United States Patent [19]

Vanderpool

[11] **3,755,984**

[45] **Sept. 4, 1973**

[54] **SEMI-AUTOMATIC BAGGING MACHINE**

[76] Inventor: **Charles C. Vanderpool,** R.D. 1, Waverly, N.Y. 14892

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[21] Appl. No.: **242,445**

[52] **U.S. Cl.** **53/52,** 53/77, 53/256, 53/386

[51] **Int. Cl.**... **B65b 57/00,** B65b 25/20, B65b 67/00

[58] **Field of Search** 53/52, 77, 241, 183, 53/256, 286, 373, 390; 211/1.5, 170–174

[56] **References Cited**

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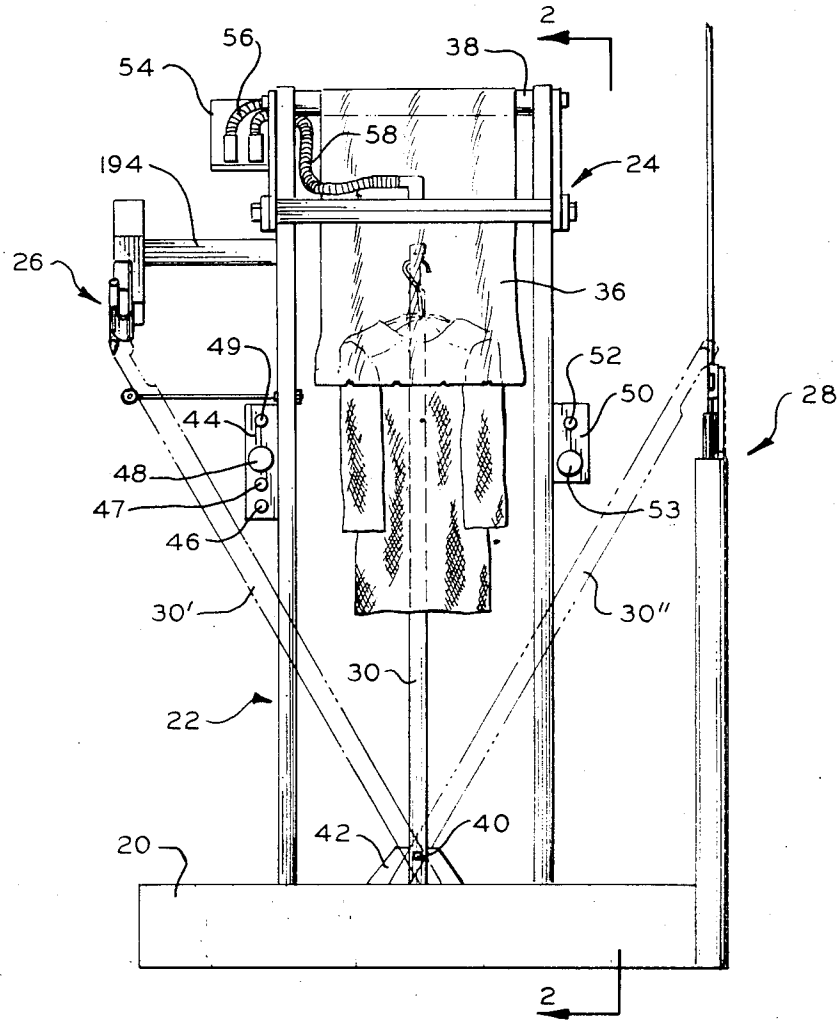
Primary Examiner—Robert L. Spruill
Attorney—Charles S. McGuire

[57] **ABSTRACT**

Apparatus for assisting an operator in applying bags, closed at the sides and one end, to items such as garments on hangers which are preferably automatically fed to and removed from the apparatus. The bags are formed from material supplied in continuous, tubular form by transversely sealing the material at a desired location and severing it near the seal, thereby closing the top of one bag and leaving an open end of the continuous material for the bottom of the next bag. The bagging material is manually drawn over a garment on a hanger supported at the upper end of a pole. The operation is more efficient than conventional manual garment bagging by making the top of the pole laterally movable to three distinct positions for loading, bagging and discharging the hanger-held garments.

14 Claims, 26 Drawing Figures



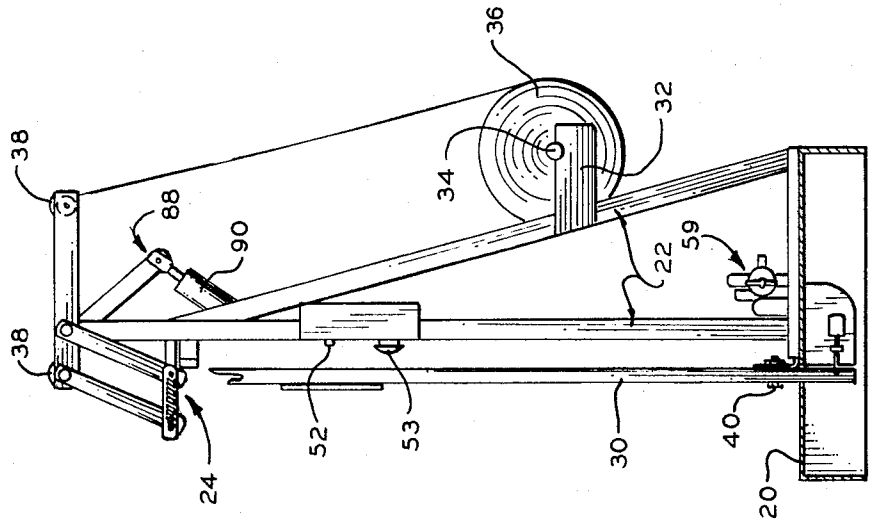

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FIG. 2

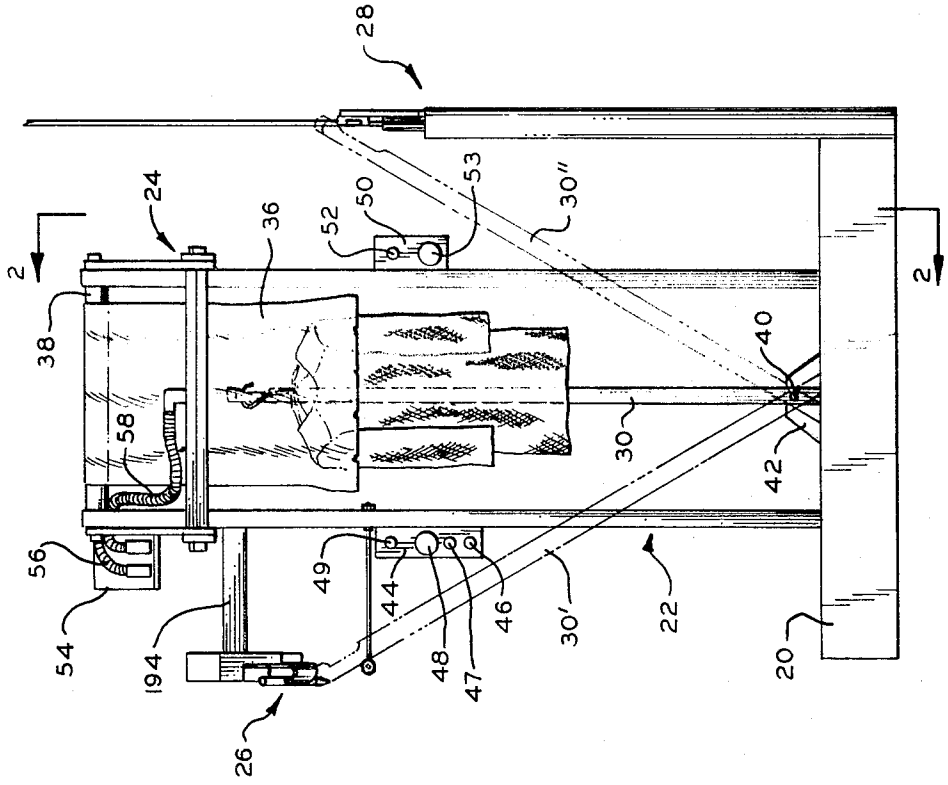
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FIG. 1

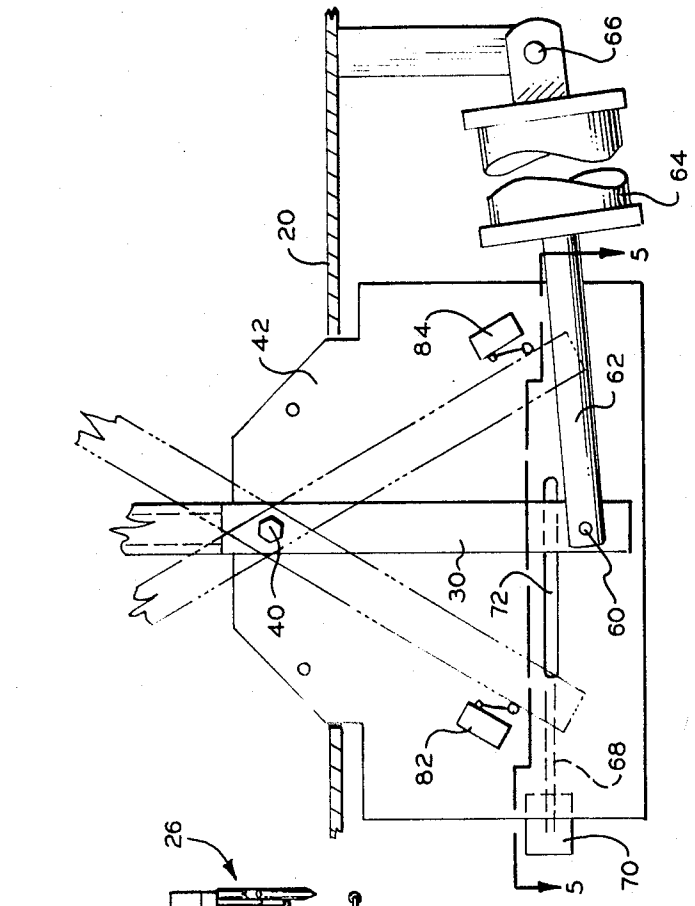
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FIG. 4

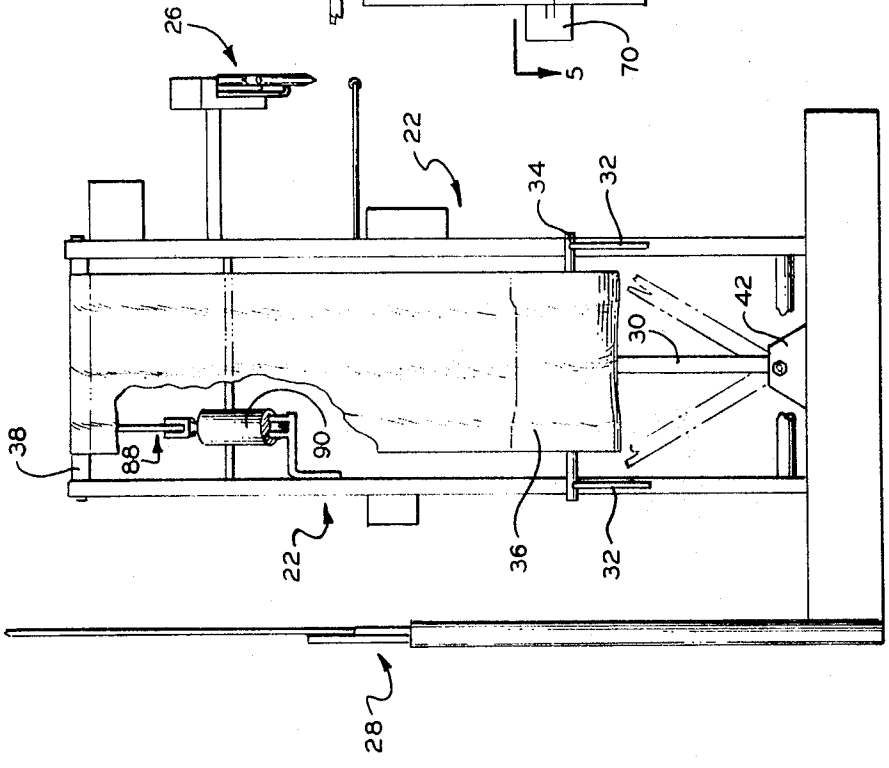
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FIG. 3

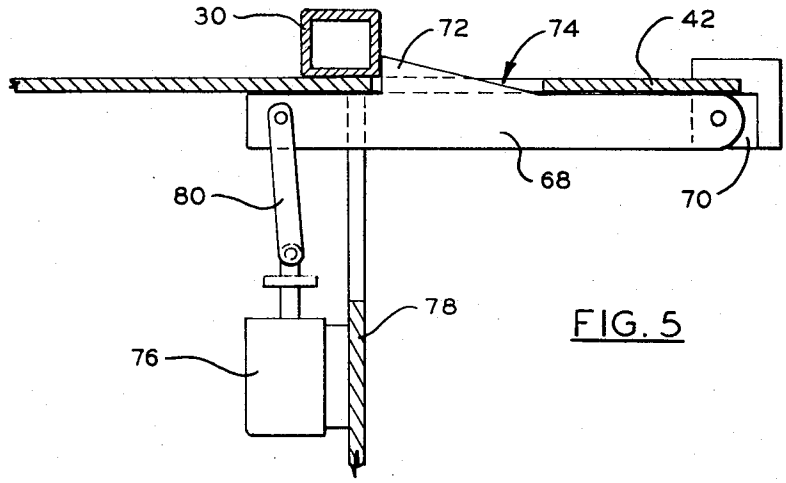
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FIG. 5

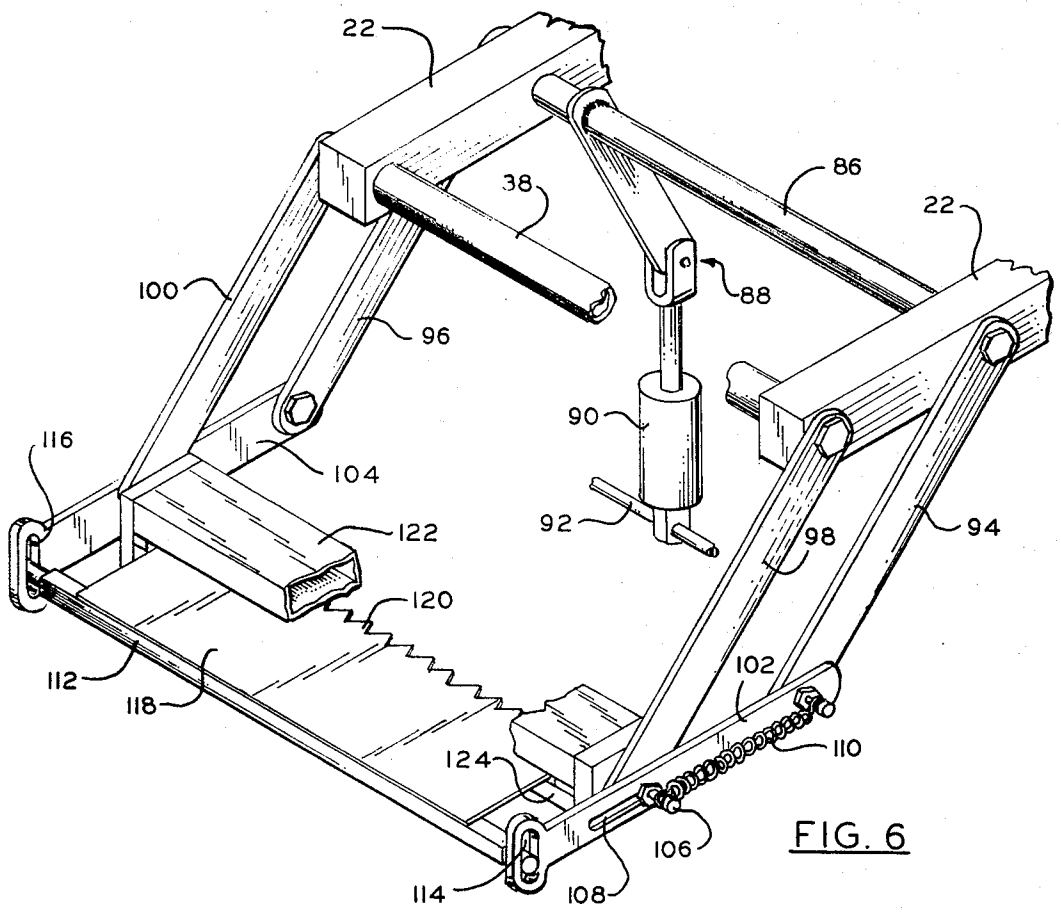
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FIG. 6

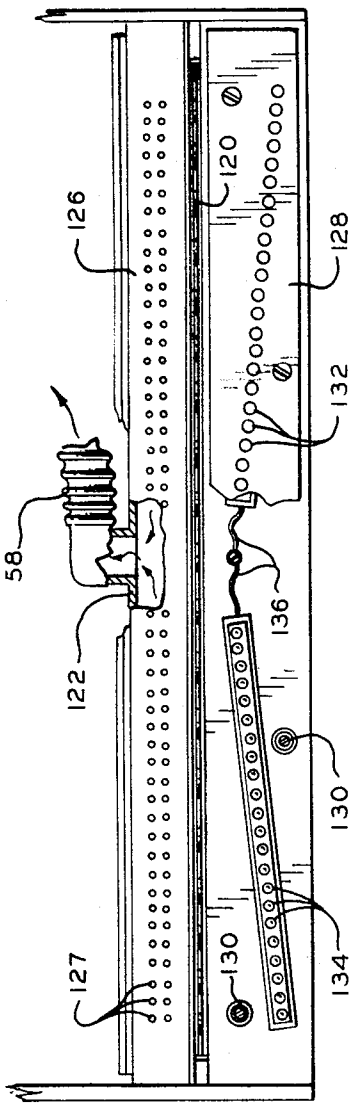
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FIG. 7

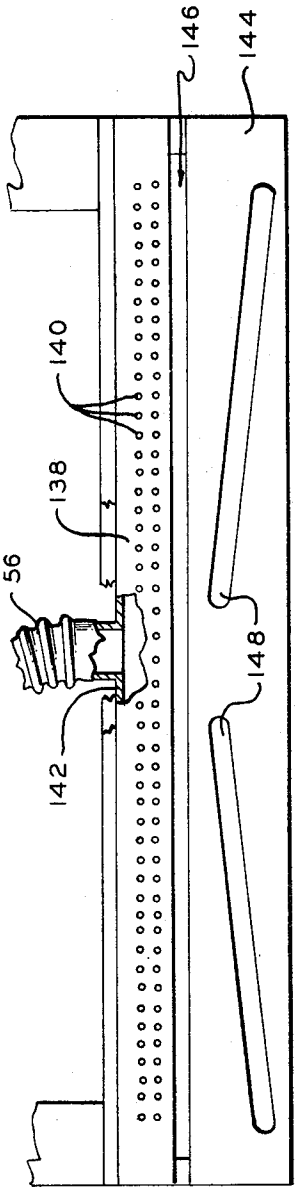
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FIG. 8

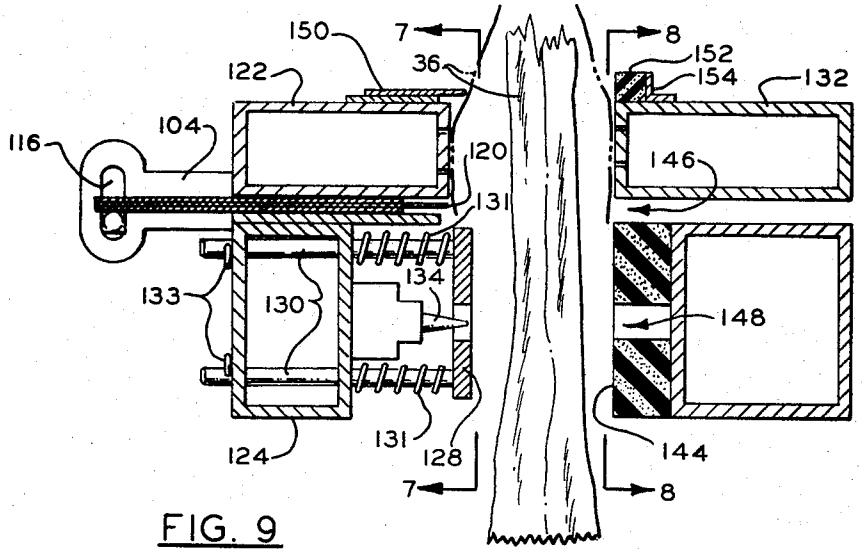
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FIG. 9

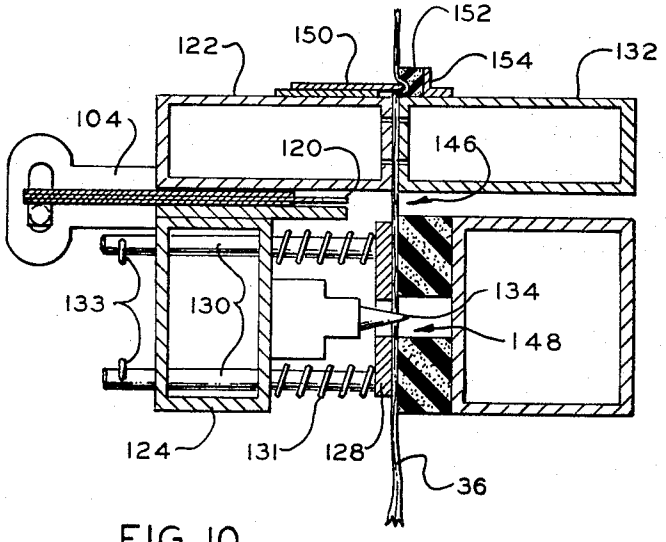
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FIG. 10

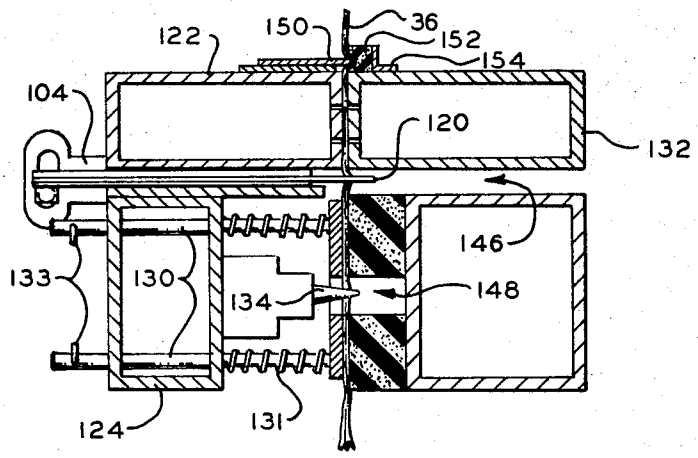
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FIG. 11

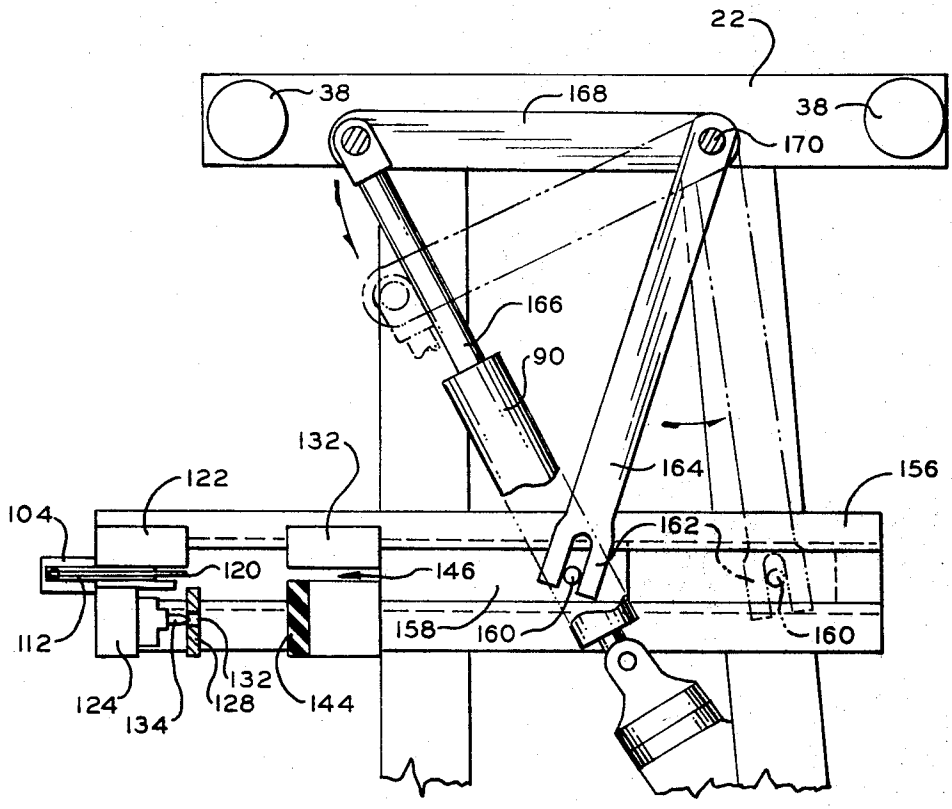
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FIG. 12

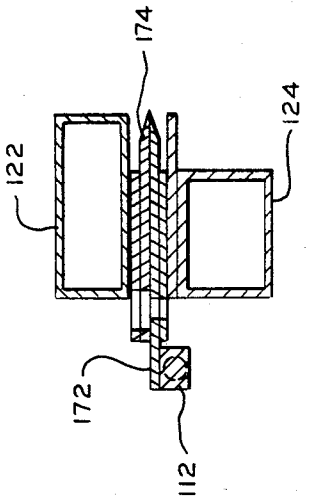

FIG. 15

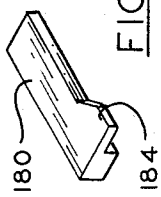

FIG. 16a

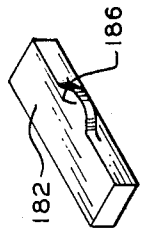

FIG. 16b

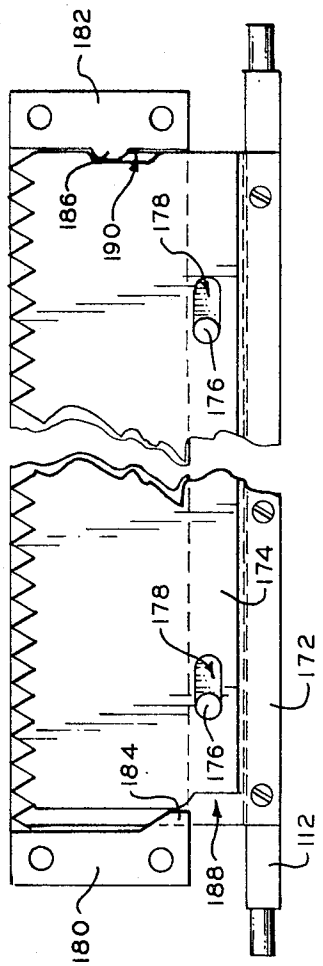

FIG. 13

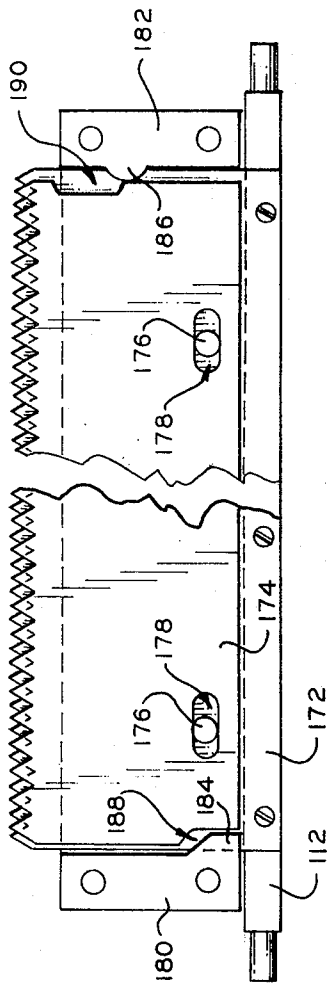

FIG. 14

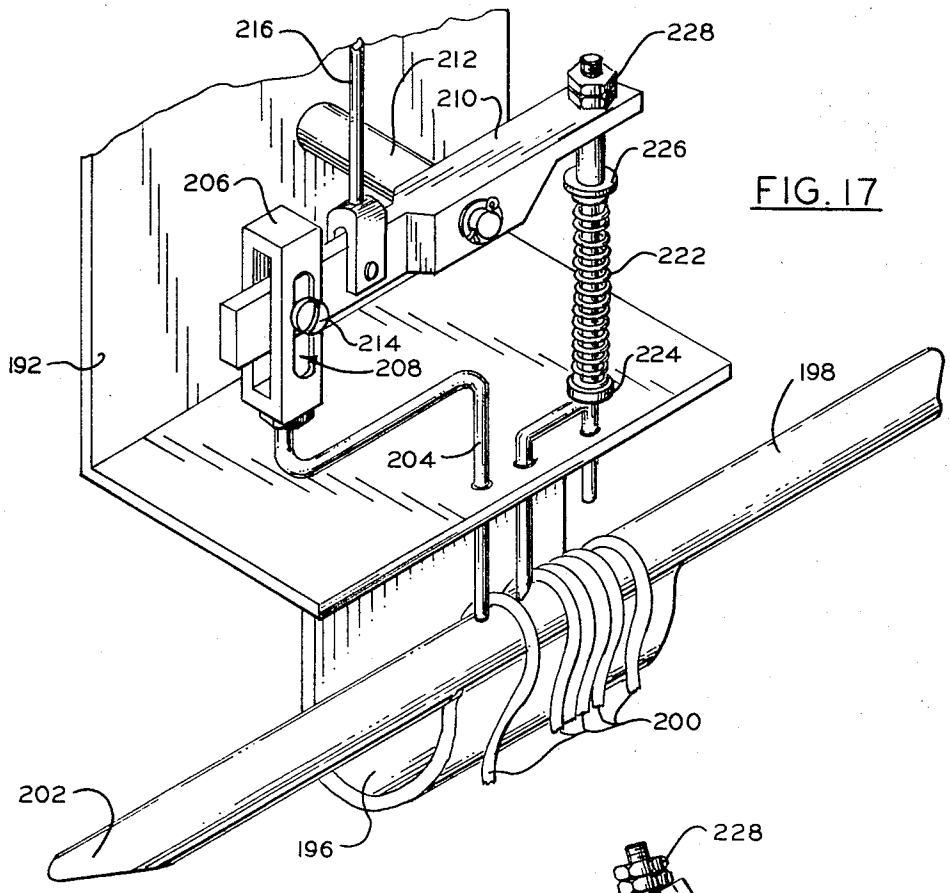
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FIG. 17

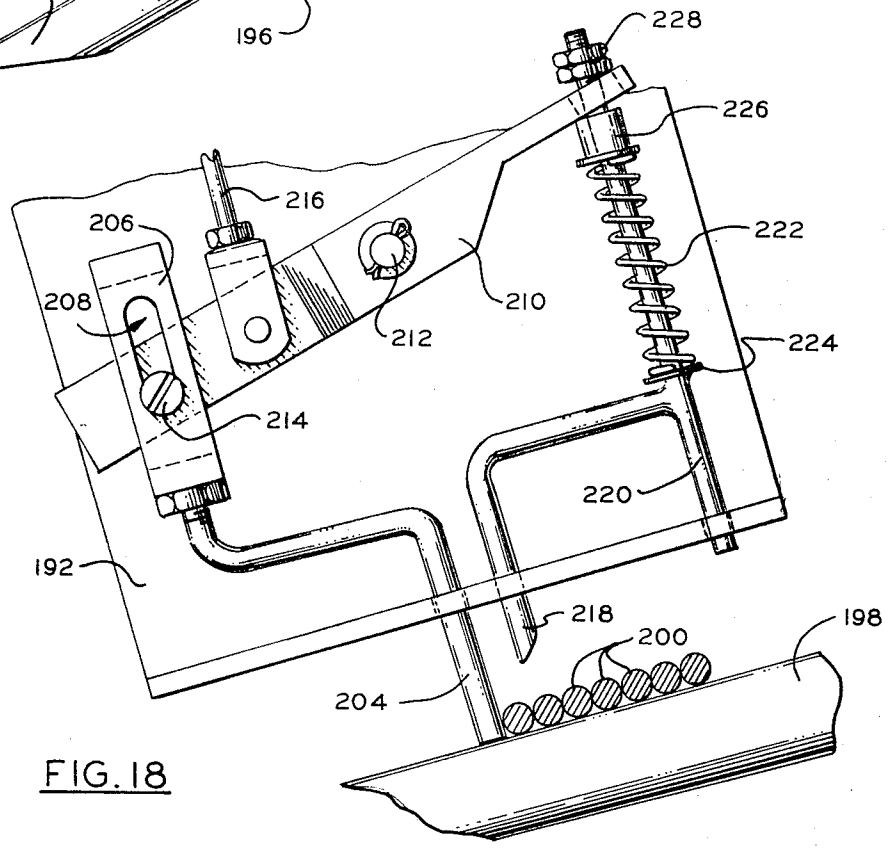
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FIG. 18

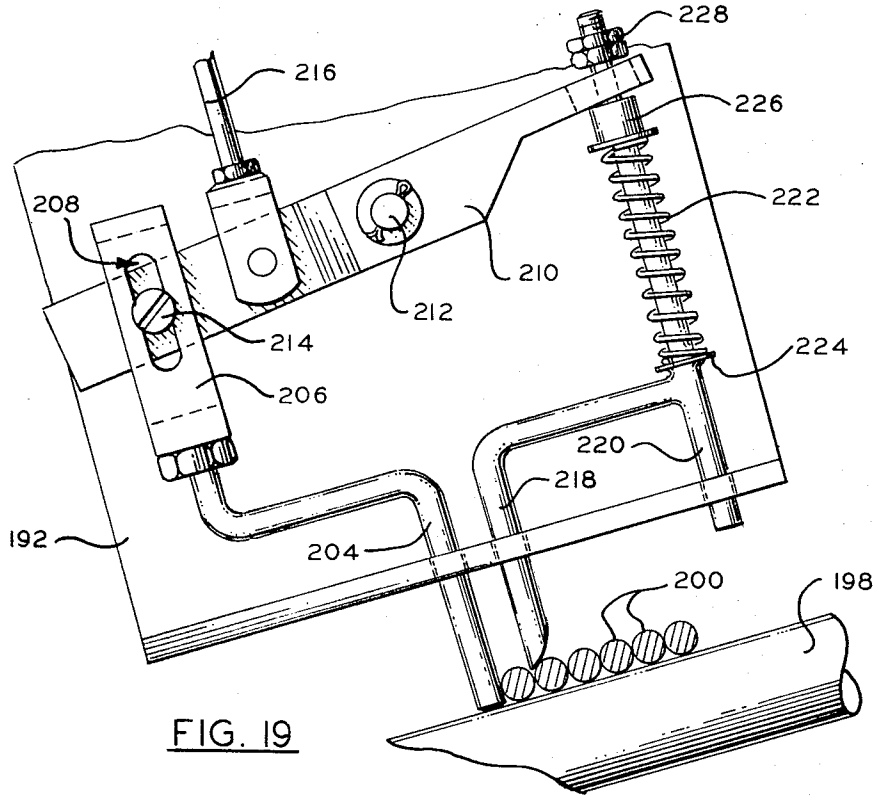
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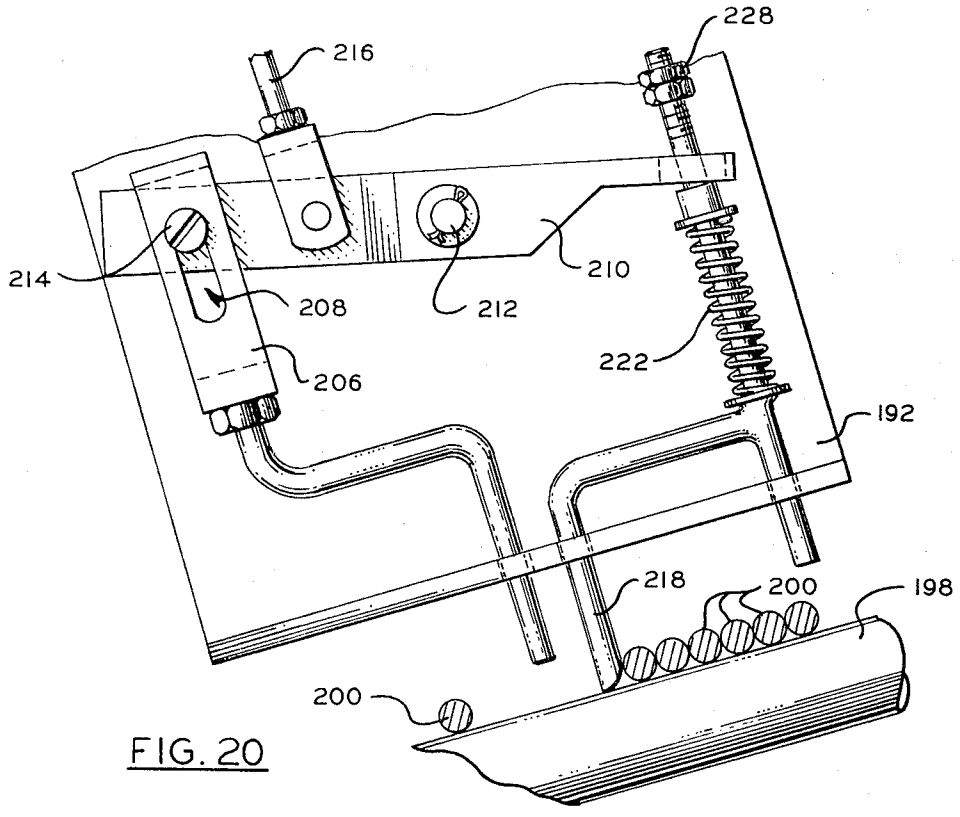
FIG. 19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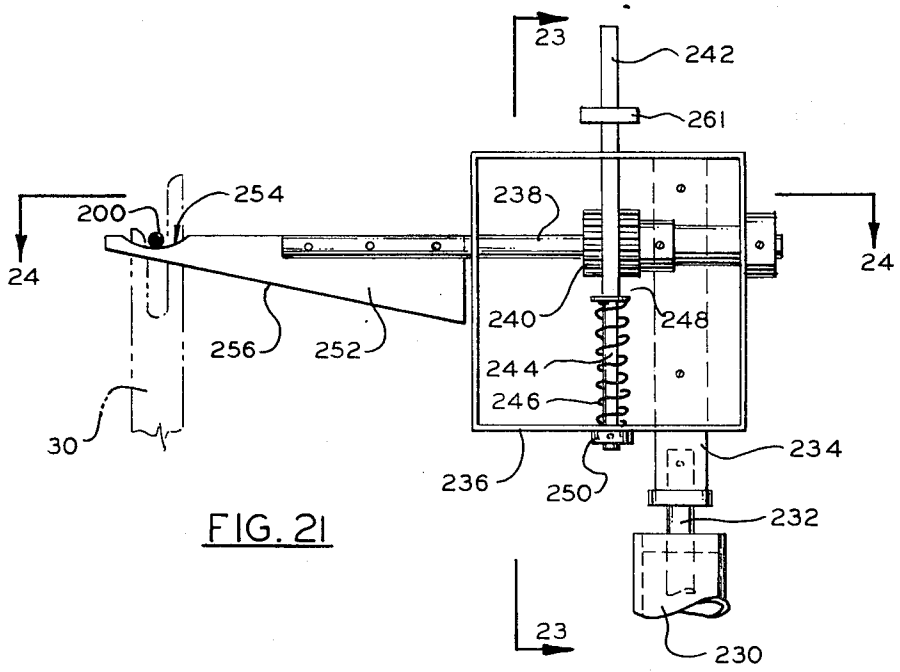
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FIG. 21

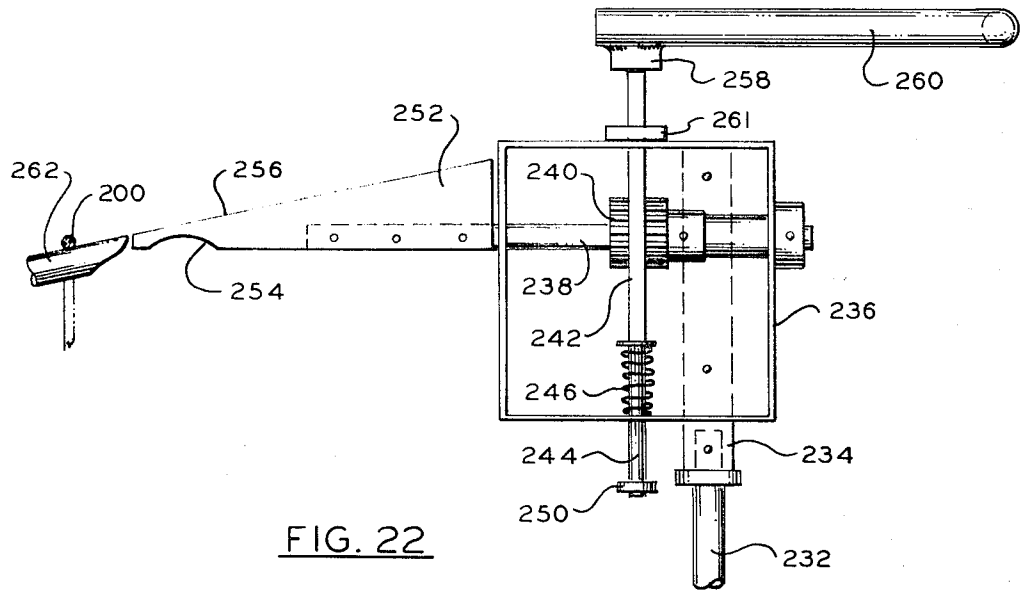
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FIG. 22

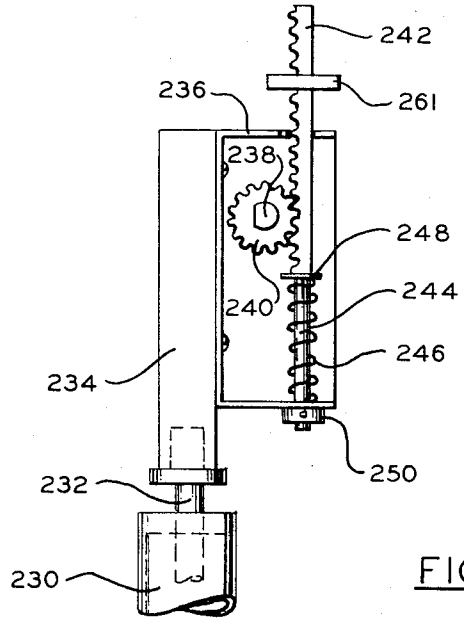
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FIG. 23

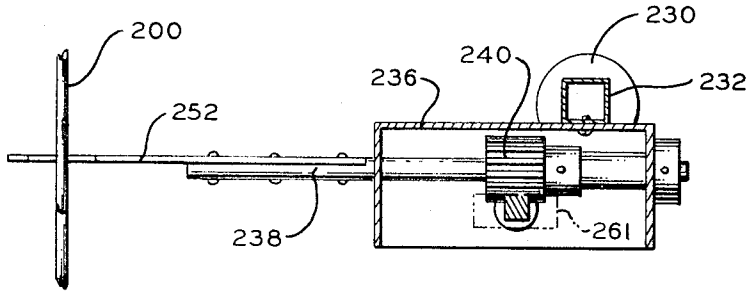
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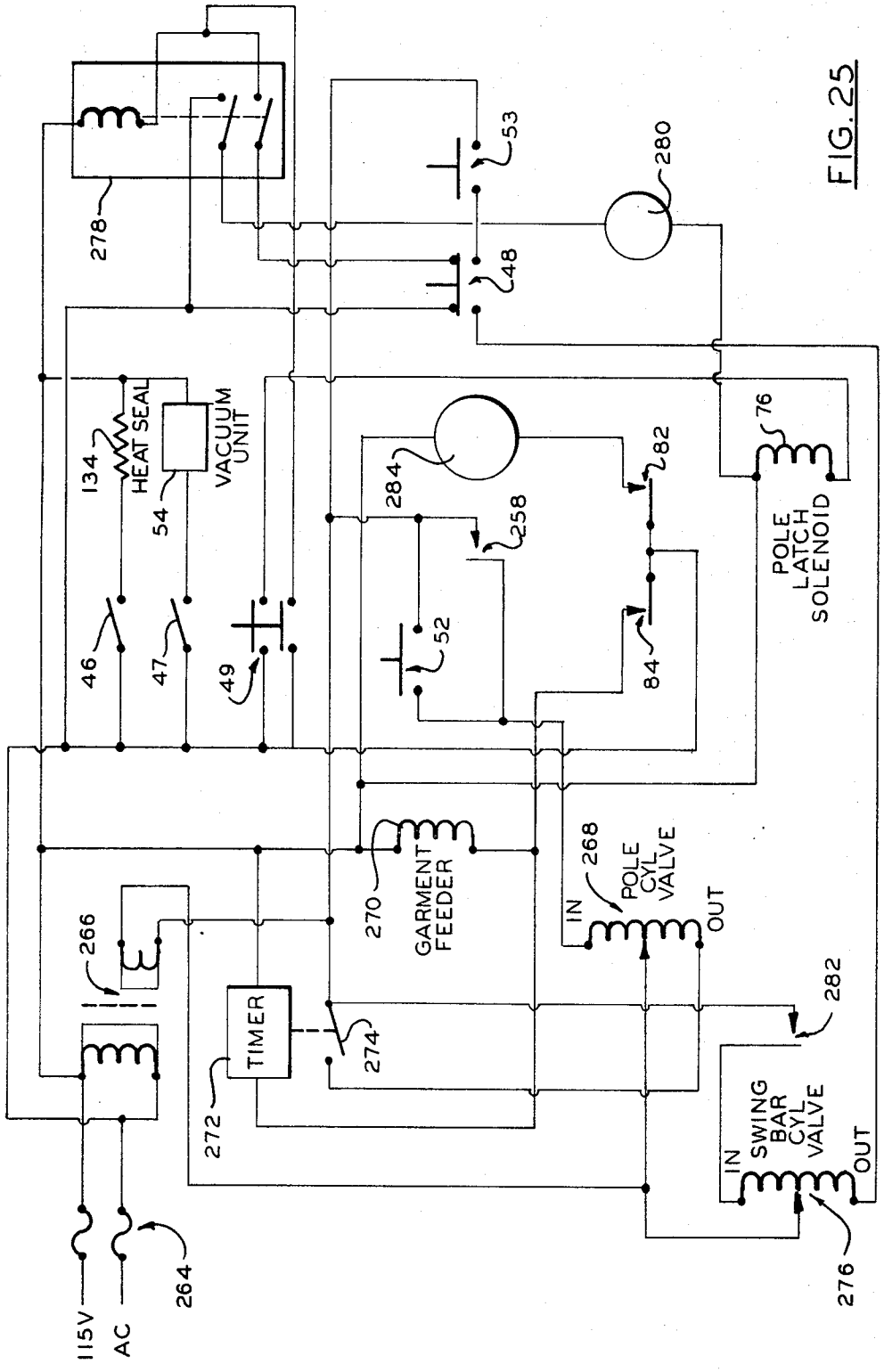
FIG. 24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134
HEAT SEAL
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VACUUM UNIT
284
258
82
76
POLE LATCH SOLENOID
46
47
49
52
84
270
GARMENT FEEDER
IN
268
POLE CYL VALVE
OUT
266
TIMER
274
282
272
IN
SWING BAR CYL VALVE
OUT
276
264
115V
AC

FIG. 25

SEMI-AUTOMATIC BAGGING MACHINE

BACKGROUND OF THE INVENTION

The present invention relates to apparatus useful in the application of individual bags, formed from material supplied in the form of a continuous, tubular web, to garments on hangers in a continuous sequence. More particularly, the invention relates to apparatus of this character which is semi-automatic in nature, requiring an operator to draw the open end of the material over the garments, but performing other functions in an automatic manner to increase the efficiency of the bagging operation.

It is a common practice to package newly manufactured, as well as dry cleaned or laundered garments and other articles in bags closed at the top and sides, and open at the bottom, with the end of a wire hanger, or the like, on which the garment is supported extending through an opening in the top edge of the bag. The bagging material is usually a transparent plastic to allow the article to be seen while still being protectively packaged. Clear polyethylene, for example, is commercially available for this purpose in various thicknesses, widths and lengths in tubular form, folded flat and supplied in rolls.

Applicant's copending U.S. application, Ser. No. 141,882, discloses fully automatic apparatus for applying bags to garments in a continuous sequence. That is, the bagging material is taken from a supply roll and drawn over a garment, sealed and cut to form an individual bag of the proper length, and another garment moved into position for bagging, all in a fully automatic manner. The apparatus is capable of bagging garments at a much faster rate than a single operator using prior, conventional apparatus and techniques, thus providing distinct labor and cost savings in a short period if used to a reasonably full portion of its capacity. Fully automatic bagging apparatus would not be economically feasible, however, in applications having only intermittent need for its capabilities.

The present invention seeks to fill the gap between the slower and more burdensome means of garment bagging previously used and the fully automatic apparatus disclosed in the aforementioned copending application. An operator is required for drawing the bagging material over the garment, but the apparatus of the invention provides many automatic features which greatly speed up the procedure over prior manual systems. The same bagging material is used with the present invention as with the automatic apparatus, or in other conventional applications, i.e., a clear polyethylene in a continuous double layer, closed at the sides.

SUMMARY OF THE INVENTION

Basically, the apparatus includes a garment support pole movable in response to push button actuation, or the like, under operator control, between three distinct positions of at least the end thereof on which the garment hanger is supported. In one position (designated the "loading" position), the hanger is placed on the pole, preferably by automatic feeding means. In the next position (the "bagging" position), the pole is disposed with the end supporting the hanger directly under means holding the leading end of the bagging material in an open condition. While the pole is in the bagging position the operator manually draws the leading end of the bagging material over the garment, stopping when it is in the desired position relative to the length of the garment. The operator then actuates an electrical switch, preferably comprising safety interlock means, to cause movement of mechanism which seals and cuts the web of bagging material to form an individual bag for the garment then in the bagging position, also forming a new leading end, held in an open condition, of the tubular web. The pole is then moved to the third, or discharge, position where the bagged garment and hanger are removed, also preferably by automatic ejection means. From the discharge position, the pole is returned to the loading position and the cycle is repeated.

In the disclosed embodiment, a single pole is provided and mounted for movement to each of the three positions in sequence. As disclosed, the pole is pivotally mounted near the lower end and is vertically disposed in the bagging position, being tilted in one direction from the vertical for loading and in the opposite direction for discharge. The mechanism for effecting the sealing and cutting operation, as well as for opening the leading end of the tubular web, may be essentially the same as the corresponding mechanism disclosed in the referenced application on the automatic apparatus. In the present invention, however, actuation of such mechanism is not automatic but rather is under the operator's control. Safety interlock means are provided to effectively prevent inadvertent actuation of the mechanism.

It is a principal object of the present invention to provide semi-automatic apparatus for providing bags, closed at the sides and one end, from a continuous supply of tubular material and placing the bags over articles to be covered in a continuous sequence, wherein the material is manually drawn over the articles and other mechanism assisting in the operation is manually actuated.

Another object is to provide semi-automatic garment bagging apparatus including means for increasing the number of garments a single operator can bag per unit of time.

Still another object is to provide, in semi-automatic garment bagging apparatus having power driven cutting and heat sealing means, novel safety features for preventing operator injury due to inadvertent or careless actuation of the power driven means.

The above and other novel features of the invention will appear more fully hereinafter from the following detailed description when taken in conjunction with the accompanying drawings. It is expressly understood that the drawings are employed for purposes of illustration only and are not designed as a definition of the limits of the invention, reference being had for this purpose to the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings, wherein like reference characters indicate like parts:

FIG. 1 is a front elevational view of the preferred embodiment, showing the garment support pole in each of its three positions;

FIGS. 2 and 3 are side and rear elevational views, respectively, of the apparatus of FIG. 1, the base portion being shown in section in FIG. 2;

FIG. 4 is a fragmentary, front view of the pole mounting and movement mechanism;

FIG. 5 is a sectional view taken on the line 5—5 of FIG. 4;

FIG. 6 is a fragmentary, perspective view of mechanism associated with the web cutting operation;

FIG. 7 is a front elevation, with portions broken away, of the face of the movable web-engaging bar, as seen from the line 7—7 of FIG. 9;

FIG. 8 is a front elevation of the stationary, web-engaging face which opposes the face shown in FIG. 7, as seen from the line 8—8 of FIG. 9;

FIGS. 9–11 are sectional side elevations of the mechanism for sealing and cutting the web, showing the sequence of operation thereof;

FIG. 12 is a fragmentary, side elevational view of an alternate construction of the mechanism of FIG. 6;

FIGS. 13 and 14 are plan views of an alternate construction of the knife blade mechanism, shown in the retracted and extended positions, respectively;

FIG. 15 is a sectional side elevation of the FIGS. 13–14 knife blade embodiment, showing also the elements between which the knife blade is mounted;

FIGS. 16*a* and 16*b* are fragments of the cam elements which move one of the knife blades laterally as it is advanced and retracted;

FIG. 17 is a perspective view of a suggested embodiment of an automatic loader mechanism incorporated in the invention;

FIGS. 18–20 are a series of side elevational views of the loader mechanism of FIG. 17, showing the sequence of operation thereof;

FIG. 21 is a fragmentary, side elevational view of the automatic ejector mechanism incorporated in the invention, shown in the lowermost position;

FIG. 22 is a side elevational view of the mechanism of FIG. 21 shown in the uppermost position;

FIGS. 23 and 24 are front and top views, respectively, of the ejector mechanism; and

FIG. 25 is an electrical schematic showing electrical operation of the system.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The apparatus of the invention is intended for operation with conventional bagging material, such as transparent polyethylene, commonly used to form temporary, disposable bags for covering garments. Such material is commercially available in the form of a continuous, tubular web, i.e., an elongated double layer, closed at the sides, folded flat and supplied in rolls. The sides may or may not have pleats or gussets, and some rolls intended for strictly manual bagging operations are pre-sealed and perforated at constant intervals along their length, thus requiring no sealing or cutting to form the individual bags. The present invention is suitable for use with virtually any commercially available, heat-sensitive bagging material, except that there is never a need for the more expensive, pre-sealed, perforated material since the apparatus of the invention includes means for sealing and cutting the web at any desired location. Any desired thickness or width, up to a maximum limit, of bagging material may be used with the apparatus of the invention.

In FIGS. 1–3 a preferred construction is shown from the front, side and rear. The apparatus is divided generally into base portion **20**, frame **22**, web-engaging section **24**, automatic loader **26**, automatic ejector **28** and garment support pole **30**. Base **20** is closed on the top and sides, open on the bottom, and of sufficient height to accommodate the lower end of pole **30**, as shown in the broken-away portion of FIG. **2**, and other mechanism described later in more detail. The base is perferably metal, but may be made of wood or other such materials if economy is of primary importance.

Frame **22** is affixed to and supported on base **20**, and provides means for holding and guiding the bagging material, as well as for supporting various other elements of the apparatus. A pair of bracket supports **32** are fixedly attached to a rear portion of frame **22** and serve to support a spindle or axle **34** of a roll of bagging material **36**. The material passes over guides **38** and downwardly with the leading end engaged by a pair of opposing faces of web-engaging section **24**.

Pole **30** is pivotally mounted by means of pin **40** on mounting plate **42**, affixed to base **20** and extending through a slot in the top thereof. The pole is movable about its pivotal mounting between three distinct positions. In FIG. **1** pole **30** is shown in solid lines in a vertical position, directly under web-engaging section **24** and the leading end of bagging material **36**. This is the position of the pole when the material is pulled over a garment supported thereon, and is hereafter referred to as the bagging position. Pole **30** is rotated in opposite directions from the bagging position to the positions shown in dot-dash lines in FIG. **1**; the position indicated by reference numeral **30'** is designated the loading position, and that numbered **30''** the discharge position. Rod **43** extends from frame **22** and holds arm **45** in a position to be contacted by pole **30** in the loading position, thereby insuring that the end of the pole will be in the exact position required for receiving a hanger fed to it by apparatus **26**. A control box having front panel **44** is attached to one side of frame **22** and holds the manually engagable portions **46, 47, 48** and **49** of electrical switches having circuit functions described later. A second control box having front panel **50** is attached to the opposite side of the front of frame **22** and supports manually engageable portions **52** and **53** of other electrical switches. Vacuum motor **54** is supported adjacent the top of frame **22** and vacuum hoses **56** and **58** extend therefrom to connections with later described vacuum faces of web-engaging section **24**. Apparatus **59**, shown in FIG. **2** only, is illustrated in a general manner to indicate the presence and preferred location of elements such as electrical and pneumatic regulating and control members such as valves, transformers, etc.

Referring now to FIGS. **4** and **5**, the lower end of pole **30** extends into base **20** and is pivotally attached by pin **60** to reciprocating piston rod **62** of air cylinder **64**. To allow for lateral movement of rod **62** as the lower end of pole **30** moves in its arcuate path, cylinder **64** is pivotally attached, as indicated by reference numeral **66**, to base **20**. Thus, inward movement of rod **62**, from the position shown in FIG. **4**, by appropriate actuation of an electrically operated valve (described later) is effective to move pole **30** to the loading position. Outward movement is likewise effective to move the pole to the discharge position.

Latch bar **68** is pivotally mounted on block **70**, affixed to mounting plate **42**, and includes stop **72** extending through slot **74** in plate **42**. Solenoid **76** is supported on bracket **78**, extending from plate **42**, and attached by link **80** to latch bar **68**. The bottom of pole **30** may be moved to the right as seen in FIG. **4** (moving the pole to the loading position) with latch bar **68** in the

engaged position, as shown. However, before the pole can be moved to the discharge position, solenoid **76** must be actuated to withdraw stop **72** from the path of the bottom of the pole. Also shown in FIG. **4** are a pair of microswitches **82** and **84**, supported on plate **42** and having contacts movable by the lower end of pole **30** as it reaches the opposite ends of its travel. The limits of travel of pole **30** may be defined by the inner and outer limits of travel of rod **62**, or fixed stops (not shown) may be provided in the path of pole **30**. The manner of actuating cylinder **64** and solenoid **76** to effect movement of pole **30** in the desired manner will be described later.

In FIG. **6** the actuating mechanism of web-engaging section **24** is shown. Spaced upper sections of frame **22** support previously-mentioned web guide **38** and actuator rod **86**, connected by linkage **88** to pneumatic cylinder **90**. The upper end of linkage **88** is keyed to rod **86** to effect reciprocal rotation thereof in response to extension and retraction of cylinder **90**, which is pivotally mounted on rod **92** extending fixedly from frame **22**. A pair of arms **94** and **96** are fixedly mounted on opposite ends of actuator rod **86** for rotation therewith. A second pair of arms **98** and **100** are pivotally mounted on opposite sides of frame **22**, parallel with arms **94** and **96**, respectively. Arms **94** and **96** are pivotally attached to connector bars **102** and **104**, respectively, and threaded studs extend from the ends of arms **98** and **100** through elongated slots in the respective connector bars. Stud **106** extends through slot **108** in bar **102** and is biased toward one end of the slot by spring **110**, a like arrangement being provided on the opposite side.

Bar **112** includes end portions extending loosely through vertical slots **114** and **116** in the end of connector bars **102** and **104**. Knife blade **118**, having sawtoothed cutting edge **120**, is fixedly attached to bar **112** and extends through a space between hollow vacuum bar **122** and laminator support bar **124**, both of which are supported between connector bars **102** and **104**.

Turning now to FIGS. **7** and **8**, the faces of the movable and stationary elements, respectively, between which the web is engaged, are shown. Upper face **126** of movable vacuum bar **122** includes a plurality of small openings **127** communicating with the hollow interior of the vacuum bar which is connected through tube **58** to vacuum motor **54**. Plate **128** is mounted on a plurality of pins **130**, extending from the plate through laminator support bar **124** (see FIGS. **9–11**). Plate **128** is biased away from bar **124** by springs **131**, pins **130** being retained by removable cotter pins **133**. Openings **132** in plate **128** are in registration with two sets of conical prongs **134** fixedly mounted on laminator support bar **124**. The prongs of each set extend from a common base of electrically conducting material and individually comprise a conducting core covered with a non-conductive, non-stick coating, preferably of Teflon, or the like. Each set of prongs is connected by wires **136** to an electrical supply and are thereby heated to a temperature sufficient to effect a seal of two layers of material **36**. For a clear showing of at least a portion of all pertinent elements, a portion of plate **128** is broken away so that only one set of openings **132** and prongs **134** are shown. It will be readily understood, however, that both the prongs and openings are duplicated on each side of the movable element. By removing cotter pins **133**, plate **128** may be easily dismounted, providing access to prongs **134** for cleaning, repair, etc.

The stationary web-engaging element is shown in FIG. **8**. Upper face **138** thereof includes openings **140** communicating with the interior of hollow vacuum bar **132** which is connected to vacuum motor **54** by tube **56**. The construction and function are identical to that of vacuum bar **122** of the movable element. Lower face **144** of the stationary element is formed of a resilient material, such as sponge rubber, and is spaced from upper face **138** to define open slot **146** therebetween in registration with knife blade **118**. Elongated slots **148** in lower face **144** on the stationary element are in registration with the two sets of prongs on the movable element.

FIGS. **9–11** illustrate the sequence of operations of the web-engaging elements. As the elements are shown in FIG. **9**, cylinder **90** (see FIG. **6**) is retracted and the movable element is spaced by the maximum amount from the stationary element. In this position, the operator may draw the bagging material **36** down over a garment supported in the bagging position. Material **36** is shown in dotted lines in FIG. **9** in its initial position, i.e., with the leading end held open by the faces of vacuum bars **122** and **132**, and in solid lines as it appears after being grasped by the operator and pulled down over the garment. When the material has been pulled down to the desired length the operator pushes both buttons **48** and **53**, thereby actuating the valve controlling the air supply to cylinder **90**. Simultaneous actuation of both buttons **48** and **53** obviously requires the use of both hands. Although actuation could be effected just as easily by actuation of a single button, or other such mechanism, an actuating means requiring the use of both hands is provided to reduce the likelihood of inadvertent actuation, thereby reducing potential accidents.

Referring again to FIG. **6**, as cylinder **90** is extended, actuator rod **86** is rotated. This rotation is imparted to arms **94** and **96**, thereby moving the other elements of the linkage and bringing the movable web-engaging element into contact with the stationary element with material **36** engaged therebetween, as shown in FIG. **10**. Plate **128** is moved toward support bar **124**, against the bias of springs **130**, by continued movement after material **36** has been engaged between the plate and lower face **144** of the stationary element. Prongs **134** extend through holes **132** and through the bagging material and into slots **148** in the lower face of the stationary element, as shown in FIG. **10**. The heat of the prongs is sufficient to effect a seal of the baggine material in the areas of contact. The limit of movement of the movable element is defined by contact of faces **126** and **138** of the movable and stationary vacuum bars, respectively, with material **36** engaged therebetween. Continued extension of cylinder **90**, after the movable element has reached the limit of its travel, will continue to rotate arms **94** and **96**, but arms **98** and **100** cannot rotate further in this direction. Thus, as connector bar **102** continues to move, stud **106** rides along slot **108** and spring **110** will be elongated. The same action will take place with respect to connector bar **104** and the elements on the other side of the linkage. Connector bars **102** and **104** will continue to move bar **112**, and knife blade **118**, until cutting edge **120** has moved through material **36**. Arcuate movement of connector bars **102** and **104** while knife blade **118** is constrained

to linear movement, is accommodated by the loose mounting of blade support bar **112** in slots **114** and **116.** Thus, the material is severed above the area where it is sealed, as shown in FIG. **11.** This forms an individual bag fromthe portion of material **36** which has been pulled down over the garment, and likewise forms a new leading end of material **36.**

To assist in the cutting operation, plate **150** is affixed to vacuum bar **122** along the upper surface thereof, and has an edge extending forwardly of the bar. Resilient member **152,** affixed by bracket **154** to vacuum bar **132,** opposes the forward edge of plate **150** so that material **36** is engaged therebetween when the movable and stationary elements come together. Thus, material **36** is securely engaged both above and below the point where it is severed, thereby insuring that the material cannot slip when engaged by knife edge **120.**

After the material is sealed and cut, cylinder **90** reverses its motion and is again retracted to move the movable web-engaging element back into spaced relation with the stationary element, as shown in FIG. **9.** The operator then pulls the severed portion of the material, now in the form of an individual bag, the remaining few inches down over the garment so that the sealed areas (closed end of the bag) engage the top of the garment. The garment hanger and top of pole **30** may extend out of the bag through the unsealed portion at the center, in the region between two sets of prongs. The operator then actuates push button **46** and the garment pole moves to the discharge position for the removal of the bagged garment. When the pole arrives at the discharge position and actuates switch **82** (FIG. **4**) automatic ejector **28** will remove the bagged garment from the pole and actuate mechanism to reverse cylinder **64,** thereby moving pole **30** to the loading position to pick up a new garment. When automatic loader **26** places a new garment on pole **30** it will automatically move back to the bagging position and stop, ready for the new leading end of material **36** to be pulled down over the garment.

The vacuum applied to the opposite sides of the new leading end of material **36** will move the end to an open condition, as shown in dotted lines in FIG. **9,** when the web-engaging elements are moved apart. The entire process is then repeated for the new, unbagged garment on pole **30,** and each subsequent garment.

Turning now to FIG. **12,** an alternate construction for the actuating elements of the web-engaging section is shown. Common reference numerals are used for elements common to both the earlier described and the present embodiment. Guides **38** for material **36** are again supported on frame **22,** as are a pair of horizontally disposed, linear tracks, one of which is seen in the sectional view of FIG. **12** and designated by reference numeral **156.** Slider bar **158** is movably supported by track **156,** and fixed stud **160** extends from one side of the bar. Slotted end **162** of arm **164** engages stud **160** to effect sliding movement of bar **158** along track **156** as arm **164** is rotated.

Air cylinder **90** is again pivotally mounted at its lower end. Rod **166** is connected to link **168** which, together with arm **164,** is keyed to shaft **170.** Thus, extension and retraction of cylinder **90,** through rod **166** and link **168,** serves to rotate shaft **170** which in turn rotates arm **164,** thereby effecting reciprocal movement of slider bar **158.** The movable web-engaging element is mounted on bar **158,** and the corresponding bar on the opposite side, in the same manner as it was mounted between bars **102** and **104** in the previous embodiment. In the present embodiment, however, there is no need to support the ends of the knife bar in slots to accommodate arcuate movement of the mounting bars as the knife blade moves linearly since in the present embodiment the slider bars also move linearly. Appropriate, spring biased means would be provided, as in the previous embodiment, for allowing relative movement between movable vacuum and laminator support bars and the slider bar so that knife blade **112** can continue to advance after the vacuum and laminator support bars have reached the limit of their travel. If desirable or necessary, to prevent binding, and the like, arms **164** may be provided on both sides to engage studs on both slider bars. Alternatively, stud **160** may be a rod extending between the two slider bars and engaged by arm **164** at the center, in which case shaft **170** would also extend between opposite sides of frame **22.**

An alternate construction of the severing mechanism is shown in FIGS. **13–16.** In this embodiment a pair of superposed and relatively movable knife blades are provided, each having a saw-toothed cutting edge. Lower blade **172** is again secured to support bar **112,** as in the previous embodiment, and upper blade **174** is placed loosely thereon with pins **176** on the lower blade extending through slots **178** in the upper blade. Elements **180** and **182** are fixedly secured adjacent the side edges of blades **172** and **174,** and include extending portions **184** and **186,** respectively. As best seen in FIGS. **16***a* and **16***b*, portions **184** and **186** extend only from the upper surfaces of elements **180** and **182,** thereby extending over the upper surface of lower blade **172** and lying adjacent the side edges of upper blade **174.** Notches **188** and **190** are formed in the opposite side edges of blade **174** to cooperate with portions **184** and **186** as cam elements to effect reciprocal, lateral movement of blade **174.**

As seen in FIG. **15,** vacuum bar **122** and laminator support bar **124** are arranged a proper distance apart to accommodate the elements of the cutting mechanism therebetween. The cutting edges of the two blades are tapered toward one another and are flush across the points. Bar **112** is mounted as before at each end on the movable support bars, or the like, with means for overtravel to allow for movement of the blades after the vacuum bar and laminator support have reached the limit of their travel. The blades are shown in FIGS. **13** and **15** in the retracted position, and in FIG. **14** in the extended position, as they would appear when cutting through the bagging material.

Elements **180** and **182** are fixed with respect to the vacuum and laminator support bars and are therefore held stationary after the bagging material has been engaged between the faces of the movable and stationary vacuum bars. Continued travel of the means supporting bar **112** moves blades **172** and **174** forwardly to cut through the bagging material. As the blades move, the right edge (as seen in FIGS. **13** and **14**) of blade **174** engages portion **186** of element **182.** Continued forward movement of the blades moves blade **174** to the left, sliding across blade **172,** to the position shown in FIG. **14** when the blades are fully extended. As the blades are retracted, contact of the edge of notch **188** with portion **184** of element **180** will move blade **174** back to the position of FIG. **13.** The sickle blade action of the present embodiment of the web severing mecha-

nism, while somewhat more complex and expensive than the first embodiment, provides a better, more reliable cutting action.

Details of one embodiment of automatic loader **26** are shown in FIGS. **17–20.** A number of different embodiments of automatic loading apparatus, including that set forth herein, are disclosed in Applicant's copending U.S. application Ser. No. 242,695, filed of even date herewith. Any such embodiments are suitable for incorporation with the present invention as well as with the bagging apparatus disclosed in Applicant's previously filed application Ser. No. 141,882. Mounting bracket **192** is fixedly supported in the proper position by arm **194** (FIG. 1) extending from frame **22.** Welded or otherwise affixed to the lower side of bracket **192** is curved channel **196** which supports along its other edge hanger support rod **198.** Fragments of a plurality of hangers **200,** carrying the garments to be bagged, are shown supported on rod **198.** End portion **202** of rod **198** is positioned closely adjacent the upper end of garment support pole **30** when the latter is in the loading position. The relative position is such that a hanger sliding off of end portion **202** will be placed on pole **30.** Rod **198** is disposed in a downwardly sloping position toward end portion **202** so that hangers placed on the rod are carried by gravity toward end **202.**

The mechanism for feeding hangers **200** one at a time to the garment pole comprises a pair of reciprocating rods and associated apparatus for moving them in proper sequence. Rod **204** has an end portion adapted to be placed in blocking relation to hangers **200,** as shown in FIG. **18,** thereby preventing any hangers from sliding off end portion **202.** Rod **204** passes loosely through an opening in bracket **192,** and is attached to element **206,** having slotted opening **208.**

Rocker arm **210** is pivotally supported on the end of rod **212,** extending fixedly from bracket **192.** Screw **214** extends loosely through slot **208** in element **206** and is secured to rocker arm **210.** Actuating arm **216** is pivotally secured to rocker arm **210** and is movable in response to actuation of a solenoid, now shown in FIGS. **17–20** but shown schematically and described more fully as to operation in FIG. **25.**

Rod **218** extends loosely through an opening in bracket **192** and extends through an enlarged opening in rocker arm **210.** Spur portion **220** likewise extends through bracket **192,** thus preventing rotation of rod **218.** Spring **222** is compressed between fixed ring **224** on rod **218** and bushing **226,** which is thereby urged against the rocker arm. Rod **218** is retained on rocker arm **210** by nuts **228.**

The elements are shown in the initial position, prior to actuation of the solenoid, in FIG. **18.** Rod **204** bears against rod **198,** preventing hangers **200** from sliding further down the rod. Upon actuation of the solenoid, arm **216** is moved upward, thereby rotating rocker arm **210** in a clockwise direction, as viewed in FIGS. **18–20.** Initial rotation moves rod **218** in a downward direction, but rod **204** does not move upward until screw **214** reaches the top of slot **208.** The elements are shown in FIG. **19** in an intermediate position of rotation of arm **210.** It will be noted that rods **204** and **218** are spaced by approximately the diameter of one of hangers **200.** Also, the end of rod **218** which moves down to engage rod **198** is tapered, thus facilitating movement thereof between two adjacent hangers.

Continued rotation of rocker arm **210** will bring the tip of rod **218** into contact with rod **198** and will then cause upward movement of rod **204.** As rod **204** is being moved upward, spring **222** is compressed. As seen in FIG. **20,** as rod **204** is raised to allow a hanger to slide off rod **198,** rod **218** blocks the path of the other hangers.

When the solenoid is deactuated the sequence of movement is reversed. As rocker arm **210** is rotated counterclockwise rod **218** remains in engagement with rod **198** as spring **222** expands. In the meantime, screw **214** has traveled back to the lower end of slot **208** and rod **204** is moved back into engagement with rod **198.** When rod **218** is raised back to the position of FIG. **18,** hangers **200** may slide as far as rod **204,** bu no further. Hangers carrying garments to be bagged may thus be fed one at a time, at proper intervals, to the bagging apparatus in response to actuation and deactuation of a solenoid, electrical operation of which is described later.

Referring now to FIGS. **21–24,** a suggested embodiment of the structure and operation of the mechanism for removing bagged garments from garment pole **30,** indicated generally in FIG. **1** by reference numeral **28,** is shown. Movement of vertically disposed air cylinder **230** is controlled by actuation of a solenoid valve, as disclosed in connection with FIG. **25.** Cylinder rod **232** carries support **234** to which box-like element **236** is affixed. Shaft **238** extends through opposite sides of element **236** and is keyed to pinion **240.** Rack **242** engages pinion **240,** as best seen in FIG. **23,** and extends through an opening in the top of element **236.** Shaft **244** is connected to the lower end of rack **242** and extends loosely through an opening in the bottom of element **236.** Spring **246** is compressed between the bottom of element **236** and fixed ring **248** at the top of shaft **244.** Thus, rack **242** is normally held by spring **246** at the upper limit of its movements defined by stop **250** on the lower end of shaft **244.**

Pickup member **252** is attached to a portion of shaft **238** and includes a horizontally disposed edge, having groove **254** therein, and edge **256** which is sloped with respect to the horizontal. When garment pole **30** is moved to the discharge position, groove **254** of pickup member **252** is located directly under the hooked end of hanger **200** on the garment pole. Upon upward movement of rod **232** of cylinder **230,** member **252** engages and lifts hanger **200** and the bagged garment supported thereon. The elements are shown in FIG. **21** just as the hanger has been picked up and lifted a very short distance. Cylinder **230** continues to extend rod **232** until the top of rack **242** contacts a fixed stop which includes switch **258** on arm **260,** as shown in FIG. **22,** extending from frame **22** or some other convenient location. Switch **258** will be shown schematically and its function described later. A small amount of additional travel while rack **242** is held stationary will rotate pinion **240,** and thereby shaft **238** and pickup member **252.** The amount of additional travel of the cylinder while rack **242** is held stationary is that required to rotate shaft **238** by 180°, and is defined by fixed stop **261** on rack **242** contacting the top of element **236,** as shown in FIG. **22,** Thus, at the uppermost limit of travel of cylinder **230,** the elements are in the position of FIG. **22,** with edge **256** of member **252** on top. Hanger **200** can then slide off member **252** and onto one end of rod **262,** positioned adjacent the tip of member **252** at the

top of its travel. The travel of cylinder **230** is sufficient, of course, to remove the bottom of the garment bag from the top of garment pole **30.** The hangers may slide down rod **262** to further automatic handling or conveying apparatus, or may accumulate on racks, or the like, for further manual handling.

Referring now to FIG. **25,** all electrically operated portions of the apparatus are shown in schematic form. The power supply, indicated in the drawing as 115 volts AC is connected through appropriate fuses **264** to one or more transformers such as that indicated by reference numeral **266** to change the line voltage as required for the components used. The same reference numerals are used to designate portions shown schematically in FIG. **25** as are used to designate the same portions shown physically in other figures. In addition to the electrical power supply, a compressed air supply at approximately 40–60 p.s.i. is required.

The operator first closes switch **46** and allows a sufficient time for the heat seal elements to warm up. In the meantime, the operator may place a supply of garments on hangers on rod **198** of automatic loader **26,** making sure that the hangers are not crossed or tangled. Switch **47** is then manually closed to start vacuum unit **54** and the leading end of the bagging material is opened and one side applied against the opposing faces of the two vacuum bars.

Garment pole **30** is assumed for purposes of explanation to be initially in the bagging position, and the operator manually presses the button on panel **50** to close switch **52.** This supplies power to the four-way solenoid valve controlling air supply to cylinder **64.** The valve is indicated in FIG. **25** by reference numeral **268** and the power supplied through switch **52** actuates the valve to cause inward movement of the cylinder, thereby moving pole **30** to the loading position. When pole **30** reaches the loading position the lower end thereof contacts and closes switch **84,** as shown in FIG. **4,** thereby supplying power to coil **270** of the solenoid which moves arm **216** (FIGS. **17–20**) to allow a hanger to be transferred to the garment pole. Closing of switch **84** likewise actuates electronic timer **272** which is adjustable to allow control of the time interval for which garment pole **30** will remain in the loading position.

Upon expiration of the time interval set on timer **272,** contacts **274** are closed to supply power to four-way valve **268,** this time actuating the valve **268,** this time actuating the valve to move cylinder **64** outwardly. When the lower end of pole **30** contacts stop **72** of latch bar **68** the pole will be stopped in the bagging position. The operator may now reach up with both hands grasp the open end of bagging material **36,** and pull it down over the garment. After the material is manually pulled down the desired distance the operator simultaneously presses the two push-buttons which actuate switches **48** and **53** to supply power to valve **276** controlling the air supply to cylinder **90** (FIG. **6**). Power supplied through switches **48** and **53** actuates the valve to cause inward movement of the cylinder, thereby moving the movable web-engaging element toward the stationary element and sealing and cutting the material in the manner previously described.

One of the two series-connected switches, in the illustrated embodiment switch **48,** is a double pole type having normally closed and normally open contacts. Relay **278** is in an actuated condition with its normally open contacts closed prior to operator actuation of switches **48** and **50.** The normally closed contacts of switch **48** provide a holding circuit for relay **278.** While the contacts of relay **278** are closed, power is provided to three-way air valve **280** which is interposed in the air line between the pressure supply and the side of four-way valve **276** controlling the air supply for the outward stroke of cylinder **64.** The power supplied through relay **278** holds valve **280** open; thus, when the relay is deactuated by movement of switch **48** to the normally open contacts, valve **280** is closed, cutting off the air supply through valve **276** to cylinder **64.** Garment pole **30** will then be standing in the vertical (bagging) position without air pressure on the pole pivot cylinder.

Movement of the swing bar (FIG. **6**) or slide bar (FIG. **12**) mechanism to the full extent of its inward travel to seal and cut the material in the manner described, closes the contacts of switch **282.** This supplies power to actuate valve **276** to supply air pressure moving cylinder **90** in the inward direction, thereby moving the web-engaging elements back into spaced relation. The new leading end formed when the web is cut will be opened by the vacuum faces and the individual bag formed by the sealing and cutting operation is released. The bag may now be manually pulled down the few remaining inches over the garment with the top of pole **30** and hanger **200** extending through the unsealed area of the material which was between the two sets of heated prongs.

The operator now presses switch **49** on panel **44.** This switch has two sets of normally open contacts, closure of one set supplying power to actuate solenoid **76** (see also FIG. **5**) and of the other set providing actuating current to the coil of relay **278.** Actuation of solenoid **76** removes stop **72** from the path of the lower end of pole **30** and actuation of relay **278** again opens valve **280** to provide air pressure through valve **276** for moving cylinder **64** in the outward direction. The provision of relay **278** and valve **280** prevents the more severe shock which would occur in moving pole **30** to the discharge position if constant air pressure were supplied tending to move cylinder **64** to the outward or extended position.

When pole **30** arrives at the discharge position the lower end actuates switch **82** (see also FIG. **4**), closing the contacts thereof and providing power to actuate air valve **284** which controls the supply of air pressure to cylinder **230** (FIGS. **21–24**). The cylinder rod will thus move upward, removing the hanger and bagged garment from the end of pole **30,** until it reaches the upper limit of its travel. When the top of rack **242** contacts switch **258,** power is again supplied to valve **268** to move it in the direction providing air pressure to move cylinder **64** in the inward direction. Pole **30** will then be rotated all the way from the discharge to the loading position. Initial movement of pole **30** will release switch **82,** thereby deactuating valve **284** and removing air pressure from cylinder **230,** allowing pickup member **252** to return to the lower position.

Movement of pole **30** to the loading position will again close switch **84,** actuating garment feeder solenoid **270** and timer **272.** The pole will then automatically return to the bagging position and the cycle is repeated. It will be noted that switches **46** and **47** are turned on when use of the apparatus begins and do not thereafter require actuation. Switch **52** is also actuated only once, to effect initial movement of pole **30** to the

loading position; thereafter the pole is automatically moved from the discharge back to the loading position. Thus, the only repeated operations required of the operator are pulling the bagging material down over the garment in the bagging position, simultaneously actuating switches **48** and **53**, and actuating switch **49**. The timing of each cycle is under the operator's control, thereby allowing the operator to work at a desired pace, but the automation of the handling of the garments and the cutting and sealing of the bagging material greatly increases the number of garments which a single operator can bag per unit of time.

What is claimed is:

1. Apparatus for sequentially forming individual bags, closed at the sides and one end and open at the other end, from a continuous, tubular web of material and for assisting in sequential application of such bags to a succession of garments supported on hangers, said apparatus comprising, in combination:

a. support means having an upper portion for receiving and holding a hanger with a garment thereon;
b. means operable to move at least said upper portion of said support means sequentially through at least three laterally distinct positions;
c. means engaging and holding open the leading end of the tubular web in an initial position above one of said positions of said upper portion;
d. guide means establishing the path of the web from a supply location through said initial position as the leading end is drawn downwardly therefrom; and
e. means selectively operable to effect a transverse seal between the sides of the tubular web and to sever the web adjacent the seal, thereby forming an individual bag and a new leading end of the web.

2. The invention according to claim **1** wherein said support means comprises a pole which is substantially vertically disposed at least in said one position of said upper portion.

3. The invention according to claim **2** wherein said pole is pivotally mounted at a lower portion for movement of said upper portion through said three positions, the other two being on opposite sides of said one position.

4. The invention according to claim **3** and further including means for placing a hanger on said pole when the latter is on one side of said one position, and means for removing said hanger from said pole when the latter is one the other side of said one position.

5. The invention according to claim **3** wherein said pole is movable by a cylinder connected thereto below the pivotal mounting thereof.

6. The invention according to claim **3** wherein said pole is movable from said one position to another position in response to operator actuation, and thereafter movable automatically to the last position and back to said one position.

7. The invention according to claim **1** wherein said selectively operable means comprise a pair of relatively movable units between which said web is constrained by said guide means to pass, and which move into engagement with one another with said web therebetween upon actuation of said selectively operable means.

8. The invention according to claim **7** wherein said selectively operable means are actuated by simultaneous manual engagement of a pair of members spaced sufficiently to require the use of both hands for such simultaneous engagement.

9. The invention according to claim **8** wherein said pair of members comprise the manually engagable portions of electrical switches.

10. The invention according to claim **1** wherein said means selectively operable to sever the web comprises a pair of superposed knife edges movable through the plane of the web, to effect severing thereof, and simultaneously movable laterally with respect to one another in sickle blade fashion.

11. Semi-automatic apparatus for applying plastic bags to individual garments on hangers in a continuous sequence, the bags being formed by said apparatus from a continuous tubular web of plastic material, said apparatus comprising, in combination:

a. a pole having a notched upper end for receiving a garment hanger;
b. means mounting said pole for movement between first, second and third laterally distinct positions of said upper end;
c. loader means operable to automatically feed a single hanger from a supply thereof for engagement on said upper end when said pole is in said first position;
d. guide means establishing the path of the web from a supply position to a position of the loading end above said second position of said pole, whereby said web may be drawn downwardly over a garment suspended on a hanger on said upper end when said pole is in said second position;
e. ejection means operable to automatically remove a hanger from said one end when said pole is in said third position; and
f. manually engagable switch means operable to move said pole from said second to said third position.

12. The invention according to claim **11** wherein said ejector means are automatically operable in response to said pole reaching said third position, and further including means for moving said pole from said third to said first position in response to movement of said ejector means to remove a hanger from said one end.

13. The invention according to claim **12** wherein said loader means are automatically operable in response to said pole reaching said first position, and further including means for moving said pole from said first to said second position upon expiration of a predetermined time interval after reaching said first position.

14. The invention according to claim **13** wherein said pole is pivotally mounted near its lower end for movement between said three positions, said pole being vertical in said second position and rotated in opposite directions from said second to said first and third positions.

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