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Filed July 6, 1965

DISPENSING APPARATUS FOR STACKED ARTICLES PROVIDED
WITH MEANS TO STRIP THE END ARTICLE FROM THE STACK

7 Sheets-Sheet 1



BY *Connolly and Hutz*
ATTORNEYS

Jan. 10, 1967

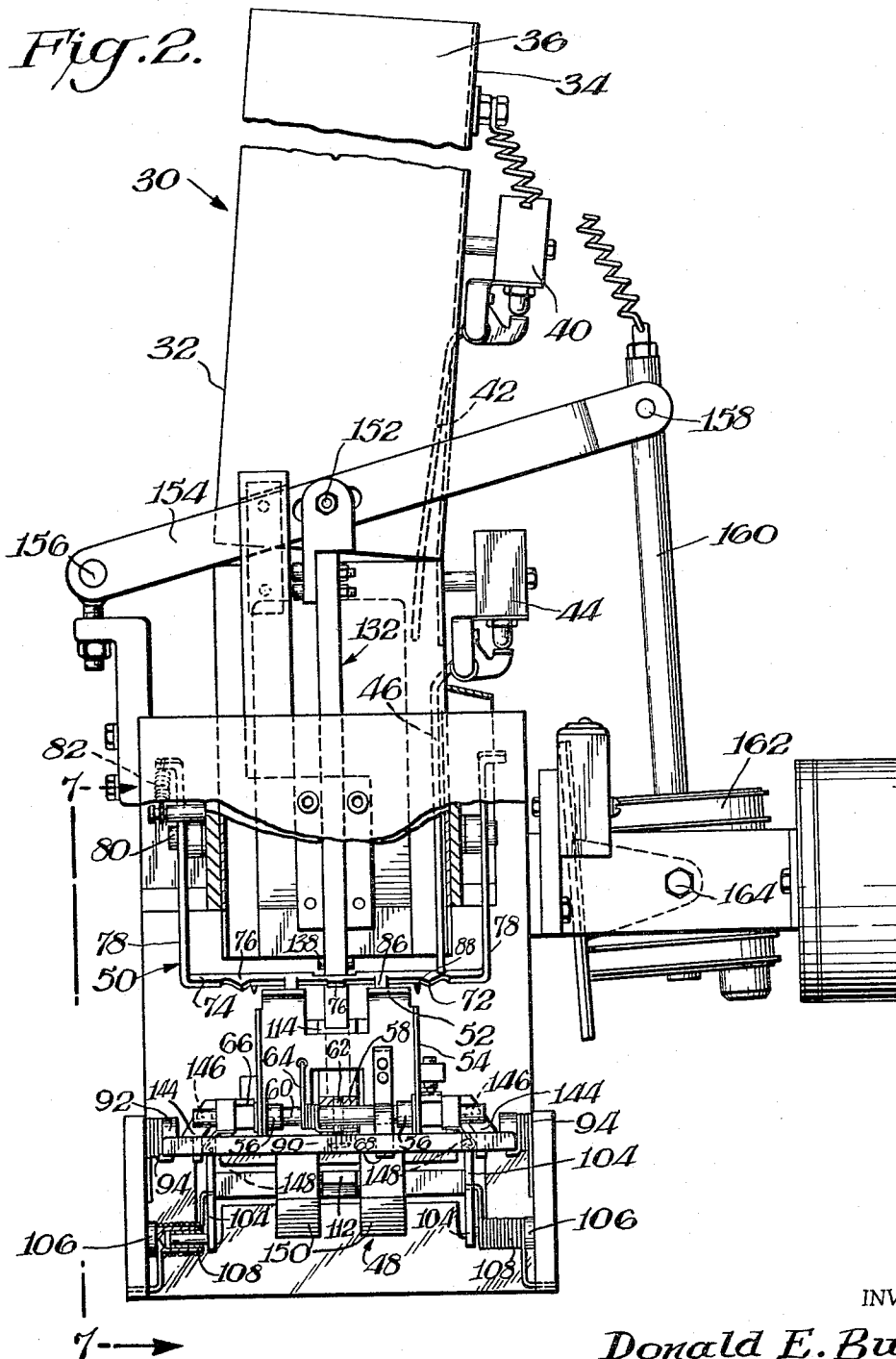
D. E. BURT

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7 Sheets-Sheet 2



INVENTOR

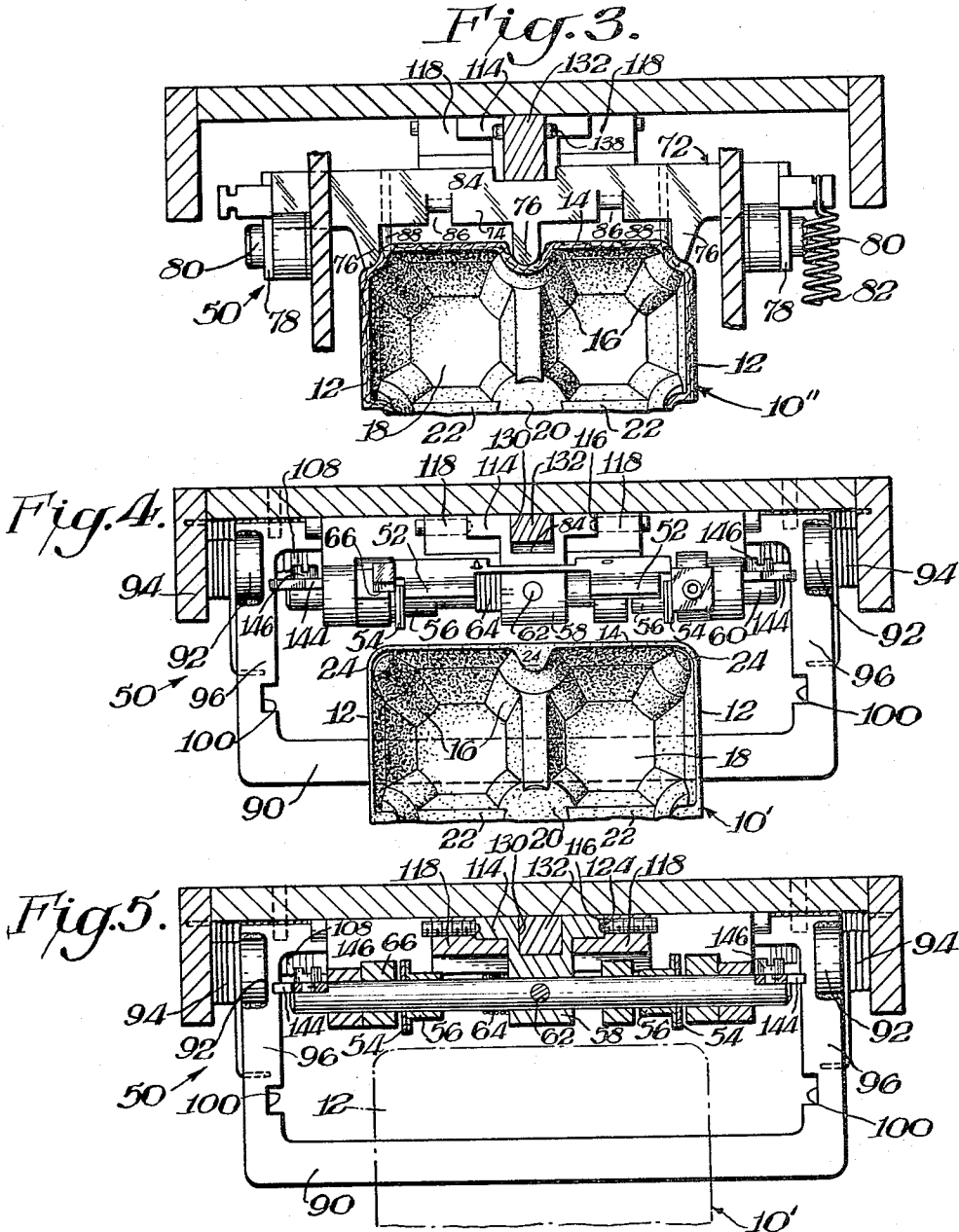
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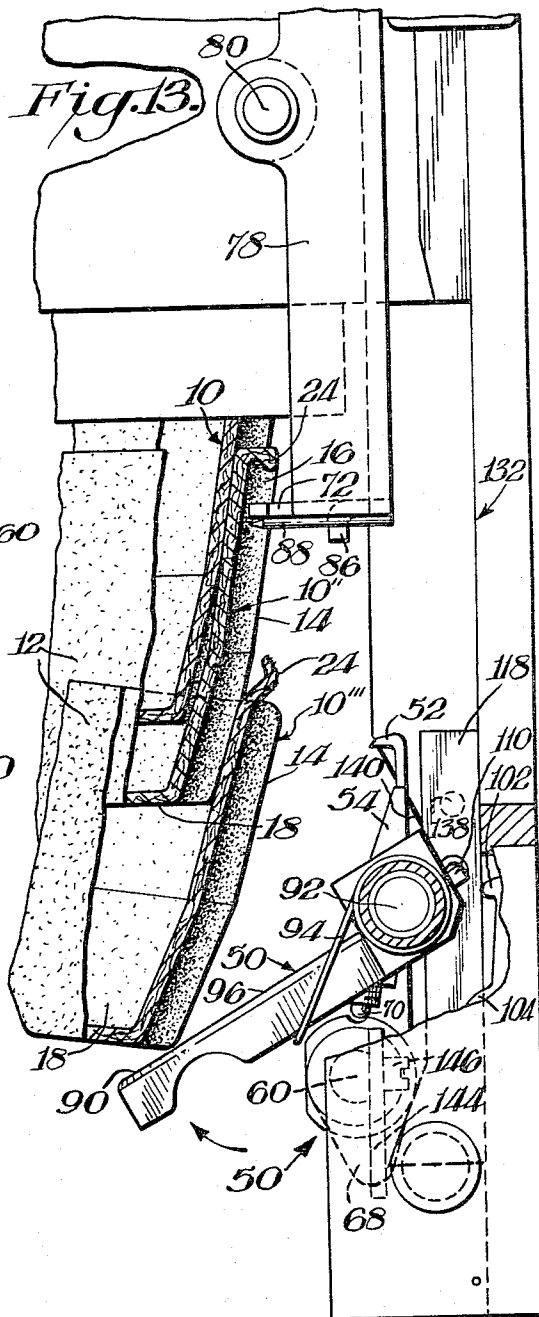
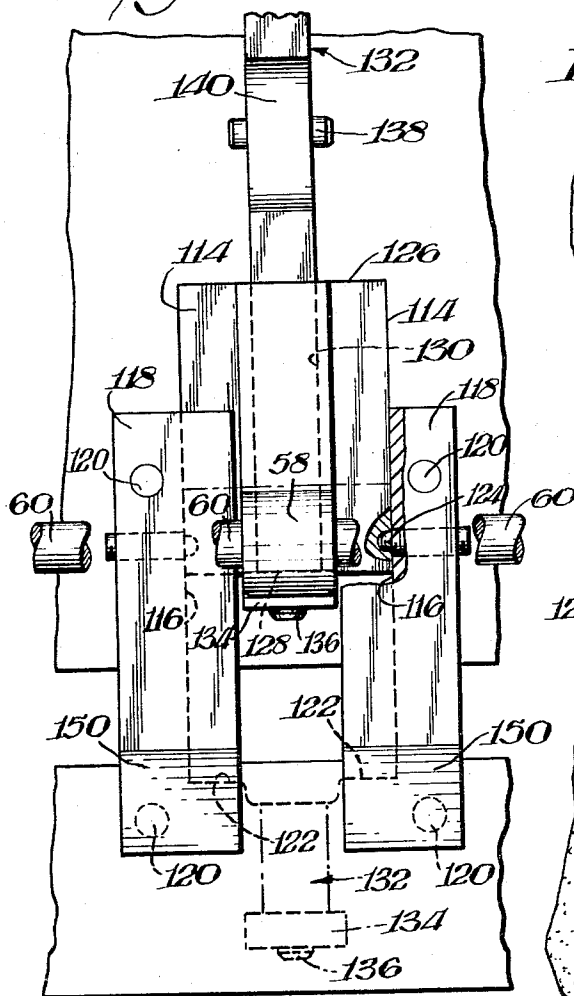
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Fig. 6.



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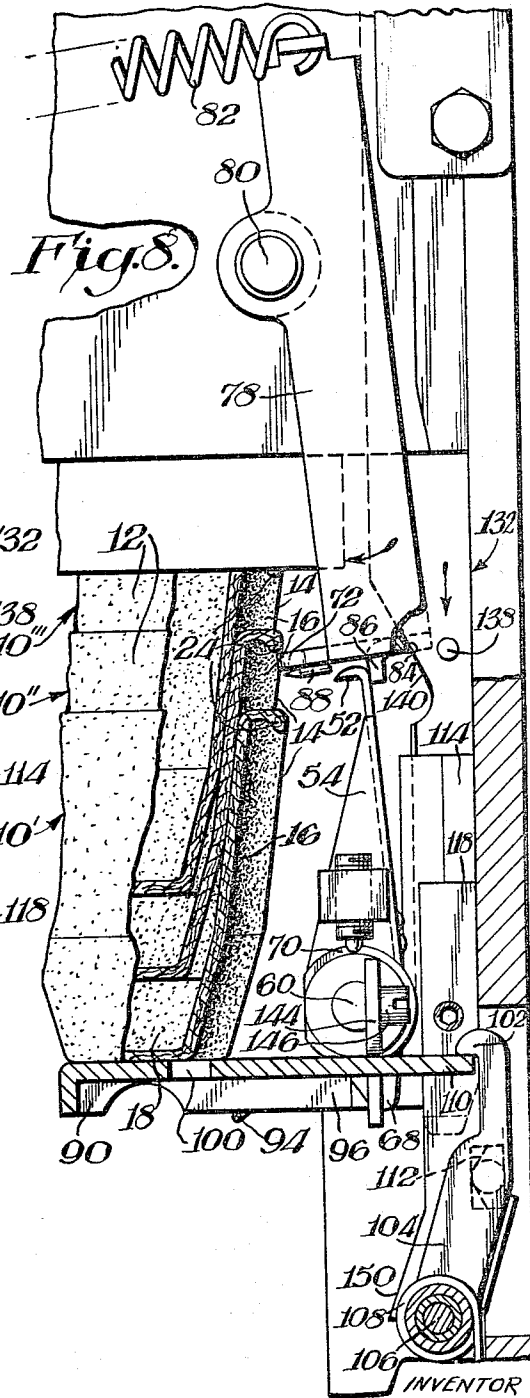
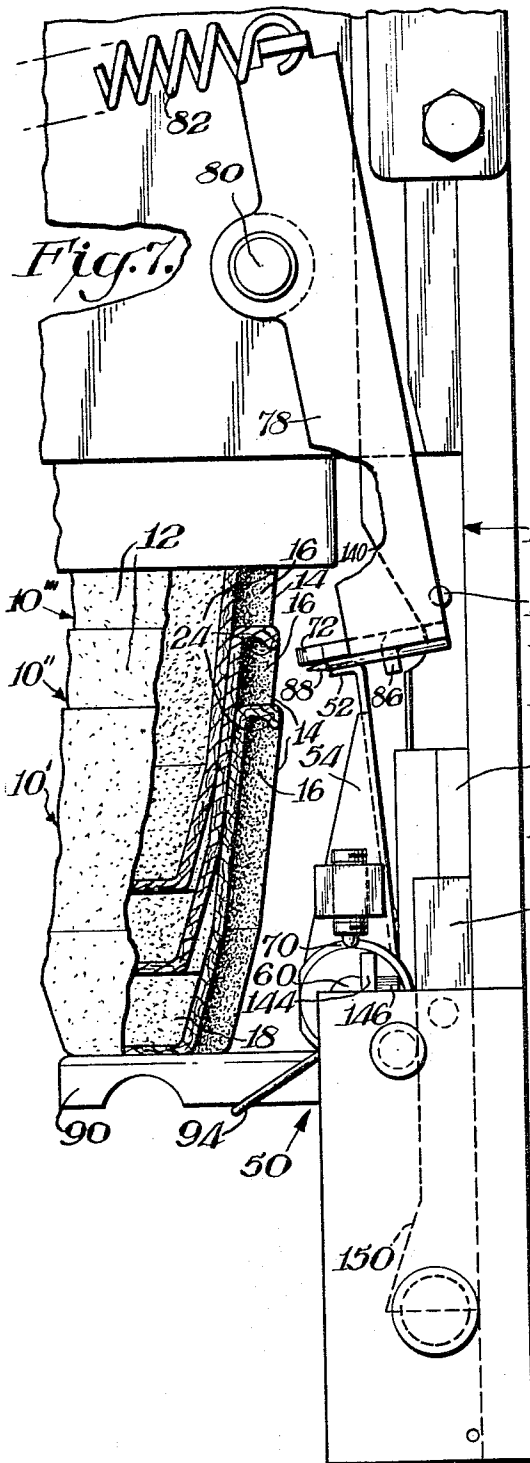
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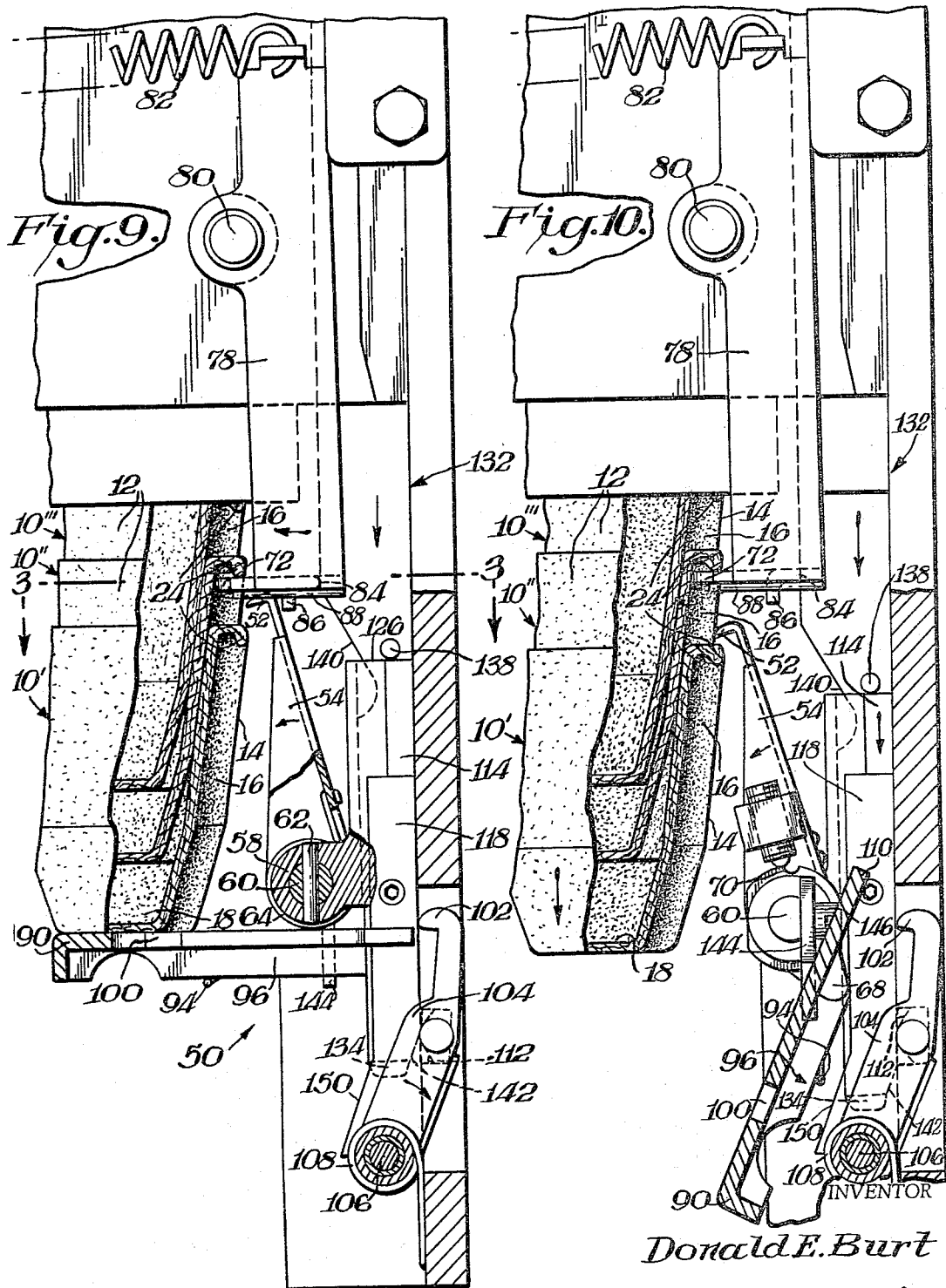
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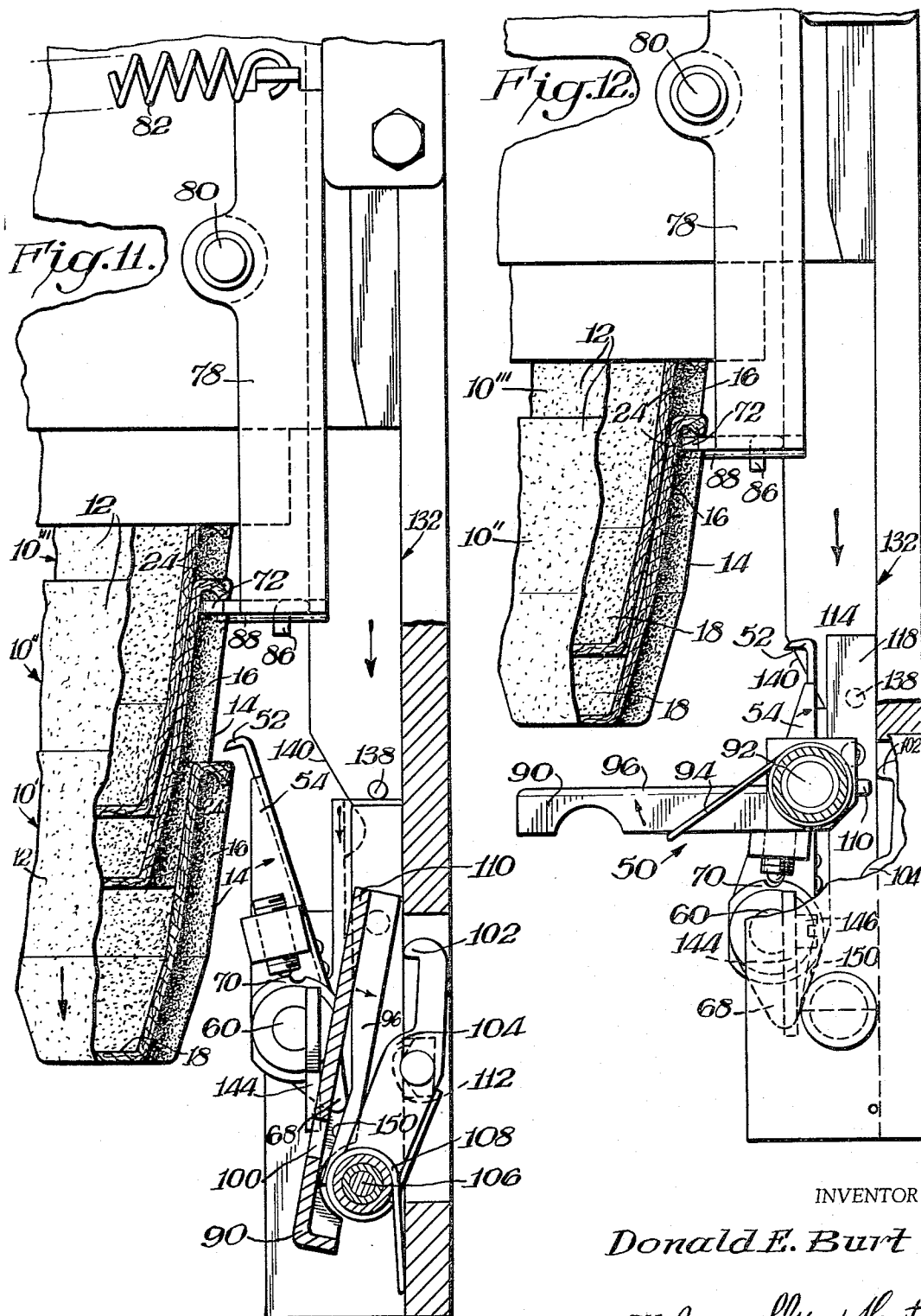
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7 Sheets-Sheet 7



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DISPENSING APPARATUS FOR STACKED ARTICLES PROVIDED WITH MEANS TO STRIP THE END ARTICLE FROM THE STACK

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11 Claims. (Cl. 221—221)

This invention relates to apparatus for dispensing articles from a stack, and more particularly to an arrangement for dispensing molded pulp cartons singly from a stack with an improved sequence of motion which minimizes jamming.

Prior to the present invention, many machines have been proposed for dispensing articles singly from a stack, but the prior machines encounter certain problems and none have been found completely satisfactory for certain kinds of articles. For example, with molded pulp articles of the type having dished portions adapted for nested stacking as well as opposed edge portions, especially when the opposed edge portions include outwardly directed peripheral flange portions at their upper extremity, the dispensing apparatus heretofore available has been marked by a tendency to mutilate or tear the cartons in a highly unsatisfactory manner which promotes jamming of the apparatus. Such jamming requires shut-down of the machine while personnel is utilized to clear the torn articles from the machine before operations may commence once again. Obviously, this is undesirable not only from the standpoint of wasted time but also when the expense of the many mutilated cartons is taken into consideration.

Accordingly, it is an object of the present invention to provide dispensing machinery adapted to handle a wide range of articles and particularly molded pulp articles which tear or rip relatively easily compared with plastic or other articles, and which are adapted for nested stacking wherein the adjacent side walls of stacked articles frictionally adhere to each other because of the roughened surface of the molded pulp. Because of the tendency to cling together when nested in a stack, and the propensity of molded pulp to tear when acted upon by small, high speed mechanical finger elements of dispensing machinery, the problem of avoiding mishaps during continued automatic operation of such machinery is great. To this end, the dispenser arrangement of this invention includes mechanical finger elements designed to handle a particular exemplary type of molded pulp carton in a manner which minimizes tearing by affording contact with the maximum available area of the laterally extending flange portions of the carton. In addition the sequence of operation of the various mechanical finger elements is arranged to provide an improved sequence of operation which minimizes jam-ups even when the flange portions of cartons are inadvertently torn. Not only is the improved sequence of operation desirable when cartons are torn by the machinery itself, but occasionally misformed cartons are present in stacks of such articles, and the apparatus of this invention is designed to compensate for such irregular articles and dispenses them properly in sequence along with the properly formed cartons.

Other object and advantages of the present invention will become apparent from a reading of the following description in conjunction with the accompanying drawings wherein similar reference characters refer to similar parts and in which:

FIG. 1 is a front elevational view of the dispensing apparatus of this invention including a small stack of cartons;

FIG. 2 is a side elevational view of the dispensing apparatus with the stack of cartons removed;

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FIG. 3 is a sectional view on line 3—3 of FIG. 9;

FIG. 4 is a sectional view on line 4—4 of FIG. 1;

FIG. 5 is a sectional view on line 5—5 of FIG. 1;

FIG. 6 is a fragmentary elevational view of the lost motion slide arrangement;

FIG. 7 is a sectional elevational view on line 7—7 of FIG. 2;

FIG. 8 is a sectional view similar to FIG. 7 showing a different portion of the sequence of operation;

FIG. 9 is a sectional view similar to FIG. 7 showing a different portion of the sequence of operation;

FIG. 10 is a sectional view similar to FIG. 7 showing a different portion of the sequence of operation;

FIG. 11 is a sectional view similar to FIG. 7 showing a different portion of the sequence of operation;

FIG. 12 is a sectional view similar to FIG. 7 showing a different portion of the sequence of operation; and

FIG. 13 is a sectional view similar to FIG. 7 showing the dispensing apparatus of this invention compensating for a mutilated carton in the stack.

Referring in more particularity to the drawings, the dispensing apparatus of this invention is illustrated for purposes of clarity as operating on one particular type of article having dished portions adapted for nested stacking. Such articles 10 comprise 2 x 6 molded pulp egg cartons of a variety finding increasing commercial popularity but presenting unusual dispensing or de-nesting problems.

Each carton 10 comprises a pair of opposed edge portions 12 taking the form of sides of an elongated rectangle and a pair of opposed edge portions 14 taking the form of ends of the elongated rectangle. The side edge portions 12 and the end edge portions 14 are each characterized in part by indentations or partial post formations 16 at spaced intervals. The marginal partial posts 16 define article receiving pockets 18 which are further defined by full posts 20 positioned centrally of the carton and separating ribs 22 connecting the partial posts and the full posts with each other, all as is well-known. The partial posts 16 positioned along the opposed side edge portions 12 and the opposed end edge portions 14 include outwardly directed flanges 24 at the upper portions thereof. Additionally, thickened shoulder portions 17 associated with the partial posts 16 determine the depth to which one carton 10 may nest in its adjacently positioned carton in a stack.

It will be noted that the side and end edge walls as well as the ribs which define the deeply dished pocket portions of the illustrated carton have high, relatively steep walls. When such cartons are formed of molded pulp it is clear that the roughened surface of at least one side of the steep pulp walls causes frictional adherence of one carton to the adjacent carton when a plurality of such cartons are pressed together in a nested stack. The separation or removal of the end carton from the stack requires considerable force to overcome the frictional resistance. Additionally, the outwardly directed flange portions 24 at the top of the partial posts 16 present only minimal areas of molded pulp upon which the mechanical finger arrangements of an automatic dispensing machine may operate. These small flange areas, while conveniently positioned for engagement by automatic finger mechanisms, are subject to mutilation by the rapidly acting fingers, and are occasionally received in mutilated condition from the molded pulp manufacturer. In the drawings, the cartons 10 are arranged in a nested stack. For convenience, the lowermost or end article to be removed from the stack is identified by the numeral 10', the second or new end article in the stack is indicated by the numeral 10'', and the third article in the stack by the numeral 10'''. Also, for purposes of convenience, the stack may be visualized as an elongated stack having a longitudinal

axis which corresponds with the initial direction of article separation or de-nesting.

The dispensing apparatus 30 of this invention comprises an arrangement for dispensing articles such as cartons of the above described type from a stack of such articles, and further comprises means 32 for holding a stack of such articles 10 generally uniformly nested with their opposite edge portions 12, 14 in generally straight alignment. The stack holding means 32 includes a vertically arranged chute having a rear wall 34, and side walls 36 which extend upwardly a sufficient distance to accommodate a large supply of nested articles. In some commercial applications, the supply of articles may constitute a stack which extends vertically upwards for a number of feet and even may extend to the floor above in, for instance, a large egg packaging plant which permits loading of the chute with fresh stacked cartons from the floor above. The weight of such a high stack of articles is considerable, especially when it is considered that the operator who fills the chute pushes down on the stack with considerable force to insure the deepest possible nesting which permits the largest number of articles to be included in a stack of given height. Not only does the dispensing arrangement which operates at the bottom of the stack have to accommodate these large vertically downward forces, but must work equally well with a small, light stack of articles in the holding means 32.

If desired, the stack holding means 32 may be angled rearwardly slightly to relieve a portion of the weight of the stack from the automatic fingers of the dispensing mechanism. When this feature is utilized, it is not necessary to include a front wall to the holding means 32 other than a short front wall arrangement 38 near the lower portion of the holding means. This affords visibility to determine the height of a stack of cartons in the machine, and permits front loading of fresh cartons by an operator standing on the floor by the machine.

Additionally, a first limit switch 40 including a trip member 42 may be provided in the rear wall 34 of the holding means 32 to give an appropriate signal when the stack is depleted to a predetermined point so that a fresh supply of cartons may be placed in the holding means. Additionally, a second limit switch 44 including a trigger arrangement 46 may be provided to halt operation of the continuously acting automatic dispensing machine if, for some reason, the stack of cartons is depleted beyond a certain minimal point. This will prevent the dispensing arrangement of this invention from continuing to operate when no cartons are present. The dispensing means includes two units 48 and 50 which may be mirror image duplicates of each other. For convenience, the following description will be directed to one of the units 50, and it will be understood that the other unit 48 operates in similar fashion. The two units cooperate, in the illustrated embodiment, with the opposed end edge portions 14 of the cartons in the stack to remove articles singly from one end of the stack in the holding means.

The dispensing unit 50 includes stripping finger means 52 mounted for to-and-fro longitudinal travel relative to the stack as well as for in-and-out lateral shifting to engage or avoid the end article 10' to be removed from the stack. The stripping finger means 52 is adapted to engage the upper portion of the end wall 14 of the lowermost carton 10' in the zone between the partial posts 24. As shown in the drawings, the stripping finger means 52 includes an L-shaped upper portion which is adapted to hook over the upper edge of the carton end wall.

The stripping finger means 52 is mounted for in-and-out lateral shifting by means of an extension arm portion 54 pivotally mounted as at 56 on a longitudinally shiftable support member 58. The support 58 includes a shaft 60 which is fixed by a pin 62 to provide the pivot axis for the extension arm 54 of the stripping finger means 52. A coiled torsion spring 64 secured at one end to the member 58 and at the other end to the arm 54 constitutes a yieldable biasing means normally tending to shift the stripping

finger means 52 to the inward extent of its lateral motion. The inward extent of lateral motion is governed by a stop arrangement 66 which operates between the stripping finger extension arm 54 and the fixed shaft 60. The outward extent of lateral shifting of the stripping finger means 52 is governed by a cam follower 68 integrally associated with the finger arm 54 on the opposite side of the pivot fulcrum 60. The cam follower 68 is adapted to ride on a cam surface, explained below, to control laterally outward shifting motion of the stripping finger means. Additionally, a spring-loaded ball detent arrangement 70 operating between the stripping finger arm extension 54 and the fixed shaft 60 is adapted to maintain the stripping finger means 52 at the outward extent of its lateral motion for a purpose described below.

The dispensing unit 50 further includes a first stack retaining means 72 mounted for in-and-out lateral shifting relative to the stack to engage or release the balance of the stack. The first stack retaining means includes a horizontal member 74 including a plurality of projections 76 adapted to engage beneath the outwardly directed flange portions 24 of the second carton 10' in the stack. The horizontal member 74 is connected by lever arm arrangements 78 to a fixed pivot point 80 on the front wall 38 of the stack holding means. A coil tension spring 82 fixed at one end to the front wall 38 and at the other end to the arm 78 serves to motivate the first stack retaining means 72 to the outward extent of its lateral shifting motion. A cam following surface 84 adapted to ride on a shiftable cam element, explained below, motivates the inward lateral shifting of the first stack retaining means. Additionally, the horizontal member 74 includes a pair of down-turned abutment ears 86 adapted to contact the stripping finger means 52 during inward lateral motion of the first stack retaining means to dislodge the springloaded detent restraining means 70 which maintains the stripping finger means at the outward extent of its lateral shifting motion. This permits the torsion spring 64 to pivot the stripping finger means 52 to the inward extent of its lateral motion for engagement with the upper rim of the first carton 10' in the stack.

The horizontal member 74 of the first stack retaining means, in addition to the three laterally inwardly projecting elements 76, may further include one or more sharpened prong elements 88 adapted to pierce the upper portion of the carton end wall 14 to assist in supporting the balance of a stack while the end article is being removed from the stack. While the prong elements 88 are optional, it has been found that with cartons formed of molded pulp having certain characteristics, the prong elements will help to increase the effect of the finger elements 76 which engage only the small outwardly directed flange portions of the carton.

A second stack retaining means 90 is mounted for in-and-out laterally shifting to engage or release the dish or pocket portion 18 of the end article 10' of the stack. The second stack retaining means 90 is mounted for pivotal motion about a trunnion 92 secured in the means for holding the stack. A pair of coiled torsion springs 94 are connected at one end with the framework and at the other end with the extension arm portions 96 of the second stack retaining means. The spring 94 normally biases the second stack retaining means to the inward extent of its lateral movement. As can be noted particularly from FIGS. 4 and 5, the extension arm portions 96 of the second stack retaining means 90 each include a cut-out notch portion 100 which forms a portion of an arrangement for rendering a one-way drive engagement, explained below, ineffectual at a predetermined point in the cycle of operation. The upper surfaces of the extension arm portions 96 in the zone immediately laterally outwardly of the cut-out notch portions 100 serve as cam or abutment surfaces for the one-way drive connection, again as explained in more detail below.

Additionally, means is provided to latch the second

stack retaining means at the inward extent of its lateral motion to enable it to support the downwardly directed forces associated with loading and storage of extremely high stacks of articles. The latch arrangement comprises a catch head 102 on the upper end of a lever arm 104 pivoted at 106 to the framework of the machine. A coil torsion spring 108 having one end secured to the frame and the other end acting upon the arm 104 normally biases the catch head 102 laterally inwardly to engage a catch element 110 which extends outwardly beyond the pivot 92 of the extension arm 96 for the second stack retaining means. As viewed, for instance, in FIG. 8, it will be clear that latching of the catch head 102 over the catch element 110 prevents downward swinging or lateral outward shifting of the second stack retaining means 90, and thus constitutes a mechanically rigid arrangement for supporting the full downwardly directed forces of loading and storage of extremely high stacks of articles. Additionally, the extension arm 104 for the catch head 102 includes a cam following surface 112 which follows a reciprocating cam, described below, for unlatching the catch head 102 from above the catch element 110 to permit laterally outward cam motivated motion of the second stack retaining means 90.

Mechanical means are connected to operate through a cycle of motion which moves the above described finger elements through a dispensing cycle. First, the pivot shaft 60 secured to the element 58 is mounted for to-and-fro longitudinal motion relative to the stack, as noted above. The element 58 is formed as a unitary portion of a slide block 114 mounted for reciprocal sliding motion in a pair of guide ways 116 formed in opposed guide blocks 118 secured as at 120 to the frame portion of the dispensing unit 50. The guide ways 116 of each guide block 118 include an abutment shoulder 122 at the lower extremity thereof. These shoulders, as explained below, prevent gravity actuated motion of the slide element 114 longitudinally outwardly of the unit 50.

Each guide block 118 further includes a spring-loaded ball detent arrangement 124 adapted to engage a cooperating indentation in the side walls of the slide block 114. This spring-loaded arrangement serves to maintain the slide block 114 at the inward or upward extent of its longitudinal shifting motion relative to the guide blocks 118. The upper surface 126 of the slide block 114 serves as an abutment surface for cooperative engagement with a second abutment for dislodging the slide block 114 from its upward or longitudinally inward position as determined by the detent arrangement 124 to permit to-and-fro longitudinal sliding of the block within the guide ways 116. The lower surface 128 of the guide block 126 also serves as an abutment surface for cooperative engagement with another abutment arrangement for returning the slide block 114 longitudinally inwardly or upwardly until the detent arrangement 124 secures it relative to the guide way 116. Finally, the slide block 114 includes a longitudinally directed slide groove 130 on its laterally outward face to slidably receive a motivating cam bar 132.

The cam bar 132 is positioned longitudinally parallel with the axis of the stack of articles. The bar 132 is positioned to ride with a loose working fit in the rear face of the groove 130 of the slide block 114. At the lowermost extremity of the cam bar 132, a T-shaped abutment head 134 is secured as at 136 to abut against the lower surface 128 of the slide block 114. Positioned above the slide block 114 at the mid-portion of the cam bar 132 is a second fixed abutment element 138 adapted to engage the upper surface 126 of the slide block 114. The abutment portions 134 and 138 of the cam bar are spaced a distance from each other which is greater than the longitudinal dimension of the guide block 114 to constitute a lost motion connection between the cam bar 132 and the fixed shaft 60 associated with the slide block 114.

The laterally inward face of the cam bar 132 is con-

structed to define a cam surface 140 adapted to ride in cooperative engagement with the cam follower surface 84 of the cross head 74 for the first stack retaining means. As can be seen, the angled cam face 140 is positioned to move the first stack retaining means 72 laterally inwardly against the restraining pressure of the spring 82 upon downward longitudinal motion of the cam bar 132.

Another cam surface 142 positioned at the lower or longitudinally outward extent of the cam bar 132 is provided on the laterally outward side thereof to engage the cam follower surface 112 which governs the unlatching motion of the catch head 102 from above the catch element 110. Downward motion of the cam bar 132 thus serves to unlatch the catch head 102 and permit outward lateral motion of the second stack retaining means 90.

A cam arrangement for shifting the second stack retaining means laterally outwardly is controlled by downward motion of the cam bar 132 and comprises a pair of one-way drive devices 144. Each device 144 comprises a pusher dog arrangement pivoted at 146 to the outer ends of the fixed shaft 60 about which the stripping finger means is pivoted. Each trip device 144 is loaded by an appropriate spring 148 to its outward, operative position where it bears on the upper surface 96 of the extension arm portion of the second stack retaining means 90. As can be seen from FIGS. 10 and 11-13, downward motion of the slide block 114 generates outward longitudinal motion of the trip dogs 144 against the upper surface of the extension arm portion 96 of the second stack retaining means to swing the second stack retaining means 90 laterally outwardly about its pivot 92. As the one-way drive elements 144 ride down the upper surface of the second stack retaining means as it moves outwardly, the elements 144 come into registry with the cut-out notch portions 100 of the second stack retaining means. At this point, the torsion spring 94 for the second stack retaining means generates inward lateral motion of the second stack retaining means because the notch portions 100 permit the stack retaining means to swing inwardly past the one-way drive elements 144. Thus, the cut-out notch portions 100 render the one-way drive ineffectual as the stripping finger pivot shaft 60 reaches its outward extent of longitudinal shifting. Thereafter, it will be noted that, as the shaft 60 and its associated one-way drive elements 144 return to the inward extent of their longitudinal motion, the elements 144 pivot inwardly to by-pass the arm extension portions 96 of the second stack retaining means 90 which has already been spring-biased to its inner position.

Finally, a fixed cam surface 150 is positioned to be engaged by the cam follower portion 68 of the arm extension portion 54 of the stripping finger means 52. As the stripping finger means 52 is carried longitudinally outward by motion of the slide block 114 and its associated pivot shaft 60, the cam follower 68 riding against the outwardly directed cam face 150 rotates the arm extension portion 54 to shift the stripping finger means 52 to the outward extent of its lateral shifting. Additionally, it will be noted that the cooperating cam elements 68, 150 rotate the arm extension portion 54 to and even slightly past the point where the spring-loaded detent arrangement 70 becomes effective to maintain the stripping finger means 52 at the outward extent of its lateral motion.

Motivating means is connected to drive the operating cam bar 132 with a reciprocatory motion to initiate repetitive cycles of coordinated motion of the various finger elements. The cam bar 132 for the dispenser unit 50 is secured at its upper end as at 152 to a lever arm 154 which is fulcrumed at 156 to the frame of the dispensing apparatus. The outer or upper end 158 of the lever arm 154 is connected to the outer end of the reciprocatory rod portion 160 of a motor device 162, also pivotally secured as at 164 to the frame of the machine.

Although any suitable reciprocating motor may be utilized to drive the cam bars 132 of the dispensing arrangement of this invention, the preferred form illustrated in the drawing utilizes a polynoid motor which is capable of the desired control. Namely, the commercially available polynoids are capable of speed regulation, which is important for rendering the dispensing arrangement of this invention compatible with the speed requirements of existing production line equipment.

In operation, the dispensing arrangement of this invention operates through a predetermined cycle of motion to dispense cartons 10 seriatim from the lower or longitudinally outward end of a stack of such articles. With a stack of such articles positioned in the holding means 32, and with the cam bar 132 at its upward or inward extent of longitudinal travel positioning the various operating elements as illustrated in FIG. 7, a dispensing cycle is ready to begin.

First, downward shifting of the rod portion 160 of the polynoid motivating device 162 generates downward or longitudinal outward motion of the cam bar 132. The initial motion of the cam bar causes the cam surface 140 to act upon the cam follower surface 84 associated with the first stack retaining means. Continued longitudinal outward motion of the cam surface 140 shifts the first stack retaining means laterally inwardly until it is engaged beneath the outwardly directed flange portion 24 of the second carton 10' in the stack. At this point, as seen in FIG. 8, the depending abutment elements 86 associated with the first stack retaining means come into engagement with the outer end of the arm extension portion 54 of the stripping finger means 52.

Continued longitudinally outward motion of the cam bar 132 continues to cam the first stack retaining means 72 laterally inwardly, and this motion forces the spring-loaded detent 70 associated with the stripping finger means to become disengaged. Disengagement of the detent arrangements 70 permits the coil torsion spring 64 to shift the stripping finger means 52 laterally inwardly, as seen in FIG. 9, until it engages above the end wall 14 of the end article 10' in the stack. Thereafter, the cam surface 140 completes the inward lateral shifting of the first stack retaining means 72 until the prong elements 88 have positively engaged with the end walls 14 of the second article 10' in the stack.

Simultaneously, as the cam surface 140 completes the final increment of inward lateral shifting of the first stack retaining means 72, the cam surface 142 at the outer end of the cam bar comes into engagement with the cam surface 112 associated with the catch head 102 and rotates it laterally outwardly to disengage it from the catch element 110 associated with the second stack retaining means. Although this unlatches the second stack retaining element to permit it to be shifted laterally outwardly, and thus may render it ineffectual for resisting the fullest extent of the downward or laterally outward forces which may be associated with very tall stacks of articles in the machine, it will be noted that the first stack retaining means 72 is at this time securing the balance of the stack against longitudinal outward motion.

Upon completion of this motion, as can be seen in FIG. 9, the abutment elements 138 on the cam bar 132 are brought into driving engagement with the upper surface 126 of the slide block 114. Further downward motion of the cam bar 132 disengages the detents 124 to drive the slide block 114 longitudinally outwardly. This causes downward motion of the fixed shaft 60 which in turn motivates two functions simultaneously. First, the one-way drive elements 144 rotate the second stack retaining means 90 laterally outward about the pivots 92. Because of the very small moment arm involved, the stack retaining means 90 is swung outwardly with a very rapid motion, to thus permit passage of the end articles 10' which are to be separated from the balance of the stack in the holding means. It will be noted, incidentally, that the

cam bar abutment element 138 thus motivates the slide block 114 against the upward bias of the spring 94 associated with the second stack retaining means.

Second, the downward motion of the shaft 60 generates longitudinal outward stripping motion of the stripping finger means 52. As can be seen in FIG. 10, the stripping finger means thus serves to strip the end article 10' from the balance of the stack, which in turn is retained by the first stack retaining means 72.

As the slide block 114 nears the outer limit of its longitudinal travel, the cam follower 68 associated with the stripping finger means 52 rides into engagement with the fixed cam surface 150. Further longitudinally outward motion thus serves to rotate the stripping finger means 52 laterally outwardly. At this point, the carton being stripped from the stack has been pulled free of the remaining articles in the stack, and is free to fall to a conveyor, not shown, positioned therebelow. The outward lateral motion of the stripping finger means at this point serves to insure that the stripping finger is disengaged from the article being dispensed if, by chance, the finger 52 had inadvertently punctured or otherwise become entangled with the molded pulp carton.

As the shaft 60 associated with the slide block 114 reaches the final increment of its longitudinally outward motion, the stripping finger means 52 is shifted laterally outwardly, as seen in FIG. 12, to the point where the detent arrangement 70 will maintain the stripping finger. Additionally, at this point, the one-way drive elements 144 come into registry with the cut-out notch portions 100 associated with the second stack retaining means. As this happens, the torsion spring 94 serves to rotate the second stack retaining means 90 laterally inwardly. Additionally, it will be noted that the lateral inward motion of the second stack retaining means includes a component of longitudinal inward motion. As explained below in connection with FIG. 13, the return motion of the second stack retaining means in this manner and at this period in the operating cycle results in an extremely desirable function.

As the cam bar 132 thus reaches the terminus of its downward reciprocation, as in FIG. 12, the first and the second stack retaining means are both at their inward extent of lateral shifting, and the stripping finger means is maintained by the detent arrangement 70 at the outer extent of its lateral shifting. Additionally, because of the return of the second stack retaining means as permitted by the cut-out notch portions 100, the slide block 114 is no longer subject to the longitudinal inward spring bias which had been generated by the torsion spring 94 associated with the second stack retaining means 90.

As the cam bar 132 begins its longitudinal inward or return motion, the operating finger elements will remain in the position illustrated in FIG. 12 until the T-shaped abutment element 134 comes into engagement with the lower abutment surface 128 of the slide block 114. This, it will be noted, serves to shift the cam surface 140, which controls the first stack retaining means, upwardly relative to the stripping finger means 52 which is maintained at its outward extent of lateral motion. This insures that the down-turned abutment elements 86 associated with the first stack retaining means will be able to shift laterally outwardly without interference from the stripping finger means.

Just before the T-shaped abutment 134 engages with slide block 114, it will be noted, the receding cam surface 142 permits the catch head 102 to be shifted by its spring 108 into latching engagement above the catch element 110 to secure the second stack retaining means in its inward, operative position. Thereafter, as the cam bar 132 continues its return motion, the slide block 114 moves upwardly therewith. As the cam surface 140 is retracted from behind the follower surface 84 associated with the first stack retaining means, the stack retaining means is permitted to shift laterally outwardly under the influence

of its motivating spring 82. As the cam bar 132 completes its final increment of return motion, the slide block 114 is elevated to its position in the slide way 116 where the spring loaded detent arrangements 124 become operative. This insures that the slide block 114 will remain in this position during the following cycle until the downward motion of the cam bar brings the abutment elements 138 into engagement once again with the upper abutment surface 126 of the slide block. As the first stack retaining means 72 is shifted laterally outwardly to disengage from the balance of the stack, the balance of the stack is permitted to shift longitudinally outwardly under the influence of gravity until the new end article 10" in the stack comes into engagement with the securely latched second stack retaining means 90. The dished portion 18 of the new end article thus rests securely upon the second stack retaining means, and supports the entire stack until the next cycle of operation begins.

The advantage of the foregoing cycle of motion is illustrated in connection with FIG. 13. In this figure, the elements are shown in their respective positions as the cam bar 132 approaches the outward extent of its longitudinal motion. The second stack retaining means is being snapped by its spring 94 to the laterally inward position, the one-way drive elements 144 having just cleared the cut-out notch portions 100. In FIG. 13, the new end article 10" is illustrated as a carton wherein the outwardly directed flange portions 24 are mutilated to the extent that one end of the carton is not retained properly by the first stack retaining means 72. As shown, although the end of the carton which is not shown is properly retained by the first stack retaining means of the dispenser unit 48, the end of the carton 10" which is illustrated is not retained by the dispenser unit 50. This end of the carton has sagged or pivoted downwardly. If the various finger elements of the dispenser were returned to their normal position in the same order of motion which they followed during the first or dispensing half of the cycle, it is clear that the stripping finger 52 would first be permitted to shift laterally inwardly and would interfere with the loosely hanging end of the article 10". Additionally, the second stack retaining means would remain in its outer position over a longer period of time, thus increasing the chances that the free or loose end of the carton 10" would sag downwardly to the point where jamming of the machine would occur.

With the cycle of operation as contemplated by this invention, however, the second stack retaining means 90 is snapped upwardly and inwardly immediately after the previously dispensed carton has cleared the mechanism. The spring 94 has sufficient power not only to return the retaining means 90 to its inner position, but also has sufficient power to shift the loose, hanging end of the carton 10" back up to its proper position. Although the spring 94 may not have sufficient power to retain the entire stack after the first stack retaining means is retracted, it does have sufficient power to insure that any torn or mutilated cartons are properly positioned as end articles in the stack before the latch mechanism 102 secures the second stack retaining means in its inward, operational position.

Thus, a dispensing apparatus has been disclosed which affords an improved cycle of motion to insure proper dispensing of particular types of molded pulp cartons. The improved cycle includes the several above described motions which contribute to the over-all effect of a superior dispensing device.

While the above described embodiment constitutes the preferred mode of practicing this invention, other embodiments and equivalents may be resorted to within the scope of the actual invention, which is claimed as follows.

What is claimed is:

1. An arrangement for dispensing articles of the type having dished portions adapted for nested stacking as well as opposed edge portions from one end of a stack

of such articles comprising means for holding a stack of such articles generally uniformly nested with their edge portions in generally straight alignment, dispensing means for removing articles singly from one end of a stack in the holding means including stripping finger means mounted for to and fro longitudinal travel relative to the stack and in and out lateral shifting to engage or avoid the end article to be removed from the stack, first stack retaining means mounted for in and out lateral shifting to engage or release the balance of the stack, second stack retaining means mounted for in and out lateral shifting to engage or release the dished portion of the end article of the stack, mechanical means connected to operate through a cycle of motion including initially shifting the first stack retaining means laterally in to engage the balance of the stack, shifting the stripping finger means laterally in to engage the end article to be removed from the stack, shifting the second stack retaining means laterally out to release the dished portion of the end article to be removed from the stack, generating longitudinal travel of the stripping finger means from the stack to remove the end article from the balance of the stack, shifting the stripping finger means laterally out to insure release of the article removed from the stack, then immediately shifting the second stack retaining means laterally to its inward position for engaging the dished portion of a new end article of the stack, generating longitudinal travel of the stripping finger means back toward the stack while maintaining it in its laterally outward position to avoid the new end article in the stack, and finally shifting the first stack retaining means laterally out to release the balance of the stack and permit forward longitudinal shifting of the stack until the dished portion of the new end article engages the second stack retaining means to support the stack.

2. An arrangement for dispensing articles as in claim 1 wherein the opposed edge portions of the articles include outwardly directed flanges and wherein the first stack retaining means engages the outwardly directed flanges of the next-to-the-end article in the stack to retain the balance of the stack in the holding means.

3. An arrangement for dispensing articles as in claim 1 wherein the second stack retaining means includes a component of longitudinal motion toward the stack as it shifts to its inward position for engaging the dished portion of the new end article of the stack.

4. An arrangement for dispensing articles as in claim 3 wherein the inward lateral shifting of the second stack retaining means is motivated by yieldable biasing means, and latch means is provided to lock the second stack retaining means in its inward position for engaging the dished portion of the end article of the stack to support the stack.

5. An arrangement for dispensing articles as in claim 3 wherein the lateral outward shifting of the first stack retaining means is motivated by yieldable biasing means and the inward lateral shifting is motivated by mechanical camming action.

6. An arrangement for dispensing articles as in claim 3 wherein the inward lateral shifting of the stripping finger means is motivated by yieldable biasing means, the outward lateral shifting is motivated by mechanical camming action, and a releasable detent arrangement is provided to maintain the stripping finger means in its laterally outward position during its longitudinal travel back toward the stack.

7. An arrangement for dispensing articles as in claim 6 wherein mechanical abutment action releases the detent arrangement to permit inward lateral shifting of the stripping finger means to engage the end article to be removed from the stack.

8. An arrangement for dispensing articles as in claim 7 wherein the mechanical abutment action includes a lug on the first stack retaining means positioned to abut the

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stripping finger means during the inward lateral shifting of the first stack retaining means.

9. An arrangement for dispensing articles as in claim 3 wherein the outward lateral shifting of the second stack retaining means is motivated by mechanical camming action. 5

10. An arrangement for dispensing articles as in claim 9 wherein the mechanical camming action which motivates the lateral outward shifting of the second stack retaining means includes a one-way pawl arrangement associated with the stripping finger means for engagement with the second stack retaining means. 10

11. An arrangement for dispensing articles as in claim 10 wherein the one-way pawl engagement with the second stack retaining means is rendered ineffectual as the stripping finger means reaches the end of its longitudinal travel 15

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from the stack to permit immediate shifting of the second stack retaining means laterally to its inward position.

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