

Sept. 1, 1964

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3,147,168

BAG MAKING MACHINE AND METHOD

Filed March 6, 1961

5 Sheets-Sheet 1

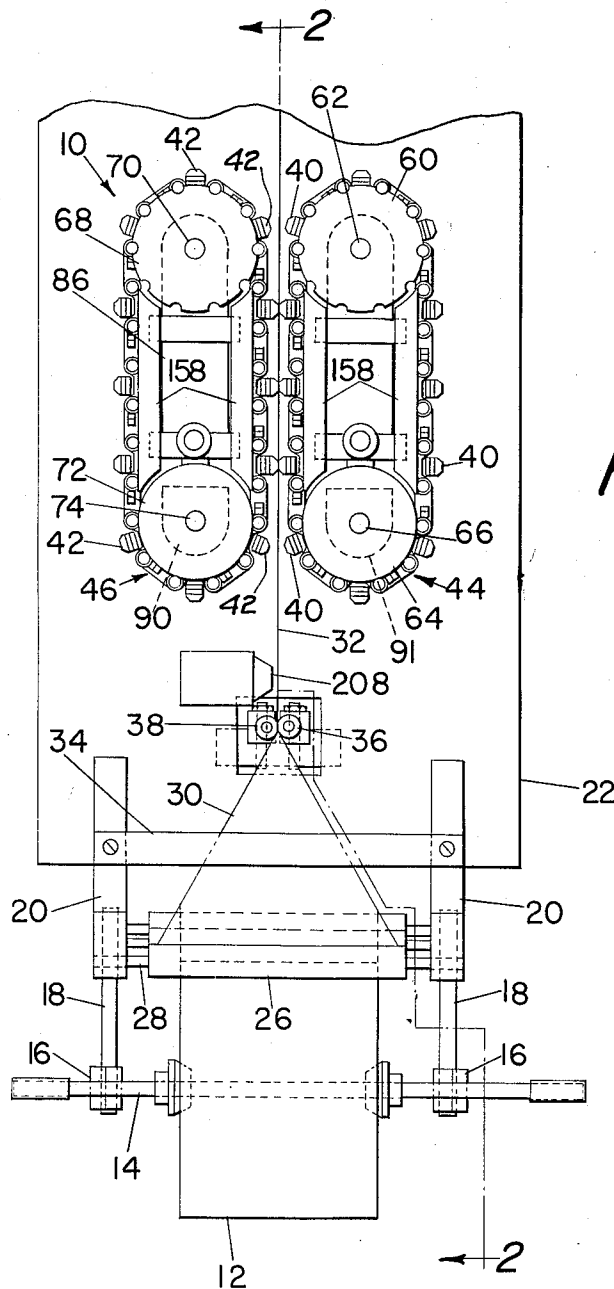


Fig. 1

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5 Sheets-Sheet 2

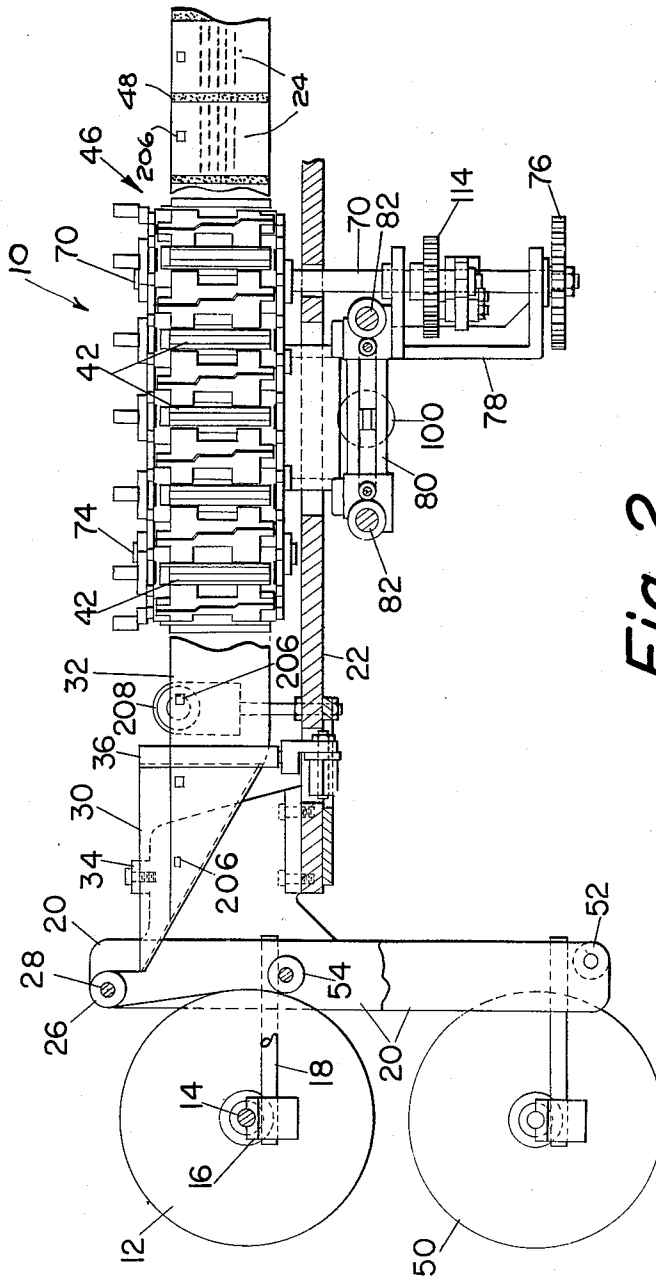


Fig. 2

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5 Sheets-Sheet 3

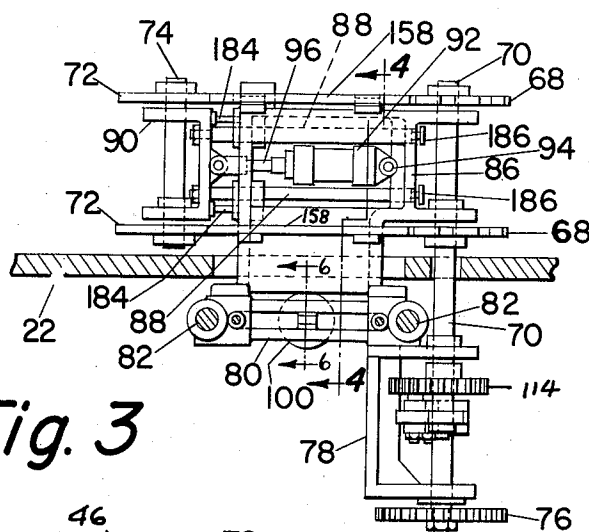


Fig. 3

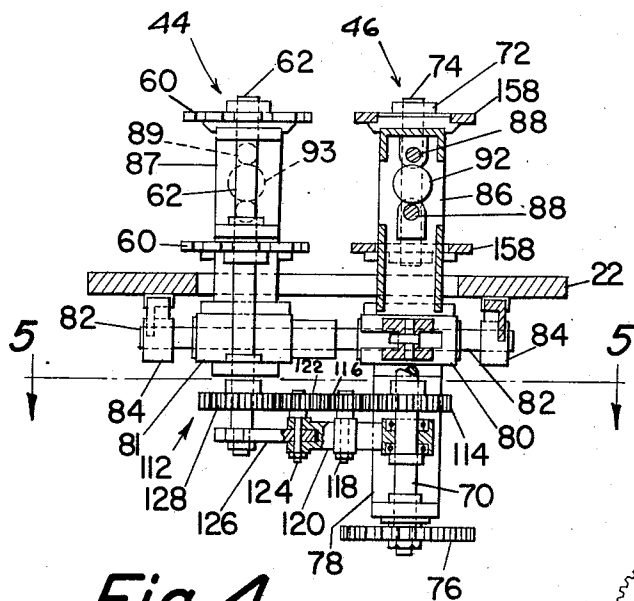


Fig. 4

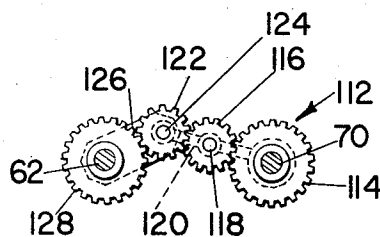


Fig. 5

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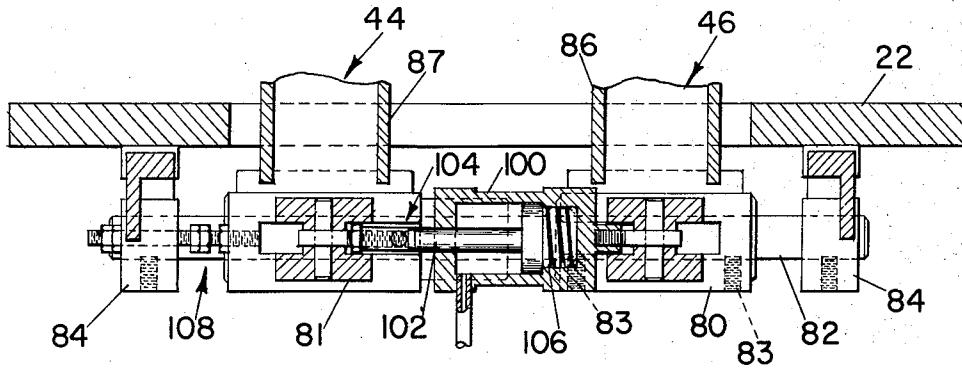


Fig. 6

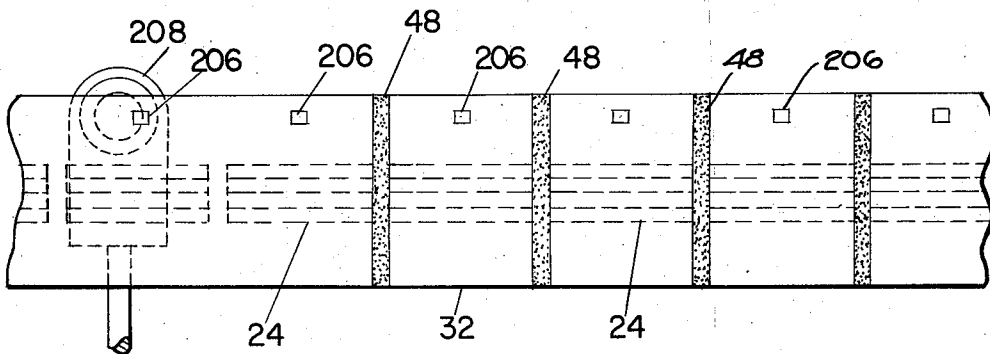


Fig. 11

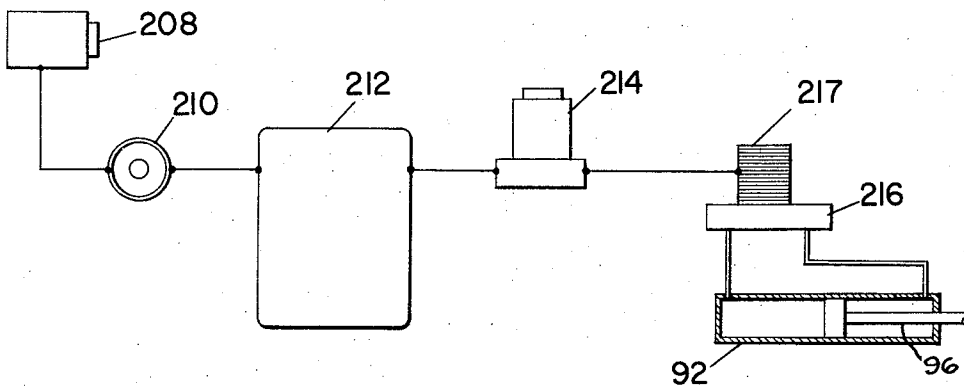


Fig. 12

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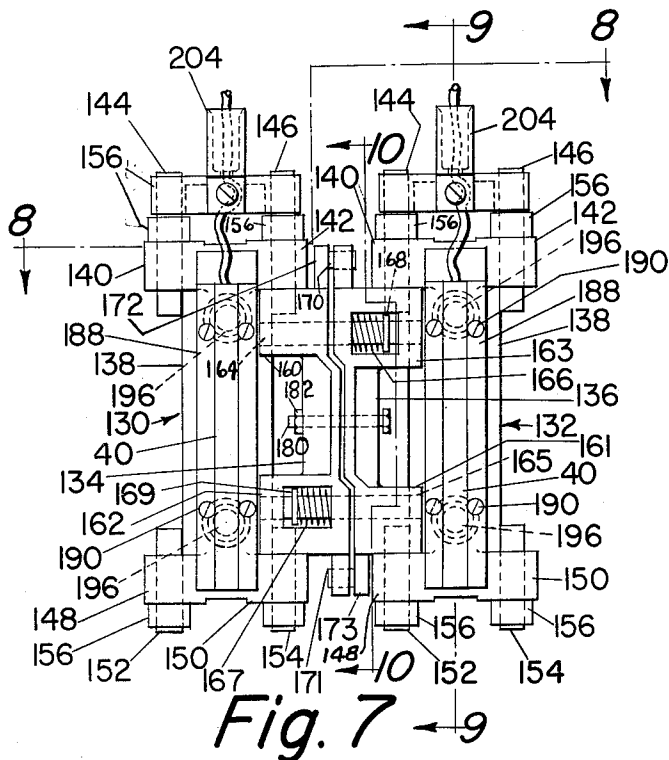


Fig. 7

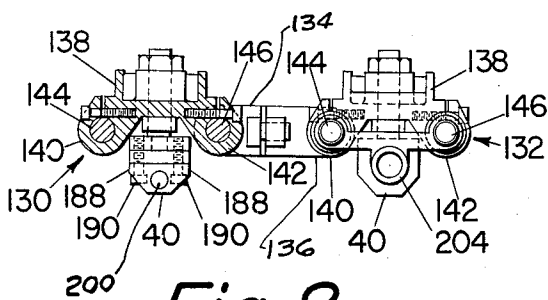


Fig. 8

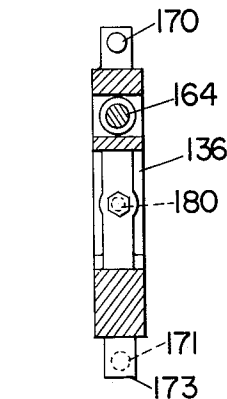


Fig. 10

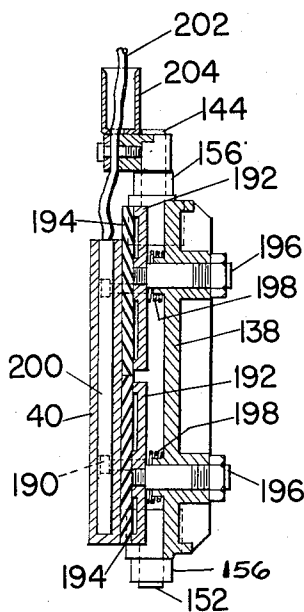


Fig. 9

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BAG MAKING MACHINE AND METHOD

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17 Claims. (Cl. 156—290)

This invention relates to a bag making machine and more particularly to sealing apparatus for producing spaced transverse seals in a folded web of bag making material to form a series of connected bag sections open at their upper ends.

The invention has for an object to provide novel and improved web sealing apparatus particularly adapted for handling printed web material defining successive bag sections and wherein novel provision is made for effecting registration of the transverse seals between successive printed areas of the web in a novel and superior manner.

The invention has for another object to provide novel and improved web sealing apparatus of the character described wherein provision is made for varying the spacing between successive transverse seals in accordance with variations in the spacing of the printed areas on the web to assure registration between such printed areas.

A further object of the invention is to provide a novel and improved web sealing mechanism of the character described wherein provision is made for detecting any variation in the spacing of the printed areas and for automatically changing the spacing of the sealing elements in accordance with such variations whereby to assure registration of the transverse seals between such printed areas.

A still further object of the invention is to provide a novel and improved method of maintaining registration of successive continuously moving sealing elements with the spaces between successive nominally spaced printed areas of a strip of bag forming material within commercial tolerances of the nominal spacing.

With these general objects in view and such others as may hereinafter appear, the invention consists in the bag sealing apparatus; in a method of sealing to maintain registration between printed areas of a strip of bag making material; and in the various structures, arrangements and combinations of parts hereinafter described and particularly defined in the claims at the end of this specification.

In the drawings illustrating the preferred embodiment of the invention:

FIG. 1 is a plan view of a portion of a bag making machine embodying the present sealing apparatus;

FIG. 2 is a side elevation of the same, shown partly in cross section, as viewed from the line 2—2 of FIG. 1;

FIG. 3 is a side elevation of a portion of the sealing apparatus shown in FIG. 2 with the sealing elements removed to show the operating mechanism;

FIG. 4 is an end view of the apparatus shown in FIG. 3 with some of the parts shown in cross section as seen from the line 4—4 of FIG. 3;

FIG. 5 is a plan view of a portion of the driving mechanism shown in FIG. 4 as seen from the line 5—5 of FIG. 4;

FIG. 6 is a detail view of mechanism for effecting separation of opposed sealing units when the machine is idle;

FIG. 7 is a front elevation detail view of a pair of linked sealing elements forming a part of the chains of sealing elements shown in FIG. 1;

FIG. 8 is a plan view detail of the pair of linked sealing elements shown in FIG. 7, one of the links being shown in cross section as seen from the line 8—8 of FIG. 7;

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FIGS. 9 and 10 are vertical sections taken on the lines 9—9 and 10—10, respectively, of FIG. 7;

FIG. 11 is a side view of a length of connected bag sections produced by the present sealing apparatus; and

FIG. 12 is a wiring diagram of the control mechanism to be referred to.

In general the present invention contemplates a bag making machine embodying novel sealing apparatus for heat sealing together the side walls of a folded web of heat sealable bag making material along spaced transverse zones to provide a series of connected bag sections open at their upper ends. The bag making material used in practicing the present invention embodies a thermoplastic material or may be provided with a coating of thermoplastic material which becomes adhesive upon being subjected to heat and pressure to cause adherence of the confronting inner faces of the folded web. The bag material is also provided with printed matter at spaced areas defining the nominal widths of successive bags.

The present sealing apparatus forms a part of a bag forming, filling and closing machine wherein a web of bag forming material is withdrawn from a roll thereof and passed under a V-shaped forming member to fold the web upon itself and provide a U-shaped strip. The folded strip is engaged between the continuously moving sealing elements to effect advance of the strip and to seal the strip transversely at spaced intervals. The connected bag sections are then severed intermediate the sealed areas to produce individual bags open at the top, the individual bags being received by carriers which convey the bags past filling mechanism wherein a predetermined quantity of material is deposited in each bag. Thereafter, the open mouths of the bags are sealed, and the completed bags are released by their carriers onto a conveyor to be delivered from the machine.

In the illustrated embodiment of the invention the sealing apparatus comprises spaced web advancing and heat sealing elements carried by opposed cooperating endless conveyer chains, and in practice the leading end of the folded web is placed between the grip of the cooperating sealing elements to effect sealing of the web along spaced transverse zones between successive printed areas as the web is continuously advanced by the sealing elements.

In practice it is difficult to maintain uniform registration of the seals between the printed areas of the web because of variations in the web caused by atmospheric or other conditions. While such variations from the nominal spacing of the printed areas may be relatively slight, they are cumulative so that if a uniform spacing of the sealing elements is maintained it is practically impossible to maintain registration of the seals between the printed areas.

In accordance with the present invention provision is made for extending and contracting the chains and consequently the spacing between successive sealing elements to compensate for such variations in the spacing of the printed areas whereby to effect registration of the seals between the printed areas within commercial tolerances of the nominal spacing of the printed areas. In the illustrated embodiment of the invention provision is made for cyclically detecting the position of the printed areas on the web at a predetermined time during the passage of each printed area prior to entering the sealing apparatus and for alternately increasing and decreasing the spacing between the sealing elements in response to deviations from the nominal spacing detected during the continuous movement of the web.

Referring now to the drawings, the present heat sealing and registering apparatus indicated generally at 10 is embodied in a bag making machine wherein a supply roll 12 of bag forming material is mounted on a shaft 14 journaled in bearings 16 secured to supporting arms 18 extended from spaced frame members 20 attached to the

platen 22 of the machine frame. The bag forming material embodies a thermoplastic adhesive and is provided with printed areas defining successive bag sections as indicated generally by the numeral 24 in FIG. 11. A web of bag making material withdrawn from the supply roll is guided over an idler roll 26 supported on a shaft 28 journaled in the frame members 20. The web is then guided under a shaping member 30 arranged to form the web into a U-shaped strip 32 as the web is advanced. The shaping member may be supported by a tie bar 34 extending across and secured to the spaced frame members 20. The leading end of the folded strip is threaded between a pair of upright rollers 36, 38 adjustably supported from the platen as shown. The strip is then engaged between opposed upright heat sealing bars 40, 42, a series of which are carried in spaced relation by opposed continuously traveling conveyer chain units 44, 46. The continuously traveling cooperating sealing bars 40, 42 serve to grip and withdraw the web from the supply roll and to heat seal together the side walls of the strip along spaced transverse zones 48 to provide a series of connected bag sections open at the top.

A second supply roll 50 may be similarly supported below the first roll 12 for use when the first roll is depleted. The web withdrawn from the second supply roll is arranged to pass under an idler roll 52 and over an idler roll 54 before passing over the idler roll 26 to be threaded into the machine as described.

As herein illustrated, the conveyer chain unit 44 is arranged to pass around upper and lower drive sprockets 60 fast on a shaft 62 at one end of the conveyer and around upper and lower idler disks 64 fast on a shaft 66 at the other end of the conveyer. The opposing conveyer chain unit 46 is similarly arranged to pass around upper and lower drive sprockets 68 fast on a shaft 70 at one end of the conveyer and around upper and lower idler disks 72 fast on a shaft 74 at the other end of the conveyer. As illustrated in FIGS. 2 and 3, the shaft 70 which drives the conveyer chain 46 may be continuously rotated through connections from the bag forming machine including a gear 76 fast on the lower end of the shaft 70, which gear may be in mesh with a driving gear not shown. The lower end of the shaft 70 is supported in a U-shaped bracket 78 secured to and depending from a conveyer supporting bracket 80 which in turn is mounted for sliding adjustment on a pair of transversely extended rods 82 secured at their ends in spaced brackets 84 depending from and attached to the underside of the platen 22, see FIG. 4. The conveyer supporting bracket 80 has mounted thereon a chain carrier bracket 86 in which the upper end of the shaft 70 is journaled as shown in FIG. 3. The chain carrier bracket 86 carries a pair of longitudinally extended rods 88 mounted for sliding movement therein and which are arranged to support a U-shaped bearing bracket 90 in which the vertical shaft 74 is journaled.

From the description thus far it will be seen that the sealing bar chain 46 runs around upper and lower driving sprockets 68 fast on the driving shaft 70 and around upper and lower idler disks 72 fast on the shaft 74 journaled in the bracket 90. As illustrated in FIG. 3, provision is made for increasing and decreasing the distance between the center lines of the driving shaft 70 and the idler shaft 74 to effect elongation of the conveyer chain whereby to increase the distance or pitch between successive heat sealing bars 42. The means for increasing and decreasing the distance between the shafts 70, 74 includes an air cylinder 92 pivotally mounted at 94 in the bracket 86. The piston rod 96 of the air cylinder is connected to the idler shaft bracket 90. Thus, in operation the longitudinally extended supporting rods 88 may be extended or retracted in their bearings within predetermined limits to effect stretching or contraction of the conveyer chain 46 for the purpose described.

The cooperating conveyer chain unit 44 is similarly sup-

ported by a bracket 81 also mounted for sliding adjustment on the transversely extended rods 82. The shaft 62 on which the upper and lower driving sprockets 60 are mounted is journaled in a chain carrier bracket 87 which also carries longitudinally extended rods 89 which support a U-shaped bracket 91 in which the vertical idler shaft 66 is journaled. An air cylinder 93 carried by the bracket 87 is connected to the bracket 91 to similarly effect an increase or a decrease in the distance between the center lines of the driving shaft 62 and the idler shaft to effect stretching of chain 44.

As illustrated in FIG. 6, provision is made for separating the opposing conveyer chain units 44, 46 when the machine is stopped in order to permit threading of the leading end of the strip between the sealing bars 40, 42 when a new web is withdrawn from a supply roll to start the sealing operation and also to prevent direct engagement of the heated sealing bars or excessive heating of that portion of a strip already engaged by the heating bars 40, 42. As herein shown, an air cylinder 100 is connected at one end to the conveyer supporting bracket 80, which latter may be adjustably fixed to the transverse rods 82 by set screws 83. The piston rod 102 of the air cylinder 100 is connected to the opposing conveyer supporting bracket 81. In operation when the machine is started, air is admitted to the cylinder to slide the bracket 81 and its conveyer chain unit 44 on the transverse rods 82 toward the fixed conveyer chain unit 46, such movement being adjustably limited by stop screws 104. When the machine is shut down the air to the cylinder is cut off, and a coil spring 106 provided in the cylinder is arranged to slide the unit 44 away from the unit 46 to separate the cooperating heating elements, such outward movement being adjustably limited by the stop screws 108.

Provision is made for driving the shaft 62 from the driving shaft 70 through a gear train indicated generally at 112 which is arranged to rotate the shaft 62 in a direction opposite to the direction of rotation of the shaft 70 so that the inner runs of each chain will be traveling in the same direction to advance the strip, the gear train being also arranged to remain in meshing engagement when the conveyer chain unit 44 is moved toward and away from the conveyer chain unit 46. As illustrated in FIGS. 4 and 5, the shaft 70 is provided with a gear 114 in mesh with an idler gear 116 mounted for rotation on a stud 118 carried by an arm 120 pivotally supported on the shaft 70. The idler gear 116 meshes with a gear 122 mounted to rotate on a stud 124 which extends through the yoked end of the arm 120 and also through the outer end of a second arm 126 embraced by said yoke. The second arm 126 is pivotally mounted on the drive shaft 62, which latter is provided with a gear 128 in mesh with the gear 122. With this construction it will be seen that in operation when the conveyer chain units 44, 46 are moved toward and away from each other, the gear train 112, above described, will accommodate itself to such movement while remaining in driving engagement.

In accordance with one feature of the present invention the individual links which make up the conveyer chains 44, 46, on which the sealing bars 40, 42 are mounted, are connected in a manner such as to permit stretching of the chains to effect an increase in the spacing between successive sealing bars when the conveyers are elongated as described. Referring now to FIGS. 7 and 8, a pair of heater bar carrying links 130, 132 are shown connected by a pair of cooperating expansion links 134, 136 arranged to permit elongation and contraction of the chains. Each conveyer chain 44, 46 is similar in structure, and successive heater bar links are connected by similar expansion links throughout the length of each chain. As shown in FIGS. 7 and 8, each link 130, 132 is provided with an elongated body portion 138, U-shaped in cross section, arranged to support a heat sealing bar 40 or 42, and each body portion is provided with a pair of spaced upper lugs

149, 142 in which link pins 144, 146, respectively, are clamped. Each body portion is also provided with a pair of similarly spaced lower lugs 148, 150 for clampingly supporting link pins 152, 154 respectively. Each link pin is provided with a roller 156 for cooperation with the drive sprockets and the idler disks of the conveyers. The rollers 156 are also arranged to engage side rails 158 during their travel between the sprockets and the disks. The side rails 158 are supported by the chain carrier brackets 86, 87 as shown in FIG. 1.

The connecting expansion links 134, 136 are identical in structure except that one link of each pair is inverted with respect to the other. As herein shown, the link 134 is provided with an upper lateral extension 160 arranged to pivotally receive the downwardly extended end of a link pin 146 and with a lower lateral extension 162 arranged to pivotally receive the upwardly extended end of a link pin 154. Similarly, the expansion link 136 is provided with lateral extensions 161, 163 arranged to pivotally receive the extended ends of pins 152, 144 of the second heater bar link 132. The upper extension 160 of the expansion link 134 is provided with a laterally extended pin 164 fast therein which is slidably received in openings formed in the extension 163 of the second expansion link 136. A spring 166 coiled about the pin 164 is interposed between a collar 168 secured to the pin and a side wall of a hollow portion of the extension 163 and tends to urge the expansion link 136 toward the cooperating link 134 as limited by a set screw 170 carried by the link 136 and which engages a stop lug 172 formed on the link 134. Similarly, the extension 161 of the expansion link 136 is provided with a laterally extended pin 165 fast therein which is slidably received in openings formed in the extension 162 of the opposing expansion link 134. Also, a spring 167 coiled about the pin 165 is interposed between a collar 169 secured to the pin and a side wall of a hollow portion of the extension 162 which tends to urge the expansion link 134 toward the cooperating link 136 as limited by a set screw 171 carried by the link 134, the set screw engaging a stop lug 173 formed on the link 136.

With this construction it will be seen that adjacent heating bar links 130, 132 are connected by the expansion links 134, 136 in a manner such as to maintain a predetermined minimum distance between adjacent sealing bars when the chain is relaxed or unstretched and that such minimum spacing may be adjusted by the set screws 170, 171. It will also be seen that when the conveyor chains are elongated in the manner described, the expansion links 134, 136 permit stretching of the chain to provide an increased spacing between the heat sealing bars. As shown in FIG. 7, the expansion links 134 and 136 are also connected by a through bolt 180 which may be threadedly engaged in the link 134 and secured therein by a nut 182, the other end of the bolt 180 extending loosely through a clearance opening in the link 136 with the head thereof spaced from the adjacent wall of the link 136 a distance such as to limit maximum expansion of the chain. In practice the actual maximum and minimum extensions of the chains are more accurately determined by stops which cooperate with the fixed conveyor supporting bracket 86 and the movable bracket 90 supported by the longitudinally extended rods 88. As shown in FIG. 3, when the movable bracket is in its retracted position the vertical face of the U-shaped bracket 90 engages the heads of adjustable stop screws 184 to limit the minimum distance between successive heating bars 40 or 42, and when the movable bracket 90 is in its extended position, as effected by the air cylinder 92, the collars 186 provided at the outer ends of the slide rods 88 engage the adjacent vertical face of the fixed bracket 86 to limit the maximum distance between the heating bars 40 or 42. Thus, the through bolts 180 merely serve as a safety to limit the maximum expansion of the links 134, 136.

As illustrated in FIG. 9, each sealing bar 40 and 42

comprises a vertically elongated metal bar having a relatively narrow engaging portion and laterally extended flange portions 188 which are connected by screws 190 to upper and lower backing plates 192, the screws passing through intervening insulating pads 194 as shown. The sealing bars are mounted to yield slightly when a bar 40 engages a cooperating bar 42 to provide a slight resilient pressure during the heat sealing operation and, as shown in FIG. 9, the backing plates 192 are connected to the reduced diameter threaded ends of upper and lower supporting rods 196 slidably carried by the body portions 138 of the sealing bar links. Coil springs 198 interposed between the body portion 138 and the backing plates 192 are arranged to urge the sealing bar outwardly relative to the body portion 138, and a nut provided at the outer threaded end of each rod 196 is arranged to limit the outward movement. Thus, cooperating sealing bars 40, 42 may yield inwardly a short distance when they meet to grip successive spaced portions of the folded strip to advance the strip and to effect heat sealing along the spaced transverse zones engaged by the sealing bars. Each sealing bar may be electrically heated in any usual or preferred manner which, as herein shown, may comprise an electrical heating element 200 extended longitudinally in the heating bar and which is connected at its upper end to a flexible cable 202 extended through and secured to an adapter 204 mounted on the upper ends of the link pins 144, 146 of each sealing bar link as shown in FIG. 7. The flexible cables 202 may be connected to a rotary manifold or distributor, not shown, which may be electrically connected to a source of power in a manner such as to permit the flexible cables to follow along with their respective heating bars during the travel of the chain.

From the description thus far it will be seen that the present heat sealing apparatus includes a pair of opposed elongated chain conveyers 44, 46, each conveyor carrying spaced heat sealing bars 40, 42, respectively, which are arranged to cooperate to grip and advance a folded strip of bag making material at spaced areas to effect sealing of the strip at such spaced areas whereby to provide a series of connected bag sections open at their upper ends. It will also be observed that the chains are resiliently connected by expansion links arranged to contract the chain to provide a minimum spacing or pitch between adjacent sealing bars, and that provision is made for elongating the conveyers to stretch the chains whereby to provide a maximum spacing or pitch between adjacent sealing bars.

As hereinbefore described, the present apparatus is particularly adapted to provide seals between successive printed areas 24 on the folded strip, such printed areas defining the nominal spacing between the bag sections. In accordance with a feature of the present invention the minimum pitch of the sealing bars when the chain is in its relaxed or contracted condition is preferably arranged to be slightly less than the nominal pitch of the printed strip, and the maximum pitch of the sealing bars when the chain is in its elongated or stretched position is arranged to be slightly more than the printed pitch of the folded strip of bag making material. As a result when the chain is in its contracted position successive seals will be spaced apart slightly less than the nominal spacing of the printed web, and when the chain is in its stretched position successive seals will be spaced apart slightly more than the nominal spacing. In practice the pitch of the teeth or notches in the driving sprockets 60, 68 is equal to the nominal pitch and, therefore, will not correspond to either the minimum or maximum pitches of the chains. However, in operation the rollers 156 carried by the sealing bar links will be forced into the notches as they ride onto the sprockets because of the resilient connections between the links while the remainder of the chain will remain in its contracted or extended condition.

In order to assure registration of the seals in the zones between successive printed areas within commercial lim-

its of the nominal spacing provision is made for cyclically detecting the position of the printed areas of the moving strip prior to entering the sealing apparatus, and control means responsive to a change in the position of successive printed areas at a predetermined time in each cycle as indicated by the detecting means is arranged to alternately increase the pitch between the sealing bars for a predetermined time and then decrease the spacing between the sealing bars whereby to maintain registration of the sealed areas within the predetermined limits of the transverse zones between the printed areas of the strip. As herein shown, each printed bag section is provided with a printed dark spot 206, the spacing or pitch of the dark spots being equal to the nominal pitch when printed. It will be understood that when the conveyers are contracted the minimum spacing between the sealing bars effects advance and sealing at points spaced slightly less than the nominal pitch, and as a result successive dark spots 206 will "drift" rearwardly in relation to the sealing bars. The position or change in position of the dark spots at a predetermined time in each cycle is arranged to be detected photoelectrically and, as illustrated in FIGS. 1 and 2, an electric eye 208 is positioned relative to the moving strip to detect the passage of the dark spots 206. The eye 208 is sensitive to a change in light value from dark to light so that in operation the eye is arranged to detect the trailing edge of a dark spot as successive spots on the forwardly moving strip "drift" rearwardly relative to the electric eye.

Referring now to FIG. 12, which diagrammatically illustrates the control means for effecting extension and contraction of the chains, the electric eye is controlled by a rotary timing unit 210 which comprises simply a pair of contacts driven by the bag making machine to close and open the operating circuit once each cycle. The electric eye is operative only when the contacts of the timing unit are closed, that is, the electric eye is capable of sending a signal to the control means upon detection of the trailing edge of a dark spot only when the timing unit contacts are closed. As illustrated in FIG. 12, the control means includes an amplifier unit 212, a time delay device 214 and a solenoid operated air valve 216, the latter when energized being arranged to admit air under pressure to one end of the air cylinder 92 to effect stretching of the chain and to effect return of the piston in the air cylinder when the solenoid is deenergized to permit contraction of the chain. The time delay device 214 may comprise any usual or preferred timing arrangement, the illustrated arrangement comprising a solenoid actuated pneumatic device commercially available under the trade name of "Agastat" and which is arranged to close switch contacts when energized to close the circuit to the solenoid 217 of the solenoid operated valve 216.

In operation, when the strip is initially fed between the sealing bars 40, 42 with the chains in their relaxed condition and the machine is started, the dark spots 206 will start to "drift" rearwardly with relation to the sealing bars spaced at their minimum pitch. Eventually, there will come a time when just after the rotary timing contacts have closed, the trailing edge of one of the dark spots will pass in front of the eye causing the eye to give a signal to the system. This signal passes to the control box or amplifier 212 which then causes the contacts of the solenoid operated time delay device 214 to close the circuit to energize the solenoid 217 of the air valve 216. As a result air will be admitted to the cylinder 92 to effect stretching of the conveyers to expand the pitch of the sealing bars to their maximum pitch. Shortly thereafter, during the same cycle, the cyclically operated timing contacts are opened which effects resetting of the electric eye 208. Additional signals which may be produced during the next few immediately succeeding cycles will produce no effect at this time because the cylinder is already extended. With the sealing bars extended to their maximum pitch it will be seen that the

dark spots will now start "drifting" forwardly and eventually when the timing contacts of the rotary timer 210 are closed the electric eye 208 will fall on the light area of the bag making material, and because there is no change in light value at the time the contacts are closed no signal will be fed into the control unit. At this time the time delay device 214 will maintain the solenoid 217 energized and the valve 216 open to keep the chain stretched for a predetermined time, during which time the dark spots will "drift" further in a forward direction. At the end of the predetermined time setting of the time delay device 214, the latter will open its contacts to deenergize the solenoid valve 216 to cause the piston to be retracted and the chain shortened to return the sealing bars to their minimum pitch. Succeeding dark spots 206 on the continuously moving strip will now start to drift rearwardly until they are once again in a position so that the trailing edge of a dark spot will be detected when the cyclically operated contacts are closed to again effect stretching of the chain as described. Since the change from one pitch to the other is relatively small to take care of slight deviations from the nominal spacing of the printed areas, the sealing bars concurrently in sealing engagement with the strip when the pitch is changed will not affect the seal already made since the bag making material has sufficient flexibility and resiliency to stretch or contract with the sealing bars. Furthermore, the flow of air to the cylinder 92 may be controlled to effect either a sudden or a gradual extension or contraction of the chains to control any effect the change of pitch of the sealing bars may have on the strip engaged at the time of change.

From the above description it will be seen that the present sealing apparatus is constructed to be capable of changing the pitch of the sealing bars from a minimum pitch slightly less than the nominal pitch to a maximum pitch slightly more than the nominal pitch to compensate for any slight deviation of successive printed areas of a strip from the nominal pitch. It will also be seen that the present apparatus is provided with control means including means for detecting any slight deviation of the printed areas from the nominal spacing at a predetermined time in each cycle of operation, and means responsive thereto for first increasing the pitch of the sealing bars and maintaining such increased pitch for a predetermined length of time, and then decreasing the pitch of the sealing bars, such pitch being alternately increased and decreased in accordance with the changes in position of the printed areas relative to the sealing bars as indicated by the detecting means whereby to assure registration of successive seals between successive printed areas within commercial tolerances of a nominal spacing.

While the preferred embodiment of the invention has been herein illustrated and described, it will be understood that the invention may be embodied in other forms within the scope of the following claims.

Having thus described the invention, what is claimed is:

1. In a bag making machine, in combination, means for continuously advancing and sealing a folded strip of bag making material having successive nominally spaced printed areas thereon, said sealing means comprising a pair of opposed endless conveyer chains, each provided with spaced sealing elements arranged to cooperate to effect the sealing operation along spaced transverse zones intermediate successive printed areas to form a series of connected bag sections, control means for maintaining registration of the seals between successive printed areas including means for detecting the position of successive printed areas on the moving strip at a predetermined time in each cycle of operation, and means responsive to said detecting means for automatically changing the spacing of the sealing elements by extension or contraction of said chains when a deviation from said nominal spacing is detected.

2. In a bag making machine, in combination, means for

continuously advancing and sealing a folded strip of bag making material having successive nominally spaced printed areas thereon, said sealing means comprising a pair of opposed endless conveyer chains, each provided with spaced sealing elements arranged to cooperate to effect the sealing operation along spaced transverse zones intermediate successive printed areas to form a series of connected bag sections, control means for maintaining registration of the seals between successive printed areas including means for detecting the position of successive printed areas on the moving strip at a predetermined time in each cycle of operation, and means responsive to said detecting means for automatically changing the spacing of the sealing elements by elongation or contraction of said chains when a deviation from said nominal spacing is detected, said conveyer chains being provided with expansible links arranged to permit an increase and a decrease in the spacing of the sealing elements upon elongation and contraction respectively of the chains.

3. A bag making machine as defined in claim 2 wherein the conveyer chains are alternately elongated and contracted upon detection of the printed areas relative to the sealing elements to first present the sealing elements at a maximum spacing for a predetermined time and then at a minimum spacing, said maximum spacing being slightly more than said nominal spacing and said minimum spacing being slightly less than said nominal spacing.

4. In a bag making machine, in combination, means for continuously advancing and sealing a folded strip of bag making material having successive nominally spaced printed areas thereon comprising a pair of opposed elongated endless conveyer chains, each chain being provided with spaced sealing elements arranged to cooperate to effect sealing of the strip along spaced transverse zones intermediate successive printed areas to form a series of connected bag sections, said chains being capable of extension and contraction to increase and decrease the pitch of the sealing elements, pitch varying means for alternately extending and contracting the chains to maximum and minimum limits slightly more than and slightly less than said nominal spacing, said chains being initially in their contracted condition, and control means for maintaining registration of the seals between successive printed areas within commercial tolerances of said nominal spacing including means for detecting the position of successive printed areas at a predetermined time in each cycle of operation whereby to detect a progressive lag in the position of advance of successive printed areas when the sealing elements are at their minimum pitch, means responsive to said detecting means for actuating said pitch varying means to effect elongation of the chains and an increase in said pitch to said maximum spacing, time delay means for maintaining the pitch at its maximum spacing for a predetermined time and for thereafter causing the chains to contract and decrease the pitch to said minimum spacing.

5. In a bag making machine, in combination, means for continuously advancing a strip of printed heat sealable bag making material including means for gripping and heat sealing the strip along spaced zones intermediate successive nominally spaced printed areas to form a series of connected bag sections, said sealing means comprising a pair of opposed elongated stretchable conveyer chains having spaced heat sealing elements arranged to cooperate to grip and seal the strip along said spaced zones, pitch varying means for stretching said chain to space the sealing elements at a maximum pitch greater than said nominal spacing and for contracting the chain to space the sealing elements at a minimum pitch less than said nominal spacing, and control means for maintaining registration of the seals between successive printed areas within commercial tolerances of said nominal spacing including means for detecting the position of successive printed areas of the continuously moving strip relative to the spaced sealing elements at a predetermined

time in each cycle of operation of the machine, and means responsive to detection of a lag in the position of advance of successive printed areas when the sealing elements are at their minimum pitch for actuating said pitch varying means to effect stretching of the conveyer and increasing said pitch to its maximum spacing to cause the gripping element to grip and advance longer lengths of the strip each cycle, time delay means for maintaining the conveyer stretched for a predetermined time and for thereafter causing the conveyer to contract and return the sealing elements to their minimum pitch whereby to again cause a lag in the position of advance of successive printed areas relative to the spaced sealing elements and to again effect stretching of the chain when such lag is detected.

6. A bag making machine as defined in claim 5 wherein adjacent sealing elements of each stretchable chain are connected by resiliently expansible links to permit said increase and decrease in the pitch of the sealing elements.

7. A bag making machine as defined in claim 5 wherein the means for stretching and contracting the chain includes an air cylinder and means for adjustably limiting the stretching and contraction of the chains.

8. A bag making machine as defined in claim 5 wherein one end of each stretchable conveyer chain is provided with a movable support, said stretching means including an air cylinder having a piston connected to said movable support to effect said stretching and contraction of the chains.

9. A bag making machine as defined in claim 8 wherein the detecting means includes an electrical circuit having a photoelectric eye sensitive to a change in light value from dark to light and arranged to detect such a change, a cyclically operated switch for rendering the eye active at said predetermined time in each cycle, amplifying means actuated by said electric eye and operatively connected to said time delay means, and a solenoid operated valve actuated by said time delay means for admitting air to said cylinder to effect stretching of the chain to its maximum pitch and for thereafter causing return of the chain to its minimum pitch.

10. In a bag making machine of the character described, in combination, sealing apparatus for applying spaced seals to a continuously moving web of bag forming material, said sealing apparatus comprising a pair of opposed elongated conveyer means, each provided with spaced sealing elements arranged to cooperate to form said seals in the web, said conveyer means being stretchable to permit an increase and a decrease in the pitch of the sealing elements, and means for stretching and contracting said conveyer means.

11. In a bag making machine of the character described, in combination, sealing apparatus for applying spaced seals to a continuously moving web of bag forming material, said sealing apparatus comprising a pair of opposed elongated conveyer means, each conveyer means provided with spaced sealing elements arranged to cooperate to apply said seals to the web, said sealing elements being connected by expansible and contractable means to permit an increase and a decrease in the pitch of the sealing elements, and means for effecting an increased and decreased pitch of the sealing elements.

12. A bag making machine as defined in claim 11 wherein each sealing element is resiliently mounted to yield when engaged by a cooperating sealing element to effect gripping of the web engaged therebetween.

13. A bag making machine as defined in claim 11 wherein provision is made for limiting the maximum and minimum expansion and contraction of the sealing elements.

14. A bag making machine as defined in claim 11 wherein provision is made for moving one of said conveyer means laterally with respect to the other to effect separation thereof.

15. A bag making machine as defined in claim 14 which includes means for driving the conveyer means

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including a gear train interconnected to both conveyer means and arranged to remain in driving engagement upon separation of said opposed conveyer means.

16. A method of maintaining registration of successive continuously moving sealing elements with the spaces between successive nominally spaced printed areas on a strip of bag forming material within commercial tolerances of said nominal spacing which comprises: continuously moving said strip of printed material along a fixed path; continuously moving said sealing elements along said path opposite the spaces between said printed areas; alternately increasing and decreasing the spacing between the continuously moving sealing elements, along said path, to values more than and less than the nominal spacing, respectively; detecting the relative positions of said printed areas and said sealing elements; and controlling the time

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at which a change in spacing of said elements is effected in response to detection of said relative spacing at a value at the limit of said commercial tolerances.

17. The method defined in claim 16 wherein said sealing elements are first spaced apart a minimum distance until said limit of said commercial tolerances is detected, then increasing the space between said elements to its maximum value, holding them at said maximum spacing for a predetermined period of time, then returning said elements to their minimum spacing.

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