Sept. 4, 1962 C. D. KEELY ET AL 3,052,072

CARTON SEALING MECHANISM

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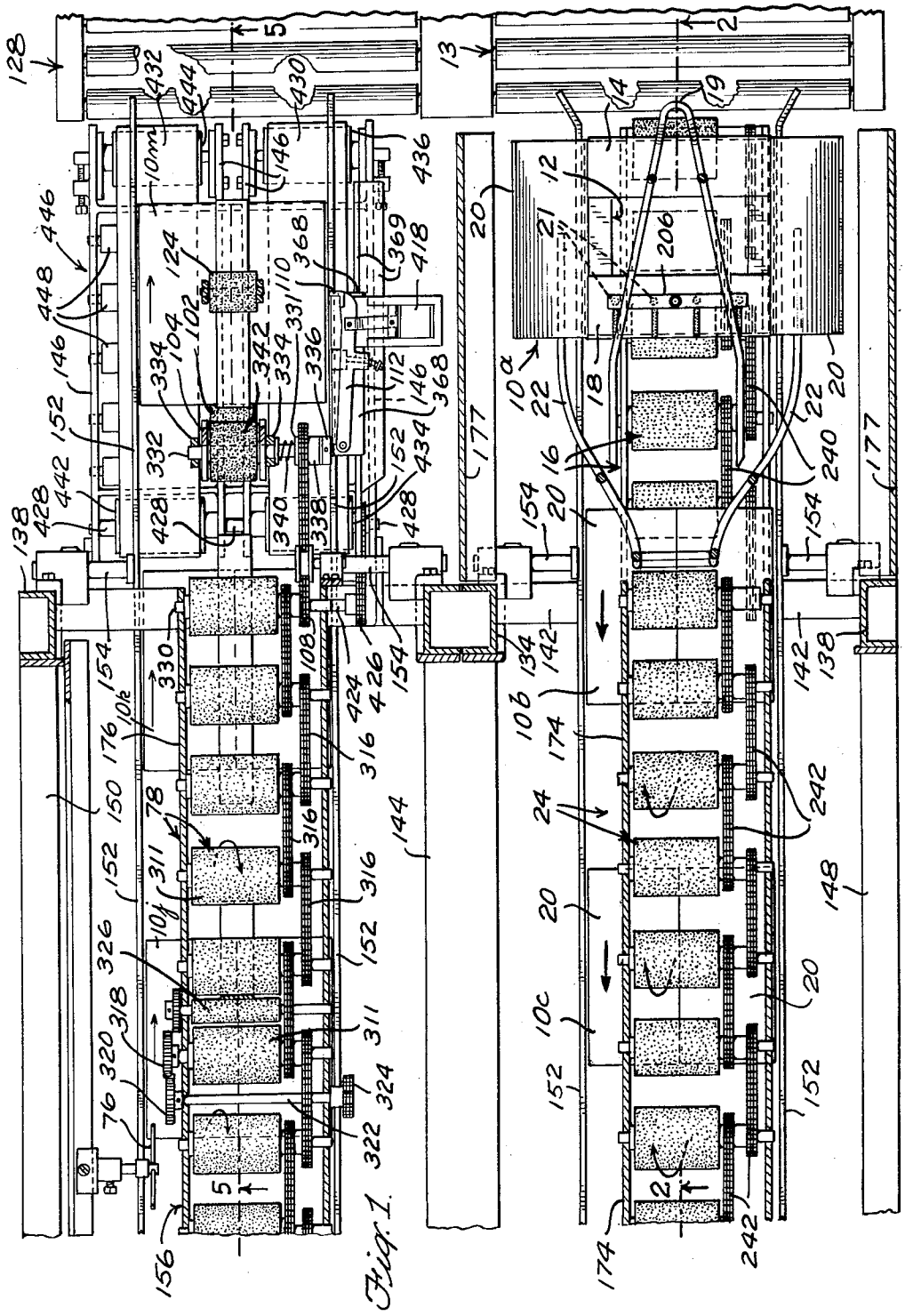


Fig. 1.

Sept. 4, 1962 C. D. KEELY ET AL 3,052,072

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Filed May 7, 1959 8 Sheets-Sheet 2

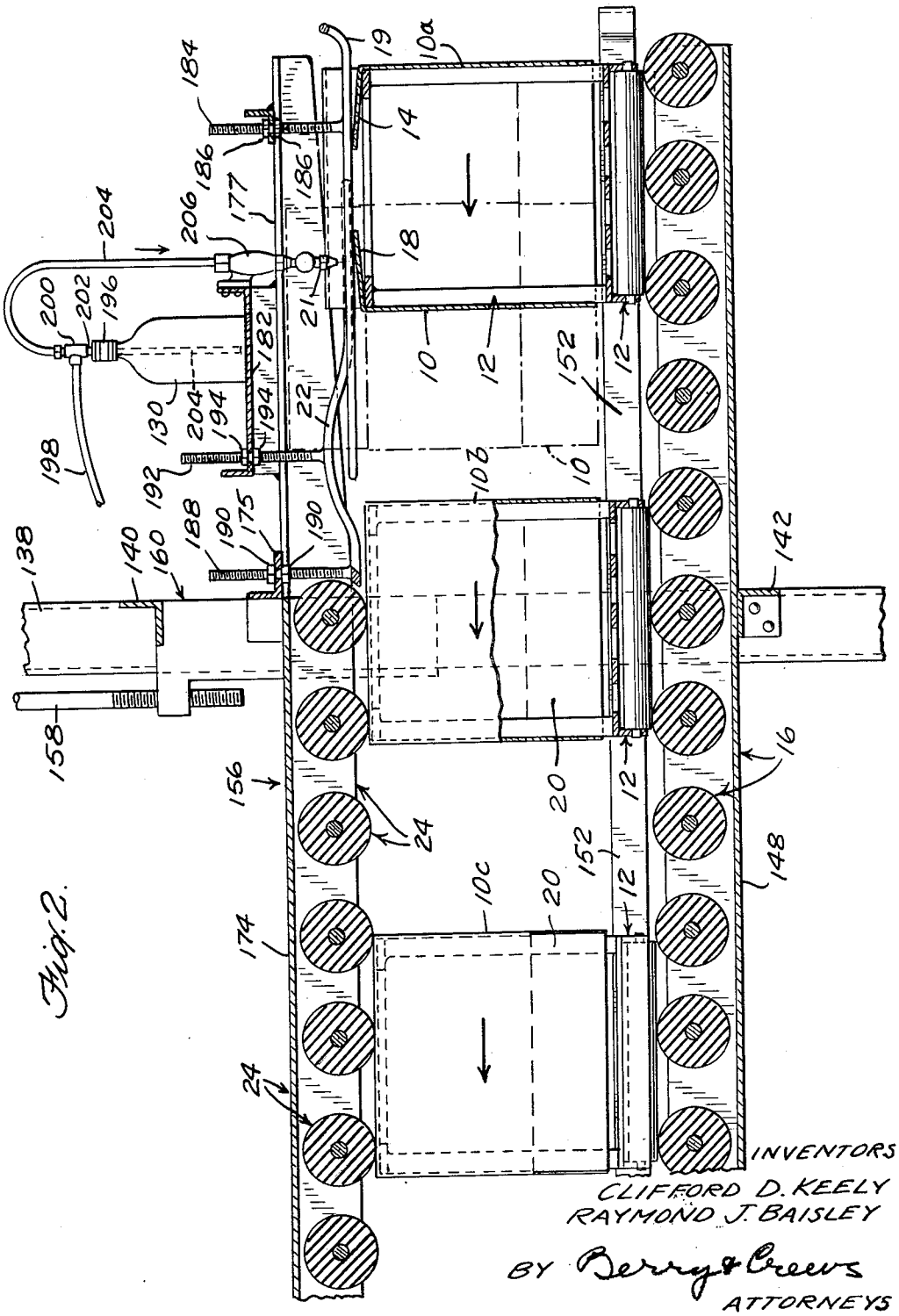


Fig. 2.

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Sept. 4, 1962 C. D. KEELY ET AL 3,052,072

CARTON SEALING MECHANISM

Filed May 7, 1959 8 Sheets-Sheet 3

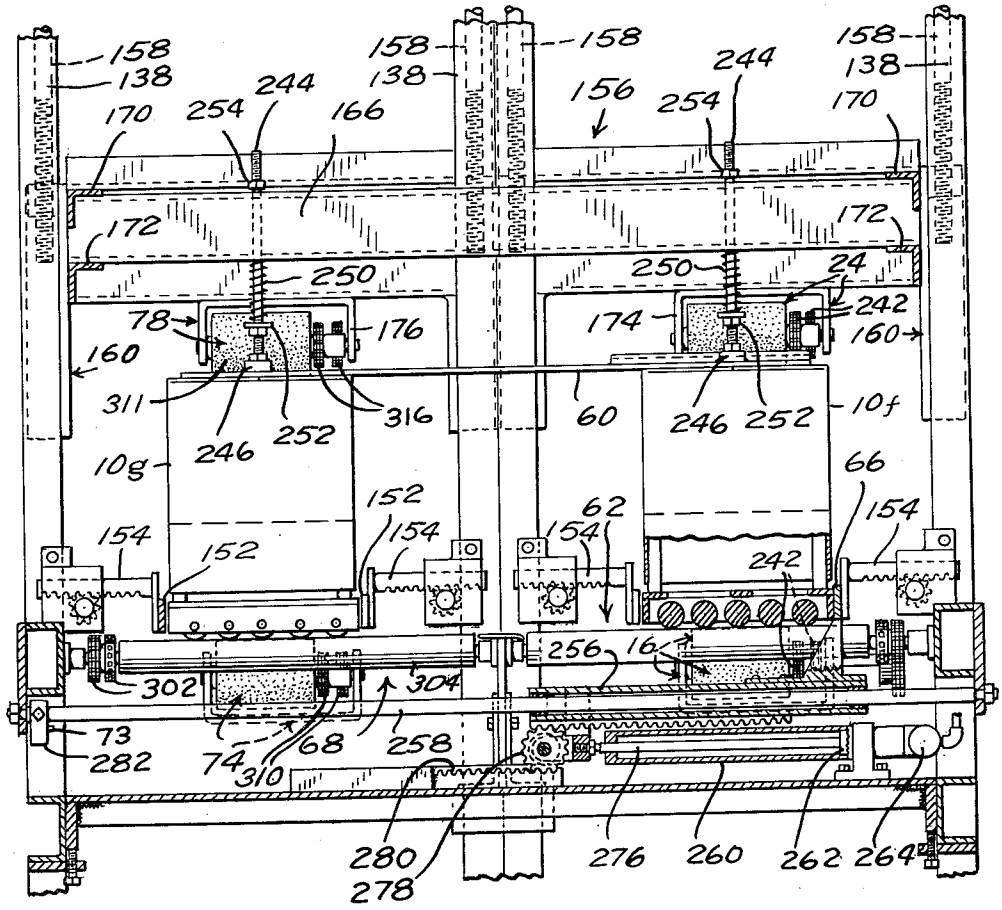


Fig. 3.

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CARTON SEALING MECHANISM

Filed May 7, 1959 8 Sheets-Sheet 4

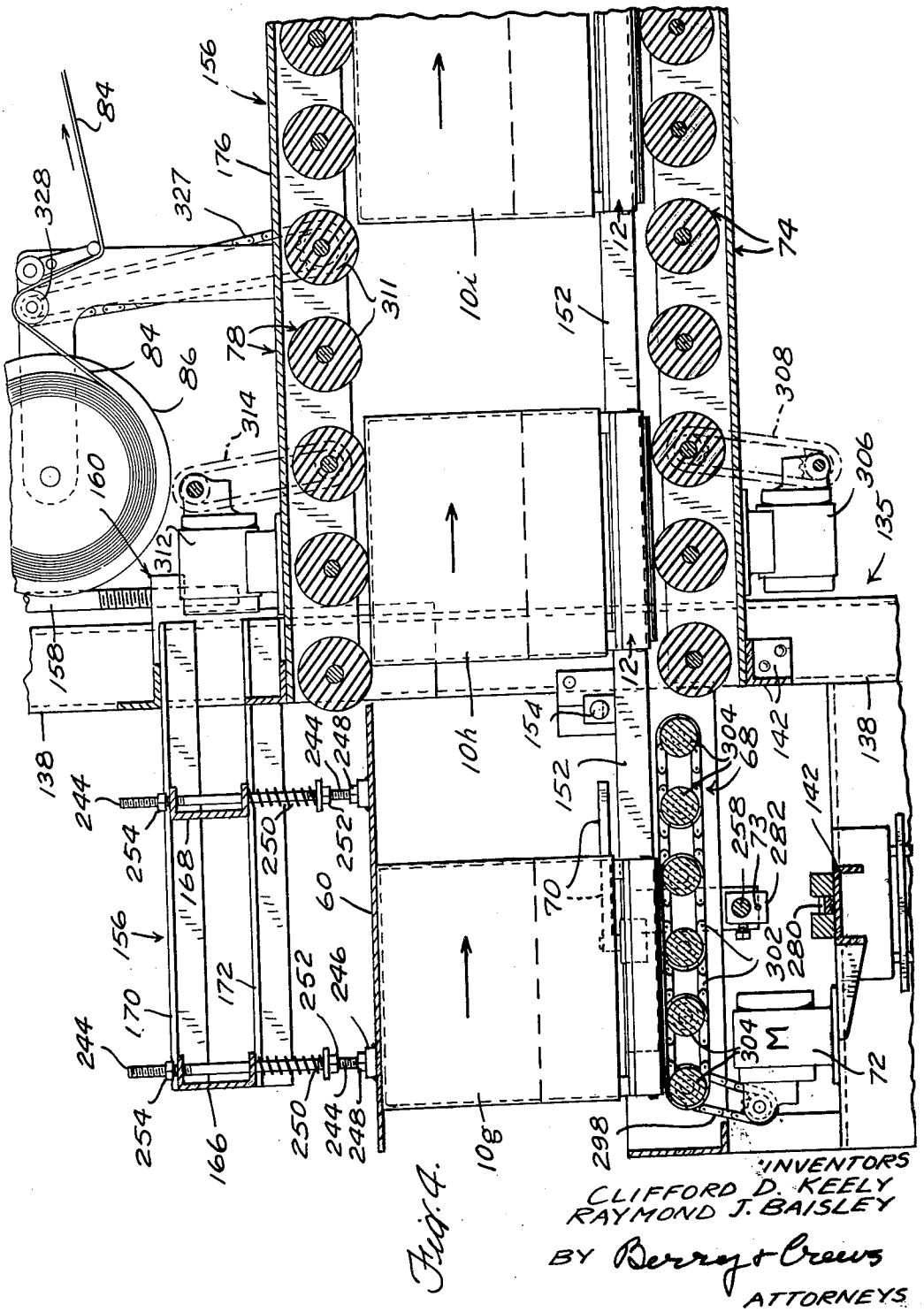


Fig. 4.

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CARTON SEALING MECHANISM

Filed May 7, 1959 8 Sheets-Sheet 5

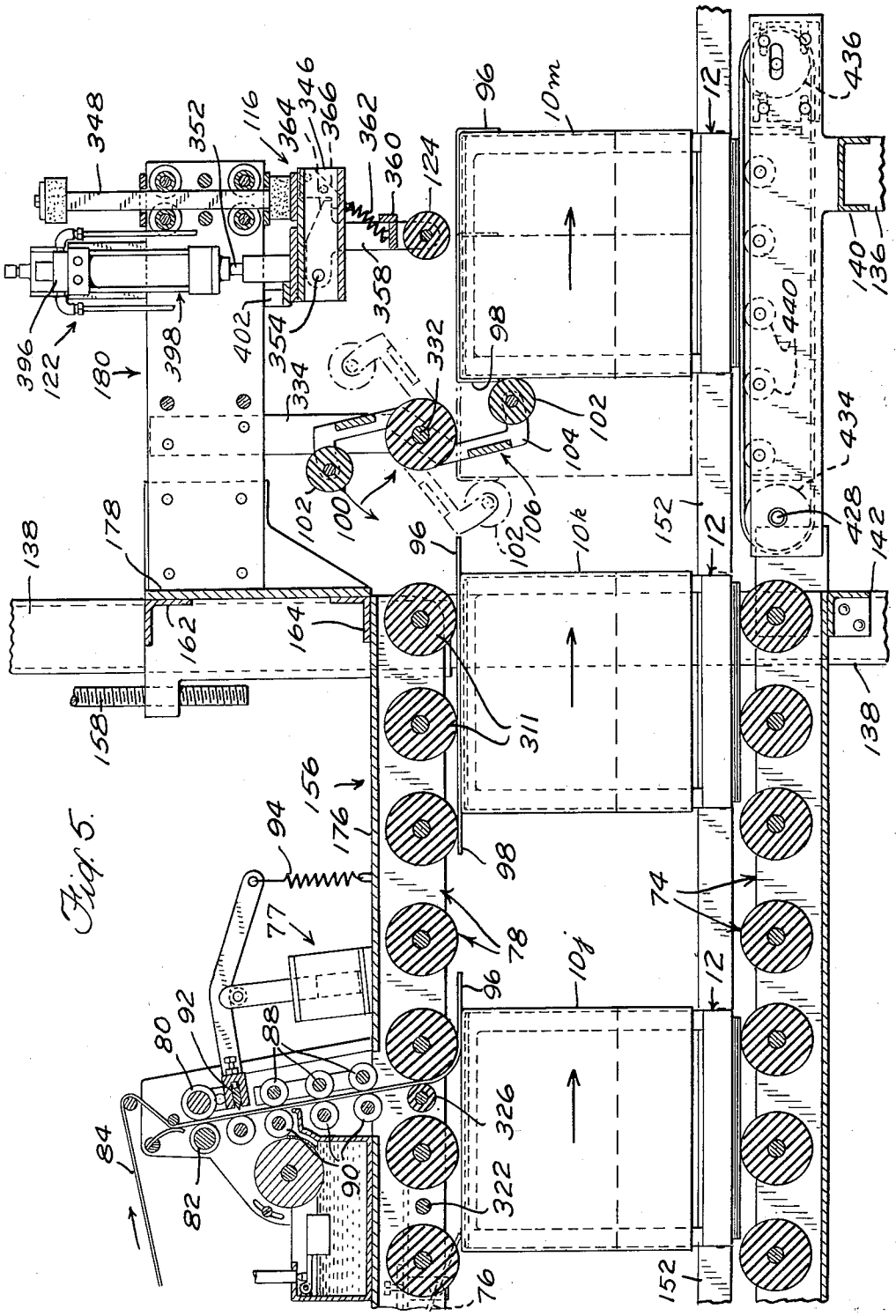


Fig. 5.

Sept. 4, 1962 C. D. KEELY ET AL 3,052,072

CARTON SEALING MECHANISM

Filed May 7, 1959 8 Sheets-Sheet 6

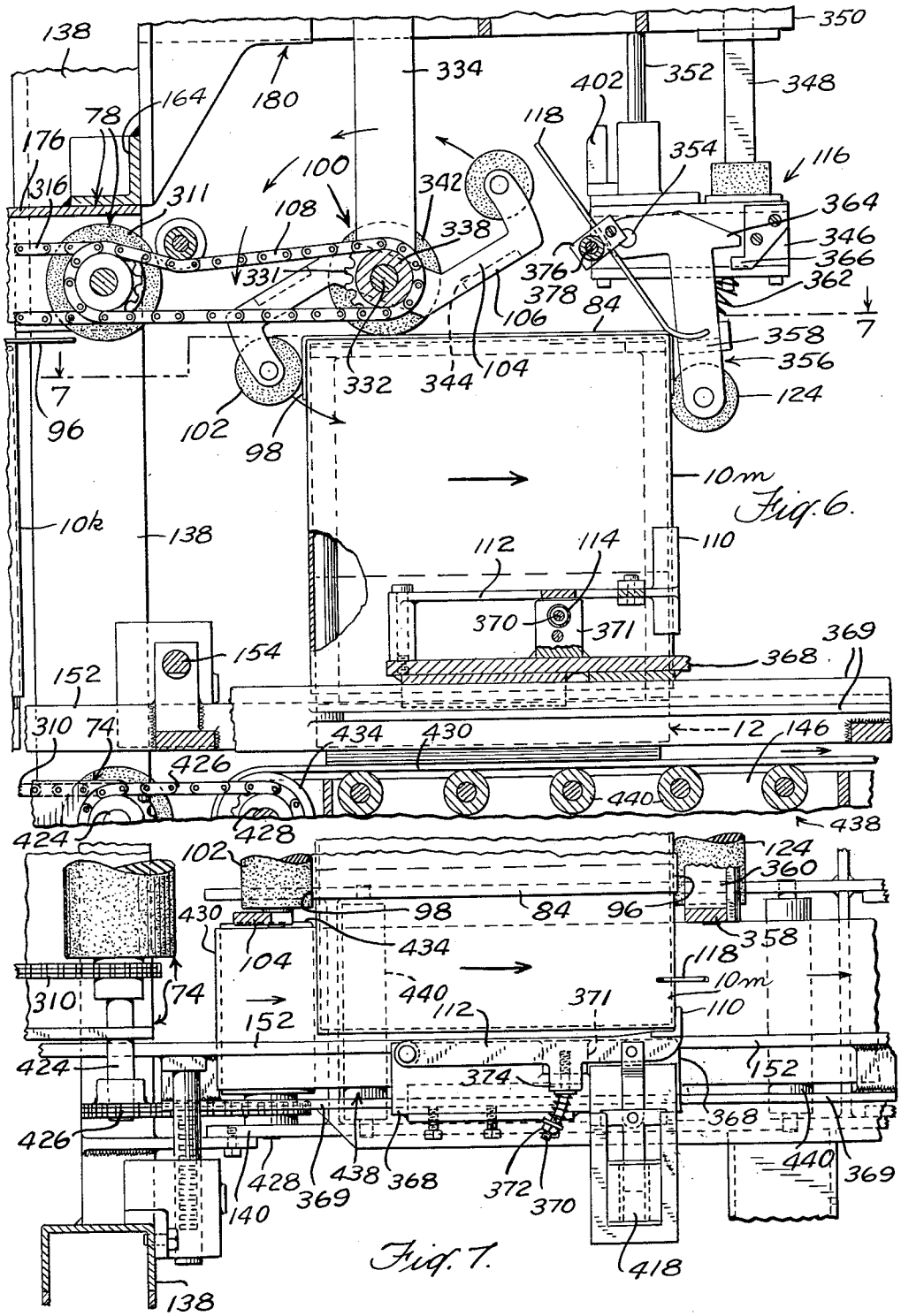


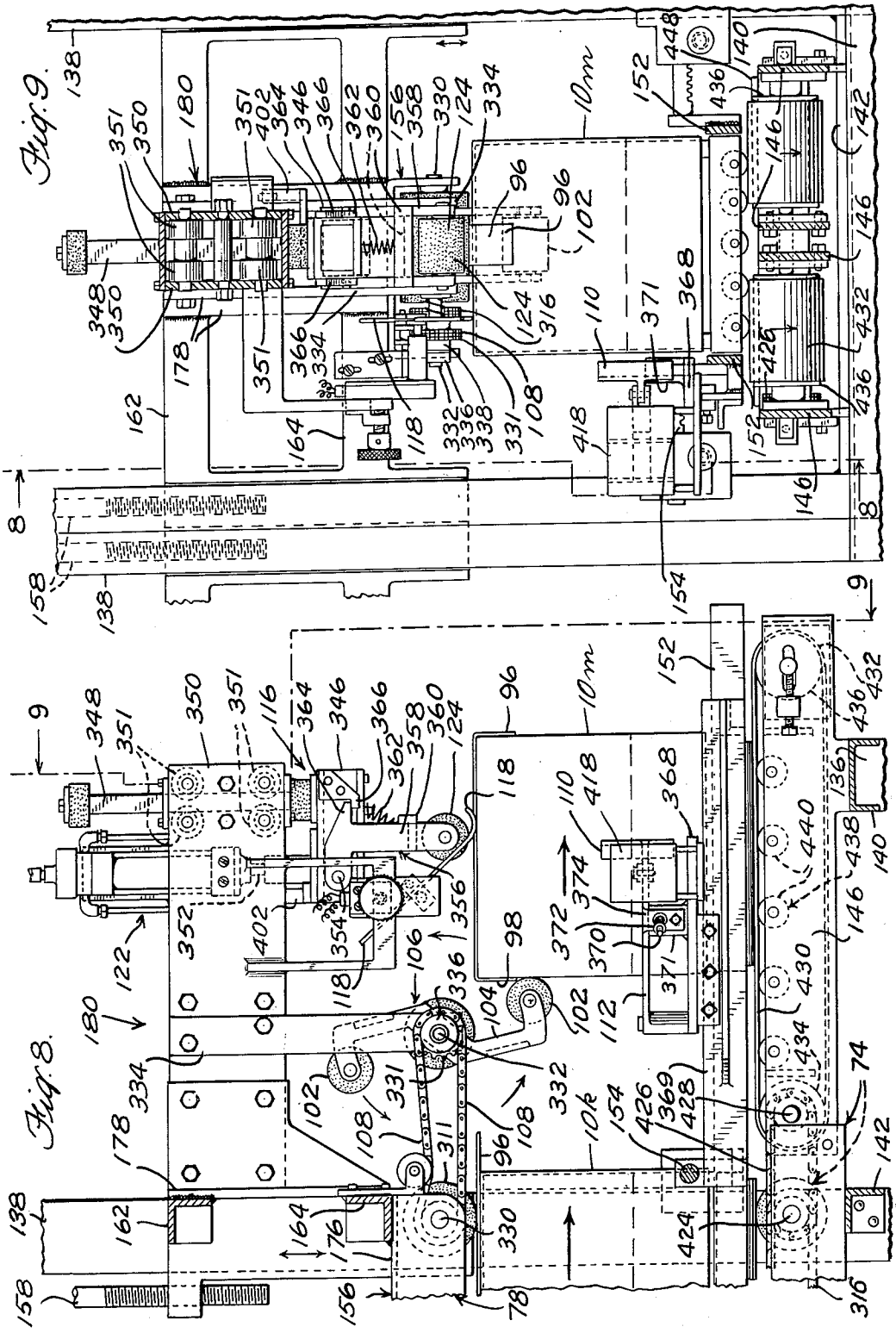
Fig. 6.

Fig. 7.

Sept. 4, 1962 C. D. KEELY ET AL 3,052,072

CARTON SEALING MECHANISM

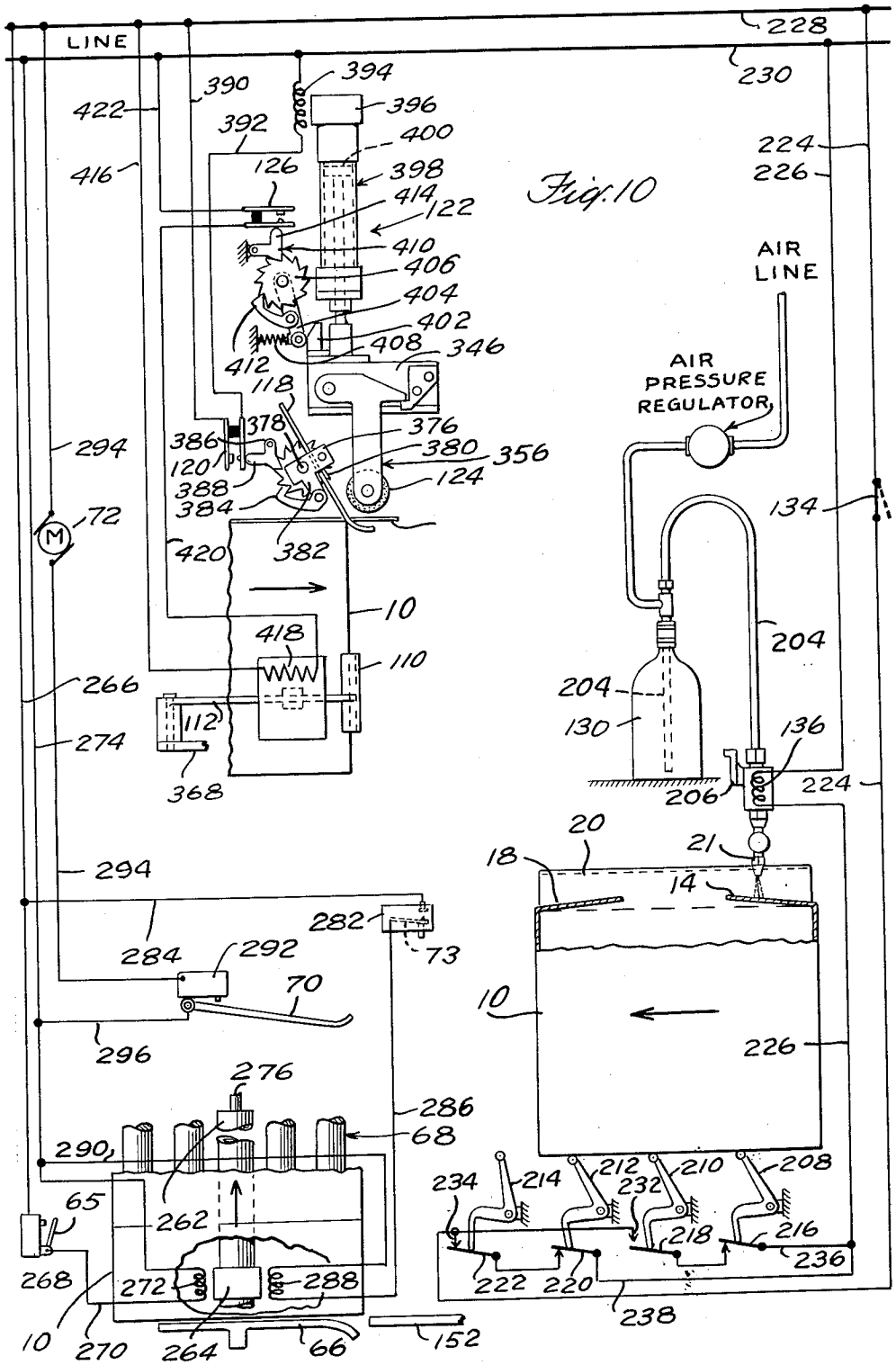
Filed May 7, 1959 8 Sheets-Sheet 7



Sept. 4, 1962 C. D. KEELY ET AL 3,052,072

CARTON SEALING MECHANISM

Filed May 7, 1959 8 Sheets-Sheet 8



United States Patent Office 3,052,072 Patented Sept. 4, 1962

3,052,072

CARTON SEALING MECHANISM

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Filed May 7, 1959, Ser. No. 811,625
17 Claims. (Cl. 53—66)

This invention relates to automatic carton sealing mechanism and is in the nature of an improvement upon the machines disclosed in my pending applications, Serial No. 557,227, filed December 30, 1955 for Carton Flap Sealing Machine, now U.S. Patent No. 2,898,820, and Serial No. 808,253, filed April 22, 1959 for Mechanism for Applying and Pressing Adhesive Tape to Perpendicularly Related Faces of Traveling Cartons, now U.S. Patent No. 2,999,342.

The machine of Serial #557,227 is a U-return type of machine in which the sealing is effected by gluing. A carton is advanced along a preliminary portion of a first course with its leading and trailing flaps folded in and its side flaps upstanding. As the carton travels through the first course, glue is deposited successively on the upper faces of the infolded leading and trailing flaps, and the side flaps are then folded in and down on the inside flaps to which the glue has been applied. At the end of the first course the carton is moved, without reorientation, through a second course at right angles to the first with the side flaps held down. At the end of the second course the carton is returned to the operator's station, still without reorientation, along a third course, parallel to the first, with the side flaps still held down.

The machine of Serial #808,253 is a U-return type of machine in which the sealing is effected by gummed tape. A carton is advanced along the first course with its leading and trailing flaps folded in and its side flaps upstanding. There is no means for depositing glue.

As the carton travels through the first course, the side flaps are first folded down. A length of tape is then automatically fed out and applied along the center seam at the top of the traveling carton, the length of the tape being controlled by the length of the carton and exceeding the length of the carton by a predetermined amount. The excess tape is divided between leading and trailing overhanging ends. There is provided in the first course an untimed roll-over device which automatically rolls the tape down along the top of the carton and then rolls the trailing tape end down against the trailing end of the carton. At the end of the first course the carton is moved, without reorientation, through a second course at right angles to the first with the side flaps held down by the applied tape. At the end of the second course the carton is returned to the operator's station, still without reorientation, along a third course parallel to the first, with the side flaps still held down. As the carton travels through the third course the carton end which was originally the leading end has become the trailing end. A second roll-over device, similar to the first, is provided in the third course for automatically rolling down the now trailing, protruding tape end.

It will be seen that the two machines are broadly similar but differ in the fact that one seals the carton by gluing while the other seals the carton by taping. Gluing and taping have their own advantages in carton sealing, each over the other, and at times it is desirable both to glue and to tape. Gluing has the salient advantages, among others, that it costs less and that adhesives can be used which are not soluble in water, or rather which become insoluble in water shortly after they have been applied. Gummed tape has the advantages, however, (1) that it seals carton against ingress of dust and other contaminants, and (2)

that the tape when provided with a ripcord can be quickly and easily opened. So long as a choice must be made between a gluing machine and a taping machine, a gluing machine will be preferred by some users and a taping machine will be preferred by others, the difference of choice being brought about chiefly because of differences in the classes of work principally required by the respective users. Gluing and taping can be used jointly with great advantage whenever unusual security, and especially unusual security together with dustproof sealing, is required.

It is a primary object of the present invention to provide a machine, desirably of the U-return type, in which provision is made for gluing in the first course and for taping in the third course, the arrangement being such that the machine can be used for gluing alone or for taping alone, with results equal respectively to those secured by the prior gluing and taping machines, or for both gluing and taping at a single pass of the carton through the machine.

The gluing mechanism can be rendered active or inactive merely by flipping on or off a switch which controls the glue emitting valve. The taping mechanism can be rendered inactive, simply by opening a target switch circuit or by withdrawing the leading end of the reeled tape from the initial tape feeding instrumentalities, and can be rendered active simply by closing the circuit switch or by rethreading the tape. The side flap folding and holddown means and the conveyor means, required in either case, contribute importantly to either operation or to both according to the mode of operation elected by the user. The combined machine has all the capabilities of the two separate machines, but occupies only the space of one, and costs a great deal less than the two separate prior machines.

It is not practically desirable to provide tape applying and roll-over mechanisms in the first course of the novel composite machine. In lieu thereof tape feeding and applying mechanism is provided in the third course and a single roll-over mechanism is provided in the third course for rolling down the tape end which trails during the travel of the carton along the third course. There is also provided in the third course a roll-down mechanism which may or may not include a gate for arresting the carton independently of the conveyor at a roll-down station, means for causing a roll-down roller to travel down and then up along the leading end of the arrested carton, and means automatically effective to cause the gate to release the carton, if a gate is used, for further advance and discharge from the machine when the leading tape end has been thus roller-pressed into place at the roll-down station and the roll-down roller has substantially returned to its normal raised position. The roll-over and roll-down mechanisms form a combination which is indifferent to the length of the carton. There is no expenditure of make-ready time when the carton length is changed. In fact, the carton length may vary from carton to carton.

The roll-down mechanism embodies features which are novel per se, and the same mechanism enters into novel combination with the tape applying and roll-over mechanisms.

Other objects and advantages will hereinafter appear.

In the drawing forming part of this specification,

FIG. 1 is a fragmentary, sectional plan view showing the operator's station and portions of the first and third courses adjacent to said station;

FIG. 2 is a fragmentary longitudinal vertical sectional view showing substantially the same portion of the first course as is shown in FIG. 1, the section being taken on line 2—2 of FIG. 1 looking in the direction of the arrows;

FIG. 3 is a fragmentary view in transverse vertical section, partly broken away, showing principally the mechanism of the second course;

FIG. 4 is a fragmentary longitudinal view in vertical section showing the conveyors at the beginning of the third or return course and associated mechanisms;

FIG. 5 is a fragmentary longitudinal vertical sectional view showing substantially the same portion of the third course as is shown in FIG. 1, the section being taken on line 5—5 of FIG. 1 looking in the direction of the arrows;

FIG. 6 is a fragmentary view partly in side elevation and partly in section, and partly broken away, showing the roll-over and roll-down mechanisms with the carton arrested at the roll-down station;

FIG. 7 is a fragmentary horizontal sectional view of the mechanism of FIG. 6 in the condition of FIG. 6, the section being taken on line 7—7 of FIG. 6 looking in the direction of the arrows;

FIG. 8 is a view in side elevation directed partly to the roll-over and roll-down mechanisms, with a carton moving away from the roll-down station, the section being taken on the line 8—8 of FIG. 9 looking in the direction of the arrows;

FIG. 9 is a view partly in elevation and partly in section, taken on the line 9—9 of FIG. 8 looking in the direction of the arrows;

FIG. 10 is a diagrammatic view showing the electrical circuits for controlling the roll-down mechanism including the gate, the carton propelling mechanism of the second course, and the glue depositing mechanism.

For the purpose of affording a clear comprehension of the general organization and of the principle of operation of the machine, a concise general description will first be given, by reference to the principal parts, and without attention to details. A carton 10, mounted upon a dummy 12, is introduced into the machine from a roller table 13 at the right hand end of the machine by the operator, with its trailing or rear flap 14 manually folded forward and down. The reference character 10 is not directly applied to any carton but cartons drawn in in various positions are designated 10*a* and 10*k* and 10*m*. The carton carrying dummy 12 is fed onto a constantly driven roller conveyor 16 which carries the carton supporting dummy 12 toward the left through a first or outgoing course.

The leading flap 18 of the carton immediately encounters an overhead folding bar 19 which turns the flap 18 back and down against the upper end of the dummy 12. The rear flap, manually folded inward, follows the flap 18 under the bar 19 and is held down by the bar. While held down by the bar 19, the flaps 14 and 18 are fed beneath transversely aligned glue discharging nozzles 21 which are controlled and timed by the carton blank itself to discharge glue (if glue is to be used) first upon the flap 18 and then upon the flap 14, the discharge of glue being interrupted momentarily as the gap between the flaps 18 and 14 passes beneath the nozzles.

The upstanding side flaps 20 are then engaged and folded in and down over the flaps 14 and 18, and into substantially meeting relation with one another by overhead plows 22. The flaps 20 are held down by the plows and are guided by the plows beneath holddown means in the form of a roller conveyer 24. The conveyer 24 consists of a multiplicity of overhead rollers which are constantly driven at the same peripheral speed as the rollers of the conveyer 16. The carton is next fed beneath a holddown plate 60 and onto a roller table 62, the rollers of which are constantly driven to continue the advance of the carton at the same speed at which it was advanced by the conveyers 16 and 24, to the end of the first or outgoing course.

At the end of the outgoing course, the carton engages and moves a switch actuating arm 65 (FIG. 10) which actuates a pneumatic pusher 66 (FIGS. 3 and 10) to push the carton sidewise across the machine from the line of the outgoing course to the line of the return course. In transferring the carton through the second course the pusher pushes the carton off the constantly running roller table 62 and onto a normally idle roller table 68. As the carton arrives in position to be propelled along the third or return course, it engages a switch actuating arm 70 to close the operating circuit of a drive motor 72, causing the motor to drive the rollers of the table 68 at the same peripheral speed as the rollers of table 62, but in the opposite direction. At about the same time the pusher 66 engages a switch actuating arm 73, and this causes the pusher to be returned to its initial position and condition as shown in FIG. 3.

The table 68 delivers the carton onto a constantly running conveyor 74. As the carton moves clear of the switch arm 70, the arm returns to its normal position, permitting the switch to open, and thereby causing the motor 72 and the rollers of the table 68 to come to rest. Before the clearance of the arm 70 by the carton, the control of the carton feeding has been taken over by the conveyor 74 and an overhead, driven roller conveyor 78. The conveyors 74 and 78 run constantly at the same speed as the other conveyors which have been referred to. The carton passes beneath the holddown conveyor 78 as it clears the holddown plate 60.

As the carton travels along the return course it engages a control arm 76 (FIGS. 1 and 5) of a normally open switch. Movement of the control arm 76 to switch closing position causes a solenoid 77 to be energized, and the solenoid forces an idler roller 80 against a constantly driven tape feeding roller 82, causing tape 84 to be fed out from a supply reel 86 onto the top of the carton, as partially shown with respect to the carton occupying the position 10*j* in FIG. 5. The tape passes to the carton between opposed constantly driven rollers 88 and 90.

When the carton clears the switch arm 76 the arm drops down, the solenoid 77 is de-energized, the idler roller 80 moves away from the driving roller 82, and the tape is severed by a pinch cutting knife 92 under the impelling force of a spring 94. The switch arm 76 is so situated that the tape is delivered to the carton with an overhanging end 96 of predetermined length protruding beyond the forward face of the carton. The switch arm 76 is of such length and has a range of movement such that the length of tape fed exceeds the length of the carton by a predetermined amount, causing an overhanging end 98, generally substantially equal in length to the overhanging end 96, to protrude beyond the rear end of the carton.

After the application of the tape, the carton continues along the return course between the overhead conveyor 78 and the supporting conveyor 74, past a tape end rolling station at which a roll-over device 100 acts to fold-down the tape end 98 and to roll the tape end smoothly and firmly against the trailing face of the carton. The roll-over device 100 comprises a pair of diametrically opposed rollers 102 which are mounted at the outer ends of hook-shaped arms 104 of a rotary carrier 106. The carrier 106 is constantly urged in a counterclockwise direction (FIGS. 5 and 6) by driving chain 108. The transmission means between the chain 108 and the carrier 106 effects a slip-drive, so that when one of the rollers comes down on top of a carton it may be arrested in carton riding position while continuing to be urged yieldingly through the slip clutch against the carton by the driving tendency of the chain 108.

As the trailing edge of the carton begins to move out from under the roller 102 which has been riding the carton, the roller 102 begins to move down (FIG. 6). The arrangement is such that the roller will always keep pace with the moving carton as the roller moves down, and will continuously press the tape end against the trailing face of the carton. When the active roller 102 has reached its lowermost position, it starts to move up, and as it moves up it again urges the same tape end firmly against the trailing end of the carton, more certainly to assure an even and dependable cohesion of the tape end with the carton face.

While the carton is in the course of being acted upon

by the roll-over mechanism, it can be cooperatively arrested at a roll-down station, independently of the conveyor 74, by a gate 110. The gate 110 is carried on a pivoted arm 112 and is normally maintained in carton arresting position by a compression coil spring 114. The arresting of the carton is effected for the purpose of enabling roll-down mechanism 116 to act, and is not for the purpose of favoring the roll-over mechanism. On the contrary, it is a feature of merit of the roll-over mechanism that this mechanism is adapted to tolerate the interruption, since this enables the roll-down mechanism 116 to be located closer to the roll-over mechanism 100 than would otherwise be feasible, and thereby reduces the required length of the machine. The arresting of the carton at the roll-down station has a slight extra advantage in that it increases the time available for the adhesive to become set, while the side flaps continue to be held down to relieve the possibly unset adhesive of strain. This extra pressing or holding cannot be otherwise provided without substantially extending the machine in length.

At, or just before, arrival of the carton at the roll-down station, the carton engages a switch controlling arm 118 (FIG. 6) and swings the arm counterclockwise. As a consequence of the counterclockwise movement of the arm a switch 120, see FIG. 10, is momentarily closed, and this causes a pneumatic operator 122 to be set into action to thrust a roll-down roller 124 downward along the leading end of the carton and then upward along the leading end of the carton to its starting position. The tape is pressed against the leading end of the carton throughout both strokes of the roller 124. As the pneumatic operator 122 nears its normal or initial position on the return stroke, a switch 126 is closed momentarily, and this serves electromagnetically to open the gate 110 for permitting the carton to advance beyond the rolldown station and to be discharged from the machine onto a roller table 128.

While the mechanism 116 has been referred to herein as a roll-down mechanism in conformity with the illustrative disclosure, it will be appreciated that this mechanism can be used in other apparatus in inverted form; i.e., for acting upward and then downward on the end of a tape length applied to the bottom of a carton. The term "roll-down" is not therefore to be construed as implying action in a specified direction unless in a particular instance, the context so requires. The roll-over mechanism can also be arranged to act upon tape applied to a carton bottom in a suitable case, and is also to be broadly construed.

The operation has been described as it would be when both gluing and taping are desired. It will be readily apparent, however, that the taping could be suppressed by the simple expedient of throwing the switch in the target circuit "off" or by withdrawing the leading end of the tape from between the rollers 80 and 82. Alternatively the gluing can be suppressed when desired. The glue is supplied under pressure from a supply container 130 through nozzles 21 under electromagnetic control. Operation of the glue supplying means may be suppressed simple by setting a switch 134, which is in circuit with the electromagnet 136, in an open position.

Provision for accommodating cartons of different heights, both before and after filling, though present, forms no part of the present invention. In order to afford a complete understanding of the procedure, however, it will be alluded to briefly. It is customary to use a machine of the U-return type both for sealing the bottoms of the cartons, supported bottom up on dummies 12, and for sealing the filled cartons right side up on carriers.

For small production operations, it may be desirable to use one machine to seal the bottoms before filling and the tops after filling. It is not desirable to be compelled to readjust the machine height frequently nor to accumulate a large number of bottom sealed cartons, prior to top sealing. Sets of dummies 12 for the bottom sealing operation and carriers for the top sealing operation are, therefore, provided, so related in height that they cause the bottom and top ends to be carried through the machine at the same level. Through this expedient the operator is able to switch back and forth at will between bottom sealing and top sealing, as often as may be expedient, without having to change the height adjustment of the machine.

The machine includes a stationary frame 135 which comprises short upright members 136, tall upright members 138, cross members 140 and 142, and longitudinal members 144, 146, 148 and 150. Side guides 152 are adjustably carried from the upright members 138 on racks 154. A vertically adjustable frame 156 which carries all the overhead mechanism is supported from the upright members 138 through adjusting screws 158. The adjusting screws 158 are adapted, through mechanism not shown, for synchronous operation from a common drive member. The vertically adjustable frame 156 includes vertical members 160, transverse members 162, 164, 166 and 168, and longitudinal members 170, 172, 174 and 176. A bracket 178 of the upper frame 156 carries a frame extension 180 upon which the roll-over and roll-down mechanisms are supported.

The longitudinal frame members 174 rotatively support the rollers of the upper conveyor 24 and extend beyond the upper conveyor to the introductory end of the machine. A cross member 182, mounted on the members 177, supports the glue container 130 and the nozzle 21. The folding bar 19 is adjustably supported in fixed position by screws 184 and nuts 186 from the member 174. The plows 22 are adjustably supported in fixed positions by screws 188 and nuts 190 from a cross member 175, and by screws 192 and nuts 194 from the member 182.

The glue container 130 is in the form of a jar which has a cap 196 clamped onto it in an air tight manner. An air pressure line 198 leads into a fitting 200. The fitting 200 has one tube 202 which extends through the cap 196 for transmitting air under pressure into the top of the container 130, and a second tube 204 which extends through the cap 196 to a point near the bottom of the container 130 for delivering glue from the container. The tube 204 delivers glue to a manifold 206 which is equipped with an electromagnetically controlled valve and with the nozzles 21.

Alongside the conveyor 16 are switch arms 208, 210, 212 and 214, see FIG. 10, which are appropriately located to time the turning on and turning off of the glue supply as desired. The arms 208 and 212 are associated with normally open switches 216 and 220 while the arms 210 and 214 are associated with normally closed switches 218 and 222. Conductors 224 and 226 are connected respectively with line conductors 228 and 230, the switch 134 being interposed in the conductor 224 as previously described, and the electromagnetic winding 136 being interposed in the conductor 226. The conductor 224 is connected with contacts 232 and 234 of the switches 218 and 222, and the conductor 226 is connected with the movable members of switches 216 and 220 respectively, through branch conductors 236 and 238.

When the carton engages the arm 208 to close the switch 216, a circuit is completed through the switches 216 and 218 and this causes glue to be discharged on the carton flap 18 until the carton engages the arm 210 to open the switch 218. When the carton, in its continued advance, engages the arm 212 to close the switch 220, a circuit is completed through the switches 220 and 222 and this causes glue to be discharged on the carton flap 14 until the carton engages the arm 214 to open the switch 222.

During the continued advance of the carton the switch 218 cannot be re-closed until after the switch 216 has

been opened, and the switch 222 cannot be re-closed until after the switch 220 has been opened. No further glue will be discharged therefore until the next following box comes along to cause a repetition of the cycle just described.

The arms 208, 210, 212 and 214 are desirably mounted with provision for individual adjustment along the path of carton travel, so that the timing of the glue delivery can be adjusted as desired. Ordinarily it will be desired to so control the depositing of glue that the glue stripes will not run from edge to edge of a carton flap but will terminate at short distances within the edge boundaries.

The rollers of the conveyor 16 are driven from a motor (not shown) through a chain and sprocket drive (not shown). Each roller shaft, other than the one at the extreme introductory end has fast upon it two sprockets one of which is driven from a sprocket of one neighboring roller shaft and the other of which drives a sprocket on the other neighboring roller shaft. The drive is transmitted through a series of chains 240. The rollers of the roller table 62 are similarly driven continuously and at constant speed from the terminal roller shaft of the conveyor 16.

The rollers of the overhead conveyor 24 are similarly driven from an overhead motor (not shown) and the drive is similarly transmitted from roller to roller through chains 242.

The pressure plate 60 which bears downward against the carton through the latter part of the first course, through all of the second course, and through the initial part of the third course, is supported from the overhead frame 156, being carried by the cross members 166 and 168. Rods 244 are threaded into nuts 246 which are made integral with the plate 60 as by welding, at the upper side thereof, the rods being fixed in their relations to the plate by lock nuts 248. The rods 244 extend upward through the cross members 166, 168. Compression coil springs 250 surround the respective rods 244, bearing at their lower ends against nuts 252 which are threaded on the rods, and at their upper ends against the under faces of the cross members 166 or 168 as the case may be. Nuts 254, threaded on the upper ends of the rods 244, are normally maintained by upward pressure of the cartons slightly out of contact with the upper faces of the cross members 166, 168 but serve to limit descent of the plate 60 when no carton is present beneath the plate. Weight loading pressure or spring loading pressure is not mandatory. The plate 60 may allow slight clearance above the top of the box, the main object being to keep the flaps from springing upward.

The pusher 66 is carried on a rack sleeve 256 which is slidably mounted on a transverse rod 258. The pneumatic actuator of the pusher comprises a cylinder 260 in which a piston 262 is adapted to be urged toward the left or toward the right (as viewed in FIG. 3) according to the setting of a valve (not shown) which is mounted for crosswise movement in the head 264 of the cylinder. The parts are normally in the condition illustrated in FIGS. 3 and 10, the valve being located to cause the piston to be urged toward the right as viewed in FIG. 10.

When the switch actuating arm 65 is moved by the carton to switch closing position, a circuit is completed from line conductor 228 through a conductor 266, switch 268, conductor 270, winding 272 and conductor 274 back to line conductor 230. This reverses the position of the valve, causing air under pressure to be admitted to the right hand end of the cylinder 260 and to be allowed to escape from the left hand end of the cylinder.

The rod 276 of piston 262 carries a pinion 278 which runs upon a stationary rack 280 and drives the rack sleeve 256 at twice its own linear speed and through twice the length of its own travel. The rack sleeve 256 carries the pusher toward the left until the sleeve 256 engages the actuating arm 73 of a switch 282 which is mounted on the rod 258 with capacity for adjustment longitudinally of the rod.

Closing of the switch 282 completes a circuit from the line conductor 228 through the conductor 266, a conductor 284, the switch 282, a conductor 286, a winding 288 and conductors 290 and 274 back to line conductor 230. This reverses the position of the valve of the cylinder head 264, causing air under pressure to be delivered to the left hand end of the cylinder 260 and to be allowed to escape from the right hand end of the cylinder, so that the pusher is returned to its initial position, shown in FIG. 3.

As the carton engages the switch actuating arm 70 it closes a switch 292. This completes a circuit from line conductor 228 to a conductor 294 in which the motor 72 is interposed, thence through the switch 292 and through the conductors 296 and 274 back to line conductor 230. The motor 72 is connected to drive the initial roller of the normally idle roller table 68 through a chain and sprocket drive, the chain being designated 298 in FIG. 4 and the input sprocket 300 of the initial roller being shown in FIG. 3. The drive is transmitted from roller to roller through chains 302 in the manner already described with reference to the other conveyers. As previously noted, the switch 70 is permitted to open and the motor 72 and the rollers 304 of the table 68 are allowed to come to rest as the carton moves clear of the arm 70.

The rollers of conveyer 74 are constantly driven from a motor 306 through a chain 308, and the drive is transmitted from roller to roller through chains 310.

The rollers 311 of conveyer 78 are constantly driven from a motor 312 which is carried by the frame 156, through a chain 314, the drive being transmitted from roller to roller through chains 316 in the manner already described. One of the rollers 311 has an extended shaft upon which a gear 318 is made fast. The gear 318 drives a gear 320 fast on a shaft 322, which shaft also has fast upon it a sprocket 324. The sprocket 324, through a chain and other gearing, not shown, constantly drives the roller 82, the rollers 90 and a tape feeding roller 326. Another of the rollers 311 is connected through a chain 327 to drive a tape pre-feeding roller 328.

The shaft 330 of the final roller of the conveyer 78 acts through a sprocket and the chain 108 to drive a sprocket 331 which is mounted on a shaft 332 with freedom to turn and to move axially relative to the shaft. The shaft 332 is rotatively supported from above by depending arms 334 of the auxiliary frame 180. The shaft 332 has fast upon it a friction collar 336 which bears against a friction hub 338 of the sprocket 331. A compression coil spring 340 bears at one end against one of the arms 334 and at the other against the sprocket 331, to urge the hub 338 toward the collar 336 for effecting a slip drive of the shaft 332.

The carrier 106 of the rollers 102 comprises the arms 104 which are keyed to the shaft 332 for rotation in unison with the shaft, the arms being located at opposite sides of a pressing roller 342 which is mounted on the shaft with freedom for rotation relative to the shaft. The arms 104 are connected to one another by webs 344 to form a rigid carrier frame.

The roll-down mechanism 116 comprises a plunger head 346 which includes the rigid vertically extended guide bar 348. The bar 348 is guided for vertical reciprocation in a guideway provided between plates 350 of the frame extension 180 by two opposed pairs of circumferentially channeled rollers 351. The plunger head 346 is carried at the lower end of the piston rod 352 of the pneumatic actuator 122 and is driven down and up by the actuator.

The plunger head 346 has pivoted upon it at 354 a bearing frame 356 for the roll-down roller 124. The bearing frame 356 includes a pair of parallel angle levers

358 which are connected to one another by a cross bar 360. A compression coil spring 362, interposed between the plunger head 346 and the cross bar 360, yieldingly urges the bearing frame 356 in a clockwise direction (as viewed in FIGS. 6 and 8). Such movement is limited by engagement of projections 364 on the levers 358 with abutment stops 366 on the plunger head 346. The spring 362 permits a slight yielding in a forward and upward direction of the bearing frame 356. This arrangement is a very advantageous one for assuring dependable and substantially predetermined pressure of the roller 124 against the leading face of the carton.

The carrying arm 112 of the gate 110 is supported on a bracket 368, which bracket is secured upon a fixed bar 369 that extends parallel to the side guides 152. The spring 114 which presses the gate 110 inward beyond carton arresting position surrounds a stationary curved rod 370. The rod 370 is threaded at its inner end into a boss 371 of the bracket 368. The spring 114 bears at its outer end against a nut 372 which is threaded on the rod 370 and at its inner end against a boss 374 which is formed on the outer side of the gate carrying arm 112.

The means for controlling operation of the roll-down mechanism, including the gate 110, is chiefly illustrated in FIG. 10. The switch actuating arm 118 is carried by a crank arm 376, the latter arm being free to turn on a pivot pin 378. The pin 378 also supports a ratchet wheel 380 with freedom for rotation relative to the pin. A second crank arm 382, unitary with the crank arm 376, pivotally supports at its outer end a pawl 384 for engagement with the ratchet wheel 380. As the carton comes under the arm 118 the pawl is swung through a single tooth space of the ratchet wheel in a counterclockwise direction, and thereby feeds the ratchet wheel through a single tooth space. This causes one tooth of the ratchet wheel to pass an anti-back-feed pawl 386, so that the pawl 386 is forced out of one notch and over a tooth and is then permitted to drop into the next notch. As an incident of these movements a projection 388 on the pawl 386 momentarily closes the switch 120.

Closing of the switch 120 completes a circuit from line conductor 228 through conductor 390, switch 120, conductor 392 and electromagnetic winding 394 back to the line conductor 230. The energization of the winding 394 causes a valve (not shown) in the head 396 of pneumatic cylinder 398 to be shifted into position for driving the piston 400 downward. At a predetermined point in the downward travel of the piston, the position of the valve is automatically reversed by conventional means (not shown) causing the piston to return to its upper limit of movement.

As the piston moves downward, driving the plunger head 346 downward, an upstanding cam arm 402 carried by the plunger head moves clear of the outer end of a crank arm 404, permitting the arm 404 to be swung idly in a counterclockwise direction through an arc equal to one tooth space of an associated ratchet wheel 406 by a compression coil spring 408. The ratchet wheel 406 is held against counterclockwise rotation by an anti-back-feed pawl 410 so that a pawl 412, pivoted on the arm 404, is drawn idly by the arm 404 over a tooth of the stationary wheel.

As the cam arm 402 returns upward, however, and nears the upper limit of its movement, it engages the arm 404 and forces it in a clockwise direction to the position in which it is illustrated in FIG. 10. This causes the pawl 410 to ride out of a notch and over a tooth, and then to drop into the next notch of the wheel 406. A projection 414 on the pawl 410 is caused by the rise and fall of the pawl 410 to close the switch 126 for an instant and then to permit the switch to reopen.

Closing of the switch 126 completes a circuit from line conductor 228 through a conductor 416, a gate opening electromagnetic winding 418, a conductor 420, the switch 126 and a conductor 422 back to line conductor 230. As has already been explained, the opening of the gate frees the carton for advance beyond the roll-down station and for discharge from the machine. As soon as the leading end of the carton has passed the gate the gate seeks to return to its carton obstructing position but it is prevented from doing so until the entire carton has cleared the gate.

As has been indicated, the inclusion of the gate and the operating mechanism therefor is optional. When the gate 110 is omitted the switch 126, the winding 418 and the immediately associated conductors 416, 420 and 422 are also omitted, the roller 124 being then relied upon to arrest and detain the carton.

Because of the downward pressures exerted on the carton by the roll-over mechanism it is desirable to provide a continuous carton support in the final stage of the return course. The final roller shaft 424 of the conveyer 74 is connected through a chain 426 to operate the driving shaft 428 of conveyer belts 430 and 432. The belt 430 runs upon a drive roller 434 fast on the shaft 428 and an end roller 436, and is supported between its ends upon a roller table 438 consisting of a series of small rollers 440 which are rotatively supported in a pair of the longitudinal frame members 146. The belt 432 similarly runs upon a drive roller 442 fast on the shaft 428 and an idler end roller 444, and is supported between its ends upon a roller table 446 which consists of a series of small rollers 448 rotatively supported in a second pair of longitudinal frame members 146.

The belt conveyers 430 and 432 carry the carton out of the machine and deposit it upon the roller table 128 at the operator's station.

While a preferred embodiment of the invention has been illustratively shown and described in detail, it is to be understood that changes may be made therein and the invention practiced in other forms. It is not therefore, the intention to limit the patent to the specific details illustratively described, but to cover the invention broadly in whatever form its principles may be utilized.

We claim:

1. A machine for taping cartons comprising, in combination, a constantly running carton supporting and feeding conveyor, means for automatically measuring and adhering a length of sealing type, controlled and determined in length by the length of the carton, itself, along a carton face which extends in the direction of the supporting plane of the conveyor, with end portions of the tape of predetermined lengths protruding freely beyond the leading and trailing ends of the carton, untimed, automatically acting roll-over mechanism comprising a tape pressing member mounted for planetary movement and unidirectional slip driving means therefor constructed and arranged constantly to urge the pressing member in a single direction of planetary movement suitable to cause the pressing member first to move into and maintain bearing engagement with the adhered tape on the moving carton and then to press in and forward the rearwardly protruding tape end against the trailing end of the carton as an incident of the travel of the carton past such roll-over means, and automatic mechanism for rolling the protruding leading end of the tape down against the leading end of the carton.

2. A machine for taping cartons comprising, in combination, a constantly running carton supporting and feeding conveyor, means for automatically measuring and adhering a length of sealing tape, controlled and determined in length by the length of the carton, itself, along a carton face which extends in the direction of the supporting plane of the conveyor, with end portions of tape of predetermined lengths protruding freely beyond the leading and trailing ends of the carton, untimed automatically acting roll-over mechanism comprising a tape pressing member mounted for planetary movement and unidirectional slip driving means therefor constructed and arranged constantly to urge the pressing member in a

single direction of planetary movement suitable to cause the pressing member first to move into and maintain bearing engagement with the adhered tape on the moving carton and then to press in and forward the rearwardly protruding tape end against the trailing end of the carton as an incident of the travel of the carton past such roll-over means, and automatic mechanism for rolling the protruding leading end of the tape down against the leading end of the carton, including means for temporarily arresting the carton independently of the running of the conveyor.

3. A machine for taping cartons comprising, in combination, a constantly running conveyor for the cartons, means for automatically measuring and adhering a length of sealing tape, controlled and determined in length by the length of the carton, itself, along a carton face which extends in the direction of the supporting plane of the conveyor with end portions of the tape of predetermined lengths protruding beyond the leading and trailing ends of the carton, untimed roll-over mechanism comprising roller means mounted for planetary movement and automatically effective first to press against the tape previously adhered to the carton face and thereafter to press the rearwardly protruding tape end against the trailing end of the carton, and means effecting a slip drive of said roller means so that the planetary movement of the roller means may be interrupted by engagement with the carton face to which the tape has been initially adhered and the rolling of the tape may be interrupted during any interruption of travel of the carton, and may be caused to be immediately resumed upon the resumption of such travel, and automatic mechanism for rolling the protruding leading end of the tape down against the leading end of the carton, including means for temporarily arresting the carton independently of the traveling conveyor.

4. A machine for taping cartons comprising, in combination, a constantly running carton supporting and feeding conveyor, means for automatically measuring and adhering a length of sealing tape, controlled and determined in length by the length of the carton, itself, along a carton face which extends in the direction of the supporting plane of the conveyor, with end portions of tape of predetermined lengths protruding freely beyond the leading and trailing ends of the carton, untimed, automatically acting roll-over mechanism comprising a tape pressing member mounted for planetary movement and unidirectional slip driving means therefor constructed and arranged constantly to urge the pressing member in a single direction of planetary movement suitable to cause the pressing member first to move into and maintain bearing engagement with the previously adhered tape on the moving carton and then to press in and forward the rearwardly protruding tape end against the trailing end of the carton as an incident of the travel of the carton past such roll-over means, means for temporarily arresting the carton independently of the conveyor at a tape ending station, and roll-down means at said station comprising a roller operable downward and then upward for pressing the protruding leading end of the tape against the leading end of the carton as the roller moves down and as it moves up.

5. A machine for taping cartons comprising in combination, a constantly running conveyor for the cartons, means for automatically measuring and applying a length of sealing tape along the top of a traveling carton with a predetermined portion of the tape protruding beyond the leading end of the carton, and automatic mechanism for rolling down against the leading face of the carton the forwardly protruding length of tape, including tape pressing roll-down means at a roll-down station, a feeler for sensing the arrival of a carton at the roll-down station, a gate normally maintained in a carton arresting position for arresting and detaining the carton at the roll-down station, means responsive to the feeler for effecting a complete outgoing and return cycle of the roll-down means, and means responsive to the final return movement of the roll-down means for causing the gate to release the carton.

6. A machine as set forth in claim 5 in which the means for effecting a cycle of operation of the roll-down means comprises a reciprocatory pneumatic driver for the roll-down means, a control valve therefor, electromagnetic means for moving said valve to cycle initiating position, and switch means including an actuator movable unidirectionally by the feeler from an inactive position, through an active position and then to a second inactive position in response to unidirectional movement of the feeler, to cause momentary energization and then deenergization of said electromagnetic means.

7. A machine as set forth in claim 6 in which one way driving means is provided between the feeler and the switch actuator for permitting the latter to remain in an inactive position as the feeler returns from carton displaced position to a normal, more advanced position upon clearance of the feeler by a carton.

8. In a machine for taping cartons, the combination, with a constantly running conveyor for the cartons, of means for automatically measuring and applying a length of sealing tape along the carton top with a predetermined end portion of the tape protruding beyond the leading end of the carton, roll-down means at a roll-down station normally maintained in a withdrawn position but operable for rolling down against the leading face of the carton the forwardly protruding length of tape, a feeler displaceable from a normal position by a carton for sensing the arrival of a carton at the roll-down station, a gate at the roll-down station, means yieldingly detaining the gate in a normal, carton arresting and detaining position, means responsive to the feeler for initiating a full reciprocation of the roll-down means, and means responsive to return operation of roll-down means for causing the gate to be momentarily withdrawn and then released for yielding return to its normal position.

9. A side closing machine adapted for sealing the upper side of a tubed carton blank or a filled carton either by taping or by gluing or both, comprising, in combination, conveyor means for advancing the cartons, a deflector for folding in the leading end flap and for holding down the leading and trailing end flaps, optionally usable means associated with said deflector for discharging glue onto the infolded leading and trailing end flaps, plows disposed after the deflector for folding the side flaps in against the infolded leading and trailing flaps, hold-down means for retaining the side flaps in such infolded position throughout an extended course of travel, optionally usable means for feeding sealing tape to the upper side of the carton, roller means disposed to bear against the closed upper side of the carton to press the tape or the glued joint, as the case may be, means for pressing the tape, if present, against the leading end panel of the carton at an end taping station, and roller means engageable with the closed upper side and with the rear side of the carton to press the tape, if present, against the rear end panel of the carton.

10. A side closing machine adapted for sealing the upper side of a tubed carton blank or a filled carton either by taping or by gluing or both, comprising, in combination, means defining an outgoing course, a transverse course and a return course for the cartons and carton blanks, conveyors for the outgoing and return courses, means for automatically transferring the individual carton from the outgoing course to the return course through the transverse course, a deflector in the outgoing course for folding in the leading end flap and for holding down the leading and trailing end flap, said deflector including optionally usable means for ejecting glue onto the infolded leading and trailing end flaps, folders in the outgoing course following the deflector for folding the side flaps in against the infolded leading and trailing end flaps, hold-down means for retaining the side flaps in such infolded position throughout the transverse course and through a

preliminary portion of the return course, optionally usable means for feeding sealing tape to the carton in the return course, roller means disposed to bear against the closed upper side of the carton as the carton travels along the return course to press the tape or the glued joint, as the case may be, means for passing the tape, if present, against the leading end of the carton at an end taping station, and roller means engageable with the closed upper side and with the rear end of the returning carton to press the tape, if present, against the rear end of the carton.

11. A side closing machine as set forth in claim 10 in which the means for pressing the tape against the leading end of the carton is constructed and arranged to arrest the carton at the end taping station independently of the return course conveyor.

12. A side closing machine as set forth in claim 9 in which the means for transferring the carton automatically from the outgoing course to the return course comprises a pusher responsive to the travel of the carton along the outgoing course.

13. In a machine of the U-return type for glue sealing cartons, in combination, a continuously running conveyor for advancing a carton through a first course, means for holding down the leading and trailing inner flaps through the introductory portion of the first course, means timed by the carton itself for discharging glue onto said flaps, one after the other, while skipping the gap between the flaps, means for folding the side flaps down onto the inner flaps, means responsive to the carton for transferring the carton, without reorientation, through a second course at right angles to the first, means responsive to the carton for starting the carton, still without reorientation, along a return course, a constantly running conveyor for continuing the carton along the return course, means for continuously pressing the outer side flaps down against the inner flaps from the point where the side flaps are first folded down in the first course to the discharge end of the third course, means interposed in the path of the carton for arresting it for a substantial length of time as it nears the end of the return course, whereby the holding down of the side flaps is prolonged and the glue is given additional time to become set before being subjected to strain, and means responsive to the carton temporarily to incapacitate the carton arresting means at the conclusion of a predetermined length of time after the carton has been arrested for causing the advance of the carton along the return course to be resumed.

14. In a machine of the U-return type for tape sealing cartons, in combination, a continuously running conveyor for advancing a carton with the trailing inner flap folded in and the leading inner flap and the side flaps upstanding, and for advancing the carton through a first course, means in the first course for folding in the leading inner flap and for holding down the leading and trailing inner flaps, means for folding the side flaps in and pressing them against the inner flaps, means responsive to the carton at the end of the first course for transferring the carton without reorientation through a second course at right angles to the first, means at the end of the second course responsive to engagement by the carton for starting the carton, still without reorientation, along a third or return course, a continuously running conveyor for continuing the carton along the third course, hold-down means disposed in the first, second and third courses for holding the side flaps firmly down, and means in the third course for automatically tape sealing the carton.

15. A machine for taping cartons comprising, in combination a constantly running conveyor for the cartons, means for automatically measuring and applying a length of sealing tape along a horizontally disposed carton face with predetermined end portions of the tape protruding beyond the leading and trailing ends of the carton, untimed roller means automatically effective to press against the tape applied to the horizontally disposed carton face and thereafter to roll in and then out along the trailing end of the carton while roller pressing the rearwardly protruding tape end against said trailing end of the carton both as the roller moves in and as it moves out, and roll-down mechanism comprising a gate for temporarily arresting the carton independently of the conveyor at a tape ending station and a roller operable inward and then outward for pressing the protruding leading end of the tape against the leading end of the carton as the roller moves in and as it moves out.

16. A machine for taping cartons comprising, in combination, a constantly running conveyor for the cartons, means for automatically measuring and applying a length of sealing tape along a horizontally disposed surface of a traveling carton with a predetermined portion of the tape protruding beyond the leading end of the carton, and automatic mechanism at a roller pressing station for rolling in against the leading face of the carton the forwardly protruding length of tape, including a tape pressing roller, a feeler for sensing the arrival of a carton at the roller pressing station, and mechanism responsive to the feeler for setting the roller pressing mechanism into operation to arrest and detain the carton at the roller pressing station, and for effecting a complete tape pressing reciprocation of the tape pressing roller, from beyond a boundary edge of the leading face inward along said leading face substantially to the end of the tape covered area and thence outward along said face to a position clear of said boundary edge.

17. A machine for taping cartons comprising, in combination, a constantly running conveyor for the cartons, means for automatically measuring and applying a length of sealing tape along a horizontal face of the carton with a predetermined end portion of the tape protruding beyond the leading end of the carton, roller pressing means at a roller pressing station for pressing the forwardly protruding tape length against the leading face of the carton, said roller pressing means including a feeler displaceable from a normal position by a carton for sensing the arrival of a carton at the roller pressing station, a pressing roller, and mechanism responsive to the feeler for arresting the carton and for effecting a full in and out reciprocation of the pressing roller from beyond a boundary edge of the leading face inward along said leading face substantially to the end of the tape covered area and thence outward along said face to a position clear of said boundary edge while the carton is detained at the roller pressing station.

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CERTIFICATE OF CORRECTION

Patent No. 3,052,072 September 4, 1962

Clifford D. Keely et al.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 3, line 38, for "10a and 10k and 10m." read -- 10a to 10k and 10m. --; column 5, lines 60 and 61, for "simple" read -- simply --; column 13, line 6, for "passing" read -- pressing --; line 16, for the claim referrence numeral "9" read -- 11 --.

Signed and sealed this 1st day of January 1963.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

DAVID L. LADD
Commissioner of Patents