July 13, 1943. J. HOHL ET AL 2,324,393

BAG MAKING MACHINE

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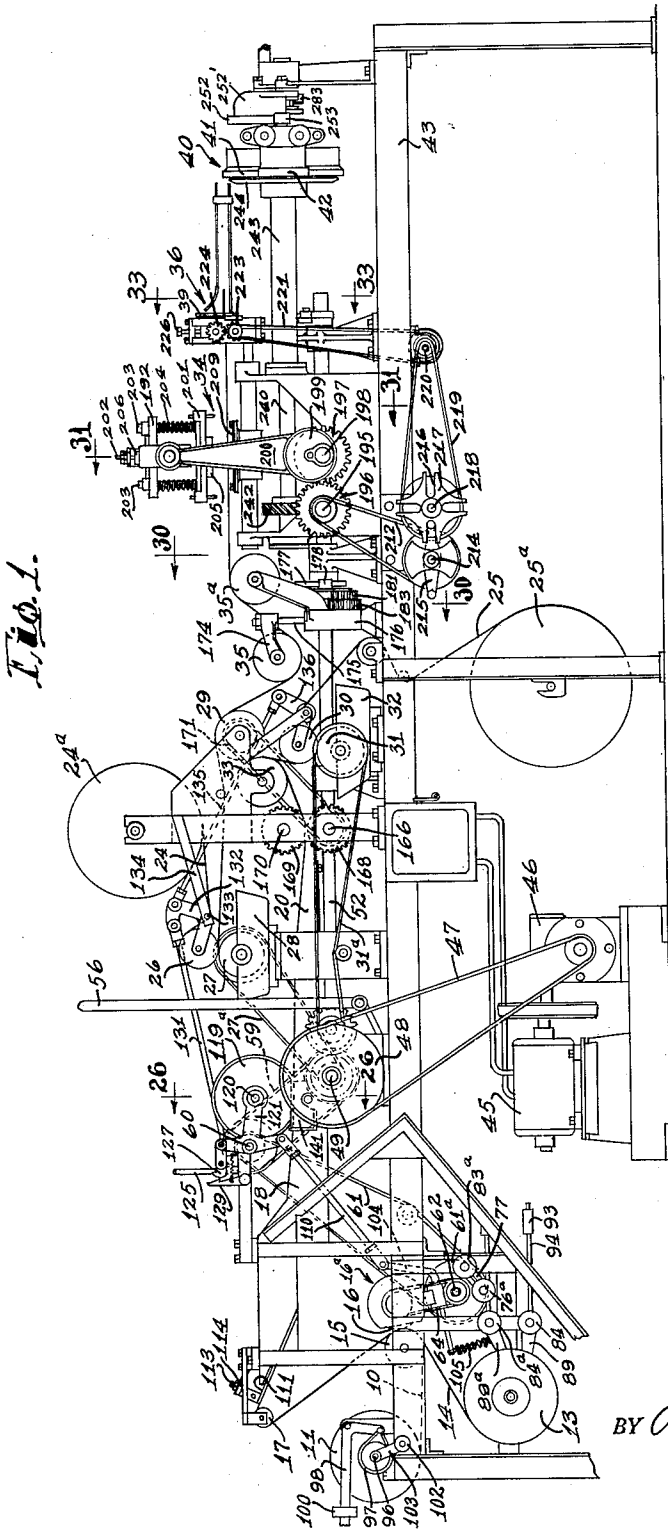


Fig. 1.

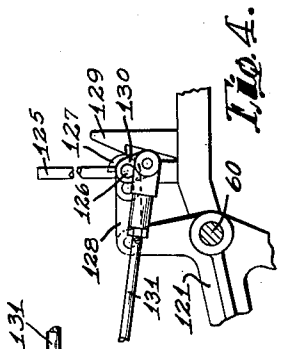


Fig. 4.

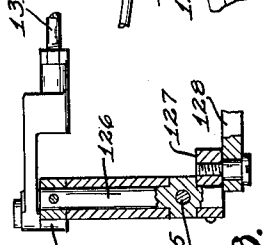


Fig. 3.

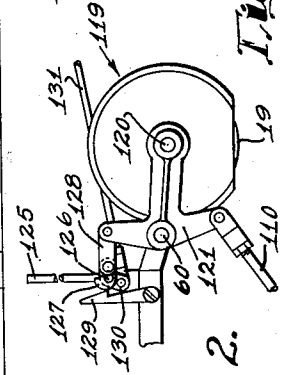


Fig. 2.

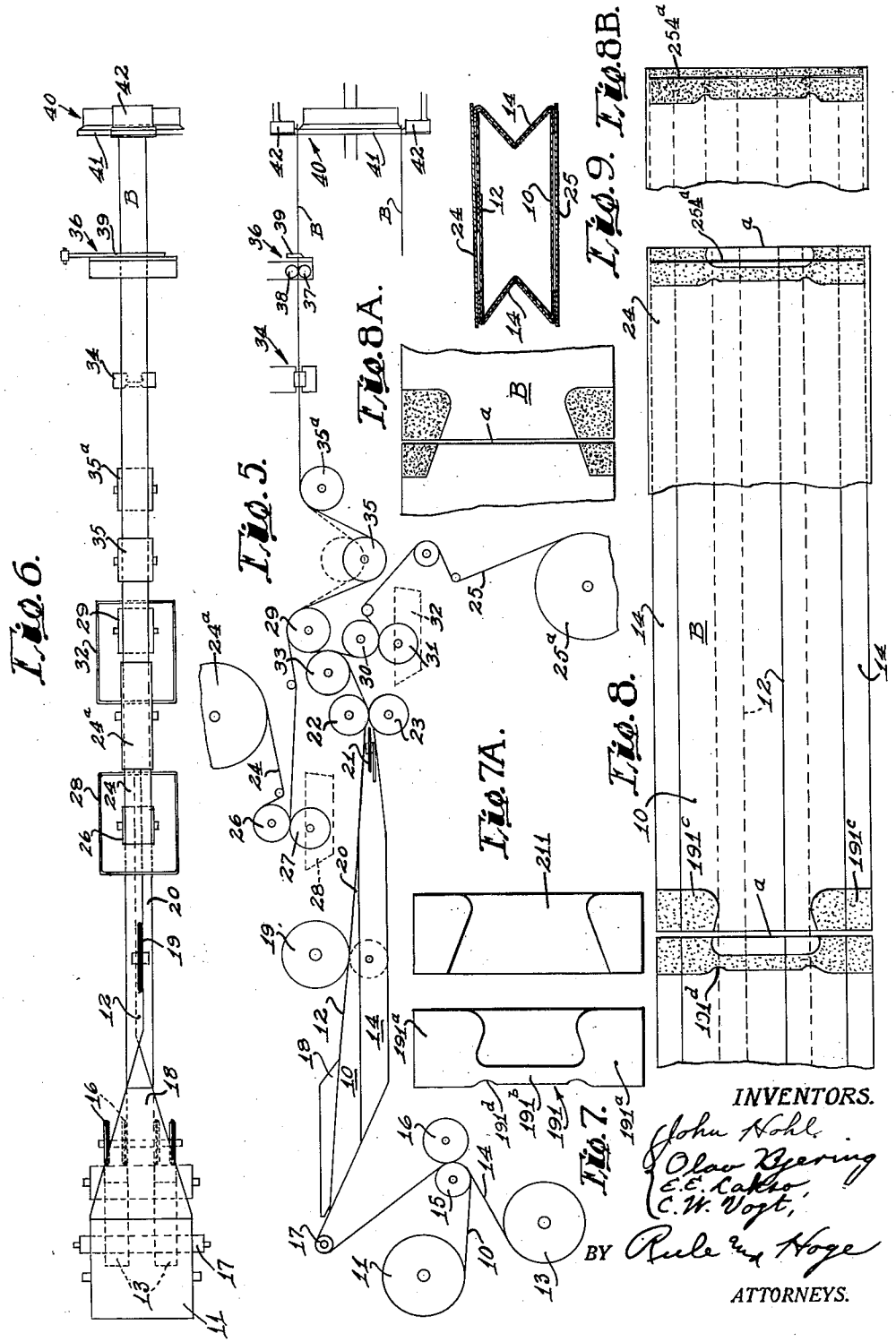
C. W. Vogt
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Olav Bjerring
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July 13, 1943. J. HOHL ET AL 2,324,393

BAG MAKING MACHINE

Filed Sept. 13, 1939 16 Sheets-Sheet 2



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July 13, 1943. J. HOHL ET AL 2,324,393

BAG MAKING MACHINE

Filed Sept. 13, 1939 16 Sheets-Sheet 3

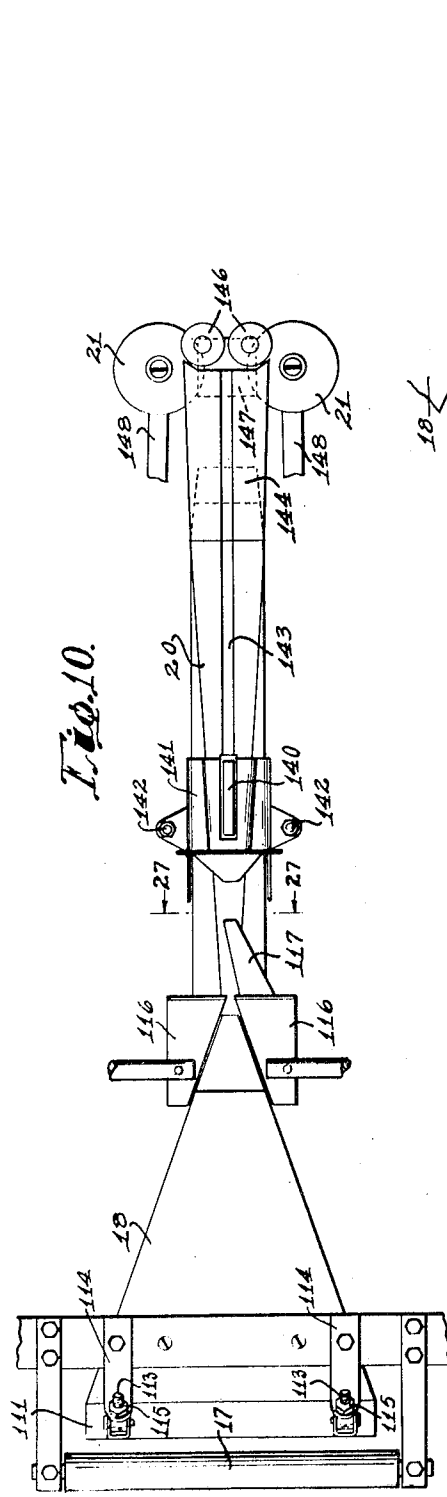


Fig. 10.

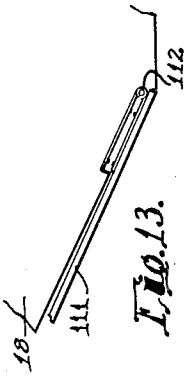


Fig. 13.

Fig. 11.

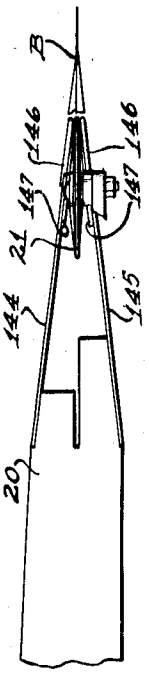


Fig. 12.

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July 13, 1943. J. HOHL ET AL 2,324,393

BAG MAKING MACHINE

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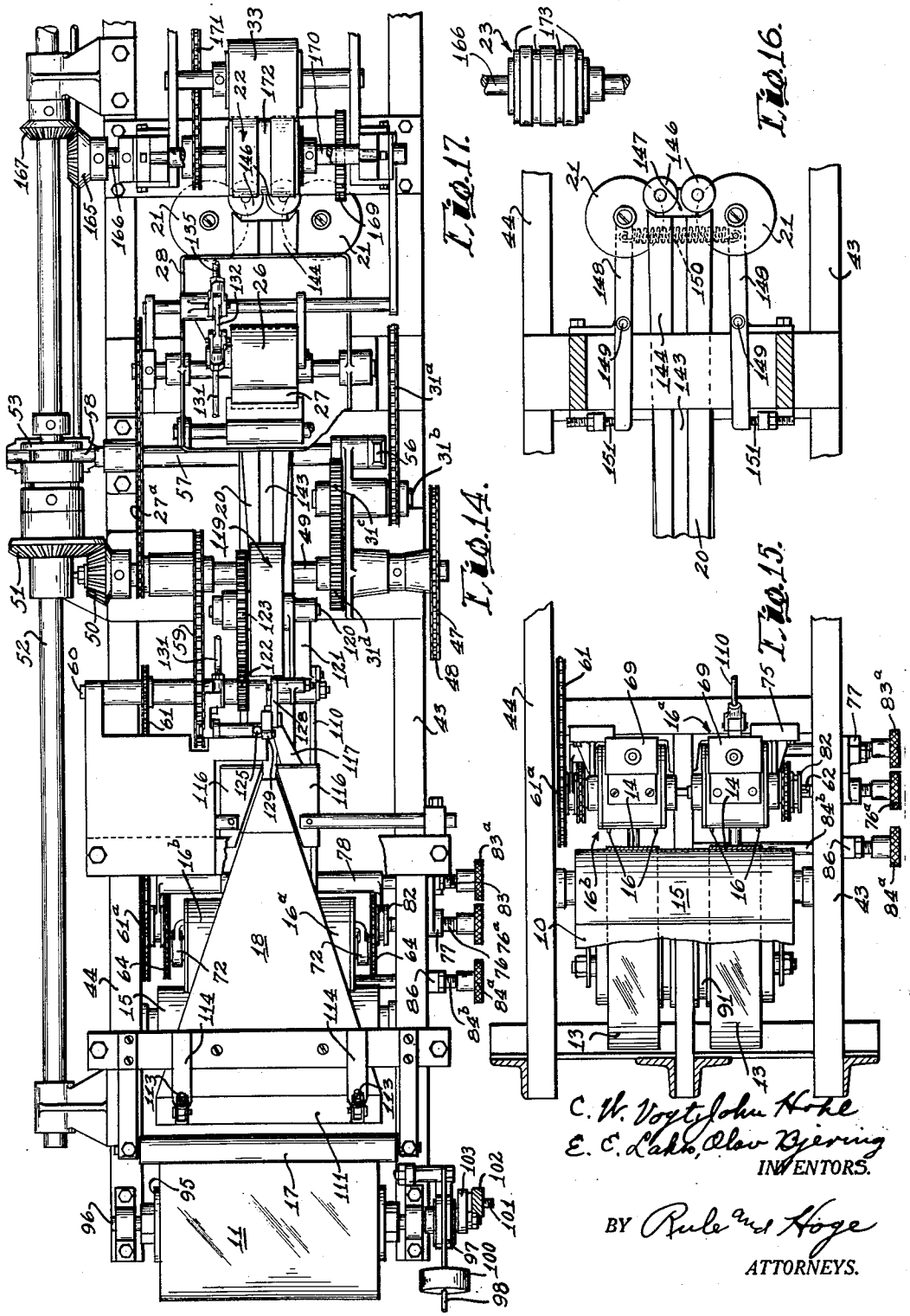


Fig. 17.

Fig. 16.

Fig. 14.

Fig. 15.

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BAG MAKING MACHINE

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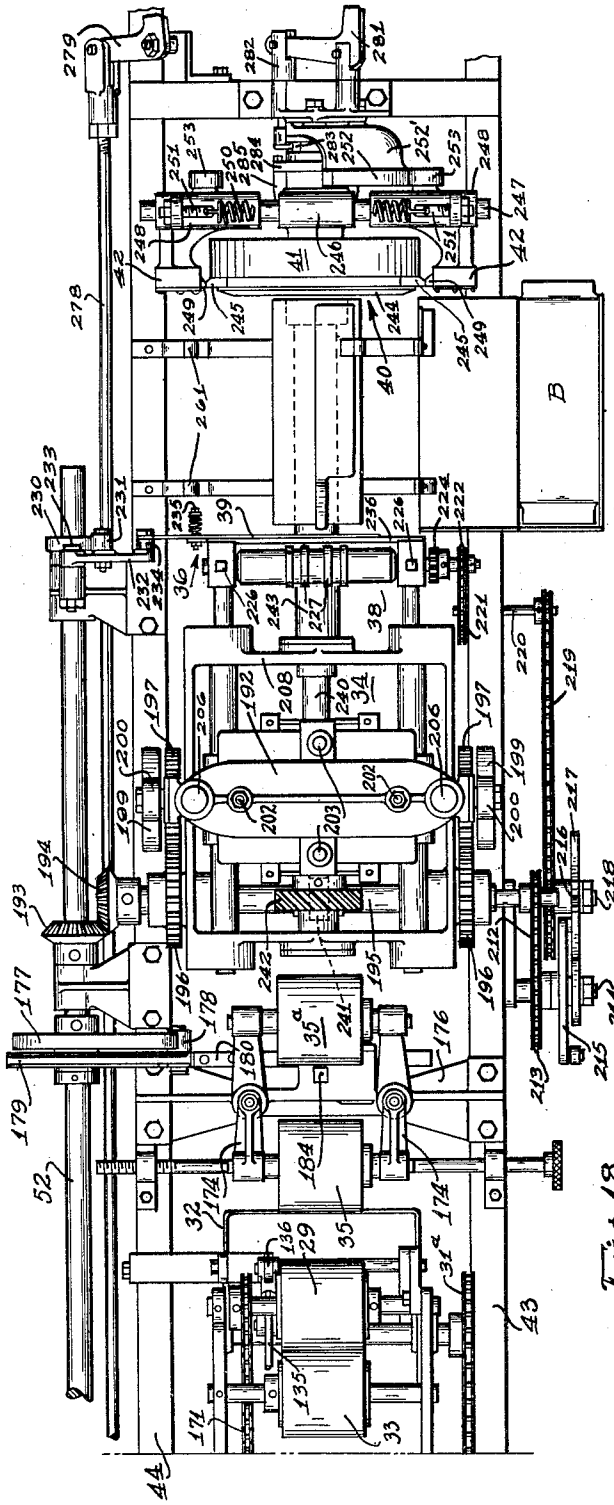


Fig. 18.

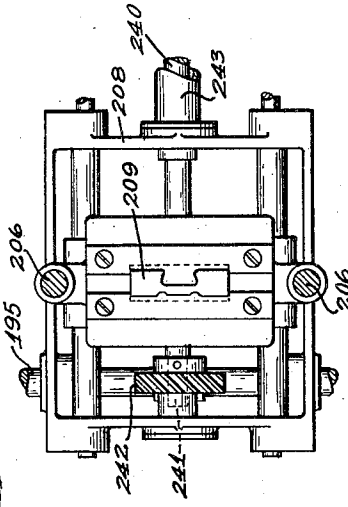


Fig. 19.

C. W. Vogt,
C. E. Lakso,
John Hohl,
Olaf Bjerring.
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July 13, 1943. J. HOHL ET AL 2,324,393

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Fig. 20.

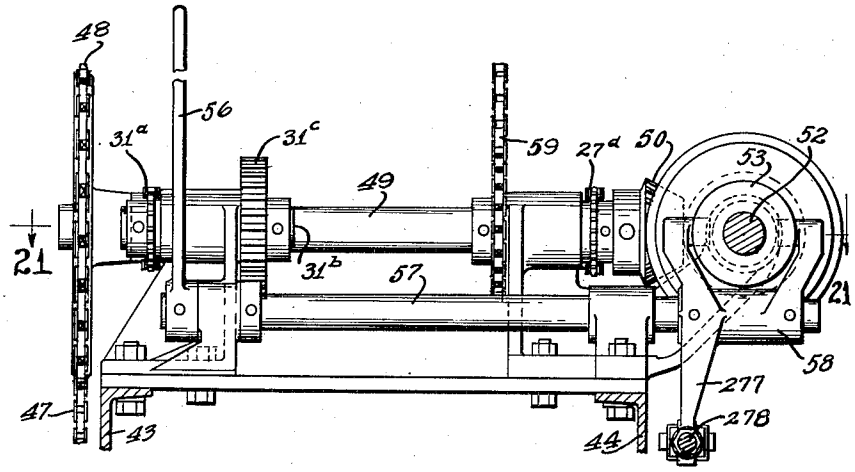
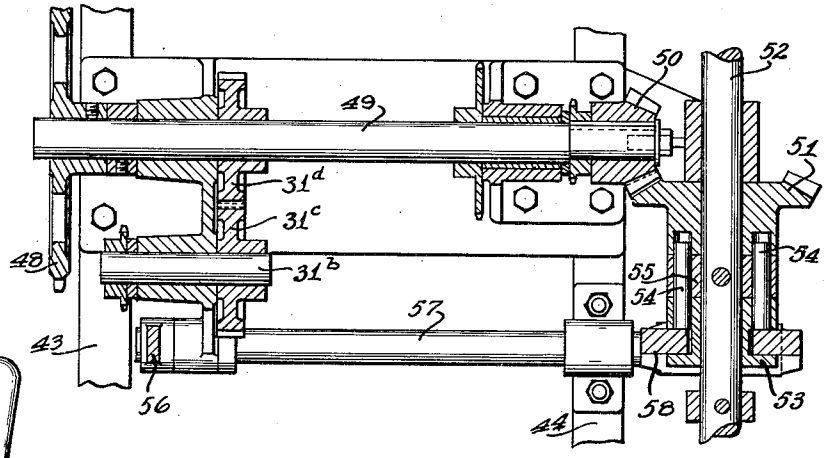


Fig. 21.



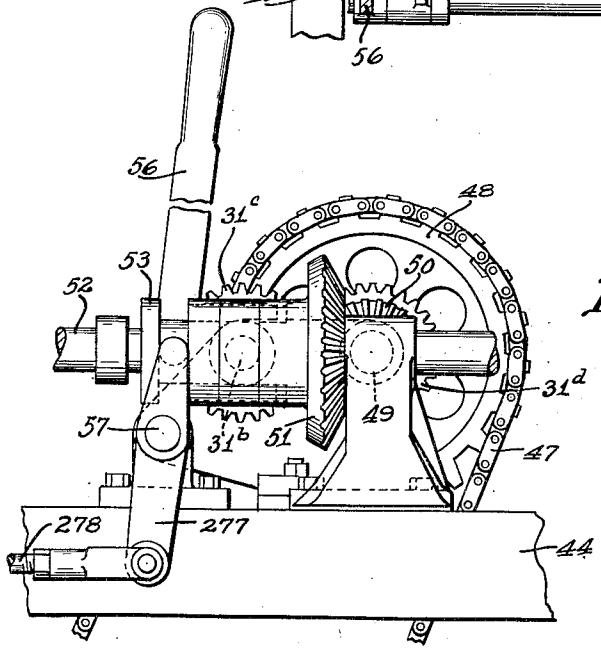


Fig. 22.

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BAG MAKING MACHINE

Filed Sept. 13, 1939 16 Sheets-Sheet 7

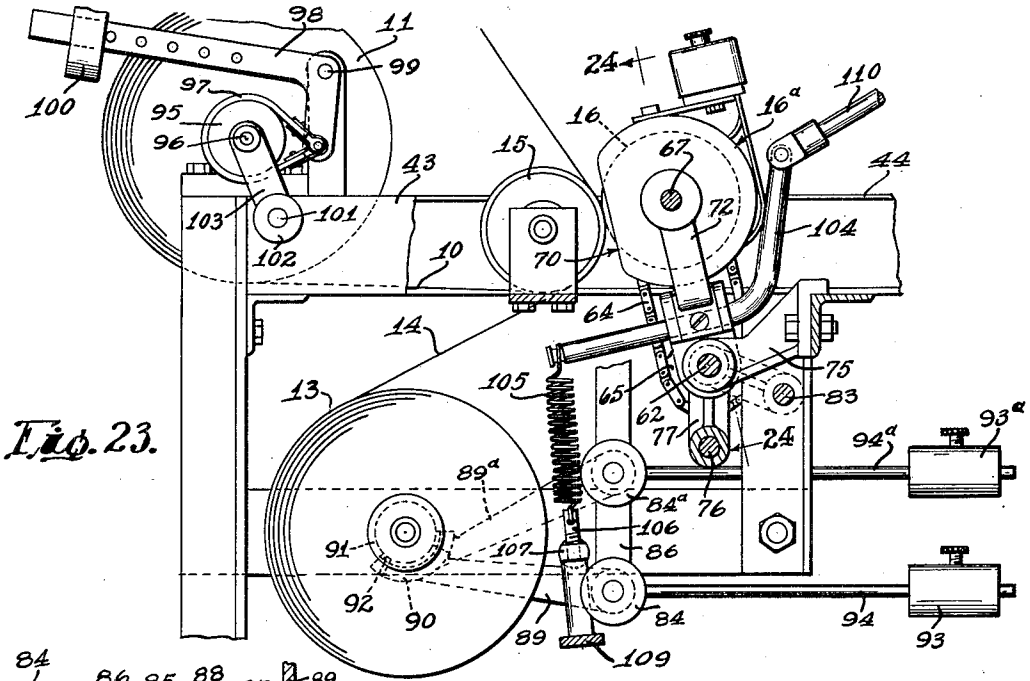


Fig. 23.

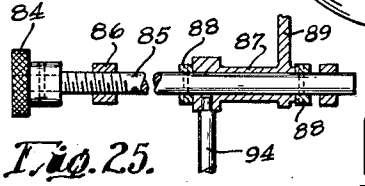


Fig. 25.

Fig. 24.

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July 13, 1943. J. HOHL ET AL 2,324,393

BAG MAKING MACHINE

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Fig. 26.

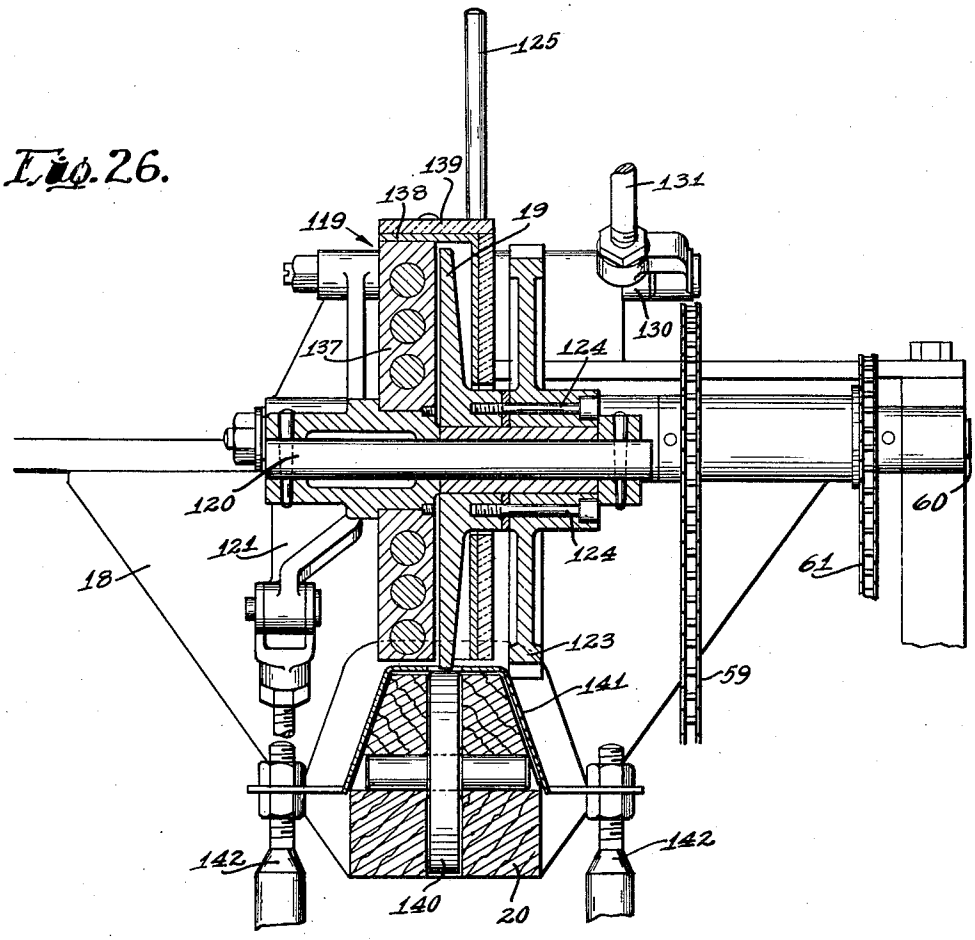


Fig. 27.

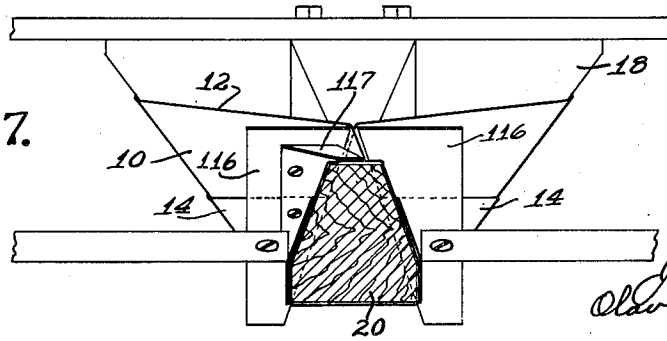
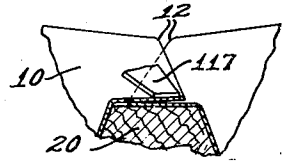


Fig. 28.



C. W. Vogt
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Olav Bjering
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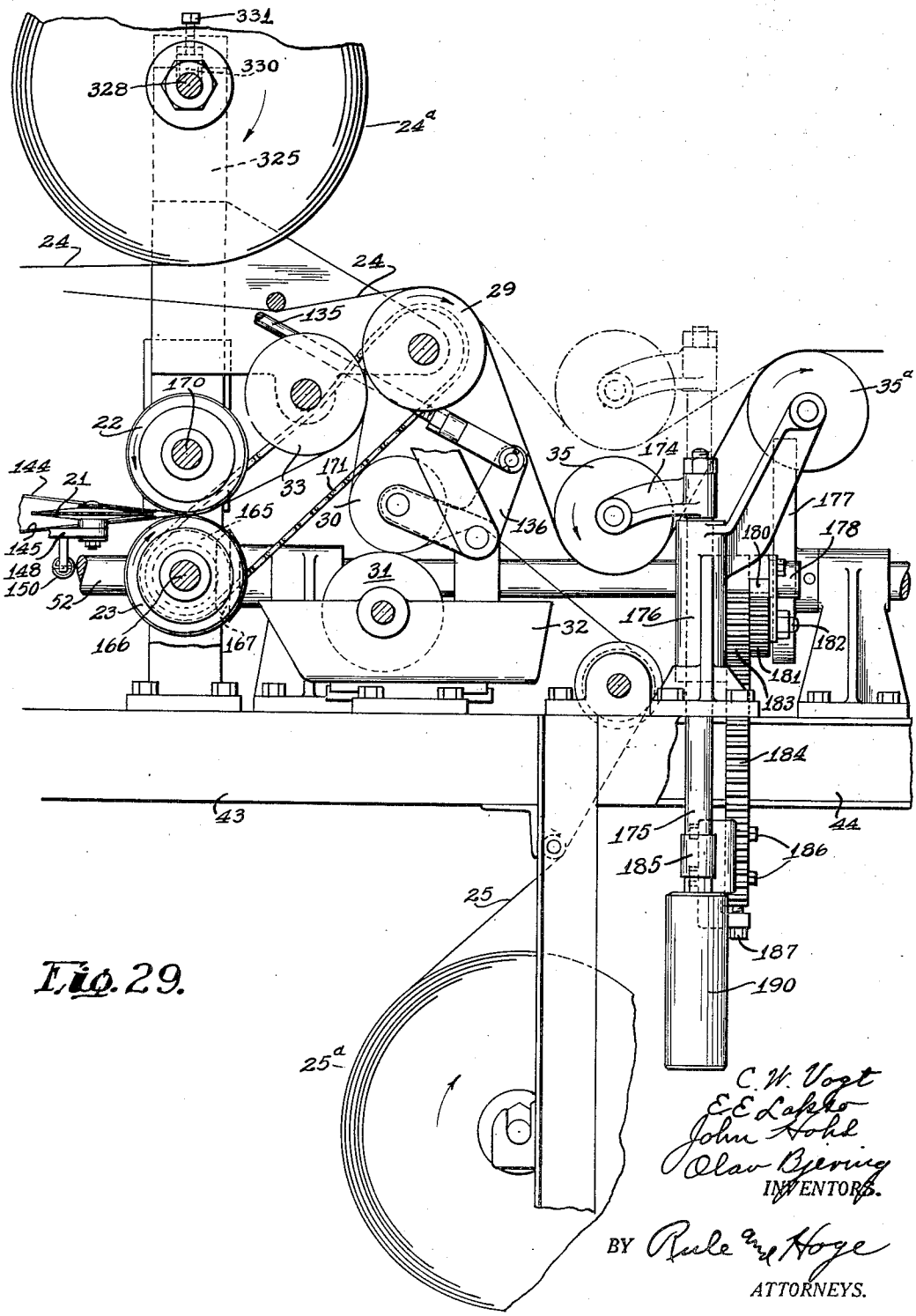


Fig. 29.

C. W. Vogt
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BAG MAKING MACHINE

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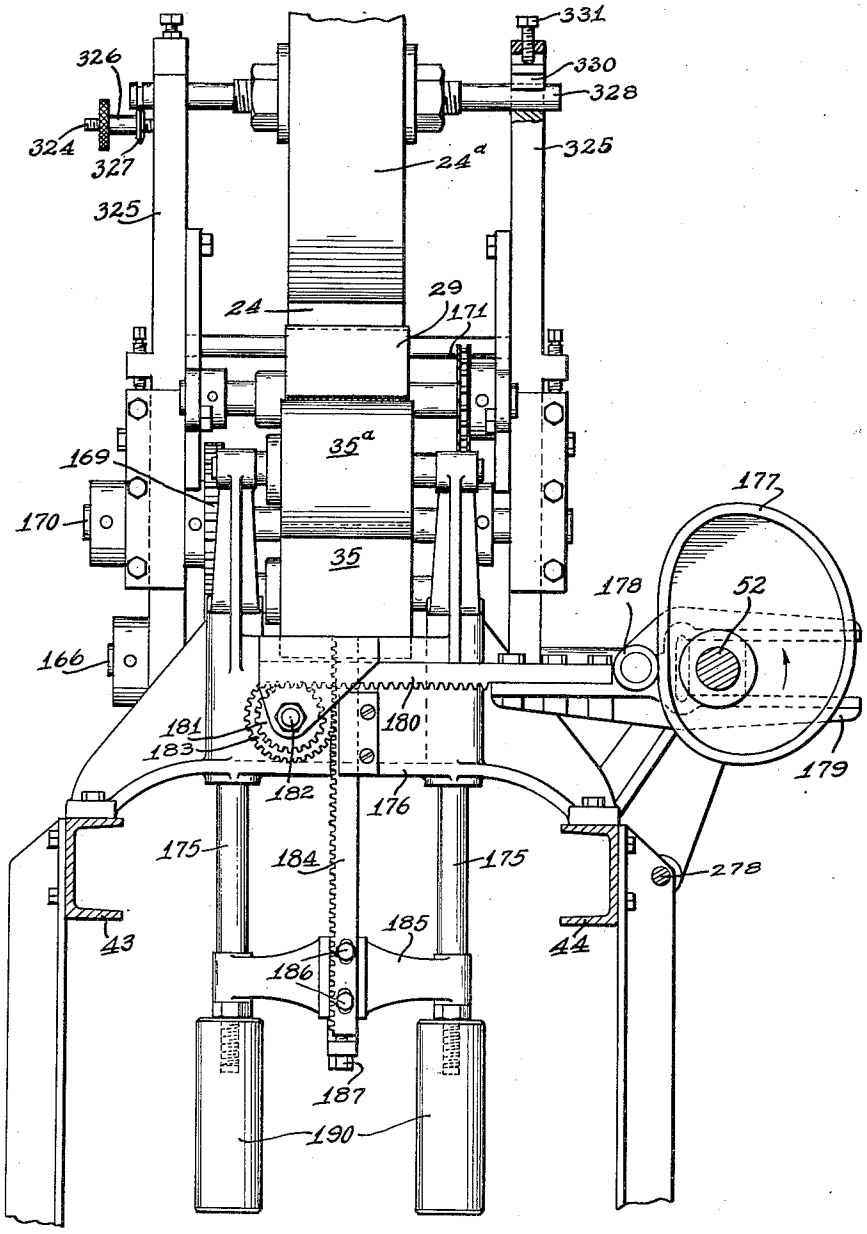


Fig. 30.

C. W. Vogt, John Hohl
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BAG MAKING MACHINE

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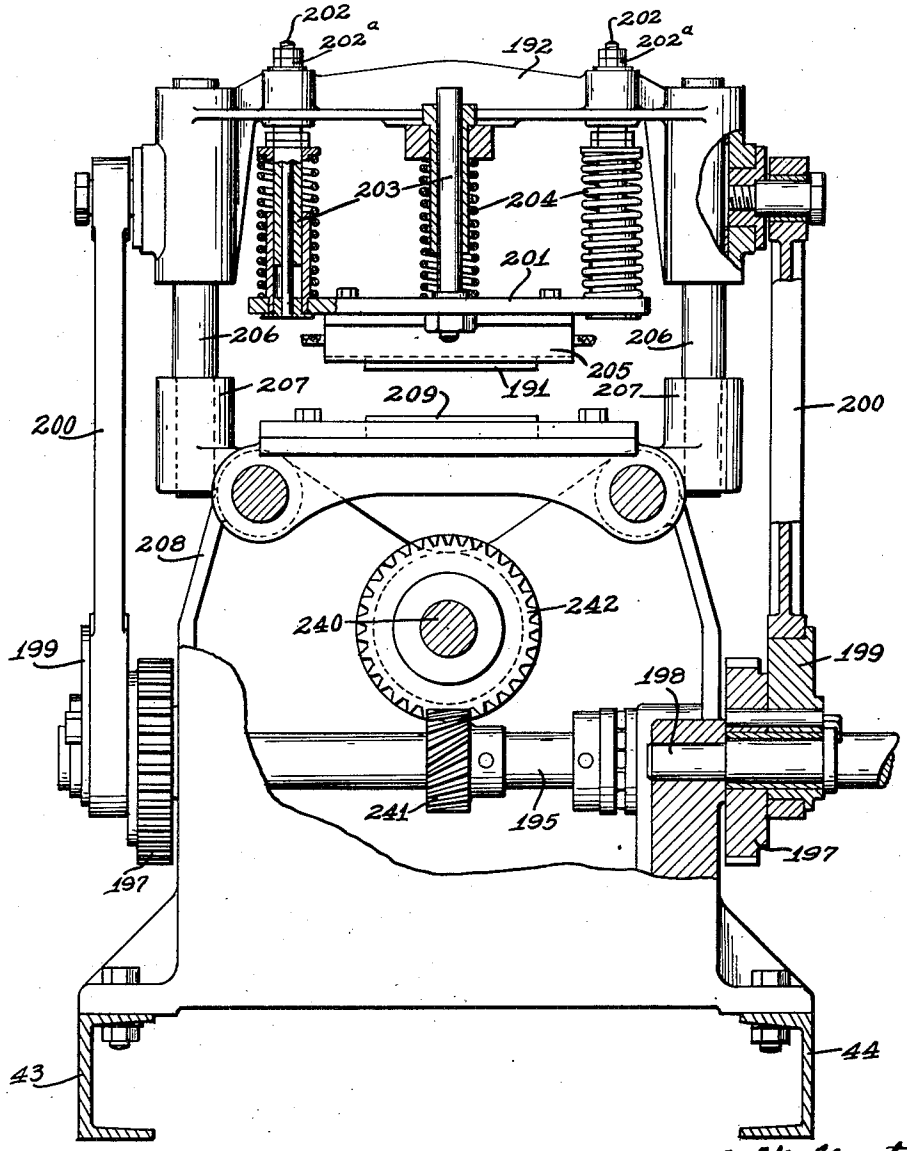


Fig. 31.

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July 13, 1943. J. HOHL ET AL 2,324,393

BAG MAKING MACHINE

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Fig. 32.

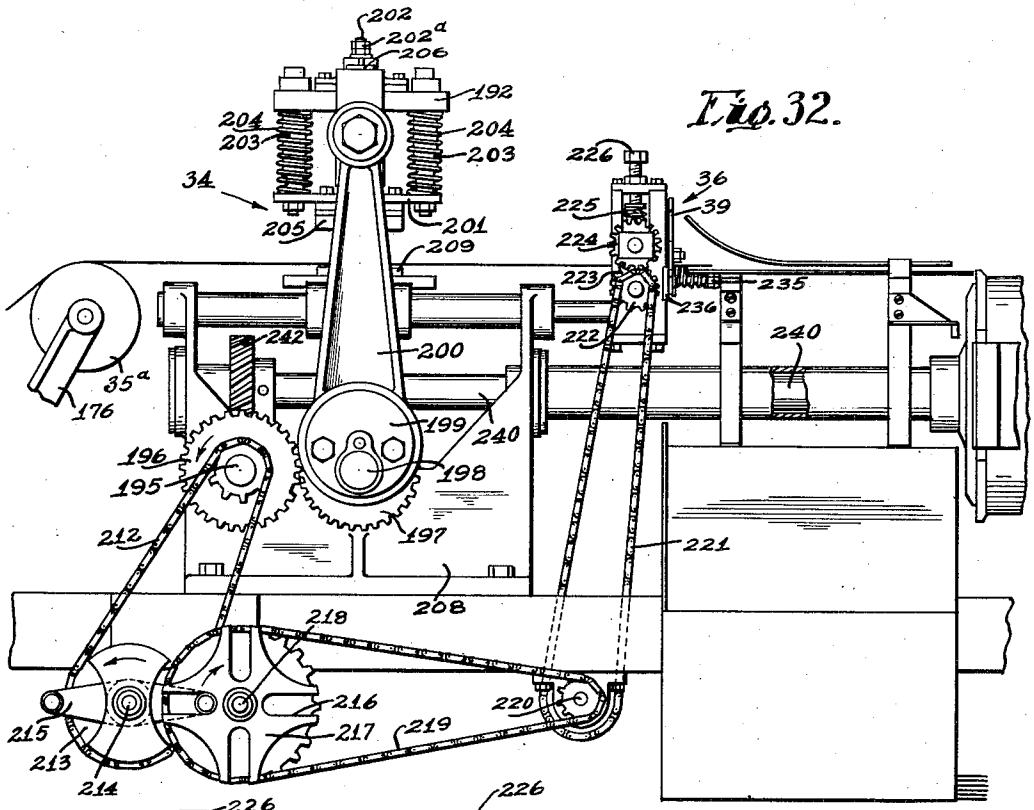
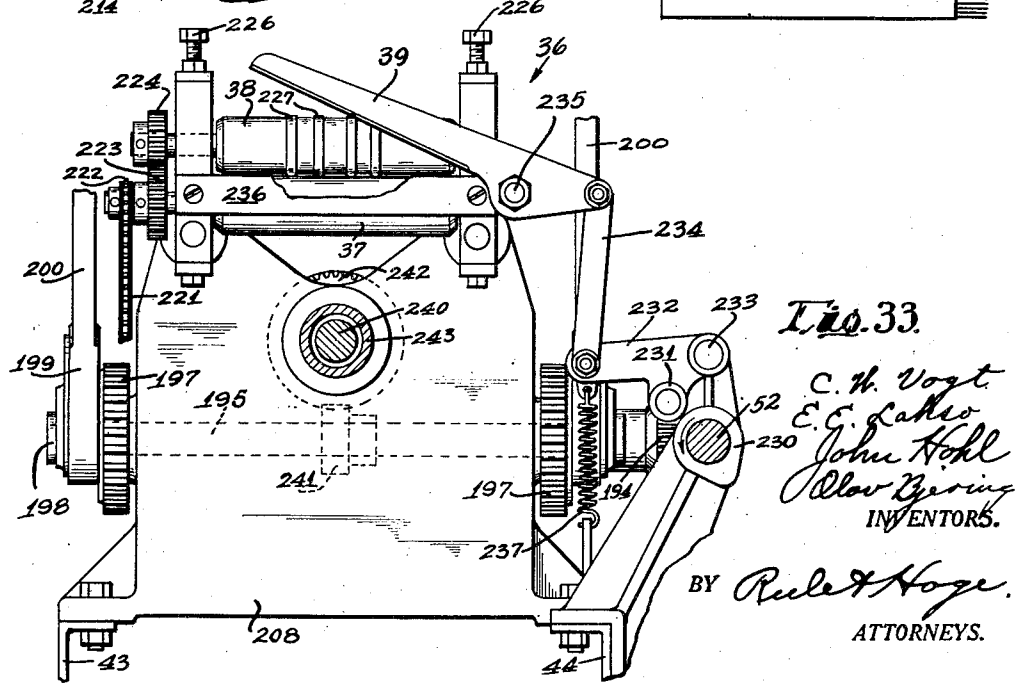


Fig. 33.



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Allen Gering
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July 13, 1943. J. HOHL ET AL 2,324,393

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Fig. 34.

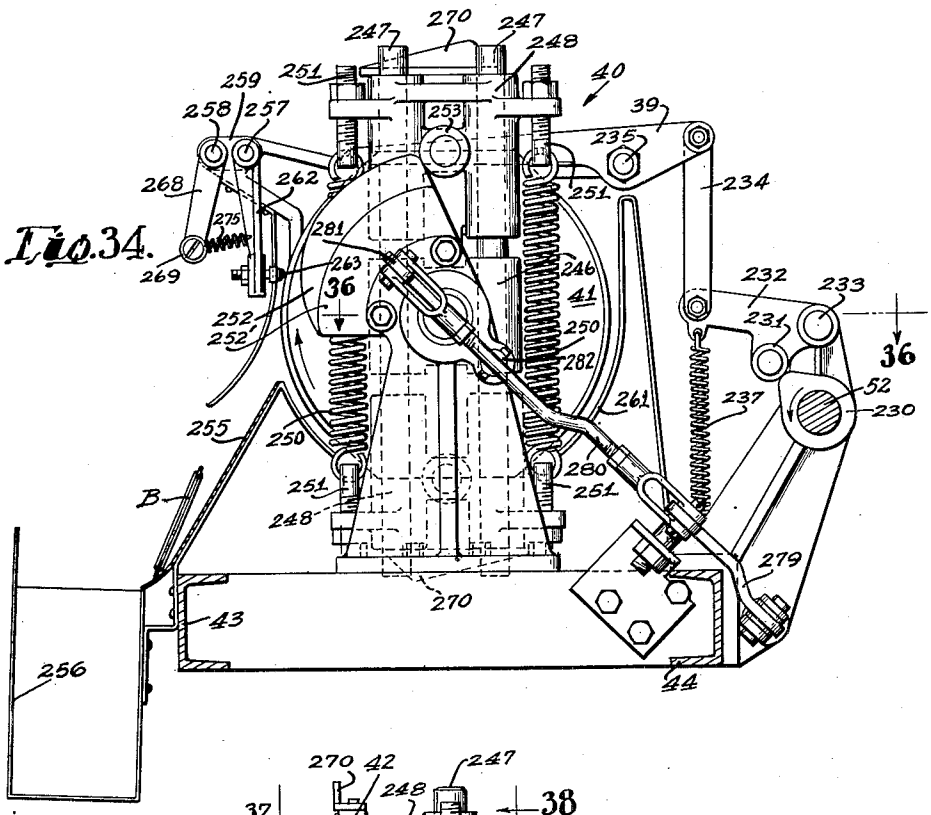
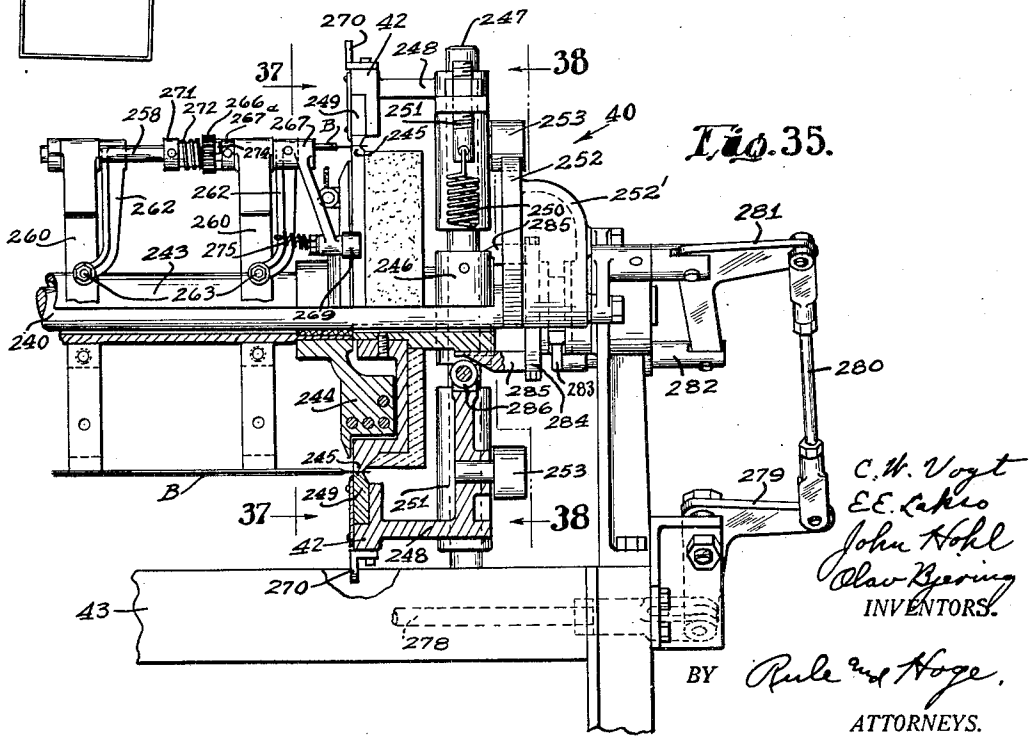


Fig. 35.



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July 13, 1943. J. HOHL ET AL 2,324,393

BAG MAKING MACHINE

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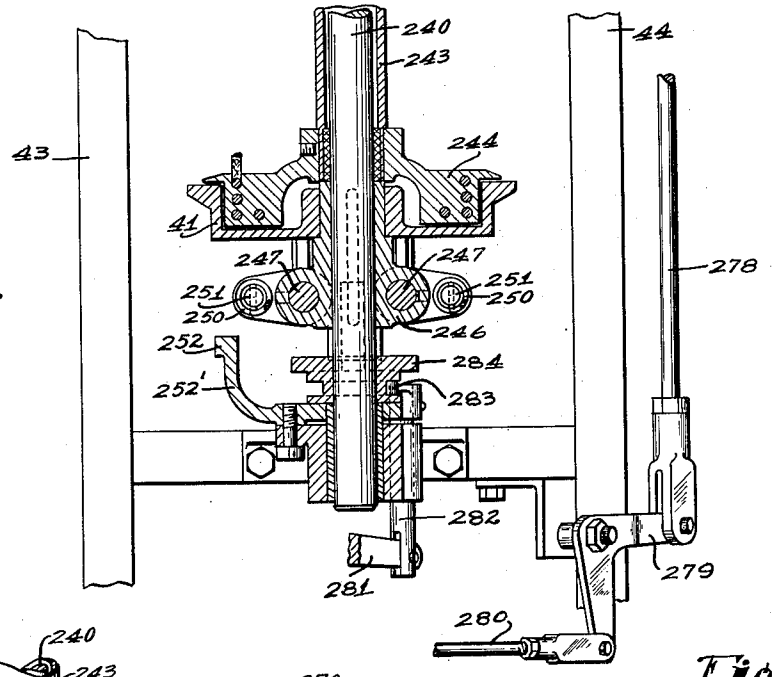
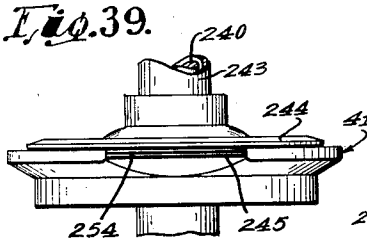


Fig. 36.

Fig. 39.



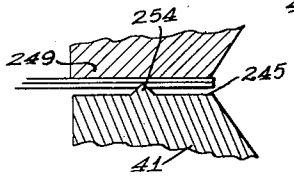


Fig. 40.

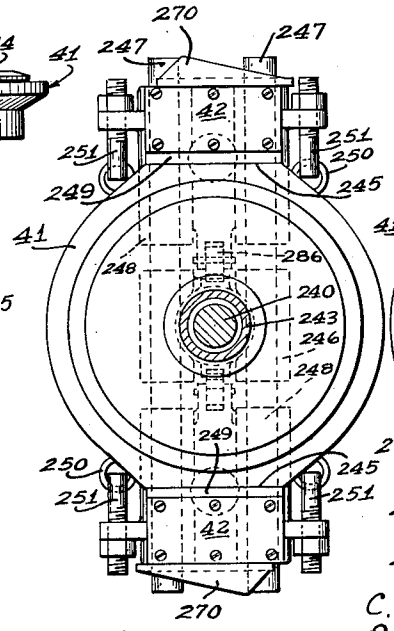
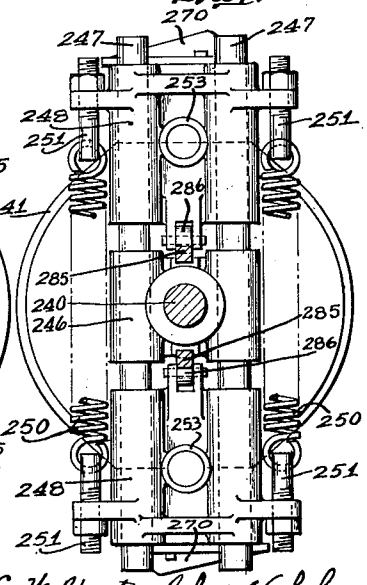


Fig. 37.

Fig. 38.



C. W. Voyt, John Hohl
E. E. Lakso, Olav Byring
INVENTORS.

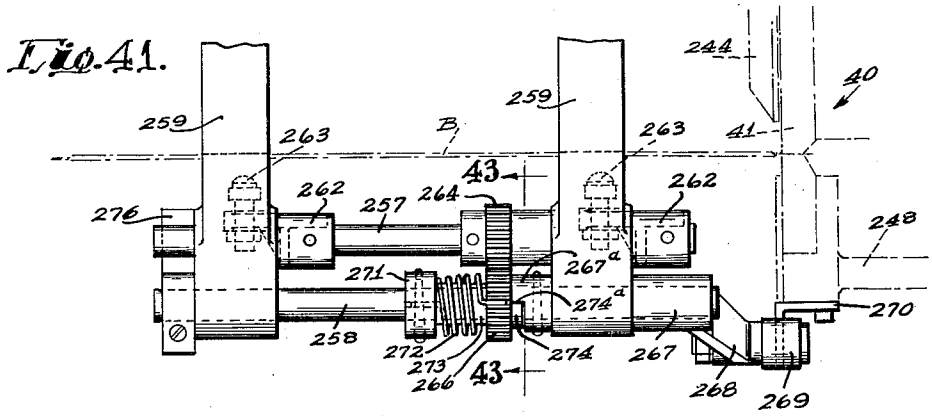
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ATTORNEYS.

July 13, 1943. J. HOHL ET AL 2,324,393

BAG MAKING MACHINE

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Fig. 41.



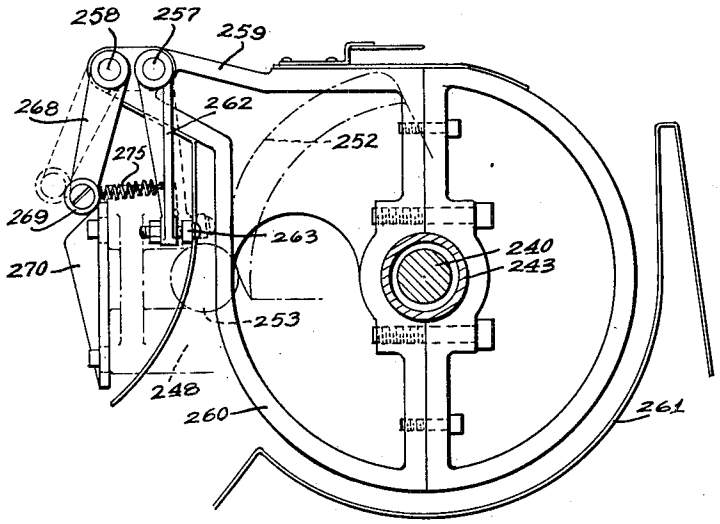


Fig. 42.

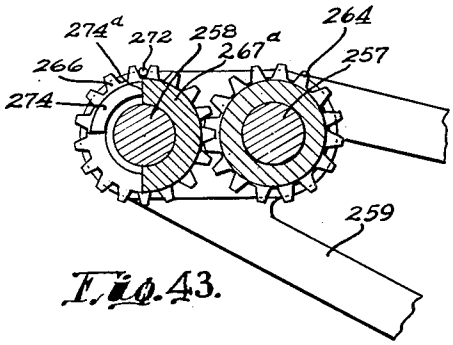


Fig. 43.

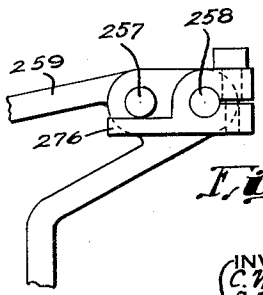


Fig. 44.

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Olaf Bjoring

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Rule & Hoge, ATTORNEYS

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BAG MAKING MACHINE

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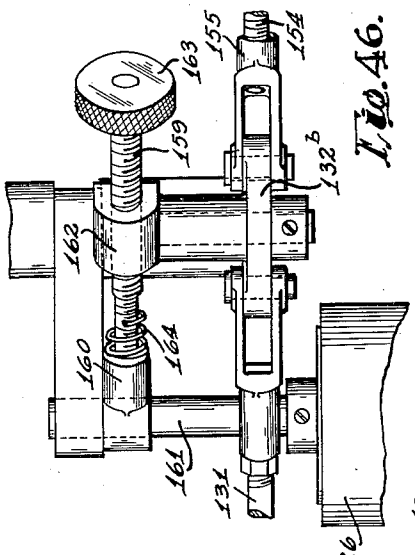


Fig. 46.

Fig. 45.

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C. H. Vogt
John Hohl
Olav Bjering
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BY Rule & Hoge,

ATTORNEYS

Patented July 13, 1943 2,324,393

UNITED STATES PATENT OFFICE

2,324,393

BAG MAKING MACHINE

John Hohl and Olav Bjering, Toledo, Ohio, Eino E. Lakso, Fitchburg, Mass., and Clarence W. Vogt, Weston, Conn.; said Hohl, said Bjering, and said Lakso assignors to Owens-Illinois Glass Company, a corporation of Ohio

Application September 13, 1939, Serial No. 294,734

44 Claims. (Cl. 93—18)

Our invention relates to apparatus for making bags or containers adapted to be filled with oil or other liquids or materials. The apparatus as herein disclosed is particularly adapted for manufacturing bags from webs of thin, flexible, impervious, transparent material such as "Pliofilm," "Cellophane" or the like, with reinforcing strips or panels of like material on opposite sides of the bag, the latter being further reinforced by paper or other sheet material covering the intermediate sides of the bag. A bag of this character is disclosed in the patent to Hohl and Bjering, number 2,233,704, March 4, 1941.

An object of the present invention is to provide a new and practical machine for continuously manufacturing bags of the character indicated and particularly bags such as disclosed in said copending application.

A further object of the invention is to provide such a machine in which the main web or film and the reinforcing strips of film are continuously fed forward, brought into assembled relation, the reinforcing strips heat sealed to the main web or film, the reinforced web as it advances being drawn over a shaping die and shaped to tubular form with its edges overlapping and then heat sealed, the tube thus formed being flattened with a concomitant infolding or plicating of the sides of the tube as it advances, reinforcing webs of paper or the like being thereafter adhesively attached to the opposite flat sides of the collapsed tubular web, the latter thereafter heat sealed transversely at intervals and finally severed at said transverse sealing areas to form individual bags.

A feature of the invention relates to the novel apparatus for applying the reinforcing strips of film to the main web and heat sealing said strips along their margins.

A further feature of the invention relates to the heat sealing means for continuously sealing the overlapping edges of the main web to form a tubular body.

A further novel feature of the invention relates to the means for pleating or infolding the sides of the tube and flattening the latter.

Another object of the invention is to provide novel means for cross-sealing the tube which is held stationary at the cross-sealing station, and to further provide novel tension and take-up mechanism for taking up the slack during said cross-sealing operation.

A further object of the invention is to provide means for effecting a supplemental cross-sealing operation after the bags have been severed, in order to insure a perfect seal. An aim of this supplementary sealing operation is to overcome the difficulties incident to obtaining a reliable seal with a varying number of plies or layers of the material at different points transversely of the bag, and particularly to insure a perfect seal of the multiple layers at the infolded portions of the bag.

Other objects of the invention will appear hereinafter.

Referring to the accompanying drawings:

Fig. 1 is a diagrammatic side elevation view of a machine constructed in accordance with our invention;

Figs. 2, 3 and 4 are detail views of a latch mechanism for lifting and holding the seaming rolls and glue rolls in an inoperative position;

Fig. 5 is a diagrammatic view in side elevation illustrating the various rolls from which the webs are fed and the manner in which the webs are assembled and also illustrating the sealing and severing mechanism;

Fig. 6 is a diagrammatic plan view of the apparatus shown in Fig. 5;

Fig. 7 is a plan view of a cross-sealing device;

Fig. 7A is a plan view of a modified form of cross-sealing device;

Fig. 8 is a plan view illustrating the manner in which a flattened tube is cross-sealed with the sealing device shown in Fig. 7 and severed into individual bags;

Fig. 8A illustrates the cross-sealing with the sealing device of Fig. 7A and the severance at the cross-seal;

Fig. 8B illustrates the final cross-sealing of the bottom of the bag, following the operation indicated in Fig. 8A;

Fig. 9 is a cross-sectional view of a bag partly collapsed;

Fig. 10 is a diagrammatic plan view showing the shaping mandrel, the tube sealing means, and the folding mechanism;

Fig. 11 is a side elevation of such apparatus;

Fig. 12 is a fragmentary side elevation showing the forward end of the shaping mandrel and the rolls for pleating or infolding the sides of the bag;

Fig. 13 is a fragmentary detail view of a hinged plate shown in Figs. 10 and 11;

Fig. 14 is a plan view of the left-hand portion of the machine including the tube forming and sealing apparatus, means for applying the reinforcing strips of film, and the means for folding and flattening the tube;

Fig. 15 is a fragmentary part sectional plan

view, showing particularly the rolls of reinforcing film strips and seaming means for sealing the strips to the main film;

Fig. 16 is a fragmentary plan view of the infolding rolls;

Fig. 17 is a detail view of a feed roll;

Fig. 18 is a plan view of that portion of the machine to the right of that which is shown in Fig. 14;

Fig. 19 is a fragmentary sectional plan of the cross-sealing means;

Fig. 20 is a cross-sectional elevation showing the main driving shaft, counter-shaft and clutch mechanism;

Fig. 21 is a sectional plan of the same at the line 21—21 on Fig. 20;

Fig. 22 is an end elevation of the mechanism shown in Figs. 20 and 21;

Fig. 23 is a part sectional side elevation illustrating the main web or film, a reinforcing web, longitudinal sealing means for said webs, and brake mechanisms for the rolls;

Fig. 24 is a section at the line 24—24 on Fig. 23;

Fig. 25 is a fragmentary sectional view showing means for adjusting a roll of reinforcing film, including a pivot rod for a brake arm, the section being taken at the line 25—25 on Fig. 24;

Fig. 26 is a sectional elevation illustrating the sealing mechanism by which the main web is sealed longitudinally to form a tube, said section being taken at the line 26—26 on Fig. 1;

Fig. 27 is a section at the line 27—27 on Fig. 10 and shows the tube-forming mandrel;

Fig. 28 is a detail view showing particularly a shaping finger used in forming the longitudinal seam;

Fig. 29 is a fragmentary side elevation showing the rolls of reinforcing paper webs and means for assembling the webs with the tubular web, and also illustrates the tension and take-up mechanism;

Fig. 30 is a fragmentary cross-sectional elevation substantially at the line 30—30 on Fig. 1 and shows particularly the tension and take-up mechanism;

Fig. 31 is a cross-sectional elevation substantially at the line 31—31 on Fig. 1, illustrating the cross-sealing mechanism;

Fig. 32 is a fragmentary side elevation showing the cross-sealing and severing mechanism;

Fig. 33 is a fragmentary cross-sectional elevation substantially at the line 33—33 on Fig. 1, showing a pair of feed rolls and the bag severing mechanism;

Fig. 34 is a cross-sectional elevation showing the supplemental cross-sealing mechanism;

Fig. 35 is a part sectional side elevation of the same;

Fig. 36 is a section at the line 36—36 on Fig. 34;

Figs. 37 and 38 are sectional views at the lines 37—37 and 38—38 respectively on Fig. 35;

Fig. 39 is a fragmentary plan view of the sealing disk and heating element shown in Fig. 36;

Fig. 40 is a detail of the sealing means;

Fig. 41 is a plan view of a bag holding device cooperating with the sealing turret for holding the bag when the sealing head is withdrawn;

Fig. 42 is an end elevation of mechanism shown in Fig. 41;

Fig. 43 is a section at the line 43—43 on Fig. 41;

Fig. 44 is a detail view of a stop device shown in Fig. 41;

Fig. 45 is a fragmentary elevation view of mechanism for lifting the glue rolls and adjusting means therefor;

Fig. 46 is a plan view of mechanism shown in Fig. 45.

General arrangement and operation

The machine as illustrated is designed to make bags from a series of strips or webs. The method of assembling these strips and forming the bags is illustrated diagrammatically in Figs. 1, 5 and 6 and may be generally stated as follows:

The main web or strip of film 10 is fed from a supply roll 11 and as it advances is shaped to tubular form with its edges 12 overlapping. The edges are then sealed and the tube thus formed is thereafter collapsed with side portions thereof infolded, cross-sealed and severed transversely into individual bags. The web 10 forms the body or inner layer of the bag as shown in Fig. 9. Beneath the roll 11 is a pair of rolls 13 of reinforcing strips 14. The web 10 and reinforcing strips 14 may consist of pliofilm or other thin, transparent, flexible material adapted to be sealed together by the application of heat and pressure.

The strips 10 and 14 are fed over a roll 15 and thereby brought into superposed relation with the reinforcing strips 14 suitably spaced apart and positioned to reinforce the portions of the web 10 which are later infolded and form opposite sides of the bags. The roll 15 forms a backing for sealing disks 16 which engage the marginal portions of the reinforcing strips, applying sufficient heat and pressure thereto to seal the strips to the main web. With one form of sealing disks herein shown the sealing takes place along narrow strips or seams. As a modified form of the invention the sealing area may be widened to the full width of the reinforcing strips.

The reinforced web is advanced over a guide roll 17 and thence forward beneath a triangular shaping block or die 18. As the web advances the side portions thereof are folded upwardly and brought into overlapping relation as shown at 12, thereby giving the web a tubular form. A heat sealing roll 19 engages the overlapping edges of the web and seals them together. The tube thus formed advances along a mandrel 20 which forms a continuation of the shaping block 18. At the forward end of the mandrel there is provided means for infolding the reinforced sides of the tube and at the same time collapsing it to flattened form. Such means includes disks 21 by which the sides of the tubes are folded inwardly. The tube passes between a pair of feed rolls or pull rolls 22 and 23 by which it is fully collapsed.

Reinforcing strips or webs 24 and 25 supplied from rolls 24^a and 25^a respectively are fed forward into juxtaposition with the upper and lower sides respectively of the flattened tube. The web 24 as it is fed from the supply roll is directed over a backing roll 26 and is fed between the latter and a glue roll 27 running in a glue pot 28. From thence the web advances to a guide roll 29 over which the collapsed tube is also drawn, thereby adhesively applying the web 24 to the upper face of the collapsed tube. The lower paper web 25 is in like manner passed between a pair of rolls 30 and 31, the latter running in a glue pot 32. The web 25 as it leaves the glue roll is brought into contact with and adhesively

secured to the lower surface of the tubular film as the latter passes over an idler roll 33.

The webs when thus assembled form the laminated or reinforced tube which in its collapsed form is advanced to a cross-sealing unit 34 by which the tube is heat sealed transversely at spaced intervals. As the portion of the tube which is being sealed is held stationary during this sealing operation, a tension and take-up mechanism is provided between the roll 29 and the sealing element 34 to take up the slack and provide for a continuous advance of the webs past the roll 29. Said tension and take-up mechanism includes a roll 35 and means for moving it up and down as hereinafter set forth and a guide roll 35a.

After the sealing operation the tube is advanced to the cut-off unit 36 which includes a pair of feed rolls 37, 38 and a knife 39 which periodically severs the tube at the cross-seals, thereby forming individual bags. A turret sealer 40 may be used for effecting a supplemental cross-sealing operation. This comprises a rotating turret 41 and clamping heads 42 which rotate therewith. Each bag B when severed by the knife 39 has its bottom end clamped between the turret 40 and one of the heads 42 for the final sealing operation. The bag-forming apparatus is mounted on a framework comprising horizontal channel bars 43 and 44 extending substantially the full length of the machine.

Power drive and clutch mechanism

The mechanism is driven by an electric motor 45 (Fig. 1) mounted on the machine base and operating through speed reduction gearing within a gear box 46, a sprocket chain 47 and gear 48 to transmit motion to the main drive shaft 49 (see Figs. 14 and 20 to 22) which extends across the machine. The drive shaft has keyed thereto a bevel pinion 50 which drives a bevel gear 51 mounted to rotate on a counter-shaft 52 which extends lengthwise of the machine.

Clutch mechanism for effecting a driving connection between the gear 51 and the counter-shaft includes a clutch sleeve 53 slidable on the counter-shaft and carrying a pair of pins 54 which extend through a collar 55 keyed to the counter-shaft, said pins adapted to enter openings formed in the hub of the gear 51. The clutch is operated by a hand lever 56 on a rock shaft 57 to which is keyed a yoke 58 engaging an annular recess in the sleeve 53.

The drive shaft 49, which rotates continuously while the motor is running, has driving connections independent of the counter-shaft 52 for driving the heat sealing rolls and the glue rolls while the counter-shaft and parts driven thereby are at rest. This permits the sealing rolls or disks to be uniformly heated prior to operation of the machine and prevents overheating of the backing rolls for the sealing disks while the machine is out of operation. It also permits the glue rolls 27 and 31 which run in the glue pots to be continuously rotated which is necessary to keep the glue in proper condition.

The glue roll 27 is positively driven from the shaft 49 by a sprocket chain 27a (Figs. 1, 14 and 15) running over sprocket wheels on the shaft 49 and the shaft of the roll 27. The roll 31 is driven from the shaft 49 through a train of gearing including a sprocket chain 31a which is trained over a sprocket wheel on the glue roll shaft and a sprocket wheel in a stub shaft 31b (Figs. 14 and 21). Intermeshing spur gears 31c and 31d provide a driving connection between the shaft 31b and the shaft 49.

Strip sealing units

The driving connection between the shaft 49 and the longitudinal sealing rolls 16 includes a sprocket chain 59 (Figs. 1 and 14) driven from the shaft 49 and driving a shaft 60. The latter operates through a sprocket chain 61 and gear 61a (Figs. 1 and 24) to drive a shaft 62 (Figs. 1, 23 and 24). Sprocket chains 64 run over sprocket wheels 65 on the shaft 62 and sprocket wheels 66 on shafts 67. The latter have mounted thereon the pairs of heat sealing disks 16. Said disks are thus continuously rotated from the main drive shaft 49.

The heat sealing means includes two strip sealing units 16a and 16b, each comprising a pair of disks 16 and a stationary heating element 68 for each pair of disks. Each heating element is electrically heated and the temperature thereof is automatically controlled by a thermostat 69. It will be noted that the sealing disks 16 are in close proximity to the heating body and are substantially enclosed, the heating element having a flattened face 70 to expose the sealing disks and permit them to contact with the web 14.

The sealing units 16a and 16b (Figs. 14, 15, 23, 24) are separately mounted in yokes 72 which are pivotally supported on a bearing sleeve 73 in which the driving shaft 62 for the sealing disks is journalled. Each unit includes a heating body 68 which is enclosed in a casing including side plates 74 having hubs in which the shaft 67 is journalled, said hubs being pressed into the arms of the yoke 72. The sleeve 73 is mounted in brackets 75 on the machine frame. The sealing units are separately adjustable lengthwise of the bearing sleeve 73. Means for adjusting the unit 16a includes an adjusting rod 76 (Figs. 23, 24), said rod being screw-threaded in a stationary supporting arm 77 on the machine frame. A yoke 78 mounted on the rod 76 includes an arm 79 through which the drive shaft 62 extends, said arm engaging between bearing lugs on the yoke 72 for moving the sealing unit. A collar 80 keyed to the shaft 76 provides an operating connection between said shaft and the yoke 78. Rotation of the shaft 76 by means of a knob 76a causes a lengthwise movement of the shaft and with it the yoke 78, the yoke 72 and the sealing unit 16a. An arm 81 of the yoke 78 engages a recessed hub 82 of the gear 65 which is splined on the shaft 62, thereby adjusting said gear with the sealing unit. Adjusting mechanism for the sealing unit 16b, substantially identical with that just described in connection with the unit 16a, includes a screw-threaded adjusting rod 83 carrying a knob 83a and operatively connected to the sealing unit.

The guide roll 15 over which the reinforced film is directed provides a backing for the sealing disks 16 and may consist of or be lined with rubber, rubber composition or other suitable backing material for the sealing disks. Means for holding the sealing disks with a yielding pressure against the roll 15 includes arms 104 fixed to or carried by the yokes 72, the latter being mounted to rock about the axis of the shaft 62. Coil springs 105 are connected each at one end to an arm 104. The opposite ends of the springs are connected to screw threaded rods 106 which extend freely through eyes in the ends of arms 107, the latter secured to the machine frame. Sleeves 108 threaded on the rods 106 bear at their inner ends against the arms 107 and carry adjusting

knobs 109 at their outer ends. By rotating the knobs 109 the screw rods are moved lengthwise and thereby adjust the tension on the springs 105 and adjustably vary the pressure of the sealing disks against the films. A rod 110 is connected to one of the arms 104 and is operable by mechanism as hereinafter described to swing the sealing units away from the roll 15. The sealing units are tied together for such swinging movement by a pin 110a (Fig. 24) fixed to one yoke 72 and projecting into an opening in the opposite yoke.

Adjusting means and brakes for film rolls

The rolls 13 are separately adjustable laterally. The adjusting means for one roll includes an adjusting knob 84 (Figs. 23, 24 and 25) on an adjusting shaft 85 having a screw-threaded mounting in an arm 86 on the machine frame. Journalled on the shaft 85 is a sleeve 87 held against movement lengthwise of the shaft by collars 88. An arm 89 extends from the sleeve 87 and at its forward end is formed with a shoe 90 which seats in a recess 91 (Figs. 15 and 23) in the spool on which the roll 13 is mounted. It will be seen that by rotating the knob 84 the shaft 85 is adjusted lengthwise and operates through the parts just described to adjust the roll 13. The arm 89 also serves as a brake arm for adjusting and maintaining the tension on the web 14. The shoe 90 may carry a brake pad 92 of leather or the like. The braking pressure is applied by means of a weight 93 adjustable lengthwise on a rod 94 extending from the sleeve 87. Mechanism substantially like that just described is provided for adjusting the other roll 13 and regulating the tension of the web, including a knob 84a, adjusting rod 84b, brake arm 89a, rod 94a and weight 93a.

The main film roll 11 (Figs. 14 and 23) is carried on a spool or tube 95 on a spool shaft 96. A brake mechanism for the spool serves to adjust the tension on the film. Said brake mechanism includes a brake strap 97 engaging the spool and placed under tension by a bell crank lever 98 fulcrumed at 99 and carrying a weight 100 adjustable lengthwise of the lever for adjusting the tension on the brake strap. The spool carrying the film roll 11 is adjustable lengthwise on the shaft 96. The adjusting means includes a screw rod 101 screw threaded in the machine frame and a knob 102 for rotating the rod. An arm 103 is connected with said rod for movement therewith toward and from the machine frame. Said arm is connected with the spool shaft 96 for moving the latter and the spool 95 therewith.

Forming the tube

The web after passing the sealing rolls is directed over the idler roll 17 and thence to the shaping means by which it is given tubular form. Such means includes the shaping block or mandrel 18 (see Figs. 5, 6, 10 and 11) and an entrance plate 111 therebeneath which is substantially triangular in shape and in effect forms a part of the mandrel. The plate 111 engages and directs the sheet just before the commencement of and during its gradual formation or transition from a flat sheet to tubular form. The plate slopes downwardly and forwardly and is placed at a predetermined angle to the horizontal center line of the mandrel required to prevent strains or stresses in the film at any point during the continuous forming operation. The calculated or theoretical angle holds good for a perfectly uniform, flat and straight sheet of film but adjustment to a slightly different angle may be required when imperfect rolls of film are being used in order to obtain the best forming operation. By an imperfect roll is meant a roll having a non-uniform or non-circular perimeter. The plate 11 is mounted for such adjustment while the film is in motion. To permit this adjustment the plate is attached by a hinge 112 (Figs. 11 and 13) at its lower end to the mandrel and at its upper end carries screw rods 113 adjustable in brackets 114 and held in adjusted position by nuts 115.

As the web 10 advances along the shaping block 18, it is gradually given a tubular form, the edges 12 of the web being brought around the shaping block 18 and the mandrel 20 which forms a continuation thereof. The edges are overlapped about one-half inch, more or less, before they reach the sealing disk 19. A pair of guide plates 116 on opposite sides of the shaping block cooperate therewith to guide and fold the web around the block. A finger 117 (Figs. 10, 27, 28) attached to one of the guide plates 116 serves as an additional guiding means and flattens the overlapping edges of the film down onto the mandrel.

The mandrel 18, 20, is so shaped that the advancing film can closely follow the contour of the mandrel while being wrapped therearound to tubular form, without any portion of the film being placed under a stress or strain. To accomplish this, the shape of the mandrel is such that the length of each line measured along the surface of the mandrel and representing the path of any point in the film in its passage from the point at which the wrapping of the film commences, to the point at the forward end of the mandrel at which the wrapping is completed, is equal to every other such line, the lines being measured from the point at which the folding operation commences to the point at which it is completed.

Seam sealer

The seam sealer 119 in the form shown is similar in construction to and operates on the same principle as the sealing elements 16a and 16b heretofore described. Referring to Figs. 2 to 26, it comprises the sealing disk 19 mounted to rotate on a stud shaft 120 carried on a bracket 121 mounted to rock about the axis of the shaft 60. The sealing disk is driven from the shaft 60 through a spur gear 122 (Fig. 14) on the shaft 60 and a spur gear 123 on the shaft 120. The gear 123 as shown in Fig. 26 is attached to the sealing disk by bolts 124.

Referring to Fig. 26 the seam sealing unit 119 includes a stationary heating element 137 electrically heated, the temperature being controlled automatically by a thermostat. The roll or disk 19 and heater body 137 may be enclosed in a casing 138, if desired, and an outer housing 139 of heat insulating material may be provided. Beneath the sealing disk 19 is a backing roll 140 of rubber or other resilient material. The roll 140 is mounted in the mandrel 20. Shields or guides 141, adjustably mounted on posts 142, extend over the upper part of the mandrel adjacent the sealing disk and guide the film as it approaches the sealing disk. The mandrel is provided with a longitudinal recess 143 (Fig. 10) extending forward from the sealing disk to hold the film out of contact with the mandrel along the heated seam and thereby prevent sticking.

The guides 141 also prevent the seam from sticking to the sealing disk 19. The width of the seam or overlap can be adjusted by adjusting the guides 141 up and down. When adjusted quite close to the mandrel they cause the film to hug the mandrel closely which gives a greater overlap than when the film is loose on the mandrel.

Lifting sealing disks and backing rolls

Referring to Figs. 1 to 4 and 26, the bracket 121 carrying the sealer 119 is rocked about the axis of the shaft 60 by the following mechanism. A hand lever 125 is fixed to a pivot pin 126 mounted in the machine frame. A dog 127, fixed to the pin 126, is connected through a link 128 to an arm of the bracket 121. When the hand lever is in the vertical position shown in Figs. 1, 2 and 4, the dog 127 forms with the link 128 a toggle which holds the bracket 121 and sealing roll in operative position. When the hand lever is swung to the left from the position shown in Figs. 1 and 2, the toggle is broken and the bracket 121 swung about its pivot, thereby lifting the sealing roll to an inoperative position. The dog 127 engages a latch 129 and holds the roll in its lifted position. The link 110, (Figs. 2 and 23) heretofore referred to, provides a connection between the bracket 121 and the strip sealing elements 16^a, 16^b, by which the latter are also swung to an operative position.

The hand lever 125 also operates to lift the rolls 26 and 30 to inoperative position through the following mechanism. A rock arm 130 keyed to the pivot pin 126 is connected to a rod 131 which extends forward and has a pivotal connection at its forward end with a bell crank lever 132 (Fig. 1) pivoted at 133 to a bracket arm 134. The roll 26 is mounted on the other arm of said bell crank. A rod 135 connects the bell crank 132 to a similar bell crank 136 which carries the roll 30. It will be apparent that the operation of the lever 125 for lifting the sealing disk 19 also will, through the connections above described, lift the rolls 26 and 30 as well as the sealing elements 16^a and 16^b, and all of said sealing elements and rolls will be held in lifted position by the latch 129.

Infolding and collapsing tube

Means for infolding or pleating the sides of the tubular film are provided at the forward end of the mandrel 20. Such means (Figs. 10, 12 and 29) include flexible sheet metal plates 144 and 145 attached to the upper and lower surfaces of the mandrel, projecting forwardly therefrom and forwardly convergent. Each of the plates carries at its forward end a pair of small disks or creasing rolls 146. These disks as shown are pivotally mounted on plates 147 attached to the plates 144 and 145 with the peripheries of the disks about in line with the longitudinal edges of the plates. The rolls 21 for infolding or pleating the sides of the tube are carried on a pair of arms 148 (Fig. 16) mounted on pivots 149. A coil spring 150 connected to the arms 148 draws the disks 21 inwardly, thereby applying a yielding pressure of the disks against the film. The inward movement of the disks is limited by adjusting stops 151.

As the tube advances the disks 146 in the interior thereof serve to crease the tube, thus forming the corner folds while the disks 21 on the exterior of the tube fold the sides of the tube inward. The number of pleating disks 21 and creasing disks 146 may be increased to obtain any desired number of infolds or pleats in the plicated sides of the tube. Referring to Fig. 29, the feed rolls 22 and 23 are immediately in advance of the infolding rolls or disks 21 and serve to compress or iron the tube into its completely collapsed and folded flat condition.

Reinforcing webs

After the collapsed or folded tube passes beyond the feed rolls 22, 23, it advances to and between the rolls 33 and 29 which respectively engage the upper and lower surfaces of the tube, and as it is drawn over said rolls the reinforcing paper webs 24 and 25 (Figs. 1, 6 and 29) are applied as heretofore described. The glue rolls 27 and 31 which run in the glue pots 28 and 32 respectively are continuously rotated as hereinafter described, while the folded tube advances in contact therewith so that a continuous layer or film of the glue is applied to the paper webs and adheres the webs to the opposite faces of the folded tube. The paper reinforcing webs are thus firmly attached to the tube. The rolls 26 and 30 herein referred to as backing rolls, hold the advancing paper webs in contact with the rolls 27 and 31 with pressures which may be individually adjusted for the two rolls by adjusting the effective length of the rods 131 and 135. Such adjustment is by means of the threaded connection of the rods to the links at the ends of the rods.

The reinforcing paper rolls 24^a and 25^a are individually adjustable in an axial direction for accurately aligning the reinforcing webs with the tube to which they are applied. Adjustable brakes individual to these rolls are also provided for a purpose which will presently appear. The adjusting means for the rolls and also the brake mechanism may be substantially the same for each roll. Referring to Fig. 30 the roll adjusting means includes a stationary screw rod 324 carried on one of the standards 325 which support the roll. A sleeve 326 threaded on the rod 324 carries a disk 327 engaging an annular groove in the shaft 328 on which the roll is supported. The sleeve 326 carries a hand knob for rotating it and thereby adjusting the shaft 328 lengthwise in the standards and with it the roll 24^a.

A brake mechanism for the roll shaft (Figs. 29, 30) includes a brake shoe 330 which bears on the shaft 328 with a pressure adjustable by means of a screw 331. By means of such brake devices the tension on each of the webs 24 and 25 may be adjusted and thereby accurately adjust the rate at which each web is fed forward. In this manner a uniform advance of the webs at the same speed and also at the speed of the folded bag may be maintained. This is particularly desirable when the reinforcing webs are lithographed, printed or otherwise decorated with legends or designs which may be repeated at intervals corresponding to the length of the individual bags. The tension adjusting means permits the decorations on one face of the series of bags to be maintained in register with those on the opposite face.

Figs. 45 and 46 illustrate a construction permitting the pressure of either of the rolls 26 and 30 to be adjusted without affecting the other and while the machine is in operation. As here shown the rod 135 has a screw-threaded end portion 152 which is threaded into a socket formed on a link 153 which provides an adjustable connection with the bell crank 136. The opposite end of the rod has a screw-threaded section 154

which is threaded into a socket on a link 155 connected to the arm 132b. The rod is rotated by a knob 156. The screw threads on the sections 152 and 154 respectively have a different pitch, thereby providing a differential adjustment. This permits a fine adjustment in the effective length of the rod 135. Locking nuts 157 and 158 may be provided to lock the rod in its adjusted position. The adjusting means just described permits the pressure of the roll 30 on the workpiece and glue pot roll 31 to be adjustably varied independently of the rolls 26 and 27.

The pressure of the roll 26 on the work-piece is adjustable by means of an adjusting rod 159 having differential screw threads, one entering a threaded socket in a connector 160 mounted on the shaft 161 of the roll 26, the other threaded in a bearing lug 162 pivotally mounted on the arm 132b. The rod 159 is rotated by a knob 163. Rotation of the latter serves to rock the frame 132a which carries the roll, about the pivot 133, thus adjustably varying the pressure on the web 24 as it runs on the roll 27. As the arm 132b is held in fixed position by the rod 131, adjustment of the roll 26 is independent of adjustment of the roll 30. A coil spring 164 mounted on the rod 159 is held under compression between the connector 160 and the bearing lug 162 and serves as a locking means to prevent any rotation of the adjusting rod due to vibration of the machine.

The pull rollers 22 and 23 are positively driven from the counter-shaft 52 through mechanism including a bevel gear 165 (Figs. 14 and 29) on the shaft 166 to which the roller 23 is keyed. The gear 165 meshes with a gear 167 on the counter-shaft. A pair of intermeshing spur gears 168 and 169 (see Fig. 1) on the shaft 166 and a shaft 170 on which the roller 22 is mounted, provide a driving connection between said shafts. The roll 29 also is positively driven from the shaft 166 by means of a sprocket chain 171 (Figs. 1 and 29) running over sprocket wheels on the shaft 166 and the shaft for the roll 29.

The upper pull roller 22 is formed with an annular recess or relief 172 (Fig. 14) in its periphery to prevent contact with the hot longitudinal seam and thereby prevent it from being pressed against and sticking to the lower side of the tube. The lower pull roll 23 (see Fig. 17) is formed with four grooves or reliefs 173 corresponding in position to the reverse bends or folds in the tube, to prevent direct pressure and thereby prevent too sharp creasing. The tube as it passes beyond the pull rolls is bent or curved over the roll 33 which serves to keep the infolds or pleats in position within the tube.

Take-up mechanism

The tension and take-up mechanism will now be described. This mechanism serves to take up the slack in the tube between the roll 29 and the cross-sealer while the latter holds the tube clamped during the cross-sealing operation. Referring to Figs. 1, 18, 29 and 30, the take-up roll 35 is mounted in a pair of brackets 174 attached to the upper ends of a pair of vertical rods 175 slidable vertically in bearings formed in a stationary bracket 176. The up and down movements of the take-up roll are under the control of a cam 177 keyed to the counter-shaft 52. A cam roll 178 running on the cam is carried by a fork 179 which straddles the shaft 52 and reciprocates horizontally thereon. A horizontal rack 180 secured to the yoke 179 engages a pinion 181 keyed to a shaft 182 to which is also secured a pinion 183 in mesh with a vertical rack 184. The latter is connected to a yoke 185 which is secured to the rods 175. The connection between the rack bar 184 and the yoke 185 includes clamping bolts 186 on the yoke engaging elongated slots in the rack bar, permitting a limited adjustment of the rack bar relative to the yoke by means of an adjusting screw 187. Weights 190 on the rods 175 serve to hold the cam roll 178 in engagement with the cam throughout the rotation of the cam. The latter is designed to effect the required movement of the take-up roll to take up all of the slack and maintain a uniform tension on the tubular web.

Cross-sealing unit

The cross-sealing unit 34 comprises a cross-sealing element or plate 191 carried by a cross-sealer head 192 (see Figs. 18, 31, 32) which is periodically moved up and down. The head is operated from the counter-shaft 32 through mechanism including a bevel gear 193 on the counter-shaft driving a gear 194 on a cross-shaft 195. Spur gears 196 on the shaft 195 drive a pair of gears 197 on stud shafts 198 on which are mounted eccentrics 199. The eccentrics are connected through eccentric rods 200 to the head 192 for moving the latter up and down. A spring loaded plate 201 is connected to the head 192 by rods 202 attached to the plate and having a sliding connection with said head, said rods having adjustable stop nuts 202a threaded thereon. Four guide posts 203, each comprising telescoping sections, extend between the plate 201 and the head 192. Coil springs 204 mounted on the guide posts are held under compression between the plate 201 and said head. A heater body 205 containing the electrical heating elements, is attached to the plate 201 and heats the cross-sealing plate 191.

The head 192 is guided in its up and down movements by vertical guide rods 206 mounted in sockets 207 on a frame 208 mounted on and forming part of the machine frame. The shaft 195 is rotated continuously and operates through the eccentrics to move the sealing plate 191 downward, thereby clamping the tubular film against a stationary platen 209 which has a resilient mounting on the frame 208, and effecting a cross-seal of the shape indicated in Figs. 7 and 8. The eccentrics are preferably so designed and the parts so adjusted that the sealing plate is held in contact with the work-piece while the shaft 195 is rotating through 160° and is lifted during the remaining 200° of the cycle.

The sealing plate 191 as shown on Fig. 7 is formed with a sealing surface comprising comparatively wide end portions 191a united by a comparatively narrow strip 191b. The bag contacting surface of the lower platen 209 (Fig. 19) is preferably the same shape as the sealing surface of the plate 191 and registers therewith. This sealing surface is of such contour that when the tube is severed at the lines *a* (Fig. 8) to form the individual bags, the sealed area at the end of the bag which forms the bottom thereof, extends entirely across the bag while sealed areas 191c, severed therefrom, extend part way across the upper end of the bag, leaving an unsealed intermediate portion which provides a restricted or narrow fill opening. The sealed portions 191c preferably extend inwardly as far as the infolded sides of the bag so that the opening is limited

to the intermediate space between the infolds. In order to minimize strains in the bag, recesses or reliefs 191d are provided in the sealing surface at the infolded portions of the tube.

Fig. 7A illustrates a modified form of sealing plate 211 in which the sealing surface is discontinued across the intermediate portion of the plate, the narrow sealing strip 191b of Fig. 7 being omitted. With this construction the sealing area only extends across the portion of the bag including the side infolds which increase the number of plies or layers of film. A second sealing operation as hereinafter described completes the seal.

Cut-off unit

The tubular film is intermittently drawn forward in alternation with the cross-sealing operations by the pair of pull rolls 37 and 38. These rolls are driven from the shaft 195 through a train of gearing (Figs. 1, 32, 33) including a Geneva drive. A sprocket chain 212 driven by the shaft 195 is trained over a sprocket gear 213 on a shaft 214 for driving said shaft. A driving element 215 on the shaft 214 carries rolls engaging radial slots 216 in a Geneva gear 217 fixed to a shaft 218. The continuous rotation of the driving element 215 imparts intermittent rotations, each through 90°, to the gear 217. The gearing is so arranged and proportioned that each step rotation of the Geneva drive takes place during a half rotation of the shaft 195 and while the cross-sealing platen is in its lifted position, the Geneva drive being at rest throughout the other half rotation of the shaft 195, during which the sealing operation takes place.

A sprocket chain 219, trained over sprockets on the shaft 218 and a shaft 220, rotates the latter and thereby drives a sprocket chain 221 trained over a sprocket wheel on the shaft 220 and a sprocket wheel 222 on the shaft of the roll 37, thereby driving said roll. Intermeshing spur gears 223 and 224 are mounted on the shafts of the rolls 37 and 38 so that they are both positively driven. Coil springs 225 maintain a yielding pressure of the rolls 37 and 38 against the work-piece therebetween. This pressure is adjustable by means of adjusting screws 226. The roll 38 is formed with circumferential ribs 227 providing reliefs therebetween for all of the crease lines of the folded tubes. In other words, the ribs 227 engage the work-piece intermediate the crease lines so that excessive pressure at the creases is prevented.

The knife 39, as shown in Fig. 33, is actuated by a cam 230 on the shaft 52. A cam roll 231 running on the cam is carried by a rock arm 232 pivoted at 233 and connected through a link 234 to the knife plate 39 which is pivoted at 235. The knife 39 cooperates with a stationary blade 236 to sever the collapsed tube at line *a* (Fig. 8) with a shearing cut while the rolls 37 and 38 are at rest. A spring 237 connected to the rock arm 232 holds the cam roll in engagement with the cam.

Turret sealer

The turret sealing mechanism, shown in detail in Figs. 34 to 44 inclusive, for effecting the final sealing operation, will now be described. The turret 41 is mounted on and continuously rotated by a horizontal shaft 240 which, as shown in Figs. 31 and 32, is driven from the shaft 195 through intermeshing gears 241 and 242 connected respectively to the shafts 195 and 240. The shaft 240 extends through a stationary tube or casing 243 on the forward end of which is mounted the heating element 244, electrically heated and having the temperature automatically controlled by a thermostat as heretofore described in connection with the other heat sealing elements. The rotating turret or sealing element 41 is substantially circular except that it is provided with two diametrically opposed flat surfaces 245 (Fig. 37) which contact with the work-piece during the sealing operation.

A cross-head 246 is mounted on the shaft 240 to rotate with the turret 41. The cross-head carries a pair of parallel rods 247 positioned on opposite sides of the shaft 240. Sealing heads 248 are slidably mounted on the rods and each head carries a platen or backing plate 249 movable toward and from the sealing surface 245 for clamping the work-piece against said surface with a yielding pressure during the sealing operation. Such pressure is supplied by coil springs 250 held under tension. The springs are anchored to posts 251 connected to the heads 248 and adjustable lengthwise therein for adjustably varying the tension of the springs.

After a sealing operation, the head 248 is moved radially outward to separate the platen 249 from the sealing surface 245. This movement is effected by a stationary cam 252 (Figs. 34, 35) which engages a cam roll 253 on the head as the latter moves upward toward its upright position. The cam 252 as shown is formed integral with a stationary hood 252'. The cam roll runs off the cam when the sealing head is in a substantially vertical position (Fig. 34), permitting the head to move down and clamp the end of the bag which has been fed forward between the sealing surfaces. The parts are so timed that this clamping takes place just before the bag has been completely severed from the oncoming tube by the blade 39. The bag remains clamped by the sealing head during the rotation of the turret through about three-fourths of a revolution and is then released by the operation of the cam 252. While the bag is thus clamped the heat sealing operation takes place, this sealing being supplemental to the cross-sealing operation effected by the cross-sealer 34.

When a cross-sealing plate 211, such as shown in Fig. 7A has been used, the turret seal serves to complete the seal across the entire width of the bag at the bottom end thereof. It will be noted that the turret sealer operates only on the forward or bottom end of the bag. As shown in Figs. 39 and 40, the sealing surface 245 of the turret is formed with a rib 254 extending lengthwise of said surface. This rib serves to supply a localized pressure by which the work-piece is creased along a line 254a (Figs. 8 and 8B), said line extending the full width of the bag. The effect of this is to insure a perfect seal, especially along the infolded side portions of the bag where otherwise there would be more or less liability of an imperfect seal, particularly at the folding lines or creases. When the plate shown in Fig. 7A is used, the sealing surface 245 of the turret (Fig. 40) is given the contour shown in Fig. 8B.

By reference to Fig. 9 it will be apparent that with the particular form of bag shown, there are as many as eight superposed layers or plies of film along the side margins of the folded bag, four of these being comprised in the reinforcing strip 14 and the other four in the main film 10. Inwardly beyond the edges of the strip 14

to the inner edge of the infold, there are six layers. Intermediate the infolds there are only two superposed layers or plies except at the seam or overlap 12 along the middle of the bag where there are three plies.

This varying number of plies which the sealing heat must penetrate places an uneven load on the cross-sealer 34 and makes it difficult to obtain a perfect seal. The turret sealer serves as a reinforcing means for insuring a complete and reliable seal. The heavy adjustable springs 250 provide any selected pressure which may be needed to insure a perfect seal. The heat does not need to be very great as the seal is still hot from the preliminary cross-sealing operation when delivered to the turret sealer. The rib 254 (Fig. 40) serves to seal any wrinkles in the pliofilm or open portions that have not already been taken care of by the cross-sealer 34.

Bag discharging means

When the turret sealing operation is completed and the bag released from the clamping head by the operation of the cam 252, the bag drops down an inclined surface or chute 255 (Fig. 34) into a receptacle 256. In order to prevent the possibility of the bag sticking to a sealing surface when the platen 242 is lifted and being carried beyond the discharging station, the following mechanism is provided to grip the bag as the cam operates to separate the sealing surfaces. Referring particularly to Figs. 34, 35 and 41 to 44, such mechanism comprises parallel shafts 257 and 258 journalled in bracket extensions 259 of a pair of guides 260 by which the bag is guided in its travel circumferentially of the turret shaft during the sealing operation. As shown in Fig. 42, each of the guides 260 is made in sections clamped to the stationary tube 243. Stationary guides 261 extend along the lower portion of the guides 260 concentric therewith and spaced therefrom to provide a passageway for the bags.

Rock arms 262 are fixed to the rock shaft 257, extend downwardly therefrom, and carry at their lower ends buttons 263 adapted to engage a bag when it has been carried upwardly with the sealing head to discharging position, and clamp it against the guides 260. This clamping operation may take place immediately after the sealing surfaces are separated by the cam 252 so that the bag is pulled free from the rotating sealer if there is any tendency for the bag to stick to the hot surfaces. A gear 264 is keyed to the shaft 257 and meshes with a gear 266 which is loosely mounted on the shaft 258 for rotation relative thereto. A sleeve 267 keyed to the shaft 258 carries a depending rock arm 268 on the lower end of which is a cam roll 269. Each of the sealing heads 248 carries a cam 270 which engages the cam roll and rocks the shaft 258 just after the cam 252 has released the bag from the sealing head, the parts being at this time in the position shown in Fig. 42. A sleeve 273 is attached to a collar 271 keyed to the shaft 258. A coil spring 272 on the sleeve 273 has one end connected to the collar 271 while the other end engages the pinion 266. The gear 266 is formed with a segmental hub portion or rib 274 and a collar 267ª keyed to the shaft 258, has a portion of its outer end cut away to provide a shoulder 274ª adapted to engage the rib 274 on the gear 266. The rock arm 268 is held in its inward position shown in full lines in Fig. 42 by a spring 275.

When the cam 270 rocks the arm 268 outwardly to the dotted line position (Fig. 42), the sleeve 267 is rotated together with the shaft 258. At the same time the gear 266 owing to the tension of the spring 272 thereon, rotates with the shaft 258 and rotates the gear 264 and shaft 257 and thereby swings the bag gripping arms 262 inwardly so that they clamp the bag to the guides 260. The spring 272 operates through the spur gears to retain the arms 262 in bag gripping position until the cam 270 passes beyond the rock arm 268 and permits the latter to be swung inward by its spring 275. This return movement of the rock arm 268 operates through the sleeve 267 to rotate the gear 266 in opposition to the spring 272, thereby retracting the gripping arms 262. This releases the bag, permitting it to drop into the receptacle 256. The rotation of the shaft 258 in a direction to swing the arm 268 inwardly is limited by a stop plate 276 (Figs. 41 and 44) clamped to the shaft 258 and extending beneath the shaft 257.

Mechanism is provided for automatically withdrawing the sealing heads from the turret and holding them in separated position whenever the main clutch is operated for disconnecting the counter-shaft 52 from the main drive shaft 49. Such mechanism includes an arm 277 (Fig. 22) on the yoke 58 of the clutch and a rod 278 connected to said arm and extending forwardly therefrom to the forward end of the machine. The rod 278 is connected at its forward end (Figs. 34, 35 and 36) to one arm of a bell crank 279, the other arm of which is connected through a rod 280 to one arm of a bell crank lever 281. The other end of the bell crank 281 is pivoted to a slide bar 282 mounted for lengthwise movement in the machine frame. The inner end of the rod 282 carries a yoke 283 which engages a collar 284 splined on the shaft 240 for rotation therewith and movement lengthwise thereof. The collar carries a pair of dogs 285 at diametrically opposite points on the collar. Said dogs project inwardly into position to engage rolls 286 carried on the sealing heads.

When the main clutch is operated to disconnect the counter-shaft 52, it operates through the linkage just described to move the collar 284 inwardly, causing the dogs 285 to cam the sealing heads 248 outward and hold the sealing surfaces separated so long as the main clutch remains open and the sealing turrets idle. This prevents overheating of the backing plates 249 and also of any bag which might be clamped on by sealing heads when the machine is thrown out of gear.

Modifications may be resorted to within the spirit and scope of the appended claims.

We claim:

1. Apparatus for forming bags comprising means for continuously advancing a film of flexible heat plastic material from a roll of said material, means for folding the film to tubular form with its edges overlapping as the film advances, means for continuously heat sealing together the overlapped edges of the advancing film and thereby forming a continuously advancing tube, means for infolding the advancing tube along opposite sides thereof and simultaneously collapsing the tube, cross-sealing mechanism comprising means for periodically clamping the collapsed tube at intervals lengthwise of the tube and simultaneously applying heat by which the material is heat sealed, a severing device positioned forwardly beyond said cross-sealing mechanism, means for periodically actuating said sev-

ering device and thereby severing the tube into individual bags, and a supplemental cross sealing device positioned forwardly beyond the severing device and operable to effect a supplemental cross-sealing operation on each bag.

2. Apparatus for forming containers of flexible sheet material comprising means for advancing a web or film of the material from a roll, means for folding the web to tubular form as it advances, said folding means including a forming block around which the advancing web is folded, a plate extending along one side of the block and interposed between the block and the web, and means for adjusting the angle of said plate relative to the block.

3. Apparatus for forming containers of flexible sheet material comprising means for advancing a web or film of the material from a roll, means for folding the web to tubular form as it advances, said folding means including a forming block around which the advancing web is folded, a plate extending along one side of the block and interposed between the block and the web, said plate being hinged at one end, and means for adjusting the plate about the axis of said hinge.

4. Apparatus for forming containers made of flexible sheet material, said apparatus comprising means for supporting a rolled film or web of the material, means for feeding the web from the roll, a forming block along which the web is advanced, said block having forwardly converging sides, said web being guided beneath and along the under surface of said forming block, guiding means for folding the sides of the web upwardly around said block and overlapping the edges, means for sealing said edges together to form a tube, an entrance plate on the under side of said forming block between the web and said block, said plate being downwardly and forwardly inclined and having forwardly converging sides, and means for adjusting the angle of said plate.

5. Apparatus for forming containers made of flexible sheet material, said apparatus comprising means for supporting a rolled film or web of the material, means for feeding the web from the roll, a forming block along which the web is advanced, said block having forwardly converging sides, said web being guided beneath and along the under surface of said forming block, guiding means for folding the sides of the web upwardly around said block and overlapping the edges, means for sealing said edges together to form a tube, an entrance plate on the under side of said forming block between the web and said block, said plate being downwardly and forwardly inclined and having forwardly converging sides, means for adjusting the angle of said plate, and means for collapsing the advancing tube and simultaneously infolding the opposite sides thereof.

6. In an apparatus for forming containers of flexible sheet material, the combination of means for supporting a rolled film or web of the material, means for continuously feeding the web forward from the roll, means for folding the advancing web to tubular form including a mandrel around which the web is wrapped with the edges of the web overlapping, means for sealing the overlapping edges, and mechanism at the forward end of the mandrel for infolding the sides of the tube, said mechanism including spaced blades substantially flush with the upper and lower faces respectively of the mandrels, said blades projecting forwardly beyond the forward end of the mandrel and forwardly convergent, and infolding disks arranged to roll on the opposite sides of the tube as it advances over said blades, said disks positioned to extend inwardly between the blades adjacent the forward ends thereof, thereby folding the sides of the tube inwardly.

7. In an apparatus for forming containers of flexible sheet material, the combination of means for supporting a rolled film or web of the material, means for continuously feeding the web forward from the roll, means for folding the advancing web to tubular form including a mandrel around which the web is wrapped with the edges of the web overlapping, means for sealing the overlapping edges, and mechanism at the forward end of the mandrel for infolding the sides of the tube, said mechanism including spaced blades projecting forwardly beyond the forward end of the mandrel, infolding disks arranged to roll on the opposite sides of the tube as it advances over said blades, said disks positioned to extend inwardly between the blades, thereby folding the sides of the tube inwardly, and creasing disks mounted at the ends of said blades, substantially in the plane of the blades and in position to be enveloped by the advancing tube with their peripheries about in line with the longitudinal edges of said blades for engaging the inner surface of the tube and creasing it along the margins of the infolded sides.

8. In an apparatus for forming containers of flexible sheet material, the combination of means for supporting a rolled film or web of the material, means for continuously feeding the web forward from the roll, means for folding the advancing web to tubular form including a mandrel around which the web is wrapped with the edges of the web overlapping, means for sealing the overlapping edges, and mechanism at the forward end of the mandrel for infolding the sides of the tube, said mechanism including spaced blades substantially flush with the upper and lower faces respectively of the mandrels, said blades projecting forwardly beyond the forward end of the mandrel and forwardly convergent, infolding disks arranged to roll on the opposite sides of the tube as it advances over said blades, said disks positioned to extend inwardly between the blades adjacent the forward ends thereof, thereby folding the sides of the tube inwardly, and feed rolls positioned immediately in advance of said infolding disks and between which the tube is fed, said feed rolls arranged to fully collapse the tube as it advances.

9. Tube forming apparatus comprising means for supporting a rolled web, means for feeding the web from the roll, a mandrel, means cooperating therewith to fold the web to tubular form with the edges of the web overlapping, means for sealing the overlapped edges, forwardly convergent, flexible blades extending forward from the forward end of the mandrel, means cooperating with said blades for infolding the sides of the tube, said infolding means including disks mounted adjacent the forward converged ends of said blades for rotation in position to engage the exterior surface of the tube at opposite sides thereof and fold said sides between the said blades, and a pair of rolls positioned adjacent the forward ends of said blades and in advance of the infolding disks, and means for driving said rolls and causing them to draw and flatten the tube.

10. Bag forming apparatus comprising in com-

bination, means for supporting a roll of film, means for drawing a web of film from the roll, a forming mandrel around which the web is folded as it advances and its edges overlapped, means for sealing the overlapped edges to form a tube, means for folding the tube as it advances, means for supporting rolls of reinforcing webs, means for feeding the reinforcing webs and advancing them into juxtaposition to the opposite faces of the folded tube, pots to contain adhesive material, rolls running in said pots, means for directing the reinforcing webs over said rolls as the webs advance toward the folded tube, means for arresting the movement of the webs, automatic means to separate the webs from the rolls running in said pots when the movement of the webs is discontinued, and means to drive said last mentioned rolls while the movement of the webs is discontinued.

11. Bag forming apparatus comprising means for continually forming and advancing a tube of flexible sheet material, means for collapsing and folding the tube at it advances, a glue pot, a glue roll running therein, means for feeding a reinforcing strip over said roll and into engagement with the folded tube and thereby reinforcing the tube, means for arresting the tube, and automatic means for rotating the roll in the glue pot while the tube is at rest.

12. Bag forming apparatus comprising means for forming a tube, mechanism for advancing the tube including a drive shaft, a cross sealing device, a take-up roll engaging the tube, a cam on said drive shaft, and operating connections between the cam and said roll for periodically moving the latter transversely and thereby taking up slack in the tube.

13. Bag forming apparatus comprising, in combination, means for advancing a web of thermoplastic material, means for forming the web into a tube as it advances, means for infolding the sides of the tube to form pleats extending lengthwise of the tube, heat sealing mechanism for cross-sealing the tube, said mechanism comprising a heat-sealing plate extending transversely of the advancing tube and having a heat-sealing surface extending lengthwise thereof, said surface having widened end portions, and means for applying said surface to the tube and thereby effecting a transverse seal covering an area substantially co-extensive with said surface, said widened end portions positioned and arranged to engage and seal the marginal portions of the tube defined by said pleats.

14. Bag forming apparatus comprising means for advancing a film of thermoplastic material, means for shaping said film to tubular form as it advances, means for collapsing the tube as it is formed, cross-sealing means comprising a heat sealing plate positioned to extend transversely of the advancing tube, means for periodically moving said plate into contact with the collapsed tube and thereby effecting a seal, said plate formed with sealing areas spaced apart and positioned to seal corresponding areas of the tube extending from the outer edges of the folded tube inwardly to intermediate points, leaving an unsealed area between said points, means for severing the tube into individual bags along lines which extend transversely of the tube and cross said sealed areas, and supplemental sealing means positioned beyond said cross-sealing means and operable to effect a cross-seal at one end of each severed bag.

15. Bag forming apparatus comprising means for advancing a film of thermoplastic material, means for shaping said film to tubular form as it advances, means for collapsing the tube at it is formed, cross-sealing means comprising a heat sealing plate positioned to extend transversely of the advancing tube, means for periodically moving said plate into contact with the collapsed tube and thereby effecting a seal, said plate formed with sealing areas spaced apart and positioned to seal corresponding areas of the tube extending from the outer edges of the folded tube inwardly to intermediate points, leaving an unsealed area between said points, means for severing the tube into individual bags along lines which extend transversely of the tube and cross said sealed areas, supplemental sealing means positioned in advance of said cross-sealing means and operable to effect a cross-seal at one end of each severed bag, and supplemental cross-sealing mechanism positioned forwardly beyond the severing means and operable to effect a cross-seal at the forward end of each bag, thereby completing a bottom seal for the bag.

16. Bag forming apparatus comprising means including feed rolls for continuously advancing a tubular work-piece, means for driving said feed rolls continuously, intermittent feed rolls located forwardly beyond the continuous feed rolls, a cross-sealing device, means for actuating the sealing device periodically and effecting a cross-seal of the work-piece at a cross-sealing station between the continuous and the intermittent feed rolls, and mechanism for periodically driving the intermittent feed rolls in synchronism with the operations of the cross-sealing device and so timed that the sealing operation is effected while the intermittent feed rolls are at rest.

17. Bag forming apparatus comprising means for forming and collapsing a tube of sheet material, feed rolls between which the tube is held, means for continuously driving the feed rolls and thereby continuously advancing the tube, a cross-sealing device located forwardly beyond said rolls, means for periodically operating the cross-sealing device, a pair of feed rolls located forwardly beyond the cross-sealing device, and driving mechanism for rotating said last mentioned rolls intermittently and thereby advancing the tube intermittently through a cross-sealing station, the driving means for the intermittent rolls being interconnected with the means for operating the cross-sealing device and timed to effect intermittent forward movement of the tube alternating with the intermittent operation of the cross-sealing device.

18. Bag forming apparatus comprising means for forming and collapsing a tube of sheet material, feed rolls between which the tube is held, means for continuously driving the feed rolls and thereby continuously advancing the tube, a cross-sealing device located forwardly beyond said rolls, means for periodically operating the cross-sealing device, a pair of feed rolls located forwardly beyond the cross-sealing device, driving mechanism for rotating said last mentioned rolls intermittently and thereby advancing the tube intermittently through a cross-sealing station, the driving means for the intermittent rolls being interconnected with the means for operating the cross-sealing device and timed to effect intermittent forward movement of the tube alternating with the intermittent operation of the cross-sealing device, and take-up mechanism positioned and arranged to engage the tube at a

point between the continuous feed rolls and the cross-sealing device and operable to take up the slack in the tube while the intermittent feed rolls are at rest.

19. Bag forming apparatus comprising means for forming and collapsing a tube of sheet material, feed rolls between which the tube is held, means for continuously driving the feed rolls and thereby continuously advancing the tube, a cross-sealing device located forwardly beyond said rolls, means for periodically operating the cross-sealing device, a pair of feed rolls located forwardly beyond the cross-sealing device, driving mechanism for rotating said last mentioned rolls intermittently and thereby advancing the tube intermittently through a cross-sealing station, the driving means for the intermittent rolls being interconnected with the means for operating the cross-sealing device and timed to effect intermittent forward movement of the tube alternating with the intermittent operation of the cross-sealing device, shear mechanism positioned forwardly beyond the intermittent feed rolls, and means for operating the shear mechanism periodically to sever the tube into individual bags, said shear operating mechanism being timed to sever the bags while the intermittent feed rolls are at rest.

20. Bag forming apparatus comprising, in combination, a pair of feed rolls, means for intermittently driving said rolls and thereby periodically feeding forward a work-piece between said rolls, a severing device positioned forwardly of said rolls, a work-piece gripping device positioned forwardly beyond the severing device, means for operating the severing device periodically in timed relation to the movements of the feed rolls and while the latter are at rest, and means for actuating said gripping device periodically and causing it to grip the forward end of the work-piece while the severing device operates to sever a length from the work-piece.

21. Bag forming apparatus comprising, in combination, a pair of feed rolls, means for intermittently driving said rolls and thereby periodically feeding forward a work-piece between said rolls, a severing device positioned forwardly of said rolls, a work-piece gripping device positioned forwardly beyond the severing device, means for operating the severing device periodically in timed relation to the movements of the feed rolls and while the latter are at rest, means for actuating said gripping device periodically and causing it to grip the forward end of the work-piece and hold the latter while the severing device operates to sever a length from the work-piece, means for rotating said gripping device intermittently about an axis transverse to the axes of the forward rolls while said severed length is held thereby, and means for then releasing and discharging said severed length.

22. Bag forming apparatus comprising, in combination, a pair of feed rolls, means for intermittently driving said rolls and thereby periodically feeding forward a work-piece between said rolls, a severing device positioned forwardly of said rolls, a work-piece gripping device positioned forwardly beyond the severing device, means for operating the severing device periodically in timed relation to the movements of the feed rolls and while the latter are at rest, means for actuating said gripping device periodically and causing it to grip the forward end of the work-piece and hold the latter while the severing device operates to sever a length from the work-piece, and means for heating said gripping device and thereby heat sealing the work-piece.

23. Bag forming apparatus comprising means for advancing sheet material, means for giving it tubular form, means for folding and collapsing the tube, a pair of feed rolls between which the collapsed tube is directed, means for periodically rotating said rolls through a predetermined angle and advancing the tube at each said rotation a distance equal to the length of a bag to be formed therefrom, a cross-sealing device position forwardly beyond the feed rolls, means for periodically operating the cross-sealing device in timed relation to the operation of the said rolls and causing it to grip the forward end of the work-piece and effect a cross-seal, a severing device intermediate said rolls and sealing device, and means for actuating said severing device periodically while the said rolls are at rest and while the work-piece is gripped by said sealing device.

24. Bag forming apparatus comprising means for advancing sheet material, means for giving it tubular form, means for folding and collapsing the tube, a pair of feed rolls between which the collapsed tube is directed, means for periodically rotating said rolls through a predetermined angle and advancing the tube at each said rotation a distance equal to the length of a bag to be formed therefrom, a cross-sealing device positioned forwardly beyond the feed rolls, means for periodically operating the cross-sealing device in timed relation to the operation of the said rolls and causing it to grip the forward end of the work-piece and effect a cross-seal, a severing device intermediate said rolls and sealing device, means for actuating said severing device periodically while the said rolls are at rest and while the work-piece is gripped by said sealing device, means for rotating the sealing device while the severed work-piece is gripped thereby, and means for releasing and discharging the severed work-piece.

25. Bag forming apparatus including means for intermittently advancing a collapsed tube in the direction of its length, said means including a pair of feed rolls between which the tube is fed and means for periodically rotating the rolls intermittently through a predetermined angle and thereby advancing the tube the length of a bag, a cross-sealing device positioned forwardly beyond said feed rolls and comprising a pair of sealing members between which the forward end of the collapsed tube is directed, means for moving said sealing members toward each other for gripping the work-piece, means for heating a said sealing member and thereby effecting a seal, severing means interposed between the feed rolls and sealing device and operable periodically to sever the tube to form individual bags, and means for rotating the sealing device about an axis parallel with the direction in which the tube is advanced thereto.

26. In a bag forming apparatus, heat sealing mechanism comprising a heat sealing element, means for rotating it about an axis, a stationary heater body, means for supplying heat to the latter and thereby heating said rotating element, a clamping device mounted to rotate with said rotating element and movable toward and from the latter for gripping a work-piece, and means for automatically releasing the work-piece during said rotation.

27. In a bag forming apparatus the combination of means for intermittently advancing a

collapsed tube forwardly in the direction of its length, a cross-sealing device positioned and arranged to engage the forward end of the tube, means for periodically severing the tube to form individual bags, and means for rotating said sealing device about an axis parallel with said direction.

28. In a bag forming apparatus the combination of means for intermittently advancing a collapsed tube forwardly in the direction of its length, a cross-sealing device positioned and arranged to engage the forward end of the tube, means for periodically severing the tube to form individual bags, said sealing device comprising a rotary sealing element having a sealing surface to engage the work-piece, a head rotatable with said sealing element and having a work engaging surface movable toward and from said sealing surface for gripping the work-piece, spring means for holding said head in gripping position, means for rotating the sealing device, and means operable to withdraw said head and release the work-piece during the rotation of the seal.

29. The combination of a sealing disk, a shaft on which said disk is mounted, means for rotating the shaft and the disk, said disk being formed with diametrically oppostie sealing surfaces on the periphery thereof, heads mounted to rotate with said disk and providing work-piece holding surfaces opposite said sealing surfaces, means for moving said heads toward said disk and causing them to hold work-pieces on said sealing surfaces, and means operative by the rotation of the disk to automatically withdraw said heads and release the work-pieces.

30. Heat sealing mechanism comprising a shaft, a sealing disk mounted thereon, said disk formed with diametrically opposite sealing surfaces, a cross-head mounted on said shaft for rotation therewith, guide posts carried by said cross-head, sealing heads mounted on said guide posts and movable thereon toward and from said shaft, plates carried by said sealing heads and movable therewith into gripping engagement with work-pieces overlying said sealing surfaces, and means for reciprocating said sealing heads.

31. Heat sealing mechanism comprising a shaft, a sealing disk mounted thereon, said disk formed with diametrically opposite sealing surfaces, a cross-head mounted on said shaft for rotation therewith, guide posts carried by said cross-heads, sealing heads mounted on said guide posts and movable thereon toward and from said shaft, plates carried by said sealing heads and movable therewith into gripping engagement with work-pieces overlying said sealing surfaces, coil springs holding said sealing heads in gripping engagement with the work-pieces, a stationary cam, and cam rolls carried by said sealing heads and operable by the cam to withdraw said heads.

32. Bag forming apparatus comprising means for intermittently feeding a collapsed tube horizontally forward in the direction of its length, a drive shaft beneath and parallel with the path of movement of the tube, a sealing disk mounted for rotation with said shaft, means for rotating said shaft and disk, said disk being formed with a sealing surface periodically brought by the rotation of the disk into a position to receive the forward end of the tube, clamping means mounted to rotate with the sealing disk and operable to clamp individual lengths of the work-piece against said sealing surface, means for severing said individual lengths from said tube, and means for releasing the severed lengths during the rotation of the sealing disk.

33. Bag forming apparatus comprising a drive shaft, a heat sealing element driven thereby, gripping elements, automatic means for periodically moving said gripping elements toward and from said sealing element for holding work-pieces in contact with the sealing element, a motor for driving said shaft, clutch mechanism for connecting and disconnecting the shaft to and from the motor, and means automatically operated by said clutch mechanism for withdrawing said gripping elements and holding them away from the sealing element when the clutch mechanism is operated to disconnect the drive shaft from the motor.

34. The combination of a heat-sealing element, a backing plate movable toward and from said element, a shaft connected to drive said element, a motor having driving connection with said shaft including a clutch, means for operating the clutch to disconnect the motor from said shaft, and means operated by the clutch operating mechanism for withdrawing said backing plate and holding it in a retracted position while the drive shaft is disconnected from the motor.

35. The combination of a driving shaft, a heat sealing element mounted on the shaft, a motor having driving connections with the shaft for rotating it, clutch mechanism for releasing the shaft from the motor, a backing plate mounted to rotate with said sealing element, automatic means for moving said backing plate toward and from the sealing element during the rotation of the latter, a collar on said shaft, a dog on said collar, connections between the clutch mechanism and said collar for shifting the latter lengthwise of the shaft when the clutch mechanism is operated, and means actuated by said dog to withdraw the backing plate from said sealing element.

36. Heat sealing mechanism comprising, in combination, work-piece holding devices, a drive shaft on which said devices are mounted, means for rotating the drive shaft and said devices, means for heating a said device for heat sealing a work-piece, means actuated by the rotation of said shaft for moving said devices toward and from each other, and means for gripping a work-piece when said devices are separated and holding it against rotation.

37. Heat sealing mechanism comprising, in combination, work-piece holding devices, a drive shaft on which said devices are mounted, means for rotating the drive shaft and said devices, means for heating a said device for heat sealing a work-piece, means actuated by the rotation of said shaft for moving said devices toward and from each other, means for gripping a work-piece when said devices are separated and holding it against rotation, said holding means including a rock arm, a stationary support for the work-piece, means carried by said rock arm to press the work-piece against said support, and means to rock said arm and release the work-piece after said work-piece holding devices have advanced beyond the work-piece.

38. A bag forming apparatus comprising means for supporting a roll of thermoplastic web, driving means for continuously advancing the web, means for folding the web into tubular form as it advances, with the edges of the web overlapping, means for heat sealing the overlapping edges, a

cross-sealing device positioned at a station forwardly beyond said heat sealing means, said cross-sealing device comprising means for clamping the tube and holding it stationary at said station, operating means interconnected with said driving means for operating the cross-sealing device periodically at predetermined intervals corresponding to predetermined lengths of the tube advanced by said driving means, take-up mechanism between the cross-sealing device and said sealing means for taking up the slack in the tube during the cross-sealing operation, and driving means for the take-up mechanism interconnected with said first mentioned driving means and causing said take-up mechanism automatically to take up slack intermittently in synchronism with the operations of the cross-sealing device and in predetermined amounts corresponding to the lengths of film advanced by the said film advancing means between successive operations of the cross-sealing device.

39. A bag forming apparatus comprising, in combination, means for forming a tube, means for collapsing the tube, automatic means for advancing it continuously beyond the collapsing means, cross-sealing mechanism positioned at a station forwardly beyond said collapsing means, said cross-sealing mechanism comprising means operating periodically to grip the tube and effect a cross-seal with the tube held stationary at said station during the cross-sealing operation, said cross-sealing mechanism being interconnected with the tube advancing means for timing the operations of the cross-sealing mechanism to correspond to predetermined lengths of tube advanced by said tube advancing means, take-up mechanism operable periodically for taking up the slack in the tube between the collapsing means and the cross-sealing mechanism while the tube is held by the latter, and driving means for the take-up mechanism interconnected with the tube advancing means, whereby the operations of the take-up mechanism are synchronized with the operations of the cross-sealing mechanism.

40. A bag forming machine comprising in combination means for feeding a web of uniform width forwardly in the direction of its length, a mandrel extending along the path of the web, means cooperating with the mandrel for folding the web therearound to tubular form while the web advances along the mandrel, the base of the mandrel being substantially an equilateral triangle with the base of the triangle parallel with the web and perpendicular to said direction in which the web travels, said base being downwardly and forwardly inclined with the sides forwardly convergent, the mandrel and folding means being so arranged that the web is gradually folded from a flat condition at the base of said triangle to a tubular shape adjacent the forward end of the triangular base, said mandrel including a part extending forward from said forward portion of said triangular base along which the web advances with said forwardly extending part enwrapped therein with the edges of the web overlapped, the perimeters of cross-sections of said forward extension at different points along its length being substantially equal for maintaining a uniform overlap of said edges, and means for continuously sealing the overlapped edges to complete the tube, said sealing means comprising a sealing roll mounted over said extension in a position to run on the overlapped edges, means for heating said roll, and a backing roll therebeneath mounted in said extension beneath the sealing roll, said extension being recessed to receive the backing roll.

41. Bag forming apparatus comprising means for continuously advancing a collapsed tube, cross-sealing means comprising a heat sealing plate positioned to extend transversely of the advancing tube, means for periodically moving said plate into contact with the tube and thereby effecting a seal, said plate formed with sealing areas spaced apart and positioned to seal corresponding areas of the tube extending from the outer edges thereof inwardly to intermediate points, leaving an unsealed area between said points, means for severing the tube into individual bags along lines which extend transversely of the tube and cross said sealed areas, and additional sealing means positioned forwardly beyond said cross-sealing means and operable to effect a cross-seal at one end of each severed bag.

42. Bag forming apparatus comprising in combination means for advancing a collapsed tube lengthwise, cross-sealing mechanism operable periodically for cross-sealing the advancing tube at intervals lengthwise thereof, cutting means for severing the tube adjacent the cross-seals and thereby forming individual segregated bags, and a supplemental cross-sealing device positioned forwardly beyond the cutting means and operable to cross-seal the segregated bags.

43. Bag forming apparatus comprising in combination means for advancing a collapsed tube lengthwise, cross-sealing mechanism operable periodically for cross-sealing the advancing tube at intervals lengthwise thereof, cutting means for severing the tube adjacent the cross-seals and thereby forming individual segregated bags, and a supplemental cross-sealing device positioned forwardly beyond the cutting means and operable to cross-seal the segregated bags, said cutting means being positioned between the cross-sealing devices.

44. A bag forming apparatus comprising automatic means for continuously advancing a tubular film, a cross-sealing device comprising means for clamping the film and holding it stationary at a sealing station, means interconnected with the film advancing means for periodically operating said cross-sealing device at intervals corresponding to predetermined lengths of the film, take-up mechanism, and driving means interconnected with the means for advancing the film for operating the take-up mechanism in cycles and causing it to take up a predetermined amount of slack in the tube during each cycle, said cycles being in timed relation to the operations of the cross-sealing device.

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