

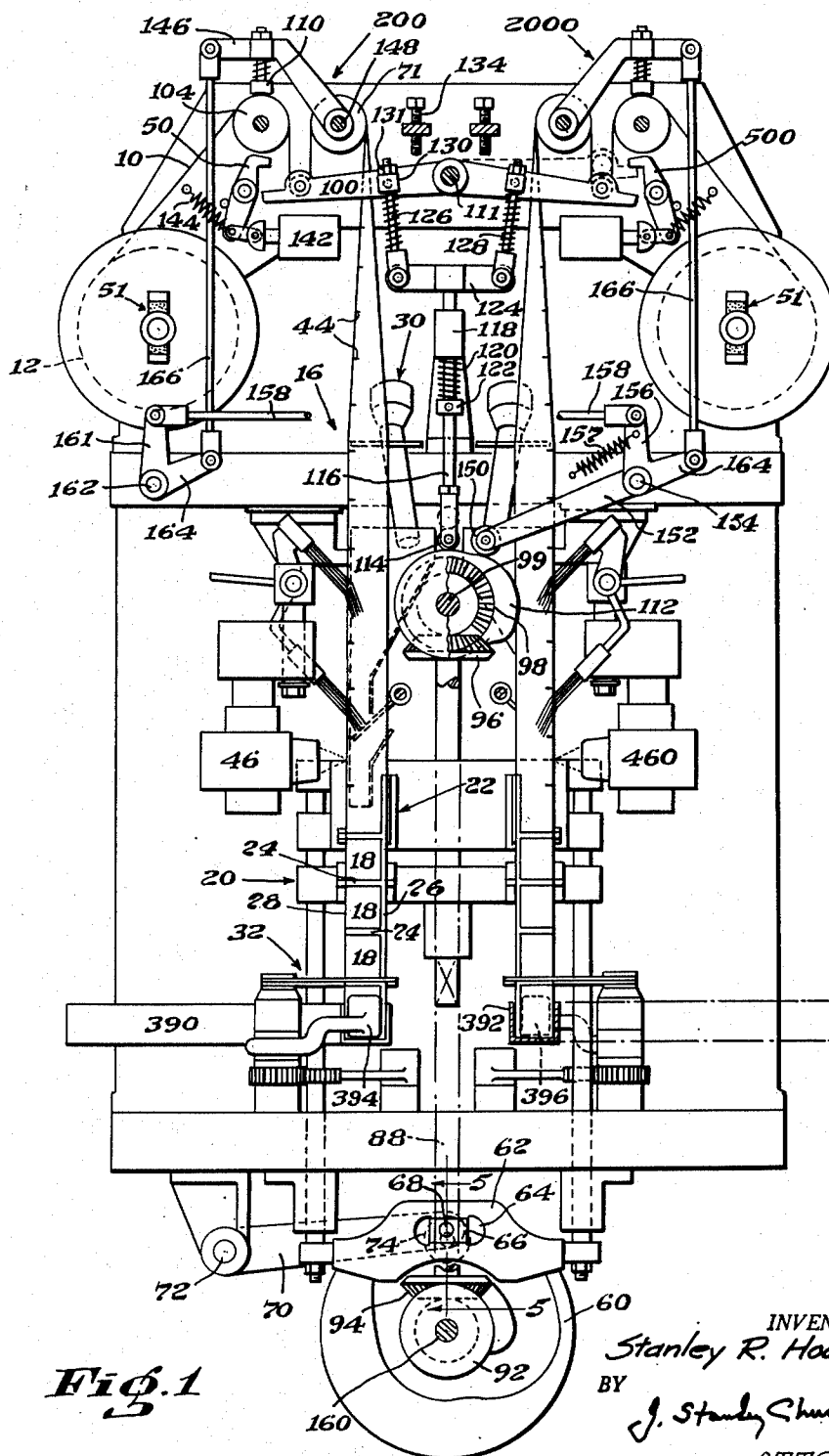
April 28, 1953

S. R. HOWARD
WEB FEEDING METHOD AND MEANS FOR
CONTAINER FORMING APPARATUS

2,636,732

Filed March 30, 1948

4 Sheets-Sheet 1



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Fig. 2

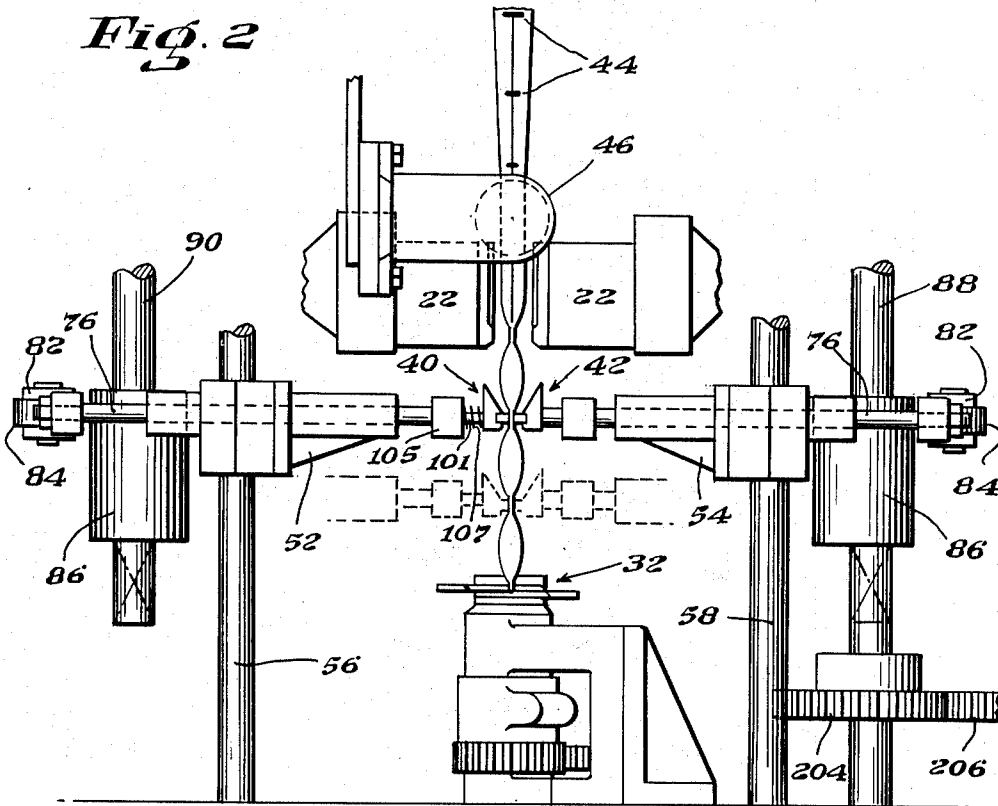
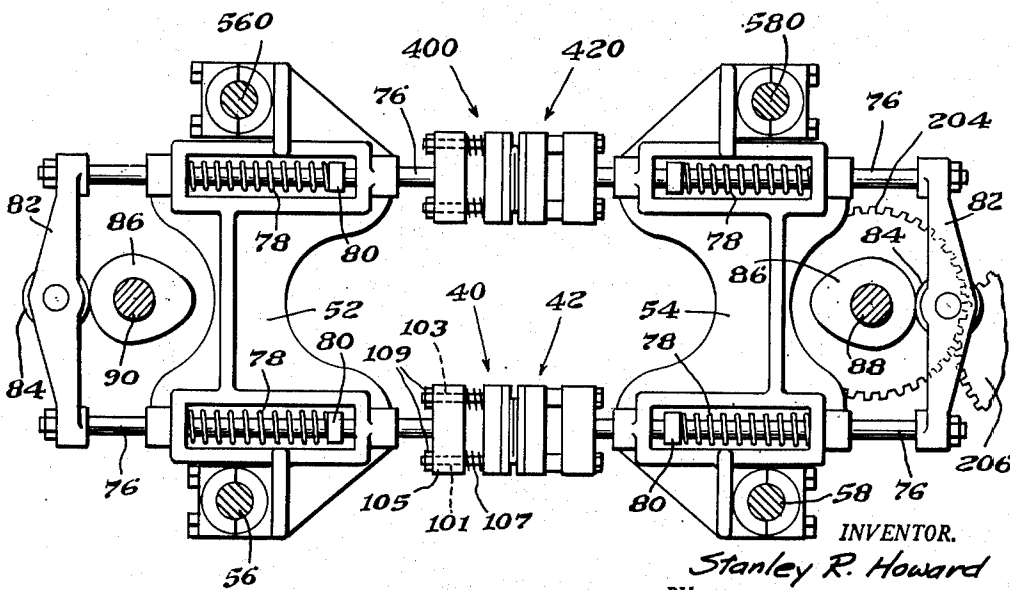


Fig. 3

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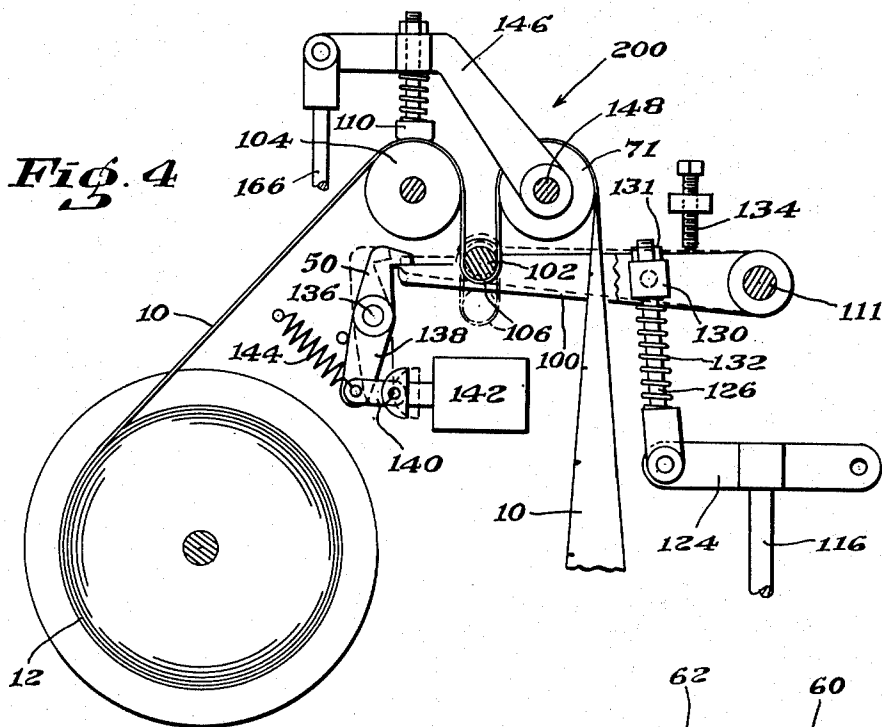
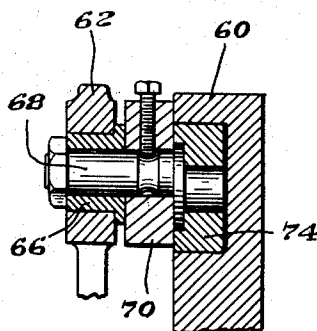
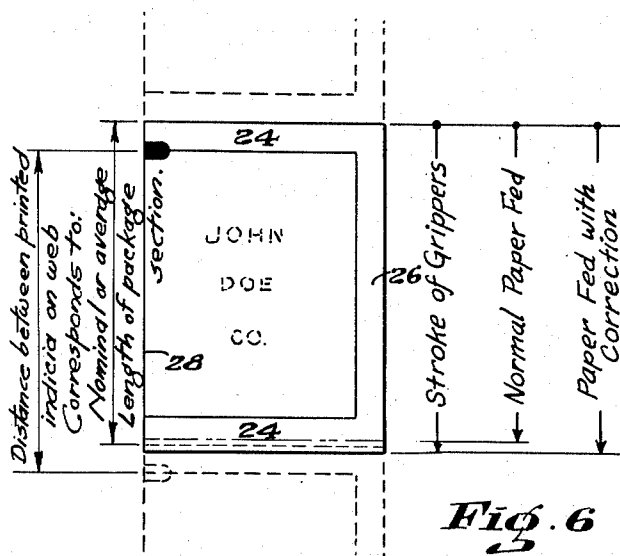


FIG. 5



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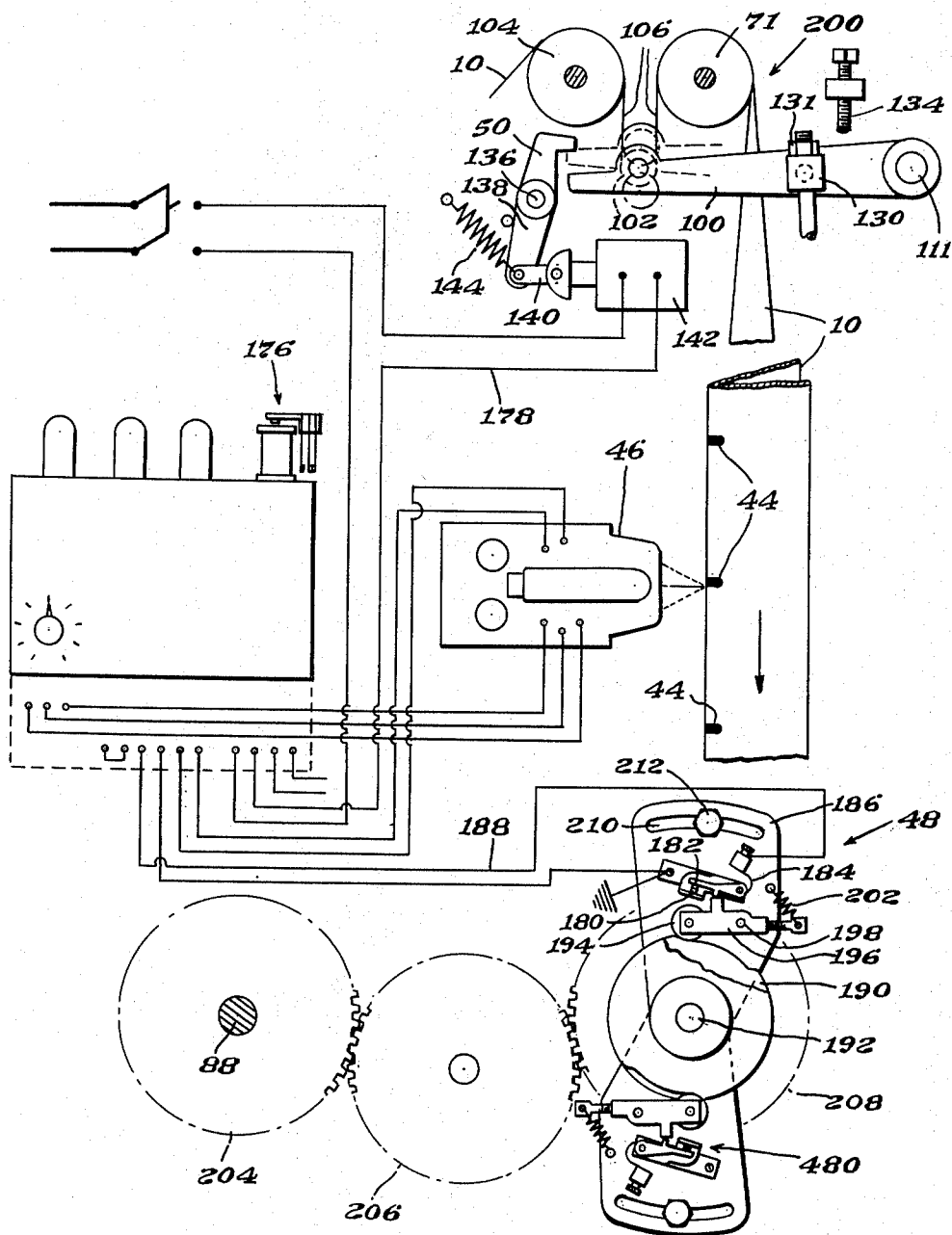


Fig. 7

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2,636,732

WEB FEEDING METHOD AND MEANS FOR
CONTAINER FORMING APPARATUSStanley R. Howard, Milton, Mass., assignor to
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Application March 30, 1948, Serial No. 17,973

16 Claims. (Cl. 271—2.6)

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This invention relates to a packaging machine and particularly to a bagging machine, such as a tea-bagging machine.

In general the object of the invention is to provide a novel and improved packaging machine wherein a printed web of flexible sheet material, such as heat sealable printed paper, is utilized to produce successive filled and sealed containers in a rapid, efficient and commercially acceptable manner and wherein novel provision is made for controlling the feeding of the web to effect registration of the successive printed sections of the web with relation to the container forming mechanisms within tolerances permitted by the commercial acceptability of the packages produced. In its preferred embodiment the invention is embodied in a tea-bagging machine.

With this object in view and such others as may hereinafter appear, the invention consists in the packaging machine, and particularly in the tea-bagging machine, 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 side elevation of a tea-bagging machine embodying the present invention; Fig. 2 is a front elevation of the lower portion of the machine shown in Fig. 1 and illustrating the web advancing grippers; Fig. 3 is a plan view of the web advancing grippers shown in Fig. 2; Fig. 4 is a detail view in side elevation of web unwinding and releasing mechanism and control mechanism associated therewith; Fig. 5 is a detail view in cross section taken on the line 5—5 of Fig. 1; Fig. 6 is a front elevation of a completed tea bag and adjacent sections indicating the length of the predetermined web advance, and the advance with the corrective stroke relative to the bag length or to the distance between the printed indicia on the web; and Fig. 7 is an electrical wiring diagram for the web feed control mechanism.

In general the invention contemplates a packaging machine, and particularly a bag forming, filling and sealing machine, wherein novel and improved web feeding control mechanism enables the machine to operate upon a printed web and to effect registration of successive printed bag forming sections of the web with respect to the bag forming, filling and sealing mechanisms with permissible tolerances. Briefly provision is made for detecting a variation of the web from the maximum permitted tolerance during the feeding thereof and for effecting a corrective

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feeding during the same cycle of operation that the detection is made, so that until a further detection indicates the need for another correction the web is fed to effect registration as above stated within the tolerances permitted.

Referring now to the drawings, the present invention is illustrated as embodied in a commercial machine for making individual filled and sealed containers such as tea bags, from an elongated web or strip of paper in accordance with the method disclosed in the United States patent to Patterson, No. 2,272,530, issued February 10, 1942, and in general comprises an improvement in the apparatus disclosed in the United States patent to Patterson, No. 2,385,229, issued September 13, 1945. As herein shown, such machines may be constructed in duplex form for simultaneously producing two strips of connected and filled containers and for severing the strips through sealed portions thereof to form individual tea bags.

In the operation of such a machine and, as illustrated in Fig. 1, a web of heat sealable paper 10 is withdrawn from a supply roll 12 thereof and advanced over forming mechanism 16 which operates to fold the web longitudinally along a medial line to bring together the two half sections of the web preparatory to forming a strip of connected bag sections 18. The paper is drawn over the forming mechanism 16 by vertically and horizontally reciprocable gripping and advancing mechanism 20 operative to advance the strip substantially one bag length each cycle of operation and to present the strip in operative relation to sealing mechanism indicated generally at 22 arranged to apply heat and pressure to seal the strip simultaneously along a transverse zone 24 and an adjacent longitudinal zone 26 during each sealing operation to form a series of connected bag sections closed on one side by the folded edge 28 and heat sealed along the remaining side and at the top and bottom.

In the illustrated embodiment of the invention provision is made for first unwinding the paper web from the supply roll 12 and then releasing a predetermined length of the unwound web to be advanced by the gripper mechanism 20, and, as herein shown, the material is arranged to be unwound from the supply roll 12 by unwinding and releasing mechanism, indicated generally at 30, which includes an idler roll 71 for guiding the web to the bag forming mechanisms. The supply roll 12 may be provided with suitable retarding means, such as a friction bearing indicated at 51, for preventing inadvertent unwinding

of the web material and to maintain the web relatively taut between the supply roll and the unwinding mechanism.

Provision is also made for depositing successive charges of the commodity into successive of the uppermost bag sections as they are being formed, by feeding mechanism indicated generally herein at 30, the feeding mechanism operating in timed relation to the web advancing mechanism 20 and the sealing mechanism 22. In the operation of the machine, the open top of a bag section which has been provided with a charge of the commodity during one cycle of operation is closed during a succeeding cycle. Thereupon, the strip is intermittently advanced to severing mechanism, indicated generally at 32, which operates to sever the strip through successive transverse sealed portions 24 to form individual filled and sealed bags.

The machine illustrated and described in the Patterson Patent No. 2,385,229 above referred to was particularly designed for producing paper tea bags made from a web of plain, unprinted heat sealable paper, and such machines are at the present time in extensive successful commercial use. However, when printed webs are used in a machine having a linear web advancing mechanism arranged to advance the web a fixed length corresponding to a predetermined bag length it is difficult to maintain correct registration of successive printed bag sections with the bag forming instrumentalities since, in practice, the sections may vary due to inaccuracies in printing, to variations in expansion and contraction of the web due to atmospheric conditions, stretching of the web during withdrawal, or possible slippage of the web. Thus, in the operation of such prior machines on a printed web any slight variations in the length of the printed sections are cumulative so that eventually the web departs from proper registration with the bag forming and severing mechanisms.

In accordance with the present invention provision is made for varying the linear advance of the web to compensate for the variations in the printed web, and, in the illustrated embodiment of the invention provision is made for unwinding and then normally releasing a predetermined length of web slightly less than the predetermined bag length to be advanced by the gripper mechanism each cycle of operation, the grippers being arranged to travel a distance slightly more than the predetermined bag length and to slip on the web when the predetermined lesser amount of web released has been advanced to its full extent so that the advance of the web during each normal cycle of operation is slightly less than the predetermined bag length. Provision is further made for effecting release of a slight additional increment of the web to permit the web to be advanced the full stroke of the grippers by control mechanism responsive to the passage of the registration marks at a predetermined time in the web advancing cycle of operation, thus permitting the web to be advanced a distance slightly more than the predetermined bag length when a deviation from a predetermined position of a registration mark occurs thereby providing in effect a correction in the linear advance of the web during the same cycle of operation in which such deviation is detected by the control mechanism.

As herein shown, each web gripping and advancing mechanism 20 includes a pair of opposed cooperating grippers 40, 42 mounted to be hori-

zontally reciprocated into and out of gripping engagement with the web, and, to be vertically reciprocated to advance the web each cycle of operation. In the present embodiment of the invention, the gripper operating mechanism may be initially adjusted to effect a linear stroke of the grippers capable of advancing the web a distance slightly more than the predetermined bag length or distance between successive substantially equally spaced registration marks 44 on the web, and, the grippers are yieldingly engageable with the web so as to permit slippage near the end of the advancing stroke when the shorter length of webbing is released but effective to advance the web the full distance of the linear stroke of the grippers when an additional length of webbing is released during the advancing movement.

In general, the control mechanism includes a photo-sensitive detector, indicated generally at 46, arranged to cooperate with the spaced registration marks 44 during the advancing cycle of operation; a timing switch 48, see Fig. 7, arranged to render the detector operative at a predetermined time in the web advancing cycle; web unwinding and releasing means, indicated generally at 206; and a solenoid operated latch member 50 operative to permit release of an additional increment of the web when actuated by the detector mechanism. The gripper members 40, 42 are arranged to yieldingly engage the web during the advancing stroke with sufficient firmness to effect positive advancement of the loose web unwound and released by the mechanism 200, yet permitting slippage of the grippers when a length of web less than the full stroke is released.

In practice, the photo-sensitive detector may be disposed relative to the web so that the light beam image is concentrated on the edge of the web at a point approximately halfway between two marks 44 when the web is at rest, as illustrated in Fig. 1. Thus, during intermittent advancement of the web the light beam may be intercepted by a mark at about the halfway point in its advance, as illustrated in Fig. 7. The detector unit herein illustrated is arranged to be excited to effect an additional increment of release of the web only when the light beam is intercepted by a mark during the "scanning" period, that is, when the circuit is closed by the timing switch 48 and then only when the beam is "cut off" or intercepted by the leading edge of a rapidly passing mark. If the beam falls directly on the mark when the switch 48 is closed, no correction in the web feed is effected, and likewise, if the beam falls on the mark and the mark then passes by so that the beam then falls on the relatively lighted background of the web during the scanning period, no correction is made.

In the operation of the apparatus, assuming that the average package length is approximately $2\frac{1}{2}$ inches, for example, successive predetermined web releasing and advancing movements are arranged to advance the web about $\frac{1}{2}$ of an inch less than the predetermined bag length, or about $2\frac{1}{8}$ inches each cycle of operation so as to effect a gradual and cumulative rising or "creeping up" of the marks 44 relative to the light beam until a point is reached where the beam is intercepted by a mark moving therepast. When this occurs, the web releasing mechanism is rendered operative to release an additional increment of web material so that the web is advanced the full stroke of the grippers, the net advance of the web being about $\frac{1}{2}$ of

an inch more than the predetermined length of a bag section or a total of $2\frac{1}{2}$ inches. Thus, it will be seen that the web advancing movement is either increased or decreased relative to the predetermined bag length, between the permitted limits or variation thereof, so that in operation substantially correct registration of successive bag sections with the container forming mechanisms is obtained.

Referring now to Figs. 1 and 2 for a more detailed description of the web releasing and advancing mechanisms, as therein shown, opposed grippers 40, 42 are arranged to be horizontally reciprocated in brackets 52, 54 respectively, the latter being adjustably clamped upon vertical rods 56, 58 supported for vertical reciprocation in suitable bearings provided in the machine frame. The rods 56, 58 are arranged to be vertically reciprocated in timed relation to the operation of the bag forming mechanisms by a cam 60 mounted fast on the main cam shaft 160, and, as herein shown, provision is made for initially adjusting the effective stroke of the cam in order to adjust the linear advance of the grippers with relation to the predetermined spacing of the bag sections of the web. The rods 56, 58 are secured at their lower ends to a pair of yoke shaped tie pieces 62 only one of which is shown, the illustrated tie piece 62 having a central slotted portion 64 for cooperation with a slide block 66 mounted on one end of an eccentric stud 68 carried in a lever 70 fast on a rocker shaft 72, the eccentric stud being rotatably adjustable in the lever 70. The eccentric end of the stud 68 is provided with a roller 74 cooperating with the fixed cam path of the cam 60, as clearly shown in Fig. 5.

With this construction it will be seen that by rotary adjustment of the eccentric stud 68 the effective length of the lever arm 70 may be varied, rotary adjustment in one direction operating to increase the distance from the center of the rocker shaft 72 to the center of the roller 74 to thus decrease the effective stroke, and, rotary adjustment in the opposite direction operating to decrease the distance from the center of the rocker shaft to the center of the roller to thus increase the effective stroke. Thus, the linear movement of the gripper units may be initially adjusted so as to be capable of effecting a linear advance of the web a distance slightly more than the average spacing between successive marks 44. It will be understood that the gripper carrying brackets 52, 54 may be adjusted on their respective rods 56, 58, to align the cooperating gripper units 40, 42 for cooperation with successive transverse sealed portions 24 of the web.

While the above description has been confined to the operation of one pair of cooperating gripper units 40, 42 for advancing a web of container forming material into operative relation to the package forming instrumentalities, it will be understood that in the duplex machine herein illustrated, an identical and simultaneously operating pair of gripper units 400, 420 are carried by the brackets 52, 54 respectively, as illustrated in Fig. 3, the brackets being also adjustably supported upon similar vertical rods 560, 580 arranged to be vertically reciprocated by the cam 60 through similar connections including a lever arm fast on the rocker shaft 72 so that in operation each pair of grippers are simultaneously operated to cause the webs to be advanced concurrently into operative

relation to their respective container forming, filling and severing mechanism.

As illustrated in Figs. 2 and 3, each gripper unit 40, 42 and their corresponding units 400, 420 are supported for horizontal reciprocation upon individual rods 76 slidably carried in the brackets 52, 54, each rod being provided with a coil spring 78 interposed between a portion of its supporting bracket and a collar 80 adjustably secured to the rod, the springs being arranged to urge the grippers inwardly into cooperating engagement with their opposing grippers and their respective container forming webs. The rods 76 of each unit are joined at their outer ends by a tie piece 82 and each tie piece carries a roller 84 arranged to cooperate with elongated cams 86 secured to vertical cam shafts 88, 90 respectively. Thus, in the operation of the machine, the gripper units 40, 400 and 42, 420 are horizontally reciprocated simultaneously into and from engagement with the webs, the spring 78 effecting a yielding engagement therewith and the cams 86 operating to positively separate the grippers. The springs 78 may be adjusted so as to provide a sufficiently firm grip as to effect a positive advance of the web material freed from the supply roll 12 by the unwinding and releasing mechanism 200 and yet capable of slipping on the web when an amount less than the full stroke of the grippers is released. The vertical cam shafts 88, 90 are arranged to be rotated from the main cam shaft 160 by connections including bevel gears 92, 94 to the vertical shaft 88, bevel gears 96, 98 to a horizontal cam shaft 99 and a second set of similar bevel gears to the vertical shaft 90. As herein shown, one gripper member, 40, may be yieldingly mounted to provide a more accurate control of the gripper pressure, the gripper member being provided with a pair of pins 101, 103 slidably carried in a block 105 secured to the end of the rod 76. Springs 107 coiled about the pins and interposed between the gripper member and the block are arranged to yieldingly urge the gripper 40 toward its opposing gripper, each pin 101, 103 being provided with a nut 109 on its outer end for adjustably limiting the movement in this direction.

As above stated, the web unwinding and releasing mechanism, indicated generally at 200, is arranged to normally release a length of web slightly less in length than the predetermined bag section to be advanced by the gripping and advancing mechanism 20 into operative relation to the bag forming and filling mechanisms, and, to release an additional increment of the unwound web material when actuated by the control mechanism 46, the additional material being also advanced by the gripping mechanism 20 to provide in effect a corrective feeding movement during the same cycle of operation in which a deviation from a predetermined position of the web is detected. As best shown in Fig. 4, the web unwinding and releasing mechanism 200 comprises a cam operated rocker lever 100 pivotally mounted at 101 and having a roller 102 carried thereby which is arranged to engage the web and to control the length of web material unwound and released each cycle of operation. As herein shown, the web 10 unwound from the supply roll 12 is arranged to pass over an idler roll 104, under the roller 102, and then over the guide roll 71, the unwound portion of the web forming a loop 106. In operation, the downward rocking movement of the lever 100 effects un-

winding of a predetermined length of web material each cycle of operation, and, upward rocking movement of the lever is arranged to release a predetermined length of the unwound material by leaving the loop 136 free to be advanced by the grippers 40, 42. The unwinding and releasing lever 100 is limited in its downward movement by its operating cam and connections therebetween to effect a positive limit of unwinding movement, and, is normally limited in its upward movement by the solenoid operated latch member 59 arranged to engage the outer end of the lever 100.

The downward or unwinding movement of the rocker lever 100 may occur during the stationary period of the web and at a time when the sealing members 22 are in engagement with the web, and the upward or releasing movement of the rocker lever 100 may occur immediately thereafter or just prior to the web advancing movement. In order to prevent additional unwinding of the web material from the supply roll 12 during the web advancing movement, a spring pressed clamp 110 may be provided which is arranged to cooperate with the idler roll 104 to clamp the web immediately after the unwinding operation, the clamp being released at the end of the web advancing movement when the sealer members 22 engage the web to permit a succeeding length of web to be withdrawn from the supply roll, the sealing members 22 preventing upward or retracting movement of the web during this time.

As illustrated in Fig. 1, the lever 100 is arranged to be rocked to effect unwinding and releasing of the web by a cam 112 fast on the horizontal cam shaft 99 and through connections including a cam roll 114 carried on the lower end of a vertical rod 116 mounted to be reciprocated in a bearing 118, the rod 116 being urged downwardly to hold the roll 114 against its cam by a spring 120 interposed between a portion of the bearing and a collar 122. The upper end of the rod 116 is provided with a tie piece 124 which carries two separate rods 126, 128 pivotally carried in the ends thereof for cooperation with opposed unwinding and releasing mechanisms of the duplex machine. Each rod 126, 128 is provided with a yieldable connection in which the rod is arranged to pass through a swivel 130 carried by the lever 100, the rod being provided with a nut 131 at its outer end for engagement with the top of the swivel to positively urge the lever 100 downwardly. A coil spring 132 is interposed between the underside of the swivel and the connected end of the rod to permit the lever 100 to be yieldingly rocked upwardly to release the loop 106 of unwound material. Adjustment of the downward limit of rocking movement of the lever 100 may be effected by adjustment of the nut 131.

In the operation of the machine, the lever 100 is normally engaged by the latch member 59 to limit the amount of the web released to an amount slightly less than the length of a predetermined bag section. However, when the control mechanism detects a deviation from a predetermined position of the web during the advancing movement, the solenoid operated latch 59 is arranged to unlock the arm 100 whereupon the arm will be rocked upwardly an additional increment of the loop 106 by virtue of the yieldable connection, the arm being adjustably limited in its additional upward rocking movement by a set screw 134, the additional amount

released being sufficient to provide a net length of web released slightly more than the predetermined bag length. As herein shown, the normally engaged latch member 59 is pivotally mounted at 136 and is provided with an arm 138 connected by a link 140 to the armature of a solenoid 142. A spring 144 connected to the arm 138 is arranged to hold the member 59 in latching position until the solenoid is actuated by the control mechanism.

In the illustrated embodiment of the invention, the spring pressed clamp 110 is carried by an arm 146 pivotally mounted on the guide roll shaft 148 and is arranged to be actuated by the unwinding and releasing cam 112 through connections including a cam roll 150 carried by a lever 152 fast on a rocker shaft 154. The rocker shaft 154 is connected to the clamping units of opposed unwinding and releasing mechanisms of the duplex machine to effect simultaneous operation thereof, and, as illustrated in Fig. 1, one arm 156 of a bell crank fast on the rocker shaft 154 is connected by a link 158 to a corresponding arm 161 of a bell crank pivotally mounted on a shaft 162. The second arm 164 of each bell crank is connected by similar links 166 to corresponding arms 146 which carry the spring pressed clamps 110. With this construction it will be seen that when the cam 112 effects upward rocking movement of the arms 100 to release a portion of the loop 106 to be advanced by the grippers, the webs will be clamped between the idlers 104 and the clamping members 110 to prevent unwinding of material from the supply roll 12, and conversely, when the arms 100 are permitted to be rocked downwardly by the cam 112 to effect unwinding of the webs from their supply rolls, the clamping members 110 will be released from clamping engagement. A spring 157 connected to the arm 156 is arranged to hold the roller 150 against the cam. It will be observed that in operation the loop 106 contains an amount of material in excess of that required for either the normal or corrective releasing and advancing movements and that an additional length is unwound from the supply roll each cycle of operation equal to the length released and advanced during the preceding cycle so as to maintain a uniform supply of material in the loop at the start of each releasing operation.

From the description thus far it will be observed that the printed bag forming web 10 having spaced registration marks 44 thereon, corresponding to the length of successive bag sections, may be intermittently advanced a distance slightly less than the predetermined distance between registration marks cycle of operation although the linear stroke of the gripping and advancing mechanism is sufficient to provide an advancing movement slightly more than such distance, the grippers being arranged to permit slippage of the web when the normally lesser amount of web is released. It will also be observed that the web unwinding and releasing lever 100 is capable of additional rocking movement to release a predetermined additional increment of the unwound web in the loop 106 so as to permit the web to be advanced the full stroke of the grippers when the control mechanism indicates a deviation from a predetermined position of the web during the advancing movement.

Referring now particularly to Fig. 7, the detector unit 46 is arranged to energize the solenoid 142 to effect release of an additional increment

of the web when the unit is actuated by a registration mark 44, and, as herein shown, the detector unit may comprise any usual or preferred photosensitive control system adapted to concentrate a beam of light on the web and arranged to be excited by a rapid change in the reflective characteristics of the surface upon which the beam is concentrated, such as a rapid change from a light to a dark surface of the moving web, the dark surface being herein illustrated as comprising the spaced registration marks 44 arranged to intercept the beam. When the detector unit is thus excited it is arranged to operate a relay 176 to close a circuit 178 to the solenoid 142. In practice, the light beam continues to play upon the web but the unit is operative to actuate the relay 176 upon interception of the beam only during a predetermined time in the advancing cycle of operation, herein defined as the scanning period and corresponding to a time when the web has been advanced substantially half way in its movement from one position of operation to another.

As shown in Fig. 7, the scanning period is controlled by the timing switch 48 which includes a stationary contact 180 and a movable contact 182, the movable contact 182 being normally urged into circuit closing engagement with the stationary contact 180 by a leaf spring 184. The contact members 180, 182 are mounted upon an adjustable bracket 186, and, the switch is operated to open and close a circuit 188 to the detector unit 46 in timed relation to the operation of the machine by a cam 190 fast on a vertical cam shaft 192 and a cooperating cam roller 194 carried by an arm 196 pivotally mounted at 198. The arm 196 is provided with a lateral extension arranged to engage and rock the contact arm 182 to open the circuit 188, and a spring 202 is provided to urge the roller 194 against its cam. The switch cam shaft 192 is arranged to be rotated from the vertical shaft 88 by a gear train including a gear 204, idler gear 206 and gear 208 fast on the switch cam shaft 192.

Thus, the circuit 188 to the detector unit is closed by the cam 190 to provide a scanning period during the advancing stroke, at which time the detector unit is rendered operative to energize the solenoid 142 when the light beam is intercepted by a registration mark 44. The time at which the scanning period starts relative to the moving period of the web may be varied by rotary adjustment of the contact carrying bracket 186 which latter is mounted for rotary movement on the switch cam shaft 192 and is provided with an arcuate slotted portion 210 at its outer end arranged to receive a bolt 212 for fastening the bracket in its adjusted position.

It will be understood that the characteristics of the preferred detector unit 46 are such that if the light beam is directly in alignment with a registration mark 44 when the timing switch 48 is closed, thus indicating substantially uniform registration of the printed bag sections with the bag forming and severing mechanisms, the relay 176 will not be actuated and also if the light beam is first directed on the mark and then passes from the mark to the relatively lighter surface of the web during the scanning period, also indicating substantially uniform and commercially acceptable registration of the bag sections, the relay will not be actuated to effect additional release of the web. The only time the detecting unit will respond to the passage of the moving web is when the light beam is first

directed onto the relatively light surface of the web material when the timing switch is closed and is then rapidly intercepted by the passage of a registration mark during the scanning period, such position being indicated generally in Fig. 7 wherein the switch contacts 180, 182 are closed and the light beam is just about to be intercepted by a mark 44, indicating that the printed bag sections are lagging slightly behind proper registration with the bag forming and severing instrumentalities.

Upon interception of the light beam by a registration mark at such time, the relay 176 will be actuated to close the circuit 178 to the solenoid 142 which is in turn energized to rock the latch member 60 out of locking engagement with the end of the lever 100 thus permitting the latter to be rocked upwardly to release an additional increment of web material which additional increment is advanced by the grippers to provide an overfeed or corrective stroke. Thereafter, in the operation of the machine, the uppermost bag section is sealed and provided with a charge of the commodity, the lowermost bag section is severed from the web, and the unwinding and releasing mechanism is operated to effect normal unwinding and releasing of the web during the succeeding cycle unless the position of the web during such cycle is such as to again require that an additional increment of the web be released and advanced. It will thus be seen that the releasing mechanism is rendered operative to permit the web to be advanced the full stroke of the grippers to correct the position of the web during the same cycle of operation that a deviation from a substantially uniform position of advancement is detected so as to assure that none of the bag sections deviate from such position beyond predetermined commercially acceptable limits.

From the description thus far it will be seen that in the operation of the web unwinding, releasing and advancing mechanisms successive normal or uncorrected web advancing movements which are slightly less than the predetermined spacing of the printed sections of the web will cause the marks to rise relative to the light beam concentrated on the moving web and that this action will be cumulative so that eventually the mark will intercept the light beam, as described, to effect additional release and advancement of the web. As herein shown, similar control mechanism is provided for controlling each web of a duplex bag forming machine, and includes a similar unwinding and releasing mechanism 2000; detecting unit 400; solenoid operated latch 500; and timing switch 430 so that in operation, although the web advancing mechanisms are simultaneously operated through the same cam 60, yet each web may be individually controlled to selectively effect an additional advance of a web as determined by its individual detecting unit. In some cases no correction is required depending on variations of the many conditions affecting the 26 expansion and contraction of the paper web.

Thus the bag forming webs are maintained in registered relation within predetermined tolerances with respect to the bag forming mechanisms comprising the package sealing mechanism 22, filling mechanism 30 and severing mechanism 32 which may comprise the mechanisms illustrated and described in the Patterson Patent No. 2,385,229 above referred to, and to which reference may be had for a more complete de-

scription and mode of operation thereof. As herein shown, successive connected filled and sealed bags advanced into operative position to the severing mechanism 32 are cut off and received in suitable guides 390, 392 through which they are advanced in an upright position by intermittently operated pusher arms 394, 396 to be delivered from the machine.

From the above description it will be seen that provision is made in the present apparatus for controlling the intermittent advance of a printed web of bag forming material into operative position with relation to the forming and severing mechanisms to maintain the length of individual bag sections within predetermined tolerances, the control mechanism being adapted to correct the linear advance of the web during the same cycle in which a deviation beyond such tolerances is detected.

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 machine of the character described, in combination, web feeding means for intermittently advancing a web having substantially equally spaced registration marks thereon defining successive package sections comprising means operative independently of the advancing movement for withdrawing a length of web from a supply roll and for thereafter releasing a predetermined fixed length of said withdrawn portion slightly less in length than a predetermined package length each cycle of operation, means for advancing the released length of web, control means including means for detecting the position of a registration mark at a predetermined time during the advance of the web, and means responsive to said detecting means when a deviation from a predetermined position beyond an allowable tolerance is detected by interception of the detecting means by the registration mark during said predetermined time for controlling said withdrawing and releasing means to effect release of a predetermined additional fixed increment of web material to be concurrently advanced by said advancing means during the same cycle of operation in which such interception occurs whereby to provide a net advance of the web a distance slightly more than the predetermined package length.

2. In a machine of the character described, in combination, web feeding means for intermittently advancing a web having substantially equally spaced registration marks thereon defining successive package sections comprising means operative independently of the advancing movement for withdrawing a length of web from a supply roll and for thereafter releasing a fixed predetermined length of said withdrawn portion slightly less in length than a predetermined package length each cycle of operation, a pair of horizontally and vertically reciprocable grippers arranged to advance the released length of web, control means including means for detecting the position of a registration mark at a predetermined time during the advance of the web, and means responsive to said detecting means when a deviation from a predetermined position beyond allowable tolerances is by interception of the detecting means by the registration mark during said predetermined time de-

tected for controlling said withdrawing and releasing means to effect release of a predetermined additional fixed increment of web material to be concurrently advanced by said grippers during the same cycle of operation in which such interception occurs whereby to provide a net advance of the web a distance slightly more than the predetermined package length.

3. In a machine of the character described, in combination, web feeding means for intermittently advancing a web having substantially equally spaced registration marks thereon defining successive package sections comprising means operative independently of the advancing movement for withdrawing a length of web from a supply roll and for thereafter releasing a predetermined fixed length of said withdrawn portion slightly less in length than a predetermined package length each cycle of operation, a pair of horizontally and vertically reciprocable grippers arranged to advance the released length of web, control means including means for detecting the position of a registration mark at a predetermined time during the advance of the web, and means responsive to said detecting means when a deviation from a predetermined position beyond allowable tolerances is detected by interception of the detecting means by the registration mark during said predetermined time for controlling said withdrawing and releasing means to effect release of a predetermined additional fixed increment of web material to be concurrently advanced by said grippers during the same cycle of operation in which such interception occurs whereby to provide a net advance of the web a distance slightly more than the predetermined package length, and means for operating said grippers through a predetermined linear advancing movement substantially equal to the longer length of web advanced, said grippers being yieldingly engageable with the web and capable of slipping relative thereto when the shorter length of web is fully advanced.

4. In a machine of the character described, in combination, web feeding means for intermittently advancing a web having substantially equally spaced registration marks thereon defining successive package sections comprising a supply roll, a reciprocable member arranged to engage the web and to effect withdrawal of a length thereof from the supply roll when moved in one direction and to release a predetermined length of the withdrawn portion when moved in the opposite direction, means for normally limiting the releasing movement of said reciprocable member to permit release of a length of web slightly less in length than a predetermined package length each cycle of operation, means for advancing the released length of web, control means including means for detecting the position of a registration mark at a predetermined time during the advance of the web, and means responsive to said detecting means when a deviation from a predetermined position beyond allowable tolerances is detected for removing said limiting means so as to permit release of an additional increment of web to be advanced by said advancing means during the same cycle of operation in which such deviation is detected whereby to provide a net advance of the web a distance slightly more than said package length.

5. In a machine of the character described, in combination, web feeding means for intermittently advancing a web having substantially equally spaced registration marks thereon defining successive package sections comprising a sup-

ply roll, a rockingly mounted member engageable with the web arranged to effect withdrawal of a length thereof from the supply roll when rocked in one direction and to release a predetermined length of said withdrawn portion when rocked in the opposite direction, means for normally limiting the releasing movement of said rocking member to permit release of a fixed length of web slightly less in length than a predetermined package length each cycle of operation, means for advancing the released length of web, clamping means cooperating with said web to prevent further withdrawal from the supply roll during the advancing movement, horizontally reciprocable members arranged to engage and clamp the free end of the web to prevent retraction of the web during the withdrawing operation, control means including means for detecting the position of a registration mark at a predetermined time during the advance of the web, and means responsive to said detecting means when a deviation from a predetermined position beyond allowable tolerances is detected by interception of the detecting means by the registration mark during said predetermined time for removing said limiting means so as to permit release of an additional fixed increment of web to be advanced by said advancing means during the same cycle of operation in which such interception occurs whereby to provide a net advance of the web a distance slightly more than said package length.

6. In a machine of the character described, in combination, web feeding means for intermittently advancing a web having equally spaced registration marks thereon defining successive package sections comprising means operative independently of the advancing movement for withdrawing a length of web and for thereafter releasing a fixed predetermined length of said withdrawn portion slightly less in length than a predetermined package length each cycle of operation, means for advancing the length of web released, control means including a normally inoperative photo-sensitive detector arranged to cooperate with said registration marks, a timing switch for rendering said detector operative to detect the position of a registration mark at a predetermined time during the advance of the web, and means responsive to said detecting means when a deviation from a predetermined position beyond allowable tolerances is detected by interception of the detecting means by the registration mark during said predetermined time for controlling said withdrawing and releasing means to effect release of a predetermined additional fixed increment of web material to be concurrently advanced by said advancing means during the same cycle of operation in which such interception occurs whereby to provide a net advance of the web a distance slightly more than said package length.

7. In a machine of the character described, in combination, web feeding means for intermittently advancing a web having substantially equally spaced registration marks thereon defining successive package sections comprising a supply roll, a rockingly mounted member engageable with the web arranged to effect withdrawal of a length thereof from the supply roll when rocked in one direction and to release a predetermined length of said withdrawn portion when rocked in the opposite direction, a solenoid operated latch engageable with the rocked member for limiting the releasing movement to normally permit release of a length of web slightly less in length

than a predetermined package length each cycle of operation, means for advancing the released length of web, and control means including a normally inoperative photo-sensitive detector arranged to cooperate with said registration marks, a timing switch for rendering said detector operative to detect the position of a registration mark at a predetermined time during the advance of the web, said solenoid operated latch being responsive to said detecting means when a deviation from a predetermined position beyond allowable tolerances is detected to effect movement of the latch out of latching engagement with said rocker member so as to permit release of a predetermined additional increment of web material to be concurrently advanced by said advancing means during the same cycle of operation in which such deviation is detected whereby to provide a net advance of the web a distance slightly more than said package length.

8. In a machine of the character described, in combination, web feeding means for intermittently advancing a web having substantially equally spaced registration marks thereon defining successive package sections comprising a supply roll, a rockingly mounted member engageable with the web arranged to effect withdrawal of a length thereof from the supply roll when rocked in one direction and to release a predetermined length of said withdrawn portion when rocked in the opposite direction, a solenoid operated latch engageable with the rocked member for limiting the releasing movement to normally permit release of a length of web slightly less in length than a predetermined package length each cycle of operation, means for advancing the released length of web, and control means including a normally inoperative photo-sensitive detector arranged to cooperate with said registration marks, a timing switch for rendering said detector operative to detect the position of a registration mark at a predetermined time during the advance of the web, said solenoid operated latch being responsive to said detecting means when a deviation from a predetermined position beyond allowable tolerances is detected to effect movement of the latch out of latching engagement with said rocker member so as to permit release of a predetermined additional increment of web material to be concurrently advanced by said advancing means during the same cycle of operation in which such deviation is detected whereby to provide a net advance of the web a distance slightly more than said package length, said web advancing means comprising a pair of horizontally and vertically reciprocable grippers having a predetermined linear advancing movement substantially equal to the longer length of web advanced and being yieldingly engageable with the web and capable of slippage relative thereto when the shorter length of web is fully advanced.

9. In a machine of the character described, in combination, web feeding means for intermittently advancing webs having substantially equally spaced registration marks thereon defining successive package sections comprising means operative independently of the advancing movement for withdrawing a length of web and for thereafter releasing predetermined fixed lengths of said withdrawn portion of each web slightly less in length than a predetermined package length each cycle of operation, means for simultaneously advancing the released lengths of each web, control means for each web for detecting the position of a registration mark on its respec-

tive web at a predetermined time during the advance of the webs, and means responsive to said detecting means when a deviation from a predetermined position beyond allowable tolerances is detected by interception of the detecting means by the registration mark during said predetermined time for selectively controlling said withdrawing and releasing means to effect effecting release of a predetermined additional fixed increment of web material to be advanced by said advancing means during the same cycle of operation in which such interception occurs whereby to provide a net advance of such web a distance slightly more than said package length.

10. In a machine of the character described, in combination, web feeding means for intermittently advancing webs having substantially equally spaced registration marks thereon defining successive package sections comprising supply rolls, reciprocable members arranged to engage the webs and to effect simultaneous withdrawal of a length thereof from each supply roll when moved in one direction and to release a predetermined length of the withdrawn portion of each web when moved in the opposite direction, means for normally limiting the releasing movement of said reciprocable members to permit release of a length of web slightly less in length than a predetermined package length each cycle of operation, means for simultaneously advancing the released lengths of each web, control means including means for detecting the position of a registration mark on its respective web at a predetermined time during the advance of the webs, and means responsive to said detecting means when a deviation from a predetermined position beyond allowable tolerances is detected for selectively removing said limiting means so as to permit release of a predetermined additional increment of web to be advanced by said advancing means during the same cycle of operation in which such deviation is detected whereby to provide a net advance of such web a distance slightly more than said package length.

11. In a machine of the character described having web sealing means and web severing means, the improvement comprising web feeding means for intermittently advancing a web having substantially equally spaced registration marks thereon defining successive package sections, said web feeding means comprising means operative independently of the advancing movement for withdrawing a length of web and for thereafter releasing a predetermined fixed length of said withdrawn portion slightly less in length than a predetermined package length each cycle of operation, means for advancing the released length of web, control means including means for detecting the position of a registration mark at a predetermined time during the advance of the web, and means responsive to said detecting means when a deviation from a predetermined position beyond allowable tolerances is detected by interception of the detecting means by the registration mark during said predetermined time for controlling said withdrawing and releasing means to effect release of a predetermined additional fixed increment of web material to be advanced by said advancing means during the same cycle of operation in which such interception occurs to provide a net advance of the web a distance slightly more than said package length.

12. In a machine of the character described having web sealing means and web severing means, the improvement comprising web feeding

means for intermittently advancing webs having substantially equally spaced registration marks thereon defining successive package sections, said web feeding means comprising supply rolls, reciprocable members operative independently of the advancing movement arranged to engage the webs to effect simultaneous withdrawal of a length thereof from each supply roll when moved in one direction and to release a predetermined length of the withdrawn portion of each web when moved in the opposite direction, means for normally limiting the releasing movement of said reciprocable members to permit release of a fixed length of web slightly less in length than a predetermined package length each cycle of operation, means for simultaneously advancing the released lengths of each web, control means including means for detecting the position of a registration mark on its respective web at a predetermined time during the advance of the webs, and means responsive to said detecting means when a deviation from a predetermined position beyond allowable tolerances is detected by interception of the detecting means by the registration mark during said predetermined time for selectively removing said limiting means so as to permit release of a predetermined additional fixed increment of web to be advanced by said advancing means during the same cycle of operation in which such interception occurs to provide a net advance of such web a distance slightly more than said package length.

13. In a machine of the character described, in combination, web feeding means for intermittently advancing a web having substantially equally spaced registration marks thereon defining successive package sections comprising means operative independently of the advancing movement for withdrawing a length of web from a supply roll and for thereafter releasing a predetermined fixed length of said withdrawn portion slightly less in length than a predetermined package length each cycle of operation, a pair of horizontally and vertically reciprocable grippers arranged to advance the released length of web, control means including means for detecting the position of a registration mark at a predetermined time during the advance of the web, and means responsive to said detecting means when a deviation from a predetermined position beyond allowable tolerances is detected by interception of the detecting means by the registration mark during said predetermined time for controlling said withdrawing and releasing means to effect release of a predetermined additional fixed increment of web material to be concurrently advanced by said grippers during the same cycle of operation in which such interception occurs whereby to provide a net advance of the web a distance slightly more than the predetermined package length, and cam operated means for effecting vertical reciprocation of said grippers a distance substantially equal to the longer length of web to be advanced, and means for initially adjusting the linear stroke of said cam operated means.

14. In a machine of the character described, in combination, web feeding means for intermittently advancing a web having substantially equally spaced registration marks thereon defining successive package sections comprising means operative independently of the advancing movement for withdrawing a length of web from a supply roll and for thereafter releasing a predetermined fixed length of said withdrawn portion

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slightly less in length than a predetermined package length each cycle of operation, means for advancing the released length of web, control means for detecting the position of a registration mark at a time when the web arrives at a point approximately halfway in its intermittent movement, and means responsive to said detecting means when a deviation from a predetermined position beyond allowable tolerances is detected by interception of the detecting means by the registration mark during said predetermined time for controlling said withdrawing and releasing means to effect release of a predetermined additional fixed increment of web material to be advanced by said advancing means during the same cycle of operation in which such interception occurs detected whereby to provide a net advance of the web a distance slightly more than said package length.

15. The method of feeding a web of package forming material having substantially equally spaced registration marks thereon defining successive package sections which comprises first withdrawing a length of package forming material from a supply thereof, then releasing a predetermined fixed length of the withdrawn portion slightly less in length than a predetermined package length, advancing the released length of web, detecting the position of a registration mark at a predetermined time during the advancing movement, and when a deviation from a predetermined position beyond allowable tolerances of the registration mark is detected releasing and advancing a predetermined additional fixed increment to obtain a net advance a distance slightly more than said package length.

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16. The method of feeding webs of package forming material having substantially equally spaced registration marks thereon defining successive package sections which comprises first withdrawing a length of package forming material for each web, then simultaneously releasing a predetermined fixed length of each withdrawn portion slightly less in length than a predetermined package length, advancing the released lengths of web, detecting the position of a registration mark on the individual webs at a predetermined time during the advance of the webs, and, when a deviation from a predetermined position beyond allowable tolerances of a registration mark of one of the webs is detected, selectively releasing and advancing such web a predetermined additional fixed increment to obtain a net advance of such web a distance slightly more than said package length.

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