

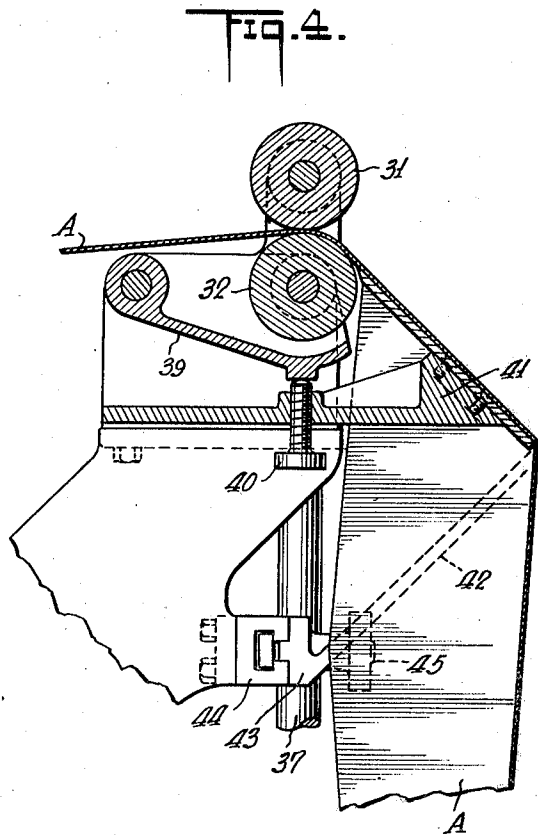
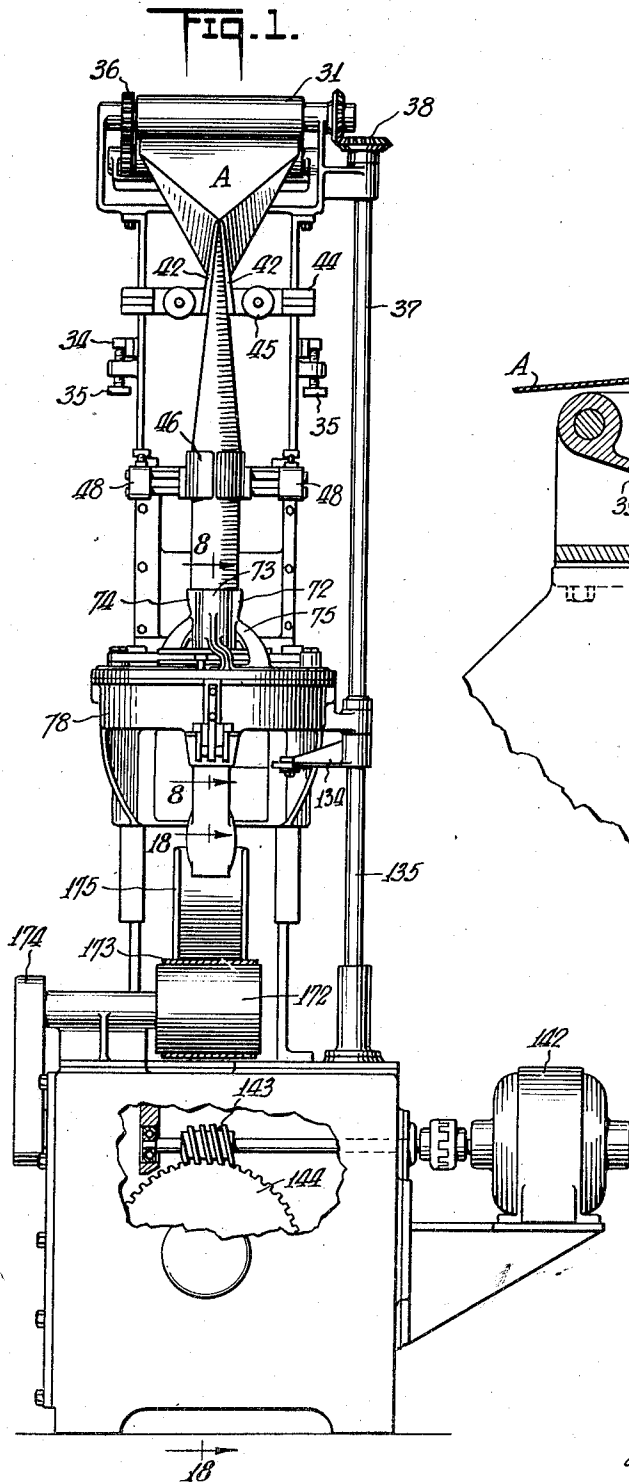
April 12, 1938.

E. E. LAKSO

2,113,658

PACKAGING MACHINE

Original Filed Oct. 2, 1935 13 Sheets-Sheet 1



INVENTOR

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April 12, 1938.

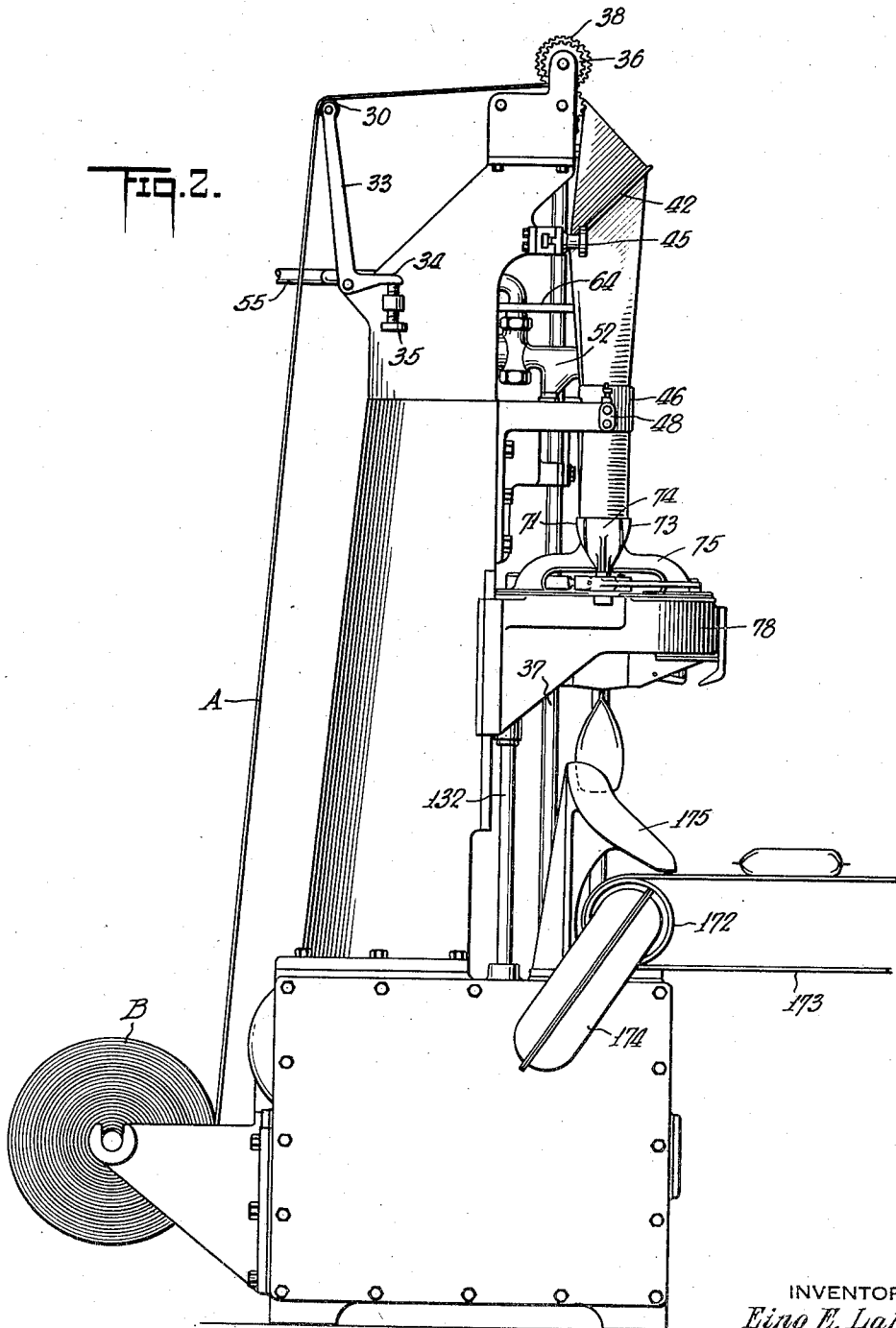
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PACKAGING MACHINE

Original Filed Oct. 2, 1935

13 Sheets-Sheet 2



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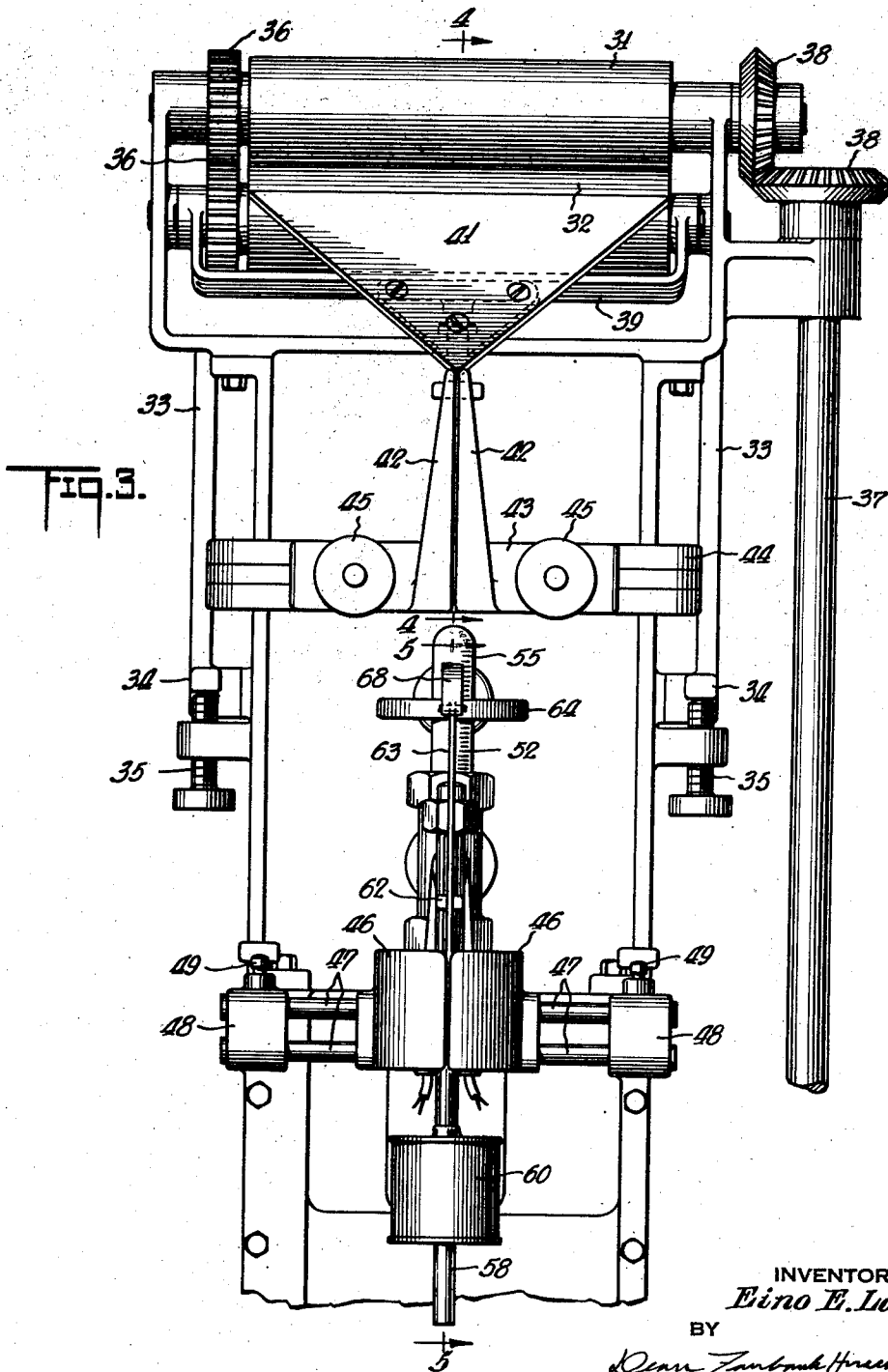
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PACKAGING MACHINE

Original Filed Oct. 2, 1935

13 Sheets-Sheet 3



April 12, 1938.

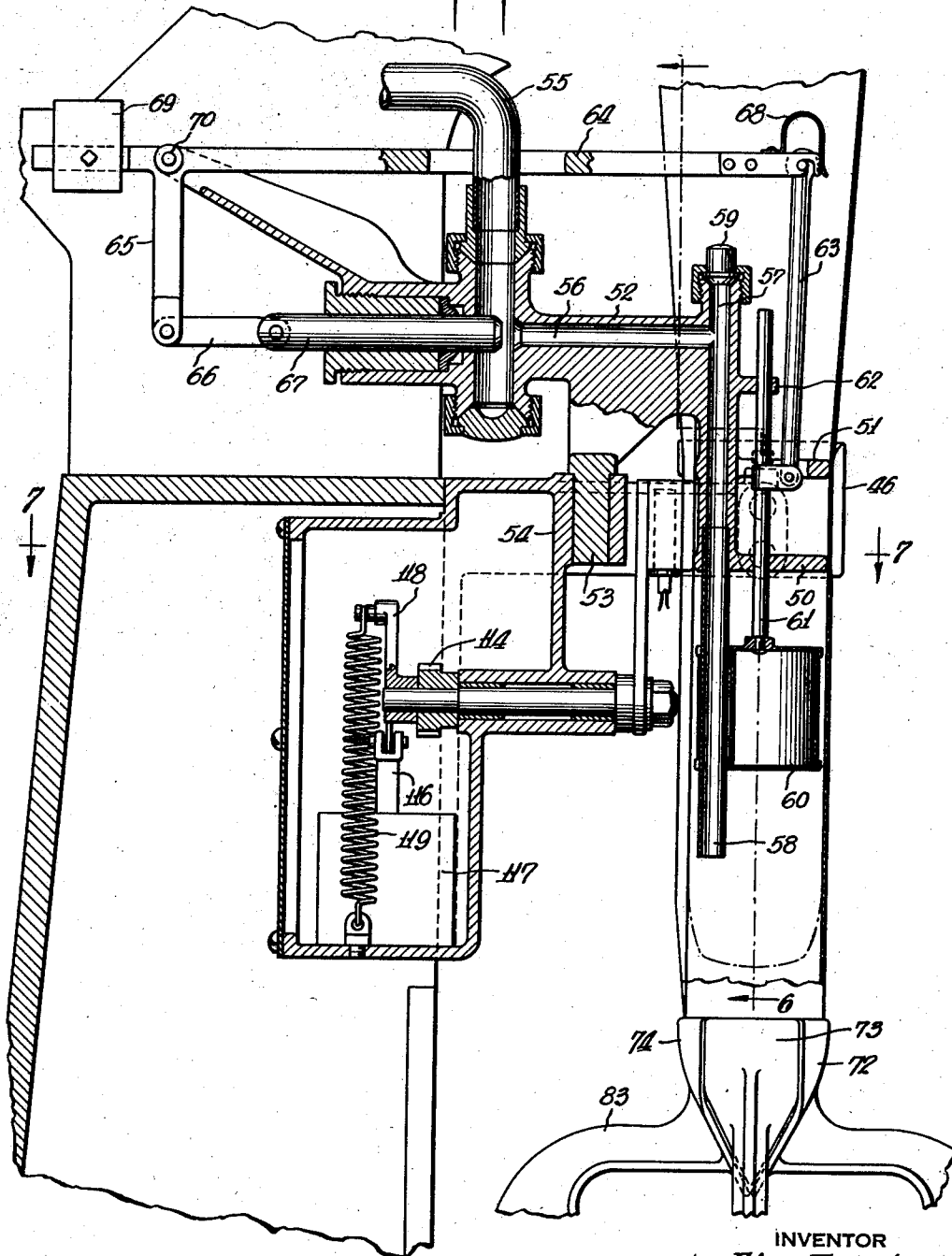
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PACKAGING MACHINE

Original Filed Oct. 2, 1935 13 Sheets-Sheet 4

FIG. 5.



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PACKAGING MACHINE

Original Filed Oct. 2, 1935 13 Sheets-Sheet 5

FIG. 6.

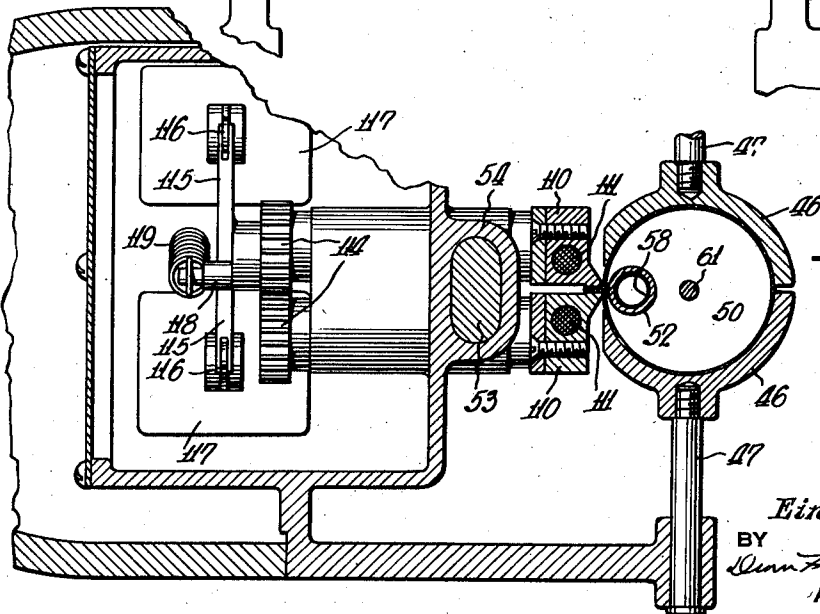
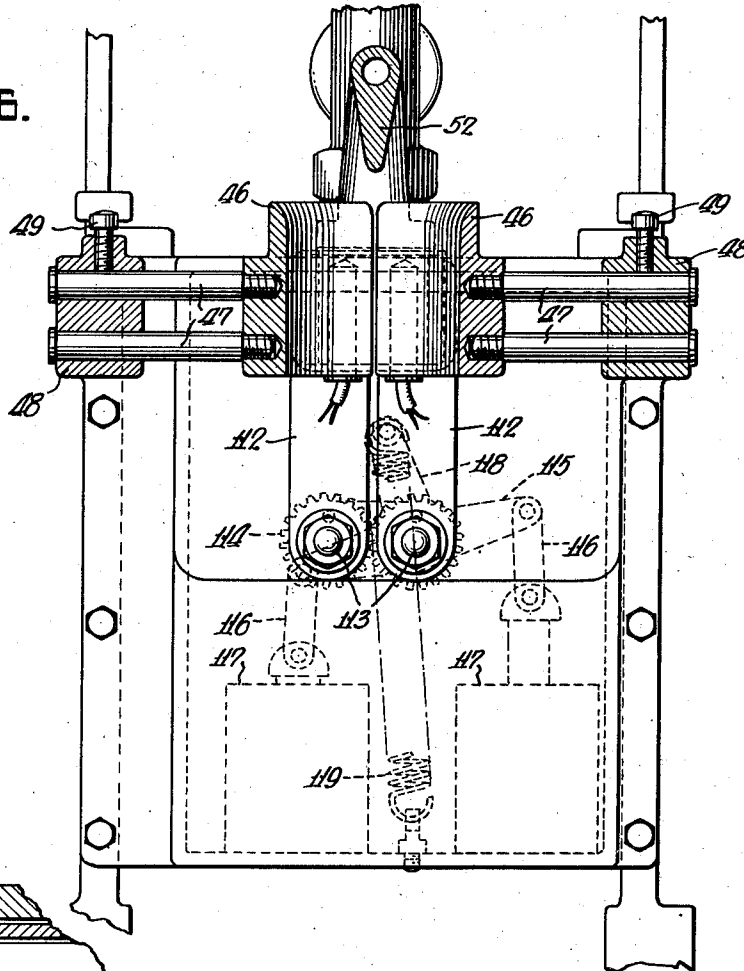


FIG. 7.

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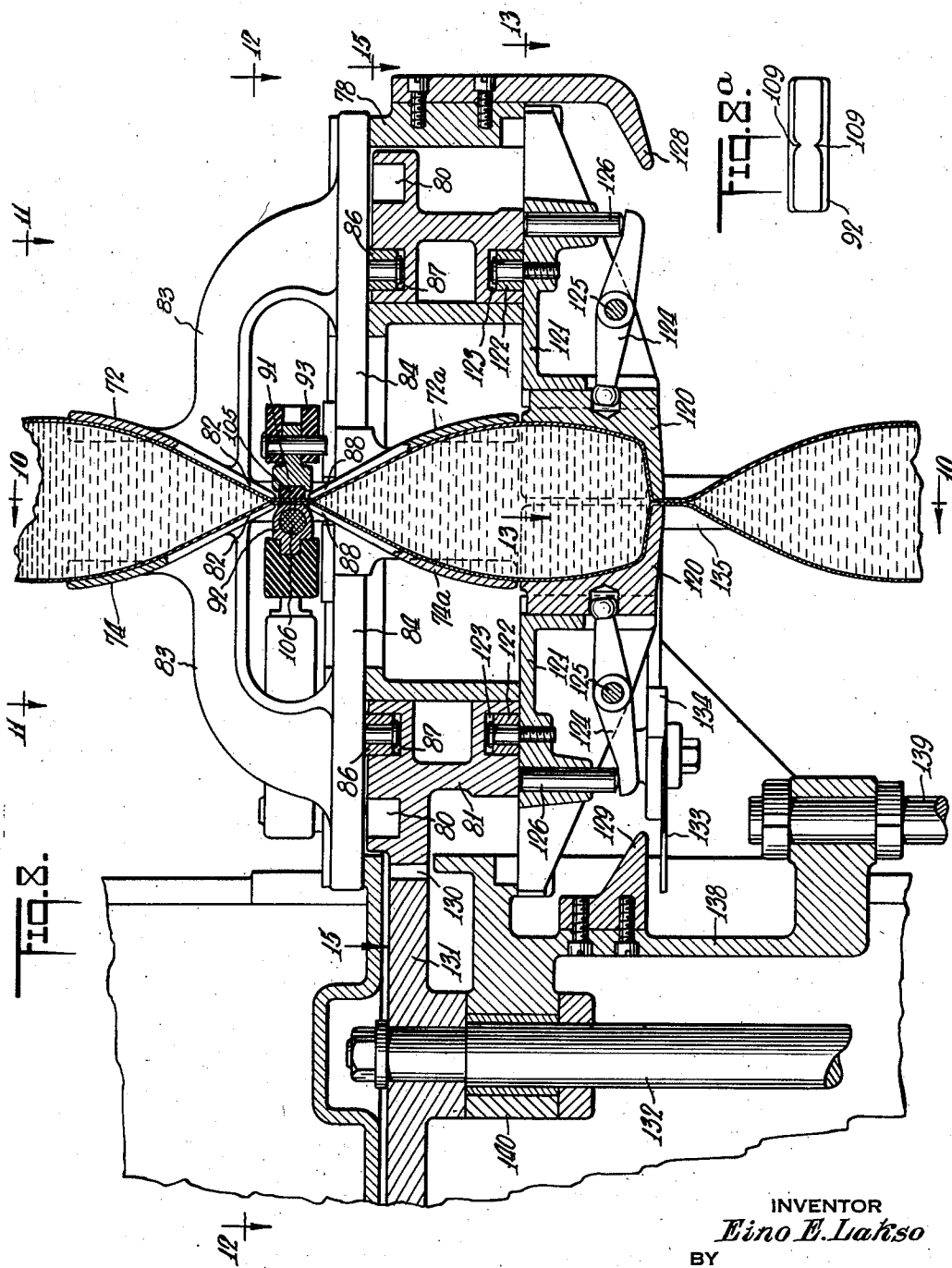
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PACKAGING MACHINE

Original Filed Oct. 2, 1935 13 Sheets-Sheet 6



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PACKAGING MACHINE

Original Filed Oct. 2, 1935 13 Sheets-Sheet 7

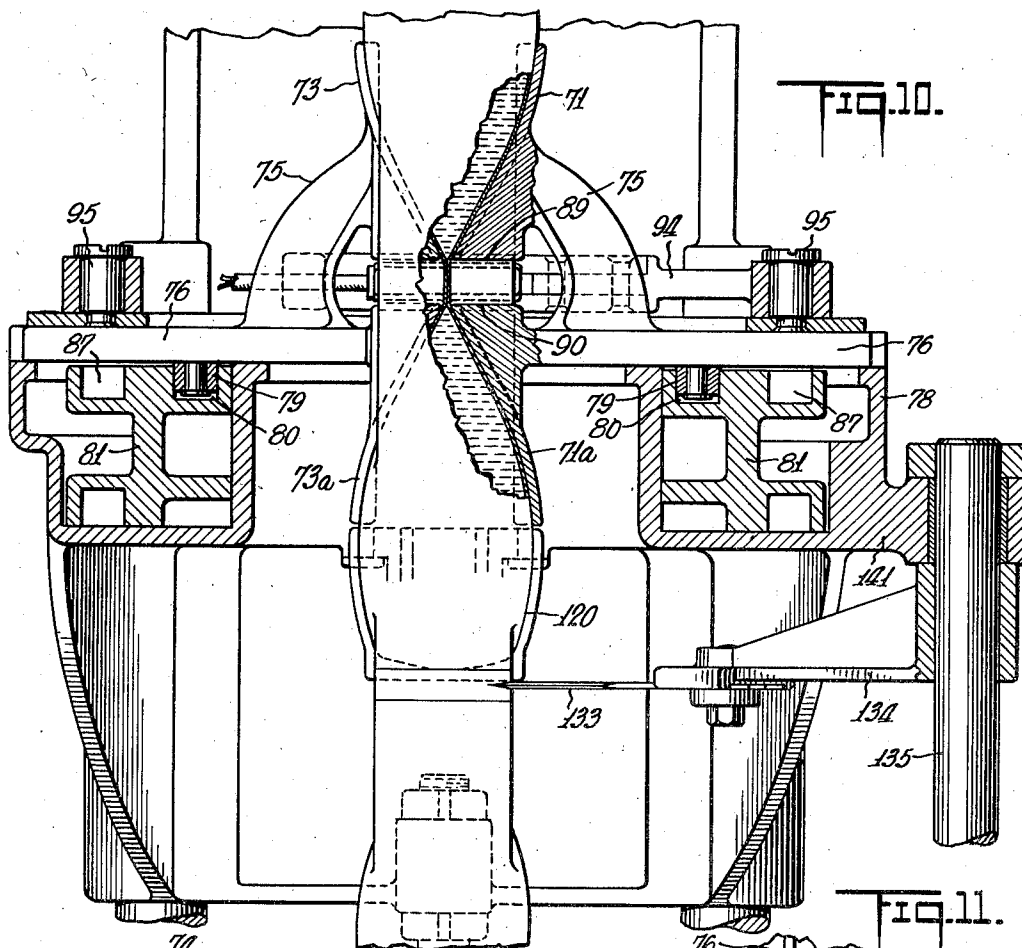


FIG. 10.

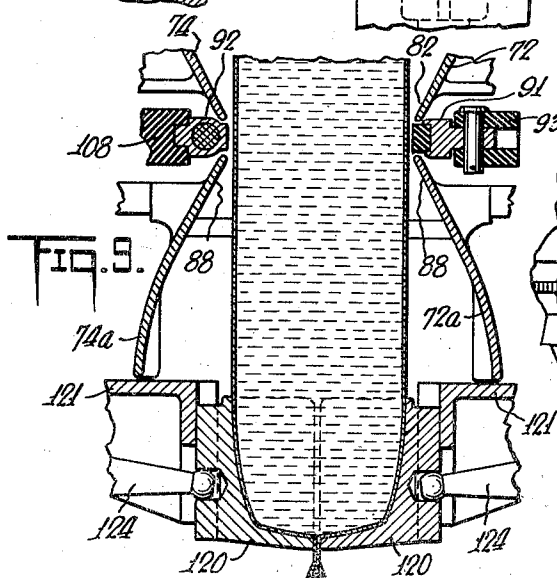


FIG. 9.

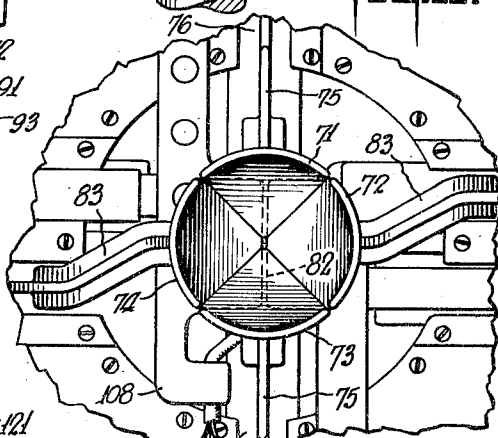


FIG. 11.

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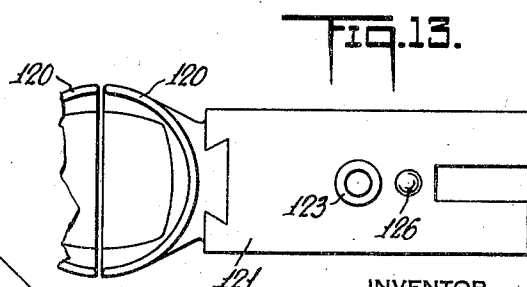
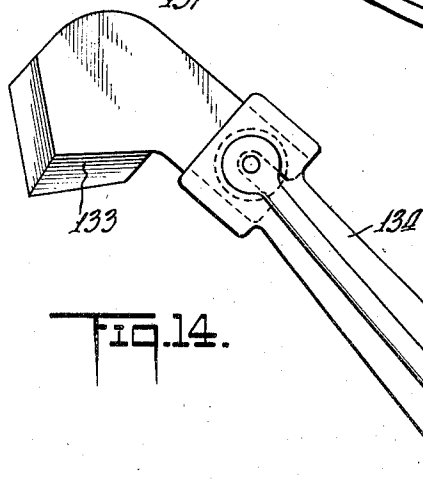
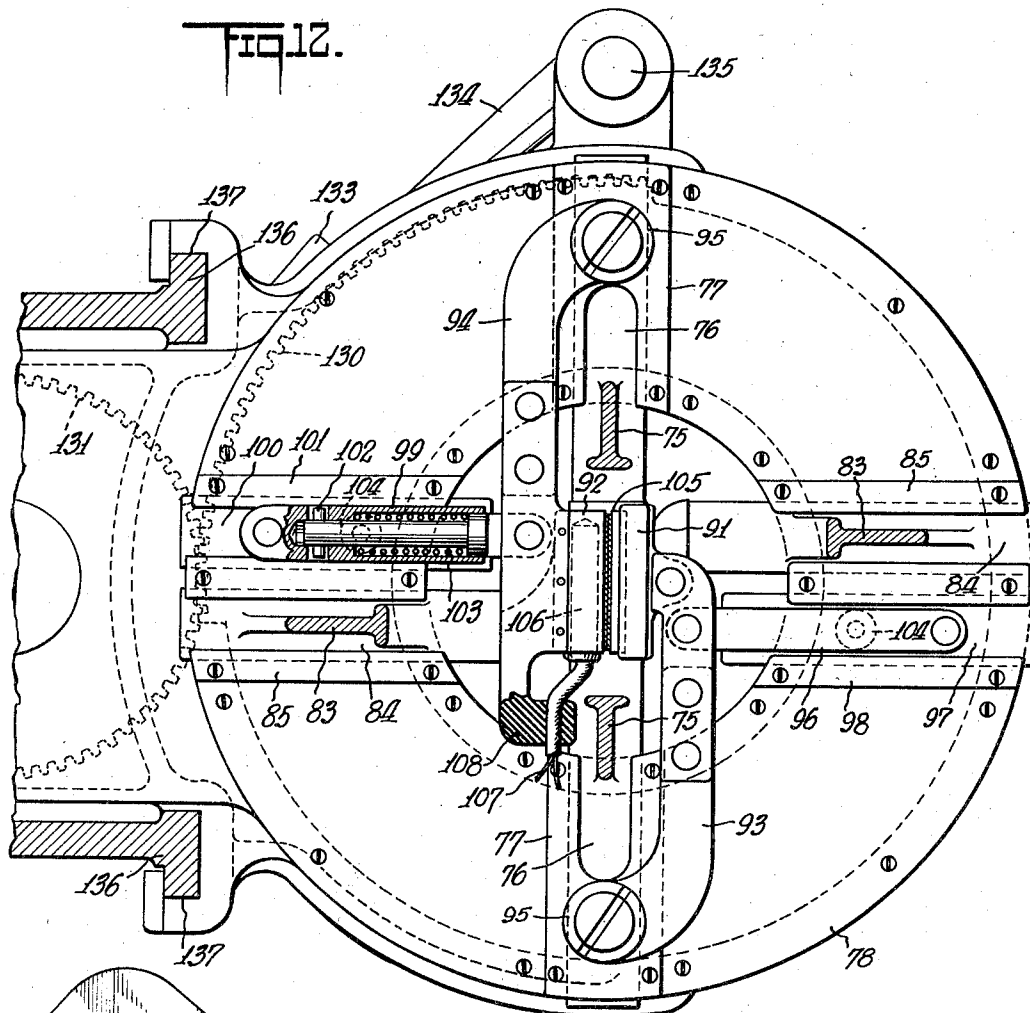
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PACKAGING MACHINE

Original Filed Oct. 2, 1935 13 Sheets-Sheet 8



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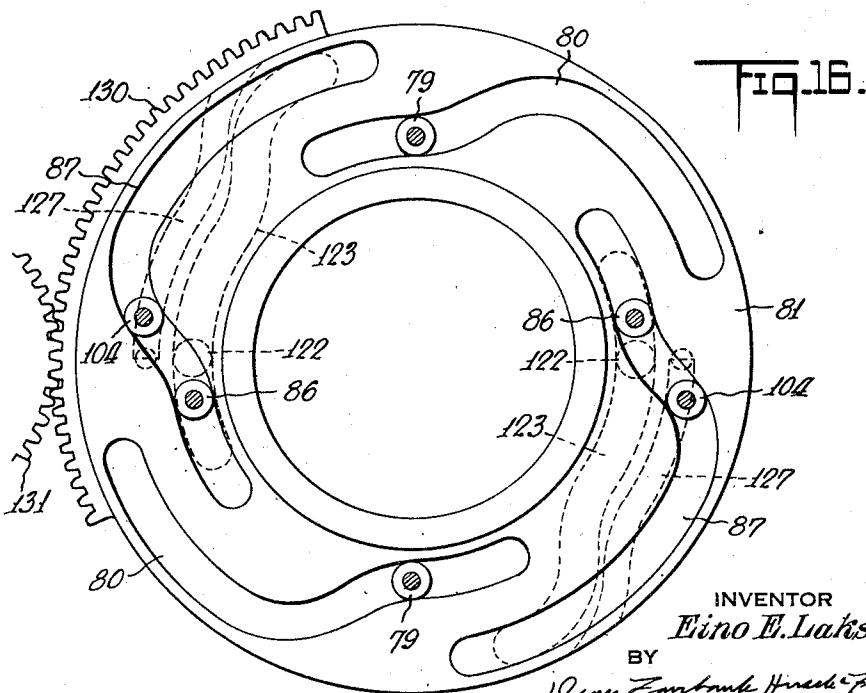
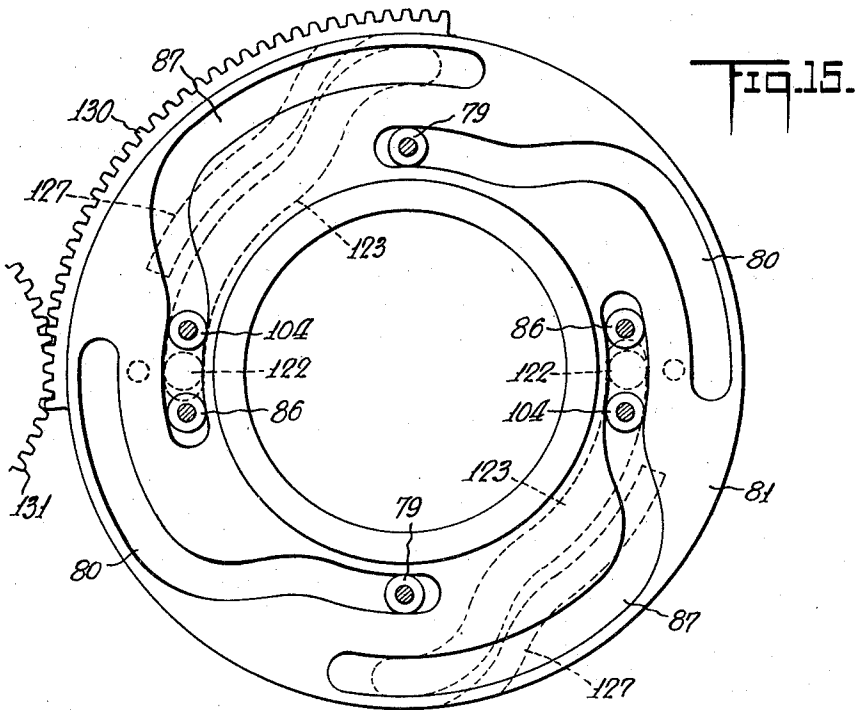
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PACKAGING MACHINE

Original Filed Oct. 2, 1935 13 Sheets-Sheet 9



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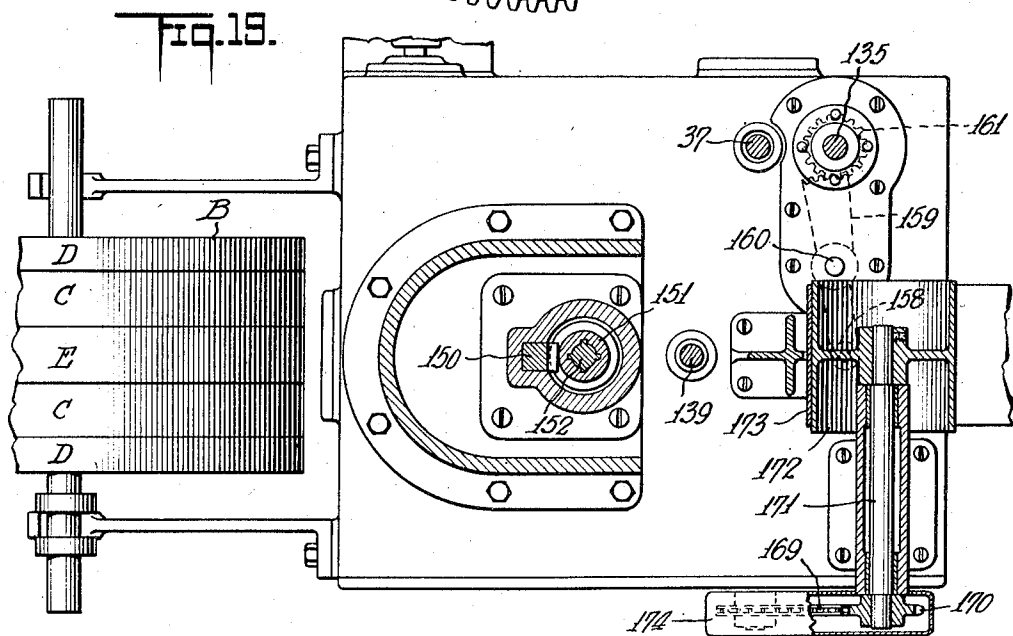
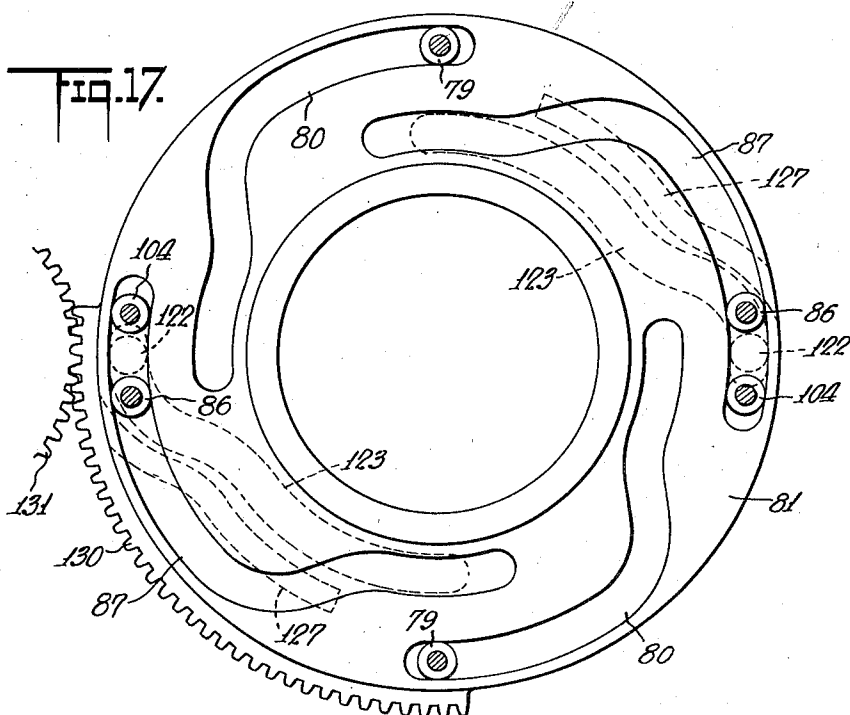
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PACKAGING MACHINE

Original Filed Oct. 2, 1935 13 Sheets-Sheet 10



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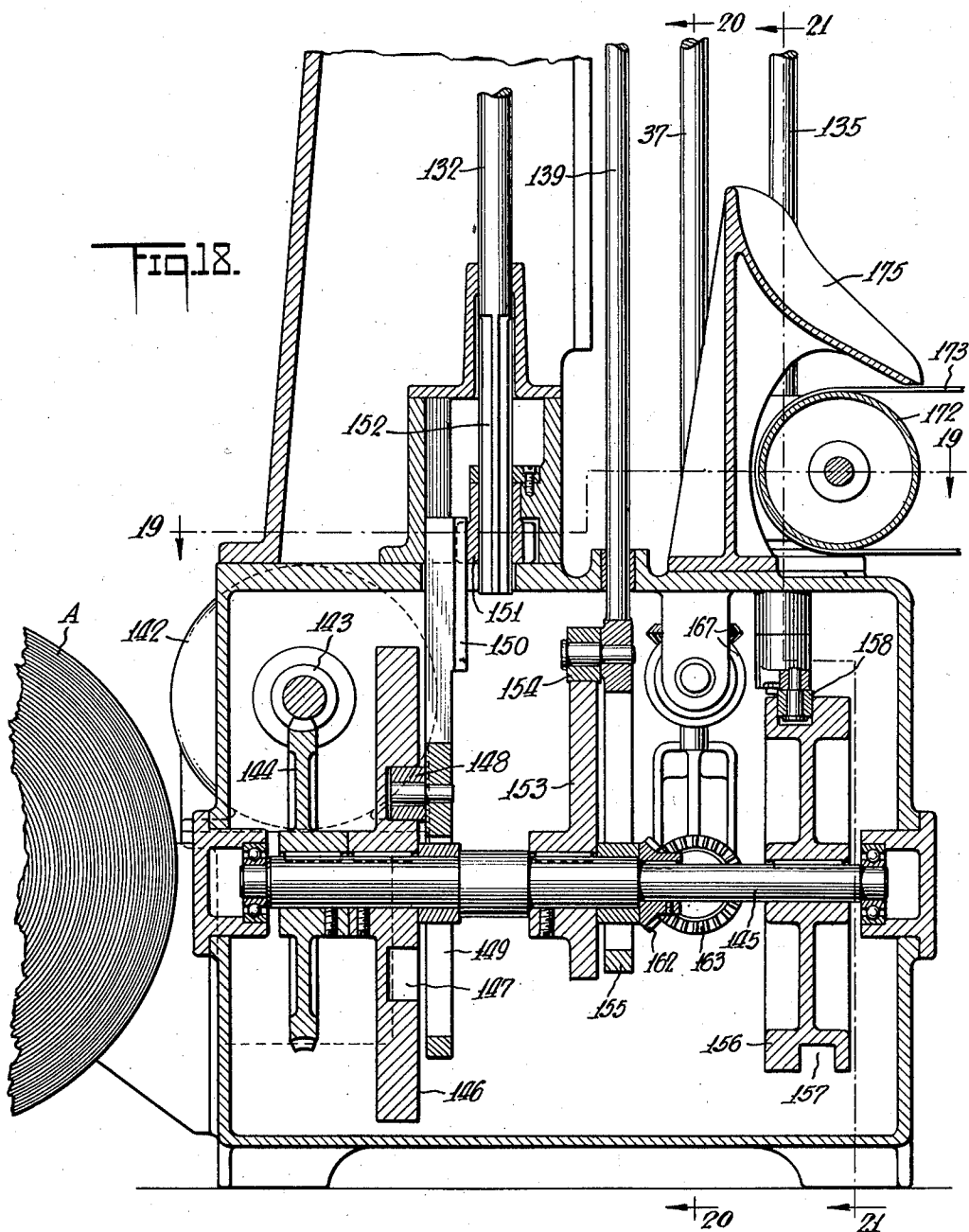
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PACKAGING MACHINE

Original Filed Oct. 2, 1935 13 Sheets-Sheet 11



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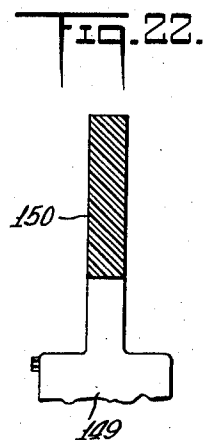
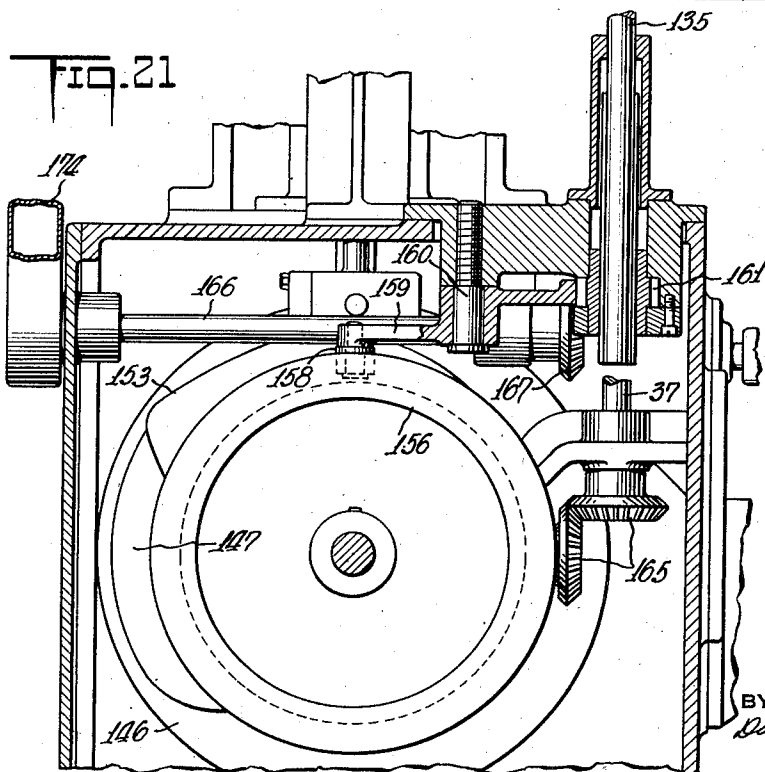
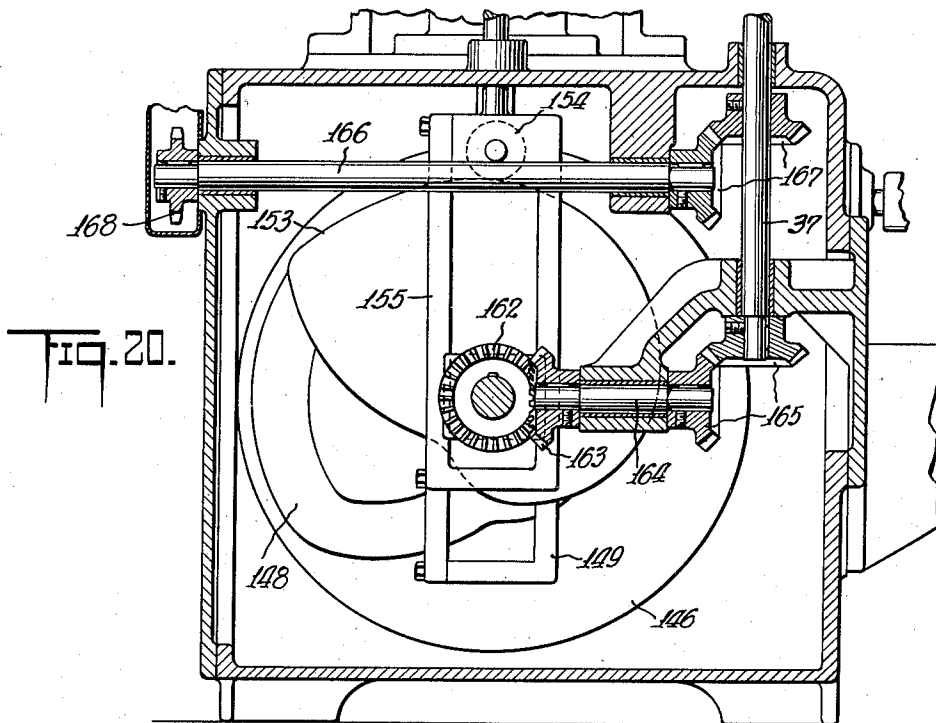
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PACKAGING MACHINE

Original Filed Oct. 2, 1935 13 Sheets-Sheet 12



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PACKAGING MACHINE

Original Filed Oct. 2, 1935

13 Sheets-Sheet 13

Fig. 23.

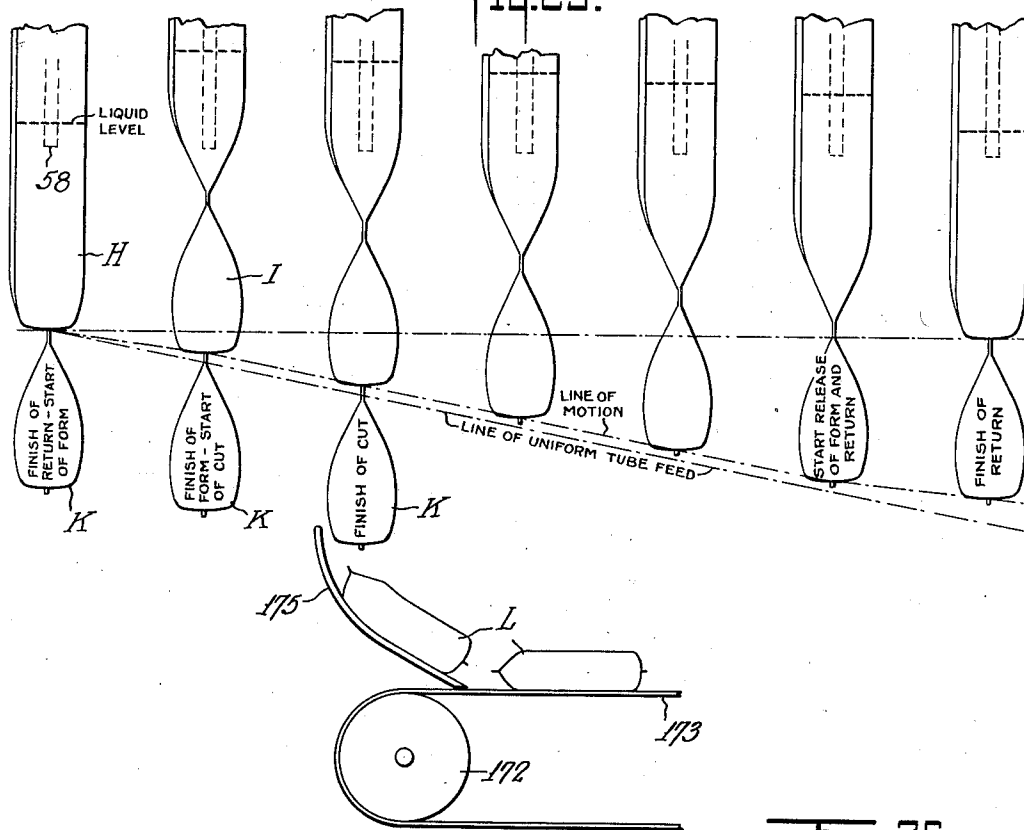


Fig. 24.

Fig. 25.

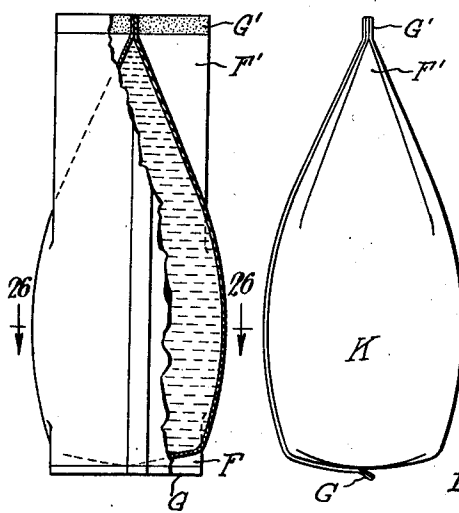
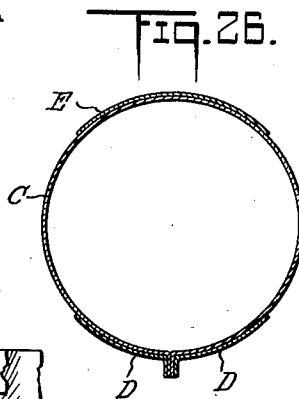
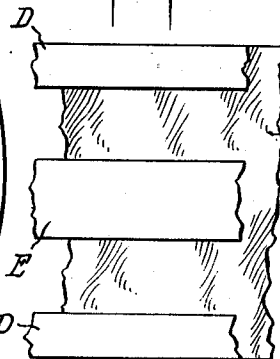


Fig. 27.



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UNITED STATES PATENT OFFICE

2,113,658

PACKAGING MACHINE

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mesne assignments, to Owens-Illinois Glass
Company, Toledo, Ohio, a corporation of Ohio

Application October 2, 1935, Serial No. 43,140
Renewed September 8, 1937

20 Claims. (Cl. 93—2)

This invention relates to machines for forming sealed packages including a liquid or other pourable material, and relates more particularly to the type of machine which operates to form a tubular casing encircling the material to be packaged and closes the ends of the package.

Although certain features of my invention are equally applicable for use in machines for packaging pulverulent, granular or other solid material or a plastic material, my improved machine in certain of its novel features and in its preferred embodiment is primarily adapted for the packaging of liquids.

Certain features of the invention are particularly adapted for use in forming a wrapper of a transparent flexible impervious material, layers of which may be sealed together merely by the application of heat and pressure even though the surfaces of said layers may be wet by the liquid being packaged and said liquid is squeezed out from between said surfaces by the application of the pressure employed in effecting the heat seal. A material of this kind is on the market under the name of "Pliofilm" and is understood to have as its base a chlorinated rubber compound. Other materials having the desired properties might be employed for the enwrapment or casing of the package.

The casing material is preferably supplied in sheet form and its opposed edges progressively brought together to form a tube into which the liquid is delivered as the tube is formed and the tube is collapsed or pinched together and sealed at spaced points along its length as it is formed and filled.

As one important feature I utilize the weight of the liquid in the tube as the means for advancing it downwardly beyond the points at which it is formed and filled.

As another important feature the sealing off of successive filled sections of the tube includes the tucking in of opposed sides so that the end seam is of a length not substantially greater than the diameter of the tube.

As a further important feature the portion of the filled tube is so supported or controlled that the sealing off insures the forming of a package of predetermined volume, and the complete filling with liquid so that each package contains a definite and predetermined volume of liquid without the necessity of any other measuring or weighing mechanism. This method of sealing below the liquid level prevents the inclusion of air or surface foam in the package.

My invention may be employed in many different embodiments, and therefore, the specific construction shown in the accompanying drawings is to be considered merely as a preferred embodiment, and various changes may be made in the details of construction and arrangement of parts without departing from the spirit of the invention.

In these drawings:

Fig. 1 is a front elevation of the machine, a portion of the casing being broken away to show a part of the driving gearing,

Fig. 2 is a side elevation,

Fig. 3 is a front elevation similar to a portion of Fig. 1, but on a larger scale and the enwrapping material being omitted,

Figs. 4 and 5 are sectional details on the lines 4—4 and 5—5 respectively of Fig. 3,

Figs. 6 and 7 are vertical and transverse sections on the lines 6—6 and 7—7 respectively of Fig. 5.

Fig. 8 is a vertical section through the portion of the machine for forming and sealing the tube sections or bags, said section being taken on the line 8—8 of Fig. 1,

Fig. 8a is a face view of one of the sealing elements,

Fig. 9 is a section similar to a portion of Fig. 8, but showing the parts in a different position.

Fig. 10 is a section on the line 10—10 of Fig. 8,

Fig. 11 is a top plan view of certain of the parts shown in Fig. 8 and taken on the line 11—11 of that figure,

Fig. 12 is a horizontal section on the line 12—12 of Fig. 8,

Fig. 13 is a plan view of one of the bag forming and supporting clamps taken on the line 13—13 of Fig. 8,

Fig. 14 is a perspective view of the cutter,

Fig. 15 is a transverse section on the line 15—15 of Fig. 8 and showing the sealing cam,

Figs. 16 and 17 are views similar to Fig. 15, but showing the sealing cam in different operating positions,

Fig. 18 is a vertical section of certain of the gearing taken on the line 18—18 of Fig. 1,

Fig. 19 is a transverse section on the line 19—19 of Fig. 18,

Figs. 20 and 21 are sections on the lines 20—20 and 21—21 respectively of Fig. 18,

Fig. 22 is a face view of a vertically movable rack gear shown in Fig. 18,

Fig. 23 is a diagrammatic view showing the tube and bag in the successive positions which it occupies in the formation of the packages,

Fig. 24 is an edge view of one of the packages, certain of the parts being broken away,

Fig. 25 is a view at right angles to the view shown in Fig. 24,

Fig. 26 is a transverse section on the line 26—26 of Fig. 24, but on a slightly larger scale, and

Fig. 27 is a face view of a portion of the laminated sheet material which may be employed, and on a somewhat smaller scale.

In the specific machine illustrated, the sheet material A is delivered from a roll B as shown in Fig. 2. This sheet material may be of the character illustrated in Fig. 27 and includes a sheet C of thin transparent impervious flexible material of such a composition that superposed layers may be sealed together by heat and pressure. As a reinforcement for the sheet C and to protect the sheet along the longitudinal and transverse seams which are to be formed, the sheet C is provided with marginal strips D adjacent to opposite longitudinal edges and an intermediate strip E. These strips D and E are preferably of paper, although they may be of other materials which are not fused or softened at the sealing temperature of the sheet C and which will protect the sheet C from direct contact with the mechanism which applies the pressure and heat. This sheet material and its characteristics and advantages are more fully set forth, and this construction is claimed in my copending application Serial No. 41,345, filed September 20, 1935.

The laminated sheet A delivered from the roll B passes over a guide roll 30 and between a pair of feed rolls 31, 32. The guide roll 30 is supported on a pair of arms 33 pivoted at opposite sides of the machine and having extensions 34 which may be adjusted by screws 35 or other equivalent means so that the sheet will properly enter between the two feed rolls. These rolls are connected by gears 36 and the upper roll is driven at the desired uniform speed from a shaft 37 through gears 38. The lower feed roll 32 is adjustable toward and from the upper roll by any suitable means to pinch the sheet with the desired pressure and to prevent slipping. As shown in Fig. 4 the lower roll is carried by a pivoted bracket 39 and adjustable by one or more adjusting screws 40.

As the sheet material passes from between the feed rolls it is guided over an inclined substantially triangular apron 41 and below this apron is a pair of inclined guides 42 for progressively bringing the opposite edges of the sheet substantially together. These guides 42 may be substantially parallel and are preferably adjustable toward and from each other not only to secure the desired folding of the sheet but also to facilitate the initial threading up of the sheet. As shown they are each carried by a separate slide or bracket 43 which is transversely movable in the T-slot of a transverse bar 44 and may be held in adjusted position by clamping screws 45.

The support for the guides 42 is shown as disposed substantially directly below the feed rolls, and the guides 42 incline outwardly and upwardly so that their outer upper ends are adjacent to but upon opposite sides of the apex of the triangular apron or guide 41.

The sheet passes downwardly between the two guides 42 and then into mechanism which brings the sheet to substantially cylindrical form. This mechanism includes a pair of outer approximately semi-cylindrical guides 46 rigidly but adjustably supported on the frame of the machine. The supports as shown include a pair of outwardly extending rods 47 slidable in a bracket 48 and held

in adjusted position by means of set screws 49 as shown particularly in Figs. 3, 6 and 7.

Encircled by the guides 46 is a pair of guides 50, 51 which may be in the form of discs or rings of an external diameter equal to the desired internal diameter of the tube to be formed and which may be spaced from the guides 46 to a distance substantially equal to the thickness of the sheet by the adjustment of the guides 46 in the brackets 48.

The sheet is of a width slightly greater than the circumference of the guides 50, 51 so that as the sheet passes downwardly between the outer guides 46 and the inner guides 50, 51, the edges of the sheet will come together and lie in superposed relationship in a radial plane whereby they may be pressed and sealed together to form the tube. This sealing mechanism will be described more fully hereinafter.

The guides 50, 51 may be carried by or integral with a bracket 52 which is supported on the frame of the machine and extends inwardly between the edges of the sheet at a point above where said edges are brought together. This bracket may be comparatively thin and downwardly tapered in a vertical transverse plane between the edges of the sheet as is shown particularly in Fig. 6. The bracket has a passage there-through for the delivery of the liquid to the tube at a point below that at which the edges are sealed together. As shown the bracket has a depending non-cylindrical stud 53 seated in a correspondingly shaped socket in a bracket 54 on the frame of the machine so that the bracket 52 and the parts carried thereby may be readily lifted out for cleaning, sterilizing, adjustment or repair.

The bracket 52 is shown as connected to a supply pipe 55 and has a horizontal bore 56 intersecting a vertical bore 57. At the lower end of the latter there may be an extension pipe 58 leading down into the tube to a point substantially below the desired liquid level in the latter so as to prevent foaming. To facilitate cleaning, the bore 57 may have a removable closure 59 at the upper end so that upon removing said closure a cleaning brush may be passed through the bore 57 and extension 58. The bracket also carries a float 60 disposed within the tube and serving to control the supply of liquid and maintain a substantially constant liquid level. As shown this float is provided with a guide rod 61 extending through the guide 50 and a lug 62, and this rod is connected by a link 63 to a pivoted lever 64. This lever has a depending extension 65 which is connected by a link 66 to a valve 67 which engages a seat in the end of the bore 56. As the liquid level in the tube rises the float 60 will swing the lever 64, 65 in a counterclockwise direction as viewed in Fig. 5 and tend to close the valve 67. In normal operations the float 60 may move up and down in a comparatively narrow range and regulate the supply of liquid and maintain the liquid level varying within the limits somewhat diagrammatically indicated in Fig. 23.

To facilitate cleaning, the link 63 is detachably connected to the lever 64, for instance, by having a pin held at the base of a slot by means of a spring 68.

The operation of the valve and float may be regulated by a counterbalancing weight 69 adjustable toward and from the pivotal support 70 of the lever.

The two edges of the sheet, after they are brought together, are sealed together by a pair of sealing members 110 between which the out-

standing edges of the sheet pass as shown particularly in Fig. 7. Each of these members has therein an electrical heating unit 111 similar to the heating coil 106 (Fig. 12). The two members

110 are supported upon lever arms 112 mounted upon parallel rock shafts 113 which are connected for simultaneous opposite rotation by gears 114. One of these rock shafts 113 is provided with a lever arm 115 extending in opposite directions therefrom and having its opposite ends connected by links 116 to the cores of solenoids 117. The lever arm 115 has an upwardly extending arm section 118 connected to a spring 119. With the parts in the position shown in Figs. 6 and 7 the spring exerts a pull tending to rotate the rock shafts in such direction as to press the sealing members together and apply a slight pressure to the opposite sides of the edges of the material sliding therebetween. When the machine is stopped for any reason a circuit may be automatically or manually closed to energize the solenoid shown at the right of Fig. 6 to rock the lever arm and swing the spring 119 to the opposite side of dead center so as to pull the sealing members apart. This will prevent any overheating of the portion of the sheet material between these members when the machine is at rest, and the material is not in motion. Upon starting the machine the other solenoid may be manually or automatically energized to rock the lever arm in the opposite direction and bring the sealing members together and bring the spring to the position where it exerts a yielding pressure tending to prevent separation of the members.

Below the float there is provided means which brings together the opposite sides of the tube and effects a transverse seal. The mechanism which folds and tucks in the sides is shown particularly in Figs. 8 to 12 inclusive. This includes four members 71, 72, 73 and 74, shown in top plan view in Fig. 11. The diametrically opposite members 71 and 73 are wedge-shaped with the tapered face receding from the point as shown in Fig. 10. The other two members 72 and 74 have their lower edges, shown in dotted lines in Fig. 11, adapted to come together substantially along a diameter of the tube. All four of the members flare upwardly and outwardly and each at its upper end is arcuate and extends along approximately one-quarter of the circumference of the tube.

The two members 71 and 73 serve as tuckers and taper downwardly substantially to a radial line as well as tapering inwardly. These two members are carried by brackets 75 which are in turn carried by slides 76 mounted to move endwise and radially of the tube in guides 77 on a cam casing 78 forming a sliding frame section of the machine. Each slide 76 has a roller 79 on the under side thereof and traveling in a cam groove 80 of a cam member 81 described more in detail later.

The two members 72 and 74 change in shape progressively downwardly from arcuate sections extending along approximately one-quarter of the tube to substantially flat parallel lower end portions 82 spaced slightly apart so that there may be slight liquid flow in the juxtaposed part of the tube. These members are carried by brackets 83 which are somewhat similar to the brackets 75 except that they are offset in opposite directions as shown in Figs. 11 and 12. These brackets are mounted on and carried by slides 84 somewhat similar to the slides 76, but at right angles thereto. These slides 84 are mounted in guides

85 and each has a roller 86 upon its under side and mounted to travel in a cam groove 87 which is in the cam member 81 previously referred to.

The four members 71, 72, 73 and 74 are moved inwardly and outwardly by the rotation of the cam member 81 as will be described hereinafter more in detail. The lower ends of members 72 and 74 terminate at a lower plane than the ends of 71 and 73, due to 72 and 74 coming practically together and clearance being provided between the flat faces 82 and the sides of the wedge-shaped tuckers bringing edge 89 on a higher plane.

Below said plane and rigid with each of these members are similarly shaped corresponding members in reverse position in respect to the horizontal plane. The lower members 71a and 73a are similar to the members 71 and 73 except that they converge upwardly rather than downwardly and serve to tuck in the lower portion of the same opposed folds which are tucked in by the two upper members. These members 71a and 73a may be rigidly connected to and depend from the slides 76.

The members 72a and 74a are similar to 72 and 74, but converge upwardly and terminate in substantially flat portions 88 with their edges parallel to and directly below the edges of the portions 82 and parallel to the edge portions 89 of the upper members 71 and 73 and the parallel radial portions 90 of the sections 71a and 73a. These members 72a and 74a are carried by and depend from the slides 84.

The four upper members and corresponding lower members are movable to an outer limiting position so as to permit the tube or bag to hang substantially freely therebetween as shown in Fig. 9, or may be moved inwardly to the positions shown in Figs. 8, 10 and 11 to collapse a section of the tube. The upper members 71 and 73 form the reentrant tucks F and the lower members form the reentrant tucks F' as shown in Figs. 24 and 25. The upper members 72 and 74 press together opposite sides to form what becomes the transverse seam G and the lower members act similarly to form the part that becomes the seam G' as also shown in these same figures.

The upper members and lower members are spaced apart to collapse a section of approximately twice the width of a desired terminal seam of the completed package, and means are provided for effecting the seal while the folding and tucking members are in inward position. This sealing means includes a pair of pressure applying members 91, 92 which have opposed sides substantially parallel to each other and also parallel to the edges of the portions 82 and 88. The sealing members 91 and 92 are carried by arms 93, 94 respectively which are mounted upon opposed pivot pins 95. The arm 93 is connected by a link 96 to a slide 97 movable in guideways 98 and parallel to one of the slides 84. The arm 94 is connected by a link 99 to a slide 100 movable in guideways 101 and parallel to the other of the slides 84. The link 96 may be a rigid bar, but the link 99 is preferably made of two telescoping sections with limited relative endwise movement. As shown a pin 102 limits this relative endwise movement of the sections while a spring 103 tends to extend the link 99 to the maximum extent.

The two slides 97 and 100 are provided with rollers 104 on the under sides and travel in the same grooves 87 as do the rollers 86.

The pressure applying member 91 may have a

substantially straight surface or inserted bar 105 of rubber or other equivalent resilient material, while the opposed member 92 may be of metal and have therein an electrical heating coil 106 connected to conductors 107 supported in an extension 108 on the arm 94. This extension including the portion which directly supports the member 92 may be of insulating material to prevent undue conduction of heat away from the surface to be heated.

When the folding and tucking members are in outermost or open position the cam member 81 is in the position shown in Fig. 17. As this cam is rotated in a clockwise direction from the position shown in Fig. 17 the rollers 79 and 86 are first brought inwardly as indicated in Fig. 16. At the time the rollers reach the position shown in Fig. 16 the folding and tucking members have reached their innermost position and they form the tucks in two sides of the tube and press the other two sides together. The cam grooves are of such shape that the cam member may continue this clockwise rotation from the position shown in Fig. 16 to the position shown in Fig. 15 and during this portion of the rotation the folding and tucking members will not be moved, but the rollers 104 will be brought inwardly to swing the two arms 93 and 94 toward each other and to press the members 91 and 92 against the sides of the tube to seal the juxtaposed layers together and to form a transverse hermetically tight seal. As the cam rotates in the opposite direction the sealing members will first be moved away from the seam and the folding and tucking members will thereafter be moved outwardly to the position shown in Fig. 9.

In order to effect the proper seal and to prevent undue strain on portions of the wall of the completed package the member 92 preferably has a face thereof provided with reentrant angles 109 as shown particularly in Fig. 8a, the purpose of which is described in detail in the copending Vogt and Lakso application Serial No. 36,772, filed August 19, 1935.

The casing 78 forming the housing for the cam member 81 also supports slides which carry members which act to support the weight of the filled section of the bag during the time the folding, tucking and sealing operations are effected, and these cooperate with the members 71a, 72a, 73a and 74a in giving to the completed package the accurately predetermined shaped and therefore volume at the time the sealing is effected. As shown particularly in Figs. 8, 9, 10 and 13 there is a pair of these supporting members 120 each forming substantially one-half of an open topped cup receiving the lower end of the tube above the point of the last previous seal. These members are mounted for vertical sliding movement in slides 121 radially movable on the under side of the casing 78 and below and parallel to the slides 84. Each slide 121 has a roller 122 mounted to travel in a cam groove 123 in the under side of the cam member 81 and shown in dotted lines in Figs. 15, 16 and 17.

For moving the supporting members 120 vertically on the slides 121 the latter are shown as provided with levers 124 mounted on pivot pins 125 intermediate of their ends and in the under side of the slides 121. One end of each lever extends into a socket in the supporting member 120 while the opposite end rests on a pin 126 which is mounted for vertical sliding movement in the slide 121. The upper end of each pin 126 engages the under side of the cam member 81 and may

be forced down or permitted to rise during the rotation of the cam member 81 by the action of an inclined surface 127 shown in dotted lines in Figs. 15, 16 and 17. The radially outer end of each slide 121 is bifurcated as shown in Fig. 13, and the casing is provided with a pair of lugs 128, 129 which engage the outer end of the levers 124 and force these ends upwardly and therefore force the support members 120 downwardly when the slides 121 have moved outward radially to such an extent that the pins 126 come beyond the outer surface of the adjacent portion of the cam member 81 or to a high portion of the cam surface.

The cam groove 123 and the cam surface 127 are of such shape that when the folding and tucking means are in outermost position as shown in Fig. 9 the supporting members 120 are in innermost position and form a support for the lower sealed off end of the bag or tube as shown in Fig. 9, and the members 120 are also in their lowermost position. As the sealing and tucking members move inwardly the walls of the tube take an inclined position and therefore the surfaces would tend to have a relative vertical movement in respect to the tucking and folding members. To compensate for this the sealed off bottom of the tube is raised at the same time that the folding and tucking members come inwardly so that the portion of the tube wall opposite the sealing members 91, 92 does not have any vertical movement in respect to these members during the inward movement of the walls. When the tucking, folding and sealing have been effected and the parts are in the positions shown in Figs. 8 and 10 the support members 120 will move outwardly with the members 71, 72, 73 and 74 and their corresponding members 71a, 72a, 73a and 74a to permit relative movement from the sealing position to a position substantially flush with the lower ends of the members 120. Upon the reverse movement of the cam members the members 120 are first moved inwardly to form a support for the sealed end before the tucking and folding members come in to form the next seal thereabove.

Any suitable means may be employed for oscillating the cam member 81. As shown in Figs. 8, 12, 15, 16 and 17 a portion of the periphery of the cam member is provided with a gear section 130 which meshes with a pinion 131 mounted on a shaft 132 having means for oscillating the same. By making the gears 131 of one-half the pitch diameter of the gear section 130 a rotation of the shaft through 180° will rotate the cam member 81 through the desired angle of 90°.

After the completion of the sealing operation above described, and before the members 120 are separated, the sealed off section of the tube which forms the package is cut off directly below the members 120 intermediate of the upper and lower edges of the walls which were sealed together by the members 91, 92. For this purpose there is provided a knife 133 connected to an arm 134 mounted to swing in a horizontal plane and carried by a vertical shaft 135. The knife is preferably one having a point which will first pierce the sealed section and with diverging edges which progressively cut the material in opposite directions from the point at which it is pierced. The cutting movement of the knife as well as the return movement out of the material is effected while the supporting members 120 are in their innermost position and substantially stationary, and the knife travels closely adjacent to the substantially flat under surface of the members 120

so that said members adequately support the seam during the severing action.

It is preferable that the sheet material be continuously delivered by the feed rolls at a substantially uniform rate, and it is likewise desirable that there be no relative vertical movement of the tucking, folding, transverse sealing and cutting means in respect to the sheet or tube during the operation of said members. Therefore these members are mounted for back and forth vertical movement. As shown the casing 78 which encloses the cam member and supports said members and their guides is not a rigid part of the frame, but is mounted to slide vertically and has grooves 137 engaging guides 136, of the stationary part of the frame as shown in Fig. 12. The casing 78 is provided with a lug 138 connected to a vertical reciprocating rod 139 and is also provided with a lug 140 providing a bearing for the pinion 131 for moving the latter and its shaft 132 vertically in keeping it in mesh with the gear segment 130. It also has a lug 141 within which is mounted the bearing for the shaft 135 and effecting the corresponding vertical movement of the latter and the knife guided thereby. Obviously if desired the shafts 132 and 135 need not move vertically, but in that event the casing 78 should be provided with suitable parts for sliding the pinion 131 and the hub of the arm 134 vertically on splines on these shafts.

All of the operating parts may be driven from a single motor 142 shown in Fig. 1 and driving a worm 143 meshing with a gear 144. The gear is shown particularly in Fig. 18 as mounted on a shaft 145 disposed in a gear casing in the base of the machine. On this shaft there is provided a disc 146 having a cam groove 147 receiving the roller 148 of a scotch yoke 149. This scotch yoke has an extension 150 provided with inclined rack teeth (see Fig. 22) engaging corresponding teeth on a pinion 151 on a splined extension 152 on the lower end of the shaft 132. The pinion is held against vertical movement, but as the rack bar 150 raises and lowers the pinion 151 is rotated, and this rotation is transmitted to the shaft 132 which may move upwardly and downwardly through the pinion in accordance with the movement of the operating mechanism above described.

The shaft 145 is provided with a second cam 153 which engages a roll 154 on a second scotch yoke 155. This scotch yoke is connected to the rod 139, and the cam 153 is of such shape as to impart the desired vertical movement to the casing 78 and the parts mounted therein or carried thereby. The shaft 145 is also provided with a cam wheel 156 having a cam groove 157 in the periphery thereof and receiving a roller 158 mounted on an arm 159 mounted to swing about a horizontal axis on a pivot pin 160. The opposite end of the arm 159 is provided with a gear segment meshing with a pinion 161 held against vertical movement, but splined on the shaft 135. The shape of the cam groove 157 is such as to impart the desired oscillatory movement to the knife 133 and in the proper timed relationship to the other operations.

The shaft 145 is also provided with a bevel pinion 162 meshing with a bevel pinion 163 on a countershaft 164, and this countershaft is connected to the shaft 37 by a second pair of bevel pinions 165. Through this gearing the feed rollers are continuously rotated, whereas the other mechanisms directly operated from the shaft 145,

namely, the oscillatory cutter, the oscillatory gear member and the vertically movable housing, have back and forth movement rather than continuous one-way movements.

The shaft 37 may be connected to a second countershaft 166 through bevel pinions 167, and the countershaft may serve to operate a conveyor for carrying away the completed packages after they are severed. As shown the countershaft 166 is provided with a sprocket wheel 168 which is connected by a chain 169 to a sprocket wheel 170 on a shaft 171 which drives the pulley 172 of a belt conveyor 173. The sprockets and chains may be enclosed in a housing 174.

Directly below the lowest point of the supporting members 120 there may be provided a chute 175 for guiding the severed packages onto the conveyor as shown in Figs. 1 and 2. The packages when suspended may be of the shape shown in Figs. 2, 24 and 25, but when resting upon the side the liquid pressure will cause them to be symmetrical at opposite ends as shown at the right of Fig. 2 and in Fig. 23 as the members 71, 72, 73 and 74 are of substantially the same shape and inclination as the members 71a, 72a, 73a and 74a.

If the sequence of operations is not entirely clear from the foregoing description of the machine, it will be apparent from Fig. 23 which shows the successive positions. It will be noted from this figure that the position of the lower end of the filling tube 58 does not change, but that the liquid level changes with the collapsing of the section of the tube and the forming of the seal. The bottom of the tube section above the seam at first does not drop as rapidly as the line of uniform feed of the sheet due to the upward movement of the members 120, but after the seal has been formed as in the second and third positions in Fig. 23 and the sealed off section is being cut off, the parts open out to the position shown in Fig. 9 and the lower end of the sealed off section lowers at the same rate as the sheet material and the liquid level drops slightly due to the fact that the liquid is not being fed in as fast as the tube is lowered. The liquid level rapidly rises again during the movement from the first to the second position in Fig. 23 due to the collapsing of the sides of the tube. If a variable rate of feed be provided for the sheet material and a stopping and starting of the feed during the sealing and cutting operations, then it is not necessary to provide for any vertical movement of the tucking, folding, sealing, supporting and cutting mechanisms.

The sheet material may be more or less elastic or the sealing together of the edges of the sheet to form the longitudinal seam may permit slight variation in the diameter of the tube, and therefore in the diameter of the final package. The casing members 71a, 72a, 73a and 74a together with the bottom supporting members 120 give to the package definite and predetermined shape and volume, and therefore accurately determined volume of the contents of the package. If the tube be too large due to stretching of the material, partial opening of the seam or for other cause, the members 71a, 72a, 73a, 74a and 120 will bring the package down to a predetermined shape and may possibly even form a slight fold in a part of the wall and expel a small amount of the liquid upwardly between the surfaces which are held but not tightly by the parts 82 and 88.

The sealing device does not operate until after

the encasing members are in final position, and therefore at the instant the sealing is effected the contents has been brought accurately to the predetermined volume before the sealing.

5 Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A packaging machine including means for progressively forming a tube and continuously
10 advancing it at a uniform rate, a sealing clamp for sealing together opposite sides of the tube to form closures at successive spaced points along the length of the tube, and means for moving
15 said sealing clamp back and forth along the path of movement of the tube.

2. A packaging machine including means for progressively forming a vertically disposed tube, a sealing clamp for sealing together opposite sides
20 of the tube to form closures at successive spaced points along the length of the tube, and means for moving said sealing clamp back and forth along the path of movement of the tube, said tube advancing downwardly by gravity at a uni-
25 form rate during the upward movement of said clamp and said clamp moving downwardly with said tube during the sealing operation and through a lesser distance than the space between successive sealing points.

3. A packaging machine including means for progressively forming a tube and permitting it
30 to advance downwardly at a uniform rate by the action of gravity, means for filling said tube with liquid, and means for sealing together opposite sides of said tube to form closures at spaced
35 points along the length of the tube as the tube descends, said sealing means being disposed below the minimum liquid level maintained in said tube, whereby each sealed off section of the tube is completely filled with liquid.

4. A packaging machine including means for continuously advancing a strip of sheet material
40 at a uniform rate, means for progressively sealing together the opposite edges of said strip to form a tube, means for delivering liquid to said tube and at such a rate in respect to the rate of forma-
45 tion of the tube as to maintain a liquid level within said tube between predetermined limits, and means for successively sealing off sections of the tube as the tube advances and at points below
50 said lower limit.

5. A packaging machine including means for progressively forming a vertically disposed tube, means for delivering liquid to said tube, a float
55 within said tube for controlling the rate of flow of the liquid in respect to the rate of movement of the tube, and means disposed below said float for sealing off successive packages from the lower end of the filled section of the tube.

6. A packaging machine including means for continuously advancing a strip of sheet material,
60 means for bringing together the opposite edges of said strip to form a tube with the edge portions together and extending outwardly radially from the wall of the tube, and means for pressing and
65 sealing together said outwardly extending edge portions as the formed tube advances.

7. A packaging machine including means for continuously advancing a strip of sheet material,
70 means for bringing together the opposite edges of said strip to form a tube with the edge portions together and extending outwardly radially from the wall of the tube, and heated sealing clamps yieldingly pressed together and between
75 which said outwardly extending edges pass to

progressively form a seal along the length of the tube.

8. A packaging machine including means for continuously advancing a strip of sheet material,
5 means for bringing together the opposite edges of said strip to form a tube with the edge portions together and extending outwardly radially from the wall of the tube, a pair of heated clamp mem-
10 bers between which said edge portions pass, and yielding means for pressing said clamp members toward each other or holding them in spaced relationship.

9. A packaging machine including means for progressively forming a depending tube, means
15 for delivering filling material to the lower portion of the tube as the latter is formed, a vertically movable member encircling said lower portion, means carried by said member for sealing off the lower filled portion of the tube at spaced points
20 along the downward movement of the latter, and a cam carried by said member and encircling said tube for operating said sealing means.

10. A packaging machine including means for progressively forming a depending tube, means
25 for delivering filling material to the lower portion of the tube as the latter is formed, a vertically movable member encircling said lower portion, means carried by said member for sealing off the lower filled portion of the tube at spaced
30 points along the downward movement of the latter, and means also carried by said member for supporting the bottom of the tube during the sealing operation.

11. A packaging machine including means for progressively forming a downwardly moving sus-
35 pended tube, casing members movable toward and from said tube for engaging the latter and giving to the lower portion of the tube a predetermined shape and volume, and means disposed above said casing members for sealing off said
40 lower portion of predetermined shape.

12. A packaging machine including means for progressively forming a downwardly moving sus-
45 pended tube, casing members movable toward and from said tube for engaging the latter and giving to the lower portion of the tube a predetermined shape and volume, and means disposed above said casing members for sealing off said lower portion of predetermined shape, said casing members and
50 said sealing means being movable outwardly away from said tube to permit the latter to move downwardly therebetween by gravity.

13. A packaging machine including means for progressively forming a depending tube, means
55 for delivering filling material to said tube, members for forcing toward each other opposite sides of said tube thereby reducing the volume of the lower portion of the tube, means for supporting and lifting the bottom of the tube during the inward movement of said members, and means
60 above said members for sealing together the tube to form a package.

14. A packaging machine including means for progressively forming a depending tube, means
65 for delivering filling material to said tube, members for forcing toward each other opposite sides of said tube thereby reducing the volume of the lower portion of the tube, means for supporting and lifting the bottom of the tube during the inward movement of said members, means above
70 said members for sealing together the tube to form a package, and means below said support for cutting off the previously formed and sealed package intermediate of the upper and lower edges of the sealed portion.

15. A packaging machine including means for advancing a strip of sheet material at a uniform rate, means for progressively sealing together opposite edges thereof to form a tube, means for
 5 filling the lower portion of said tube, a member movable lengthwise of said tube, means carried by said member for bringing together opposite edges of said tube, and means for moving said
 10 member vertically and at a rate different from the rate of movement of said sheet material during the inward movement of said fourth mentioned means.

16. A packaging machine including means for progressively forming and filling a tube formed
 15 of flexible sheet material, a member encircling said tube and movable vertically through a range materially less than the length of the desired package, means carried by said member for bringing together opposite sides of the tube,
 20 means also carried by said member for sealing said sides together to form a hermetic closure, means also carried by said member for supporting the bottom of the tube during said sealing operation, and means also carried by said mem-
 25 ber and disposed below said supporting means for cutting off a previously formed package.

17. A packaging machine including means for progressively forming and filling a tube formed
 30 of flexible sheet material, a member encircling said tube and movable vertically through a range materially less than the length of the desired package, means carried by said member for bringing together opposite sides of the tube, means also carried by said member for sealing
 35 said sides together to form a hermetic closure, means also carried by said member for supporting the bottom of the tube during said sealing operation, means also carried by said member and disposed below said supporting means for cutting off a previously formed package, and a
 40 cam encircling said tube and carried by said member and serving to actuate all of said other means carried by said member.

18. A packaging machine including means for

advancing a strip of material at a uniform rate, means for progressively forming said strip into a depending tube, means for filling the lower por-
 5 tion of said tube, said strip feeding means serving to control the downward movement of the filled lower portion of the tube by gravity, means for tucking in opposite sides of the tube at a point
 10 above the lower end thereof, means for pressing together other sides to form a thin transversely extended section with unfolded tucks, and means for sealing together the separate layers of the tube wall at said section to form a hermetic seal.

19. A packaging machine including means for advancing a strip of material at a uniform rate, means for progressively forming said strip into
 15 a depending tube, means for filling the lower portion of said tube, said strip feeding means serving to control the downward movement of the filled lower portion of the tube by gravity, means for tucking in opposite sides of the tube
 20 at a point above the lower end thereof, means for pressing together other sides to form a thin transversely extended section with unfolded tucks, means for sealing together the separate layers of the tube wall at said section, and means
 25 spaced therebeneath to a distance substantially the height of a package for severing the sealed section.

20. A packaging machine including a drive shaft, means operated thereby for continuously
 30 advancing a strip of sheet material, means for progressively bringing and sealing together the opposite edges of the strip to form a tube, means for delivering a liquid to the lower portion of said tube, an annular member encircling the tube,
 35 means driven by said shaft for alternately raising and lowering said member, folding, sealing and severing devices carried by said member, and means operated by said shaft for moving said member back and forth to form separate suc-
 40 cessive packages from the progressively filled descending end of the tube.

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