

June 10, 1969

E. SWAITHES

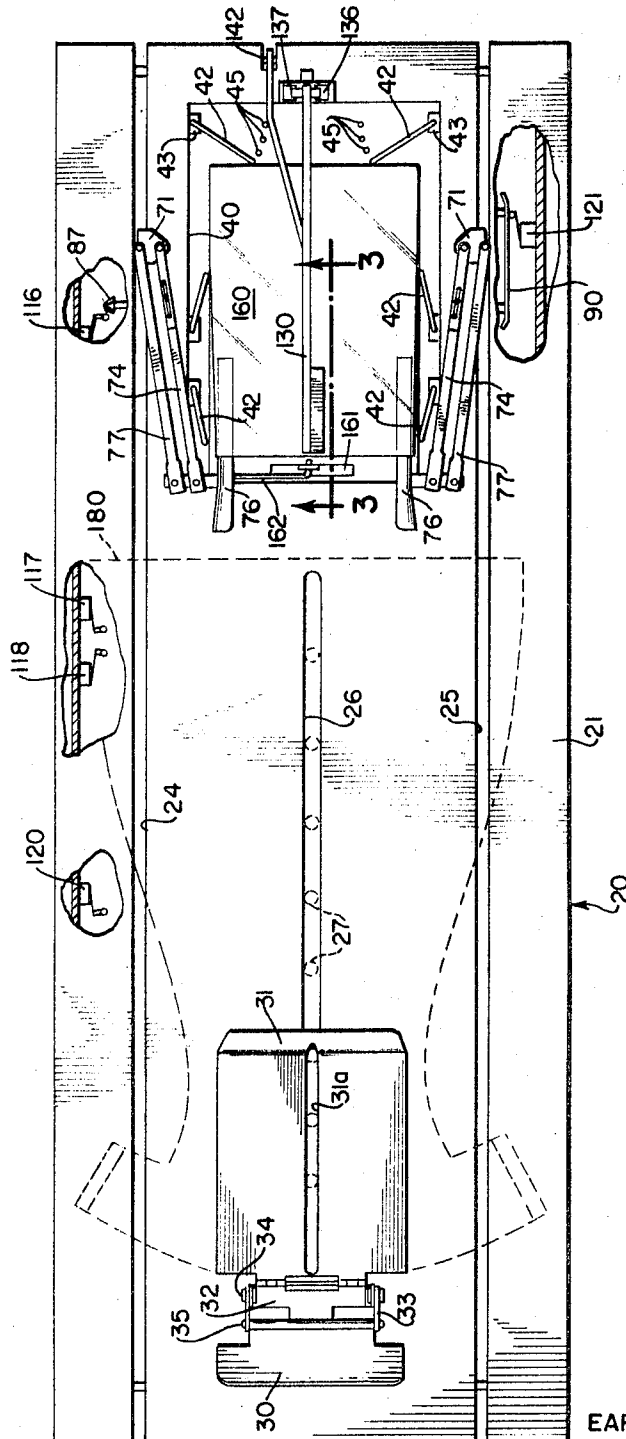
3,448,557

FOLDING AND BAGGING MACHINE

Filed April 19, 1967

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FIG. 1



INVENTOR
EARL SWAITHES

BY *Darby & Darby*

ATTORNEYS

June 10, 1969

E. SWAITHES

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FIG. 3

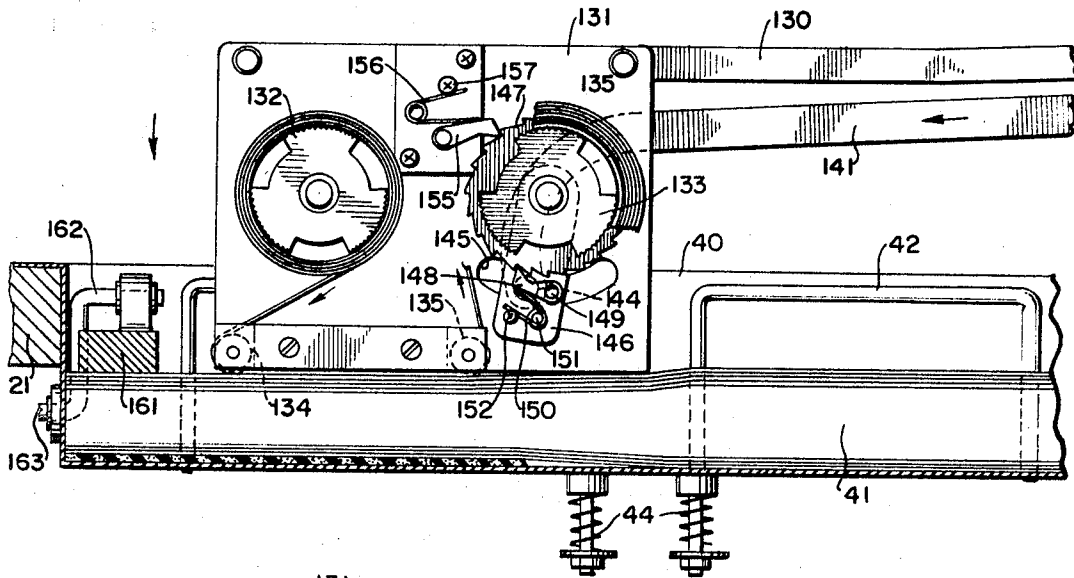
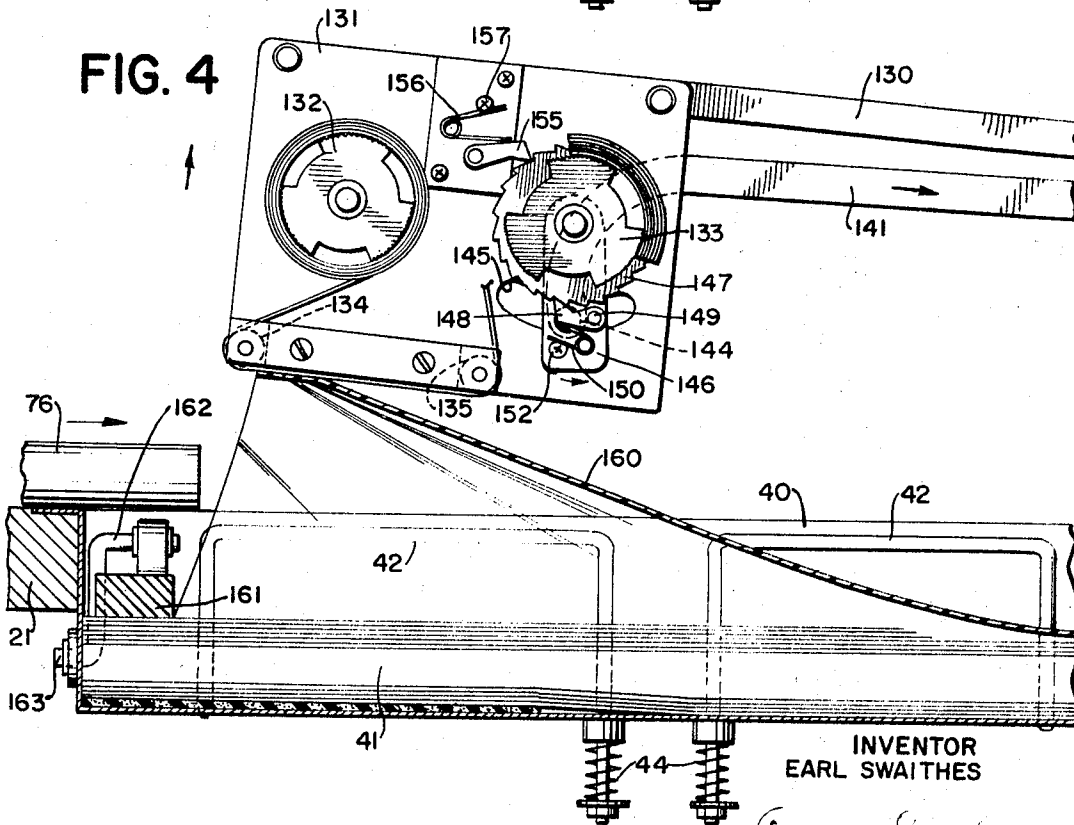


FIG. 4



INVENTOR
EARL SWAITHES

BY

Earl Swaites

ATTORNEYS

June 10, 1969

E. SWAITHES

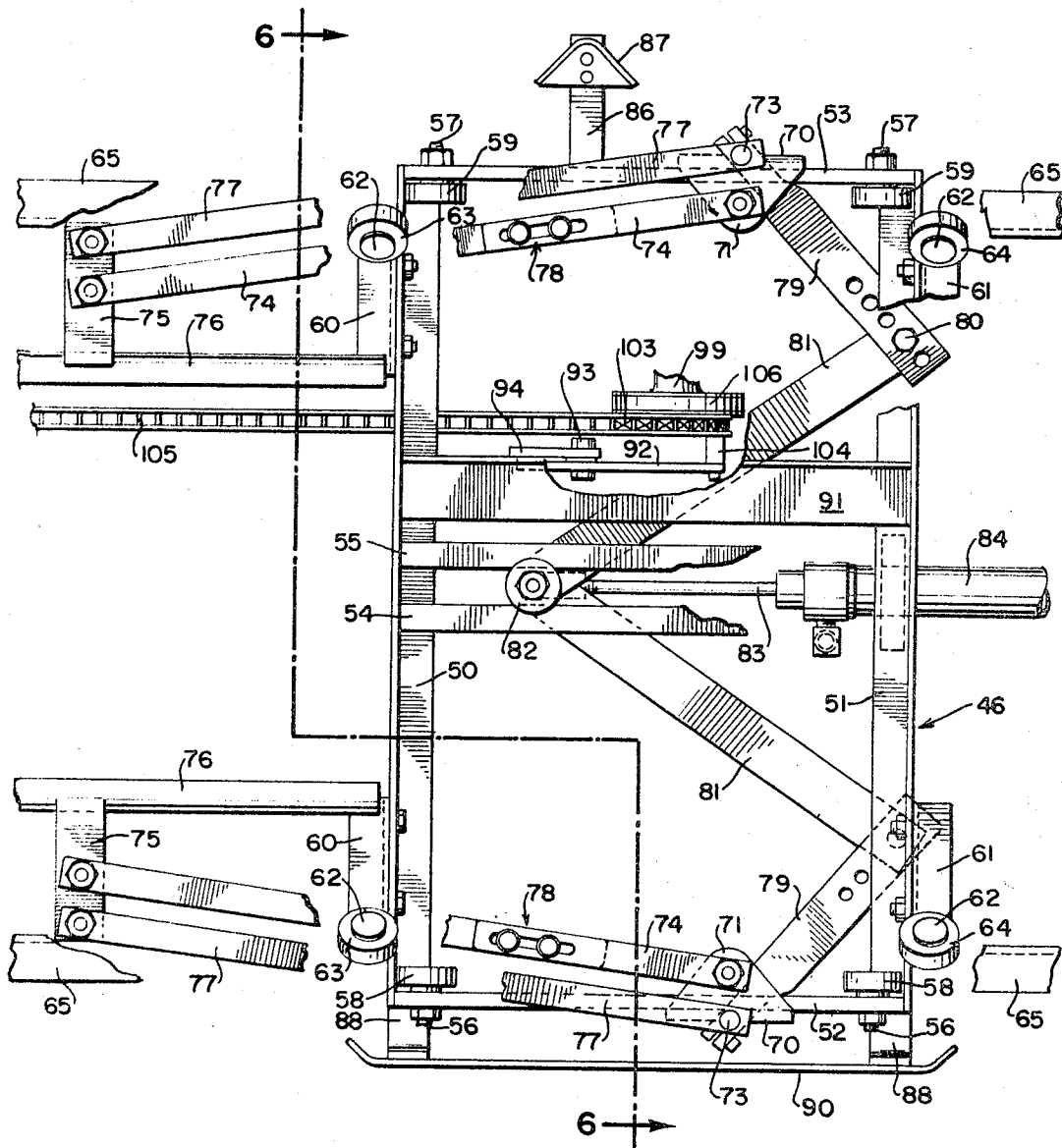
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FIG. 5



INVENTOR
EARL SWAITHES

BY *L. Wright & L. Wright*
ATTORNEYS

June 10, 1969

E. SWAITHES

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FIG. 8

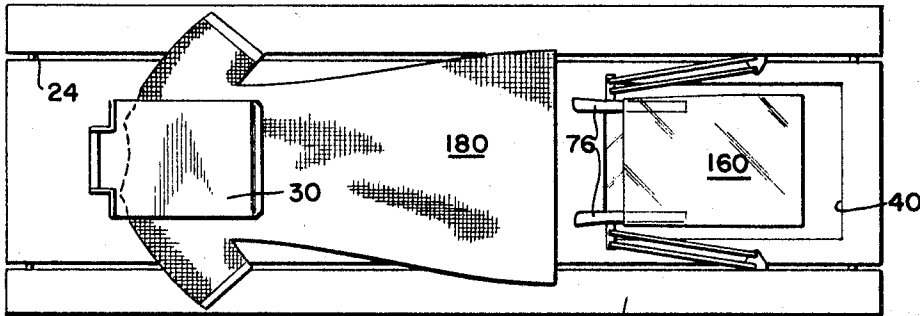


FIG. 9

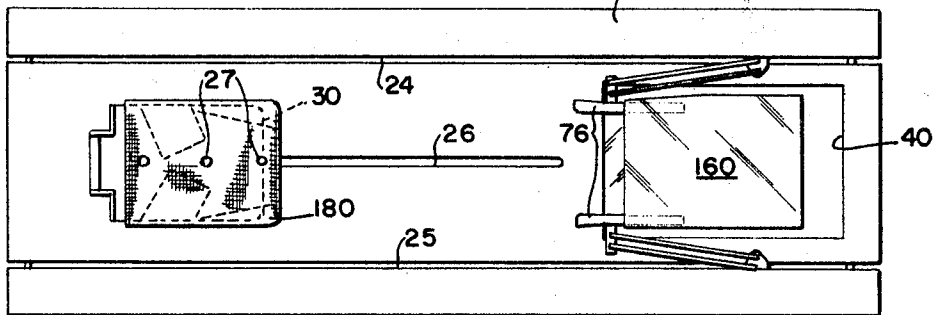


FIG. 10

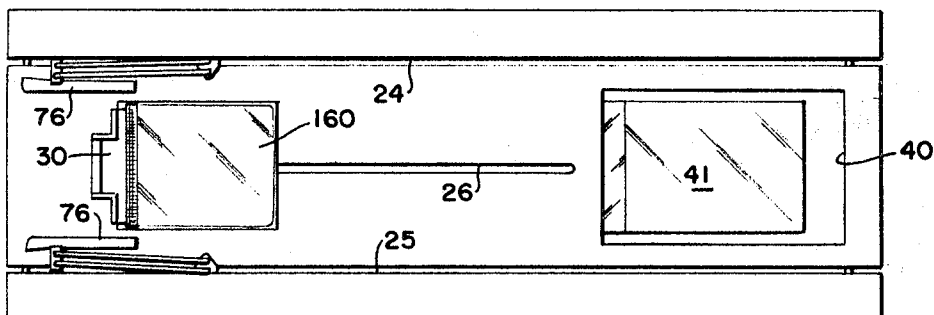
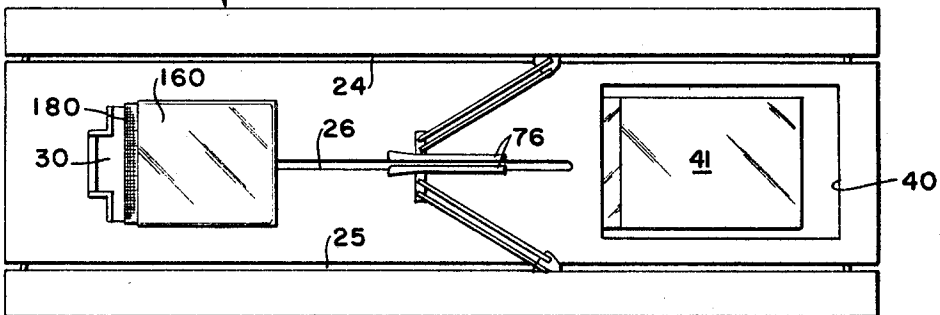


FIG. 11



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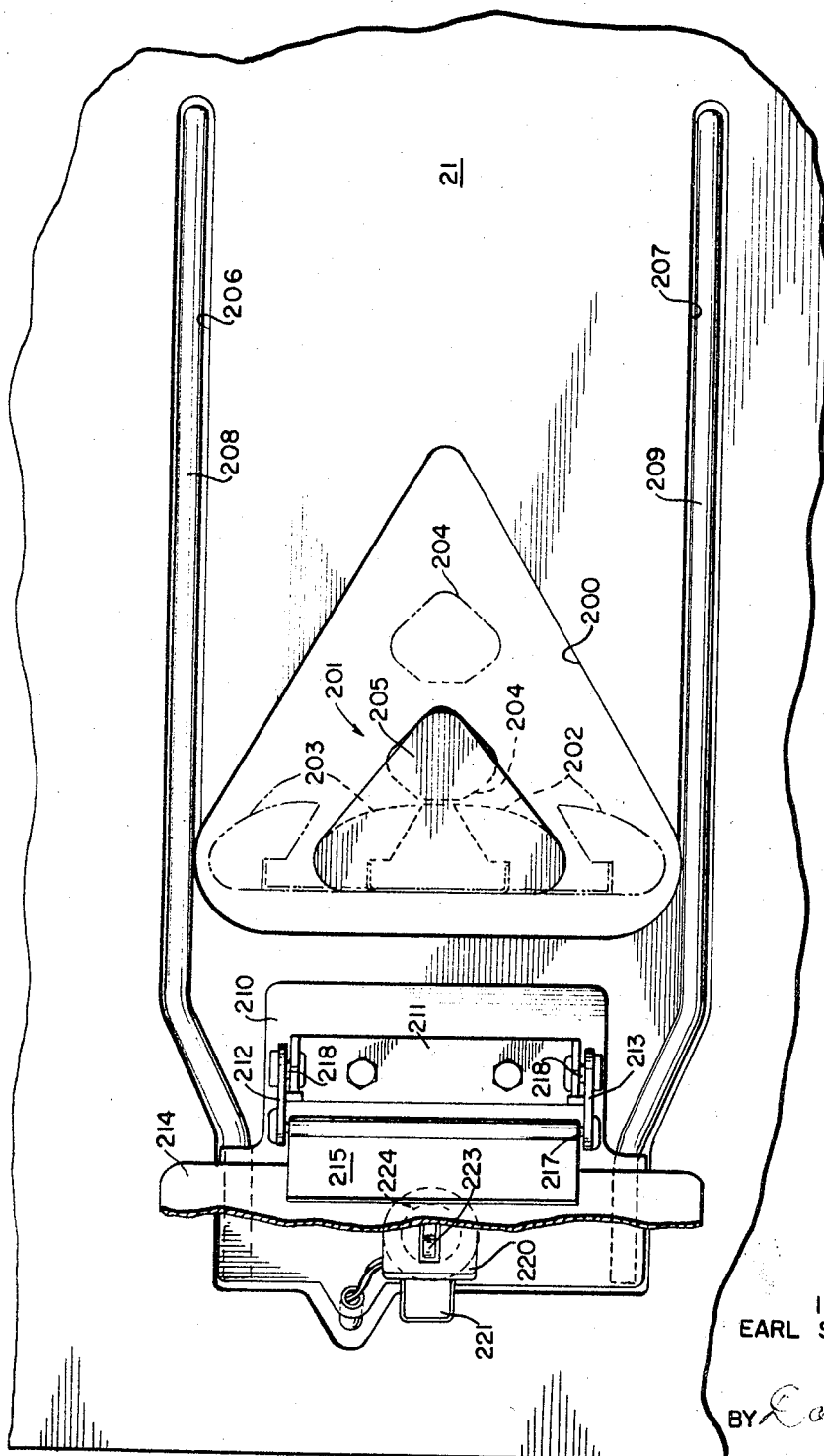
E. SWAITHES

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INVENTOR
EARL SWAITHES

BY *Earl G. Dwyer*
ATTORNEYS

June 10, 1969

E. SWAITHES

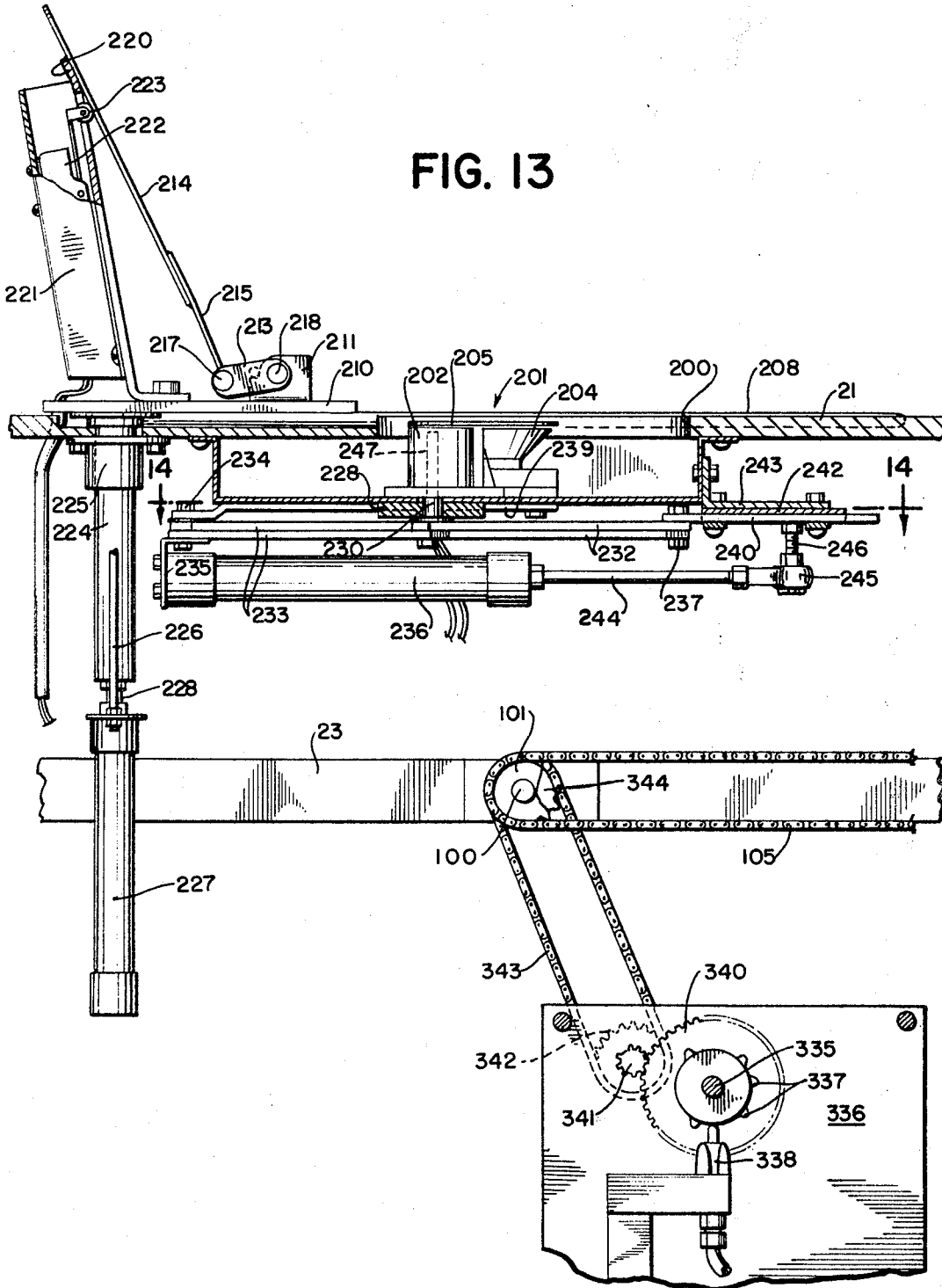
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FIG. 13



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E. SWAITHES

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FIG. 14

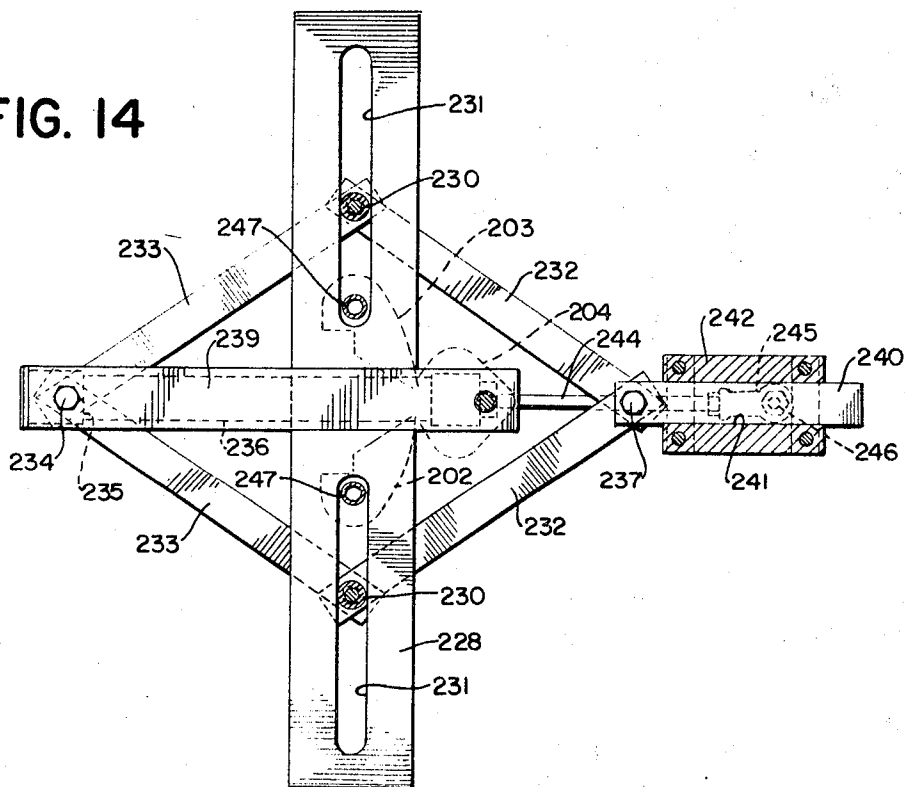


FIG. 17

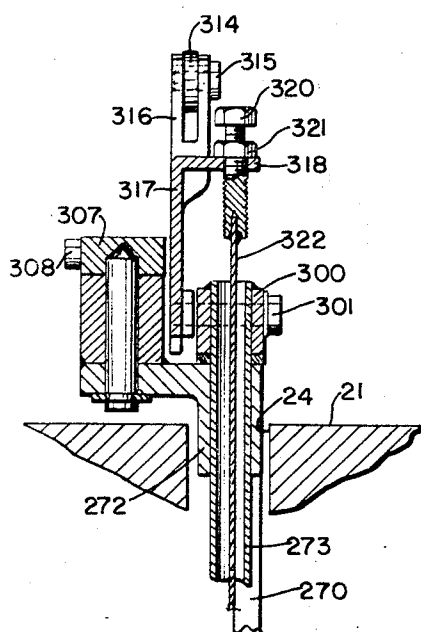
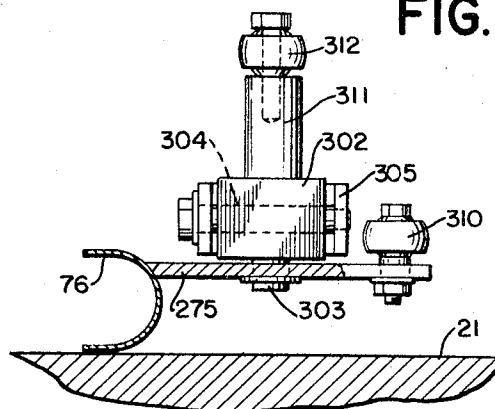


FIG. 18



INVENTOR
EARL SWAITHES

BY

ATTORNEYS

June 10, 1969

E. SWAITHES

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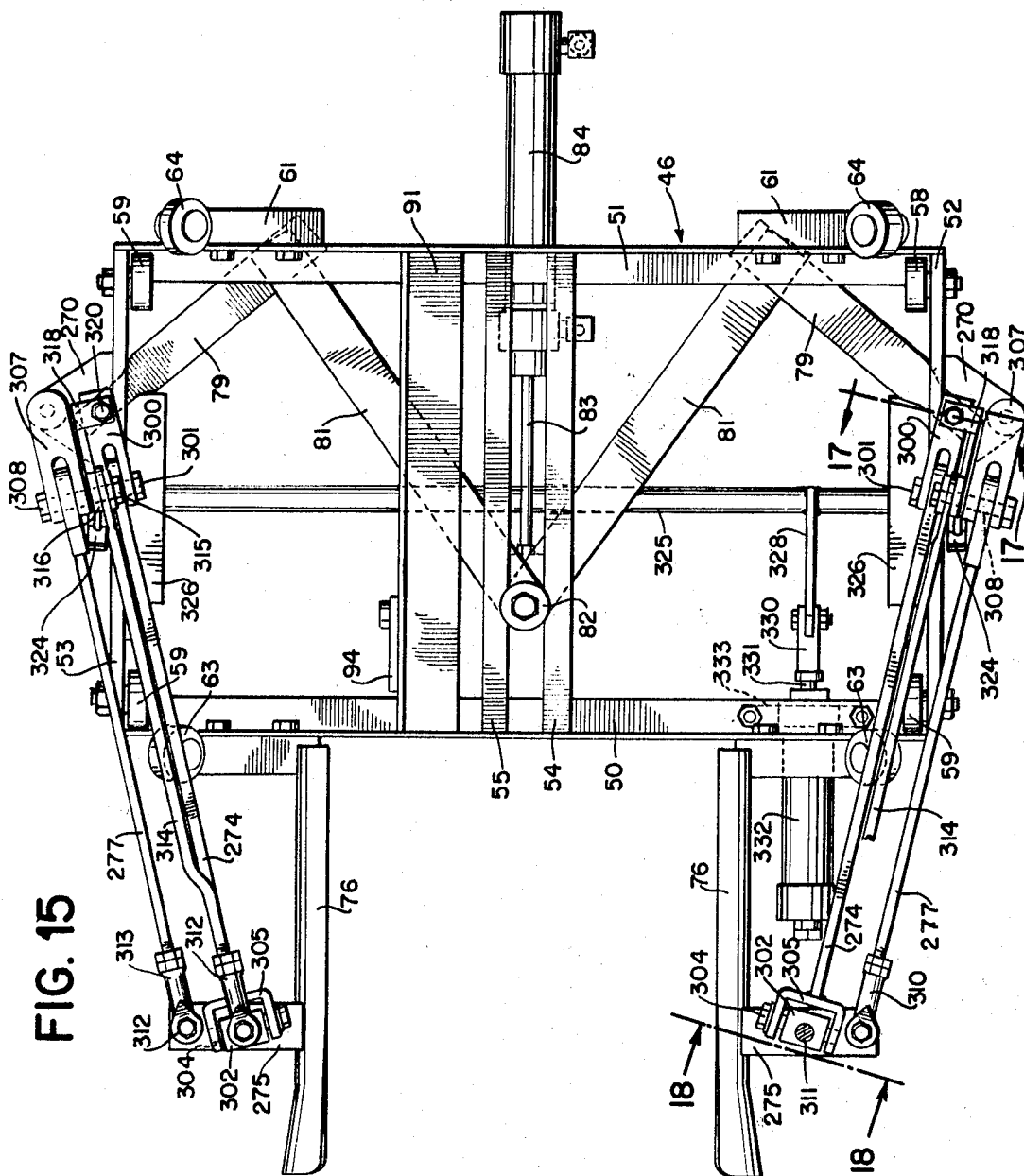


FIG. 15

INVENTOR
EARL SWAITHES

BY *Daryl Daryl*
ATTORNEYS

June 10, 1969

E. SWAITHES

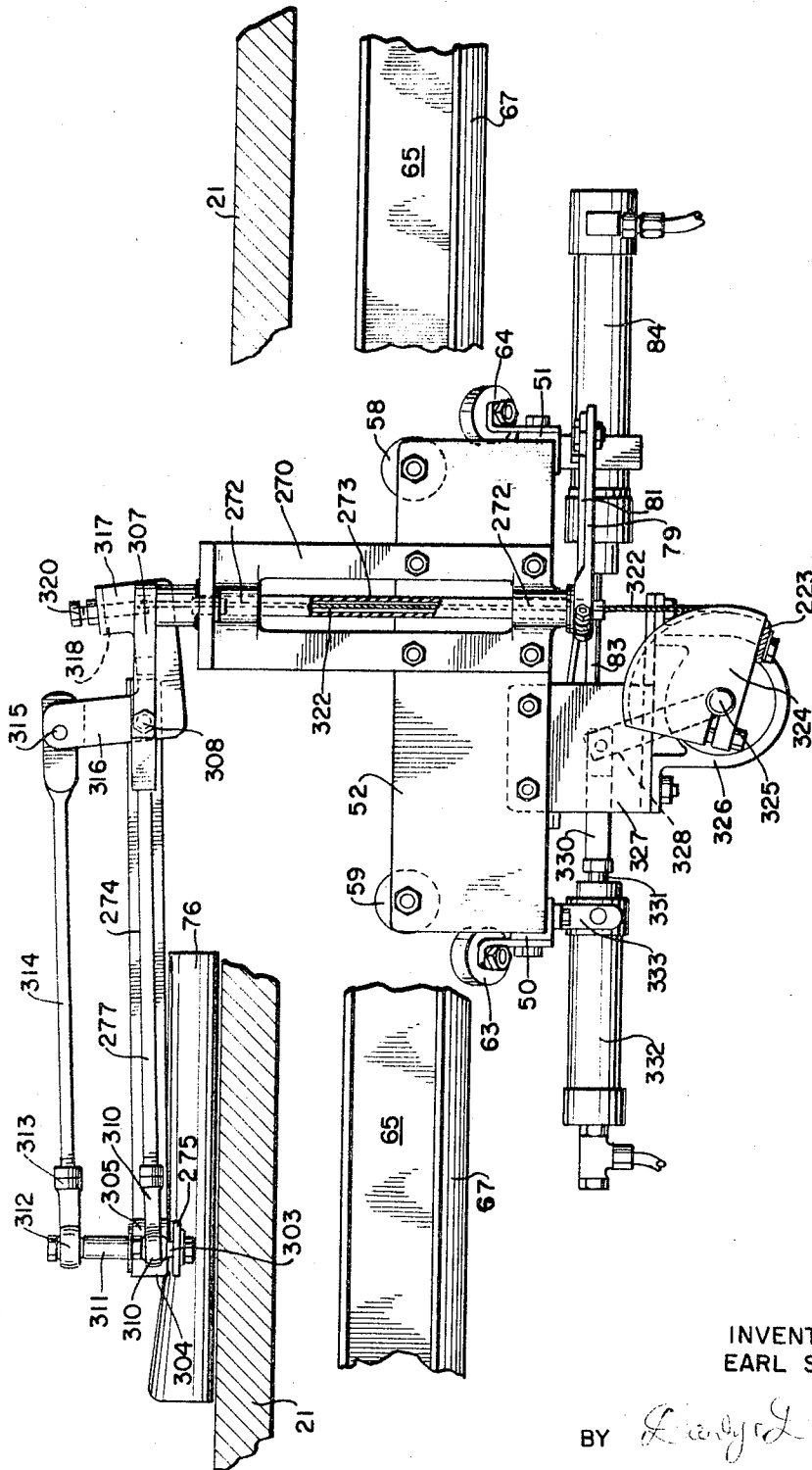
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FIG. 16



INVENTOR
EARL SWAITHES

BY

Earl Swaites

ATTORNEYS

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3,448,557

FOLDING AND BAGGING MACHINE

Earl Swaithes, Star City, Ark., assignor to Spartans Industries, Inc., New York, N.Y., a corporation of New York

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Int. Cl. B65b 63/04, 3/02

U.S. Cl. 53—117

20 Claims

ABSTRACT OF THE DISCLOSURE

The disclosure here disclosed is a machine for facilitating the folding and bagging of garments such as shirts. The mechanism includes means about which a garment is manually folded together with means for automatically taking a bag or envelope from a magazine, opening the bag, inserting transporting fingers therein, transporting the bag to position encompassing the folding means and garment thereon and removing the fingers from the bag. In a second embodiment additional elements are provided for shaping and pressing a garment collar and modifications made in the basic machine structure to adapt it to this additional operation.

As indicated above, the invention lies in the field of packaging machines, generally, and more specifically, in the field of such machines adapted to place a folded garment in a bag by inserting the bag over the garment.

In the past, it has been customary to fold garments and place them in bags in separate operations; specifically, to place a garment face down on a table, place a board thereon, the board being of substantially lesser size than the garment, folding the garment sleeves and upper body inwardly on top of the board, the folds extending for the length of the garment, and then folding the garment upwardly from the bottom and depositing it on the board. At each stage of the folding, pins were utilized to maintain the garment in place on the board and the final folds were likewise held in place with pins. This was done in order that it be possible to take the garment from the board and at that time, or frequently later, and in a different area, insert the garment in an envelope.

By means of the present invention, mechanisms are supplied which facilitate the folding of the garment about a board, or in some cases, two boards, and which automatically cause the separation of a bag from a stack thereof, and the transporting of that bag into position so that the open end of the bag moves over the folded garment, thereby inserting the garment in the bag, after which the transporting means leave the bag and return to position to pick up another bag and to complete the cycle when such repetition is initiated by the operator.

In one embodiment of the invention, the mechanism includes also means for forming and heating the collar of a garment such as a shirt, to assure that prior to the folding and bagging operation and actually as a part thereof, the collar is properly stretched and formed so that the appearance of the article will be proper.

Objects and features of the invention will be apparent when the following description is considered with the appended drawings in which:

FIGURE 1 is a top-plan view of the machine of my invention, showing particularly a folding board or plate with a garment (shown in dotted lines) in position therebeneath, ready to be folded about the board. The figure also shows the general organization of the top of the machine and of the fingers which transport bags from the stack thereof to the garment.

FIGURE 2 is a side elevationatl view of the machine of FIGURE 1, having parts broken away and showing particularly the drive mechanism for the carriage and the

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mechanism for separating the two layers of a bag and thus permitting transporting fingers to enter within the bag,

FIGURE 3 is a detailed view showing a portion of the mechanism which serves to separate the two layers of the bag to permit entry of the fingers within the bag,

FIGURE 4 is a view similar to FIGURE 3, but showing the mechanism in a position which it assumes after the upper layer of the bag has been gripped and raised to open the bag,

FIGURE 5 is a top plan view of the carriage which travels back and forth beneath the table and on which the transport fingers extending above the table to transport the bags are mounted,

FIGURE 6 is a transverse cross-sectional view of the carriage mechanism and of the frame and table top, the view being taken on the plane of the line 6—6 of FIGURE 5,

FIGURE 7 is a fragmentary transverse sectional view of the table top, showing the mounting of a treadle and switch operated thereby for controlling the drive motor of the machine,

FIGURE 8 is a schematic showing of the table top with a garment placed thereon prior to the folding thereof, and with the folding board in position on the upper part of the garment. This figure also shows the bag-transporting fingers inserted within a bag and spread to hold the bag open,

FIGURE 9 is a view similar to FIGURE 8, but showing the conditions after the garment has been folded about the board,

FIGURE 10 is a view similar to FIGURE 9, but showing the situation after the carriage has moved to the left to deposit the bag about the garment on the board, and then moved further to the left and into position such that the fingers are spread apart,

FIGURE 11 is a view similar to FIGURE 10, but showing the condition after the fingers have moved to the right, outside of the bag, and have moved together, after passing the end of the bag, into position to be inserted in another bag for a repetition of the operation,

FIGURE 12 is a plan view of a modified form of the bagging machine, showing the use of a pair of folding elements or boards, together with a collar forming and pressing mechanism,

FIGURE 13 is a transverse, vertical cross-sectional view with part broken away, showing air cylinders and related mechanisms, and in addition, the drive mechanism for various control cams,

FIGURE 14 is a cross-sectional view taken on the plane of the line 14—14 of FIGURE 13, showing particularly the mechanism for actuating the collar-pressing elements,

FIGURE 15 is a plan view of a modified finger-actuating mechanism,

FIGURE 16 is a side elevational view of the carriage of this second embodiment of the invention, with parts broken away and showing particularly the control mechanism for the bag-transporting fingers,

FIGURE 17 is a section view taken on the plane of the line 17—17 of FIG. 15, and

FIGURE 18 is a section view taken on the plane of line 18—18 of FIG. 15.

Referring now to the drawings, and particularly to FIGURES 1 and 2 thereof, it will be seen that the bagging and folding machine of my invention comprises a table generally designated 20. This table comprises the table top 21, which is supported on frame members 22, 23, which members may be of any desired construction and materials.

The table top 21 is provided with grooves 24 and 25, through which elements of the bag-transporting finger mechanism extend, as will later appear. Also, the top 21 is provided with a groove 26, which serves to orient the garment with respect to the table, by providing a means

for receiving the closure buttons 27 of the garment here designated 28.

Pivotally mounted on the table top 21 is a folding board 30, which is also provided with a laterally extending groove 31 to aid in orienting the garment with respect to the board.

As is seen particularly in FIGURE 2, the folding board 30 is pivotally mounted on the table top by means of the bracket 32 affixed to the table, by which a link 33 is pivotally mounted at 34. Board 30 is in turn pivotally mounted at 35 on the link 33, the arrangement giving the board a sufficient latitude of movement so that garments of varying thicknesses can be readily taken care of. Formed integrally with the bracket 32 is a rest 36, which supports the following board 30 in its inoperative position.

At the opposite or right-hand end of the table top 21 is a well 40, which serves as a supply magazine for plastic or other bags or envelopes designated 41 (see also FIGURE 6). In order that bags of varying sizes may be utilized, the well 40 is supplied with upright guide members 42, which guide members effectively limit the size of the well to that desired. As seen particularly in FIGURE 6, the guide members 42 are of generally U-shape and extend through guide members 43, which are fastened to the sides and end of well 40. Each guide member 42 is rotatable in its bearing 43 and is also slidable therein, being urged into a lower position by means of a spring 44 surrounding the extended arm of the U and bearing against the underside of the well 40, and a nut or collar on the end of the arm of the U-shaped guide. It will be seen that with this arrangement the guide can be manually raised and rotated to a desired position to conform the space outlined by the guides to the size of a bag to be utilized.

As is clearly indicated in FIGURE 1, a number of holes 45 is provided in the bottom of the well 40, each hole being arranged on an arc of the circle struck about the center of the respective bearing 43, the holes accommodating the shorter end of the respective U-shaped guide member 42, and thus determining the position of the guide. It will of course be obvious that the guides are placed in corresponding positions to accommodate various sizes of bags, which are generally rectangular, although other shapes could be provided if desired.

As has been indicated, bag-transporting fingers are provided, which fingers take a bag from the stack in the magazine or well 40, transport it to a position where it surrounds a garment folded on the board 30, are removed from the bag, returned outside the bagged garment on the board 30, and re-entered into the next succeeding bag then uppermost in the stack in well 40.

The finger-operating mechanism is mounted on a carriage generally designated 46 (FIGURES 5 and 6), which carriage moves horizontally beneath the table in a reciprocating motion, as will be described.

Carriage 46 comprises a left-hand frame member 50, and right-hand frame member 51, these frame members being joined at their ends by front and rear frame members 52 and 53, as well as by the central frame and guide members 54 and 55.

Rotatably mounted on studs 56 and 57 in the frame members 52 and 53, respectively, are rollers 58, 59. Adjustably mounted on the right and left frame members 50 and 51, are brackets 60 and 61, respectively. Each of the brackets 60 and 61 is provided with a portion extending at an angle with respect to the horizontal, in which portion is fixed a stud 62, on which a roller is rotatably mounted, the forward rollers, as seen in FIGURE 5, being designated 63, and the rearward ones 64.

By means of the rollers 58, 59, 63 and 64, the carriage is mounted on the table 20 for reciprocating horizontal movement along the length of the table. In order to provide such mounting, channel members 65 are mounted on brackets 66, which are in turn fixed to the underside of the table top 21. Channel members 65 are so mounted that their flanges extend outwardly and each of these channel

members has an angle member 67 suitably fixed thereto, with the apex of the angle facing downwardly as indicated in FIGURE 6. Rollers 58 roll along the upper face of the lower flange of one of the channels 65, while the rollers 59 roll along the upper face of the lower flange of the other channel 64. In like manner the rollers 63 roll along and bear against the lower inner face of one of the angle members 67, while the rollers 64 bear against the lower face of the inner portion of the other angle member 67; the roller and channel arrangement thus serving to guide the carriage for horizontal reciprocating movement, as stated hereinabove.

Referring again to FIGURE 6, it will be seen that there is a bracket mounted on each of the members or plates 52 and 53, these brackets being designated 70, each bracket extending upwardly through the respective slot 24 or 25 of table top 21, and being bent inwardly as indicated at 71. Attached to each of the brackets 70 is a plurality of bearings 72, in which a shaft 73 is journaled. Pivotally mounted on the inwardly facing extension 71 of each bracket 70 is a link 74, which extends generally to the left and inwardly, and is pivotally connected at its left end to a bar 75, which supports the bag-transporting finger 76.

Likewise pivotally connected to the bar 75, is a second link 77, which extends generally rearwardly and outwardly and is fixed at its right-hand end by means not shown, to the shaft 73.

As will be seen, the link 74 is made adjustable in length by means of the usual slot and screw connection indicated at 78, so that the pantograph arrangement formed as described above has an initial, adjusted position, the pantograph serving always to keep the bag-transporting fingers 76 parallel to the table center line, despite their inward and outward movement.

Fixed to each of the shafts 73 at its lower end, is an arm 79, which arm is pivotally connected by suitable means such as a shouldered screw 80 with a second arm 81, which is in turn pivotally mounted on a traveling head 82, which is guided for reciprocating movement by the frame members 54 and 55. Fixed to the traveling head 82 by any suitable means, such as a threaded connection, is the piston rod 83 of an air cylinder 84. Thus, as the piston rod moves inwardly and outwardly of its cylinder, the shafts 73 are caused to oscillate in their bearings and to move the fingers 76 toward and away from each other while maintaining the fingers parallel to each other and to the center line of the table 21.

To complete the description of the carriage, it is pointed out at this time that fixed to the frame member 53 (FIGURE 6) there is a bracket 85, the outer right angled extension 86 of which supports a cam 87, which as will later be described, cooperates with a one-way valve actuator to exert certain control functions.

In like manner, there is supported from the frame member 52, by means of brackets 88, an elongated cam member 90, which also cooperates with certain valves for the exertion of control functions.

Referring now to FIGURES 2 and 5, it will be seen that frame members 50 and 51 have extending therebetween a generally central angle frame member 91, which has fixed to its upright flange a downwardly extending plate or bracket 92. Pivotally mounted on the bracket 92 at point 93, is an arm 94, the pivotal movement of which is limited by the fixed studs 95 and 96.

Mounted on the upper longitudinally extending frame member 23 (FIGURE 2) at the left end of table 20, is a stub shaft 100, on which is rotatably mounted a sprocket wheel 101. Similarly, adjacent the right-hand end of the table 20, there is mounted on the upper frame member 23, a stub shaft 102, on which is rotatably mounted a sprocket wheel 103, which has integral therewith a V pulley not designated.

Extending rearwardly from the arm 94, as seen in FIGURE 2, is a pin 104, which extends into an aperture in a link of the chain 105, forming one of the link pivots,

whereby the chain 105 drives the carriage in its reciprocatory movement. As will be obvious, the arm 94 is pivotally mounted and its pivotal movement limited in order to permit accommodation to the spacing between the reaches of the chain 105, while at the same time preventing shift of the position of the carriage relative to the chain by virtue of the movement of the pivoting arm 94 through 180 degrees.

As is shown in FIGURE 2, the chain is driven by means of a V belt 106, which extends around a V pulley mounted on shaft 102 and around a similar V pulley 107, mounted on the shaft 108 of drive motor 110.

Mounted on the shaft 108 is a second V pulley (not seen in the drawings) about which extends a strap 111, one end of which is fixed to a bracket 112 and the other end of which is fixed to the piston rod 113 of an air cylinder 114, the last mentioned elements constituting a brake, as will appear hereinafter.

The drive motor 110 is mounted in a common manner on a platform 115, which platform is pivotally mounted at 116 on a frame member 117, the arrangement providing that the weight of the motor and platform elements exert a force which keeps the drive belt 106 under a proper constant tension.

Referring now to FIGURES 1 and 6, it will be seen that certain valve actuators and switches designated 116, 117, 118, and 120 are fixed to a longitudinally extending frame member in any suitable manner and are adapted to have portions thereof extend into the path of the cam 87. The actuators 116, 117, 118, and 120 are arranged to actuate their respective valves only when the cam passes over them in a predetermined direction, and to be ineffective in the opposite direction, the actuators being of a well-known type, one example being those known as Mead Hydraulic Switches, type MV-20-B. Actuators 116 and 118 are effective when the carriage moves from left to right, while actuators 117 and 120 are effective when the carriage moves from right to left.

Switch 121 is a microswitch and is mounted on a longitudinally extending frame member at the forward side of the table, beneath the table top. This switch is actuated by the cam 90 when the carriage moves from left to right, and remains unactuated when the carriage moves from right to left. The valves 116, 117, 118 and 120 above discussed control the position of the piston rods in various air cylinders which have been mentioned, although the exact manner of control will appear later when the operation of the machine is described.

As was indicated, the machine of the instant invention is provided with means for opening the uppermost bag in the magazine and presenting it in this open condition so that the bag-transporting fingers 76 can enter the bag. These bag-opening means are shown in FIGURES 1 through 4 and will now be described, reference being made to those figures.

Mounted at the left end of arm 130 is a plate 131. On the plate 131 are mounted supply and take-up reels 132 and 133, respectively, for pressure-sensitive adhesive tape. As clearly indicated, the tape path leads from the supply reel 132 over rollers 134 and 135, and thence to the take-up reel 133. Supply reel 132 is suitably frictionally braked so that it resists movement, thus assuring that the tape is always taut between the rollers 134 and 135.

Referring now particularly to FIGURES 1 and 2, it will be seen that arm 130 is pivotally supported at 136 in a bracket 137 fixed to the table top 21, immediately to the right of the well 40, and that a downwardly oriented extension of arm 130 passes through a slot in the table top and lies in position to be pivotally connected to the piston rod 138 of the air cylinder 140, which is suitably mounted on the undersurface of the base of the well 40.

A second arm 141 is pivotally mounted at 142, on a bracket 143 fixed to the right side of the table framework. At the forward and downwardly extending end of the arm 141, a pin 144 is provided which extends through a

slot 145 in the plate 131 and is pivotally fixed in an aperture in a swinging arm 146 mounted on the axis or shaft of the reel 133.

Formed integrally with the reel 133, is a ratchet wheel 147, which cooperates with a drive pawl 148, pivotally mounted by a pin 149, fixed in the swinging arm 146.

A coil spring 150 mounted on a pin 151 fixed in plate 146 bears against a fixed pin 152 at one end and against the pawl 148 at its opposite end, thus holding the drive pawl against ratchet wheel 147.

A detent pawl 155 is pivotally mounted on the plate 131 or on the auxiliary plate spaced therefrom. The detent pawl 155 bears against the ratchet wheel 147 in the usual manner and is held in position by means of a coil spring 156, which bears against the stationary pin 157 at one end and against the detent pawl 155 at the opposite end.

As will be seen from the above, when the air cylinder 140 has pressure fluid supplied to the left-hand end thereof, it causes the arm 130 to rotate in a counterclockwise direction on its pivot 136, lowering the plate 131 so that the pressure-sensitive tape held taut between rollers 134 and 135 is brought into contact with the upper layer of a bag at the top of the stack in the magazine 40. Also, as the plate is being lowered, the swinging plate 146 is caused to rotate in a clockwise direction about the reel shaft, thereby driving the reel 133 in a clockwise direction and advancing the tape so that an unused portion is presented, which adheres to the bag.

As seen in FIGURE 4, as plate 131 rises due to admission of air to the right-hand end of the cylinder 140 (FIGURE 2), the uppermost bag designated 160 (FIGURE 4) is opened by virtue of the adhesion of the upper portion thereof to the tape. Also, as the plate 131 rises, the plate 146 and drive pawl 148 are caused to move in the opposite or counterclockwise direction, passing over the teeth of the ratchet wheel 147, which is held in a fixed position at this time, due to the detent pawl 155.

As will also be seen in FIGURE 4, a weight member is supplied to hold the front edges of the bags in the stack in position in the magazine, the bags being so constructed that the lower edge thereof extends beyond the opening therein. The weight, designated 161 (FIGURES 3 and 4) is pivotally mounted on a rod 162, which is in turn pivoted in the wall of the bag well, as indicated at 163.

Referring once again at this time to FIGURES 2 and 7, it will be seen that a foot treadle is provided, which foot treadle is designated 164 and is fixed to arms 165, which are fixed at their ends to a pivot rod 166. Rod 166 extends between and is pivotally mounted in two depending arms of the bracket 167, which is mounted on the underside of the table top 21.

Likewise fixed to the pivot rod 166 is a small plate 170, on which is adjustably mounted a microswitch 171, the roller actuator 172 of which bears against the underside of the bracket 167. The treadle 164 is normally held in its upper, unoperated position by means of tension springs 168.

When treadle 164 is depressed, the contacts of microswitch 171 close and cause energization of the motor 110. Once the motor has been energized, the carriage starts to move and by such movement closes the contacts of a second microswitch 121, which as has been described, is fixed in position on one of the frame members of the table 20 and arranged to be actuated by the cam 90 (FIGURES 1 and 5).

Microswitch 121 has contacts which are normally closed, so that in the position indicated for the carriage in FIGURE 1, the contacts thereof are open. Thus as the carriage moves to the left after energization of the motor by the foot treadle, the contacts of microswitch 121 close and continue the energization of the motor despite the fact that the foot treadle would normally then be released. Such energization continues until the carriage has returned to substantially the position shown in

FIGURE 1, at which time the cam causes opening of the microswitch contacts and the de-energization of the motor.

It should be noted at this time that the solenoid 114 is arranged to be energized when the motor is de-energized, and vice versa, so that when the carriage approaches its normal at-rest position as seen in FIGURE 1, the motor is de-energized, and substantially simultaneously therewith the band brake already described is applied to assure that the movement of the carriage be arrested at a desired position.

Referring now particularly to FIGURES 8 through 11, a brief description of the operation of the machine through a cycle will be given, it being understood of course that the magazine has been filled with bags, the tape supply reel 130 has a supply of tape thereon, and that the various pressure fluid cylinders are connected to a source of fluid pressure.

The operator first places a garment such as that indicated at 180 in position on the table, with the neck thereof adjacent the left-hand end of the folding board 30. The garment is then folded as indicated in FIGURE 9, so that the sleeves and adjacent side portions of the garment overlie the board 30, and the bottom of the garment folded a number of times so that it also lies on top of the board 30.

The operator then depresses the foot treadle 164, which causes the motor to be energized and the carriage moved toward the left.

The bag-spreading fingers have been caused to move outwardly to the extent permitted by the bag into which they were inserted at the termination of the preceding cycle, and they therefore remove the outermost bag from the stack, pulling it loose from the pressure-sensitive tape, which has raised the upper flap thereof, and start to transport that bag toward the left end of the table. Shortly after the carriage starts to move toward the left, the contacts of microswitch 121 close due to cam 90 leaving the switch actuator, thus continuing the motor energization despite the fact that the operator may thereafter and in fact, will thereafter, release the treadle 164. As the carriage continues its travel toward the left, the cam 87 causes valve 117 to be momentarily actuated, resulting in the application of pressure fluid to the left end of cylinder 140, thereby causing the tape head or plate 131 to descend and the tape carried thereby to adhere to the upper flap of the now uppermost bag in the magazine.

Continued travel of the carriage to the left causes the bag to be placed around the folded garment on the board 30, and once the movement of the bag is arrested by the bottom thereof coming into contact with the garment on the board 30, the fingers 76 slide out of the bag and immediately after leaving the bag, move outwardly to their maximum extent due to the fact that pressure fluid has been continuously applied during the operation thus far described, to the right-hand end of cylinder 84.

As the carriage traveled to the left, cam 87 caused operation of valve actuator 120, which reversed the connections to pressure fluid cylinder 140, permitting pressure to the right-hand end thereof and causing a bag at the top of the supply to be opened in the manner already described.

Shortly after the bag-transporting fingers move outwardly as described above, that link of the chain to which pin 94 of link 102 is connected moves around the left-hand sprocket, causing the direction of carriage movement to reverse, and the carriage, with the fingers thereof separated to their maximum extent, moves to the right.

When the fingers have cleared the folding board 30 and garment thereon, cam 87 causes actuation of valve actuator 118, which reverses the pressure supply to cylinder 84, causing the bag-transporting fingers 76 to move inwardly to their maximum extent, these fingers always

being maintained parallel to each other and parallel to the center line of the table by means of the pantograph connections described in detail hereinabove, the position of the parts being that indicated in FIGURE 11.

Further movement of the carriage to the right causes the fingers 76 to enter into the bag which is held open in the manner already described in detail and depicted particularly in FIGURE 4, until as the carriage reaches its righthand limit of movement, valve actuator 116 is operated by the cam 87 and causes the fingers to be spread apart, the degree of movement being limited by the bag itself.

Immediately following this, the carriage again reaches the position shown in FIGURE 8 and the contacts of microswitch 121 are opened, the motor de-energized, and the brakes applied to the shaft thereof. At this time the cycle has been completed and the operator removes the folded garment and bag thereon from the folding board 30, closes the envelope or bag flap, raises the board 30 about its pivot into its rest position, and places another garment on the table in preparation for the next cycle of operation.

The foregoing has described one form of my invention. A modification thereof is depicted in FIGURES 12-16, which modification will now be described, without repetition, however, of the descriptions of the mechanisms which are common, as is true of most thereof.

As indicated heretofore, this second embodiment of the invention differs from the first, primarily in that means are provided for shaping and pressing the collar of the garment during the folding of the garment, the specific structure of the folding board and its pivot is somewhat modified and added to, to take care of a garment of this type; and the drive and control mechanisms are likewise modified, as is the finger-actuating mechanism and the control therefor.

Referring now to FIGURE 12, there is shown in that view a fragmentary elevation of a modified table top as well as a modification of the folding board structure.

The table top modification consists primarily in that a well 200 is provided. In this well there is mounted a collar shaping and pressing mechanism generally designated 201, which consists of the elements 202, 203, and 204, which are arranged in their closed position in the form of a triangle, over which a cover plate 205 extends. Drive mechanism is provided, which moves the elements outwardly toward the positions shown in dot-dash lines in FIGURE 12, to thereby shape a collar which has been placed about them when in closed position. The mechanism which actuates the elements 202, 203, and 204 will be described later.

Adapted to lie in grooves 206 and 207 in the table top 21 are two fork-tine members 208 and 209 (FIGS. 12 and 13) which are fixed to a plate 210, which plate is mounted for vertical reciprocatory movement. Mounted on plate 210 by means of the bracket 211 and hinge links 212 and 213, is a folding board 214, the mounting of board 214 including a hinge piece 215 together with a pivot rod 217 and two short pivot rods 218, one at each end of the bracket 211. The link arrangement is similar to the first embodiment and provides for readily folding garments of different thicknesses.

As will be readily understood, the fork-tine members 208 and 209 underlie a garment which has been placed with the collar thereof extending through the aperture 200 in the table top and about the collar-pressing mechanism 201, so that when the folding board 214 is placed over a garment, the edges of the board and of the garment overlie the tines 208 and 209. When the bagging operation is to be performed, the tines, together with the folding board and the garment folded thereon, are raised so that a bag may be placed about the garment without there being interference with the downwardly extending buttons or other fasteners or in the formed and pressed collar portion thereof. The raising of the tines, folding

board, and garment thereon takes place under drive of mechanism which will shortly be described.

Also mounted on the plate or platform 210 is a rest 220 which serves to support the folding board 15 when it is in a substantially vertical position.

Mounted on the rear surface of the rest 220 is a housing member 221 (FIG. 13) on which there is in turn mounted a microswitch 222, the actuator 223 of which extends forwardly through an aperture in the rest 220 and into position to be engaged by the folding board 214 when the folding board is in its rest position.

The plate or platform 210 has fixed to the underside thereof a cylinder 224, which cylinder is slidably mounted in the bushing 225, which is fixed to the underside of table 21. Supported beneath the rod 224 by any suitable means such for example as the hanger rods 226, is a pressure fluid air cylinder 227. The piston rod 228 which operates in the cylinder 227, is connected at its upper end to the cylindrical support 224. Thus as the piston is actuated in one direction or the other, the platform is caused to raise or lower, the admission of pressure fluid to the cylinder being under control of valving means which are, in turn, controlled by cams or the like as will appear.

The collar shaping and pressing mechanism is actuated by means of another pressure fluid cylinder, as is shown particularly in FIGURES 13 and 14. Mounted on the bottom of the well 200, in which the collar shaping and pressing unit is placed, is a guide plate 228. Pins 230 fixed to the underside of the pressing elements 202 and 203 extend through slots in the fuse of well 200 into guide slots 231 in the plate 228.

Pivotally mounted on each of the pins 230 is a pair of links 232 and 233. The left ends of links 233 are in turn pivotally interconnected by means of a screw and nut indicated at 234, the screw extending through a bracket 235 to which a pressure fluid cylinder 236 is fixed by any suitable means at its left end as well as through a plate 239 guided in a groove extending transversely across the upper surface of plate 228.

A pin fixed in collar shaping element 204 extends downwardly through a slot in the bottom of well 200 and is fixed to plate 239 at its righthand end.

Links 232 are similarly pivotally interconnected at their righthand ends by means of a screw 237. The screw 237 also is connected to a rod 238, and at its righthand end to a guide member 240 which is guided for reciprocatory horizontal movement in a slot 241 formed in a guide plate 242 which is in turn fixed to the side wall of the well 200 by means of a bracket 243.

Piston rod 244 of the pressure fluid cylinder 236 is joined at its righthand end by means of a fitting 245 and screw 246 to the guide member 240. It will be seen therefore, that when pressure fluid is admitted to the cylinder 236 at its righthand end, the piston rod 244 is retracted into the cylinder, the collar-forming element 204 is moved to the right, since the net motion of the cylinder 236 and plate 239 is to the right the motion of rod 244 to the left being limited by an ear formed on the guide 240. At the same time, the elements 202 and 203 are spread apart by movement of links 232 and 233 so that the three elements 202, 203 and 204 are spread apart while retaining their triangular arrangement and serve to form the collar and to press it into shape.

At the termination of the forming and pressing operation, pressure fluid is of course admitted to the opposite end of the cylinder 236, with the result that the collar-forming elements 202, 203, and 204 are moved inwardly, lying beneath the triangular plate 205, the formed and pressed collar then being readily removed from the forming elements. It should be noted at this time that the forming elements 202 and 203 are provided with heater units such as units of the Calrod type, which units are indicated in dotted lines at 247 (FIGURE 12).

Since the folded garment is raised to a level above the

table top the bag transporting fingers now have to rise to a level above the table top in order to properly place the bag about the folded garment.

The modification of the carriage and finger control mechanism which brings about this raising and lowering of the fingers, in addition to the inward and outward movement and the horizontal reciprocatory movement previously described will now be described, reference being had to FIGURES 15 through 18.

In this connection it is believed unnecessary to describe the carriage proper or the pressure fluid cylinder arrangement for actuating the finger-supporting pantograph arms to bring about their inward and outward motion while maintaining the fingers parallel to the center line of the table. However, the mechanism to provide for vertical movement of the bag transporting fingers, while assuring that the fingers will remain in a plane parallel to the table top, will be described.

Comparing FIGURE 15 with FIGURE 5, it will be seen that the carriage structure is substantially identical, with the exception that mechanism has been added to make it possible to cause the bag-transporting fingers to be lowered into position to enter a bag and to be raised, after a bag has been detached from the stack in the magazine, to a position on a level such that the bag may be placed over the garment which has been raised by virtue of operation of the platform 210 as previously described.

The brackets 70, although essentially similar to those of FIGURE 5, have been reversed so that the horizontally bent-over portions thereof, instead of extending inwardly, extend outwardly, these brackets being designated 270 in FIGURES 15 and 16. Mounted in bushings 272 formed in or fixed to the brackets 270, are shafts 273, which shafts are similar to those in the first embodiment, save that they are hollow. They are, however, operated through the medium of the pressure fluid cylinder 84 and links 78 and 81, in the same manner as previously described.

Mounted on each shaft 273 for rotation therewith, is a short forked arm 300. Mounted in the fork of the arm 300 on a substantially horizontal pivot pin 301, is an arm 274, which arm is connected by means of a trunnion arrangement shortly to be described, to the link 275.

The trunnion arrangement just mentioned comprises a trunnion block 302 (see also FIG. 18), a downwardly extending rod-like portion 303 of which is pivotally mounted in an aperture in the plate or link 275. The block 302 has a horizontally extending shaft 303 fixed therein on which a fork member 305 is pivotally mounted, the fork 305 being fixed by means of a screw or turn buckle arrangement 306 to the left end of arm 274.

Pivotally mounted on bracket 270 is another forked arm 307. Pivotally mounted in the arm 307 by means of the substantially horizontal pivot 308 is an outer pantograph arm 277, which arm is similar to arm 77 of the first embodiment. At its lefthand end the arm 277 has fixed thereto a member 310, which member terminates in a socket portion of a ball and socket joint, the ball member of which lies above the plate 275 and is fixed in that plate.

Returning now to the inner pantograph arm 274 and the construction of the cooperating trunnion, it will be seen that the trunnion block has a cylindrical portion 311 extending upwardly therefrom, which terminates in a ball member 312. A socket or female member is formed in the end of a member 313, which is in turn fixed to the end of an arm 314, which arm is pivotally supported at its righthand end by means of a pivot 315 in a bell crank 316.

The bell crank 316 is pivotally mounted on the pivot pin 301 on which the arm 274 is also pivotally mounted, as previously described. The righthand extension designated 317, of the bell crank 316, extends upwardly and is formed with a bent-off portion 318 (see FIGURE 17).

The portion, 318 bent off from the bell crank 316, as just above described, overlies the upper end of the tubular shaft 273.

Fixed in an aperture in the member 318, is a screw 320, the vertical position of which is adjustable, the screws being locked in an adjusted position by means of the lock nut 321. Fixed in the lower end of the screw 320 in any suitable manner, is the end of a flexible cable 322, which cable extends downwardly through the tubular shaft 273, the lower end being fixed as indicated at 323 in a groove in the periphery of a segmental sheave or pulley 324. The pulleys 324, one at either side of the carriage, are mounted on a shaft 325 for rotation therewith. Shaft 325 is carried in bearings 326 fixed to brackets 327, fastened by an suitable means to the carriage side plates 52 and 53. Fixed to the shaft 325 (FIGURE 15), near the forward side thereof, is arm 328, which by means of an aperture in the upper end thereof is joined pivotally to the forked member 330 fixed to the piston rod 331 of a fluid pressure cylinder 332.

The pressure fluid cylinder 332 is fastened by any suitable means, such for example as the bracket 333, to the underside of the carriage frame member 50. It will be seen therefore, that as the piston rod of the pressure fluid cylinder 332 moves to the right, the segmental pulley 324 is rotated in a clockwise direction, causing the cable 322 to be pulled downwardly, resulting in clockwise rotation of the bell crank 316 about its pivot 301.

As a result of this action, the outer ends of the arms 274, 314, and 277 move in circle arcs about their respective pivots, the relationship of the arms 274 and 314 being maintained so that the plate 275 is in a plane parallel to the table top 21, irrespective of the position of the ends of arms 274 and 314 along their respective circle arcs.

At the same time, due to the pantograph arrangement described in detail in connection with the first embodiment, the arms 274 and 277 move along horizontal circle arcs, maintaining the plate or arm 275 always perpendicular to the center line of the table top 21.

The bag-transporting fingers are essentially the same in this embodiment of the invention as in the prior embodiment, and for this reason are designated by the same reference character in FIGURES 15 through 18. As in the first embodiment, these bag-transporting fingers are in the shape of a circle arc and are fixed directly to the inner ends of the plates 275, the fingers being designated 76.

As has been indicated hereinabove, the mode of controlling the admission of pressure fluid to the various cylinders has been slightly modified in that the valve actuators mounted on the table frame have been replaced by valve actuating cams mounted in a group on a cam shaft, as is shown particularly in FIGURE 13.

The cam shaft 335 is journaled for rotation in a bracket plate 336, suitably mounted on the frame of the machine, and the various cams 337 fixed to that shaft are arranged to cooperate with valve actuating means as indicated at 338. Mounted on cam shaft 335 is a gear 340, which gear meshes with a pinion 341, the shaft of which is also journaled in the bracket 336. Mounted on the pinion shaft at the rear of bracket 336 is a sprocket wheel 342 which is driven through chain 343 by a sprocket 344 which is mounted on shaft 100.

It will be recalled that there is also mounted on the shaft 100, which is an idler shaft, a sprocket wheel 101, about which the chain 105 which drives the carriage runs.

Since the chain 105 is driven by the motor 103 in the manner already described in connection with FIGURES 1 and 2, it will be clear that the cam shaft 335 and the cams 337 thereon are driven in a definite time relationship to the carriage driving chain.

The valves and valve actuators are not described in detail, since many such forms of valves and actuators are suitable for the purpose. It is only necessary that these valves be so arranged that when one valve actuator is

operated, the piston of a particular pressure fluid cylinder is moved in one direction, and when a second valve actuator is operated the piston of that same cylinder is caused to move in the opposite direction.

The sequence of operation of the valves is substantially identical with that disclosed in connection with the first embodiment, save that additional operations are performed as described hereinabove, particularly the operation of the collar-shaping and pressing mechanisms, the operation of the platform raising and lowering mechanism, and the operation of the bag-transporting finger-raising and lowering mechanisms.

The operation of the second embodiment of the invention is as follows:

At the termination of a cycle of operation the parts are substantially in the positions as shown in FIGURES 12 through 16 of the drawings. The operator then spreads a shirt on the table with the sleeves and sides thereof overlaying the tines 208 and 209, and with the collar, which has previously been buttoned together, placed about the forming elements 202, 203 and 204.

At this time, the operator actuates a valve control, not shown, which admits pressure fluid to the lefthand side of cylinder 236, resulting in the collar-shaping and pressing elements being spread to shape the collar. At the same time that the collar-pressing elements are operated, a circuit is closed to energize the heating elements in those forming elements, so that the collar is shaped and simultaneously pressed.

After actuating the collar-forming elements, the operator places the folding board 214 in position over the tines 208 and 209 and proceeds to fold the sides of the garment, including the sleeves, inwardly in the usual pattern. Thereafter the lower portion of the garment is folded over the folding board in the same manner as described in connection with the first embodiment, and a single pin is inserted in the garment through the various layers thereof to hold it in position.

Next, the operator actuates a second switch conveniently located, as for example, at the front of the table, which valve admits pressure fluid to the righthand end of the cylinder 236, causes de-energizing of the heating elements of the pressing elements and causing retracting of the pressing elements to their position beneath the plate 205.

The operator then operates a foot treadle exactly similar to the one described in connection with FIGURE 1, which in the manner described in connection with the first embodiment of the invention, initiates the cycling operation, that is, causes the motor to drive the carriage toward the left. At this time the bag-transporting fingers 76 are within the uppermost bag in the magazine and the cylinder 84 continues to be supplied with pressure fluid at its righthand end, urging the bag-transporting fingers outwardly against the sides of the bag.

Shortly after the fingers start to move to the left, the cam shaft 335 moves into a position such that the valve actuator controlling admission of pressure fluids to the lower end of cylinder 227, is actuated, thereby raising the platform 210, together of course with the folding board 214 and the garment folded about that board.

At substantially the same time, another cam on the cam shaft 335 operates a valve actuator, causing admission of pressure fluid to the left end of cylinder 332 and of course connecting the right end of that cylinder to tube exhaust.

As a result, the piston rod 331 moves to the right and the mechanism already described causes the fingers 76 to be moved vertically upward while being maintained parallel to the surface of table 21. The fingers 76 are now at the level of the rods or tines 208 and 209 and the bag is spread so that it is open and can readily encompass the tines, folding board and garment folded thereon. Furthermore, the level of the platform and bag fingers is such that the bag bottom slides over the garment with-

out catching on any buttons or on the downwardly extending collar portion thereof.

As the carriage continues its leftward movement, the bag comes into position where the bottom thereof strikes the garment and is arrested thereby. The fingers in their continuing movement are therefore removed from the bag and as they finally leave the bag, move outwardly.

Shortly thereafter the movement of the carriage reverses and the fingers in their outer position and in their upper position move to the right. When the fingers have cleared the tines 208 and 209 and the folding board, they move inwardly and downwardly under control of additional cams on the cam shaft 335 and as they move to the right, enter a bag which has meanwhile been opened in the manner described in connection with the first embodiment. Shortly thereafter a cam on the cam shaft or on the carriage is actuated to open the circuit to the drive motor and the motor stops as described also in connection with the first embodiment of the invention.

The operator now removes the folded garment with its encompassing bag from the folding board and tines and restores the folding board to its rest position. This restoration of the folding board actuates the microswitch 223 of FIGURE 13, which in turn operates a valve actuator which causes pressure fluid to be admitted to the upper end of cylinder 227, an exhaust to occur at the lower end thereof, whereby the platform 210 is lowered to its lower position, restoring the tines to their position in the grooves in the table top and thus placing all of the mechanisms in the position for the initiation of a new cycle of operation.

While I have described preferred embodiments of my invention, it will be understood that many modifications and variations of the specific mechanism utilized might be made without departing in any sense from the spirit of the invention. I wish therefore to be limited not by the foregoing description, but on the contrary, solely by the claims granted to me.

What is claimed is:

1. In a device for folding and bagging garments and the like, in combination, a table adapted to have a garment placed thereon in unfolded condition, a folding board mounted on said table adjacent one end thereof and positionable against a garment on said table to facilitate folding of a garment thereabout, a magazine for bags located adjacent the opposite end of said table, a pair of bag-transporting fingers mounted for reciprocatory movement along said table top, means for moving said fingers toward and away from each other, means to open the uppermost bag in said magazine and means controlling the movements of said bag-transporting fingers through a cycle of operations comprising moving said fingers with a bag thereon toward said folding board to place a bag in encompassing position about a garment on said folding board, moving said fingers beyond said board to deposit said bag in said encompassing position, moving said fingers apart, returning said fingers toward said magazine, moving said fingers together while continuing said movement toward said magazine, entering said fingers in the open end of said uppermost bag and spreading said fingers apart within said bag.

2. A folding and bagging machine as claimed in claim 1, wherein said means for mounting said bag-transporting fingers for movement along said table top comprises a carriage, means mounting said carriage for reciprocatory movement relative to said table top, a pair of sprocket wheels one at either end of said table, means driving at least one of said sprocket wheels, an endless chain extending about said sprocket wheels and means joining said carriage to said chain for drive thereby.

3. A bagging and folding machine as claimed in claim 1 wherein said means for opening said uppermost bag in said magazine comprises a pivotally mounted arm having an end portion overlying the open ends of bags in said magazine, a supply roll for pressure sensitive adhesive

tape mounted on said arm end portion, a take-up reel for said tape also mounted on said arm end portion and means for causing oscillatory movement of said arm about its pivotal mounting to cause a portion of tape extending between said reels to be pressed against the upper layer of the bag and to be moved to an elevated position by movement of said arm to thereby open the bag.

4. A folding and bagging machine as claimed in claim 3 wherein said take-up reel has a ratchet wheel fixed thereto and wherein a second arm is pivotally mounted in a position offset from said first arm mounting, said second arm having its end portion mounted for arcuate movement about the center of said ratchet wheel and said end portion carrying a pawl engaging said ratchet wheel to cause advance of said tape as said first arm is lowered toward said uppermost bag.

5. A folding and bagging machine as claimed in claim 4 wherein said mounting of said arm end for arcuate movement comprises a link rotatably mounted on the axis of said take-up reel and a pivotal connection between said link and said arm end.

6. A folding and bagging machine as claimed in claim 3 wherein said means for oscillating said arm comprises a pressure fluid operated piston connected to said arm.

7. A folding and bagging machine as claimed in claim 1 wherein said means for moving said bag-transporting fingers toward and away from each other comprises a pair of supports one mounted adjacent the rear and one adjacent the front of said table top, said supports being mounted for reciprocatory movement lengthwise of said table, a pantograph mounted on each said support, each pantograph comprising a pair of arms each mounted for horizontal movement about a vertical center on the corresponding support, a link pivoted to the ends of said arms remote from said support, one of said bag-transporting fingers being fixed to each said link and extending parallel to said table top and its center line, a lever arm fixed to the pivot of a corresponding one of each pair of pantograph arms and means for actuating said lever arms.

8. A folding and bagging machine as claimed in claim 7 wherein said actuating means for said pantograph arms comprises a pressure fluid actuated piston and means connecting said piston to said lever arms.

9. A folding and bagging machine as claimed in claim 1 wherein said means for mounting said bag-transporting fingers for movement along said table comprises a carriage, means mounting said carriage beneath said table top for reciprocatory movement relative to said table top, a pair of sprocket wheels, one at either end of said table, means driving one of said pair of sprocket wheels, an endless chain extending about said sprocket wheels and means joining said carriage to said chain for drive thereby and wherein said means for moving said bag-transporting fingers toward and away from each other comprises a pair of supports, one adjacent the front and one adjacent the rear of said table top, said supports being fixed to said carriage and extending upwardly through said table top, a pantograph mounted on each said support, each pantograph comprising a pair of arms each mounted for horizontal movement about a vertical center on the corresponding support, a link pivoted to the ends of said pantograph arms remote from said support, one of said bag-transporting fingers being fixed to each said link and extending parallel to said table top and its center line, a lever arm fixed to a corresponding one of each pair of pantograph arms, a pressure fluid actuated piston operating in a cylinder fixed to said carriage, means connecting said piston to said lever arms, and means to operate said pressure fluid actuated piston in timed relationship to the reciprocation of said carriage.

10. A folding and bagging machine as claimed in claim 9 wherein said pressure fluid piston is double acting and wherein said means for operating said piston in timed relationship to said carriage reciprocation comprises a pair of actuators, one for operating said piston in each

direction and camming means driven by said chain for operating said actuators.

11. A folding and bagging machine as claimed in claim 1 wherein said folding board is pivotally mounted on a horizontal axis on a vertically reciprocable platform, and wherein a fork member is supported on said platform and extends toward said magazine, said fork and board cooperating to form supporting and folding means, a well in said table to adjacent said reciprocable platform, garment collar shaping and pressing elements adapted to press a collar while said garment is being folded about said board mounted in said well; means to actuate said collar shaping and pressing means and means to actuate said platform to elevate said fork, board and garment into a plane above said table top to provide clearance for placing a bag about said garment.

12. A folding and bagging machine as claimed in claim 11 comprising means mounting said bag-transporting fingers for vertical movement while being maintained parallel to said table top to thereby position a bag transported thereby in vertical position to encompass a bag on said fork and board when in elevated position.

13. A folding and bagging machine as claimed in claim 12 wherein said means mounting said fingers for reciprocatory movement along said table top comprises a carriage, tracks extending lengthwise of said table beneath said table top and means mounting said carriage for movement along said tracks; said means for moving said fingers toward and away from each other comprises, a pair of supports mounted on said carriage adjacent the front and rear thereof and extending upwardly through slots in said table, means pivotally mounting a pair of pantograph arms on each said support for horizontal movement, a link pivotally joining the remote ends of said arms and means mounting said fingers on said links, said fingers extending longitudinally of said table; and said means for moving said arms vertically while maintaining them parallel to said table top comprises a third pair of pantograph arms, mounting each said third pantograph arm on a substantially horizontal axis, said third pantograph arm extending parallel to one of the arms of each said pair of arms and being mounted for arcuate movement about the axis of one of each of said pair of pantograph arms, and means connecting each said link to said third pantograph arms for movement about horizontal axes.

14. A folding and bagging machine as claimed in claim 13 wherein each said means mounting said third pantograph arms comprises a bell crank pivotally mounted on the horizontal pivot of the corresponding one of said pair of pantograph arms and a pivotal connection between one arm of said bell crank lever and said third pantograph arm.

15. A folding and bagging machine as claimed in claim 14 wherein means are provided for actuating said third pantograph arm, said means comprising a pressure fluid actuated piston mounted on said carriage and means interconnecting said piston and the second arm of each said bell crank lever.

16. A folding and bagging machine as claimed in claim 15 wherein said interconnecting means comprises, a shaft mounted on said carriage and extending from front to rear thereof, a lever arm on said shaft, means connecting said lever arm to said shaft, a pulley adjacent each end of said shaft and a cable fixed at one end to the periphery of each said pulley and at the other end to the corresponding second arm of said bell crank.

17. A folding and bagging machine as claimed in claim 11 wherein said means for raising and lowering said platform comprises, a bushing mounted on said table top beneath an aperture thereof, a guide rod depending from said platform and extending through said bushing, and a pressure fluid actuated piston connected to said guide rod, said piston moving in a cylinder fixed to said table top and in axial alignment with said piston.

18. A folding and bagging machine as claimed in claim 11 wherein said collar shaping and pressing means comprises three shaping elements arranged in a triangular formation, means guiding each said element for movement along a straight line to form a similar but larger triangle and means for moving said elements simultaneously along said guide means.

19. A folding and bagging machine as claimed in claim 18 wherein said guiding means comprises a pin on each of said shaping elements, said pins extending downwardly through slots in said table top, a guide plate having slots therein through which two of said pins extend, and a third slot in said table top extending at right angles to said first and second slots through which said third pin extends and wherein said means for moving for moving said elements comprises a pair of arms pivotally mounted on each said two pins, a pivot interconnecting the remote end of corresponding arms of each pair, a pressure fluid cylinder mounted on one of said pivots, a pressure fluid actuated piston in said cylinder, a pivot interconnecting the remote ends of the other pair of levers, means connecting said piston to said second pivot, and means for guiding said cylinder and piston for movement along the line of said third slot, said guide means including a link interconnecting said cylinder pivot and said third pin.

20. A folding and bagging machine as claimed in claim 19 wherein means are provided for limiting the movement of said piston relative to said table in one direction whereby said three shaping and pressing elements lie at all times at the apices of similar triangles.

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TRAVIS S. MCGEHEE, *Primary Examiner.*

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