor 199, the contacts of switch S₂ and conductor 200 to the operating coil of magnetic switch 186 and from this coil to the opposite supply conductor 188. The next movement, consequently, is a step advance of flight chains 71a, and, in Fig. 20, this is about to take place through the energization of solenoid 166 by the closing of magnetic switch 186.

The particular actuating mechanism for switches S₄ and S₅ is shown in Fig. 13 and diagrammatically in Fig. 21 in several different positions. Referring to Fig. 13, the case detector 193 is a narrow plate having beveled forward and rear edges which is engaged by the case on the platform and held down as shown in Fig. 13. Detector plate 193 is carried on the upper end of an arm 201 which is pivoted at 202 to a bracket projecting downwardly from beneath elevating table 44a. An extension 203 of arm 201 on the opposite side of pivot 202 engages the operating lever of switch S₄ and moves it to the position shown in Fig. 20 and also in Fig. 21-A. The actuating mechanism includes a third and longer arm 204 which turns loosely on pivot 202 and is actuated from extension 203 by means of a tension spring 205 which urges arm 204 against a stop pin 206 on the side of extension 203. Arm 204 actuates the operating lever of switch S₅.

Referring now to Fig. 21, with the full case resting on table 44a ready to be ejected, arms 203 and 204 of the actuating mechanism have, by their vertical descent with the table, engaged and moved the operating levers of the respective switches S₄ and S₅ to the position shown in Fig. 21-A (also in Fig. 20), where the movable contacts of both switches engage their top stationary contacts. This brings about the energization of the operating coil of magnetic switch 186, through the circuit previously described.

The energization of solenoid 166 by the closing of magnetic switch 186 causes the operation of one-revolution clutch 85a, and the flight conveyor chain 71a moves forward one flight bar space. The flight bar 79a which is immediately behind the tray at position C_{5a} moves the tray to the left and ejects it onto roller conveyor 99a. The movement of the flight bar releases the operating lever of switch S₆ thus opening this switch, which is in the circuit (to be described presently) of solenoid 183 which opens air valve 182. Hence, table 44a cannot be accidentally raised during movement of the flight conveyor. The succeeding flight bar 79a brings up the empty case from position C₄ to position C₅ on the elevating table. The ejection of the full tray from the table 44a releases detector 193 and the switches S₄ and S₅ move to the position shown in Fig. 21-B where the movable contacts engage the lower contacts of both switches.

The circuit of the energizing coil of magnetic switch 186 is opened either by this movement or by the release of switch S₂ at position C_{3a}. As soon as the new empty

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tray arrives on table 44a, it depresses detector 193 (Fig. 21-C) thus moving the lower end of extension 203 to the right and raising movable contact 196 of switch S₄ against the upper stationary contact, but arm 204 merely moves against the side of the actuating lever of switch S₅ and the movable contact 208 of this switch remains in the down position.

The movement of switch S₄ closes a circuit from conductor 195 through movable contact 196 to conductor 207, thence to movable contact 208, and to the lower stationary contact of switch S₅, to a conductor 209. Conductor 209 leads to switch S₆ which has been reclosed by the engagement of its operating lever with the end of the flight bar 79a which moves the new case into position on table 44a. This closes a circuit through a conductor 210 to the operating coil 183 of air valve 182 thus opening this valve and causing the air cylinder 112a to raise table 44a to its up position to receive the charge of bottles from charge directing mechanism 7a of the bottle packing machine.

This releases arms 203 and 204 from the operating levers of switches S₄ and S₅, and the movable contact of switch S₄ returns to engagement with its lower stationary contact. The dropping of movable contact 196 of switch S₄ leaves open the circuit to the operating coil of magnetic switch 186 so that, although the case detector switches S₁ and S₂ may be closed by cases at their respective positions, the flight conveyor chains 71a are prevented from being advanced by the step-by-step mechanism. The table operated switch S₃ which is closed only when table 44a is in its down position also prevents the flight conveyor chains from being advanced accidentally when the table 44a is in the up position.

After the discharge of the load of bottles into the tray on the raised table, cam 150a again moves air valve 182 to the closed position thereby lowering table 44a, and the cycle described above again commences.

The mechanically and the electrically controlled apparatuses operate in substantially the same way to automatically feed the trays or cases to, and in coordination with, the bottle packing mechanism. It will be understood that additional changes may be made in the construction and arrangement of the two embodiments of the invention hereinabove disclosed without departing from its spirit or from its scope which is set forth in the appended claims.

We claim:

1. In an article packing machine, packing mechanism for inserting an assembled charge of articles into a case, a movable table for raising an empty case from a lower position into charge-receiving position with respect to said mechanism and for returning the filled case to said lower position, a case slideway at the level of said lower table position, an endless conveyor having spaced rigid flight bars arranged to move successive empty cases along said slideway and over said table, mechanism constructed and arranged to advance said conveyor intermittently a predetermined distance at each operation of said advancing mechanism and to terminate said advance when one of said flight bars has positioned a case over said table and in registry with said inserting mechanism, and elevating mechanism for raising said table to enable the case thereon to receive a charge and for returning said filled case to its previous position in front of said flight bar, whereby, on the next advance of said endless conveyor, said flight bar will remove the filled case from said table and the next succeeding flight bar will position the next succeeding case upon said table.

2. In an article packing machine, packing mechanism for inserting an assembled charge of articles into a case, a movable table for raising an empty case from a lower position into charge-receiving position with respect to said mechanism and for returning the filled case to said lower position, a case slideway at the level of said lower table position, an endless conveyor having spaced rigid

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flight bars arranged to move successive empty cases along said slideway and over said table, mechanism constructed and arranged to advance said conveyor intermittently a predetermined distance at each operation of said advancing mechanism and to terminate said advance when one of said flight bars has positioned a case over said table and in registry with said inserting mechanism, elevating mechanism for raising said table to enable the case thereon to receive a charge and for returning said filled case to its previous position in front of said flight bar, whereby on the next advance of said endless conveyor said flight bar will remove the filled case from said table and the next succeeding flight bar will position the next succeeding case upon said table, and means for controlling said conveyor advancing mechanism to cause an advance of said endless conveyor after each complete reciprocation of said table.

3. An article packing machine as set forth in claim 2 in which a one-revolution clutch is operatively connected to actuate the charge-inserting mechanism to insert the assembled charge of articles into the case, said one-revolution clutch having a tripping member to initiate its operation, and said tripping member being actuated by the reciprocating table as the table reaches the charge-receiving position.

4. An article packing machine as set forth in claim 2 in which the table elevating mechanism is provided with control means to cause the table to rise, said means being operatively connected with the conveyor advancing mechanism and actuated thereby substantially at the end of each advancing movement of the conveyor.

5. An article packing machine as set forth in claim 2 in which the conveyor advancing mechanism is constructed to operate through a complete cycle and is provided with a tripping device for initiating such operation, said tripping device being actuated by the reciprocating table substantially as it reaches its lower position.

6. An article packing machine as set forth in claim 5 in which the tripping device comprises a latch mechanism, said mechanism being actuated to release position by the downward movement of the reciprocating table and substantially at the end of such movement.

7. An article packing machine as set forth in claim 2 in which the endless conveyor is provided with a drive shaft, the conveyor advancing mechanism comprising a continuously rotating crank, a rack bar driven by said crank, the teeth of said rack bar engaging a gear arranged to rotate freely on the endless conveyor drive shaft, a toothed wheel keyed to said drive shaft, a driving pawl for coacting with said wheel, said pawl being pivotally mounted upon and rotating with said gear, means for biasing said pawl into engagement with said toothed wheel, a shiftable shield constructed and arranged to engage said pawl and hold it out of engagement with said wheel, and means for shifting said shield out of engagement with said pawl when said crank is at one end of its stroke to cause said pawl to engage the toothed wheel and rotate the drive shaft of the endless conveyor.

8. In an article packing machine, charge-releasing mechanism, charge-directing mechanism for receiving the released charge and through which the same is dropped into a case, a reciprocating table for raising a case from a lower position into charge-receiving position with respect to the charge-directing mechanism and lowering the filled case to said lower position, a conveyor having spaced flight bars arranged to move over said table when at said lower position to move successive cases beneath said charge-directing mechanism, step-by-step conveyor operating mechanism for moving said conveyor a predetermined distance at each operation of said mechanism, said movement terminating when a case has been positioned by one of said flight bars in registry with said charge-directing mechanism, elevating mechanism for raising and lowering said table, means for controlling said step-by-step operating mechanism to cause an advance of said

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conveyor after each complete reciprocation of said table, an in-feed conveyor constructed and arranged to deliver empty cases to said flight conveyor, timing mechanism associated with said in-feed conveyor, and means operated by said step-by-step mechanism for actuating said timing mechanism to cause the delivery of the cases one at a time between the flight bars of the flight conveyor.

9. An article packing machine as set forth in claim 8 in which a one-revolution clutch is operatively connected to actuate the charge-inserting mechanism to cause the assembled charge of articles to be inserted in the case, said one-revolution clutch having a tripping member to initiate its operation, and said tripping member being actuated by the reciprocating table as it reaches the charge-receiving position.

10. An article packing machine as set forth in claim 8 in which the step-by-step conveyor moving mechanism is constructed to operate through a complete cycle and is provided with a tripping device for initiating such operation, said tripping device being actuated by the reciprocating table substantially as it reaches its lower position.

11. In an article packing machine, packing mechanism for inserting a charge of articles in a case including a reciprocating table, the initiation of the cycle of operation of said packing mechanism being effected by the rise of said table, a flight conveyor to advance empty cases, said table serving to raise a case from said flight conveyor to the charge-receiving position of said packing mechanism and to return the filled case to said flight conveyor for ejection, step-by-step conveyor moving mechanism having a cycle of operation for advancing said flight conveyor, elevating mechanism for said table, means actuated by the return movement of said table to effect the initiation of the cycle of operation of said step-by-step conveyor moving mechanism, and means actuated by said mechanism for controlling said elevating means to raise said table.

12. In an article packing machine, packing mechanism for inserting a charge of articles in a case including a reciprocating table, the initiation of the cycle of operation of said packing mechanism being effected by the rise of said table, a flight conveyor to advance empty cases, said table serving to raise a case from said flight conveyor to the charge-receiving position of said packing mechanism and to return the filled case to said flight conveyor for ejection, step-by-step conveyor moving mechanism having a cycle of operation for advancing said flight conveyor, elevating mechanism for said table, cycle initiating means actuated by the return movement of said table to effect the initiation of the cycle of operation of said

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step-by-step mechanism, means actuated by said conveyor moving mechanism for controlling said elevating means to raise said table, and means operated by a case on the flight conveyor to condition the cycle initiating means for operation.

13. The combination as set forth in claim 12 including an in-feed conveyor for supplying cases to the flight conveyor, and means operated by a case on the in-feed conveyor for further conditioning the cycle-initiating means for operation.

14. The combination as set forth in claim 12 including an in-feed conveyor for supplying cases to the flight conveyor, timing mechanism therein operated by the step-by-step mechanism to deliver the cases one at a time between the flight bars, and means operated by a case on the in-feed conveyor for further conditioning the cycle-initiating means for operation.

15. In an article packing machine, packing mechanism for inserting a charge of articles in a case including a reciprocating table, the cycle of operation of said packing mechanism being initiated by the rise of said table, a flight conveyor to advance empty cases, said table serving to raise a case from said flight conveyor to the charge-receiving position of said packing mechanism and to return the filled case to said flight conveyor for ejection, step-by-step conveyor moving mechanism having a cycle of operation for advancing said flight conveyor, elevating mechanism for said table, cycle initiating means actuated by the return movement of said table to effect the initiation of the cycle of operation of said step-by-step conveyor moving mechanism, means actuated by said mechanism for controlling said elevating means to raise said table, and an in-feed conveyor for supplying cases to the flight conveyor.

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