

[54] STRAPPING MACHINE

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[51] Int. Cl. B65b 13/24

[58] Field of Search 100/4, 33 R, 30;
140/93.4; 81/9.1 S

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Primary Examiner—Billy J. Wilhite
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[57] ABSTRACT

A strapping machine for applying a strap around an object wherein means are provided for holding the leading end of the strap encircled about the object and overlapping a supply portion of the strap and for feeding a seal having an opening therein and for applying the seal around the overlapped portion of the strap to form a seal joint therebetween, a seal magazine for holding a stack of nested seals with the openings therein aligned to be fed individually to the seal joint forming means, a seal positioning mechanism extending from the charging end of the magazine to near the discharging end thereof and passing through the aligned openings at the stack of the nested seals housed in the magazine, and a hold-down mechanism for maintaining a constant pressure on the seals housed within the seal magazine independent of the number of seals in the stack of nested seals.

13 Claims, 16 Drawing Figures

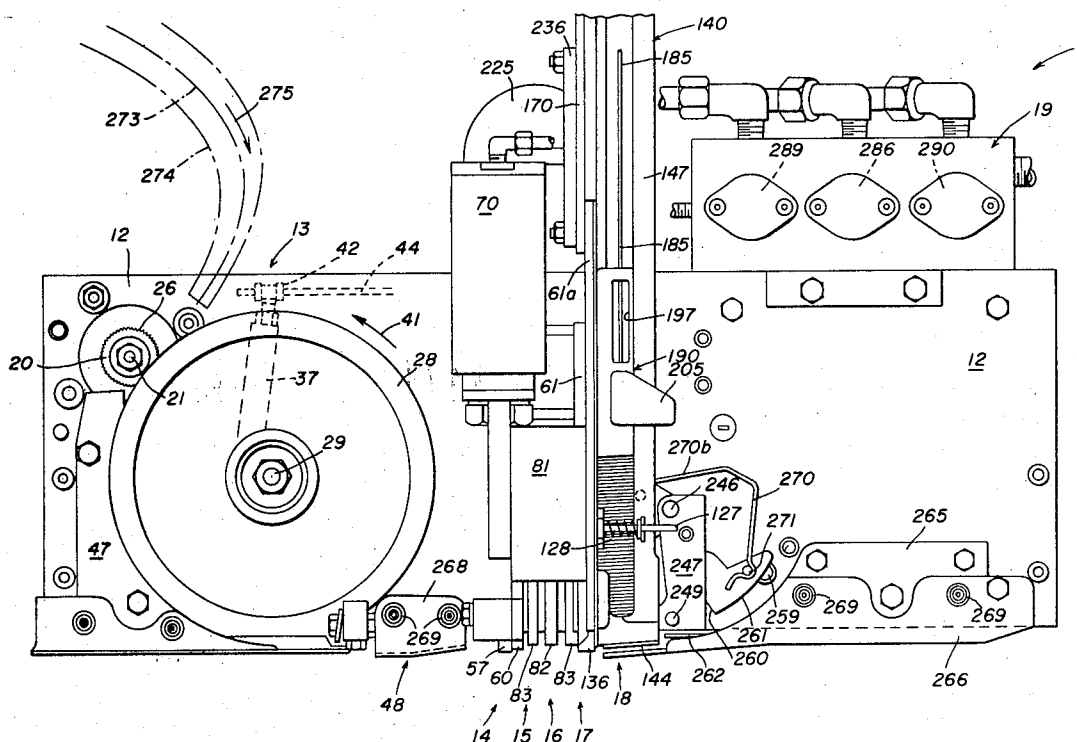


FIG. 1

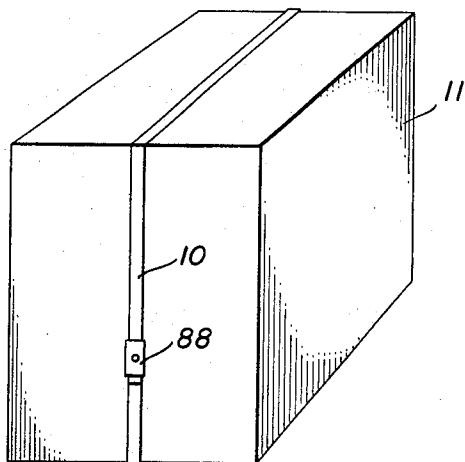


FIG. 2

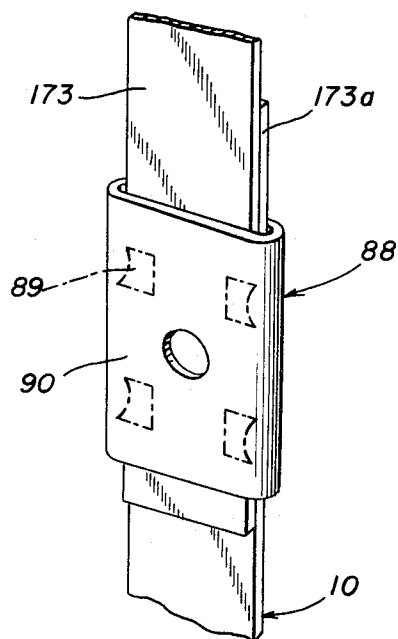


FIG. 4

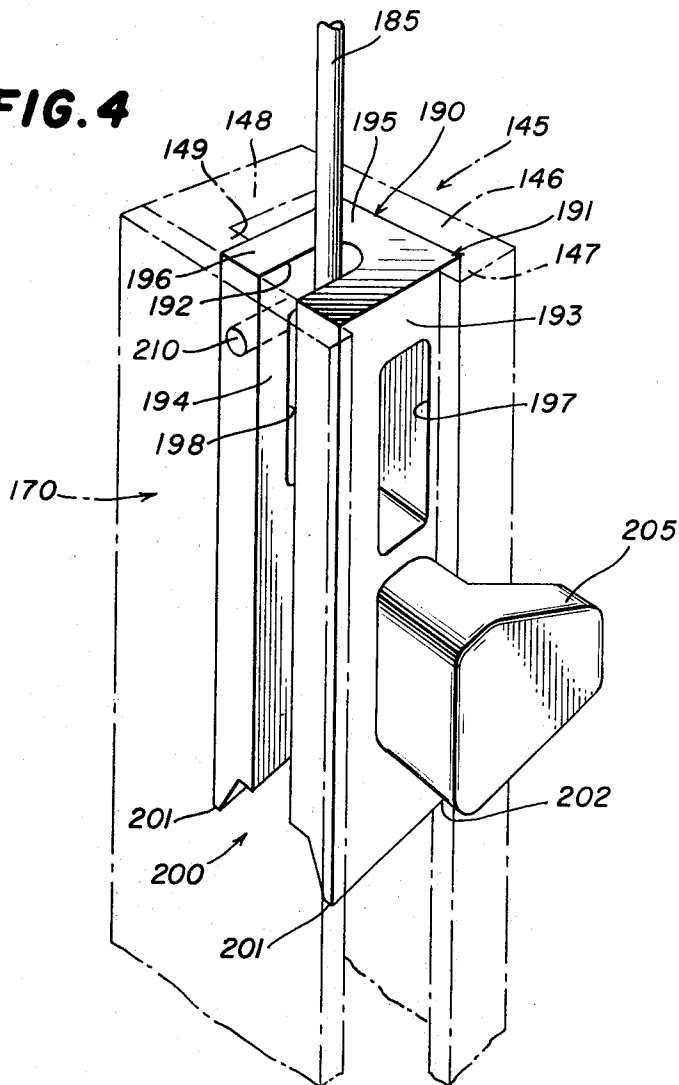
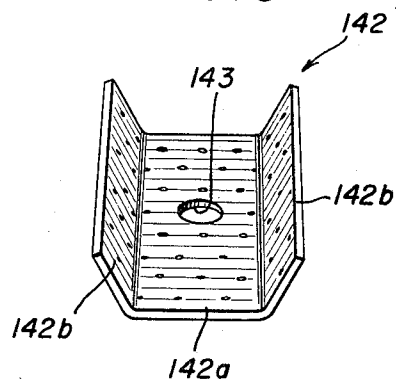


FIG. 3



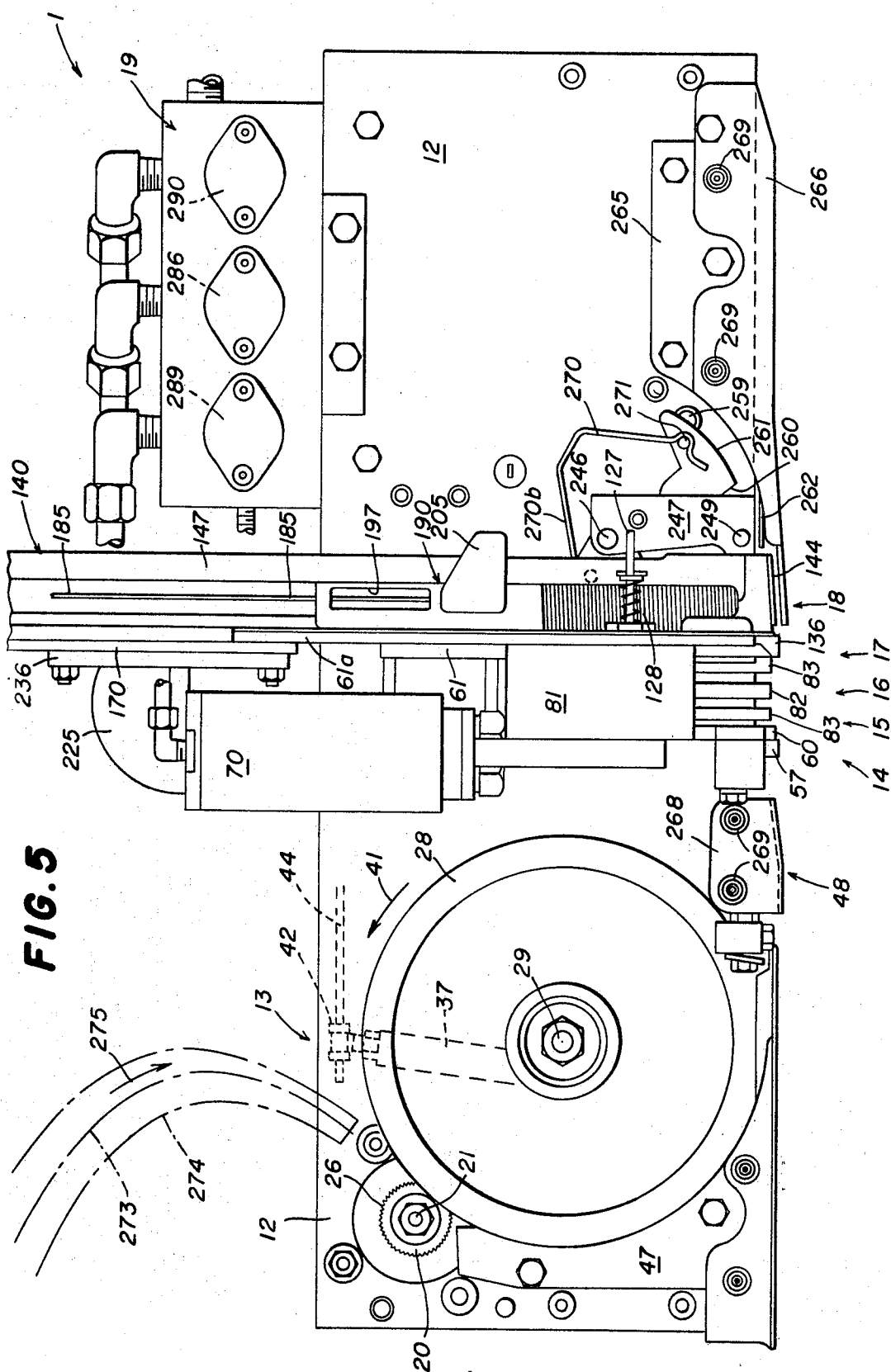


FIG. 6

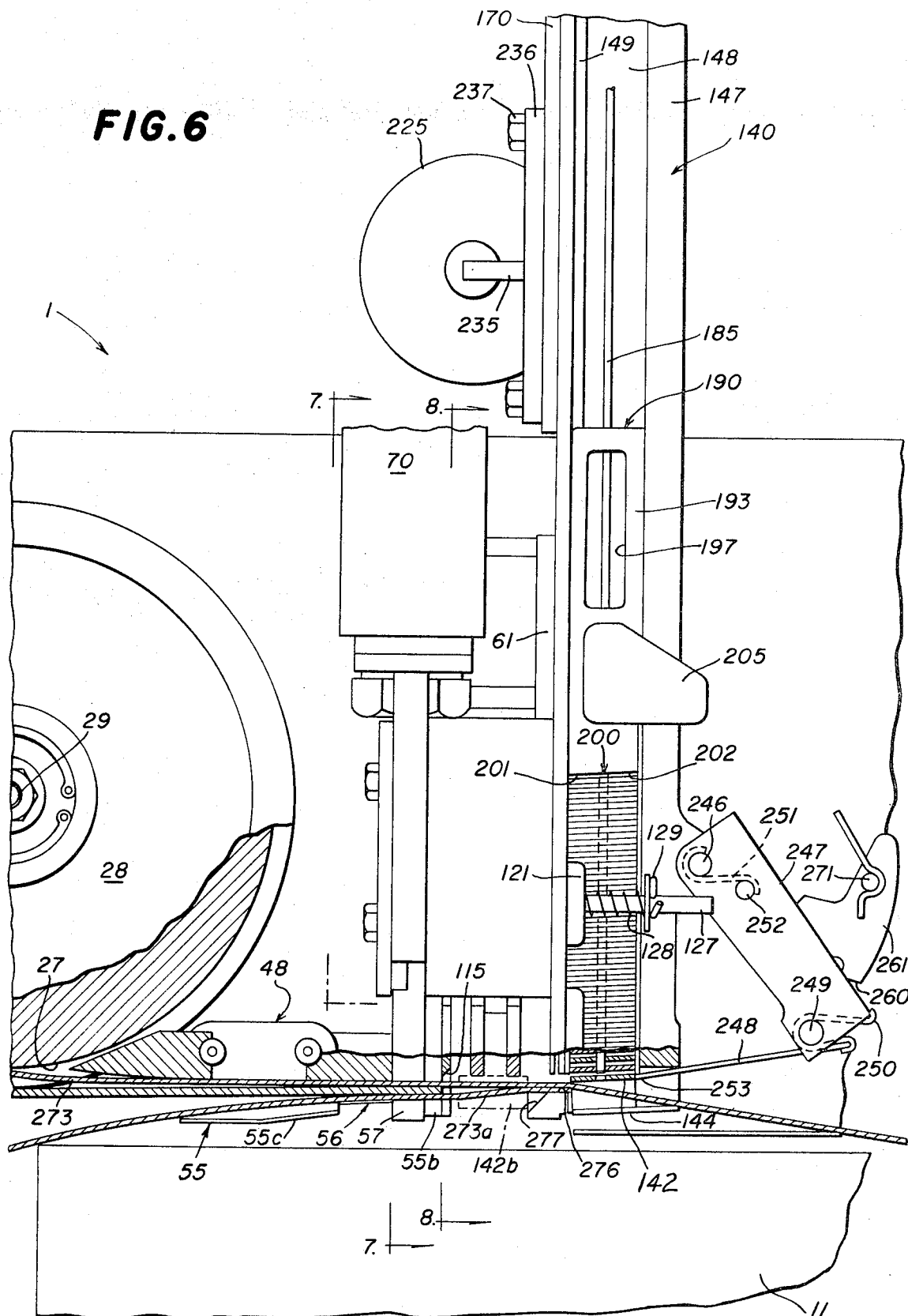


FIG. 8

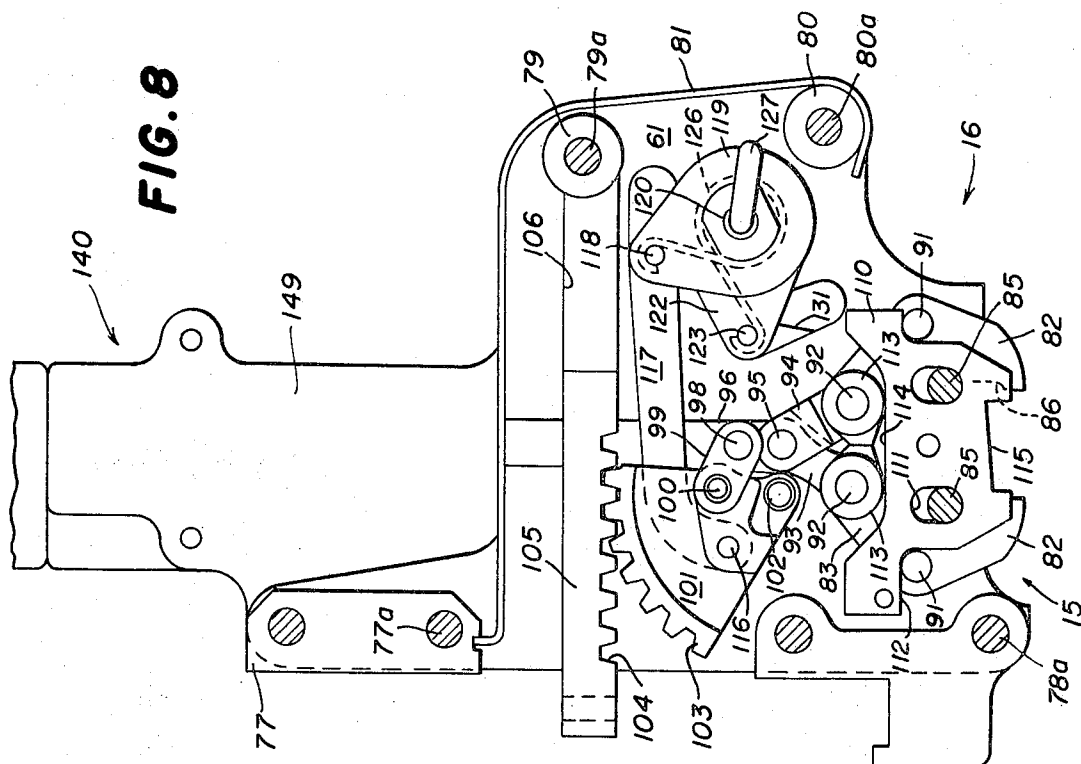


FIG. 7

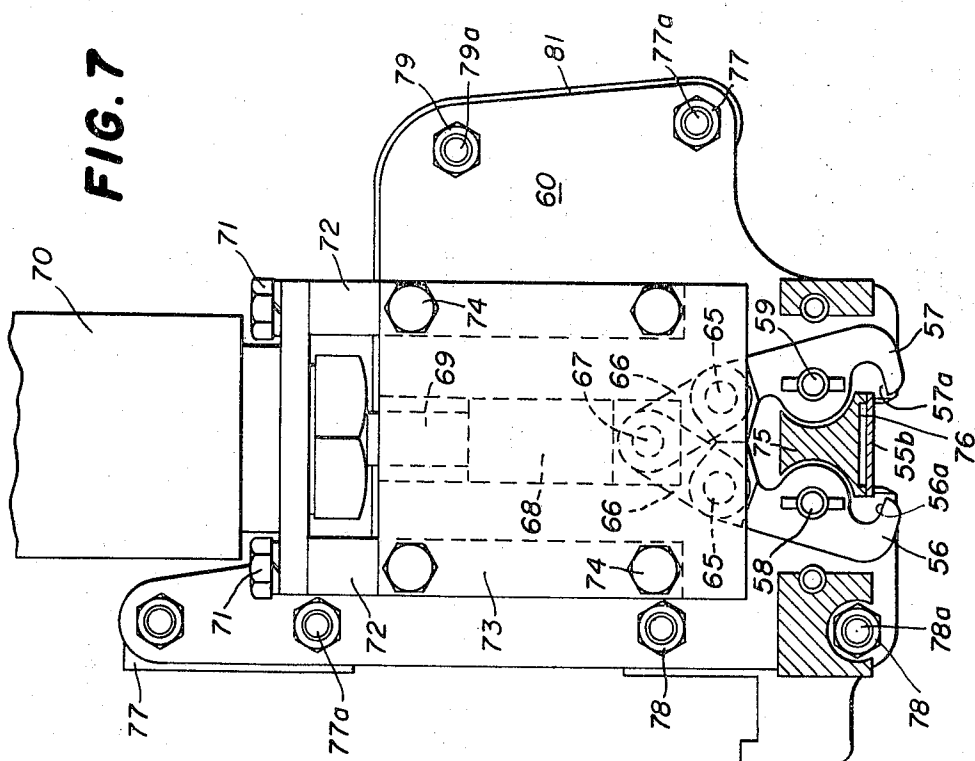


FIG. 9

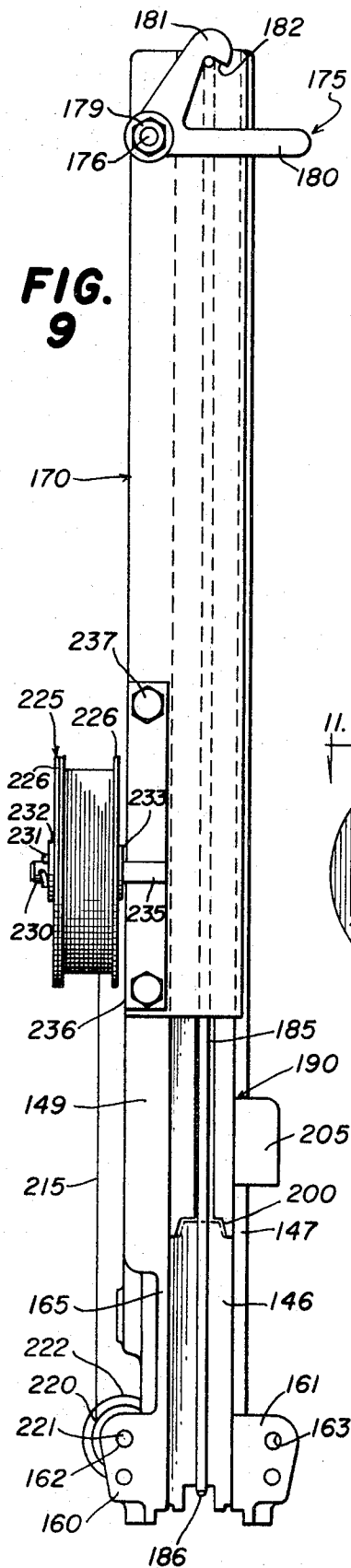


FIG. 10

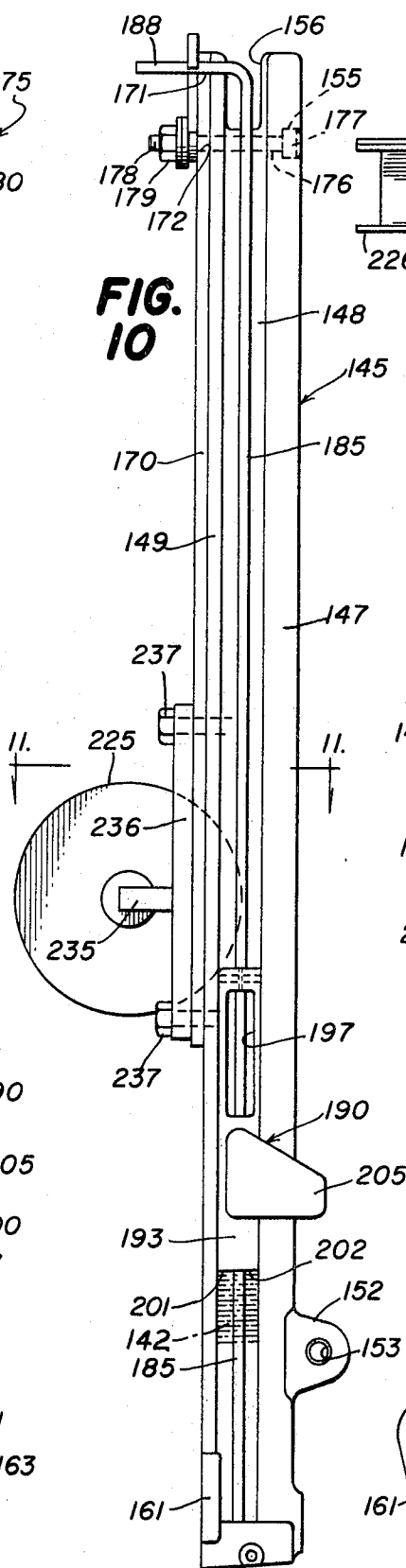


FIG. 11

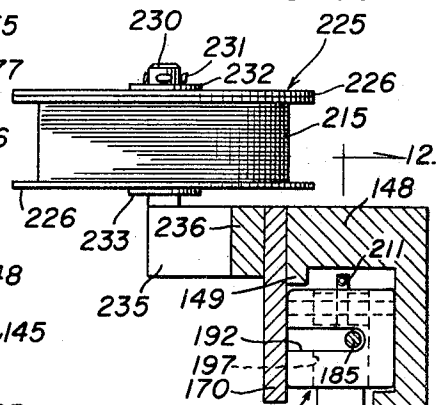


FIG. 12

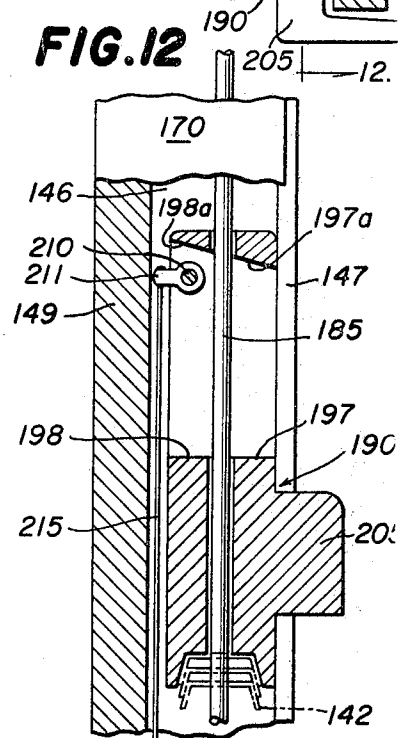


FIG. 13

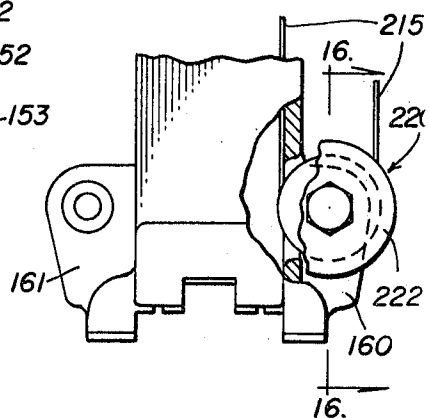


FIG. 14

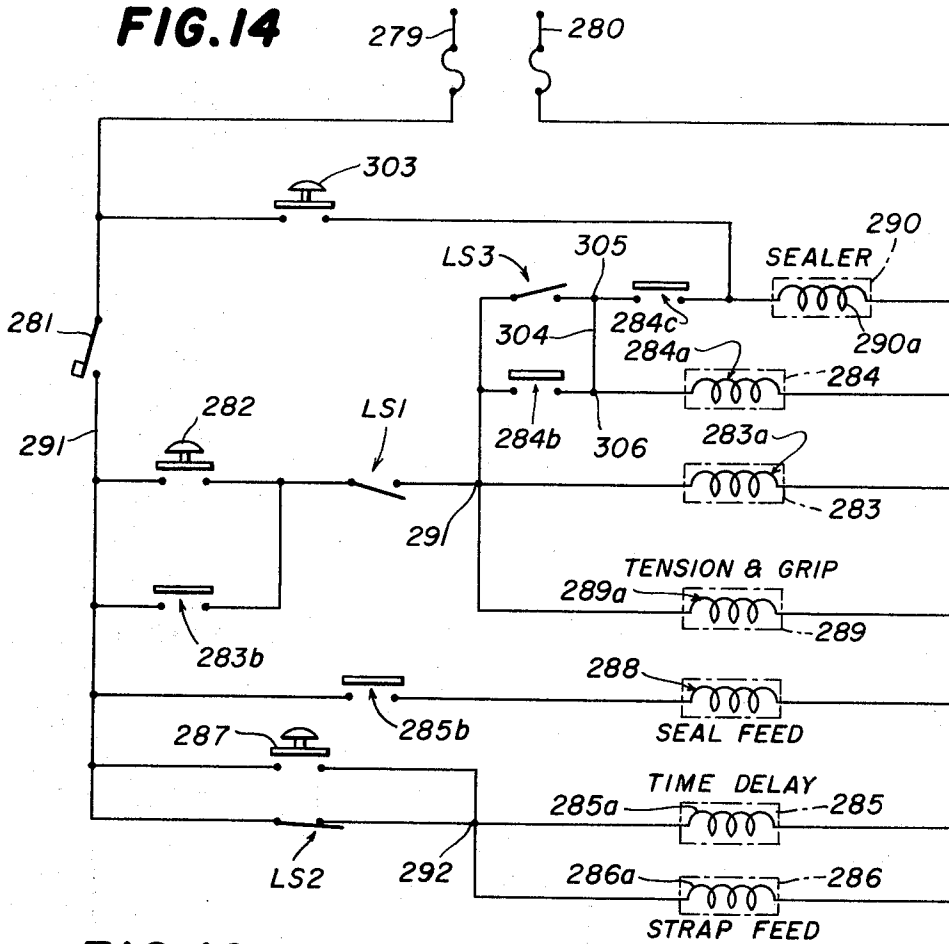


FIG. 16

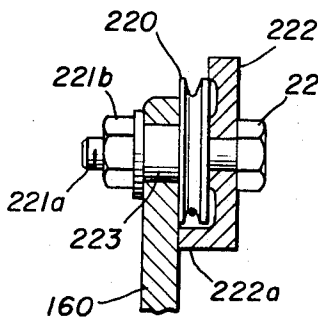
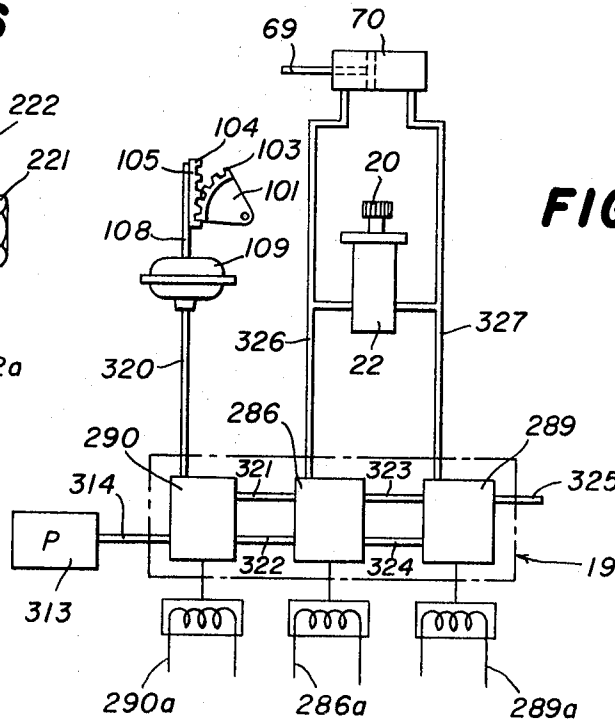


FIG. 15



STRAPPING MACHINE

This invention relates to a strapping machine and more particularly to an improved seal positioning mechanism and hold-down mechanism for maintaining the seals in alignment in the seal magazine.

It is an important object of the present invention to provide in a strapping machine for applying a strap around an object wherein means are provided for holding the leading end of the strap encircled about the object and overlapping a supply portion of the strap and for feeding a seal having an opening therein and for applying the seal around the overlapped portion of the strap to form a seal joint therebetween, the combination therewith of a seal magazine for holding a stack of nested seals with the openings therein aligned to be fed individually to the seal joint forming means, a seal positioning mechanism extending from the charging end of the magazine to near the discharging end thereof and passing through the aligned openings in the stack of nested seals housed in the magazine, whereby the nested seals in the magazine are maintained in alignment when the magazine is subjected to vibration.

Another object of the present invention is to provide a strapping machine of the type set forth in which a latch mechanism is provided to maintain the seal positioning mechanism in place during operation of the strapping machine.

Another object of the present invention is to provide a strapping machine of the type set forth wherein there is provided a hold-down mechanism associated with the seal magazine for providing a constant pressure on the stack of nested seals housed therein during the dispensing of all the seals in the magazine.

A further object of the present invention is to provide a strapping machine of the type set forth wherein the seal positioning mechanism and the hold-down mechanism are combined to maintain the nested seals in alignment and under constant pressure within the magazine during the dispensing of all the seals in the magazine and when the magazine is subjected to vibration.

The invention, both as to its organization and method of operation, together with further objects and advantages thereof, will best be understood by reference to the following specification taken in connection with the accompanying drawings in which:

FIG. 1 is a perspective view of a strapped object;

FIG. 2 is a perspective view of overlapping portions of the strapping material having a seal crimped therearound;

FIG. 3 is an enlarged perspective view of a seal particularly showing the opening therein;

FIG. 4 is a perspective view of the weight positioned on the stack of nested seals and particularly showing the seal magazine in phantom;

FIG. 5 is a side elevational view of the strapping machine embodying the present invention;

FIG. 6 is an enlarged elevational view of the seal magazine and constant tensioning mechanism shown in FIG. 5;

FIG. 7 is a sectional view of the strapping machine shown in FIG. 6 taken along lines 7—7 thereof;

FIG. 8 is a sectional view of the strapping machine shown in FIG. 6 taken along lines 8—8 thereof;

FIG. 9 is an end elevational view of the seal magazine particularly showing the seal positioning mechanism

and the hold-down mechanism of the present invention;

FIG. 10 is a side elevational view of the mechanism illustrated in FIG. 9;

FIG. 11 is a sectional view partly in elevation of the mechanism shown in FIG. 10 taken along lines 11—11 thereof;

FIG. 12 is a sectional view of the seal magazine shown in FIG. 11 taken along lines 12—12 thereof;

FIG. 13 is an enlarged elevational view partly in section of the pulley device shown in FIG. 9;

FIG. 14 is a schematic diagram of the electrical circuit used for control of the operating portions of the machine;

FIG. 15 is a schematic diagram of the pneumatic circuit used to power the operations of the machine; and

FIG. 16 is a sectional view of the pulley device shown in FIG. 13 taken along lines 16—16 thereof.

The strapping head 1 of the present invention is related to that disclosed in the Hall et al. U.S. Pat. No. 3,139,813, issued July 7, 1964, the disclosure of which is incorporated herein by reference, and is especially shown in FIGS. 5 to 8. The head 1 is provided with a single large rectangular plate 12 which is the main support frame for all of the components of the strapping head. The major operating portions of the head consist of the strap feed, slack take-up and tensioning portion 13, the leading strap end gripping portion 14, the strap shear portion 15, the joint sealing or forming portion 16, the strap gathering jaw portion 17, and the strap seal storing and feeding portion 18. In addition, there is a valve manifold 19 which houses three air valves for controlling the air powered portions of the machine powering the portions 13 to 18.

The strap feed, slack take-up and tensioning portion 13 is provided with a serrated rotary feed wheel 20 which is secured to the end of a shaft 21. The shaft 21 is the drive shaft of an air motor 22 (see FIG. 15) provided with a flange which is secured to the main frame 12 by means of screws. The air motor 22 is mounted on one side of the frame 12 and projects through a circular hole to the other side of the frame 12. The rotary feed wheel 20 is positioned so that the teeth or serrations 26 about its periphery are parallel to an annular wall 27 on a strap feed idler wheel 28 adjacent to it. The idler wheel 28 is considerably larger in diameter than the rotary feed wheel and it is mounted, as particularly shown in FIGS. 5 and 6, to the outer end of a shaft 29. As an idler, it is free to rotate relative to the shaft 29. The shaft 29, in turn, is mounted with its center eccentric, and is connected to the lower end of an arm 37 which extends radially outward from the shaft 29. The intermediate portion of the arm 37 is provided with means to apply a rotating force on the shaft 29 tending to urge it in a counterclockwise direction shown by the arrow 41 in FIG. 5.

The free end of the arm 37 is secured by a universal coupling 42 to one end of a rod 44. The other end of the rod 44 is in line with the actuating arm of a switch LS3. The rod 44 is used to actuate the switch LS3 upon rotational movement of the shaft 29, as will hereinafter be described. Around the lower portion of the idler wheel 28 is a guide 47 which is used to guide strap around the idler wheel in the region from adjacent to the rotary feed wheel 20 to the front surface of the head 1. Above the level of the strap feed, slack take-up

and tensioning portion 13 is a strap straightening region 48.

The strap straightening region 48 includes a blade 55, as particularly seen in FIG. 6, which blade 55 includes a portion 55c underlying the strap straightening portion 48 and extending to the right, as seen in FIG. 6, to a portion 55b, the portion 55b acting as a stationary support for strap severing, as hereinafter set forth. The portion 55c of the blade 55 cooperates with the strap straightening region 48 to guide the strap into the strapping head 1 and particularly into the severing and gripping portion thereof. When a metal strap is used, the strap straightening region 48 includes a mechanism not disclosed herein, see the aforementioned Hall et al. patent. When a strap made up of a synthetic organic resin such as polypropylene is used, the mechanism disclosed herein is sufficient.

After the straightening region 48 is the leading strap end gripping portion 14. It is particularly shown in FIGS. 6 and 7 and consists of two grippers 56 and 57 which are pivoted on two pins 58 and 59 mounted between two side plates 60 and 61. The grippers 56 and 57 are provided with sharpened jaws 56a and 57a which are adapted to react against the leading end of the strap when it is positioned beneath the blade 55.

The blade 55 is secured to the frame 12. This blade 55 has the multiple functions of assisting in strap straightening (when a metal strap is used) and strap gripping, as described, and also its leading edge acts as a shear blade, as hereinafter described. It has an additional function of strap guiding because its rear end 55c extends substantially to the region of the guide 47 where it guides the strap from the idler wheel 28 all the way into the joint sealing or forming portion 16.

The upper ends of the grippers 56 and 57 are pivoted on pins 65 to two toggle links 66 which are pivoted on a pin 67 to a yoke 68. The yoke is secured to the piston rod 69 of a piston contained in the air cylinder 70. In operation, the grippers 56 and 57 are positioned as shown in FIG. 7 and the piston rod 69 of the air cylinder 70 is retracted at that time. Upon extending of the piston rod 69 by admission of air in the proper direction to the air cylinder 70, the pin 67 is moved to cause the link 66 to pivot the grippers 56 and 57 and cause their jaws 56a and 57a to grip a strap positioned beneath the blade 55. The cylinder 70 is secured by screws 71 to a pair of supports 72 which are provided with a cover plate 73 and secured by means of screws 74 to the side plate 60. Above the blade 55 in this region is a fixed strap guide 75 which has a groove 76 formed in it to provide an opening larger than the thickness of strap to be used where the supply strap end can be guided and moved freely even though the leading strap end is gripped in a fixed position against the lower surface of the blade 55 during tensioning.

Forward of the leading strap end gripping portion 14 is first the strap shear portion 15 and then the joint sealing or joint forming portion 16. Both of these are contained between the two parallel side plates 60 and 61. Both of the side plates 60 and 61 are held apart and in parallel relationship by means of four spacers 77, 78, 79 and 80. The side plates are assembled to the spacers by means of bolts 77a, 78a, 79a and 80a so as to provide a substantially closed boxed in structure. A sheet metal cover plate 81 surrounds a portion of the structure in order to conceal its mechanism. This housing is hooked around the spacer 80 at one end and hooked

onto the spacer 77 at its other end. It is easily removable for servicing the mechanism.

The mechanism for joint sealing in the region 16 consists of a plurality of six jaws 82 and 83. There are, in this particular showing, four jaws 83 positioned two each opposite the two others and two jaws 82 positioned one opposite each other. The arrangement is such that the jaws 82 are alternately sandwiched between the jaws 83. In addition, there are two fixed die members (not shown) on either side of the jaws 82. The jaws 82 and 83 are pivoted on pins 85 to the side plates 60 and 61 while the die members are mounted in a fixed position on these pins 85. Each of the jaws 82 and 83 are provided with recessed portions 86 which are adapted to engage the edges of a seal and wrap it around overlapping strap ends adjacent to it and cause a seal joint to be formed by deforming the seal and strap ends with these recessed portions 86 as the seal reacts against the lower surfaces of the die members. The result is a seal joint 88 as shown in FIG. 2. This seal joint 88 has tabs 89 which are the regions contacted by the die members while the recessed portions 86 of the sealer jaws engage beneath the remaining edge portions 90. It should be emphasized at this point that the particular sealer jaws and sealer mechanism generally used and shown herein are an example of a conventional type well-known in the art and it is not intended to be restricted to this particular form. It is shown merely by way of example.

In addition to the sealer jaws 82 and 83 being pivoted on the pins 85, they are also secured together by pins 91 so that they pivot integrally. The upper ends of the sealer jaws 83 are pivoted on pins 92 to two toggle links 93 and 94. These toggle links 93 and 94 are in turn pivoted together on a pin 95 which is mounted between two slides 96, only one being shown. The slide 96 is hereinafter referred to as the cross-head. Both the slide (not shown) and the cross-head 96 are provided with another pin 98 which is pivoted to two links 99, one adjacent to the slide and the other adjacent to the cross-head 96. These links 99 are in turn pivoted on a pin 100 to a gear sector 101. This gear sector 101 is pivoted on a pin 102 between the side plates 60 and 61. The gear sector 101 has teeth 103 which normally engage teeth 104 on a rack 105 which is guided in two oppositely positioned grooves 106 formed in the side plates 60 and 61. The rack 105 is mounted by means of two screws to the piston rod 108 of the air cylinder 109 which is hereinafter referred to as the sealer cylinder.

In operation, the sealer parts are initially retracted to their position as shown in FIG. 8. As the piston rod 108 is extended by admitting air under pressure in the proper direction to the sealer cylinder 109, the rack 105 causes the gear sector 101 to rotate on its pin 102 in a clockwise direction, as viewed in FIG. 8, and this causes the sealer jaws 82 and 83 to pivot in such a manner that the oppositely positioned recess portions 86 are moved toward each other to cause the formation of a sealed joint 88 when a seal encircling two overlapped strap ends are present in the sealing region. After joint formation, the rack 105 is returned by retraction of the piston rod 108 to return all parts of the sealer mechanism to their original positions as shown in FIG. 8.

There is a shear blade 110 provided with elongated openings 111 through them, and the shear blade is mounted by these elongated openings 111 on the stationary pins 85. Shear blade 110 is also provided with

shoulders 112 which ordinarily rest on pins 91. During actuation of the sealer mechanism, there are rollers 113 mounted on the pins 92 and these rollers engage the upper edge 114 of the shear blade 110 as the sealer jaws 83 are pivoted. The result is that, with the proportion and positioning of the parts as shown, the shear blade 110 is moved downwardly by the rollers 113 during the last portion of the sealing stroke. This causes the lower edge 115 of the shear blade to shear through a strap positioned in its path by reacting with the stationary shear blade 55. As the sealer parts are again retracted to their initial positions, the pins 91 engaging the shoulders 112 of the shear blade 110 cause it to also retract to its original position as shown in FIG. 8.

Also pivoted on a pin 116 to the gear sector 101 is an L-shaped link 117 having its other end pivoted on a pin 118 to a first latch plate 119. The latch plate 119 is mounted to pivot on a hollow shaft 120 which is secured to the side plate 61 by means of a nut 121 threadably engaging its threaded outside surface. The end of the shaft 120 which is visible in FIG. 8 is a flanged end while its remaining portion is that which is threaded. The flanged end retains the latch plate 119 on the shaft 120. Between the first latch plate 119 and the side plate 61 is a second latch plate 132 which is also pivoted on the shaft 120. It has a protruding portion provided with a pin 123 which projects into an opening extending through the side plate 61. The pin 118 on the first latch plate 119 also protrudes through an opening extending through the side plate 61. Both of the openings are elongated to allow for a limited length of travel of the pins 118 and 123 during pivotal movement of both latch plates 119 and 122 on the shaft 120. A coil spring 126 surrounds the shaft 120 and has its opposite ends connected around the pins 118 and 123 in such a manner that the latch plates tend to be rotated in opposite directions by the force of the spring 126. There is also a latch bolt 127 of circular rod cross-section which protrudes through the hollow of the shaft 120. It is provided with a hook end used ordinarily to engage one or both of two notches and provided on the latch plates 119 and 122 respectively. The other end of the latch bolt 127 protrudes beyond the opposite side of the side plate 61 and it is provided with an encircling compression spring 128 which is mounted to react against the first cotter pin 129 to urge the latch bolt to the right, as viewed in FIG. 5. The tension of the spring 128 in this direction urges the end of the latch bolt into the path of the notches on the latch plates 119 and 122.

The pin 123 is also engaged with a slot in a triangular shaped link 131. This link 131 provides a toggle and is also pivoted on a pin to the upper end of the gathering jaw 136. This mechanism embodying the gathering jaws 136 (a second jaw not being shown) constitutes the strap gathering jaw portion 17. The strap gathering jaw portion 17 and particularly the gathering jaws 136 operate in the same manner as set forth in the Hall et al. patent. Particularly the jaws 136 operate in the manner set forth in the Hall et al. patent column 8, lines 7-45 thereof, which for the sake of brevity is not reproduced herein.

Beyond the strap gathering jaw portion 17 is the strap seal storing and feeding portion 18. It is particularly shown in FIGS. 4-6 and 9-13 where a seal storage magazine 140 extends along the outside wall of a side plate 61a. Side plate 61a is immediately adjacent to side plate 61 and it is secured to it by means of the same

bolts 77a, 78a, 79a and 80a which maintain the side plates 60 and 61 assembled together with their spacers. Also, this side plate 61a is provided with an irregular cutout surface which provides room for the operating mechanism of the gathering jaws.

The seal magazine 140 houses a plurality of nested channel shaped seals 142 each of which has a shape as shown in FIG. 3. Each seal 142 is provided with a back surface 142a bridged between two depending legs 142b which extend divergently away from each other, the back surface 142a having an aperture or opening 143 therein. As shown in FIG. 6, the seal 142 in the stack at the dispensing end of the magazine 140 is positioned with its depending legs 142b resting on two plates 144 secured to the base of the seal magazine 140.

The seal storage magazine 140 further includes an elongated housing 145 including a sidewall 146 having a small inturned front wall 147 and further extending rear wall 148 opposite to the front wall 147 and a side wall 149 extending from the rear wall 148 parallel to the side wall 146. The side wall 149 extends only a small distance toward the front wall 147 thereby to form an L-shaped elongated housing, is best seen in FIG. 4. The housing 145 is further provided with a mounting tab 152 extending in the same direction as the front wall 147 and mounted on the housing 145 at the juncture between front wall 147 and the side wall 146 toward the dispensing end of the magazine 140, as seen in FIG. 10, the mounting tab 152 having an aperture 153 therein for mounting the housing 145 to the side plate 61. The side wall 146 further has a counter sunk aperture 155 toward the loading end of the magazine 140, as best seen in FIG. 10, which aperture 155 is for a purpose hereinafter to be explained. The rear wall 148 is provided with a cutout 156 at the top thereof. At the bottom of the housing 145 there are provided two ears 160 and 161 each respectively mounted on the side walls 146 and 149, the ears 160 and 163 also serving to mount the housing 145 on the strapping head 1. Each of the ears 160 and 161 is provided respectively with an aperture 162 and 163 extending therethrough and the side wall 149 is provided with a cutout 165 at the bottom thereof, as best seen in FIG. 9.

The housing 145 is further provided with a plate 170, the plate 170 being generally rectangular in shape and being fixedly secured to the side wall 149 and extending from the dispensing end of the housing 145 downwardly to a point intermediate thereof, as best seen in FIGS. 9 and 10. The plate 170 has a slot 171 therein at the edge thereof and an aperture 172 slightly away from the slot 171, all for a purpose hereinafter to be explained.

A latch 175 is mounted on the plate 170 and is rotatable with respect thereto. The latch 175 is held in position by means of a pin 176 having a head 177 seated in the counter sunk aperture 155 in the side wall 146 extending through the housing 145, through the aperture 172 in the plate 170 and outwardly therefrom. The latch 175 is maintained in position by means of a nut 179 threadably secured on the threaded end 178 of the pin 176. The latch 175 has a latch arm 180 which extends substantially outwardly from the pivot pin 176 and a latch arm 181 having a generally hooked configuration and having an abutment surface 182 on the inner end of the latch arm 181, all for a purpose hereinafter to be explained.

A seal positioning mechanism 185 in the form of a rod extends longitudinally through the housing 145 from the loading end thereof to near the dispensing end thereof, the rod 185 having a terminal end 186 which is positioned near the dispensing end of the housing 145 and a terminal end 188 thereof which is at right angles to the main body portion of the rod 185 and extends through the slot 171 in the plate 170. The portion 188 of the rod 185 is contacted by the abutment surface 182 of the latch arm 181, when the latch 175 is in the locked position thereof, to maintain the rod 185 in position. As may be seen, the rod 185 passes through the aligned openings 143 in the nested staples 142 stored in the housing 145, the rod 185 passing through the apertures 143 in each of the seals 142 stored in the housing 145 except for the seal 142 at the dispensing end of the housing, which seal is ready to drop into position to be fed into the sealing jaw mechanism. The rod 185 has a diameter which is smaller than the diameter of the apertures 143 in the seals 142, for a purpose hereinafter set forth.

There is further provided a weight 190 adapted to slide within the housing 145, which weight 190 includes a U-shaped body 191 having a front wall 193, a rear wall 194 and a bite portion or side wall 195, thereby to form a slot 192 extending longitudinally of the weight 190. There is also provided a top wall 196 which may be substantially flat. There is an opening 197 in the front wall 193, see FIG. 12, which has an upper surface 197a slanting toward the rear wall 194. There is an opening 198 in the rear wall 194 which has an upper surface 198a slanting in the same direction as the wall 197a, thereby to form a larger opening in the weight 190 adjacent the rear wall 148 of the housing than the opening 197 adjacent the front wall 147 of the housing. The weight 190 is also provided with a bottom wall 200 which has the same general configuration as the seal 142 thereby to permit the weight 190 firmly to rest on the seal 142 stored in the seal magazine 140 nearest the loading end thereof. The bottom wall 200 of the weight 190 is cut at an angle thereby to provide a lower edge 201 and an upper edge 202, the angular configuration of the bottom wall 200 of the weight 190 best being seen in FIGS. 6 and 10, the angle between the upper end 202 and lower end 201 preferably being about 3°. The weight 190 is further provided with a handle 205 to facilitate manual movement of the weight longitudinally of the housing 145.

As may be seen from FIG. 11, the weight 190 is adapted to move longitudinally of the housing 145 between the front wall 147 and the side wall 149 thereby to insure a space between the rear wall 196 of the weight 190 and the rear wall 148 of the housing 145. A pin 210 extends through the weight 190 and supports an arm 211 positioned perpendicularly to the pin 210 and extending between the weight 190 and the rear wall 148 of the housing 145, the arm 211 being fixedly mounted on the pin 210 which is also fixedly mounted in the weight 190. Connected to the arm 211 is a cord or a cable 215 which extends longitudinally through the housing 145 and passes around a pulley 220. The pulley 220, as best seen in FIGS. 13 and 16, is mounted on a spindle or bolt 221 having a threaded surface at the end thereof 221a on which is mounted a nut 221b thereby to mount the pulley 220 to the ear 160. The pulley 220 is rotatably mounted with respect to the ear 160 and the bolt 221 by means of a bushing 223 fitting within

the aperture 162 in the ear 160 rotatably to mount the pulley 220 with respect to the ear 160 and the bolt 221. Intermediate the head of the bolt 221 and the pulley 220 is a pulley guard 222 having a portion 222a extending around a predetermined angular extent of the pulley 220, thereby to insure that the cord 215 does not jump off the pulley 220 when the housing 145 is subjected to vibration.

The cord 215 after passing the pulley 220 is directed upwardly to a reel 225 having spaced apart flanges 226. The reel 225 is rotatably mounted on a spindle 230 which extends from a mounting arm 235, the reel 225 being held on the spindle 230 by means of a cotter pin 231 and washers 232 and 233. The mounting arm 235 extends from a mounting plate 236 which is fixedly mounted to the plate 170 by means of bolts 237. The reel 225 is spring loaded so as to provide constant tension on the cord 215 regardless of the position of the weight 190 in the housing 145, that is, the tension on the cord 215 will be the same whether the weight 190 is at the charging end of the housing 145 or near the discharging end thereof.

Pivoted on a pin 246 to the wall of the seal magazine 140 is a seal feed hinge 247. Its free end is provided with a seal feed bar 248 pivoted to it on a pin 249 and this seal feed bar 248 is urged in a clockwise direction, see FIG. 6, by means of a spring 250 coiled around the pin 249. Another spring 251 encircles the pin 246 and reacts between the seal magazine 140 and another pin 252 mounted through the seal feed hinge 247 in order to urge the seal feed hinge 247 in a clockwise manner. The free end 253 of the seal feed bar 248 is notched with a little shoulder to engage the edge of the endmost seal 142 when it is positioned with its depending legs 142b resting on the plates 144. Ordinarily, the seal feed hinge 247 is retracted to the position as shown in FIG. 6 with the seal feed bar 248 engaging the forward seal, but the forward seal is resisted from being displaced until the seal feed hinge 247 is pivoted on its pin 246 to drive the seal feed bar 248. As soon as the seal feed hinge 247 is released, the endmost seal 142 is moved by the force of the spring 251 applied to the seal feed hinge 247 to cause the seal to be fed into a region between the sealing jaws 82 and 83 in preparation for sealing.

After a seal is fed or discharged from the seal feed magazine 140, the pin 252 projecting laterally from the seal feed hinge 247 engages the extreme free end of the latch bolt 127 immediately to cause the positioning of the strap gathering jaws 136, as previously described. The seal feed hinge 247 is returned to its retracted position by means of a roller (not shown) which is part of the cross-head 96 actuated during movement of the sealing mechanism, as previously described. In order to clarify the relative sequential movement of the seal feed hinge 247 with the sealer mechanism, the seal feed hinge 247 is first moved from the position shown in FIG. 6 to feed a seal and it moves to a position shown in FIG. 5 during this time. Then, the sealer mechanism is operated to form a seal joint 88 and move the seal feed hinge 247 again to retract it during the joint forming period. There is a laterally extending plunger 259, FIG. 5, which is retracted through the frame 12 in order to release the seal feed hinge 247 initially. Upon return movement of the seal feed hinge 247 to its position shown in FIG. 6, an end surface 250 of a projecting

ear 261 on the hinge 247 latches against the plunger 259 to retain the hinge in its retracted position.

Beyond the seal magazine 140 is a strap guide 262 which extends for some distance and is held in place by being bent around two pins (not shown) which are mounted in a guide support block 265. On both sides of the strap support guide 265 are mounted side guides 266 which are spring loaded against the guide support 265 and which can be spread apart to allow for removal of the strap from between them. Likewise, there are two side plates 268 mounted on opposite sides of the straightening portion 48, as shown in FIG. 5. These are likewise spring loaded laterally against their support. Specifically, all of the side guides 266 and 268 are provided with means for spring loading the guides toward each other as by identical springs 269, as best shown in FIG. 5.

As shown in FIG. 5, the seal feed hinge 247 is provided with a V-shaped link 270 having a central flat portion 270b. It is connected at its one end to the hinge 247 by means of a pin 271. At its other end, the link 270 encircles a pin (not shown) of the cross-head 96 so that one end of the link 270 moves with the hinge 247 while the other end moves with the cross-head 96. The reason for this is to prevent actuation of the switch arm of the switch LS2 (see FIG. 14) by means of the portion 270b of the link 270 until both the seal feed hinge 247 and the sealer mechanism have been retracted. This is important to the control of certain operations of the machine operated by switch LS2. The essence of the importance of this arrangement is that the seal feed hinge 247 must be retracted before the sealer mechanism is retracted, but both must be retracted before switch LS2 is operated and strap feed is initiated.

A spring loaded plunger (not shown) deflects the leading end 273a of the strap when it is initially fed past the gathering jaw region 17 to deflect the strap end away from the seals 142 stacked in the magazine 140 to prevent contact of the strap end with the seals and thereby to arrest strap feed. The tendency for this to happen would be increased in case of a strap with an end curved or otherwise deformed in a direction toward the seal magazine 140.

Before describing the electrical and pneumatic circuits, the following summary of the mechanical operation of the strapping apparatus is presented. Initially, the strapping head 1 is presented with a package 11 along its front face. A length of strap 273 is fed from a suitable supply source through a guide 274 in the direction of the arrow 275 (FIG. 5) in order to feed the strap 273 between the rotary feed wheel 20 and the idler wheel 28. Then, the rotary feed wheel 20 is rotated by its air motor 22 to feed a length of strap around the idler wheel 28, through the straightening portion 48, past the leading strapping end gripping portion 14, the strap shear portion 15, the joint sealing or forming portion 16, the strap gathering jaw portion 17, the strap seal storing and feeding portion 18, and into a region beyond the side guides 266. This leaves a free end of strap protruding above the level of the strapping head 1. At this time, the seal feed hinge 247 is released by retracting the plunger 259 to feed a seal 142 into a position between the sealer jaws 82 and 83. The strap length positioned in the strapping machine acts as a guide along which the seal 142 is fed to guide the seal into proper place in the head. This leading strap end 273a is grasped by the operator and manually looped

around and beneath the package 11 and guided below the blade 55 between the side guides 268 of the strap straightening portion 48, past all of the mechanism leading to the strap gathering jaw portion 17 and is finally deflected up onto a ledge 276 on each gathering jaw 136 where the leading strap end is arrested in its forward movement. The front of each gathering jaw 136 is provided with a sloped surface 277 which provides the deflection for the strap end up onto the ledge 276. At this time, the package 11 is positioned with the strap loop 10 loosely surrounding it. The leading strap end gripping jaws 56 and 57 are then pivoted to grip the leading strap end 273a against the bottom surface of the blade 55.

Next, the rotary feed wheel 20 is rotated in a reverse direction to cause reverse movement of the strap 273 in order to withdraw the slack from the strap loop 10 loosely surrounding the package 11. At the end of strap slack take-up period, the rotary feed wheel 20 causes the strap 273 to be tensioned tightly on the package 11. After tensioning is completed, a signal from the tensioning means causes actuation of the piston of the sealer cylinder 109 to cause the sealing portion 16 to form a sealed joint of the type shown in FIG. 2 between the overlapping strap ends of the strap. At the end of the joint forming stroke, the supply strap end is severed from the strap loop and the leading strap end gripping portion 14 is actuated in a direction to allow removal of the strap loop with the package 11 as the package 11 is moved away. Actually, the leading strap end gripping portion 14 is not released until the feeding of strap initiated immediately after strap shearing. After a new length of strap has been fed into the machine far enough to pass between the guide plates 266 and beyond them, the machine is ready for a new operating cycle.

During operation of the strapping head 1 there is very often associated vibration due to machinery present in the area. When vibration is excessive, the seals 142 have a tendency, in the prior art machines, to misalign in the magazine 140 thereby to cause jamming of the machine and costly down time. In the prior art devices such as that described in the aforementioned Hall et al. patent, the weight resting on the seals was spring loaded, that is one end of a spring was attached to the bottom of the weight and the other end of the spring was attached to the bottom of the magazine. However, with the above described arrangement, as the weight progressed toward the bottom or discharge end of the magazine as the seals were used, the amount of force exerted by the spring on the weight became less, thereby to allow vibration to rattle the seals and misalign them. In the present invention, two structures cooperate to prevent misalignment of the seals 142. The seal positioning member 185 extends from the charging end of the housing 145 to near the discharging end thereof. The seal positioning member in the form of a rod 185 extends through the central aperture or openings 143 in each of the seals 142 thereby to prevent gross misalignment of the seals 142 in the housing 145. Although the apertures 143 are oversized with respect to the diameter of the rod 185, the seals 142 are prevented from misalignment by the presence of the rod 185 passing therethrough. The rod 185 terminates with one end 186 thereof positioned slightly above the discharge end of the housing 145, thereby to allow the seal 142 nearest the discharge end of the magazine 140 to

be free of the rod 185 in order for that seal 142 to be able to drop freely onto the plate 144 without hindrance from the rod 185.

The presence of the rod 185 serves to position the seals 142 within the housing 145; however, the hold-down mechanism including the weight 190 along with the constant pressure device provided therefor further serves to maintain the seals 142 in their nested position within the magazine 140. The bottom surface 200 of the weight 190 is formed to fit snugly upon the top most seal 142 in the stack of nested seals in the housing 145, thereby to insure that the weight is firmly seated on the stack of the seals. Further, the weight 190 is provided with the slot 192 therein to cooperate with the rod 185 so as to permit the rod 185 to serve its aligning function without interference from the weight 190. Additionally, the cord 215 and the associated pulley 220 in cooperation with the spring loaded reel 225 serves to provide a constant pressure on the weight 190 regardless of the position of the weight within the magazine 140, all in contradistinction to the prior art. The above features of the present invention serve to maintain the weight 190 in contact with the uppermost seal in the stack of nested seals regardless of the position of the weight 190 in the magazine 140 and regardless of the amount of the vibration the magazine 140 encounters. As may be seen, the weight 190 provides a constant pressure on the stack of nested seals and the reel 225 serves to enable the magazine 140 to be mounted in both the vertical and horizontal positions. Of course, if the reel 225 exerted sufficient tension on the cord 215 and the cord was sufficiently strong, the magazine 140 could be mounted so that the seal 142 would be fed upwardly, all providing for additional flexibility in the orientation of the magazine 140 with respect to the package being strapped.

The seals 142 are loaded into the magazine 140 simply by releasing the spring tension in the reel 225 so as to permit the weight 190 to be slid out of the charging end of the housing 145. Prior or subsequent to removal of the weight 190, the seal positioning rod 185 may be removed from the magazine 140 by disengaging the latch 180 from its latched position, as shown in FIG. 9, by pivoting the latch arm 181 to the left to the unlatched position thereof wherein the abutment surface 182 is out of contact with the portion 188 of the rod 185, thereby to allow removal of the rod 185 from the magazine 140. To this end plate 170 is provided with the slot 171 therein to permit the rod 185 to be moved away therefrom so as to enable the weight 190 to be removed after the rod. Once the rod 185 and the weight 190 have been removed from the magazine 140, additional seals 142 may be positioned therein by dropping the same from the charging end of the magazine or by moving a stack of nested seals 142 into position. Thereafter, the weight 190 and the rod 185 are re-introduced as shown in the drawings. Once the stack of nested seals has been replaced in the magazine 140, the machine is again ready to operate.

As hereinbefore stated, the bottom surface 200 of the weight 190 is canted at an angle so that there is provided a lower edge 201 and an upper edge 202, the angle formed being about 3° between the lower edge 201 and the upper edge 202. The biasing of the bottom surface 200 of the weight 190 permits the nested seals 142 also to be biased at an angle of approximately 3°, the oversized apertures 143 being sufficiently large to

permit the seals 142 to be tilted at an angle of 3° with respect to the rod 185 without binding on the rod. The purpose of the 3° angulation of the stack of nested seals is to provide for easier seal feeding to the position shown in phantom in FIG. 6. It is, of course, understood that the plates 144 are also tilted at a 3° angle so as to provide the same tilt for the seal resting thereon as the seals in the magazine 140.

Having referred to the general operation of the machine, the electrical and pneumatic operations can now be described with reference with FIGS. 14 and 15. In FIG. 14, which shows the electrical circuit, there are two electric wires 279 and 280 which are connected to opposite sides of an electrical input. The wire 279 is connected to one side of a master switch 281 which has its other side leading through a wire 291 to a cycle switch 282 and a holding switch 283b in parallel with it. Both are connected through a switch LS1 to a junction 291 which carries four parallel branches leading to the wire 280 on the opposite side of the electrical system. The first parallel branch contains switch LS3, switch contact 284c, and the solenoid 290a of the sealer valve 290, all in series. The second parallel branch contains relay switch 284b and solenoid 284a of relay 234 in series with each other. The third parallel branch contains the solenoid 283a of relay 283. The fourth parallel branch contains solenoid 289a of the tension and grip valve 289. Also leading from wire 291 is a branch circuit containing relay switch 285b and seal feed plunger solenoid 288. Also connected with wire 291 is a manual strap feed switch 287 leading to a juncture 292 in parallel with switch LS2 leading to the same juncture 192. Beyond the juncture 192 are two parallel circuits, the first of which contains solenoid 285a of a time delay relay 185 and the second of which contains solenoid 285a of the strap feed valve 286. It should be mentioned that the relay switches 284b and 284c are actuated by energization and de-energization of solenoid 284a, relay switch 283b is actuated by relay solenoid 283a and relay switch 285b is operated by relay solenoid 285a. Also connected from wire 279 to a point between relay switch 284c and the sealer solenoid 290a is a manual seal switch 303. A wire 304 is also connected between a juncture 305 and 306 in two of the parallel branch circuits.

In FIG. 15 which shows the pneumatic circuit, there are shown the three control valves 290, 286 and 289 (these valves are physically positioned together in the manifold 19 as shown in FIG. 5). A source of high pressure fluid 313 is connected by a conduit 314 to the valve 310. The valve 290 is connected to the sealer cylinder 109 by means of conduit 320. The valve 290 is also connected to an exhaust conduit 320 and another conduit 322. Both conduits 321 and 322 lead into valve 286 and this valve has two conduits 323 and 324 leading from it to the third valve 289. From valve 289 is an exhaust conduit 325 leading to the atmosphere. Both of the conduits 321 and 323 are connected to a common exhaust leading to exhaust conduit 325. Both conduits 322 and 324 are connected to the common high pressure conduit 314 leading from the high pressure source 313. Leading from the valve 286 is a conduit 326 which leads to one side of the air motor 22 and to one side of the strap end gripping cylinder 70. A conduit 327 leads from the valve 289 to the opposite side of their air motor 22 and to the opposite side of the strap end gripping cylinder 70. There is only a single conduit 320

leading to the sealing cylinder 109 because its piston rod 108 is of a spring return type.

To summarize the entire operation of the machine, with respect to the electrical and pneumatic circuits, initially the machine is put into operation by inserting the leading strap end 273a of a supply of strap between the rotary feed wheel 20 and the idler wheel 28. The supply of strap is ordinarily a coil of strap positioned in a convenient fixed place relative to the installation where the strapping head 1 is located. As shown in FIG. 5, the strap can be inserted through a guide 274 which leads into the region between the rotary feed wheel 20 and the idler wheel 28. Also, the operator must fill the seal magazine 140 with a plurality of stacked seals 142 by first removing the rod 185 and the weight 190 and then replacing them after the seals have been placed in the magazine. Initially, the seal feed hinge 247 is latched to a position indicated in FIG. 6, the manual seal switch 303 is open, the master switch 281 is open, the manual strap feed switch 287 is open and the cycle switch 282 is open. At this time, the master switch 282 is closed. This energizes the strap feed solenoid 286a and the time delay relay solenoid 285a through the contacts of closed switch LS2. Energizing the strap feed solenoid 286a actuates the solenoid valve 286 to cause air pressure from the high pressure source 313 to be fed through conduits 314 and 316 to conduit 326. The air pressure in conduit 326 feeds to both the air motor 22 and the leading strap end gripping cylinder 70. This maintains the piston rod 69 of the leading strap end gripping cylinder retracted so that the strap gripping members 56 and 57 are retracted out of the path of the strap. Feeding of the air pressure to the air motor 22 causes it to rotate the rotary feed wheel 20 in a direction to feed strap into the machine past the operating portions at the front face of the machine. The energized time delay relay solenoid 285a permits the strap to be fed for approximately one second for the particular embodiment shown. This is accomplished by having the solenoid delay the closing of its relay switch 285b for one second. After one second, the relay switch 285b closes to energize the seal feed plunger solenoid 288. This causes the plunger 259 to retract and allow the seal feed hinge 247 to pivot from a position as shown in FIG. 6 to a position as shown in FIG. 5. During this time a seal 142 is fed from the seal stack in the seal magazine 140 over the strap previously fed into the machine until the seal is positioned within the sealing region of the sealer jaws 82 and 83. The seal is arrested in its forward movement as it contacts the side plate 60. The pivoting of the seal feed hinge 247 immediately causes the arm of switch LS2 to move and cause switch LS2 to open. This immediately de-energizes the solenoid 285a of the time delay relay and also the solenoid 286a of the strap feed valve solenoid 286a to arrest strap feed. As the time delay relay solenoid 285a is de-energized, its relay switch 285b again opens to free the plunger 259 of the magnetic pull of the seal feed plunger solenoid 288. The plunger 259 is spring loaded outwardly toward the ear 261 on the seal feed hinge 247 against which it rests at this time.

As the plunger 259 is retracted initially, it strikes the arm of switch LS1 to close it. Closing this switch LS1 merely prepares the strap tensioning, gripping and sealing circuits for their later operation. Also, as the seal feed hinge 247 pivots downwardly, the pin 252 on it strikes the latch bolt 127 to release the latch plate 122

(FIG. 8) and cause the gathering jaws 136 to assume positions where their free ends are in the path of the strap.

The one second delay period for strap feed is calculated to feed out only enough strap that it projects slightly above the head 1. This is not intended to be enough length of strap for encircling a package. Therefore, the manual strap feed switch 287 is closed to feed out additional strap by energizing the strap feed valve solenoid 286a. The manual strap feed switch 287 is held closed for as long a period as required to feed out the length of strap needed. Even though the electrical circuit permits the time delay relay solenoid 285a to again be energized at this time, if it is energized long enough to allow its relay switch 285b to close and energize the seal feed plunger solenoid 288, there is no physical effect at this time because the plunger is being held retracted by the ear 261 on the seal feed hinge 247.

With sufficient strap drawn off, the operator manipulates it over, around and beneath the package 11 to be strapped and guides the strap through the strap straightening portion 48, and up onto the ledges of the strap gathering jaws 136.

It should be emphasized that the feeding of a seal 142 is deliberately delayed until after the strap 273 is fed into the machine during the one second time delay. The reason for this is to feed the strap into position with a minimum of possibility of the leading strap end 273a catching on anything in its path. With both the seal feed bar 248 and the seal 142 to be fed out of the way at this time, there is a substantially clear path for the strap 273 to follow without too much risk of snagging. The machine was deliberately designed with this sequencing of having the seal feed follow the strap feed to provide another advantage which is that the strap itself acts as a guide during the time the seal is fed into the sealer portion and the strap also acts as a support for the seal to prevent the seal from falling out of the machine.

Next, the cycle switch 282 is closed and this energizes the relay solenoid 283a and the solenoid 289a of the tension and grip solenoid valve 289. Energizing the relay solenoid 283a closes its relay switch 283b which acts as a holding contact upon release of the cycle switch 282 to its open position. When the tension and grip valve 289 is actuated at this time, it causes high pressure air to pass through the conduit 327 and into the opposite side of both the air motor 22 and the leading strap end gripping cylinder 70. Immediately, the piston rod 69 extends to cause the gripping jaws 56 and 57 to grip the leading strap end against the under surface of the blade 55 (FIGS. 6 and 7). Simultaneously therewith the air motor 22 rotates in a direction opposite to its rotation during strap feed and this causes withdrawal of the strap 273 around the idler wheel 28 in a clockwise direction as viewed in FIG. 6. Strap withdrawal continues until all the slack is taken up in the strap loop encircling the package 11 and continues until a certain degree of tension is reached. When this certain degree of tension is reached, there is a deflection of the idler wheel shaft 29 and its related parts and the shaft 21 of the rotary feed wheel 20 in combination with a movement resulting from penetration of the serrations on the rotary feed wheel into the strap. This movement of the strap feed parts by deflection and penetration provides an angular movement of the arm

37 and this in turn causes movement of the rod 44 to allow actuation of the switch LS3.

Actuation of the switch LS3 at this time closes its contacts to energize the relay solenoid 234a of time delay relay 284. Energizing this relay solenoid closes relay switches 284b and 284c after a short time delay. Closed relay switch 284b is a holding contact for relay solenoid 284c. Closing of relay switch 284c causes energization of the solenoid 290a of the sealer valve 290. This causes high pressure to flow through conduit 320 and into the sealer cylinder 109 to cause its piston rod 108 to extend and actuate the sealer jaws 82 and 83 to form a sealed joint 88 of the type shown in FIG. 2 and thereafter sever the supply strap end from the strap loop 10 encircled about the package 11. The time delay provided by relay 284 insures that full tension is reached in the strap before the sealer mechanism is operated and provides enough time to insure that full compression of a compressible object being strapped occurs. Also, when a plurality of heads 1 are being used, the time delay is set long enough to guarantee that full tension is reached by all heads before any one operates to seal or form a joint.

During the shearing and sealing operation the cross-head 96 causes the seal feed hinge 247 to again retract from the position shown in FIG. 5 to the position shown in FIG. 6 where the seal feed bar 248 has its end 253 engaging the edge of the next seal 142 in the stack of seals held in the seal magazine 140. As the edge 260 of the ear 261 on the seal feed hinge 247 passes by the seal feed plunger 259, the spring loading on the plunger causes it to extend and latch the seal feed hinge 247 against its end surface 260. There the seal feed hinge 247 is held until seal feed plunger 259 is again retracted during the next cycle of operation.

As soon as shearing has occurred, during the final portion of the sealer mechanism stroke, the tension in the strap at the supply end is relieved. This relieves the deflection in the strap feed members 20 and 28 and their related parts in order to allow the arm 37 to pivot back to its original position. As this occurs, the rod 44 causes switch LS3 to again open. At this time, the seal feed hinge 247 is fully retracted to allow the plunger 259 to extend and open switch LS1. Opening switch LS1 de-energizes relay solenoid 283 and the solenoid 289a of the tension and grip valve 289. Opening switch LS1 also de-energizes relay solenoid 284a to again open its relay switches 284b and 284c. This causes de-energization of the solenoid 290a of the sealer valve 290 to relieve pressure from the air sealer cylinder 189 to the atmosphere through conduit 321. When this happens, the spring loaded return of the sealer cylinder 109 causes the sealer parts to assume their original positions as shown in FIG. 8. During this return movement of the sealer parts the cross-head 96 is retracted so that the V-shaped arm 270 is also fully retracted to where the portion 270b of this arm again causes movement of the switch arm of switch LS2 to again close it. Closing of this switch LS2 initiates the one second time period of strap feed caused by the time delay relay 285 and leaves the end of the operating cycle with a portion of strap feed into the machine and extending above the level of the strapping head 1. It is then in readiness for the next cycle of operation which is initiated by again closing the manual strap feed switch 287 to feed out a sufficient length of strap to encircle the next object or package to be strapped.

Ordinarily at the time when the air is released from the conduit 327, the leading strap end gripping piston rod 69 is urged to a retracted position by means of an internal spring. However, because of the gripping action between the gripping jaws on the strap loop on the package 11, the weight of the package is transmitted through the gripping jaws to wedge them against the side plate 60 of the head near which they are mounted. The spring return force on the piston rod 69 is not enough to overcome the wedging force to retract them. It is not until strap feed is subsequently initiated that the gripping jaws retract and their retraction is brought about by the admission of high pressure air into conduit 326 simultaneously with the admission of high pressure air from the conduit 328 to the air motor 22 for strap feeding. Note that the strapped package cannot be removed from the machine before this occurs because the gripping jaws are holding the strap loop up against the front face of the strapping head 1.

While the strapping machine herein described was particularly adapted to be used with metal strapping, the machine may be modified to use plastic strapping. With plastic strapping, the shear blade mechanism is preferably activated by a separate shear cylinder and the tension on the strapping is released prior to shearing thereof.

Although only a single embodiment of the invention has been shown and described, it should be understood that the invention can be made in many different ways without departing from the true scope of the invention as defined by the appended claims.

What is claimed is:

1. In a strapping machine for applying a strap around an object wherein means are provided for holding the leading end of the strap encircled about the object and overlapping a supply portion of the strap and for feeding a seal having an opening therein and for applying the seal around the overlapped portion of the strap to form a seal joint therebetween, the combination therewith of a seal magazine for holding a stack of nested seals with the openings therein aligned to be fed individually to the seal joint forming means, and a seal positioning mechanism extending from the charging end of the magazine to near the discharging end thereof and extending through the aligned openings in the stack of nested seals housed in said magazine, whereby the nested seals in said magazine are maintained in alignment when said magazine is subjected to vibration.

2. The strapping machine set forth in claim 1, wherein the seal at the discharging end of said seal magazine is positioned at an angle other than 90° with respect to the longitudinal axis of said seal magazine.

3. The strapping machine set forth in claim 1, wherein the openings in the seals are oversized with respect to said seal positioning mechanism so as to permit the seals in said seal magazine to be stored at an angle other than 90° with respect to the longitudinal axis of said seal magazine with said seal positioning mechanism extending through the aligned apertures of the seals.

4. The strapping machine set forth in claim 1, wherein said seal positioning mechanism is a rod extending from the charging end of said magazine to near the discharging end thereof.

5. The strapping machine set forth in claim 1, wherein said seal positioning mechanism is an L-shaped

rod with one end thereof extending outside of said seal magazine at the charging end thereof.

6. The strapping machine set forth in claim 1, and further comprising a weight positioned on the seal nearest the charging end of said seal magazine, said weight having an opening therein receiving said seal positioning mechanism therethrough.

7. In a strapping machine for applying a strap around an object wherein means are provided for holding the leading end of the strap encircled about the object and overlapping a supply portion of the strap and for feeding a seal having an opening therein and for applying the seal around the overlapped portion of the strap to form a seal joint therebetween, the combination therewith of a seal magazine for holding a stack of nested seals with the openings therein aligned to be fed individually to the seal joint forming means, a seal positioning mechanism extending from the charging end of the magazine to near the discharging end thereof and extending through the aligned openings in the stack of nested seals housed in said magazine, and a latch mechanism positioned on said seal magazine near the charging end thereof for latching said seal positioning mechanism in place when said seal positioning mechanism is in position in said seal magazine and extending through the aligned openings in the stack of nested seals housed in said magazine, whereby said seal positioning mechanism is maintained in position and the seals in said magazine are maintained in alignment when said magazine is subjected to vibration.

8. The strapping machine set forth in claim 7, wherein said latch mechanism includes a latch arm mounted for pivotal movement on said seal magazine between a latched position wherein said arm is in contact with said seal positioning mechanism and maintains it in position and an unlatched position wherein said latch arm is spaced away from said seal positioning mechanism a distance sufficient to permit withdrawal of said seal positioning mechanism from said seal magazine.

9. In a strapping machine for applying a strap around an object wherein means are provided for holding the leading end of the strap encircled about the object and overlapping a supply portion of the strap and for feeding a seal having an opening therein and for applying the seal around the overlapped portion of the strap to

form a seal joint therebetween, the combination therewith of a seal magazine for holding a stack of nested seals with the openings therein aligned to be fed individually to the seal joint forming means, a seal positioning mechanism extending from the charging end of the magazine to near the discharging end thereof and extending through the aligned openings in the stack of nested seals housed in said magazine, hold-down mechanism associated with said seal magazine for providing a constant pressure on the stack of nested seals housed therein, independent of the number of seals in the stack of nested seals, whereby the nested seals in said magazine are maintained in alignment and under constant pressure within said magazine during the dispensing of all of the seals in said magazine and when said magazine is subjected to vibration.

10. The strapping machine set forth in claim 9, wherein the openings in the seals are oversized with respect to said seal positioning mechanism so as to permit the seals in said seal magazine to be stored at an angle other than 90° with respect to the longitudinal axis of said seal magazine with said seal positioning mechanism extending through the aligned openings of the seals.

11. The strapping machine set forth in claim 9, wherein said seal positioning mechanism is a rod extending from the charging end of said magazine to near the discharging end thereof.

12. The strapping machine set forth in claim 9, and further comprising a latch mechanism positioned on said seal magazine near the charging end thereof for latching said seal positioning mechanism in place when said seal positioning mechanism is in position in said seal magazine and extending through the aligned openings in the stack of nested seals housed in said seal magazine.

13. The strapping machine set forth in claim 9, wherein said hold-down mechanism includes a weight positioned on the seals in said seal magazine, said weight having an opening extending therethrough for accommodating said seal positioning mechanism, and a spring loaded reel operatively connected to said weight for exerting a constant pressure on said weight and thereby on the seals independent of the number of seals in said magazine.

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