United States Patent

[11] 3,596,431

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[54] METHOD AND APPARATUS FOR COMPRESSING AND WRAPPING BAGS

8 Claims, 24 Drawing Figs.

[52] U.S. Cl. ..... 53/124 A, 53/24, 53/124 C, 53/383, 93/36 MM

[51] Int. Cl. B65b 13/20, B65b 51/02, B31b 1/62

[50] Field of Search ..... 93/36 MM, 93; 53/24, 124, 383

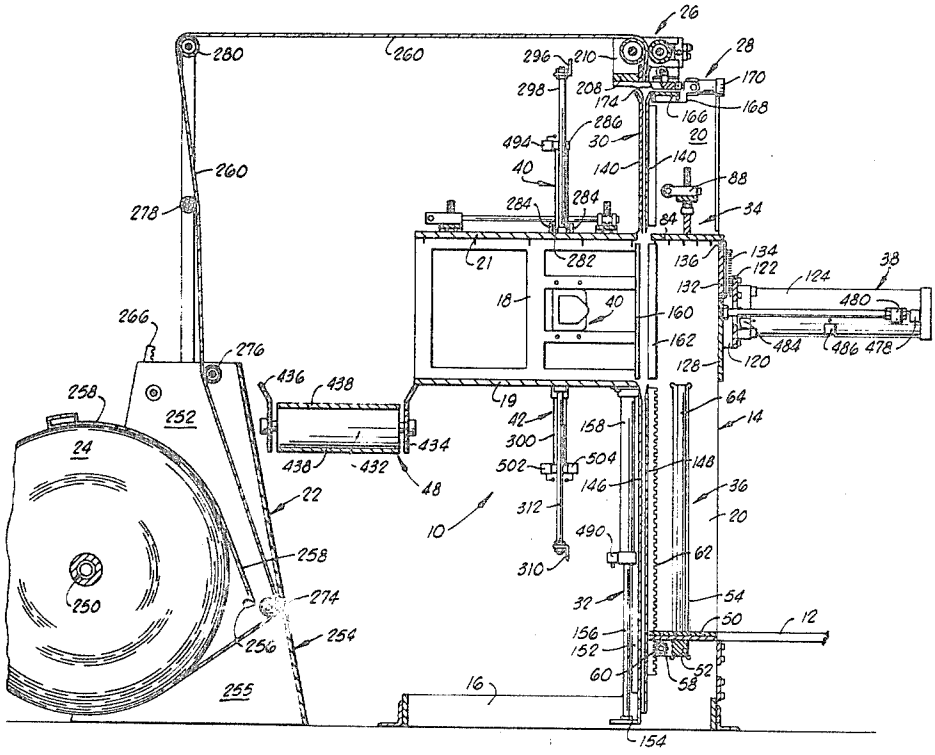
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Primary Examiner—Wayne A. Morse, Jr.
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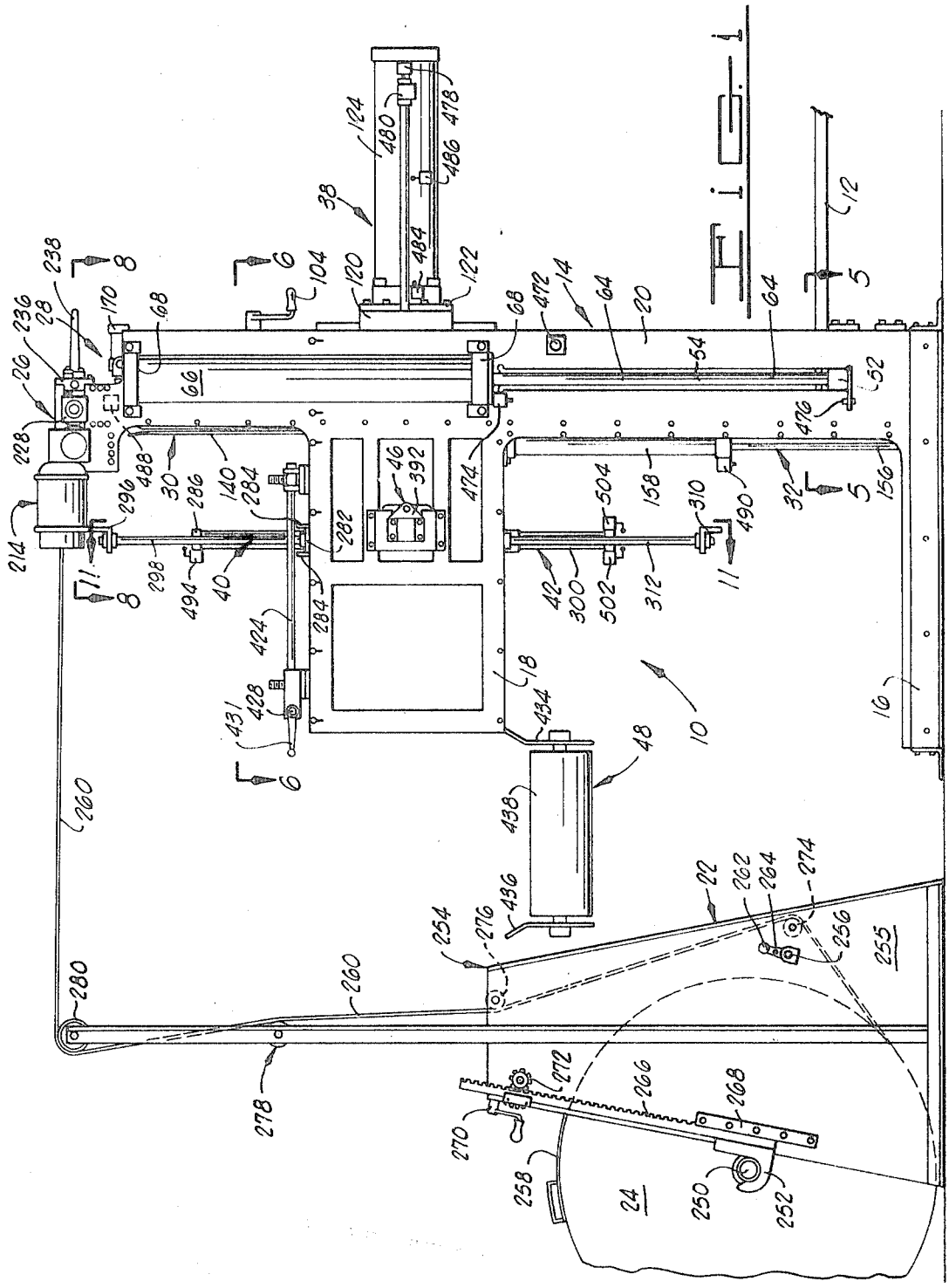
ABSTRACT: An apparatus and method for compressing a stack of flat, empty bags to form a compressed bale, and for wrapping the bale in an open ended wrapper, the apparatus including cooperating upper and lower platens between which the stack is compressed, and a piston and cylinder assembly for displacing the compressed bags while under compression into a wrapping zone. A wrapper paper feeding and guiding mechanism automatically interposes an elongated sheet of wrapper paper in the path of travel of the compressed bags into the wrapping zone. This causes the wrapper paper to extend around the compressed bale on three sides after a reciprocating knife has severed a portion of the wrapper paper from the continuous sheet. A piston and cylinder assembly then folds down a top extension of the severed portion of the wrapper sheet to cover a portion of the fourth side of the bale. A reciprocating adhesive spray head then moves across the folded down top extension and sprays adhesive thereon. Another piston and cylinder assembly then folds upwardly a bottom extension of the wrapper sheet so that it overlaps the folded down top extension and covers the remainder of the fourth side of the bale. Finally, a press roller is extended across the wrapped bale along the line of adhesive application to bond the top and bottom extensions of the severed portion of the wrapper paper.



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SHEET 1 OF 9



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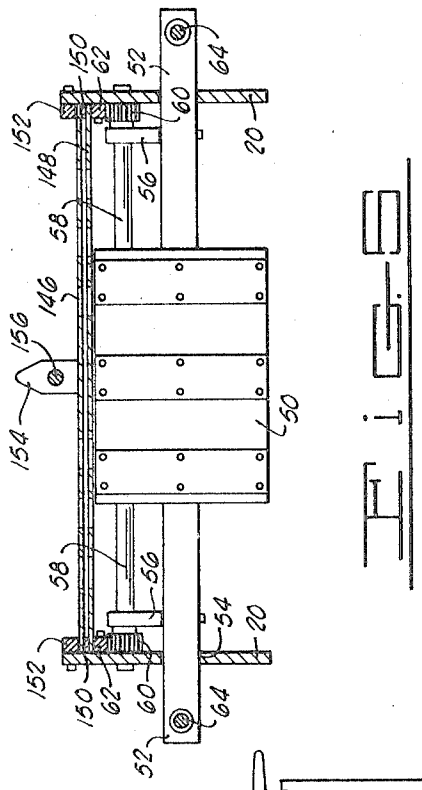


Fig. 5

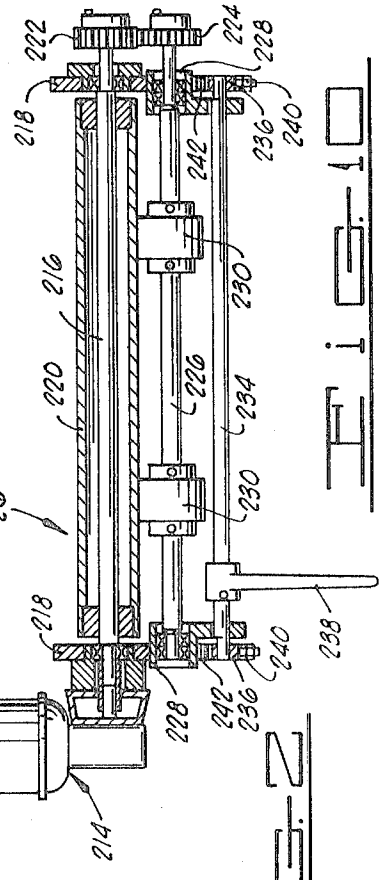


Fig. 10

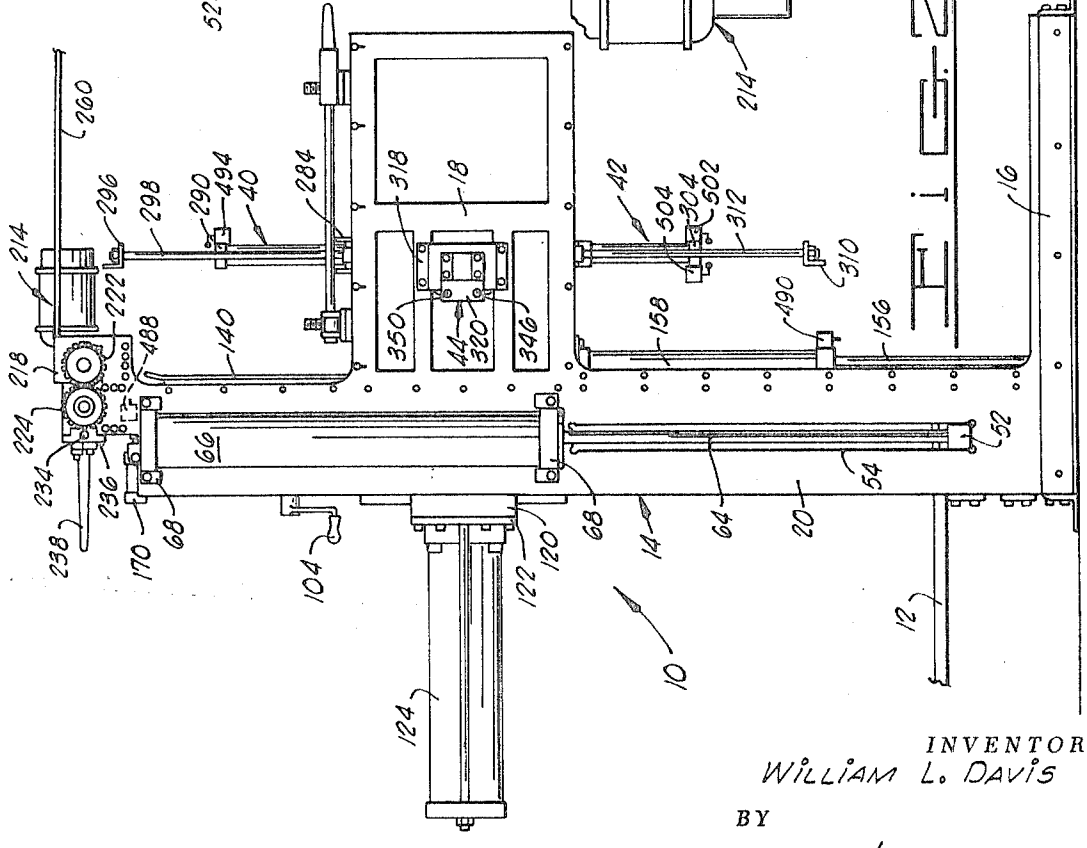


Fig. 2

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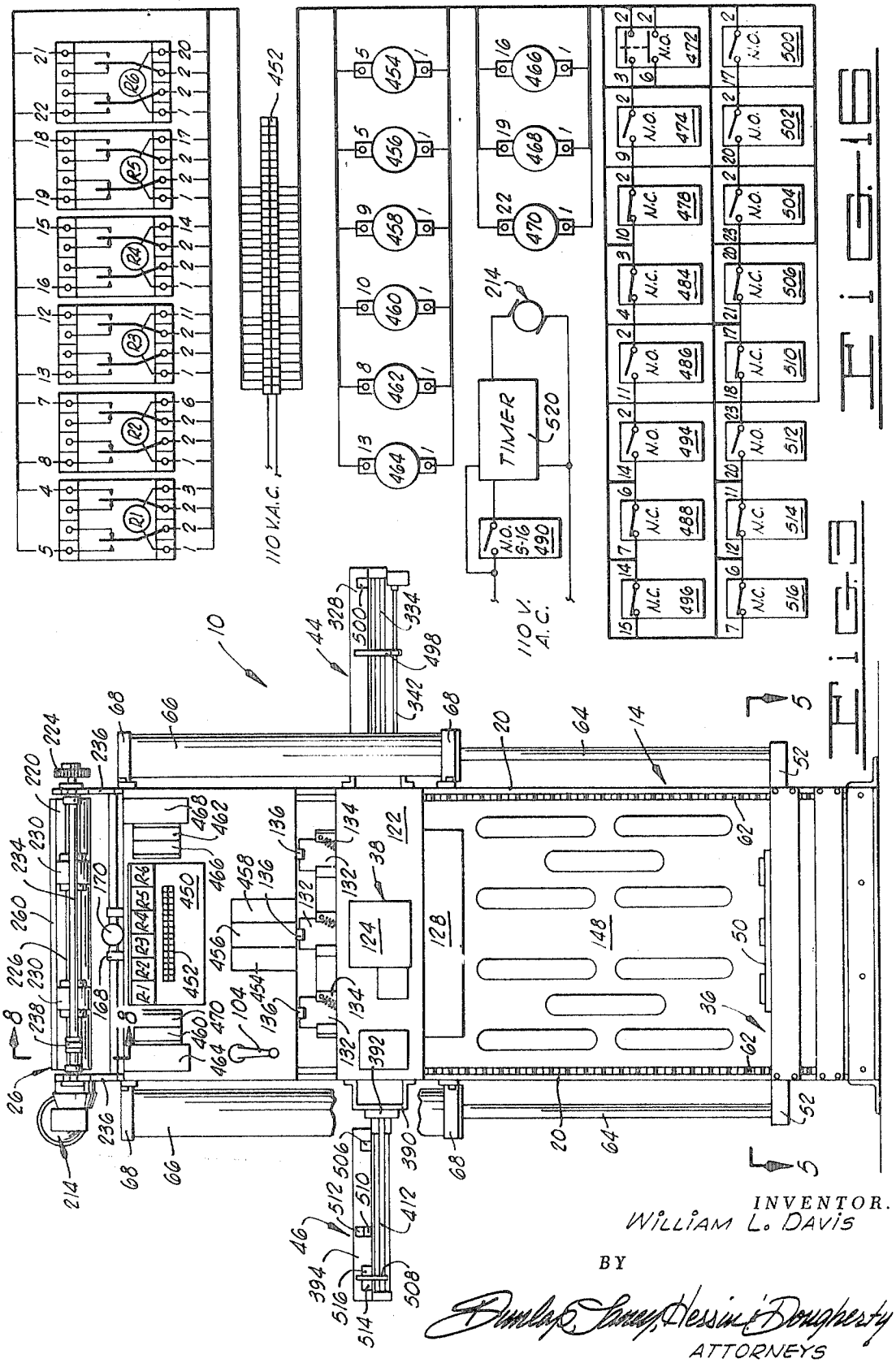
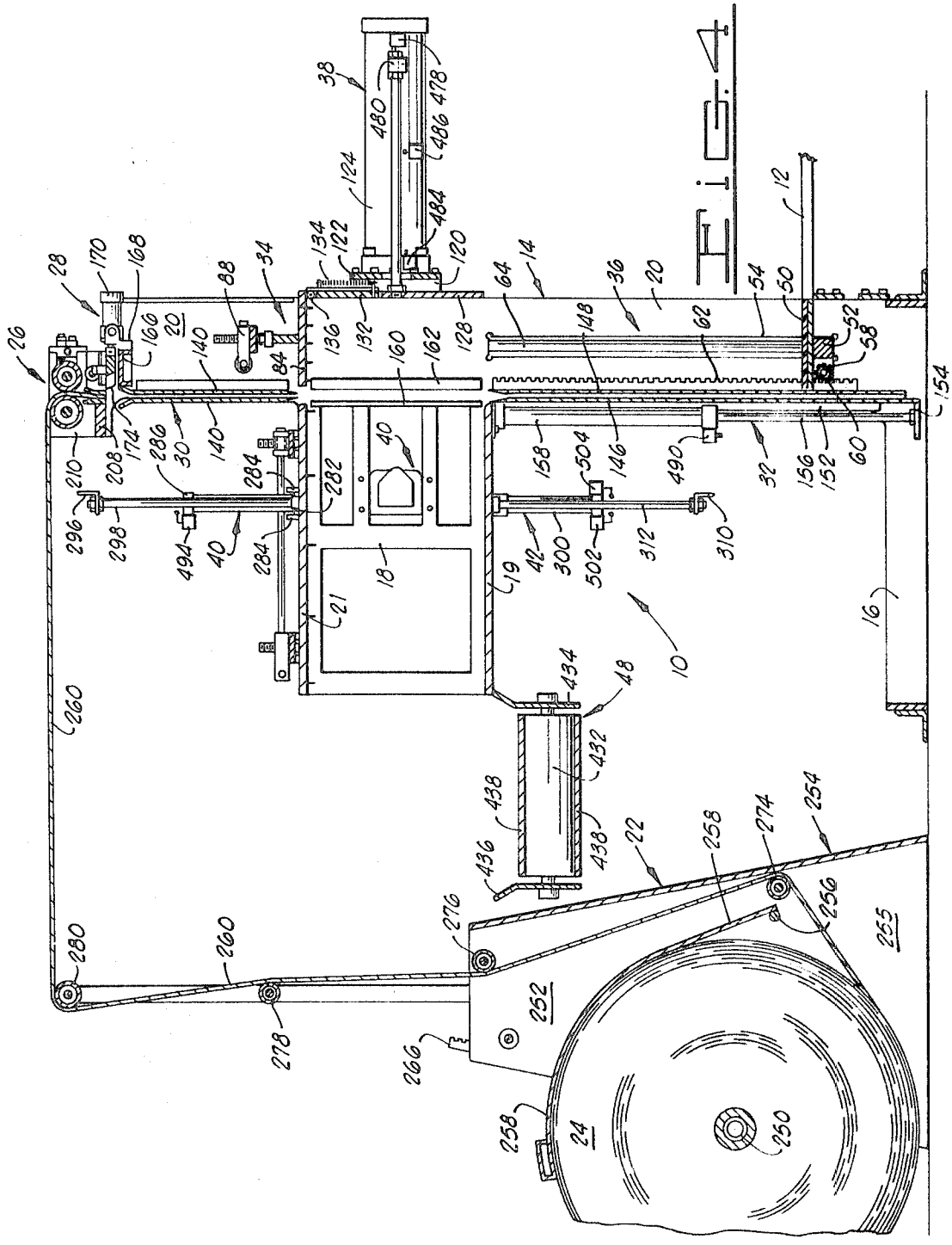

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TIMER
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Fig. 4



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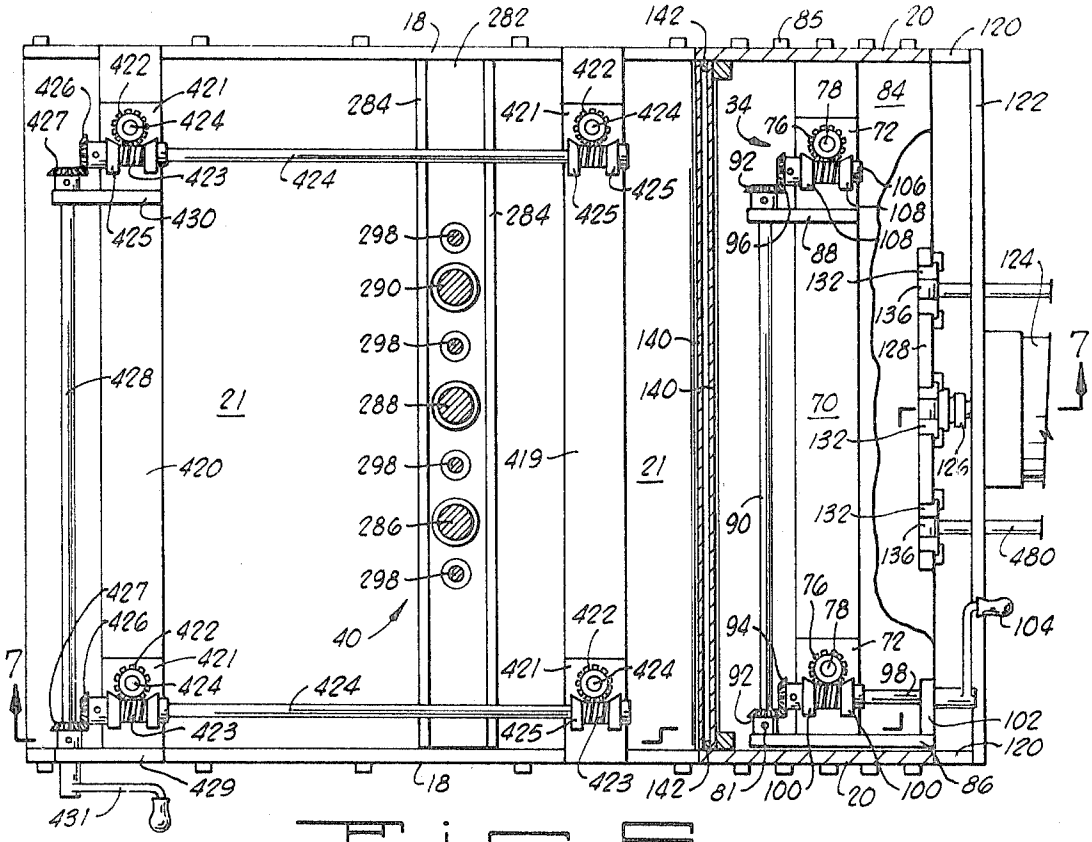


Fig. 6

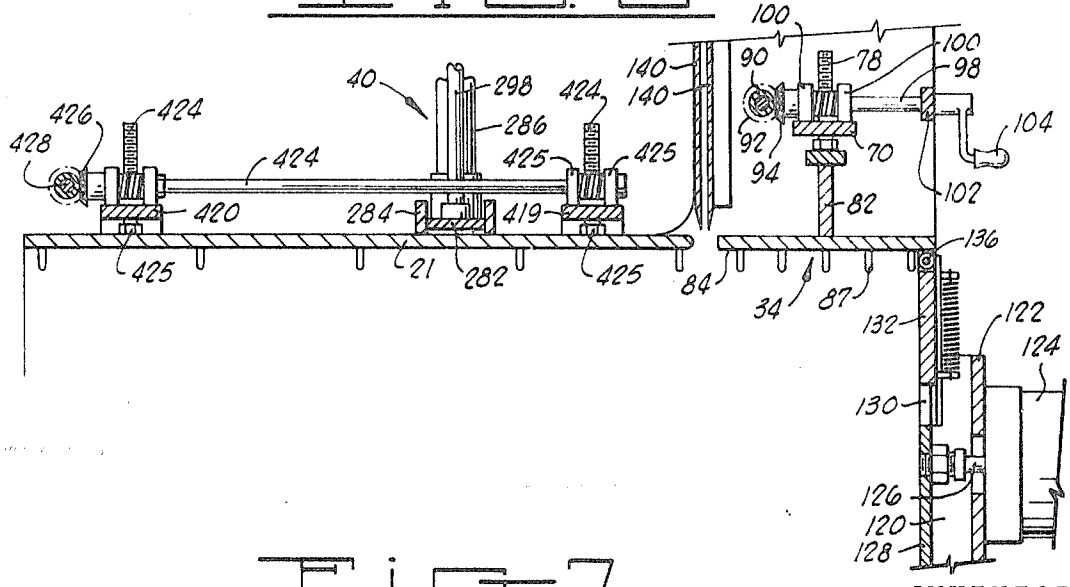


Fig. 7

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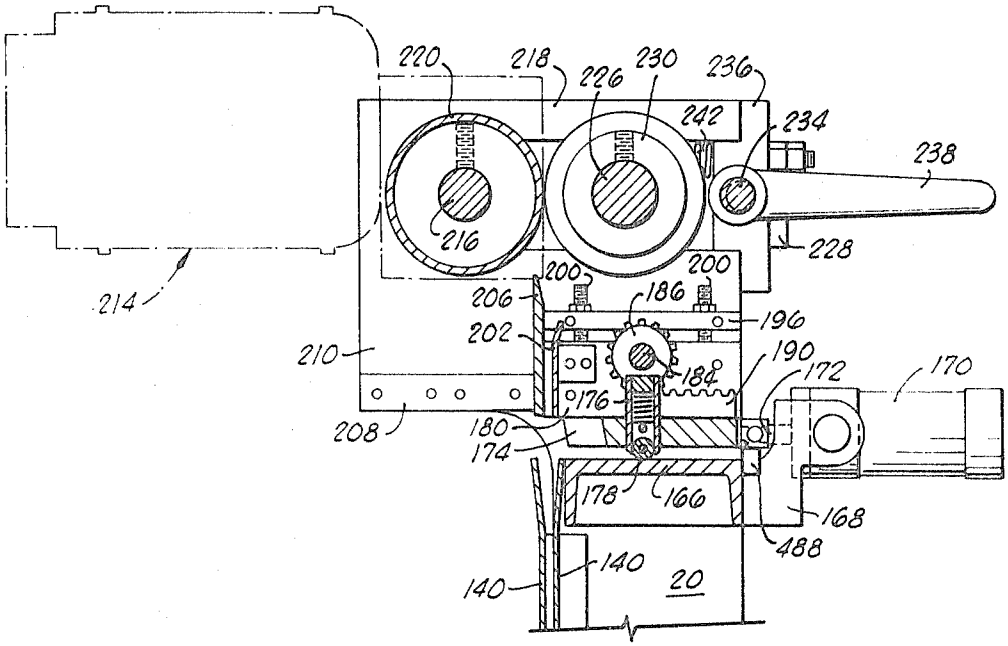


Fig. 8

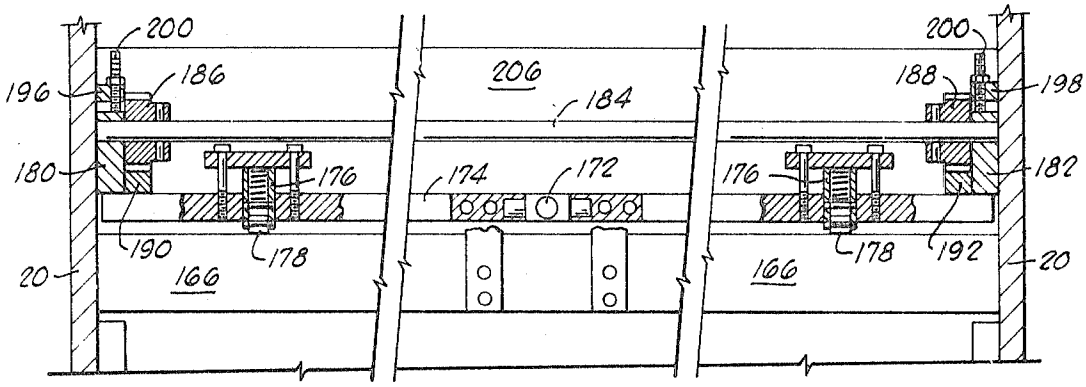
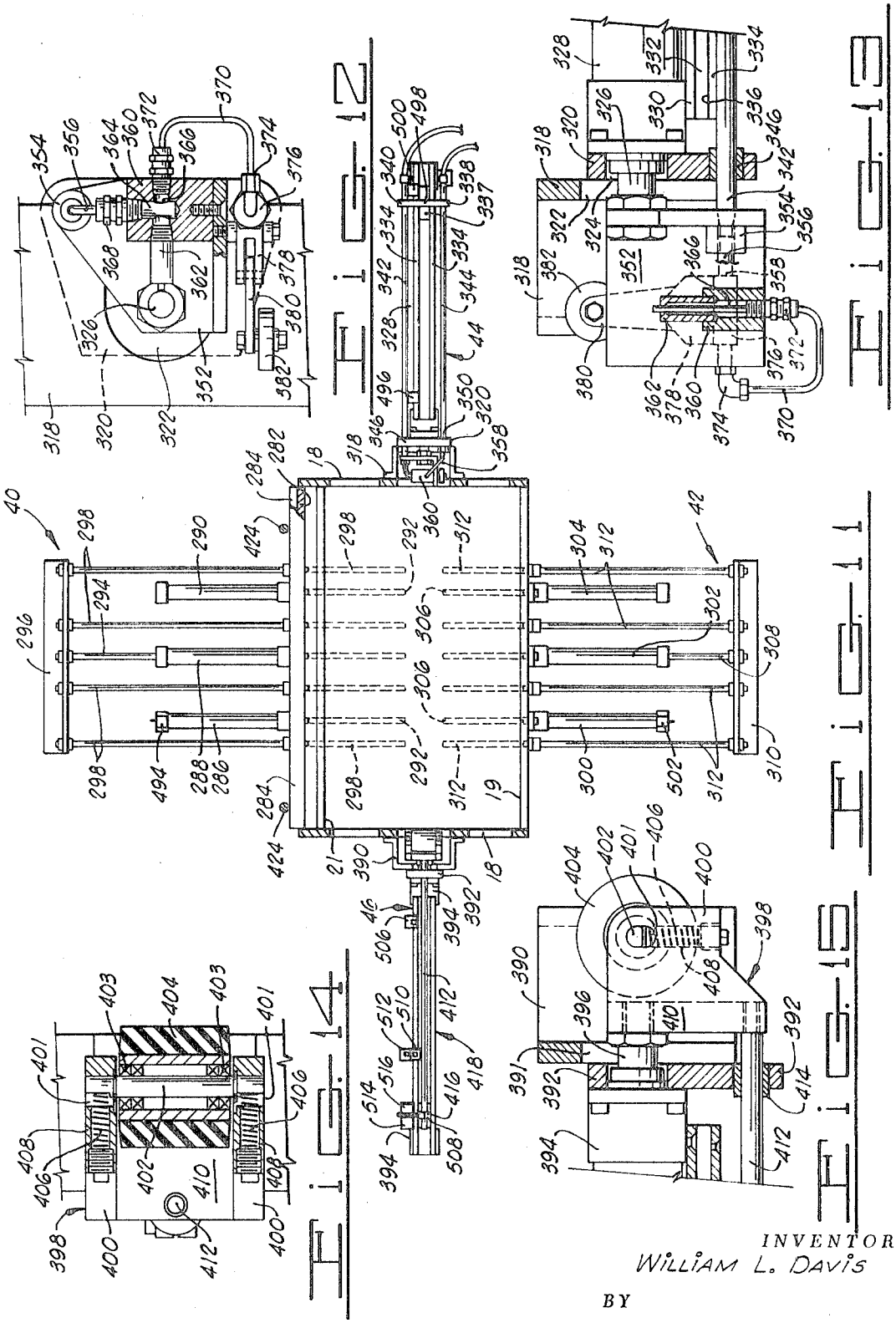


Fig. 9

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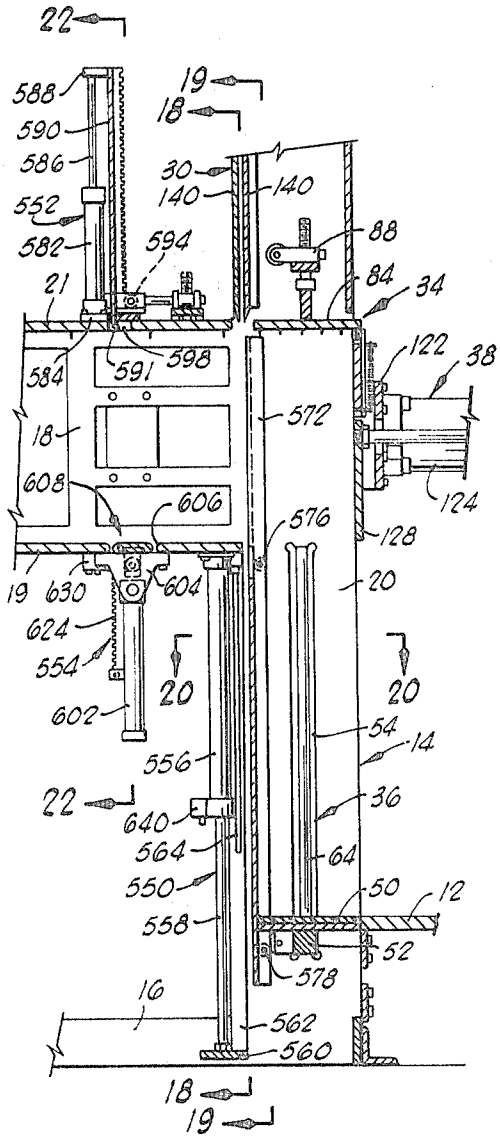


FIG. 17

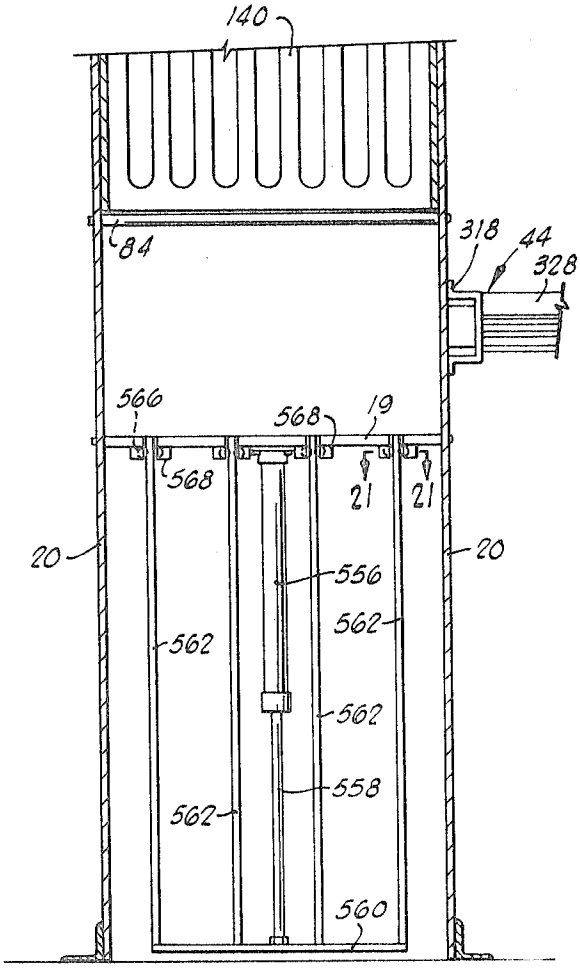


FIG. 18

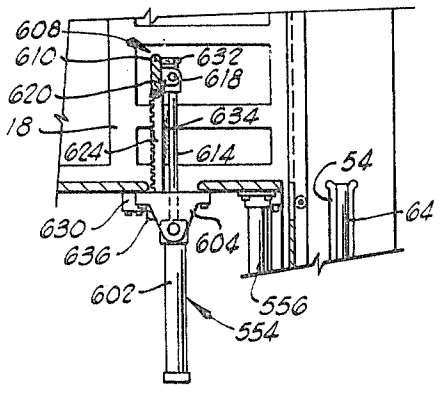


FIG. 24

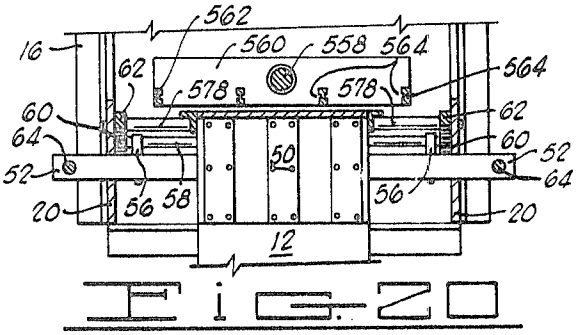


FIG. 20

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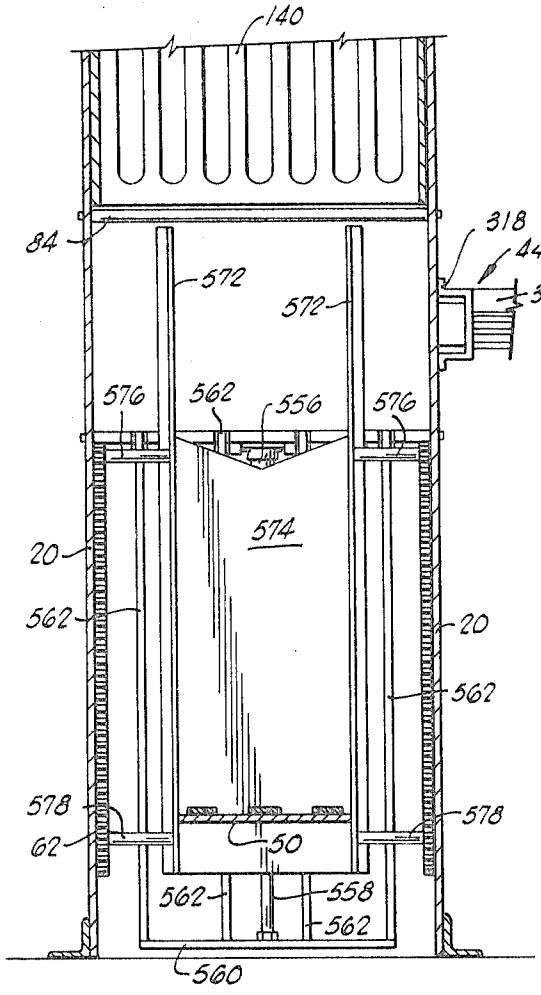


FIG. 19

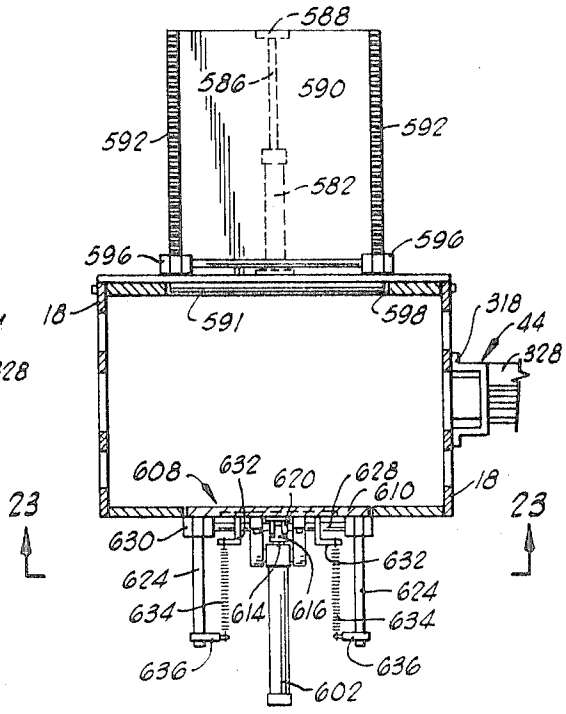


FIG. 22

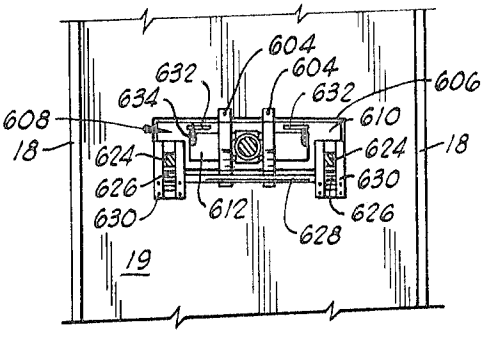


FIG. 23

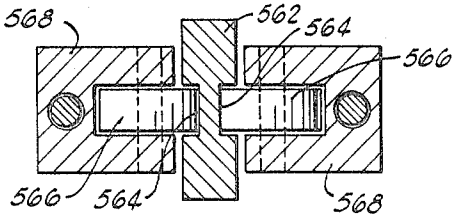


FIG. 21

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METHOD AND APPARATUS FOR COMPRESSING AND WRAPPING BAGS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a method and apparatus for compressing a stack of vertically superimposed, flat, flexible bags to form a compressed bale, then wrapping the compressed bale in an open ended wrapper.

2. Brief Description of the Prior Art

In the manufacture of large flexible grocery or shopping bags of the type described in U.S. Pat. No. 3,180,237 to Davis, the finished bags are then customarily packaged for shipment to the customer by grouping the individual bags in hands, grouping the hands in a stack, compressing this stack to express air from the bags and minimize the bulk of the stack, and then wrapping the compressed bags with a paper wrapper to form a package for shipment or storage. A typical commercially utilized banding press for performing the compression and wrapping operations described is that which is marketed by the Potdevin Machine Company of Teterborough, New Jersey.

BRIEF DESCRIPTION OF THE PRESENT INVENTION

The present invention provides an improved method for compressing and wrapping a plurality of flexible bags for storage or shipment, and a reliable and efficient improved banding press for carrying out the steps of the method.

Broadly described, the steps of the method entail initially compressing a plurality of vertically superimposed bags to flatten the bags and express air therefrom; then displacing the compressed bags through a sheet of wrapping or banding paper disposed in a vertical plane by movement of the bags along a path extending normal to this plane so that the stacked, compressed bags are surrounded on three sides by a generally C-shaped portion of the wrapping paper; next folding one of the free extending portions of the wrapping paper over at least a portion of the fourth side of the stack of bags, followed by the application of an adhesive to the outer surface of this folded, free extending portion. The other free extending portion is then folded over the free extending portion of the wrapping paper which was first folded to completely cover the fourth side of the stack. Finally, pressure is applied to superimposed free extending portions of the wrapping paper to bond them together and complete the banding of the compressed stack of bags.

The improved banding press of the invention broadly comprises a framework having mounted thereon horizontally extending upper and lower platens, means for moving one of the platens relative to the other to compress a stack of bags positioned therebetween, and means for horizontally displacing the compressed stack of bags from between the upper and lower platens into a wrapping or banding zone.

The banding press further includes a paper feeding assembly for continuously feeding a strip of wrapping paper to the press, paper guiding means which functions to guide the paper wrapper into a plane which extends across the path along which the compressed stack of bags is horizontally displaced from a position between the platens to the banding zone, and means for severing from the strip of wrapping paper, the portion of the paper which is to be used to band the bags. The banding press also comprises a flap folder assembly which functions in timed sequence with the movement of compressed bags into the banding zone to fold flap portions of the wrapping paper into overlying relation with respect to each other so that the paper is wrapped around four sides of the bag stack. Also functioning in synchronism with the flap folder assembly is an adhesive applicator which moves along one of the flaps after it has been folded to apply adhesive along an area which will be contacted by another flap which will subsequently be folded by the flap folder assembly. Finally, the banding press includes a seam roller assembly which presses the overlapped flaps together along the zone where adhesive has been applied to bond the flaps together and thus complete the wrapping of the bags.

It is a major object of the invention to provide an improved method for compressing flexible bags and then wrapping them in a flexible wrapper which extends around the compressed bags on four sides.

Another object of the invention is to provide an improved banding press for expressing air from a stack of vertically superimposed paper bags.

Another object of the invention is to provide an apparatus for automatically forming a circular flexible band around a stack of flexible bags which are under compression.

A further object of the invention is to provide a machine for automatically compressing a stack of superimposed flexible bags, then while the bags are compressed, automatically wrapping the stack of bags with a flexible wrapper so that the wrapper extends around four sides of the bag, and finally, automatically gluing the wrapper in position around the stack of bags.

Yet another object of the invention is to provide an apparatus for automatically compressing and wrapping a bale of paper grocery bags for storage and shipment, which apparatus is mechanically reliable and is characterized in having a long and trouble free operating life.

Other objects and advantages of the invention will become apparent as the following detailed description of the invention is read in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevation view of a bag compressing and wrapping machine constructed in accordance with the present invention.

FIG. 2 is a side elevation view of the machine depicted in FIG. 1 as the machine appears when viewed from the opposite side thereof from the side shown in FIG. 1.

FIG. 3 is a front elevation view of the bag compressing and wrapping machine shown in FIG. 1.

FIG. 4 is a view partially in elevation and partially in section of the bag compressing and wrapping machine depicted in FIG. 1.

FIG. 5 is a sectional view taken along line 5–5 of FIG. 3.

FIG. 6 is a sectional view taken along line 6–6 of FIG. 1 and showing a portion of the device broken away for clarity of illustration.

FIG. 7 is a sectional view taken along line 7–7 of FIG. 6.

FIG. 8 is a sectional view taken along line 8–8 of FIG. 3.

FIG. 9 is a partially sectional and partially elevational enlarged detail view of the cutter knife assembly as it appears when viewed from one side thereof.

FIG. 10 is a view partially in section and partially in elevation of the draw roll assembly forming a part of the invention.

FIG. 11 is a sectional view taken along line 11–11 of FIG. 1.

FIG. 12 is an enlarged detail view, partially in section and partially in elevation of the adhesive applicator assembly forming a part of the invention.

FIG. 13 is a detail view of the apparatus shown in FIG. 12 as it appears when viewed from a different side.

FIG. 14 is an enlarged, detail view, partially in section and partially in elevation of the seam roller assembly forming a part of the invention.

FIG. 15 is another partially sectional, partially elevational view of the seam roller assembly as it appears when viewed from another side.

FIG. 16 is an electrical wiring diagram of the electrical circuit utilized in the invention.

FIG. 17 is a view similar to FIG. 4, but illustrating a modified embodiment of the invention.

FIG. 18 is a sectional view taken along line 18–18 of FIG. 17.

FIG. 19 is a sectional view taken along line 19–19 of FIG. 17.

FIG. 20 is a sectional view taken along line 20–20 of FIG. 17.

FIG. 21 is a sectional view taken along line 21–21 of FIG. 18.

FIG. 22 is a sectional view taken along line 22–22 of FIG. 17.

FIG. 23 is a sectional view taken along line 23–23 of FIG. 22.

FIG. 24 is an enlarged detail view, partly in section and partly in elevation, of a modified lower flap folder assembly forming a part of the modified embodiment of the invention illustrated in FIGS. 17—23.

In referring to the drawings and to the following detailed description of a preferred embodiment of the invention, major machines, assemblies or subassemblies have been designated by reference numerals associated with lead lines having arrowheads. Individual elements are indicated by reference numerals which carry plain lead lines not having arrowheads.

The banding press of the invention which is utilized in carrying out the improved method of compressing and wrapping or banding a stack of flexible bags is shown in its entirety and overall appearance in FIGS. 1—4. The banding press is conventionally utilized in conjunction with a bag collating and stacking machine in which a plurality of paper bags are stacked in vertically superimposed relation, and this stack is then discharged from the collating and stacking machine into the banding press. Thus, in FIGS. 1—4, the banding press, designated generally by reference numeral 10, is shown adjacent and aligned with, a bag supporting plate 12 from which a stack of bags to be compressed and wrapped or banded is introduced to the banding press. The banding press 10 includes a framework 14 which has a horizontally extending base portion 16, and horizontally extending, substantially parallel, apertured sideplates 18 which, with a horizontal bottom plate 19 and adjustable top plate 21, form a portion of a banding chamber in which the compressed bags are wrapped or banded as hereinafter described.

The framework 14 further includes a pair of vertically extending side panels or plates 20 which define between them an upwardly extending elevator way along which the stack of bags to be compressed is elevated as the two platens hereinafter described are moved relatively toward each other. Positioned adjacent the framework 14 is a mill roll assembly 22 which functions to support and feed wrapping or banding paper from a large roll 24 in a manner hereinafter described. Mounted on the upper end of the framework 14 is a draw roll assembly 26 for continuously drawing a strip or web of wrapping paper from the mill roll assembly 22. Adjacent the draw roll assembly 26 is a cutter knife assembly 28 which functions periodically, and in timed sequence with other operations of the banding press, to sever the strip or web of wrapping or banding paper along a transverse line.

For the purpose of guiding the web of wrapping paper in a vertically extending plane, an upper paper guide assembly 30 extends across the back of the upper end portion of the framework 14 and is aligned with a lower paper guide assembly 32 which is disposed on the lower portion of the framework 14 and at the backside thereof. An adjustable upper platen assembly 34 (see FIG. 4) is positioned in the upper portion of the framework, and a lower platen assembly 36 is positioned in the lower portion of the framework 14. Located in horizontal alignment with the banding or wrapping chamber which is defined by the sideplates 18 of the framework 14, and secured to the forward side of the framework 14, is a transfer unit assembly 38.

Secured across the framework 14 between the sideplates 18 above the wrapping chamber defined therebetween is an upper flap folder assembly 40. In substantial vertical alignment with the upper flap folder assembly 40 and secured across the lower side of the sideplates 18 to the bottom plate 19 is a lower flap assembly 42. Projecting horizontally outwardly from one of the sideplates 18 defined in the wrapping zone is an adhesive applicator assembly 44. On the opposite side of the wrapping chamber from the adhesive applicator assembly 44, and secured to a sideplate 18, and extending horizontally therefrom, is a seam roller assembly 46. Finally, to the rear of the framework 14 in a position to receive compressed, wrapped bales or stacks of bags from the wrapping chamber is located a bag delivery assembly 48.

Having thus briefly alluded to the various assemblies which are functionally and mechanically integrated in the banding press 10 of the invention, the several parts of the various assemblies will next be described in greater detail. The description of the assemblies will be undertaken substantially in the order in which the various assemblies are encountered by bags moving into and through the banding press after having been stacked in vertically superimposed, individually flattened condition upon the bag supporting plate 12. From this plate, the stack of vertically superimposed bags is moved by any suitable mechanism into the banding press 10 where the bags come to rest upon a portion of the lower platen assembly 36. The lower platen assembly 36 is the moving element functioning in the compression of the stack of bags, and includes a platen panel 50 (see FIG. 5) which is secured across an elongated platen support beam 52. The beam 52 extends transversely and horizontally across the framework 14 and projects through an elongated, vertically extending slot 54 formed in each of the side panels 20.

Secured to the back edges of the platen support beam 52 at locations just inside the side panels 20 of the framework 14 are a pair of horizontally spaced bearing brackets 56 which journal the end portions of an elongated shaft 58 (see FIG. 5). The shaft 58 carries at its opposite ends outside the bearing brackets 56, a pair of gears 60 which are keyed to the shaft for rotation therewith. The gears 60 mesh with the teeth carried upon elongated, vertically extending racks 62 secured to the inside faces of the side panels 20 of the framework 14. It will be seen that during vertical reciprocating movement of the platen supporting beam 52 and of the platen panel 50 which is secured thereto, a bending moment tending to twist the platen support beam about its axis is resisted by the support and strength afforded by the interlock between the gears 60 and the racks 62.

At the outer ends of the platen support beam 52, the beam is connected to the lower ends of a pair of downwardly extending, substantially parallel piston rods 64 which are best illustrated in FIG. 3 of the drawings. The piston rods 64 are connected at their other ends to pistons which are disposed within air cylinders 66 secured by brackets 68 on opposite side panels 20 of the framework 14 at the upper portion thereof. Periodically, and in timed sequence with the remaining functions performed by the banding press, the cylinders 66 are pneumatically actuated to retract the piston rods 64 and thus elevate the platen supporting beam 52 and the platen panel 50 carried thereby for the purpose of compressing the bag stack in a manner hereinafter described.

Mounted in the upper portion of the framework 14 is the adjustable upper platen assembly 34. The upper platen assembly 34 is illustrated in detail in FIGS. 4 and 6, and includes an elongated mounting bracket 70 which extends transversely across the framework 14 and is secured at its opposite ends to the side panels 20. The elongated mounting bracket 70 has secured to the upper surface thereof at horizontally spaced intervals therealong, a pair of bearing keeper blocks 72 which rotatably journal the flanged lower end 74 of a worm gear unit 76. Extending upwardly through an aperture in the mounting bracket 70 and through an aligned threaded aperture formed through the center of the worm gear unit 76 is a threaded stud 78 which is secured in any suitable way to the upper side of a transverse platen mounting bracket 82. The platen mounting bracket 82 is an elongated bracket which is secured at its lower edge to the central portion of an elongated upper platen panel 84. The opposite end portions of the platen panel 84 are adjustably secured to the side panels 20 of the framework by means of suitable bolts 85 extended through suitable oversized apertures 87 (see FIGS. 6 and 7).

Secured across one end of the mounting bracket 70 adjacent, and inside of, the side panel 20 is a bearing block 86. Another bearing block 88 is secured to the upper side of the mounting bracket 70 and is horizontally spaced from the bearing block 86. The bearing blocks 86 and 88 journal the opposite ends of an elongated, horizontally extending shaft 90 which extends substantially parallel to the mounting bracket 70, and which has keyed thereto, a pair of miter gears 92.

The miter gears 92 are horizontally spaced along the shaft 90 and are positioned to engage a pair of meshing miter gears 94 and 96 as illustrated in FIG. 6. The miter gear 94 is keyed to one end of a shaft 98 which is journaled in a pair of bearing blocks 100 mounted on the upper side of the mounting bracket 70. The shaft 98 also extends through a bearing block 102 which is secured to, and projects normally, from the bearing block 86. At its end opposite the end carrying the miter gear 94, the shaft 98 has an adjusting handle 104 secured thereto which is employed for a purpose hereinafter described. The miter gear 96 is keyed to a relatively short shaft 106 which is journaled in a pair of bearing blocks 108 secured to the upper surface of the elongated mounting bracket 70.

The transfer unit assembly 38 is best illustrated in FIGS. 1, 3, 4 and 8. Secured to a central portion of each of the side panels 20 of the frame 14 are a pair of cylinder mounting brackets 120. The cylinder mounting brackets 120 support a transversely extending elongated cylinder mounting plate 122 to which is bolted or otherwise suitably secured an air cylinder 124. The air cylinder 124 contains a piston (not shown) which is secured to one end of the piston rod 126 having its other end secured to a pusher plate 128. The pusher plate 128 has formed therein a plurality of transversely spaced, vertically extending slots 130 (see FIG. 7).

Each of the slots 130 slidably retains a plunger plate 132 which is biased upwardly in the respective slot by a suitable spring 134 which is extended between the pusher plate 128 and the lower portion of the respective plunger plate 132. At its upper end, each plunger plate 132 journals a roller 136 which is positioned to extend beyond the upper edge of the respective pusher plate and bear against the upper platen panel 84. Thus, the plunger plates 132 can accommodate themselves in their position to adjustments of the upper platen panel 84 as may be required. It will be noted in referring to FIGS. 1 and 4 that the transfer unit assembly 38 which includes the air cylinder 124 is located so that the air cylinder and piston 126 are located just below the upper platen assembly 34 and are aligned with the wrapping chamber located between the sideplates 18 of the framework 14.

The upper paper guide assembly 30 is mounted on the framework 14 to the rear of the upper portion thereof and extends transversely between the side panels 20 of the framework. The upper paper guide assembly 30 includes a pair of vertically extending rigid sheets of metal 140 which are spaced slightly from each other by means of suitable spacer strips 142 (see FIG. 6) extended between the side edges of the sheets. Further, the side edges of the sheets 140 are suitably secured to the outer side panels 20 of the framework 14. It will be noted that the sheets 140 are positioned immediately below the draw roll assembly 26 for receiving a web or slip of paper therefrom in a manner hereinafter described. It will also be noted in referring to FIG. 4 that at their lower edges, each of the sheets 140 is beveled or tapered inwardly so that these sheets may move into the outwardly beveled or divergent upper edges of sheets forming the lower paper guide assembly 32 next to be described. The sheets 140 terminate along a horizontal line which is above the horizontal level of the upper platen panel 84 and is also above the horizontal level of the adjustable top plate 21 which is aligned with the upper platen panel.

The lower paper guide assembly 32 is mounted on the lower portion of the framework 14 and, like the upper paper guide assembly, includes a pair of parallel, vertically extending, slightly horizontally spaced rigid sheets 146 and 148. The rigid sheets 146 and 148 are spaced from each other by spacer strips 150 disposed between the opposite side edges of the rigid sheets. The thus connected sheets 146 and 148 are vertically slidable in channels defined between the vertically extending guide bars 152 disposed at the back of the framework, and the vertically extending racks 62 hereinbefore described in referring to the lower platen assembly 32. Projecting rearwardly from about the center of the lower edge portion of the rigid sheet 146 is a toe portion 154 to which is secured the lower end of a piston rod 156 slidably mounted in an air cylinder 158. The air cylinder 158 is supported upon the lower side of the horizontal bottom plate 19 to which reference has hereinbefore been made, and which forms the bottom of the wrapping chamber. It will be noted that the space between the rigid sheets 146 and 148 is open at the lower side thereof. These two sheets are tapered at their upper ends so as to enlarge the spacing between them, and form a mouth for receiving the inwardly tapered lower edges of the sheets 140 of the upper paper guide assembly 30 when the sheets 146 and 148 of the lower paper guide assembly 32 are reciprocated upwardly in a manner hereinafter described. For the purpose of further guiding the parallel sheets 146 and 148 of the lower paper guide assembly 32 during its upward reciprocating movement, a pair of horizontally spaced guide strips 160 and 162 are secured to the inside face of each of the side panels 18 of the wrapping chamber, and are positioned so that the sheets will slide between these guide strips when moved upwardly across the entrance to the wrapping chamber.

The cutoff unit assembly 28 is mounted in the upper portion of the framework 14 and is best illustrated in FIGS. 4, 8 and 9. The cutoff unit assembly 28 includes a transversely extending girt 166 which extends between, and has its opposite ends secured to, the sideplates 20 of the framework 14. The girt has secured thereto, and projecting forwardly therefrom, a pair of cylinder mounting brackets 168 which function to support an air cylinder 170. The air cylinder 170 has a piston rod 172 projecting therefrom which is secured at its outer end to a reciprocating cutoff knife 174. The cutoff knife 174 has a slanting or inclined leading cutting edge so as to be better able to slice through, and sever cleanly, the web or strip of paper through which it is reciprocated by the air cylinder 170 in the manner hereinafter described. The cutoff knife 174 carries in horizontally spaced relation along its length, a pair of spring biased plungers 176 which carry rollers 178 at their lower ends, which rollers 178 bear against the upper surface of the girt 166. It is upon these rollers that the cutoff knife 174 moves across the flat upper surface of the girt in making its reciprocating cutting stroke.

The side portions of the upper surface of the cutoff knife 174 bear against the lower surface of a pair of knife guide blocks 180 and 182 secured to the sideplates 20 of the framework 14 in vertically spaced relation to the girt 166. A shaft 184 extends across the framework 14 and has its ends journaled in the knife guide blocks 180 and 182. Keyed to the shaft are a pair of small gears 186 and 188 which meshingly engage a pair of racks 190 and 192 secured to the upper surface of the cutoff knife 174.

For the purpose of slightly raising or lowering the knife guide blocks 180 and 182 in order to vary the horizontal plane in which the cutoff knife 174 reciprocates, a pair of adjusting blocks 196 and 198 are secured to the inside surfaces of the sideplates 20 of the frame 14 and carry a plurality of vertically extending adjusting screws 200 which can be screwed in or out to vary the vertical positions of the knife guide blocks. This adjustment, in conjunction with the biasing effect of the spring biased plungers 176, permits the horizontal plane in which the cutoff knife 174 reciprocates to be adjusted as may be necessary to obtain optimum cutting efficiency.

Secured to the forward portion of each of the knife guide blocks 180 and 182 is a transversely extending doffer plate 202 which functions to guide the paper strip or web from the draw roll assembly 26 into the upper paper guide assembly 30 in a manner hereinafter described. Horizontally spaced from

the doffer plate 202 and secured between plates 210 forming a portion of the draw roll assembly is an elongated, transversely extending cooperating knife member 206 which is a stationary cutting member which cooperates with the reciprocating cutoff knife 174 in severing the strip or web of paper. The cooperating knife member 206 is mounted in the illustrated position by means of a knife member mounting bracket 208 which extends transversely across the machine between a pair of plates 210 forming a portion of the draw roll assembly 26 as hereinafter described.

The draw roll assembly 26 which feeds the wrapping paper web or strip to the upper paper guide assembly 30 is best illustrated in FIGS. 4, 10 and 11. The draw roll assembly includes a motor and gear reducer combination 214 mounted on top of the framework 14 with the output from the motor-gear reducer 214 driving an elongated shaft 216 which is secured in suitable bearing boxes 218 mounted on the upper side of the framework. The shaft 216 has keyed thereto for rotation therewith, a draw roll 220 which extends across the machine between the sideplates 20 of the frame 14. The end of the shaft 216 opposite its end which is drivingly connected to the motor-gear reducer 214 has keyed thereto a gear 222 which drivingly engages a gear 224 carried on the outer end of a shaft 226 which is journaled in a pair of bearing boxes 228. Intermediate the length of the shaft 226, a pair of horizontally spaced draw rollers 230 are mounted and are of substantially the same diameter as the roller 220. The draw rollers 230 bear against, and cooperate with, the roller 220 for drawing paper therebetween and feeding it to the divergent upper ends of the rigid sheets 140 of the upper paper guide assembly 30. It will be noted in referring to FIG. 4 that the line of contact between the draw rollers 230 and the draw roller 220 extends across, and directly above, these sheets.

Passing through oversized apertures in rearwardly projecting wings of the bearing boxes 228 is an eccentric shaft 234. The ends of the shaft 234 are suitably journaled in bearing caps 236 which are suitably secured to the framework 14 of the machine. The offset or eccentric portion of the shaft 234 is extended through the apertures in the wings of the bearing box 228. A handle 238 is keyed to the shaft 234 so that the shaft may be rotated about its axis, and so that the eccentric characteristic of this shaft will then function to move the bearing boxes 228, and the shaft 226 and draw rollers 230 carried thereby, toward the axis of the shaft 234. The draw rollers 230 may thus be separated from the draw roller 220. Extending through a portion of each of the bearing caps 236 is a spring retainer stud 240, and each of the spring retainer studs 240 has mounted therearound and extending beyond the end thereof into contact with the respective bearing blocks 228, an extension spring 242. It will be seen that the extension springs 242 effectively bias the bearing boxes 228 toward the axis of the shaft 216 so as to maintain frictional contact between the draw rollers 230 and the draw roller 220 when the handle 238 is in the illustrated position.

The mill roll assembly 22 of the invention is illustrated in detail in FIGS. 1 and 4. As shown in these figures, the mill roll assembly 22 includes a large mill roll 24 of wrapping paper which is mounted upon a roll shaft 250 having its opposite ends journaled in bearing brackets 252 secured to opposite sides of a mill roll framework designated generally by reference numeral 254 and having sidewalls 255. The sidewalls 255 of the framework 254 journal a brake shaft 256 which has secured to the central portion thereof, a brake band 258 which exerts a drag on the peripheral surface of the mill roll 24 to prevent it from overrunning during the withdrawal of a web of paper 260 therefrom. A handle 262 is secured to the brake band shaft 256 at one end thereof outside of the framework 254, and a locking pin 264 extends through this handle into a registering aperture in the adjacent sidewall 255 of the framework 254 to permit the handle to be rotated to tension the brake band 258, and the handle locked in a set position when the tensioning is thus accomplished.

For the purpose of raising and lowering the mill roll 24 of wrapping paper, the bearing brackets 252 are each secured to an elongated rack 266 which is slidably mounted in a rack guide 268. The racks 266 are elevated and lowered by means of a handle 270 which, through suitable gearing 272, drives each of the racks in an up and down reciprocating motion to move the bearing brackets 252 upwardly or downwardly. Thus, the mill roll 24 can be rolled into a position in which the shaft 250 extends over the bearing brackets 252, and then may be lifted up to a position where it clears the floor as illustrated in FIGS. 1 and 4 of the drawings. Extending from the mill roll 24 to the upper portion of the framework 14 is the web or strip 260 of wrapping paper hereinbefore described. The strip 260 is passed over a series of guide rollers 274, 276, 278 and 280 so that it is in substantially horizontal alignment with the draw roll assembly 26.

The upper and lower flap folder assemblies 40 and 42 are best illustrated in FIG. 11 of the drawings. It will here be noted that the upper flap folder assembly 40 includes a transversely extending bracket 282 which is secured across the upper edges of the parallel apertured sideplates 18 defining the wrapping chamber of the apparatus, and further includes a pair of transversely extending, parallel brace plates 284 secured to the side edges of the bracket 282 and extending between the parallel apertured sideplates 18. Mounted on the bracket 282 are three horizontally spaced, aligned air cylinders 286, 288 and 290.

The air cylinders 286 and 290 have extending therefrom, a pair of piston rods 292 which, upon extension, project downwardly through suitable apertures into the wrapping chamber defined between the sidewalls 18, the horizontal bottom plate 19, and the adjustable top plate 21. The air cylinder 288 has a piston rod 294 which extends from opposite ends thereof and carries a piston at a medial portion of the rod located within the air cylinder. The upper end portion of the piston rod 294 is secured to an angle brace 296 which extends transversely with respect to the wrapping chamber and which has secured to the horizontal flange thereof, a plurality of flap folding rods 298. The rods 298 are positioned for extension through aligned apertures formed in the bracket 282 and in the adjustable top plate 21 so that their lower ends can be extended and retracted through these aligned apertures as a result of actuation of the air cylinder 288.

The lower flap folder assembly 42 is similarly constructed to the upper flap folder assembly 40 and includes air cylinders 300, 302 and 304 which are secured to the lower side of the horizontal bottom plate 19 in horizontally spaced, aligned relation. The cylinders 300 and 304 contain pistons secured to one end of piston rods 306 which are extendible through apertures in the horizontal bottom plate 19 into the wrapping chamber. The cylinder 302 has an elongated piston rod 308 extending thereinto and projectable upon actuation of this cylinder from either of the opposite ends of the cylinder. When the piston rod 308 is projected from the upper end of the cylinder 302, it may be extended through an aperture formed in the horizontal bottom plate 19. The lower end of the piston rod 308 is secured to an angle bracket 310 to which are secured in horizontally spaced relation, the lower ends of a plurality of flap folding rods 312. The flap folding rods 312 are positioned in substantially horizontal alignment with the piston rods 306 and 308 and are aligned with apertures in the horizontal bottom plate 19. It may be noted at this point that all of the piston rods and flap folding rods constituting parts of both the upper and lower flap folding folder assemblies 40 and 42 are aligned in a vertical plane which is located at about the position where the pusher plate 128 is located at the end of the extension stroke of the piston rod 126 of the transfer unit assembly 38.

The adhesive applicator assembly 44 of the invention is illustrated in detail in FIGS. 12, 13 and 11. As here depicted, the adhesive applicator assembly 44 includes a frame mounting plate 318 which is secured to one of the parallel apertured sideplates 18 of the framework 14. A cylinder mounting plate

320 is bolted or otherwise suitably secured to the mounting plate 318 and extends across a relatively large aperture 322 formed in the frame mounting plate. A piston rod opening 324 is formed in the cylinder mounting plate 320 in alignment with the opening 322 formed in the frame mounting plate 318. The aligned openings 322 and 324 thus accommodate a piston rod 326 which extends horizontally from an air cylinder 328 attached by suitable bolts to the air cylinder mounting plate 320. The air cylinder 328 is mounted on the framework 14 through the instrumentalities of the mounting plates 318 and 320 in such a way that its piston rod 326 will be extended outwardly at a slight angle with respect to a transverse plane extending between the apertured sideplates 18 within the wrapping chamber. The reason for this angularity of the piston rod 326 will be hereinafter explained.

Secured to one side of the housing of the air cylinder 328 is a backplate 330. Spaced horizontally from the backplate 330 by means of suitable space bars 332 are a pair of outer plates 334 (see FIG. 14) which define slide channels 336 in which flanges 337 carried by slide member 338 are slidably positioned. The slide member 338 also includes a second pair of outwardly projecting flanges 340. The flanges 340 of the slide member 338 receive a pair of horizontally spaced elongated tubular members 342 and 344 which extend parallel to the air cylinder 328.

The tubular member 342 is connected at its end nearest the outer end of the air cylinder 328 to a source of compressed air (not shown), and has its other end portion extending through a bronze bearing 346 disposed in the cylinder mounting plate 320. The second tubular member 344 has its end nearest the outer end of the air cylinder 328 connected to a source of liquid paste or adhesive (not shown), and has its other end extended through a bronze bearing 350 disposed in the cylinder mounting plate 320. The ends of the tubular members 342 and 344 opposite their ends connected to the source of compressed air and source of liquid paste, respectively, pass through suitable openings and seals formed in a generally L-shaped paste head bracket 352 and are respectively connected through suitable fittings 354 to air intake conduit 356 and paste intake conduit 358, respectively, mounted on the paste head bracket.

It will also be noted in referring to FIG. 13 that the free outer end of the piston rod 326 is secured to the paste head bracket 352. Thus, as the piston 326 is extended out of the air cylinder 328, the paste head bracket 352 will be moved outwardly due to its securement to the end of the piston rod, and this outward movement will carry with it, the tubular members 342 and 344 which are free to slide through the bearings 346 and 350 and are slidably supported on the air cylinder 328 as a result of their attachment to the slide member 338.

Mounted in the angle of the L-shaped paste head bracket 352 is a paste head 360. The paste head 360 includes a paste ejection nozzle 362 which is threaded into a suitable bore in the paste head 360 and has a hollow interior communicating with an air channel 364 and a paste channel 366 formed in the paste head. The air intake conduit 356, hereinbefore described, supplies air through a suitable fitting 368 to the air channel 364 in the paste head. Paste is supplied to the paste channel 366 by a suitable paste conduit 370 connected to the paste head through a suitable fitting 372. The paste conduit 370 is connected at its end opposite the fitting 372 through a suitable fitting 374 to a paste valve 376 which is mounted on the outer side of one of the legs to the L-shaped paste head bracket 352. The paste valve 376 is interposed in the paste intake conduit 358 and is opened and closed during operation of the apparatus by means of a valve operator member 378. The valve operator member 378 is secured to a cam arm 380 which carries at its outer end a roller 382. The connection between the roller 382, cam arm 380 and valve operator member 378 is such that when the roller engages an object which biases it and the cam arm 380 toward the air cylinder 328, the valve operator member 378 will be moved to open the paste valve 376 and permit paste to flow from the paste intake conduit 358 to the paste conduit 370.

The seam roller assembly 46 forming a part of the invention is best illustrated in FIGS. 11, 14 and 15. The seam roller assembly 46 includes a U-shaped bracket 390 which is bolted or otherwise suitably secured to a sideplate 18 of the framework 14. The U-shaped bracket 390 has a large aperture 391 formed therein over which is secured a mounting plate 392 used for mounting to the bracket 390, an elongated air cylinder 394. The mounting plate 392 is also apertured to accommodate a piston rod 396 which is extensible from the cylinder 394, and which has secured to its free outer end, a roller mounting bracket designated generally by reference numeral 398. The roller mounting bracket 398 includes a pair of parallel flanges 400 which project away from the cylinder 394 and are each provided with an oversized aperture or slot 401, which apertures loosely receive the opposite ends of a roller mounting shaft 402.

The roller mounting shaft 402 has journaled thereon by the use of suitable bearings 403, a seam roller 404. The shaft 402 is yieldably supported in the oversized apertures 401 by springs 406 which extend against the shaft 402 from a pair of spring bores 408 formed in the flanges 400. Thus, some yielding of the shaft 402 can occur against the resilient bias of the springs 406 when the roller 404 encounters an immovable surface tending to force the roller toward the springs.

Secured to a backplate 410 forming a portion of the roller mounting bracket 398 is one end of a guide rod or tube 412. The guide rod 412 extends through a bushing 414 in the cylinder mounting plate 392 and further extends parallel to the cylinder 394. One end portion of the guide rod 412 is secured to a flange 416 forming a portion of an elongated slide member designated generally by reference numeral 418. Slide member 418 is constructed generally similarly to the elongated slide member 338 hereinbefore discussed and is mounted on the cylinder 394 for sliding movement relative thereto. It will be noted in referring to FIGS. 3 and 11 that the seam roller assembly 46 is positioned in substantially horizontal alignment with the adhesive applicator assembly 44 and with the upper and lower flap roller assemblies 40 and 42, respectively.

The adjustable top plate 21 can be adjusted upwardly or downwardly to match the horizontal level of the upper platen panel 84 by the use of the mechanism best illustrated in FIGS. 1, 4, 6 and 7. As here shown, a pair of transverse girts 419 and 420 extend between, and have their opposite ends secured to, the sidewalls 18. The girts 419 and 420 each carry a pair of horizontally spaced bearing blocks 421 which each rotatably journal a flanged portion of a worm gear unit carrying a worm gear 422 at the upper end thereof. A threaded bolt 424 is threaded through a threaded bore formed vertically and axially through each of the worm gear units and has its head secured to the adjustable top plate 21.

The four worm gears 422 are aligned in two pairs with the gears in each pair meshing with a worm 423 carried on a shaft 424. Each of the shafts 424 are journaled in shaft brackets 425 secured to, and projecting vertically from, the girts 419 and 420 (see FIGS. 6 and 7). At one of its ends, each shaft 424 has keyed thereto a miter gear 426. The miter gears 426 mesh with miter gears 427 keyed to a transversely extending shaft 428 which has one of its end portions journaled in a bracket 429 secured to the sidewall 18 of the framework 14, and its other end portion journaled in a bracket 430 secured to the girt 420. A handle 431 is secured to the end of the shaft 428 which projects through the bracket 429.

The bag delivery assembly 48, in the illustrated embodiment of the invention, comprises a plurality of rollers 423 which are rotatably mounted in roller supporting brackets 434 and 436 supported in any suitable way on the framework 14 of the apparatus, or from the floor upon which the framework rests. The rollers 432 carry a continuous belt 438 onto which compressed and wrapped bales of bags are moved from the banding chamber located between the apertured sidewalls 18. The bag delivery assembly 48 functions to convey these wrapped bales of compressed bags to a table (not shown) where the end flaps of the wrappers extending around the compressed bags

can be tucked and sealed preparatory to shipment. As will be hereinafter explained, the compressed, wrapped bales positioned within the wrapping chamber between the apertured sidewalls **18** are discharged from this chamber by the forced introduction of a new stack of bags under compression into the chamber as the transfer unit assembly **38** is operated.

In FIG. **16** of the drawings, an electrical wiring diagram is depicted which illustrates the basic circuitry utilized in the banding press of the invention. In referring to this circuit diagram, reference should also be made to the several figures of the drawing where certain switches utilized for actuating solenoid valves in the pneumatic flow lines have been illustrated. In FIG. **16**, there are depicted six relays R–1 through R–6, and these are shown mounted on an instrument panel **450** above a terminal block **452**. Also illustrated in FIG. 3 are the locations of a plurality of solenoid type valves which are positioned in the several pneumatic or air supply lines used for actuating the air cylinders in a manner hereinafter described. These valves, designated by reference numerals **454** through **470** are electrically operated by the opening and closing of a plurality of switches in a timed sequence and for functions hereinafter described.

The several switches utilized in the electrical circuitry for the operation of the valves **454—470** are illustrated in their various locations in the various figures of the drawings, and are shown in their electrical relationship to the valves **454—470** and to the relays R–1—R–6 in FIG. **16** of the drawings. Thus, a microswitch **472** is positioned on the framework **14** in a position to be either manually closed, or closed by the introduction of a stack of bags into the framework **14** in a position of rest on the lower platen panel **50**. A switch **474** is mounted on the framework **14** in a position to be contacted and closed by a switch trip **476** secured to the platen support beam **52** when the lower platen panel **50** is reciprocated upwardly to its full extent by means of the air cylinders **66** and piston rods **64**.

A normally closed switch **478** is mounted adjacent the outer end of the air cylinder **124** and is adapted to be opened and closed by the movement of a switch trip rod **480** which is slidably mounted on a suitable support bracket on the side of the air cylinder **124** and has one of its ends connected to the pusher plate **128** for reciprocating motion therewith. It will be understood from the following description that when the piston rod **126** is fully retracted, the switch trip rod **480** will be brought into contact with the switch **478** so that this switch will be opened.

The switch trip rod **480** also carries a protuberance which will contact and trip a switch **484** secured to the cylinder mounting plate **122** adjacent the forward end of the air cylinder **124** when the piston rod **126** is fully extended. The switch **484** is a normally closed switch which is opened by this contact with the protuberance of the switch trip rod **480**. Spaced along the path of travel of the switch trip rod **480** is another switch **486** which is a normally open switch which is closed only during the retraction stroke of the switch trip rod **480**.

Located in the path of reciprocating movement of the cutoff knife **174** so that as this blade is retracted, it will be opened, is a normally closed switch **488**. Conversely, the switch **488** will be opened when the knife blade reciprocates in a direction to cut the web of paper **260** as hereinafter described.

Mounted on the lower end of the air cylinder **158** is a switch **490** which is closed by the retraction of the piston rod **156** which is secured to the spaced sheets **146** and **148** of the lower paper guide assembly **32**. A switch **494** is secured to the upper end of the air cylinder **286** so that, as the piston rod **294** is retracted within the air cylinder **288** to lower the angle bracket **296**, the switch **494** is contacted and is closed. Mounted near the inner end of the air cylinder **328** is a normally closed switch **496** which is opened by a switch trip **498** carried on and movable with the slide member **338** at a time when the piston rod **326** is fully extended from the air cylinder **328**.

At the opposite end of the air cylinder **328** from the switch **496**, a switch **500** is mounted on this air cylinder and is also located for contact and closure by the switch trip **498** when the piston rod is fully retracted within the cylinder **328**. Secured to the lower end of the air cylinder **300** are normally open switches **502** and **504**, which switches are closed when the piston rod **308** is retracted within the cylinder **302** to move the angle brace **310** in toward the outer ends of the cylinders **300**, **302** and **304**. A normally closed switch **506** is mounted near the inner end of the air cylinder **394** and is positioned for contact by a switch trip **508** mounted on the slide member **418** when the piston rod **396** is fully extended from the air cylinder **394**. Mounted intermediate the length of this air cylinder are a normally closed switch **510** and a normally open switch **512** which are opened and closed, respectively, during the retraction of the piston rod **396** into the air cylinder **394**. Finally, a pair of normally closed switches **514** and **516** are contacted by the switch trip **508** at a time when the piston rod **396** has completed its retractive stroke into the air cylinder **394** so that these switches are at this time opened.

Before commencing the full and detailed description of the operation of the invention, the action of the switches and valves in the circuitry depicted in FIG. **16** may initially be described to aid in clarifying the overall description to follow. Thus, at the outset of the operation of the banding press, the switch **472** is depressed causing the relay R–1 to close, with the switch **484** at this time acting as an electrical interlock to hold in the relay. When the relay R–1 closes, the valves **454** and **456** shift, causing the piston rods **64** to be retracted in the cylinders **66**. When the piston rods **64** are retracted in the cylinders **66** completely, the switch **474** is contacted and closed, causing the valve **458** to open to admit air to the cylinder **124**. This causes the piston rod **126** to be extended and the result is that switch **478** is released to become open, causing the valve **460** to open to deliver air to the cylinder **170**, and thus extend the cutoff knife **174**.

When the piston rod **126** is fully extended, the switch **484** is opened, thus releasing relay R–1 and therefore permitting valves **454** and **456** to shift in a manner which will cause the extension of the piston rods **64** from the air cylinders **66**. When these piston rods commence to extend, the switch **474** is opened, causing the valve **458** to shift, resulting in the retraction of the piston rod **126** into the cylinder **124**. As the piston rod **126** is retracted, the switch **486** is contacted by the switch trip **480** so that this switch is closed. Also, at the completion of the retraction stroke of the piston rod **126**, the switch **478** is contacted and opened. The opening of the switch **478** causes the valve **460** to be thrown, thus effecting the retraction of the cutoff knife **174**.

As this knife is retracted, the switch **488** is depressed to open this switch. This closes the relay R–2, and the switch **516** at this time is closed and acts as an electrical interlock to hold in the relay. The closure of the relay R–2 causes the valve **462** to be shifted, and this in turn introduces air to the cylinder **158** to retract the piston rod **156** causing the lower paper guide assembly **32** to be reciprocated upwardly. As the toe portion **154** forming a portion of this assembly reaches its uppermost limit of travel, it contacts and closes the normally open switch **490** which energizes a timer **520** which operates the draw roll motor and speed reducer **214** to feed a measured amount of paper into and through the upper paper guide assembly **30** and the lower paper guide assembly **32**.

When switch **486** is depressed by the retraction of the piston **126** into the cylinder **124**, the relay R–3 closes and the normally closed switch **514** acts at this time as an electrical interlock. The closure of the relay R–3 causes the valve **464** to shift, thus introducing air to the cylinders **286**, **288** and **290** to actuate the upper flap folding assembly **40** and move the rods **292** and **298** into the wrapping chamber. When the piston rod **294** has been fully retracted within the air cylinder **288**, the switch **494** is closed to close relay R–4. At this time, the switch **496** acts as an interlock holding in the relay. The closure of the relay R–4 causes the valve **466** to be thrown, thus in-

troducing air to the air cylinder **328** to extend the piston rod **326** therefrom.

When the piston rod **326** is fully extended from the air cylinder **328**, the switch **496** is opened, causing the relay R–4 to open. This permits the valve **466** to return to its initial position so as to return the air cylinder **328** to its initial status and retract the piston rod **326**. When the piston rod **326** is fully retracted within the air cylinder **328**, the switch **500** is closed to close the relay R–5. At this time, the switch **510** acts as an electrical interlock for the relay R–5. When the relay R–5 is closed, the valve **468** is thrown, introducing air to the air cylinders **300**, **302** and **304** in a way to cause the retraction of the piston rod **308** and extend the rods **306** and **312** of the lower flap folding assembly into the wrapping chamber. When the piston rod **308** is fully retracted in the air cylinder **302**, the switches **502** and **504** are both closed by contact with the angle brace **310**. This causes the relay R–6 to close, and it is held closed by the switch **506** which acts an an electrical interlock.

When the relay R–6 closes, the valve **470** is thrown, causing air to be introduced to the cylinder **394** so that the piston rod **396** is extended therefrom. When the piston rod **396** is fully extended from the air cylinder **394**, the switch **506** is opened, causing the relay R–6 to open. This throws the valve **470**, thus retracting the piston rod **396** within the air cylinder **394**. When the piston rod **396** is partially retracted, switch **510** is opened and switch **512** is closed. When switch **510** is opened, the relay R–5 opens. This throws the valve **468** which effects the extension of the piston rod **308** from the cylinder **302**. When the switch **512** is closed by the movement of the switch trip **508** during actuation of the air cylinder **394**, the relay R–6 closes and the switch **506** at this time acts as an electrical interlock. This causes the valve **468** to be thrown, in turn causing the piston rod **396** to be extended from the air cylinder **394**. When the piston rod **396** is fully extended from the air cylinder **394**, the switch **506** is again opened causing the relay R–6 to open. This throws the valve **468**, again effecting the retraction of the piston rod **396** within the air cylinder **394**. When the piston rod **396** is fully retracted within the air cylinder **394**, the normally closed switches **514** and **516** are opened. The opening of the switch **514** opens relay R–3 which causes the valve **464** to be thrown, thus effecting extension of the piston rod **294** from the air cylinder **288**. When the switch **516** is opened, the relay R–2 is opened, which causes the valve **458** to be thrown. This causes the piston rod **156** to be extended from the air cylinder **158** to return the lower paper guide assembly **32** to its lowered original position.

OPERATION

In the operation of the apparatus for the compression and wrapping of bags as constructed in accordance with the invention, and in the practice of the method of the invention, there are initially placed on the bag supporting plate **12**, a stack of vertically superimposed, aligned, flat bags which it is desired to compress and wrap or band for the purpose of storage or shipment of the bags. From the bag supporting plate **12**, this stack of bags is pushed or moved by any suitable means into the banding press **10** where the stack occupies a position on the upper surface of the platen panel **50** forming a portion of the lower platen assembly **36**. Here the bags are confined between the sideplates **20** of the framework **14** and the metal sheet **148** of the lower paper guide assembly **32**.

When the switch **472** is momentarily closed, the relay R–1 is closed and is held in by the interlock switch **484**. With the closure of the relay R–1, valves **454** and **456** are thrown, permitting the air flow to the two air cylinders **66** to be such that the piston rods **64** are retracted. The retraction of the piston rods **64** in the slots **54** lifts the platen support beam **52** upwardly, carrying with it the platen panel **50** and the stack of bags supported thereon.

During the upward travel of the lower platen assembly **36**, the platen panel **50** is maintained in proper horizontal alignment, and does not sustain distortion as a result of any bending moment imposed thereon by the stack of bags, because of the mechanical support and reinforcement afforded by the engagement of the gears **60** with the vertically extending racks **62**. Thus, these gears **60** track the racks **62** as the lower platen panel **50** and the platen support beam **52** by which it is supported move upwardly.

After the uppermost bag in the stack of bags carried on the platen panel **50** contacts the upper platen panel **84**, the bags within the stack commence to undergo compression, with the air contained within the bags being expressed therefrom. The upward reciprocation of the lower platen panel **50** continues until the upper limit of the retraction stroke of the piston rods **64** is reached. At this time, the stack of bags is fully compressed, and the lower platen panel **50** is aligned with the horizontal bottom plate **19** forming the bottom of the wrapping chamber. It should further be pointed out at this point that variations in the extent of compression, or in the size of the stack of bags to be compressed, can be accommodated or adjusted by manipulation of the adjustable upper platen assembly **34**. Thus, by rotation of the handle **104** after the securing bolts or studs **85** have been loosened, the worm gear units **76** may be driven in rotation to raise or lower the upper platen panel **84** to a selected position. A corresponding adjustment in the adjustable top plate **21** of the wrapping chamber will need to be concurrently made, and this adjustment is accomplished by rotation of the handle **431**.

When the stack of bags has been compressed by the retraction of the piston rods **64** to their limit of travel upwardly in the air cylinders **66**, the switch **474** is closed by the switch plate **476**. Closure of the switch **474** actuates the valve **458** positioned in the air supply so as to extend the piston rod **126** from the air cylinder **124** in the transfer unit assembly **38**. As the piston rod **126** is extended, it pushes the pusher plate **128** toward the compressed stack of bags. When the piston rod **126** begins to extend from the cylinder **124**, the switch **478** is opened, causing the valve **460** to shift so as to deliver air to the air cylinder **170**. This causes the cutoff knife **174** to reciprocate through the web **260** of wrapping paper immediately prior to the forcing of the bale or stack of compressed bags through the severed, lower portion of this web as hereinafter described. The reciprocating movement of the pusher plate **128** carries with it, the several plunger plates **132** which are reciprocably mounted in the slots **133** in the upper end portion of the pusher plate **128**. The plunger plates **132** are, of course, vertically yieldable due to their vertically sliding mounting in the pusher plate **128**, and they are maintained in the elevated position permitted by the adjusted location of the upper platen panel **84** by the rollers **136** which track the lower surface of this platen panel. The combined pushing effect of the pusher plate **128** and the plunger plates **132** effectively displaces the compressed stack of bags from between the upper and lower platen assemblies **34** and **36**, respectively, and toward the wrapping chamber.

At the time that the pusher plate **128** and plunger plates **132** carried thereby drive the compressed bale from between the upper and lower platen assemblies **34** and **36**, a web of wrapping paper has been extended between the rigid sheets **140** of the upper paper guide assembly **30**, across the space between the rear edges of the upper platen panel **84** and lower platen panel **50**, and between the rigid sheets **146** and **148** of the lower paper guide assembly **32** which, at this time, is in the lowered position depicted in FIG. 4. With the web or strip of wrapping paper thus positioned, the continued movement of the compressed stack or bale of bags in a horizontal direction through the vertical plane occupied by the paper web in the machine will result in the compressed stack being encompassed on three sides by the wrapping paper, with flaps of the paper extending from the upper and lower edges of the stack toward the air cylinder **124**. As the bale or stack is moved further into the wrapping chamber by a distance approximately equivalent to twice the thickness of the stack, the upper and lower flaps of the wrapper extend horizontally from the top

and bottom sides of the stack beneath the portions of the adjustable top plate **21** and the horizontal bottom plate **19** which have been traversed by the compressed stack or bale.

When the piston rod **126** is extended from the cylinder **124**, the valve **484** is opened, causing the relay R–1 to open which throws the valves **454** and **458**, thus extending the piston rods **64** from the cylinders **66** and returning the lower platen assembly **36** to its lowermost or original position. As the piston rods **64** commence to be extended from the pistons **66**, the switch **474** is released, throwing the valve **458**, and causing the piston rod **126** to be retracted within the cylinder **124**. As the piston rod **126** is retracted, the switch **486** is closed followed by the opening of the switch **478** by contact with the switch trip **480**.

When the switch **478** is opened, the valve **460** is thrown so as to effect the retraction of the cutoff knife **474** by proper actuation of the air cylinder **170**. This retraction of the cutoff knife closes the switch **488** which energizes the relay R–2. The relay R–2 is held in by the switch **516**. Energization of the relay R–2 throws the valve **462** so as to cause the piston rod **156** to be retracted within the air cylinder **158**. This actuation of the air cylinder **158** results in the upward reciprocation of the lower paper guide assembly **32** so that the tapered upper edges of the rigid sheets **146** and **148** forming a portion of this assembly are moved upwardly into close proximity to the tapered lower edges of the rigid sheets **140** forming a portion of the upper paper guide assembly **30**.

In this position, the sets of upper and lower spaced rigid sheets are aligned, and form a substantially continuous channel for the feeding of paper thereinto by the draw roll assembly **26**. When the piston rod **156** has been fully retracted into the air cylinder **158**, the switch **490** is struck by the protuberance carried on the toe portion **154** so as to close this switch. Closure of the switch **490** energizes the timer **520**, and also makes a circuit to the motor of the motor-gear reducer combination **214**. The timer **520** is set to drive the motor for a predetermined period of time so as to feed an exact measured amount of paper into the aligned, adjacent upper and lower paper guide assemblies **30** and **32**, respectively.

When the switch **486** is closed by the full retraction of the piston rod **126** within the cylinder **124**, the relay R–3 closes and is held in by the interlock switch **514**. This causes the valve **464** to be thrown, and introduces air to the air cylinders **286**, **288** and **290**. The piston rod **294** is retracted in the air cylinder **288**, and the piston rods **292** are extended from the air cylinders **286** and **290**. With the retraction of the piston rod **294** into the air cylinder **288**, the angle brace **296** is drawn downwardly toward the wrapping chamber and the flap holding rods **298** are extended through apertures in the bracket **282** and in the adjustable top plate **21** into the wrapping chamber. Simultaneously, the piston rods **298** and **292** are being extended from the air cylinders **286** and **290**, respectively. This action of the flap holding rods **298** and the piston rods **292** forces down the horizontally extending top flap of the severed paper web, and moves it to a position in which it partially covers the fourth or trailing side of the compressed stack of bags. Thus, the top flap or top extension of the severed wrapper is folded down to a position in substantial parallelism with the fourth side of the bag stack.

When the piston rod **294** is fully retracted within the air cylinder **288**, the switch **494** is closed to close relay R–4 which is held in by the interlock switch **496**. The closure of the relay R–4 causes the valve **466** to be thrown. This actuation of the valve **466** changes the status of the air cylinder **328** forming a part of the adhesive applicator assembly **44** so that the piston rod **326** is extended therefrom into the wrapping chamber.

It will be recalled that the air cylinder **328** and piston rod **326** have been described as having their major longitudinal axes extending at a slight angle with respect to a vertical plane positioned transversely across the wrapping chamber. The reason for this angulation is to assure that the roller **382** forming a portion of the adhesive applicator assembly **44** will maintain continuous contact with the folded down upper flap of the wrapping paper as the paste head **360** carried at the end of the piston rod **326** traverses the compressed bale. Thus, as the piston rod **326** is extended, the roller **382** will contact the folded down top flap of the wrapper, and will force this top flap against the vertical side of the stack of compressed bags.

This contact will bias the roller **382** and the cam arm **380** carried thereby in a direction to move the valve operator member **378** and open the paste valve **376**. The paste will then flow to the paste ejection nozzle **362** where it will be mixed with a jet of air delivered to the paste head **360** from the tubular member **342**. Thus, as soon as the roller **382** contacts the wrapping paper and forces it against the adjacent side of the bale of compressed bags, a fine spray of paste or suitable adhesive will be discharged from the nozzle **362** along a horizontal line extending across the wrapping paper adjacent from the edge thereof which was formerly severed by the cutter knife assembly **28**. At the time that the piston rod **326** commences to be extended from the air cylinder **328**, air jets (not shown) which face the trailing side of the compressed stack of bags located in the banding chamber are activated so as to blow the ends of the wrapper sheet against the track of bags.

When the piston rod **326** has been fully extended, the switch **496** is opened, thus causing the relay R–4 to open. This shifts the valve **466** and causes the status of the cylinder **328** to be reversed, and the piston rod **326** to be retracted. When the piston rod **326** is fully retracted within the air cylinder **328**, the switch **500** is closed so that the relay R–5 is closed and is held in by the normally closed switch **510**. With the closure of relay R–5, the valve **468** is thrown which causes the piston rod **308** to be retracted within the air cylinder **302** and the piston rods **306** to be extended from air cylinders **300** and **304**.

As the piston rod **308** is retracted within the air cylinder **302**, the flap folding rods **312** are extended into the wrapping chamber simultaneously with the extension in coplanar alignment therewith of the piston rod **306**. Now the result of this movement of the flap folding rods **312** and piston rod **306** is to fold upwardly through a right angle, the horizontally extending bottom flap of the wrapper paper. This flap is thus brought upwardly to where it overlaps the previously downwardly folded upper or top flap of the wrapper paper. The overlap of the flaps is such that the bottom flap extends over the line along which glue has been applied during the reciprocating stroke of the piston rod **326** of the adhesive applicator assembly **44** as hereinbefore described.

When the piston rod **308** is fully retracted within the cylinder **302**, the switch **502** is closed and the switch **504** is also closed by contact of the angle bracket **310** with this switch (see FIG. **11**). A closure of these switches causes the relay R–6 to close, and the switch **506** acts as an interlock switch for the relay. When the relay R–6 closes, the valve **470** is shifted to cause the piston rod **396** to be extended from the air cylinder **394** forming a part of the seam roller assembly **46**. As the piston rod **396** extends outwardly from the cylinder **394**, the roller **404** carried in the roller mounting bracket **398** engages and bears against the overlapped top and bottom flaps of the wrapper paper along a line which overlies the line along which glue has previously been applied to the underlying top flap. The roller **404** applies bonding pressure along this seam according to the amount of compression which has been set in the springs **406**. During the extension of the piston rod **396**, air jets (not shown) located on opposite sides of the banding press are activated to blow the ends of the wrapper sheet against the bags and prevent fouling of these on the reciprocating roller **404** or roller mounting bracket **398**. After the piston rod **396** has been fully extended, and the roller **404** has completed traversal of the overlapped top and bottom flaps or wrapper extensions along the seam line, the switch **506** is opened, causing the relay R–6 to open. This throws the valve **470** to reverse the status of the air cylinder **394** and retract the piston rod **396**. As the piston rod **396** is undergoing its retraction stroke, and before full retraction is effected, the switch trip **508** finally contacts and opens switch **510** and contacts and closes switch **512**.

When the switch 510 is opened, the relay R–5 is released or opened. With the release of the relay R–5, the valve 468 is shifted, causing the piston rod 308 to be extended from the cylinder 302, and the piston rods 306 to be retracted into the air cylinders 300 and 304. When the switch 512 is closed, the relay R–6 is closed and is held in by the interlock switch 506. The closure of the relay R–6 causes the valve 470 to shift. This causes the status of the cylinder 394 to again be reversed so that the piston rod 396 is again extended therefrom, and the roller 404 again undergoes a stroke across the seam line of the overlapped top and bottom flaps of the wrapper paper.

When the piston rod 396 is fully extended, the switch 506 is opened, causing relay R–6 to open. This throws the valve 470 so as to reverse the status of the air cylinder 394, and retract the piston rod 396 within this cylinder. It will be apparent from the description of the action of the seam roller assembly 46 that a double stroke is made by this assembly so that the roller 404 is passed twice across the seam line where the top and bottom flaps of the wrapper paper are overlapped.

When the piston rod 396 is fully retracted within the cylinder 394, the switch 514 is opened and the switch 516 is also opened. With the opening of the switch 514, the relay R–3 is opened which causes the valve 464 to be shifted. Shifting of the valve 464 retracts the piston rods 292 within the cylinders 286 and 290 and also effects the extension of the piston rod 294 from the air cylinder 288. Thus, the flap folding rods 298 are withdrawn upwardly from the wrapping chamber, as are the piston rods 292. When the switch 516 is opened by the complete retraction of the piston rod 396 within the cylinder 394, the relay R–2 is opened. This causes the valve 458 to shift with the result that the piston rod 156 is extended from the cylinder 158 to return the lower paper guide assembly 32 to its lowermost position, and to thus stretch or carry the paper web across the path through which the compressed bale is moved when the cycle hereinbefore described is repeated.

As each successive compressed bale or stack of bags is forced into the wrapping chamber by the periodic actuation of the transfer unit assembly 38, a bale of bags which has previously been wrapped about on four sides, with the wrapper paper secured by gluing and bonding in the manner described, is forced out of the wrapping chamber and onto the bag delivery assembly 48. Here, the wrapped bale rests upon the continuous belt 438 and is carried by this belt to a remote location, such as a wrapping table, where the open ends of the wrapper are tucked in and sealed, and the packaging of the compressed bags is completed in that manner.

Another embodiment of the invention is illustrated in FIGS. 17—24. In this embodiment of the invention, structural elements corresponding in construction and in function to those which have previously been described herein are indicated by identical reference numerals to those previously employed. FIG. 17 corresponds to FIG. 4 except for its showing of structural modifications in the lower paper guide assembly, designated in FIG. 17 by reference numeral 550, the upper flap folder assembly 552 and the lower flap assembly, designated generally by reference numeral 554.

Referring initially to the lower paper guide assembly 550, this assembly, in the modified embodiment, includes a pneumatically actuated cylinder 556 which has positioned therein, a piston connected to a downwardly extending piston rod 558. At its lower end, the piston rod 558 is secured to a transversely extending horizontal plate 560. The plate 560 is secured to four horizontally spaced, vertically extending slide members 562 (see FIG. 18). The vertically extending slide members 562 have longitudinally extending slots 564 in the opposite sides thereof as shown in FIGS. 20 and 21, and the slide members are guided by rollers 566 engaging the slots 564 on opposite sides of each member, and mounted in supporting brackets 568 which are secured to the under side of the horizontal bottom plate 19.

When the piston rod 558 is retracted in the cylinder 556, the vertically extending slide members 562 are reciprocated upwardly while guided by the paired rollers 564, and the slide members move across the entrance to the wrapping chamber and into a position where the upper ends of the slide members are in juxtaposition to the lower end of the outermost of the metal sheets 140 forming the upper paper guide assembly 30. The vertically extending slide members 562 thus form one side of a channel for guiding the paper downwardly as it is fed from the upper paper guide assembly as hereinbefore described.

The opposite side of the channel for guiding the downwardly moving wrapping paper as it is fed from the upper paper guide assembly 30 is formed by a pair of vertically extending angle iron guide members 572. The angle iron guide members 572 have secured between them a stack guiding plate 574 (see FIG. 19) which functions to guide the stack of bags which is to be wrapped at such time as this stack is elevated on the lower platen panel 50. It will be apparent that the bag stack will normally be of a transverse width which permits it to be fitted between the vertically extending guide members 572 so that it will bear against the upwardly extending stack guiding plate 574 as the stack is being elevated. The vertically extending guide members 572 are retained in the illustrated position by an upper pair of horizontally extending brace members 576 which extend from the members 572 to the vertically extending racks 62 on opposite sides of the framework. A second pair of lower brace members 578 is secured between the lower end portions of the vertically extending guide members 572 and the racks 62 in similar fashion.

It will be noted that the upper end portions of the vertically extending guide members 572 have their rear surfaces substantially aligned with the inside surface of the innermost metal sheet 140 forming a portion of the upper paper guide assembly 30. Thus, in cooperation with the vertically extending slide members 562 of the lower paper guide assembly 550 at such time as these vertically extending members are elevated in the manner described, the vertically extending guide members 572 form a channel into which the wrapping paper may be fed from the upper paper guide assembly 30. From what has previously been said relative to the horizontal spacing of the vertically extending guide members 572, it will be apparent that the stack of bags, following compression, can be pushed into the wrapping chamber by the transfer unit assembly 38 by moving the stack between the vertically extending guide members 572.

The modified upper flap folder assembly 552 is best illustrated in FIGS. 17 and 22. As is here shown, the upper flap folder assembly 552 includes a pneumatic cylinder 582 which is secured through a suitable bracket 584 to the upper surface of the adjustable top plate 21, and which has extending upwardly therefrom, a piston rod 586. At its upper end, the piston rod is connected to a cylinder tie plate 588. The cylinder tie plate is secured to the back of a flap folding plate 590 in the manner best illustrated in FIG. 22. The flap folder plate 590 terminates in a curved or arcuate lower end 591, and has secured along the opposite vertical edges thereof, a pair of vertically extending racks 592. The racks 592 each carry teeth which engage gears 594 which are rotatably journaled in bearing boxes 596 which are secured to the upper side of the adjustable top plate 21. It will be noted in referring to FIG. 17 that the lower end 591 of the flap folding plate 590 is curved to prevent tearing or ripping the wrapping paper as the flap folding plate descends when the piston rod 586 is retracted in the cylinder 582. It will also be noted that the top plate 21 has a transversely extending slot 598 therein which accommodates the lower end portion of the flap folding plate 590, and also permits the lower ends of the racks 592 to reciprocate downwardly into the flap folding chamber. The curved lower end 591 of the flap folding plate 590 extends to a lower position than the lower ends of the racks 592 so that the lower end of the flap folding plate contacts the flap of the wrapping paper which is to be folded before such flap is contacted by the lower ends of the racks.

The modified lower flap folder assembly **554** includes a pneumatic cylinder **602** which is pivotally mounted in a pair of horizontally spaced cylinder brackets **604** which are bolted to the lower side of the horizontal bottom plate **19**. The cylinder brackets **604** bridge across an opening **606** which extends transversely in the horizontal bottom plate **19**, and which accommodates a heater assembly designated generally by reference numeral **608**. The heater assembly **608** includes a heater bracket panel **610** which has mounted in a recess in the center thereof, and on the side thereof facing the cylinder **602**, a heater element **612** (see FIG. **23**).

Projecting from the upper end of the cylinder **602** is a piston rod **614** which is secured to a rod eye **616**. The rod eye **616** journals a pin **618** which has its opposite ends secured in a clevis bracket **620** which is secured to the side of the heater accommodating plate **610** which carries the heater **612**. It will thus be perceived that the heater assembly **608** is pivotally attached to the end of the piston rod **614** so that the heater assembly can be pivoted from a horizontally extending position to a vertically extending position as shown in FIG. **24**.

The outer ends of the heater accommodating plate **610** are pivotally connected to the upper ends of a pair of elongated racks **624**. The racks **624** carry teeth which engage the teeth of a pair of gears **626** which are keyed to an elongated, horizontally extending shaft **628**. The shaft **628** has its opposite end portions extending through, and journaled in, two pairs of gear brackets **630** which are bolted or otherwise suitably secured to the lower side of the horizontal bottom plate **19** as best illustrated in FIGS. **23** and **24**. Secured to the lower side of the heater accommodating plate **610** are a pair of downwardly extending, L-shaped spring studs **632**. The spring studs **632** serve as anchor points for the upper ends of a pair of helical springs **634**. The helical springs **634** have their lower ends connected to a pair of stop brackets **636** which are connected to the lower portions of the racks **624**.

OPERATION OF THE EMBODIMENT OF THE INVENTION DEPICTED IN FIGURES 17—24

The operation of the embodiment of the invention depicted in FIGS. **17—24** is similar in many respects to the operation of the embodiment of the invention which has been hereinbefore described. Details of the operation of the apparatus where similar to the operation hereinbefore described will therefore be omitted, and the discussion will be concentrated on variations of operation due to the modifications of structure which are entailed. As has been previously indicated, a stack of bags to be compressed and wrapped is introduced to the compressing and wrapping apparatus from the bag supporting plate **12**. The stack of bags comes to rest upon the platen panel **50** of the lower platen assembly **36**. Upon the development of the proper signal to open the appropriate valving to the air cylinders **66** as hereinbefore described, the lower platen panel **50** is elevated by retraction of the piston rods **64** within the air cylinders **66**. The bags are compressed against the top platen **84** in the manner hereinbefore described, and then in timed sequence, the piston rod **126** is extended from the air cylinder **124** to force the compressed stack of bags from between the upper and lower platen assemblies **34** and **36**, respectively, and into the wrapping chamber. Prior to this time, a sheet of wrapping paper has been extended downwardly across the opening into the wrapping chamber, so that the wrapping paper is caused to encompass the compressed bags on three sides. Concurrently with the extension of the piston rod **126** from the cylinder **124**, the timing sequence of the electrical circuitry and air system hereinbefore described causes the cutoff knife **174** to sever the wrapping paper.

When the piston rod **126** has been fully extended, switches are tripped which open an appropriate relay so as to supply air through appropriate valving to the air cylinders **66** to cause the piston rods **64** to be extended therefrom and return the lower platen panel **50** to its position illustrated in FIGS. **17** and **19**. The downward movement of the piston rods **64** throws switches which ultimately effect the retraction of the piston rod **126** into the air cylinder **124**. The retractive movement of the piston rod **126** throws a switch located on the side of the air cylinder **124** which causes the cutoff knife **174** to retract. Retraction of the cutoff knife **174** closes a switch which energizes a relay which, in turn, closes a solenoid valve causing air to be delivered to the cylinder **556** of the lower paper guide assembly **550**. This effects the retraction of the piston rod **558** into the air cylinder **556** and results in the upward reciprocation of the vertically extending slide members **562**. These members are moved by such upward reciprocation into a position in which the upper ends of the members are positioned adjacent the lower end of the upper paper guide assembly **30**, and more specifically, adjacent the lower ends of the sheets **140**. A channel is now formed between the vertically extending slide members **562** and the vertically extending guide members **572** for receiving wrapping paper fed downwardly via the upper paper guide assembly **30**.

When the piston rod **558** reaches its fully retracted position, the plate **560** contacts a switch **640** which, through a suitable timing system, causes a measured amount of wrapping paper to be fed into the upper and lower paper guide assemblies **30** and **550**, respectively.

The retraction of the piston rod **126** into the cylinder **124** also causes an additional switch to energize a relay which opens a solenoid valve to cause air to be delivered to the appropriate end of the cylinder **582** to effect retraction into the cylinder of the piston rod **586**. As the piston rod **586** moves downwardly into the cylinder **582**, the flap folding plate **590** is moved downwardly into the wrapping chamber. This movement of the flap folding plate **590** causes the top extension of the sheet of wrapping paper to be folded downwardly along the side of the stack of bags which faces toward the air cylinder **124**. At the same time that the flap folding plate **590** is being reciprocated downwardly, the racks **592** afford support and guidance to the plate due to their engagement with the gears **594**.

When the piston rod **586** has been retracted to the maximum extent, the tie plate **588** contacts a switch which closes a relay causing the shifting of a valve which introduces air to the cylinder **328** forming a portion of the adhesive applicator assembly **44**. The piston rod **326** is then extended from the cylinder **328** and adhesive is applied to the folded down upper flap as hereinbefore described. When the piston rod **326** of the adhesive applicator assembly **44** has been fully extended in the manner described, a switch is opened which has previously acted as an interlock for the relay energized by the full retraction of the piston rod **586**, so that by the opening of this switch as the piston rod **326** reaches its full extension, the relay is opened and the retraction of the piston rod **326** into the cylinder **328** is commenced.

When the piston rod **326** completes its retractive movement into the cylinder **328**, an appropriate switch is depressed by its movement to energize an appropriate timing relay included in the electrical circuitry. The timing relay opens for a preselected time interval, a solenoid valve which supplies air to the air cylinder **602**. This causes the piston rod **614** to be extended from the air cylinder **602**. As the piston rod **614** is extended, it moves ahead of it, the heater accommodating plate **610** to which the rod is connected through the clevis bracket **620**. The upward movement of the heater accommodating plate **610** necessarily carries with it, the elongated racks **624** which are guided in their movement by the engagement of their teeth with the gears **626**.

At a point near the upper end of the stroke of the piston rod **614**, the stop brackets **636** carried on the lower end portions of the racks **624** strike the gear brackets **630** and further upward movement of the racks is therefore arrested. The point at which the clevis bracket **620** is connected to the heater accommodating plate **610** is, however, horizontally offset from the pivotal axis of the heater accommodating plate on the upper ends of the racks **624**. Thus, continued upward move-

ment of the piston rod 614 results in the heater accommodating plate 610 being pivoted about a horizontal axis which includes the points of connection of this plate to the upper ends of the racks 624 so that the heater accommodating plate moves into a vertically extending position as depicted in FIG. 24. This figure shows the appearance of the lower flap folding assembly 554 at a time when the piston rod 614 is fully extended. During the upward movement of the piston rod 614, the lower or bottom extension of the wrapping paper has been engaged and folded upwardly against the back side of the stack of bags in overlapping relation to the previously downwardly folded top extension. It will be recalled that prior to this time, adhesive has been applied along the lower edge of the downwardly folded top extension so that with the upward folding of the bottom extension, the upper edge of this lower flap is brought into contact with the adhesive previously applied to the top flap.

When the piston rod 614 has been fully extended to the position shown in FIG. 24, the flat upper side of the heater accommodating plate 610 is pivoted into a vertical plane and bears against the exposed surface of the bottom flap of the sheet of wrapping paper at a location where this bottom flap overlies the top flap. Thus, heat is applied in this area so that a heat sealing adhesive may be used to establish a strong bond between the top flap and the bottom flap. The timing relay which has been previously described as controlling the time period over which air is directed to the air cylinder 602 to effect extension of the piston rod 614 functions to maintain a period of dwell of the piston rod 614 in its extended position so that the heat can be applied to the overlapped wrapping paper flaps over a selected time period. This further assures the establishment of a permanent bond through the intervening adhesive.

At the time that the piston rod 614 reaches its upper limit of travel, this movement may be made to throw a switch which effectively controls solenoid valving to extend the piston rod 558 from the cylinder 556, and thus lower the movable portion of the lower flap folder assembly 550. The actuation of a second switch upon extension of the piston rod 614 controls the air flow to the piston 552 to extend the piston rod 586 and elevate the flap folding plate 590 of the upper flap folder assembly 552. It will thus be noted that the flap folding plate 590 is not retracted so as to release the downwardly folded upper flap until such time as the lower flap folder assembly 554 has effectively folded the lower flap upwardly into a sealing position atop the downwardly folded top flap.

Although preferred embodiments of the invention have been herein described, it is to be understood that variations in the steps of the method described, and modifications and innovations to the depicted and described apparatus, can be effected without departure from the basic principles which underlie the invention. Changes and innovations of this type which continue to rely upon the basic principles of the invention are therefore deemed to be circumscribed by the spirit and scope of the invention.

What I claim is:

1. A banding press apparatus comprising:
upper and lower vertically spaced platens mounted on said framework;
means mounted on said framework for moving one of the platens relative to the other to compress a stack of bags positioned therebetween;
a wrapping chamber defined by said framework and horizontally spaced from said platens at a vertical level between the vertical levels of the platens;
means mounted on said framework for positioning flexible wrapping paper in a substantially vertical plane between said wrapping chamber and said upper and lower platens;
means mounted on said framework for horizontally displacing said compressed stack of bags through the plane of said flexible wrapping paper to fold said paper around three sides thereof with end portions of the paper extended from the top and the bottom sides of the compressed stack;
flap folding means on said framework for folding the extending end portions of the paper around a fourth side of the compressed stack of bags in overlapped relation to each other, said flap folding means comprising:
an upper flap folding assembly for folding downwardly the end portion of the paper extending from the top side of the compressed stack, said upper flap folding assembly comprising:
a piston and cylinder; and
vertically extending flap folding rods extendible into said wrapping chamber from the top thereof and at one side thereof;
a lower flap folding assembly for folding upwardly the end portion of the paper extending from the bottom side of the compressed stack, said lower flap folding assembly comprising:
a piston and cylinder; and
vertically extending flap folding rods extendible into said wrapping chamber from the bottom thereof and at one side thereof in substantially vertical alignment with said first-mentioned flap folding rods;
an adhesive applicator assembly mounted on said framework and cooperating with said flap folding means to place adhesive between the overlapped areas of said end portions;
means for synchronizing the piston and cylinders of said upper and lower flap folding assemblies with said adhesive applicator assembly to initially extend said first-mentioned flap folding rods into said wrapping chamber, then placing adhesive on the outer surface of the end portion of the paper folded by said upper flap folding assembly, then extending the second-mentioned flap folding rods into said wrapping chamber to fold upwardly the end portion of the paper extending from the bottom side of the compressed stack; and
means for applying pressure to said end portions at the overlapped areas to bond the end portions to each other through said adhesive.

2. A banding press apparatus comprising:
a framework;
upper and lower vertically spaced platens mounted on said framework;
piston and cylinder means drivingly connected to said lower platen for elevating the lower platen;
means for raising and lowering said upper platen;
a wrapping chamber defined by said framework and horizontally spaced from said platens at a vertical level between the vertical levels of the platens;
paper feeding means mounted on said framework;
at least one pair of horizontally spaced, rigid, vertically extending sheets defining a channel for receiving paper from said paper feeding means and guiding it in a substantially vertical plane between said wrapping chamber and said upper and lower platens;
means mounted on said framework for horizontally displacing said compressed stack of bags through the plane of said flexible wrapping paper to fold said paper around three sides thereof with end portions of the paper extending from the top and the bottom sides of the compressed stack;
means for folding the uppermost of said end portions of the paper comprising:
a piston and cylinder; and
vertically extending flap folding rods extendible into said wrapping chamber from the top thereof and at one side thereof;
means for folding the lowermost of said end portions of the paper comprising:
a piston and cylinder; and
vertically extending flap folding rods extendible into said wrapping chamber from the bottom thereof and at one side thereof in substantially vertical alignment with said first-mentioned flap folding rods;

means for automatically actuating the means for folding the lowermost of said end portions at a time after the uppermost end portion has been folded;

an adhesive applicator assembly mounted on said framework and cooperating with said flap folding means to place adhesive between the overlapped areas of said end portions; and

means for applying pressure to said end portions at the overlapped areas to bond the end portions to each other through said adhesive.

3. In a bag press apparatus of the type which includes means for compressing a plurality of superimposed bags and a wrapping chamber adjacent said compressing means for receiving said compressed bags and retaining the bags during wrapping, the improvement which comprises:

means for folding wrapping paper around three sides of the stack of compressed bags with the two end portions of the wrapping paper forming flaps extending substantially parallel to each other from opposite, substantially parallel sides of the stack of bags;

flap folding means for folding the extending end portions of the wrapping paper around a fourth side of the compressed stack of bags into overlapped relation to each other, said flap folding means comprising:

a first flap folding assembly for folding one of said end portions through a substantially right angle fold into juxtaposition to the fourth side of the compressed stack of bags, said first flap folding assembly comprising: first flap folding rod means extendible into said wrapping chamber from one side thereof along the fourth side of the compressed stack of bags; and means for reciprocating said first flap folding rod means into and out of said wrapping chamber in a path for contacting one of said end portions;

a second flap folding assembly for folding the second of said end portions through a substantially right angle fold into juxtaposition to the fourth side of the compressed stack of bags, said second flap folding assembly comprising:

second flap folding rod means extendible into said wrapping chamber along the fourth side of the compressed stack of bags and from the opposite side of said wrapping chamber from the side from which said first flap folding rod means is extended into said chamber; and

means for reciprocating said second flap folding rod means into and out of said wrapping chamber in a path for contacting the second of said end portions;

an adhesive applicator assembly mounted on said wrapping chamber and cooperating with said flap folding means to place adhesive between the overlapped areas of said end portions as said end portions are folded around the fourth side of the compressed stack of bags;

means for synchronizing the means for reciprocating the first flap folding rod means, the means for reciprocating the second flap folding rod means, and the adhesive applicator assembly to initially extend said first flap folding rod means into said wrapping chamber, to then place adhesive on the outer surface of said one end portion of the wrapping paper folded by said first flap folding rod means, and then to finally extend said second flap folding rod means into said wrapping chamber to fold said second end portion into juxtaposition to the fourth side of said stack of compressed bags and overlapping said one end portion at the location where adhesive is placed; and

means for applying pressure to said end portions at the overlapped areas to bond the end portions to each other through said adhesive.

4. The improvement defined in claim 3 wherein each of said flap folding rod means comprises a plurality of elongated flap folding rods, and wherein each of said means for reciprocating one of the flap folding rod means comprises a cylinder and piston assembly including a piston rod drivingly connected to the flap folding rods of the respective associated flap folding rod means.

5. A banding press as defined in claim 2 wherein said pressure applying means comprises:

a roller; and

means for driving said roller across the overlapped end portions of said paper.

6. A banding press as defined in claim 5 wherein said means for positioning flexible wrapping paper comprises:

a pair of paper feeding draw rolls;

an upper paper guide assembly for receiving paper from said draw rolls; and

a lower paper guide assembly for receiving paper form said upper paper guide assembly.

7. A banding press as defined in claim 6 wherein said means for horizontally displacing said compressed stack of bags comprises:

a cylinder mounted on said framework; and

piston means extendible from said cylinder in a horizontal direction between said platens.

8. A banding press as defined in claim 7 wherein said adhesive applicator assembly comprises:

a paste head including a nozzle for spraying paste;

means for moving said paste head in a horizontal direction and along said fourth side of said compressed stack; and

means for supplying paste to said paste head.