# **United States Patent**

### De Woskin et al.

#### [54] METHOD OF AND APPARATUS FOR FORMING PACKAGES

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## [45] Apr. 25, 1972

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#### [57] ABSTRACT

Method of and apparatus for forming packages in which a packaged item is disposed between two layers of transparent plastic and surrounded by a frame constituted by a card folded in half on a center fold line and having two window openings, one on each side of the fold line. Such cards, placed on jigs, are fed intermittently to a station where a transparent plastic film is sealed to each card overlying the openings and the film is bulged down through the openings to form two pockets, then to a station where an item (or items) to be packaged is placed in one of the pockets and the card is folded over and then fed to a station where the two halves of the folded card are sealed together around the openings.

#### 15 Claims, 21 Drawing Figures







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44 137







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FIG. 14

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FIG. 21

#### METHOD OF AND APPARATUS FOR FORMING PACKAGES

#### BACKGROUND OF THE INVENTION

The invention relates to a method of and apparatus for forming packages, and more particularly to a method of and apparatus for forming display packages utilizing cards and transparent plastic film.

The invention is generally in the same field as the coas-signed prior U.S. Pat. No. 3,030,752, issued Apr. 24, 1962, <sup>10</sup> entitled Packaging. The method and apparatus of this prior patent have been quite satisfactory for forming display packages in which an item is packaged on a card sealed under a transparent plastic film, but are not readily adapted to the 15 formation of various types of display packages and particularly the so-called see-through picture-frame type of display package wherein a packaged item (or items) is disposed between two layers of transparent plastic so that both sides of the item (or items) are visible with a frame formed from a card 20 1; surrounding the packaged item or items. In this regard, it is to be noted that in carrying out the method of said prior U.S. patent utilizing the apparatus shown therein, a continuous web of transparent film is applied to the cards held in jigs and the items to be packaged placed on the film, after which the cards 25 invention; are folded over and their top halves sealed to their bottom halves around their window openings, the film thereafter being severed between cards. Also, the jigs utilized therein are multiple-part jigs, of relatively high cost, and requiring manipulation (i.e., opening and closing). 30

#### SUMMARY OF THE INVENTION

Among the several objects of this invention may be noted the provision of an improved method of and apparatus for forming display packages, utilizing pre-cut card blanks and a 35 web of transparent plastic film, adapted for forming various types of display packages including see-through picture-frame packages as well as others; the provision of such a method and apparatus wherein the film is sealed to the cards and severed 40 between successive cards before the item or items to be packaged are applied and before the cards are folded and sealed; the provision of such a method and apparatus for forming skin packages wherein the transparent plastic film is shrunk over the packaged item or items; and the provision of 45 such apparatus having simplified inexpensive jigs which have no movable parts and which do not require opening or closing or similar manipulation.

Packages are formed by means of the invention utilizing cards, each adapted to be folded over on a fold line and having 50at least one window opening with this opening on one side of the fold line. In general, the method of this invention involves feeding the cards one after another in the direction of length of the fold line and; sealing a transparent film to one face of the card over the window opening, then feeding the cards with 55 the film thereon in a direction at right angles to the fold line, placing an item or items to be packaged in position to lie between the two parts of the card and under the film when the card is folded over on the fold line, subsequently folding the card over on the fold line, and sealing the two parts of the 60 folded card together around the window opening.

Apparatus of this invention generally comprises means for intermittently feeding forward a series of jigs through a filmapplying station and thence to a packing station, and thence to a sealing station and thence out of the sealing station, with 65 dwell intervals between successive feeding operations, wherein each jig has at least one recess therein corresponding to the window opening in a card, and each jig is adapted to have an unfolded card placed thereon before it is fed to the film-applying station. Means is provided for supplying a web 70 of transparent plastic film to be fed into position overlying the cards on the jigs as the jigs with the cards thereon are fed to the film-applying station. Means is provided at the film-applying station for sealing the film to the card around the opening. Means is provided for severing the film between successive 75 the window openings 5 in card 1. Extending up from the jig ad-

cards following the sealing of the film to a card. Each card is adapted to have an item or items to be packaged placed thereon at the packing station, the card then being folded over on said fold line, and means is provided at the sealing station for sealing the two parts of the folded card together around the window openings therein.

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

#### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective of a see-through picture-frame package such as may be produced by the method and apparatus of this invention;

FIG. 2 is a perspective of a card used in making the FIG. 1 package, showing the card in its initial flat unfolded condition;

FIG. 3 is a perspective of a jig used in the apparatus of this invention:

FIG. 4 is an enlarged transverse section on line 4-4 of FIG.

FIGS. 5-8 are longitudinal sections of the jig illustrating successive steps in the formation of a package in accordance with this invention;

FIG. 9 is a plan of apparatus made in accordance with the

FIG. 10 is a front elevation of FIG. 9;

FIG. 11 is an enlarged vertical section on line 11-11 of FIG: 9:

FIG. 12 is an enlarged vertical section on line 12-12 of FIG. 9;

FIG. 13 is an enlarged fragmentary vertical section on line 13-13 of FIG. 11;

FIG. 14 is an enlarged fragmentary vertical section on line 14-14 of FIG. 11;

FIG. 15 is an enlarged section on line 15-15 of FIG. 12;

FIG. 16 is a vertical section on line 16-16 of FIG. 15;

FIG. 17 is an enlarged vertical section on line 17-17 of FIG. 11;

FIG. 18 is a vertical section on line 18-18 of FIG. 17;

FIG. 19 is a plan on line 19-19 of FIG. 18;

FIG. 20 is a view on line 20-20 of FIG. 10; and

FIG. 21 is a diagram showing the pneumatic and electrical circuitry of the apparatus.

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

#### DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings, FIGS. 1 and 4 show a package P such as is made by the apparatus of this invention, utilizing the card 1 best illustrated in FIG. 2. This card, which is made of suitable heavy paper stock or cardboard, is of elongate rectangular shape, and is provided with a transverse score line 3 at the center of its length constituting a fold line on which it may be folded in half. As herein illustrated, the card has two rectangular window openings 5 therein, one in each of the two halves of the card on opposite sides of the line 3, these window openings being adapted to register one with the other when the card is folded in half on line 3. Each half of the card also has a hole 7 between the outer end of the respective window opening 5 and the respective end of the card, these holes 7 being adapted to register when the card is folded in half on line 3 to form a hole for hanging the package P on a pin or peg of a display rack for displaying the packages. One face of the card has a coating 9 of heat-sealable plastic material thereon, such as a vinyl resin, e.g., polyvinyl chloride. This face is on the inside when the card is folded in half. The other face (the outside face when the card is folded in half) may bear suitable printing.

At 11 in FIG. 3 is indicated a jig which comprises an elongate rectangular flat bar having a pair of rectangular openings 13 on opposite sides of its transverse center line, these openings 13 corresponding in size and shape and location to

jacent its ends are pins 15 for entry in holes 7 in card 1. The jig is rabbeted along its length at one side at the top thereof as indicated at 17 for a purpose that will appear.

In accordance with this invention, a card 1 is applied to the top face of the jig as shown in FIG. 5 with the coated face of the card up, pins 15 extending up through holes 7 in the card to register the card on the jig, thus registering the window openings 5 in the card with the openings or recesses 13 in the jig. A heat-sealable transparent plastic film F is applied over the card between the pins 15, covering the window openings 10 5. The film is bulged slightly downwardly through the window openings 5 as shown in FIG. 6 to form two shallow pockets 19s in the film, and is then heat-sealed to the card via the coating 9 on the card all around the window openings 5 as indicated at 21. After the heat-sealing operation, the film in the shallow pockets 19s is stretched (at room temperature) to convert these to deeper pockets 19d as appears in FIG. 7. An item I, such as a coil of elastic, is placed in one of the pockets 19d, and then the card is folded over in half on fold line 3 as illustrated in FIG. 8 to enclose the item I in the two pockets 19d of the transport file. 5 the transparent film. Finally, the two halves of the card and the film are sealed together as indicated at S substantially all around the window openings in the two halves of the card to complete the formation of the package P, leaving a vent V for 25 escape of air from the chamber formed by the pockets. The film, having been stretched at room temperature, tends to revert to its original condition before stretching, and thus subsequently shrinks around the item I to constitute the package P as a skin package.

Referring now to FIG. 9, apparatus made in accordance with this invention for forming the packages P is shown to comprise a table T the top 23 of which is provided with means indicated generally at 25 for guiding an endless series of the jigs 11 for movement in an endless path, more particularly a 35 rectangular path. The guide means 25 has front and back reaches 25c and 25a constituting the two opposite long sides of the stated rectangular path, and end reaches 25b and 25d constituting the two opposite ends of the rectangular path. The guide means is constituted by pairs of parallel bars 40 secured to the table top 23, the bars of the pair defining the front reach 25c being indicated at 27 and 29, the bars of the pair defining the back reach 25a being indicated at 31 and 33, the bars of the pair defining the end reach 25b being indicated at 35 and 37 and the bars of the pair defining the other end reach 25d being indicated at 39 and 41. The parallel bars 27 and 29 of the front reach 25c and the parallel bars 31 and 33 of the back reach 25a are spaced a distance slightly greater than the width of a jig 11, and the jigs 11 in these reaches are disposed end-to-end. The parallel bars 35 and 37 of the end reach 25b and the parallel bars 39 and 41 of the other end reach 25d are spaced a distance slightly greater than the length of a jig 11 and the jigs 11 in each of these end reaches are disposed side-to-side extending transversely with respect 55 to the bars.

A plurality of the jigs constituting a series S1 are disposed end-to-end in a row in the back reach 25a of the guide means 25 and are guided for sliding over the table top in the direction of the length of the jigs by the bars 31 and 33 from right to left 60 as viewed in FIG. 9. A plurality of jigs constituting a series S2are disposed in the end reach 25b of the guide means 25, the jigs in this series S2 being disposed side-to-side (i.e., the long sides of adjacent jigs in series S2 engage one another) and being guided for sliding over the table top 23 toward the front 65 of the apparatus in the direction transverse to the length of the jigs by bars 35 and 37. The leading (i.e., the front) jig of series S2 constitutes the trailing jig (the left end jig) of a series S3 of the jigs disposed in the front reach 25c of guide means 25. The jigs in series S3 are disposed end-to-end in reach 25c and are 70 guided for sliding over the table top 23 end-to-end from left to right by the bars 27 and 29. A plurality of jigs constituting a series S4 is disposed in the right end reach 25d of the guide means 25. The jigs in series S4 are disposed side-by-side (i.e., with the long sides of adjacent jigs engaging one another) and 75 jig width.

are guided for sliding over the table top 23 from front to back in the direction transverse to the length of the jigs by bars 39 and 41. As shown in FIG. 9, there is a one-jig gap in the rectangular concatenation of jigs at the trailing (back) end of series  $\overline{S2}$ , which is also the leading (left) end of series S1, and another one-jig gap at the trailing (front) end of series S4, which is also the leading (right) end of series S3.

A pusher P1 is provided for pushing series S1 of jigs from right to left. A pusher P2 is provided for pushing series S2 toward the front of the apparatus. A pusher P3 is provided for pushing series S3 from left to right, and a pusher P4 is provided for pushing series S4 toward the back of the apparatus. Means is provided for actuating pushers P1 and P3 in unison for pushing series S1 to the left and series S3 to the right one 15 jig length, and then returning these pushers to their retracted position shown in FIG. 9. As shown in FIG. 20, this means comprises an air cylinder 43 for actuating pusher P1 and an air cylinder 45 for actuating pusher P3, these cylinders being mounted underneath the table top 23. At the outer end of piston rod 47 which extends toward the right from a piston (not shown) in air cylinder 43 is a slide 49 guided for sliding movement lengthwise of the table underneath the table top 23 by guide means such as indicated at 51. Slide 49 extends up through a slot 55 in the table top and pusher P1 is secured to the upper end of the slide. At the outer end of piston rod 57 which extends toward the left from a piston (not shown) in the air cylinder 45 is a slide 59 guided for sliding movement lengthwise of the table underneath the table top 23 by guide means such as indicated at 61. Slide 59 extends up through a slot 65 (see FIG. 11) in the table top, and pusher P3 is secured to its upper end. The slides 49 and 59 for pushers P1 and P3 are connected for simultaneous movement by cables 67 and 69 trained around pulleys 71 underneath the table top 23, the arrangement being such that when the piston rods are extended, the pushers P1 and P3 occupy their retracted position of FIG. 9, and when the piston rods are retracted the pushers P1 and P3 are moved inward from their respective ends of the table one jig length through a jig-advancing stroke.

Means is provided for actuating pushers P2 and P4 in unison for pushing series S2 in the direction toward the front of the apparatus and for pushing series S4 in the direction toward the back of the apparatus, and then returning these pushers to their retracted position shown in FIG. 9. As shown in FIG. 20. this means comprises a single air cylinder 73 mounted underneath the table top having a piston (not shown) and a piston rod 75 extending from the piston through one end of the cylinder toward the rear of the apparatus. A slide 77 on the outer end of the piston rod is guided for sliding movement in front-to-rear direction by guide means such as indicated at 79. Slide 77 extends up through a slot 83 in the table top and pusher P2 is secured to its upper end. Pusher P4 is secured to a slide 85 guided for sliding movement parallel to slide 77 by guide means such as indicated at 87 underneath the table top. Slide 85 extends up through a slot 91 in the table top and pusher P4 is secured to its upper end. Slide 85 is actuated from cylinder 73 oppositely to slide 77 via a linkage comprising a lever 93 pivoted at its center as indicated at 95 underneath the table top, a link 97 interconnecting slide 77 to one end of the lever and a link 99 interconnecting the other end of the lever and slide 85.

During each cycle of the apparatus, pushers P1 and P3 are actuated through a forward stroke (i.e., pusher P1 is driven toward the left and pusher P3 is driven toward the right as viewed in FIG. 9 one jig length to advance each series S1 and S3 of jigs one jig length). This advances the jig at the leading (left) end of series S1 into position as the trailing jig of series S2, and advances the jig at the leading (right) end of series S3 into position as the trailing jig of series S4. Pushers P1 and P3 are then retracted and pushers P2 and P4 are then actuated through a forward stroke (i.e., pusher P2 is driven down as viewed in FIG. 9 and pusher P4 is driven up as viewed in FIG. 9) one jig width to advance each series S2 and S4 of jigs one

The jigs in series S1 proceed endwise intermittently to and through a station A where cards 1 are applied thereto. The jigs in series S2 proceed sidewise intermittently to and through a film-applying station B where a web of transparent film F from a supply roll R is applied thereto overlying the cards on the jigs in series S2, and the film is bulged downwardly through the window openings in the cards to form pockets, sealed to the cards, and severed between successive cards on successive jigs. The cards on the jigs in series S2 are fed in the direction transverse to the length of the card and thus in the direction of 10length of the fold line 3 of each card. The jigs in series S3 proceed endwise intermittently to and through a packing station C where an item such as I is placed in one of the pockets and the card is folded over on fold line 3, thence to a sealing 15 station D where the two halves of the folded card are sealed together to complete the formation of a package. The cards on the jigs in series S3 are fed in the direction of their length and thus at right angles to the direction of length of the fold line 3 of each card. The jigs then turn the corner and proceed in se-20 ries S4 toward the back of the apparatus. They then proceed toward the left in series S1 and the completed packages are ejected from the jigs at station E; then the emptied jigs return to station A.

At 101 is indicated a roll stand on table T for holding the 25roll R of transparent film F. The film has a width somewhat less than the spacing of the two pins 15 on a jig 11 and sufficient to cover both of the window openings 5 in a card 1. The stand 101 holds the roll with the longitudinal center line of the film generally aligned with the centers of the jigs in series S2, 30 and with the film thus disposed for being applied to the cards on the jigs in series S2 overlying the cards between the pins 15 on these jigs. Film withdrawn from roll R passes through a guide 103 extending over series S2 adjacent the trailing end of this series for guiding the film into position over the jigs in se- 35 ries S2. As herein illustrated, there are five jigs in series S2. As shown best in FIG. 11, the guide 103 extends over the trailing one of these five jigs, and the film F extends down from the guide and forward over the next four jigs.

Means indicated generally at  ${\bf 105}$  is provided for bulging the ~40film downwardly through the window openings 5 of the card 1 on the second jig 11 of the five-jig series S2 and sealing the film to the card. This means comprises an elongate rectangular platen 107 having a length generally equal to the length of 45 a jig and width generally equal to the width of a jig. Mounted on the bottom face of the platen 107 are two rectangular male die blocks each designated 109 and each slightly smaller than the window opening 5 in a card 1, these two blocks being adapted on downward movement of the platen from a raised 50 retracted position to bulge the film overlying the card on the second jig 11 of series S2 downward through the two window openings 5 in the card and into the recesses 13 in the jig to form the shallow pockets 19s. On such downward movement of the platen, the bottom face of the platen surrounding the die blocks comes into engagement with the film around the die blocks and presses it against the card on the second jig, after the formation of the shallow pockets. The platen is heated as by means of an electrical resistance strip heater 111 accommodated in a recess 113 in the platen so as to heat-seal the film (after it has been bulged down through the window openings) to the card. The bottom face of the platen is preferably covered with a sheet of Teflon or the like (not shown) to keep the film from sticking to the platen. At 115 is indicated an air cylinder for moving the platen up and down. 65 This extends up from a platform 117 mounted on a frame 119 spanning the series S2 of jigs. The platform extends lengthwise over series S2, and cylinder 115 is mounted adjacent the back end of the platform. Piston rod 121 of the cylinder extends down from a piston therein (not shown) through a hole in the 70 platform and has its lower end connected to the platen as indicated at 125. Bolts 127 threaded at their lower ends in the platen carry a head 129 having upwardly extending end members 131 the rearward faces of which slide against a crossbar 133 of the frame 119. A thermostat 135 for controlling the 75

heater 111 to control the temperature of the platen 107 is mounted on top of the latter.

Means indicated generally at 137 in FIG. 14 is provided for stretching the film in the shallow pockets 19s of the card on the fifth (leading) jig 11 of series S2 to convert these to the deeper pockets **19***d* (FIG. **7**). This stretching means comprises a vertically movable yoke 139 having two rectangular male die blocks each designated 141 extending downward therefrom. Each block 141 is slightly smaller than the window opening 5 of a card; and, on downward movement of the yoke from a raised retracted position the die blocks are adapted to move down in the window openings 5 of the card on the fifth jig and stretch the film (generally at room temperature) to deepen the previously formed shallow pockets. The yoke is moved up and down by an adjustable-stroke air cylinder 143 mounted on the platform 117 in front of cylinder 115. Means for adjusting the stroke of this cylinder is indicated at 144. Piston rod 145 of this cylinder extends down from a piston therein (not shown) through a hole in the platform 117 and has its lower end connected to the yoke as indicated at 149. A clamping plate 151 is provided for clamping the card down on the fifth jig to enable the stretching of the film by the die blocks. This plate is carried by the yoke and vertically movable relative to the yoke, having rods 153 extending upward therefrom slidable in holes 155 in the yoke, with coil compression springs 157 interposed between the yoke and the plate. The rods 153 have heads 159 at their upper ends limiting the downward movement of the clamping plate 151 relative to the yoke. The plate 151 has a pair of rectangular openings 161 through which extend the die blocks 141 (which are deep relative to blocks 109).

The stroke of piston rod 145 may be adjusted by the means indicated at 144 so as to stretch the film in the shallow pockets 19s to form the deeper pockets 19d of the requisite depth without rupturing the film. It enables a fine adjustment of the pocket depth so that the film F will enclose item I without undue distortion of the card and without forming the pocket too deep for subsequent shrinkage of the stretched film tightly around item I.

Means indicated generally at 163 is provided for severing the film F between the cards on the third and fourth jigs 11 of series S2. This means comprises a block 165 (see FIGS. 17 and 18) secured on top of the pusher P3 and cantilevered laterally from the pusher toward the back of the apparatus in position to overlie the fourth jig of series S2. The bottom of the block is upwardly stepped at its free (back) end as indicated at 167 in FIG. 18. A shaft 169 is journalled in the block extending laterally with respect to the pusher P3. On the back end of this shaft is a blade holder 171 carrying a cutter blade 173 in a plane perpendicular to the axis of the shaft. The blade 173 has an exposed cutting corner 175. It is rotatable with the shaft on the axis of the shaft between a cutting position as shown in solid lines in FIG. 17 in which the blade is angled to position its corner in a cutting position wherein the corner is adapted to move through the rabbet 17 of the third jig to sever the film between the third and fourth jigs, and a generally vertical position as shown in phantom in FIG. 17 wherein the corner is in a raised retracted position clear of the 60 jigs.

A nut 177 having a knurled head 179 is threaded on the front end of shaft 169, backed by a lock nut 181, and a coil compression spring 183 surrounds the shaft between the block and the blade holder 171 to bias the shaft toward the back of the apparatus (toward the right as viewed in FIG. 18). This establishes a frictional resistance to rotation of the shaft. The angled cutting position of the blade is determined by the engagement of an edge of the blade with a stop finger 185 on a stop plate 187 adjustably mounted on top of the block, and the vertical retracted position of the blade is determined by engagement of an opposite edge of the holder with another stop finger 189 on plate 187. When the pusher P3 is retracted (i.e., moved to its solid-line position of FIG. 17), the blade holder comes into engagement with a trip roller 191 on a trip arm 193 adjustably mounted on the top of a support 195 on the table

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top to swing the blade holder and blade to cutting position in readiness for an ensuing cutting operation. When pusher P3 is advanced (i.e., moved to its dotted-line position of FIG. 17), the edge of the blade comes into engagement with a trip roller 197 on a trip arm 199 adjustably mounted on top of a support 201 on the table top to swing the blade holder and blade to their vertical retracted position for retraction of the pusher.

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Means indicated generally at 203 is provided at the sealing station D for sealing the two halves of the folded card together at S around the opening therein. This means, as herein illustrated, is constituted by an electronic heat-sealing press comprising an upper electrode 205 movable vertically toward and away from the table top 23, which serves as a lower electrode. This electrode is adjustably mounted as indicated at 207 undemeath an insulation yoke 209 at the lower end of a piston rod 211 extending down from a piston (not shown) in an air cylinder 213 mounted on a platform 215 extending over the leading jig of series S3 (i.e., the jig at the right end of series S3 plate 217 having a downwardly extending rib pattern such as indicated at 219 for sealing the two halves of the card together in the desired pattern S. This rib pattern has a gap at 221 for forming the aforesaid vent V in the seal. The upper electrode carries a spring contactor 223 slidably engageable with a conductor strip 225. At 227 is indicated a radio frequency generator for converting a low-frequency electric power supply to high-frequency electrical energy, this high-frequency energy being applied to the table top 23 (and hence jigs 11) and to the electrode 205 via strip 225 and contactor 223 to establish 30 an electrostatic field, the polarity of which is alternated millions of times per second, thereby to accomplish sealing of the two halves of the package by dielectric hysteresis.

Means indicated generally at 227 is provided at station E for ejecting completed packages from the jigs 11 as they move 35 toward the left as viewed in FIG. 9. This means comprises a pair of guides each designated 229 mounted on top of the rails 31 and 33 generally at the point where the jigs are pushed endwise out of series S4 back into series S1. These guides project laterally inward to some extent beyond the inside faces of the 40 rails 31 and 33, and each has an inclined groove 231 angled upward in forward direction (toward the left as viewed in FIG. 9), the two grooves being opposite one another and adapted to receive the side margins of a completed package and guide it upward along the incline of the grooves away from the jig on which it was formed. Deflectors 233 are provided at opposite sides of the path of the jigs for entry between the leading end of a package and its jig to deflect the leading end of the package into the inclined grooves 231. Leaf springs 235 are 50 provided to grip a package in the grooves and prevent it from sliding back downward, so as to hold a package in inclined position in the grooves until the next package proceeding up the incline of the grooves pushes the first package forward. The latter is then directed by a suitably curved plate 237 into a 55 chute 239.

Referring to FIG. 21 showing the pneumatic and electrical circuitry of the apparatus, at 243 is indicated a solenoid valve for actuating the air cylinder 143 of the film stretching means 137. This has two solenoids 245 and 247 and is adapted, on momentary energization of solenoid 245 to supply compressed air to the lower end of cylinder 143 and vent its upper end for raising the stretcher die blocks 141 via piping 249 and, on momentary energization of solenoid 247, to supply compressed air to the upper end of cylinder 143 and vent its lower 65 end for driving blocks 141 downward. At 251 is indicated a solenoid valve for actuating the air cylinders 43, 45 for pushers P1 and P3 and the air cylinder 115 for the heat-sealing platen 107. This has a solenoid 253 and is adapted, when this solenoid is deenergized, to supply compressed air to the left 70 end of cylinder 43 and the right end of cylinder 45 and to vent the opposite ends of these cylinders to effect retraction of pushers P1 and P3 and also to supply compressed air to the lower end of cylinder 115 and vent its upper end to raise the platen 107, and, when solenoid 253 is energized, to reverse 75 this action for advance of pushers P1 and P3 and a downstroke of platen 107. The piping interconnecting the valve and cylinders 43, 45 and 115 is indicated at 255.

At 257 is indicated a solenoid valve for actuating the air cylinder 73 for pushers P2 and P4. This has a solenoid 259 and is adapted, when this solenoid is deenergized, to supply compressed air to the front end of cylinder and to vent its other end to effect retraction of the pushers P2 and P4, and, when solenoid 259 is energized, to reverse this action and advance the pushers. Piping interconnecting valve 257 and cylinder 73 is indicated at 261.

At 263 is indicated a solenoid valve for actuating the air cylinder 213 at the sealing station D. This has a solenoid 265 and is adapted, when this solenoid is deenergized, to supply 15 compressed air to the lower end of cylinder 213 and to vent its upper end for raising the electrode 217 and, when solenoid 265 is energized, to reverse this action and raise the electrode. Piping interconnecting valve 263 and cylinder 213 comprises as viewed in FIGS. 9 and 10). The electrode 205 has a bottom 20 a line 267 interconnecting the valve and the lower end of the cylinder and including a pressure switch 269 and a line 271 interconnecting the valve and the upper end of the cylinder and including a pressure switch 273. Switch 269 closes when pressure in line 267 drops below a predetermined value; switch

273 closes when pressure in line 271 increases above a 25 predetermined value. A needle valve 275 in line 267 between valve 263 and the pressure switch 269 restricts flow of air through the line to provide time for the electrode 217 to press firmly on the card before the RF generator 227 fires to form the seal S.

Still referring to FIG. 21, electric power supply lines are indicated at L1 and L2, and a main on-off switch for these lines is indicated at 277. At T is indicated a transformer having its primary T1 connected across lines L1 and L2 in a line 278. Solenoids 245 and 247 are connected in parallel as indicated at 279 across the secondary T2 of the transformer, with solenoid 245 under control of a manual start switch 281 and solenoid 247 under control of a limit switch 283 which is closed when pushers P2 and P4 operated by cylinder 73 reach the limit of their advance stroke. At RC is indicated the coil of a relay R which is connected across lines L1 and L2 in a line 285 including a limit switch 287 which is closed when pushers P1 and P3 reach the limit of their advance stroke. Solenoid 253 of valve 251 is connected across lines L1 and L2 in a line 289 including a contactor R1 of relay R which is normally closed in line 289, and adapted to close into a holding circuit 291 for relay coil RC when the latter is energized. Line L2 includes a limit switch 293 between 278 and 289 which is closed by cylinder 143 at the limit of its upward stroke. The solenoid 259 of valve 257 is connected in parallel around relay coil RC in a line 295 including a limit switch 297 which is closed when pushers P1 and P3 are retracted by cylinders 43 and 45. The solenoid 265 of valve 263 is connected in parallel with solenoid 259 in a line 299. The pressure switches 269 and 273 are connected in series with the RF generator 277 in a power line 301 including an on-off switch 303 for disconnecting the generator when the apparatus is not in use. This arrangement prevents the RF generator from firing when the air supply is shut off for any reason, e.g., for carrying out service or maintenance operations, since both switches 269 and 273 must be closed for the generator to fire and switch 273 (the high pressure switch) opens when the air supply is cut off.

Operation is as follows:

For purposes of describing the operation of the apparatus, it will be assumed that the apparatus is off, with pushers P1, P2, P3 and P4 all in their retracted position. Heat-sealing platen 107 is raised, having previously carried out the sealing of the film F to the card on the second jig of series S2 and the formation of the shallow pockets 19s in the film at this second jig. Yoke 139 carrying the two stretcher die blocks 141 is down, having effected the stretching of the film to form the deep pockets 19d at the fifth jig in series S2. The film F extends continuously over the jigs in series S2 from the roll R to the card on the fifth jig. Electrode 205 at sealing station D is raised,

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having previously effected the formation of the seal S for the package on the jig in the press at station D. It will be understood that there are cards (as yet unfolded) on all the jigs in series S2, and completed packages P on all the jigs in series S4 (in addition to the completed package in the press at station D). Items are placed in the pockets of the cards in series S3 at station C and the cards are folded over for entry into the press. Unfolded cards are placed on the jigs in series S1 at station A.

To start the apparatus (assuming switches 277 and 303 have 10 been closed), the operator momentarily closes the start switch 281. Momentary closure of this switch momentarily energizes solenoid 245 to set valve 243 to supply compressed air to the lower end of cylinder 143 and to vent its upper end so as to raise the yoke 139 and die blocks 141. When piston rod 145 of cylinder 143 reaches the upper limit of its stroke, limit switch 293 is closed. This completes a circuit through solenoid 253 of valve 251 via line 289 (including relay contractor R1 normally closed in line 289) to set valve 251 to supply compressed air to 20 the right end of cylinder 43 and the left end of cylinder 45 and to vent the opposite ends of these cylinders so as to drive pushers P1 and P3 through a forward stroke to advance each of the series S1 and S3 one jig length, with attendant advance of the jig at the leading end of series S1 into position as the 25 trailing jig of series S2, and advance of the jig at the leading end of series S3 into position as the trailing jig of series S4. As the pusher P3 moves through its forward stroke, it moves the blade 173 with this blade in its angled cutting position through a cutting stroke in the direction from left to right in FIG. 9 and 30 right to left in FIG. 17. The corner 175 of the blade moves through the rabbet 17 of the third jig and between the third and fourth jigs of series S2 to sever the film F between these jigs

Simultaneously with the above-described operation of cylin- 35 ders 43 and 45 to advance the series S1 and S3 of jigs, valve 251 supplies compressed air to the upper end of cylinder 115 and vents its lower end for a downstroke of piston rod 121 of this cylinder and of the heat-sealing platen 107 and the shallow-pocket-forming die blocks 109. On advance of pushers P1 40 and P3, limit switch 297 opens. As the platen 107 moves downward and before its lower face engages the film, die blocks 109 engage the film overlying the two openings or recesses 13 in the jig 11 of series S2 underlying the platen 107, and the blocks bulge the film downward through the window openings 5 in the card 1 on this jig and down into its recesses 13 to form the two shallow pockets 19s in the film. Then the lower face of the platen 107 (the face around the die blocks 109) engages the film around the window openings 5 in the 50 card and effects heat-sealing of the film to the card via the coating 9.

As the pushers P1 and P3 complete their advance stroke, limit switch 287 is closed, resulting in energization of coil RC of relay R. On energization of the latter, its contactor R1 opens off line 289 and closes on line 291 to establish a holding circuit for coil RC via lines 291 and 285 (switch 293 being closed at this time). This breaks the circuit for solenoid 253, with resultant reset of valve 251 to supply compressed air to the left end of cylinder 43 and the right end of cylinder 45 and to vent the opposite ends of these cylinders to move pushers P1 and P3 back through a return stroke to their respective retracted positions. As pusher P3 is retracted, the blade 173 (in its retracted position on account of engagement of blade holder 171 with trip roller 197 on the preceding advance 65 stroke of pusher P3 and the blade holder) is retracted along with pusher P3. As the pusher P3 completes its return to retracted position, the blade holder 171 engages trip roller 191 to swing the blade 173 back to its cutting position in readiness for the next cycle of pusher P3. Simultaneously with the operation of cylinders 43 and 45 to retract pushers P1 and P3 (and the cutting blade 173), the now deenergized valve 251 supplies compressed air to the lower end of cylinder 115 and vents its upper end to raise the platen 107 back to its retracted position in readiness for the next cycle.

On closure of contactor R1 into line 291 when the pushers P1 and P3 have completed their advance stroke as above described, solenoid 265 of valve 263 is energized via lines 291 and 299. Valve 263 thereupon supplies compressed air to the upper end of cylinder 213 and vents the lower end of cylinder 213 via the needle valve V. This drives the electrode 205 down for engagement of its bottom plate 217 with the foldedover card on the jig 11 at the sealing station D. With the resultant increase of pressure in pressure switch 273 and drop of pressure in switch 267, these switches close to cause the RF generator 277 to fire and effect sealing of the card as indicated at S by the electrode plate 217. The needle valve 275, in restricting flow of air from 269 to 263, provides a delay in the firing of the generator to allow time for the electrode plate 217 to press firmly on the card before the generator fires. This completes the formation of a package P at station D.

On return of the pushers P1 and P3 to retracted position, limit switch 297 closes with resultant energization of solenoid 259 of valve 257 via line 295. Valve 257 thereupon supplies compressed air to the back end of cylinder 73 and vents its front end to advance pusher P2 and pusher P4 so that the series S2 of jigs 11 is advanced (moved frontward) one jig width and series S4 is advanced (moved toward the back of the apparatus) one jig width. When the pushers P2 and P4 complete their advance stroke, limit switch 283 is closed to energize solenoid 247 of valve 243. Valve 243 thereupon supplies compressed air to the upper end of cylinder 143 and vents its lower end so that yoke 139 carrying die blocks 141 is driven downward to stretch the film in the shallow pockets 19s down into the recesses 13 in the jig 11 under the yoke 139 to convert these pockets into the deep pockets 19d. As the yoke moves downward, switch 293 opens and this results in deenergization of relay coil RC so that its contactor R1 is thrown back on line 289, also in deenergization of solenoid 259 of valve 257 which thereupon supplies compressed air to the front end of cylinder 73 and vents its back end to retract the pushers P2 and P4, and also in deenergization of solenoid 265 of valve 263 which thereupon supplies compressed air to the lower end of cylinder 213 and vents its upper end to raise the electrode 205. With compressed air delivered to the lower end of cylinder 213, pressure switch 269 is open so that the RF generator circuit 301 is broken. This completes a cycle; it will be observed that all components are now back in their starting position (i.e., all four pushers P1-P4 are retracted, platen 107 is up, yoke 139 is down, electrode 205 is up, switches 281, 283, 287 and 293 are open, switch 297 is closed, relay coil RC is deenergized and relay contactor R1 is toward the left) ready for the start of the next cycle by reactuating start switch 281.

From the above, it will be seen that on each cycle of operation the first action is the retraction of yoke 139 carrying the stretcher die blocks 141 (which had moved downward during the preceding cycle) followed by movement of pushers P1 and P3 through a forward stroke. This advances the jigs in series S1 and in series S2 one jig length, bringing the jig which was under the yoke 139 out from under the yoke to the packing station C, bringing the jig which was under electrode 205 and which carries a package P completed on the previous cycle 60 into position at the trailing end of series S4, bringing a jig carrying a card folded with an item I therein from the packing station C to the sealing station D under electrode 205, and bringing a jig carrying a card from the card-applying station A into position at the trailing end of series S2. On the advance of pusher P3, the film F is cut by blade 173. Pockets 19s are formed in the film from roll R, and the film is sealed to the card on the second jig of series S2 (which is stationary at this time) by the platen 107 and die blocks 109, after which the platen is raised. As series S1 is advanced, completed packages 70 P are ejected at station E. When series S3 has completed its advance, electrode 205 is driven down to seal the package on the jig at station D. Pushers P1 and P3 then return to their retracted position. Pushers P2 and P4 are then actuated to advance series S2 and series S4 one jig width, yoke 139 is driven 75 down to stretch the film and form the deeper pockets 19d in

the film on the card on the jig at the leading end of series S2 of jigs, pushers P2 and P4 are then retracted, and electrode 205 is raised.

The film F in a completed package P, having been stretched by the stretcher die blocks 141, ultimately shrinks around the item I to constitute the package as a skin package. The vent V permits escape of air for such shrinkage.

While the method and apparatus are described above as utilized to produce the see-through picture-frame packages P (involving use of the elongate card 1 with two window 10 openings 5 on opposite sides of transverse fold line 3), it will be understood that the method and apparatus of the invention may be utilized to produce packages using cards which are more square in form than the card 1 and which are folded on a longitudinal fold line; and may be utilized to produce 15 packages from cards which have only one window opening (similar, for example, to the packages produced by the apparatus of the aforesaid U.S. Pat. No. 3,030,752, or to the package shown in the coassigned U.S. Pat. No. 3,486,615).

In view of the above, it will be seen that the several objects 20 of the invention are achieved and other advantageous results attained.

As various changes could be made in the above methods and constructions without departing from the scope of the invention, it is intended that all matter contained in the above 25 description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

We claim:

1. A method of forming packages utilizing cards, each 30 adapted to be folded over on a fold line and having at least one window opening with said opening on one side of the fold line, comprising sealing a transparent film to one face of a card and bulging the film through the window opening to form a pocket in the film, placing an item or items to be packaged in the pocket, folding the card over on said fold line, and sealing the 35 jigs in said fourth series extending transversely of said path at two parts of the folded card together around the window opening therein, wherein the film is stretched in forming the pocket and wherein the film is first bulged through the window opening to form a relatively shallow pocket before the film is sealed to the card, the film is then sealed to the card, and the 40 station. pocket is thereafter deepened by stretching the portion of the film constituting the pocket.

2. The method of claim 1 wherein, in sealing the two parts of the folded card together, a vent is left for escape of air from the chamber formed by the pocket to enable the stretched film 45 means at the film applying station comprises a vertically to shrink around the item or items.

3. Apparatus for forming packages utilizing cards each adapted to be folded over on a fold line and having at least one window opening with said opening on one side of the fold line, comprising means for intermittently feeding forward a series of jigs through a film-applying station and thence to a packing station, thence to a sealing station and thence out of the sealing station, with dwell intervals between successive feeding operations, each jig having at least one recess therein, and each jig being adapted to have an unfolded card placed thereon before it is fed to the film-applying station, means for supplying a web of transparent plastic film to be fed into position overlying the cards on the jigs as the jigs with the cards thereon are fed to the film-applying station, means at the filmapplying station for sealing the film to the card around the 60opening, means for severing the film between successive cards following the sealing of the film to a card, each card being adapted to have an item or items to be packaged placed thereon at the packing station, the card then being folded over on said fold line, and means at the sealing station for sealing the two parts of the folded card together around the window opening therein.

4. Apparatus as set forth in claim 3 wherein the means at the film-applying station further comprises means for bulging the 70 film downwardly through the opening in each card to form a pocket in the film.

5. Apparatus as set forth in claim 4 wherein the means at the

film-applying station comprises first means for forming a shal-low pocket in the film before the film is sealed to the card, and second means for subsequently deepening the pocket by stretching the film.

6. Apparatus as set forth in claim 5 for forming packages utilizing cards having a pair of window openings therein, one in each part of the card on each side of the fold line, wherein each jig has a pair of recesses therein corresponding to the pair of window openings in a card, and having means at the film-applying station for bulging the film downwardly through the two openings in each card to form a pair of pockets in the film and sealing the film to the card around the two openings.

7. Apparatus as set forth in claim 6 for forming packages utilizing elongate cards adapted to be folded in half on a fold line transverse to the length of the card, wherein each jig is an elongate jig having said openings on opposite sides of its transverse center line.

8. Apparatus as set forth in claim 7 wherein the jigs are movable in a rectangular path in which the jigs move in the direction transverse to their length at the ends of the rectangular path and end-to-end in the direction of their length along the sides of the rectangular path, and wherein the film-applying station is at one end of the path.

9. Apparatus as set forth in claim 8 wherein the means for intermittently feeding the jigs forward comprises a first pusher for pushing a first series of jigs aligned end-to-end along one side of said rectangular path, a second pusher for pushing a second series of jigs along said one end of said rectangular path with the jigs in said second series extending transversely of said path at its said one end, a third pusher for pushing a third series of jigs aligned end-to-end along the other side of said rectangular path oppositely to the first series, and a fourth pusher for pushing a fourth series of jigs along the other end of said rectangular path oppositely to the second series with the its said other end.

10. Apparatus as set forth in claim 9 wherein the packing station is along said other side of said path and the sealing station is along said other side of said path following the packing

11. Apparatus as set forth in claim 10 having means for removing completed packages from the jigs as they proceed along said one side of said path.

12. Apparatus as set forth in claim 10 wherein the first movable heat-sealing platen having two die blocks on its lower face adapted to bulge the film overlying the card on a jig in said second series down through the window openings in the card into the recesses in the jig to form two shallow pockets, the lower face of the platen then contacting the film around said window openings to heat-seal it to the card.

13. Apparatus as set forth in claim 12 wherein the second means at the film applying station comprises a vertically movable yoke spaced in forward direction from said platen 55 having two stretcher die blocks extending downward therefrom adapted on downward movement thereof to enter the shallow pockets in the film of a card on a jig and deepen them by stretching the film.

14. Apparatus as set forth in claim 13 having a clamping plate below the yoke mounted for vertical movement relative to the yoke and having openings for the stretcher die blocks, and spring means interposed between the yoke and the clamping plate.

15. Apparatus as set forth in claim 16 wherein the means for 65 severing the film comprises a cutting blade carried by the third pusher for movement therewith and for movement relative thereto between a cutting position and a retracted position, and having means for moving the blade to cutting position on retraction of the third pusher and for moving it to retracted position as the pusher reaches the end of a forward stroke thereof.

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#### PO-1050 (5/69)

## UNITED STATES PATENT OFFICE CERTIFICATE OF CORRECTION

Patent No. 3,657,857 Dated April 25, 1972

Inventor(s) Irvin S. DeWoskin et al.

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 12, line 64, "16" should read -- 9 --.

Signed and sealed this 29th day of August 1972.

(SEAL) Attest:

I

EDWARD M.FLETCHER,JR. Attesting Officer ROBERT GOTTSCHALK Commissioner of Patents