Feb. 26, 1952 A. E. LINDSTROM 2,587,180

CONTAINER FILLING AND CAPPING MACHINE

Filed May 5, 1945 6 Sheets-Sheet 1

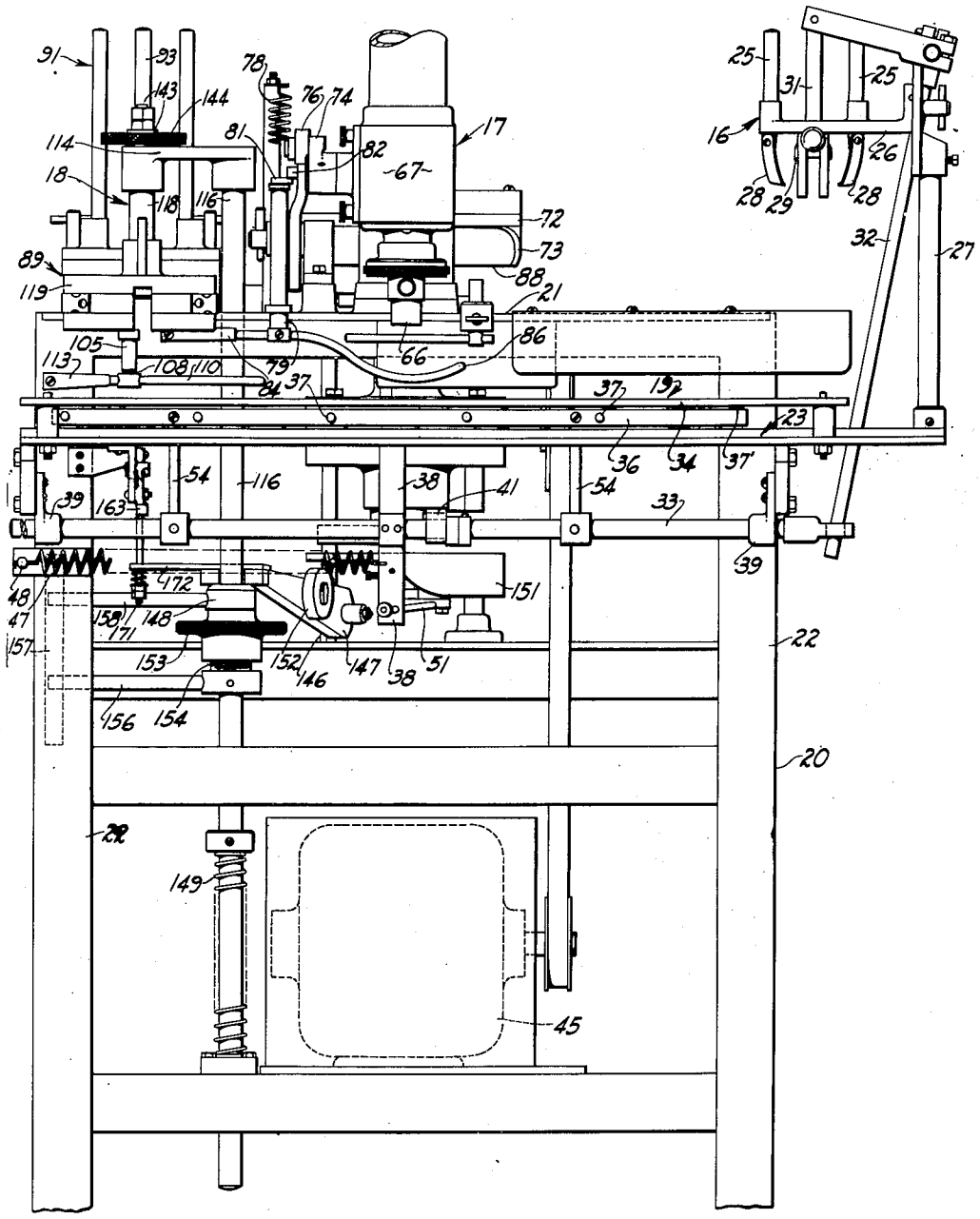


FIG. 1

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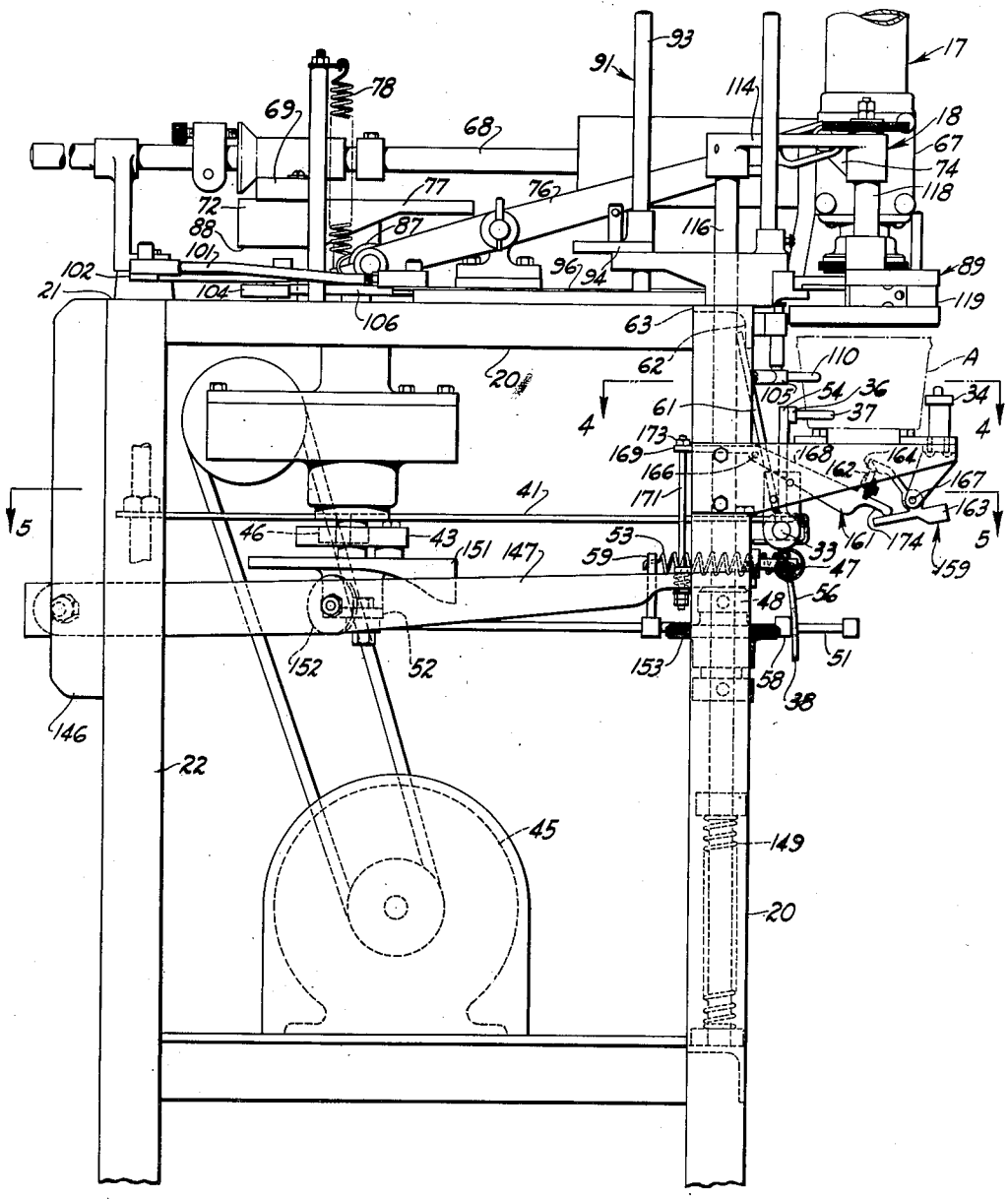


FIG. 2

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CONTAINER FILLING AND CAPPING MACHINE

Filed May 5, 1945 6 Sheets-Sheet 3

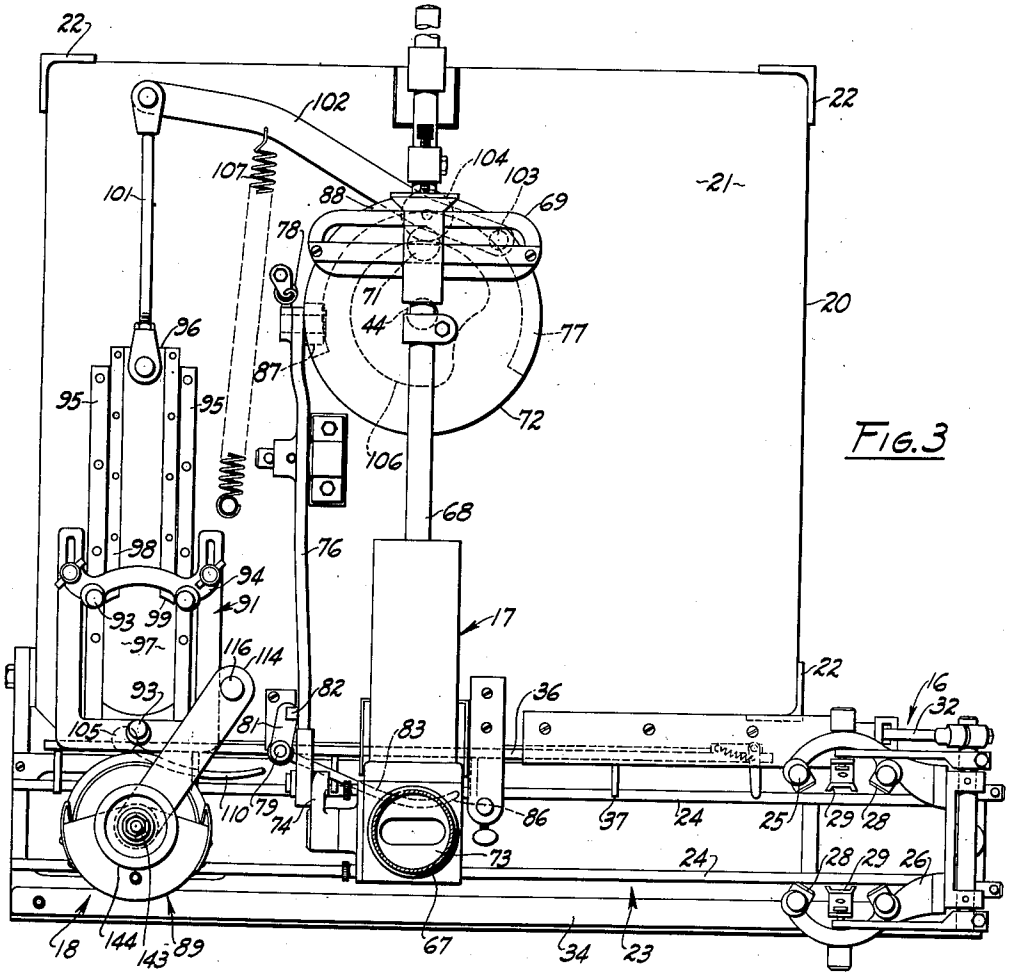


FIG. 3

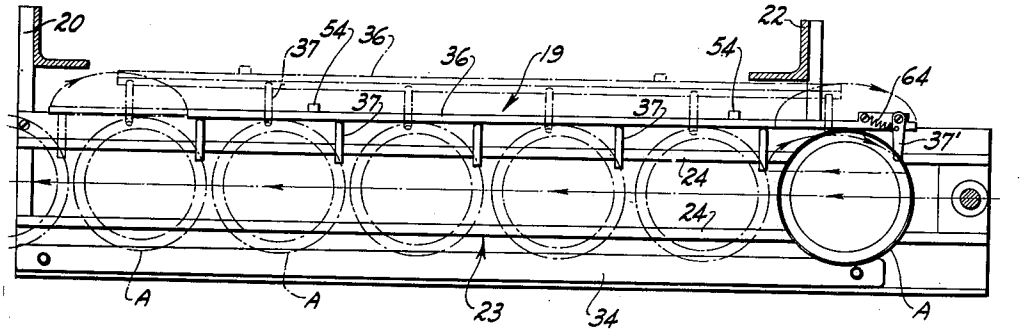


FIG. 4

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CONTAINER FILLING AND CAPPING MACHINE

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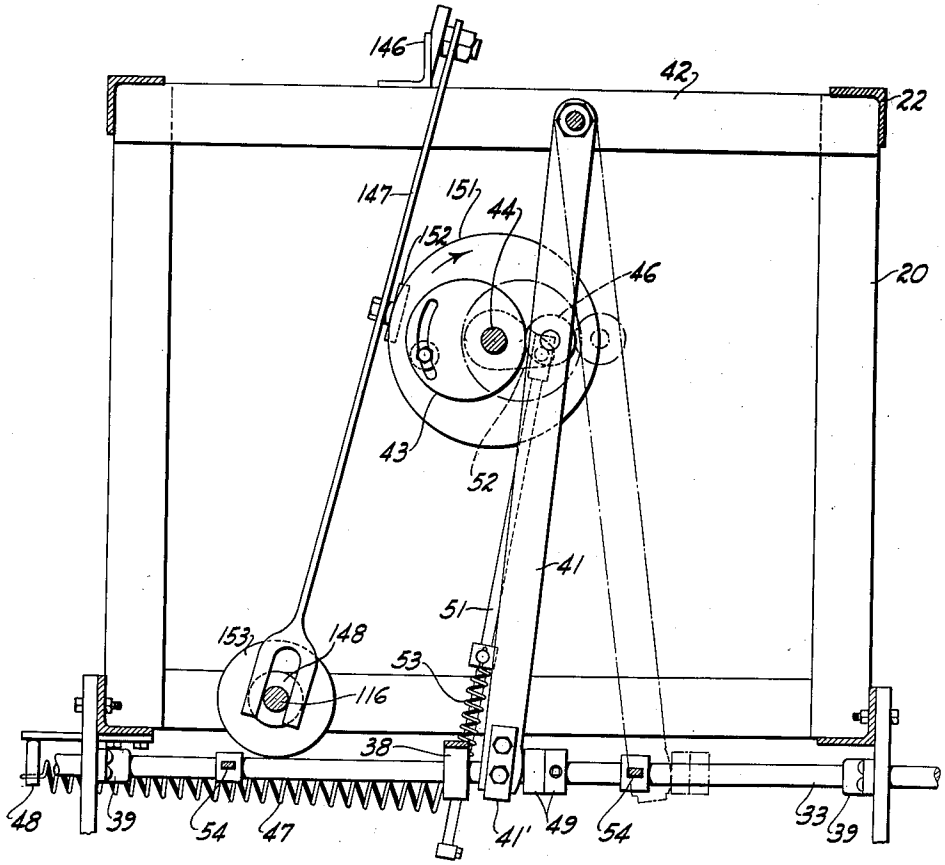


FIG. 5

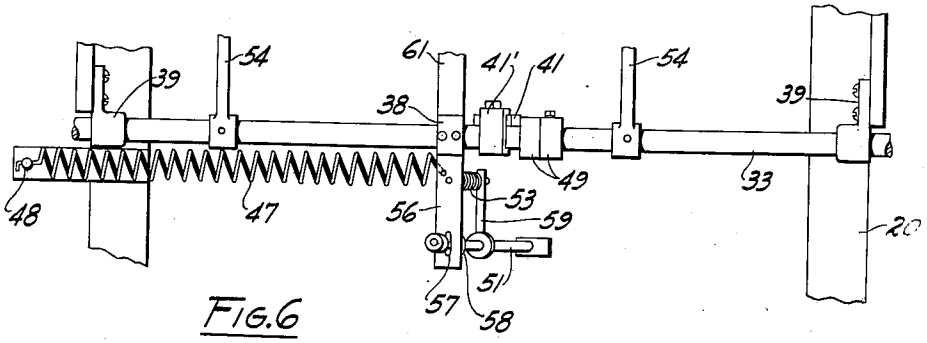


FIG. 6

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CONTAINER FILLING AND CAPPING MACHINE

Filed May 5, 1945 6 Sheets-Sheet 5

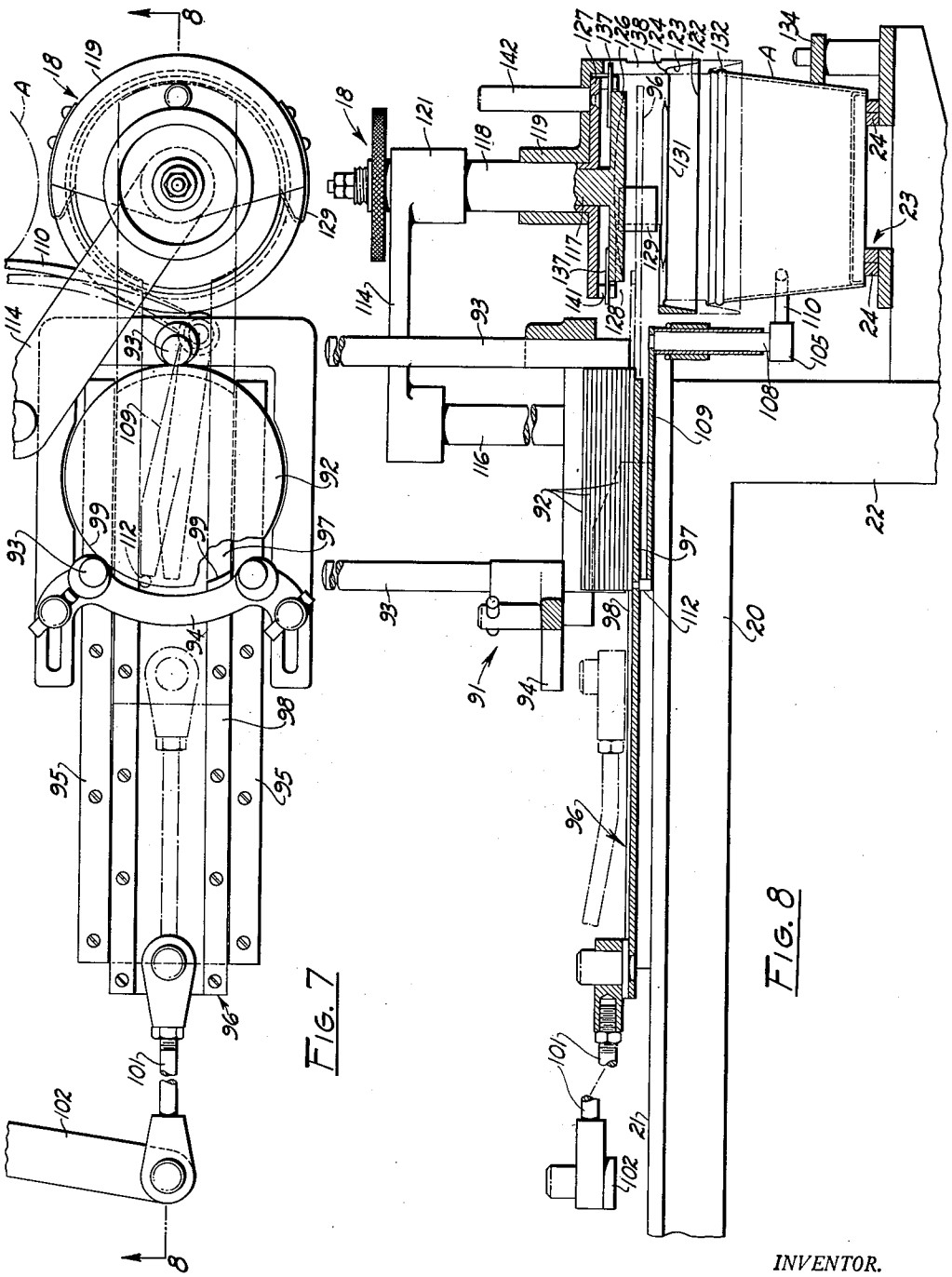


FIG. 7

FIG. 8

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CONTAINER FILLING AND CAPPING MACHINE

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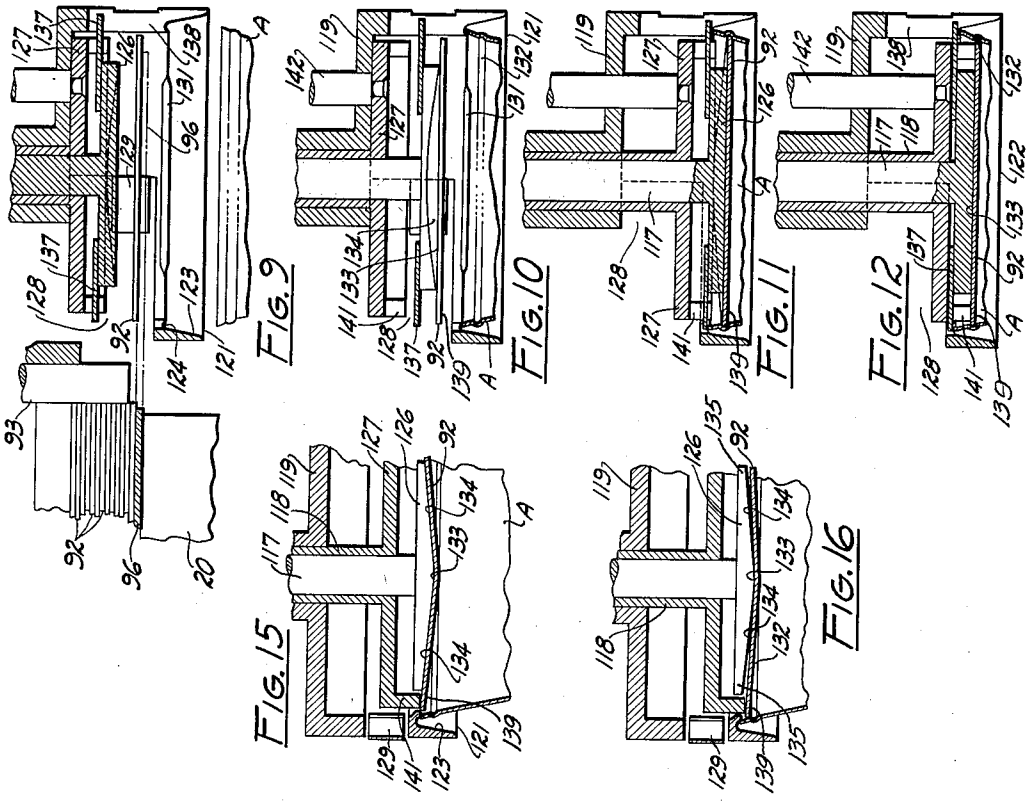


FIG. 9 FIG. 10 FIG. 11 FIG. 12

FIG. 15 FIG. 16

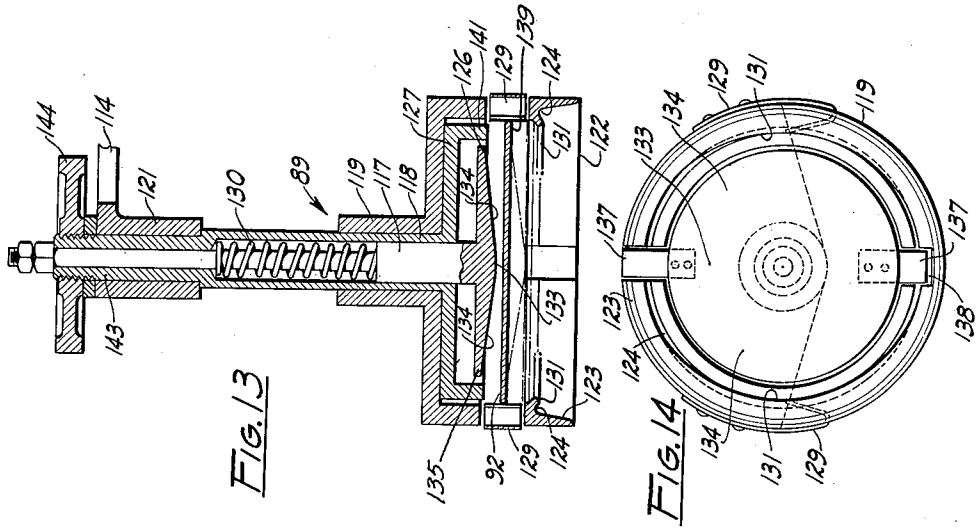


FIG. 13 FIG. 14

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UNITED STATES PATENT OFFICE

2,587,180

CONTAINER FILLING AND CAPPING MACHINE

Andrew E. Lindstrom, Larkspur, Calif., assignor, by mesne assignments, to United Metal Seal Company, Dorchester, Mass., a corporation of Massachusetts

Application May 5, 1945, Serial No. 592,213

13 Claims. (Cl. 226—92)

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The invention relates to a machine for filling containers and in the present embodiment of the invention, more particularly to a machine of this type arranged for handling relatively easily deformable containers, such as paper cartons having tapering side walls, the machine having as component parts thereof a container dispenser means, a means of supplying contents to the containers, a means of capping the containers after they are filled, and a means for conveying the containers for cooperation with the supplying and the capping means.

An object of the invention is to provide a machine of the character described employing a single conveyor unit for moving the containers to the different mechanisms, in which the relationship between the mechanisms and the unit is such that the mechanisms may operate simultaneously on different containers on the conveyor line without requiring any lag or variation of the speed of movement of the containers for accommodation with the different operations.

Another object of the invention is to provide a machine of the character described in which the containers are caused to move from one operating machanism to another such as for filling and capping, by a conveyor means utilizing rapid reciprocating advancing and recovering movements and acting in cooperation with said mechanisms whereby the operations thereof can be performed completely during the recovery movement.

Another object of the invention is to provide a conveyor operating to advance the containers by means of reciprocating contact members intermittently and simultaneously engaging all the containers on the line, wherein the movement of the members will be such as to avoid any deflection of the containers from their proper course particularly during the operation of disengagement or reengagement of the members with the containers.

A further object of the invention is to provide a machine of the character described capable of being used with extremely light and very easily deformable containers, such as paper cups, in which the conveyor means for advancing the containers from one operating mechanism to another, and control means for such mechanisms, will be so designed to engage the containers that the latter may operate such control means without being deflected out of the proper course or deformed in any manner.

A still further object of the invention is to provide a machine of the character described in which the various mechanisms, such as for filling and capping the containers, will be held inoperative in case the containers are not present on the means for conveying the containers to such mechanisms or are out of position on such conveying means or with respect to said mechanisms.

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A further object of the present invention is to provide a machine for filling containers, embodying container dispensing, filling and capping operations, in which all of the advance movements of the operations are performed through yieldable spring pressure means, with only the return or recovery movements mechanically actuated, whereby stoppages or misalignments of the containers at any point in the operations will effect an overcoming of the relatively yieldable resistance of the advancing stroke means, permitting free mechanical recovery strokes without the possibility of damage to either the containers or the mechanism.

An additional object of the invention is to provide a machine of the character described adapted for use with a container and cap of relatively flexible material, in which the capping operation is performed by utilizing the flexibility of both the cap and the body of the container, but in such manner as to avoid imposing any undue strain on or permanently deforming any portion of the cap or body, and without danger of crushing the contents or forcing portions thereof through the joint between the body and cap when the capping operation is performed with the body substantially completely filled.

The invention possesses other objects and features of advantage, some of which, with the foregoing, will be set forth in the following description of the preferred form of the invention which is illustrated in the drawings accomanying and forming part of the specification. It is to be understood, however, that variations in the showing made by the said drawings and description may be adopted within the scope of the invention set forth in the claims.

Referring to said drawings:

Figure 1 is a front elevation of the filling machine of my invention.

Figure 2 is a side view of the machine as viewed from the left in Figure 1.

Figure 3 is a plan view of the machine.

Figure 4 is a sectional plan view of the machine, showing the container feed track, the plane of the section being indicated by the line 4—4 of Figure 2.

Figure 5 is a view similar to Figure 4, taken on the line 5—5 of Figure 2, and showing the mechanism for actuating the container conveyor.

Figure 6 is a front view of the portion of the mechanism illustrated in Figure 5.

Figure 7 is a top plan view of the capping mechanism of the machine.

Figure 8 is a vertical sectional view of the capping mechanism taken on the line 8—8 of Figure 7.

Figures 9 to 12 inclusive are fragmentary views similar to Figure 8, but showing the parts in

progressive different positions of the capping operation.

Figure 13 is a vertical sectional view of the capper plunger unit taken at right angles to Figure 8.

Figure 14 is a bottom view of the unit shown in Figure 13.

Figures 15 and 16 are enlarged fragmentary sectional views of the capper plunger mechanism as viewed in Figure 13 but in different operative positions.

As shown in the drawings, the machine in general includes a means 16 for dispensing container bodies A, a mechanism 17 for filling the containers, a capping mechanism 18 for the filled containers, and a means 19 for conveying the container bodies successively to the filling and capping mechanisms. The container dispensing means and filling and capping mechanisms are mounted on a main frame 20 which also supports the conveying means. The frame 20 is here shown in the form of a table having a top 21 and supporting legs 22, the conveyor means and the portions of the dispensing means and the filling and capping mechanisms in direct cooperative relation with the conveyor means being disposed at what may be termed the front side of the table and adjacent the top 21. As will be clear from Figure 1, the conveyor means 19 extends for substantially the full width of the frame 20, the dispenser mechanism being disposed at the right side, the capper mechanism at the left, while the filling mechanism is interposed between such mechanisms.

Included as a part of the conveyor means is a track 23 preferably comprising spaced rails 24 which form a support for the container bodies and over which they are guided and advanced to the different mechanisms in operative relation thereto, the bodies being primarily deposited upon the track one at a time from the dispenser 16. The dispenser here illustrated comprises a means of supporting directly over the track 23 a vertical column of bodies in nested relation and with the open side uppermost, the bodies being stacked and guided between posts 25 which are mounted on an open base 26 held in spaced relation over the track by a standard 27. Carried by the base are a plurality of spring arms 28 designed to engage under the rim or other suitable portion of the lowermost body in the stack so as to support such body and the bodies thereabove. Intermittent release of the bodies as required in the operation of the machine is effected by means of a pair of opposed pawls 29 mounted for vertical reciprocation and arranged on the ascending movement to be elevated over and upon the rim of the lowest body, so that upon the subsequent descent of the pawls the body will be released from engagement with the spring holding arms and deposited upon the track. The pawls are pivotally carried on a link 31, in turn carried by a lever 32 connected to a shaft 33 for working in timed operative relation with the rest of the mechanism of the machine.

Extending longitudinally of the track is guide rail 34 which is preferably fixed in position along the outer side of the track and in upwardly spaced relation thereto so as to engage the sides of bodies A when disposed upon the track. Rail 34 as here shown extends for the full length of the track and is designed to retain the bodies against outward transverse displacement on the track as they are advanced therealong for cooperation with the filling and capping mechanisms.

Means are provided for guiding the container bodies on the track against inward transverse displacement, and in the present embodiment such means are incorporated with means for advancing the bodies along the track for cooperation with the different mechanisms. As here shown, included as part of the foregoing, is a rail 35 arranged for positioning along the inner side of the track and in parallel relation to the rail 34. The rail 36 is movable transversely relative to rail 34 and in inward position provides therewith a guiding means with which the bodies engage at opposite sides in their movement from the dispenser to the filling and capping mechanisms. Movement of the rail 36 is designed to effect advance of the bodies to operative position relative to such mechanisms, with intermittent periods of rest while the bodies are so disposed and of a duration sufficient to permit the complete filling and capping operations on different bodies on the track.

In accordance with the foregoing, there are provided means for reciprocating the rail 36 longitudinally of the track, and means on the rail for engaging the rear portions of the several bodies, that is the unfilled, the filled, and the filled and capped, on the track, the operation being such that said body engaging means will be held in operative engagement with the bodies during the advance movement of the rail, but wil be retracted transversely out of such engagement on the recovery movement of the rail. The means of engagement of the rail with the rear portion of the bodies is here shown in the form of fingers 37 fixed to the rail and extending transversely therefrom toward the rail 34. Fingers 37 are spaced apart a distance somewhat in excess of the width of the bodies and arranged in the inward positioning of the rail 36 to extend to a point preferably short of the center of the rear side of the bodies. As will be clear, the fingers 37 will serve to push the bodies individually on the track and since the spacing of the fingers exceed the width of the bodies, contact between the bodies will be avoided. This is important particularly in respect to the empty bodies, since the latter are usually tapered and so light that contact between the bodies with any appreciable force will likely result in causing them to be tilted or moved to an improper position.

For reciprocation of the rail and for movement transversely, the rail is here shown mounted on a lever unit 38 which is fixed to shaft 33 for movement therewith both rotative and longitudinal. Shaft 33, as will be noted, extends parallel to the track 23 and is mounted in bearings 39 on the frame for rotation and axial displacement. As a means of reciprocating the shaft 33, there is operatively connected thereto a lever 41 pivoted to a cross bar 42 at the rear of the frame and arranged to be moved in one direction by means of a cam 43 fixed on a shaft 44 and engaging a follower roller 46 carried by the lever. Shaft 44 is power driven and, is here shown operatively connected with an electric motor 45. Lever 41 moves the shaft 33 against resistance of a tension spring 47 connected at one end to lever 38 and at the other end to a pin 48 at the forward edge of the frame. It will thus be clear that on rotation of shaft 44, rail 36 and fingers 37 will be yieldingly advanced under pull of the spring 47 and retracted by thrust of the cam against lever roller 46. Connection between lever 41 and the shaft 33 is preferably effected by means of a strap 41' attached to the lever and arranged to abut

against one of a set of collars 49 secured on the shaft 33, the collars being adjustably or removably positioned on the shaft in order to vary the effective length of the stroke of the shaft for accommodating the conveying means to different sizes of containers.

For effecting the transverse oscillation of the rail 36, the lever 38 is operatively connected by means of a connecting rod 51 to a crank arm 52 fixed to the power driven shaft 44, the action of the crank being utilized to move the rail transversely back from the track while a spring 53 is utilized to urge the rail to advance inward on the track. As will be clear from Figures 2, 5 and 6, lever 38 is in effect a unit provided with a series of upper arms 54 and a lower arm 56, the arms 54 carrying the rail 36 while the arm 56 is arranged for cooperation with rod 51. The latter extending through an opening 57 in arm 56 and has adjustably secured thereon a collar 58 which is positioned to contact the arm and move the lever to retracted position on the forward movement of the crank 52. Spring 53 as shown in Figure 2, is attached at its opposite ends to the arm 56 and a stud 59 fixed to the rod and positioned thereon inwardly of collar 58. As will be clear, on rearward movement of the crank, rod 51 will be retracted, thereby extending spring 53 and causing the rail 36 to move to advance position under pull of the spring. Inward movement of the rail is preferably limited by engagement of an upper arm 61 of lever 38 with a thrust surface 62 forming part of the angle-iron member 63 of the main frame.

The relationship in the timing of the means for effecting longitudinal reciprocation of rail 36 including fingers 37, with respect to the means for effecting the transverse oscillation of such parts, is such that the latter movement will be predominant only near the beginning and ending of the recovery stroke of the reciprocating motion, or in other words when the speed of the latter movement is near its minimum. Accordingly as will be clear from Figure 5, when the lever 41 has been moved to advance the fingers to the most forward longitudinal position on the track, the crank 52 which as viewed in the figure rotates clockwise, has advanced midway of its forward stroke, and in order to avoid communicating the advance movement of the rod to the lever 38 until the aforesaid advance movement of the fingers has been completed, the collar 58 is set back on the rod so that contact will not be made with the lever unitl the longitudinal forward positioning of the lever is reached. In the same way, on the recovery movement of the rod, the collar will become released from lever 38 as the longitudinal forward stroke of the fingers is commenced. Furthermore in order to maintain the fingers in transversely advanced position throughout the forward longitudinal stroke, the operative relationship of the spring 53 is made such as to cause a tension to be maintained on lever 38 at all times and thus cause the arm 61 to engage surface 62 throughout said stroke. It will thus be seen as indicated by dotted lines in Figure 4, that the movement of the rail and fingers will be along a straight path during the body advancing stroke, and in a semi-elliptical path during the recovery stroke.

Operation of the conveyor system will now be clear. As the bodies are deposited by the dispenser, the rail 36 and fingers will move into engagement with bodies on the track, the fingers being advanced to full forward position over the

track by the time the forward longitudinal stroke of the rail and fingers is commenced. Throughout the forward stroke, the fingers remain behind the bodies and convey all of the bodies a full position ahead, the bodies beneath the filling and capping mechanisms being likewise advanced and succeeding bodies positioned in operative relation with the mechanisms in place of the displaced bodies. As the bodies reach the end of the intermittent advance movement, the rail and fingers are retracted and the longitudinal recovery movement is initiated. With the bodies now in stationary position, the filling and capping operations may be performed, the recovery movement continuing until near the end of the stroke, when the said operations will have been completed and the rail and fingers moved into engagement with the next bodies. It will thus be evident that an effective conveyance of the bodies to the filling and capping mechanisms will be provided, and with a mode of operation which insures against crushing of the bodies and displacement thereof from proper positioning on the track and in relation to said mechanisms.

Means are provided for preventing the advance of the bodies on the track in case several bodies are accidentally deposited by the dispenser in nested relation on the track. As here shown the foregoing is simply effected by securing the first finger 37' in pivotal attachment with the rail 36, a very light spring 64 being connected between the rail and finger to normally hold the finger in extended relation similar to the rest of the fingers 37. Should the multiple-body deposit be made, the finger 37' will be unable to push the bodies ahead and thus prevent delivery of same to the mechanisms.

The filling mechanism 17 may be of any suitable type, but with the discharge opening 66 thereof positioned to deliver the contents to the bodies when the latter are delivered in operative relation thereto on the track. As here shown the mechanism includes a cylinder 67 associated with a plunger 68 which serves to alternately draw into the cylinder and discharge therefrom a measured charge of the substance with which the bodies are being filled. The plunger is reciprocated by means of a scotch yoke 69, engaging with a pin 71 carried by disc 72 affixed to the power shaft 44. Control of the intake and discharge of the material in the cylinder is effected by means of a rotary valve 73, to which is connected a crank 74, arranged to be oscillated in timed relation with the plunger 68 by means of a lever 76 rocked by a cam 77 formed on disc 72. In order to prevent the material being fed to the cylinder or discharged therefrom in case no body is disposed in operative relation to the filler mechanism, means are provided for preventing the rocking of lever 76 and consequent oscillation of the valve 73. As will be clear from Figure 2, the lever is arranged to be maintained in engagement with the cam 77 by means of a spring 78, and a detent device is provided which will normally hold the lever in inoperative position for actuation by cam 77 except when a body is disposed in operative relation under the discharge outlet 66. Mounted on the frame adjacent the connection between lever 76 and crank 74 and for pivotal movement about a vertical pin 79 is a detent arm 81 which may be moved into and out of position under a projection 82 on lever 76. Secured for movement with the arm 81 is a deflector arm 83, which is normally resiliently held by means of a spring 84 in a position with a portion 86 thereof in the path of the containers

on the track. As will be clear from Figure 3, in which the parts are positioned as when a container is absent from under the outlet 66, with the arm 83 extended the detent arm 81 will be disposed in inward relation in position to engage pin 82. Lever 76 engages cam 77 through a follower roller 87, and when the roller is engaged with the protruding portion 88 of the cam, the projection 82 will be positioned above the level of arm 81, so that when the roller is engaged with the cam portion 88 and no container is present to deflect the arm 83 to inward position the detent 81 will move under the projection 82 and thereby prevent operation of the filling mechanism until such time as a container body is moved into operative relation under the outlet 66, so as to receive the contents therefrom.

The capping mechanism 18 as previously explained, is located beyond the filling mechanism 17, and is provided with a capper head or unit 89, which is positioned in overlying relation with the track and spaced thereabove similar to the outlet 66 of the filling unit so that the container bodies may move thereunder into and out of operative relation therewith. As will be clear from Figures 3 and 4, the capper head is removed from the filler dispensing unit or cylinder a distance equal to twice the spacing between centers of adjacent bodies so that when the bodies are moved over the track by the successive, intermittent progressions of the fingers, the filled bodies passing from the mechanism 17 will be subsequently delivered to the capper in proper position, and whereby a filling and capping operation may take place simultaneously but on different bodies.

The capper mechanism, in the present embodiment, includes, in addition to the capper unit 89 a means 91 for dispensing closure caps for the bodies and for delivering same to the capper head for application to the bodies when moved thereunder. The caps as here shown are in the form of flat discs 92 made of pasteboard or the like and while of thicker material than the walls of the container bodies, possess in common with such walls an appreciable amount of flexibility. The cap dispenser means includes a set of posts 93 mounted on the top 21 adjacent the track and designed to hold a plurality of the caps in vertically stacked relation and in horizontal position. Two of the posts 93 are preferably supported on an adjustable mounting plate 94 so that the dispenser may be adjusted to accommodate different sizes or designs of caps. Positioned on the table and guided between rails 95 for movement to and from the capper head 89 is a reciprocating slide 96 which is designed to underlie the caps between the posts 93 and to convey the lowermost cap therein to operative position within the head. The slide is formed with portions 97 and 98 having their upper surfaces preferably flat and of different heights, the portion 97 with the lower surface being disposed at the forward part of the slide while the portion 98 with the upper surface is located longitudinally inward of the lower portion. Portion 98 is here shown formed of opposed strips with a space therebetween so as to clear one of the posts 93 of the cap stack holder during reciprocation of the slide. As will be seen by reference to Figure 8, when the slide is in fully retracted position as indicated in solid lines, the lower portion 97 will completely underlie the stack of caps in the holder and provide a full support or seat for the lowermost cap. Likewise in this position of the slide, the upper portion 98 will be disposed back of the stack but with the forward edge or shoulder 99 thereof in horizontal alignment and operative engagement with the rear edge of said lowermost cap. Portion 98 is arranged to extend no higher than the upper surface of the cap and therefor when the slide is advanced, only such lowermost cap will be engaged and caused to be moved out to the head; however, during the period the slide is out of retracted position, portion 98 will ride under and support the succeeding cap. As soon, of course, as the slide delivers the cap on portion 97 and is returned to fully retracted position the cap previously supported on portion 98 is deposited upon and supported exclusively by the portion 97.

As a means of reciprocating the slide, the latter is connected by means of a link 101 to a lever 102 pivotally secured by a pin 103 to the top 21. On the lever 102 is provided a follower roller 104 designed to engage a rotating cam 106 carried by motor driven shaft 44 and by means of which the lever is drawn to move the slide to retracted position. Movement of the lever in the reverse direction so as to advance the slide is effected by a spring 107, and as shown in Figure 3, the cam is shaped to provide for a relatively short interval for accomplishment of the complete advance and recovery operation.

Means are provided for preventing the reciprocation of the slide so as to avoid delivery of caps to the capper head in case during the operation of the machine, no container body is either being delivered to or operatively disposed under the head. Such means is in the form of a detent device somewhat similar to the arrangement shown in connection with the filler mechanism but with the addition that release of the device for permitting operation of the slide and delivery of a cap requires that a container body be in position on the track for delivery to the capper mehcanism on initiation of the forward stroke of the conveyor. As shown in Figures 7 and 8, such device includes a detent lever 105 pivotally mounted at the front of the frame by means of a pin 108 fixed to both arms 109 and 110 of the lever. Arm 109 extends under the slide 96 and may be moved on rocking the lever to lie in or out of the path of a stop 112 fixed to the slide, as the slide is advanced on its forward stroke. A will be evident if the arm is opposite the stop forward movement of the slide will be prevented since spring 107 will be unable to move lever 102. Arm 110 of the detent lever is positioned to normally lie, under influence of a spring 113, both in the space arranged for occupation by a filled body when operatively disposed under the capper head and in the space occupied by a filled body on the track when the conveyor starts on the advance stroke which will move the body in the space under the head. With no body in both of said spaces or at least in the space preceding the capper, the lever arm 109 will be positioned across the stop and slide 96 will be held in retracted position; however, when the advance strike is commenced and a body is positioned in the spaces preceding the capper, arm 110 will be deflected by the body therein and the slide will be free to advance. In connection with the above, it may be noted that the cam 106 is arranged in such relation to the conveyor movement that the advance movement of the slide will be initiated after the advance stroke of the conveyor has been com-

menced, thus affording the detent a sufficient opportunity for clearing the stop 112 as long as a container is in the space preceding the head.

The capper head 89 is carried by a bracket 114 which is secured to the upper end of, and arranged for vertical reciprocal movement with, a spindle 116 mounted in suitable bearings on the frame 20. As here shown, the head comprises a plurality of plunger members, to wit, an inner member 117, an intermediate member 118 and an outer member 119. The inner and outer members, as will be clear from Figure 13, are carried by the intermediate member, the latter being vertically adjustably secured in a sleeve 121 forming part of the bracket 114. Outer member 119, which is formed hollow, is designed on depression of the head to engage and center the body under the head and is provided with an open end 122 at the bottom thereof, in which the upper portion of the sidewalls of the container bodies are arranged to be received. In order to center the body in position the inner surface 123 of the end 122 is flared outwardly, and such surface terminates at its inner end in recess 124 in which the upper edge or rim of the container body is designed to seat when the body has been centered in proper position. The outer member in the depressed position of the head will be held in engagement with the body due to the weight of the member, since the member is free to move upwardly on the intermediate member 118. Members 117 and 118 are provided with transversely enlarged portions 126 and 127 respectively, and in the elevated position of the head such portions will be disposed within the member 119 adjacent the inner end of the hollow interior portion thereof. Formed in the side wall of member 119 opposite the cap dispenser holder 91 is an opening 128 through which in the elevated position of the head, slide 96 together with a cap thereon, may be moved into the member 119 to deliver the cap thereinto. As will be clear from Figure 8, the cap is delivered by the slide into the member 119 at a point below the enlargements 126 and 127, and in order that the cap will be supported within the member 119 when the slide is withdrawn, a pair of opposed spring clips 129 are provided at the transverse ends of the opening 128, the clips being designed to resiliently engage diametrically opposed points at the periphery of the cap.

After a body is positioned under the head and the cap supported in the spring clips 129 as above set forth, the head will be caused, in the operation of the machine, to move downward toward the body, as a result of which the enlargement or plunger 126 of the inner member will engage the cap in the springs and release same therefrom, the plunger 126 being permitted a limited longitudinal movement relative to the intermediate member, and normally maintained in extended, depressed position by means of a spring 130 interposed between shoulders on the members 118 and 117. Within the member 119 adjacent the annular recess 124 is a pair of diametrically opposed shoulders 131 protruding sufficiently inward to lie in the path of the cap when the latter is released from the springs 129 and allowed to descend toward the body. It will thus be clear that on release of the cap from the springs 129 the former will be deposited on the shoulders 131 and thereby interrupt the fall of the cap, the shoulders being preferably segmental in form so as to firmly support the cap in horizontal position thereon. As said movement continues, the outer member 119 lowers upon the container body and the surfaces 123 engage with the rim thereof to center the body in position, until the rim becomes engaged within the groove 124 so that the body will be firmly held by the member upon the track in proper centered relation. Meanwhile, the descending plunger has followed its resiliently pressed engagement with the cap so that while the cap remains supported on the shoulders 131 a downwardly extending flexure will be produced in the cap.

In the type of container illustrated, the closure is arranged to be effected by insertion of the periphery of the cap in an annular groove 132 provided on the inner surface of the sidewalls of the body adjacent but spaced from the rim at the open side of the container. As the circumference of the cap is greater than the inner surface of the body walls at the open side of the groove, it will be evident that in order to insert the cap in the groove either or both the cap and body will have to be flexed or otherwise distorted during the insertion operation. In accordance with the above, the means of the present invention is designed to effect the temporary flexure of the cap, whereby the latter may be easily inserted in the groove without danger of deforming any of the portions of the container including the cap or impairing the desired firm fit and seal of the cap with the body. As will be clear from Figure 13, the underside of the plunger 126 is formed with a diametrical ridge 133 which extends perpendicular to an imaginary line passing through the diametrically opposed shoulders 131, the semicircular areas 134 at the opposite sides of the ridge being sloped divergently upward and outward from the ridge 133 to the opposing peripheral portions 135 of the plunger. It will thus be seen that upon the continued depression of the plunger while the cap is seated upon the shoulders 131 or otherwise similarly held against movement with the plunger, the cap will be flexed on and about the line of the ridge 133 as illustrated in Figures 15 and 16. As will be evident, with the cap flexed in the above manner and moved downwardly into engagement with the sidewalls of the body, the peripheral portions of the cap at the ends of the central line of flexure will readily spread the side walls of the body sufficient to permit the insertion of such cap portions in the groove.

As a means of limiting the downward movement of the cap into the body, in other words, to insure the retention of the cap within the groove, there are fixed to the plunger a pair of opposed projections 137 which are positioned to engage the rim of the container as illustrated in Figure 12, when the plunger has depressed the peripheral cap portions in the groove. Desirably at least one of the projections 137 is engaged in a longitudinally extending guide slot 138 in the side wall of the member 119 so as to maintain the plunger with the ridge 133 in the proper relation to the shoulders 131.

As will be seen from Figure 15, the inclination of the areas 134 is such as to cause the cap portions 139 adjacent the shoulders to move downwardly beyond the shoulders when the aforesaid portions at the ends of the central line of flexure are inserted into the groove thus avoiding excessive deflection of the cap. In order to move the portions 139 into the groove, as well as the other portions of the periphery of the cap still out of the groove, means are provided on the portion 127 of the intermediate member for

preferably engaging the entire upper side of the cap near the periphery as soon as the plunger 126 has reached its lowest position. As shown in Figure 13, such means includes a ring or annulus 141 extending downwardly from the portion 127 and interposed between the edge of the plunger and the inner wall of the member 119.

When the plunger 126 has reached the lowermost position, intermediate member 118 will be caused, on the final portion of the descending stroke of the head, to move downwardly relative to plunger 126 against the resistance of spring 130, and thus force the unseated peripheral portions of the cap to move into the desired seating engagement in the groove. With all portions of the cap periphery fully seated in the groove, both the cap and body are restored to their original form and firmly secured together in seal tight engagement. It is important to note that with the method and means of the present invention for applying the cap to the body, air is permitted to vent from the interior of the body practically until the cap is in final position in the groove. In this manner not only will the cap applying operation be performed more readily, but the contents will not be disturbed during the operation or sealed in with excess air or air under pressure. Downward movement of the annulus 141 is limited by engagement of the portion 127 with the projections 137, thus insuring the proper insertion of the cap into the groove. Preferably relative rotation between members 118 and 119 is prevented by means of a stud 142 fixed to member 118 and extending through an opening in the member 119.

In order to provide for ready replacement of the capping units for different sizes of container bodies, the shank 143 of the intermediate member is threaded and engaged by a hand wheel 144 by which the member is clamped in position at the sleeve 121.

Means are provided for effecting the reciprocation of the capper head in timed relation to the conveyor mechanism so that the capping operation will be completely performed during the recovery of the conveyor means, in other words, while the body to be capped is in stationary position under the head. Pivotally mounted on a member 146 of the frame is a lever 147, the free end of which is loosely engaged around the spindle 116, and engaged upon a collar 148 carried by the spindle. The spindle is normally urged to an elevated position by means of a spring 149, and in order to depress the lever so as to effect a descension of the spindle the lever is operatively associated with a cam 151 fixed to the power driven shaft 44 and designed to engage a roller 152 on the lever. As will be understood, the cam is formed and positioned to depress the roller after a cap has been inserted in the head and to permit elevation of the head under force of spring 149 after the cap has been operatively applied to the body. As a means of varying the depth and duration of the stroke of the capper head adjustment is provided for raising and lowering the collar 148 so as to vary the position of the roller and lever relative to the cam. As here shown, such adjustment is effected by means of a threaded hand wheel 153 vertically adjustable on a threaded collar 154 and engaging the collar 148. Collar 154 is fixed to the spindle and is guided for longitudinal movement but held against rotation by means of a rod 156 extending from the collar and engaging in a vertical guide 157. As will be evident, by rotating wheel 153 the position of lever 147 may be changed with respect to cam 151, and thus provide for the desired variation in operation. Preferably a rod 158 is secured to collar 148 and engaged in guide 157 to prevent rotation of the collar.

If desired, there may be incorporated with the machine, a means operating in conjunction with mechanism thereof, for printing on the container, for example the date upon which the container has been filled and capped. In the present embodiment, a printing means is provided on the machine and arranged for operation with the capper mechanism, and preferably the printing means is designed to apply the imprint on the under side of the container body as the capper head is moved into engagement with the body. As shown in the drawings, the means comprises a lever 161 carrying the type 162, the impression of which is to be applied to the body, and a lever 163 carrying the pad 164 for applying ink to the type. The levers are positioned under the conveyor track and fulcrumed to the frame on parallel pivot pins 166 and 167. Lever 161 includes a pair of arms 168 and 169, the arm 168 having releasably mounted thereon the type member 162 while the arm 169 is operatively connected to the cam operated lever 147 by means of a link-rod 171 connected to an extension 172 of lever 147. Rod 171 is loosely engaged in arm 169, and is provided with a head 173 which serves to lower the arm and thus raise type member 162 into engagement with the body on descension of the capper. In the inoperative position of lever 161, lever 163 holds the pad 164 in contact with the printing face of member 162, but when arm 168 is raised, lever 163 will be tilted backward to disengage the pad from member 162, lever 163 remaining in such position until a projection 174 on lever 161 strikes lever 163 on the return movement of lever 161.

In operation the machine functions as follows:

As each body is deposited on the track by the dispenser 16, rail 36 with fingers 37 moves all of the bodies on the track a distance sufficient to advance each body to the position occupied by the body ahead. In this manner, as a result of such movement, a filled body will move out of operative relation with the filler unit and another will move out of operative relation with the capper, while succeeding bodies will move to engagement with the filler and capper. As a body moves into operative relation under the filler discharge opening and the end of the forward stroke of the conveyor is reached, detent arm 81 will have released lever 76 so that valve 73 may be moved to communicate with the discharge outlet. After the recovery stroke of the conveyor has started so that the body is stationary under the filler, the plunger 68 is advanced to express the charge from the filler cylinder to within the body and the filled body is then ready for transfer to the capper. As the advance movement of the conveyor is again initiated, the body under the filler is moved forward into the intermediate space between the filler and capper head, thereby displacing the filled body now on the way to operative positioning under the capper. As the body in the intermediate space moves forward on such advance movement of the conveyor, the side thereof deflects the detent lever 105, thus releasing the capper slide whereupon the latter will deliver a cap to the head. Upon completion of said advance stroke of the conveyor, the latter will have moved the body to operative position under the head, where it will

leave it for the performance of the capping operation. With the body thus disposed, cam 151 will depress lever 147, thereby causing the members of the capper head to engage the body and apply the cap in the manner described. At the same time the capping operation is being completed, the dater mechanism is actuated to imprint the date on the container bottom, and with the container thus filled, capped, and dated, the capper head is retracted and the conveyor upon the succeeding advance stroke moves the container out from under the head for disposal as desired.

I claim:

1. In a machine of the character described, including a track for supporting container bodies with an open side uppermost, and means associated with the track for advancing the containers one at a time thereon to operative positioning with said unit and for interrupting the movement of the body when in such position, a capping mechanism at said track comprising a cap dispensing means including a holder for supporting and maintaining a plurality of caps in vertically stacked relation, a cap depositing and applying unit positioned transversely of said holder and over said track and spaced vertically therefrom to permit the operative positioning of a body between the track and unit, resilient means in said unit for receiving and supporting a cap in said unit for deposit on a body thereunder, a reciprocating pusher bar positioned to engage one of the caps in said holder and move it into operative position in said resilient receiving means, said unit also including a vertically movable member depressible to engage and hold the container and operative on depression thereof to release the cap from the resilient supporting means and force it into closing engagement with the container body.

2. In a machine of the character described, the combination with a support for a container body, a capping mechanism for the body comprising a cap depressing unit positioned in vertically spaced relation over said support to permit reception of a body therebetween and including a vertically movable member formed to receive and resiliently hold a cap for positioning on the body and having body engaging portions arranged on descent of the member to center and retain the body on the support in operative relation to the mechanism, a plunger movable vertically relative to said holding member positioned to overlie the cap in said member when received therein and operative on descension to release the cap and press it into operative engagement with the body.

3. In a machine of the character described, including a support for a container body, and means for conveying caps for said body from a stack one at a time and positioning same in operative relation on the cap supporting parts, a capping mechanism for the body including a unit positioned over the support and spaced therefrom to permit of the body being inserted therebetween, a cap receiving and body centering member having first portions for supporting the cap substantially along the edges thereof in spaced aligned relation over the body and second portions engageable with the body adjacent the top thereof to center and hold the same in operative relation to the mechanism, a plunger mounted within the member for vertical movement relative thereto positioned to overlie the cap in an elevated position and to release the cap and press it into operative engagement with the container when in a depressed position, and cap dispensing means opposite said member including a means of supporting a plurality of caps in vertically stacked relation.

4. In a machine of the character described, including a support for a container body, a capping mechanism positioned over said support for engaging and centering the body thereon relative to such mechanism and including a means of supporting a cap over and in alignment with the body on said support and a means of flexing and depressing the cap into operative engagement with the body, a cap dispenser mechanism including means for supporting a plurality of caps in vertically stacked relation with the lowermost cap opposite the cap supporting means of the capping mechanism, a horizontally movable slide member having a portion arranged to engage the lowermost cap in said stack and move it into operative relation with the supporting means of the cap mechanism, said supporting means being vertically movable with said cap displacing means and including resilient members adapted to engage a cap at a plurality of points on the edge thereof, means to raise and lower said cap depressing means, means to reciprocate said slide member in alternate relation with said cap depressing means including a power actuated member operatively connected to said slide member to intermittently move same.

5. A machine in accordance with claim 4 characterized by means for preventing the movement of the slide member to advanced position except when a body is positioned upon the support under the capping mechanism, said means including a detent normally having a portion operatively engaging a relatively fixed part of said member so as to lock the member against advance movement, and having a portion displaceable by the body when positioned under the capping mechanism and operative when in displaced position to move the first portion to release the slide.

6. In a machine of the character described, the combination with a support for a container body to be capped, a capping unit including a part arranged for positioning over the support with the body therebetween, means engageable with the container body to center and hold same in operative relation with the unit and with the open side uppermost, means to support a cap in the unit substantially exclusively at opposed edge portions thereof and substantially at the open side of the body, a plunger included in said unit part formed to flex the cap when supported as aforesaid from one side to the other about an axis at right angles to the axis of the container body and a line intersecting the cap supporting means and to press the cap in such form into operative engagement with the body, and means to press the peripheral portions of the cap into coplanar relationship in operative engagement with the body.

7. In a capper mechanism for flexible walled container bodies and closure caps, a supporting and holding means for a container body, cap deforming means, one of said means movable relative to the other, said holding means providing for support of the cap over the open side of the body substantially exclusively at diametrically opposite points of the cap, said deforming means formed and operative on movement of the one means relative to the other to engage and flex the cap along a line at right angles to a line intersecting said points and to press the peripheral portions of the cap at the end of the line of flex-

ure into operative engagement with the body, and means to press into coplanar relationship and into operative engagement with the body the remaining peripheral portions of the cap.

8. In a capper mechanism for flexible walled container bodies and closure caps, means for supporting an open body in position for receiving a cap, means providing a support for the cap over the body opening substantially exclusively at diametrical points adjacent the periphery of the cap, means movable relative to one of the first mentioned means formed to engage the cap and flex it substantially entirely across the cap about a line at right angles to a line intersecting said points and to press the peripheral cap portions along the line of flexure into operative engagement with the container in advance of the other peripheral portions of the cap, and means operative to press into coplanar relationship and into operative engagement with the body the said other peripheral portions of the cap.

9. In a capper mechanism for flexible walled container bodies and closure caps, means for supporting a body with an open side at the top and in position to receive a cap, means providing a support for the cap in position above the opening, means operative to engage the cap in said position to flex same about a line intersecting opposed peripheral portions and with the convex side facing the body, and means operative to engage the cap in flexed position to restore all peripheral portions of the cap in coplanar relation and in operative engagement with the container body.

10. In a copper mechanism for flexible walled substantially cylindrical container bodies and flexible circular closure caps, the walls of the bodies having a peripheral groove on the inner side near the open side of the body, means for supporting a body with the open side in position to receive a cap, means providing a support for the cap in position above the opening in the body, means operative to engage the cap when in said position to flex same downwardly on a diametrical line from one circumferential point to the other and to press the flexed cap into the body with the circumferential portions at said points seated in the groove, and means to depress other circumferential portions of said cap into coplanar relation with the cap portions in the groove and to insert in the groove said last named circumferential portions of the cap.

11. In a capper mechanism for flexible-walled, substantially cylindrical-walled container bodies and flexible circular closure caps, the walls of the bodies having an annular groove on the inner side near the open side of the body, a means for supporting the body with the open side at the top, a depressible member movable toward the supporting means and having an annular portion engageable with the rim of the body to center and hold the body in position, diametrically opposed rests on said member located inwardly of the rim engaging portion and providing a seat above the groove for engagement with the under side of the cap, means on the member for positioning the cap in aligned relation with the body opening when seated on said rests, a depressible plunger within said member arranged to engage over the cap and having its under side engageable with the cap on said rests and formed with a downwardly projecting portion extending diametrically at right angles to a line extending from one of said rests to the other whereby on depression of the plunger the cap will be flexed downwardly and diametrically, means to depress the plunger to position the opposed circumferential flexed portions in the groove, and a second plunger in said member arranged for positioning above the cap and depressible to in the last mentioned position of the cap to force the remaining circumferential portions of the cap downwardly and into the groove.

12. In a capper mechanism for flexible-walled, substantially cylindrical container bodies and circular flexible closure caps therefor, a means for supporting the containers with an open side at the top, a capper unit positioned above the supporting means to permit of the container body being interposed therebetween and including an intermediate member associated with means for vertically reciprocating same, an outer member carried by said intermediate member for vertical reciprocation thereon and provided at the bottom with a ring formed to engage the body and center same in operation relative to the unit and having provided therein a groove positioned and formed to receive the rim of the body, an inner member carried by the intermediate member for vertical reciprocative movement relative thereto and the outer member, means resiliently holding the inner member in an advanced depressed position relative to the intermediate member, said inner member having as its lower part a disc designed to fit within said ring and provided with opposing halves at its under side sloping divergently toward and merging in a diametrical ridge, opposed cap supporting seats within said outer member above the body engaging portion thereof and disposed along a diametrical line at right angles to said ridge, said intermediate member having at the lower part thereof an annulus designed to surround said disc and engage the cap, said disc and annulus normally lying above said shoulders, and said outer member being provided with an open portion above said shoulders for the introduction of a cap within the member.

13. The method of capping with a flexible-walled disc a substantially cylindrical container body provided with flaring flexible side walls formed with an annular groove below the rim of the body, the circumference of the disc being greater than the normal circumference of the body at the upper edge of the groove, which comprises flexing the disc about a diametrical line and inserting the disc while so flexed into the body with the convex side in advance and until the peripheral portions of the disc at both ends of the line of flexure are inserted in the groove, and then forcing into the groove the remainder of the peripheral portions of the disc progressively from said ends to the portions mediately of such ends.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
901,420	Chamberlain	Oct. 20, 1908
1,111,973	Scholl et al.	Sept. 29, 1914
1,260,220	Lundeen	Mar. 19, 1918
1,804,772	Hubbard	May 12, 1931
1,939,401	McClatche	Oct. 12, 1933
1,989,036	Geyer	Jan. 22, 1935
2,125,821	Sibley	Aug. 2, 1938
2,264,738	Blann	Dec. 2, 1941