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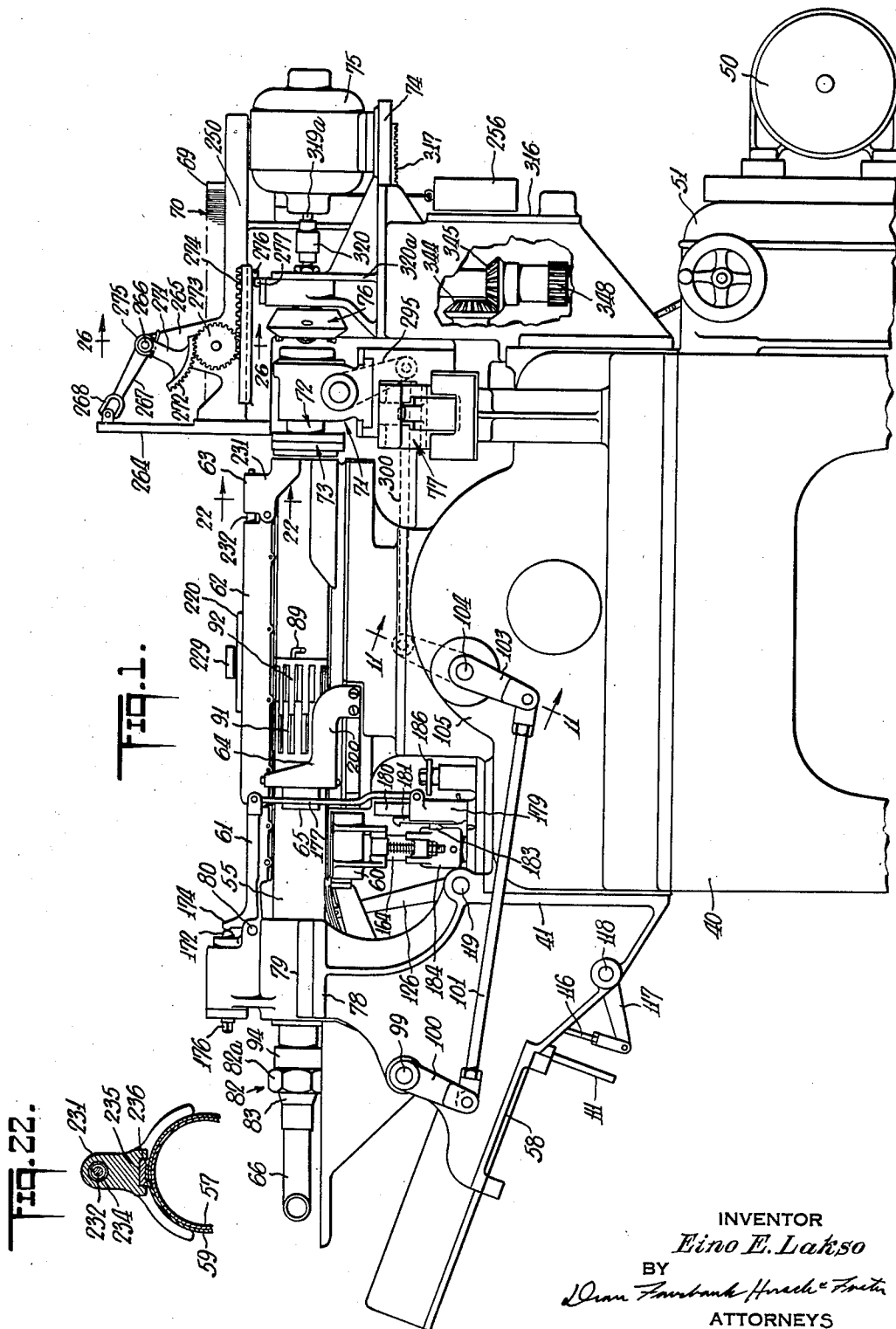
E. E. LAKSO

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PACKAGE FORMING APPARATUS

Filed Aug. 10, 1935

11 Sheets-Sheet 1



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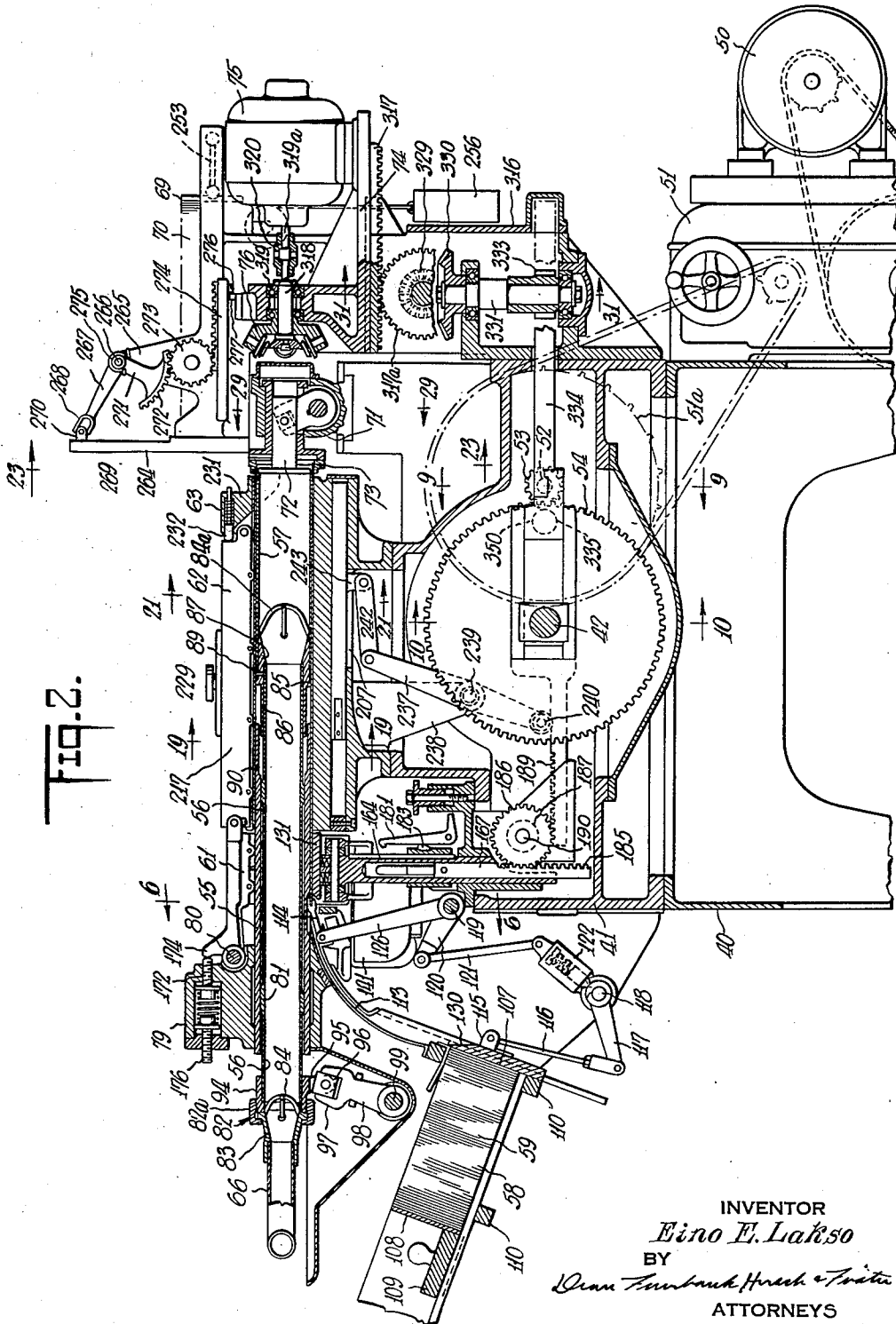
E. E. LAKSO

2,089,273

PACKAGE FORMING APPARATUS

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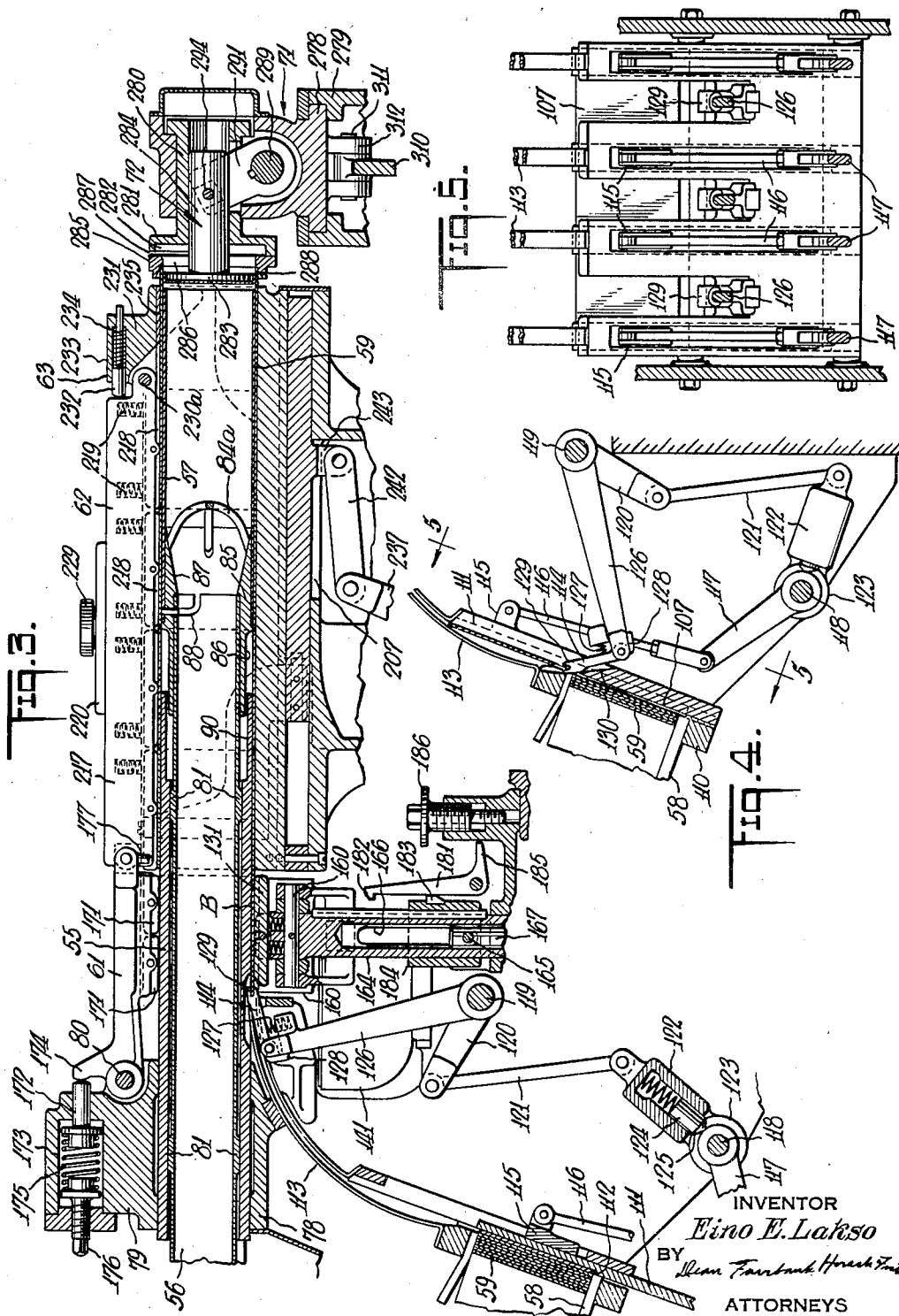
E. E. LAKSO

2,089,273

PACKAGE FORMING APPARATUS

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11 Sheets-Sheet 3



INVENTOR
Eino E. Lakso

BY
Dean Fairbank Hirschfeld
ATTORNEYS

Aug. 10, 1937.

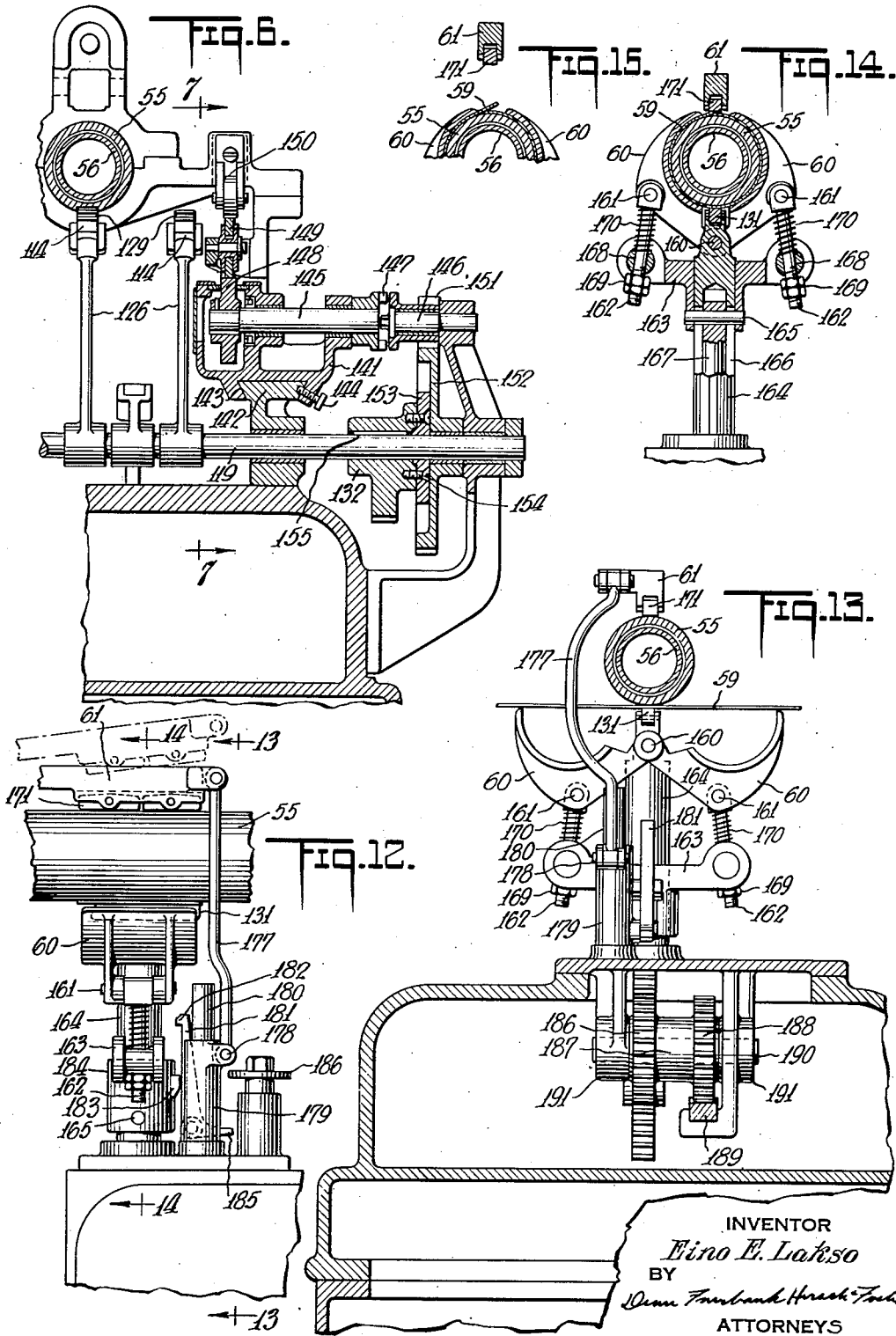
E. E. LAKSO

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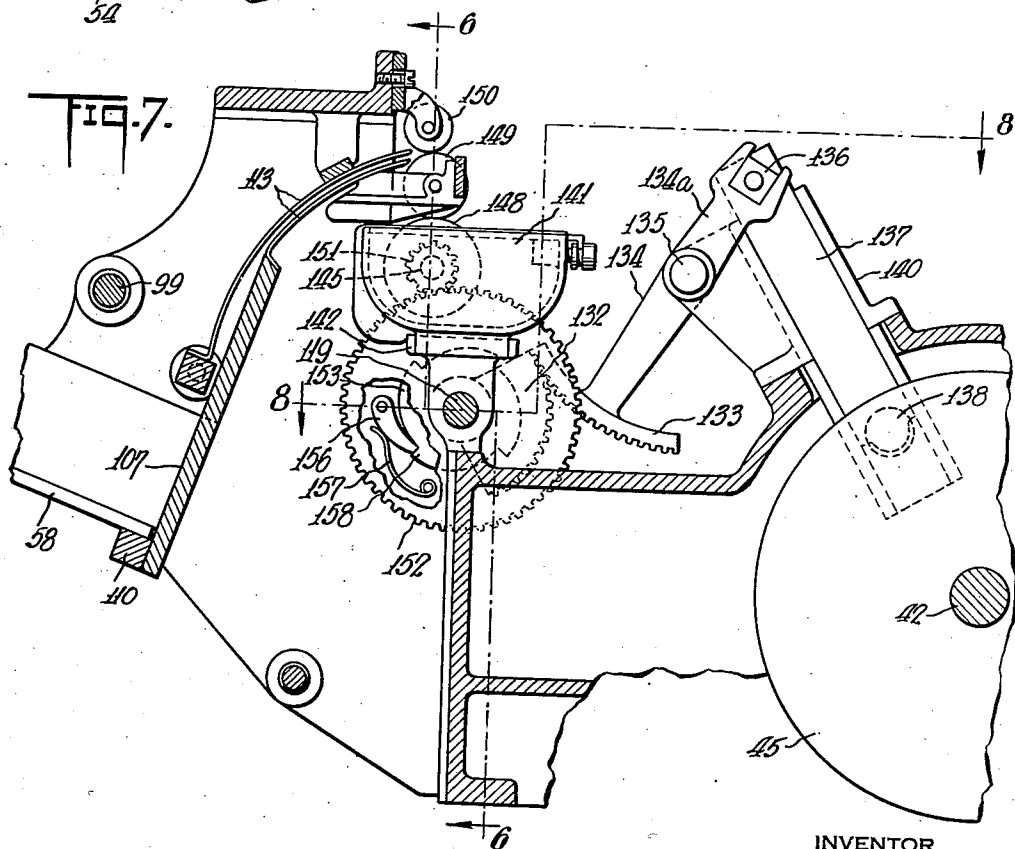
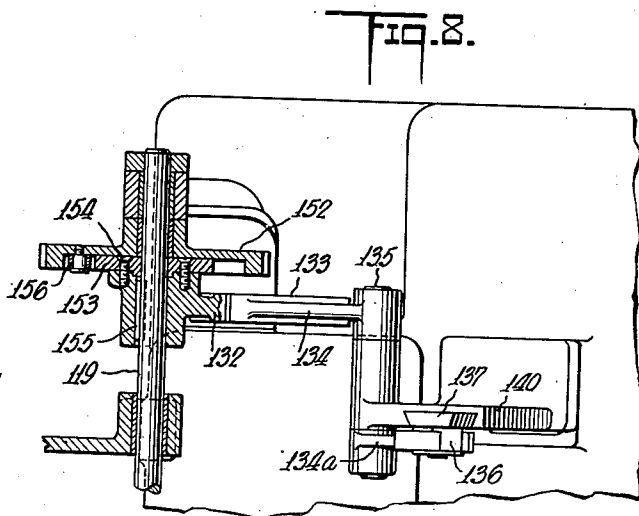
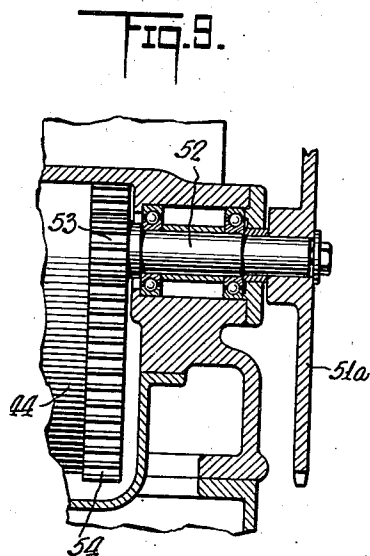
E. E. LAKSO

2,089,273

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11 Sheets-Sheet 5



INVENTOR
Eino E. Lakso
BY
Dean Fairbank Hirsch-Frost
ATTORNEYS

Aug. 10, 1937.

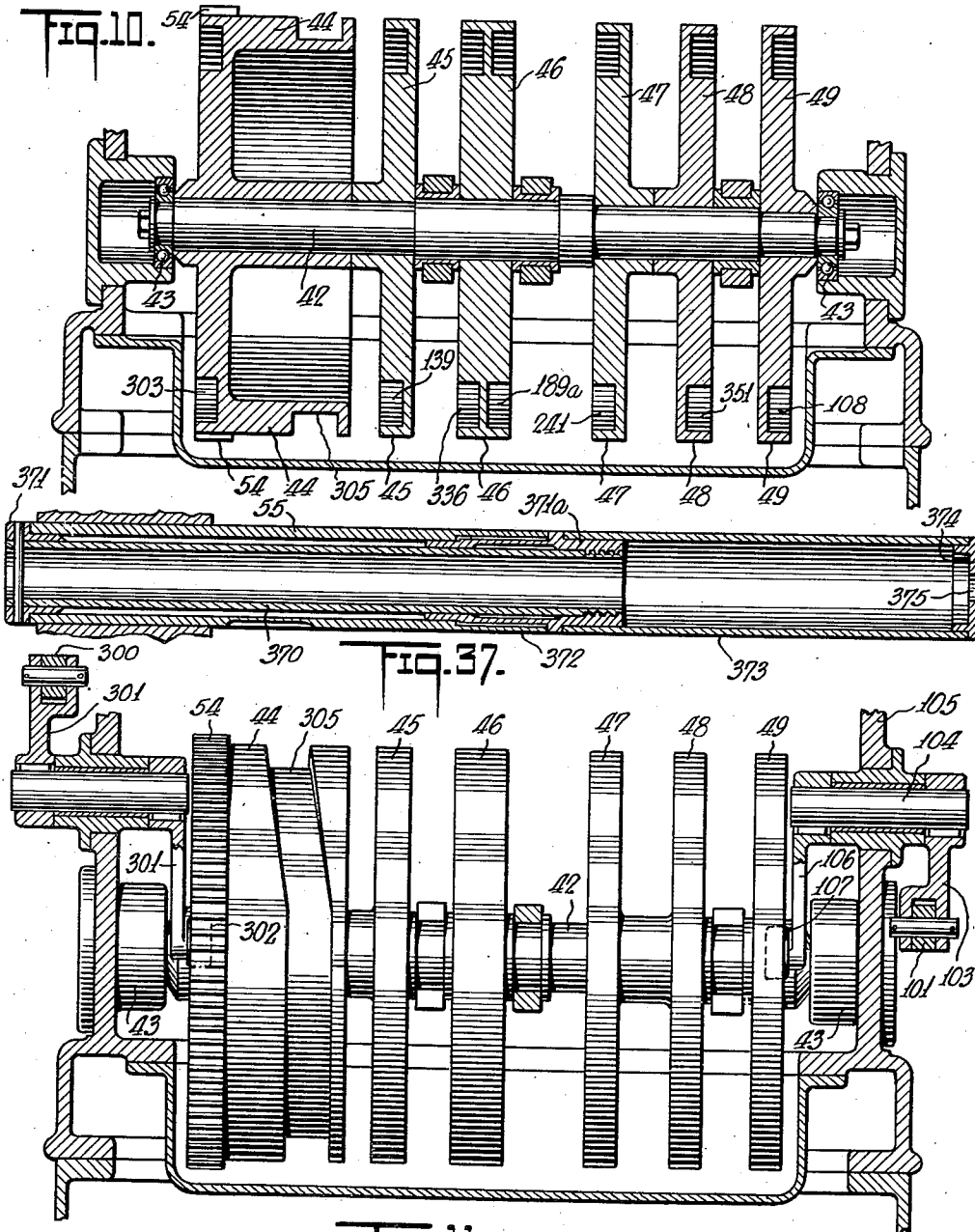
E. E. LAKSO

2,089,273

PACKAGE FORMING APPARATUS

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11 Sheets-Sheet 6



INVENTOR
Eino E. Lakso
BY
Dean Fairbank Hirsch & Foster
ATTORNEYS

Aug. 10, 1937.

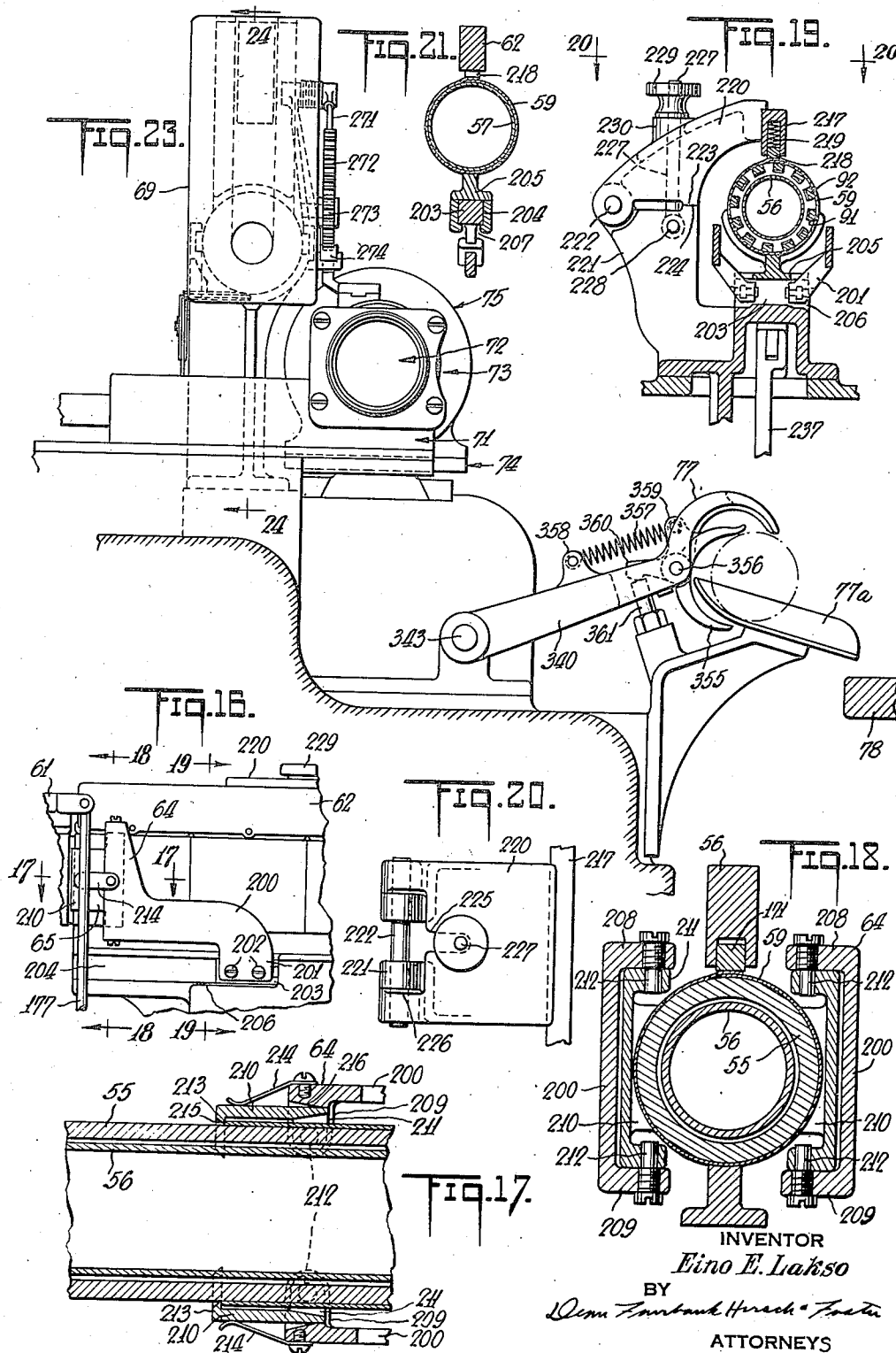
E. E. LAKSO

2,089,273

PACKAGE FORMING APPARATUS

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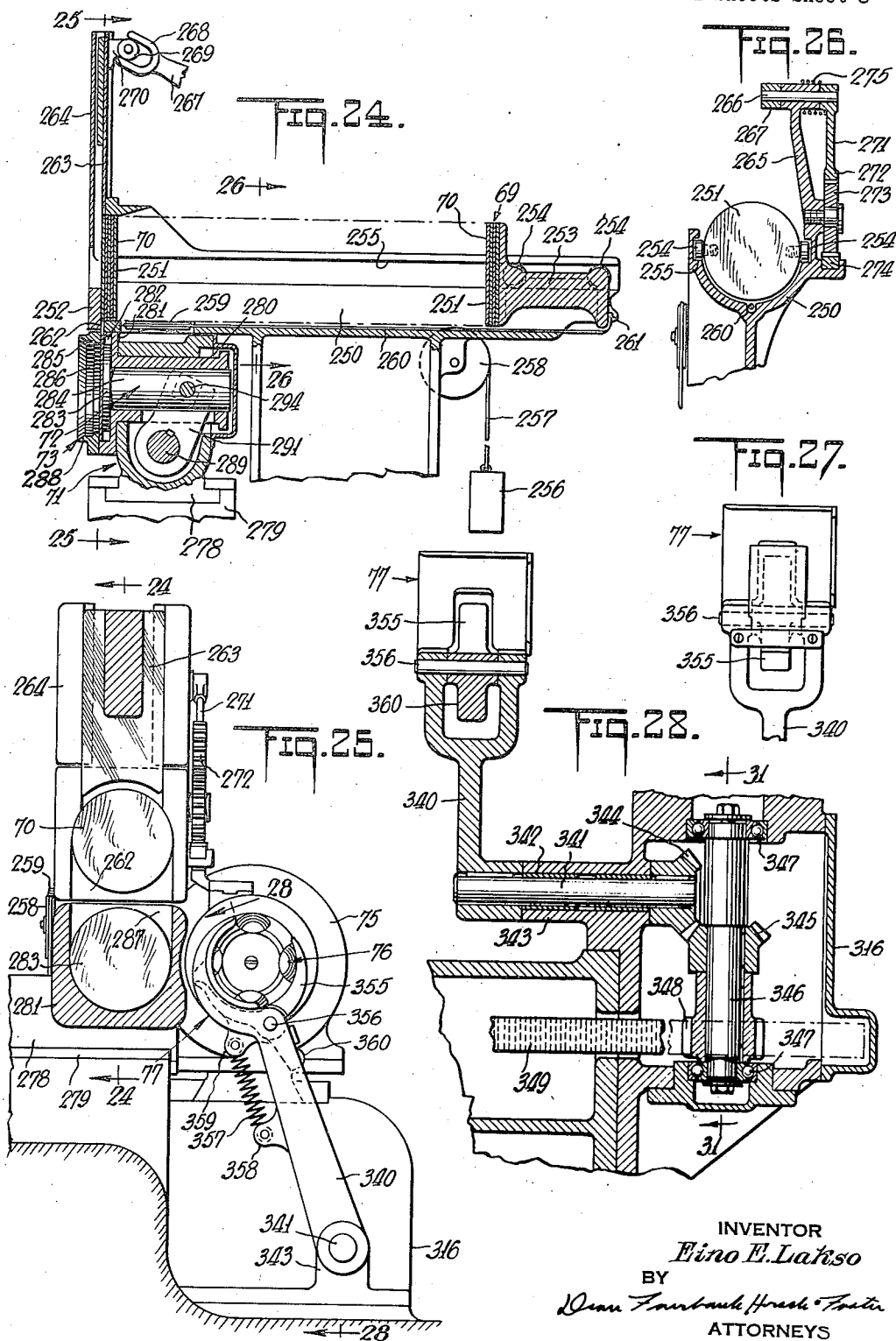
E. E. LAKSO

2,089,273

PACKAGE FORMING APPARATUS

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11 Sheets-Sheet 8



INVENTOR
Eino E. Lakso
BY
Dean Fairbank Hresh Foster
ATTORNEYS

Aug. 10, 1937.

E. E. LAKSO

2,089,273

PACKAGE FORMING APPARATUS

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11 Sheets-Sheet 9

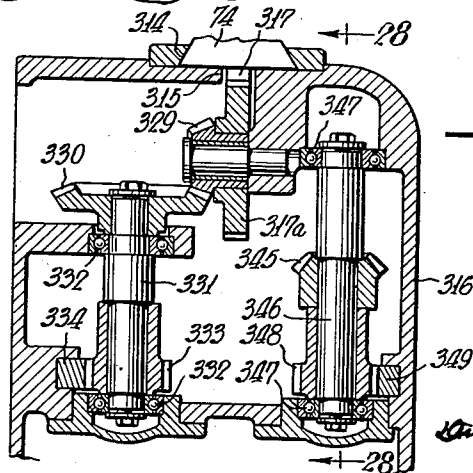
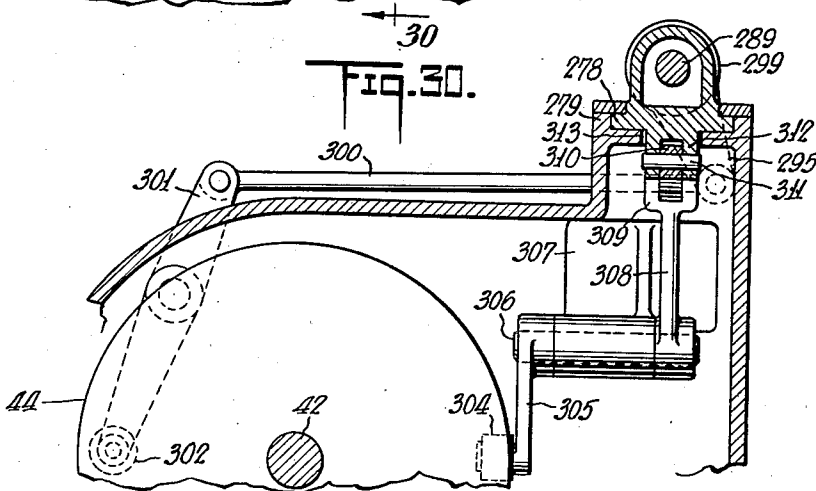
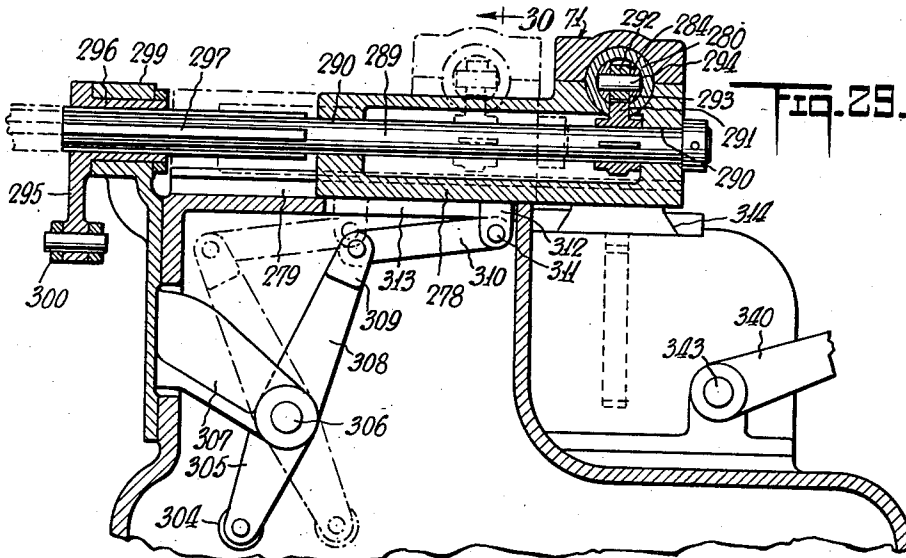


FIG. 31.

INVENTOR
Eino E. Lakso
BY
Oliver Fairbank Henshaw & Frost
ATTORNEYS

Aug. 10, 1937.

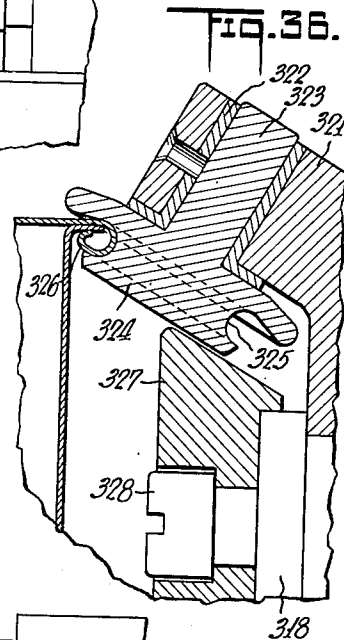
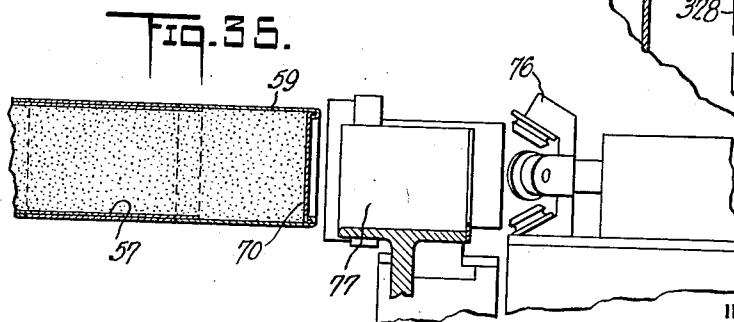
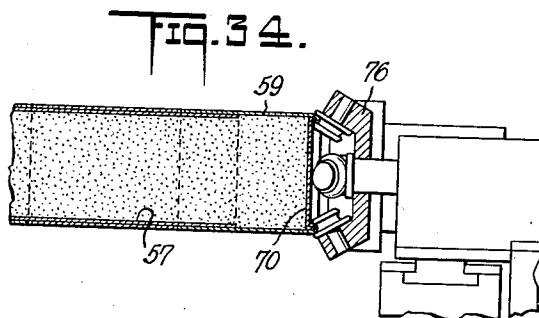
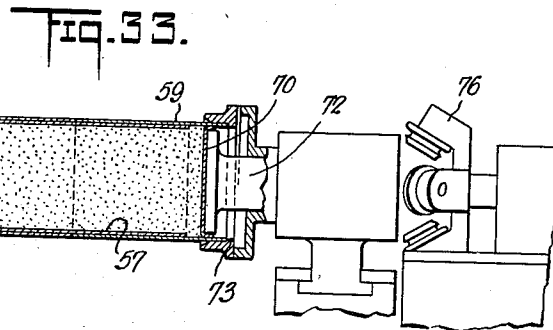
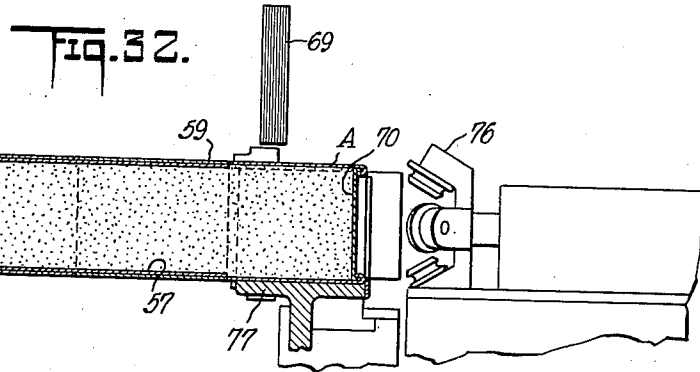
E. E. LAKSO

2,089,273

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Filed Aug. 10, 1935

11 Sheets-Sheet 10



INVENTOR
Eino E. Lakso

BY

Dean Fairbank Hersh & Foster
ATTORNEYS

Aug. 10, 1937.

E. E. LAKSO

2,089,273

PACKAGE FORMING APPARATUS

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11 Sheets-Sheet 11

Fig. 38.

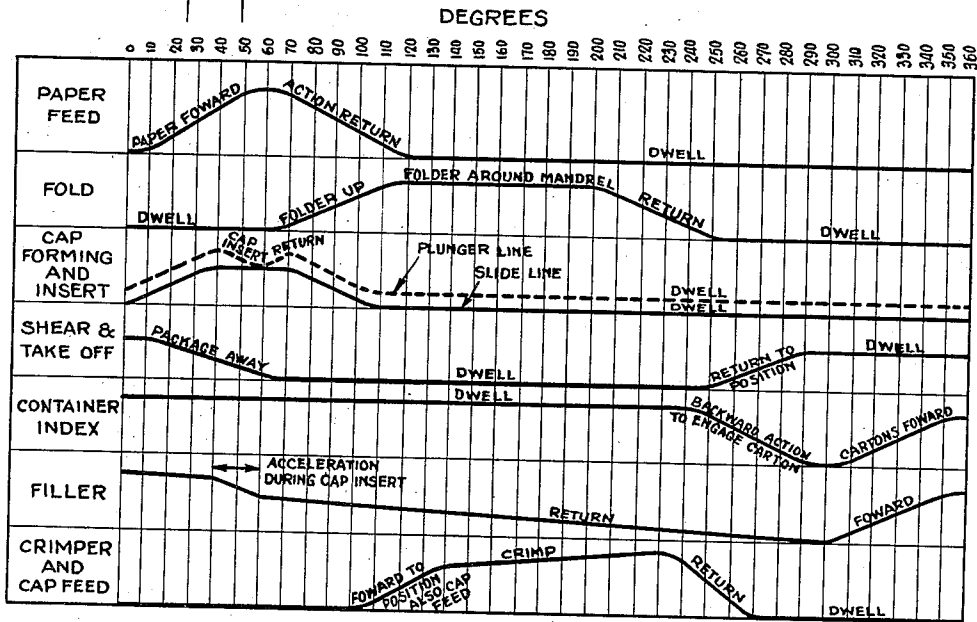
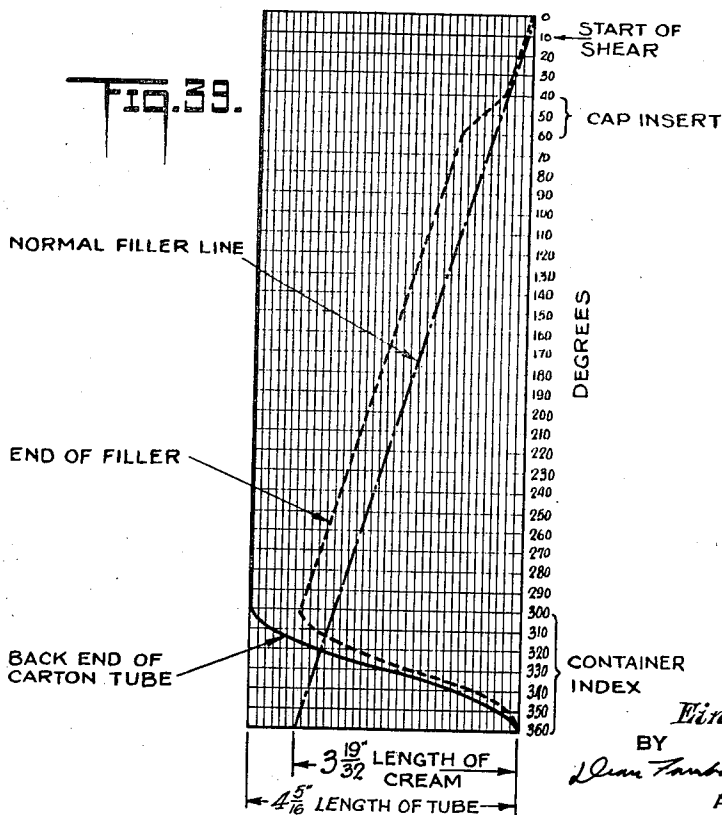


Fig. 39.



INVENTOR
Eino E. Lakso
BY
Dean Fambach, Hersh & Foster
ATTORNEYS

UNITED STATES PATENT OFFICE

2,089,273

PACKAGE FORMING APPARATUS

Eino E. Lakso, Fitchburg, Mass., assignor, by
mesne assignments, to The Girdler Corpora-
tion, Louisville, Ky., a corporation of Dela-
ware

Application August 10, 1935, Serial No. 35,565

20 Claims. (Cl. 93—3)

My present invention relates primarily to the manufacture of packages of plastic material, and in the embodiment illustrated the containers are filled as they are being formed rather than being filled after the forming is completed, and as a separate operation, although the novel features of the container forming apparatus may, if desired, be employed to make the containers to be later filled with any material.

The apparatus is well suited for automatically packaging various types of plastic materials which are sufficiently hard to be form retaining and at the time sufficiently soft to be extruded in filling the package. As an example of such plastic material, I have particularly in mind edible materials which are normally liquid at body temperature, such as partially frozen ice cream, sherbet, water ice or the like, and which may be formed into packages of any predetermined and definite volume.

As one feature of the invention improved means are provided whereby separate blanks are fed in succession, bent to tubular form, the opposite edges sealed together and bottoms attached.

As a further feature I provide improved means for feeding and bending the blanks.

As a further feature I provide improved means for sealing the edges after the tube or peripheral wall is formed by the blank.

As a further feature I provide improved means for feeding blanks to form the bottom, applying them to the peripheral wall and ejecting the container.

As a further feature I provide a hollow mandrel around which the wall blank is bent, so that I may utilize this mandrel for the delivery of the filling material to the tube as the latter is fed off the end of the mandrel.

As a further feature I deliver separate blanks in end to end relationship so as to form what is in effect a continuous tube, and as the latter is filled, the separate sections formed of the separate blanks are moved laterally after being filled, so that the continuous body of filling material is sheared off by this relative movement of the sections of the walls, and no separate subdividing means are required. The wall of the sections may be formed from a continuous strip of sheet material partially but not completely cut transversely into sections. Thus only slight severing of the sheet is required after filling.

As a further feature of the invention the filling tube, which may constitute the mandrel or a part thereof, is given a reciprocating movement so

that during the backward movement the filling material is sucked back from the end of the container tube or peripheral wall so that a bottom wall may be fitted into the end of the peripheral wall as distinguished from fitting over as a cap.

In the embodiment of the invention hereinafter described more in detail, the plastic material is continuously forced under pressure through the filler tube from any suitable source of supply, such for instance as a continuous freezer of the type illustrated in Vogt Patents Nos. 1,783,864, 1,783,866 and 1,783,867.

Blanks for forming the peripheral wall may be of stiff cardboard or the like, and are arranged in a magazine adjacent the mandrel. They are successively carried into position, bent about the mandrel, and adhesive material is applied to at least one edge of each blank as it is shifted from the blank supply magazine into position for bending. The blanks are then brought to tubular form about the mandrel with the adhesive bearing edge of the blank overlapping the opposite edge thereof, and pressure is exerted on the overlapped edges to complete the sealing of the cylinder.

The blanks are slid axially along the mandrel and over the discharge end of the filler tube, the latter being preferably of the same outside diameter as the mandrel and connected to a smaller inlet section of the filler tube which is axially slidable within the mandrel. As the filler moves back the container is filled with the plastic material emanating from the filler tube.

By reason of the axial movement of the filler tube, relative movement of the entire bar of ice cream contained within and projecting beyond the tube is effected with respect to the series of tubular containers which encircle the mandrel. By proper timing of the blank movement and the tube movement, the leading end of the filling material is drawn back from the terminal end of the last container section in order to provide a space for the application of an internal closure cap.

With the peripheral wall completely filled with the material, except for the space at the leading end thereof, a capping mechanism moves into position in axial alignment with the feed tube and forces a flanged cap into the end of the container to form the bottom of the container. This capping mechanism is then shifted laterally to a position where it receives another cap and to provide clearance for a crimping mechanism axially aligned with the filler tube and movable into engagement with the end of the capped

container to lock the cap in the container by spinning or crimping.

Thereafter the crimping mechanism is retracted axially and a shear or take-off mechanism engages the filled container and moves it in a lateral direction, cleanly shearing the plastic bar at the line of abutment of successive wall sections, whereupon the next filled section moves into position to be capped and similarly operated upon.

Preferably the machine is entirely automatic. A single set of cams may control, in properly timed sequence, the movement of the filler tube, the feeding of the cylinder forming blanks, the gluing, folding and sealing of these blanks, the advance of the blanks, the supply of bottoms, the movement of the bottom applying mechanism into and out of alignment with the filled sections, the insertion of the bottoms or ends, withdrawal of the bottom applying mechanism, axial movement of the crimping mechanism and rotary movement of the crimpers, withdrawal of the crimping mechanism, and the operation of the take-away or shearing mechanism.

As previously noted a machine having many features of my invention is capable of forming the containers without filling them. In such a machine the filling tube may be omitted or the machine may be operated without any filling material being supplied.

The machine is so designed that it occupies but a comparatively small amount of space, all the various moving parts being compactly arranged and all of such parts being disposed relatively closely adjacent the control or timing mechanism, to the end that the attachment of the various movable parts to the control cams may be simply effected without the need for using long lever trains or complex shafting and gearing.

Merely as an example, my improved machine may be employed for manufacturing the type of package shown in the Vogt Patent 2,051,923, issued August 25, 1936.

The invention may be more fully understood from the following description in connection with the accompanying drawings, wherein:—

Fig. 1 is a view mainly in side elevation of a machine embodying my invention,

Fig. 2 is an enlarged longitudinal sectional view through such machine,

Fig. 3 is a further enlarged view in longitudinal section through the central portion of the machine illustrating more particularly the paper blank folding or clamping mechanism and the closure cap applying mechanism.

Fig. 4 is a view partly in section and partly in side elevation showing the blank feeding mechanism in the opposite extreme position from the position illustrated in Fig. 3.

Fig. 5 is a view showing part of the paper blank feeding mechanism, this view being taken approximately on the line 5—5 of Fig. 4,

Fig. 6 is a vertical transverse sectional view through the glue applying mechanism and associated parts taken approximately on the line 6—6 of Fig. 7,

Fig. 7 is an enlarged view partly in vertical section and partly in side elevation on the line 7—7 of Fig. 6 showing the actuating mechanism for the adhesive applying means and for the paper blank shifting mechanism,

Fig. 8 is a transverse sectional view on the staggered line 8—8 of Fig. 7,

Fig. 9 is a sectional detail showing part of the

main drive mechanism and taken on the line 9—9 of Fig. 2,

Fig. 10 is a somewhat diagrammatic transverse sectional view on the line 10—10 of Fig. 2 showing the various cams mounted on the master cam shaft,

Fig. 11 is an elevational view of the cams taken on the line 11—11 of Fig. 1 showing the connection of the end cams to the devices which are operated thereby,

Fig. 12 is a side elevational view of the mechanism for actuating the folding clamps and illustrating in dotted lines the uppermost position of the pressure clamp which completes the blank folding operation,

Fig. 13 is a view on the line 13—13 of Fig. 12 showing the folding clamps in open position,

Fig. 14 is a generally similar view on the line 14—14 of Fig. 12, but omitting the operating mechanism for the clamps and showing them in closed position to complete the folding of the cylindrical blank about the mandrel,

Fig. 15 is a sectional detail view illustrating the position of the blank after it has been folded around the mandrel and before the pressure clamp has descended to complete folding of the overlapped blank edges and press said overlapped edges adhesively together.

Fig. 16 is a side elevational detail of the drag clamps or indexing clamps which engage the formed container and advance the series of containers along the mandrel and onto the discharge end of the filler tube,

Fig. 17 is an enlarged longitudinal sectional view on the line 17—17 of Fig. 16,

Fig. 18 is a transverse sectional view on the line 18—18 of Fig. 16,

Fig. 19 is a transverse sectional view on the line 19—19 of Figs. 2 and 16 showing in section the pressure bar which maintains the blanks folded as they traverse the mandrel and filler tube,

Fig. 20 is a top plan view of the mechanism for adjusting the pressure on this bar, said view being taken on line 20—20 of Fig. 19,

Fig. 21 is a transverse sectional view on the line 21—21 of Fig. 2 showing in cross section the actuating bar for the drag clamps,

Fig. 22 is a sectional detail of the tilting clamp which prevents rotation of the cylindrical container during capping and spinning, this view being taken on the line 22—22 of Fig. 1,

Fig. 23 is a transverse sectional view on the line 23—23 of Fig. 2 showing the capper shifted laterally out of registration with the cap magazine and into alignment with the filler tube and container to be capped,

Fig. 24 is a vertical sectional view through the cap blank hopper and cap forming and applying mechanism taken on line 24—24 of Fig. 23 and showing the capper in registry with the hopper,

Fig. 25 is a vertical sectional view on the line 25—25 of Fig. 24, showing the take-off or shear mechanism in position to engage and remove a formed and filled package,

Fig. 26 is a transverse sectional view through the cap magazine on the line 26—26 of Fig. 24,

Fig. 27 is a side elevational view of the package take-off mechanism,

Fig. 28 is a view on the line 28—28 of Fig. 25 showing this device partly in elevation and all of the operating mechanism therefor in section,

Fig. 29 is a transverse sectional view on the line 29—29 of Fig. 2 showing the operating mechanism for shifting the cap forming and filling mechanism into and out of alignment with the

hopper and for reciprocating the cap applying plunger. The dotted lines in this view illustrate the position of the parts just before a cap is fed to the cap applying mechanism from the hopper,

Fig. 30 is a transverse sectional view on the line 30—30 of Fig. 29,

Fig. 31 is a transverse sectional view on the line 31—31 of Figs. 2 and 28,

Figs. 32, 33, 34 and 35 are somewhat diagrammatic views partly in section and partly in elevation illustrating the successive operations of the take-off mechanism, capping mechanism and crimping mechanism and their relationship to the filler tube movement and container indexing,

Fig. 36 is an enlarged sectional detail through the crimping head showing the way in which the container is crimped or beaded to lock the cap in position,

Fig. 37 is a longitudinal sectional view through an adaptor fixture which may replace the filler tube when the machine is merely used for forming containers without filling them,

Fig. 38 is a diagram showing the timing of the cams and graphically illustrating the manner in which the paper blank feed mechanism, the blank folding mechanism, the cap forming and inserting mechanism, the shear and take-off mechanism, the container index or feeding mechanism, the filler tube, the crimper and the cap feeding mechanism are properly relatively timed in order to effect the completion and removal of one package at each revolution of the cam shaft.

Fig. 39 is another diagram indicating the relative positions of the end of the filler tube and the trailing end of the container throughout one complete cycle or one complete revolution of the cam shaft.

In order that the ensuing description of the structural details of the various parts of the machine may be more readily understood I shall first describe the general sequence of operations and the general arrangement of the various mechanisms which constitute the machine without reference to how such mechanisms are operated, or their relative timing.

General assembly

Before describing the machine in detail an understanding of the general assembly and general arrangement of parts may be had from Figs. 1 and 2. Supported on a suitable base 40 is the main frame 41 of the machine, this frame providing bearings for a horizontally disposed, transversely extending cam shaft 42 on which the six main cams (Figs. 10 and 11) are keyed. The cam shaft bearings are shown at 43 (Fig. 10) and the cams are consecutively numbered for future reference as 44 to 49 inclusive.

The main shaft or cam shaft 42 may be driven in any suitable manner as for instance from a motor 50 through a conventional Reeves drive indicated generally at 51, the Reeves drive determining the speed of rotation of a gear 51a on a counter shaft 52 carrying a pinion 53 which meshes with gear teeth 54 arranged on the outer surface of the cam 44.

Fixedly mounted on the frame 41 at a higher elevation than the cams and their shaft is a horizontally disposed hollow mandrel 55, slidable within the mandrel is the smaller inlet section 56 of a two-section filler tube through which plastic material is adapted to be forced under pressure. The tube section 56 has limited sliding movement within the mandrel and is coupled to a larger section 57 projecting beyond the end of

the mandrel and of external diameter corresponding to the external diameter of the mandrel whereby this tube section 57 forms in effect an extension of the mandrel.

A magazine 58 is loaded with a series of rectangular paper blanks 59 and suitable mechanism to be later described engages the foremost blank in the magazine and advances it to a position directly under the mandrel 55, one edge of the blank in the course of this movement having adhesive material applied thereto by gluing mechanism which will be described more fully hereafter.

The cross sectional view of Fig. 13 shows one of these paper blanks 59 arranged under the forming mandrel 55 and it also shows the two folding jaws 60 which engage this blank and warp it around the mandrel in cylindrical form as indicated in Fig. 15 with the ends of the blank overlapping. Thereupon a presser foot 61 descends upon these overlapped edges and presses together to afford firm adhesion.

As the formed cylinders are drawn along the mandrel and drawn along over the feed tube extension 57, the adhesively connected overlap of the tubes or cylinders is always maintained under pressure, a spring clamp 62 serving this purpose during the major portion of travel of the formed cylinders and a second tilting clamp 63 exerting pressure upon the overlapped parts of the cylindrical paper bodies up until the time that they actually advance beyond the feed tube and are filled with the plastic substance.

The indexing means for advancing the formed cylinders includes a reciprocating drag clamp structure indicated generally at 64, the jaws 65 of this clamp being disposed at opposite sides of the mandrel and normally tending to move inwardly against the mandrel or against the paper cylinder which encircles it. The range of reciprocating movement of the drag clamps 64 is equal to the length of one of the formed cylinders so that as the clamp moves to the left from the position of Fig. 1, the jaws will engage behind the last formed cylinder and as the clamp moves to the right, back to the position shown in Fig. 1, the entire line of cylinders on the mandrel and the feed tube extension will be advanced by the push of the last cylinder engaged by the jaws.

A conduit 66 continuously delivers a plastic substance to be packaged into the smaller section 56 of the filler tube, this conduit receiving material from any suitable source of supply such for instance as a continuous ice cream freezer of the type illustrated in Vogt Patents Nos. 1,783,864, 1,783,866 and 1,783,867.

Since the machine is intended not only to fill the cylinders with ice cream but also to insert an end closure into one end of each cylinder and crimp this closure in position and furthermore, since it is desirable that the end of the cylinder which receives the cap should be devoid of cream when the cap is applied, it is necessary that the filler tube itself be axially movable. If for instance the tube is drawn to the left from the position of Fig. 2 at the proper rate of speed, the cream will continue to emerge from the end thereof but the leading end of the extruded bar will remain stationary with respect to the rest of the machine. Also, if this retractile movement of the feed tube is accelerated, the leading end of the bar will actually be retracted with respect to the paper cylinder which encircles it in order to leave the desired amount of space

at the end of the cylinder for the reception of the cap.

Arranged beyond the end of the feed tube and laterally thereof is a cap blank magazine 69 (Figs. 23 and 24) containing a plurality of circular cap blanks 70. A cap transferring and applying mechanism indicated generally at 71 is mounted to slide back and forth from a position under the magazine where it receives one of the cap blanks into a position in axial alignment with the end of the filler tube in which position a plunger member 72 thrusts the cap blank into the end of the leading filled cylinder.

As the cap is thrust home a forming die 73 associated with the plunger (Fig. 33) forms a flange on the cap, whereupon the plunger is withdrawn and the cap transferring and applying mechanism shifted laterally out of alignment with the feed tube and back into position under the cap magazine. Thereupon, a crimper carriage 74 mounting a motor 75 which drives a rotary crimping head 76 axially aligned with the feed tube, is shifted axially, bringing the rotating head into operative engagement with the end of the capped container and crimping the cap in place (preferably by forming a cap flange engaging bead on the end of the container).

Thereafter the crimping mechanism is axially withdrawn to the position of Fig. 2 and a swingable package take-off or shear member 77 (Figs. 23 and 25) engages the filled and capped cylindrical container and shifts it laterally with respect to the filler tube to discharge position, the package being automatically ejected from the take-off member onto discharge chute 77a prior to the return of the take-off device for engaging the next filled and capped container. It is after the crimping of the cap that the entire forward movement of the ice cream bar and the row of cylinders occurs, this movement being comparatively rapid and advancing the filled and capped container through a distance approximately equivalent to its own length into the cradle-like take-off device 77.

Figs. 32 to 35 illustrate diagrammatically the sequence of operations. In Fig. 32 a completely filled, capped and crimped container A has just been projected forward into the cradle-like take-off member 77. The crimping mechanism is axially withdrawn and the cap transferring and applying mechanism is out of registration with the feed tube and is under the cap blank magazine.

In Fig. 33 the take-off has swung the package A to discharge position. The cap transferring and applying mechanism is shifted laterally into axial alignment with the feed tube. The retractile movement of the tube has been slightly accelerated to provide clearance for the entrance of a cap 70 into the mouth of the next cylinder. Plunger 72 has carried this cap forward through the forming die 73 flanging the cap and thrusting it into the cylinder mouth.

In Fig. 34 plunger 72 has been withdrawn and the cap transferring and applying mechanism has again been shifted back into position under the cap blank magazine. The crimping head has come forward and is beading the container mouth over to lock the cap in position. While these operations have been taking place it will be observed that the filler tube has been slowly retracted at a correct rate of speed to prevent any relative movement between the leading end of the ice cream bar and the other parts of the machine. In other words this leading end re-

mains stationary during the capping and crimping.

In Fig. 35 the crimper is withdrawn; the take-off is in position to receive the next package and the filler tube is nearly withdrawn from the newly formed and capped package. At the time that this feed tube fully withdraws to the position shown in Fig. 32, the filler tube and the entire line of cylindrical containers are rapidly advanced through a distance equal to the length of a single container, thereby again moving the filled container A into the take-off which by a lateral swinging movement carries the filled container to discharge. The only material which needs to be sheared is the plastic material and this shears cleanly. The rigid shear or take-off device 77 and the rigid filler tube end 57 of course facilitate the clean shearing action.

Having thus generally described the mode of operation of the apparatus, I shall now describe the various mechanisms which cooperate to form the complete machine and shall then subsequently describe the manner in which these various mechanisms are actuated and timed from the series of cams on the main shaft or cam shaft 42 of the machine.

Forming mandrel and filler tube Figs. 1, 2 and 3

The forming mandrel 55 is both internally and externally cylindrical. It is secured in position with respect to the main frame by cooperating clamping elements 78 and 79 (Fig. 1). Element 78 is in the form of a semi-cylindrical socket integral with the main frame of the machine and element 79 is a complementary semi-cylindrical sleeve coacting with the socket to grip the mandrel. The tilting presser foot member 61 has one end pivoted at 80 in the upper clamp 79.

The feed tube section 56 is of less external diameter than the internal diameter of the mandrel 55 and is provided at intervals with an annular series of externally raised ribs 81 which bear against the inner face of the mandrel and guide the sliding movement of the feed tube with a minimum of friction.

The supply pipe 66 which is of smaller diameter than the feed tube is coupled with feed tube section 56 by a standard coupling 82. This coupling includes an internally tapered section 83 with its smaller end of the same diameter as the supply pipe 66 and its wider end of the same diameter as the feed tube section 56. Arranged in this coupling part is a spreader 84 for plastic material, this spreader illustratively including a generally hemispherical spider construction with its concavity presented toward the supply tube 66. The function of the member 84 is to assist in the expansion of the relatively small diameter stream of plastic material coming from pipe 66 to a sufficient extent so that this cream will completely fill the section 56 of the filler tube proper.

The filler tube section 57 is coupled to the filler tube section 56 by a coupling piece 85, this piece including a reduced portion 86 snugly fitting over the end of the section 56 and an externally cylindrical and internally tapered portion 87 snugly fitting within the larger section 57 and carrying a spreader 84a. A pair of bayonet slot connections 88 and 89 between the coupling member 85 and the tube sections 56 and 57 respectively permit convenient disconnection of the two tube sections for purpose of cleaning or when the entire tube is to be removed and replaced by the adaptor shown in Fig. 37, this adaptor being designed

merely for permitting the formation and capping of empty containers.

Ice cream emanating from tube section 56 expands through the tapered inside of the coupling portion 87 and again is subjected to the action of a spreader 88 which may correspond in construction to the spreader 84. Due to the difference in diameters between filler tube section and supply pipe 66 and filler tube sections 56 and 57, it will be apparent that even with the filler tube stationary, the speed of flow of plastic material at the mouth of the feed tube is considerably less than the rate of flow of material through the supply pipe 66. The spreader members oppose sufficient resistance to flow to insure that the entire feed tube is maintained full of ice cream throughout its entire cross section at all times.

The end of the mandrel 55 is internally socketed or cut away as at 90 to provide clearance for the reduced portion 86 of the coupling 85. This section of the mandrel is likewise provided with a plurality of spaced longitudinally extending slots 91 coacting with corresponding raised ribs 92 on the coupling section 86 so that the coupling and the mandrel are dove-tailed to block relative rotation of the respective sections of the feed tube and consequent inadvertent disconnection of the bayonet slot connections 88, 89. This dove-tailing arrangement also guards against a formed cylindrical container snagging on the feed tube section 57 or coupling 85 as a formed cylinder slides off the mandrel and onto the feed tube.

Any suitable means may be employed for imparting the desired axial movement to the feed tube. I have illustratively shown a collar 94 encircling one end of the feed tube (and against which coupling 82 is drawn by nut 82a) and having a forked extension 95 carrying a swivelled block 96 which is engaged by the bifurcated end 97 of a crank arm 98, this crank arm being fixed upon a shaft 99 extending transversely of the machine.

At its opposite end shaft 99 carries a second crank arm 100 and a link 101 connects crank arm 100 with a crank arm 103 keyed on the outer end of a shaft 104 extending through a journal in the housing 105 for the cams. Keyed upon the inner end of the crank shaft 104 is another crank arm 106 (Fig. 11) carrying a roller 107 travelling in a cam groove 108 in the cam 49.

I have not shown the layout of the cam grooves but have instead diagrammatically illustrated in Fig. 38 the timing of the various cams and of the various mechanisms which they control. It will be observed from this figure that the motion of the filler tube consists of a long slow retraction stroke which is effective to maintain the leading end of the ice cream bar in fixed relation with respect to the rest of the machine save at the one interval when a quick acceleration of the stroke actually retracts the ice cream bar with respect to the container to provide space for the cap insert. It will also be noted that the forward stroke of the filler is very rapid, the filler moving forward through a distance nearly equivalent to the length of a cylindrical container just after the crimper has been withdrawn and the take-off has moved into position to receive the container.

70 *Cylinder blank feeding and gluing mechanism* Figs. 1, 2, 3, 4, 5, 6, 7 and 13

The magazine 58 for the blanks 59 is an inclined trough-like structure against the forward face 107 of which a series of blanks are advanced

by a follower plate 108 actuated by a sliding weight 109. This magazine may be supported upon cross bars 110 constituting part of the main frame of the machine. Constituting part of the front wall of the trough-like structure are a plurality of axially shiftable blank lifting fingers 111, each being offset intermediate its ends to provide a shoulder 112 of sufficient width to engage under the edge of the foremost blank in the magazine and these fingers serve to carry the foremost blank upwardly out of the top of the magazine from the position shown in Fig. 3 to the position illustrated in Fig. 4. From this position the blank is advanced between pairs of curved guide rails 113 to and beyond the gluing mechanism and into the position illustrated at Fig. 13 by a set of transfer arms 114 which engage the lower edge of the blank and shift it from the lowermost to the uppermost position (Fig. 3). The lifting fingers 111, the transfer arms 114 and the gluing mechanism (which I am about to describe) are all operated and controlled from the same cam and in properly timed relationship so that the surface speed of the glue applying roll 149 (Figs. 6 and 7) is equal to the speed of travel of the blank under the impetus of the transfer arms 114.

The front wall of the blank hopper is slotted to provide clearance for the movement of brackets or lugs 115 carried by the lifter fingers 111. These brackets are pivotally connected to the upper ends of links 116, the lower ends of said links being pivoted to the free ends of levers 117 fixed on a rock shaft 118 carried by the machine frame. The rock shaft 118 is actuated from a shaft 119, this shaft having a crank arm 120 connected by link 121 to a lever 122 having a spring clutch engagement (Fig. 3) with a hub 123 fixed on the rock shaft 118. The purpose of the spring clutch is to break the otherwise rigid connection between shaft 119 and lifting fingers 111 in the event that a blank 59 should become jammed. This clutch may be of any suitable construction and is illustratively shown as comprising a spring urged plunger 124 sliding in the hollow lever 122 and having a conical end working in a conical notch 125 in the hub 123. In the event that the lifting fingers encounter unexpected resistance in their upward movement due to jamming of the blank 59, the plunger 124 will slip out of its notch 125 and the connection between the shaft 119 and the lifting fingers 111 will thus be broken.

The transfer arms 114 are pivotally mounted on the ends of elongated crank arms 126 fixed on the shaft 119. Each transfer arm 114 is spring pressed in one direction by a coiled expansion spring 127 to an extent limited by the engagement of the tail piece 128 of the arm with the crank arm 126 in which the arm 114 is pivoted. The arms 114 work between or dove-tail with respect to the fingers 111 and each arm 114 has a bifurcated free end 129 to straddle the lower edge of a blank which has been lifted to the position of Fig. 4 by the lifting fingers. Deep tapering notches 130 in the wall 107 of the hopper provide clearance for movement of the transfer arms 114 so that they can engage with the lower edge of a blank which has been lifted by the fingers 111 and advance the blank past the gluing or adhesive applying mechanism (Figs. 6 and 7) and into position (Fig. 13) to be folded into cylindrical form about the mandrel 55.

The particular number of lifting fingers 111 and transfer arms 114 employed may vary with the size of the blank to be handled but in the

type of machine illustrated a sufficient number of fingers and arms are provided to eliminate the need for any edge guides for the paper blanks as they are moved from the hopper and carried into position under the mandrel.

During the movement of the blanks from the hopper into position under the mandrel, the pairs of guides 113 which are staggered with respect to the path of travel of the transfer arms 114 serve to prevent the fairly stiff but flexible paper or cardboard blanks from becoming disengaged from said arms.

The two extreme positions of the shaft 119 and the blank transferring mechanism which it actuates are illustrated in Figs. 3 and 4. In Fig. 3 it will be observed that the fingers 111 are in their lowermost position and that the arms 114 have reached the limit of their upward swing having thrust the blank under the mandrel, in which position its intermediate portion is sustained by the spring pressed platform 131 and its edges rest on the ends of the folding clamps 60 (Fig. 13).

As the shaft 119 is rocked in counterclockwise direction to the position shown in Fig. 4, it will be observed that the train of levers or links 120, 121, 122, 117 and 116 have shifted the lifting fingers 111 from their lowermost position to their uppermost position, these fingers wiping the foremost blank from the stack and carrying it upwardly to a position where it clears the slots 130, rendering its lower edge readily accessible to transfer arms 114. As a result of this same movement of the shaft, the levers 126 have swung downwardly, carrying with them the arms 114 and springs 127 have thrown these arms into the slots 130 of the magazine end plate and into position where upon clockwise movement of the shaft 119 they will engage the lower edge of the blank which has just been lifted out of the magazine by the lifting fingers 111.

As previously noted, in passing from the magazine into position under the mandrel, one edge of the blank is glued and in order to prevent any skewing of the blank under pressure of the glue rolls, the surface speed of the glue rolls is caused to equal the speed of travel of the blank under the influence of the transfer arms 114. With this in view the glue applying roll is actuated from the shaft 119.

An understanding of the glue applying apparatus and the operating mechanism for the glue rolls and the relation of this mechanism to the shaft 119 and the means for operating the shaft 119 are most clearly apparent from Figs. 6 to 8 inclusive.

As best illustrated in Figs. 6 and 7 the shaft 119 has a gear segment 132 affixed thereto and this segment meshes with an arcuate rack 133 carried by a lever 134 fixed to a rock shaft 135 journaled in the main frame. On the opposite end of the shaft 135 is a crank arm 134a having a connection at 136 with a reciprocating bar 137 carrying a roller 138 for engagement in the groove 139 of cam 45.

A guideway 140 secured upon the cam housing guides the reciprocatory movement of the bar 137 and as this bar is reciprocated its motion will be translated into an alternating rotary motion of the shaft 119 through the medium of rack 133 and segment 132.

A glue pot 141 is removably mounted upon the main frame work of the machine. One means for effecting this removable mounting is to provide a bevelled trackway 142 as part of the main frame and to provide a correspondingly bevelled or

undercut groove 143 in the bottom of the glue pot so that the latter may be slid into position on the trackway and removably secured in position as by a set screw or locking screw 144.

Journalled transversely within the glue pot is a shaft 145 driven from a shorter shaft 146 through the medium of a two toothed clutch arrangement 147, the purpose of this clutch being to permit the glue pot assemblage to be removed from the machine by a sliding movement when the teeth of the two clutch members are out of horizontal alignment as shown in Fig. 6. The shaft 145 carries a roller 148 dipping into the glue pot and frictionally driving a glue applying roller 149. The edge of the paper blank passes between the top of the roller 149 and a superjacent roller 150 spaced a distance from the transfer roller, approximately corresponding to the thickness of the paper blank and exerting but slight pressure thereon.

The means for driving the transfer roller 149 at a surface speed corresponding to the speed of travel of the blank includes a relatively small pinion 151 fixed upon the shaft 146 and a relatively large gear 152 rotatable on the shaft 119 and intermittently driven by suitable means such as a ratchet and pawl mechanism from said shaft. Illustratively a ratchet plate 153 is secured as at 154 to the gear segment 132 which is keyed at 155 on the shaft 119. One or more dogs or pawls 156 are pivoted on the inner face of the gear 152 and springs 157 press these dogs into engagement with the teeth 158 of the ratchet plate 153.

As seen in Fig. 7 when the ratchet blade is carried in clockwise direction by the positive movement of the shaft 119, the dog 156 serves to drive the gear 152 in clockwise direction and through the speed multiplication afforded by the gear 152 and the pinion 151 to rotate the glue wheel 148 and thereby turn the transfer wheel at a surface speed corresponding to the speed of movement of the blank. The edge of the blank passing between the transfer wheel 149 and the pressure roller 150 receives glue from the wheel 149. This glue may be applied as a continuous stripe or as a row of glue spots or in any other manner required for effective subsequent gluing together of the overlapped edges of the blank. The term "glue" is of course intended to be interpreted broadly enough to include any adhesive material.

The mechanism for folding the blank about the mandrel into cylindrical form is illustrated in detail in Figs. 12 to 14 inclusive. The actual folding devices consist of the pivoted jaw members 60 and the tilting presser foot 61.

The two generally semi-circular jaws 60 have their inner ends pivotally connected to a common pivot shaft 160 and intermediate their ends these blank folding jaws are pivotally connected at 161 to the upper ends of pusher rods 162, adjustably mounted in a cross head 163 which has vertical sliding movement on a post 164, the upper end of which carries pivot pin 160. To prevent rotation of the cross head with respect to the post a pin 165 of the cross head works through aligned slots 166 at opposite sides of the post and the actuating member for the cross head is in the form of a rod 167 slidable in the lower hollow portion of the post 164.

As best seen from Fig. 14 the lower ends of the pusher rods pass freely through openings 168 in the cross heads, suitable means such as the nuts 169 encircling the lower ends of the rods and en-

gaging the under side of the cross head, limiting the upward movement of the pusher rods under the influence of coiled expansion springs 170 encircling the rods and disposed between the rod pivots and cross head. By virtue of this adjustable rod construction the effective length of one pusher rod may be adjusted with respect to the length of the other pusher rod to insure that one arcuate clamp member 60 reaches its completely closed position before the other clamp does and thereby predetermines the direction of overlap of the edges of the cylinder forming blank 59.

With the two clamps 60 folded in their extreme uppermost position it will be observed (Fig. 15) that there is still sufficient space between the ends of these clamps to permit the presser foot 61 to descend and complete the formation of the cylinder and to press the overlapped edges of the blank against each other.

The presser foot which as previously noted is hinged as at 80 to clamp member 79 is in the form of a lever which near its free end carries a pair of rubber blocks or equivalent pressure applying devices 171. A spring plunger 172 slidable in a socket 173 in the clamp 79 works against a heel piece 174 of the presser foot lever 61 and normally maintains this lever in the position of Fig. 3. Plunger 172 is thrust into engagement with the lever heel piece by a coiled expansion spring 175, the tension of which may be conveniently adjusted by adjustable nut 176 which serves as a reactance piece for the spring. In order to effect elevation of the lever 61 during the upward swinging movement of the folding clamps 60, the free end of this lever is pivotally connected to the upper end of a rod 177, the rod being laterally bowed as indicated in Fig. 13 to clear the mandrel and the lower end of this lever being pivotally connected at 178 with a sleeve 179 vertically slidable on a post 180 secured to the main frame of the machine.

Pivoted intermediate its ends on the lower portion of the sleeve 178 is a lever 181 formed at its upper end with a detent 182 projecting into the path of upward movement of a lug 183 carried by a sleeve 184 which encircles the post 164 and constitutes part of the cross head 163. Thus as the cross head moves upwardly to close the clamps 60, the lug 183 engages the detent 182 of the lever 181 acting through this lever to elevate the sleeve 179 and thus thrust the lever 177 upwardly and tilt the presser foot 61 to the position illustrated in dotted lines in Fig. 12. Lever 181 also includes a tail piece 185 adapted for engagement with a trip member 186 so that as the folding clamps 60 reach the completely closed position of Fig. 15, the tail piece of lever 181 is tripped by the member 186, throwing the detent 182 out of engagement with the lug 183 and thus releasing sleeve 179 and permitting the presser foot to descend into blank clamping position under the impetus of the spring 175. Upon descent of the cross head 163, the lug 183 cams past the detent 182, these members being provided with bevelled faces for this purpose.

Any suitable means may be employed for vertically reciprocating the cross head 163 and thereby actuating the folding clamps, one suitable mechanism being more particularly illustrated in Figs. 2 and 13 wherein it will be observed that the rod 167 extends at its lower end into the casing for the cams and is formed with rack teeth 185 meshing with a gear 186, the latter in turn being fixed on the same hub 187 as the gear 188.

Gear 188 is operated by a horizontally reciprocable rack 189 carrying a roller (not shown) working in the groove 189a of the cam 46.

The hub 187 turns freely upon a short horizontal shaft 190 mounted in bearings 191 within the casing for the control cams.

The drag clamp or container indexing mechanism

As above suggested, means is provided for engaging behind the rear edge of the last formed paper cylinder and advancing the entire line of cylinders forwardly along the mandrel and along the discharge section 57 of the filler tube. The details of this clamp mechanism are illustrated more particularly in Figs. 1, 3 and 16 to 21 and 22. A pair of bracket members 200 disposed at opposite sides of the mandrel include reduced inwardly offset ends 201 connected as by screws 202 to any suitable mechanism for reciprocating the brackets. This mechanism in the present instance consists of a slide bar 203 (Fig. 21) travelling in a trough-like horizontal guideway 204 formed in the main frame of the machine and closed by a cover 205.

The side walls of this guideway are slotted or cut away as at 206 to permit attachment of the bracket ends 201 to the slide bar and the bottom of the guideway is also cut away as at 207 to permit connection of the slide bar to its actuating means.

Any suitable means may be employed for reciprocating the slide bar and for illustrative purposes I have shown (Fig. 2) a lever 237 pivoted intermediate its ends at 239 in a bracket 238 forming part of the main frame. The lower end of this lever carries a cam roller 240 working in the cam groove 241 in the cam 47 and the upper end of this lever is connected by a link 242 to a pendant extension 243 of the slide bar 203, such extension working in the slot or cut-away 207 (Fig. 21).

As best seen in Figs. 17 and 18 the bracket members 200 at their wider ends lie substantially parallel with the axis of the mandrel. At their wider extremities they present inwardly directed integral ears or lugs 208—209 disposed at the tops and bottoms of the brackets respectively. Plate-like dog members 210 disposed at opposite sides of the mandrel are pivotally mounted within the ears 208—209 of the respective brackets 200. These members are provided at their pivoted ends with inwardly directed ears 211 fulcrumed on inwardly extending pins 212 carried by the ears 208—209. The free ends of the members 210 are inwardly flanged, as indicated at 213, the edges of these flanges following the circular contour of the mandrel.

Springs 214 fixed upon the brackets 200 urge the dogs inwardly against the mandrel and the free edges of the flanges 213 are bevelled as at 215 (Fig. 17) so that as the dogs move to the left from the position of Fig. 17 they will ride over the edge of a cylindrical blank which has been formed on the mandrel but as they are drawn to the right they will engage behind the edge of the blank and drag this blank along the mandrel.

The particular fulcrum arrangement for the plate-like dogs 210 is of importance because it is desirable that when the clamp member moves to the right the natural tendency of the free ends of the dogs is to move toward the mandrel rather than to move away from it. With the particular arrangement shown, it will be apparent that the pivots 212 are closer to the axis of the mandrel than is the major portion of the free flanged edge

213 of the dog and therefore when the clamp is drawn to the right the normal tendency of the dogs 210, even independently of the springs 214, is to swing about these pivots causing the free flanged edges of the dogs to swing inwardly and engage behind the edge of a preformed cylindrical paper blank.

It may be observed that the bracket members 200 are bevelled, as at 216, to provide clearance for the slight swinging movement of the dogs incidental to the outward movement of the free ends of the latter as the clamp is moved to the left in Fig. 17 and the bevelled edges 215 of the flanges 213 ride outwardly over a new blank to be engaged. These drag clamps serve two functions. One is to engage the last formed cylindrical blank and advance the entire line of blanks along the mandrel. The other is to retain the entire line of blanks against retrograde movement under the pressure of the cap applying and cap spinning or crimping mechanism. The purpose of the springs 214 is to hold the dogs securely in position behind the edges of the last blank so that the line of blanks will not be moved backwardly during the insertion and spinning over of the cap in the end of the foremost blank.

In other words, even independently of the springs 214 the pivotal mounting afforded by the pairs of ears 208—209 and the pairs of ears 211 would insure inward movement of the clutching ends of the dogs to engage and advance the line of blanks and the springs serve primarily to hold the clamps in position to resist a rearward thrust on the line of blanks.

The stationary seam clamp (Figs. 1, 2, 3, 19 and 20)

As a completely formed and folded blank is drawn endwise along the mandrel out from under the presser foot 61 it passes immediately under an elongated seam clamp, which exerts pressure on the overlapped and adhesively secured edges of the blank during travel of the blank from its forming to its filling position. This clamp is in the form of an elongated downwardly facing channel member 217. Arranged in the mouth of this channel are the clamping bars 218 and a series of coiled expansion springs 219 disposed in the channel react against the bottom thereof and press downwardly on the bars 218 serving to maintain the same under tension and pressed against the seams or overlapped portions of the cylindrical blanks. The channel piece is carried by an arm 220, the latter being pivoted to an upstanding bracket 221 fixed upon the main framework of the machine. The arm 220 may swing about its pivot 222 in a clockwise direction (Fig. 19) to an extent limited by the engagement of a boss 223 on the arm with a corresponding boss 224 on the bracket. Those portions of the bracket and the arm which are pivotally connected together are bifurcated, as clearly seen in Fig. 20, and a slot 225 in the arm communicates with the furcation 226 therein.

In order to position the channel piece 217 correctly and to hold it firmly against elevation, a screw 227 is pivoted on a cross pin 228 extending through the bifurcated portion of the bracket. The free end of this screw may be swung into the notch 225 and a nut 229 screwed onto the end of this screw and against a boss 230 on the upper surface of the arm firmly clamps the arm against pivotal movement. The purpose of this construction is firstly, to inhibit upward movement of the channel piece 217 while the machine is in operation and secondly, to permit the entire channel

piece with its springs 219 and presser bars 218 to be bodily swung out of the way in order to gain access to the mandrel in the event that the machine is to be disassembled or in the event that the blanks, which are traversing the mandrel, become skewed or jammed or in the event that the adaptor tube of Fig. 37 is to be substituted for the filler tube 56, 57.

Preventing rotation of blanks during crimping or spinning

Pivotally mounted upon an extension of channel member 217 is a clamp element 231, the principal purpose of which is to restrain a filled blank or container from rotation during the time that the cap is being spun into position. The clamp 231 is of generally arcuate cross section to embrace the top of the mandrel and is yieldingly pressed against the top of the tube section 57 by a spring plunger 232. This plunger working in a socket 233 in the clamp element 231 is normally pressed toward the channel piece 217 by coiled expansion spring 234 and since the channel piece definitely limits the spring-urged movement of the plunger toward the left (Fig. 3) the net result of the effort of the spring is to swing the clamp element 231 about its pivot 230 and against the blanks which are passing over the tube section 57.

As will be observed from the sectional view of this clamp (Fig. 22) the clamp is provided with a longitudinally extending inlaid bar 235 presenting on its inner face a shoulder 236 to be abutted by the exposed edge of the outermost layer of the overlapped and adhesively connected seam of the cylindrical blank. Any tendency of the cylindrical blank to rotate with the spinning or crimping head is blocked by the abutment of the exposed seam edge against the shoulder 236 so that the filled and capped blank is secured against rotation during the cap spinning operation.

Cap blank magazine and cap forming and applying mechanism (Figs. 1 to 3, 23 to 26, 29 to 31)

The magazine which holds the cap blanks to be applied to the individual filled cylindrical cartons, includes a generally trough-shaped cap blank receiving portion 250. As best seen in Figs. 24 and 26 the trough 250 may be an integral part of the main frame of the machine and extends longitudinally of the machine and is laterally offset and disposed somewhat above the discharge end of the filler tube. The circular cap blanks 251 are stacked on edge in the trough and the entire series of blanks are urged against an abutment plate 252 at one end of the trough. One suitable mechanism for this purpose includes a follower member 253 provided with rollers 254 which travel in guideways 255 in the sides of the track. A counterweight 256 is suspended on the end of a flexible device 257 and this device is led over suitable pulleys 258 and 259, then rearwardly through a groove 260 at the bottom of the trough at which point it is connected to the follower as at 261 (Fig. 24).

Immediately adjacent the abutment plate 252 the trough is provided with a slot 262 through which the foremost cap blank of the series is adapted to be urged downwardly into the cap applying mechanism. To effect this downward movement of one cap of the stack there is provided a pusher 263 slidably mounted in an upward extension 264 of the abutment plate 252.

Preferably the crimper mechanism controls the actuation of the slide member. A bracket 265 rising from the main frame of the machine mounts a short transverse shaft 266 and fixed upon said shaft is a lever 267 having its forked end 268 engaged with a roller 269 carried by bracket 270 which is fixed to the upper end of the pusher 263. Shaft 266 carries a crank arm 271 affording an arcuate rack 272 at its free end, this rack meshing with an idler gear 273 and the idler gear meshing with a rack 274, the movement of which is controlled from the carriage 74 of the crimping mechanism.

A coiled torsional spring 275 anchored to the bracket 265 normally tends to swing the arm 271 in counter-clockwise direction (Fig. 1) and through the gear 273 to shift the rack 274 to the left and through the shaft 266 to swing the lever arm 267 downwardly, thereby moving the pusher 263 downwardly to wipe a cap blank from the forward end of the series of caps in the magazine. This spring actuated movement of the cap blank delivery mechanism however is normally blocked by the engagement of a lug 276 on the rack 274 with a stop lug 277 forming a fixed part of the carriage of the crimping mechanism. Thus the lever 267 is only free to swing downwardly under the influence of the spring 275 at such times as the crimping carriage shifts to the left from the position shown in Fig. 1. The importance of spring actuating the cap blank ejecting follower is the fact that if the cap blank should jam it will oppose sufficient resistance to the spring actuated ejector mechanism to immediately block downward movement of the follower and the stalling of this mechanism will immediately become apparent to an operative who can stop the machine and remove the single damaged cap blank. Even if the operative failed immediately to notice this failure of the cap applying mechanism, the worst that could happen would be the delivery of a few filled but uncapped packages of ice cream. The return movement of the cap blank actuating mechanism is of course positively effected by rack 274 which is positively shifted by the lug 277 in the crimper carriage.

The means for receiving the cap blanks, transferring them into axial alignment with the filled containers and forcing them home into the mouths of these containers includes a carriage 278 slidable in a transverse trackway 279. Fig. 29 illustrates in full and dotted lines the two limit positions of this carriage, one directly under the cap blank magazine and the other in direct axial alignment with the filled container.

With particular reference to Figs. 3, 24, 29 and 30, it will be observed that there is disposed transversely of this carriage a cylindrical bushing or sleeve 280 which at one end flares out to afford a flange 281 having a cup-shaped depression 282 therein, the latter being adapted to receive a head 283 of the cap applying plunger 284 which slides within the sleeve 280. Secured against the flange 281 is a circular forming die 285 having a central opening 286 therein of lesser diameter than the cap blanks. With the cap applying plunger retracted the blanks delivered from the cap magazine pass downwardly through a slot 287 between the plunger head 283 and the die 285. As the plunger shifts to the left (see Fig. 3) the plunger head forces the cap blank through the die, flanging the periphery of the blank and forcing the flanged cap into the mouth of the container. The extreme edge of this container already lies within a tapered recess 288 formed

in the non-working face of the circular die 285. This tapered recess aids in centering the die with respect to the container as the die is shifted to the left (Fig. 3) and just before the cap is rammed home.

Means is provided for intermittently positively reciprocating the plunger 284 and means is also provided for intermittently shifting the carriage member 278 from one extreme position to the other along the trackway 279. One suitable mechanism for effecting the desired plunger reciprocation includes a shaft 289 extending axially of the carriage 278 and having bearings at 290 in this carriage said carriage being preferably elongated and hollow. Keyed upon the shaft 289 is a crank arm 291 the forked end 292 of which extends upwardly into a slot 293 in the piston and straddles a cross pin 294 extending across the slot. Thus as the crank arm 291 is rocked by the shaft 290 the plunger 284 is reciprocated. A crank arm 295 is provided at one end with a hub portion 296 keyed as at 297 to an end of the shaft 289. This hub portion fits within an eye 299 fixed with respect to the main frame of the machine. The hub 296 is locked against axial movement with respect to the encircling eye 299 in order to permit the shaft 289 to slide through the hub as the carriage 278 is shifted back and forth along its trackway 279.

Fig. 30 illustrates the means for rocking the crank arm 295 to oscillate shaft 289 and thereby reciprocate plunger 284. Such means may conveniently include a link 300 pivotally connected at one end to the free end of the crank 295 and pivoted at its other end to the end of a lever 301, said lever being fulcrumed intermediate its ends on a fixed part of the cam housing and its free end carrying a roller 302 travelling in a suitable groove 303 in the cam 44. This same cam may also control the reciprocating movement of the slide 278, this being accomplished by means of a roller 304 working in a peripheral groove 305 in the cam 44. Roller 304 is carried by the end of a crank 305, this mounted on shaft 306 journaled in a bracket 307 pendant within the cam housing and a second crank arm 308 fixed to the opposite end of the shaft 306 has its upper bifurcated end 309 pivotally connected to a link 310, the opposite end of this link having a pivotal connection at 311 with a bracket 312 fixed to the bottom of the carriage 278. The bottom of the carriage track is cut away at 313 to accommodate for movement of the bracket 312 from the full line to the dotted line position of Fig. 29.

The operation of this cap applying mechanism will be more or less apparent from the foregoing description. The carriage is shifted to a position under the cap magazine where the cap blank is delivered between the forming die and the plunger head. It is then shifted into axial alignment with the oncoming filled package and at the proper moment the plunger moves forward forcing the cap blank through the die to flange it and thrust it into the mouth of the container. Thereupon the plunger withdraws and the carriage slides back into position under the cap magazine.

The crimping mechanism (Figs. 1, 2, 31 and 36)

The carriage 74 of the crimping mechanism is slidable back and forth in a trackway 314 disposed over a slot 315 in a transmission gear housing 316. Attached to the underside of this trackway is a rack 317 driven from a gear 317a in a manner to be more fully hereinafter described.

The rotary crimping head 76 is carried by a shaft 318 journaled in suitable bearings 319 in a bracket 320a rising from the carriage 74. In this bracket in fact which affords the stop lug 277 controlling the movement of the rack 274. The shaft 318 of the crimping head is axially aligned with the shaft 319a of the motor 75 and is coupled to such shaft in any suitable fashion as indicated at 320.

The circular crimping or spinning head is provided with an angularly disposed outwardly extending flange 321. Bearings such as 322 in this flange afford rotary mountings for the integral stub shafts or hubs 323 of freely revolving crimpers 324, each in the nature of a wheel having an annular peripheral groove 325 therein properly designed to engage the end of one of the cylindrical containers and by a spinning operation roll the edge of this container inwardly over the flanged cap blank 70. The manner in which these spinning devices, several in number, roll the edge of the container inwardly to form a bead at 326 is most clearly illustrated in Fig. 36.

In order to prevent the shafts 323 from dropping out of the bearings 322 when the crimping head is at rest a frusto-conical retainer member 327 is detachably secured to the end of the spinning head shaft 318 as by a set screw 328, the tapered peripheral wall of the block 327 permitting but limited inward movement of the spinning device 324. Of course when the crimping head is rotating centrifugal force will normally tend to prevent inward displacement of the spinning devices 324 and they will not frictionally contact the block 327.

Any suitable mechanism for intermittently advancing and retracting the carriage of the crimping mechanism may be employed and in the present instance as above noted, a gear 317a is continuously in mesh with rack 317. The actuating mechanism for the gear 317a includes a bevelled gear 329 fixed with respect to the gear 317a and meshing with a crown bevel gear 330 on the upper end of a shaft 331 having bearings at 332 within the gear case 316. On the lower end of the shaft 331 is a pinion 333 intermittently actuated by a rack 334, the motion of this rack being controlled by a roller 335 on one end of the rack working in a groove 336 in the cam 46.

Shear or take-off mechanism

The shear or take off member for the completely filled and capped package includes as above noted a trough shaped element 77 which is fixed on the end of a lever 340 (Figs. 23, 25, 28 and 31). As most clearly illustrated in Fig. 28 lever 340 is fixed upon the end of a shaft 341 having suitable bearings at 342 in a sleeve 343 which projects from the gear case 316. The inner end of the shaft 341 carries a bevelled pinion 344 meshing with a bevelled gear 345 on a vertical shaft 346 journaled within the gear casing in suitable bearings 347. The lower end of the shaft 346 carries a pinion 348 meshing with a rack 349, this rack at one end carrying a roller 350 for engagement with a groove 351 in its actuating cam 48. Thus intermittent reciprocation of the rack acts through the gears 348, 345 and 344 to rock the shaft 341 and swing the lever 340 from one extreme position to the other, that is, from the position of Fig. 25 where it is receiving a formed package to the position of Fig. 23 where it is discharging a package on the table 78.

In order to insure positive ejection of the

packages from the member 77, this trough or cradle like member is formed with a supplemental rockably mounted arcuate section 355 having a pivot at 356 in the cradle proper and normally lying within the plane of the cradle as indicated in Fig. 25. A coiled contractile spring 357 having an anchorage at 358 on the lever 340 and connected to a lug 359 on the pivoted cradle section 355 normally tends to hold this section in the position of Fig. 25. However as the lever 340 in passing from the position of Fig. 25 to the position of Fig. 23 approaches the delivery table 77a, a pendant extension 360 of the rockable cradle section engages a stationary pin 361 and this section is rocked about its pivot against the action of the spring 357 in the manner illustrated in Fig. 23 to positively eject a package from the cradle like or take off device.

Adaptor for forming and capping empty containers

Before recapitulating the operation of the machine and referring to the chart (Fig. 38) showing the relative timing of the various mechanisms which constitute the machine, brief reference may be had to Fig. 37 showing an adaptor which is substituted for the filler tube 56, 57 when the machine is to be used merely for forming and capping containers without filling them.

In Fig. 37 the entire filler tube unit has been removed from within the mandrel 55 and a tubular element 370 has been introduced through the rear end of the mandrel to an extent limited by a flange 371 carried by the end of this tube. The inner end of tube 370 is then screwed into the end of a coupling piece 371a carried by a complementary tube section 373 of the same outside diameter as the mandrel proper. Coupling piece 371a as indicated at 372 is provided with longitudinal webs which dove-tail into the ribs and grooves at the mandrel end. A cap 374 is fitted into the end of the tube section 373 and serves as a reactance piece against which the cap blanks are applied and against which the crimping head works. Preferably the cap 374 is provided with a central opening 375 therein and both ends of the tube 370 are also open so that no air will be trapped and compressed between the cap blank and the cap 374 as the cap blanks are forced home by the plunger member 72. It will be understood that upon removal of the feed tube structure and when the container forming adaptor is in position, the crank arm 98 will merely swing idly and the adaptor structure consisting of the two connected complementary tube sections 372 and 373 remains stationary during the formation of the containers and the application and spinning of the caps.

Timing

Instead of illustrating in detail all of the cam grooves and showing their correlation for purposes of timing, I have shown in Fig. 38 a chart which clearly indicates the relative timing of the various mechanisms. In this chart the motion of the drag clamps is designated as a carton index and the movement of the take-away mechanism is illustrated under the heading "Shear or take-off". From this chart it will be apparent that upon one complete revolution of the main shaft of the machine a complete cycle of operations has been performed since at each revolution a completed package of ice cream is formed and delivered to the receiving table.

At that particular point in the revolution of the

the main shaft which has arbitrarily been selected as zero degrees on the chart of Fig. 8, a filled and capped package is resting in the cradle of the take-off mechanism. The pusher arms 114 of the carton blank shifting mechanism are in the position of Fig. 4. The carton indexing and drag clamps are at rest in their forward position, that is to say, they have moved to a point where a new carton or container may be formed behind them. The cap applying mechanism which has previously received a cap from the cap magazine is just starting to shift out from under the magazine and toward alignment with the filler tube. The blank folding clamps 60 are in their lowered inoperative position and the crimper carriage is in its inoperative position and at rest.

While the cap applying carriage is moving toward alignment with the filler tube, the take-off mechanism shifts the completed package laterally and a new paper blank is moved into position under the mandrel. Just before this blank has arrived at its position to be folded, the cap applying mechanism has reached a position in alignment with the filler tube and the cap applying plunger shifts a cap blank in the end of the package at the same time that the retractile movement of the filler tube is accelerated, this cap in effect following the retreating end of the plastic bar of ice cream. Next, as will be clearly apparent from the chart and starting at about 70°, the carton blank action returns during the time that the folding clamps move upwardly to fold a new carton blank about the mandrel. During this folding operation the cap applying mechanism is returning to its position under the cap blank magazine. The shear and take-off mechanism is at rest in inoperative position and the filler tube is still retracting slowly so that the end of the ice cream bar remains stationary with respect to an encircling container. At approximately 100° just before the paper blank action has completed its return stroke and just before the carriage for the cap applying mechanism reaches its position under the cap blank magazine, the crimper carriage starts to move toward the container and from approximately the 130° position of the shaft to the 200° position the only parts which are in motion are the crimper head which is moving slowly to the left and spinning over the bead on the container mouth, the filler tube meanwhile continuing its slow retractile stroke. Just before the crimping operation is completed and before the crimper carriage is shifted back to the right, the blank folding clamps which have held the blank in folded position for some time return to their lower open position. Just after their return has been completed and while the crimper carriage is still returning to its inoperative position the carton indexing drag clamps shift to the left into position to engage the new carton and the take-off member returns to a position in axial alignment with the filler tube ready to receive the next filled and capped container.

When this take-off member has completed its return stroke to receiving position the container indexing drag clamps and the filler tube both move sharply forward to the right, thereby advancing a new filled and capped container into the take-off device thereby restoring the parts to the positions which they occupied at zero degrees in the revolution of the shaft.

The diagrammatic showing of Fig. 39 hardly

needs any description. In this chart the dot and dash diagonal line shows what the backward action of the filler tube would be if the stationary carton were filled full length and with a half inch of full or bottom cap allowance. The dash line indicates the movement of the discharge end of the filler tube and the heavy blank line indicates the movement of the rear end of a container, the entire movement of this container occurring in 60° of the complete revolution of the shaft. It will be observed that the dash line representing the movement of the filler tube mouth follows the normal line up to the 40° point then backs away to make room for the cap and then again runs parallel to the normal line until the 300° point is reached after which it moves forward, always maintaining the same distance from the carton end blank per degree of the cycle except at the point of cap insertion. It will be understood that the delivery of the plastic material from any suitable source will be regulated so as to just fill the space caused by the backward motion of the filler so that that end of the bar which projects beyond the filler tube as the latter is retracting is under no pressure.

It will be obvious that the specific construction hereinabove described may be modified in detail, and that many of the operations may be accomplished by a wide variety of other mechanisms to accomplish the same result. Therefore it is to be understood that I am not limited or restricted in any way to the details illustrated except insofar as they are defined in the appended claims.

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

1. Apparatus of the class described including a tube having an outlet at the end thereof through which plastic material is delivered, and means for advancing a series of individual tubular sections concentric with and along the exterior of the tube toward and beyond the outlet end thereof to receive the plastic material.
2. Apparatus of the class described including a tube through which plastic material is delivered, means for advancing endwise a series of individual tubular sections along the exterior of the tube toward and beyond the outlet end thereof to receive the plastic material, and means for intermittently effecting changes in relative rates of movement of the material and the sections to leave empty the leading end of the last section of the series.
3. Apparatus of the class described including a tube through which plastic material is delivered, and adapted to support a series of individual tubular sections encircling the same, means for advancing said sections endwise along the exterior of the tube toward and beyond the outlet end thereof to receive the plastic material, and means for applying caps to the leading ends of the sections as they are filled.
4. Apparatus of the class described including a tube through which plastic material is delivered, means for advancing a series of individual tubular sections along the exterior of the tube toward and beyond the outlet end thereof to receive the plastic material, and means for shifting the resulting filled sections laterally to shear the plastic material along the line of abutment of the filled section and the following section.
5. Apparatus of the class described including a tube through which plastic material is delivered, means for advancing a series of individual tubular sections along the exterior of the tube toward

and beyond the outlet end thereof to receive the plastic material, and means for intermittently axially retracting the tube to leave the leading end of the terminal section empty.

5 6. Apparatus of the class described including a tube through which plastic material is delivered, means for advancing endwise a series of individual tubular sections along the exterior of the tube toward and beyond the outlet end thereof to receive the plastic material, means for changing the relative rates of travel of the material and the sections to leave the leading end of the terminal section empty, means for inserting a closure into said empty end, and means for spinning over 10 the end of the section to lock said closure in position.

7. Apparatus of the class described including a tube through which plastic material is delivered, means for advancing a series of individual tubular sections along the exterior of the tube toward and beyond the outlet end thereof to receive the plastic material, means for retracting the material to leave the leading end of the terminal section empty for the reception of an end closure, 20 and means for shifting the filled section laterally to shear the contained material from the following portion of the plastic bar.

8. An apparatus of the class described, including a tubular mandrel, means for delivering a continuous stream of plastic material there-through, means for forming a plurality of successive tubular container wall sections around the exterior of the mandrel, and means for advancing said tubular wall sections in succession along said mandrel and off the end thereof whereby they are filled in succession with said plastic material.

9. Apparatus of the class described including a tube through which plastic material is delivered, means for forming tubular container wall sections 25 around the exterior of the tube, means for sliding the sections along the tube to permit filling of the sections with the plastic material delivered from the tube, and means for intermittently moving the tube in the opposite direction to empty the leading end of the terminal container section 30 for the reception of an end closure.

10. Apparatus of the class described including a tube through which plastic material is delivered, means for bending a sheet around the exterior of the tube to form a tubular section, means for effecting relative axial movement of the tube and section to permit transfer of the plastic material from the tube into the section, and means for accelerating such relative movement to leave the leading end of the terminal section empty for the reception of an end closure.

11. Apparatus of the class described including a tube through which plastic material is delivered, means for bending a sheet around the tube to form a tubular wall section around the exterior of the tube, means for effecting relative axial movement of the tube and section to permit transfer of the plastic material from the tube into the section, means for accelerating such relative movement to leave the leading end of the terminal section empty for the reception of an end closure, means for inserting a flanged cap into the end of the section, and means for spinning the end of the section over to lock the cap 70 in position.

12. Apparatus of the class described including a tube through which plastic material is delivered, means for forming a series of tubular wall sections around the exterior of the tube, means for effecting relative axial movement of the tube and

sections to permit transfer of the plastic material from the tube into the sections in succession, means for sucking the material back to leave the leading end of the section empty for the reception of an end closure, and means for severing the plastic material between the terminal section and the next succeeding section.

13. An apparatus of the class described including a hollow mandrel through which a body of plastic material is forced under pressure, means for bending a series of rectangular paper blanks around the mandrel in succession to form tubular container walls, means for moving said walls in succession off the end of said mandrel whereby they are filled with the material passing through the mandrel, and means for removing the filled sections laterally.

14. An apparatus of the class described including a hollow mandrel through which a continuous bar of plastic material is delivered, means for bending a series of rectangular paper blanks around the mandrel to form tubular sections, means for moving said sections in succession off the end of the mandrel whereby they are filled with the material delivered from the mandrel, and means for closing the forward end of each section after it is filled and while in alignment with the mandrel.

15. An apparatus of the class described including a hollow mandrel through which a body of plastic material is forced under pressure, means for folding a rectangular paper blank around the mandrel to form a tubular section, means for moving said section to a position where it is filled with the material passing through the mandrel, means for moving a closure blank laterally to a position opposite the end of the section, and means for moving the closure blank toward the mandrel and into engagement with the end of the section.

16. An apparatus of the class described including a hollow mandrel through which a body of plastic material is delivered, means for sliding a tube section over the mandrel to a position where it is filled with the material passing through the mandrel, means for shifting the filled tube section laterally to shear the contents from the advancing bar of plastic material, and means for preventing advance of the plastic bar during shearing.

17. Apparatus of the class described including means for delivering endwise a series of tube sections, a cap applying mechanism shiftable laterally into and out of axial alignment with the line of travel of the tube sections, means for feeding cap blanks to the cap applying mechanism when the latter is out of alignment with said line of travel, said mechanism including means for flanging the cap blanks and for thrusting them in succession into the end of the leading tube section when said mechanism is aligned therewith.

18. Apparatus of the class described including a mandrel, means for bringing a series of rectangular blanks adjacent thereto in succession, means for bending the blanks around the mandrel, to form tube sections, means for feeding the tube sections along the mandrel, a cap applying mechanism shiftable laterally into and out of axial alignment with the mandrel, and means for feeding cap blanks to the cap applying mechanism when the latter is out of alignment with the mandrel, said mechanism including means for flanging the cap blanks and for thrusting them into the end of the leading tube section when said mechanism is aligned with the mandrel, and

means for engaging the resulting container and shifting it laterally with respect to the mandrel.

19. Apparatus of the class described including means for forming a series of tube sections and delivering them endwise in succession, a cap applying mechanism shiftable laterally into and out of axial alignment with the line of travel of the sections, means for feeding cap blanks to the cap applying mechanism when the latter is out of alignment with the series of tube sections, said mechanism including means for flanging the cap blanks and for thrusting them into the end of the leading tube section when said mechanism is in said line of travel, means for engaging the resulting formed container and shifting it laterally, and means for ejecting said container from said shifting means.

20. In a machine of the class described a filler tube through which plastic material is continuously forced under pressure and along which encircling cylindrical containers are intermittently advanced in succession to receive the material delivered from the end of the filler tube, and means for reciprocating the filler tube back and forth, the speed of movement in a direction opposite to the direction of flow of the material being such with respect to the rate of flow of the plastic material through the tube that the leading end of the plastic bar temporarily remains stationary during withdrawal of the end of the tube from a stationary filled container.

EINO E. LAKSO.

15