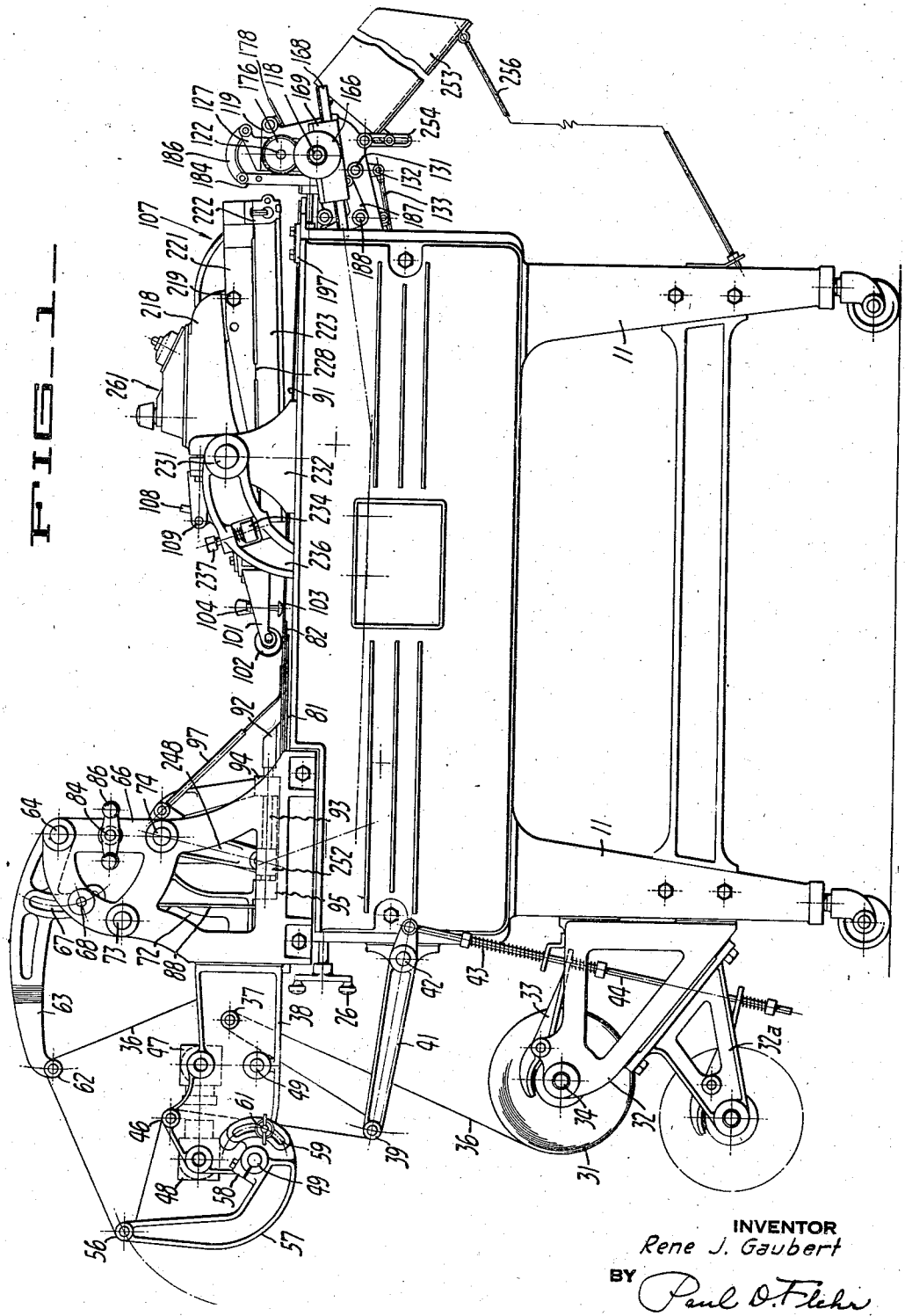
May 2, 1944. R. J. GAUBERT 2,347,902

BAG MAKING MACHINE AND METHOD

Filed Nov. 6, 1940 8 Sheets-Sheet 1

FIG. 1



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BAG MAKING MACHINE AND METHOD

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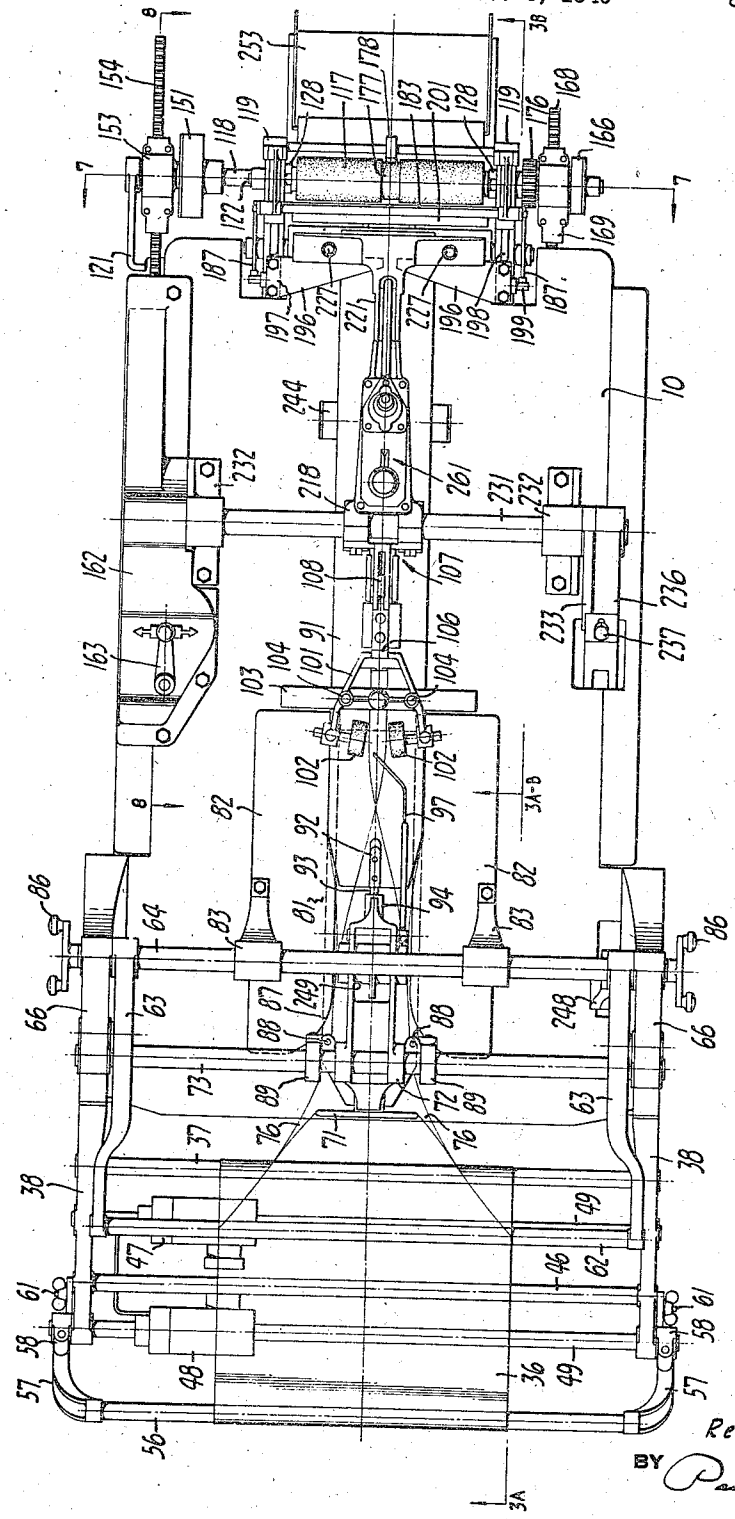

FIG. 2

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BAG MAKING MACHINE AND METHOD

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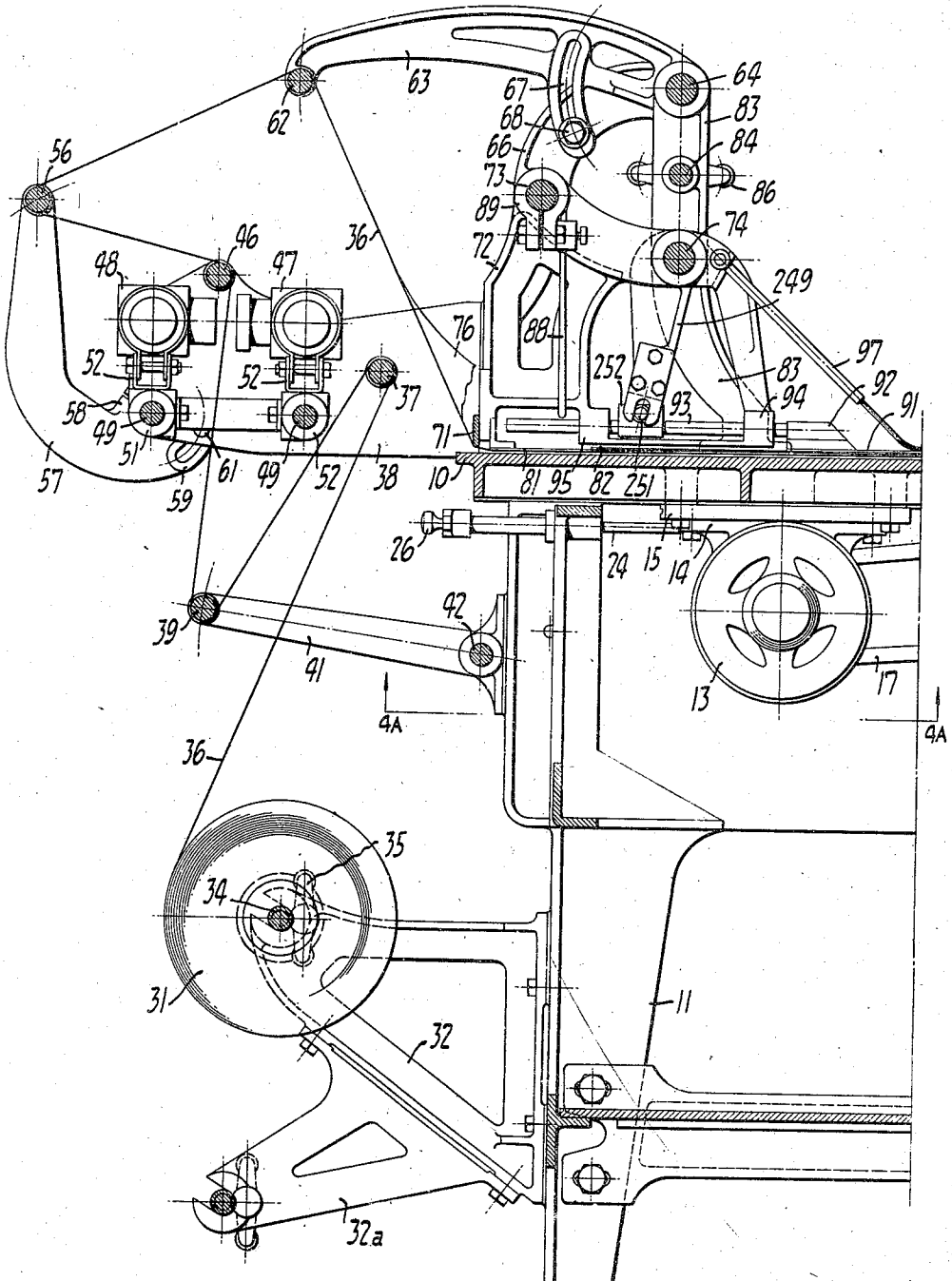

FIG. 3A.

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BAG MAKING MACHINE AND METHOD

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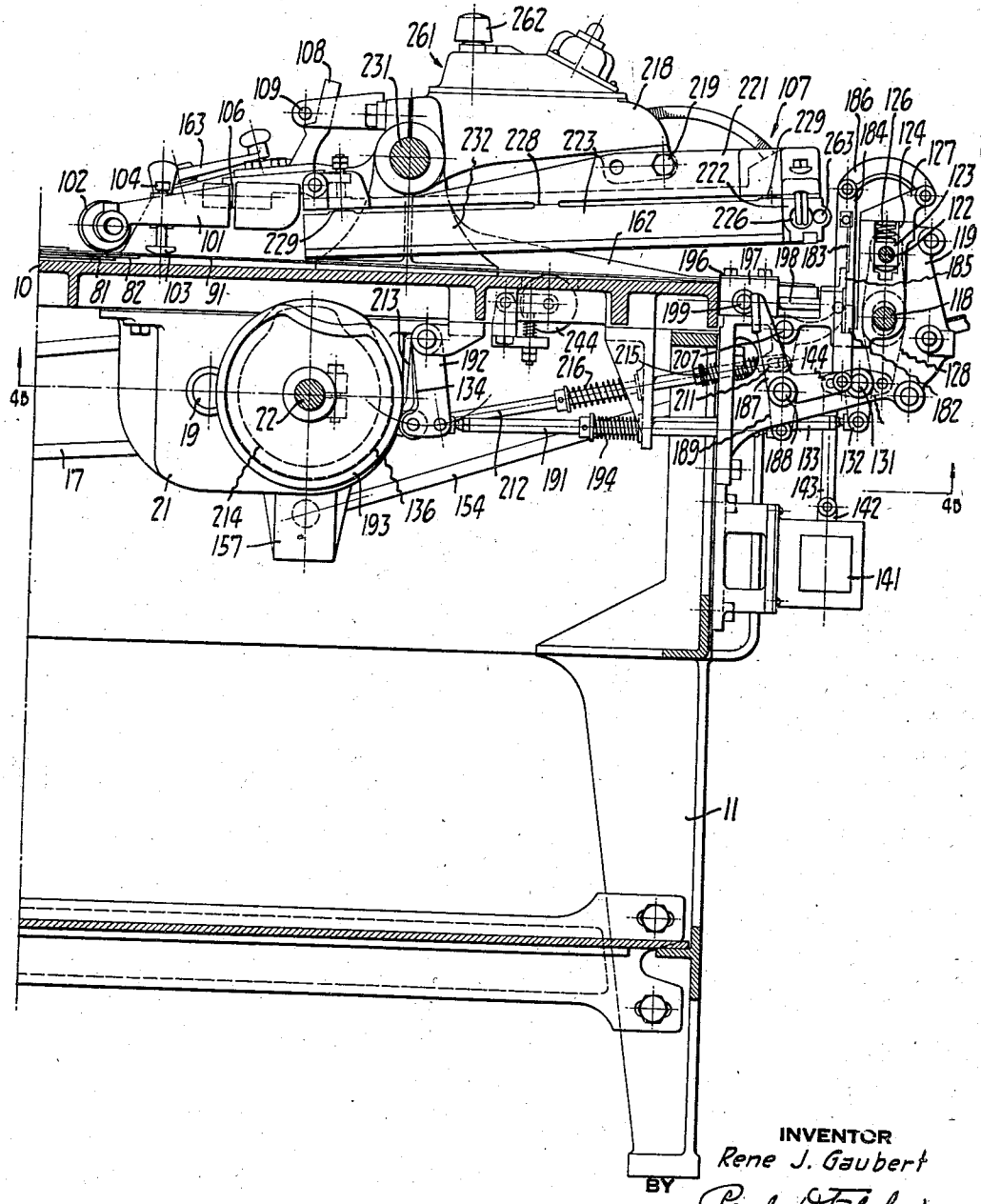
FIG. 3B.



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BAG MAKING MACHINE AND METHOD

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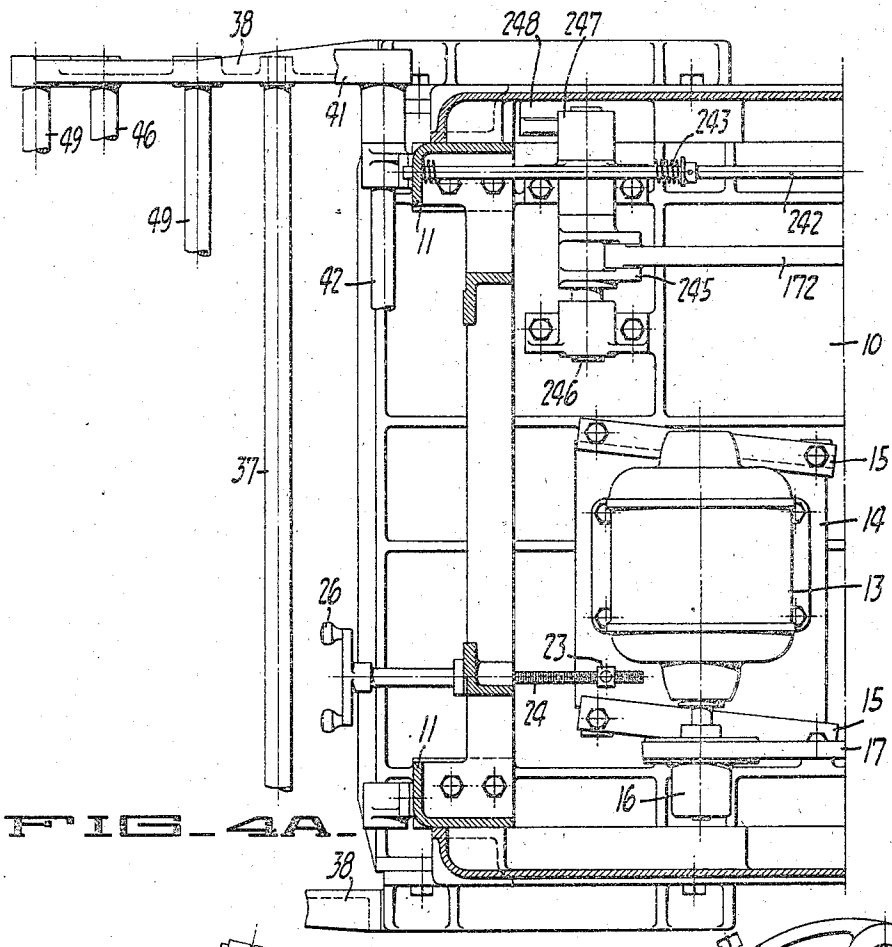

FIG_4A_

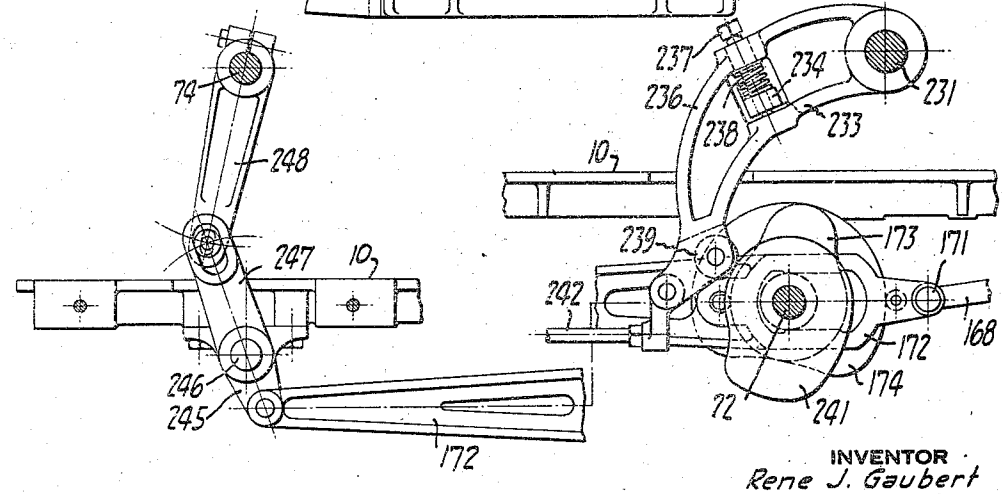

FIG_5_

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BAG MAKING MACHINE AND METHOD

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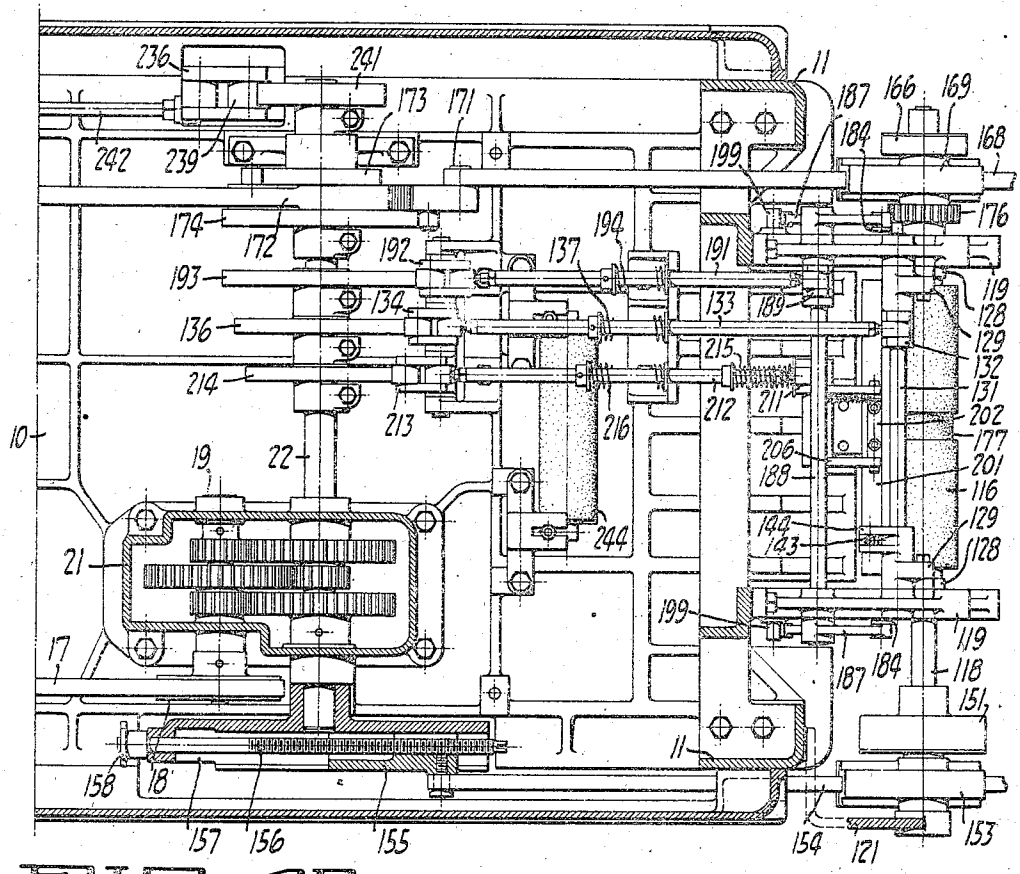

FIG. 4B.

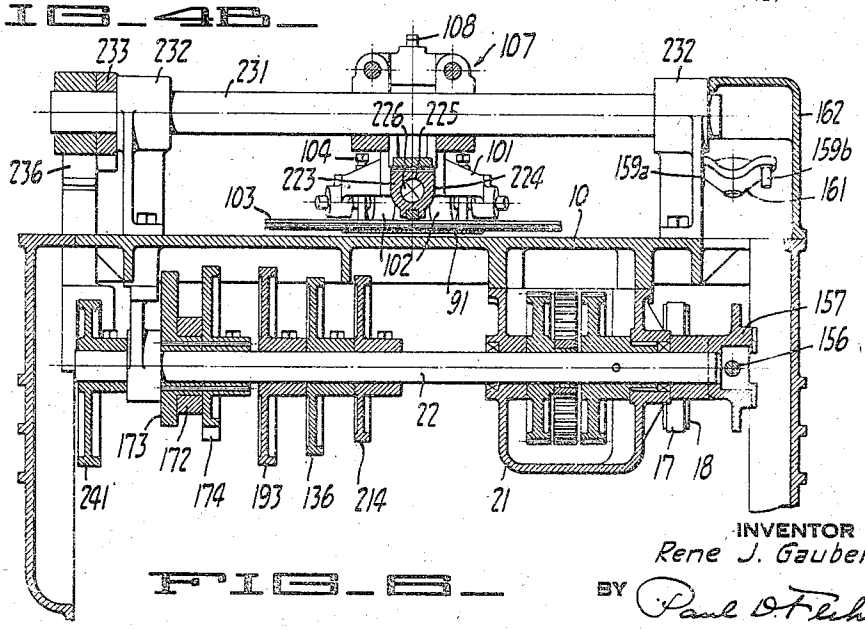

FIG. 5.

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BAG MAKING MACHINE AND METHOD

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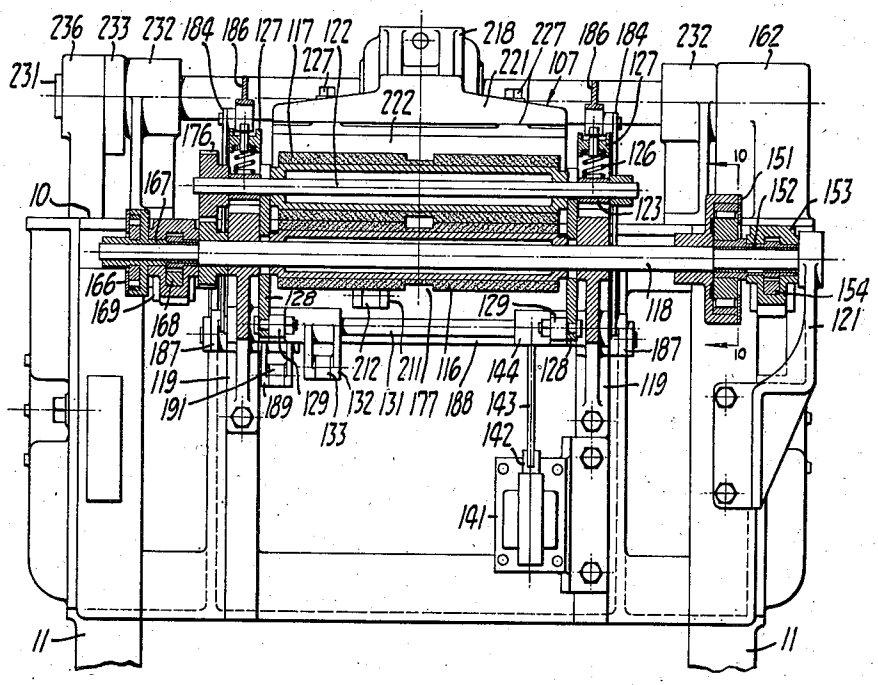
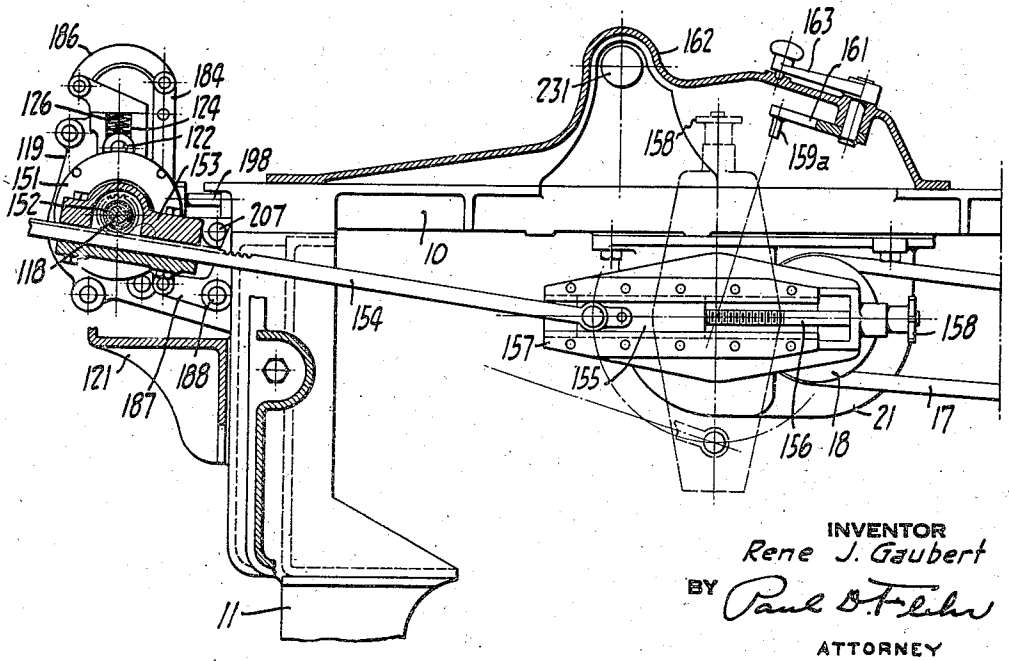


FIG-7-

FIG-8-



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BAG MAKING MACHINE AND METHOD

Filed Nov. 6, 1940 8 Sheets-Sheet 8

FIG_9_

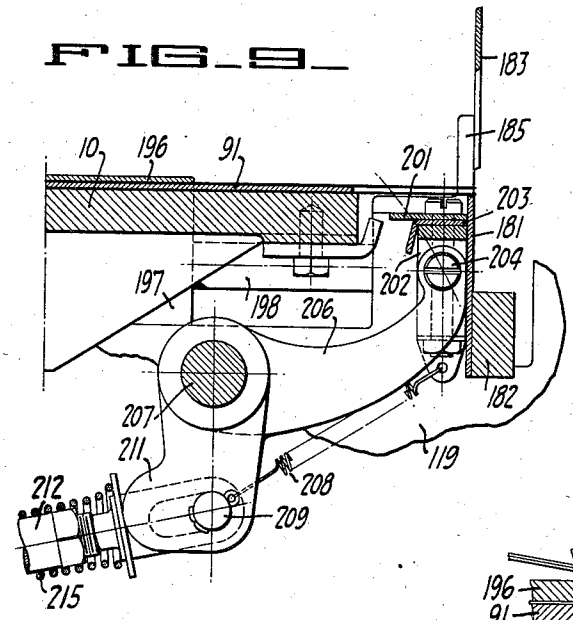


FIG_10_

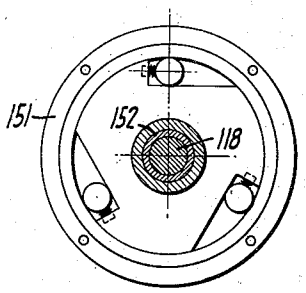


FIG_11_

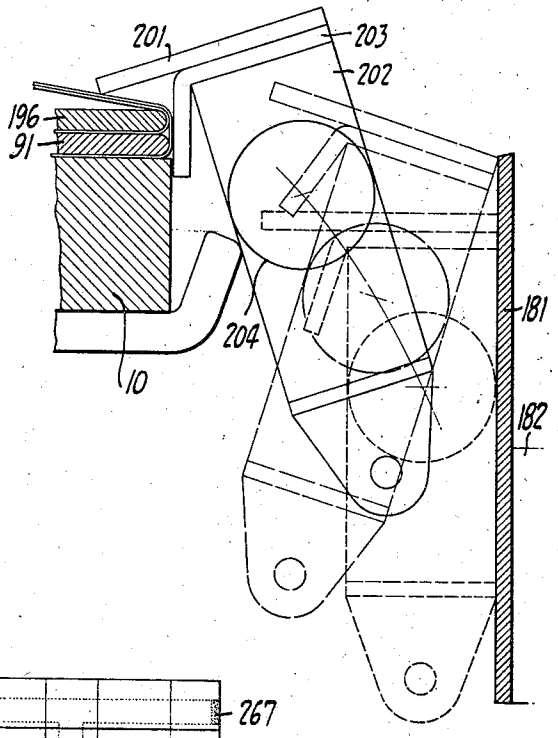


FIG_12_

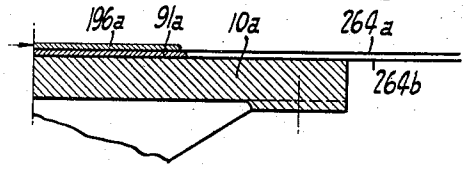
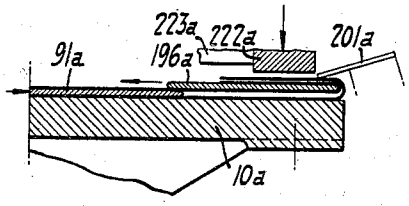


FIG_13_



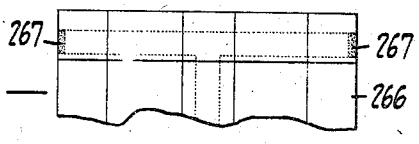


FIG_15_

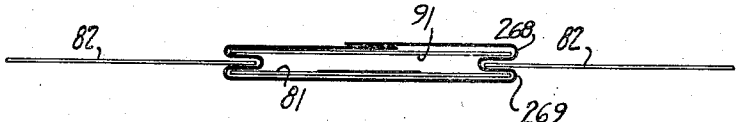


FIG_14_

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Patented May 2, 1944

2,347,902

UNITED STATES PATENT OFFICE

2,347,902

BAG MAKING MACHINE AND METHOD

Rene J. Gaubert, Oakland, Calif., assignor to Simplex Wrapping Machine Co., Oakland, Calif., a corporation of California

Application November 6, 1940, Serial No. 364,593

22 Claims. (Cl. 93—18)

This invention relates generally to improvements in machines and methods for forming bags from sheet or rolled material such as moisture-proof "Cellophane" or "Pliofilm" in an automatic manner.

The present construction is similar to the bag making machine and method disclosed in my patent, Ser. No. 2,094,594, dated October 5, 1937, in certain respects and employs certain of the inventions disclosed and claimed therein.

It is an object of the invention to provide a machine and method of the above character which, in a continuous and automatic manner operates to make bags from a roll of material of the character referred to by forming the bags and by making a T-shaped seal between the overlapping portions of the bag by the application of heat under pressure.

Another object of the invention is to provide a machine of the character referred to which is capable of high speed operation, which provides a compact feed and discharge construction for the bags, and which provides for the optional provision of side tucks in the bags.

Another object of the invention is to provide a machine and method for making a substantially leak-proof bag of the character referred to.

Other objects and advantages of the invention will be apparent from the following description in which a preferred embodiment of the invention has been described in conjunction with the accompanying drawings.

In the drawings:

Figure 1 is a side elevational view showing a machine incorporating the present invention;

Figure 2 is a plan view of the machine shown in Figure 1;

Figure 3 is an enlarged longitudinal sectional view containing two portions, 3A and 3B, as indicated by the corresponding reference lines in Figure 2;

Figure 4 is a bottom plan view partially in section and shown in two parts, 4A and 4B, as indicated by the lines 4A and 4B respectively in Figures 3A and 3B;

Figure 5 is a detailed cross-sectional elevation of a part of the cam driven mechanism;

Figure 6 is a transverse cross-sectional view taken in a plane indicated by the line 6—6 in Figure 3B;

Figure 7 is a transverse cross-sectional view taken as indicated by the line 7—7 in Figure 2;

Figure 8 is a longitudinal sectional view taken as indicated by the line 8—8 in Figure 2;

Figure 9 is an enlarged view illustrating the relation of the end margin folding means and the cut-off knives;

Figure 10 is a detailed section of one of the overrunning clutches as indicated by the line 10—10 in Figure 7;

Figure 11 is a schematic view illustrating the operation of the bottom fold mechanism;

Figure 12 is a schematic section illustrating a modified form of the invention useful in sealing leak-proof bags;

Figure 13 is a sectional view similar to Figure 12 but showing the parts in a different operating position;

Figure 14 is a schematic view illustrating the relation of the various folding plates for folding the material to the desired bag form;

Figure 15 is a fragmentary view of the end of a bag which is sealed in a leak-proof manner.

The machine disclosed in the drawings includes a working table having a table top 10 which is supported by legs 11. The machine is adapted to be driven by means of a suitable electric motor 13 (Figures 3 and 4) which is slidably secured to the bottom face of table top 10 by means of motor base 14 guided in ways 15. The motor shaft carries an adjustable pulley 16 which is connected by belt 17 with a driven pulley 18 on a countershaft 19. Countershaft 19 is mounted in a gear box 21 which, through suitable reduction gearing, serves to drive the drive shaft 22 of the machine from which the various operating parts are driven in timed relation.

To vary the speed drive of the machine, the pulley 16 may be of the conventional "Reeves" type which is self-adjusting in response to the tension placed on the belt 17 to change the effective pitch diameter engaged by belt 17. To afford this adjustment a nut 23 (Figure 4A) is mounted on motor base 14 for engagement by a screw 24 suitably supported on the frame of the machine and having an operating handle 26. By adjusting screw 24, the motor pulley 16 can be moved toward and from the driven pulley 18 so that the belt 17 is automatically adjusted to different diameters of the driving pulley 16. To maintain the alignment of belt 17 and pulley 16, the ways 15 are inclined relative to the longitudinal axis of the machine.

Generally, the table referred to provides a working surface over which a continuous strip of the material is drawn in intermittent fashion, with guide means provided over the table for forming the strip of material into elongated tubular bag form with side tucks provided if desired, so that such bag-like tube form is drawn

over a mandrel to which it is guided to a cut-off point. The folding over of the side edges of the strip provides overlapping marginal portions along the edge of the form. After the cutting off operation (as later described) a bottom margin is folded over to provide a generally T-shaped overlapping fold for heat-sealing as later described. After the sealing operation, the guide plate or mandrel is advanced to carry the folded and sealed end of the bag into engagement with a pair of feed rollers, which have just ejected the previously formed bag and which thereafter grip the sealed end of the bag form and draw the form along for a distance corresponding to the selected bag length. In proper timed relation, the roller drive is released, preferably by light-sensitive control, so that the cut-off operation can be performed to complete the bag forming operation.

This cycle of operation continues automatically so that bags are successively formed and ejected from the machine. The various mechanisms for carrying out the cycle of operations will now be described in greater detail.

Referring to Figures 1 and 3A, a roll of material such as moisture-proof "Cellophane" or "Pliofilm" is shown at 31, being journaled in similar supporting brackets 32 mounted on the frame, and a suitable spring-urged friction brake 33 being associated with the roll. To adjust the roll axially, the roll shaft 34 may be grooved for engagement by an adjusting screw 35 threaded in one of brackets 32. If desired, an auxiliary roll support in the form of brackets 32a may be provided below the brackets 32 to enable forming of bags of double wall thickness.

As seen most clearly in Figure 3A, the strip or sheet of material 36 extends upwardly from the roll 31 over a stationary guide bar or roll 37 extending transversely between two projecting supporting brackets 38. From roll 37, the sheet of material extends downwardly over a spring-urged roll 39 supported between respective arms 41 pivoted at 42 on the frame. As seen most clearly in Figure 1, arms 41 are urged in a counter-clockwise direction by compression spring 43 disposed about a rod 44 which is pivotally connected to the adjacent arm 41.

From roll 39 (Figures 1 and 3A), the sheet of material extends substantially vertically upwards to roll 46, also supported between brackets 38. Immediately below roll 46 a light-sensitive cell 47 and a source of light 48 are disposed at opposite sides of the sheet of material adjacent one edge thereof, being supported on respective supporting rods 49 by respective collars 51 connected by U-brackets 52. From roll 46 the sheet of material extends outwardly over adjustable roll 56 carried by respective arms 57 pivoted at the ends of one of rods 49 by means of a slotted clamping hub 58. Each arm 57 is also provided with an arcuate slot 59 concentric with its pivot and adapted to receive a clamping bolt 61 threaded in the adjacent bracket 38.

From the adjustable roll 56 (Figures 1 and 3A), the sheet of material extends over a second adjustable roll 62 carried by respective adjusting arms 63 pivoted on transverse rod 64 supported in respective similar standards 66 on the frame. Each arm 63 is also provided with an arcuate slot 67 adapted to receive a clamping bolt 68 threaded in the adjacent standard 66.

The provision of the adjustable arms 57 and 63 for supporting and guiding a portion of the material enables the adjustment of the length of material between the point of light sensing and the point of cut-off for a purpose later described.

From roll 62 (Figures 1 and 3A), the sheet of material 36 extends downwardly to the table top 10 and is carried under a centrally disposed transversely extending guide bar 71 which is carried by bracket 72 depending from respective cross shafts 73 and 74 supported in the standards 66. Guide bar 71 is supported in spaced relation from the table top 10 and is of a width substantially equal to the total bag width to be formed, so that the side edges of the sheet tend to bend upwardly as indicated at 76 and pass to either side of the bracket 72 in substantially upright position. The bar 71 is preferably detachably mounted on its supporting bracket so that various bars of selected width can be used in accordance with the width of bag to be formed.

As the material passes the guide bar 71 and starts its initial travel over the table top 10, means is brought into play to provide an initial fold at each side edge of the material as a preliminary to forming the side tucks or folds of the bag form. For this purpose, a forming plate or mandrel 81 (Figures 2 and 3A) has its tapered end secured to the bracket 72 immediately behind the bar 71 and is of a width corresponding to the desired bag width, so that the side edges of the sheet can be folded thereover to determine the bag width. The folding means includes opposed tuck plates or mandrels 82 supported from respective arms 83 slidably engaged with respective shafts 64 and 74 for sliding movement therealong. Intermediate the bars, each arm 83 is provided with a threaded aperture to receive adjusting rod 84 having opposite threaded portions and journaled in standards 66. Rod 84 is provided with operating handles 86 at its ends.

By operating handles 86 and rod 84, the respective tuck plates 82 are moved inwardly and outwardly so that their inward edges overlap the stationary plate 81 to the desired extent of the tuck to be formed in the sides of the bag. To assist in the forming operations, the leading edges of the tuck plate 82 may be curved as at 87 (Figure 2) to assist in folding over the side edges of the strip without injury thereto.

To maintain the edges of the sheet of material upright, a pair of depending adjustable arms 88 (Figures 2 and 3A) may be provided depending from collars 89 on shaft 73 to engage the upturned edges of the sheet of material and maintain such edges upright and with an inward turning tendency.

The tuck folding operation is completed as the material moves along the tuck plates 82 by means of a plate or mandrel 91 which extends lengthwise along the table top 10 and has its leading edge secured to a bracket 92 carried by rod 93 slidably mounted in respective bosses 94 and 95 of bracket 72. The mandrel 91 is thus mounted for endwise sliding movement for a purpose later described. The mandrel 91 may be provided with a suitable fabric covering to facilitate the pressure heat sealing operation.

The mandrel or plate 91 is of the same width as the stationary plate 81 and is held in spaced relation above the table top 10 so that the tuck plates 82 extend inwardly between the bottom stationary plate 81 and the overlapping portion of the mandrel 91. The edges of the sheet of material are folded over on top of the mandrel 91 in overlapping relation by the twisting tendency of the material as guided in reaching the

mandrel 91, so that the bag formed passes from the stationary plate 81 and the tuck plates 82 onto the mandrel, the longitudinal bag form is completed as shown diagrammatically in Figure 14. The folded tuck portions remain folded during the subsequent travel of the material. Means are provided for guiding the material into a fold with the side margins overlapping, and this means may take the form of a guide finger 97 suitably mounted on the bracket 72 and having its end bent, as seen most clearly in Figure 2 to engage over the adjacent edge portion of the material and under the opposite edge portion, thereby insuring a proper overlapping relation of such edge portions.

To insure tensioning of the material in its final folded form, a floating tensioning assembly is provided in the form of a floating bracket 101 carrying respective friction rollers 102 for engaging the respective side portions of the material and urging such material inwardly over the mandrel 91. Rollers 102 converge in the direction of travel of the material to cause tensioning thereof over the mandrel 91 as a preliminary to the final creasing of the side folds thereof. Bracket 101 also carries a transverse bar 103 held in depending relation by adjustable studs 104 to aid in holding the material in place. The bracket 101 is pivoted at 106 (Figure 3B) to the heater or sealing unit 107 and can be raised to place the rollers 102 and bar 103 in inactive position by engaging latch lever 108 with pin 109 suitably supported on the sealing unit 107.

From the above description, it is seen that the sheet of material is folded into tubular form of bag-like contour about the mandrel 91 as it travels along the table in intermittent fashion as later described. The mandrel 91 as seen most clearly in Figure 3b extends to adjacent the end of the table top 10 so that the folded tubular material will be fed centrally along the table and projected past the table when initially fed into engagement with a pair of feed rollers 116 and 117.

The feed rollers 116, 117 are operated intermittently and, as later described may be disengaged from each other after the drive is interrupted at the desired time in accordance with the length of the bag being formed. After the feed of the rollers is interrupted, the end of the bag is formed by first cutting off the bag at the desired point, then folding over the lower margin of the bag form, after which the sealing unit becomes operative to make the seal.

Lower roller 116 is secured on roller shaft 118 which is journaled in suitable spaced apart bearing brackets 119 on the frame and also in auxiliary bearing bracket 121. Upper roller 117 is secured on roller shaft 122 having guides 123 slidably disposed in the upright slotted end portions 124 of brackets 119. Springs 126 held in place by suitable spring retainer brackets 127 above respective guides 123 urge the roller 117 downwardly against the lower roller 116. Such engagement is adapted to be interrupted by roller disengaging links 128 slotted to engage shaft 118 and having forked ends engaging shaft 122 for the upper roller. Each of links 128 is pivotally connected to an arm 129 on a transverse shaft 131 suitably journaled in brackets 119 and carrying a depending arm 132 pivotally connected to link 133 pivotally connected at its rearward end (Figure 3B) to cam follower arm 134 operatively engaged with cam 136 under the influence of spring 137. Thus, the upper roller will be periodically lifted out of engagement with the lower roller under the control of cam 136 in timed relation to the other cam driven operations including the drive for the rollers which ends just before the rollers are disengaged.

Means may be provided for controlling the lifting of the roller to obtain an accurate length of the desired bags from the light sensitive control means. Such means may comprise a solenoid 141 having its armature 142 connected by link 143 with arm 144 on shaft 131 so that upon energization of the solenoid the upper roller will be lifted, such lifting occurring ahead of usual drive for the rollers, therefore also ahead of the timed lift from the cam control, which serves to release the tension on the bag form during the cutting operation which occurs with the bag form stationary.

The feed rollers are driven intermittently by adjustable means and for this purpose shaft 118 (Figures 7 and 10) is connected by one-way overrunning clutch 151 with gear sleeve 152 which is journaled on a reduced end of shaft 118. Collar 153 is journaled about sleeve 152 and provides a sliding support for drive rack 154 meshing with the gear portion of the sleeve. Rack 154 (Figure 8) is pivotally connected to eccentric slide 155 threaded to receive screw 156 journaled in slide carrier 157 secured on drive shaft 22. Carrier 157 is provided with suitable ways to support slide 155 for endwise adjustment upon rotation of screw 156.

Screw 156 carries gear 158 which is adapted for engagement by either of pins 159*a*, 159*b* (Figures 6 and 8) carried by fork 161 journaled in the housing cover 162 and having adjusting handle 163. By adjusting handle 163 from its central inactive position as shown in Figure 2 to engage one of pins 159*a* or 159*b* with the gear 158, the adjusted position of the slide 156 can be controlled and thereby the extent of throw of rack 154. The rack 154 and the one-way clutch 151 are so related to the shaft 118 that they are active in driving as the rack moves to the right as viewed in Figure 8.

Referring again to Figure 7, at its left end shaft 118 also carries one-way overrunning clutch 166 having a drive connection with gear sleeve 167 engaged with rack 168 which is supported in collar 169. Rack 168 (Figures 4B and 5) is connected at 171 to cam follower slide 172 having suitable rollers engaging respective complemental cams 173 and 174 carried by drive shaft 22. The arrangement of clutch 166 and gear sleeve 167 is such that rack 168 drives in the same direction as the rack 154, i. e., to the left as viewed in Figure 4B.

As seen in Figure 7, shaft 118 has gear connection 176 with upper shaft 122 so that when engaged the rollers are driven simultaneously. The cooperation of racks 154 and 168 in driving the rollers is described hereinafter in detail.

Rollers 116 and 117 may be grooved as at 177 intermediate their length to receive opposed strippers 178 which prevent sticking and serve to strip the bags from the rollers. Grooves 177 also prevent engagement of the sealed seam of the bags with the rollers.

As previously explained, immediately after the roller drive is stopped and the rollers are separated to relieve tension on the bag form, the cutting knife becomes active to cut off the bag which has previously been formed.

As seen in Figures 3B and 9, the stationary knife 181 is supported by knife holder 182 on

the frame in cooperative relation and beneath a reciprocating knife 183 having its cutting edge inclined for better cutting action. Knife 183 is pivotally supported between similar links 184 and suitable spring-urged against an upright finger 185 of the knife holder which is engaged by the leading portion of the knife blade. Links 184 are pivotally connected at their upper ends to supporting arms 186 pivotally mounted on brackets 127. Links 184 are pivotally connected at their lower ends to respective operating bellcranks 187 secured on transverse shaft 188. Shaft 188 also carries depending arm 189 which is connected by link 191 with cam follower 192 urged against cam 193 by spring 194 associated with link 191.

After the rolls have been disengaged to remove the tension from the bag form, cam 193 allows spring 194 to become operative to move knife 183 downwardly to sever the bag form. This leaves an end margin of the bag form projecting beyond the table top 10 and means is provided for folding this end margin to form the bottom fold of the bag. To determine and retain the fold line for the end margin, a pair of horizontally disposed and inwardly projecting fingers 196 (Figures 2 and 3B) are mounted on respective spring-urged blocks 197. Blocks 197 are slidably carried on rods 198 mounted in recesses of the table top and carry respective pins 199 engaging the associated bellcranks 187. Thus upon rocking of bellcranks 187 during the cutting operation, fingers 196 move under the influence of their springs into substantial alignment with the end of the table top. To effect the folding of the end margin over fingers 196, a folding blade or lip 201 (Figure 9) is detachably secured on a rectangular block 202 with an angle-shaped strap 203 interposed. Block 202 is pivotally mounted at 204 on similar arms 206 secured on shaft 207. Spring 208 is tensioned between block 202 and pin 209 carried by depending arm 211 and having a pivotal slotted connection to the operating link 212. Link 212 (Figures 3B and 4B) is pivoted to cam follower 213 which is operatively engaged with cam 214 under the influence of spring 216 associated with link 212. The slotted connection between pin 209 and link 212 is provided with spring 215 which yields to allow overdriving by the cam 214 and thereby avoid adjustment of the linkage to provide an exact stopping point of the drive from cam 214.

Immediately after operation of the knife, the cam 214 becomes effective to move the folding blade 201 upwardly as indicated in the various positions shown in Figure 11, such movement being controlled not only by the pivoting movement of the bracket but also by the spring 208. Blade 201 is finally positioned in overlapping relation with respect to the end margin of the bag form and with respect to the fingers 196 as shown in full lines in Figure 11. The end result of the folding operation is to place a bottom fold transversely across the end of the bag formed over the mandrel or plate 91.

The folding over of the end margin for sealing is effected immediately prior to the operation of the heater unit for sealing the overlapping seams by the application of pressure and heat. The heater structure 107 (Figures 2 and 3B) includes a supporting casting 218 providing a pivotal support at 219 for a frame portion 221. Frame 221 is generally T-shaped in plan and has mounted thereon a heater bar 222 forming the bar of the T and a heater bar 223 forming the leg of the T. The heater bars 222 and 223 are generally similar in construction and include a body 224 (Figure 6) of metal which is hollow to provide an inner recess 225 in which a suitable electrical heating element 226 is mounted. The bottom surfaces of heater bars 222 and 223 provide a sharply formed, limited T-shaped pressing area for engagement with the overlapping portions of the bag. The bar 222 may be rigidly secured to the frame portion 221 at a pair of spaced points of connection 227. The bar 223 (Figure 3B) is preferably provided with a central pivotal connection 228 with frame portion 221 and a pair of end guide connections 229 which allow limited vertical movement of the ends while maintaining the alignment of the bar. This provides a floating mounting for heater bar 223 which is self-aligning upon engagement with the bag form.

The frame portion 221 of the heating unit is releasably clamped on a cross shaft 231 (Figures 2, 3B, and 6) which is suitably supported by brackets 232 on the table top. Secured on shaft 231 is an arm 233 (Figures 2 and 5) which has a lug 234 projecting into a recess in arm 236 pivoted on shaft 231. Lug 234 is threaded to receive adjusting screw 237 about which spring 238 is mounted. Arm 236 extends downwardly and has roller 239 and engaging heater control cam 241 on drive shaft 22. By adjusting screw 237 the position of heating unit 107 can be controlled to obtain the proper movement thereof from cam 241. Arm 236 also has pivotally connected thereto a link 242 (Figures 4A and 4B) which extends rearwardly to engage a compression spring 243 which urges the arm against the cam and normally holds the heater unit elevated as shown in Figure 3B.

The heater unit can be rocked downwardly from the position shown in Figure 3B so that T-shaped bar engages the overlapping end and side edge margins so that the overlapping portions of the "Cellophane" or "Pliofilm" are held in engagement between the mandrel and the heater bars for a sufficient time to effect sealing operation. Usually mandrel 91 will be interposed throughout the entire length of the bag to prevent sealing between the upper and lower portions. However, this interposition may be dispensed with along the end margin as later described.

Roller 244 (Figures 2 and 3B) which projects upwardly through the table top to engage and facilitate feeding of the bag form is yieldably mounted to recede during the sealing operation.

In order to control the temperature of the heater bars a thermostatic switch is provided as shown generally at 261 having a conventional control button 262 to enable its operation. Preferably, the heat-responsive element 263 (Figure 3B) of the switch is positioned within the heater bar 222 directly adjacent its heating element 226, so as to be directly responsive to the internal temperature condition of the unit rather than the external temperature condition thereof.

After the sealing operation, the rollers begin their drive synchronously with the advance of the mandrel 91 by the rack 168 to pick up the bag form and carry it into engagement with the rollers for feeding movement thereby. Cam follower slide 172 (Figure 5) is pivotally connected to an arm 245 (Figures 4A and 5) secured on shaft 246 suitably journaled on the frame. Shaft 246 carries arm 247 having a slotted pivotal connection with an arm 248 depending from cross shaft 74. Shaft 74 (Figure 3A) also carries a

depending forked arm 249 engaging a pin 251 carried by collar 252 secured on rod 93 which, as previously described, is connected to the mandrel 91. Thus, upon reciprocation of the operating parts therefor, the mandrel 91 will be advanced to engage the bag form and carry it forward for engagement with the feed rollers which thereupon engage the bag form and carry it forward until the rollers are again stopped, when the cutting off, folding, sealing, and advancing operations are again performed in sequence as described.

As seen in Figure 1, when the bags are ejected from the machine, they are discharged into a bag holder or a discharge chute 253 adjustably mounted at one end by slotted link 254 and at the other end by adjustable rod 256.

In order to insure the forming of a leak-proof bag, I prefer to employ the type of construction illustrated in Figures 12 and 13 wherein the end of mandrel 91*a* is normally spaced from the end of the table top 10*a*.

Figure 12 shows the mandrel 91*a* and one of the fold line fingers 196*a* for the end margin in normal position with the two sides 264*a* and 264*b* of the bag form projecting to the point of cut-off. In Figure 13, finger 196*a* has been advanced to set the fold line for the end margin of the bag form and folding plate 201*a* has performed the folding operation. After withdrawal of finger 196*a*, the heater unit including element 222*a* will become operative to effect the seal. As shown in Figure 13, heater bar or element 222*a* is offset downwardly from bar 223*a* forming the leg of the T. With this construction, the end-sealing operation is applied throughout all thicknesses of the folded end margin as well as the walls 264*a* and 264*b* of the bag proper. Immediately after withdrawal of the heater unit, the mandrel 91*a* is advanced and its first operation is to break the seal between the walls 264*a* and 264*b* of the bag except at the corners of the bag before the seal has had time to set. The end corners of the mandrel may be cut away or rounded so that the seal at the corners is not affected. Also the operating means for the mandrel is preferably modified by providing a longer feeding stroke for the mandrel, so that after separating the desired portions of the bag walls, the mandrel picks up the bag form and advances it into engagement with the feeding rollers as previously described.

Operation of the apparatus is as follows: Assuming the machine to be equipped with forming plates of the proper width, and the tuck plates 32 to be adjusted for the proper depth of tuck, the sheet of material, such as moisture-proof "Cellophane" or "Pliofilm," is manually threaded through the machine over the guiding rollers, and through and around the various forming plates including the mandrel 91 until its end is engaged with the feeding rollers. The tensioning rollers, which are released during the threading operation, may then be engaged with the bag form. Also the adjustable slide 155 may be set manually to vary the effective throw of feed rack 154 (Figure 8) and thereby adjust the amount of feed of the bag from prior to interruption of the drive to the feed rollers to thereby control the desired bag length. This adjustment may be made, however, during initial operation by manipulation of the adjusting handle 163. If the bags being formed are provided with printed indicia, the handle 163 may be employed to secure accurate cutting off at the length indicating marks usually provided along the material.

Also, the light sensitive control of the drive interruption may be employed, as for example with material having a series of dots or light-interrupting marks printed along one edge of the material, with the dots spaced apart the distance required to form one bag length, the apparatus may be adjusted so that when one dot or mark is in light-interrupting position, another such dot will be at the point of cut-off. This adjustment may be effected for positioning the adjusting rolls 56 and 62 so that the length of material between the point of light sensing and the point of cut-off is an exact multiple of the desired length for one bag.

After proper adjustment of the machine, the heating unit is turned on and when it has become sufficiently hot, the motor is also started and operation of the machine begins.

After the first sealing operation, the bag form is advanced by the mandrel 91 into engagement with the feeding rollers. The mandrel 91 and the rack 168 which performs the initial driving of the feed rollers are both driven from slide 172, and the arrangement is such that the peripheral travel of the rollers is the same as the linear travel of the mandrel, thereby insuring a gentle pick-up of the bag form by the rollers without injury. When the drive of the rollers by the rack 168 is completed, the mandrel 91 is withdrawn. Subsequently the rack 154 begins its driving movement of the rollers. The adjustable travel of rack 154 by its slide 155 enables accurate timing of the feed roller drive to control the extent of feed of the bag form. The machine therefore feeds the bag form for a predetermined extent in accordance with the required bag length.

The drive rollers during ejection of the bag form serve to flatten out the bag and sharply crease all the fold lines, and also, the rollers drive the air out of the bags. Both of these operations serve to aid stacking of the finished bags.

The release of the feed rollers may optionally be placed under control of the light-sensitive cell upon interruption of the light beam by a marking dot to control the length of the bag.

When the feed of the bag form is interrupted and the rollers are released to relieve the tension, the knife 183 (Figure 9) becomes active to cut off the bag which has been already formed and to provide an end margin for folding in the next bag to be formed. The folding plate 201 for the end margin then becomes effective to fold such end margin over fingers 196 into position for sealing by the heater unit. The fingers 196 are then withdrawn and the heater unit then becomes operative under control of its cam to seal both the overlapping side margins and the end margin. After release of the heater unit, the mandrel 91 is again advanced to initiate feeding of the bag form.

The above-described cycle of operations is repeated as each successive bag is formed.

It will be understood that the dimensions of the heater bars 222 and 223 are selected so as to be effected for the maximum length and width of bag which can be formed in the machine. When forming bags of smaller width, the ends of the bar 222 will project beyond the sides of the bag, while in forming bags of shorter length the heater bar 223 will make a seal longer than that required so that a portion of the longitudinal overlapping side margins of the next bag will also be sealed and will again subsequently be subjected to another sealing operation. It will be

understood that the length of feed of mandrel 91 limits the length of the bag as to shortness, while the maximum length is determined by the maximum feed by the rollers and the length of the seal which can be applied. It will be understood that the machine can be employed also to form bags without side tucks by omitting the tuck plates.

In operation using the light sensitive means for interruption of the feed of material, it has been pointed out that the rollers should attempt to drive the bag form for a greater distance than that required for a bag, so that the light interrupting mark will always be fed into the path of the light beam. At this time, the solenoid 141 is energized and the rollers are separated to interrupt the feed, this action taking place with sufficient rapidity so that the mark stops in light interrupting position and the solenoid remains energized. The separation of the rollers as with their cam control, is not sufficient to disengage their gear connection. The solenoid remains energized until the mandrel 91 starts advancing to feed the bag form into engagement with the rollers and thereby move the mark out of light-interrupting position, as well as restarting the cycle of operations.

With particular reference to the operation with the mandrel 91*a* as shown in Figures 12 and 13, it will be noted that after the withdrawal of the fold line retaining fingers 196*a* from the position shown in Figure 13, the heater bar 222*a* is effective to apply heat under pressure through the entire layers of the bag form including the actual side walls of the bag and the folded over end margin portions, so that an effective end seal is applied across the entire width of the end margin seal. Subsequently, when the mandrel 91*a* is advanced, it serves to immediately break a portion of the seal between the two adjacent walls of the bag, but it does not affect the seal made along the folded over end margin which is sealed for its entire length including its side edge creases at the corner portions of the bag. For example, as shown in Figure 15, the bag 266 is shown as having a seal 267 extending entirely across the end margin as indicated by the shading. This seal is effective between the folded over end margins of the two side walls as well as between the adjacent side wall and the adjacent marginal portion. The extent of the seal through the various thicknesses is controlled in part by the temperature of the heater unit and the length of application of the heater unit in effecting the seal.

With the construction shown in Figure 13, it is preferred to have the upper plate or mandrel 91 slightly wider than the plate 81 so that the edge creases 268 adjacent the folded over end margin will project beyond the opposite edge creases 269 for direct creasing and sealing between the table top and the heater bar.

I claim:

1. In a method for making bags from material like "Cellophane" characterized by the use of a plate-like mandrel having a contour corresponding generally to the contour of the finished bag, which comprises folding the side edges of the sheet over the mandrel through an angle of substantially 180° to place their margins in overlapping relation, folding an end margin at the bottom of the bag into overlapping relation with the bag wall and with said overlapping side margins, then applying heat under pressure directly through all of the overlapping portions along said end margin, and then separating the central portion of the inner faces of the bag walls adjacent said end margin while leaving the corners sealed.

2. In a machine for making bags from a continuous strip of material like "Cellophane," a frame, a plate-like mandrel movably mounted with respect to the frame, means for directing the strip of material along one face of the mandrel, means for folding projecting side margins of the strip over the mandrel to provide an overlap between the edge portions of said margins, means for feeding said strip, said folding means operating during feeding of said strip, means for periodically interrupting the feed of said strip, means for folding a projecting end margin of the strip of material over one end edge of the mandrel to provide an end overlap during interruption of said feed, heat sealing means, means for applying said means to said overlapping portions to effect a seal, and means for advancing said mandrel to engage the sealed bag end with said feeding means.

3. In a machine for making bags from a continuous strip of material like "Cellophane," a frame, a plate-like mandrel mounted for reciprocation on said table, means for directing the strip of material along one face of the mandrel, means for folding projecting side margins of the strip over the mandrel to provide an overlap between the edge portions of said margins, means for feeding said strip, said folding means operating during feeding of said strip, means for periodically interrupting the feed of said strip, means for cutting off said strip during interruption of said feed, means for folding a projecting end margin of the strip of material through 180° to provide an end overlap during interruption of said feed, a heater, means for applying said heater to said overlapping portions to effect a seal during interruption of said feed, said mandrel being spaced from said end overlap during the sealing operation, and means for advancing said mandrel to first partially break the seal between the walls of said bag aligned with said end overlap and to thereafter engage the sealed bag end with said feeding means.

4. In a machine for making bags from a continuous strip of material like "Cellophane," said machine being characterized by the folding of the bags about a mandrel, a pair of feed rollers for receiving folded material from said mandrel, and means for driving said feed rollers, said driving means including means for varying the extent of travel of said rollers in a given length of time and means for effecting adjustment of said varying means during operation thereof.

5. In a machine for making bags from a continuous strip of material like "Cellophane," said machine being characterized by the folding of the bags about a mandrel, a pair of feed rollers for receiving folded material from said mandrel, and drive means for said feed rollers including one part having an invariable driving action and another and subsequently acting part having a variable driving action.

6. In a machine for making bags from a continuous strip of material like "Cellophane," said machine being characterized by the folding of the bags about a mandrel, said mandrel being mounted for reciprocating movement, a pair of feed rollers for receiving folded material from said mandrel, drive means for said feed rollers including a pair of reciprocating racks, a one-way overrunning clutch between each of said racks and said rollers, means for driving one

of said racks in its active direction of movement in time with the material feeding movement of said mandrel, and means for subsequently driving the other rack in its active direction of movement in timed relation to the driving movement of said first rack to advance said material in accordance with the desired length of bag.

7. In a machine for making bags from a continuous strip of material like "Cellophane," said machine being characterized by the folding of the bags about a mandrel, said mandrel being mounted for reciprocating movement, a pair of feed rollers for receiving folded material from said mandrel, drive means for said feed rollers including a pair of reciprocating racks, a one-way overrunning clutch between each of said racks and said rollers, means for driving one of said racks in its active direction of movement in time with the material feeding movement of said mandrel, whereby the material is engaged with said rollers while moving at substantially the same speed, and means for subsequently driving the other rack in its active direction of movement to advance the material, the drive means for said last-named rack including means for varying the extent of travel imparted to said rollers without varying the timed relation to the operation of said first rack.

8. In a machine for making bags from a continuous strip of material like "Cellophane," said machine being characterized by the folding of the bags about a mandrel, said mandrel being mounted for reciprocating movement, feed means for receiving folded material from said mandrel, drive means for said feed means including one part having an invariable driving movement and a second part having a variable driving movement, means for operating said one part in time with the material feeding movement of said mandrel, and means for subsequently operating the other part of said drive means in timed relation to the driving movement of said first part to advance said material in accordance with the desired length of bag.

9. In a machine for making bags from a continuous strip of material like "Cellophane," said machine being characterized by the folding of the bag about a mandrel, said mandrel being mounted for reciprocating movement, feed means for receiving folded material from said mandrel, drive means for said feed means including one part having an invariable driving movement and a second part having a variable driving movement, means for operating said one part in time with the material feeding movement of said mandrel, and means for subsequently operating the other part of said drive means in timed relation to the driving movement of said first part to advance said material in accordance with the desired length of bag, the second part of said drive means including means for varying the extent of travel imparted to said feed means whereby to control the length of bag being formed.

10. In a machine for making bags from a continuous strip of material like "Cellophane," said machine being characterized by the folding of the bags about a mandrel, a pair of feed rollers for receiving folded material from said mandrel, and means for driving said feed rollers, said driving means including a drive shaft, a slide mounted for rotation with said drive shaft and for adjustment axially of said drive shaft, a rack connected to said slide for reciprocating movement thereby, an overrunning clutch between said rack and said feed rollers, and means for adjusting the position of said slide during rotation thereof with said shaft.

11. In a machine for making bags from a continuous strip of material like "Cellophane," said machine being characterized by the folding of the material about a plate-like mandrel, a pair of feed rollers positioned adjacent an end of said mandrel for receiving folded material therefrom, means for moving said mandrel to feed folded material to said rollers, and means for interrupting the feed of material by said rollers including means for separating said rollers.

12. In a machine for making bags from a continuous strip of material like "Cellophane," a frame, a plate-like mandrel about which the material is folded, means including a pair of feed rollers for receiving material from said mandrel, light-sensitive means responsive to indicia on said material, and means controlled by said light-sensitive means for interrupting the drive of said feed rollers with respect to the material.

13. In a machine for making bags from a continuous strip of material like "Cellophane," means for supporting and folding said material into a bag form, means for feeding material along said supporting and folding means, light-sensitive means responsive to indicia on said material, and means controlled by said light-sensitive means for interrupting the drive of said feeding means with respect to the material.

14. In a machine for making bags from a continuous strip of material like "Cellophane," said machine being characterized by the folding of the material about a plate-like mandrel, a pair of feed rollers positioned adjacent an end of said mandrel, means for yieldably urging said rollers into engagement, means for moving said mandrel to feed folded material to said rollers, cyclic drive means for said rollers, means for effecting an adjustment of the extent of feed of said rollers in a given portion of each cycle of feed, means for overcoming said yieldable engaging means to disengage the rollers from the material to relieve the tension thereon, and means for cutting said material.

15. In a machine for making bags from material like "Cellophane," means including a plate-like mandrel for folding material into a bag form, said folding means including means for placing the side margins of said material in overlapping relation and an end margin of said material in overlapping relation with respect to the length of material to provide a T-shaped area of overlapping portions of the material, said mandrel being positioned below said side margins and having an end adjacent to but spaced from said end margin, and a T-shaped heater unit mounted to engage said T-shaped overlapping area, said T-shaped heater unit having its portion forming the bar of the T offset downwardly from its portion forming the leg of the T.

16. In a machine for making bags from a continuous strip of material like "Cellophane," said material having a series of equally spaced light-interrupting marks along its length, a frame, a plate-like mandrel about which the material is folded, means including a pair of feed rollers for receiving material from said mandrel, light-sensitive means for sensing said marks, means controlled by said light-sensitive means for separating said rollers upon sensing of a mark by said light-sensitive means to interrupt the feed of material with said mark in active position, and means for advancing said mandrel to feed material to said rollers and also move said mark

from its active position, whereby said separating means is rendered ineffective.

17. In a machine for making bags from a continuous strip of material like "Cellophane," said material having series of equally spaced, light responsive indicia along its length, a frame, a plate-like mandrel about which the material is folded, feed means for receiving material from said mandrel, light sensitive means for sensing said indicia, means controlled by said light sensitive means for disabling said feed means upon sensing of an indicia by said light sensitive means to interrupt the feed of material with said sensed indicia in active position.

18. In a machine for making bags from a continuous strip of material like "Cellophane," said material having series of equally spaced, light responsive indicia along its length, a frame, a plate-like mandrel about which the material is folded, feed means for receiving material from said mandrel, light sensitive means for sensing said indicia, means controlled by said light sensitive means for disabling said feed means upon sensing of an indicia by said light sensitive means to interrupt the feed of material with said sensed indicia in active position, and means for advancing said mandrel to feed material to said feed means and also to move said sensed indicia from its active position whereby the feed means is again rendered effective.

19. In an automatic machine for forming bags from a strip or ribbon of fusible material like moisture-proof "Cellophane," means for forming an advancing portion of the strip into a relatively flat tube, said means including a plate-like mandrel about which the tube is formed, means for folding an end margin of the tube over the forward end of the mandrel, means forming a heat seal across the folded end margin to make the bottom of a bag, discharge means for gripping the end of the tube and for withdrawing the tube in a forward direction from the mandrel, means for severing the tube near the forward end of the mandrel after a predetermined length of the tube has been withdrawn whereby the withdrawn portion forms a completed bag, and means for advancing the tube toward the discharge means immediately after sealing of the folded over end margin of the same and before gripping of the same by the discharge means.

20. In an automatic machine for forming bags from a strip or ribbon of fusible material like moisture-proof "Cellophane," means for forming an advancing portion of the strip into a relatively flat tube, said means including a plate-like mandrel about which the tube is formed, means for folding an end margin of the tube over the forward end of the mandrel, means forming a heat seal across the folded end margin to make the bottom of a bag, discharge means for gripping the end of the tube and for withdrawing the tube in a forward direction from the mandrel, means for severing the tube near the forward end of the mandrel after a predetermined length of the tube has been withdrawn whereby the withdrawn portion forms a completed bag, and means for reciprocating the mandrel to advance the tube toward the discharge means.

21. In an automatic machine for forming bags from a strip or ribbon of fusible material like moisture-proof "Cellophane," means for forming an advancing portion of the strip into a relatively flat tube, said means including a plate-like mandrel about which the tube is formed, means for folding an end margin of the tube over the forward end of the mandrel, means forming a heat seal across the folded end margin to make the bottom of a bag, discharge means including rollers for gripping the end of the tube and for withdrawing the tube in a forward direction from the mandrel, means for severing the tube near the forward end of the mandrel after a predetermined length of the tube has been withdrawn whereby the withdrawn portion forms a completed bag, and means for reciprocating the mandrel to advance the tube toward the discharge means.

22. In an automatic machine for forming bags from material like moisture proof "Cellophane," means for forming a sheet portion of the material into a relatively flat tube, said means including a plate-like mandrel about which the tube is formed, means for folding a projecting end margin of the tube through an angle of substantially 180° and over a forward end of the mandrel, means forming a heat seal across the folded end margin to make the bottom of a bag, discharge means for gripping the folded end of the tube and for withdrawing the tube in a forward direction from the mandrel, and means for advancing the tube toward the discharge means immediately after operation of said end folding means and after sealing of the folded over end margin of the same and before gripping of the same by the discharge means.

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