



May 13, 1958

H. J. GOSS

2,834,263

BOX STRIPPING AND EXTRACTING APPARATUS

Filed Dec. 3, 1956

5 Sheets-Sheet 2

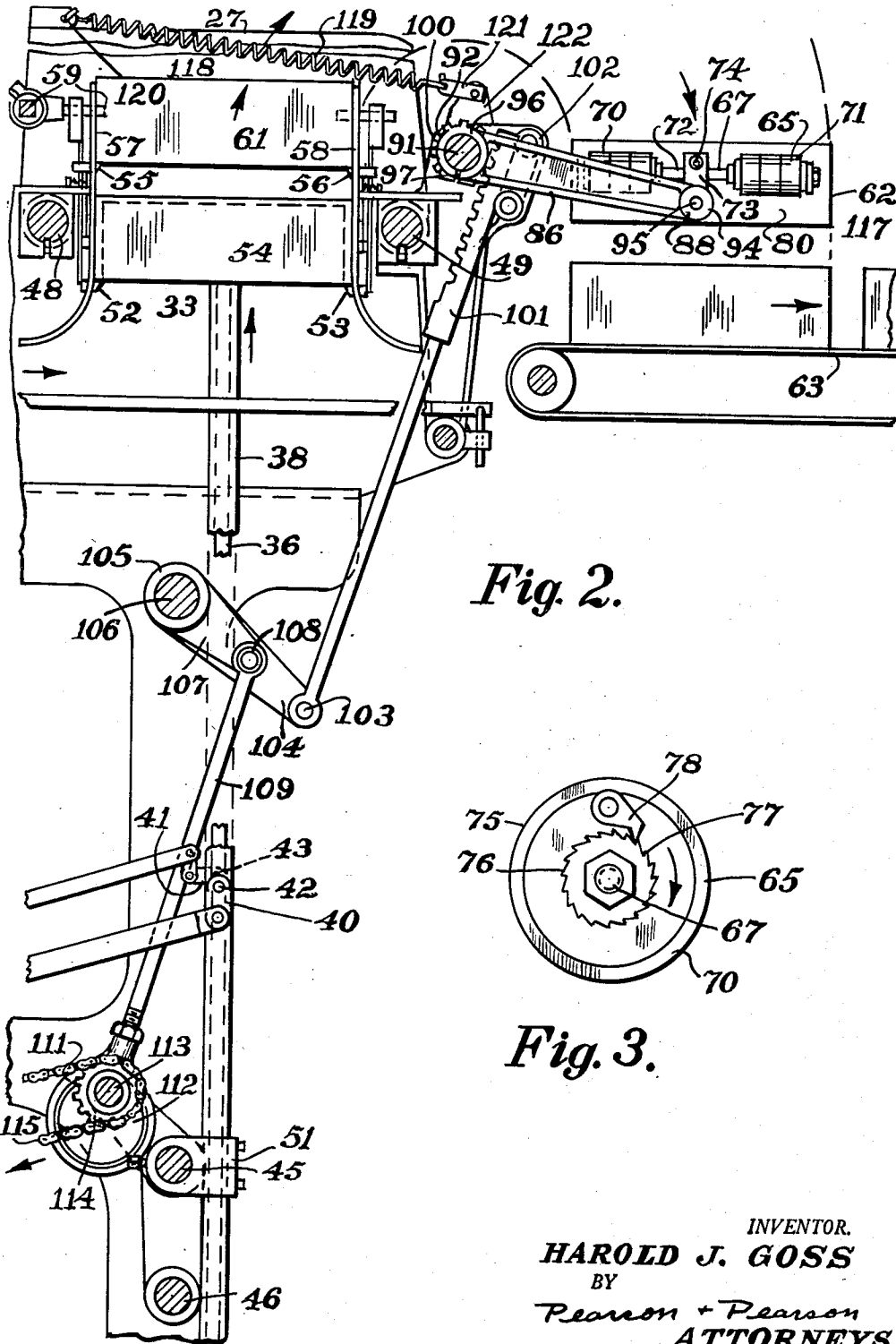


Fig. 2.

Fig. 3.

INVENTOR.  
**HAROLD J. GOSS**  
BY  
*Pearson + Pearson*  
ATTORNEYS

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H. J. GOSS

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5 Sheets-Sheet 3

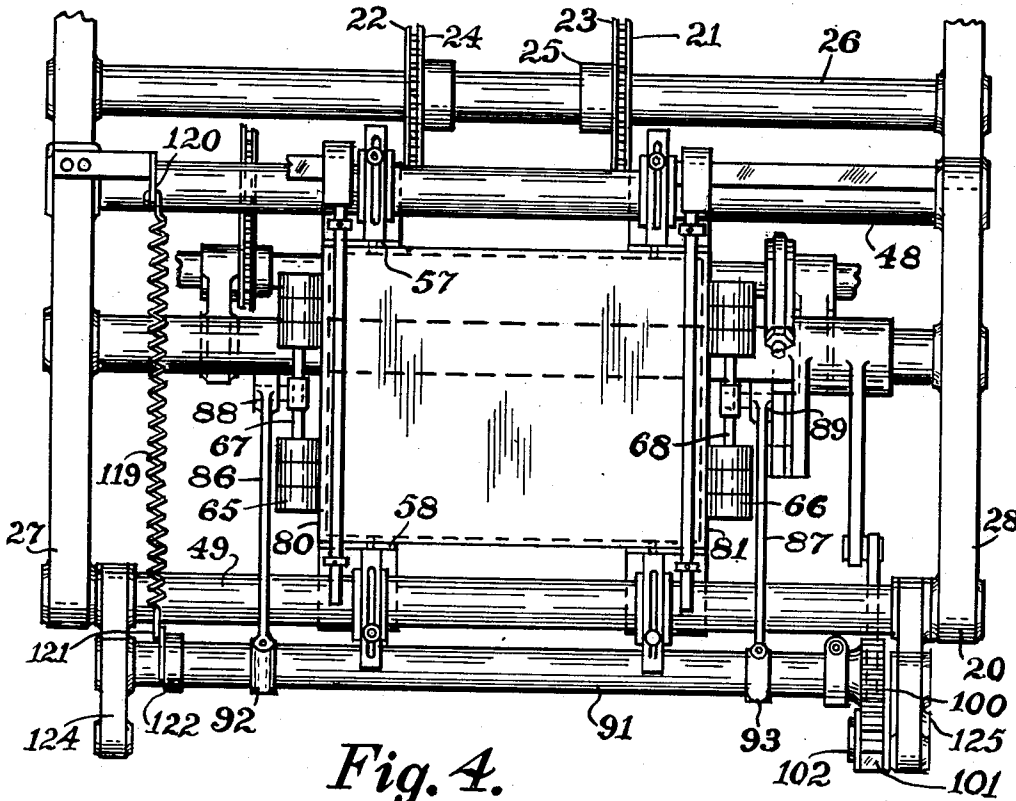


Fig. 4.

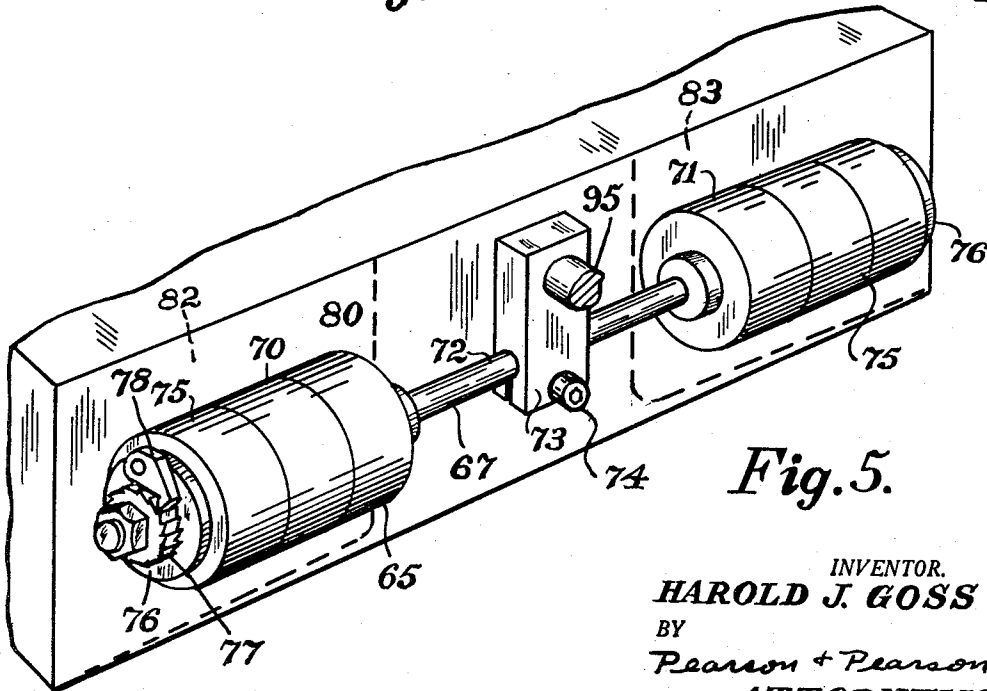


Fig. 5.

INVENTOR.  
**HAROLD J. GOSS**  
BY  
*Pearson + Pearson*  
**ATTORNEYS**

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H. J. GOSS

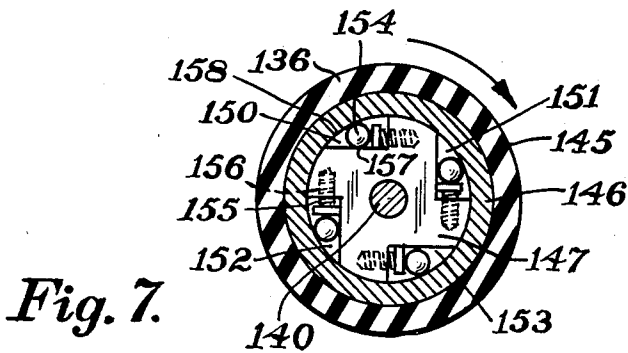
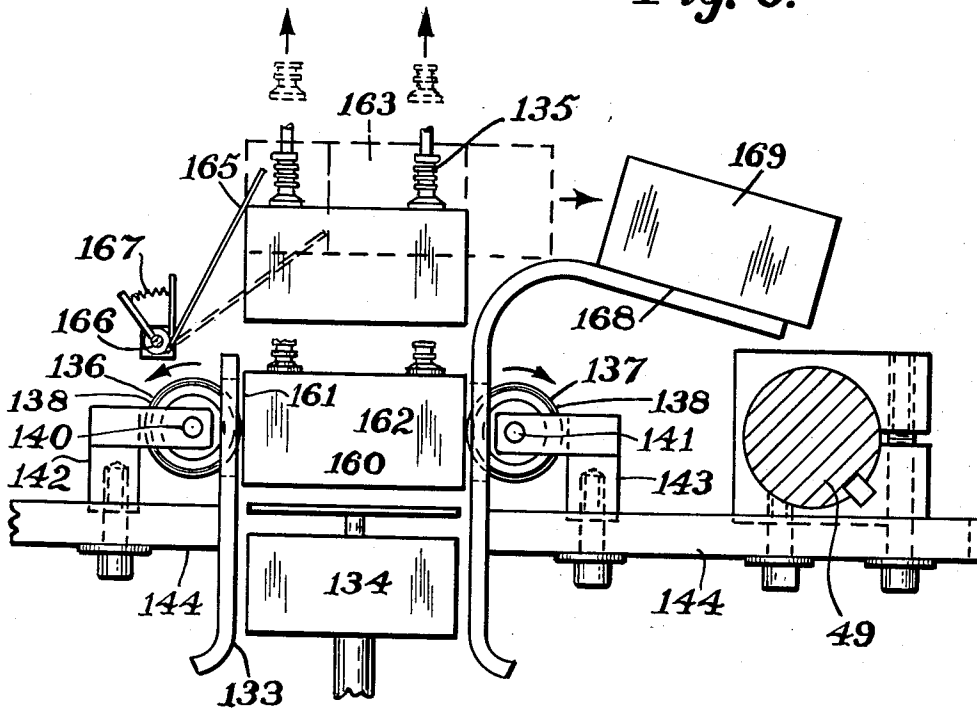
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Fig. 6.



INVENTOR.  
**HAROLD J. GOSS**  
BY  
*Pearson + Pearson*  
**ATTORNEYS**

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H. J. GOSS

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5 Sheets-Sheet 5

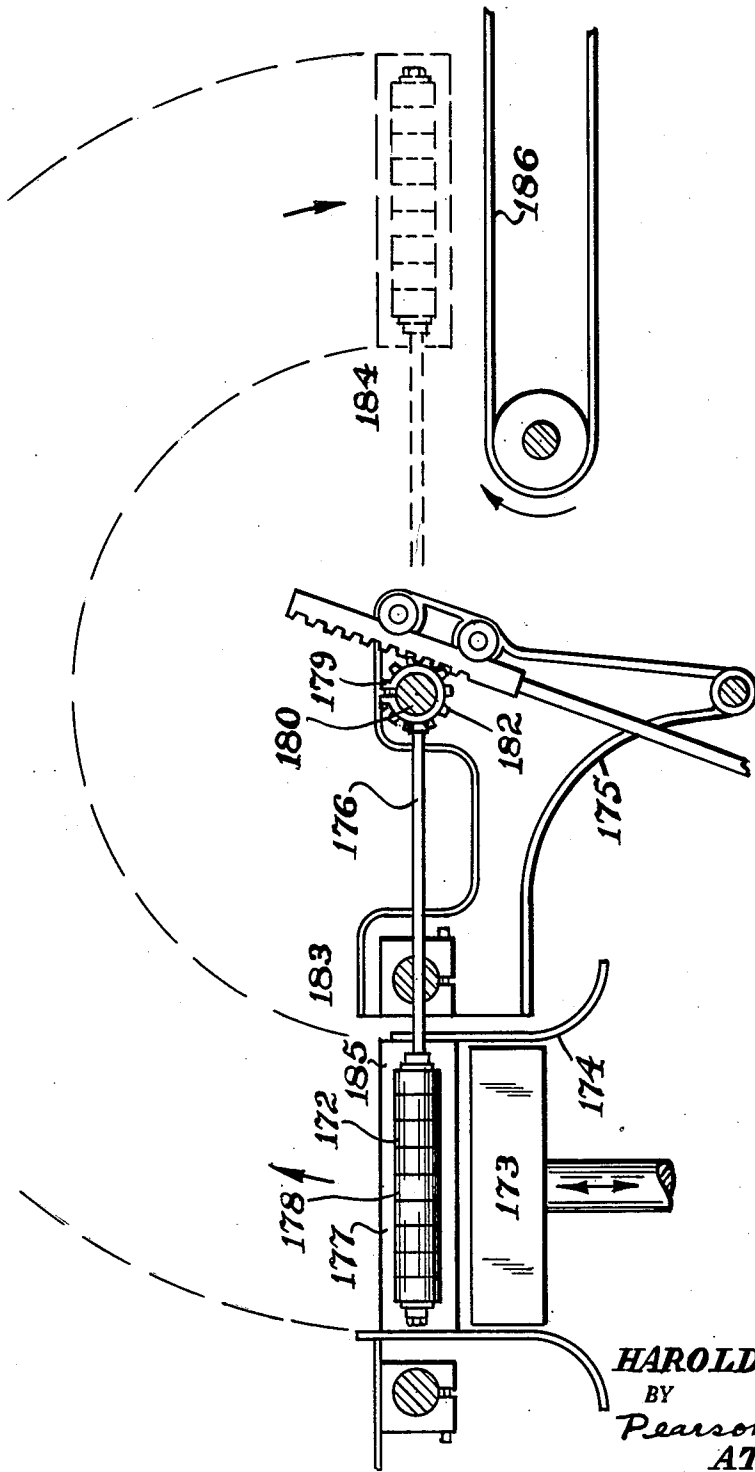


Fig. 8.

INVENTOR.  
**HAROLD J. GOSS**  
BY  
*Pearson + Pearson*  
ATTORNEYS

2,834,263

**BOX STRIPPING AND EXTRACTING APPARATUS**

Harold J. Goss, Nashua, N. H., assignor to The International Paper Box Machine Company, Nashua, N. H., a corporation of New Hampshire

Application December 3, 1956, Serial No. 625,696

11 Claims. (Cl. 93—51)

This invention relates to an apparatus for extracting and inverting boxes formed on plunger and channel type box forming machines.

Plunger and channel box forming machines are well known and usually comprise a plunger of single or multiple type reciprocating axially in a vertical box forming channel. Flat box blanks are fed individually and successively to the plunger at the lower end of the path thereof, with the bottom panel of the blank supported flatwise on the plunger. The plunger then forces the blank through the channel, thereby causing the side wall panels of the blank to be down folded and any attachment flaps to be infolded to form the box. The wall panels of the resulting box may be connected by stays, interlocking flaps or glue flaps all in a well known manner. At the upper end of the path of the plunger or box form the blank has been formed into a completed tray type box, with its bottom panel facing upwardly, and the box must be not only stripped from the plunger but removed from the forming zone to enable a repeat of the cycle.

In my prior U. S. Patent No. 1,538,851 issued May 19, 1925, and entitled "Assembling Mechanism for Box Making Machines," a machine of the above mentioned type is shown and the boxes are stripped from the plunger by resiliently mounted fingers and then lifted into an axially extending vertical stack while still in inverted position. In my prior U. S. Patent No. 2,469,641 issued May 10, 1949, and entitled "Method and Machine for Making Unitary Setup Covered Boxes," pneumatic apparatus for removing boxes from a plunger is disclosed in which a suction head, on an oscillating arm adheres flatwise on an upward facing cover of the box, moves the box through an arc of less than 90° and drops the box into a chute. In the apparatus of Patent No. 2,469,641, the box is righted and deposited bottom down only because the box includes a cover. With trays, having no cover, the suction head could only adhere to the bottom panel of the tray and drop the tray while still in inverted position.

In my copending application, Serial No. 498,261 filed March 31, 1955, now U. S. Patent No. 2,774,287, and entitled "Suction Stripping and Stacking Apparatus" pneumatic apparatus is also used for stripping a box from a plunger, the suction heads adhering to the bottom panel of the box and moving axially away from the plunger rather than laterally away therefrom.

The application of suction grippers to the bottom of a box for disengaging the box from a plunger and stacking or discharging the same is disadvantageous in that the grippers bar the way for further advance of the box or inversion of the box to right side up position. In my said copending application, therefore, it is necessary to provide mechanism for returning the suction grippers in a path outside the path of removal of the box and the box is not inverted but remains upside down in the apparatus of said application.

It is the principal object of this invention to provide box extracting means for vertically reciprocable plunger

type machines wherein tray boxes are individually and successively stripped from the machine by being moved upwardly laterally and downwardly to right side up position and then discharged onto a stack, conveyor or the like.

Another object of the invention is to provide mechanical stripping and discharge means for engaging the walls of a tray box and arranged to swing in a semicircular path between a forming channel and a discharge station, thereby eliminating complicated air valves, suction heads and the circuitous paths of the prior art.

A further object of the invention is to provide improved extraction apparatus for tray boxes wherein the completed box is frictionally gripped on the exterior faces of opposite side walls and the box lifted by its side walls. The possibility of distorting the box by gripping the bottom panel or of fracturing the box edges by gripping the same with hooks being thus avoided.

Still another object of the invention is to provide extraction means especially useful with glued tray boxes wherein the stripping and discharge apparatus tends to maintain the wall flaps and tabs in erected and adhered condition by supporting and pressing on opposite side walls of the box during the entire extraction operation.

A still further object of the invention is to provide a simple, rugged and positive mechanism for stripping, removing and righting each individual tray box completed in a forming channel by a single swinging action and with few moving parts.

Other objects and advantages of the invention will be apparent from the claims, the description of the drawings and from the drawings in which a preferred embodiment is illustrated as applied to a typical plunger and channel type box forming machine.

Fig. 1 is a somewhat diagrammatic side elevation, partly in section of a portion of a plunger and channel type box forming machine with the apparatus of this invention installed thereon and gripping a tray box.

Fig. 2 is a view similar to Fig. 1 showing the extraction apparatus of the invention swung through an angle of 180° and discharging a tray box by gravity onto a conveyor.

Fig. 3 is an end view of one of the stripping rolls of the invention on an enlarged scale.

Fig. 4 is a plan view of the device shown in Fig. 1 and

Fig. 5 is an isometric view, on an enlarged scale, of a stripping roll in frictional engagement with the side wall of an inverted tray box.

Fig. 6 is a fragmentary side view similar to Figs. 1 and 2 showing the stripping means of the invention adapted to strip a tray box from the plunger of a suction extraction type box forming machine.

Fig. 7 is an end view in section, similar to Fig. 3, showing a modified form of unidirectional rotation mechanism, and

Fig. 8 is a view similar to Figs. 1 and 2 showing the device of the invention arranged to strip, extract and invert tray boxes.

In the drawings, a portion of a machine 20 is illustrated, sufficient to show the invention hereof, the remaining parts of the machine being well known. Machine 20 is a typical plunger and channel box forming machine and includes a conveyor 21 comprising the registration chains 22 and 23 trained around sprockets 24 and 25 carried by a shaft 26 journaled in the side frame pieces such as 27 and 28 of the machine. The spaced lugs such as 29 of the chains 22 and 23 deliver flat box blanks such as 31 individually and successively onto suitable platform means 32 at the entrance to box forming channel 33 and just above the plunger 34. Plunger 34, in the machine shown, includes a plate 35 carried by a slide rod 36 and a box form 37 carried by a slide rod 38,

rod 36 being telescopically slideable within rod 38. Suitable linkage 40 and 41 actuated by cams not shown, and connected at 42 and 43 to rods 36 and 38 cause the plunger 34 to reciprocate vertically and axially into channel 33 to downfold the wall panels of the blank into box form. The side frame pieces 27 and 28 are connected by transverse rods such as at 45, 46, 47, 48 and 49 and a vertical guide such as at 51 is provided for rod 38.

Oppositely disposed resilient fingers or hooks, 52 and 53 serve to strip each successive box such as 54 from the plunger 34, when the plunger reverses its path. Hooks 52 and 53 are carried by a cross bar 59, and so arranged to lift each box 54 up to a higher level as shown at 61.

Additional fingers, or hooks, 55 and 56 mounted at the end of bars 57 and 58 which in turn hold the boxes in position as shown at 61. Cross bar 59 is synchronized with the movement of plunger 34 and conveyor 21 all in a well known manner not shown and forming no part of this invention. All of the above described parts are also well known and result in completed boxes being delivered to the location shown at 61 with the box in inverted, upside-down condition and with bottom side up. It will be apparent that the upward movement of the fingers 52 and 53 will continually build up a vertical stack of completed boxes, in extension of the channel 33, if suitable magazine supports are provided as in present machines.

In this invention, however, such magazine supports are completely eliminated and the boxes are each moved upwardly, laterally and downwardly to a discharge station 62 where they are individually delivered to a conveyor 63 in reversed, or righted, bottom down condition. It should be noted that, while the tray boxes such as at 61 have been stripped from the plunger 34, they have not been stripped from the machine and that the boxes must remain under control during transfer while still being carefully handled to avoid fracture, marking or loosening of the stays or glue flaps thereof.

The tray box stripping means of this invention is mechanical rather than pneumatic and comprises a pair of roller members 65 and 66, each rotatably mounted on a shaft 67 or 68 on an opposite side of a tray box such as 61, proximate the upward end of the path of plunger 34. Preferably each roller member such as 65 is made up of a pair of spaced roll sections such as 70 and 71 each at an opposite end of the shaft such as 67, the central portion of the shaft at 72 being supported in a split clamp such as 73, tightenable and adjustable by a set screw 74. Each roller member such as 65 is friction faced as with rubber at 75 and each section is connected to its shaft 67 by unidirectional rotation mechanism such as at 76. Preferably means 76 comprises a ratchet 77 fixed to shaft 67 and a pawl 78 fixed to the outer end of the section such as 70, each pawl permitting free rotation of the roller members in an angular direction which advances the box trays but preventing rotation in the opposite angular direction. The roller members 65 and 66 are spaced to frictionally bear against the outside face of the opposite side walls such as 80 and 81 of a tray box 61 and tend to retain the walls and adhered glue flaps such as 82 and 83, in squared and leveled condition even if the adhesive is not yet dry. (See Fig. 5.)

The box discharge means of the invention comprises a pair of oppositely disposed arms 86 and 87, each carrying the clamp such as 73 of one of the roller members 65 or 66 proximate its free terminal end 88 or 89 and each fixed on a rock shaft 91 at its base 92 or 93. Preferably the terminal end such as 88 of each arm such as 86 includes a head 94 and a short lateral rod 95 extending to the clamp 73 as shown. Preferably the base 92 of each arm 86 is in the form of a split sleeve or collar 96, tightenable by a set screw 97 to any desired angular position on shaft 91. Rock shaft 91 is suitably journaled at each opposite end on machine 20 and carries a gear

100 meshed with a gear rack 101. Rack 101 is supported on its flat rear face in rollers such as 102 and is pivotally connected at 103 to an arm 104 carried by a sleeve 105 mounted on a transverse shaft 106. Sleeve 105 includes a second arm 107 pivotally connected at 108 to the connecting rod 109 of a yoke type cam follower 111. Follower 111 is actuated by a cam 112 carried by a transverse shaft 113 rotated by a sprocket 114 and chain 115. Chain 115 is synchronized with the other drive mechanism of the machine not shown and with the movement of the conveyor 21, plunger 34 and cross bar 59, all in a manner well known in the trade.

With each revolution of cam 112, the gear rack 101 is moved downwardly and then upwardly. Upon downward movement the arms 86 and 87, which support roller members 65 and 66 are moved arcuately upwardly, laterally and then downwardly from the position shown in Fig. 1 to the position shown in Fig. 2. Each box such as 61, frictionally gripped by the roller members 65 and 66 is thus moved by contact with the outside faces of a pair of opposite walls 80 and 81 out of the forming channel portion of the machine at 33 to the discharge station 117 through an arc of 180°. Because the roller members 65 and 66 rotate unidirectionally the tray box 61 is not dropped during the upward component of the semicircular path. However, at the end of the downward component, thereof, the weight of the box alone permits gravity to cause the tray box to fall out of the roller members, bottom down onto the conveyor 63. The gear rack 101 is then moved upwardly to return the arms 86 and 87 to their initial position shown in Fig. 1. During the semicircular stroke of the arms 86 and 87, the next successive box has been moved by fingers 55 and 56 into the pickup station 118 for gripping by the roller members 65 and 66 and another tray box has been formed by the plunger 34 and channel 33.

A tension spring 119 is fixed at one end 120 to side frame 27 and at the other end 121 to an arm 122 carried by shaft 91. At the end of the forward stroke shown in Fig. 2 and at the end of the rearward stroke shown in Fig. 1, spring 119 is arranged to cushion the impact of arms 86 and 87. The extraction mechanism of the invention including the roller members 65 and 66, the arms 86 and 87, the shaft 91 and the gear and gear rack mechanism may be mounted on side frame pieces 124 and 125 detachably mounted on transverse rod 127 to serve as an optional attachment to existing machines or may be built into the machines as desired.

As shown in Fig. 6, the mechanical tray box stripping mechanism of the invention may be used with a suction cup box extracting mechanism of a well known type. A box forming plunger 134 reciprocable in a box forming channel 133 is provided together with suction cups such as 135. A pair of unidirectionally rotatable rollers 136 and 137 are mounted at each opposite side of the terminus of the path of plunger 134, each having a curved friction surface such as at 138. Unlike the embodiment of Figs. 1 to 5 the rollers 136 and 137 are rotatable on shafts such as 140 and 141 which are fixed in brackets such as 142 and 143 carried by the frame 144.

As shown in Fig. 7 each roller such as 136 is provided with a covering sleeve 145 of rubber or the like, fixed to a metal tube 146. Tube 146 encircles a member 147 fixed to the shaft 140 both being non-rotatable. Member 147 includes four right angular grooves such as 150, 151, 152 and 153 each groove containing a ball such as 154 pressed outwardly by a coil spring 155 based in a recess 156. The sleeve 145 and tube 146 are free revolving unidirectionally in the direction of the arrow but are prevented from revolving in the opposite direction by the binding of the balls 154 between the floor 157 of the grooves and the inner wall 158 of the tube 146.

Each completed tray box such as 160 formed by plunger 134 in channel 133 is gripped by the frictional contact of its side walls 161 and 162 and the curved

friction faces such as 138 of rollers 136 and 137 and stripped from the plunger upon the return stroke thereof. The suction cups 135 are synchronized with the plunger 134, in a well known manner, to extract each box 160 upwardly to the position occupied by box 163. An arm 165 pivoted at 166 and spring pressed by spring 167 is engaged by the upwardly moving box and pushes the box laterally onto an inclined chute 168 at the same time that suction is eliminated from the cups 135. The boxes such as 169 on the chute 168 are not automatically inverted in this embodiment of the invention.

However, as shown in Fig. 8, the unidirectionally, rotatable rollers such as 172 may perform the functions of stripping a box directly from the plunger, moving it upwardly, laterally and downwardly away from the channel and inverting the box to right side up position. A pair of identical rollers such as 172 are each mounted on an opposite side of the terminus of the path of the plunger 173 in forming channel 174 of a box forming machine 175. Each roller is carried by a shaft such as 176 and adapted to rotate only in the direction of advance of a box such as 177 by means 178 similar to the device shown in Fig. 3 or Fig. 7. The pair of shafts such as 176 are elongated and extend to a pair of spaced, split collars such as 179 mounted on a shaft 180. Shaft 180 includes a gear 182 similar to gear 100 and oscillates between the stripping station 183 and the discharge station 184 in a manner similar to that shown in Figs. 1 to 5, thus with each forward and return stroke of the plunger the rollers such as 172 strip each successive completed tray box 185 from the plunger, move the box through an arc of 180° upwardly, laterally and downwardly and discharge the box onto a conveyor belt 186 by gravity and then return for the next successive box.

I claim:

1. Apparatus for extracting completed inverted tray boxes from a plunger and channel box forming machine, said apparatus comprising mechanical box stripping means, at opposite sides of the box forming channel of said machine in the path of each successive completed tray box, said means frictionally gripping opposite outside walls of each said tray box and preventing rearward, while permitting free forward, movement thereof and box discharge means supporting said box stripping means and moving in timed relation to the box forming mechanism of said machine toward and away from a box discharge station, said box discharge means supporting said box stripping means at said box discharge station in righted position for free downward movement of a box under the influence of gravity.

2. Apparatus as specified in claim 1 wherein said box stripping means comprises a pair of oppositely disposed, friction-faced roller members, each revoluble in one direction but not revoluble in the opposite direction and each comprising spaced rolls mounted at opposite ends of a common shaft.

3. Apparatus as specified in claim 1 wherein said box stripping means comprises a pair of friction faced roller members, each on an opposite side of each successive box beyond the end of the stroke of the plunger of said machine and each including a ratchet and pawl for permitting unidirectional rotation only of said roller members.

4. Apparatus as specified in claim 1 wherein said box discharge means comprises a pair of pivoted arms, each supporting one of said box stripping means at the free

terminal end thereof and oscillating through an angle of about 180° to said box discharge station.

5. Apparatus as specified in claim 1 wherein said box discharge means comprises a pair of oscillating arms and said box stripping means comprises a pair of friction faced, unidirectionally rotatable roller members, each mounted at the free terminal end of one of said arms.

6. In a box forming machine of the type having a vertical box forming channel and a plunger reciprocating axially therein to form boxes in bottom up position, the combination of mechanical box stripping means comprising a pair of shaft supported roller members, each in engagement with an opposite side of a completed box proximate the end of the upward path of the plunger of said machine, said roller members being connected to said shaft by a ratchet and pawl permitting free rotation thereof forwardly but preventing rearward rotation thereof; box discharge means comprising a pair of oppositely disposed arms pivoted to said machine for oscillation through an angle of 180°, each said arm carrying the shaft of one of said roller members and means for oscillating said arms in synchronization with the movement of said plunger in said channel.

7. A combination as specified in claim 6 wherein the means for oscillating said arms comprises a shaft upon which said arms are mounted, a gear on said shaft; a gear rack engaged with said gear and cam and follower mechanism for reciprocating said gear rack.

8. Apparatus for extracting and inverting boxes formed bottom up in a box forming channel, said apparatus comprising a pair of friction faced roller members, each mounted to engage an opposite, exterior side wall of a box in said channel and each mounted to rotate unidirectionally on a shaft in an angular direction permitting passage of the box therebetween and oscillating means, supporting the shafts of said roller members, for swinging the same angularly and laterally away from said forming channel until each successive box falls by gravity from between said roller members.

9. Apparatus for stripping and extracting completed inverted tray boxes from a plunger and channel box forming machine, said apparatus comprising mechanical box stripping means at opposite sides of the box forming channel of said machine in the path of each successive completed tray box, said means comprising a pair of rollers each on an opposite side of the terminus of said path and mounted to rotate unidirectionally in the direction of advance of a box, each said roller having a curved face adapted to frictionally grip an opposite side wall of each successive completed box and box extraction means moving in timed relation to the box forming mechanism of said machine, said box extraction means being adapted to move each box gripped by said stripping means upwardly and laterally away from said box forming channel.

10. Apparatus as specified in claim 9 wherein said box extraction means supports said box stripping means and is arranged to laterally transport and invert said rollers with a tray box gripped therein, to discharge each successive box therefrom by gravity.

11. Apparatus as specified in claim 9 wherein said rollers are mounted on shafts and said box extraction means comprises mechanism for oscillating said shafts around a fixed pivot through an arc of 180° for discharging each successive tray box by gravity from said rollers.

No references cited.