

July 24, 1962

W. F. MITCHELL

3,045,403

PACKAGING MACHINE AND METHOD OF FORMING PACKAGES

Filed Nov. 12, 1959

8 Sheets-Sheet 2

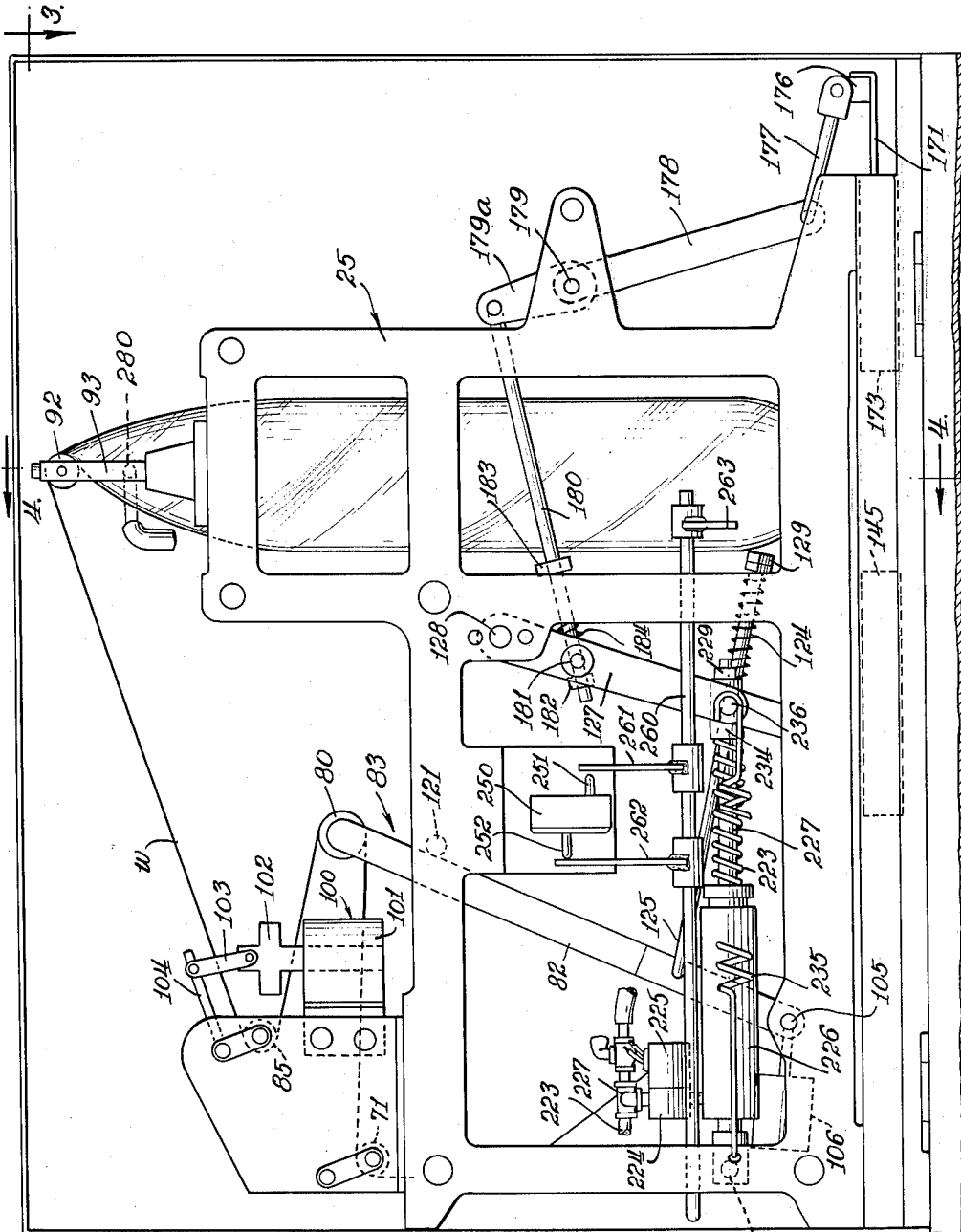


Fig. 2.

INVENTOR,
Wallace F. Mitchell
BY
Fidler, Beardsley and Beardsley
Attys.

July 24, 1962

W. F. MITCHELL

3,045,403

PACKAGING MACHINE AND METHOD OF FORMING PACKAGES

Filed Nov. 12, 1959

8 Sheets-Sheet 4

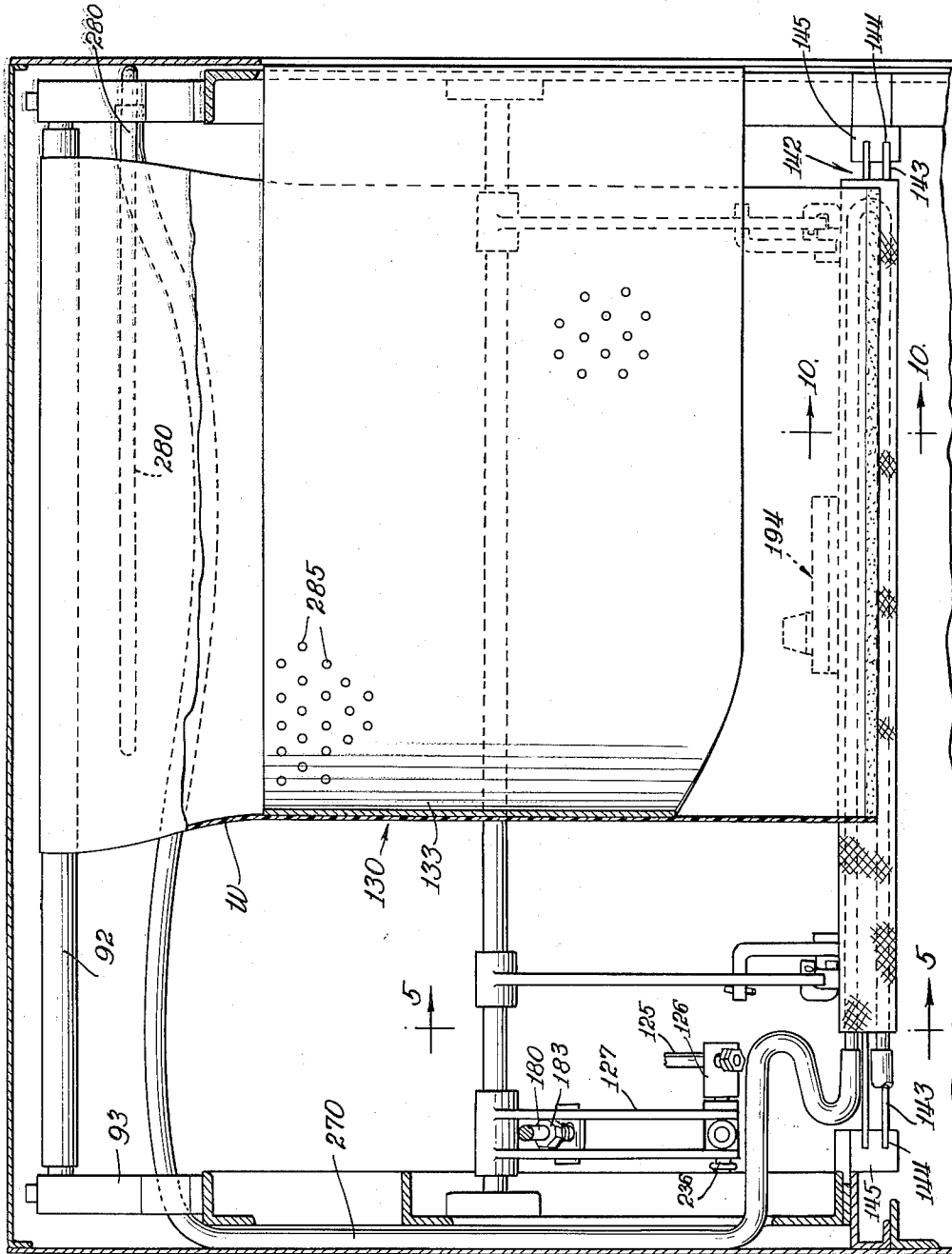


Fig. 4.

INVENTOR.
Wallace F. Mitchell
BY
Fidler, Beardsley and Beardsley
Att'ys.

July 24, 1962

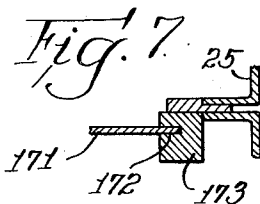
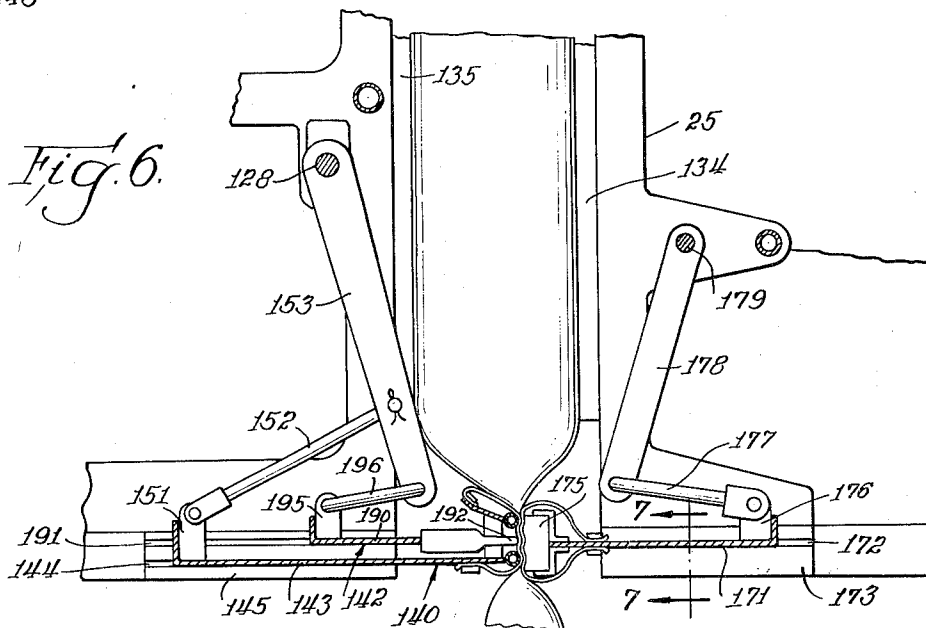
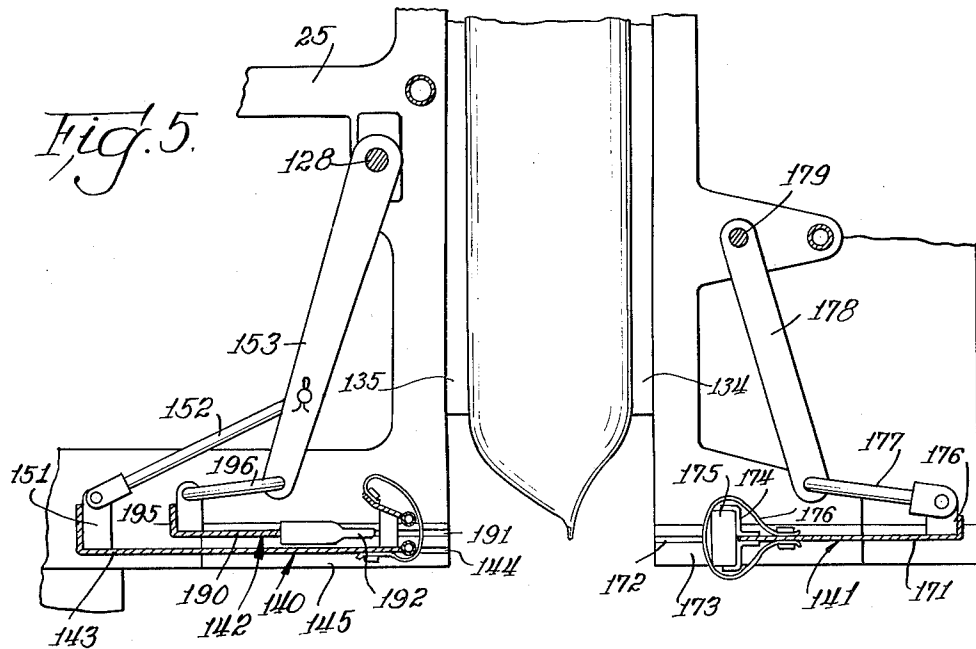
W. F. MITCHELL

3,045,403

PACKAGING MACHINE AND METHOD OF FORMING PACKAGES

Filed Nov. 12, 1959

8 Sheets-Sheet 5



INVENTOR.
Wallace F. Mitchell
 BY
Fidler, Boudley and Boudley
 Attys.

July 24, 1962

W. F. MITCHELL

3,045,403

PACKAGING MACHINE AND METHOD OF FORMING PACKAGES

Filed Nov. 12, 1959

8 Sheets-Sheet 6

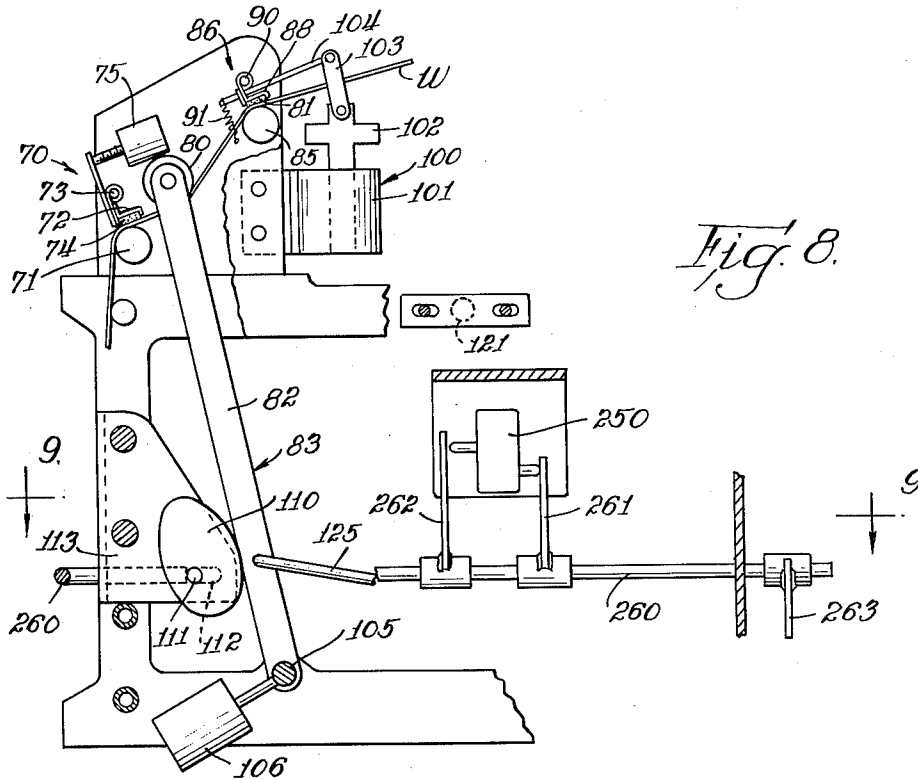


Fig. 8.

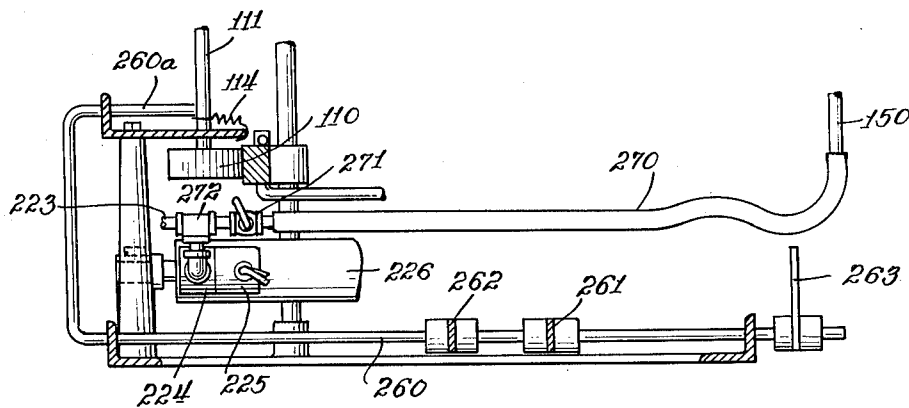


Fig. 9.

INVENTOR.
Wallace F. Mitchell
 BY
Fidler, Beardsley and Bradley
 Attys.

July 24, 1962

W. F. MITCHELL

3,045,403

PACKAGING MACHINE AND METHOD OF FORMING PACKAGES

Filed Nov. 12, 1959

8 Sheets-Sheet 7

Fig. 10.

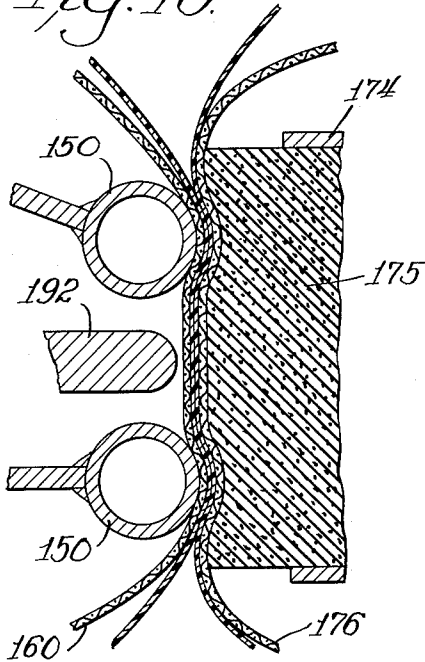


Fig. 11.

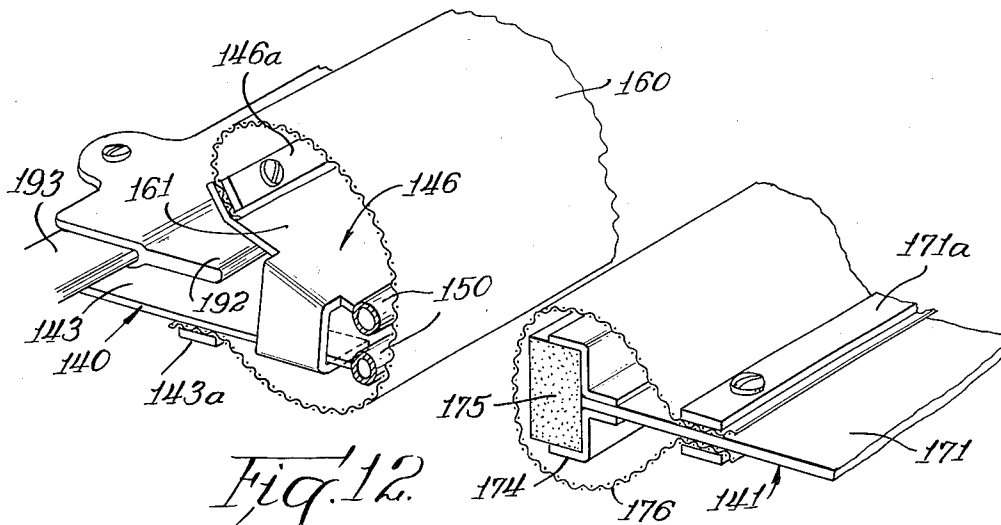
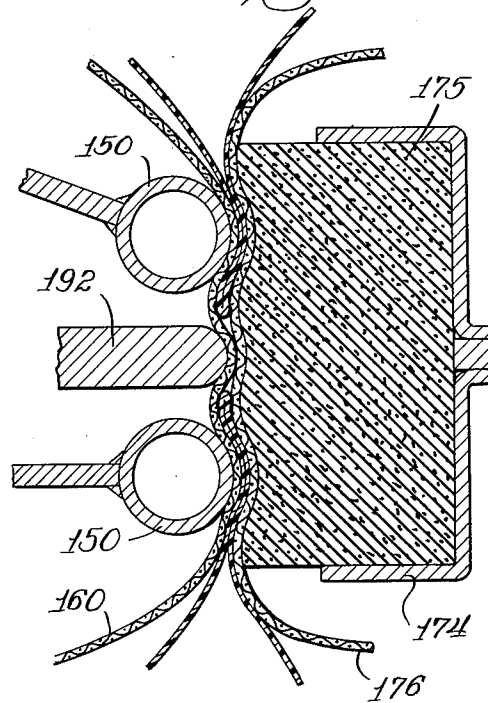


Fig. 12.

INVENTOR.
Wallace F. Mitchell
BY
Fidler, Boardley and Bradley
Attys.

July 24, 1962

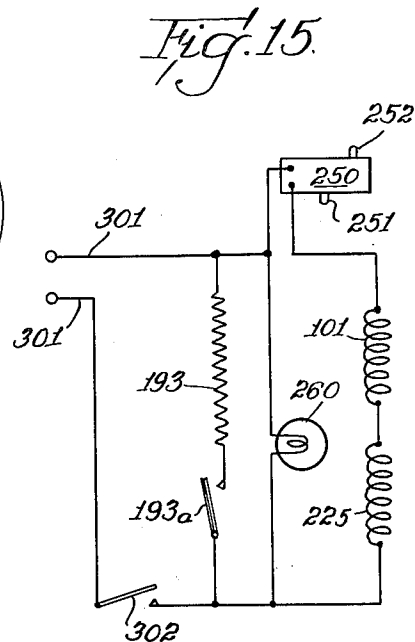
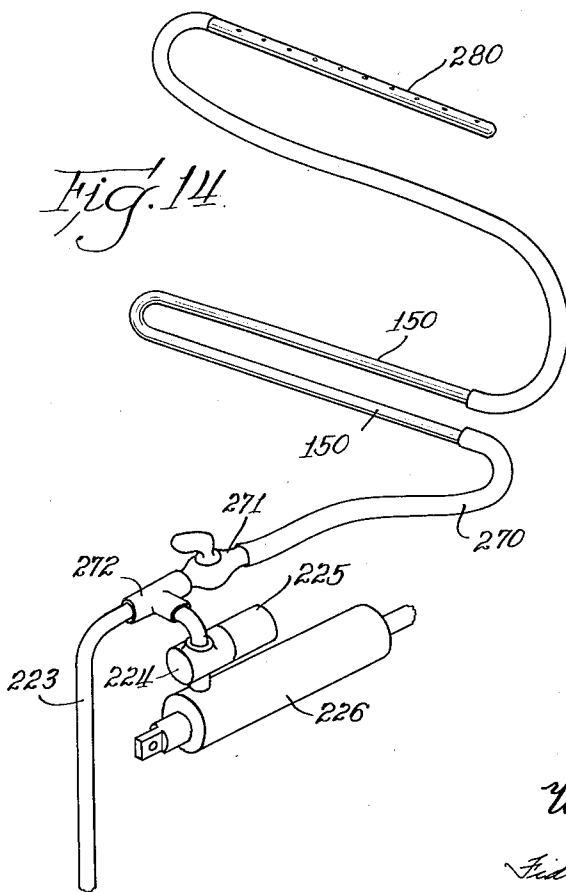
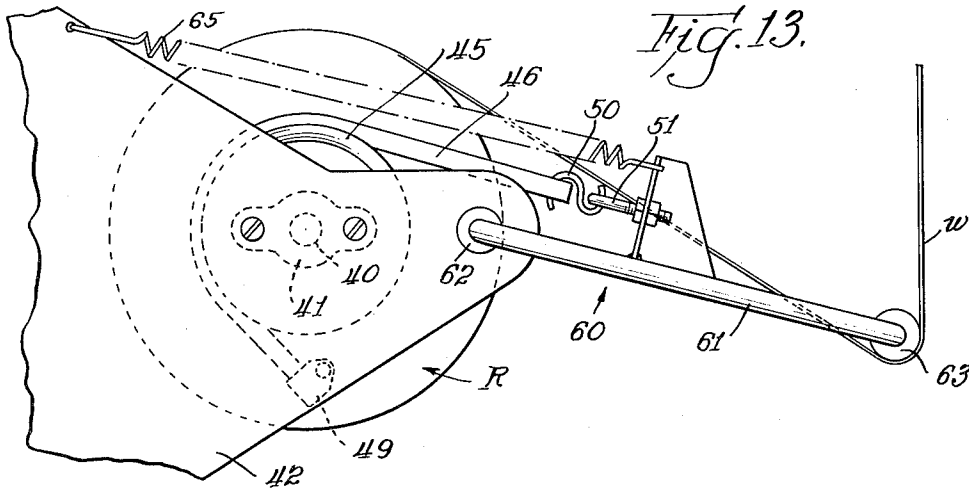
W. F. MITCHELL

3,045,403

PACKAGING MACHINE AND METHOD OF FORMING PACKAGES

Filed Nov. 12, 1959

8 Sheets-Sheet 8



INVENTOR.
Wallace F. Mitchell
BY
Fidler, Beardsley and Bradley
Attys.

1

3,045,403

PACKAGING MACHINE AND METHOD OF FORMING PACKAGES

Wallace F. Mitchell, Arlington Heights, Ill., assignor to
E-Z Packaging Corporation, Chicago, Ill., a corpora-
tion of Illinois

Filed Nov. 12, 1959, Ser. No. 852,307

6 Claims. (Cl. 53-74)

This application is a continuation in part of Mitchell U.S. Patent 2,931,149 issued April 5, 1960 on an application filed March 17, 1958.

This invention relates to packaging machines and has to do more particularly with an improved machine for forming a bag-type container around the article to be packaged from flexible film stock in web form, and to a novel method of forming packages.

This invention is adapted for application to the packaging of a large number of different types of items. One illustrative application is the packaging of folded items of clothing, such as men's shirts and for the purpose of illustration the invention is shown and described herein in connection with a machine particularly adapted for such use although the machine as shown is capable of packaging other items.

Machines have been known heretofore for forming bag-like containers or wrappers around articles from flexible, heat-sealing, thermoplastic film stock in the form of a continuous web and then severing such bag-like container or wrapper from the web, thus providing a bag enclosing the article. The stock may be any suitable heat-sealing, thermoplastic film material and preferably polyethylene is used because of its desirable properties, such as, strength, flexibility, heat-sealing ability, thermoplastic nature and transparency. The stock used is folded along its longitudinal centerline to provide two folds or plies and is wound into a roll from which it is withdrawn as desired. In forming a bag according to known practice, a length of web is withdrawn from the roll, and the web is heat sealed and severed along a transverse line to form one edge of the bag, the fold forming another edge. Thereafter, the article to be packaged is inserted between the folds of the web and then the web is heat sealed and severed along a second transverse line spaced from the first line, to form the third edge of the bag. In each sealing and severing operation the severed web is sealed on both sides of the line of severing. Therefore, in forming bags subsequent to the first bag formed from any single roll of film stock, it is only necessary to perform a single heat sealing and severing step. The fourth edge, which is opposite the fold in the web, is open and hence the packaged article may readily be removed through such opening whenever desired.

Heretofore the stock was heat sealed and severed by clamping it between a clamp including a pair of clamping elements and a pad and by applying a heated blade to the stock between the pair of clamping elements. Because the clamping elements were close to the heated blade, they were heated thereby and often served to heat seal and sever the stock along transverse lines displaced from the intended line of heat-sealing and severing, with the result that the web was severed either on one side or the other or both of the desired line of severing rather than on the desired line.

An object of the present invention is to provide a new and improved packaging machine and method of forming packages.

Another object is to provide a packaging machine of the type having a pair of spaced parallel clamping elements and a cooperating pad movable into position to clamp the film stock therebetween and a heated blade movable between the clamping elements and into position

2

to heat seal and sever the film stock, wherein means are provided for cooling the clamping elements to thereby prevent them from softening or severing the film stock clamped in the clamps.

Another object is to provide a packaging machine of the foregoing character wherein the clamping elements are formed by hollow tubing and are cooled by passing a current of air through such tubing.

Another object is to provide a packaging machine of the foregoing character wherein means are provided for preventing the film stock from sticking either to the clamping elements, the pad or the blade.

Another object is to provide a novel mechanism for moving the clamping elements, pad and blade between their respective active and inactive positions.

Other objects and advantages will appear from the following description, taken in connection with the appended drawings, wherein:

FIGURE 1 is a perspective view showing a preferred embodiment of my invention, with certain of the mechanism and the web being shown in broken lines;

FIG. 2 is an enlarged, sectional view taken along line 2-2 of FIG. 1 and is essentially a view of the upper portion of the machine from the rear, with the rear cover removed;

FIG. 3 is an enlarged, sectional view taken along line 3-3 of FIG. 1, and is essentially a view of the upper portion of the machine from the top, with the top cover removed;

FIG. 4 is a sectional view taken along line 4-4 of FIG. 2;

FIG. 5 is an enlarged, fragmentary sectional view taken along line 5-5 of FIG. 4;

FIG. 6 is a view similar to FIG. 5 but showing the movable members in a different operating position;

FIG. 7 is a fragmentary, sectional view taken along line 7-7 of FIG. 6;

FIG. 8 is a fragmentary, sectional view taken along line 8-8 of FIG. 3;

FIG. 9 is a fragmentary, sectional view taken along line 9-9 of FIG. 8;

FIG. 10 is an enlarged, fragmentary view of the clamping elements and the severing and sealing blade;

FIG. 11 is a view similar to FIG. 10 but showing the members in a different operating position;

FIG. 12 is an enlarged, fragmentary view showing details of construction of the clamping elements;

FIG. 13 is an enlarged, fragmentary front elevational view of the roll support, accumulator and brake mechanism;

FIG. 14 is a diagrammatic view showing the air system; and

FIG. 15 is a wiring diagram showing the electrical system.

Referring now particularly to FIG. 1, the machine is formed with a bottom section 20, a top section 21 and an intermediate section 22 upstanding from the rearward portion of the bottom section so as to support the top section 21 in overhanging relation to the bottom section.

The machine comprises a frame 25 (see FIGS. 2 and 3) formed from a plurality of vertically and horizontally arranged structural members secured together suitably to support the various members forming the mechanism hereinafter described. The frame 25 and the mechanism supported thereby are enclosed in a casing formed by a plurality of cover members. Two front cover members 30, 31 hinged to the frame permit access to the interior of the casing. The remaining cover members 32 and the counter 38 are suitably secured to the frame.

A stock roll R (FIGS. 1 and 13) consisting of a roll of longitudinally folded film stock is removably carried by

and rotatably mounted by an arbor 40 journaled in bearings 41 (one of which is shown) carried by brackets 42 projecting from the frame 25 in the lower portion of the casing. The stock roll R is removably mounted on the arbor by cones (not shown) in a known manner, against angular movement relative to the arbor so that it rotates with the arbor.

A roll brake is provided for holding the arbor against rotation in its bearings, which brake includes a brake pulley 45 secured to the arbor for rotation therewith and having a V-shaped groove (not shown) in the periphery, and a V belt 46 connected at one end to the adjacent bracket 42 and at the other end to a bracket carried by an arm 61 of an accumulator yoke 60 hereinafter described. The belt 46 is arranged to pass around and engage the brake pulley 45 for a substantial angular extent and preferably approximately 180°. The end of the belt 46 which is attached to the bracket 42 is fixedly attached as by a clamp 49 and the other end is attached to the bracket 47 by an adjustable connection, such as, a hook 50 and screw anchor 51 so that the effective length of the belt 46 may be adjusted.

An accumulator yoke 60 (FIGS. 1 and 13) is provided for withdrawing stock from the roll R and for applying the roll brake to prevent further rotation of the stock roll R when the desired length of stock has been withdrawn as hereinafter explained.

Referring particularly to FIGS. 1 and 13, the accumulator yoke 60 includes side bars 61 pivotally supported at one end in bearings 62 in the brackets 42 for swinging movement. The side bars 61 carry at their outer ends a shaft (not shown) on which is rotatably mounted a guide roller 63. The side bars, shaft and roller together constitute the accumulator.

The accumulator, as will be seen, swings about a pivot which is displaced from the axis of rotation of the stock roll. The arrangement is such that as the accumulator swings downwardly under the action of gravity on the yoke and roll it withdraws stock from the roll causing the roll to rotate. As the accumulator approaches the end of the downward movement it applies a tension to the brake belt and at the same time wraps it further around the brake pulley to thereby halt the rotation of the stock roll R.

A tension spring 65 (FIG. 13) is connected between the accumulator and a fixed portion of the machine (for example, between the bracket 47 and the bracket 42) which serves to counterbalance the accumulator and yieldably and resiliently limit the downward movement of the accumulator.

Referring particularly to FIG. 1, it will be seen that the portion W of the stock which has been withdrawn from the roll R and which is sometimes hereinafter referred to as the "web" extends from the stock roll R and under the roller 63 and thence upwardly through the intermediate section 22 of the machine and to the upper section 21.

The web W then passes through a one way brake 70 (see FIGS. 3 and 8) mounted on the frame at the upper right-hand portion of the upper section 21. The brake 70 includes a first brake member 71 comprising a roller rotatable in the frame 25 and a second brake member comprising a brake shoe 72 extending substantially the depth of the machine from front to rear, and mounted for movement about a fixed pivot 73. The brake shoe carries a friction member 74 formed from a suitable soft, resilient friction material, such as, sponge rubber or a spongy plastic. The brake shoe 72 normally is pressed by gravity against the roller 71 and bears against the web W to grip the latter between the brake members in such manner as to permit upward advancing movement of the web W but to prevent any reverse, downward movement. A biasing weight 75 is provided which is adjustable relatively to the pivot axis of the brake shoe for adjusting the gripping action of the brake.

Upon any upward movement of the web W past the brake 70, which movement is effected by means to be described hereinafter, the tendency of the web W to shorten in the portion extending between roll R and the brake 70 causes the accumulator yoke 60 to be rotated upwardly from its normal position (shown in FIG. 13). This upward rotation causes the tension on the brake belt to be relieved and the angular extent of engagement between the brake belt and brake pulley to be lessened, which frees the pulley 45 and consequently the arbor 40 and the stock roll R for rotation. As explained above, the web W is gripped by the brake 70 so that it cannot be drawn downwardly. Accordingly, when the upward movement of the web ceases, the weight of the accumulator yoke 60 in moving downwardly to its normal position causes stock to be withdrawn from the stock roll R with the result that the roll is rotated. However, when the accumulator 60 reaches its normal position the brake belt acting on the pulley causes the belt to be engaged against the pulley sufficiently to halt further rotation of the roll R and to hold the roll in its halted position until the accumulator yoke 60 is again lifted.

It will be seen that the difference in the length of the web W which extends from the roll R to the brake 70 in the upper and lower positions of the accumulator yoke 60 constitutes an accumulated length of web W which may be drawn upwardly through the brake 70 merely upon the application of sufficient force to lift the accumulator yoke 60. The machine is so designed that this length of material is always sufficient for the purposes required by other mechanisms of the machine so that it is not necessary for such other mechanisms to cause the roll to rotate. Rotation of the roll is effected by the lowering of the accumulator yoke as just explained, which action takes place during a portion of the cycle of operation of the machine in which the web is not being drawn upwardly through the brake 70. Accordingly, it is not necessary that the web-advancing means hereinafter to be described serve to withdraw stock from the roll or cause rotation of the roll. It might be explained at this point that the web-advancing means hereinafter described operates with sufficient rapidity so that if it were required to accelerate the roll to withdraw stock from the roll an undue load would be placed on such mechanism and, moreover, the web would be stressed and either stretched or torn.

After passing over the brake roll 71, the web W passes under a measuring roller 80 (FIGS. 2 and 8) rotatable on a shaft 81 carried by a pair of parallel side arms 82 which members together form a measuring yoke 83. The web W then passes around a roller 85 rotatably mounted in the frame 25 and forming a first braking member of a solenoid activated brake 86. The other brake member includes a brake shoe 88 carrying a friction member 89 formed from sponge rubber or a spongy plastic. The brake shoe 88 is mounted for movement about a pivot 90 and is disposed to be moved into position engaging the roller 85 and to grip the web thereagainst. However, the brake shoe 88 is normally urged yieldably away from the roller 85 by a spring 91.

The brake 86 is actuated to grip the web by a solenoid 100 including a coil 101 (see also FIG. 15) and a co-operating plunger 102 connected by a link 103 to a lever 104 rigidly attached to the brake shoe. The arrangement is such that when the solenoid coil 101 is energized as hereinafter explained, the plunger 102 is pulled down and rocks the brake shoe 88 about its pivot and into gripping relation with the roller 85.

Means are provided between the brake 70 and the brake 86 for advancing a measured length of stock, the length of which is sufficient to form the bag. Such means operates to provide between the brakes 70 and 86 a length of stock which is available to be advanced past the brake 86 during the forming of the bag, by means hereinafter described, without requiring the withdrawal of any additional stock from the roll R.

5

The measuring yoke 83 includes the aforementioned arms 82 carrying the roller 80 which arms are pivotally mounted on the frame by a shaft 105 for movement of the yoke between an inner or rest position (as seen in FIG. 2) and an outer or activated position (as seen in FIG. 8). The yoke 83 normally is maintained in its inner position by its own weight. An adjustable counterweight 106 is rigidly connected as by an arm 107, to the shaft 105, to vary the effective weight of the measuring yoke assembly.

The limit of movement of the measuring yoke into its outer position is determined by a cam-shaped adjustable actuator 110. The actuator 110 is supported on the frame by a shaft 111 extending through a slot 112 in a bracket 113 at the rear of the frame and through a bearing (not shown) at the front of the frame. The rear end of the rod is urged toward the right (as viewed in FIGS. 8 and 9) by a spring 114. A handle 115 is provided for rotatably adjusting the shaft and consequently the actuator 110 to different rotational positions. Thus, the operator can adjust the outer position of the measuring yoke 83 and consequently the length of material measured out, as will now be explained.

The limit of movement of the measuring yoke 83 into its inner position is determined by a pair of fixed, adjustable, stops 120, 121 (FIGS. 3, 8 and 9) carried by the frame 25, which stops lie in the path of movement of the side arms 82 respectively in position to be abutted thereby.

The measuring yoke 83 is moved into its inner position by a rod 125 which is connected at one end to the measuring yoke (FIGS. 3 and 8) and passes through a swivel pin 126 pivotally carried, in a manner hereinafter described, by a main drive arm 127, which latter is fixed on the main drive shaft 128 journaled in the frame 25. Carried on the outer and free end of the rod 125 is an adjustable stop 129, such as a pair of nuts, and inwardly of the stop a coil spring 124 is received on the shaft. The arrangement is such that counterclockwise movement of the main drive shaft 128 (as viewed in FIG. 2) moves the measuring yoke 83 in a clockwise direction and into its inner position. In this position the weight of the yoke overbalances the counterweight slightly so that the yoke remains in such position until the web is drawn downwardly in the machine as hereinafter explained.

The measuring yoke is normally in its inner position and is counterbalanced by the counterweight 106 so that very little force is necessary to move it toward its projected position. Thus, upon advancing movement of the web in a "feeding" direction through the brake 86 by the weight of the article as hereinafter explained the measuring yoke 83 is moved rapidly to its outer position. In such feeding it is not necessary to advance any of the web which is between the one-way brake 70 and the accumulator roller 63. Accordingly, the advancement of the portion of the web between the brake 70 and the article guide 130 (hereinafter described) does not require the lifting of the accumulator.

The weight of the accumulator is such that the web is advanced past the brake 70 by the measuring yoke only when the latter moves toward its inner position to draw the web past the brake 70. The solenoid operated brake 86 has been electrically closed to clamp the web before the measuring arm is moved toward its inner position. When the web forwardly of the brake 70 is advanced and the measuring yoke moves toward outer position, as above explained, the weight of the accumulator is such as to prevent any movement of the portion of the web which is back of the brake 70. In other words, such portion of the web is advanced only when the measuring yoke 83 is moved to its inner position by its actuating mechanism and any other advancement of the portion of the web forwardly of the brake 70 does not require advancing movement of the web rearwardly of the brake 70. In passing from the brake 86 to the article guide 130, the

6

web is led over a guide roller 92 (FIG. 2) supported vertically above the center of the article guide by a pair of brackets 93.

The article guide 130 (see FIGS. 1, 2 and 3) serves both for spreading the two plies or folds of the web W and for guiding an article to be packaged into the space between the two folds or plies. The article guide or receiver 130 includes a member of rigid sheet material bent into a U shape disposed vertically, thus providing a left-hand wall 131, a right-hand wall 132 parallel thereto and an arcuate end wall 133 joining the right and left-hand walls 131 and 132. The walls 131 and 132 at their forward portions are formed with divergent portions 134 and 135 which form an entry portion of the article guide and which portions are secured to the frame for supporting the article guide thereon.

The side walls 131 and 132 of the article guide are spaced apart a distance which permits the easy insertion of the article to be packaged. Thus, the spacing between such walls is dictated by the thickness of the article. The height and length of such walls also are dictated by the corresponding dimensions of the article to be packaged. The dimension of the package in a front to rear direction relatively to the machine is determined, of course, by the width of the film stock. The dimension of the package in a vertical direction relatively to the machine is determined by the adjustment of the measuring means. The thickness of the package, of course, is established by the thickness of the article to be packaged, since the flexible film stock adapts itself to the size and shape of the article to be packaged, insofar as this result may be accomplished depending upon the size and shape of the article relatively to the size of the wrapper.

Means are provided for clamping two plies of the web together along a longitudinal line at a level below the article guide to permit severing of the web and sealing or welding the plies together on the two sides of the lines of severance. Referring now particularly to FIGS. 3, 5 and 6, the clamping and welding means includes a clamp slide 140, a pad slide 141 and a blade slide 142.

The clamp slide has a plate or slide portion 143 slideable in grooves 144 in guide blocks 145 secured to the frame at the front and rear portions, respectively. Integral with the clamp slide 140 at its forward end is a clamping member 146. The forward edges of the slide portion 143 and of the clamping member integrally carry gripping elements or clamp jaws 150. The clamp jaws are formed from hollow tubing and preferably from a single tube which is bent back upon itself, as shown particularly in FIGS. 4 and 14. The clamp jaws 150 are cooled by passing compressed air therethrough in a manner hereinafter described.

The clamp slide is formed with an upstanding flange 151 to which is pivotally connected one end of each of a pair of actuating rods 152, the other ends of which are connected to a pair of actuating levers 153 secured on the main drive shaft 128 and rockable therewith.

The pad slide 141 has a slide portion 171 which is slideable in grooves 172 formed in blocks 173 at the front and rear of the machine, respectively. The slide portion 171 carries at its inner end a channel-shaped element 174 in which is secured a pad 175 formed of a suitable material, such as, a heat-resisting foam plastic which material is not deteriorated by the heat of the severing and sealing hereinafter described.

The slide portion 171 has at its outer edge an upstanding flange 176 to which is pivotally connected one end of each of a pair of actuating rods 177, the other ends of which are connected respectively to levers 178 which are carried rigidly on an auxiliary drive shaft 179 journaled in the frame. The auxiliary drive shaft 179 is connected to the main drive shaft 128 whereby it is rocked in the opposite direction from the main drive shaft whenever the latter is rocked. This connection includes a lever 179a (FIG. 2) rigidly carried on the auxiliary

drive shaft 179 to the end of which is pivotally connected to drive rod 180 which passes through a swivel pin 181 pivotally carried by the main actuating lever 127. The rod 180 is retained in the pin 181 by a nut 182. On the opposite side of the swivel pin a stop 183 is provided and a compression spring 184 is interposed between the stop 183 and the swivel pin 181, the purpose of which spring will hereinafter appear.

The blade slide 142 (FIG. 5) includes a slide portion 190 which slides in grooves 191 formed in the blocks 145 and carries at its forward end a severing and sealing blade 192. The blade is heated by a heater element 193 carried by the blade slide 142 and connected electrically to an adjustable thermostat 194 (FIG. 4) and to a source of electrical energy (not shown) as hereinafter explained. The blade slide 142 has at its rear end an upturned flange 195 to which is connected one end of a pair of actuating rods 196, the other ends of which are connected to the actuating levers 153.

The clamp slide 140 and the pad slide 141 are arranged for sliding movement in a horizontal plane toward and away from each other below the article guide 130 so that they meet and are arranged to clamp together the two plies of the web along a line substantially in the vertical medial plane of the article guide 130. At this point it should be explained that the clamping jaws 150 and the pad 175 extend from the front to rear of the machine a sufficient distance so that they project beyond the side edges of the web.

The clamp slide 140 and the pad slide 141 move between projected positions of mutual engagement and retracted positions away from each other in which latter position they are well to the sides of the article guide 130 and do not interfere with the movement of the two plies of the web past and below the lower edges of the article guide 120.

The blade slide 142 is slideable from a retracted position (FIG. 5) where it is displaced from the clamping jaws 150 to a projected position (FIG. 6) where it is in position between the clamping jaws. The arrangement is such that the clamping jaws 150 first engage the web and urge it against the pad, whereafter the blade is moved into position (FIG. 11) to heat seal and sever the web. It will be understood by those skilled in the art that the heat of the blade 192 when it is in its projected position causes the film stock forming the plies to be melted along the line corresponding to that of the blade edge and at the same time the severed edges of the film stock are sealed by the material melting and rolling back from the blade while in plastic condition and then fusing together.

Means are provided for preventing the film stock from sticking to the blade and clamping jaws when these elements are brought into their projected positions to clamp, sever and heat seal the web. This means takes the form of a flexible shroud 160 which is attached at one end to a rearwardly extending portion 161 of the clamping member 146 by a holding stay 146a and is turned back upon itself and passes down in front of the clamping jaws 150 and is secured to the underside of the slide portion 143 as by a holding strip 143a.

Somewhat similar means are provided for covering the channel 174 and pad 175 which means includes a flexible shroud 176 wrapped around the channel 174 and pad 175 as shown in FIG. 12 and suitably secured as by a pair of holding strips 171a.

The shrouds 160 and 176 are formed from a material to which the web material does not stick when the web is heated. To this end, the shrouds preferably are made from cloth formed by weaving threads of glass fibers ("Fiberglas") which cloth is coated with "Teflon" (which is polymerized tetra-fluoro-ethylene made and sold by E. I. duPont de Nemours & Co. of Wilmington, Delaware).

The shroud 160 also serves to prevent the web W from coming into contact with the hot surfaces of the clamp-

ing member and sticking thereto. To this end I preferably support the shroud 160 in such manner that it is spaced from the hot surfaces of the clamping member and thus holds the web away from such surfaces. In the preferred form the shroud is arranged as shown in FIG. 12 so that it is spaced from the hot surfaces except where it is attached and thus holds the film stock spaced from such surfaces.

The pad slide and clamping slide are moved to their clamping (projected) positions when the main drive shaft is rocked in a counterclockwise direction by the main drive as hereinafter explained. This movement rocks the pairs of levers 153 in a corresponding direction to thereby actuate the paired rods 152 and 196 to move the clamping slide and blade slide toward their projected positions. The counterclockwise movement of the driving lever 127 also compresses the spring 184 against the stop 183 to urge the rod 180 to the right (as viewed in FIG. 5), which moves the lever 179a in a clockwise direction to rotate the auxiliary shaft 179 correspondingly. Thus, the levers 178 are rocked in a clockwise direction to move the pad slide 141 inwardly into the position shown in FIG. 6 to grip the web between it and the clamping jaws.

Owing to the fact that the rods 152 are pivotally connected to their respective levers 153 at points nearer to the pivot axis of such levers than are the rods 196, the blade slide 142 moves inwardly faster than the clamping slide and for a greater distance.

It should be noted at this point that clamping jaws 150 and pad 175 clamp the web before the blade engages the web and remain in clamping engagement with the severed and sealed ends of the web and bag after the later is formed. Thus, when the clamping slide and the pad slide are retracted, the package, including the bag and enclosed article, can drop free of the web without any possibility of the weight of the package causing the web to be torn at the line of severance. It will be seen that when each article is packaged and the package wrapper severed from the web the package drops by gravity onto the counter 38.

The main drive shaft 128 is rocked by a suitable drive means which in the present illustrative embodiment of the invention includes an air motor 220 pivotally supported on the frame for slight rocking movement by a pivot pin 221 supported in the frame 25. The air motor 220 is supplied with compressed air from a suitable source such as an air compressor (not shown) which is connected to a fitting (not shown) connected by a hose 223 to a T connection 272 which in turn is connected to an air valve 225 mounted on and controlling the flow of air to the air motor 220.

The air motor includes a cylinder 226 in which a piston (not shown) is slideable and to which is connected a piston rod 227 which projects from the cylinder and which is pivotally connected to the lever 127 by a swivel pin 236 through which the piston rod is slideable. The end of the piston rod 227 which projects from the cylinder 226 threadedly carries an adjustable stop nut 229. A spring 233 surrounds the piston rod 227 and is compressed between the cylinder 226 and a washer 234 on the piston rod 227 to yieldably urge the washer 234 against the swivel pin 236. The swivel pin 236 serves to mount the swivel pin 126 by reason of the latter's being threaded into the swivel pin 236. The threads are such as to permit relative swiveling movement of the two swivel pins about their common axis.

The main drive shaft is normally urged clockwise (as viewed in FIG. 2) to the limit of its movement by a return spring 235 connected between the arm 232 and a fixed anchor such as the frame 25.

When the air valve 224 is opened to allow air under pressure to enter the cylinder 226, the piston (not shown) is driven forwardly (to the right as viewed in FIG. 2) to exert a force, through the driving spring 233, on the washer 234 and rock the drive arm 127 to thereby rock

the main drive shaft 128 in a counterclockwise direction and move the clamp slide 140 and pad slide 141 into their inner, abutting positions. When the air valve 224 is closed, the return spring 233 returns the lever 127 to its initial position.

Supported on the frame 108 is a microswitch 250 having a closing plunger 251 and an opening plunger 252. The microswitch is of a conventional type wherein it is closed upon depression of the plunger 251 and stays closed until the opening plunger 252 is depressed, and is opened upon depression of the opening plunger 252 and stays open until it is again closed by the depression of the closing plunger 251.

The microswitch controls the energization of the electrical circuit hereinafter described including the air valve solenoid 225. At the time when the measuring yoke 83 is moved to the left as viewed in FIGS. 8 and 9 the microswitch is closed. Near the end of the stroke of the yoke 83 it depresses the plunger 251 to close the microswitch 250 and initiate a cycle of operation of the machine. This is effected by a control rod 260 which is slideable in the frame in a side-to-side direction. The rod 260 has a main portion provided with two arms 261 and 262 upstanding therefrom in position to abut against the plungers 251 and 252, respectively, upon suitable operation in opposite directions. The rod 260 also carries an arm 263 which lies in the path of the piston rod 227 for actuation thereby.

The rod 260 is bent back upon itself whereby its one end 260a is positioned to be abutted by the shaft 111 carrying the actuator 110.

From the foregoing, it will be seen that when the measuring yoke 83 is moved to its outer position it strikes against the actuator 110 which moves the shaft 111 into engagement with the end of the control rod to move the latter to the left (as viewed in FIG. 9) and energizes the microswitch. The control rod 260 is not biased in either direction but remains at the limit of its movement in either direction until moved in the opposite direction by the control rod.

When the air motor 220 is actuated and the piston rod 227 is projected further from the cylinder 226, it strikes the arm 263 to move the control rod into a position to open the microswitch 250.

Means are provided for passing a current of cooling air through the hollow clamping jaws 150 to prevent them from being overheated by the heat of the blade 192. Accordingly, one end of one of the clamping jaws 150 is connected through a hose 270 to a divider valve 271 connected to the T connector 272. The valve 271 may be opened to any desired extent to permit the continuous passage of air to the hose 270 to the extent desired with the remainder of the air being available to actuate the air valve.

Means are also provided for introducing air under pressure into the space between the plies and the web for the purpose of separating and spreading the plies of the web ahead of the article guide. This is effected by providing a perforated closed end tube 280 which is supported in position approximately vertically above the center of the article guide and between the top of the article guide 130 and the guide roller 92. The introduction of air under pressure between the plies also aids in dissipating any static electrical charge which may have developed because of the friction arising out of the passage of the web over the guide rolls and along and over the article guide.

The foregoing advantageous results may be enhanced in some instances by providing perforations 284 in the walls of the web guide, preferably substantially over the entire area of the walls. The perforations allow air to pass through the walls and force the film stock away from the walls and thus overcome the attraction between the article guide and film stock caused by the static electrical charge. Moreover, the compressed air which

reaches the perforated tube 280 has been heated by its passage through the clamping elements and also the air, in many instances, will be moist where the machine is located in a humid climatic zone, as for example a laundry. This moist heated air is highly effective in dissipating rapidly any static electrical charge which may have been built up on film stock, extending from the guide roller to the end of the web.

FIG. 15 shows a schematic wiring diagram of the electrical circuits embodied in the machine. A pair of conductors 301 are provided for connecting the several circuit elements hereinafter described to a source of electric power (not shown) and a main switch 302 is provided which is connected in series with all of the other circuit elements. The blade heating resistor 193 and the adjustable thermostatic switch 194 are connected across the line beyond the switch 302. The thermostatic switch 194 controls the energization of the heating resistor to maintain the blade at a substantially uniform, desired temperature. The actuating solenoid 225 for the air valve 224 is connected across the line beyond the switch 302 (indicated diagrammatically) and in series with the microswitch 250, whereby the solenoid 225 is actuated to maintain the valve open while the microswitch is closed and is deenergized when the microswitch is open to permit the normally closed air valve to close. The actuating solenoid 101 for the brake 86 also is connected in series with the microswitch and hence is in energized condition during movement of the web by the measuring yoke. A pilot lamp 260 preferably is provided which is connected across the line beyond the main switch 302 to indicate whether the latter is open or closed.

When the machine is to be placed in operation an air supply (not shown) is connected to the hose 233 which supplies air to the valve and to the tube 280. The electrical circuit is connected to a source of electrical energy and the main switch 302 is closed which energizes the heater 193 and pilot light 260.

The machine normally assumes the condition illustrated in FIGS. 2, 3, 4, 5 and 12, wherein the three slides are in their retracted positions. Under normal conditions of operation the slides are in their inner positions only for a period sufficient to sever and weld the film material. Assuming that there is no film stock in the machine, and the machine is to be prepared for operation, a roll of film stock is placed on the arbor 40 and secured thereon.

Film stock is withdrawn manually from the roll R and trained through the brake 70, under the roller 80, through the brake 86, then over the guide roller 92 and down over the article guide 130 with a sufficient length of web depending below the article guide to permit the formation of a preliminary weld. The depending end of the web is pulled downwardly manually to apply a sufficient tension thereto and for a sufficient distance to move the measuring yoke 83 to its outer position to close the microswitch 250. This institutes an initial cycle of operation similar to that initiated by the insertion of an article in the article guide, as described hereinafter, resulting in the severing of the web and welding the edges of the plies or folds along transverse lines on opposite sides of the line of severance. The two plies of the portion of the web which is above the line of severance are welded together throughout their transverse edge portions and the web thus extends in unbroken form across the bottom of the article guide from one side edge to the other. This prevents the web from being drawn upwardly over the article guide and provides a closed side for the bag to be formed, as will now be described.

In each packaging operation of the machine subsequent to the initial cycle an article to be packaged is inserted manually in the article guide or receiver 130 through the front opening thereof and is then released, whereby it falls by its own weight. Owing to the fact that the two plies of the film stock are welded along a transverse line

11

and form a continuous expanse of film under the article guide, the article is caught thereby and its weight causes the web to be drawn downwardly over the article guide. In this connection it is to be understood that the machine is so constructed and adjusted that a cycle of operation will be initiated solely by the weight of the article when inserted in the machine and released, as just described.

The aforementioned movement of the web causes the portion which extends from the article guide 130 back to the brake 70 to be advanced. The weight of the accumulator exerted on the portion of the web from the brake 70 back to the accumulator holds the brake 70 closed so that there is no advancement of that part of the web at that time. However, the weight of the article is sufficient to move the measuring yoke 83 to its outer position and permit the previously measured length of web to be advanced past the brake 86, web guide roller 92 and receiver 130. The measuring yoke is free to move outwardly because of its sliding connection with the lever 127.

In moving into its outer position the measuring yoke strikes the actuator 110 and moves it and the shaft 111 outwardly to move the control rod 260 to the left (as viewed in FIG. 9) which moves the arm 261 to close the microswitch 250. This energizes the solenoid 101 which applies the brake 86 and prevents reverse feeding movement of the web and also any further feeding of the portion of the web forwardly of the brake 86.

The solenoid 225 also is energized to open the air valve 224, whereby the piston of the air motor 220 is actuated to move the piston rod 227 to rock the lever 127 and the main drive shaft 128 in a counterclockwise direction (as viewed in FIG. 2).

When the lever 127 is rocked counterclockwise, the swivel pin 126 acting on the spring 124 rocks the measuring yoke 83 out of its outer position and moves it towards its inner position, the initiation of such action being aided by the energy stored in the compressed spring 124. Since the brake 86 is at that time closed to clamp the web, the movement of the measuring yoke causes the web from the measuring yoke to the stock roll to be advanced to permit such movement of the measuring yoke. This action lifts the accumulator yoke sufficiently to permit such advancing movement of the web. After the measuring yoke has concluded its movement to its inner position, the accumulator falls to thereby draw a predetermined length of film stock from the roll. The one-way brake prevents any reverse feeding of the web by reason of the downward movement of the accumulator yoke.

The counterclockwise movement of the main drive shaft 128 moves the clamping slide 140 and the blade slide 142 toward their projected positions as above described. At the same time, the lever 127 causes the swivel pin 181 to press against the spring 184 and move the drive rod 180 to the right (as viewed in FIG. 5) and cause the lever 179a to rock the shaft 179 clockwise and thus move the pad slide 141 to its projected position.

During this movement the blade slide moves from a position (FIG. 5) retracted well out of the space between the clamping jaws to a position (FIG. 10) between them but not in severing and sealing position against the web.

During the movement of the clamping slide 141, the blade slide 142 moves faster and further so that when the clamping slide reaches its fully projected position, the blade slide has been moved substantially, but not quite to, its fully projected position (FIG. 11). The compressibility of the pad 175 allows the clamp jaws 150 to move an additional distance inwardly to allow the heated blade 192 to move into firm control with the pad to sever the film stock and seal or weld the edges of the plies on either side of the line of severing.

The blade 192 is held in severing and sealing position for a short period by reason of a "dwell" provided in the mechanism. This dwell is produced as hereinafter described.

12

After the slides have been moved into their fully projected positions, the piston and piston rod 227 continue to be projected, the spring 233 permitting such movement until the piston rod strikes the arm 263 and moves the control rod 260 to cause the arm 262 to contact the plunger 252 to open the microswitch 250.

When this occurs, the solenoid 101 is deenergized with the result that the brake 100 is released to permit another cycle of operation. At the same time, the solenoid 225 is deenergized which permits the return spring 235 to rock the lever 127 to its initial rest position. This effects the return of all of the slides to their initial positions.

The air is supplied to the clamping elements 150 and the perforated tube 280 continuously during the operation of the machine and its supply is not affected by the repeated cycling of the machine. Likewise, the heater element 193 is operated independently of the cycling of the machine.

The spring 233 and the spring 184 provide a yieldable drive which permits considerable movement of the piston rod 227 even if the slides 140, 141 and 142 are prevented from moving inwardly. Thus, should the operator inadvertently place his hand between the slides during their inward movement, he will not be seriously injured.

I claim:

1. A packaging machine for forming a bag around an article to be packaged from flexible heat-sealing thermoplastic film stock in web form, said machine having a frame, means on said frame for rotatably supporting a supply of film stock, the improvement comprising means on said frame for releasably gripping the web of stock withdrawn from the roll including a first gripping element having a pair of spaced parallel elongate tubular sections, and a second elongate gripping element having a heat-resistant, resilient face portion, means for moving said gripping elements into and out of gripping engagement, an elongate sealing and severing element supported for movement past and in the space between said tubular sections toward and away from said second gripping element, between a projected position engaging said second gripping element and a position spaced from said second gripping element, means for heating said sealing and severing element and means for passing a cooling fluid through said tubular sections.

2. A packaging machine including the combination of a supporting frame; means operatively related to the frame to feed a web of longitudinally folded, flexible, heat-sealing, thermoplastic film stock, the folds of which are welded together along a line transversely of the web to provide a closed end; means operatively related to the frame to suspend a portion of the web in a vertical plane with said closed end downward; means operatively related to the frame to spread the open longitudinal edges of said web immediately above said closed end; said edges being spread to permit transverse insertion of an article to be packaged between the folds; means operatively related to said frame to permit a downward movement of the web due to the weight of said article after said article has been inserted in said folds; means operatively related to said frame to weld said folds together transversely of said web and immediately above said article after said downward movement of the web, and means operatively related to said frame to sever said web immediately above the last mentioned weld.

3. A machine according to claim 2 including means operatively related to said frame to utilize said downward movement of the web for controlling said severing and welding means.

4. A machine according to claim 2 including means operatively connected to said welding and severing means to cool the web above and below the line of severing and welding.

5. A machine according to claim 2 including means

operatively related to frame to limit said downward movement of said web.

6. A machine according to claim 2 including means on said frame for releasably gripping the web of stock withdrawn from a roll of the feed means including a first gripping element having a pair of spaced parallel elongate tubular sections, and a second elongate gripping element having a heat-resistant, resilient face portion, means for moving said gripping elements into and out of gripping engagement, an elongate sealing and severing element supported for movement past and in the space between said tubular sections toward and away from said second gripping element, between a projected position engaging said second gripping element and a position spaced from said second gripping element, means for heating

5

10

15

said sealing and severing element and means for passing a cooling fluid through said tubular sections.

References Cited in the file of this patent

UNITED STATES PATENTS

2,146,308	Maxfield	Feb. 7, 1939
2,269,533	Howard	Jan. 13, 1942
2,272,530	Patterson	Feb. 10, 1942
2,726,706	Hakomaki	Dec. 13, 1955
2,737,859	Allison	Mar. 13, 1956
2,919,530	Garson et al.	Jan. 5, 1960
2,931,149	Mitchell	Apr. 5, 1960
2,961,031	Fener	Nov. 22, 1960
2,994,997	Gwinn	Aug. 8, 1961