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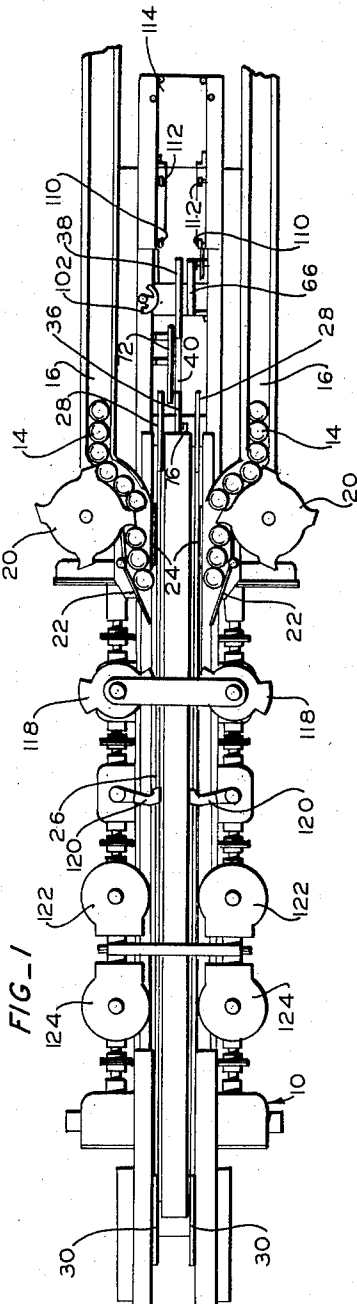
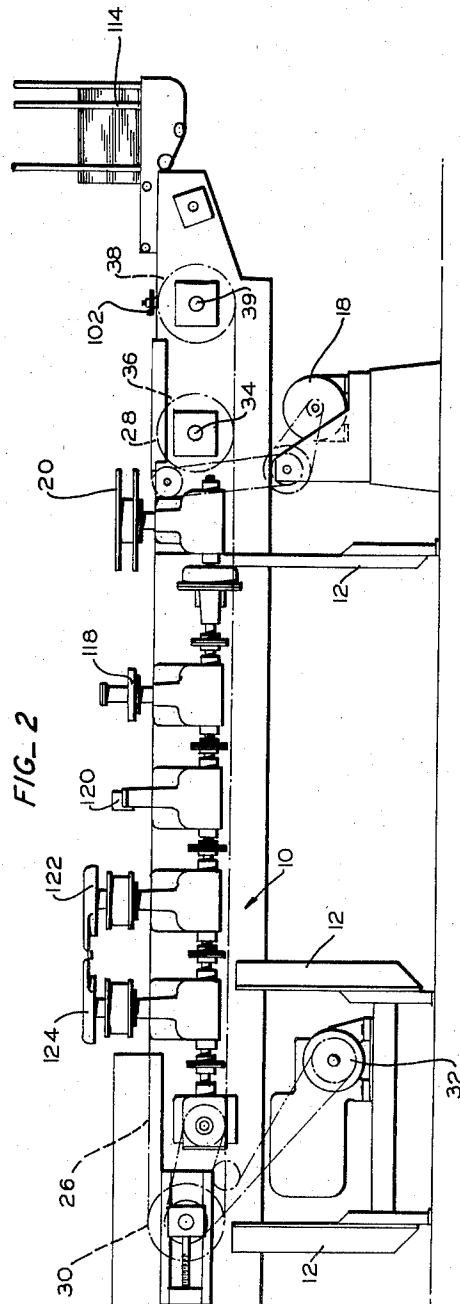
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2,863,371

CARTON BLANK UNFOLDING MACHINE

Filed April 14, 1958

4 Sheets-Sheet 1



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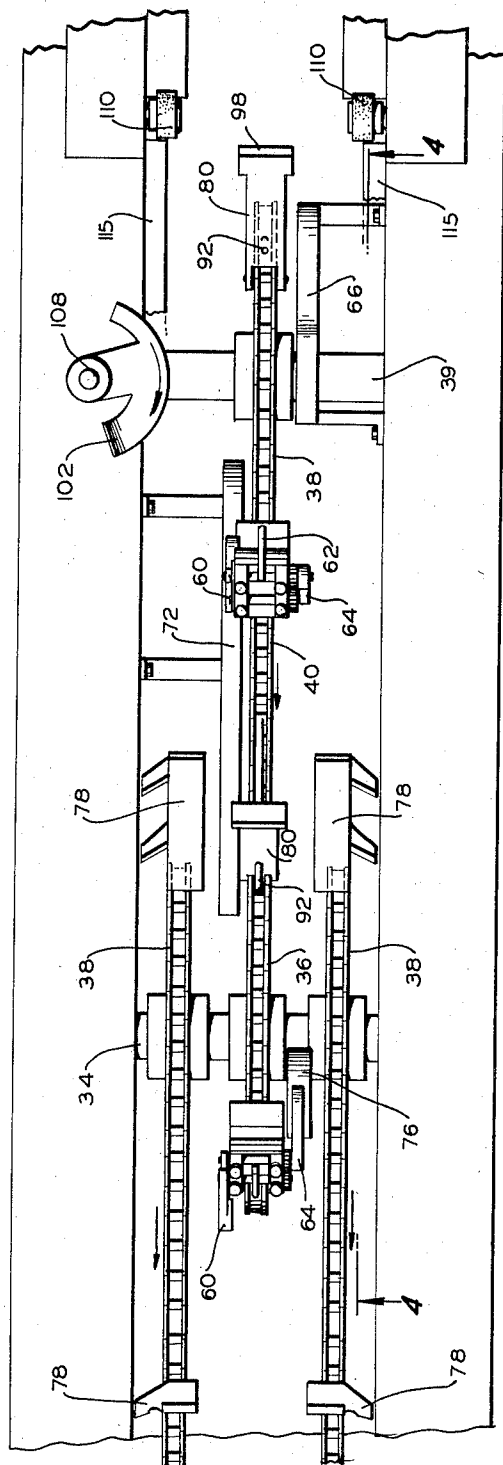
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4 Sheets-Sheet 2

FIG. 3



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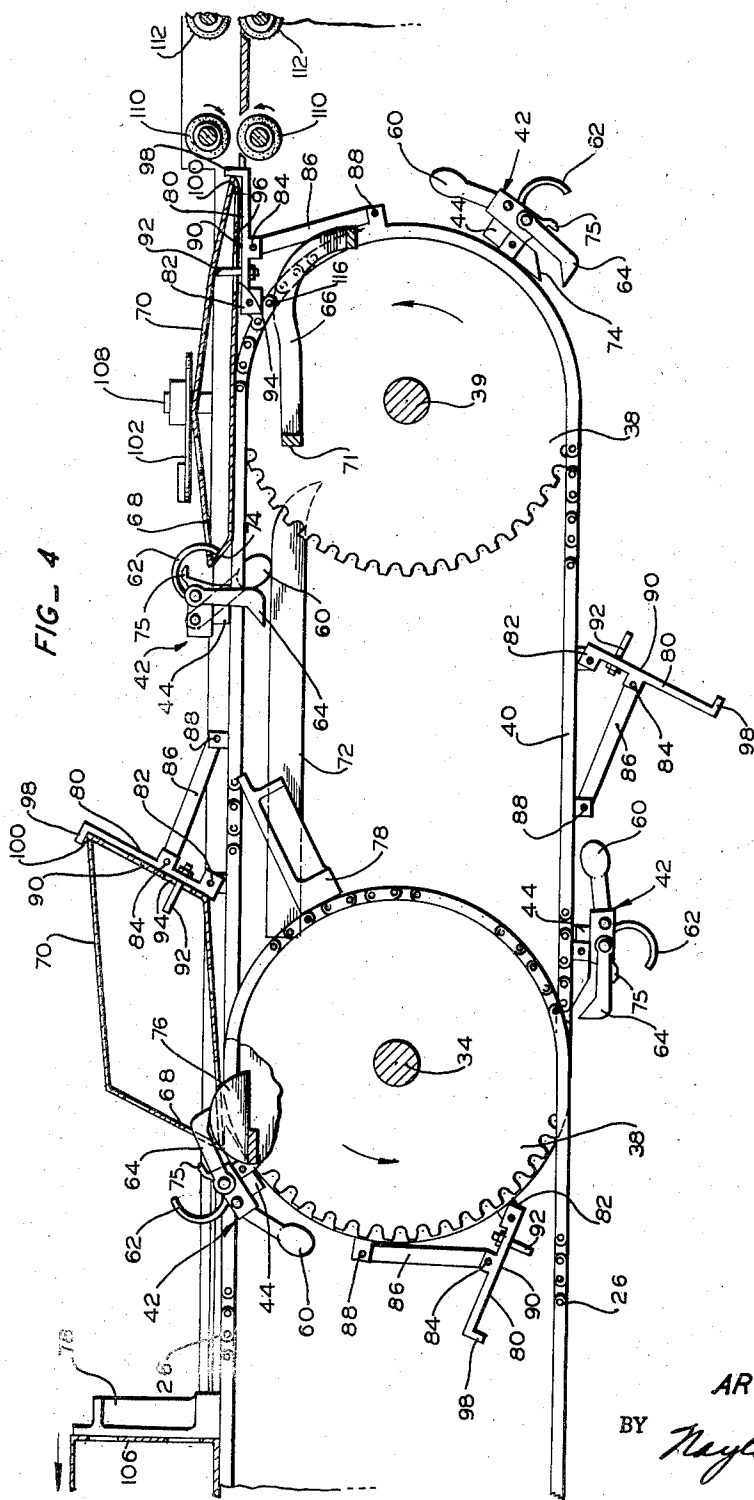
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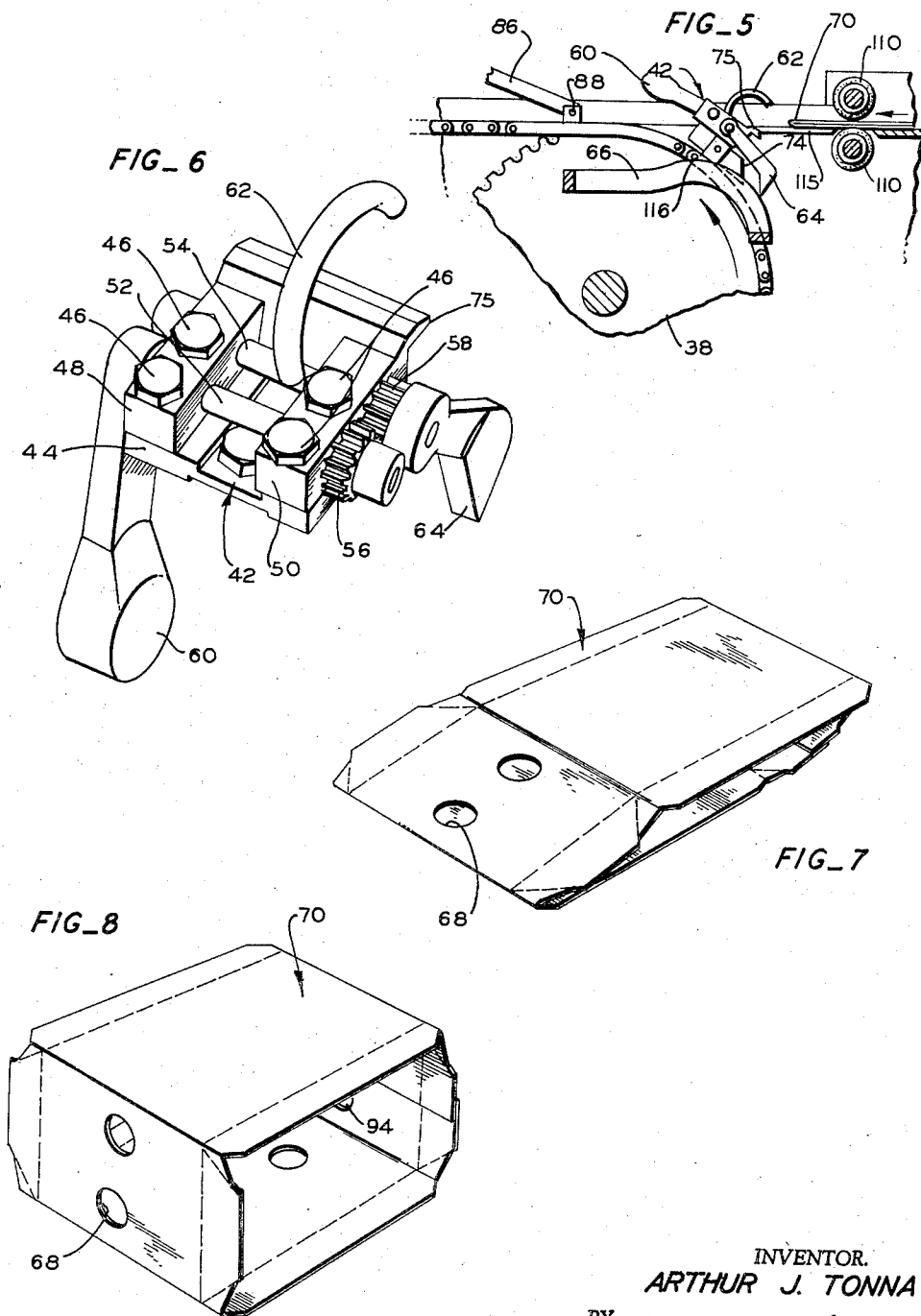
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CARTON BLANK UNFOLDING MACHINE

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4 Sheets-Sheet 4



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1

2,863,371

CARTON BLANK UNFOLDING MACHINE

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9 Claims. (Cl. 93—53)

This invention relates to improvements in carton blank unfolding machines and is particularly useful in conjunction with "Six Pac" machines for unfolding carton blanks preparatory for the insertion of cans therein.

There are used in the brewing industry for packaging purposes what are commonly known as "Six Pac" machines, so designated because the machines pack cans in units of six into cartons. There are many forms of such machines, but a machine with which the subject invention is particularly useful is one which handles "non-glue" cartons, i. e., ones having can-held tuck flaps serving to maintain can-restraining flap elements in position.

In the high speed operation of "Six Pac" machines of the later type, it is essential that cartons be fed quickly thereto in unfolded condition. It is therefore an object of this invention to provide a machine for use in conjunction with "Six Pac" machines which will quickly and reliably unfold carton blanks initially supplied to the machine in folded condition.

It is a further object to provide a machine as described above which is relatively simple in construction, involving a minimum of maintenance and which is of general utility where the unfolding of carton blanks is a requirement.

Other objects and advantages of this invention will become apparent from the following description taken in conjunction with the drawings forming a part of this specification in which:

Figure 1 is a plan view of a "Six Pac" machine which embodies the subject invention.

Figure 2 is a view in side elevation of the machine of Figure 1.

Figure 3 is an enlarged detail view in plan of that part of the machine of Figures 1 and 2 in which the subject invention resides.

Figure 4 is a sectional view taken along the lines 4—4 of Figure 3 illustrating the construction and mode of operation of this invention.

Figure 5 is a sectional view of the cam actuating means for a carton-engaging hook assembly utilized in this invention.

Figure 6 is a perspective view of the hook assembly shown in Figure 5.

Figure 7 is a perspective view of a carton blank in partially unfolded condition.

Figure 8 is a perspective view of a carton blank in the fully unfolded condition ready for the receipt of cans therein.

In Figure 1 is shown a "Six Pac" machine 10 with which this invention has particular utility. The machine 10 is of the type described above in which the cans within the cartons serve to secure such cartons closed thru use of tuck flaps. It is supported upon framework 12 with the cans 14 in upright position being fed right to left from a standard brewery conveyor 16 driven by motor 18, the cans moving past rotary counters 20 and guides 22 and 24 to loading conveyor 26 of the "Six Pac" machine 10 for the carton loading and closing operation.

In Figure 2 is shown loading conveyor 26 which is

2

trained around sets of sprockets 28 and 30, the latter acting as driving sprockets therefor, being linked to driving motor 32. Sprocket set 28 is secured to shaft 34, as is sprocket 36. Sprocket 36 with sprocket 38 secured to shaft 39, serves to carry auxiliary conveyor 40. Thus, rotation of sprocket set 28 with loading conveyor 26, effects rotation of shaft 34, the sprocket 36 secured thereto, and the auxiliary conveyor 40 driven thereby.

Secured to auxiliary conveyor 40 for rotation therewith are carton blank hook assemblies 42, one of which is shown in Figure 6. Each hook assembly 42 is comprised of a supporting plate 44 to which are secured, through use of bolts 46, blocks 48 and 50. Shafts 52 and 54 are journaled in blocks 48 and 50 and carry interengaging spur gears 56 and 58. Shaft 52 carries at the end opposite gear 56 an elongated pendulous cam follower 60 and shaft 54 carries an elongated hook or finger 62 intermediate the blocks 48 and 50. Secured to the outer extremity of shaft 54, at the same end to which gear 58 is secured, is a finger-like cam follower 64. It is the interaction of this follower 64 with undulated cam 66, secured to framework 12, which through gears 56 and 58 prevents downward rotation of hook 62 until the proper point in the sequence of the carton feed and unfolding operations.

As follower 64 rides downward upon cam 66, the finger 62 is permitted limited downward rotation to project into upper forward perforation 68 of carton blank 70. Upon reaching the end 71 of cam 66 the follower 64 drops free, no longer acting to restrain the downward movement of finger 62, which permits the subsequent rotation of finger 62 downward in response to follower 60 moving into engagement with cam 72. The downward rotation of the finger 62 thus effected by follower 60 causes the carton blank 70 to be firmly gripped by the hook assembly 42 with the finger 62 pressing the carton blank 70 downwardly against the bevelled rear edge 74 of plate 44. Outwardly extending flange 75 at the rear of plate 44 serves to guidably restrain the front end of blank 70 when such blank is in substantially unfolded condition.

A third cam 76 of semi-circular disc shape is provided to subsequently engage follower 64, effecting its upward rotation and the upward rotation of hook 62 geared thereto, thus releasing hook 62 from perforation 68 of carton blank 70 and permitting its pickup by the loading conveyor 26 and the pushers 78 carried thereby.

Also secured to auxiliary conveyor 40 for rotation therewith, are elongated carton lift and pusher plates 80. These plates are pin-connected at their inner ends 82 to the auxiliary conveyor 40 and at points 84 intermediate their extremities to links 86 which latter are in turn pin-connected to auxiliary conveyor 40 at points 88. Secured to the faces 90 of plates 80 are pins 92 which engage the perforations 94 of the aft underside 96 of the carton blanks 70. At the extremities of the plates 80, opposite their pin-connected inner ends 82, are angular projections 98 formed to engage the aft edges 100 of carton blanks 70 in their travel with auxiliary conveyor 40. It is the function of the lift and pusher plates 80 to engage the aft undersides 96 of the blanks 70, breaking the blanks upon initial contact to a partially unfolded condition as they are held by hooks assemblies 42 at their forward ends and restrained by a rotary restraining segment 102 against uncontrolled breaking under the action of insertion of plate pins 92. The lift and pusher plates 80 further unfold the carton blanks 70 as they move upward and forward into a position inclined somewhat rearwardly from vertical. The carton blanks 70 are then in position for pickup by the pushers 78 carried by loading conveyor 26 which serve to square up the carton blanks 70 into fully unfolded

3

condition as they squarely abut the aft ends 106 of the blanks 70.

Positioned above and to one side of the auxiliary conveyor 40 is the rotary restraining segment 102 disposed to be driven in rotation about shaft 108 into and out of a restraining position over a carton blank as positioned on conveyor 40. This segment serves as a temporary restraining means limiting the upward movement of the carton blank 70 when such blank is initially engaged on the aft underside 96 by the lift and pusher plates 80. This temporary restraint permits the carton blank to be controllably broken initially, thereby enabling full control of the subsequent unfolding thereof, which takes place after removal of such restraint through rotation of segment 102 out of its restraining position.

Carton blank feed means comprising sets of gripper rollers 110 and 112 and a stacker 114 containing the blanks 70 are aligned with the auxiliary conveyor 40 for the feeding of the blanks 70 in flat folded condition via guide tracks 115 to the auxiliary conveyor 40 where said blanks are acted upon by the hook assemblies 42 and the lift and pusher plates 80 carried thereby.

It is important that the operation of the auxiliary conveyor 40, the gripper rollers 110 and 112, the feed means (not shown) from the stacker 114, and the segment 102 be in a sequential relationship as described hereinafter; and it is preferable that the motor 32 serve as a common driving means for such parts of the machine driving through positive linkages. Segment 102 and gripper rollers 110 and 112 can satisfactorily be driven through gear trains (not shown) in turn driven by the rotating shaft 34. To assure the above sequential relationship, it is important that the carton blanks 70 be positively fed to the auxiliary conveyor 40 by the gripper rollers 110 and 112. To this end it is desirable that the rearward set of gripper rollers 112 be serrated.

Describing now the operation of the machine of this invention, the carton blanks 70 in substantially flat folded condition are fed one at a time from the stacker 114 to the serrated gripper rollers 112 by feed means (not shown). Rollers 112 securely grip the blank 70, moving it in the direction right to left indicated in Figure 4 to pass between rubber rimmed gripper rollers 110 which move the blank as shown in Figure 5 into a position upon guide tracks 115 adjacent the auxiliary conveyor 40. The conveyor 40, coordinated in its movement with the rollers 110 and 112, is there shown located with the hook assembly 42 approaching the position for reception thereunder of the blank 70. Follower 64 riding upon undulated cam 66 holds finger 62 in an elevated position until the movement of conveyor 40 carries it past the uppermost point 116 of the cam 66, the downward undulation of the cam then permitting the follower 64 and the finger 62 actuated thereby limited downward rotation, with finger 62 projecting into perforation 68 of blank 70. With the blank advancing at the same speed as does the hook assembly 42 in its lineal travel with the conveyor 40, the blank 70 is caused to abut the bevelled rear surface 74 of plate 44, the finger 62 thereafter rotating downward through cam actuation as described above to project into perforation 68 in the front end of blank 70.

Continued travel of the conveyor 40 carries follower 64 free of cam 66, eliminating the restraining effect thereof upon the downward rotation of hook 62. Follower 60 is carried into engagement with cam 72 which causes its upward rotation thus effecting, through gears 56 and 58, the downward rotation of finger 62, already projecting into perforation 68, to firmly press the blank 70 against the bevelled rear edge 74 of plate 44. The segment 102 has with the feeding of blank 70 to the conveyor 40 rotated into a position over the blank thereby serving to restrict the upward movement of such blank.

As shown in Figure 4, the lift and pusher plate 80

4

carried by conveyor 40 immediately behind each blank engaging hook assembly 42 rotates with such conveyor into a substantially horizontal position underneath the blank 70 to engage the aft underside 96 in abutting relationship, with the projection 98 engaging the aft corner 100 of blank 70. Pin 92 carried by lift and pusher plate 80 projects into perforation 94 underneath the blank 70 at the after end to exert an upward force thereupon and cause the blank 70, restrained as in Figure 4 by segment 102, to break into the partially unfolded condition therein shown.

With continued movement of conveyor 40, the continuously rotating segment 102 rotates from its restraining position over the conveyor 40, and the lift and pusher plate 80 assumes a partially erect position, thereby effecting a substantial unfolding of the carton blank as illustrated to the left in Figure 4.

As the conveyor 40 continues its movement to the left, the hook assembly 42 and the lift and pusher plate 80 serve to move the blank therewith, the blank 70 being supported in substantially unfolded condition by plate 80. Follower 60 moves free of cam 72 to permit upward rotation and withdrawal of finger 62 from its position in perforation 68 of the blank 70, such rotation being effected through action of cam 76 upon follower 64.

Upon withdrawal of finger 62 from the perforation in blank 70, the blank is ready for pickup by pusher 78 which engages the blank at its after end, accomplishing the completion of the unfolding operation as it assumes an abutting squared up position relative thereto.

The carton blank 70 in its fully expanded condition is then ready for the carton loading operation which is accomplished as the carton is moved down the loading conveyor 26 by a pusher 78. Cans 14 are inserted into the blanks 70, being fed through rotary counters 20 past guides 22 and 24 and in groups of three into each open side of the upright blank by rotating segments 118. The cartons are then moved by the conveyor 26 into a position for flap closing, which is accomplished by rotary fingers 120, units 122 and 124, and the rotary elements (not shown) carried thereby. Said carton loading and flap closing means do not form a part of the present invention.

What is claimed is:

1. A carton blank unfolding machine comprising in combination, conveyor means, carton blank feed means, carton blank hook means carried by the conveyor means, lift and pusher means carried by the conveyor means, restraining means, means disposed to actuate the respective conveyor, feed, and restraining means in sequential relationship such that a carton blank is fed in flat condition from the feeder means, firmly gripped at its forward end by the hook means, engaged at its after end and lifted from the underside by the lift and pusher means to break the carton blank into a substantially unfolded condition, the restraining means permitting but limited upward movement of the carton blank during the initial breaking thereof and the hook means being subsequently released from the blank after substantial unfolding thereof.

2. A carton blank unfolding machine comprising in combination, conveyor means, carton blank feed means adjacent the conveyor means, blank gripping hook means carried by the conveyor means, blank lift and pusher means carried by the conveyor means, restraining means adjacent the conveyor means for limiting upward movement of blanks, driven means for actuating the respective conveyor, feed and restraining means in timed relationship such that a carton blank is fed in folded condition by the feed means to be firmly gripped by the hook means and broken into partially unfolded condition by the lift and pusher means while being restricted in upward movement by the restraining means, the carton blank after removal of the restraining means being pushed upward and forward by the lift and pusher means to a substantially unfolded condition, the hook means thereafter being

5

released from gripping engagement with the carton blank.

3. A carton blank unfolding machine comprising in combination, a conveyor disposed to be driven in rotation, feed means disposed adjacent the conveyor and aligned therewith, hook means carried by the conveyor, lift and pusher means carried by the conveyor, restraining means disposed adjacent the conveyor, driven means serving to drive the machine such that the feed means delivers carton blanks to the conveyor to be grippingly engaged by the hook means, said blanks being restrained by the restraining means during the breaking of the blanks but released of such restraint during the unfolding thereof to a substantially unfolded condition by the lift and pusher means, the carton blanks thereafter being released from the gripping engagement of the hook means.

4. A carton blank unfolding machine comprising in combination, a conveyor disposed to be driven in rotation, feed means adjacent the conveyor and aligned therewith having a plurality of gripper rollers disposed to be driven in rotation, a plurality of hook means carried at intervals by the conveyor for rotation therewith, each having an elongated rotatably disposed gripping finger secured thereto, a plurality of lift and pusher means carried by the conveyor for rotation therewith intermediate the hook means, restraining means disposed adjacent to the conveyor having a segment rotatable into a restraining position, driven means serving to drive the machine to perform in sequence the feeding of a carton blank from the feed means to be gripped by the hook means, the carton blank being then moved by the hook means to a position underneath the restraining means, pushed upward and forward to be broken into partially unfolded condition by the action of the lift and pusher means, the upward movement of the blank at such time being limited by the restraining means, the blank thereupon being further unfolded by the action of the lift and pusher means as the restraining means is rotated from its restraining position over the blank, the blank continuously moving with the conveyor through the cooperative action of the hook means and the lift and pusher means and being thereafter released from the hook means.

5. A carton blank unfolding machine comprising in combination, a conveyor adapted to be driven in rotation, feed means aligned with the conveyor having a plurality of sets of cooperating gripper rollers, at least one set of which is serrated for the positive feeding of carton blanks, a plurality of hook means carried by the conveyor for rotation therewith, each having a curved finger adapted to rotate into a perforation in the upper side of the forward portion of a carton blank to thereby firmly press the blank against the hook means in gripping relationship, a plurality of lift and pusher means carried intermediate the hook means by the conveyor for rotation therewith, each having a pin disposed to project into a perforation in the underside of the rear portion of the blank thereby exerting an upward force to break the carton into a partially unfolded condition when the lift and pusher means is carried by the conveyor into contact with the underside of the carton blank, rotary segmental restraining means disposed adjacent the conveyor to be rotated alternately into and out of a restraining position over a carton blank serving when positioned over such blank to limit the upward movement thereof until the breaking of the blank by the lift and pusher means, and driven means positively connected to and driving the feed means, the conveyor, and the restraining means.

6. A carton blank unfolding machine comprising in combination, a conveyor adapted to be driven in rotation, feed means aligned with the conveyor, a plurality of hook means carried by the conveyor, a plurality of lift and pusher means carried by the conveyor intermediate the hook means, rotary segmental restraining means disposed adjacent the conveyor, pusher means aligned with and disposed adjacent the conveyor, driven means for

6

actuating the respective conveyor, feed, restraining and pusher means such that a carton blank is fed in folded condition by the feed means, firmly gripped by the hook means and engaged and broken into partially unfolded condition by the lift and pusher means while being restricted in upward movement by the restraining means, the carton then being forced by the lift and pusher means forward and upward into a substantially unfolded condition after withdrawal of the restraining means, the pusher means thereafter effecting complete unfolding of the carton to an upright position after the release therefrom of the hook means.

7. A carton blank unfolding machine comprising in combination, a conveyor disposed to be driven in rotation, feed means aligned with the conveyor, hook means carried by the conveyor having an elongated rotary finger and having pivotally connected thereto first and second interconnected cam followers for effecting rotary movement of the elongated finger, first, second and third cams disposed adjacent the conveyor to be engaged by the first and second cam followers as the conveyor is driven in rotation, lift and pusher means carried by the conveyor, restraining means adjacent the conveyor, pusher means adjacent the conveyor, driven means for actuating the conveyor, feed means, restraining means, and pusher means such that a carton blank is fed by the feed means, firmly gripped by the hook means and engaged and broken into partially unfolded condition by the lift and pusher means while being restricted in upward movement by the restraining means, the carton then being forced into a substantially unfolded condition by the lift and pusher means after removal of the restraining means, the pusher means thereafter engaging the carton blank to complete the unfolding thereof after the release of the hook means from gripping engagement therewith.

8. In a machine of the type described adapted to receive four-walled flattened tubular blanks and to unfold them while conveying them to a filling station, said machine comprising conveyor elements operable to engage beneath said blanks and push-lift the eventual upper wall and leading and trailing end walls with respect to the lower wall to substantially unfold said blanks, and pusher means adapted to square up the walls of said blanks and move said blanks past said filling station, said blanks in their flattened condition having a top layer of walls comprising said eventual leading end wall and upper wall and having a bottom layer of walls comprising said lower wall and said eventual trailing end wall, with at least one aperture being formed through said leading end wall of each blank; the improvement comprising hook elements movable in advance of and along with said push-lift conveyor elements, means to introduce each hook element through the aperture of the leading end wall of the blank and into engagement with the lower wall thereof preliminary to the unfolding of the blank by said push-lift conveyor elements, to maintain each hook element in engagement with said lower wall until the unfolding of the blank has been at least initiated by a push-lift conveyor element, and to thereafter withdraw each hook element from said aperture.

9. In a machine of the type described adapted to receive four-walled flattened tubular blanks and to unfold them while conveying them to a filling station, said blanks in their flattened condition having a top layer of walls comprising the eventual leading end wall and upper wall and having a bottom layer of walls comprising the lower wall and the eventual trailing end wall, said trailing end wall having at least one aperture therein, said machine comprising conveyor elements operable to engage beneath said blanks and push-lift the eventual upper wall and leading and trailing end walls with respect to the lower wall to substantially unfold said blanks, said conveyor elements comprising pivotally mounted plates having end flanges and projecting pins, and means adapted to train and operate said plates to project said pins

7

through the apertures of said trailing end walls and against said upper walls and to engage said plates against said trailing end walls and said end flanges against the trailing ends of said blanks, thereby causing said blanks to break from their flattened condition preliminary to the unfolding thereof; the improvement comprising cyclically movable restraining means and means for moving the same in timed relation to said conveyor elements

8

over said blanks to controllably limit the degree of break of said blanks and insure full control engagement of said conveyor elements with said blanks and for then moving said restraining means out of a position above said blanks to enable the unfolding thereof.

No references cited.