Jan. 23, 1945. C. J. MALHIOT 2,367,684

PACKAGING MACHINE AND METHOD OF PACKAGING

Filed Aug. 7, 1941 6 Sheets-Sheet 1

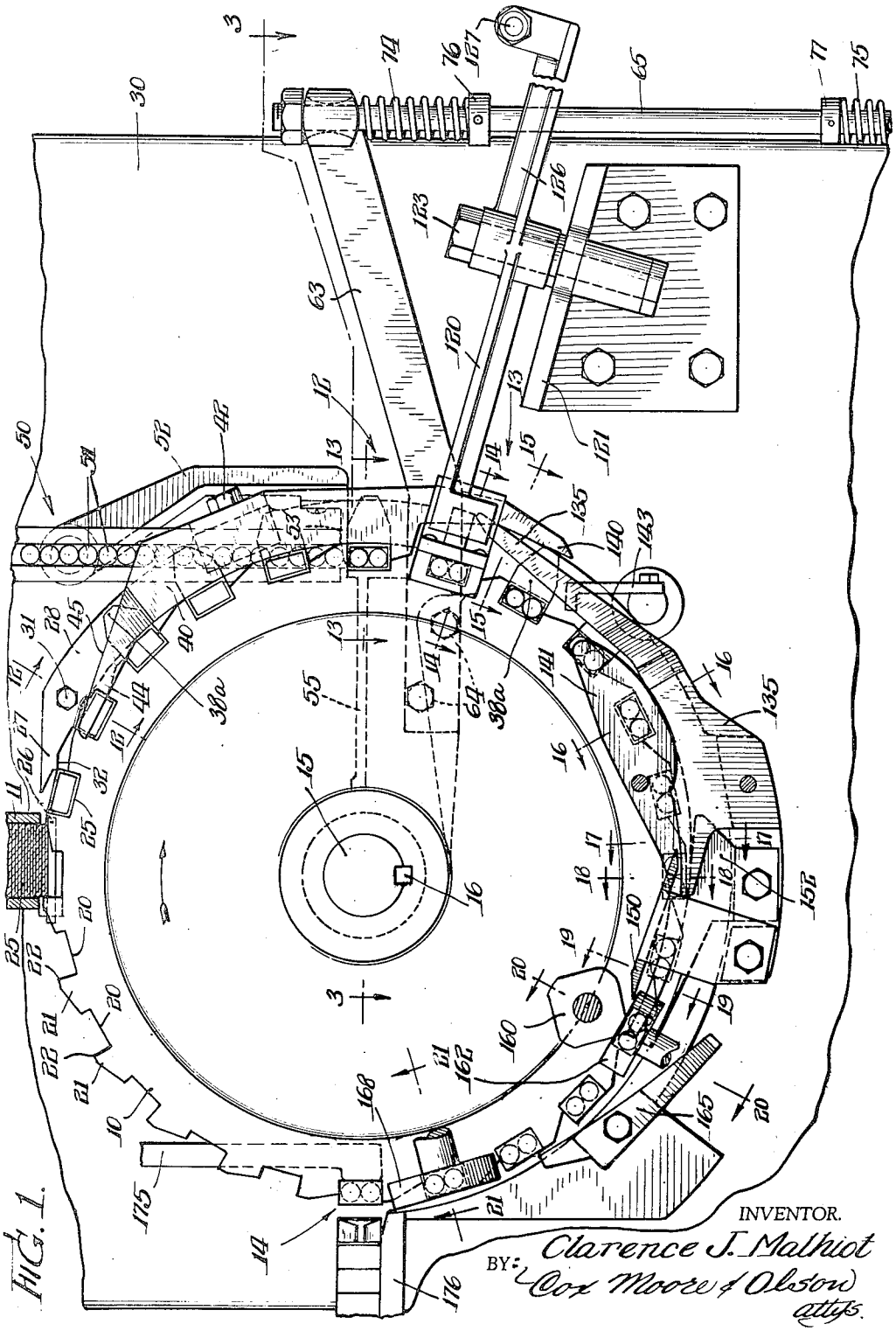


FIG. 1.

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PACKAGING MACHINE AND METHOD OF PACKAGING

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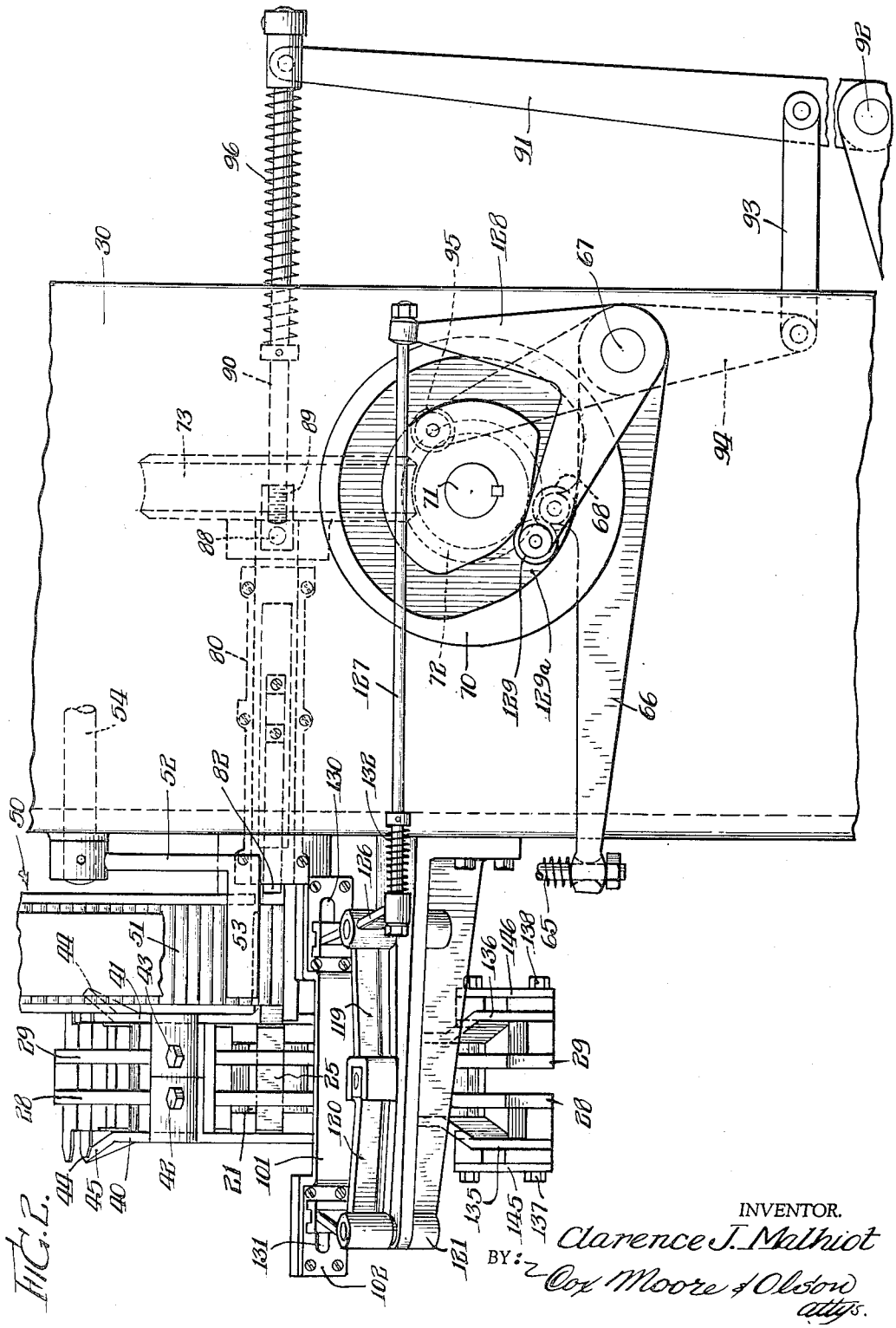


FIG. 2.

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Jan. 23, 1945. C. J. MALHIOT 2,367,684

PACKAGING MACHINE AND METHOD OF PACKAGING

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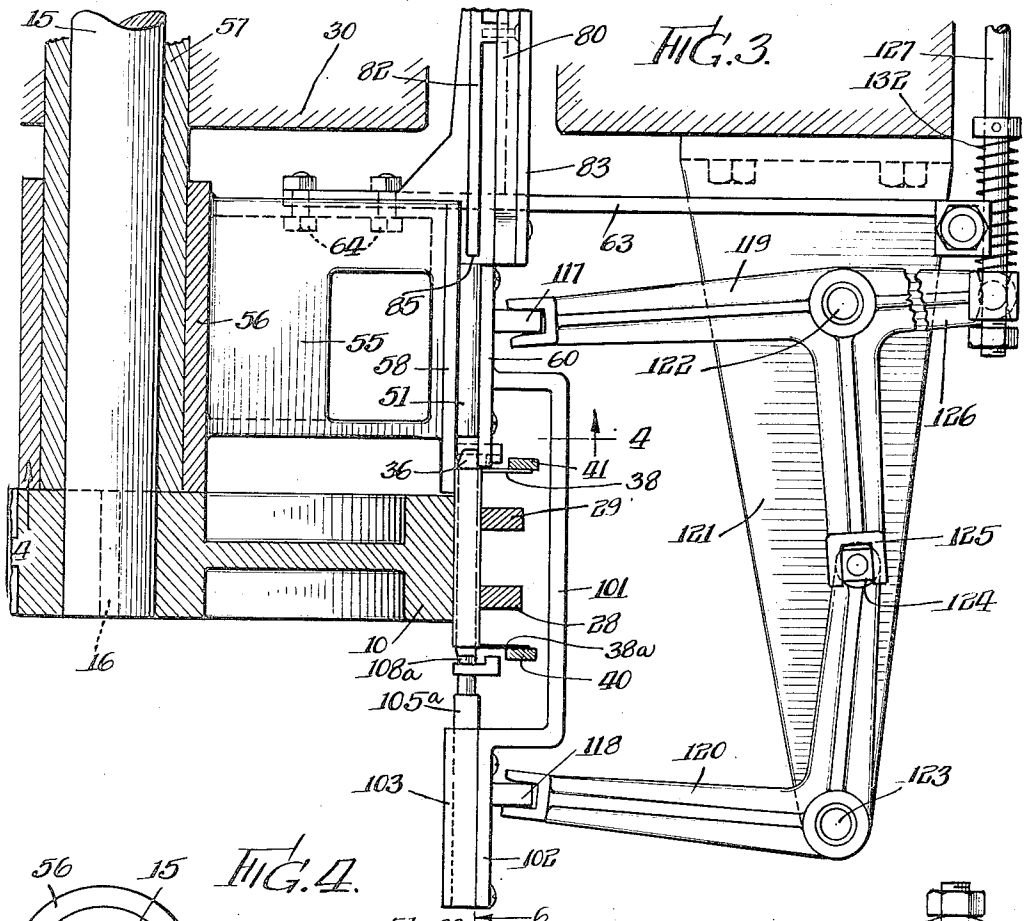


FIG. 3.

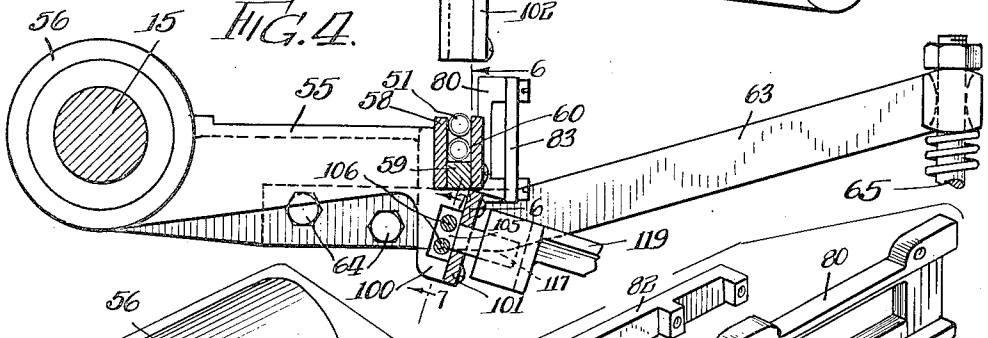


FIG. 4.

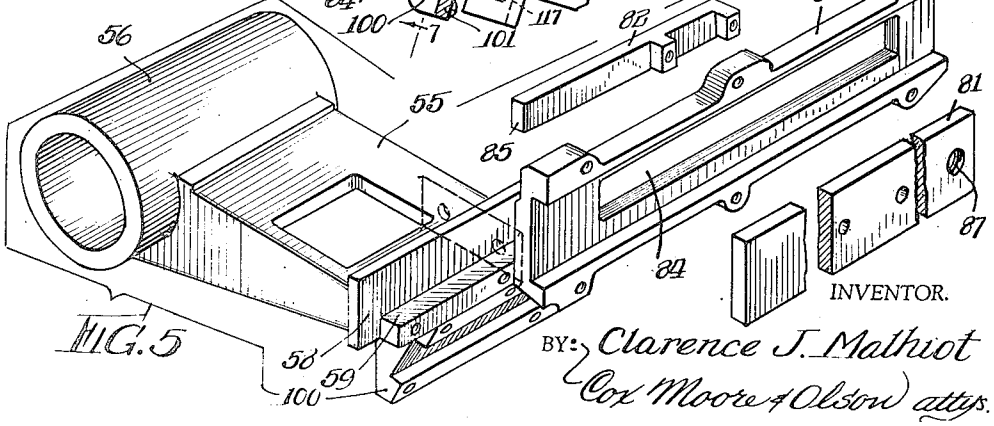


FIG. 5.

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PACKAGING MACHINE AND METHOD OF PACKAGING

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FIG. 6.

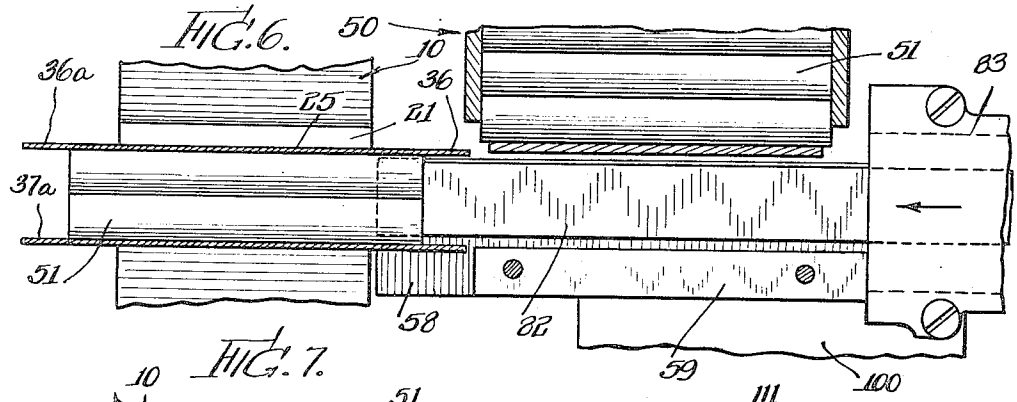


FIG. 7.

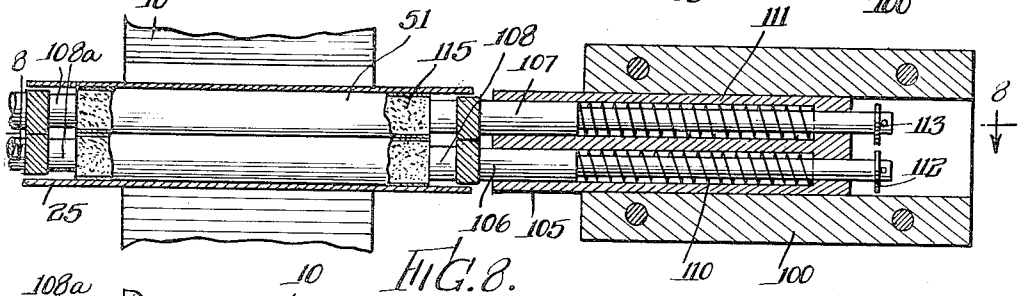


FIG. 8.

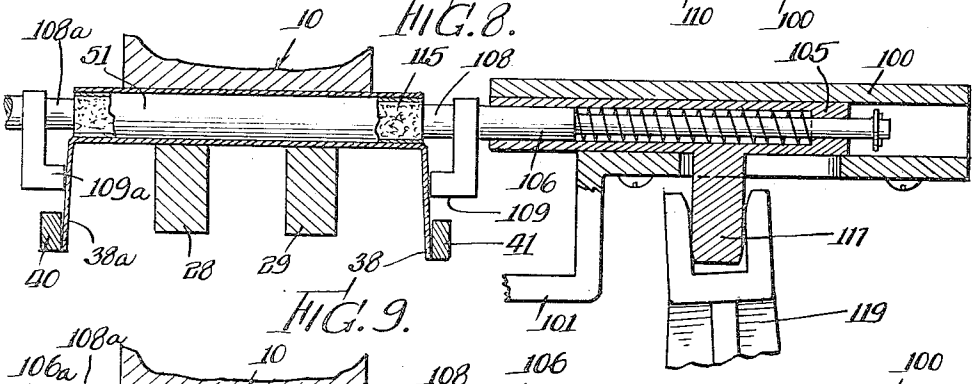


FIG. 9.

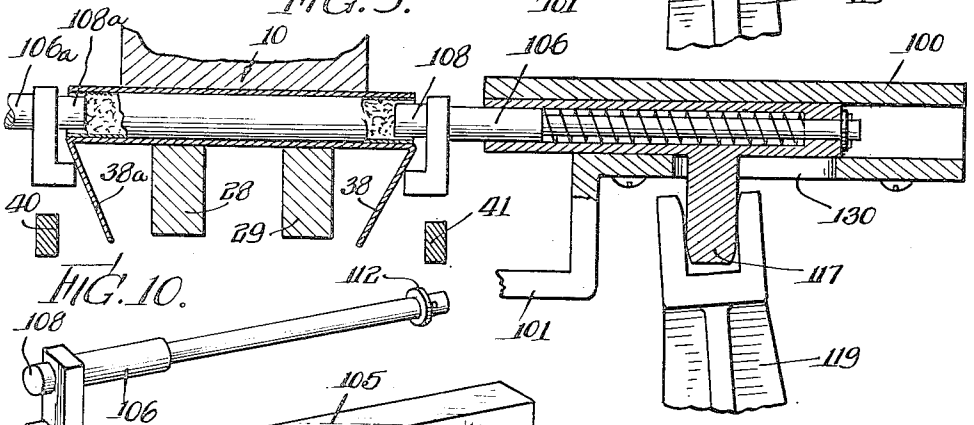


FIG. 10.

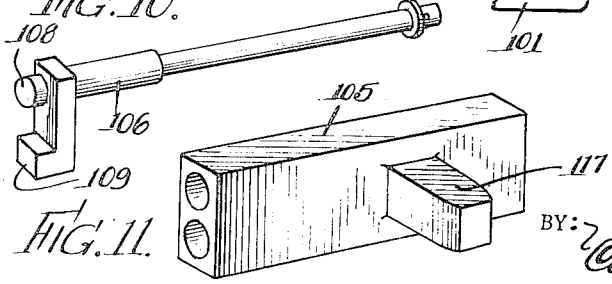


FIG. 11.

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FIG. 12.

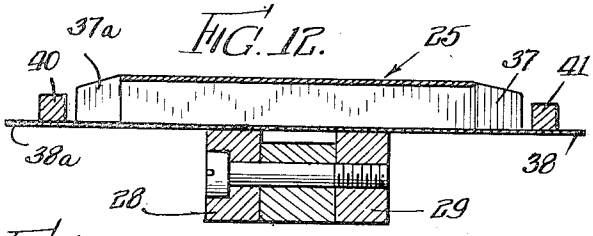


FIG. 12a

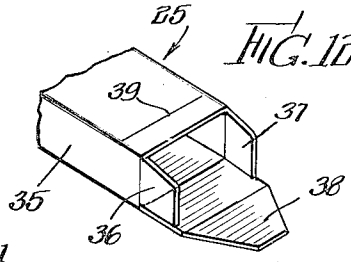


FIG. 13.

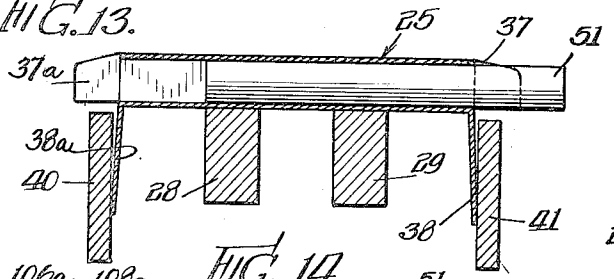


FIG. 13a

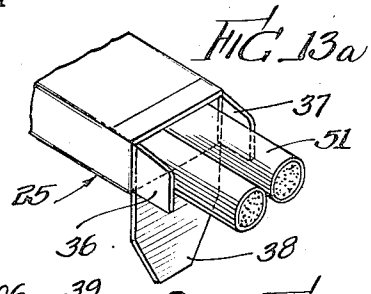


FIG. 14.

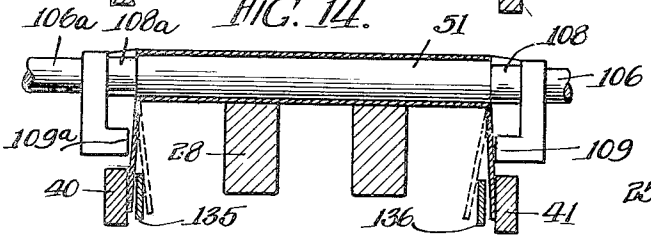


FIG. 14a

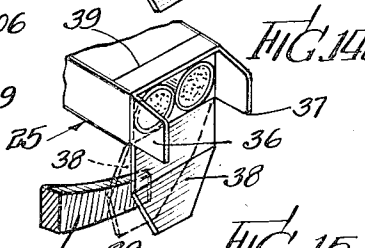


FIG. 15.

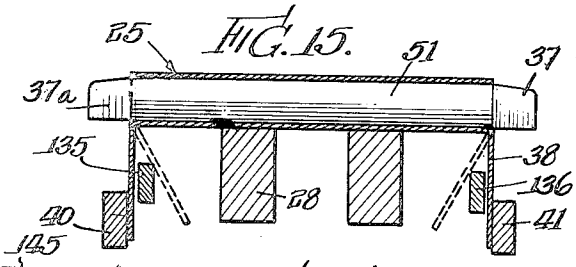


FIG. 15a

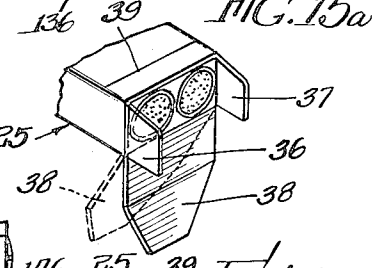


FIG. 16.

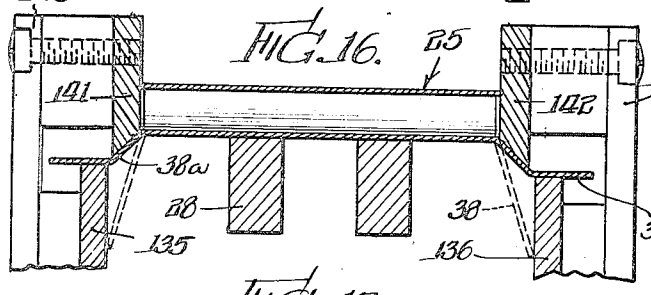


FIG. 16a

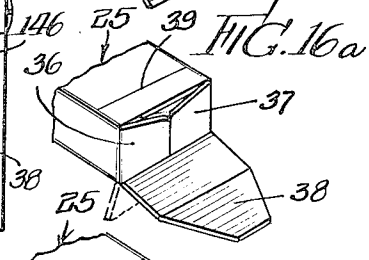


FIG. 17.

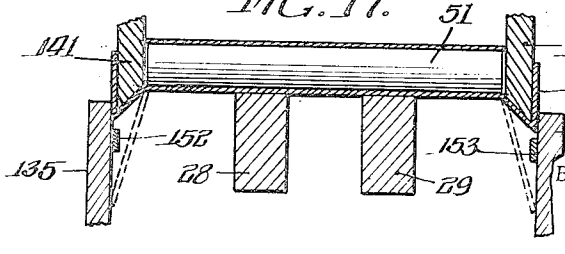
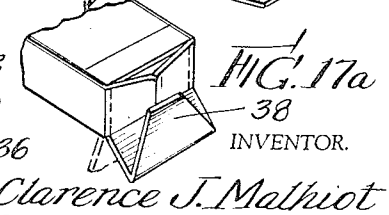


FIG. 17a



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FIG. 18.

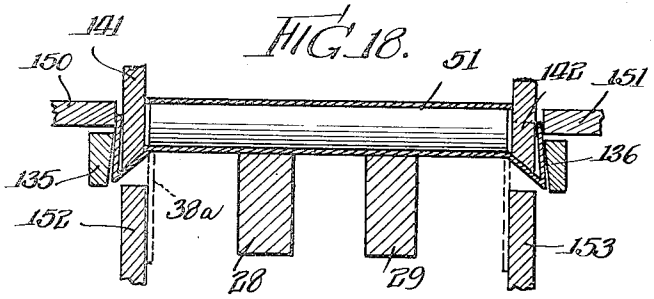


FIG. 18a

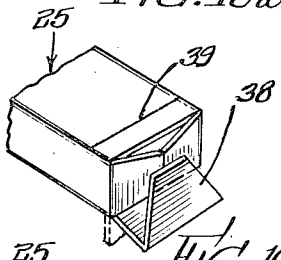


FIG. 19.

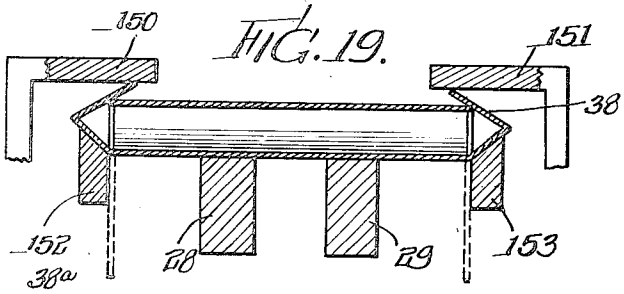


FIG. 19a.

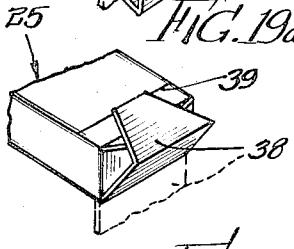


FIG. 20.

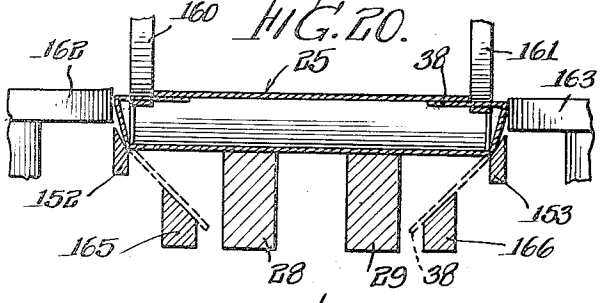


FIG. 20a.

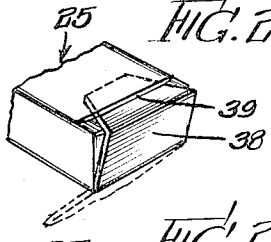


FIG. 21.

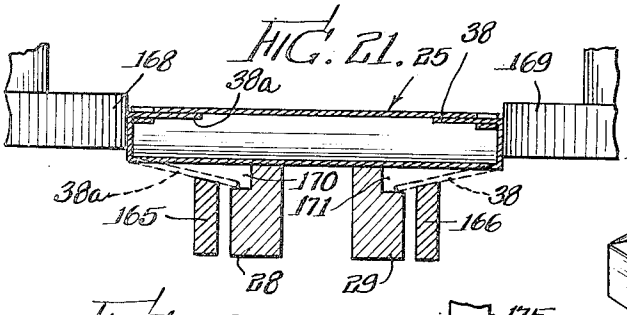


FIG. 21a.

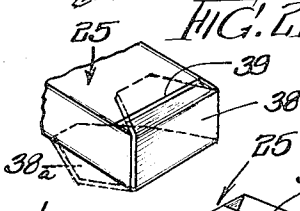


FIG. 23.

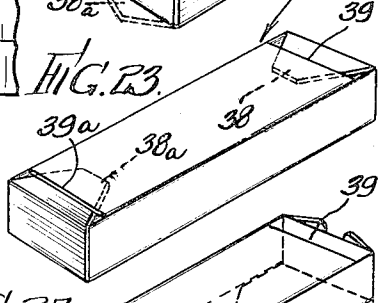


FIG. 22.

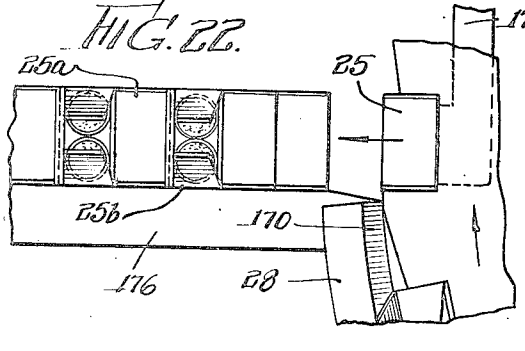
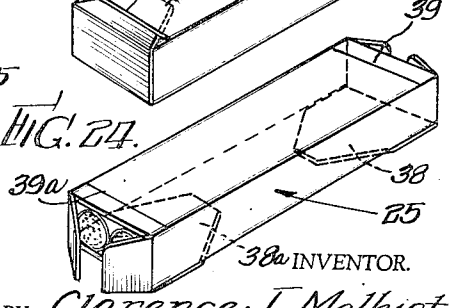


FIG. 24.



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Patented Jan. 23, 1945

2,367,684

UNITED STATES PATENT OFFICE

2,367,684

PACKAGING MACHINE AND METHOD OF PACKAGING

Clarence J. Malhiot, Oak Park, Ill., assignor to F. B. Redington Co., Chicago, Ill., a corporation of Illinois

Application August 7, 1941, Serial No. 405,816

27 Claims. (Cl. 93—6)

This invention relates to packaging machines and methods of packaging, and to detector means and methods, particularly adapted for use with packaging apparatus, for detecting an improper filling of a package and for resultingly controlling the packaging operation.

It is an object of the invention to provide improved packaging apparatus and methods, and to provide improved detecting means and methods operable during a packaging operation, for detecting an improper filling of a package and for controlling the resultant packaging operations.

More particularly it is an object of the invention to provide detector mechanisms and methods, and packaging means controlled thereby, which are reliable and rapid in operation, which are operable upon frangible articles, and which are operable on the articles during their continuous and high speed movement through the machine.

A further object of the invention is to provide detector means and methods of the type stated, which individually sense both the presence or absence and also the condition of each article to be packaged, and which operate in a manner so as to positively insure that only properly filled packages will be transmitted through and delivered normally from the machine.

A still further object of the invention is to provide detector means and methods, and packaging devices controlled thereby, which, while readily distinguishing between properly and improperly filled packages, do not impair the package container, but leave the same in ready condition to be corrected or repacked, as for example by hand.

Various other objects, advantages and features of the invention will be apparent from the following specification when taken in connection with the accompanying drawings wherein a preferred embodiment is set forth for illustrative purposes.

In the drawings, wherein like reference numerals refer to like parts throughout:

Fig. 1 is a general assembly view, in front elevation, of a packaging machine constructed in accordance with the principles of the invention and adapted to carry out the methods thereof;

Fig. 2 is an end view of the machine of Fig. 1, looking from the right, and more particularly illustrating the mechanisms at the package filling and detector stations;

Fig. 3 is a partial horizontal section through the machine, on the line 3—3 of Fig. 1, and showing the parts at the filling and detector stations;

Fig. 4 is a sectional view through the mechanism of Fig. 3 on the line 4—4 thereof;

Fig. 5 is an exploded view of the parts of Fig. 4, illustrated in perspective;

Figs. 6 and 7 are sectional detail views of the filling and detector mechanisms, respectively, and taken on the lines 6—6 and 7—7 of Fig. 4;

Fig. 8 is a sectional view of the detector mechanism on the line 8—8 of Fig. 7;

Fig. 9 is a view similar to Fig. 8 but showing the detector operating upon an improperly filled package;

Figs. 10 and 11 are detail perspective views of parts of the detector mechanism;

Figs. 12 to 21 are detail illustrative views, indicating successive steps in the operation of the machine and taken successively on the lines 12—12 to 21—21 of Fig. 1, each view being taken looking in a clockwise direction;

Figs. 12a to 21a are detail perspective views of the package end in its condition as illustrated, respectively, in Figs. 12 to 21;

Fig. 22 is a detail view of the machine at the package discharging station; and

Figs. 23 and 24 are illustrative perspective views showing, respectively, a properly filled and an improperly filled package or carton as discharged from the machine.

In the drawings the invention has been illustrated as embodied in a machine for packaging cigarettes or the like, as the invention in certain of its aspects is particularly adapted to packaging machines of such character. It is to be understood, however, that other aspects of the invention are adapted for general use, including packaging machines for packaging other types of articles. The machine shown is in many of its aspects similar to that illustrated in the patent of Michael J. Milmoe, No. 1,486,598, dated March 11, 1924, to which reference may be made for a more detailed showing of certain of the mechanisms.

Referring more particularly to the drawings, and first to Fig. 1 thereof, it will be seen that the machine comprises in general a main carrier or conveyor 10 adapted to convey the packages or cartons from a supply magazine 11, past the filling and detector stations generally indicated by the numerals 12 and 13, and along the packaging or carton folding and tucking mechanisms arranged peripherally of the wheel, for final ejection at the delivery station of the machine, generally indicated by the numeral 14. The wheel 10 is adapted to be driven continuously and at a constant speed of travel during operation of the machine, by means of a central driving shaft 15 to which it is secured by a key 16, in a manner

best shown in Figs. 1 and 3. The shaft is driven in a clockwise direction as seen in Fig. 1.

The conveyor wheel comprises a series of circumferentially arranged pockets 20 into which the cartons are deposited from the carton supply magazine 11, the pockets being separated by a series of transverse projections 21, Figs. 1 and 2, the forward ends of which are raised to provide extending abutment surfaces as indicated at 22. The cartons, indicated by the numeral 25, are supported in superposed relation within the magazine 11 by a pair of fingers 26 arranged on opposite sides of the bottom of the magazine and adapted to support the ends of the lowermost carton in the stack. As the wheel 10 is rotated, the abutment surfaces 22 of the projections 21 successively engage the body of the lowermost carton, between the support fingers 26, causing the cartons which come from the magazine in flat condition to be successively deposited within the wheel pockets 20. The manner of operation of mechanism of this character is set forth in detail in the aforesaid Milmoe Patent No. 1,486,598.

Continued motion of the conveyor wheel causes the cartons to be engaged against the ends 27 of a pair of guide members 28 and 29, Figs. 1 and 2, extending peripherally of the wheel 10 and adapted to continuously engage the outer surfaces of the cartons and hold them within the pockets of the conveyor wheel until the cartons reach the discharge station 14. To this end it will be noted that the guide members extend in parallel relationship continuously along the periphery of the wheel substantially from the supply magazine 11 to the discharge station. They are supported upon the frame or main housing 30 of the machine by means of bolts or the like such as indicated at 31. The forward ends of the guide members are provided with engagement projections 32, Fig. 1, adapted to abut the leading edge of the carton, squaring the same, and feeding it properly within the conveyor wheel pocket.

Referring, for example, to Fig. 12*a*, it will be seen that the cartons 25, in the particular illustrated embodiment, when in open or squared position, comprise a rectangular body 35 having an end closure comprising a pair of side flaps 36 and 37, and a cover flap or tab 38. The carton is symmetrical, and is provided with similar closure members at both ends, see Fig. 12. The carton body is further provided at each end with a slit 39 adapted to receive the end of the cover flap. The end closure is closed by first folding the side flaps into closed position, as shown for example in Fig. 16*a*, and thereafter folding and tucking the cover flap into position and into the slit 39, as shown for example in Fig. 19*a*. As the cartons are initially squared and arranged within the pockets of the conveyor wheel, the side flaps and the cover flaps extend outwardly from the carton body, as shown in Fig. 12*a*.

As the movement of the conveyor wheel 10 progresses, bringing the carton to the position indicated by the section line 12—12 in Fig. 1, and illustrated in Figs. 12 and 12*a* of the drawings, a pair of folding cams 40 and 41, Figs. 1 and 2, mounted on the guides 28 and 29 by bolts or the like 42 and 43 and arranged on either side of the conveyor wheel, engage the cover flaps at either end of the carton for the purpose of reversely folding them from the position illustrated in Figs. 12 and 12*a* to that shown in Figs. 13 and 13*a*. The forward ends of the folding cams are bent outwardly as indicated at 44, and these end extensions are further provided with cam surfaces 45, the arrangement being such that as the cartons are moved by the conveyor, the cover flaps are caused to engage these cam surfaces, being reversely folded, outwardly from the periphery of the conveyor wheel, to the Figs. 13 and 13*a* position. During this folding operation the side flaps 36 and 37 are not engaged and accordingly remain in their original position.

In the interest of uniformity, and for purposes of comparison of Figs. 12 to 21 inclusive, the guides 28 and 29 are in each instance illustrated below the carton. It is to be understood, however, that the actual disposition of the guides with respect to the carton, in so far as vertical position is concerned, constantly changes along the periphery of the conveyor wheel.

As the cartons reach the Fig. 13 position, they have arrived at the filling or loading station where the articles to be packaged are inserted into the cartons. In the particular illustrated embodiment these articles are cigarettes. The loading or carton-filling mechanism is illustrated in Figs. 1 to 6 inclusive. Specifically, there is provided a vertically extending hopper, generally indicated by the numeral 50, Figs. 1 and 2, within which the cigarettes 51 are carried in superposed relation. A latch device comprising an arm 52 having at its lower end a laterally extending finger 53, is provided for controlling the movement of the cigarettes from the lower end of the hopper. To this end the arm 52 is pinned to a shaft 54 journaled in the frame of the machine and provided with driving mechanism operable to oscillate the shaft in timed relation with the movement of the conveyor wheel and other parts of the loading mechanism later to be described. As the shaft 54 is oscillated, the finger 53 is periodically removed from and returned to supporting position with respect to the stack of cigarettes in the hopper, and upon each oscillation a predetermined number of the cigarettes, two in the particular disclosed embodiment, are permitted to drop into the loading mechanism.

Referring specifically to Figs. 3, 4 and 5, the loading mechanism comprises a main support arm 55 having a hub portion 56 loosely journaled on a sleeve 57 fixed to the frame of the machine and within which the conveyor wheel drive shaft 15 is rotatably mounted. The support arm is mounted between the frame of the machine and the conveyor wheel 10, as best shown in Fig. 3. The support arm is provided at its outer end with a vertical plate 58, a horizontal ledge 59, and a second vertical plate 60, Fig. 4, secured to the ledge 59 by screws or the like. The plates 58 and 60, and the ledge 59, form a pocket or trough structure into which the cigarettes are dropped from the hopper 50 upon withdrawal of the finger 53. During operation of the machine the support 55 is oscillated between predetermined upper and lower limits by means later to be described. When the support is in its uppermost position, as shown in Fig. 1, the ledge 59 is so disposed with respect to the bottom of the hopper 50, that two cigarettes will drop onto the ledge upon operation of the finger 53. The finger 53 is then returned to supporting position and the support 55 is lowered, or moved clockwise as seen in Fig. 1, at the speed of movement of the conveyor wheel 10; and during the time that the support 55 is moving at the rate of travel of the conveyor wheel, the cigarettes are ejected from the ledge 59 longitudinally into the carton carried by the conveyor wheel. The support arm 55 is thereupon returned to its origi-

nal upper position and the operation repeated, the support arm thus oscillating between predetermined upper and lower limits, and moving downwardly at the speed of the conveyor wheel, as stated.

To effect the oscillation of the support, the support is provided with an extension 53, Figs. 1 and 4, secured in position by means of bolts 54. This extension at its outer end is operatively associated with a vertically reciprocable rod 65 secured at its upper end to the extension and at its lower end to an operating lever 66, Fig. 2. The lever 66 is pivoted to the frame of the machine, as indicated at 67, and is provided with a roller 68 engageable within a suitably shaped cam track formed in the rear face of a cam disc 70 mounted upon the driving shaft 71. This latter shaft is provided with a worm gear 72 having engagement with and driving a gear 73 on shaft 15; the arrangement being such that shaft 71 with its cam 70 and the shaft 15 are constantly driven during operation of the machine, and the shaping of the cam track being such as to impart the desired predetermined operation to the rod 65 and the connected loading support member 55. It will be noted that the rod 65 is not rigidly connected to the members 63 and 66, but is associated therewith in a manner so as to permit of the rocking movements of the parts. More particularly, the rod is loosely fitted within neck-shaped openings in the ends of members 63 and 66, and compression springs 74 and 75 bearing, respectively, against the extension 63 and the lever 66, and against collars 76 and 77 secured to rod 65, hold the parts in position. These springs are normally unyielding, but may yield in the event of jamming of the parts.

The means for ejecting the cigarettes from the ledge 59 longitudinally into the cartons comprises a guide 80, Fig. 5, formed as a part of the end of the support member 55, a slide block 81 longitudinally slidable within the guide, and a loading member 82 secured to the slide block. A plate 83 is adapted to be bolted to the front face of the guide 80, and together with the guide forms a longitudinal sliding track for the slide block 81. The loading member 82, which may be bolted to the slide block, extends rearwardly through a slot 84 formed in the guide, the end 85 of the loading member being positioned so as to abut the ends of the cigarettes and force them longitudinally from the ledge 59 into the carton.

To control the movements of the slide block 81, the latter is provided with an opening 87 adapted to rotatably receive a laterally projecting pin 88, Fig. 2, formed as a part of a block 89 threadedly secured to an operating rod 90. This operating rod receives its motion from a lever 91 pivotally secured to the frame of the machine as indicated at 92 and adapted to be operated by a link 93 connected to one end of a lever 94 mounted on the same pivot axis 67 which carries the lever 66. The other end of lever 94 carries a roller 95 engageable within a cam track formed on a disc (not shown) similar to the cam disc 70 and mounted on the same driving shaft 71 but within the main housing 30. The cam track receiving the roller 95 is suitably shaped so as to impart the proper timed movements to the slide block 81 and the loading member 82 by means of the linkage described. A compression spring 96 forms a part of the operating connection between the lever 91 and the rod 90, and may yield in the event of jamming of the parts. The manner of operation of the loading member 82 to move the cigarettes from the ledge 59 into the open end of the carton is specifically illustrated in Fig. 6. As previously stated, this loading or filling of the cartons takes place while the support 55 and conveyor wheel 10 are moving as a unit. The loading operation takes place as the member 82 moves to the left as seen in Fig. 6, and as the loading member is retracted to the right the support 55 may be restored upwardly to its initial position.

Means is provided for detecting the condition of the filled carton immediately after the loading operation, the detector mechanism operating upon the carton at a station indicated by the section line 14—14 in Fig. 1, to which the carton moves immediately as it leaves the loading station. The detecting mechanism, like the filling or loading mechanism, operates upon the carton and the material therein during the continuous movement of the conveyor wheel 10, and to this end the sensing elements of the detector mechanism are carried by the support arm 55, so that such elements move with the conveyor and at the speed thereof during the sensing operation.

The support arm 55 is provided at its outer end with a depending projection 100, Fig. 5, forming the support for the sensing elements of the detector mechanism. This projection has a yoke member 101 secured thereto, by means of screws or the like, Fig. 4, the member being of general U-shape as best shown in Fig. 3, whereby to extend around the periphery of the conveyor wheel and associated parts. The unsupported end 102 of the yoke member carries, by means of screws or the like, a fitting 103 of the same general shape as the projection 100, the arrangement being such that the yoke member, together with the extension 100 and the fitting 103, provide housings on either side of the conveyor and in line with the conveyor pocket, in which the detector sensing elements are longitudinally slidable.

The manner in which the sensing elements are slidably mounted within the housing structures, and the construction of the elements, are best illustrated in Figs. 7 to 11 inclusive. It is to be understood that sets of sensing elements are provided operable upon both ends of the package, the constructions being essentially similar so that a detailed description of one set will suffice for both. In Figs. 7 to 11 inclusive the sensing elements for the inner end of the package, the upper end as seen in Fig. 3, are illustrated in detail.

As shown, a slide block 105 is longitudinally reciprocable within the housing structure formed by the projection 100 and the yoke member 101, and this slide block is provided with a pair of longitudinal bores within which the sensing elements 106 and 107 are slidably mounted. Each sensing element is provided on its end, as best shown in Fig. 10, with a first or sensing projection 108 adapted to engage and sense the end of the cigarette, and a second or operating projection 109 adapted to engage the cover flap 38 of the carton. Compression springs as indicated at 110 and 111, Fig. 7, normally urge the sensing elements toward the carton end, the movement of the elements being limited by pin and washer assemblies on the ends of the sensing elements as indicated at 112 and 113. Means is provided, about to be described, for shifting the slide block 105, and the corresponding slide block for the other end of the carton, longitudinally within their slide housings toward and away from the carton ends, and it will be seen that as the slide blocks are shifted toward the carton ends the

sensing elements are brought individually into engagement with the ends of the cigarettes. If the cigarettes are properly in position within the carton, and are properly filled with tobacco 115, the sensing elements will be blocked upon engagement with the cigarettes, as shown in Fig. 8, the cover flaps 38 and 38a thereby remaining in the perpendicular position at which they are being held at the time by the folding cams 40 and 41. As the sensing elements are blocked by engagement with the ends of the cigarettes, the compression springs such as indicated at 110 and 111 yield as shown in Figs. 7 and 8, whereby the sensing elements are stopped during the continued movement of the slide blocks, such as 105, toward the carton ends. On the other hand, if no cigarette is in position, or if the cigarette is inadequately filled with tobacco or otherwise of improper condition such as of insufficient length or the like, the sensing elements continue in their movement toward the carton ends with the slide blocks, causing the cover flaps 38 and 38a to be further reversely folded or bent to the position shown in Fig. 9, and for a purpose later to be described. It will be noted that there are sensing elements for each end of each cigarette, so that if any part of the contents within the carton is absent or in improper condition, this fact will be detected by an additional cover flap increment of movement.

To enable the slidable movements of the detector mechanism slide blocks, the blocks are provided with operating projections 117 and 118, Figs. 8, 9, 11 and 3, which projections are engaged by bifurcated end portions of a pair of bell-crank levers 119 and 120, Fig. 3. These bell-crank levers are pivoted on a frame bracket 121 as indicated at 122 and 123 and are interconnected for simultaneous operation, the interconnecting means comprising a rotatably mounted block member 124 secured to the lever 120 and engageable within the bifurcated end portion 125 of the lever 119. Lever 119 is also provided with a rearwardly extending arm 126 the end of which is adapted to be secured to an operating rod 127, Figs. 3 and 2. This operating rod is connected at its other end to an arm 128 forming a part of a bell-crank lever, which has a roller 129 engaging a cam track 129a formed on the front surface of the cam disc 70 hereinbefore described. As the cam lever is operated rod 127 will be reciprocated in timed relation to the movements of the other parts of the machine, whereby to cause the simultaneous pivotal movement of the bell-crank levers 119 and 120, and the resulting slidable shifting of the slide blocks of the detector mechanism. To permit of the slidable movements of the blocks, it will be noted that the operating projections 117 and 118 extend outwardly through slots 130 and 131 in the associated housing structures. It will further be noted that the connection between the rod 127 and the lever operating arm 126 is of the safety type including a compression spring 132. Also, the connections at the opposite ends of the rod are such as to permit of the pivotal movements of the parts in a manner similar to that heretofore described in reference to operating rod 65.

The sensing elements are brought into operative engagement with the ends of the cigarettes during the downward movement of the support arm 55, at which time the sensing elements are being shifted at the speed of the conveyor wheel 10 and as a unit therewith. The detector slide blocks are then reversely shifted to withdraw the sensing elements from the carton ends, and the support 55 restored upwardly to normal position. During the downward shifting of the support 55, the loading mechanism operates upon a carton at the loading station, whereas the detector elements operate on the carton at the detector station, immediately in advance of the carton being loaded. To accommodate the bodily shifting of the detector slide blocks with the support 55, it will be noted that the slide block projections 117 and 118 are vertically shiftable within the bifurcated ends of the bell-crank levers 119 and 120.

The purpose of the detector mechanism, and the functions effected thereby in the subsequent operation of the machine, will be best understood by reference to Figs. 14 to 21 inclusive, and related figures of the drawings. As previously stated, if properly proportioned and filled cigarettes are properly positioned within the cartons at the detector station, no additional bending movement is imparted to the cover flaps 38 and 38a, Fig. 8, but if improper conditions exist an additional increment of movement is imparted to the cover flaps as shown in Fig. 9. Referring to Figs. 1, 14 and 14a, it will be seen that at the detector station the cartons come into operative engagement with the forward ends of a pair of folding cams 135 and 136 provided on either side of the conveyor wheel, these cams being mounted, respectively, upon the guides 28 and 29 by bolts or the like 137 and 138, as best shown in Fig. 2. The forward ends of the cams are so disposed that the cartons are moved into operative engagement therewith, as the conveyor wheel moves after the sensing elements of the detector have been engaged with the cigarettes and while being held in engagement therewith, as for example during the downward movement of the support 55. If the package is properly filled, it will accordingly be seen that the cover flaps 38 and 38a will move to a position outside of the cams 135 and 136, as shown in full lines at Fig. 14, but if the package is an improper one, the flaps will be held in their further folded position by the sensing elements at the time the folding cams 135 and 136 are engaged, so that the flaps will be caught inside of the ends of these folding cams, as shown in dotted lines in Fig. 14; and during the subsequent movements of the carton through the machine, the cover flaps will be folded in one manner or another depending upon how they lie with respect to these folding cams. Referring to Fig. 15, the position of the parts is illustrated at the station 15—15, Fig. 1, immediately as the cartons leave the detector station. The folding cams 40 and 41 terminate shortly beyond the station 15—15, the trailing end of the cam 40 being indicated by the numeral 140 in Fig. 1.

Means is provided for folding the carton side flaps into closed position, to the position illustrated in Fig. 16a, such means comprising a pair of stationary cams 141 and 142, Figs. 1, 16 and 16a, and a pair of rockable or moving folding members, provided for each end of the carton, and one of which is indicated by the numeral 143 in Fig. 1. The arrangement is such that as the cartons are brought into operative juxtaposition to the forward ends of the cams 141 and 142, the folding member 143 and the corresponding folding member at the opposite end of the carton rotate counterclockwise as seen in Fig. 1 at a speed faster than the movement of the carton, whereby the movable folding members engage the trailing side flaps 37 and 37a and fold them into closed

position. Substantially simultaneously the folding cams 141 and 142 engage the leading side flaps 36 and 36a, folding them into closed position, and thereafter engaging and retaining the flaps 37 and 37a closed. It is to be understood that the folding members such as 143 have an oscillating motion, counterclockwise into engagement with the flaps, and thereafter clockwise to be withdrawn. The cams 141 and 142 are supported from the guides 28 and 29 by suitable brackets 145 and 146, Figs. 1, 2 and 16, which extend beyond the range of the carton parts so as not to interfere with the movement thereof.

The cams 141 and 142 also cooperate with the cams 135 and 136 to effect the folding of the cover flaps 38 and 38a. More particularly, referring to Figs. 16 and 17, it will be seen that the two sets of cams are so shaped that their cooperative surfaces grip and fold the cover flaps as the cartons are moved by the conveyor wheel. However, such folding occurs only as to properly filled packages, the cover flaps of improperly filled packages being retained inside the guides 135 and 136, as shown in the dotted lines.

As the cartons reach the station 18—18 of Fig. 1 two pairs of additional stationary folding cams 150, 151 and 152, 153 have become operative, to engage in the folding operations. The cams 152 and 153, the extreme forward ends of which are shown in Fig. 17, first become operative to retain the cover flaps of improperly filled cartons in position, and thereafter cooperate with cams 150 and 151 to fold the cover flaps of properly filled cartons, as shown in Fig. 19. The cams 150 and 151 first cooperate with the cams 135, 136 and the cams 141, 142, Fig. 18, and thereafter with cams 152 and 153, Fig. 19, to effect the final folding operations on the properly filled carton cover flaps.

As the cartons reach the station 20—20 of Fig. 1, a pair of rollers 160 and 161, Fig. 20, become operative to engage and depress the ends of the cover flaps and the carton bodies, opening slits 39 and 39a, and simultaneously a second pair of rollers 162 and 163 become operative to tuck the flaps into the slits. Also, as shown in Fig. 20, at this time a still further pair of stationary cams 165 and 166 become operative to grip the cover flaps of improperly filled cartons whereby to retain such carton flaps in a position illustrated by the dotted lines.

At the station indicated by the section line 21—21 of Fig. 1, and as shown in Fig. 21, the final tucking operations are effected. More particularly, the cover flaps of properly filled cartons are engaged by final tucking rollers 168 and 169, and tucked into finally seated position, whereas the cover flaps of improperly filled cartons are forced by the cams 165 and 166 into the slots 170 and 171 in the guide members 28 and 29.

As the cartons reach the ejector station 14, a pair of ejector members, one of which is indicated at 175 in Figs. 1 and 22, operate to move the cartons onto a receiving table 176 in alined relation. It will be seen that cartons which have been properly filled reach the receiving table in completely and properly folded position, as shown in Fig. 23 of the drawings, whereas improperly filled cartons will be deposited upon the receiving table in the position illustrated in Fig. 24. The cover flaps of such latter cartons are retained within the grooves 170 and 171 of the guides 28 and 29 as the cartons reach the delivery station, and these cover flaps will remain reversely bent and be caught between adjacent cartons upon the receiving table. In Fig. 22 a properly filled and folded carton is indicated at 25a, whereas an improperly filled carton is shown at 25b, and it will be seen that the latter is readily distinguishable upon the receiving table so that it may be readily removed and properly packed by hand.

The operation of the mechanism has been fully hereinbefore set forth, but may be briefly summarized as follows. The cartons 25, arranged in flat and superposed relation in a supply magazine 11, are removed from the lower end thereof by the projections 21 of the rotatable conveyor wheel 10, and deposited within the conveyor wheel pockets 20. As the cartons engage the projections 32 of the guides 28 and 29, they are squared within the pockets, and thereafter the folding cams 40 and 41 reversely bend the carton cover flaps to the position of Fig. 13. At the loading station, indicated by the line 13—13 in Fig. 1, the oscillating support arm 55 and loading mechanism carried thereby operates to insert cigarettes from the cigarette supply hopper 50 into the carton. The loading member 82 operates while the support arm 55 is moving with the conveyor wheel to push the cigarettes from the receiving ledge 59 of the support arm, onto which they are deposited from the hopper 50, longitudinally into the carton. At the next station, the detector station, indicated by the line 14—14 of Fig. 1, detector mechanism comprising the plurality of spring-pressed sensing elements, such as the elements 106 and 107, engage the ends of each of the cigarettes, determining the presence or absence of cigarettes within the carton, and also the condition of each cigarette article. These sensing elements are also carried by the support arm 55 and are movable with the conveyor during the sensing operation. If cigarettes are properly within the carton, the cover flaps remain in the position as illustrated in Fig. 8. If the carton is improperly packed, the cover flaps are further reversely bent as shown in Fig. 9, and depending upon this operation of the detector mechanism, the subsequent carton packaging or folding mechanism operates in one manner or another upon the carton flaps. If the carton is properly filled, the cover flaps thereof are first folded by folding cams 135 and 136 in cooperation with the folding cams 141 and 142, as indicated in solid lines in Figs. 15, 16 and 17, and corresponding Figs. 15a, 16a and 17a; and the carton side flaps are folded into closed position by the folding cams 141 and 142, and by the movable folding members one of which is shown at 143. Further movement of the carton then causes the folding cams 152 and 153 and the folding cams 150 and 151 to operate upon the cover flaps as indicated in Figs. 18 and 19, and the rollers 160, 161, 162, 163 and 168 and 169 to operate as indicated in Figs. 20 and 21 to complete the cover flap folding operation. But on the other hand, if the carton has been improperly filled, the cover flaps are retained by the several sets of folding cams in the positions indicated in dotted lines in Figs. 15 to 20 inclusive, the flaps finally being tucked into slots within the guides 28 and 29, as indicated in Fig. 21. As the cartons are deposited upon the receiving table 176 at the discharge station 14, properly filled cartons will accordingly be in the condition shown in Fig. 23, or as indicated at 25a of Fig. 22, whereas improperly filled cartons will be readily distinguishable therefrom, in the condition shown in Fig. 24 or at 25b in Fig. 22.

It will be seen that in accordance with the invention, the detector mechanism operates to condition the carton cover flaps so that during subsequent packaging operations, different modes of treatment, and specifically different flap folding and tucking operations, are imparted to properly filled cartons on the one hand and improperly filled cartons on the other. The detector mechanism is of such a character that it does not injure frangible articles, such as cigarettes in the specific embodiment set forth, and the sensing of the cartons takes place during the continuous movement of the conveyor wheel. Rapid operation is enabled without impairing reliability in the detecting operation. A detector is provided for each article within the carton or package, and for each article end as well, so that the detector will sense either the absence of an article or any improper condition thereof. The detector operates after the loading operation has been completed and thus senses the condition of the package as it will be finally delivered from the machine. After the operation of the detector mechanism and during the subsequent packaging operations, while different modes of treatment are accorded properly and improperly filled cartons, no cartons are spoiled or in any way damaged, the improperly filled cartons being deposited upon the receiving table in a manner rendering their detection immediately apparent so that they may be removed and further processed or filled by hand.

It is obvious that various changes may be made in the specific embodiment of the invention set forth for purposes of illustration without departing from the spirit thereof. Accordingly, the invention is not to be limited to the specific apparatus and method steps set forth, but only as indicated in the following claims.

The invention is hereby claimed as follows:

1. A packaging machine comprising means for conveying a series of containers with articles therein along a predetermined path, packaging mechanism operable upon properly filled containers, packaging mechanism operable upon improperly filled containers, detector mechanism for detecting the condition of the articles with respect to the containers whereby to determine the loaded condition of the containers, and means controlled by the detector mechanism for controlling the cooperative relation between the containers and both said packaging mechanisms whereby the the packaging mechanism for improperly filled containers operates upon containers which are improperly filled and the packaging mechanism for properly filled containers operates upon containers which are properly filled.

2. A packaging machine comprising means for conveying a series of containers along a predetermined path, means operable at a loading station for inserting articles into the containers, means operable at a subsequent detecting station for detecting the condition of the articles within the containers whereby to determine the loaded condition of the containers, packaging mechanism operable upon properly filled containers, packaging mechanism operable upon improperly filled containers, and means controlled by the detector mechanism for controlling the cooperative relationship between the containers and both said packaging mechanisms whereby to control the manner of operation of said packaging mechanisms upon the containers.

3. A packaging machine comprising means for conveying a series of containers along a predetermined path, means operable at a loading station for inserting articles into the containers, means operable at a subsequent detecting station for detecting the condition of the articles within the containers whereby to determine the loaded condition of the containers, said detecting means being operable upon the articles while the containers are being moved by the conveying means, packaging mechanism operable upon properly filled containers, packaging mechanism operable upon improperly filled containers, and means controlled by the detector mechanism for controlling the cooperative relationship between the containers and both said packaging mechanisms whereby to control the manner of operation of said packaging mechanisms upon the containers.

4. The method of packaging which comprises moving a series of containers with articles therein along a predetermined path, detecting the condition of the articles with respect to the containers whereby to determine the loaded condition of the containers, and thereafter packaging properly filled containers by folding flaps thereof in one manner and improperly filled containers by folding flaps thereof in another manner in accordance with the detected loaded condition.

5. The method of packaging which comprises conveying a series of containers along a predetermined path, loading the containers by inserting articles therein, detecting the condition of the articles within the containers and while the containers are in motion along said predetermined path, and thereafter packaging properly filled containers by folding flaps thereof in one manner and improperly filled containers by folding flaps thereof in another manner in accordance with the determination of the detecting operation.

6. A packaging machine comprising means for conveying a series of containers each with a plurality of articles therein along a predetermined path, packaging mechanism operable upon properly filled containers, packaging mechanism operable upon improperly filled containers, detector mechanism including sensing elements individually operable upon each of the articles within the containers, and means controlled by the operation of the sensing elements for controlling the cooperative relationship between the containers and both of said packaging mechanisms.

7. A packaging machine as defined in claim 6 wherein the sensing elements of the detector mechanism are operable upon the articles while the articles are in the containers and while they are being moved by the conveying means.

8. The method of packaging cigarettes which comprises conveying a series of flap type containers with cigarettes therein along a predetermined path, detecting the presence or absence of the cigarettes within the containers, detecting the packing density of the tobacco within the cigarettes which are present, and thereafter folding the flaps of the containers in one manner or in another manner in accordance with the findings of said detecting operations.

9. The method of packaging defined in claim 8 wherein the detecting operations are performed while the articles are in motion along said predetermined path.

10. A packaging machine for cartons and the like comprising means for conveying a series of cartons with articles therein along a predetermined path, packaging mechanism for folding flap portions of properly filled cartons, packaging mechanism for folding flap portions of im-

properly filled cartons, detector mechanism for detecting the condition of the articles with respect to the cartons whereby to determine the loaded condition of the cartons, and means controlled by the detector mechanism for controlling the cooperative relationship between the containers and both of said packaging mechanisms.

11. A packaging machine for cartons and the like comprising means for conveying a series of cartons along a predetermined path, means operable at a loading station for inserting articles within the cartons, means operable at a detector station for detecting the condition of the articles within the cartons, carton flap folding mechanism for properly filled cartons, carton flap folding mechanism for improperly filled cartons, and means controlled by the detector mechanism for controlling the cooperative relationship between the cartons and both of said flap folding mechanisms, said flap folding mechanisms comprising a series of stationary cams arranged along the path of travel of the conveying means.

12. A packaging machine comprising means for conveying a series of containers along a predetermined path, means operable at a loading station for inserting a plurality of articles into each of said containers, means operable at a subsequent detecting station for detecting the condition of the articles with respect to the containers whereby to determine the loaded condition of the containers, said detector mechanism including sensing elements individually operable upon each article within the containers while the containers are in motion on said conveyor, and means for imparting an increment of motion to the sensing elements during the sensing operation along the path of movement of and substantially at the speed of travel of the conveyor.

13. A packaging machine comprising means for conveying a series of containers with articles therein along a predetermined path, and detector mechanism for detecting the condition of the articles with respect to the containers whereby to determine the loaded condition of the containers, said detector mechanism including a sensing element operable upon the articles within the containers while the articles are being moved by the conveying means, and means for imparting an increment of motion to the sensing element during the sensing operation along the path of movement of and substantially at the speed of travel of the conveyor.

14. A packaging machine comprising rotary means for conveying a series of containers along a predetermined path, loading mechanism disposed at a loading station for inserting articles into the containers, detector mechanism at a subsequent detecting station for detecting the condition of the articles within the containers, and means for moving the loading mechanism and the detector mechanism at the speed and along the path of travel of the conveying means during the loading and detecting operations.

15. A packaging machine comprising means for conveying a series of containers along a predetermined path, means operable at a loading station for inserting articles into said containers, and detector mechanism operable at a subsequent detector station for detecting the condition of the articles within the containers, said detector mechanism including a plurality of substantially identical sensing elements engageable with opposite ends of each of the articles within the containers.

16. A cigarette packaging machine comprising means for conveying a series of cartons along a predetermined path, means operable at a loading station for inserting cigarettes within said cartons, and detector mechanism operable at a subsequent detector station for detecting the condition of the cigarettes within the cartons, said detector mechanism including a plurality of sensing elements engageable with opposite ends of the cigarettes within the cartons, and carton flap engaging portions on said sensing elements whereby the carton flaps are moved by the sensing elements to a position determined by the position of the cigarettes.

17. A packaging machine comprising a rotary conveyor wheel for conveying a series of containers along a predetermined path, means operable at a loading station for inserting articles into the containers, detector mechanism operable at a subsequent detecting station for detecting the condition of the articles within the containers, support structure for the detector mechanism mounted upon the axis of rotation of the rotary conveyor, and means for oscillating said support in at least one direction at substantially the speed of the conveyor.

18. A packaging machine comprising means for conveying a series of containers with articles therein along a predetermined path, and detector mechanism for detecting the condition of the articles with respect to the containers whereby to determine the loaded condition of the containers, said detector mechanism comprising a sensing element having integral article engaging and container engaging portions, and means for urging said element portions into simultaneous engagement with the container and article.

19. A packaging machine comprising means for conveying a series of containers each with a plurality of articles therein along a predetermined path, detector mechanism for detecting the condition of the articles within the containers, said detector mechanism comprising a plurality of spring-urged sensing elements, each including integral article engaging and container engaging portions, and means for simultaneously moving said sensing elements into article and container engaging positions.

20. A packaging machine comprising a rotary conveyor adapted to convey a series of containers along a predetermined rotary path, loading mechanism arranged at a loading station for inserting articles into the containers, detector mechanism located at a subsequent detector station for detecting the condition of the articles within the containers, a support for the detector mechanism concentrically mounted with the axis of the rotary conveyor, means for oscillating said support and for moving said support in one direction at substantially the speed of travel of the conveyor, means for operating the detector mechanism while said support and conveyor are moving substantially as a unit, and packaging mechanism for operating on the containers at a subsequent packaging station, the manner of cooperation between the containers and said packaging mechanism being controlled by the detector mechanism whereby properly filled containers are packaged in one manner and improperly filled containers are packaged in another manner.

21. A packaging machine comprising means for conveying a series of containers with articles therein along a predetermined path, and detector mechanism for detecting the condition of the articles with respect to the containers whereby to

determine the loaded condition of the containers, said detector mechanism comprising a pair of sensing elements, means for resiliently urging the sensing elements into simultaneous engagement with opposite ends of an article within a container, packaging mechanism operable upon the containers for effecting the packaging thereof, and means controlled by said sensing elements for controlling the cooperative relation between the containers and said packaging mechanism whereby to control the manner in which the packaging mechanism effects the packaging of the containers.

22. A packaging machine as defined in claim 1 wherein said detector mechanism comprises a pair of oppositely disposed detector members engageable with relatively oppositely disposed surfaces of the articles.

23. The method of packaging which comprises moving a series of containers with articles therein along a predetermined path, detecting the condition of the articles with respect to the containers whereby to determine the loaded condition of the containers, and thereafter packaging properly filled containers by folding flaps thereof in one direction and improperly filled containers by folding flaps thereof in another direction in accordance with the detected loaded condition.

24. A packaging machine as defined in claim 10 wherein the packaging mechanism for folding flap portions of properly filled cartons comprises means for folding the flap portions into superposed relationship to form a carton closure, and wherein the packaging mechanism for folding flap portions of improperly filled cartons comprises means for reversely folding at least one carton flap portion to open position.

25. A packaging machine comprising means for conveying a series of containers with articles therein along a predetermined path, and detector mechanism for detecting the condition of the articles with respect to the containers whereby to determine the loaded condition of the containers, said detector mechanism including a pair of relatively oppositely disposed sensing elements operable upon relatively oppositely disposed surfaces of the articles within the containers while the articles are being moved by the conveying means, and means for imparting an increment of motion to the sensing elements during the sensing operation along the path of movement of and substantially at the speed of travel of the conveyor.

26. A cigarette packaging machine comprising means for conveying a series of containers along a predetermined path, means operable at a loading station for inserting cigarettes into said containers, detector mechanism operable at a subsequent detector station for detecting the condition of the cigarettes within the containers, said detector mechanism comprising a plurality of substantially identical sensing elements engageable with opposite ends of each of a plurality of cigarettes within each of the containers, means for simultaneously projecting the sensing elements into engagement with the cigarettes, and container folding mechanism controlled by said sensing elements to control the manner of packaging of the containers.

27. A cigarette packaging machine as defined in claim 26 wherein spring means is provided for projecting the sensing elements into engagement with the cigarettes.

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