Jan. 3, 1956 D. E. PRENVEILLE ET AL 2,729,270

PRESSURE SEALING APPARATUS

Filed March 24, 1954 5 Sheets-Sheet 1

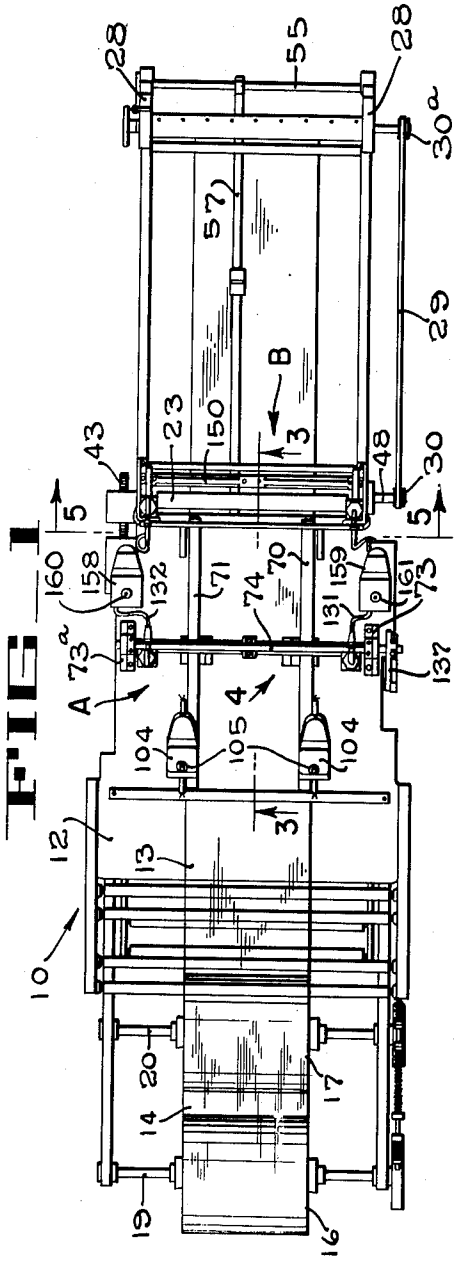

FIG. 1

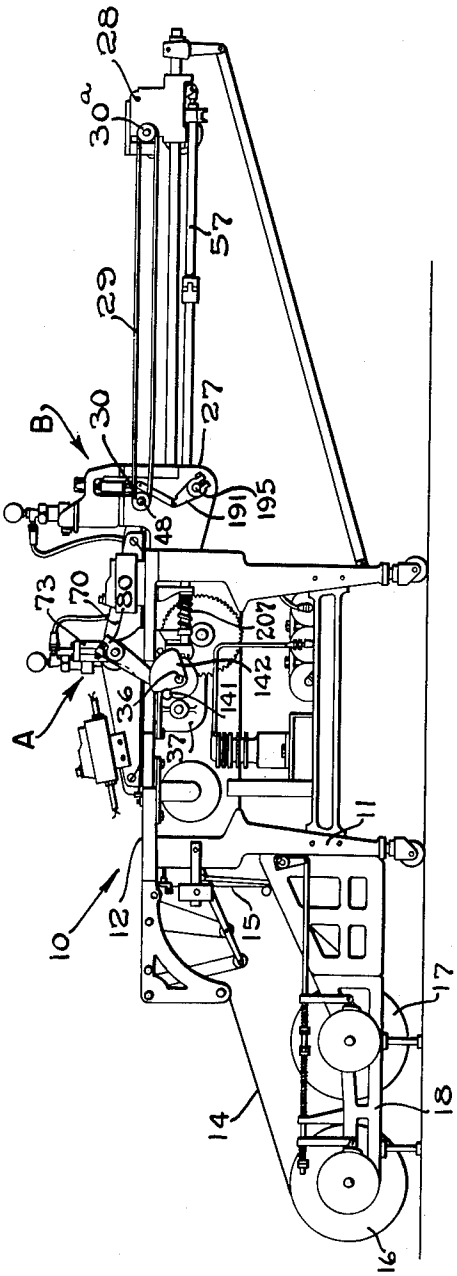

FIG. 2

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PRESSURE SEALING APPARATUS

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5 Sheets-Sheet 2

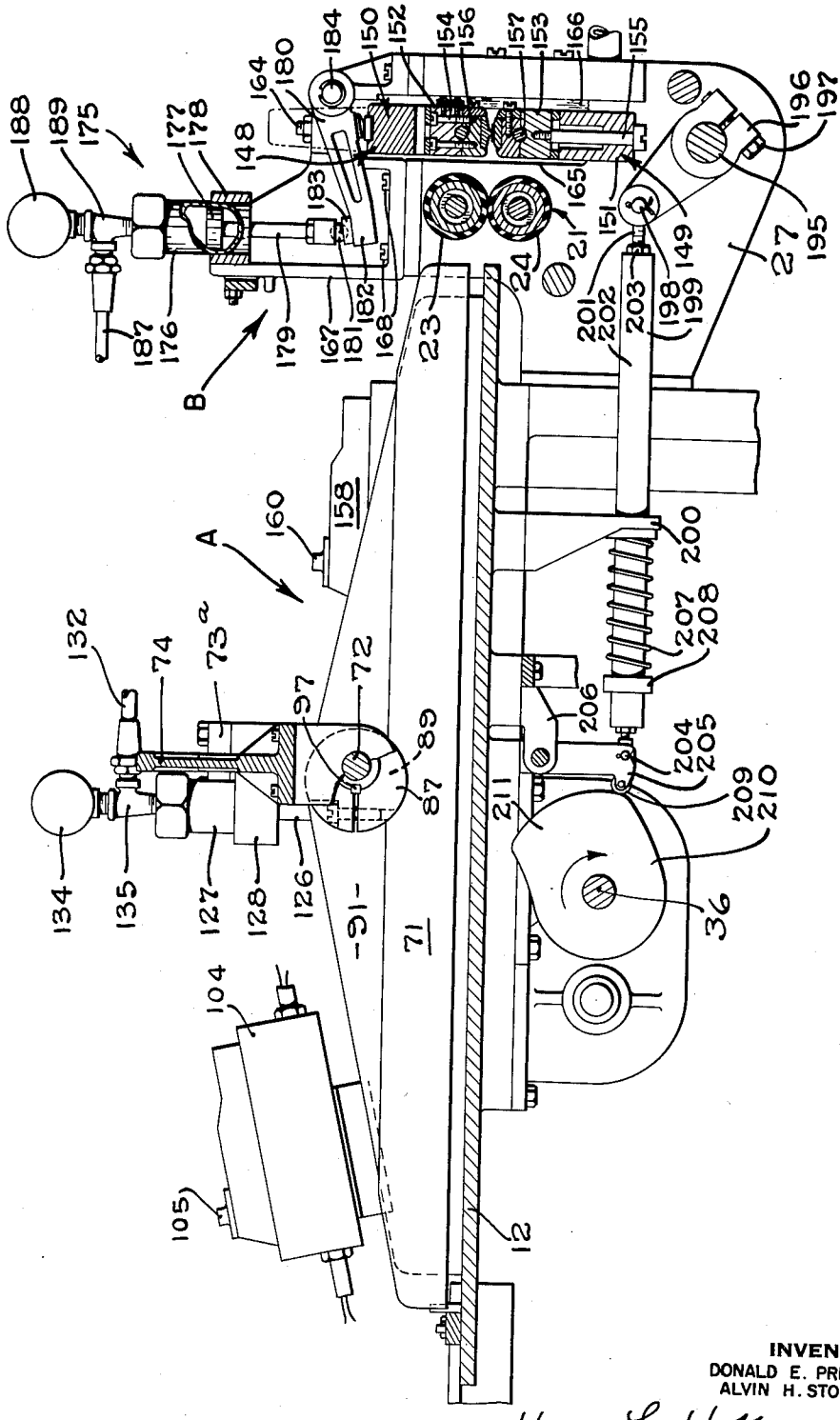

FIG. 3

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PRESSURE SEALING APPARATUS

Filed March 24, 1954

5 Sheets-Sheet 3

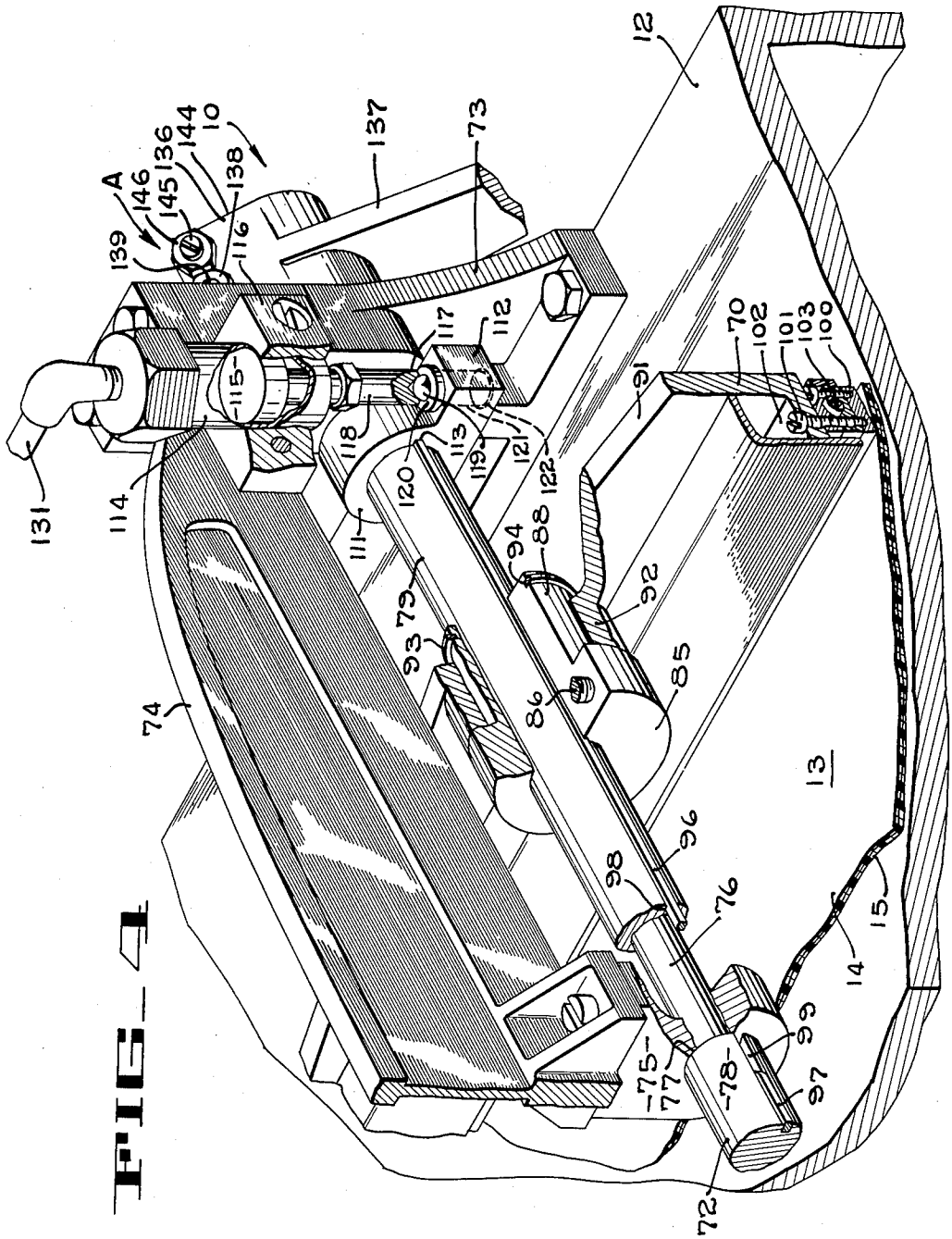

FIG. 4

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PRESSURE SEALING APPARATUS

Filed March 24, 1954 5 Sheets-Sheet 4

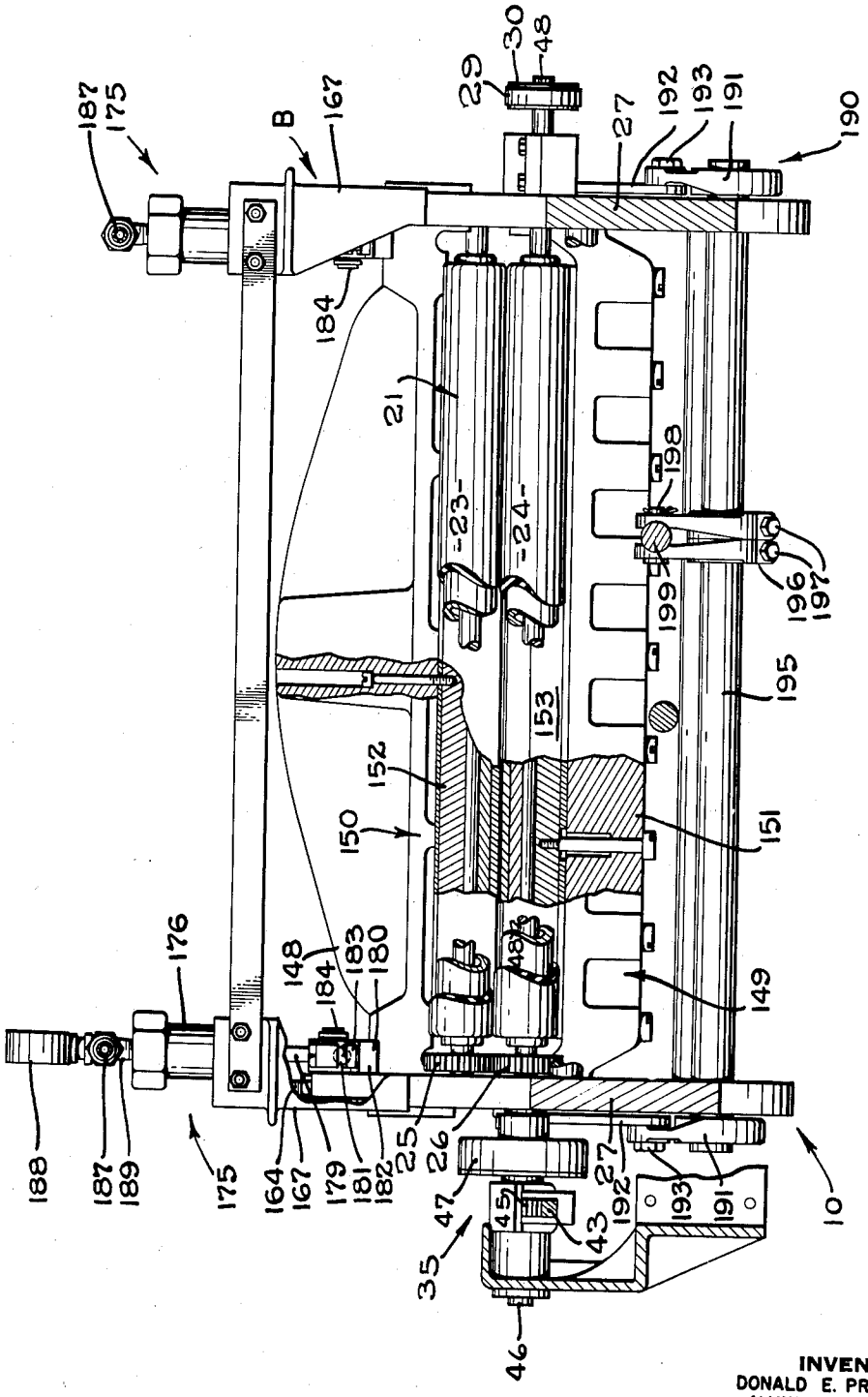

FIG_5

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PRESSURE SEALING APPARATUS

Filed March 24, 1954 5 Sheets-Sheet 5

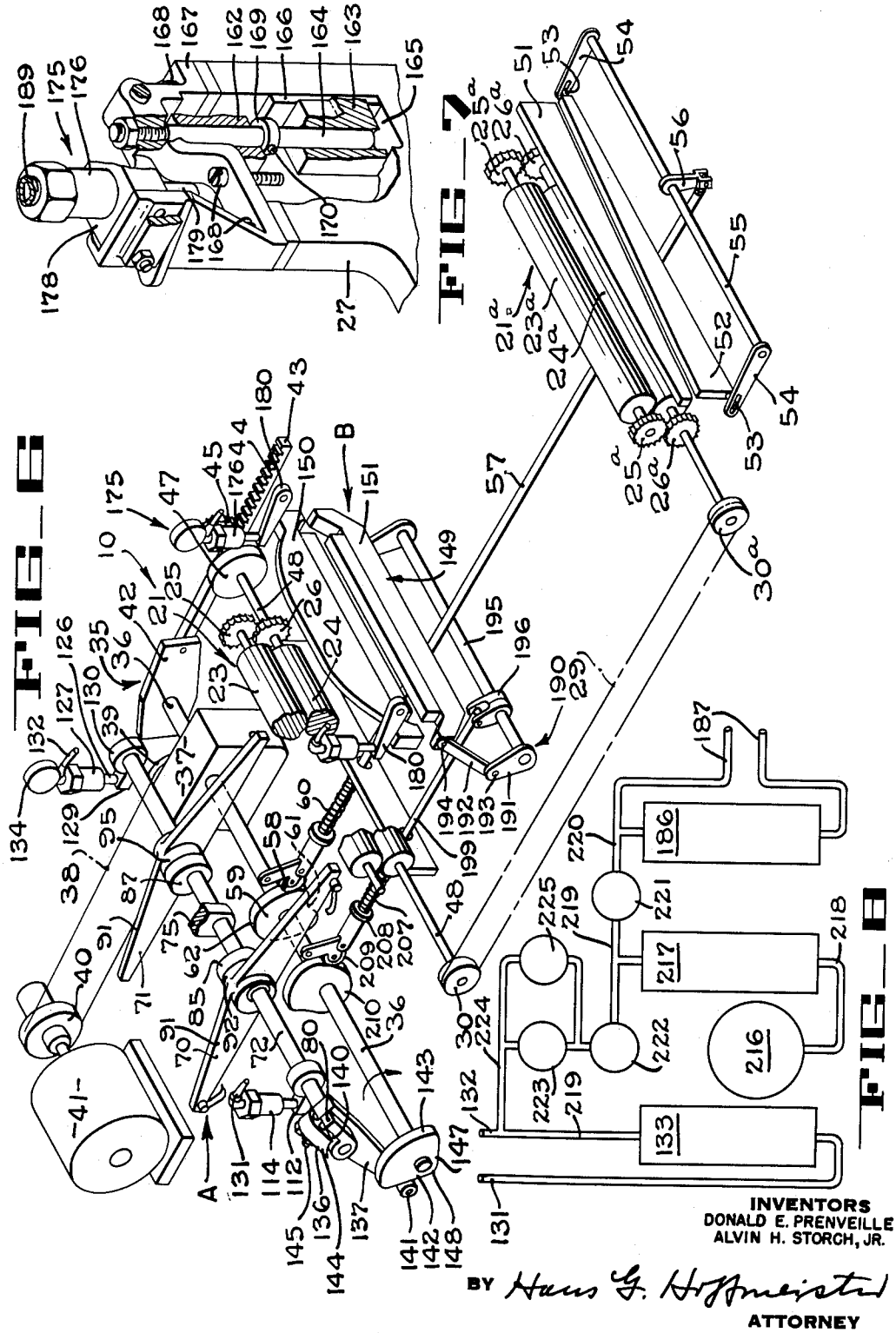

FIG. 7

FIG. 6

FIG. 8

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United States Patent Office 2,729,270 Patented Jan. 3, 1956

2,729,270

PRESSURE SEALING APPARATUS

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Application March 24, 1954, Serial No. 418,438

22 Claims. (Cl. 154—42)

This invention relates to machines for fabricating articles such as bags by uniting sheets composed of or coated with pressure sensitive material, and more particularly to apparatus for applying pressure to such sheets to seal them together.

An object of the invention is to provide novel means for applying pressure to sheet material in performing a sealing operation thereon.

Many of the plastic sheet materials now commonly employed in the manufacture of bags, require control within relatively narrow limits, of the pressure with which they are engaged by sealing members such as the pressure shoes of a bag making machine. This is particularly true in the case of heated sealing shoes used in forming bags by welding together sheets of a thermo-setting plastic such as Vinylite or polyethylene.

It is, therefore, another object of the present invention to provide actuating means, for bag making pressure shoes, adapted to automatically exert a force of predetermined magnitude in applying a pressure shoe to the sheet material.

Another object is to provide heated pressure shoe actuating means regulable to permit predetermination within close limits of the pressure exerted by the same.

Another object is the provision of actuating mechanism for a pressure-sealing shoe, characterized by uniformity in the force exerted by the mechanism throughout the entire range of movement of the same.

Another object is to provide means for adjusting the pressure shoe actuating mechanism over a range sufficiently wide to adapt it for use in connection with sealable materials whose optimum sealing pressures differ from one another to a considerable extent.

Other objects and advantageous features of the invention will become apparent from the following description and the drawings in which:

Figure 1 is a plan of a bag forming machine employing pressure shoe actuating means constructed in accordance with the present invention.

Figure 2 is a side elevation of the bag forming machine of Fig. 1.

Figure 3 is an enlarged fragmentary section taken along the line 3—3 of Fig. 1.

Figure 4 is a fragmentary perspective of one of the longitudinal sealing members and the actuating mechanism therefor viewed in the direction of the arrow 4 of Fig. 1.

Figure 5 is an elevation, partly broken away, of the transverse sealing member and the actuating mechanism therefor, taken along the line 5—5 of Fig. 1.

Figure 6 is a diagrammatic perspective of the machine of Figs. 1 and 2.

Figure 7 is an enlarged fragmentary perspective detail view.

Figure 8 is a diagram of the compressed air supply and regulating system.

The inveniton contemplates actuating mechanism for the pressure shoes of a machine for fabricating articles from

pressure sensitive sheets, and is illustrated for exemplary purposes in operative association with a machine for fabricating bags from two superimposed, continuous webs of sheet material by welding the sheets together along appropriately positioned seam lines and, upon completion of the requisite seam or seams, shearing the webs to sever the completed bag from its parent stock. The stock may be of flattened tubular form, presenting bag stock comprising two plies integrally joined along both lateral edges, in which case it is necessary only to provide transverse sealing means to seal the plies together along the line corresponding to the bottom of each completed bag. Alternatively, two separate sheets of parent stock may be used, requiring, in addition to the end-defining transverse seal, two longitudinal seals having their web-engaging portions spaced apart by a distance corresponding to the width of the completed bags, and whose function it is to seal the lateral edges of the bags. The stock may be composed of, or may be coated with, a suitable pressure sensitive material; and if this material is of the thermo-setting variety, such as Vinylite or polyethylene, the plies can readily be caused to adhere to each other along the desired seam lines, and only at those locations, by applying heat and pressure to the stock along those lines without the necessity for making provision to prevent adhesion at other contacting areas of the plies.

The pressure shoe actuating mechanism has been illustrated in the drawings in operative association with a machine for making bags from two separate superimposed sheets of heat sealable material, such as polyethylene. Inasmuch as the constructional and operational details of the web-advancing portions of the bag making machine do not constitute a portion of the invention, it will suffice herein to describe the web-advancing mechanism with only that degree of particularity necessary to convey an understanding of how the two-ply web is supplied to the pressure shoes actuated by the mechanism of the invention, and is removed from the shoes upon completion of the sealing operations on the web.

The bag making machine is indicated in its entirety at **10**. As illustrated in Figs. 1 and 2 it comprises a frame **11** supporting a horizontal bed plate **12** across the upper surface of which is drawn a web **13** composed of two continuous, superimposed plies **14** and **15** of heat sealable material supplied from rolls **16** and **17** respectively, rottatably supported from an extension **18** of the frame **11**, by mandrels **19** and **20**. As illustrated diagrammatically in Fig. 6 the web advancing means comprises two spaced sets **21** and **21***a* of draw rolls **23** and **24**, and **23***a* and **24***a*, respectively. The upper and lower rolls **23** and **24**, **23***a* and **24***a* of each set **21**, **21***a*, are interconnected by gears **25** and **26**, **25***a* and **26***a* (Figs. 5 and 6) for simultaneous rotation in opposite directions, so that the web **13**, engaged between the rolls **23** and **24**, and between the rolls **23***a* and **24***a*, will be advanced in accordance with the operation of the rolls. The rolls **23** and **24** of the first set are rotatably supported from opposed side plates **27** rigid with the frame **11** adjacent the after end of the bed plate **12**, and are so arranged that the web-engaging surfaces of the rolls are substantially in horizontal alignment with the upper surface of the bed plate **12**, so that the web **13**, in being drawn across the bed plate, lies flat on the upper surface of the same. The rolls **23***a* and **24***a* of the second set **21***a* are rotatably mounted in an extension **28** of the frame **11** at the delivery end of the machine, and are connected to the rolls **23** and **24** of the set **21** for simultaneous and corresponding rotation therewith by a belt **29** and pulleys **30** and **30***a* rigid with the rolls **24** and **24***a*, respectively.

The draw rolls of the two sets **21** and **21***a* are periodically actuated to advance the web **13** intermittently, the distance through which the web **13** is advanced during

each period of activity of the rolls corresponding to the desired length of the completed bags. The roll actuating mechanism, indicated in its entirety at **35** (Figs. 5 and 6) comprises a power shaft **36** driven at suitable constant speed by a speed reduction mechanism **37** which receives its motivating power by a belt **38** and pulleys **39** and **40** from a motor **41**. A crank **42** rigid with one end of the power shaft **36** imparts reciprocatory motion to a bar **43** having thereon rack teeth **44** constantly enmeshed with a pinion **45** carried by the input shaft **46** (Fig. 5) of a unidirectional clutch **47**, the output shaft **48** of which is rigid with the lower feed roll **24** of the first feed roll set **21**. The clutch **47** is constructed and arranged to impart rotation to the shaft **48**, and through it and the gears **25** and **26**, and the gears **25***a* and **26***a*, to the feed rolls **23**, **24**, **23***a*, and **24***a* in a manner to advance the web **13**, as the bar **43** is retracted by the crank **42**; but when the bar **43** is propelled, the rolls **23**, **24**, **23***a* and **24***a*, and consequently the web **13**, remain motionless.

The web severing mechanism for shearing each completed bag from the web **13** comprises upper and lower cutter blades **51** and **52**, respectively, mounted in position for the web **13** issuing from the second set **23***a* of draw rolls to pass between the blades. The upper blade **51** is rigid with the frame extension **28**, while the lower blade **52** is mounted by suitable guiding means (not shown) for vertical reciprocation in operative relation to the stationary blade **51**. Each end of the reciprocable blade **52** is provided with a pin **53** extending therefrom, and each pin **53** is engaged in a slot extending longitudinally in an arm **54**, the two arms **54** being rigidly affixed to a rock shaft **55** suitably journaled adjacent and parallel to the blade **52**.

A third arm **56** rigid with the rock shaft **55** is pivotally connected to one end of a rod **57** the other end of which is operatively connected to a cam follower **58** held against a cam **59** on the power shaft **36** by a spring **60**. The cam **59** is so shaped and is so positioned on the power shaft **36** that the follower **58** enters a depression **61** of the cam during each idle period of the draw rolls, permitting the spring **60** to move the rod **57** and thereby turn the shaft **55** to raise the lower cutter blade **52** to effect shearing from the web **13** the completed bag which issued from between the rolls **23***a* and **24***a* during the preceding operation thereof. The cam **59** is so proportioned that the follower **58** leaves the depression **61** and climbs onto a higher portion **62** of the cam, and thus effects retraction of the cutter blade **53** to clear the way for advance of the web **13**, prior to the next succeeding period of activity of the draw rolls.

In its advance along the bed plate **12**, the web **13** traverses first a longitudinal sealing station A, and thereafter, a transverse sealing station B (Figs. 1 and 2). At the former, two longitudinally extending sealing shoes **70** and **71** are mounted in transversely spaced, parallel relation above the bed plate **12**. Both shoes **70** and **71** are supported from a shaft **72** (Figs. 3 and 4) rotatably carried by upright brackets **73** and **73***a* (Figs. 1 and 2) rigid with and extending upward from the bed plate **12** at the lateral edges thereof. A bracing arch **74** interconnects the two brackets **73** and **73***a*; and an auxiliary bracket **75** suspended from the center of the arch **74** rotatably supports the shaft **72** above the longitudinal center line of the bed plate.

Approximately half the length of the shaft **72** is of reduced diameter, as indicated at **76** (Fig. 4), and the shoulder **77** between the portion **76** of smaller diameter and the portion **78** of larger diameter, abuts against one lateral face of the auxiliary bracket **75** and thereby restrains the shaft from shifting to the right as viewed in Fig. 4. A tubular shaft or quill **79** is rotatably fitted on the portion **76** of the shaft, and extends from the other lateral face of the auxiliary bracket and through the upright bracket **73**. The smaller portion **76** of the shaft **72** extends through and beyond the outboard end of the quill **79**, where it carries a dog **80** (Figs. 2 and 6) slidably engaging the end of the quill and thereby restraining the shaft **72** from shifting to the left as viewed in Fig. 4, and the quill from shifting to the right.

A radially split collar **85** (Figs. 1, 3 and 4) is clamped to the quill **79** by a screw **86** interconnecting the parts of the collar on opposite sides of the split; and a similar collar **87** (Fig. 1) is similarly clamped to the portion **78** of the shaft **72** between the side bracket **73***a* and the intermediate bracket **75**. Each collar **85**, **87**, is provided with a cylindrical portion **88**, **89** (Fig. 1), respectively, disposed eccentrically with respect to the quill **79** or shaft **72**, as the case might be, to which it is secured. Each of the sealing shoes **70** and **71** is provided with an upstanding web **91**. The shoe **70** is operatively connected to the quill **79** to be raised and lowered in response to rotative movement thereof by a horizontal cylindrical sleeve **92** journaled on the eccentric **88**. A snap ring **93** (Fig. 4) seated in a circumferential groove **94** in the eccentric retains the sleeve against lateral displacement from the eccentric. The shoe **71** is similarly operatively connected to the shaft **72** by a sleeve **95** (Fig. 1) journaled on the eccentric **89**.

Each collar **85**, **87** and its associated eccentric **88**, **89** are positively locked against rotation with respect to the actuating quill **79** or shaft **72**, respectively, by a key **96**, **97** (Fig. 4) seated in a keyway **98**, **99** in the quill **79** or shaft **72**, respectively, and slidably engaged within a relatively loosely fitting keyway in the bore of the associated collar and eccentric. Each of the keys **96** and **97** is elongated to permit the associated collar and eccentric to be shifted laterally after loosening the associated clamping screw **86**, so as to accommodate the sealing shoes **70** and **71** to the width of web **13** to be converted to bags.

Each of the sealing shoes **70** and **71** is provided with a pressure foot **100** secured to its lower edge by screws **101** (Fig. 4) extending through a horizontal flange **102** at the lower edge of the web **91**. Each pressure foot **100** has an electrically insulated resistance element **103** therewithin to heat the pressure foot to suitable sealing temperature by passage therethrough of electrical energy automatically controlled by a thermostat concealed within a housing **104** (Figs. 1, 2, and 3) mounted on the associated pressure shoe and carrying an adjusting knob **105** whereby the temperature of the pressure foot is regulable.

A collar **111** (Fig. 4) having a lever **112** extending therefrom is affixed to the quill **79** adjacent the side bracket **73**. The outboard end of the key **96** is seated within a keyway **113** in the bore of the collar **111** to positively lock the collar **111** to the quill **79** to prevent rotary movement of the one with respect to the other. Resilient pressure is exerted against the lever **112** in the direction causing the quill **79** to effect downward motion of the pressure shoe **91**. For this purpose, a pneumatic cylinder **114** having a piston **115** reciprocable therein, is mounted by means of a clamp **116** on the side bracket **73** directly above the collar **111**, in position for the cupped lower end **117** of the piston rod **118** actuated by pressure within the cylinder **114** to bear against a ball **119** seated in a cup **120** resting on the upper surface of the lever **112**. A shank **121** integral with the cup **120** extends downward into a socket **122** in the lever **112**, the socket **122** being of slightly greater diameter than the shank **121** to permit a sufficient amount of movement of the cup **120** to prevent binding of the parts otherwise apt to develop as the result of the arcuate motion of the lever **112** in response to straight line motion of the piston rod **118**.

The pressure shoe **71** on the other side of the machine **10** is similarly actuated by the rod **126** of a piston (not shown) reciprocable in a pneumatic cylinder **127** (Fig. 3) mounted by a clamp **128** on the side bracket **73***a*. The piston rod **126** likewise is provided with a

cupped lower end pressing a ball downward against a cup, which details are not shown but are similar in design and arrangement to the corresponding items described in connection with the actuating mechanism for the pressure shoe **70**. Figure 6, however, reveals the manner in which the piston rod **126** exerts its downward resilient pressure, derived from pneumatic pressure within the cylinder **127**, against a lever **129** extending from a clamp **130**, to urge the shaft **72** to rotate in that direction which effects downward motion of the sealing shoe **70**.

Both cylinders **114** and **127** are continuously supplied with compressed air at uniform, regulated pressure by tubes **131** and **132**, respectively, both of which lead from a supply tank **133** (Figs. 2 and 8), the capacity of which is ample to avoid any appreciable fluctuation in pressure in the tank **133** and cylinders **114** and **127** in response to motion of the pistons therein. Therefore, at all times during practical operation of the machine **10** a constant and uniform downward pressure is imposed on both levers **112** and **129**, which pressure is translated thereby into torque in the shaft **72** and the quill **79**, respectively. Thus, the two sealing shoes **70** and **71** are both pressed downward, with constant and substantially identical resilient pressure, toward the bed plate **12** which serves as a fixed, lower pressure sealing member or shoe, cooperating with both upper, movable pressure sealing members **71** and **72** to impose sealing pressure on the web **13** while heat is being applied to the same by the electrically heated pressure feet **100** in two parallel lines spaced apart by a distance corresponding to the desired bag width.

A pressure gauge **134** mounted on the fitting **135** by which the tube **132** is connected to the cylinder **127**, indicates the air pressure within both cylinders **114** and **127** above their respective pistons **115**.

Means are provided for lifting the pressure members **70** and **71** to permit advance of the web **13** engaged between each shoe and the bed plate **12**. Such raising of the pressure members **70** and **71** occurs at the proper time with relation to the operation of the feed roll actuating means **35**, and is accomplished by turning the shaft **72** and quill **79** in the reverse direction, i. e., against the yieldable pressure imposed pneumatically upon the levers **112** and **129**. The end of the quill **79** beyond which an end of the shaft **72** extends, as described hereinbefore, extends outboard beyond the side bracket **73** far enough to receive thereon a clamp **136** formed integrally with a release lever **137** (Figs. 1, 2, 4, and 6). The clamp **136** is rigidly affixed to the shaft in adjusted position with relation thereto, by a nut **138** tightened on a bolt **139** extending across a radial slot **140** (Fig. 6) in the clamp **136**. A cam follower roller **141** on the outer end of the release lever **137** is pressed against a cam **142** on the shaft **36**, due to the torque maintained on the shaft **72** by the pneumatic pressure within the cylinder **127**. The cam **142** is so located with respect to the feed roll actuating crank **42** that the follower **141** rides onto the high lobe **143** of the cam **142** a brief interval before the crank **42** starts to retract the rod **43**, i. e., just before the feed rolls are activated.

The clamp **136** is provided with a lateral extension **144** which carries an abutment screw **145** threaded therethrough in position to engage the aforementioned dog **80** on the shaft **72** and thereby impart like rotary motion to the shaft **72** when the quill **79** and clamp **136** are turned in pressure member lifting rotation. The abutment screw **145** is preferably adjusted to, and retained by a lock nut **146** in, that position wherein the screw **145** is spaced slightly from the dog **80** when both pressure members **70** and **71** are in their fully lowered position. The clearance thus established between the screw **145** and the dog **80** permits the two pressure members **70** and **71** to press against the web **13** independently of each other, assuring that the full force of each pneumatic cylinder **114**, **127** will be imposed upon the individually associated pressure members **70**, **71**, respectively. This assists, therefore, in causing both pressure shoes to exert identical pressure against the web **13**.

The parts are so proportioned and arranged that as the low lobe **147** of the rotating cam **142** approaches the follower roller **141**, both pressure members **70** and **71** engage the web **13**, which, since it is supported on the bed plate **12**, arrests the downward stroke of the shoes **71** and **70** shortly before the portion **148** of the cam **142** of least radius reaches the follower roller **141**. As a consequence, clearance is established between the cam **142** and the follower **141** for an interval in each operational cycle of the machine **10**, and throughout this interval the pressure shoes **70** and **71** exert their full force, as determined by the pneumatic pressure within the two cylinders **114** and **127**, against the web **13**. Hence, the described arrangement of lifting cam **141** and lever **137** is an important factor contributing toward uniformity in the quality of the sealed material produced by the machine **10**.

At the transverse sealing station B, opposed upper and lower pressure sealing shoes **148** and **149**, respectively, are provided (Figs. 3, 5, and 6). Each of these pressure shoes **148** and **149** comprises a rigid backing member **150**, **151**, respectively, to which a heat and pressure applying head **152**, **153** is secured by screws **154**, **155**, respectively (Fig. 3). Each of the heat and pressure applying heads **152**, **153** is heated to sealing temperature by an electrical resistance element **156**, **157**, respectively, the temperature of which is automatically controlled by a thermostat concealed within a housing **158**, **159** adjustable by a knob **160**, **161** (Fig. 1).

The upper and lower sealing shoes **148** and **149**, respectively, are mounted adjacent the first set **21** of draw rolls **23**, **24**, in position for the web **13** to pass between the shoes **148** and **149** immediately after passage between said rolls. Both shoes **148** and **149** extend transversely of the machine **10** and both are mounted for independent, vertical reciprocatory movement by having their ends **162**, **163**, respectively, slidably mounted on vertical pins **164** (Figs. 3 and 7). One such pin is rigidly supported from each of the side plates **27** within an opening **165** in the plate of sufficient size to permit freedom of movement of the shoes **148** and **149** without engagement of their ends **162** and **163** with the side plates. Preferably, however, a hardened slipper block **166** is seated within each of the openings **165** between the end **163** of the lower sealing shoe **149** and one side of the opening **165** to resist the side thrust imposed on the lower shoe **161** by its actuating mechanism, as will become apparent from the description to follow. The upper end of each guide pin **164** is threadedly engaged with a bracket **167** bridging the top of the opening **165** and rigidly secured to the associated side plate **27** by screws **168**. A collar **169** is fitted to each pin **164** for sliding movement thereon, and is adapted to be anchored in selected position of vertical adjustment by a set screw **170**. The two collars are set in such positions on their respective pins **164** that they prevent downward movement of the upper sealing shoe **148** beyond that position in which the lowermost portion of the heat and pressure applying head **152** is substantially in horizontal alignment with the upper face of the bed plate **12** and with the contacting faces of the feed rollers **23** and **24**.

Pneumatically actuated means **175** are provided for yieldably pressing the upper sealing shoe **148** downward to its lower limit of motion. For this purpose, a pneumatic cylinder **176** having a piston **177** reciprocable therein (Fig. 3) is mounted by a clamp **178** on each of the brackets **167**. The rod **179** of each of the pistons **177** exerts downward pressure against the outer end of a lever **180** through an anti-friction ball **181** seated in the cupped lower end **182** of said rod and in a cup **183** engaged upon the lever **180** in a manner similar to that in which each of the cups **120** is seated on its associated lever **112**, as hereinabove described. The opposite end of each of the

levers 180 is pivotally supported from the associated bracket 167 by a pin 184; and both levers bear downward against the top of the upper sealing shoe 148 at points between the outer ends of the levers 180 and their pivot pins 184. Preferably, the point on each lever 180 where it engages the sealing shoe 148 is relatively close to the associated pivot pin 184, thus gaining a considerable mechanical advantage and making possible the exertion of the necessary pressure of the sealing shoe 148 against the web 13 with relatively low pneumatic pressure in the cylinders 176. Both cylinders 176 are adapted to receive air under regulated pressure from an accumulator tank 186 (Figs. 2 and 8) continuously connected to the upper ends of both cylinders 176 by tubing 187. As in the case of the tank 133, the accumulator tank 186 is of sufficient volumetric capacity to prevent any material fluctuation in the pressure of its contents in response to movement of the pistons 177 within their cylinders 176. A pressure gauge 188 connected to the fitting 189 by which the tubing 187 is connected to one of the cylinders 176 gives a constant reading of the air pressure within both cylinders 176 above their respective pistons 177.

The lower sealing shoe 149 is intermittently forced upward to press the web 13 against the heated head 152 of the upper shoe 148 by an actuating mechanism indicated in its entirety at 190. This is accomplished by cranks 191 operatively connected to the ends of the lower shoe 149 by connecting rods 192 pivoted as at 193 to the cranks and at 194 to the shoe 149 (Fig. 6). Both cranks 191 are rigidly secured to a rock shaft 195 suitably journaled in the side plates 27. One end of an arm 196 is clamped rigidly to the rock shaft 195 intermediately of the side plates 27 by clamping screws 197 (Figs. 3 and 5) and the other end of the arm 196 is pivoted by a pin 198 to one end of a two-part follower rod 199 slidably journaled in a bracket 200 rigid with and extending downward from the bed plate 12. One part 201 of the follower rod 199 is threaded into a socket in an end of the other part 202, to which it is locked in selected position of longitudinal extension by a lock nut 203. The opposite end of the part 202 is pivotally connected by a pin 204 to a link 205 pivotally suspended from a bracket 206 on the under side of the bed plate 12, so that a spring 207, under compression between the bracket 200 and a collar 208 on the follower rod 199, holds a follower roller 209 rotatably mounted on the link, against a cam 210 rigid with the power shaft 36.

The cam 210 is so positioned on the power shaft 36 that the high lobe 211 of the cam propels the follower roller 209 and rod 199 to the right as viewed in Figs. 2, 3 and 6, at the same time that the low lobe 147 of the cam 142 is approaching the follower roller 141 on the longitudinal seal releasing lever 137. Consequently, at the same time that the lever 137 is released to permit the two longitudinal sealing shoes 70 and 71 to be carried downward, the rock shaft 195 is turned clockwise as viewed in Figs. 2, 3 and 6, causing the cranks 191 and connecting rods 192 to force the lower transverse sealing shoe 149 upward. The construction and realtive proportions of the parts involved in this operation are such that the lower shoe 149 is raised far enough to not only press the web 13 against the sealing head 152 on the upper shoe 149 upward. The construction and relative propor- 169. In this manner, it is assured that the web 13 will be squeezed between the upper and lower transverse sealing shoes 148 and 149 with a force whose magnitude is determined by the pneumatic pressure within the cylinders 176; and this force remains constant regardless of the height to which the upper shoe 148 is lifted, provided only that it is not raised high enough for its ends 162 to encounter the brackets 167.

In addition to the hereinbefore mentioned longitudinal seal accumulator tank 133 and the transverse seal accumulator tank 186, the air supply and pressure regulating system (Figs. 2 and 8) includes an air compressor 216 driven by a suitable motor (not shown) and a receiver tank 217. The compressor is connected by tubing 218 to the receiver 217, and is equipped with a suitable automatic control switch (not shown) enabling the compressor to maintain air pressure within the receiver tank 217 higher than the pressure at which air is to be supplied either to the cylinders 114 and 127 of the longitudinal seal, or to the cylinders 176 of the transverse seal. The receiver tank 217 communicates with the longitudinal seal accumulator tank 133 through tubing 219, and with the transverse seal accumulator tank 186 through tubing 220. The tubing 220 leads to the transverse seal accumulator tank 186 through a manually adjustable pressure reducing valve 221; but inasmuch as the eccentrics 88 and 89 develop a considerably greater mechanical advantage in applying the force of the pneumatically actuated pistons to the sealing shoes 70 and 71 than do the levers 180 in applying such force to the sealing shoes 148 and 149, equalization of the pressures exerted by all the sealing shoes is facilitated by providing two pressure reducing valves 222 and 223 connected in series with each other between the receiver tank 217 and the longitudinal seal accumulator tank 133. The tubing 219 leads from the receiver tank 217 first to the reducing valve 222 which is adjustable to deliver air at pressures within a relatively high range, say, between 125 and 250 p. s. i. From the reducer valve 222, the tubing 219 leads to the reducing valve 223, which is adjustable to deliver air at pressures within a lower range, say, between 0 and 125 p. s. i. From the lower stage pressure reducer 223, the tubing leads to the longitudinal seal accumulator tank 133.

Under certain circumstances, however, it may be desirable to provide air for the cylinders 114 and 127 of the longitudinal seal, at pressure within the range of the first stage reducer 222; and for that reason a by-pass 224 is provided around the second stage reducer 223, and a shut-off valve 225 in the by-pass 224 may be opened to permit pressure within the range of the first stage reducer 222 to build up in the longitudinal seal accumulator tank 133 and cylinders 114 and 127.

In practical operation of the bag making machine, a two-ply web 13 of heat and pressure sealable material is engaged between the feed rolls 23 and 24, and between the feed rolls 23*a* and 24*a*. Both sets 21 and 21*a* of draw rolls are periodically actuated by the crank 42 and rod 43, to advance the web 13 through a distance corresponding to the desired bag length during each period of activity of the rolls. Upon termination of each such period and while the web 13 is motionless, the cam 142 turns its low lobe 147 to the follower roller 141, permitting the pistons 115 of both cylinders 114 and 127 to force the two longitudinal sealing shoes 70 and 71 downward. The web 13 is thus engaged between the bed plate 12 and the heated pressure feet 100 of both shoes 70 and 71 in two parallel lines defining the width of the bag being formed. The force of such engagement is proportional to the pneumatic pressure within the cylinders 114 and 127 and the longitudinal seal accumulator tank 133. This pneumatic pressure is established by proper setting of one or both of the reducing valves 222 and 223 and appropriate adjustment of the by-pass shut-off valve 221, as explained hereinbefore.

Substantially simultaneously with lowering of the longitudinal sealing shoes 70 and 71, the cam 210 presents its high lobe 211 to the follower roller 209, thereby effecting raising of the lower longitudinal sealing shoe 149 to press the web upward against the upper longitudinal sealing shoe 148 and, as explained hereinabove, lifting the upper shoe 148 off the collars 169. Thus the web 13 is engaged between the heated heads 152 and 153 of the upper and lower pressure shoes 148 and 149, respectively, with a force proportional to the pneumatic pressure within both cylinders 176 and the transverse seal accumulator

tank **186**, where the pressure is established by proper setting of the reducing valve **221**.

Whereas the reducer valves **221**, **222** and **223** are of any suitable conventional type, they should be of such design and construction that they are capable of maintaining the pressure within each of the accumulator tanks **133** and **186** constant within quite close limits, although pressure within one tank may be different from that within the other. Once the temperature and pressure requirements of the particular heat sealing material to be employed have been ascertained, the apparatus can be arranged to cause each of the pressure shoes **70**, **71**, **148** and **149** to exert the optimum pressure every time they operate, by a simple adjustment of the reducer valves **221**, **222** and **223**; and proper manipulation of the thermostat-adjusting knobs **105**, **160** and **161** results in heating the web-engaging portions **100**, **152** and **153** to the optimum temperature for the material of the web. Moreover, having once been set to effect engagement of the web by sealing members heated to precisely the proper temperature and with force of precisely the proper magnitude, the web-engaging portions of the sealing members will remain at that temperature, and the web **13** will be engaged by the sealing members at that same pressure at each operation thereof over an indefinite operational period.

While we have illustrated and described a particular embodiment of the present invention, it will be understood that varous changes may be made in the details thereof without departing from the scope of the invention as defined in the appended claims.

Having thus described the invention, what we claim and desire to protect by Letters Patent is as follows:

1. A pressure sealing apparatus comprising two opposed sealing members, means yieldably pressing one of said sealing members toward the other with substantially unvarying force, and means operable to force said sealing members apart.

2. A pressure sealing apparatus comprising two opposed sealing members, pneumatic means yieldably pressing one of said sealing members toward the other with force of constant predetermined magnitude, and means operable to force said sealing members apart.

3. Pressure sealing apparatus comprising two opposed sealing members, means mounting at least one of said sealing members for reciprocatory motion toward and away from the other, means yieldably pressing one of said sealing members toward the other, means operably associated with one of said sealing members for withdrawing the same from the other sealing member, and means maintaining uniform the magnitude of the force exerted on said one sealing member by the pressing means.

4. Pressure sealing apparatus comprising opposed sealing members, means mounting at least one of the sealing members for movement toward and away from the other, pneumatically operable means for yieldably pressing one of the sealing members toward the other, means constantly supplying the pressing means with actuating fluid under uniform pressure, and means operatively associated with one of the sealing members for temporarily moving the same away from the other.

5. Pressure sealing apparatus comprising opposed sealing members, means mounting at least one of the sealing members for movement toward and away from the other, pneumatic means yieldably pressing a movably mounted one of the sealing members toward the other with pressure substantially uniform throughout the operational cycle of the sealing apparatus, regulating means operably associated with said pneumatic means and adjustable to vary the pressure imposed thereby on said yieldably pressed sealing means, and means operatively associated with a movably mounted one of the sealing members for temporarily moving the same away from the other.

6. Pressure sealing apparatus comprising relatively movable opposed sealing members adapted to receive therebetween superimposed webs of material to be sealed, fluid operated means operatively associated with one of said sealing members to press the same into sealing engagement with webs interposed between the sealing members, powered mechanism operatively associated with one of said sealing members to temporarily force the same away from the other sealing member to release the webs, and means independent of said powered mechanism for supplying the fluid operated means with actuating fluid under pressure.

7. In apparatus for forming a seal between superimposed webs, including relatively movable sealing members disposed at opposite sides of webs to be sealed and means for intermittently advancing the webs, the combination therewith of yieldable means continuously and uniformly pressing one of said sealing members toward the other to impose sealing pressure on the webs, and means operatively associated wth one of thet sealing members and operable prior to operation of the web-advancing means to space the sealing members apart and thereby release the webs therefrom.

8. In apparatus for forming a seal between superimposed webs, including relatively movable sealing members disposed at opposite sides of webs to be sealed and means for intermittently advancing the webs, the combination therewith of yieldable means continuously pressing one of said sealing members toward the other to impose sealing pressure on the webs, means limiting movement of said yieldably pressed sealing member by said pressing means, and means operatively associated with one of the sealing members and operable prior to operation of the web-advancing means to space the sealing members apart and thereby release the webs therefrom.

9. Sealing mechanism comprising opposed sealing members adapted to receive therebetween a web of material to be sealed, means mounting one of the sealing members for reciprocatory movement toward and away from the other, means yieldably pressing said movably mounted sealing member toward the other into sealing engagement with a web interposed between said sealing members, and means operatively associated with said movable sealing member for moving the same away from the other sealing member against the urgency of said pressing means to release the web.

10. In a sealing machine having two opposed sealing members, one of the sealing members being mounted for reciprocatory movement toward and away from the other, the combination therewith of pneumatic mechanism continuously and yieldably pressing the movable sealing member toward the other, powered mechanism for retracting the movable sealing member from the other sealing member against the urgency of said pneumatic mechanism, and means for periodically disabling said retracting means temporarily to permit advance of the movable sealing member to sealing relation with the other sealing member.

11. In apparatus for uniting plies of sealable material including two opposed sealing members adapted to receive therebetween superimposed plies to be united, means mounting one of the sealing members for reciprocative motion toward and away from the other, and means for intermittently advancing superimposed plies of sealable material extending between the sealing members, the combination therewith of pneumatic means arranged in cooperative association with the movable sealing member to continuously urge the same toward the other sealing member with a force of predetermined magnitude, and powered mechanism operatively connected to the movable sealing member and operable prior to each operation of the ply advancing means to retract the movable sealing member against the urgency of said pneumatic means and operable upon completion of each operation of said ply advancing means to release the movable sealing member for the same to be advanced by said

pneumatic means to sealing relation with the other sealing member.

12. A heat sealing machine comprising a stationary sealing member, a rotatably mounted shaft disposed in spaced relation to said stationary sealing member, an eccentric disc rigid with said shaft, a movable sealing member including a presser shoe and a flange upstanding therefrom having a circular opening therein, said eccentric disc being fitted to and seated within said circular opening to advance the movable sealing member to sealing relation with said stationary sealing member when said shaft turns in one direction and to retract the movable sealing member when the shaft turns in the other direction, means for heating the operative face of one of said sealing members to heat sealing temperature, a lever rigid with and extending radially from said shaft, a pneumatic cylinder fixedly mounted adjacent said shaft, a plunger reciprocable in said cylinder and extending therefrom into operative engagement with said lever to impart sealing member advancing rotation to said shaft upon movement of said plunger by pneumatic pressure within said cylinder, means maintaining predetermined pneumatic pressure within said cylinder, and means operable periodically to turn said shaft in sealing member retracting rotation against the urgency of said plunger.

13. Pressure sealing apparatus comprising two opposed sealing members, means mounting one of said sealing members in fixed position, means mounting the other of said sealing members for movement to and from sealing relation with said fixed sealing member, a shaft journalled on said fixed sealing member mounting means, an eccentric disc affixed to said shaft and fitted to a circular opening in said movable sealing member to advance said movable sealing member to sealing relation with said fixed sealing member when the shaft turns in one direction and to retract the movable sealing member when the shaft turns in the opposite direction, a crank lever rigid with said shaft, a pneumatic cylinder supported from said fixed sealing member mounting means, a plunger reciprocable in said cylinder and engaging said crank lever so as to impart sealing member advancing rotation to said shaft upon movement of said plunger in response to pressure within said cylinder, means connecting said cylinder with a supply of gas under pressure, a second crank lever rigid with said shaft, a cam follower carried by said second crank lever, a cam having a high lobe, said cam being rotatably mounted in cooperative relation with said second lever and cam follower to impart sealing member retracting rotation to said second lever and shaft as said high lobe approaches the follower, and means for rotating the cam.

14. Pressure sealing apparatus comprising two opposed sealing members, means mounting one of said sealing members in fixed position, means mounting the other of said sealing members for movement to and from sealing relation with said fixed sealing member, a shaft journalled on said fixed sealing member mounting means, an eccentric disc affixed to said shaft and fitted to a circular opening in said movable sealing member to advance said movable sealing member to sealing relation with said fixed sealing member when the shaft turns in one direction and to retract the movable sealing member when the shaft turns in the opposite direction, a crank lever rigid with said shaft, a pneumatic cylinder supported from said fixed sealing member mounting means, a plunger reciprocable in said cylinder and engaging said crank lever so as to impart sealing member advancing rotation to said shaft upon movement of said plunger in response to pressure within said cylinder, means connecting said cylinder with a supply of gas under pressure, a second crank lever rigid with said shaft, a cam follower carried by said second crank lever, a cam having a high lobe and a low lobe and rotatably mounted in cooperative relation to said second lever and cam follower to impart sealing member retracting rotation to said second lever and shaft as said high lobe approaches the follower, said low lobe being spaced from the axis of rotation of said cam by a distance less than the distance of said follower from said axis when said sealing members are in sealing relation, and means for rotating the cam.

15. A pressure sealing machine comprising a bed plate for supporting a web to be sealed, a rotatably mounted shaft above said bed plate, a sealing member mounted above said bed plate for reciprocatory up and down movement and adapted to impose sealing pressure on a web on the bed plate when the sealing member is at its lower limit of movement, means connecting said sealing member to said shaft to lower said sealing member in response to turning of said shaft in one direction and to raise said sealing member in response to turning of said shaft in the opposite direction, pneumatically operated means continuously and yieldably urging said shaft to turn in sealing member lowering direction, a crank lever rigid with said shaft, a cam follower carried by said crank lever, a cam having a high lobe and a low lobe and rotatably mounted in cooperative relation to said lever and cam follower to turn said lever and shaft in sealing member raising direction as the high lobe approaches the follower, said low lobe being spaced from the axis of rotation of the cam by a distance less than the distance of said follower from said axis when said sealing member is at its lower limit of movement, and means for turning said cam.

16. A pressure sealing machine comprising a bed plate adapted to support a web to be sealed, a spindle shaft rotatably mounted in spaced relation above said bed plate, a quill shaft rotatably mounted on said spindle shaft coaxially therewith with said spindle shaft extending beyond both ends of the quill shaft, a pressure shoe associated with each of said shafts, means connecting each of said pressure shoes to its associated shaft to raise said shoes when the associated shaft turns in one direction, independent means associated with each of said shafts for continuously and yieldably turning the same in the opposite direction, a crank lever rigid with one of said shafts, means for periodically turning said lever to turn the associated shaft in shoe raising direction, a dog rigid with the other of said shafts, and means on said lever for engaging said dog to turn said other shaft in shoe raising direction in response to turning of said lever in shoe raising rotation.

17. A pressure sealing machine comprising a bed plate adapted to support a web to be sealed, a spindle shaft rotatably mounted in spaced relation above said bed plate, a quill shaft rotatably mounted on said spindle shaft coaxially therewith with said spindle shaft extending beyond both ends of the quill shaft, a pressure shoe associated with each of said shafts, means connecting each of said pressure shoes to its associated shaft to be raised thereby when the associated shaft turns in one direction, independent means associated with each of said shafts for continuously and yieldably turning the same in the opposite direction, a crank lever rigid with one of said shafts, means for periodically turning said lever to impart to the associated shaft shoe raising rotation, a dog rigid with the other of said shafts, and means on said lever for engaging said dog to impart to said other shaft shoe raising rotation in response to turning of said lever in shoe raising direction, said dog and said dog-engaging means being spaced apart when said shoes are at the lower limits of their respective motions to free said shafts from each other for independent actuation of said pressure shoes by their respectively associated yieldable shaft turning means.

18. Pressure sealing apparatus comprising two opposed sealing members, means mounting each of said sealing members for reciprocatory movement toward and away from the other, means yieldably pressing one of said sealing members toward the other, means limiting move-

ment of said yieldably pressed sealing member toward the other, and means operatively associated with said other sealing members for positively advancing the same toward the yieldably pressed sealing member until the yieldably pressed sealing member is displaced from the position thereof determined by said limiting means.

19. A pressure sealing machine comprising two opposed sealing members, means mounting said sealing members for movement toward and away from each other, pneumatic means yieldably pressing one of said sealing members toward the other, abutment means constructed and arranged to interrupt movement of said yieldably pressed sealing member toward said other member, and means connected to said other sealing member and periodically operable to temporarily advance said other sealing member toward said yieldably pressed sealing member far enough to displace the same against the urgency of said pneumatic means from the position thereof determined by said abutment means.

20. In apparatus for uniting plies of sealable material, including two opposed sealing members adapted to receive therebetween superimposed plies to be united, means mounting each of said sealing members for movement toward and away from the other, and means for intermittently advancing superimposed plies of sealable material extending between the sealing members, the combination therewith of pneumatically actuated means operably connected to one of the sealing means to continuously press the same toward the other sealing means, means limiting movement of said continuously pressed sealing member by said pressing means; and mechanism operably connected to the other sealing member and operable between successive periods of advance of said plies to move said other sealing member toward the yieldably pressed sealing member far enough to squeeze the plies between the sealing members with sealing pressure and operable to retract said other sealing member to release the sealed plies from said sealing members.

21. A heat sealing machine comprising opposed sealing members, means mounting said sealing members for

reciprocative movement toward and away from each other, a pneumatic cylinder supported from said mounting means, a plunger including a piston reciprocable in said cylinder and a rod extending therefrom, means connecting said cylinder to a source of gas under pressure, means connecting one of the sealing members to said rod to be yieldably pushed thereby toward the other sealing member in response to pneumatic pressure imposed on the piston within the cylinder, means limiting movement of said yieldably pushed sealing member by said rod, and means operably connected to said other sealing member and operable to advance the same into sealing relation with said yieldably pushed sealing member and to retract said other sealing member from said yieldably pushed sealing member.

22. A heat sealing machine comprising opposed sealing members, means mounting said sealing members for reciprocative movement toward and away from each other, a pneumatic cylinder supported from said mounting means, a plunger including a piston reciprocable in said cylinder and a rod extending therefrom, means maintaining substantially constant predetermined pneumatic pressure within said cylinder, means connecting one of the sealing members to said rod to be yieldably pushed thereby toward the other sealing member in response to pneumatic pressure imposed on the piston within the cylinder, means limiting movement of said yieldably pushed sealing member by said rod, and means operably connected to said other sealing member and operable to advance the same into sealing relation with said yieldably pushed sealing member and to retract said other sealing member from said yieldably pushed sealing member.

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