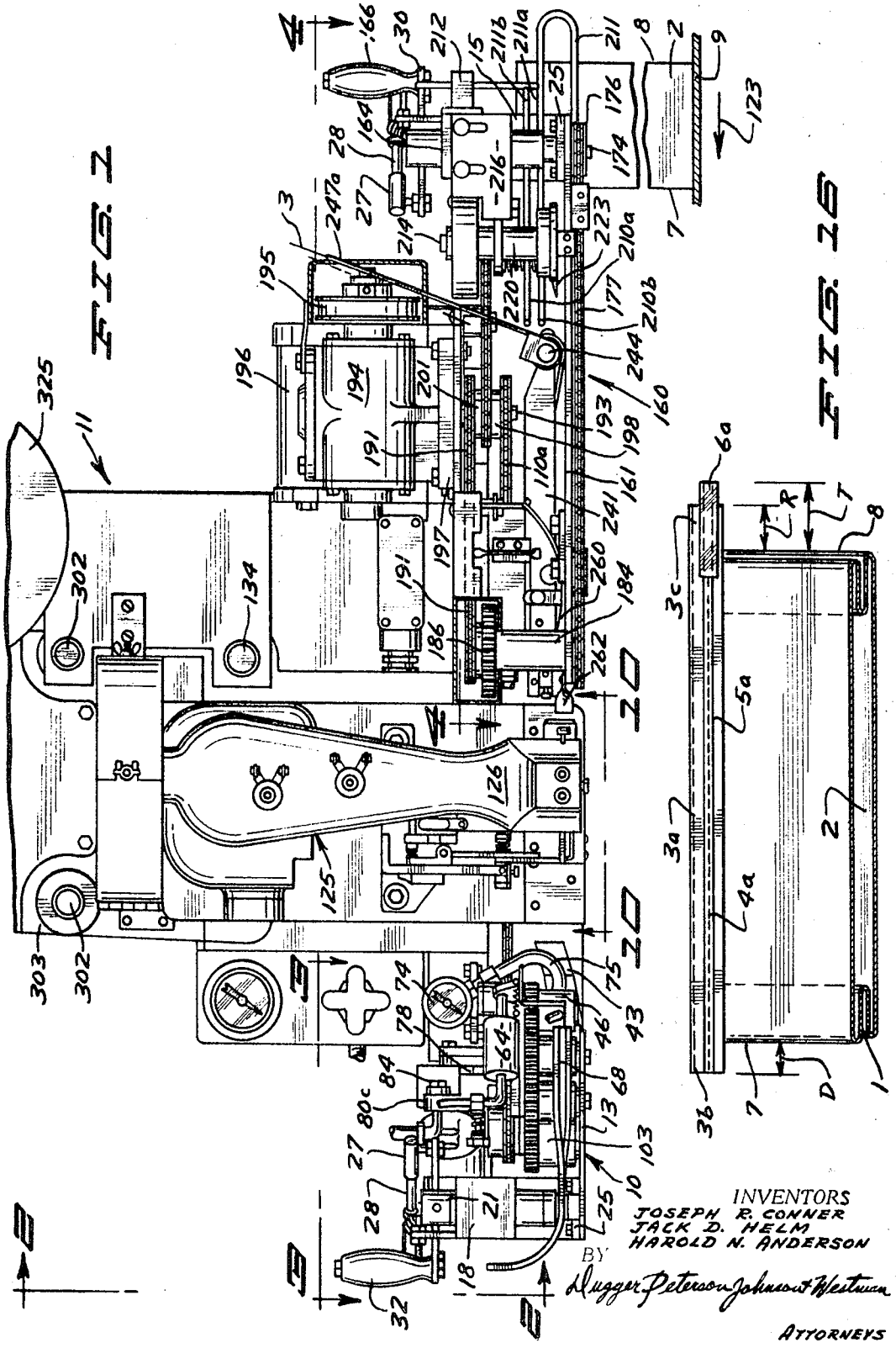
Aug. 12, 1969 J. R. CONNER ET AL 3,460,313

BAG CLOSURE APPARATUS

Filed Aug. 4, 1967 7 Sheets-Sheet 1



Aug. 12, 1969 J. R. CONNER ET AL 3,460,313

BAG CLOSURE APPARATUS

Filed Aug. 4, 1967 7 Sheets-Sheet 2

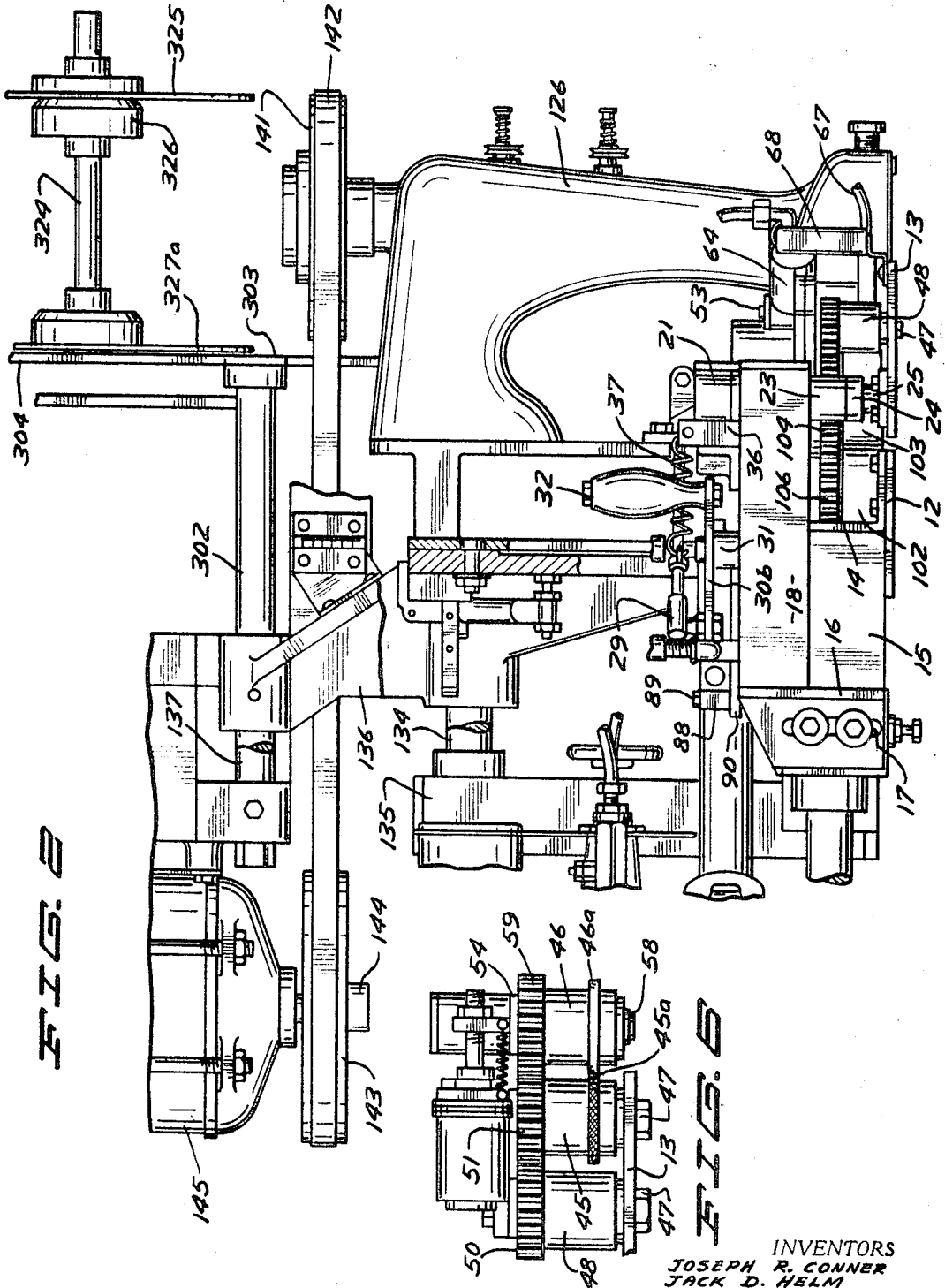


FIG. 2

FIG. 6

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BAG CLOSURE APPARATUS

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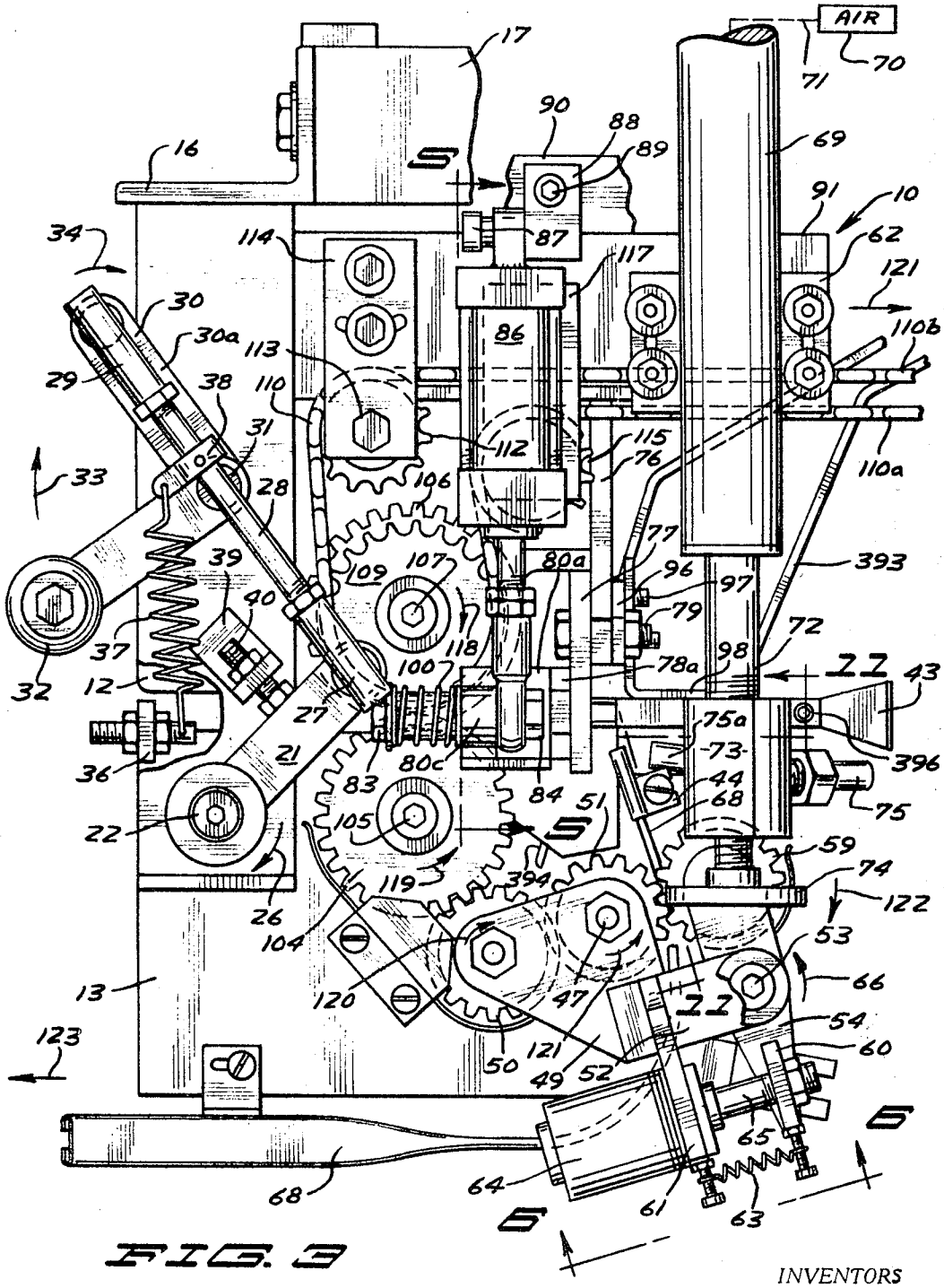

FIG. 3

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BAG CLOSURE APPARATUS

Filed Aug. 4, 1967 7 Sheets-Sheet 4

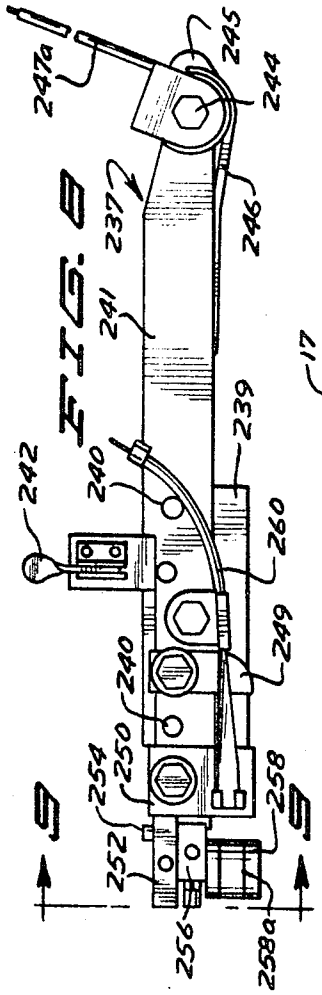

FIG. 5

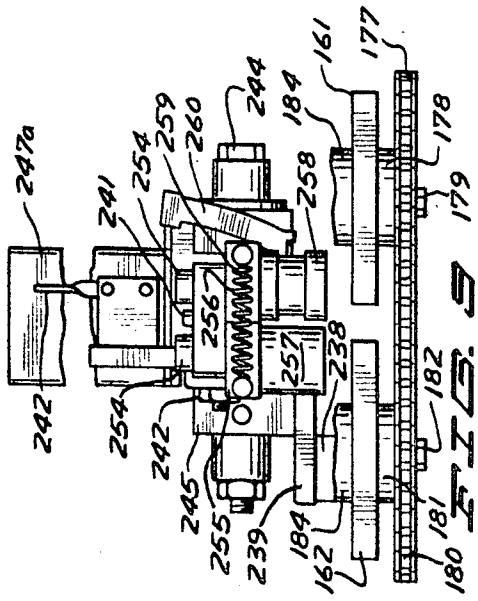

FIG. 6

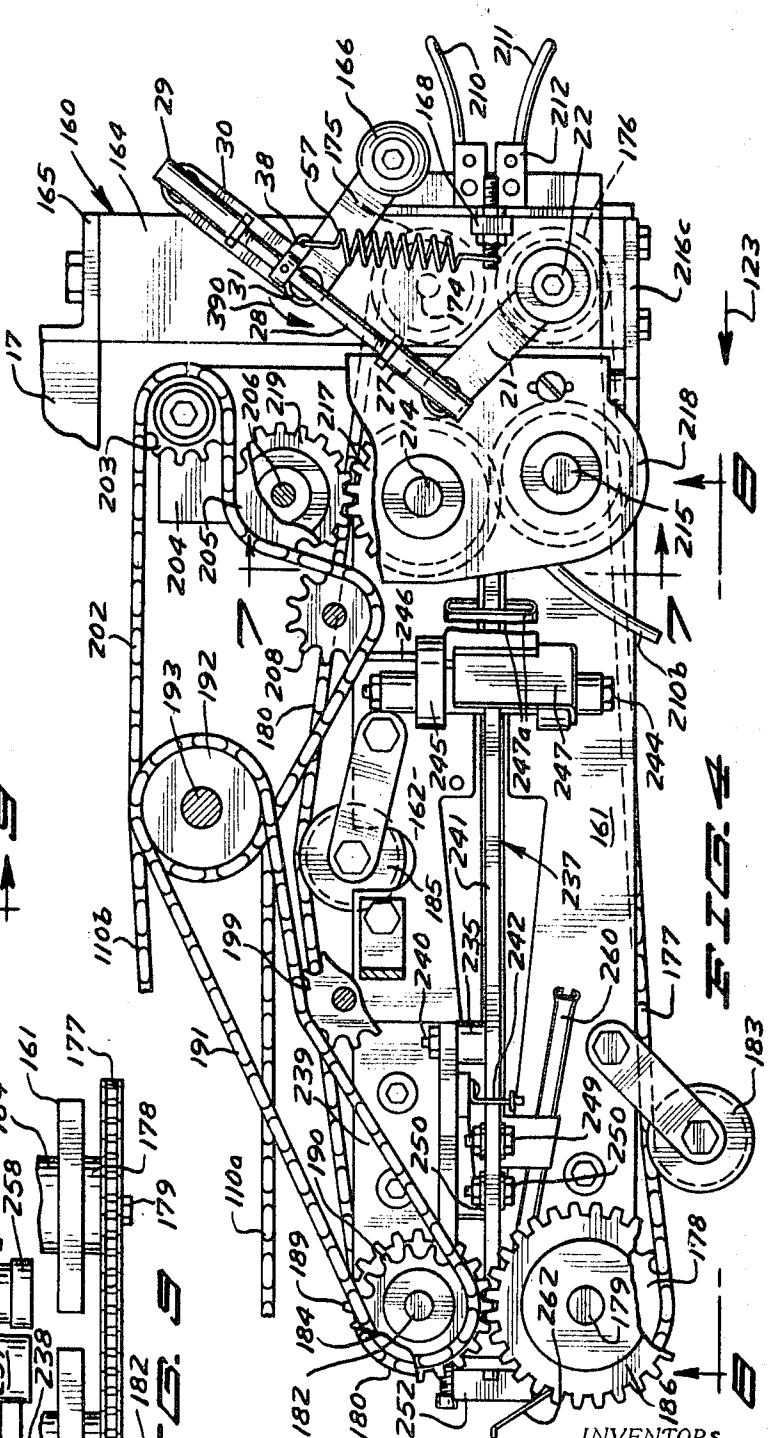

FIG. 4

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BAG CLOSURE APPARATUS

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FIG. 5

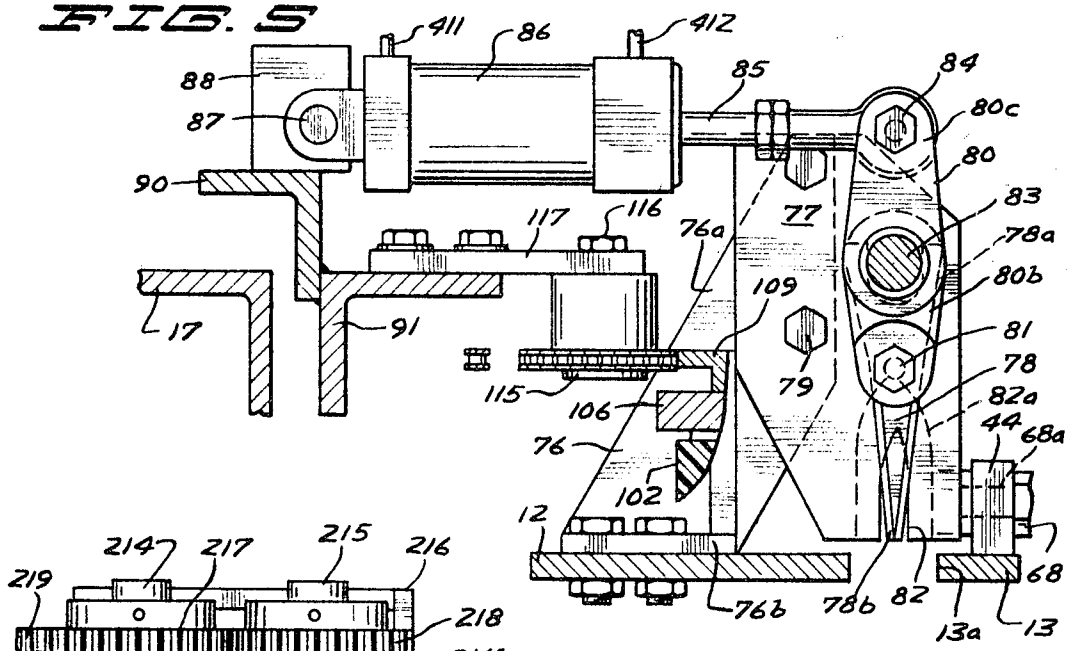


FIG. 7

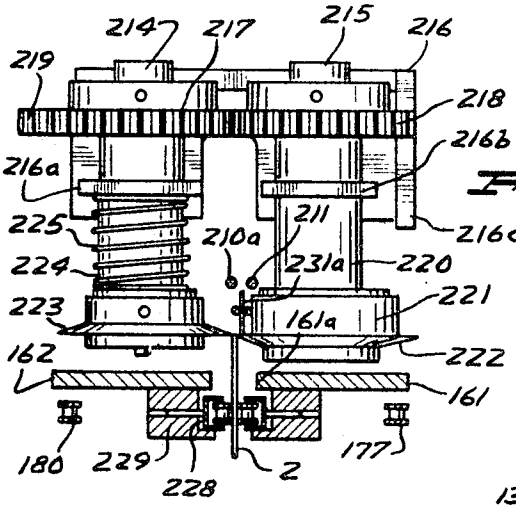
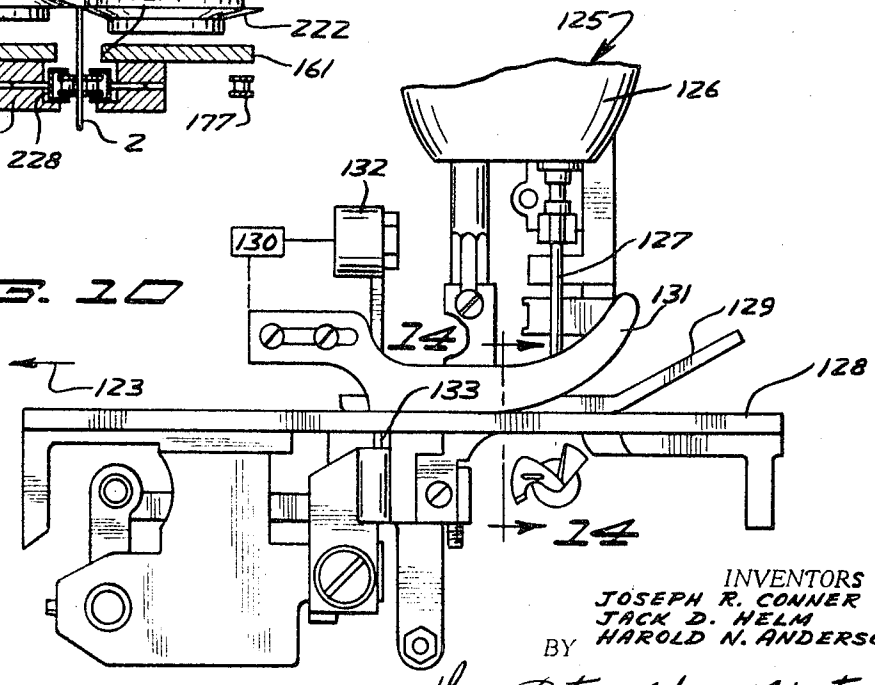


FIG. 10



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BAG CLOSURE APPARATUS

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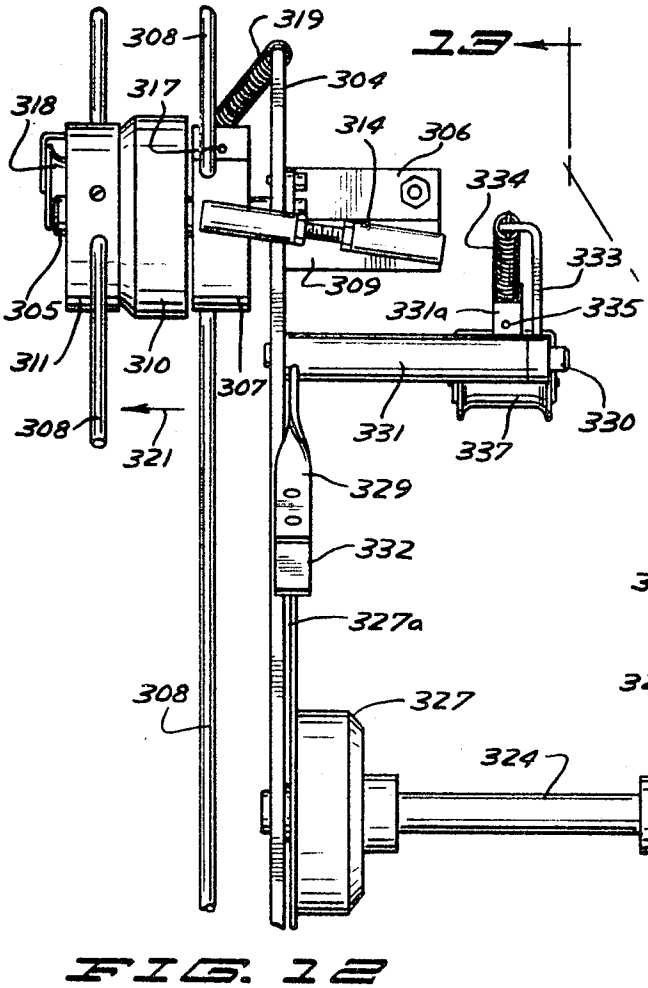

FIG. 12

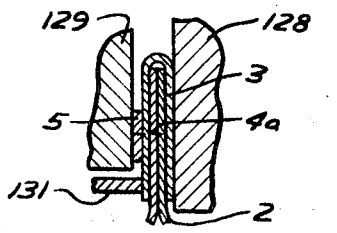

FIG. 14

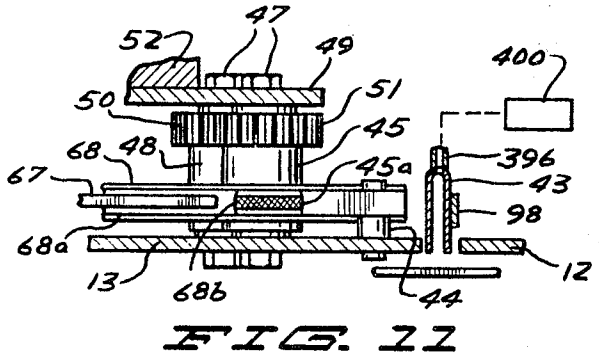

FIG. 11

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BAG CLOSURE APPARATUS

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FIG. 12

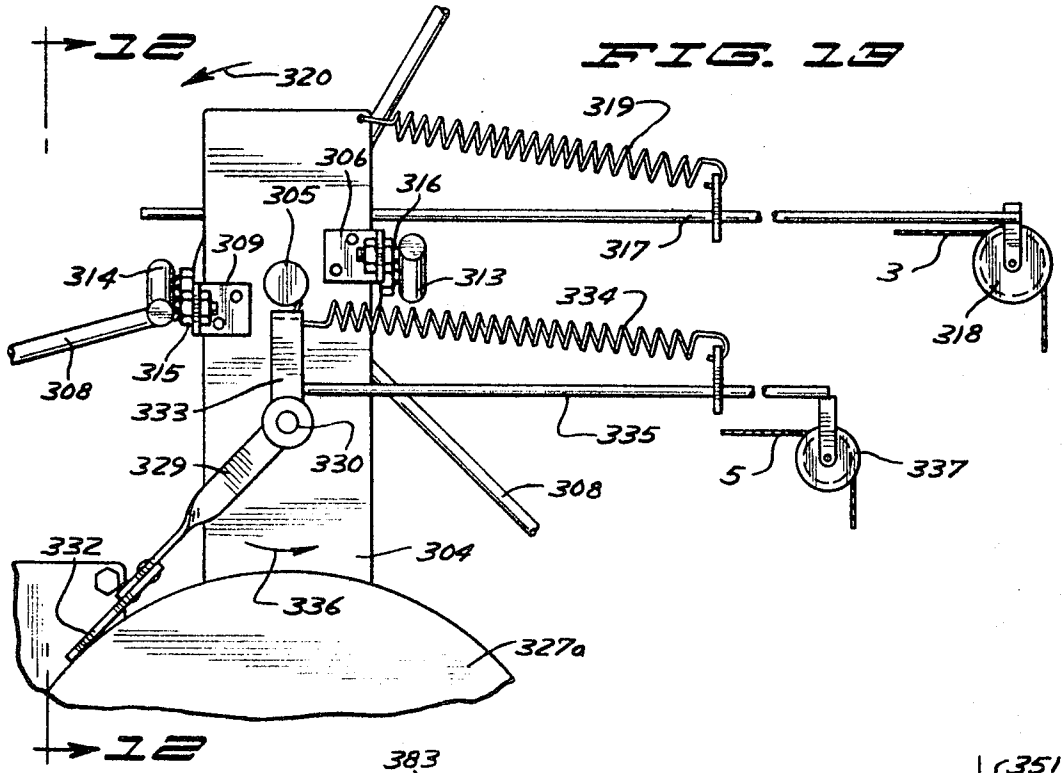
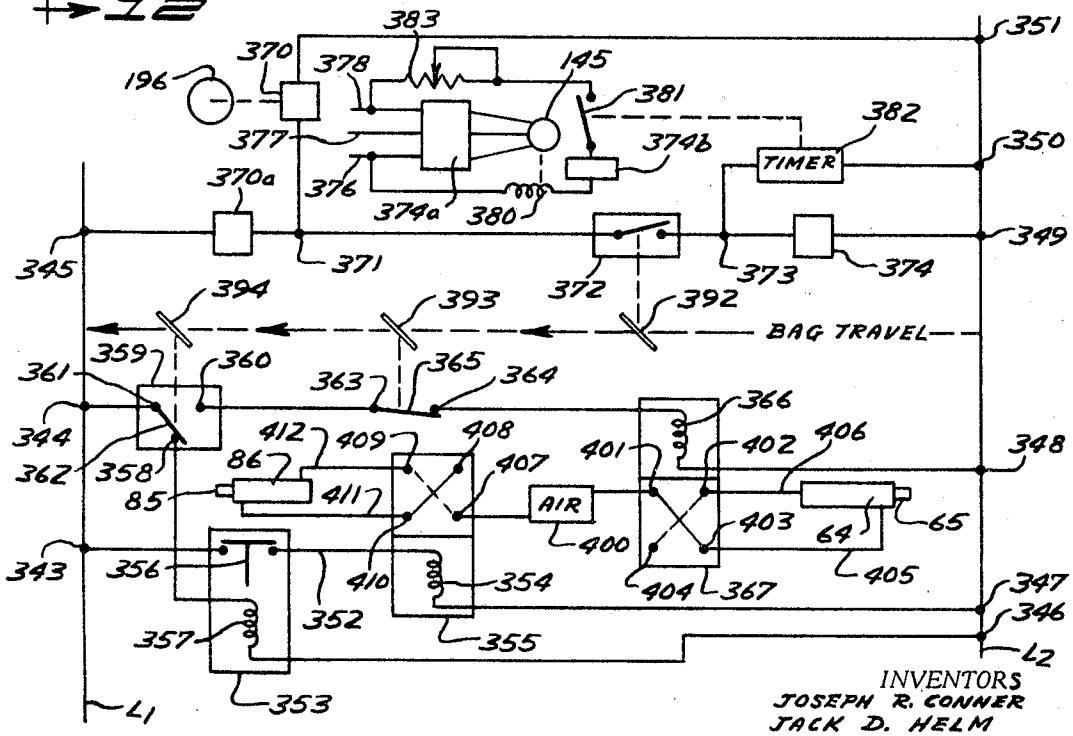


FIG. 13



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United States Patent Office 3,460,313
Patented Aug. 12, 1969

3,460,313

BAG CLOSURE APPARATUS

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Int. Cl. B65b 51/20, 61/18, 49/02
U.S. Cl. 53—64 13 Claims

ABSTRACT OF THE DISCLOSURE

A tape applicator and trimmer assembly for conveyingly holding the bag top closure upright as the bag top is moved through bag top trimmer mechanism, then beneath a folder blade support to have wide tape folded over the bag top end, and next adjacent a tear tape guide that directs tape into contact with the folded tape; a sewing machine automatically applying a single thread unravelable stitch through the bag top, tear tape and folded tape; and a tab applicator assembly for applying a tab to the terminal edge portion of the tear tape and folded tape that includes tab strip, tape guide and feed rollers, a hot air nozzle to activate the tab strip tape adhesive, a reciprocated knife for severing a tab from the tab strip tape and compressor rollers; and braking mechanism for the tear tape and wide tape reel mounting mechanism. Each of the tape applicator and trimmer assembly and tab applicator assembly include a pair of mounting plates extending along either side of the bag top and hand operated mechanism for pivoting one of the plates relative the other plate to facilitate inserting the respective tape in position to be applied and other cleaning and maintaining of the mechanism mounted on the plates.

Brief summary of the invention

Apparatus for forming a sewn bag closure on a bag that includes mechanism for applying a folded tape and tear tape on the bag end portion, sewing the folded tape and tear tape and bag one end, and applying a tab to the terminal end portion of the sewn bag closure.

A pair of mounting plates for various components of the tape applicator and tab applicator assemblies that are resiliently retained in a datum position and a spread apart position, mechanism for moving said plates between said positions, braking mechanism for the wide tape and tear tape, the mounting of the folder blade, the mechanism for severing the tab and the other structure for automatically forming a bag closure on one end of a bag having a folded tape, a tear tape, a stitch line and a tab.

For purposes of facilitating the description of the invention the tape that is folded over the bag top prior to being folded thereover is referred to as "wide tape."

Brief description of the drawings

FIGURE 1 is a side elevational view of the apparatus of this invention;

FIGURE 2 is a rear view generally taken along the line and in the direction of arrow 2—2 of FIGURE 1, for primarily illustrating the tab applicator assembly and a portion of the sewing machine assembly;

FIGURE 3 is an enlarged plan view of the tab applicator assembly in a datum condition, said view being generally taken along the line and in the direction of arrows 3—3 of FIGURE 1;

FIGURE 4 is an enlarged plan view of the trimmer and tape applicator assembly, said view being generally taken along the line and in the direction of arrows 4—4 of FIGURE 1;

FIGURE 5 is a transverse cross-sectional view, generally taken along the line and in the direction of arrows 5—5 of FIGURE 3 to illustrate the tab strip cutter knife, the mounting thereof and the structure for operating said blade, said view showing the knife as it is being moved across the notch;

FIGURE 6 is a vertical elevational view of the tab strip feeder mechanism, said view being generally taken along the line and in the direction of arrows 6—6 of FIGURE 3;

FIGUR 7 is a transverse cross-sectional view generally taken along the line and in the direction of arrows 7—7 of FIGURE 4 to illustrate the mechanism for trimming the bag top;

FIGURE 8 is a side elevational view of the wide tape applicator sub-assembly;

FIGURE 9 is an enlarged transverse sectional view of the rear end portion of the wide tape applicator sub-assembly and the bag top conveyor mechanism, said view being generally taken along the line and in the direction of arrows 9—9 of FIGURE 8;

FIGURE 10 is a fragmentary bottom view of the sewing machine, said view being generally taken along the line and in the direction of arrows 10—10 of FIGURE 1;

FIGURE 11 is generally a transverse cross-section view taken along the line and in the direction of arrows 11—11 of FIGURE 3, said view more clearly showing a portion of the structure for feeding the tab strip tape, the tube for discharging cooling air adjacent the discharge edge portion of the tab strip guide and the tube for discharging air through the transfer guide;

FIGURE 12 is a fragmentary rear view of the wide tape and tear tape reel mounting and braking mechanism, said view generally being taken along the line and in the direction of the arrows 12—12 of FIGURE 13.

FIGURE 13 is a fragmentary side view generally taken along the line and in the direction of the arrows 13—13 of FIGURE 12;

FIGURE 14 is a fragmentary vertical cross-sectional view through a portion of the sewing machine and sewn bag top closure with the thicknesses of the closure exaggerated, said view being generally taken along the line and in the direction of the arrows 14—14 of FIGURE 10;

FIGURE 15 is a simplified showing of the control circuitry and components of this invention; and

FIGURE 16 is a fragmentary side view of the bag top closure formed by the apparatus of this invention.

The type of bag top closure formed by the apparatus of this invention is generally the same as that disclosed in U.S. Patent No. 3,100,596, granted Aug. 13, 1963; and that disclosed in U.S. Patent 3,145,129, granted Aug. 18, 1964 other than the bag closure of U.S. Patent 3,145,129 is a bag bottom closure. That is, the apparatus of this invention provides a bag top closure on a filled, gusseted multi-wall paper bag 2 having gussets 1 that comprises a paper tape 3*a* folded over the end of the bag top and a line of stitched thread 4*a* driven through the folded tape and the walls of the bag and sewing the walls together adjacent the top end of the bag (see FIGURE 16). The length of the tape 3*a* is greater than the width of the bag and said tape has integral end portions 3*b* and 3*c* which extend outwardly of the leading and trailing edges 7 and 8 respectively of the bag. The stitching extends completely throughout the length of the folded tape and is driven through a narrow tear tape strip 5*a* on the side of the bag that is referred to as the needle side, this side being the side which faced the needle of the sewing machine providing the stitching. The stitching is of a single thread unravelable chain stitch type.

A tab 6*a* is releasably secured to the end portion 3*c* of tape 3*a* and firmly adhered to the adjacent end portion of the tear tape strip 5*a* over the thread on the needle

side of the folded tape. The end portion 3c is the end of the folded tape from which the unraveling of the stitched thread progresses. The tab secured to the folded tape, the tear tab and the stitched thread are in the same relationship as disclosed in U.S. Patent 3,100,596 relative the folded tape, the narrow paper ribbon and stitching respectively.

Referring now in particular to FIGURES 1–3 inclusive, the tab applicator assembly, generally designated 10, of the apparatus of this invention, generally designated 11, will now be described. The tab strip applicator assembly includes a pair of longitudinally elongated horizontal plates 12, 13 that are transversely spaced from one another and have straight adjacent edge portions, plate 12 being dependingly bolted to an angle bracket 14 that in turn is mounted on one end of the transverse elongated block 15. The opposite end of block 15 is attached to an angle bracket 16 which in turn is bolted to one end of the longitudinally elongated frame member 17 of the main frame (on parts being illustrated). Also mounted on angle bracket 16 in overlying relationship to block 15 and welded to block 15 is a support block 18. As may be noted from FIGURE 2, block 18 is of substantially greater transverse length than block 15 and extends into overlying relationship to the rear corner portion of plate 13.

The annular end portion of a pivot arm 21 is keyed to the upper end of a vertical pivot shaft 22, shaft 22 extending pivotally through an aperture in one end of the block 18. An annular spacer 23 is mounted on shaft 22 in abutting relationship with block 18, a collar 24 being provided on the shaft beneath spacer 23. An attachment member 25 is fixedly keyed to the lower end of shaft 22 and is bolted to plate 13 whereby when pivot arm 21 is turned in the direction of arrow 26, plate 13 will be pivoted about the axis of shaft 22 the same angular amount in the same direction.

A ball joint assembly 27 is pivotally connected to the end of the pivot arm 21 opposite shaft 22, the ball joint assembly mounting one end portion of a connecting rod 28 for movement about a vertical pivot axis relative said arm 21. The opposite end of rod 28 is mounted by a ball joint assembly 29 which in turn is pivotally mounted on one end of a portion 30a of a right angle crank arm 30 to permit said opposite end pivoting about a vertical axis relative arm 30. The apex portion of the crank arm is pivotally mounted on a vertical pivot member 31 which in turn is mounted on the horizontally intermediate portion of block 18 to extend thereabove. The opposite end of the crank arm mounts an upwardly extending handle 32. Accordingly, when the handle 32 is pivoted from the datum position of FIGURE 3 in the direction of arrow 33 about pivot 31, the ball joint assembly is generally pivoted in the direction of arrow 34 relative crank arm portion 30a to move the connecting rod and ball joint assembly 27 whereby the pivot arm and shaft 22 are provided in the direction of arrow 26 about the axis of shaft 22 to pivot plate 13 to move the front end portion thereof away from plate 12.

In order to resiliently urge and return plate 13 to its datum position when plate 13 is adjacent its datum position, or to its spread apart condition when plate 13 is adjacent its spread apart condition, a bracket 36 is mounted on block 18 transversely intermediate pivot 31 and shaft 22 and a short distance rearwardly thereof, one end of coil spring 37 being connected to bracket 36 while an opposite end is connected to a bracket 38 that is attached to the connecting rod 28 in a fixed position. However, when the handle 32 has been pivoted to move plate 13 to a spread apart condition relative plate 12, the end of the coil spring that is connected to bracket 38 is on the opposite side of shaft 31 from the datum condition and thereby resiliently retains the plate 13 in the spread apart condition.

To limit the pivoting of handle 32 in the direction opposite arrow 33 to a datum position, a bracket 39 is attached to block 18 and mounts an adjustment nut and bolt 40 in a position to have the bolt abut against the mid portion of the pivot arm 21. That is, bolt 40 is threaded into bracket 39 sufficiently that when arm 21 abuts against the head of the bolt, plate 13 will have its one edge 13a spaced from and parallel to the adjacent edge of plate 12.

A transfer guide 43, that is generally U-shaped in transverse cross-section, is mounted on the forward end portion of plate 12 through structure described hereinafter to extend forwardly thereof and transversely over the space between plates 12 and 13 for guiding the bag top between said plates and retaining it upright. The forward end portion of the guide which extends forwardly of plate 13 is flared to have its side wall portions converge inwardly in a rearward direction and a web portion tapered in a downwardly direction. A line 396 is connected to a source of air under pressure 400 and discharges downwardly through the web portion of the transfer guide (see FIGURE 11).

Mounted on plate 13 to extend adjacent the rearward terminal end of the transfer guide is a tab guide 68, guide 68 having a terminal end portion that is elongated in a generally transverse direction and inclined a few degrees rearwardly in a direction toward the transfer guide. An intermediate portion of guide 68 extends between feed rollers 45 and 46 to feed the tab strip tape therethrough when said rollers are in a tab feed condition (see FIGURES 6 and 11). Roller 45 has a diametrically enlarged annular flange 45a which has a knurled surface, flange 45a extending into the tab strip guide through a notch 68b formed in said guide opposite the slot 68a of the guide that extends the length thereof.

Roller 46 has a diametrically enlarged flange portion 46a having a smooth circumferential surface at the same elevation as flange 45a. A pair of vertical stud shafts 47 are mounted on plate 13 and by a somewhat triangular shaped plate 49. Roller 45 is rotatably mounted on one shaft 47 while a spacer 48 is mounted on the other shaft 47. On each of the stud shafts 47 intermediate plates 49 and 13 respectively there is rotatably mounted intermeshing gears 50 and 51. Gear 50 and spacer 48 on one shaft 47 together with roller 45 and gear 51 on the other stud shaft 47 maintain plate 49 vertically above and parallel to plate 13.

One end portion of a plate 52 is welded to an apex portion of plate 49 to extend forwardly thereof, the opposite end portion of plate 52 dependingly mounting a pivot member 53 which in turn is connected to the mid portion of an arm 54 to permit the arm pivoting about a vertical axis relative plate 52. One end of arm 54 dependingly mounts a stud shaft 58, a gear 59 being provided on stud shaft 58 in intermeshing relationship with gear 51 and connected to roller 46 to rotate said roller. Gear 51 is connected to the feed roller 45 to rotate said roller when the gear is rotated.

A bracket 60 is welded to the opposite end of arm 54 while a bracket 61 is welded to plate 52. One end of a coil spring 63 is connected to a bolt that is mounted by a bracket 60 while the opposite end is connected to a bolt that is mounted by a bracket 61, the coil spring constantly resiliently urging the bracket 60 to move toward the bracket 61 whereby rollers 45, 46 are retained in the spaced apart condition. In order to move the rollers to a tab feeding condition, there is provided a piston cylinder combination having a cylinder 64 mounted on bracket 61 and a piston rod 65 that is attached to bracket 60. Upon applying air under pressure to the cylinder 64, the piston rod is moved to an extended condition to pivot arm 54 in the direction of arrow 66 about shaft 53 to move flange 46a into abutting relationship with flange 45a, provided no tab strip extends between said flanges. Flange 46a in a tab feed condition extends into guide slot 68a.

From the entry nip formed by the rollers 45, 46 in a tab feed condition, guide 68 extends transversely outwardly

and thence rearwardly and upwardly. As may be noted from FIGURES 1 and 3, the rearward portion of the guide 68 extends to maintain a tab strip to be in cross-section in a horizontal plane while the intermediate portion is twisted such that the tab strip is in a vertical condition when it enters the entry nip between rollers 45, 46 and is moved adjacent the transfer guide.

The tab strip 6 has an adhesive surface that is activated by directing hot air thereagainst, there being provided a conventional electrical heater tube 69 that heats air as it flows therethrough. One end of tube 69 is in fluid communication with a line 71 that is connected to a source 70 of air under pressure. Appropriate valving (not shown) is provided in line 71 to control the flow of air therethrough. The tube 69 is mounted on a bracket 62 that is bolted to angle iron 91. The opposite end of the heater tube is in fluid communication with a pipe 72 that in turn is connected to a T-joint 73. One end of joint 73 opens to a thermometer 74 while the opposite end of said joint mounts and is in fluid communication with one end of an air nozzle 75. The nozzle 75 has an outlet end 75*a* that opens adjacent the exit end of the guide 68 for directing hot air under pressure into the adjacent adhesive surface of the tab strip located in the terminal end portion of said guide. In this connection, it is to be mentioned that the guide 68 and the bracket 44 have the horizontally extending slot 68*a* intermediate the opposite horizontal edges of the tab strip and facing the hot air nozzle whereby hot air from the nozzle may impinge on the adhesive surface of the tab strip.

A line 67 has one end connected to a source of air under pressure (not shown) and an opposite end portion that extends adjacent to the transversely extending portion of the tab strip guide 68. Line 67 discharges in a general horizontanl direction toward the entry nip between feed rollers 45, 46 and along slot 68*a* to provide a source of cooling air. The purpose of providing the cooling air is to keep the transfer guide 68 at a sufficiently low temperature that the adhesive is not activated by discharge of hot air from the nozzle 75 at a location rearwardly of the bracket 43.

Referring now to FIGURES 3 and 5, rearwardly of the terminal end of the transfer guide bracket 43 and to one side thereof there is provided a mounting bracket 76 having a horizontal leg 76*b* bolted to plate 12. Mounting bracket 76 has a leg 76*a* that extends vertically upwardly and transversely in a direction toward plate 13, tab strip cutter mounting plate 77 being secured to leg 76*a* by bolts 79 such that the lower end thereof extends transversely across the space between plates 12, 13 and at a slightly higher elevation than said plates. Cutter plate 77 has a downwardly opening notch 82 that converges in a longitudinal rearward direction, the transverse width of the forward portion of the notch being substantially equal to the distance between plates 12, 13 in a datum condition such as indicated by the dotted line edges 82*a* in FIGURE 5. A pivot bolt 83 has a threaded end portion threadedly secured in plate 77 at a location vertically above notch 82 such that the bolt extends horizontally rearwardly of plate 77. A cutter drive arm 80 has an intermediate portion 80*a* with an aperture through which the bolt 83 extends whereby the drive arm is pivotally mounted on said bolt, and an arm portion 80*b* integrally joined to portion 80*a* to generally depend therefrom adjacent plate 77. A bolt 81 pivotally extends through portion 80*b* and is threadedly secured in the intermediate portion of a tab strip cutter blade (knife) 78 whereby the tab strip cutter blade is located transversely between plate 77 and the drive arm. The cutter blade has bifurcated arm portions 78*a* that extend upwardly along either side of bolt 83 to form a loose pivotal fit therewith, and an elongated portion 78*b* on the positive side of bolt 81 that has transversely opposite cutting edges.

Drive arm 80 also has a transverse rearwardly, upwardly extending arm 80*c* that is pivotally connected by a pivot member 84 to the outer end of the piston rod 85 of a piston cylinder combination that also includes a cylinder 86 (see FIGURE 5). The end of the cylinder remote from the piston rod is connected by a pivot member 87 to a pivot block 88, pivot block 88 in turn being bolted by vertically extending bolt 89 to a longitudinally extending angle bracket 90. The lower end of the vertical leg of a longitudinally elongated angle bracket 90 is welded to the angle bracket 91 to extend thereabove, the rearward edge of angle bracket 91 in turn being welded to block 18.

A spring 100 is provided on bolt 83 to have one end bear against a washer which in turn bears against the head end of said bolt while the opposite end of the spring bears against leg portion 80*c* of the drive arm. As a result, the drive arm is resiliently urged in a forward direction whereby the cutter blade 78 is resiliently retained in abutting relationship with the cutter plate.

In order to mount the transfer guide bracket 43 to have its reaward end forwardly of and in longitudinal alignment for directing a bag top into notch 82*a*, bolts 78 mount a guide bracket 96 on the mounting plate 77 opposite the cutter blade 77 (see FIGURE 3). Bracket 96 in turn through bolts 97 mounts the one leg of an angle bracket 98 in a selected adjusted position while the longitudinal extending leg of said bracket is welded to one leg of the transfer bracket 43.

A sewn bag top having a tab thereon passing longitudinally rearwardly of the cutter knife 78 moves into the entry nip of compression rollers 102, 103 at a location below bolt 83. Roller 103 is rotatably mounted on a stud shaft 105 which has its lower end secured in plate 13, a gear 104 being rotatably mounted on shaft 105 and connected to roller 103 to drive said roller. Gear 104 is mounted at an elevation to be in intermeshing driving relationship with idler gear 50 and in driven relationship to a gear 106 that is rotatably mounted on a stud shaft 107. Shaft 107 has its lower end portion secured to plate 12 and rotatably mounts roller 102 in a position to be closely adjacent roller 103. Roller 102 is drivenly connected to gear 106. Also rotatably mounted on shaft 107 and drivenly connected to gear 106 is a sprocket 109. Sprocket 109 is driven by a chain 110, one run 110*b* of the chain extending around an idler sprocket 112 that is rotatably mounted by a stud shaft 113 in depending relationship to the horizontal plate 114. Plate 114 is bolted to the horizontal leg of bracket 91 to extend transversely outwardly thereof. The run 110*a* extends transversely of sprocket 109 and thence partially around the idler sprocket 115 to extend longitudinally forwardly thereof. Idler sprocket 115 is rotatably mounted on a stud shaft 116 (see FIGURE 5), shaft 116 being mounted by one end of a transverse plate 117, the opposite end of the plate being bolted to horizontal leg of bracket 91 at a location forwardly of plate 114. As a result, when chain run 110*b* is moved in the direction of the arrow 121, sprocket 109 and gear 106 are rotated in the direction of arrow 118 whereby gear 104 is driven in the direction of arrow 119. Accordingly rollers 102, 103 are respectively rotated in the direction of arrows 118, 119. At the same time gear 50 is driven in the direction or arrow 120 to in turn drive gear 51 in the direction of arrow 121, gear 51 in turn driving gear 59 in the direction of arrow 122 when air has been applied to cylinder 64 to through arm 54 move gear 59 into intermeshing relationship with gear 51. At the time gears 51 and 59 are driven, the feed rollers 45, 46 are respectively rotated in the direction of arrows 121, 122 to advance a tab strip toward the transfer guide at an elevation of the tear-tape bag top closure.

Referring now to FIGURES 1, 2 and 10, there is provided a sewing machine, generally designated 125, longitudinally forwardly of the tab applicator assembly. The sewing machine is sold under the trademark "Union Special" by the assignee of this application and is of a construction to provide a taped-sewn bag top closure of the nature described in U.S. Patents 2,987,164, 3,100,596 and 3,145,129; the type of stitching being clearly

illustrated in FIGURE 6 of U.S. Patent 2,987,164. In view of the foregoing, the sewing machine will only be briefly described. The sewing machine includes a sewing head 126 having a stitching needle 127 for forming a sewn bag top closure as the bag top in a closed condition together with the wide tape folded thereover are moved longitudinally rearwardly between the throat plate 128 and presser foot 129 (see FIGURE 10). While the sewing machine is sewing a stitch line, it in a conventional manner pulls the tear tape and folded tape rearwardly to move at the same speed as the movement of the bag. A conventionally mounted clipper blade 132 is provided to be moved adjacent a stationary knife 133 for severing the folded tape, tear tape and thread. An actuator 131 is conventionally mounted and is moved away from the throat plate when a bag top moves into the entry nip of said actuator and throat plate to actuate conventional mechanism 130 to move the clipper blade to act in conjunction with knife 133 to perform the aforementioned severing function. Also, when the bag top exits from the exit nip between said actuator and throat plate, the actuator moves toward the throat plate to actuate mechanism to again move the clipper blade relative to knife 133 to sever the tapes and thread.

A sewing machine drive pulley 141 through conventional structure provides drive for operating the sewing needle, mechanism 130 and the presser foot. Pulley 141 is driven by the belt 142 which in turn is driven by the motor pulley 143 that is keyed to the shaft 144 of a motor 145 that is mounted on the main frame.

The frame portion 136 which mounts the sewing machine is supported on frame rods 134 that in turn are attached to frame members 135. The frame members 135 in turn are joined to channel 17 through frame members (not shown). The frame portion 136 mounts rods 137 that in turn mounts the motor 145 and other structure for mounting the tab strip reel, and the thread, most of said structure not being illustrated.

Longitudinally forwardly of the sewing machine is the trimmer and tape applicator assembly, generally designated 160. Referring now to FIGURES 1 and 4, the applicator assembly 160 includes a pair of longitudinally elongated plates 161, 162, the mounting of which is generally the same as the mounting of plates 12, 13 other than plates 161, 162 are dependingly supported at their forward end portions. That is, plate 161 in the datum position is retained parallel to and transversely spaced from plates 162 but may be pivoted about a vertical axis relative plate 162 such that the rearward end of plate 161 is substantially spaced from the corresponding portion of plate 162. That is, plate 162 is bolted to an angle bracket (not shown) that in turn is attached to a block 15. Block 15 and the transversely elongated block 164 that is in overlying relationship to block 15 are bolted to an angle bracket 165 which in turn is mounted on the forward end of frame member 17. The forward end portion of block 164 which overlays plate 161, mounts a shaft 22, the lower end of the shaft having an attachment member 25 keyed thereto and bolted to the forward end portion of plate 161 to mount plate 161 whereby pivotal movement of the shaft will pivotally move said plate. A pivot arm 21 is keyed to the shaft and at its outer end mounts a ball joint assembly 27 which in turn mounts connecting rod 28. Connecting rod mounts a ball joint assembly 29 that is pivotally connected to one end of the crank arm 30. Crank arm 30 is pivotally mounted on the vertical pivot member 31 that is mounted by block 164, the crank arm also mounting an upright handle 166. A coil spring 57 is connected to bracket 38 mounted on the connecting rod and to a bracket 168 mounted on block 164 for resiliently retaining plates 161, 162, in either their datum condition or their spread apart condition in a manner similar to that described with reference to plates 12, 13. It is to be noted that no structure is provided on block 164 to limit the pivotal movement of the front end portion of plate 161 toward plate 162.

A vertical stud shaft 174 rotatably mounts a chain sprocket 175 in depending relationship to the forward end portion of plate 162 while a second stud shaft correspondingly dependingly mounts a chain sprocket 176 in depending relationship to plate 161. A chain 177 is extended around sprocket 176 and sprocket 178, sprocket 178 being mounted on and keyed to a vertical shaft 179 (see FIGURE 4) to be in underlying relationship to the rearward end of plate 161 (see FIGURE 9). A tensioning sprocket 783 is mounted on plate 161 to abut against chain 177.A chain 180 is extended around sprocket 175 and a sprocket 181 that is keyed and mounted by a shaft 182 in underlying relationship to plate 162, a tensioning sprocket 185 being mounted on plate 162 to abut against chain 180. With the plates 161, 162 in their datum position, the sprcoket 175 is transversely opposite sprocket 176 while sprocket 178 is transversely opposite bracket 181, the aforementioned sprockets mounting the chains 177, 180 such that their inner runs are in abutting relationship when no bag top is located therebetween.

A spacer member 184 rotatably mounts shaft 182, spacer member 194 being mounted in abutting relationship with the upper surface of plate 162. Likewise, a second spacer 184 rotatably mounts shaft 179 on plate 161. Keyed to the upper end of shaft 179 is a gear 186, a gear 186 being in driven relationship to a gear 187 that is keyed to shaft 182. A sprocket 190 is keyed to the upper end of shaft 182, sprocket 190 being driven by a chain 191. Chain 191 in turn is driven by a sprocket 192 that is keyed to the output shaft 193 of the reducer 194, the tensioning sprocket 199 for chain 191 being mounted on plate 162. The pulley on the input shaft of the reducer 194 is driven by a belt 195, belt 195 in turn being driven by a pulley (not shown) on the motor shaft of the drive motor 196. The reducer and drive motor are mounted on a horizontal plate 197 which in turn is mounted on the frame member 17. On the lower end of the reducer shaft 193 there is keyed a sprocket 198 for driving the chain 110 which is extended around said sprocket. Vertically between sprockets 198, 192, a sprocket 201 is keyed to shaft 193, sprocket 201 driving a chain 202. One run of the chain 202 extends longitudinally forwardly of sprocket 201 to pass around the idler sprocket 203 that is rotatably mounted on the horizontal plate 204. Plate 204 is mounted on plate 162 and extends transversely toward frame member 17 at a location just reawardly of block 164. From sprocket 203, the chain 202 extends in driving relationship to sprocket 205 that is rotatably mounted on a stud shaft 206, stud shaft 206 in turn being mounted by plate 204. Chain 202 thence passes over idler sprocket 208 and thence to sprocket 201. The idler sprocket 208 is mounted on an arm (not shown) that is pivotally connected to plate 162, there being provided a spring (not shown) for resiliently urging the arm to urge sprocket 208 in a direction to retain chain 202 in a tight condition.

A pair of longitudinally elongated bag top guides 210, 211 are respectively mounted at a higher elevation than plates 161, 162 by clamps 212, each clamp in turn being mounted by block 164. The longitudinally extending portions of the bag top guide provide a throat that initially transversely converges for directing the bag top between the plates 161, 162. As may be noted from FIGURE 1, clamp 211 has a pair of longitudinally extending rod portions 211*a*, 211*b* at a substantially higher elevation than plate 161. Portions 211*a*, 211*b* extend between shafts 174 about edge 161*a* of plate 161 and terminate at a location between shafts 214, 215. Guide 210 has rod portions 210*a*, 210*b* that extend longitudinally above the edge of plate 162 that is adjacent edge 161*a* from longitudinally adjacent shafts 174 to adjacent shafts 214, 215 and then are curved to in a longitudinal direction extend transversely across plate 161 at a location rearwardly of shaft 215.

Referring to FIGURES 4 and 7, a gear **218** is keyed to shaft **215** in intermeshing driven relationship to a gear **217** that is keyed to a shaft **214**, gear **217** in turn being driven by a gear **219** that is rotatably mounted on shaft **206** and drivenly connected to sprocket **205**. Shaft **214** is rotatably mounted by an ear **216***a* of bracket **216** while shaft **215** is rotatably mounted by an ear **216***b* of said bracket. Bracket **216** has a longitudinally extending portion **216***c* that is bolted to the end of block **164** that is opposite frame member **17**.

A knife shaft support **220** is provided on shaft **215** axially between ear **216***b* and a felt washer **221**, support **220** having an annular flange bearing against one edge of the felt washer while the opposite edge of the felt washer bears against the annular knife **222** that is keyed to shaft **215** to rotate therewith. An annular knife **223** is mounted on shaft **214** to have a circumferential edge portion in overlapped relationship to an edge portion of knife **222**, knife **223** being keyed to shaft **214** to rotate therewith but being movable a limited axial amount relative thereto. An annular member **224** is provided on shaft **214** and has an enlarged diametric flange bearing against knife **223**, said flange also seating one end of a coil spring **225** that has an opposite end bearing against ear **216***a* for resiliently urging member **224** in the downward direction. Accordingly a circumferential edge portion of knife **223** is resilently retained in an abutting relationship with a circumferential edge portion of knife **222**.

As may be noted from FIGURE 7, the knives **222**, **223** are spaced vertically above plates **161**, **162** respectively with their overlapping portions being transversely intermediate said plates. Accordingly, as the bag is moved longitudinally rearwardly, guides **210**, **211** direct the bag top to pass between the annular knives whereby the top edge portion **231***a* of the bag is trimmed off (including the thumb notch portion if one is provided) at a predetermined height above plate **161**, **162**. The transversely curved portion **210***b* of the guide that extends across plate **161** direct the trim portion **231***a* across the plate. In this connection, it is to be noted that the inner runs of chains **177**, **180** abut against the bag top at an elevation below plates **161**, **162** for supportingly retaining the bag top in a vertically extending position.

A guide bracket **228** (see FIGURE 7) is provided for each chain to abut against opposed sides of the inner runs, each guide bracket having a transverse rod portion slidably extended into an aperture of a bracket **229** that is respectively mounted on plates **161**, **162**. A spring (not shown) is provided on the rod portion of each guide bracket to bear against the respective bracket **229** for resiliently urging the guide bracket **228** toward the bracket **228** that is mounted on the opposite plate of plates **161**, **162**. A plurality of brackets **228** and bracket mounts **229** are provided on plates **161**, **162** longitudinally between shafts **179**, **215**; and **182**, **214** respectively.

Referring now in particular to FIGURES 4, 8 and 9, the wide tape applicator sub-assembly, generally designated **237**, will now be described (see FIGURES 4, 8 and 9). The sub-assembly **237** includes a spacer bar **238** located between a horizontal leg of an angle bracket **239** and plate **162**, bolts being extended through the angle bracket and bar **238** for attaching the angle bracket in an elevated condition relative to plate **162**. A pair of transverse bolts **240** are extended through appropriate apertures in the vertical leg of bracket **239** and have nonthreaded end portions extended through blocks **235** intermediate said leg and the generally horizontal, longitudinally elongated folder blade support **241**. The bolts **240** are slidably extended into apertures in the folder blade support while nuts are threaded on the bolts in abutting relationship with the angle bracket. A toggle clamp **242** is mounted on the angle bracket **239** for releasably retaining the folder blade support in abutting relationship with the blocks **235** on bolts **240**.

The forward end portion of the folder blade support is a short distance rearwardly of the exit nip of the trimmer sub-assembly and mounts a transverse bolt **244**. Bolt **244** mounts a finger support collar **245** which in turn mounts a wire finger **246** that has a longitudinally extending portion underlying and closely adjacent the folder blade support **241**. Also mounted on the bolt **244** is a tape guide **247**, said tape guide having an elongated downwardly and rearwardly extending portion **247***a* for directing the wide tape **3** in a transversely centered condition relative a bag top closure and vertically between the longitudinal portion of finger **246** and the folder blade support. As may in part be noted from FIGURE 4, portion **247***a* has a slot extending the length thereof to facilitate inserting the tape **3** therein. Accordingly, the tape guide directs the wide tape in a centered condition relative the bag top while the longitudinal portion of the wire finger partially folds the tape **3** without causing excessive dragging.

Rearwardly of the rearward terminal end of finger **246**, a smoothing finger **249** is provided on each side of the folder blade support in depending relation thereto, and bolted to said support. The smoothing fingers serve to fold the wide tape downwardly on either transverse side of the path of travel of a bag top as the wide tape is moved toward the sewing machine. Longitudinally rearwardly of the smoothing fingers and on each side of the folder blade support there is provided a folder blade **250**. The folder blades are bolted to the rearward portion of the folder blade support to extend in depending relationship thereto. The folder blades guide the wide tape accurately into closely adjacent folded relationship with the bag top closure sidewalls as the wide tape moves rearwardly therepast.

The rearward end portion of the folder blade support is extended into the notch of a generally horizontal support bracket **252**, said bracket being mounted on the folder blade support. Bracket **252** at one side thereof mounts a vertical pivot bolt **254** that pivotally mounts the forward end of a roller support **255**. Support **255** in turn dependingly mounts a compression roller **257** having a smooth circumferential surface for rotation about a vertical axis. A second pivot bolt **254** is mounted by bracket **252**, the second pivot bolt in turn pivotally mounting one end of a roller support **256**. The opposite end of support **256** dependingly mounts a compression roller **258** for rotation about a vertical axis. A coil spring **259** has its opposite ends attached to roller supports **255**, **256** to resiliently urge the rearward end portions toward one another to a position that compression roller **257** abuts against compression roller **258**.

Compression roller **258** has an axially intermediate reduced diameter portion to provide an annular groove **258***a*. Groove **258***a* is at the same elevation as the terminal end of the tear tape guide **260**, the tear tape guide terminating a short distance forwardly of roller **258** and being located transversely outwardly of the adjacent folder blade **250** from the folder blade support. The rearward end portion of guide **260** extends between shafts **179**, **182** at a lower elevation than the gears **186**, **189** that are mounted on said shafts. The rearward terminal end portion of guide **260** retains the tape **5** that passes therethrough in a vertical condition and at a lower elevation than the fold line of tape **3** and at a slightly higher elevation (for example, ⅛ of an inch) above the adjacent lower edge of the folded tape on the bag top. The intermediate portion of guide **260** is twisted through an angle of 90° such that the transverse cross-section through the tear tape **5** guided by the forward end portion of the tear tape guide is horizontal. An intermediate portion of guide **260** is mounted by a clamp that is bolted to the folder blade support.

The compression rollers **257**, **258** are rotated vertically adjacent and above the rearward edge portion of plates **162**, **161** respectively with the entry and exit nips

between the compression rollers being transversely centered between said plates. A bag top guide 262 is mounted on plate 161 for directing the bag top exiting from the compression rollers exit nip into the throat of the sewing machine formed by the presser foot and throat plate.

With reference to the trimmer and tape applicator assembly, it is to be noted that no adjustment has to be made even though bag tops of filled bags in a flattened folded condition have different thicknesses. This is achieved through the provision of the chains 177, 180 being retained in abutting relationship when no bag is passing therethrough. However, when a bag top portion is being conveyed by said chains, plate 161 may pivot to have its rearward portion move transversely away from the rearward portion of plate 162 while the coil spring 57 acts through a structure previously described to resiliently urge the rearward portion of plate 161 toward plate 162. Accordingly, as a bag top is directed by guides 210, 211 into the entry nip formed by chains 177, 180, plate 161 moves the rearward portion of chain 177 away from chain 180. As the bag top is conveyed rearwardly between said chains, spring 57 through the structure previously described pivotally moves the rearward portion of plate 161 more closely adjacent plate 162. As a result, the inner runs of the chains apply substantially constant pressure to the bag top side walls as the bag top is moved longitudinally rearwardly between said plates. Also, it is to be noted that the depth of the teeth of sprockets 186, 189 is sufficiently great that they are maintained in intermeshing relationship even though plate 161 pivots outwardly of plate 162 sufficiently to accommodate a bag top in a flat folded condition having a relatively large transverse width.

Additionally, it is to be noted that the compression rollers 257, 258 are spring urged together to permit bag tops of varying transverse widths to pass therebetween, but at the same time to firmly press the folded tape against the flattened bag top sidewalls. However, these rollers are not urged together with sufficient force to prevent a bag top moving rearwardly relative the folded tape that abuts against said rollers.

In order to mount the tape reels that provide a wound continuous length of tear tape 5 and wide tape 3, a pair of transverse rods 302 are mounted on frame member 136, said rods in turn mounting a vertical plate 303 (see FIGURES 1 and 2). An upwardly extending plate 304 is secured to plate 303, a horizontal shaft 305 being extended through an aperture in plate 304 and mounted by said plate to be held against rotation. Horizontal brackets 306 and 309 are bolted to plate 304 while on the opposite side of plate 304 from said brackets, a first hub 307 is rotatably mounted on shaft 305. A plurality of metal fingers 308 are mounted by hub 307 to extend radially outwardly therefrom. A tape mounting arbor 310 is rotatably mounted on shaft 305 intermediate hub 307 and a second hub 311 that is keyed to shaft 305. Hub 311 also mounts a plurality of radially extending fingers 308.

Hub 311 is spaced from plate 304 by a distance substantially greater than the combined axial thickness of arbor 310 and hub 307. A control link 314 at one end is pivotally connected to hub 307 and at the opposite end is pivotally connected at 315 to the remote end portion of the shaft bracket 309. A second control link 313 is pivotally connected to hub 307 diametrically opposite the pivotal connection of link 314 to said hub, the opposite end of control link 313 being pivotally connected at 316 to shaft bracket 306. The pivotal connections 315, 316 are located longitudinally opposite one another than for pivot connection 316 being at a higher elevation than pivot connection 315, bracket 306 being at a higher elevation than bracket 309.

A swing arm 317 has one end portion extended through hub 307 in perpendicular relationship to a radius line of said hub, the opposite end of the swing arm mounting a tape roller 318. A coil spring 319 has one end attached to an intermediate portion of the swing arm and an opposite end connected to plate 304 at a higher elevation than hub 307. The spring characteristics are such that no pivotal force is imparted to the swing arm when the swing arm extends generally horizontally in a datum condition with no tape extending over roller 318.

A reel of wide tape is mounted on arbor 310 such that the reel of tape cannot rotate independent of the rotation of the arbor, the tape 3 then being extended around roller 318 and thence down to and through tape guide portion 247*a*. When the tape is being moved rearwardly beneath the folded blade support, a downward force is exerted on roller 318 to through the swing arm 317, exert a force on hub 307 to rotate said hub in a direction opposite arrow 320. Due to the locations of the pivotal connections of control links 313, 314 to brackets 306, 309 and hub 307, the aforementioned rotation of the hub 307 results in hub 307 moving axially closed to plate 304. As a result, the braking action that was being exerted on arbor 310 is released and said arbor is free to rotate as tape 3 is pulled therefrom. However, the discontinuance of the advancement of the tape beneath the folder blade support results in no downward force being exerted on roller 318 (other than for the weight of the tape), and as a result the swing arm 317 and hub 307 are rotated in the direction of arrow 320 through the action of arrow 320, the control links force hub 307 to move axially in the direction of arrow 321 to abut against arbor 310 and force arbor 310 against hub 311 to stop the rotation of arbor 310. Thus, the movement of hub 307 in the direction of arrow 321 results in a breaking force being applied to arbor 310.

A horizontal shaft 324 has one end stationarily mounted by plate 304, the opposite end having a hub assembly 325 keyed thereto. Rotatably mounted on shaft 324 intermediate plate 304 and the hub assembly is an arbor assembly 326, the tape roll arbor assembly 327 being rotatably mounted on shaft 324 intermediate plate 304 and arbor 326. The arbor assembly has an enlarged diametric flange 327*a* adjacent the mounting plate. Assemblies 327 and 326 mount a reel of tear tape such that said reel can not rotate independent of the rotation of assembly 327.

Vertically above shaft 324, plate 304 mounts a pivot shaft 330. A brake arm 329 at one end mounts a brake 332 in position to engage flange 327*a*, the opposite end being welded to an annular member 331 that is pivotally mounted on said shaft 330. One end of a swing arm 335 is mounted by an offset 331*a* to extend in a generally horizontally longitudinal direction when the brake abuts against flange 327*a*. Offset 331*a* is secured to member 331 to extend radially outwardly therefrom in a different angular direction than arm 329.

One end of a coil spring 334 is connected to the upper end of the vertical bracket 333 which is keyed to shaft 330. The opposite end of spring 334 is connected to an intermediate portion of swing arm 335. Spring 334 resiliently urges arm 335 to pivot in the direction of arrow 336 to move the brake to a position that the brake abuts against flange 327*a* to apply a braking force thereto. The opposite end of swing arm 335 rotatably mounts a roller 337.

A reel of tear tape is positioned on arbor members 326, 327 and the tape 5 is extended over roller 337 and thence downwardly into the forward end portion of guide 260. When the tear tape is being pulled through guide 260, a downward force is exerted on roller 337 to, through the structure previously described, pivot the brake 332 out of contact with flange 327*a* whereby the reel of tear tape is free to rotate. However, the discontinuance of the feeding of the tear tape through guide 260 results in the swing arm 335 being moved through the action of spring 334 to a position that brake 332 again exerts a braking force on flange 327*a* to stop the rotation of the tear tape.

Referring now to FIGURE 15, there is illustrated a simplified control circuit for the apparatus of this invention. The control circuit includes main power lines L_1 and L_2, line L_1 having junctions 343, 344 and 345 while

line L_2 has junctions 346 through 351 inclusive. The solenoid coil 354 of the solenoid operated air valve 355 is connected across junctions 347 and 352, two contacts of a solenoid operated relay 353 respectively being electrically connected to junctions 343 and 352.

The solenoid operated air valve 355 includes four ports 407–410, port 407 being connected to a source of air under pressure 400 and port 408 being connected to an exhaust. Port 409 is connected through line 412 to one end of cylinder 86 for applying air under pressure to move the piston rod 85 to an extended condition while line 411 connects the opposite end of the cylinder to port 410. Internal valving is provided to fluidly connect port 407 to port 409 and port 408 to port 410 when the solenoid coil is energized; and to connect port 408 to port 409 and port 407 to port 410 when the solenoid coil is de-energized.

Relay 353 has a switch member 356 that in a solenoid energized condition electrically connects the above-mentioned contacts, but in a de-energized condition breaks the electrical connection between said contacts and accordingly the electrical connection between junctions 343 and 352. Relay 353 also includes a solenoid coil 357 that is electrically connected across junction 346 and terminal 358 of the strip cut switch 359. Switch 359 includes a second terminal 360, a third terminal 361 that is electrically connected to junction 344 and a switch member 362 that is resiliently retained in a position to electrically connect terminals 358, 361; but is movable to electrically connect terminals 360, 361.

Terminal 360 is electrically connected to terminal 363 of a strip feed switch, the strip feed switch including a terminal 364 and a switch member 365 that is resiliently retained in a position to electrically connect terminals 363, 364. A solenoid coil 366 of the solenoid operated air valve 367 is electrically connected across terminal 364 and junction 348.

The solenoid operated air valve 367 includes four ports 401–404, port 404 being an exhaust port. Port 401 is connected to a source of air under pressure 400 while port 403 is connected by a line 405 to the end of cylinder 64 for applying air under pressure to cause the retraction of piston rod 65. The opposite end of cylinder 64 is connected by a line 406 to port 402. The valve 367 is provided with internal valving that in a solenoid coil de-energized condition fluidly connects port 401 to port 403 and port 402 to port 404; but when the solenoid coil is energized, it fluidly connects port 401 to port 402, and port 403 to port 404.

A starter 370 for the drive motor 196 is connected across junctions 371, 351 starter 370 controlling the application of power through lines (not shown) to motor 196. A normally open switch 372 is connected across junctions 371, 373, a starter 374 for the sewing machine motor 145 being connected across junctions 349, 373. When power is applied across junctions 349, 373, the starter 374 operates relays that are designated by block 374*a* to electrically connect lines 376, 377, 378 to energize motor 145. Starter 374, when energized, operates an interlock, designated by block 374*b*, to an open condition, and when de-energized, interlock 374*b* closes. Starter 370 includes an interlock 370*a* that is connected in series across junctions 345, 371 that provide an electrical connection between junctions 345, 371 when the on-off switch (not shown) in the lines for supplying power to motor 196 is closed. Since the starters 370, 374 are of a conventional construction, they have not been described in detail.

The sewing machine motor includes a braking winding 380 that is connected to line 376 and is connected in series with interlock 374*b*, switch member 381 and rheostat 383, rheostat 383 being connected to line 378. Switch 381 is normally in an open condition but is moved to a closed condition by a timer 382 that is connected across junctions 373, 350. The timer is of a construction that when energized, switch 381 is retained in closed condition and is retained in a closed condition for a predetermined length of time after the timer has been de-energized. At the end of the predetermined time, switch 381 is opened. Through the provision of the braking winding, during the interval of time the switch 381 and interlock 374*b* are closed, the rotation of the motor shaft of motor 145 is brought to a quick cushion stop, i.e. stops the coasting of the motor after the de-energization of the motor.

The construction of the apparatus of this invention having been described, the operation thereof will now be set forth. The apparatus of this invention is adjusted to a correct sewing height, the frame being mounted on a conventional adjustment stand (not shown). Also the sewing needle is threaded and the wide tape 3 and tear tape 5 are inserted into tape guide 247 and tape guide 260 respectively and drawn rearwardly between compression rolls 257, 258 to have the terminal ends thereof retained in an elevated condition by the throat plate 128 and the presser foot 129. The wide tape in passing rearwardly of said rollers is in a folded condition.

Prior to inserting the tapes 3, 5, the handle 166 is pivoted in the direction of arrow 390 to move the rearward end portion of plate 161 away from plate 162 whereby access to the folder blade support and tape guide 260 may be more readily obtained. In this connection, it is to be noted that the folder blade support and tape guide 260 are mounted on plate 162 and accordingly do not move when handle 166 is pivoted.

Also, the tab strip tape 6 is inserted into guide 68 to have its terminal end extend adjacent the terminal end of transfer guide 43. Additionally, air under pressure is applied through heater tube 69 and after the heater tube has warmed to a datum temperature, the on-off switches (not shown) for lines L_1, L_2; lines 376, 377 and 378; and for the power lines for supplying power through motor 196 are turned on whereby interlock 370*a* is closed. This results in motor 196 being energized and power being applied to relays 374*a* but not therethrough to the sewing machine motor 145. Now, the conveyor 9, which extends both forwardly and rearwardly of the apparatus of this invention, moves filled bags having bag tops in a flattened folded condition such that the top leading edge portions of the filled bag is moved rearwardly in the direction of arrow 123 between bag guides 210, 211. As the bag is moved rearwardly, the bag top moves between plates 161, 162 into the entry nip of chains 177, 180, the portion of the bag top extending between a predetermined elevation above said plates being trimmed off due to the bag top subsequently moving into the entry nip of knives 222, 223 and then rearwardly of said knife. After the leading edge portion of the bag has moved rearwardly of the trimmer knife assembly, the bag moves beneath the folder blade support 241 and thence between the smoothing fingers 249. In the event the sewing machine motor is stopped at the time the bag moves beneath the folder blade support, the bag top moves relative the folded tape, and between the folded portions of the tape including the portion between the compression rollers 257, 258. However, if the sewing machine motor is operating, the tear tape 5 and wide tape 3 are being conventionally drawn toward the sewing machine at the same rate of speed as the bag moves toward the sewing machine. With the tapes 3 and 5 being moved along with the bag top, as the folder tape moves beneath the folder blade support, the smoothing finger 249 cause partial folding of the wide tape over the top terminal edges of the bag and the folding of the wide tape down along the adjacent vertical sidewall portions of the bag is completed by the folder blades 250. As the leading edge portion of the bag enters the entry nip between the compression rollers 257, 258 the tear tape passing through the rearward terminal end of the guide 260 is brought into abutting engagement with the adjacent

vertical edge portion of the folded tape by compression roller 258. After the bag top is moved out of the exit nip of chains 177, 180 and slightly rearwardly of the compression rollers 257, 258, a leading edge portion of the bag at an elevation below the folded tape abuts against the feeler rod 392, said feeler rod being connected to switch 372 to operate the switch to a closed condition. At the time switch 372 is closed, the leading edge of the bag is forwardly of the needle 127 by a distance somewhat greater than dimension D of FIGURE 16.

Switch 372 in being closed energizes the solenoid coil (not shown) of starter 374 and timer 382, starter 374 in thus being energized operating the relay 374*a* to apply power to the sewing machine motor 145 and opening interlock 374*b* to prevent the brake winding being energized. At the same time the timer 382 is energized whereby switch 381 is moved to a closed condition, switch 381 closing after interlock 374*b* is opened. As a result no braking action is applied to motor 145 at this time. The needle 127 is operated to form the unravelable chain stitch and when the leading edge of the bag top closure is moved into the entry nip formed by actuator 131 and throat plate 128, the continued movement of the bag moves the actuator away from the throat plate. This movement of the actuator actuates control mechanism 130 to operate the clipper knife 132 to sever the stitched folded tape and tear tape a predetermined distance (distance D of FIGURE 16) in advance of the leading edge of the bag top. Thus, the sewn tear tape and folded tape resulting from the sewing machine motor coasting that is further from the leading edge of the bag than distance D is trimmed away. After the trailing edge portion of the bag top has passed from between the actuator and throat plate, the actuator again moves toward the throat plate, there then only being the stitched folded tape and tear tape between the throat plate and actuator, and actuates control mechanism 130 to operate the clipper blade 132 to move to sever the folded tape, tear tape and thread at a distance R rearwardly of the bag top trailing edge. At about the same time, the bag moves out of contact with the feeler arm 392 and accordingly, switch 372 moves to an open position. This results in the starter 374 de-energizing motor 145; however, timer 382 through a time delay retains switch 381 in a closed condition for a predetermined time and then moves switch 381 to an open condition whereupon the brake winding is de-energized. De-energizing starter 374 results in interlock 374*b* being closed during the time internal switch 381 is closed and as a result the brake winding is energized to stop the coasting of the motor before said winding is de-energized.

The continued conveyance of the bag in a rearward direction by conveyor 9 moves the sewn bag top closure through the transfer guide where the discharge of air through tube 396 blows away any trimmed folded and tear tape that may not have been completely severed from the leading edge portion 3*b*. Prior to the leading edge of the bag top closure emerging from the rearward end of the transfer guide 43, the bag top moves the strip feed feeler arm 393 to a position to open switch member 365. Thence the bag leading edge moves feeler arm 394 which in turn moves switch member 362 to break the electrical connection between terminals 358, 361 and to electrically connect terminals 360, 361. Breaking the aforementioned electrical connection de-energizes solenoid coil 357 whereupon switch member 356 moves to an open condition to de-energize solenoid coil 354. As a result air under pressure is now applied through ports 407, 410 to cause the piston rod 85 to retract and thereby move the knife 80 across notch 82. However, at this time there is nothing extending through the notch to be cut.

When the trailing edge of the bag moves out of contact with the strip feed arm 393, a trailing edge portion of the folded tape is still partially in the transfer guide 43. The resulting closing of switch 365 energizes solenoid coil 366 to apply air under pressure through ports 401, 402 to the end of the cylinder 64 for extending the piston rod 65. The extending of the piston rod moves feed roller 46 closely adjacent feed roller 45 whereby the feed roller 46 is driven and the feed roller flange portions advanced the tab strip tape 6 in the direction toward the rearward end of the transfer guide. As the tab strip tape is advanced, the adhesive surface thereof is contacted by the hot air discharging from nozzle 75 to activate the adhesive and bend the tab strip tape toward the cutter plate. The leading edge of the tab strip is brought into abutting relationship with the tear tape 5*a* as said leading edge moves into the notch 82 and adheres sufficiently to the tear tape 5*a* to move rearwardly in contact with the tear tape.

After the trailing edge of the bag has moved rearwardly of the cutter blade plate a short distance, the bag moves out of contact with the strip feeler arm 394, and accordingly, switch 362 moves to break the electrical connection between terminals 361, 360 and electrically connect terminals 358, 361 to energize solenoid 357. This de-energizes valve 367 and as a result air under pressure is applied to cylinder 64 to retract piston rod 65 and move sprocket 59 and roller 46 out of a tab strip feeding condition. At the time solenoid coil 357 is energized, the terminal edge portion 3*c* of the folded tape and tear strip is substantially rearwardly of the cutter blade. The energization of solenoid coil 357 moves switch member 356 to provide a circuit for energizing solenoid coil 354. This results in air under pressure being applied through ports 407, 409 to cylinder 86 whereby piston rod 85 is moved to its extended condition. The aforementioned movement of the piston rod pivots the knife 78 to move across the notch 82 to sever the tab 6*a* from the tab strip 6.

After the sewn bag top closure has moved rearwardly of the cutter blade 78, it enters the entry nip between the driven compression rollers 102, 103, the tab in passing between the compression rollers being forced into a firm adhering relationship with the adjacent portion of the tear strip and the folded tape 3*a* on the bag top.

Even though the operation of the apparatus of this invention has been described with reference to one bag, it is to be understood that a number of bags in succession may be on conveyor 9, i.e. more than one bag may be along the path of travel of a bag through said apparatus.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. Apparatus for providing a bag closure on a bag one end portion that has a leading edge, a trailing edge and opposite sidewall portions in a flatten closely adjacent condition as the bag is conveyed in a rearward longitudinal direction along a given path of movement, said one end portion having terminal edges defining a bag opening, comprising a longitudinally elongated frame having a front portion and a rear portion, a tape applicator assembly mounted on the forward end portion of said frame, said tape applicator assembly including first and second horizontal, longitudinally elongated plates, first means mounted on the frame for mounting said first and second plates in transversely spaced relationship; second and third longitudinally elongated endless conveyor means having inner runs for abutting against said opposite sidewall portions adjacent and spaced from said bag terminal edge to retain the sidewall portions in a generally vertical extending condition abutting against one another and extending to a higher elevation than said first and second plates, fourth means mounted on said first and second plates for mounting said conveyor means with their inner runs transversely between said plates and vertically spaced therefrom and driving said conveyor means to move the conveyor means inner runs rearwardly at the same speed, longitudinally elongated tape folder means mounted on at least one of said plates for folding

a first tape over said bag terminal edge to extend generally vertically in abutting relationship with said sidewall portions as the sidewall portions are being conveyingly retained in abutting relationship by said second and third means, said folder means folding the first tape to have a folded edge and lower edges, said tape folder means having a forward end portion and a rearward end portion, means connected to said tape folder means for guidingly directed tape to the folder means forward end portion, means extending adjacent said folder means for guidingly directing a tear tape into abutting relationship with the folded tape on one side thereof vertically intermediate the tape folded edge and one lower edge of said folded tape; a sewing machine having a needle mounted on said frame longitudinally rearwardly of the tape applicator assembly for applying a threaded unravelable stitch line through said tear tape, folded tape and the adjacent bag sidewall portions to form a sewn bag closure and sever the folded tape, tear tape and thread forming the stitch line at locations spaced from and adjacent the trailing and leading edges of said sidewall portions; and a tab strip applicator assembly mounted on the rear portion of said frame for applying and adhering a tab to the trailing end portion of the sewn folded tape and tear tape to extend longitudinally away therefrom in a direction opposite the movement of the bag, said tab applicator assembly including third and fourth horizontal, longitudinally elongated plates having front and rear end portions and adjacent edge portions, fifth means mounted on the rear portion of the frame for mounting said third and fourth plates in transverse spaced relationship on either side of the path of travel of the bag, longitudinally elongated transfer guide means mounted on at least one of said third and fourth plates for maintaining the sewn bag closure in a vertical condition as the bag moves rearwardly of the sewing machine, tab strip guide means for guidingly directing a tab strip having an adhesive surface into abutting relationship with the sewn bag closure with the adhesive facing said closure as the bag moves thereby, sixth means mounted on one of said plates for severing the tab strip at a location rearwardly of the tab strip guide means and spaced from the trailing edge of the severed folded tape, and seventh means on at least one of said third and fourth plates for feeding the tab strip to and through the tab strip guide means in timed relationship to the movement of the bag to apply the tab strip to the sewn bag closure adjacent the closure terminal end portion to extend rearwardly thereof.

2. The apparatus of claim 1 further characterized in that the seventh means includes a first feed roller, a second feed roller, means on one of said third and fourth plates for mounting said first roller to rotate about a vertical axis, means for mounting said second roller to rotate about a vertical axis and moving said second roller between a datum position substantially spaced from the first roller and a second position closely adjacent the first roller to feed a tab strip extended therebetween, generally transversely toward the severing means, and means for driving said rollers when the second roller is in its second position.

3. The apparatus of claim 2 wherein the tab strip adhesive is heat activated, further characterized in that means is mounted on the frame for directing hot air into contact with the tab strip portion that has passed between said rollers.

4. The apparatus of claim 3 further characterized in that the severing sixth means comprises a cutter plate having a downwardly opening notch extending longitudinally therethrough, fourteenth means for mounting said cutter plate rearwardly of the transfer guide with its notch above the third and fourth plates and opening between said third and fourth plates, a knife, and means for mounting said knife and moving the knife across said notch for severing the tab strip extended through the notch to provide a tab.

5. The apparatus of claim 4 further characterized in that the knife mounting and moving means comprises a piston cylinder combination connected to the frame and means operated by the piston cylinder combination for moving said knife.

6. The apparatus of claim 4 further characterized in that there is provided control means on the frame for operating the second roller mounting means to the second roller second position after the bag leading edge portion has moved into said notch and prior to the severed tape and folded tape trailing edge portions have moved rearwardly of the transfer guide and thence to operate the second roller mounting means to its first position, and operating the knife mounting and moving means to move the knife to sever the tab strip after the folded tape and tear tape trailing edges have moved adjacent said notch.

7. The apparatus of claim 1 further characterized in that the first means includes a transverse mounting block, eighth means mounted on said block and attached to the front end portion of the first plate for pivoting the first plate about a vertical axis to move the first plate rear portion away from the second plate and ninth means connected to the eighth means for resiliently urging the eighth means to pivot the first plate rear portion adjacent the second plate, and that the fourth means includes tenth means mounted on the first plate for driving the second conveyor means and mounting said second conveyor means to extend generally longitudinally, eleventh means mounted on the second plate in driving relationship to the tenth means when the first plate rear portion is adjacent the second plate for mounting the third conveyor means to extend generally longitudinally and driving the third conveyor means and means for driving said eleventh means.

8. The apparatus of claim 7 further characterized in that an upright mounting member is mounted on the frame to extend to a higher elevation than the tape folding means and the tear tape guide means, means mounted on the mounting member for mounting a reel of continuous tear tape at a higher elevation than said tear guide means, a horizontal shaft stationarily mounted on said mounting member at a higher elevation than said tape folding means, arbor means rotatably mounted on said shaft for mounting a reel of continuous first tape, a first hub keyed to said shaft axially opposite the arbor means from said mounting member, a second hub pivotally and axially movable on the shaft intermediate the mounting member and the arbor means, an elongated swing arm having a first end, and a second end mounted by said second hub to extend outwardly thereof generally perpendicular to a plane of the axis of said shaft to rotate said second hub, a tape roller mounted on said swing arm to have a run of first tape extend from said first tape reel, thence over said tape roller, next downwardly to the tape folder means and then rearwardly to the sewing machine, means mounted on said mounting member and connected to said second hub for pivoting said second hub in one direction and axially moving the second hub away from the arbor means when the tape roller is moved downwardly, and move the second hub toward the arbor means when it is pivoted in the opposite direction, and spring means connected to the swing arm to resiliently urge it to move the tape roller upwardly and move the swing arm to pivot said second hub in the opposite direction so that the second hub axial moving means moves the second hub against the arbor means to force it into braking relationship to the first hub.

9. The apparatus of claim 8 wherein the tear tape has a run extending from the tear tape reel, then downwardly through the tear tape guide means and then rearwardly to the sewing machine, further characterized in that there

is provided a sewing machine motor mounted on the frame, a drive motor mounted on the frame, means for drivingly connecting the drive motor to fourth means, control means for actuating the sewing machine motor when the bag leading edge has moved adjacent said needle, and deactivating said sewing member motor when the bag trailing edge has moved rearwardly of said needle, first control means for automatically operating said seventh means to feed the tab strip after the sewn bag closure has moved at least partially rearwardly of said seventh means and then terminate the operation of the seventh means, and second control means operatively connected to the first control means for operating the sixth means to sever the tab strip after the first control means has terminated the operation of the seventh means and the sewn bag closure has moved rearwardly of the sixth means a selected distance.

10. The apparatus of claim **7** further characterized in that the tape folder means is fixedly attached to said second plate to overly the space between said first and second plates and that compression rollers are mounted on the rearward portion of said tape folder means to have the folded tape over the bag one end portion and the tear tape pass therebetween.

11. The apparatus of claim **10** further characterized in that one of said compression rollers is mounted on the tape folder means adjacent and rearwardly of the tear strip guide means, said one roller having an axial annular groove through which the tear tape is extended.

12. The apparatus of claim **11** further characterized in that the fifth means includes a transverse mounting block, twelfth means mounted on the last mentioned mounting block and attached to the third plate rear portion for pivoting the third plate about a vertical axis

to move the third plate front portion away from the fourth plate, and thirteenth means connected to the twelfth means for resiliently retaining the twelfth means in a datum position that the third and fourth plates adjacent edges are parallel to one another, said transfer guide means being fixedly attached to one of said third and fourth plates to extend over the space between said third and fourth plates.

13. The apparatus of claim **12** further characterized in that the first means comprises a transverse mounting member attached to the second plate, and means for pivotally mounting said second plate on the transverse mounting member and resiliently urging the second plate to a datum position that its front and rear portions are adjacent the respective corresponding portions of the first plate, and that the fourth means includes means for mounting the second and third means on the first and second plate respectively with the inner runs abutting when no bag is being passed therebetween and to permit relative spreading of the second and third conveyor means when the second plate is pivoted out of the plates datum position.

References Cited

UNITED STATES PATENTS

2,845,760 8/1958 Hopkins et al. ------ 53—139 X

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,460,313 Dated August 12, 1969

Inventor(s) Joseph R. Conner, Jack D. Helm and Harold N. Anderson

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

Column 5, line 35, "izontanl" should be --izontal--. Column 6, line 59, "or" should be --of--. Column 8, line 12, "783" should be --183--; line 18, "sprcoket" should be --sprocket--; line 24, "194" should be --184--; Column 9, line 27, "resilently" should be --resiliently--. Column 12, line 17, "closed" should be --closer--; line 25, after "of" insert --spring 319 on arm 317. As hub 307 is rotated in the direction of--; line 47, "horizontally should be --horizontal. Column 14, line 45, "portions" should be --portion--. Column 17, line 9, "directed" should be --directing--.

SIGNED AND
SEALED
APR 28 1970

(SEAL)
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