Aug. 25, 1953 H. L. BARTELT 2,649,674

PACKAGING MACHINE

Filed June 13, 1949 9 Sheets-Sheet 1

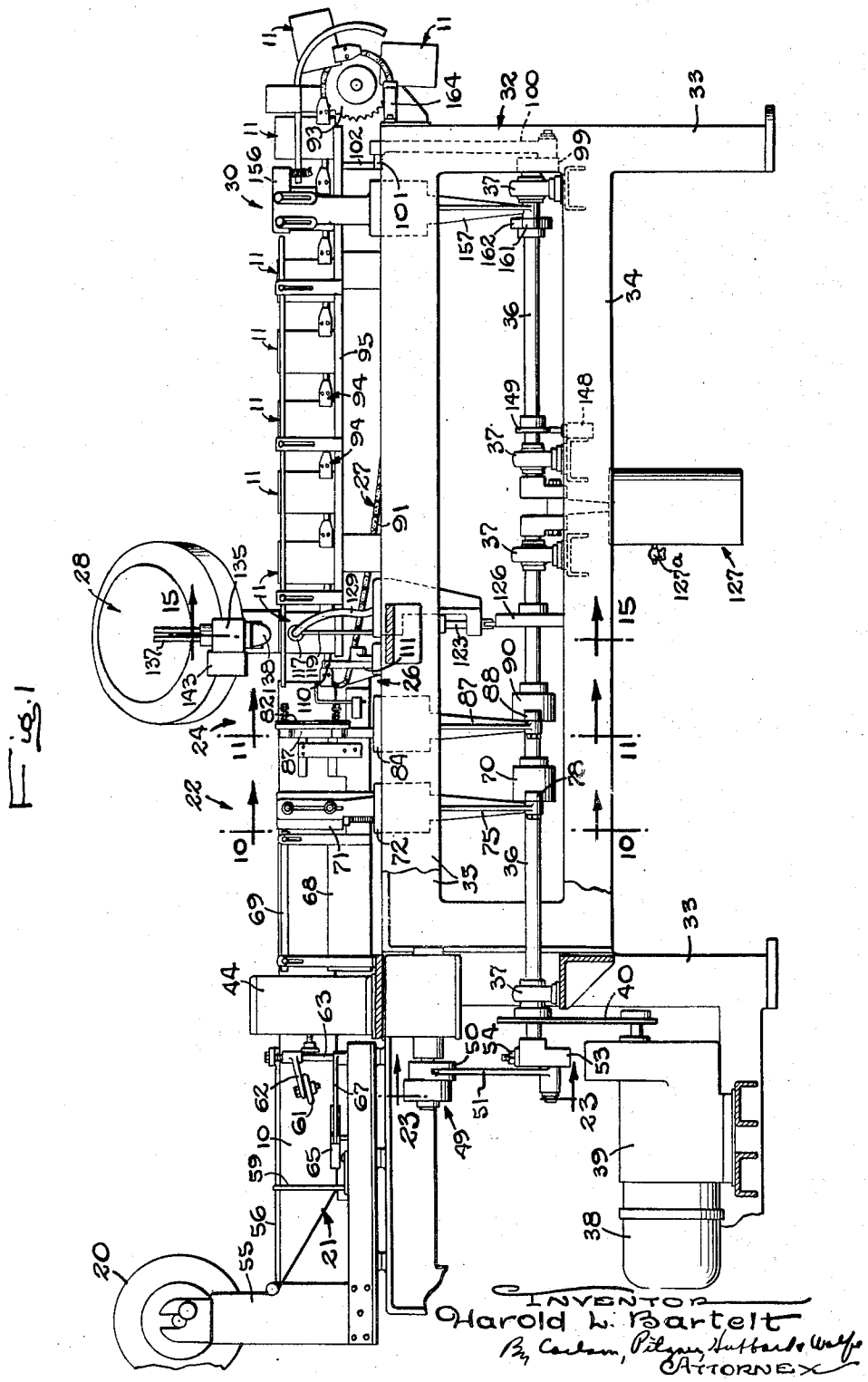

Fig. 1

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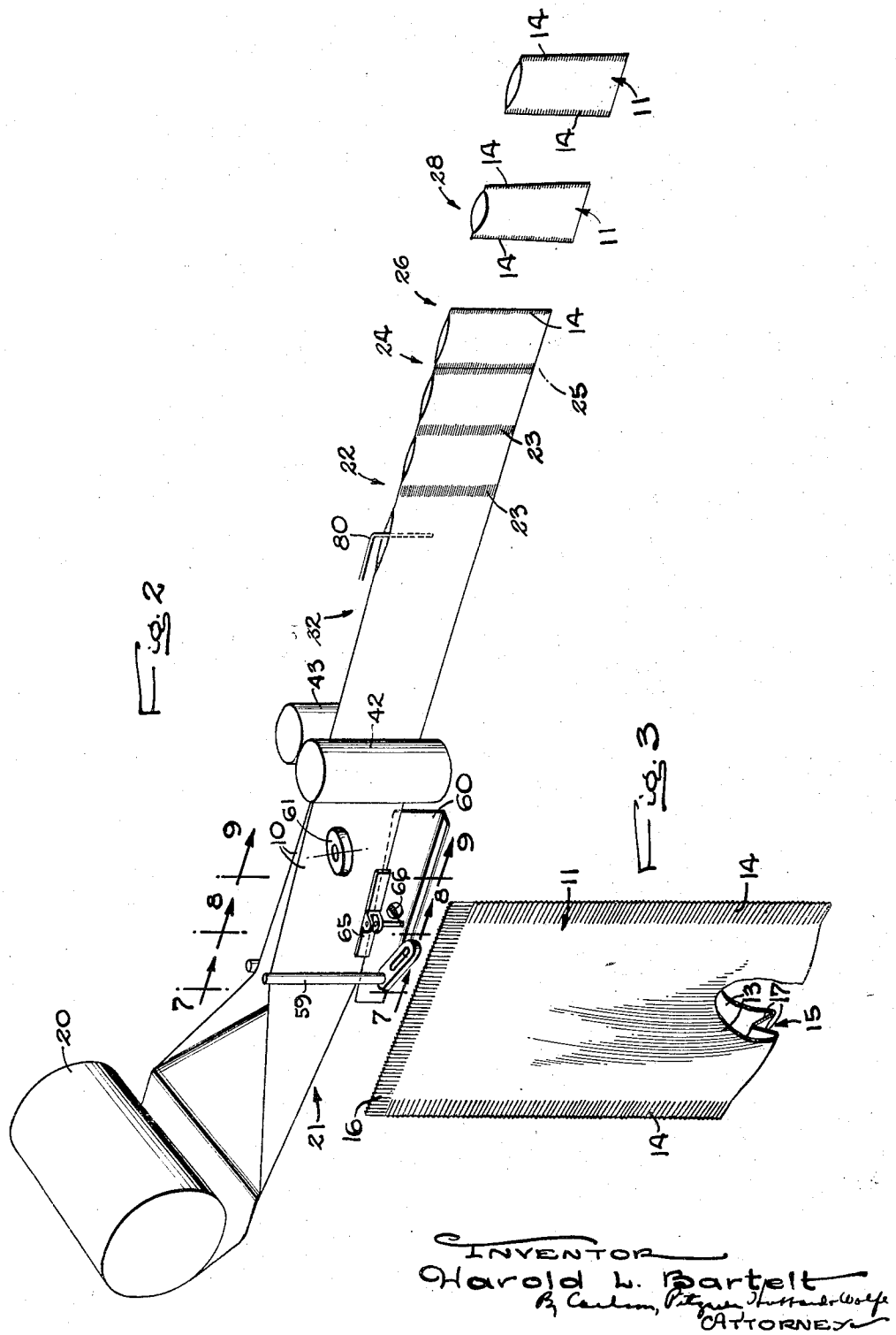

Fig. 2

Fig. 3

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PACKAGING MACHINE

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Fig. 5

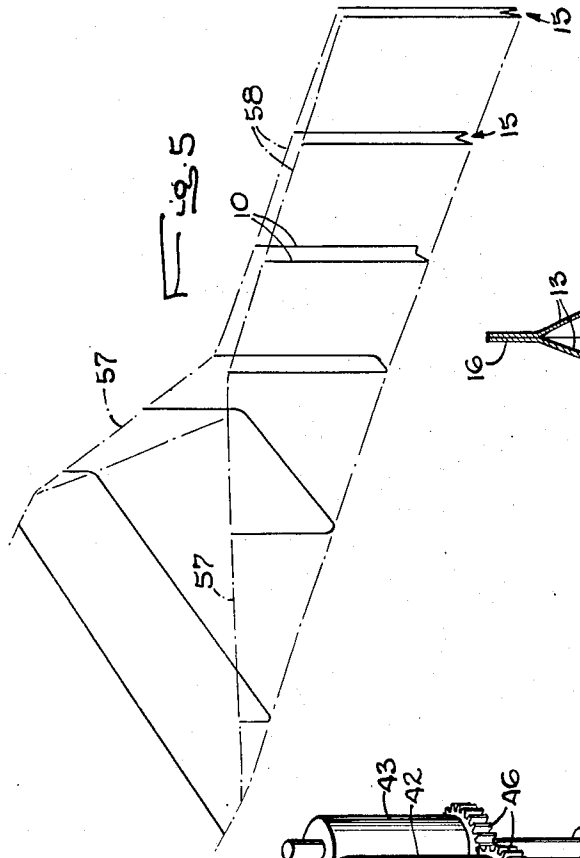


Fig. 6

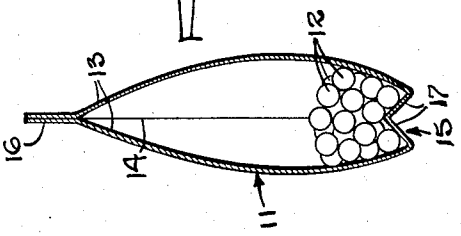
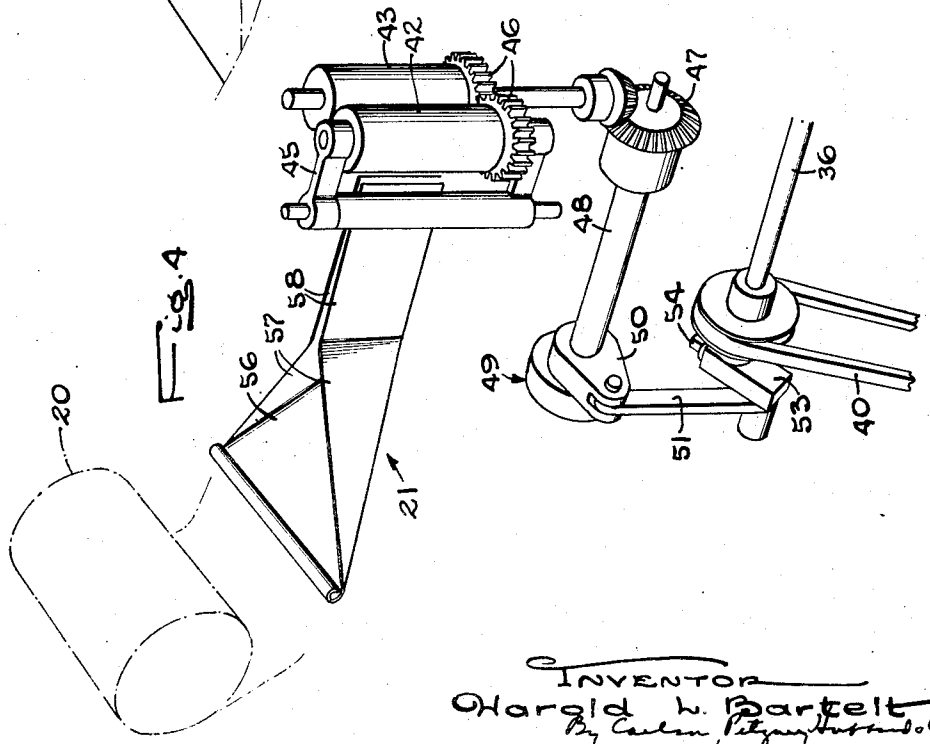


Fig. 4



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PACKAGING MACHINE

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Fig. 7

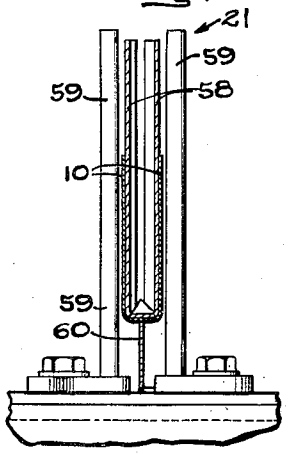


Fig. 8

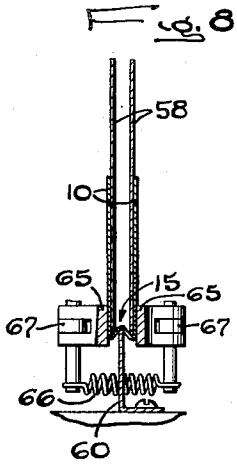


Fig. 9

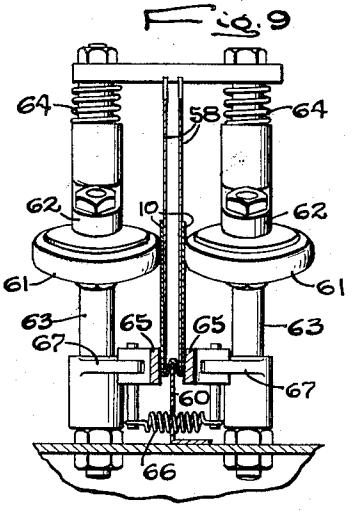


Fig. 10

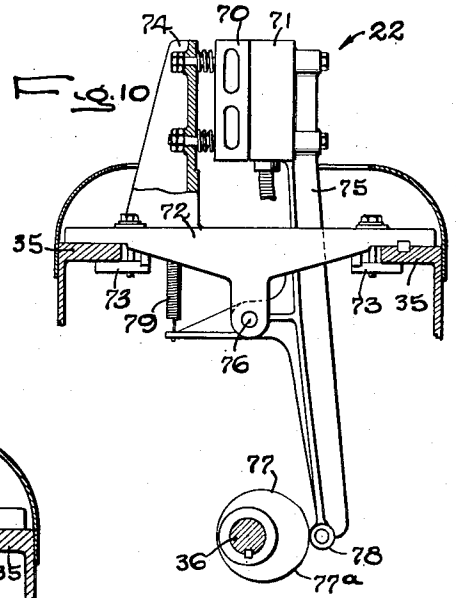
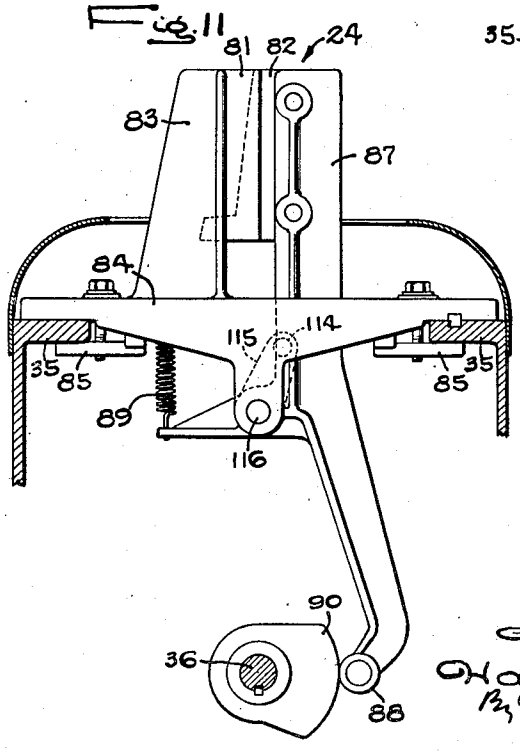


Fig. 11



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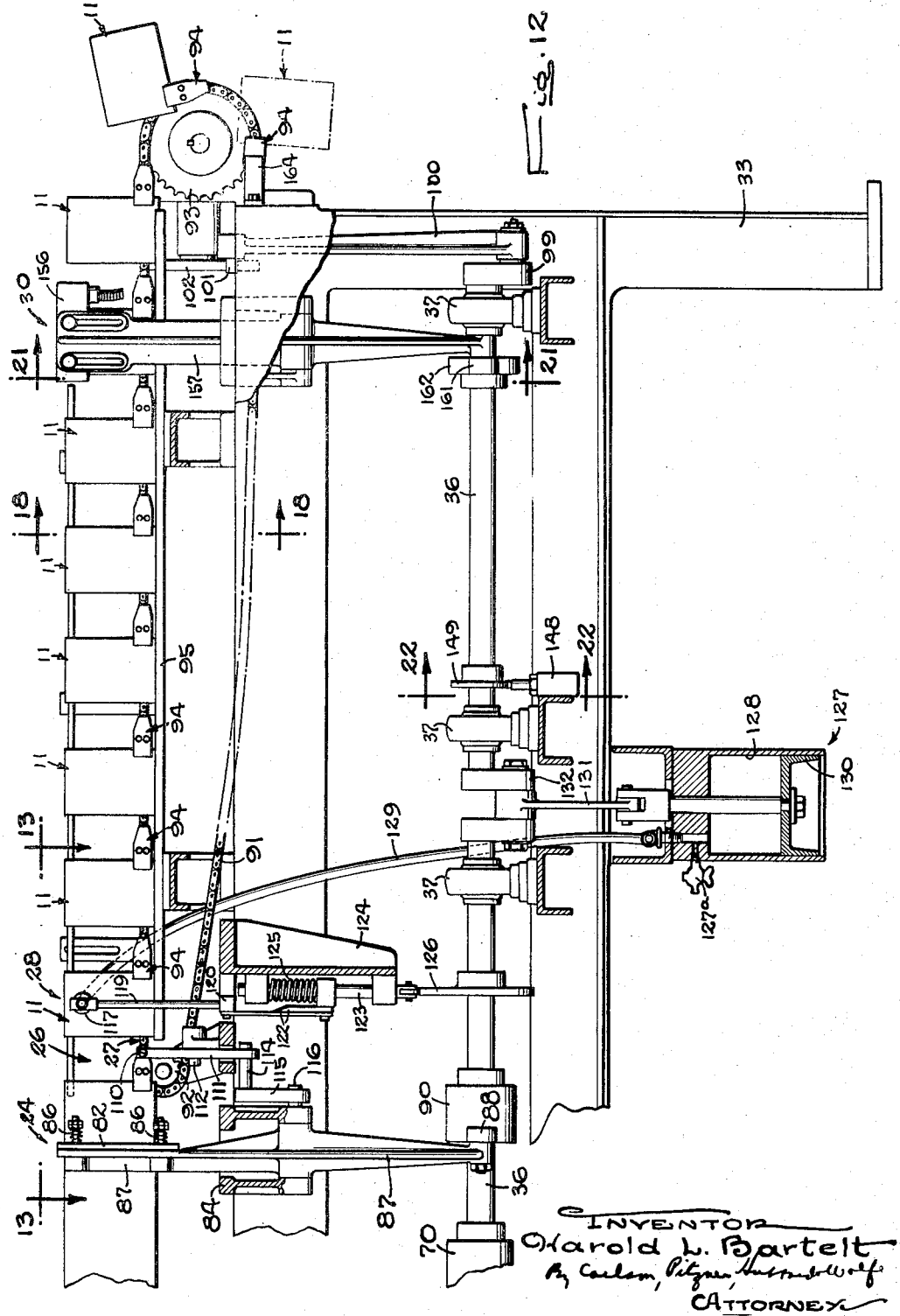

Fig. 12

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Fig. 13

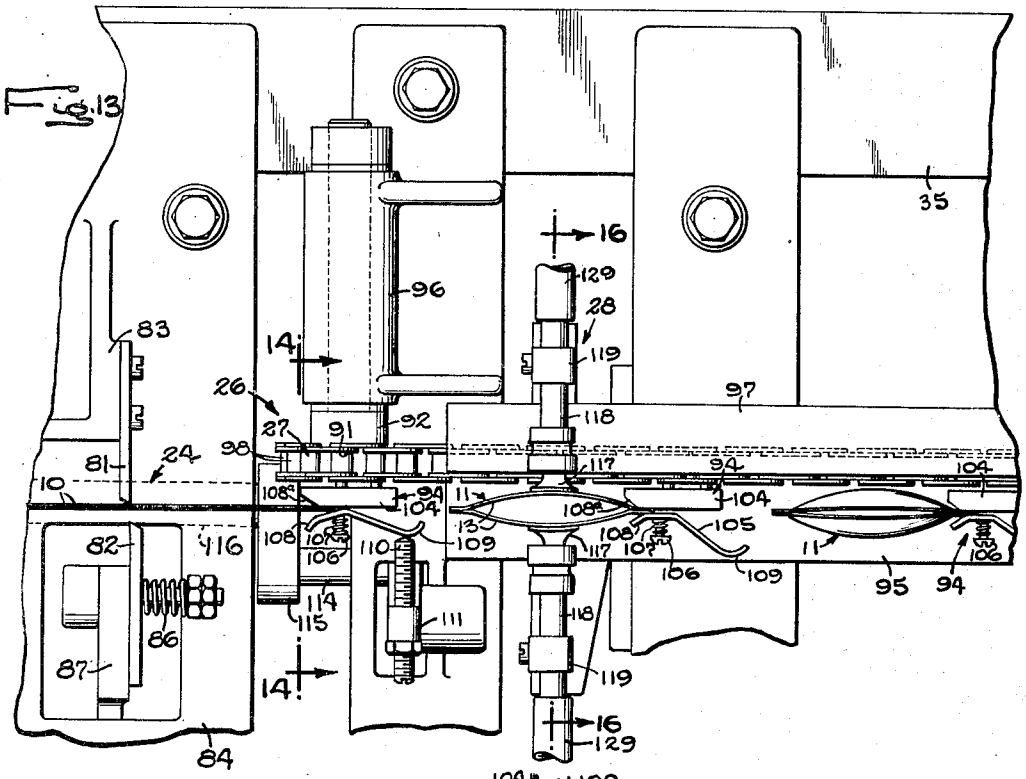
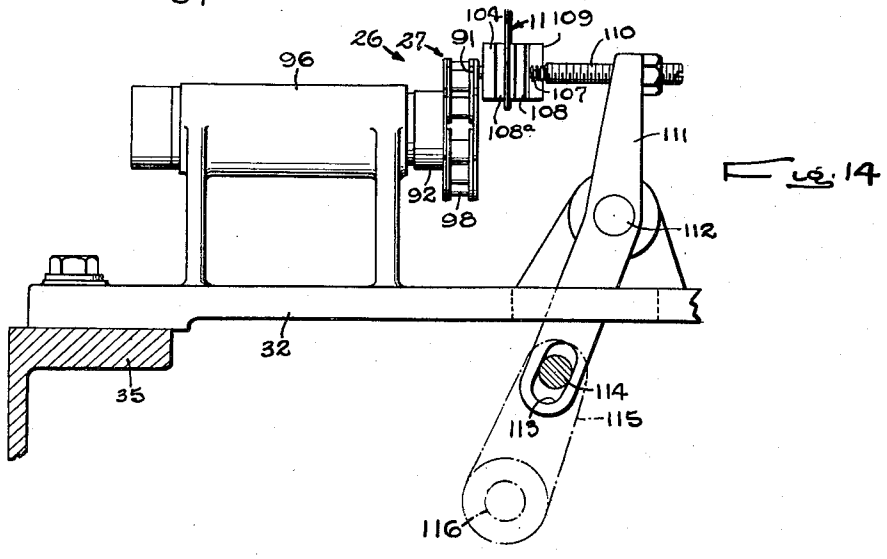


Fig. 14



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PACKAGING MACHINE

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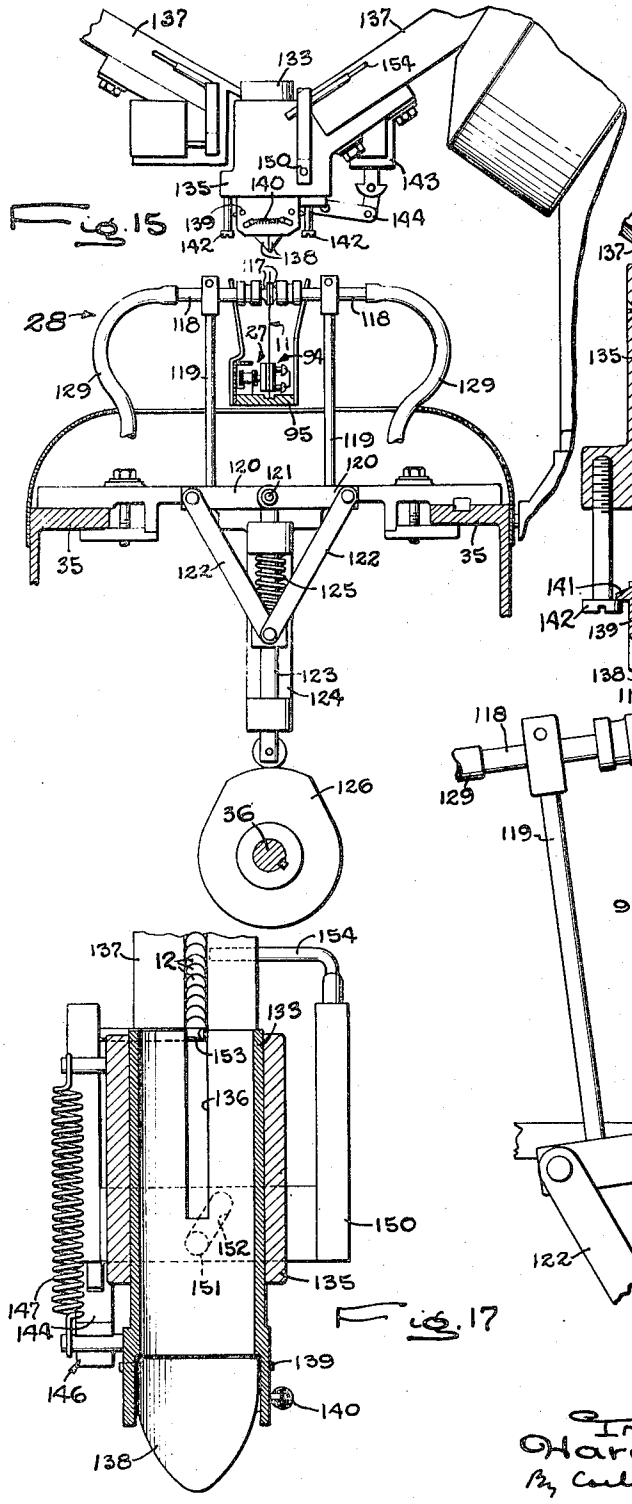

Fig. 15

Fig. 17

Fig. 16

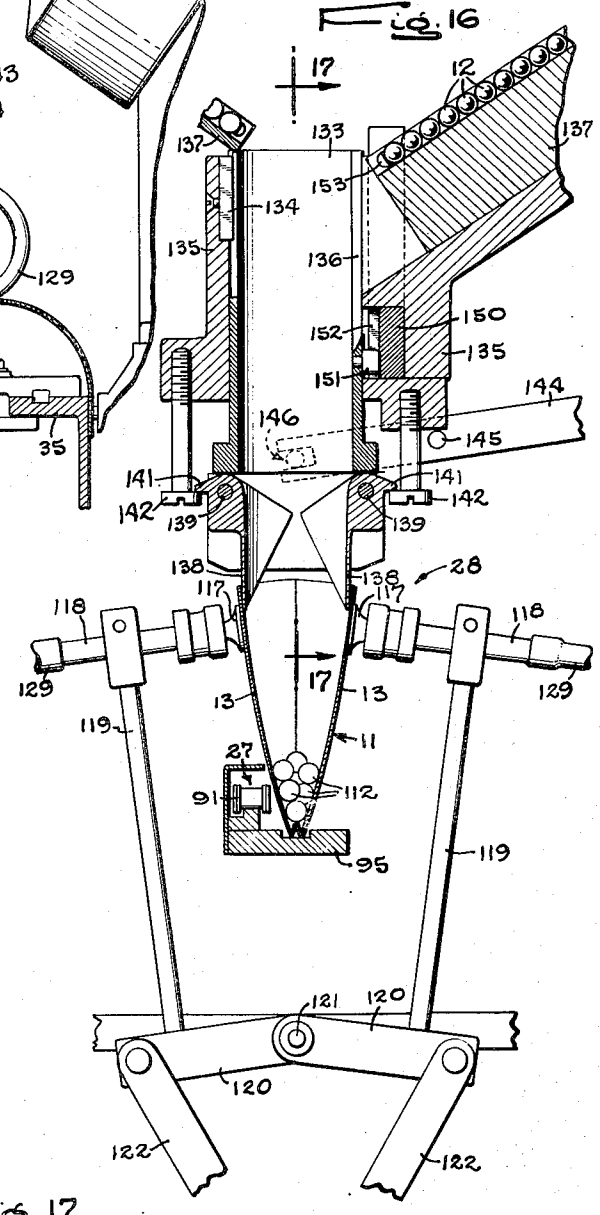

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Fig. 18

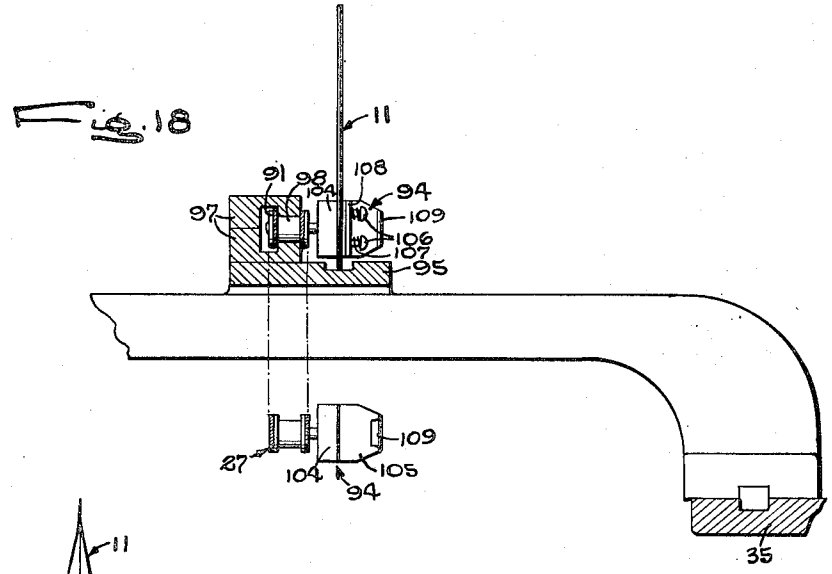

Fig. 19

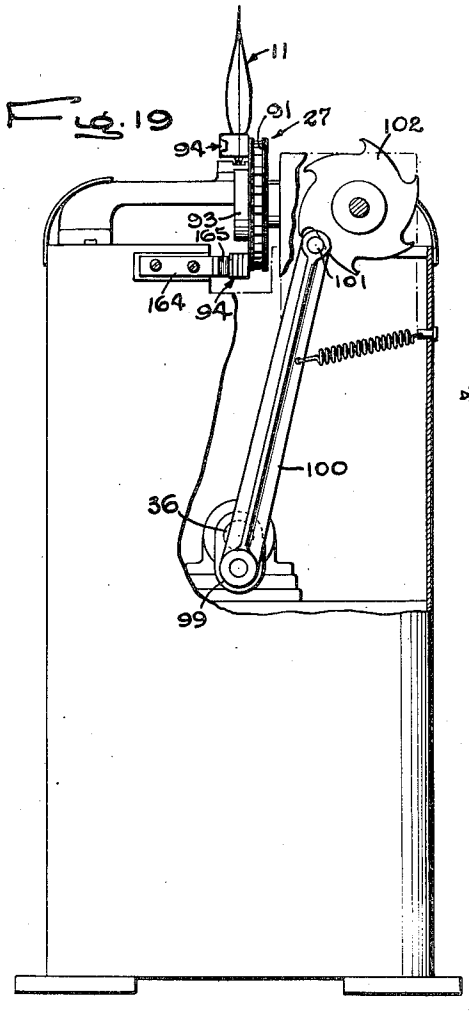

Fig. 20

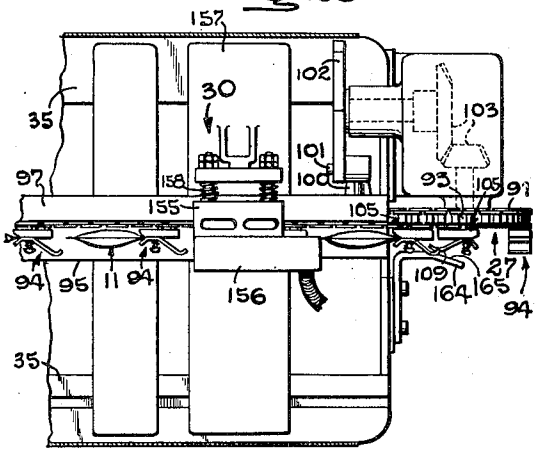

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Fig. 21

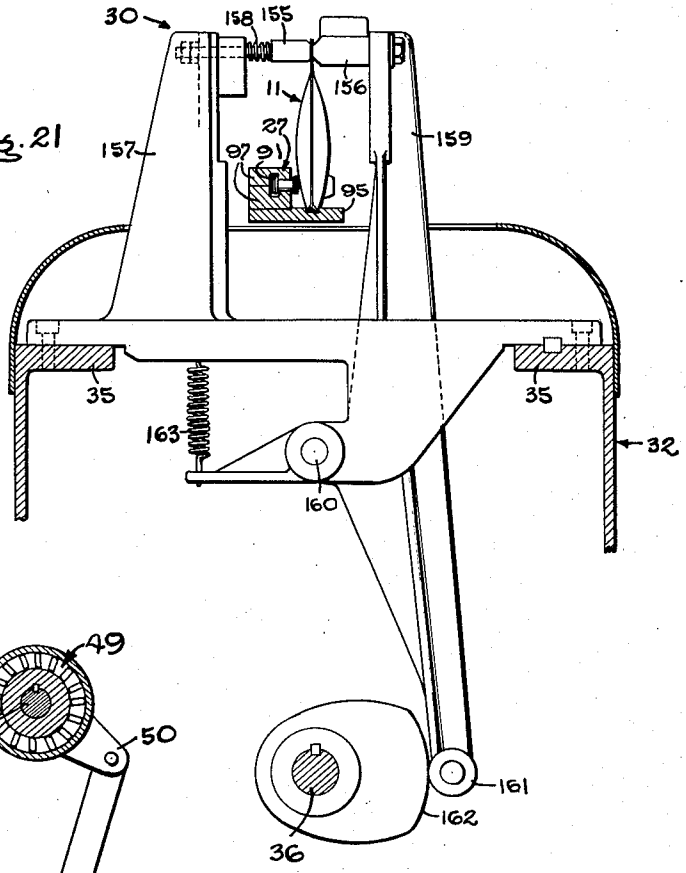


Fig. 23

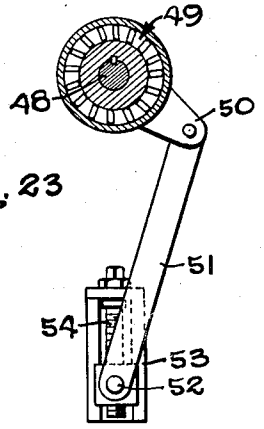


Fig. 22

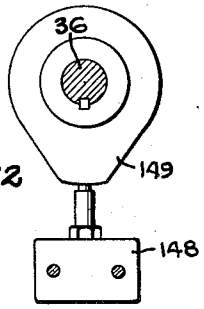
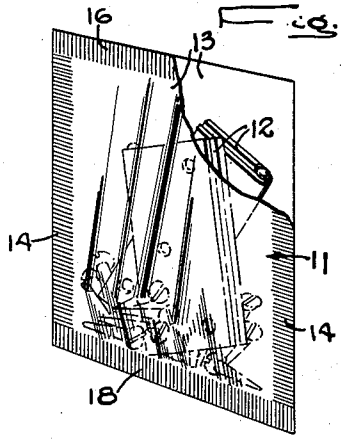


Fig. 24



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Patented Aug. 25, 1953 2,649,674

UNITED STATES PATENT OFFICE

2,649,674

PACKAGING MACHINE

Harold L. Bartelt, Rockford, Ill., assignor of forty-five per cent to Donald E. Bartelt

Application June 13, 1949, Serial No. 98,660

16 Claims. (Cl. 53—89)

1

This invention relates to a machine for operating on a pair of layers or strips of paper or other flexible material as they are advanced along a predetermined path to form bags or envelopes and then fill and close the individual bags.

The general object is to provide a machine of the above character which is of simplified and improved construction, which may be operated at high speed to package a wide variety of articles or materials, and which may be adapted readily to produce bags of widely varying lengths and widths.

Another object is to provide a machine of the above character in which the flexible strips and the bags formed therefrom are advanced step by step along a predetermined path, and the operating mechanisms in their active strokes move transversely of the path but are adapted for adjustment along the path to vary the width of the bag.

Still another object is to provide for filling each bag after it has been formed and severed from the leading end of the advancing strips.

The invention also resides in the novel structural character of the actuators for the various forming and sealing mechanisms, of the strip folding mechanism, of the bag filling mechanism, and of the auxiliary conveyor for handling the completed bags.

Other objects and advantages of the invention will become apparent from the following detailed description taken in connection with the accompanying drawings, in which

Figure 1 is a front elevational view of a packaging machine embodying the novel feature of the invention, the frame cover being broken away.

Fig. 2 is a diagrammatic view showing the various bag forming steps.

Fig. 3 is a perspective view of one of the bags.

Fig. 4 is a fragmentary perspective view of the strip feeding mechanism.

Fig. 5 is a diagrammatic view illustrating steps in the folding of the bags.

Fig. 6 is a longitudinal cross-sectional view of one of the filled bags.

Figs. 7, 8 and 9 are fragmentary sectional views taken respectively along the lines 7—7, 8—8 and 9—9 of Fig. 2.

Figs. 10 and 11 are fragmentary sectional views taken along the lines 10—10 and 11—11 respectively of Fig. 1.

Fig. 12 is a fragmentary longitudinal elevational view of the right-hand portion of the machine shown in Fig. 1.

Fig. 13 is a fragmentary plan view as viewed

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in the direction of the arrows 13—13 shown on Fig. 12.

Fig. 14 is a fragmentary sectional view taken along the line 14—14 of Fig. 13.

Fig. 15 is a fragmentary sectional view taken along the line 15—15 of Fig. 1.

Fig. 16 is an enlarged view of a portion of Fig. 15 with a filling mechanism shown in section.

Fig. 17 is a fragmentary sectional view taken along the line 17—17 of Fig. 16.

Fig. 18 is a fragmentary sectional view taken along the line 18—18 of Fig. 12.

Fig. 19 is an elevational right end view of the machine with certain of the parts broken away.

Fig. 20 is a fragmentary plan view of the discharge end of the machine.

Figs. 21 and 22 are fragmentary sectional views taken respectively along the lines 21—21 and 22—22 of Fig. 12.

Fig. 23 is a fragmentary sectional view taken along the line 23—23 of Fig. 1.

Fig. 24 is a perspective view of a modified form of bag.

While the invention is susceptible of various modifications and alternative constructions, I have shown in the drawings and will herein describe in detail the preferred embodiment. It is to be understood, however, that I do not intend to limit the invention by such disclosure but aim to cover all modifications and alternative constructions falling within the spirit and scope of the invention as expressed in the appended claims.

The machine shown in the drawings for purposes of illustration is particularly adapted for use in converting one or more continuous strips or ribbons 10 of flexible material such as paper, plastic, or the like, into a bag or envelope 11 (Figs. 3, 6 and 24), filling the same with one or more measured quantities of material or articles 12 (Fig. 6), and closing the bags. The latter, in the form shown in Figs. 3 and 6, is rectangular in shape having side walls 13 adhesively joined at their side margins by seams 14 at the the bottom by a fold or pleat 15, and across the top by an adhesive seam 16. To increase the capacity of this form of envelope, the fold 15 is of the bellows type having sides 17 of narrow width converging upwardly into the bag proper and secured at their ends to the walls 13 but not to each other. The inverted V-shaped fold permits expansion of the bag bottom as shown in Fig. 6 or collapse of the same when the bag is empty.

As an alternative, the envelope may, as shown

in Fig. 24, be formed with one transparent side wall 13 through which the articles 12 are visible. Such an envelope may be formed from two strips of different materials, closed by the side and top seals 14 and 16, and at the bottom by a seam 18 similar to and parelleling the top seam.

The adhesive used to form the seals is preferably a thermosenstive plastic material applied as a thin coating on the side of the paper which forms the inner surfaces of the bag walls. As is well known in the art, such adhesive softens quickly upon heating to the proper temperature after which the walls may be united by the application of pressure momentarily. Where one or both bag walls are themselves formed of thermoplastic material, no such additional coating is required.

Generally stated, the improved machine shown in the drawings operates to draw a length of bag material, such as paper or the like, off from a roll 20 and double the strip as it passes through a mechanism 21 (Figs. 1, 2 and 4) to form two side strips disposed side by side after which the folded strip 10 is pushed horizontally step by step through a station 22 (Fig. 10) at which the strip is cross-sealed at 23 to form intervening pockets and a station 24 (Figs. 11, 12, 13) at which the cross-seal is severed along a line 25 to form the side seams 14 of adjacent bags. Before being cut off from the leading end of the folded strip, the bag is delivered to a transfer station 26 where it is picked up by a conveyor 27 by which its step-by-step advance is continued to present the bag to one or more filling stations 28 (Figs. 1, 15) at which the bag is opened and measured quantities of the articles 12 are dropped therein. Finally, before the filled bag is discharged from the remote end of the conveyor 27, it is sealed across its upper end at a station 30 (Figs. 1 and 21) to form the seam 16.

It will be understood that the number, character, and sequence of the operations will vary considerably depending on the nature, size and shape of the material or article or the number of different kinds of articles or materials to be packed. For certain packages, it may be desirable to print directions or advertising matter on one or both sides of the envelope, this being accomplished at a special printing station 31 (Fig. 2) disposed ahead of the sealing station 22. Or, in the case of very flexible plastic materials, more than one mechanism may be required for feeding the folded strip forwardly, these being spaced along the path of advance of the strip.

The various operating stations are spaced along the top of an elongated frame 32 supported by legs 33 on side members 34 connected rigidly by crossbars and having parallel top rails 35 on which the operating mechanisms at the various stations are mounted and along which certain of the mechanisms are adjustable to vary the width of the bags.

The strip and bag feeding, sealing, cut-off, and filling mechanisms are actuated by motions derived from a camshaft 36 extending along the frame and journaled in spaced bearings 37. This shaft is driven through a belt 40 from an electric motor 38 (Fig. 1) and a speed-reducer 39 of well known construction adapted to be adjusted manually to vary the speed of the shaft and therefore the output capacity of the machine.

In the present instance, the paper strip is unwound from the roll 20, drawn through the folding mechanism and pushed onto the sealing and cut-off stations by rollers 42 and 43 engageable with opposite sides of the folded strip and driven intermittently from the camshaft 36. Herein, the roller 43 is mounted in fixed bearings on an inverted U-shaped bracket 44 (Figs. 1 and 4) while the roller 42 is carried by a yoke 45 which is pivoted on the bracket and adjustable by a suitable set screw toward and away from the fixed roller to produce the pressure which is required to advance the folded strip without substantial slippage. At their lower ends, the rollers carry meshing gears 46 and a bevel gear fast on the shaft of the fixed roller meshes with a gear 47 (Fig. 4) on a shaft 48 which is coupled through a one-way clutch 49 (Fig. 23) to an arm 50 loose on the shaft. The clutch may be a simple ratchet but preferably is a so-called Sprag clutch. The free end of the arm 50 is joined by a link 51 to the pin 52 of a crank 53 fast on the camshaft 36. By turning a screw 54, the pin 52 may be adjusted along the crank to vary the throw of the crank and therefore the distance through which the folded strip will be advanced during the half revolution of the crank in which the link 51 is lowered with a gradually accelerated and then decelerated motion. Objectionable slippage of the friction drive is thus avoided so that the bags may be formed of the desired uniform width simply by adjusting the length of the feeding motion produced by the angular displacement of the rollers 42, 43.

The paper roll 20 is mounted on a shaft journaled at opposite ends in standards 55 (Fig. 1) at the extreme left end of the frame. The strip unwound from the roll is led beneath a plate 56 (Fig. 4) having a flat triangular bottom inclined downwardly and merging at its side margins with upright sides 57. The latter converge toward each other and merge into closely spaced plates 58 (Figs. 7, 8 and 9) which converge toward each other very gradually. The lower edges of these plates are spaced apart and coact with the upwardly inclined upper edge of a blade 60 (see Figs. 2 and 7) to form the bellows fold 15 along the center line of the paper strip as the opposite side portions 10 of the latter are guided along the plates 58 to form opposite side walls 13 of the bag. Such guiding is effected by rigid pins 59 upstanding from the frame adjacent the junction of the sides 57 and the plates 58.

With the arrangement thus described, the flat paper sheet leaving the roll is shaped progressively as illustrated in Fig. 5 into the desired cross-sectional shape of the bag to be produced. Thus, the bottom plate 56 and the sides 57 convert the sheet into a rectangle which decreases progressively in width while increasing in depth up to the junction of the sides 57 and the plates 58, the depth of the folded strip then corresponding to the desired depth of the bag. Then, as, the advance of the paper continues, the gradual convergence of the plates 58 allows just enough contraction of the bottom fold to permit progressive upward or infolding by the blade 60 to form the bellows fold 15.

Novel means are provided for pressing the bag walls against the plates 58 so as to hold the paper strip centered accurately relative to the forming mechanism and thus produce bag walls of equal depth in spite of the shifting of parts of the paper as is required during the progressive formation of the bottom fold 15 by the action of the blade 60. As shown in Figs. 1, 2 and 9,

this means includes two relatively narrow rollers 61 having yieldable surfaces bearing against the paper at points disposed between the guide pins 59 and the feed rolls 42 and 43 and spaced substantially above the bottom fold, the rollers being rotatable in a plane which slopes upwardly in the direction of advance of the folded strip. Herein, the rollers are journaled on the free ends of arms 62 (Figs. 1 and 9) swingable about vertical stationary studs 63 on the feed roller supporting bracket. Torsion springs 64 act on the arms 62 to urge the rollers toward each other.

The other part of the centering means comprises two elongated shoes 65 (Figs. 1, 3, 8 and 9) urged against opposite walls of the bag along the lower edge of the plates 58 beginning at a point a short distance beyond the guide pins 59. These shoes are pivoted intermediate their ends on the ends of horizontal arms 67 (Fig. 9) pivoted on the studs 63 and drawn toward each other by a spring 66 which extends through the blade 60 beneath the folded strip.

It will be apparent that the shoes exert on the paper frictional forces which resist lateral creeping of the strip along that portion of the former plates 58 where the bottom fold 15 in the bag is formed by the coaction of the blade 60. At the same time, the rollers 61, by virtue of their inclination, exert upwardly directed forces on the bag walls and thus hold the paper strip stretched quite tightly around the surfaces of the former during the final formation of the bottom fold. As a result, the doubled strip, when the paper roll 20 is centered properly relative to the forming mechanism, is held accurately against lateral creeping resulting in folding of the strip with sides of equal depth and coinciding closely with each other at their upper ends.

After being folded to the desired symmetrical cross-section as described above, the folded strip passes between the feed rolls 42, 43 by which the several folds are collapsed and the entire strip is thus stiffened sufficiently to enable it to be pushed forwardly by the rollers without buckling. During its advance to the sealing station 22, the strip slides along a horizontal track 68 (Fig. 1) and the upper and lower edges are held between pairs of guide bars 69.

Cross-sealing of the folded strip is effected at the station by momentarily pressing the strip between a yieldable backing surface 70 (Fig. 10) and a shoe 71 heated to a temperature sufficiently high to soften the thermosensitive coating on the opposed surfaces of the paper. The backing 70 is supported on pins projecting through holes in a post 74 upstanding from a cross-member 72 adjustable along the frame rails 35 to which it is fixed by clamps 73. The shoe 71 is a metallic block having an electrical heater embedded therein. It is secured to the upper end of a vertically disposed lever 75 pivoted intermediate its ends on a pin 76 which is supported by the cross-member 72 and is disposed beneath the advancing paper strip. Rocking of the heater shoe is effected by a cam 77 fast on the shaft 36 and engageable with a follower roller 78 on the lower end of the lever 75. A spring 79 acts on the lever to hold the follower against the cam and retract the heated shoe when the low part of the cam is presented to the follower. A rise 77a on the cam swings the lever to move the shoe against the folded strip 10 and press the latter against the backing 70. Under the resulting heat and pressure, the areas of the paper equal to the size of the shoe face are heat sealed together as indicated at 23 (Fig. 2). The cam 70 is made of substantial axial length so as to permit of a wide range of adjustment of the sealing unit along the frame without necessitating adjustment of the cam along the shaft. Preferably the sides of the folded strip are separated by a finger 80 (Fig. 2) located in advance of the sealing station 22.

The vertical length of the shoe 71 is at least equal to the width of the folded strip so that the seal 23 extends entirely across the strip and therefore the full length of the bags including the bottom fold 15. However, since the paper is coated only on the inner surfaces of the folded strip, the external surfaces of the bottom fold do not become sealed together. Thus, the bag bottom is free to expand as shown in Fig. 6 by straightening of the fold 15 when the articles are introduced therein.

The width of the seal 23, as determined by the width of the shoe 71, is double the desired width of the bag side seams 14 so that the latter seams of two adjacent bags are formed by severing the folded strip along the center line of the seal. Such cutting of the seal is effected at the station 24 by blades 81 and 82 (see Figs. 11 and 13) operable with a scissors action and relatively movable transversely of the folded strip after the latter has been pushed endwise between the blades when the latter are separated. Herein, the edge of the fixed blade 81 is disposed adjacent one side of the folded strip and the blade is on a standard 83 projecting upwardly from a cross member 84 spanning the frame rails and adapted to be secured to the latter by clamps 85 which when loosened permit the scissor blades to be adjusted horizontally along the strip 10 to vary the cut-off point. The latter is spaced along the strip from the center of the sealing shoe 71 a multiple of the feeding movement produced by the rollers 42, 43. As a result, the center of one seal 23 is, by each advance of the strip, brought to a position directly opposite the cutter blade 82.

Cut-off is then effected by swinging of the blade 82 across the path of the strip to carry its inclined cutting edge across the edge of the fixed blade to the position shown in phantom in Fig. 11. For this purpose, the blade 81 is held under the pressure of springs 86 (Figs. 12 and 13) against the side of a block on the upper end of an upright lever 87 having a follower roller 88 at its lower end and urged by a spring 89 against a cam 90 on the shaft 36. The lever is fast on a rock shaft 116 disposed beneath the cross member 84 in the plane of the folded strip and journaled on this member. When the follower 88 is engaging the low part of the cam, the blade 82 is retracted and the strip may be advanced between the blades to present the next seal 23 opposite the cutting edges. Then, as the cam turns, the rise thereof engages the follower and swings the lever to carry the blade edge across the stationary edge and thus sever the folded strip along the center line of the seal 23. Like the cam 78, the cam 90 is made of substantial axial length to allow adjustment of the cutter along the frame to accommodate a relatively wide range of bag widths.

It will be observed that the active motions of the sealing and cut-off elements 71 and 82 are in the same direction and occur substantially simultaneously. Therefore, both of these elements may, if desired, be mounted on a frame rocked by a single cam.

In each advance of the folded strip, the leading end portion thereof is moved past the cut-

off position and onto the secondary conveyor 27 above referred to (Figs. 1 and 12) which grips the bag prior to cut-off and then advances the bag step-by-step to the filling and final sealing stations 28 and 30. While this conveyor may take various forms, it comprises in the present instance an endless chain 91 of the ordinary roller type extending around sprockets 92 and 93 having uniformly spaced therealong gripping devices 94 which are closed and opened automatically and which, while gripping the bag, carry it along a horizontal track on which the bag bottom rests, the track being formed by a bar 95. The upper straight run of the chain is thus disposed alongside the line of advance of the bags and above the bar which is supported by frame crosspieces, one of which supports the bearing 96 (Fig. 13) for the sprocket 92.

The upper run of the chain is supported and guided for endwise movement at the proper height above the bar 95. Herein, this is accomplished by rails 97 (Fig. 18) supported by the cross pieces 32 and engaging the tops and bottoms of the chain rollers 98 and also the side members of the links.

Preferably, the conveyor 27 is indexed forwardly through steps which are somewhat longer than the width of the widest bag to be made so that the conveyor will handle all of the bag sizes without changing the length of its stroke. Such advance of the chain may be effected by a crank 99 (Figs. 12 and 19) fixed on the far end of the camshaft 36 and connected to one end of a rod 100 whose other end (see Figs. 19 and 20) carries a pawl 101 which is held by a spring in engagement with the teeth of a ratchet wheel 102. The latter is fast on a shaft connected to the shaft of the sprocket 93 through bevel gears 103. It will be apparent that during each upward movement of the rod 100, the chain will be advanced through a fixed distance and all of the bags 11 held in the gripping devices 94 of the upper chain run will be moved correspondingly. The crank 99 is so positioned on the shaft 36 that the indexing movement of the conveyor 27 will occur while the folded strip at the sealing and cut-off stations is stationary and immediately after the blade 82 has been advanced by its cam to cut-off the strip. The conveyor motion is completed before the blade is retracted and the subsequent feeding of the folded strip initiated.

In the present instance, the gripping devices 94 each comprise a block 104 (Figs. 13 and 18) secured to extensions of the pivot pins of adjacent chain links and disposed at the side of the chain with the exposed surface of the block 104 disposed close to the path of advance of the folded strip. Cooperating with the block surface to form a clamp is a jaw 105 bent from a strip of metal and supported by two vertically spaced screws 106 projecting from the block and loosely through the flat intermediate portion of the jaw 105 so as to permit rocking of the latter away from the block. Springs 107 acting against heads on the outer ends of the screws 106 urge the jaw 105 toward closed position against the block surface. The trailing end 108 of the jaw is bent outwardly and cooperates with the beveled end 108a of the block to guide the entry of the leading end of the folded strip into the gripping device.

The leading end portion of the jaw 105 is inclined outwardly and away from the block 104 to permit the jaw to be rocked by a force applied to the curved end 109 and directed laterally of the path of advance of the gripping devices and the bags thereon. Herein, the force is derived from the cam shaft and applied by a finger in the form of an adjustable screw 110 (Figs. 12, 13 and 14) projecting from the upper end portion of a lever 111 swingable about a pivot 112 supported by a bearing on a frame crosspiece. The depending end portion of the lever is slotted as indicated at 113 in Fig. 14 to receive a pin 114 projecting laterally from the end of a crank 115 (Figs. 11 and 13) which is fast on the rockshaft 116 which carries the cut-off lever 82 above described. The arrangement is such that when the cut-off blade is retracted as shown in Fig. 13, the crank 115 will be disposed in the position shown in phantom in Fig. 14, and the finger 110 will be swung to the left against the end 109 of the jaw 105 then disposed at the transfer station thereby holding the latter inwardly so as to rock the outer end of the jaw outwardly and hold the gripping device open. Then, when the knife blade 82 is advanced by the cam 90 to cut off the leading end portion of the folded strip and form a bag, the lever 11 is swung with the cut-off lever to retract the finger 110 and allow the jaw 105 to close under the action of the springs 107. The leading end of the bag bottom is thus gripped and clamped to the chain 91 so as to be carried forwardly in the next advance of the latter which occurs before the cutter blade 82 is retracted and the clamp opening finger 110 again projected forwardly. In this way, the cam 90 is utilized to perform the additional function of opening the terminal gripping device and later allowing it to close after it has received the next bag to be cut off.

It is preferred for several reasons to fill each bag 11 after it has been severed and while it is supported by the conveyor 27. Such filling is effected at one or more stations after the bag has been opened to receive the articles on a chute through which they are discharged. To open the bag, the side walls 13 thereof are separated through the use of suction cups 117 (see Figs. 12, 13, 15 and 16) which are moved against the outer surfaces of the bag walls, subjected to a vacuum, and then moved outwardly all in timed relation to the indexing movements of the conveyor 27 and the operation of the associated filling mechanism.

The cups 117 which are made of soft rubber material are mounted on the ends of horizontally disposed tubes 118 rigid with the upper ends of upstanding arms 119 of bell crank levers 120 disposed on opposite sides of the bag at the filling station 28 and swingable about a common pivot 121. Such swinging is effected in the present instance through links 122 connecting the outer ends of the bell cranks with a slide 123 guided for vertical movement in a frame bracket 124 and urged downwardly by a spring 125. On the lower end of the slide is the follower of a cam 126 fast on the shaft 36 and adapted to raise the slide as shown in Fig. 15 and thereby swing the cups inwardly into alinement with each other and against opposite walls of the bag then disposed at the filling station. As the follower rides off from the high point of the cam, the bell cranks swing outwardly to the positions shown in Fig. 16 thereby separating the upper end portions of the bag walls so as to open the bag.

Before such separating of the cups occurs, a vacuum is created therein, preferably by the action of a pump 127 (Fig. 12) which is actuated

from the camshaft 36. Herein, the pump comprises a cylinder 128 mounted on the machine frame and communicating at its upper end with flexible conduits 129 connected to the tubes 118 leading to the suction cups. A piston 130 reciprocable in the cylinder has a rod connected by a link 131 to the free end of a crank 132 which is positioned on the shaft so as to initiate downward movement of the piston and the application of a vacuum to the suction cups as soon as the cups are brought against the walls of the bag. The vacuum continues for the remainder of a half revolution of the camshaft during which the cups are separated to open the bag and the latter is filled. As the crank motion reverses, which occurs while the cups are held retracted, the vacuum is relieved and the bag walls are released so that the bag may be pulled forwardly in the next advance of the chain conveyor. The degree of vacuum created by the pump 127 may be varied by adjusting a valve 127a (Fig. 12).

The filling mechanism for depositing the articles 12 in the bag while the latter is held open will vary in form depending on the number and size of the articles. As shown in Figs. 15, 16 and 17, the filler includes a tube 133 slidable vertically along a key 134 in a guideway formed in a bracket 135 secured to the machine frame adjacent the filling station. The tube has a side opening 136 near its upper end for receiving articles 12 gravitating downwardly from one or more inclined chutes 137 in which the articles are maintained in a row by means well known in the art.

The lower end of the tube 133 is closed by doors 138 of arcuate clam-shell shape suspended from pivot pins 139 on opposite sides of the tube at the lower end thereof and swingable toward each other to bring their adjacent sides into abutment as shown in Fig. 15, the doors being normally held in this closed position by a spring 140 stretched between pins which project outwardly from opposite sides of the doors. In this closed position, the doors form a receptacle which tapers downwardly substantially to a point and is adapted to enter between the walls of the open bag as the tube is lowered. In the final part of this motion, short arms 141 (Fig. 16) projecting outwardly from the doors encounter vertically adjustable stops 142 and, in the continued movement of the tube, the doors are swung apart to further spread the walls of the bag as shown in Fig. 16 and also to release the batch of articles then held in the receptacle, the articles falling directly into the bag. Then, as the tube is retracted upwardly, the doors are allowed to swing together and close the bottom of the tube ready to receive the next measured batch of articles.

While the lowering of the tube may be effected by a cam on the shaft 36, it is actuated in the present instance by a solenoid 143 (Fig. 15) whose armature is connected to the outer end of a lever 144 pivoted at 145 on the bracket 135 and having a pin and slot connection 146 at its inner end with the tube 133. A spring 147 (Fig. 17) operates to raise the tube when the solenoid is deenergized by opening of a switch 148 (Figs. 1, 12 and 22) by which the energizing circuit for the solenoid is opened and closed. The switch may be actuated at proper times in the cycle by a cam 149 fast on the shaft 36 and shaped to close the switch just after the bag at the filling station has been opened by the suction cups and to open the switch after an interval long enough to enable all of the articles 12 to fall into the bag.

If desired, the upward motion of the tube may be utilized to release a new batch of the articles from the chutes 137 and allow the same to gravitate into the tube. To this end, a U-shaped yoke 150 (Fig. 17) having upstanding arms is mounted in the bracket 135 adjacent the tube 133 to slide horizontally and transversely of the chute 137. This is effected by a pin 151 projecting from the tube 133 into an inclined slot 152 in the yoke and acting as a cam on the slot walls to shift the yoke to the right as shown in Fig. 17 as the tube is lowered. In this movement, a finger 153 extending horizontally from the yoke toward the chute 137 is projected across the groove in the latter and thus forms a stop for holding the upper articles in the chute against downward gravitation.

In this same movement of the yoke, a horizontal finger 154 on the yoke is withdrawn from the chute groove to the position shown in Fig. 17, thus allowing the row of articles to slide downwardly until the stop finger 153 is encountered. Now, when the motions are reversed and the tube 133 is raised by the spring 147, the yoke will be cammed to the left to project the finger 154 through the row of articles in the chute 137 and thus form a stop for holding back the articles farther up the chute. At the same time, the finger 153 becomes withdrawn from the chute allowing the articles then disposed between the fingers to gravitate into the tube through the opening 136. The number of articles thus measured into the receptacle is determined by the spacing of the fingers 153 and 154 along the chute.

If a different kind or size of article is also to be deposited in each bag, a second filler mechanism would be located at a subsequent position of the bag in its step-by-step advance by the conveyor 27. At such filling station, the bag opening mechanism above described would be duplicated. In the case of each filler, the supporting bracbet 135 is mounted on the machine frame for some degree of adjustment longitudinally of the path of advance of the bags. By such adjustment, the discharge outlet of the filler may thus be centered between the side edges of the bag 11 and thus positioned properly in relation to bags of different widths. This adjustment is made after changing the bag widths and is necessary because in the fixed indexing movements of the conveyor 27, the leading edge of bags is brought to fixed positions along the line of advance and therefore the positions of the bag centers will be determined by the widths of the bags.

After passing the filling stations, the bag is moved by the conveyor 27 into the station 30 at which the bag is heat sealed across the top to form the seam 16 and effect final complete closure of the bag. This is accomplished by mechanism similar to that for forming the cross-seals 23 and comprising a backing block 155 (Figs. 20 and 21) and a heated block 156 between which the upper edge of the bag is pressed momentarily. The block 155 is slidably supported on pins on a frame bracket 157 and urged by springs 158 toward a limit position determined by suitable stops. The block 156 in which a suitable electric heater is embedded is fixed to the upper end of an upright lever 159 swingable about a pivot 160 on the machine frame carrying a follower 161 at its lower end riding a cam 162 on the shaft

36. A spring 163 holds the lever against the cam which is shaped to hold the heater retracted during the advance of a bag into sealing position. During the dwell of the bag, the cam advances the block 156 momentarily against the bag and presses the top thereof against the backing 155 thus effecting sealing across the entire width of the bag which is spanned by both the backing and the heated block.

The bag thus sealed is released from the conveyor 27 after it has passed around the sprocket 93 and starts to move reversely. This may be accomplished conveniently by a stationary cam (Figs. 12 and 20) in the form of a rigid bar 164 projecting from the end of the machine frame and having an incline 165 disposed as shown in Fig. 20 in the path of the curved end portion 109 of the jaw 105. Thus, as the gripping device with a bag clamped therein as shown in Fig. 1 reaches the cam, the incline 165, acting on the then leading end 109 of the jaw 105, wedges this end laterally of the path of travel and toward the chain. The jaw is thus rocked relative to the block 104 about its fulcrum defined by the screws 106 thereby swinging the other end of the jaw away from the block so as to release the clamping pressure on the then inverted bag allowing the latter to fall into a suitable receptacle. The jaw is held in open position as the end 109 rides up the incline onto a straight part of the cam and until the latter has been passed whereupon the jaw is moved back against the block 104. It will be observed that the cam 164 acts on the gripping device while the chain link supporting it is still in mesh and therefore held against lateral displacement by the sprocket 93.

Operation

The machine above described is prepared for operation by stopping the motor 38 with the camshaft 36 in a position to separate the sealing elements and the cutter blades at the stations 22, 24 and 30. A roll of the plastic coated paper of a width capable of forming bags of the desired height is mounted in centered position in the machine and the leading end is manually threaded through the folding mechanism, the feed rolls, the guides, and between the sealing and cutting elements at the stations 22 and 24. Then, by turning the screw 54, the throw of the crank 53 is adjusted to turn the feed rolls 42, 43 and advance the folded strip 10 a distance exactly equal to the bag width desired. Next, the cutter unit is adjusted along the frame rails 35 to space the knife edges 81 and 82 a distance precisely equal to the envelope width from the first gripping device 94 at the transfer station 26 or, in other words, from the position which the leading end of the folded strip occupies after being fed forwardly by the rollers 42, 43 following operation of the cutter blades. Finally, the bracket 72 of the cross-sealing mechanism is adjusted to space the center of the heated shoe 71 from the knife edge 81 a distance which is a multiple of the width of the bag and the indexing movement for which the feeding mechanism is set.

During operation of the motor with the machine thus adjusted, a length of paper for forming one bag will be drawn from the roll 20 and through the folding mechanism during that part of each revolution of the camshaft 36 when the link 51 is being lowered by the crank 53 to advance the feed rolls 42, 43. The length of the folded strip 10 beyond the rolls will thus be pushed forwardly along the guides and through the sealing and cut-off stations 22 and 24 to bring the leading or previously cut off end into the gripping device 94 at the transfer station 26. At this time, the conveyor 27 will have completed its indexing movement which takes place immediately after the previous actuation of the blade 82 to cut off the leading bag.

Next, the cams 77 and 90 advance the heated shoe 71 and the blade 82 to form the seal 23 at the station 22 and sever the strip along the median line of the seal 23 at the station 24. The same motion of the lever 87 by the cam 90 rocks the arm 111 to retract the finger 110 and allow the jaw 105 of the gripping device 94 at the transfer station 26 to close and thus clamp the leading lower corner of the cut-off bag to the conveyor 27. The latter is then advanced through one step by the crank 99 thereby carrying all of the bags held in the gripping devices 94 forwardly. The leading closed bag is moved downwardly around the sprocket 93 and reversely past the stationary cam 164 by which the clamp 94 for this bag is opened to release the bag from the conveyor.

As soon as the indexing stroke of the conveyor is completed, the cams 77 and 90 allow the shoe 71 and the knife blade 82 to be retracted by their springs, the finger 110 being projected against the jaw 105 of the gripping device then at the transfer station 26, thus opening this device preparatory to receiving the end of the folded strip 10 in the next advance of the latter. One revolution of the camshaft and a cycle of the machine will have been completed.

In the next advance of the folded strip which starts immediately, a new portion of the strip is moved into sealing position and another seal 23 into centered position relative to the cut-off blades. In the final part of this movement, the lower end of the seal 23 at the leading end of the strip enters between the then open jaws 105 of the clamp at the transfer station 26. Clamping of this end of the strip takes place when the finger 110 is retracted simultaneously with the next advance of the blade 82 to cut off the end portion of the strip and form the bag.

While the conveyor 27 is at rest during each machine cycle, the bag at the filling station 28 is opened by the advance and retraction of the suction cups 117 by the cam 126 as above described, and while the bag is held open, the filler mechanism is operated to deposit a measured quantity of the articles 12 in the bag. Since at this time, only a small area at the lower corner of the bag is clamped in the gripping device of the conveyor, the bellows bottom fold 15 of the bag is free to expand and thus accommodate a relatively large number of the articles. This is also advantageous in that the upper ends of the bag walls are allowed to come squarely together when the upper part of the bag is squeezed between the backing and heated shoes 155 and 156 during a subsequent dwelling of the bag in the final sealing station 30.

It will thus be seen that during each machine cycle comprising one revolution of the camshaft 36, one bag, filled and closed on all four sides, is completed and discharged from the conveyor 27.

Since sealing of the sides and top, severing of the strip, and opening of the bag preparatory to filling are effected by mechanisms which are moved back and forth transversely of the path of advance of the folded strip 10 and the completed bags 11, the machine may be easily

adapted for making and filling bags of different widths. To effect such a change, it is only necessary to readjust the parts as described above to change the extent of rotation of the feed rolls, the spacing of the cut-off position **24** from the transfer position **26**, and the spacing of the heater shoe **71** from the cut-off position. These are easily accomplished by adjusting the throw of the crank **53** and by shifting the supports **72** and **84** along the frame. In addition, small adjustments are made in the position of the suction cups **117** and the filler lengthwise of the machine to center the latter with respect to the new size of bag. No change need be made in the conveyor **27** which is indexed through fixed distances in order to present one of the gripping devices at the transfer station at the termination of each advance.

The machine above described may be modified readily to produce and fill bags of the type shown in Fig. 24. To this end, the blade **60** and associated parts for forming the bellows fold **15** are omitted and two rolls of the different kinds of paper are mounted on the roll shaft or other suitable holder so as to be led side by side between the rollers, each paper strip being of a width equal to the desired depth of the bag. In addition, a second sealing mechanism similar to that at the station **22** is arranged to operate on the folded strip **10** at a point spaced ahead of or behind the cross-sealing station. The heated shoe of this mechanism is positioned to engage the lower edge portions of the two strips and, when actuated, to form the seam **18** across a length of the strips spanning two adjacent cross-seals **14**.

I claim as my invention:

1. In a packaging machine, the combination of, means supporting a length of bag material including two side strips disposed side by side in a vertical plane and guiding the same endwise along a predetermined path, feed mechanism engageable with said strips and operable to advance the same step-by-step along said path, said mechanism being adjustable selectively to vary the length of the advance, a unit engageable with said strips on opposite sides thereof to seal the strips together transversely at spaced points and thereby form a succession of connected bags, a unit engageable with said strips beyond said sealing unit and operable to cut off the strips within a previously formed seal, means supporting said units for adjustment longitudinally of said path to vary the width of the bags, a conveyor alined with said strips and movable along said path, means on said conveyor receiving the leading end of said strips at the end of each advance thereof and before operation of said cut-off unit, and mechanism operable intermittently after operation of said sealing and cut-off units and during dwelling of said strips to advance said conveyor and the previously cut-off bag through a fixed distance greater than the width of the bags.

2. In a packaging machine, the combination of means supporting two flexible strips side by side in a vertical plane and guiding the same endwise along a predetermined path, a continuously rotating shaft, rollers engageable with opposite sides of said strips, a crank of selectively adjustable length rotatable with said shaft, means providing a one-way drive connection between said crank and said rollers for turning the latter periodically to push the strips endwise stey-by-step, sealing mechanism including a pair of shoes extending across the respective strips and movable toward and away from each other into and out of abutting engagement with the strip to seal the engaged areas thereof together, cutter elements spaced therealong a distance correlated with the length of the indexing movement of the strips and relatively movable transversely of the strips to sever the latter within said sealed areas, and cam mechanism actuated by said shaft for operating the movable shoe and cutter element in timed relation to advance of the strips.

3. In a packaging machine, the combination of, means supporting a length of bag material including two side strips disposed side by side in a vertical plane and guiding the same endwise along a predetermined path, feed mechanism engageable with said strips and operable to advance the same step-by-step along said path, a unit engageable with said strips on opposite sides thereof to seal the strips together transversely at spaced points to form a succession of connected bags, a unit engageable with said strips beyond said sealing unit and operable to cut off the strips within a previously formed seal, an endless conveyor having a portion extending along said path beyond said strips, mechanism for advancing said conveyor step-by-step during the interval of dwell of said strips, gripping devices carried by and spaced along said conveyor distances greater than the width of said bags, the trailing one of said devices along said portion being positioned after each advance of the conveyor to receive the leading end of the strips advanced by said feed mechanism, and means operated in timed relation to the operation of said feed mechanism and said cut-off unit to open said trailing gripping device before the final advance of said strips and close the same before the next advance of the conveyor.

4. In a packaging machine, the combination of, means supporting a length of flexible bag material including two side strips disposed side by side in a vertical plane and guiding the same endwise along a predetermined path, feed mechanism engageable with said strips and operable to advance the same step-by-step along said path, said mechanism being adjustable selectively to vary the length of the advance, a unit engageable with said strips on opposite sides thereof to seal the strips together transversely at spaced points to form a succession of connected bags, a unit engageable with said strips beyond said sealing unit and operable to cut off the strips within a previously formed seal, means supporting said units for adjustment longitudinally of said path to vary the width of the bags, a conveyor extending along said path beyond said strips, mechanism for advancing said conveyor step-by-step during the intervals of dwell of said strips, gripping devices carried by and uniformly spaced along said conveyor distances greater than the width of said bags, successive ones of said devices being disposed after each advance of the conveyor in a position to receive the leading end of the strips advanced by said feed mechanism, and means operated in timed relation to the operation of said feed mechanism and cut-off unit to open the gripping device in said position before the final advance of said strips and close the same before the next advance of the conveyor.

5. In a packaging machine, the combination of means supporting a length of bag material including two side strips disposed side by side and guiding the same endwise along a predetermined path, feed mechanism operable periodically to advance the strips in successive steps, sealing and cut-off units spaced apart along said

path distances correlated with the length of steps and operable during dwelling of the strips to cross-seal the two together and cut off the leading end portion of the strips across a previously formed seal and thereby form a bag, a conveyor extending along said path beyond said strips and movable step-by-step during successive dwells of said strips and in timed relation to the operation of said cut-off unit, gripping devices carried by and spaced along said conveyor, successive ones of said devices being operable to receive the leading end of said strips in the final advance thereof, and means actuated in timed relation to said cut-off unit to open the gripping device receiving said leading end before advance of said strips and then close the same before operation of said cut-off unit to sever the strips.

6. A packaging machine having, in combination, means for supporting a length of bag material including two side strips disposed side by side in a vertical plane and advancing the same endwise step-by-step along a predetermined path, means operable during dwelling of the strips to seal the same crosswise, means operable during a succeeding dwell of the strips to sever the terminal cross-seal intermediate its edges and complete a bag, a conveyor beyond the end of said path adapted to receive and grip the leading end portion of the strips before cut-off thereof, mechanism for advancing said conveyor step-by-step in timed relation to the advance of said strips, means engageable with a bag during dwelling thereof in one position of the conveyor to separate the bag walls and thus open the upper end of the bag, a filling mechanism operable to deposit a measured quantity of material into the dwelling bag while the latter is open, and means at a subsequent dwell position of the bag engageable with the filled bag to seal the latter across its upper end.

7. In a packaging machine, the combination of, mechanism for supporting two flexible strips side by side and intermittently advancing the same endwise along a predetermined path, a device disposed along said path and engageable with spaced areas of said strips on opposite sides thereof during dwelling of the strips to seal the engaged areas together and divide the strips into a series of interconnected pockets, a conveyor alined with said strips and movable along said path, means on said conveyor adapted to grip an edge portion of the leading one of said pockets at the end of each advance of said strips, a cutting device disposed along said path between said sealing device and said conveyor and operable in timed relation to advance of said strips to sever said leading pocket from the strips and free the same for advance by said conveyor after the pocket has been received in said gripping means, a filling station disposed along said path beyond said cutting device and including means for depositing a quantity of material, mechanism operable intermittently after operation of said cutting device to advance said conveyor and present said freed pocket to said filling station in a position to receive the deposited material, and mechanism operated in timed relation to the operation of said depositing means to move the walls of said freed pocket apart and the side edges thereof toward each other whereby to form an opening for receiving said material deposit.

8. In a bag filling machine, the combination of, an endless conveyor, a filling station, means for indexing said conveyor step by step past said filling station, gripping devices attached to said conveyor at spaced points therealong and presented during the advance of said conveyor first to a gripping position and then to said filling station, each of said devices including separable jaws normally urged together to grip the edges of a bag between them and adapted when separated to receive a bag edge, mechanism for forming and supporting a row of bags connected at their adjacent edges, means for advancing said row of bags endwise step by step in timed relation to the advance of said conveyor to deliver the leading bag of the row between the jaws of the device dwelling in said gripping position, means operating during dwelling of the row of bags to cut the two leading bags apart, and mechanism operated in timed relation to the advance of said conveyor and said cut off means to separate the jaws of each of said devices as it reaches said gripping position and then to close the jaws after entry of said leading bag edge therebetween.

9. In a bag filling machine, the combination of, a series of spaced gripping devices each including a pair of separable jaws adapted to receive and grip a bag edge between them, means for supporting said devices in spaced relation and advancing the series step by step along a predetermined path to present one device to and dwell the same in a filling position and a succeeding device to a gripping position, means operated in timed relation to the advance of said devices to hold each device open during part of its dwell in said gripping position and then to close the jaws of such device before the next advance thereof, mechanism for supporting a row of bags joined at their adjacent edges and extending toward said gripping position, means operated in timed relation to the advance of said devices to index said bags forwardly and project the leading end of the row in between the open jaws of the device dwelling in said gripping position, and means operable during dwelling of the bags to cut the leading two bags apart and leave the leading bag clamped in the gripping device.

10. In a packaging machine, the combination of, an endless conveyor, means for indexing said conveyor step by step in one direction, gripping devices on said conveyor at spaced points therealong and presented to a gripping position successively, each of said devices including separable jaws adapted when spread apart to receive a bag between them, the bag-receiving opening formed by said jaws facing longitudinally of said conveyor in a direction opposite to the advance thereof, means for advancing a row of connected bags endwise step by step in timed relation to advance of said conveyor to deliver the leading bag of the row between the jaws of one of said devices dwelling in said gripping position, means operable during dwelling of the row of bags to cut the two leading bags apart, and mechanism operated in timed relation to the advance of said conveyor and cut-off means to hold open the jaws of the device dwelling in said gripping position until entry of said leading bag and then close the jaws before cutting off of such bag.

11. In a packaging machine, the combination of, an endless conveyor, means for indexing said conveyor step by step in one direction, gripping devices on said conveyor at spaced points therealong and presented to a gripping position successively, each of said devices including separable jaws adapted when separated to receive a bag between them, the bag-receiving opening formed by said jaws facing longitudinally of said conveyor in a direction opposite to the advance thereof, means for advancing bags successively

step by step in timed relation to advance of said conveyor to deliver the leading bag between the jaws of one of said devices dwelling in said gripping position, a power actuated member mounted adjacent said gripping position and movable back and forth transversely of the direction of advance of said conveyor to open and close the gripping device in said position, and mechanism for actuating said member in timed relation to the advance of said conveyor to separate the jaws of each of said devices in said gripping position and close the jaws after entry of said leading bag therebetween.

12. In a packaging machine, the combination of, an endless conveyor, means for indexing said conveyor step by step in one direction, gripping devices attached to said conveyor at spaced points therealong and presented to a gripping position successively, each of said devices including a jaw fixed to said conveyor and a movable jaw cooperating therewith to form a bag-receiving opening facing longitudinally of said conveyor and opposite to the direction of advance thereof, means for advancing bags step by step in timed relation to advance of said conveyor to deliver bags one by one between the jaws of one of said devices dwelling in said gripping position, a lever for each of said devices fulcrumed and projecting from said conveyor to swing transversely of the path of advance of said devices, said lever being connected to the movable jaw of the associated device and operable, when pressed in one direction to separate the movable jaw from the fixed jaw, means normally urging said movable jaw of each device toward the fixed jaw to close the gripping device, and mechanism actuated in timed relation to advance of said conveyor to actuate the lever of the device disposed in said gripping position whereby to receive and grip the bag advanced to the conveyor.

13. In a packaging machine, the combination of, an elongated conveyor, a power rotated shaft, means actuated periodically in the rotation of said shaft to index said conveyor endwise step by step in one direction, gripping devices attached to said conveyor at spaced points therealong and presented to a gripping position successively, each of said devices including separable jaws cooperating to define a bag-receiving opening facing longitudinally of said conveyor and opposite to the direction of advance thereof, means for supporting a series of connected bags in a row terminating at said gripping position, means actuated periodically in the rotation of said shaft to advance the row of bags during dwelling of said conveyor in steps of shorter length than the indexing movements of said conveyor and deliver the leading bag to the one of said devices dwelling in said gripping position, means actuated by said shaft during dwelling of the row of bags to cut the two leading bags apart, and mechanism actuated by said shaft to open the jaws of the device dwelling in said gripping position and then close the jaws after entry of the leading bag edge and prior to the next advance of said conveyor.

14. In a packaging machine, the combination of, an endless conveyor, means for indexing said conveyor step by step in one direction, gripping means on said conveyor at spaced points therealong presented to a gripping position successively in the advance of the conveyor, means for supporting a row of connected bags, mechanism operable during the successive dwells of said conveyor for advancing said bags step by step and dwelling the bags during the advance of the conveyor whereby to deliver the leading bag of the row into the one of said gripping means dwelling in said gripping position, mechanism actuated in timed relation to the advance of the conveyor and operable to maintain the gripping means in said gripping position open during the advance of said row of bags and then to close such gripping means before the next advance of said conveyor, and means actuated in timed relation to the advance of said bags and said conveyor and operable during dwelling of the bags and before the succeeding advance of said conveyor to cut the two leading bags apart whereby to allow the leading bag to be advanced with the conveyor.

15. A packaging machine having, in combination, means for supporting a length of bag material including two side strips disposed side by side in a vertical plane and advancing the same endwise step by step along a predetermined path, means operable during dwelling of the strips to seal the same crosswise, means operable during a succeeding dwell of the strips to sever the terminal cross-seal intermediate its edges and form a bag, a conveyor beyond the end of said path adapted to receive and grip the leading end portion of the strips before cut-off thereof, mechanism for advancing said conveyor step by step during the successive dwells of said strips, a filling mechanism spaced along said conveyor beyond the position of initial gripping of the cut-off bag and alined with the open end of such bag in a subsequent dwell position thereof, means operable during dwelling of said conveyor to deposit material into the bag disposed opposite said filling mechanism, and means disposed at a subsequent dwell position of the filled bag engageable with the open end portion thereof to seal the latter closed.

16. A packaging machine having, in combination, means for converting strip material into a row of bags connected at their adjacent edges and for advancing the bags edgewise along a predetermined path to present the leading bag to a gripping position, means operable after said leading bag has reached said gripping position to separate such bag from said row, a conveyor disposed beyond the end of said path operable to receive and grip the leading bag before cut-off thereof, mechanism for advancing said conveyor to carry the gripped bag along an extension of said path, a filling mechanism for depositing material in a bag supported by said conveyor, and mechanism operable in timed relation to the advance of the conveyor for opening a supported bag thereon and delivering material from said filling mechanism into the bag.

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2,295,335	Cloud	Sept. 8, 1942
2,334,256	Eaton	Nov. 16, 1943
2,336,962	Salfisberg	Dec. 14, 1943
2,350,666	Allen	June 6, 1944
2,475,359	Piazze	July 5, 1949