Jan. 1, 1974 L. GOGLIO 3,783,080

APPARATUS FOR SECURING VALVES ON FLEXIBLE BAGS AND FLAT SHEETS CONVERTIBLE INTO BAGS

Filed Dec. 1, 1971 5 Sheets-Sheet 1

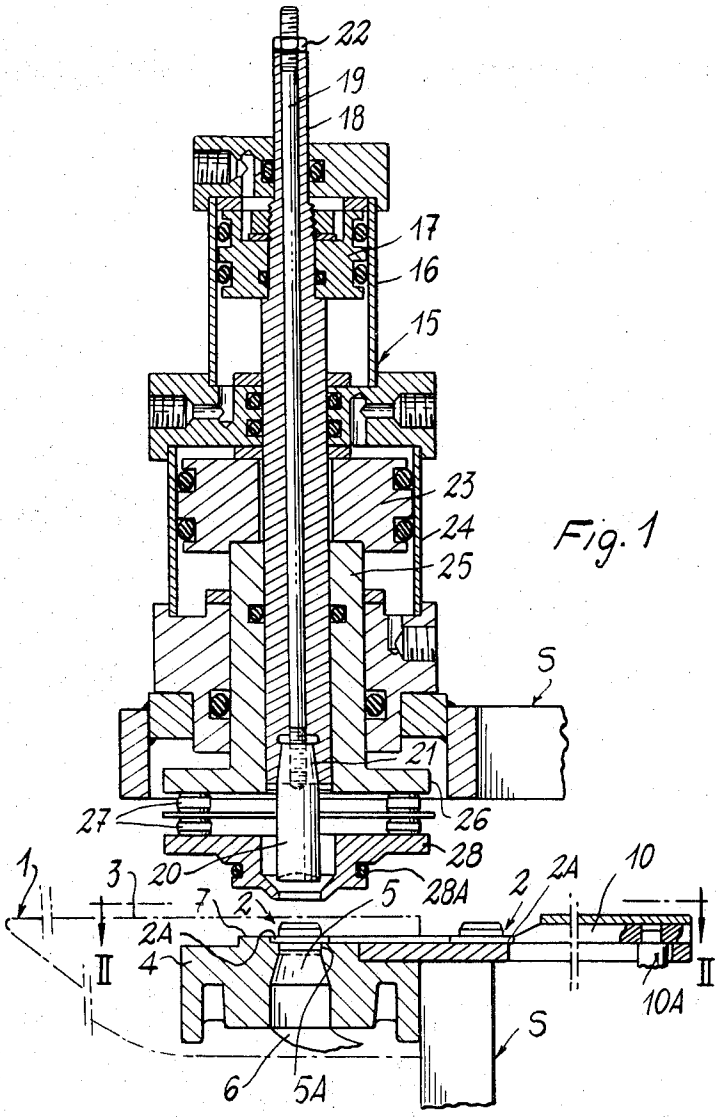



Fig. 1

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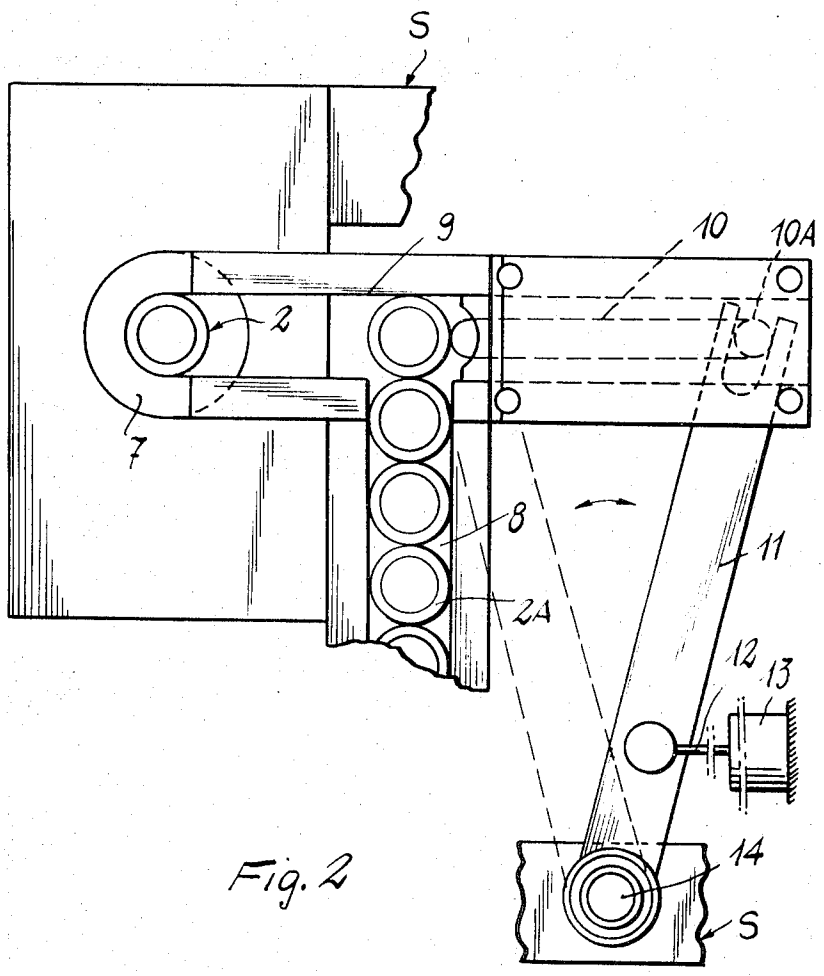



Fig. 2

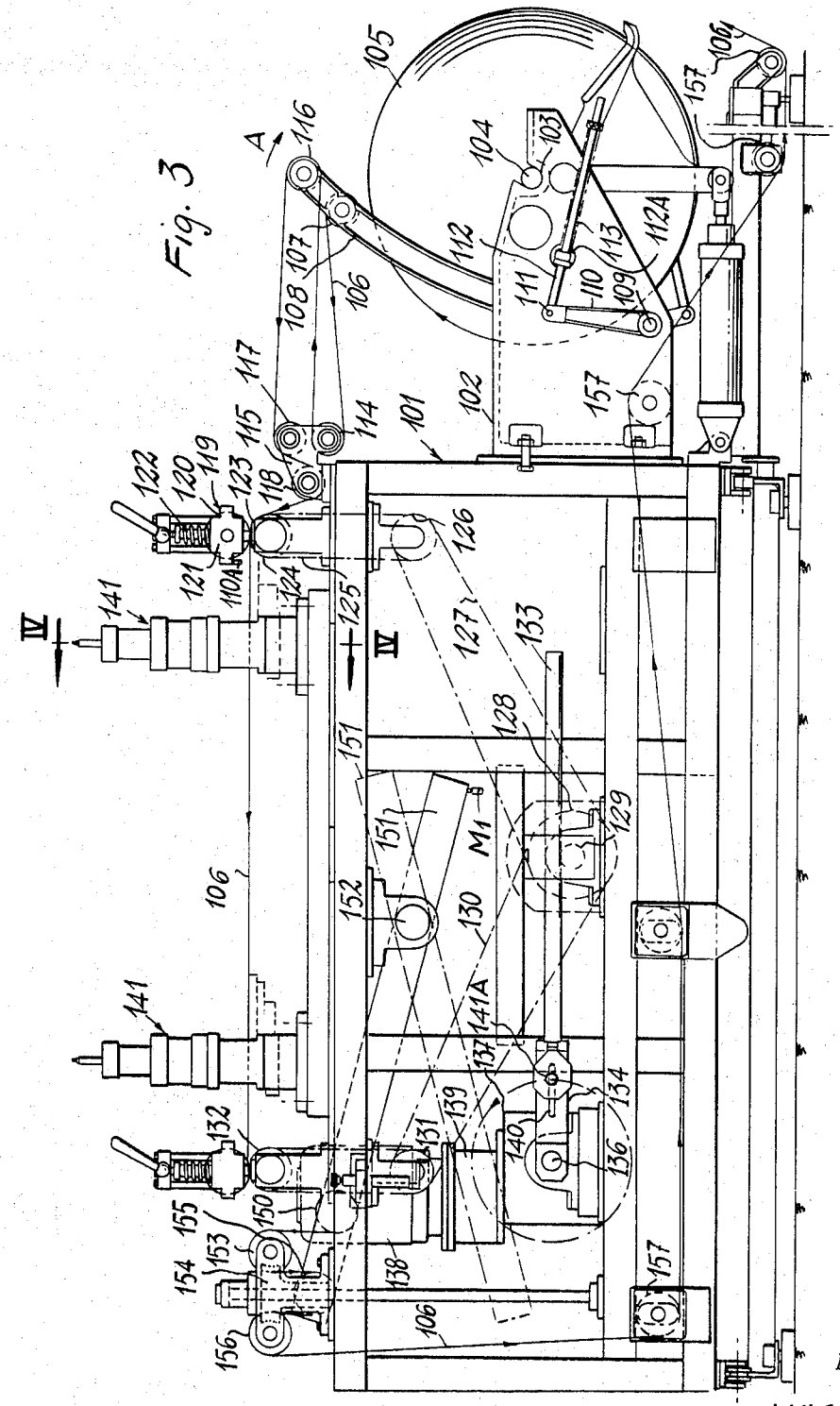
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Fig. 3




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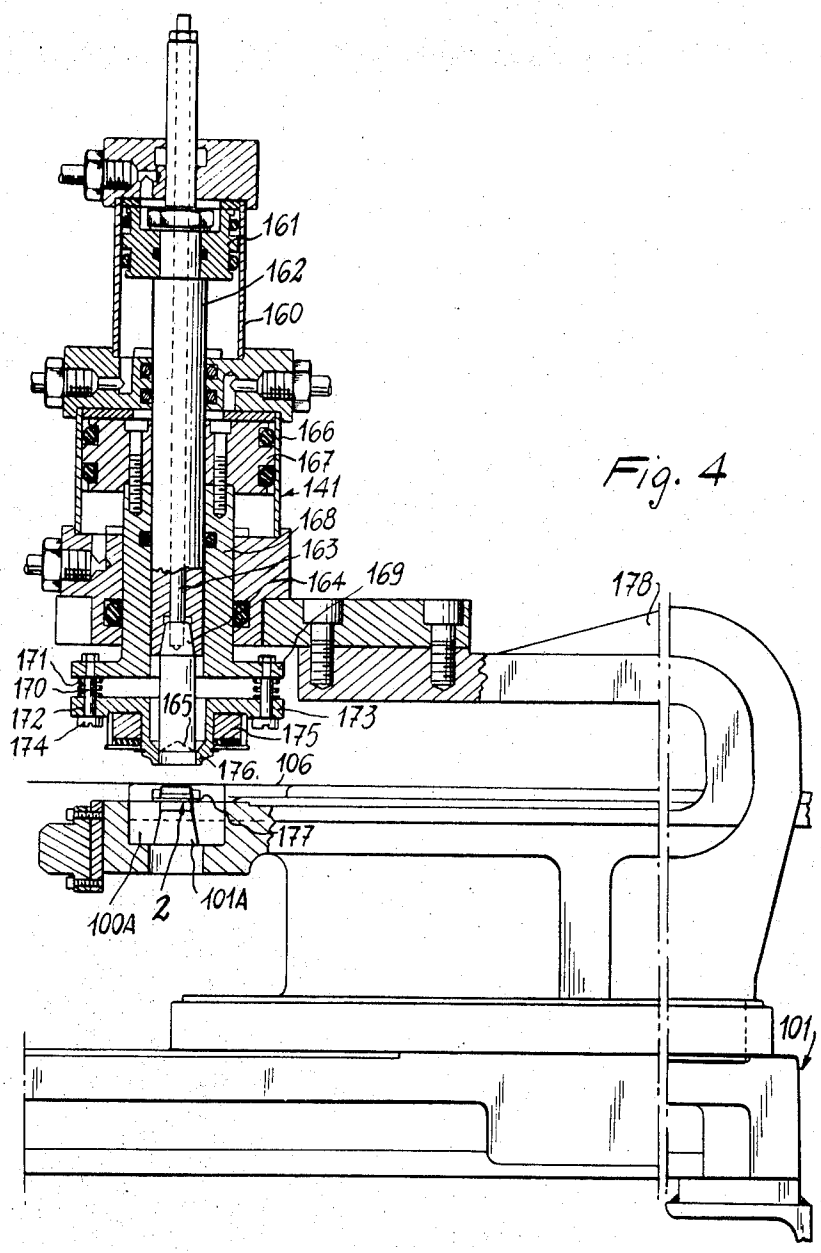



Fig. 4

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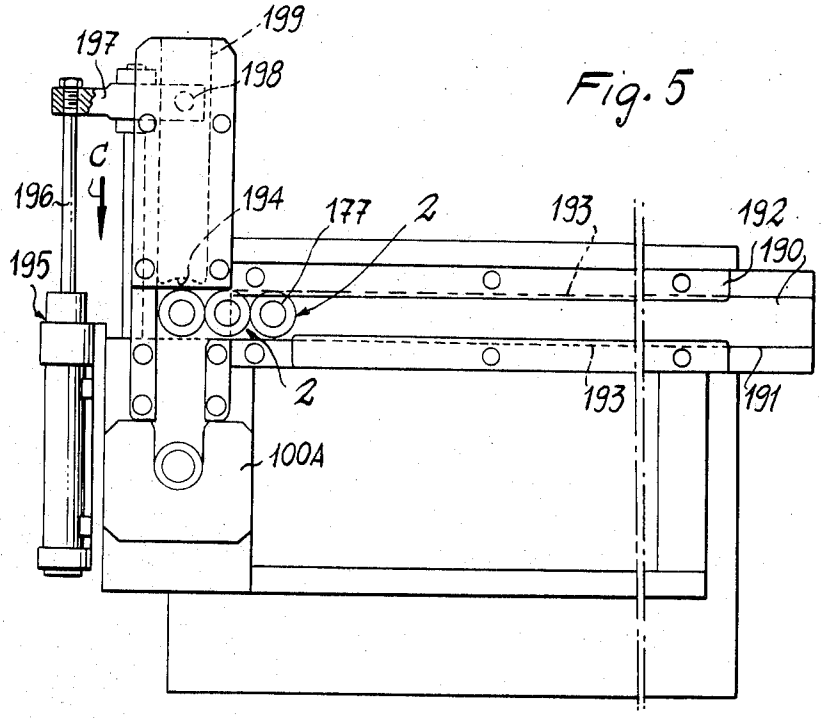



Fig. 5

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3,783,080

# APPARATUS FOR SECURING VALVES ON FLEXIBLE BAGS AND FLAT SHEETS CONVERTIBLE INTO BAGS

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U.S. Cl. 156—514 5 Claims

## ABSTRACT OF THE DISCLOSURE

An apparatus for securing valves on bags or thermoweldable flat sheets convertible into hermetically sealable flexible bags, comprising, as substantially concentrically arranged and controlled by independent driving means, a punch to provide a hole in the bag or sheet for valve positioning, and a welding member which, after a hole has been provided in the bag or sheet and a valve has been fed at said hole, causes a thermowelding of the valve about the periphery of said hole.

This invention relates to an apparatus for securing a valve by thermowelding to a flexible bag or to a flat sheet designed to be turned into a bag.

Prior art patents, such as Italian Pat. 823,800, British Pat. 1,204,462 and U.S. Pat. 3,595,467, discloses sealable bags generally made of a multi-layered material, the innermost layer of which is of a thermoweldable or thermoplastic synthetic material. Such bags are fitted with a one-way valve allowing the inside-to-outside passage for the gases developing from the product therein. These valves are comprised of three portions, namely a plastic base portion thermowelded about an aperture in the bag or multi-layered sheet, a perforated cover portion connected to the former portion and therewith defining a chamber portion accommodating a disc of resilient material at least adhering to an aperture in the base portion.

The object of the present invention is to provide an apparatus enabling to apply such valves to a flexible bag, or to flat sheets to be turned into bags.

The apparatus according to the invention is essentially characterized by comprising, as substantially concentrically arranged and controlled by independent driving means, a punch for providing the valve positioning hole in the bag or sheet, and a welding member causing the valve thermowelding about the hole periphery when the bag or sheet has been perforated and following the feeding step of a valve below the hole.

According to a feature of the invention, below the punch and the walls where the valve positioning and securing hole is to be provided, a suction conduit is provided for removing the bag or sheet portion which has been sheared by the punch.

Conveniently, a means is provided for feeding the valves one by one to the thermowelding position, that is in line with the hole and welding member providing for the valve thermowelding.

Where the apparatus is used for valve securing at a predetermined location on a strip or sheet, subsequently forming the bags therefrom, it is provided according to a further aspect of the invention that the apparatus is associated with a cylinder set for the strip or sheet feeding and operated through an electromagnetic free wheeling clutch by a crank gear, the link of which comprises a rack engaging a wheelwork operatively connected with the electromagnetic clutch and free wheel.

The invention will be more clearly understood from the following detailed description of two preferred embodiments thereof, given by mere way of not limiting example and shown in the accompanying drawings in which:

FIG. 1 is a longitudinal sectional view showing the apparatus according to the invention for applying valves to formed bags;

FIG. 2 is a schematic fragmentary sectional view taken along line II—II in FIG. 1;

FIG. 3 schematically shows an apparatus for applying valves on a sheet or strip;

FIG. 4 is a vertical sectional view taken along line IV—IV in FIG. 3; and

FIG. 5 is a plan view showing a modified form for the valve feeding means.

Referring to FIGS. 1 and 2, reference numeral **1** shows, as a whole, by dot-dash lines and by mere way of example a bag to which the valve **2** is to be applied.

The bag and valve are described in detail in one of the following patents, Italian 823,800; British 1,204,462 and USA 3,595,467.

The problem solved by the apparatus according to the invention is to provide for an aperture in the bag wall **3** and under pressure heat conditions to weld said valve **2** along the contour of the aperture, which valve is substantially in the form of a cup having a peripheral flange, as shown.

To this end, with its open inlet the bag is slipped onto a support **4**, which has a through aperture **5** connected by a pipe **6** to any suction supply.

As clearly shown in FIG. 2, support **4** has at its upper end a side wall **7** for enabling a correct centering for valve **2** at the welding position.

Valves **2** are supplied one by one at suitable time intervals from a feeding channel **8**, where such valves are arranged one after the other, to a cross path **9** as defined by guiding walls to reach the centering position, that is to contact the abutting side wall **7**. Movement along the path **9** is given by a pusher **10**, which through a cross pin **10A** is connected to the fork end of a lever **11**, to which the stem **11** of a double-acting pneumatic control jack is linked.

Lever **11** is pivoted at **14** to the carrier structure of the apparatus S.

A body, designated as a whole at **15**, is provided above the centering location of valve **2** and carried by structure S, this body comprising a first cylinder **16**, wherein a double-acting piston **17** is slidably mounted. Piston **17** is fast with a hollow stem **18** wherein a threaded end rod **19** is placed. At the lower threaded end a punch **20** is screwed and locked in a conical seating **21** of stem **18** when tightening a nut **22** which is screwed to the upper end of rod **19**.

Stem **18** slides within a piston **23** slidably arranged in a cylinder **24**. Piston **23** is also a double-acting piston. Piston **23** is fast with a tubular stem **25** within which said stem **18** slides. At its lower end stem **25** has a flange **26** carrying by means of heat insulators **27** a welding member **28**, that is a heated annular member which, for example, is heated by electrical resistances **28A** arranged therein.

The described apparatus operates as follows.

The operation begins prior to locating a valve **2** at the centering position contacting side wall **7**. By any known means the operator will first control the lowering of piston **17** and then of stem **18** and punch **20** which, by cooperating with the contour of the upper portion **5A** of through hole **5** causes the removal of a small material disc from the bag wall **3**. The separated small disc is by suction moved away through conduit **6**. Next, that is after punch **20** has moved back to a raised position, the feeder device supplies a valve **2** to the position shown in FIG. 1 by the pusher **10** operated by the cylinder **13** through lever **11** which is moved to the position shown by broken lines in FIG. 2. Piston **23** is then lowered and with its welding member **28** applies the contour of the hole in the bag wall **3** against the peripheral flange **2A** of valve **2** causing the thermowelding, or connection for valve **2** to wall **3**.

Piston 23 is then lifted and the ready bag, manually removed from the position as shown in the drawing, is replaced by another bag to be fitted with a valve. Thus, the cycle is repeated as above.

The apparatus as shown is for applying valves to bags. Referring now to FIGS. 3–5, the apparatus will be described for applying valves at predetermined intervals to a trip advancing strip or sheet.

Referring to FIGS. 3–5, the apparatus carrying structure is shown as a whole at 101 and made from sections welded to one another to form a table or bed, on one side of which two identical brackets 102 are provided, at an elongated semi-circular end seating 103 said brackets 102 carrying the axis pins 104 of a real 105 of thermoweldable strip material, for example comprising a material having two or more layers firmly connected to one another, one of the layers being a thermoplastic material, such as polyethylene. Strip 106 is first passed about an idle roller 107 rotably carried at the ends by a pair of levers 108 pivoted to said brackets 102 at 109. A crank 110 is keyed on axis 109 and linked at 111 to a rod 112 passing through a rotatable support 112A and on which a compression spring 113 is mounted, acting on one side against said support 112A and on the other side against a nut secured to the rod. This (adjustable) compression spring urges said lever 108 in the direction of arrow A.

Strip 106, moving along a path as defined by the arrows, passes about an idle roller 114 which is supported on a bracket 115 secured to said bed 101 and is then transmitted by a roller 116 secured to the outermost end of levers 108 and after shifting by a roller 117 carried by bracket 115 it is further transmitted by means of a roller 118 which is also carried by said bed 101.

The strip is then led to a drawing unit, shown as a whole at 119, comprising a first cylinder 120, the axis pins of which are carried on bearings 121 loaded by compression springs 122. In order to draw said strip, roller 120 cooperates with a roller 123 carried by the bed and on the axis of which a pulley 124, this pulley being in the case a toothed pulley, is keyed, a toothed belt 125 passing thereon and on a toothed pulley 126 which is carried by the lower face of bed 101. Coaxially with pulley 126 another toothed pulley is provided and driven by a toothed belt 127 which is driven by a toothed pulley 128 of a unit comprising two same coaxial pulleys integral to each other. These two pulleys 128 are driven by a pinion 129 through an electromagnetic clutch and a free wheel device (not shown) which are located between the pinion 129 and pulley unit 128.

The other pulley 128 in the unit operates through a toothed belt 130 a toothed pulley 131 coaxial and fast with a further pulley which, in the same manner as above described, operates a drawing unit 132 which is entirely identical to unit 119, whereby a further description thereof is deemed unnecessary.

Pinion 129 meshes with a rack 133 forming the connecting rod of a crank gear, the crank 134 of which is rotatably driven by a shaft 136 located at the outlet of a reduction gear 137. Through a unit 139 comprising an electromagnetic clutch and brake (not shown), this reduction gear 137 is coupled to a motor 138. When the clutch is activated (and hence coupled), the brake is disconnected, while the contrary occurs when the clutch is deactivated. The connecting rod comprising the rack 133 can be secured to any desired location of crank 134, to this end the latter having an elongated hole or slot, along which the articulation 141A for rack 133 can be moved and locked.

Two identical units 141, shown in FIGS. 4 and 5, are provided between the two drawing units 119 and 132 and are designed to provide for a hole at suitable locations on the strip and to weld a thermoweldable valve on the periphery of said hole. These units correspond to the apparatus as shown in FIGS. 1 and 2, whereby only a brief description thereof will now be given. Each of units 141 have a feeder device for supplying one valve 2 at a time below such units 141. The feeder device is shown in detail in FIG. 5.

At the outlet of the drawing unit 132, the strip 106 is wound about a cylinder 150 carried by a lever 151 which is pivoted to bed 101 at 152. The strip is then shifted by a roller 153 rotatably carried by a frame 154 which is secured to the bed, and then passes on another roller 155 which is secured to the end of lever 151, being shifted therefrom by a roller 156 carried by said frame 154. Finally, through a set of rollers or cylinders 157, the strip is brought to below the bed 101 and to the outlet of the apparatus, where it is withdrawn by a known form and filling type of machine converting it into a tubular body and hence into a set of bags by means of a thermowelding step, and filling such bags, prior to closure and separation thereof from said tubular body, with a metered amount of product, such as coffee.

Such machines are known and require an intermittent strip feeding, but with different modalities than those used for strip feeding in the machine herein shown. The compensation between the two different feeding rates is ensured by the provision of a reserve device comprising said lever 151 and provided with cylinders 150 and 155. More particularly, when at the form and filling machine requires to be supplied with the strip, said lever 151 is moved from the position as shown by broken lines to the position as shown by full lines, should during this interval of time the machine according to the invention be stationary, that is should the strip be stationary upstream of said unit 132. Conversely, should the form and filling machine not require to be supplied, the belt coming out of the unit 132 would accumulate between cylinders 156, 155, 153 and 150, because of lever 151 moving downwards to the position as shown by broken lines.

Units 141, identical to one another and substantially corresponding to the apparatus in FIGS. 1 and 2, comprise a first double-acting type of pneumatic cylinder 160, in which a piston 161 is mounted and connected to a stem 162, a punching head 164 being secured thereto by a threaded rod 163, the lower end of this head having a conical countersink 165 defined by a sharp edge. Lowering of piston 161 causes punching head 164 to be applied against strip 106 producing a hole therein. Unit 141 also comprises a second pneumatic cylinder 166 coaxial with cylinder 160 and also of double-acting type. Within cylinder 166 a piston 167 is arranged and connected with a hollow stem 168 having stem 162 sliding therein. The lower end of stem 168 is provided with a flange 169. Threaded pins 170 are secured on said flange and compression springs 171 are wound up about said pins 170. These pins 170 pass through holes 172 in an annular welding head 173 bearing against the head 174 of pins 170. This head 173 is concentrical with punch 164 and centrally provided with a hole. About the walls of this hole an electrical heating resistance 175 is provided. The lower end of head 173 terminates with a reduced or thinned edge 176, the average diameter of which corresponds to that for flange 177 of valve 2, valve which following hole punching can be moved to application position by the feeder device of FIG. 5.

Unit 141 is carried by bed 101 by means of a bracket 178.

The feeder device, as shown in FIG. 5, comprises a chute 190 provided with side walls 191 and guides 192 which are formed of strips secured to walls 191 to provide for two slots 193, therein accommodating the diametrically opposing ends of flanges 177 of valve 2. At the end of chute 190 a slide 194 is provided and reciprocably driven by a double-acting jack 195, the stem 196 of which is connected through a coupling 197 to a pin 198, this pin 198 being secured to slide 194 and projecting from the underside thereof. Slide 194 is guided in a guideway 199, moving in a perpendicular direction to that of the slide. When stem 196 of said pneumatic jack 195 moves in the

direction of arrow C, the first valve **2** is transferred to a centering block **100A** just below punch **174** and welding head **173**.

The above described apparatus operates as follows.

Assume that lever **151** is at the lowered position shown by broken lines and the downstream located form and filling machine is in need of strip **106**. In this case, lever **151** will rotate about pin **152** and lift on the side of its rollers **150** and **155**. Having described a determined angle, that is reached its end of stroke, said lever **151** will act upon the microswitch M1. Then, motor **138** is started, electromagnetic clutch is connected and brake **139** is disconnected, while reduction gear **137** causes crank **134** to rotate through full 360°. When pin **141A** contacts a microswitch set in a starting position, the electromagnetic clutch is disconnected and brake **139** is simultaneously operated. As pin **141A** moves through the first approximate 180°, from the position shown in FIG. 3, the electromagnetic clutch connecting the wheelwork **129** to drawing units **119** and **132** being engaged, strip **106** will be fed for a predetermined length. A photocell **110A**, such as applied to the supports **121** of drawing unit **119**, senses the presence of a notch or mark printed at suitable intervals on the strip. Upon sensing this notch, photocell **110A** will act on the electromagnetic clutch mechanically connecting said wheelwork **129** with the pulley unit **128**, so that strip **106** will be stopped even though said pin has not yet reached the outer dead center, where a microswitch is fitted, the functions of which are to be described hereinafter.

As the pin rotates through further 180° from outer dead center to the starting position, the rack **133** will not be mechanically coupled to the pulley unit **128** due to the provision of the free wheel.

Upon reach the outer dead center position, said pin **141A** will act on a microswitch provided at such a position, this microswitch acting on units **141**, such as by an electric motor provided with a cam shaft, the cams acting, for example, with a given sequence to cause the operation of the pneumatic pistons **161**, **167** and **195** in units **141**.

The operative sequence is as follows.

Initially, the piston **161** is lowered and provides for a hole in strip **106**, the sheared portion being discharged through the hole **101A** in the centering block **100A**. Thereupon, cylinder **195** is operated and feeds a valve **2** to the centering block and then moves back to its original position.

Finally, piston **167** is operated and applies edge **176** of head **173** against the thermoweldable strip **106** about the hole and against the flange **177** of valve **2**, causing the welding thereof. Then, the welding head **173** is lifted. Thus, valves **2** are applied on strip **106** at two or more positions, according to the amount of punching units **141**. Following this sequence, the operation of units **141** is stopped and when the pin is at the starting position the electromagnetic clutch **139** is disconnected, the brake is connected and the assembly is moved back to its original condition.

What is claimed is:

**1.** An apparatus for securing valves on thermoweldable flat stock for fabricating hermetically sealable flexible bags, comprising:

a punch to make a hole in said flat stock for valve positioning;

a welding member concentrically arranged around said punch and axially movable with respect to said punch;

driving means independently driving said punch and said welding member in their axial direction;

a drawing unit for feeding a strip of said flat stock across the axis of said concentric punch and welding member, said drawing unit including: at least one driven roller, crank driving means having a connecting rod forming a rack which meshes with a pinion operatively connected to and driving said driven roller, said crank driving means further including a wheel freely rotatable in one direction coupling said rack to said driven roller to drive said driven roller only when said rack moves in one direction.

**2.** The apparatus as claimed in claim **1** including a suction conduit located below the cutting end of said punch for removing the severed portion of said stock.

**3.** The apparatus as claimed in claim **1** including valve feeding means located adjacent said concentric punch and welding member.

**4.** The apparatus as claimed in claim **1** including: an electromagnetic clutch operatively positioned between said pinion and said driven roller; and a photocell detecting means operatively coupled to said electromagnetic clutch and positioned to detect reference marks on said strip.

**5.** The apparatus as claimed in claim **1** including a strip reserve and control device located in the path of said strip downstream of said concentric punch and welding member for regulating the feeding of said strip by said drawing unit.

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