Nov. 16, 1971 F. E. PRINGLE ET AL 3,619,972

PACKAGING APPARATUS

Filed Dec. 5, 1969 7 Sheets-Sheet 1

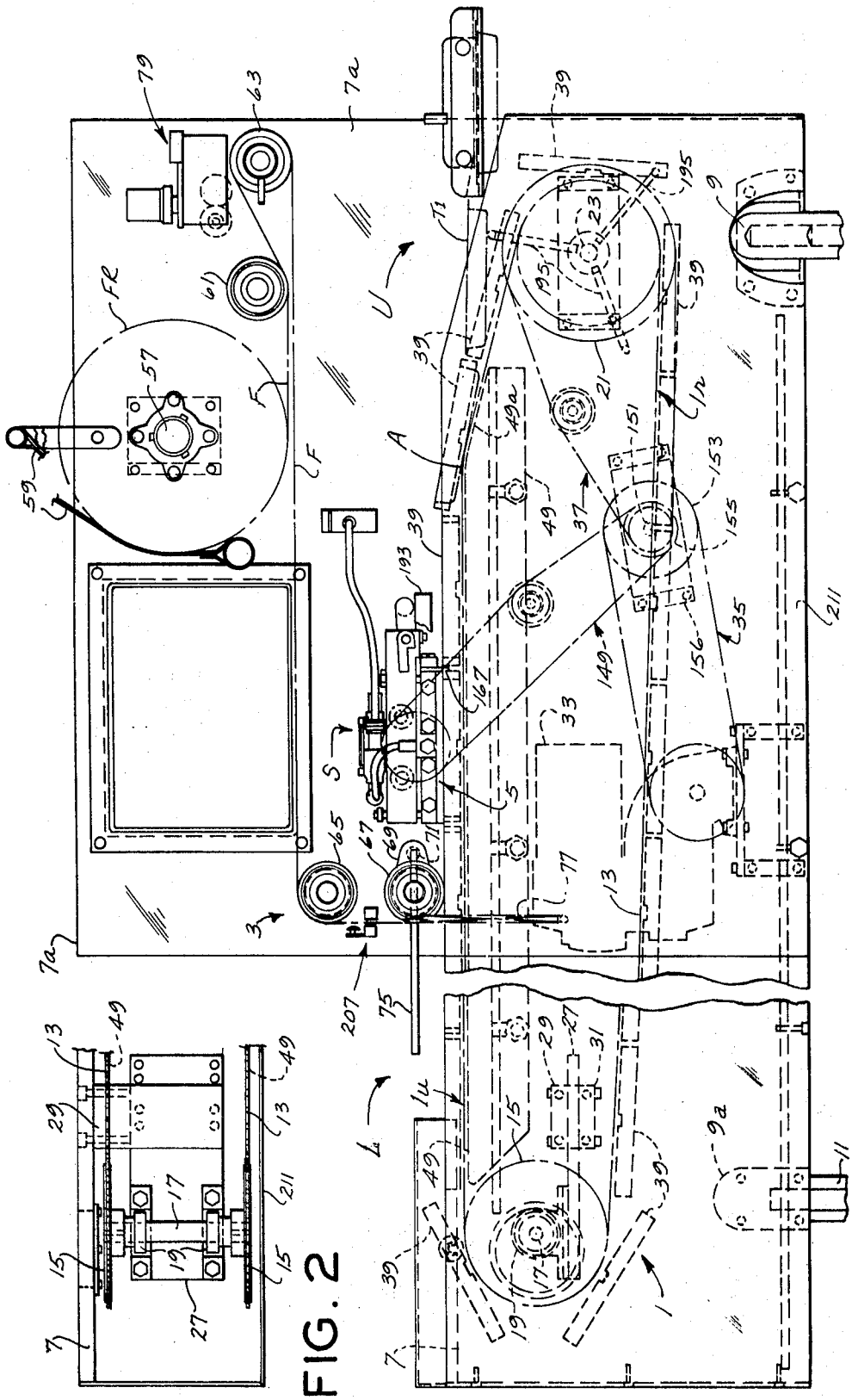


FIG. 1

FIG. 2

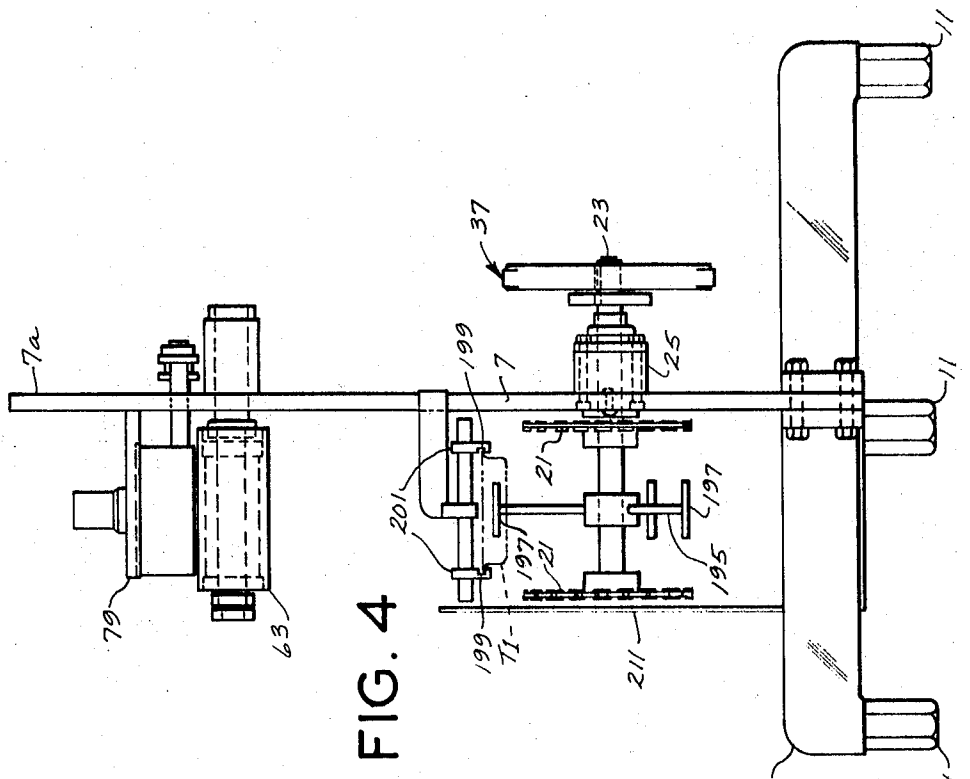

37
23
25
7a
199
7
21
201
197
195
79
63
199
71
211
11
9

FIG. 4

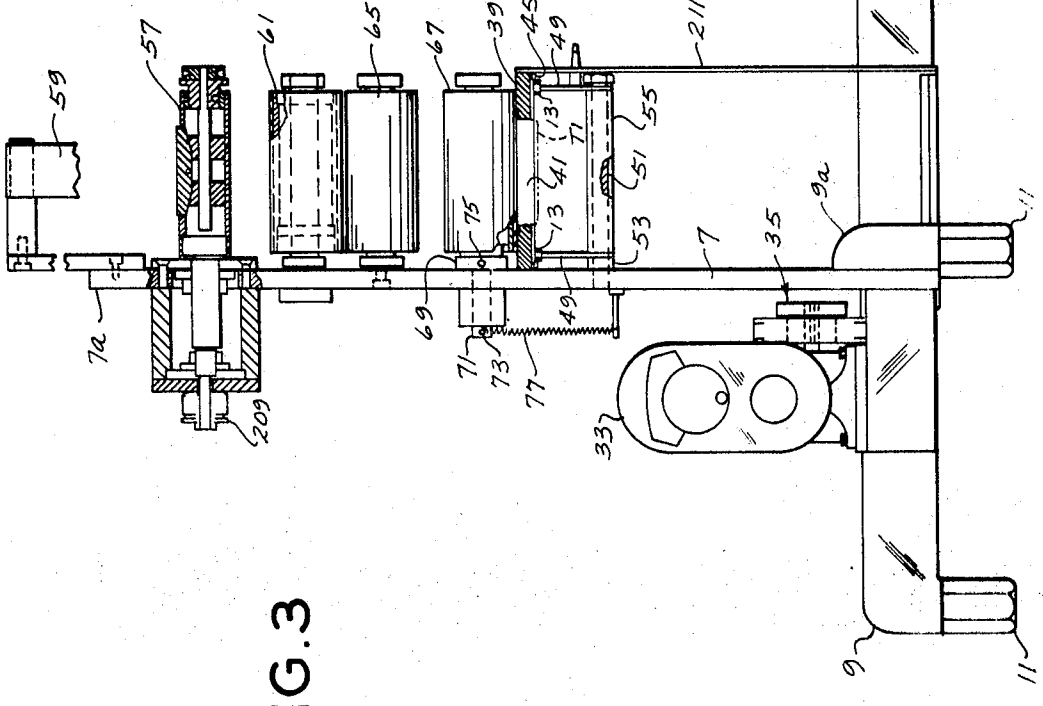

59
57
61
65
67
39
45
49
211
55
51
53
41
13
71
75
7
35
94
7a
69
71
73
77
49
209
33
11
9

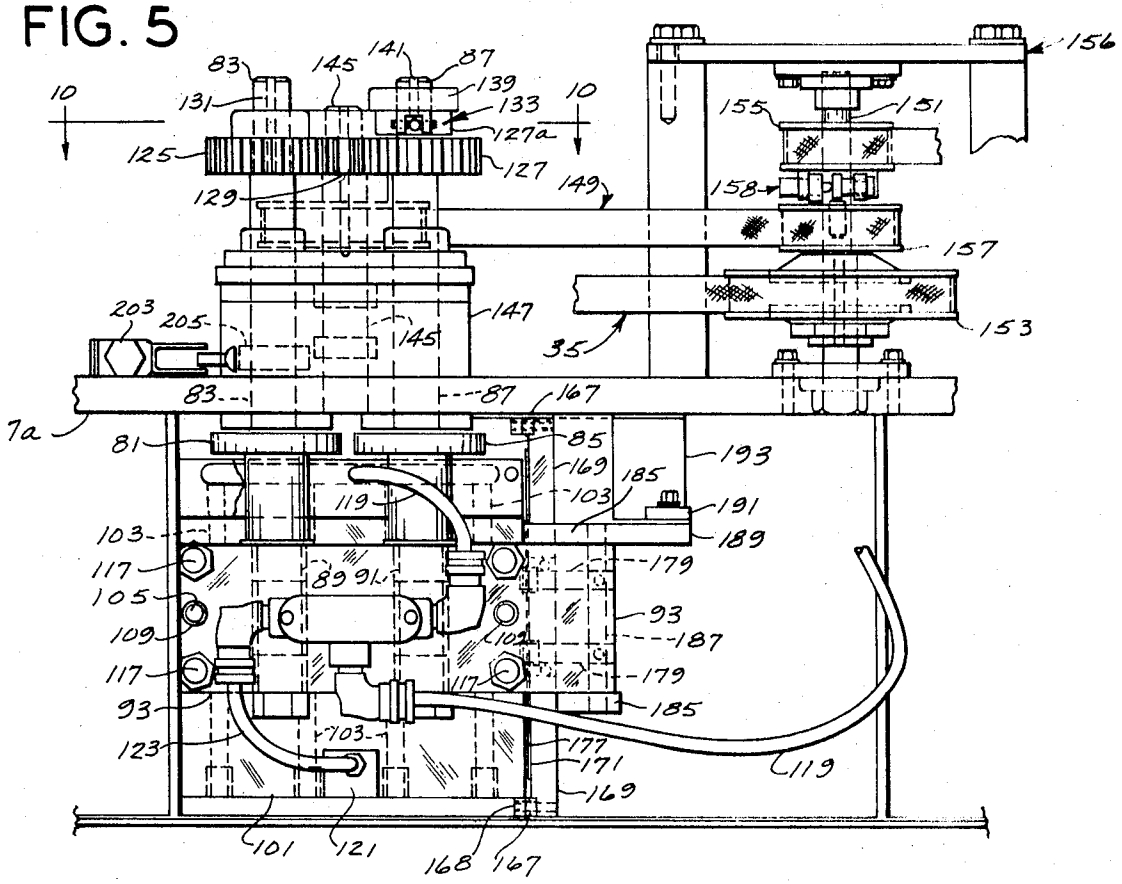
FIG. 3

Nov. 16, 1971 F. E. PRINGLE ET AL 3,619,972

PACKAGING APPARATUS

Filed Dec. 5, 1969 7 Sheets-Sheet 5

FIG. 5



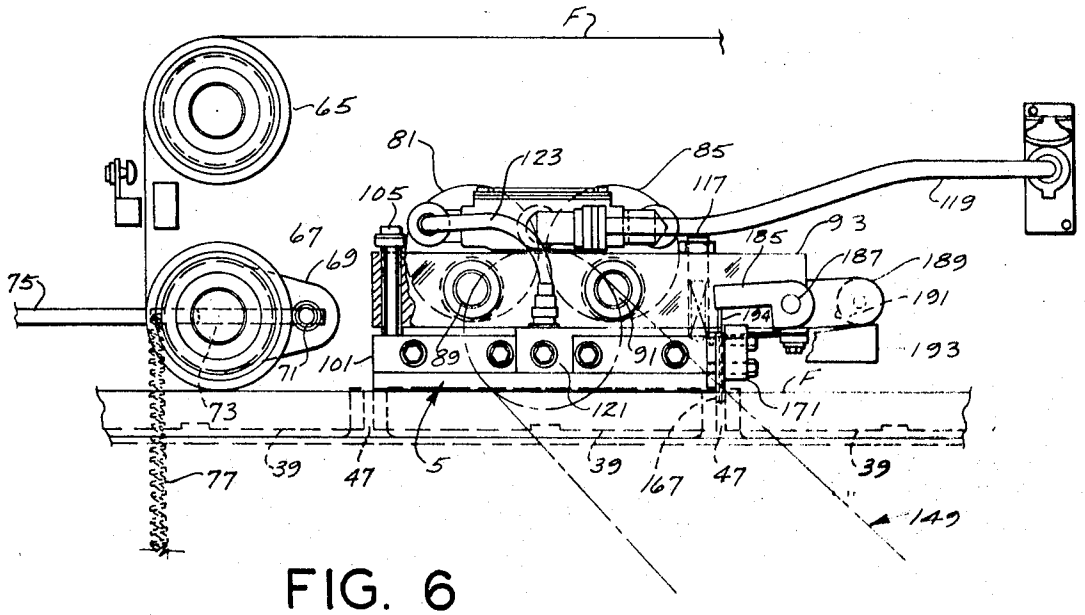


FIG. 6

Nov. 16, 1971 F. E. PRINGLE ET AL 3,619,972

PACKAGING APPARATUS

Filed Dec. 5, 1969 7 Sheets-Sheet 4

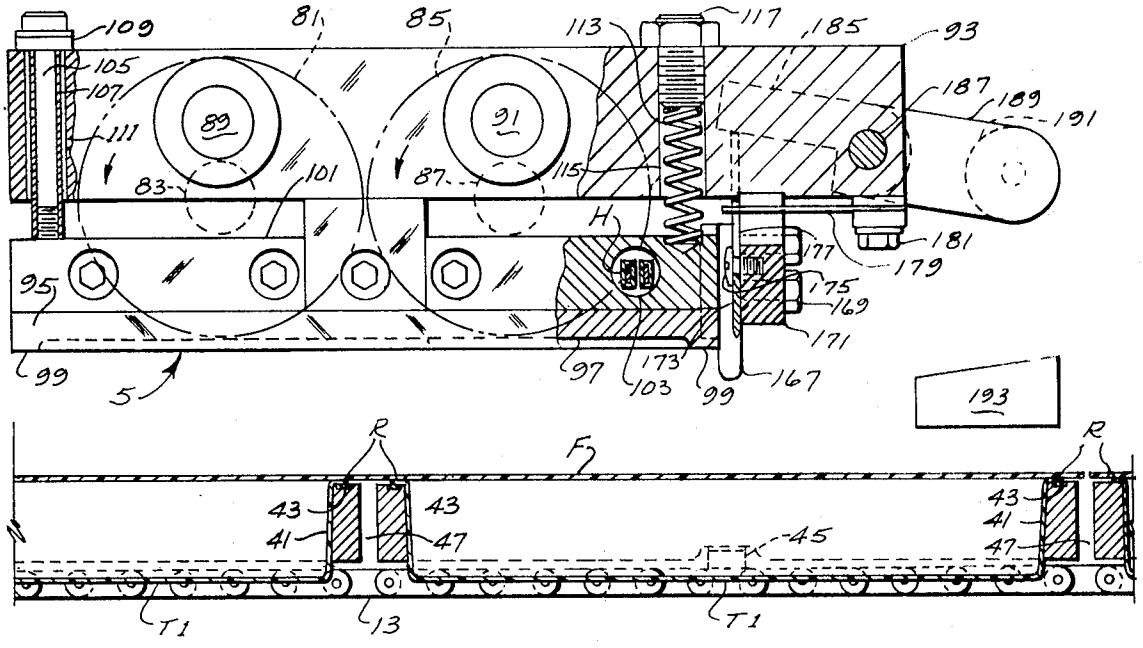


FIG. 7

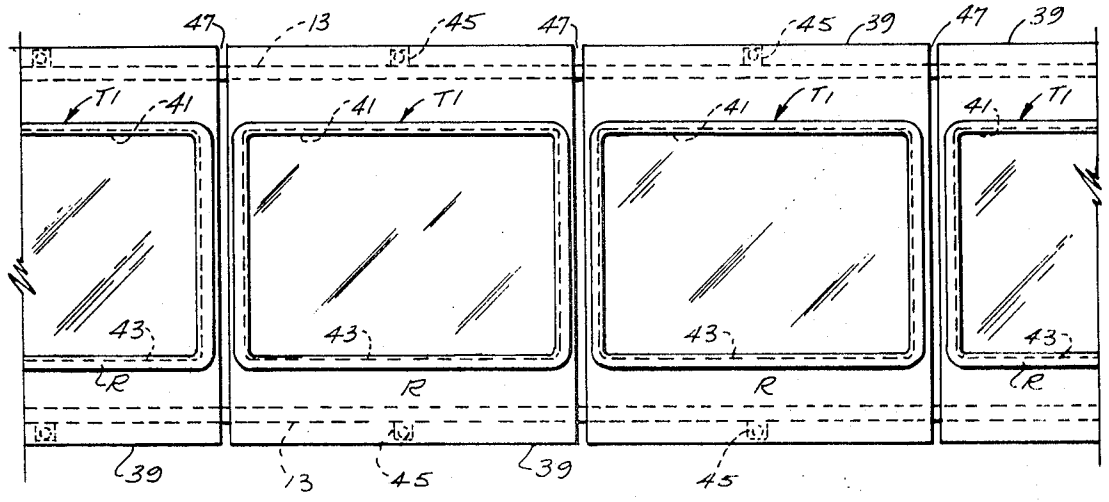


FIG. 8

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Koenig, Senniger,
Powers and Leavitt,
Attorneys.

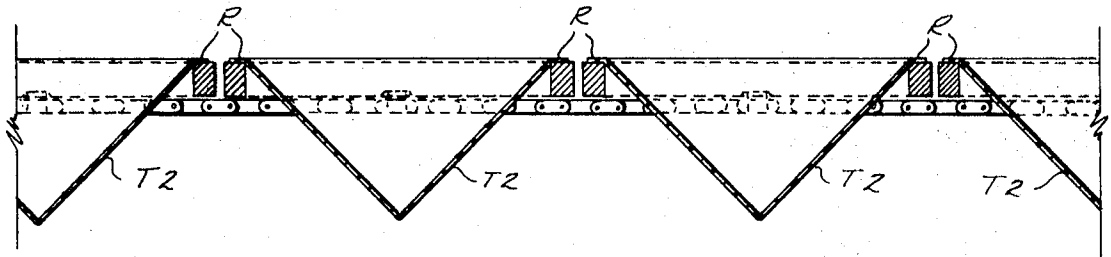

FIG. 9

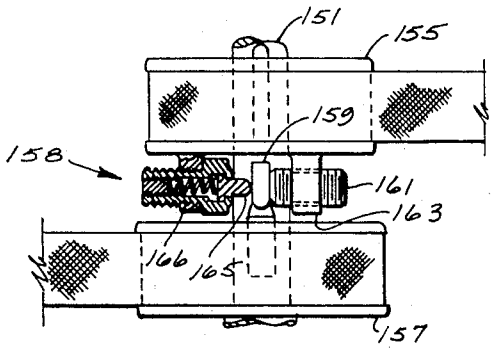

FIG. 5A

FIG. 10

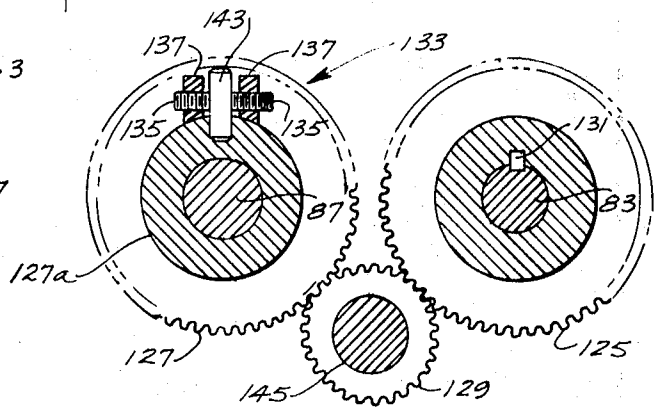

FIG. 11

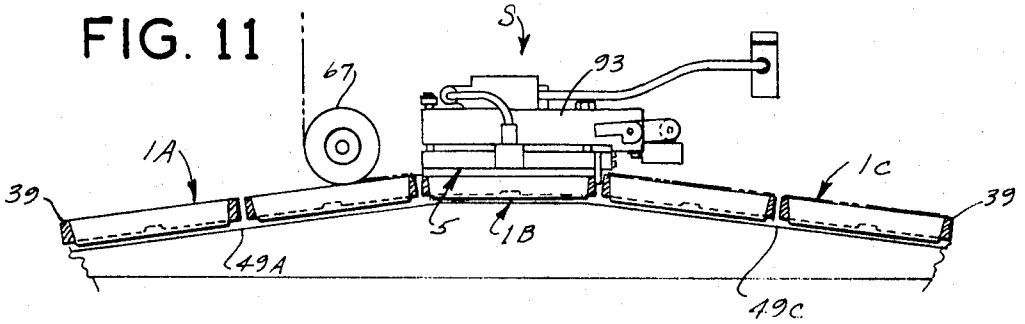

FIG. 12

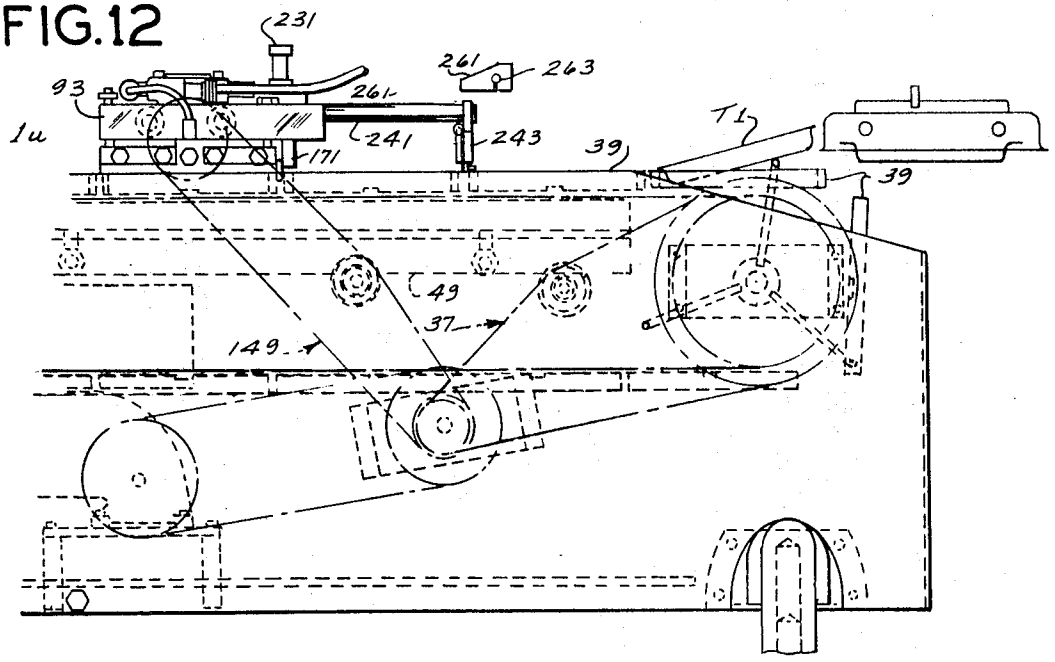

FIG. 13

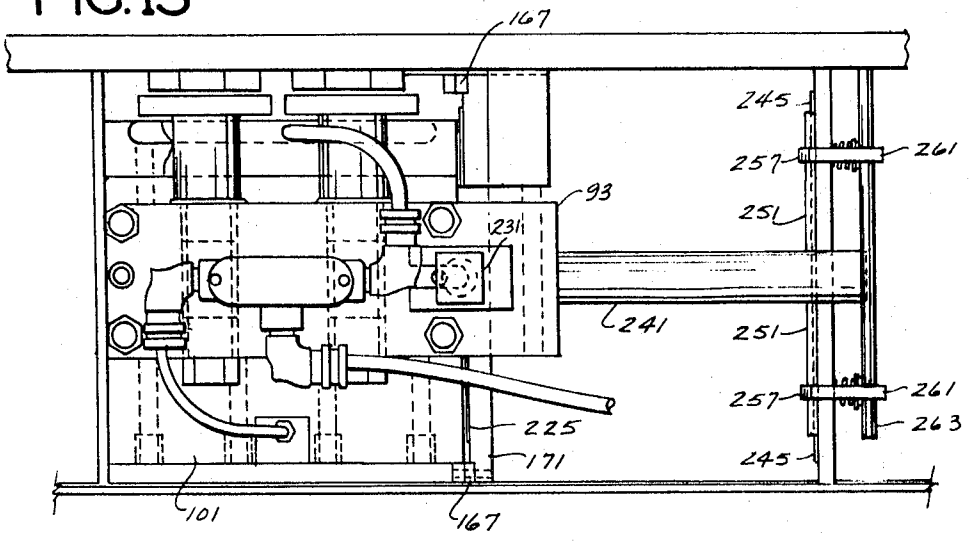

FIG. 14

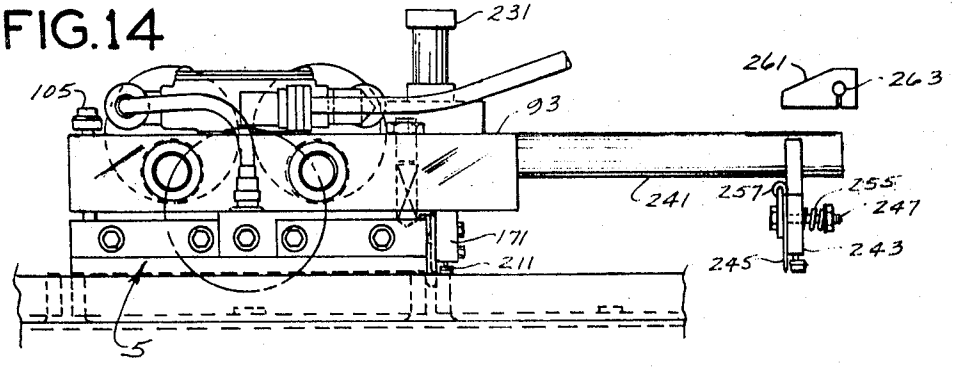

FIG. 15

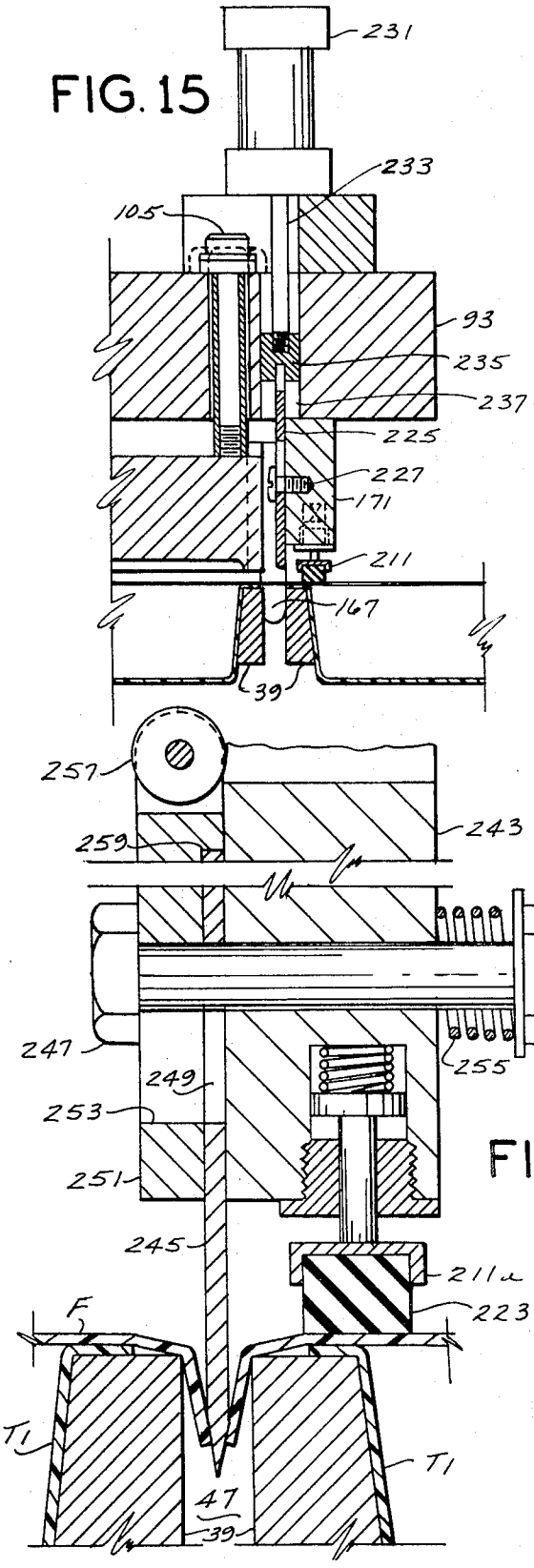

FIG. 16

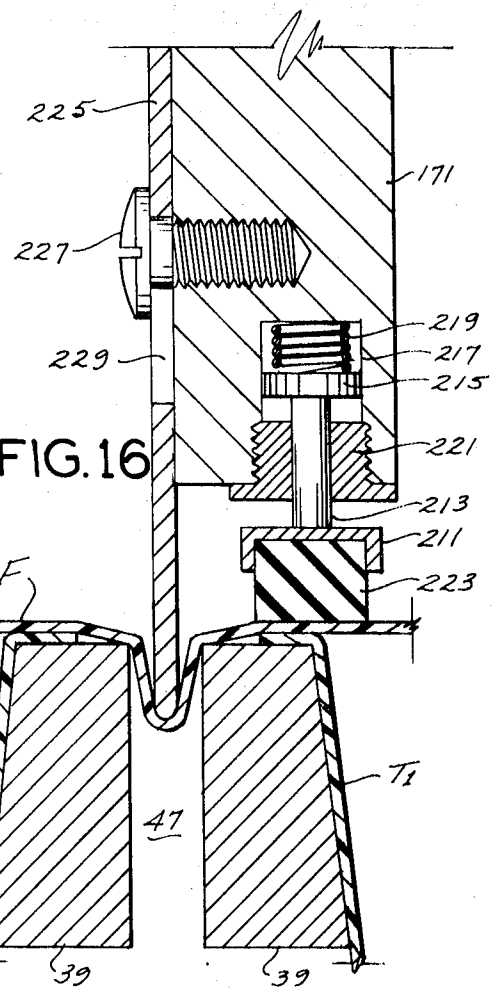

FIG. 17

United States Patent Office 3,619,972 Patented Nov. 16, 1971

3,619,972

PACKAGING APPARATUS

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Filed Dec. 5, 1969, Ser. No. 882,562
Int. Cl. B65b 7/28, 41/18
U.S. Cl. 53—51 8 Claims

ABSTRACT OF THE DISCLOSURE

A machine for applying film covers to preformed trays in which filled trays are conveyed by a conveyor continuously through a sealing zone, a web of film is fed from a roll thereof to overlie the trays as they travel through the sealing zone, and the film is sealed to the trays by a platen which moves downward to press the film against the rim of a tray, then linearly forward in unison with the conveyor continuing to press the film against the rim for a sealing interval, then upward and then back to repeat the cycle, the film being cut between successive trays.

BACKGROUND OF THE INVENTION

This invention relates to packaging apparatus and more particularly to apparatus for sealing film covers on containers.

The invention is especially concerned with apparatus for heat-sealing film covers on preformed trays or similar containers which have a peripheral flange or rim for face-to-face sealing thereto of a segment of a web of film to form the cover, of the same general class as the apparatus shown in U.S. Pat. 3,436,894.

SUMMARY OF THE INVENTION

Among the several objects of the invention may be noted the provision of improved apparatus of the class above described which, while adapted for rapid operation, is also adapted reliably to seal the film to the containers; the provision of such apparatus in which the containers are conveyed continuously at uniform speed through a sealing zone where the film is effectively sealed thereto; the provision of such apparatus adapted for automatic unloading of the containers after the covers have been applied thereto; the provision of such apparatus adapted to handle containers of various shapes and sizes; and the provision of such apparatus adapted to apply position-printed film to the containers and to provide for registration of the printing with the containers.

In general, apparatus of this invention comprises a conveyor for continuously conveying filled open-top containers one after another through a sealing zone, with their open tops upward. Means is provided for supplying a film to overlie the containers as they travel through the sealing zone. A platen is provided for sealing the film to the top of each container as it travels through the sealing zone. The platen is mounted for movement in an orbital path in which, on each cycle, it moves downward to press the film against the top of a container moving forward with the conveyor, then forward in unison with the conveyor, pressing the film against the top of this container for a sealing interval to effect forward feed of the film and sealing of the film to the rim, then upward away from the container, and then rearward for repeating the cycle. The platen remains parallel to the plane of the conveyor in the sealing zone throughout its orbital path. Means is provided for driving the platen to move it in its orbital path with allowance for movement of the platen at the speed of the conveyor when the platen moves forward with the conveyor during the sealing interval.

Other objects and features will be in part apparent and in part pointed out hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a view in front elevation of apparatus built according to this invention, broken away in part to reduce the length of the view;

FIG. 2 is a plan of part of FIG. 1, certain parts being omitted;

FIG. 3 is an end view of the apparatus, as viewed from the left of FIG. 1, with parts broken away and shown in section;

FIG. 4 is an end view of the apparatus, as viewed from the right of FIG. 1, certain parts being omitted;

FIG. 5 is a plan of another part of FIG. 1, on a larger scale than FIG. 1;

FIG. 5A (on sheet 5) is an enlarged fragment of FIG. 5 with parts broken away and shown in section;

FIG. 6 is a front elevation of the sealing means of the apparatus on the scale of FIG. 5;

FIG. 7 is a view similar to but on a larger scale than FIG. 5 with parts broken away and shown in section;

FIG. 8 is a fragmentary plan of a conveyor and trays carried thereby on half the scale of FIG. 7;

FIG. 9 is a view similar to the lower part of FIG. 7 showing another type of tray which the apparatus is capable of handling;

FIG. 10 is a vertical section on line **10—10** of FIG. 5;

FIG. 11 is a view illustrating a modification;

FIG. 12 is a fragmentary view similar to FIG. 1 showing another modification;

FIG. 13 is a view similar to FIG. 5 showing the FIG. 12 modification;

FIG. 14 is a view similar to FIG. 6 showing the FIG. 12 modification;

FIG. 15 is an enlarged fragment of FIG. 14 with parts broken away and shown in section;

FIG. 16 is an enlarged fragment of FIG. 14 showing a moved position of parts; and

FIG. 17 is an enlarged fragment of FIG. 14 with parts broken away and shown in section.

Corresponding reference characters indicate corresponding parts throughout the several views of the drawings.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring first to FIGS. 7 and 8, there is indicated at T1 a preformed rigid tray T1 of shallow rectangular form to which a lid or cover of a film, such as a transparent plastic film, is to be applied by apparatus of this invention. The tray has an outwardly extending peripheral flange or rim R all around its open top. Referring to FIG. 9, there is shown a preformed rigid triangular tray T2 having a rim R, which is another type of tray to which a film cover may be applied by apparatus of this invention. The triangular type of tray is widely used for packaging sandwiches in commissary and vending operations. The rim R in each instance is for face-to-face sealing thereto of film to form a lid or cover. The trays may be plastic trays, formed, for example, of high density polyethylene, polypropylene, oriented polystyrene or the like, and the film for the lid or cover may be a heat-sealable polyester film, or a foil with a heat-seal coating for being heat-sealed to the trays and may be one that is peelable from the rim R. The trays may be made of material other than plastic, and the film, instead of being heat-sealed to the trays, could be sealed thereto by pressure-sensitive adhesive (either on the film or on the trays).

Now referring more particularly to FIG. 1, apparatus

made in accordance with this invention for applying covers of film to the trays (T1 or T2) is shown to comprise an endless conveyor 1 adapted continuously to convey filled trays one after another at a uniform rate of speed from a loading zone L through a sealing zone S and thence to an unloading zone U. Trays are applied to the conveyor at the loading zone, being filled either before or after being applied to the conveyor, and conveyed through the sealing zone S where a film cover is sealed to the rim R of each tray, and thence conveyed to zone U where the trays with the covers sealed thereon are discharged. At 3 is indicated means for supplying a web of film to overlie the trays as they travel through the sealing zone. At 5 is indicated a platen for sealing the film to the rim of each tray as it travels through the sealing zone.

The conveyor 1 is an endless chain conveyor, having a supporting structure comprising a vertical frame plate 7 supported by a tripod leg arrangement including two outrigger legs 9 at one end and a third leg 9*a* having adjustable feet 11. It comprises a pair of chains each designated 13 trained around a pair of idler sprockets indicated at 15 on a horizontal shaft 17 journalled in bearings 19 adjacent one end of the frame plate 7 (referred to as its rearward end) and around a pair of drive sprockets 21 on a horizontal drive shaft 23 journalled in a bearing 25 on plate 7 adjacent its other end (referred to as its forward end). The bearings 19 are mounted on a horizontal plate 27 which extends rearward from between upper and lower bracket plates 29 and 31 cantilevered out from the front of the frame plate 7, and which is adjustable longitudinally of the apparatus for chain tensioning purposes. The conveyor has an upper reach designated 1*u* which travels forward from sprockets 15 to sprockets 21, and a lower return reach 1*r* which travels rearward from sprockets 21 to sprockets 15. The conveyor is adapted to be continuously driven by a motor-speed reducer unit 33 via a first belt and pulley drive 35 and a speed-reducing second belt and pulley drive 37 from the first drive 35 to the drive shaft 23.

The chains 13 carry an endless series of tray carriers, each designated 39. Each tray carrier, as herein shown, is constituted by a relatively thick rectangular plate member having an opening 41 therein which is dimensioned to receive a tray with the rim R of the tray engaging the outside (upper) face of the carrier 39 all around the opening 41. This opening is made to the shape of the trays to be handled, being rectangular as herein illustrated. A flat resilient rectangular ring 43 may be provided around the opening 41 for engagement by the rim R. Each carrier is secured on its transverse center line at opposite sides of the carrier to a pair of ears 45 on the chain 13. The pairs of ears are spaced at intervals along the length of the chain somewhat greater than the length of a carrier 39, and hence the ends of adjacent carriers are spaced from another as indicated at 47.

With respect to the upper reach 1*u* of the conveyor, as shown in FIG. 1, the chains 13 travel horizontally from the rearward end of the frame plate 7 to a point A somewhat short of the forward end of the frame plate on the upper edges of a pair of spaced chain rails 49. The sprocket shaft 23 and the sprockets 21 at the forward end of the apparatus are located at a lower elevation than the sprocket shaft 17 and sprockets 15 at its rearward end. Rails 49 have downwardly inclined upper edge portions 49*a* at their forward ends and the chains are inclined downward on these downwardly inclined upper edge portions 49*a* of the rails to the sprockets 21. The rails 49 are constituted by elongate narrow plate members supported by bolts 51 cantilevered frontward from frame plate 7, with short tubular spacers 53 on the bolts between plate 7 and the inside rail and relatively long tubular spacers 55 on the bolts between the rails (see FIG. 3).

In the upper reach 1*u* of the conveyor, the tray carriers 39 travel through the loading zone L at a convenient loading height (e.g., thirty-six inches above the floor). The frame plate 7 is of corresponding height for about half its length throughout the loading zone. The frame plate has an upward extension 7*a* throughout the remainder of its length. Extending frontward from this extension above the upper reach of the conveyor is an expansible and contractible arbor 57 for carrying a roll FR of the film F, with a friction brake strap 59 for braking the roll for film-tensioning purposes. The film supplying means 3 further includes four guide rolls indicated at 61, 63, 65 and 67 around which the film travels from the roll FR and by means of which it is guided to overlie the trays (such as T1) lodged in the tray carriers 39 as they travel through the sealing zone S. The rolls 65 and 67 are located one above the other adjacent the rearward (left) edge of the frame plate extension 7*a*. Roll 67 has a resilient (rubber) cover and may be mounted to act as a presser roll for pressing the film down against the flanges of the trays being moved forward by the conveyor. For this purpose, roll 67 is carried by a rocker arm 69 on a shaft 71 journalled in a bearing on plate extension 7*a*, with a crank arm 73 extending radially from shaft 71 in back of plate 7*a* biased to swing downward by a tension spring 77. A handle for raising the roll 67 for threading the film is indicated at 75. As shown, the film is unwound from the bottom of the roll FR, and travels forward under roll 61, over and back around roll 63, rearward back to roll 65, over and down around roll 65 to the rear of roll 67 and down around roll 67 and forward over the open tops of the trays, being pressed down against the flanges R of the trays by roll 67 under the bias of spring 77. A printer 79 may be provided for printing such matter as may be desired on the film as it travels around the roll 63.

The sealing zone S is immediately forward of the guide roll 67. The platen 5 is mounted for movement in an orbital path in this zone wherein it moves downward to press the film F against the flange R of a tray T1 carried by a carrier 39 forward of roll 67, then linearly and horizontally forward in unison with the carrier 39 and the tray carried thereby, then upward and then linearly and horizontally rearward, with the platen 5 remaining parallel to the plane of the upper reach of the conveyor in the sealing zone (i.e., remaining horizontal) throughout its stated orbital path. Means mounting the platen for movement in this path is shown to comprise a first crank disk 81 on the front end of a shaft 83 journalled in a bearing on plate extension 7*a*, and a second crank disk 85 on the front end of a shaft 87 journalled in plate extension 7*a*. These disks 81 and 85 are located side-by-side, and have eccentric crank pins 89 and 91, respectively, projecting from their front faces. A bar 93 is carried by these crank pins, extending horizontally between them. On rotation of the crank disks 81 and 85 in counter-clockwise direction as viewed in FIGS. 6 and 7, the bar 93 is moved in a path wherein certain points thereof travel in circles around the axes of the disks (i.e., the axes of shafts 83 and 87), the bar remaining horizontal throughout this path. The platen 5 is constituted by a metal sole plate 95 having a recess 97 in the bottom thereof providing a skirt 99 all around the bottom of the platen corresponding to the flange R on a tray T1. The sole plate 95 is carried by a metal head block 101 having electric heaters such as indicated at H in FIG. 7 in recesses 103 therein for heating the platen. The platen 5 is carried by the bar 93 for up and down movement relative to the bar below the bar, and is biased downward toward an extended position relative to the bar. For this purpose, the block has shoulder screws 105 threaded in tapped holes in the top of block 101 and extending upward from the block. A sleeve 107 surrounds the screw and a spacer 109 is interposed between the head of the screw and the upper end of the sleeve. The sleeves are vertically slidable in vertical holes such as indicated at 111 in the bar 93. The platen 5 is biased downward by compression springs 113 accommodated in recesses 115 in the bar and reacting downward against the top of the platen head block 101 from

set screws **117** threaded in the bar **93**, the downward movement of the platen **5** relative to bar **93** being limited by engagement of spacers **109** with the top of the bar **93**. Wiring for the heaters is indicated at **119**. A thermostat block is indicated at **121** and wiring therefor is indicated at **123**.

The shafts **83** and **87** have spur gears **125** and **127** thereon at their rear ends in back of plate extension **21***a*. A drive gear **129** in mesh with both of these spur gears provides for driving the disks **81** and **85** in unison and in the same direction (counterclockwise as viewed in FIG. 6). Gear **125** is keyed to its shaft as indicated at **131**. Shaft **87** and disk **85** are adapted to be angularly adjusted relative to gear **127** and hence relative to shaft **83** and disk **81** for accurately phasing the disk **85** relative to the disk **81** by means such as indicated generally at **133** involving a pair of set screws **135** threaded in ears **137** on a collar **139** keyed as indicated at **141** to shaft **87**, the set screws engaging opposite sides of a pin **143** projecting radially from the hub **127***a* of gear **127**.

The drive gear **129** for the two disks **81** and **85** is keyed on a shaft **145** journalled for rotation in back of plate extension **7***a* in a bearing **147**. This shaft **145** is adapted to be driven via a belt and pulley drive **149** from a lay shaft **151** on which is keyed the pulley **153** of the belt and pulley drive **35** from the motor-speed reducer unit **33**. This shaft also has keyed thereon the pulley **155** of the belt and pulley drive **37** which drives the conveyor drive shaft **23**. It is mounted in a frame **156** on the back of plate **7**. Drive **149** includes a pulley **157** on shaft **151** with a resilient yielding coupling means generally designated **158** between the shaft **151** and this pulley. This resilient coupling means (see particularly FIG. 5A) comprises a lug **159** on pulley **157** interposed between a set screw **161** threaded in an ear **163** carried on pulley **155** and a spring plunger **165** in an opposed ear **166** on pulley **155**. Pulley **157** is free to rotate relative to shaft **151**.

Means is provided for coupling the bar **93** and platen **5** carried thereby to the conveyor **1** when the bar **93** and platen **5** move downward and the platen comes into engagement with the rim R of a tray T1 in a carrier **39** so as positively to provide for forward movement of the platen in unison with the conveyor. This means comprises a pair of tongues **167**, each of which may consist of a piece of plastic, adapted to enter the space between two adjacent tray carriers **39** as the bar **93** and platen move downward to start a cycle. The tongues are secured as indicated at **169** to the ends of a cross-bar **171** which extends transversely across the bottom of bar **93** slightly forward of the forward end of the platen **5**. The length of the cross-bar is somewhat greater than the width of the platen, so that the ends of the cross-bar and the tongues **167** lie laterally outward of the sides of the platen and are adapted to straddle the film F.

The cross-bar **171** is secured to the bottom of bar **93** spaced forward from the forward end of the platen **5**. A knife blade **173** is mounted for vertically sliding movement in the space between the forward end of the platen and the cross-bar by means of bolts such as indicated at **175** extending through vertical slots **177** in the blade. The blade is biased upward to a raised retracted position wherein its lower edge, which is its cutting edge and which may be serrated, is above the bottom surface of the platen sole plate **95** by leaf springs such as indicated at **179** secured as indicated at **181** to the bottom of the bar **93**. The blade is adapted to be driven downward by means of a pair of arms **185** on a rock shaft **187** journalled in the forward end portion of bar **93**, this shaft having a crank arm **189** carrying a cam follower roller **191** engageable with a cam **193** on plate extension **7***a*. Arms **185** are engageable with upwardly extending projections **194** of the blade which lie on opposite sides of bar **93**.

Trays exiting from the sealing zone after having had the film applied thereto and severed travel to the unloading zone U where they are automatically ejected from the tray carriers **39**. The ejecting means comprises a series of arms **195** extending radially outward from sprocket shaft **23** (three such arms being shown) spaced at equal intervals around the shaft **23** and each having a crosshead **197** at its outer end. The arrangement is such that as each tray carrier **39** carrying a tray T1 travels down the incline **49***a* of the rails **49** and travel forward past the forward end of the rails toward the top of sprockets **21**, the crosshead **197** on one of the radial arms **195** engages the bottom of that tray T1 and lifts the leading end portion of the tray up out of the opening **41** in the tray carrier, bringing the tray into a generally horizontal position as shown in FIG. 1. The tray continues to move forward since its trailing end is still in the opening **41** of the tray carrier, being pushed forward by the conveyor. As it is so pushed forward with its forward end raised up above the carrier **39**, the sides of the rim R of the tray enter horizontal grooves **199** (see FIG. 4) in a pair of opposed rails **201** constituting a discharge conveyor, and the tray is left hanging by the side of its rim from the rails as the tray carrier proceeds on down and around the sprockets **21**.

At **203** is indicated a switch actuated by a cam **205** on shaft **83**. This switch **203** is interconnected with an on-off switch (not shown) for the motor of unit **33** in such manner and cam **205** is so developed and phased as to provide for stopping of the apparatus only in a raised position of platen **5** relative to the conveyor **1**.

When position-printed film (i.e., film having a printed pattern thereon repeated generally at tray length intervals) is to be applied to the trays, the pattern includes a registration mark. At **207** is indicated an electric eye scanner unit of a conventional type used in a system for transmitting a signal whenever the printed pattern on the film becomes out of register with the trays, as determined by scanning of the scanner unit for a registration mark at a predetermined point in the cycle of the platen **5**. The signal is utilized to effect correction of registration; for example it may be utilized to apply an electric brake **209** for the film roll arbor FR, which results in stretching of the film when it is pulled forward by the platen and conveyor to bring the pattern back into register with the trays. For this type of correction of registration, the film will generally be printed with the registration marks repeated at an interval slightly less than the length of a tray.

Operation of the above-described apparatus is as follows:

With the motor of unit **33** in operation, the sprocket shaft **23** is driven continuously to drive the endless chains **13** of the conveyor **1**, thereby continuously moving the tray carriers **39** forward at a constant speed in the upper reach **1***u* of the conveyor. Trays (e.g., trays T1) are placed in the tray carriers **39** as they travel through the loading zone L. The trays may have been filled before they are placed in the tray carriers, or they may be filled after they have been placed in the tray carriers as they travel through the loading zone L. The loading of the trays into the tray carriers and the filling of the trays may be automated, if desired.

The platen **5**, being driven by the motor of unit **33**, is orbited in synchronism with the conveyor **1**. The film F is trained from web roll FR around guide rolls **61**, **63**, **65** and **67** as shown in FIG. 1 and extends forward from roll **67** between the platen **5** and the tray carriers **39** in the upper reach of the conveyor **1**, overlying the trays T1 carried by the tray carriers. As the platen **5** moves downward at the rearward end of its stroke, the skirt **99** of the sole plate **95** of the platen comes into engagement with the film F all around the rim R of a tray T1 carried by a carrier **39** and starts to move linearly horizontally forward with the carrier **39**. When the sole plate engages the film around the rim R, its downward movement is arrested, and bar **93** (which yieldably carries the sole plate) moves downward relative to the sole plate against the bias of springs **113**. As the sole plate comes into engagement with the film, the lugs **167** at the forward

end of the sole plate enter the space **47** between two adjacent tray carriers **39**, so that the bar **93** and platen **5** are coupled to the conveyor **1** for forward linear horizontal movement of the platen **5** in unison with the conveyor, and with the skirt of sole plate **95** of the platen in register with the rim of the tray carried by the trailing one of these two tray carriers, i.e., with skirt **99** of the sole plate in register with the rectangular ring **43** around the opening **41** in the trailing one of the two tray carriers.

The platen **5** moves linearly and horizontally forward in unison with the tray carrier **39** of the conveyor **1** which lies under the platen for a sealing interval until the platen **5** moves upward away from the tray carrier to disengage the tongues **167** from the space **47** between the two carriers in which the tongues had been engaged. It will be observed that bar **93** carrying the platen **5** moves in a circular path via pin **89** moving in a circle around the axis of disk **81** and pin **91** moving in a circle around the axis of disk **85**. The platen first comes into engagement with the film on rim R of a tray T1 carried by a carrier **39** as bar **93** is moving downward about 30° in advance of the lowermost position (the bottom dead center position) of the bar **93** and starts coming out of engagement with the film about 30° after the bar **93** has passed through its lowermost position. Thus, the sole plate **95** of platen **5** remains in engagement with the film for heat sealing it to rim R for about 60° (⅙) of the total cycle of 360° of the bar **93**. The bar **93** and platen **5** remain coupled to the conveyor **1** for movement in unison therewith via tongues **167** for this heat sealing interval, which corresponds to 60° of rotation of the bar **93**.

It will be observed that the tray carriers **39** move forward at a constant speed. The drive **149** is made such that the normal tangential velocity of each of the crank pins **89** and **85** corresponds generally to the conveyor speed. The forward component of speed of the crank pins **85** and **91**, bar **93** and platen **5** (carried by bar **93**) would normally vary as a sine function from the position 90° trailing bottom dead center to the position 90° forward of bottom dead center. The provision of the resilient coupling means **158** in drive **149** enables variation in the speed of rotation of disks **81** and **85** and crank pins **89** and **91** to accommodate the forward movement of platen **5** at constant speed in unison with conveyor **1** during the sealing interval.

As the platen **5** moves linearly forward in unison with and pressed down toward one of the tray carriers **39**, it seals the film to the rim R of the tray T1 carried by this carrier. In the case of heat-sealable film, the heaters H are energized for heating the platen to heat-seal the film to the tray by heat and pressure. In the case of sealing the film to the tray by pressure-sensitive adhesive, the heaters are not energized, and sealing is by pressure only. The platen **5** also functions to pull film from the roll FR to overlie the next tray carrier **39** for covering the tray carried by the latter. Also, as the platen **5** moves forward, the cam follower roller **191** on arm **189** rides up on cam **193**, causing arm **189** to swing up and arms **185** to swing down, thus driving the knife blade **173** downward to cut the film between the stated tray carrier and the next carrier forward. Finally, in the unloading zone, the trays with the film covers sealed thereon have their forward ends lifted up by the arms **195**, and are thus unloaded from the tray carriers, side portions of the rim of each tray sliding forward in the grooves **199** in the rails **201**.

It will be noted that the conveyor **1**, the platen **5** and its linkage and guide rolls **61**, **63**, **65** and **67** are all in front of the plate **7**, **7***a*, and that the motor-speed reducer unit **33** and the drives **35**, **37** and **149** are in back of the plate **7**. A removable guard such as indicated at **211** may be provided at the front of the apparatus. The plate **7**, **7***a* and various components of the apparatus may be made corrosion-proof (e.g., made of stainless steel). The guard is mounted for easy removal for cleaning the apparatus, which is facilitated by having the drives in back. The platen assembly may not be completely corrosion-proof, but is readily removable for clean-up of the apparatus.

Heretofore, with regard to position-printed film supplied to users of packaging machines for covering containers, the printing companies supplying the film have had problems in providing for repeat distances of the printing which are slightly different from the distances required for use in the packaging machine to provide for registration of the printing in the completed packages. For example, the printing presses which are ordinarily used are adapted for repeat printing in even increments (e.g., 6", 6½", 7", etc.), where for purposes of enabling registration of the printing in the packaging operation, the repeat printing should be slightly off such increments (for example, 7.015"). Heretofore, it has been sought to provide for this by shrinking or stretching the film in the course of the printing operation, but this is difficult to control. This difficulty may be eliminated by making it possible for the film to be printed in normal manner with standard repeat distances and tolerances, rather than attempting to stretch or shrink it during the printing operation, by modification of the apparatus of this invention to carry out a stretching operation on the film as it is applied to the trays. This is effected, as shown in FIG. 11, by providing for the upper reach of the conveyor **1** to be inclined upwardly at a slight angle as indicated at **1A** toward the sealing zone S, then run horizontally through the sealing zone as indicated at **1B**, and then incline downwardly at a slight angle as indicated at **1C**. The angle of incline in each instance may be 1°, for example, and is considerably exaggerated in FIG. 11. The effect of this is to stretch the film as it is applied to a tray, and the amount of stretch may be controlled by suitable selection of the angle of incline or by using adjustable track sections. As shown in FIG. 11, rails **49** are modified to have inclined upper edge portions **49A** and **49C** for the inclined conveyor reaches **1A** and **1C**.

It will be understood that trays of different shapes and sizes may be handled by the use of different tray carriers **39** on the chains **13**. It will also be understood that each tray carrier may have a plurality of openings **41** for a plurality of trays; e.g., a number of narrow trays might be run side-by-side and provision made for slitting the film longitudinally between trays. It will be further understood that the trays may be multiple-cavity trays instead of single-cavity trays as herein illustrated.

FIGS. 12–17 show a modification of the above, in which the upper reach **1***u* of the conveyor **1** is horizontal throughout its length from its trailing (left) end to its leading (right) end, the rails **49** being straight without having the inclined upper edge portions **49***a* of FIG. 1 at their forward ends. Also, for cutting the film the knife is positioned one tray length forward (toward the right) from its position of FIGS. 5–7, and means for tucking the film into the space **47** between two carriers **39** is provided at the knife position of FIGS. 5–7.

More particularly, as to the modification shown in FIGS. 12–17, the cross-bar **171** on the bottom of the bar **93** adjacent its forward end is retained. A film clamp bar **211** is mounted for vertical movement at the bottom of cross-bar **171** by means of pins **213** extending up from the clamp bar having heads **215** slidable in vertical holes **217** in the cross-bar. A coil compression spring **219** acts against each of the heads **215** bias the clamp bar **211** downward to an extended position shown as being determined by engagement of each head **215** with a plug **221** adjustably threaded in the lower ends of hole **217**. Other suitable means may be used for adjusting the lowered extended position of the clamp bar. The clamp bar has a rubber pad **223** on its bottom and, in the extended lowered position of the bar, the bottom of the pad is slightly below

the plane of the bottom surface of the platen sole plate **95**.

The above-mentioned tucking means comprises a tucking blade **225** which is mounted for vertical sliding movement on the inside face of the cross-bar **171** by means of screws **227** extending through vertical slots **229** in the blade and threaded in tapped holes in the cross-bar **171**. As herein illustrated, the tucking blade is adapted to be moved up and down by an air cylinder **231**, but it will be understood that other suitable means may be provided for actuating the tucking blade. The air cylinder is mounted on top of bar **93** and has a piston rod **233** extending down from a piston therein (not shown) to a connection at **235** with the tucking blade in a hole **237** in the bar **93**.

A stem **241** is cantilevered forward from the forward end of bar **93**. At the forward end of this stem is a cross-bar **243**. This is spaced from cross-bar **171** a distance corresponding to the spacing of the tray carriers **39**. A knife blade **245** is mounted for vertical sliding movement on the rear face of cross-bar **243** by means of bolts **247** extending through vertical slots **249** in the knife blade and through bolt holes in the cross-bar **243**. The knife blade **245** is spaced forward of the tucking blade **225** a distance corresponding to the spacing of the tray carriers **39**. Blade **225** is positioned for entry into the space between two successive carriers **39** and blade **245** is positioned for entry into the space between the leading one of these two carriers and the next carrier forward (toward the right).

The knife blade **245** is backed by a pressure plate **251**, bolts **247** extending through vertical slots **253** in this plate registering with slots **249** in the knife blade. Coil compression springs **255** react from cross-bar **243** against nuts on the forward ends of the bolts to bias pressure plate **251** toward the right against blade **245** for frictional engagement of the blade with the rear face of the cross-bar **243**. The knife blade is normally located in its lowered cutting position of FIG. 17 relative to the cross-bar **243** and friction between it and the cross-bar is sufficient normally to maintain it in this cutting position as it moves down with bar **93** and cuts the film F between two successive trays, but if it should encounter any abnormal resistance to cutting pressure, the knife blade is free to retract upward relative to the cross-bar **243** as they move downward, so as to avoid damaging the knife blade. If the knife blade has moved upward relative to the cross-bar **243**, it is necessary to move it back downward to its extended cutting position relative to the cross-bar for the next cutting operation. For this purpose, the pressure plate **251** is provided with a pair of rollers **257** at the top thereof and a shoulder **259** engaging the upper edge of the knife blade. A pair of cams **261** is provided on a rod **263** cantilevered frontward from plate extension **7***a* these cams being engageable by rollers **257** when the cross-bar **243** (carrying the knife blade **245** and the pressure plate **251**) moves upward with bar **93**. The cross-bar **243** carries a film clamp bar **211***a* identical to and mounted in the same manner as film clamp bar **211**.

In the operation of the modification shown in FIGS. 12–17, position-printed film F having the printed pattern including the registration mark repeated at intervals slightly greater than the length of a tray T1 is used. It will be understood that, as the apparatus proceeds in operation with such position-printed film, the film will fall back relative to the trays T1 and become out of register with the trays. When it has become out of register a predetermined amount, the electric eye scanner **201** transmits a signal for correction of the registration. This signal is utilized to actuate the air cylinder **231** to drive the trucking blade **225** downward to its extended position in which it appears in FIG. 16. Then, as the bar **93** (carrying cross-bar **171**, clamp bar **211** and the tucking blade **225**) moves downward, and before the platen **5** engages the film, the clamp bar **211** engages the film and clamps it down against the flange at the trailing end of the tray immediately forward of (leading) the platen (see FIG. 16). Then, the tucking blade **225** moves down into the space **47** between the tray carrier **39** under the platen and the next tray carrier **39** forward and tucks a length of film into this space, as shown in FIG. 16. Due to the tucking in of the film into the space **47**, the film is advanced forward relative to and over the tray T1 to which it is about to be sealed by the platen **5** to bring the film back into register with the tray. Then the platen **5** seals the film to the tray. As long as the film is in a range of acceptable registration with the trays, as determined by the electric eye scanner **201**, the tucking blade remains up in its retracted position of FIG. 15 (wherein its lower edge is above the plane of film F at its lowest point of descent).

With the knife blade **225** in its downwardly extended position relative to cross-bar **243** shown in FIG. 17, on each descent of the cross-bar **243** with the bar **93** (and stem **241**) the knife blade moves down in the space **47** between the two tray carriers **39** which is one tray length forward of the tucking blade and cuts the film F between the trays in these two carriers. If the knife blade encounters resistance to its downward movement with cross-bar **243**, it will slide upward relative to cross-bar **243**, clamping plate **251** moving upward with it. Then, on the subsequent ascent of the cross-bar **293**, rollers **257** engage the cam blocks **261** to drive the plate **251** and knife blade downward relative to the cross-bar **243** to restore the knife blade to its downwardly extended cutting position relative to the cross-bar **243** as shown in FIG. 17.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As various changes could be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

We claim:

1. Apparatus for sealing film covers on preformed containers comprising a conveyor for continuously conveying filled open-top containers forward one after another through a sealing zone with their tops upward, means for supplying a web of film to overlie the tops of the containers as they travel through said zone, a platen for sealing the film to the top of each container as it travels through said zone, means mounting the platen for movement in an orbital path wherein it moves downward to press the film against the top of a container, then forward in unison with the conveyor pressing the film against the top of said container for a sealing interval to effect forward feed of the film and sealing of the film to the rim, then upward away from the container and then rearward for repeating the cycle, the platen remaining substantially parallel to the plane of the conveyor in the sealing zone throughout said orbital path, and means for driving the platen to move it in said orbital path with allowance for movement of the platen at the speed of the conveyor when the platen moves forward with the conveyor during the sealing interval, wherein said platen mounting means comprises a pair of rotary members having eccentric pins carrying a bar extending generally parallel to the conveyor in the sealing zone, the platen being carried by said bar for up and down movement relative to the bar below the bar, and having means biasing the platen downward toward an extended position relative to the bar.

2. Apparatus for sealing film covers on preformed containers comprising a conveyor for continuously conveying filled open-top containers forward one after another through a sealing zone with their tops upward, means for supplying a web of film to overlie the tops of the con-

tainers as they travel through said zone, a platen for sealing the film to the top of each container as it travels through said zone, means mounting the platen for movement in an orbital path wherein it moves downward to press the film against the top of a container, then forward in unison with the conveyor pressing the film against the top of said container for a sealing interval to effect forward feed of the film and sealing of the film to the rim, then upward away from the container and then rearward for repeating the cycle, the platen remaining substantially parallel to the plane of the conveyor in the sealing zone throughout said orbital path, and means for driving the platen to move it in said orbital path with allowance for movement of the platen at the speed of the conveyor when the platen moves forward with the conveyor during the sealing interval, wherein said platen mounting means comprises a pair of rotary members having eccentric pins carrying a bar extending generally parallel to the conveyor in the sealing zone, the platen being carried by said bar for up and down movement relative to the bar below the bar, wherein the driving means is connected to drive said rotary members and has a resilient coupling therein to allow movement of the platen at the speed of the conveyor.

3. Apparatus as set forth in claim **2** having a common driver for said conveyor and said rotary members with a first drive from the common drive to the conveyor and a second drive from the common driver to said rotary members, said resilient coupling being in said second drive.

4. Apparatus as set forth in claim **3** wherein each rotary member comprises a crank disk having an eccentric crank pin, the bar which carries the platen extending between said pins, each disk being mounted on one end of a shaft, and the shafts for the disks being driven via said second drive.

5. Apparatus as set forth in claim **4** having means for adjusting the phase of one disk relative to the other.

6. Apparatus as set forth in claim **1** having means for heating the platen.

7. Apparatus for sealing film covers on preformed containers comprising a conveyor for continuously conveying filled open-top containers forward one after another through a sealing zone with their tops upward, means for supplying a web of film to overlie the tops of the containers as they travel through said zone, a platen for sealing the film to the top of each container as it travels through said zone, means mounting the platen for movement in an orbital path wherein it moves downward to press the film against the top of a container, then forward in unison with the conveyor pressing the film against the top of said container for a sealing interval to effect forward feed of the film and sealing of the film to the rim, then upward away from the container and then rearward

for repeating the cycle, the platen remaining substantially parallel to the plane of the conveyor in the sealing zone throughout said orbital path, and means for driving the platen to move it in said orbital path with allowance for movement of the platen at the speed of the conveyor when the platen moves forward with the conveyor during the sealing interval, wherein the conveyor is an endless conveyor comprising an endless series of container carriers each adapted to hold a filled container and to carry it through the sealing zone with the top of the container upward, and having means movable with and movable relative to the platen mounting means for shifting the film relative to the carriers for registration of printing on the film with the trays, wherein the carriers have spaces therebetween and the means for shifting the film comprises means for tucking the film into the space between two successive carriers, and having means movable with the platen mounting means for cutting the film between two successive carriers, wherein said cutting means comprises a knife blade carried by the platen mounting means one carrier length forward of the tucking means.

8. Apparatus as set forth in claim **7** wherein the knife blade is movable upward relative to the platen mounting means from an extended lowered cutting position wherein it is adapted to enter the space between two successive carriers and a raised retracted position in the event it encounters undue resistance to cutting the film, and wherein means is provided for returning the blade to its lowered cutting position on upward movement of the platen mounting means.

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