Nov. 15, 1927.

1,649,459

G. A. FULLIPS

BOTTLE CAPPING MACHINE

Filed Dec. 13, 1923

6 Sheets-Sheet 1

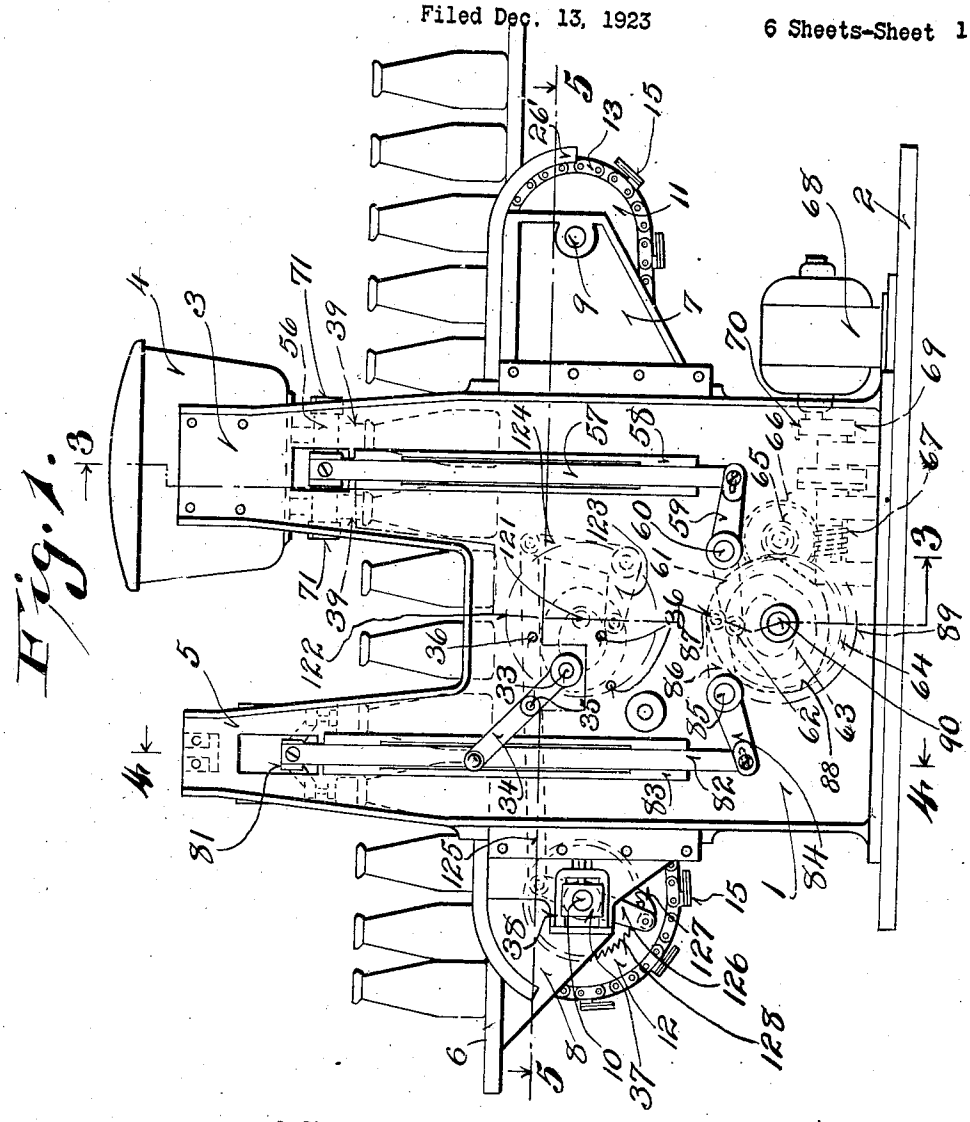


Fig. 1.

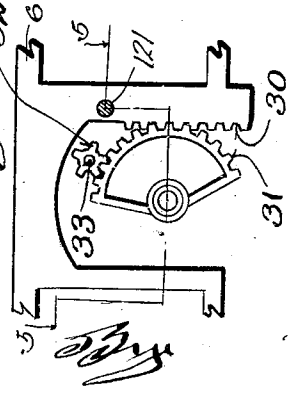


Fig. 2.

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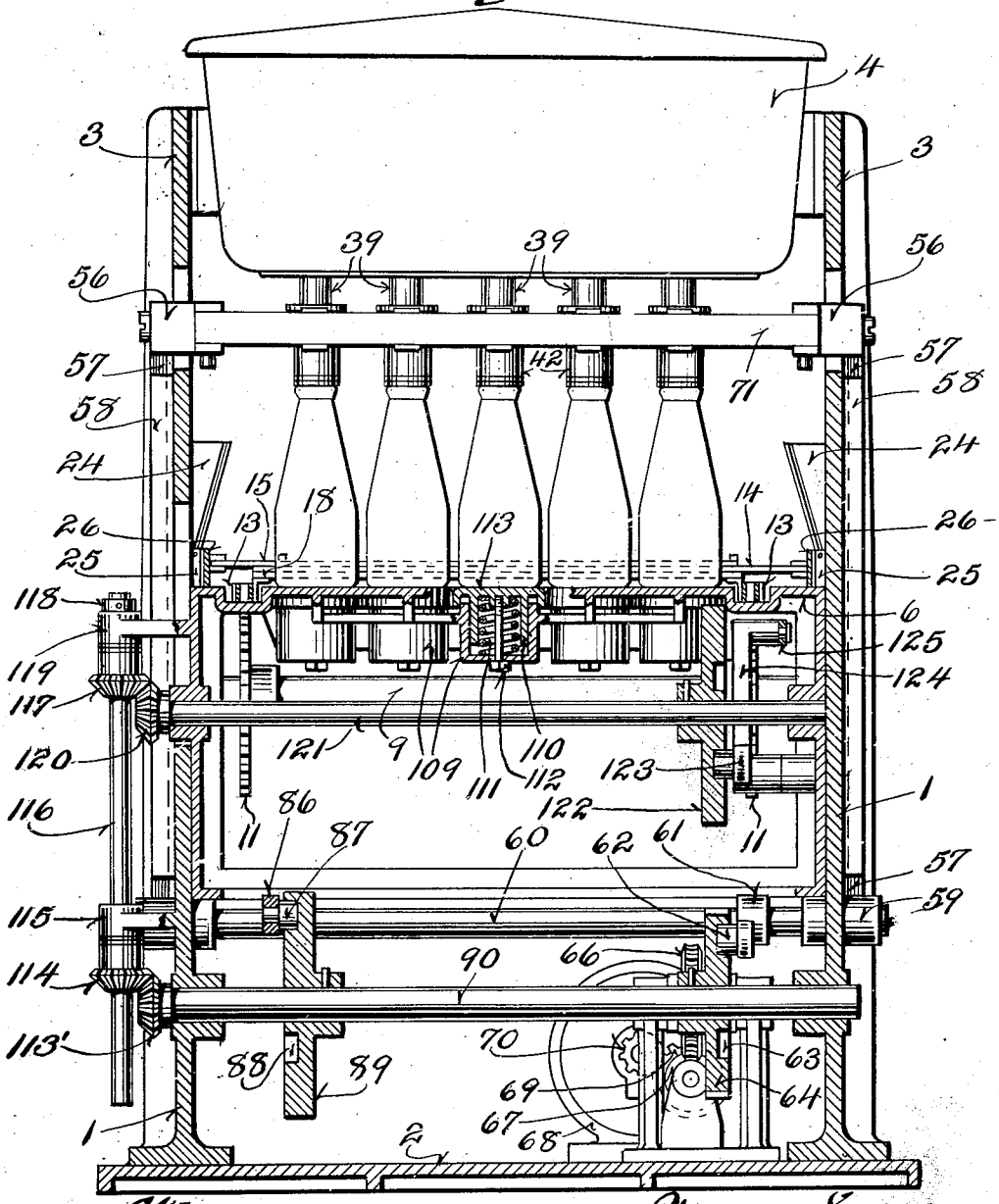
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BOTTLE CAPPING MACHINE

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Fig. 3.



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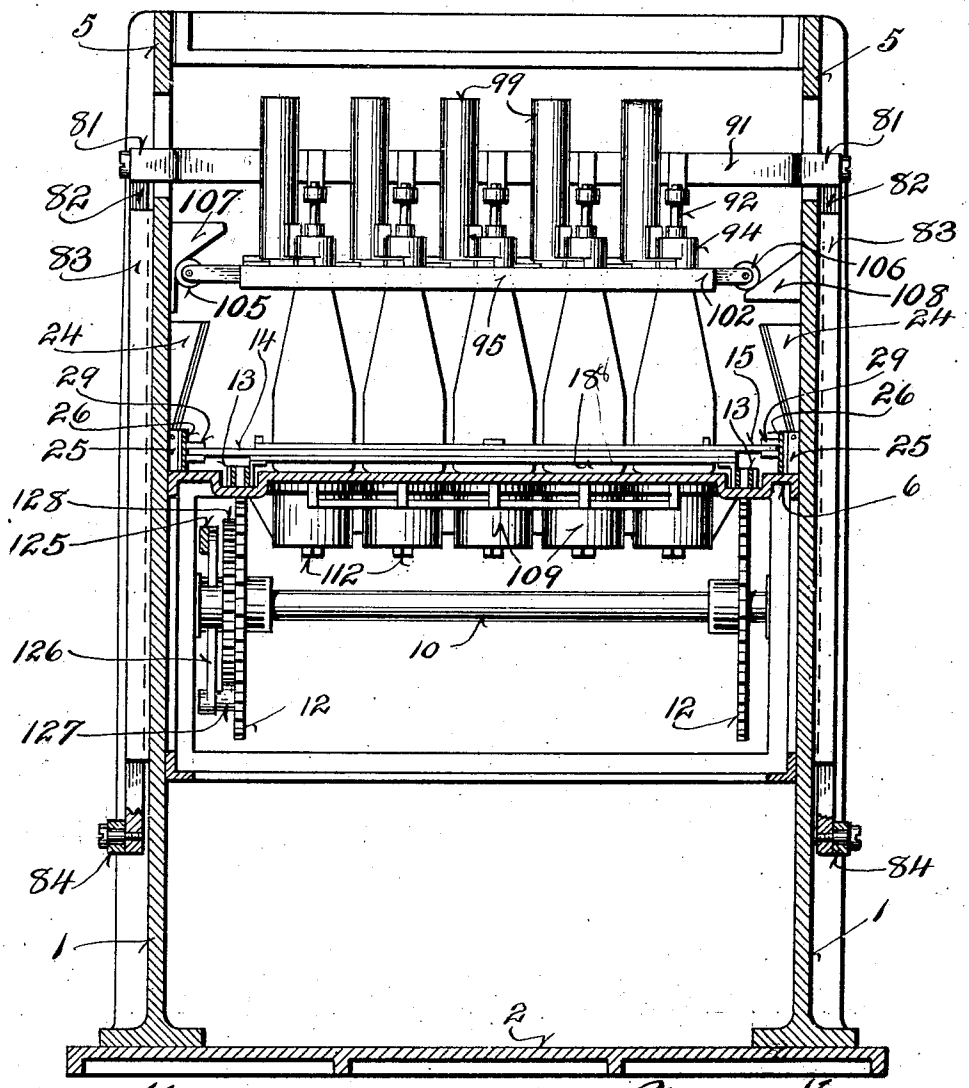
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BOTTLE CAPPING MACHINE

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6 Sheets-Sheet 3

Fig. 4.



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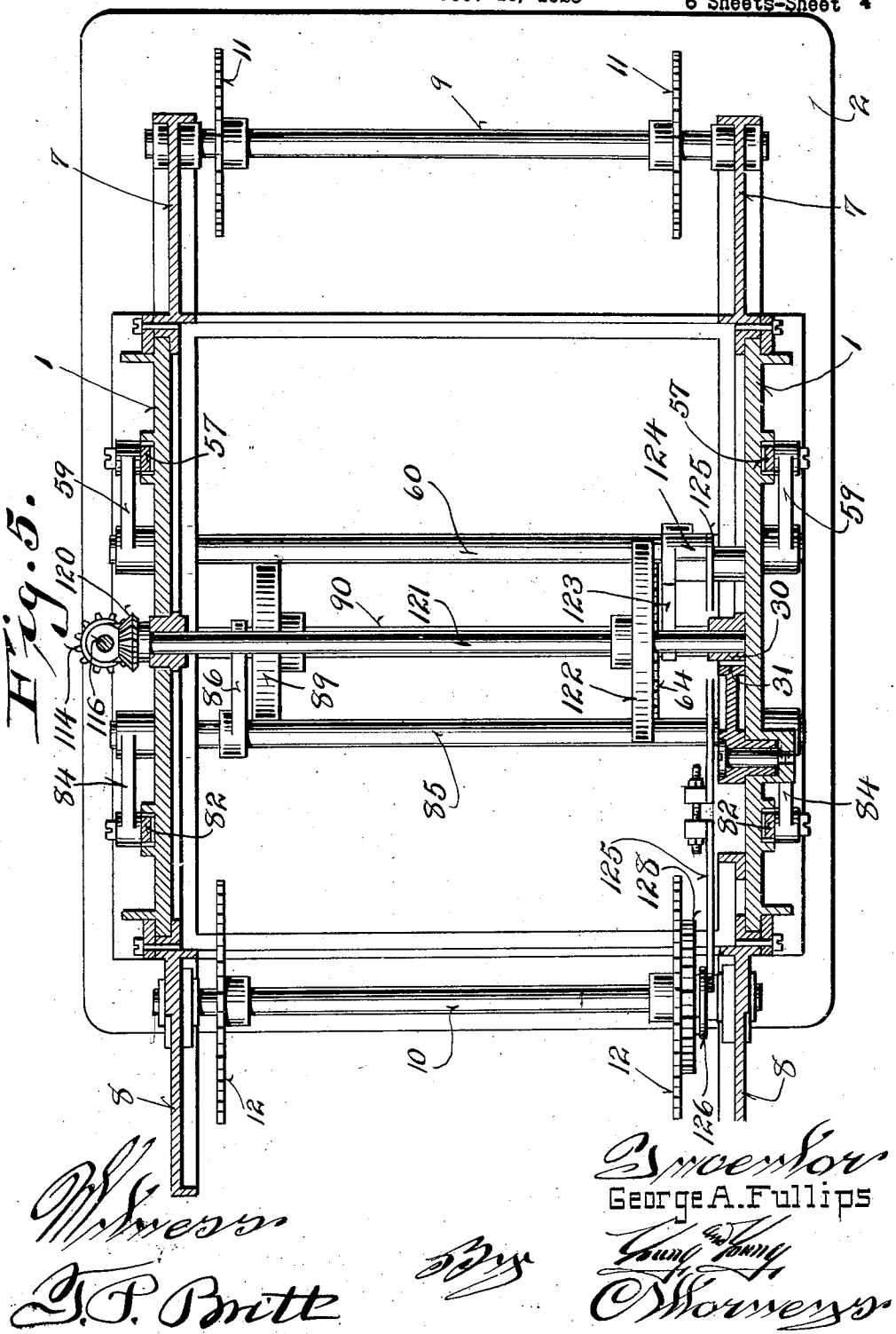
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BOTTLE CAPPING MACHINE

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Fig. 5.



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BOTTLE CAPPING MACHINE

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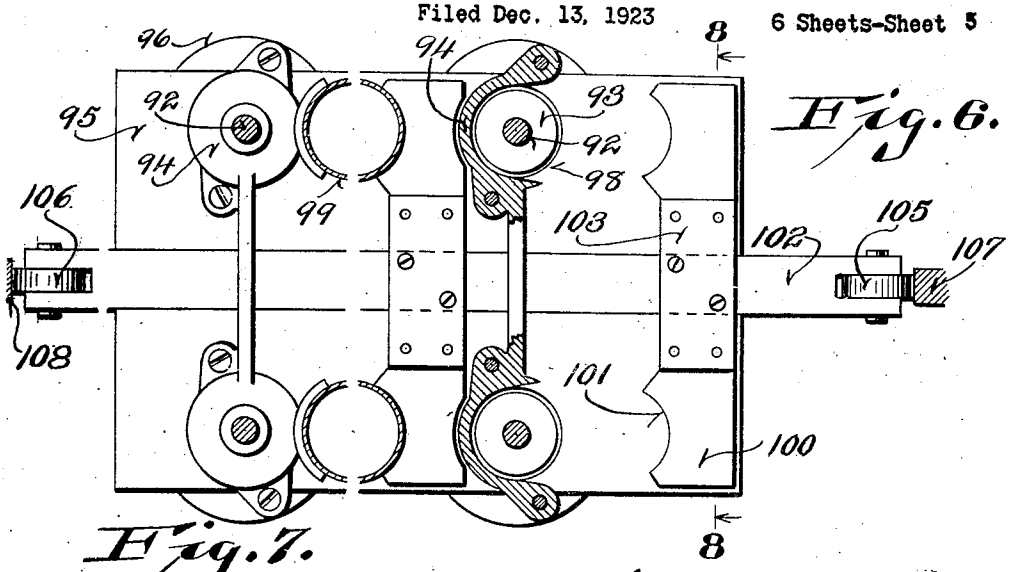


Fig. 6.

Fig. 7.

Fig. 7A

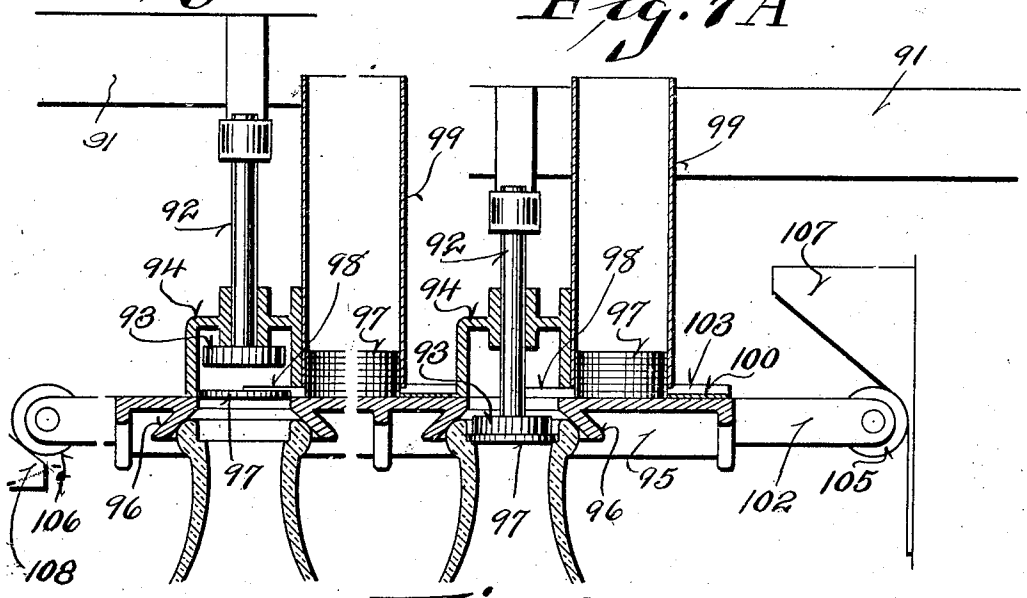
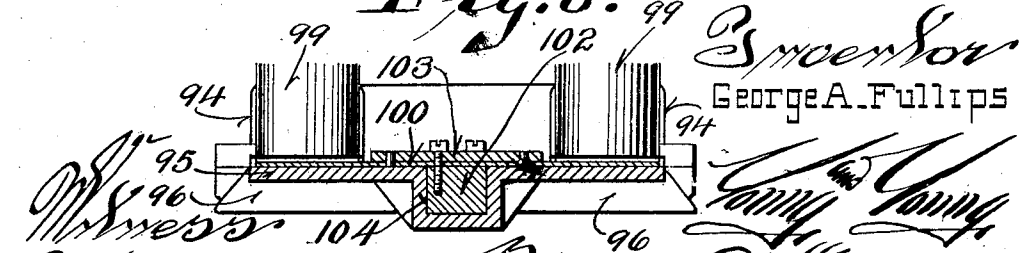


Fig. 8.



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BOTTLE CAPPING MACHINE

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Fig. 9.

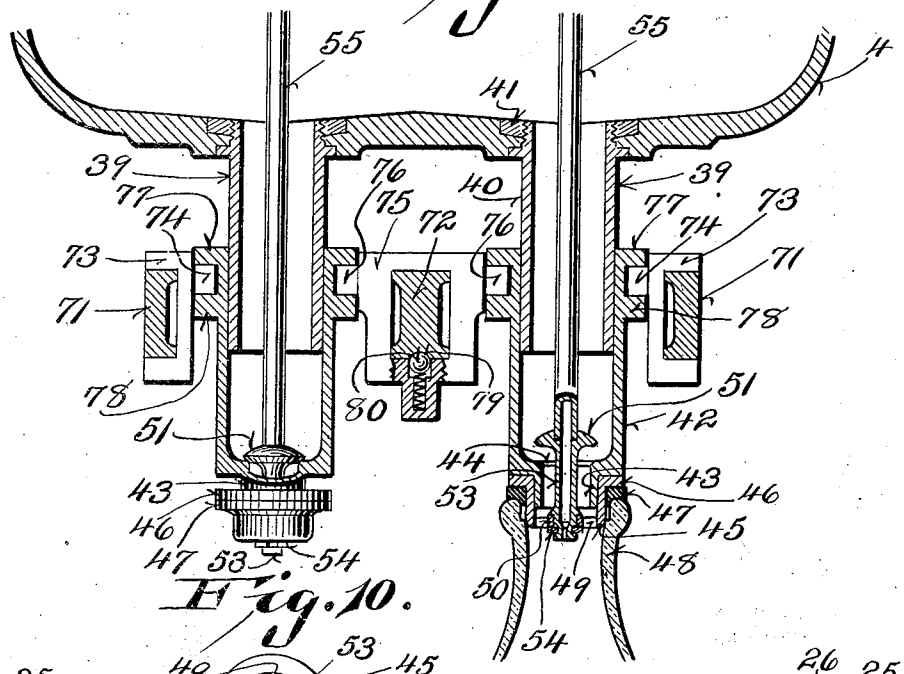


Fig. 10.



Fig. 11.

Fig. 12.

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UNITED STATES PATENT OFFICE.

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BOTTLE-CAPPING MACHINE.

Application filed December 13, 1923. Serial No. 680,407.

This invention relates to a machine for filling and capping milk bottles.

In machines for filling milk bottles as heretofore constructed, it has been the practice to raise the bottles to the filling mechanism and to move them forwardly one by one in sudden, short, jerky steps. The result of this has been that the inertia of the bottle has played a large part in the defective operation of these machines. For example, in suddenly raising and lowering the bottles, or in suddenly stopping or starting them, the contents of the bottles has been spilled and the bottles have been frequently upset and crushed by the reciprocatory portions of the mechanism. Further, the bottle output of machines of this type was limited, due to the facts enumerated above.

It is to overcome the above noted defects that this invention is designed, and objects of such invention are to provide a bottle capping machine which will move the bottles along in a relatively slow manner, but in such a way that a plurality of bottles are simultaneously handled and capped, which will advance the bottles in a manner which will not upset them or spill the contents thereof, and which will pass the bottles from one end of the machine to the other without raising the bottles or without causing them to deviate from straight lines.

Further objects are to provide a bottle capping machine, in which the mechanism for capping will operate upon either a single row of bottles, or in fact a single bottle, or upon a plurality of bottles at one time—that is to say to provide a machine which will automatically adapt itself to any number of bottles up to the capacity of the machine.

Further objects are to provide a bottle capping machine, in which spring mechanism for the capping portions of the machine is wholly avoided, in which the bottles are not elevated to the capping mechanism, but in which such capping mechanism moves downwardly to the bottles, such bottles remaining substantially in the same horizontal position.

Further objects are to provide an individual cushion support for each of the bottles so that any irregularity in the bottles will be automatically and individually cared for and breaking of the bottles will be prevented.

Further objects are to provide a machine in which means for supporting the bottles may be adjusted to adapt the machine for any type or size of bottle, and in which automatic means are provided for correctly centering the bottles irrespective of their sizes, so that the machine will automatically adjust itself when a smaller or larger size of bottle is employed.

Further objects are to provide a bottle capping machine which can be easily operated and controlled by one man, which occupies a small amount of floor space, which has a large capacity, and in which the bottles themselves are given a small or slow rate of travel through the machine, thus minimizing tipping and spilling and breaking of the bottles.

An embodiment of the invention is shown in the accompanying drawings, in which Figure 1 is a side elevation of the machine.

Figure 2 is a detail of the manually controlled elevating mechanism for the table of the machine.

Figure 3 is a transverse, sectional view on the line 3—3 of Figure 1.

Figure 4 is a transverse, sectional view on the line 4—4 of Figure 1.

Figure 5 is a horizontal sectional view on the line 5—5 of Figures 1 and 2.

Figure 6 is a detail illustrating a portion of the capping mechanism, with its central part broken away, such figure showing portions of the mechanism in horizontal section.

Figures 7 and 7A are vertical, sectional views through the mechanism shown in Figure 6.

Figure 8 is a sectional view on the line 8—8 of Figure 6.

Figure 9 is a sectional elevation through a portion of the filling mechanism.

Figure 10 is a bottom plan view of the filling device.

Figure 11 is a view of one of the elements of the feeding mechanism showing it in its automatically adjusted position for receiving relatively large sized bottles.

Figure 12 is a corresponding view showing a portion of the feeding mechanism as it appears when adjusted for receiving a smaller size of bottle.

The machine chosen for illustration is a milk bottle filling and capping machine, although obviously the machine might be used for filling and capping other types of bottles.

The machine comprises a pair of side plates 1 which form, in effect, a chassis, and between which the majority of the mechanism is mounted. These side plates are carried by a base member 2 and may be suitably braced in any desired manner adjacent their upper ends. It is to be noted that each of the side members is provided with an upstanding arm 3 which carries the milk vat 4 adjacent the forward end of the machine and with a corresponding though smaller upstanding arm 5 which guides the capping mechanism adjacent the rear portion of the machine.

The machine is provided with a table 6 which extends from one end thereof to the other and is located between the side frames and is equipped with downwardly extending forward and rear end webs 7 and 8, respectively, which are guided by the forward and rear portions of the side frames. These webs carry shafts 9 and 10 which in turn carry the forward and rear sprocket wheels 11 and 12 (see Figures 1 and 5). Chains 13 are mounted upon these sprocket wheels and are joined by transverse members which engage the bottles and, as the chains are driven, advance the bottles from one end of the machine to the other.

The transverse members for engaging and advancing the bottles are illustrated in Figures 11 and 12 and it will be seen that they comprise a bottom rod 14 and a top rod 15. These rods are provided with end slots 16 through which screws 17 are passed. The screws 17 extend downwardly into bar 18 secured to the chains 13, as may be seen from Figures 4, 11, and 12. At a point intermediate the ends of the rods they are further provided with a slotted connection as indicated at 19, thus holding the rods in alinement and permitting free relative sliding motion thereof and also permitting the rods to slide relative to the chains 13.

The rod 14 is provided with a plurality of rearwardly projecting triangular members 20 and the rod 15 is similarly provided with a plurality of rearwardly projecting triangular members 21 arranged adjacent each of the triangular members 20, as shown in Figures 11 and 12, thus providing slanting faces for engaging the bottles, such bottles being indicated at 22 and 23 in Figures 11 and 12, respectively. It is to be noted that as the rods are moved inwardly towards each other that they are adapted to engage smaller bottles, as indicated at 23 in Figure 12, and that as they engage such bottles they move the bottles outwardly until the centers thereof occupy the same relative position, as the centers of the larger bottles 22 occupied with relation to the axis of the bars 14 and 15, as is clearly shown in Figures 11 and 12.

In order to secure this relatively inward sliding of the bars, a pair of cam members 24 are provided and are carried by the inward faces of the side frames 1, as may be seen from Figures 4, 11, and 12, and these cam members cooperate with shoes 25 which carry the longitudinal guide rods 26. The shoes 25 are preferably provided with a pair of arms 27 positioned on opposite sides of the cam members 24 and provided with inwardly extending pins 28 which fit within guiding grooves formed in such cam members. Either the guiding rods or the shoes, or both, may be conveniently carried upon the table 6, as may be seen from Figure 4, and are thus raised or lowered as such table is raised or lowered, the chains, the transverse member, and the sprocket wheels moving upwardly or downwardly as such table is adjusted.

It is to be noted that each of the rods 14 and 15 of the bottle advancing means is provided with rollers 29 which contact with the bars 26. It is preferable to curve the outer portion 26′ of the guiding strips, or bars, adjacent their outer ends so as to facilitate the entrance of the members 14 and 15 between such guiding rails or bars.

Any suitable means may be provided for raising or lowering the table and the associated mechanism. For instance, the rack 30, (see Figure 2) may be secured to the table and may be operated from a segmental gear 31, such segmental gear being in turn operated by means of a pinion 32. The pinion 32 is mounted upon a shaft 33 extending transversely of the machine and provided with a crank arm 34 upon the outer side of one of the side frames 1, as shown in Figure 1, and any suitable pin, or other locking means 35, may be provided in this crank and adapted to enter any one of a plurality of apertures 36 formed in the side frame 1, as shown in Figure 1, to thus lock the table at any desired height.

It is preferable to provide for the adjustment of one of the shafts 9 or 10 so as to take up any wear that may occur in the chains 13. For instance, the shaft 10 is shown as adjustable in Figure 1. It is mounted at each end in a crosshead 37 which is slidably carried in guides 38 carried by the web 8 of the table and is adapted to be moved outwardly and held in such adjusted position in any desired manner.

The bottle filling mechanism will now be described. This mechanism comprises two rows of bottle filling units 39, as may be seen in dotted lines in Figure 1. These units are each independent valve devices of identical construction and are arranged in pairs completely across the machine so that ten bottles may be filled simultaneously when the machine is operated at its full capacity. It is

to be particularly noted, before entering the detailed description of these devices, that they work independently and that if a single bottle passes through the machine the other valves are not affected. These devices, indicated generally at 39 in Figures 1 and 9, comprise stationary sleeves 40, which are secured to the bottom of the milk vat 4 and are held in place by integral flanges and by lock nuts 41, as shown in Figure 9. Each sleeve 40 is provided with a closely fitting slidably related sleeve 42 which is normally held in the position indicated in Figure 9 with reference to the sleeve 40. This lower sleeve is provided with a contracted lower portion terminating in a downwardly extending cylindrical member 43 and equipped with a valve seat 44 inwardly of such cylindrical extension. This cylindrical extension provides a sliding tube for a relatively short sleeve 45 which freely slides thereon and is provided with an upper flange 46 adapted to contact with the face of the member 42 when such smaller sleeve 45 is elevated its maximum extent. It will be seen, therefore, that the sleeve 45 is free and slidable upon the tube 43 and normally occupies this lowest position, such lowest position being determined by mechanism hereinafter to be described. This slidable sleeve 45 is equipped with a rubber or other gasket 47 which bears against the under side of the flange 46 and is adapted to form with the top or neck portion 48 of the bottle a tight joint when the bottle is in contact with the gasket.

The sleeve 45 is provided, as may be seen from Figure 10, with a plurality of inwardly extending radial arms 49 adjacent its lower end, which integrally join a centrally disposed collar 50. A valve 51 is positioned interiorly of the sleeve 42 and has a downwardly projecting portion or shank 53 extending through the sleeve 43 and provided with a shoulder adapted to rest upon the collar 50. It is provided adjacent this lower projecting end with an annular groove within which a slotted washer 54 is adapted to be laterally slid to thus lock the valve with relation to the collar 50 and consequently to rigidly lock the valve with reference to the sleeve 45. This valve is provided with a passageway therethrough which communicates with a pipe 55 carried by such valve and projecting freely upwardly centrally of the tube 40. This tube 55 is adapted to extend to any height, preferably above the level of the milk, and to allow the air trapped within the bottle to freely escape while the milk flows between the radial arms 49 and into the bottle while filling is in progress.

It will be seen that the sleeves 42 carry all of the valve mechanism and that the valve is closed, due to the weight of the valve and of the associated parts, thus dispensing with the use of a spring. However, in the operation of the device the bottle is not elevated but occupies its original position and the members 42 are moved downwardly towards the bottles until the slidable members carried by the lower portion of the member 42, and slidably associated with such sleeve, contact with the mouth of the bottle and thus open the valve by the descent of the member 42, such valve being directly actuated by the bottle without moving the bottle upwardly.

Means for reciprocating members 42 comprise a pair of crossheads 56 (see Figures 1 and 3) which project through slots formed in the side frames 1 and which are provided exteriorly of the side frames with slots within which vertically extending slide bars 57 are rigidly secured, as clearly shown in Figures 1 and 3. These vertical slide bars are suitably held by guides 58 carried by the side frames and are connected at their lower ends by a slotted joint or equivalent mechanism with a rock arm 59 rigidly carried by a transverse shaft 60 projecting completely across the machine and through the side plates 1. The shaft 60 is rocked through the appropriate angle by means of a rock arm 61 rigidly secured thereto intermediate the ends of the shaft and between the side frames 1. This rock arm is provided with a pin and roller 62 (see Fig. 3), which fit within a cam groove 63 formed in the face of a combined cam and gear 64. The combined cam and gear 64 is provided with teeth which mesh with a pinion 65 rigidly associated with a worm wheel 66. This worm wheel is driven by a worm 67 driven by an electric motor 68 through reduction mechanism including the gears 69 and 70 and a friction clutch. It is to be noted that the shape of the cam groove 63 is such that a dwell is provided at both limits of the stroke of the cross heads 56 so that the filling mechanism is held elevated for a definite period and is held lowered for another definite period, thus allowing time both for the advancing of a new pair of rows of bottles and for the filling operation respectively.

The crossheads 56 are joined by removably positioned transverse bars 71 removably secured directly to such crossheads. Between these bars (see Fig. 9,) a centrally located bar 72 is positioned and may also, if desired, be removably secured to the crosshead. The bars 71 are provided with members 73 which have inwardly projecting tongues 74. These members 73 may be separate and distinct from each other, if desired, or they may be integrally joined, although preferably they are formed separately. The bars 72 are provided with a plurality of rectangular members 75 which are slidably positioned thereon and have outwardly projecting tongues 76. The tongues 74 and 76 are adapted for engagement with upper and

lower flanges 77 and 78 formed integrally with the slidable sleeves 42, to thus retain the slidable sleeves definitely in position with relation to the bars 71 and 72. The bar 72 is provided with a plurality of recesses 79 along its lower surface, into which spring pressed balls 80 carried by the members 75 are adapted to snap and to thus temporarily retain the members 75 in correct position.

When it is desired to remove any of the valve devices, one of the bars 71 is removed from the crosshead. However, all of the members 42 are still retained by the projecting tongues 76 of the members 75. An individual valve may be removed by sliding its member 75 longitudinally of the bar 72 and thus disengaging the tongue 76 from the flanges 77 and 78, and permitting the individual valve to be slid downwardly and completely removed.

A further way of removing the valve, when it is not desired to remove the member 42, is to remove the slotted washer 54 and to thereafter lift the tube 55 and the valve 51 upwardly through the apparatus.

The capping mechanism comprises a pair of crossheads 81 (see Figure 1) which project through slots in the portion 5 of the side frames, as shown in such figure. Vertical slide bars 82 are rigidly secured within slotted portions of the ends of these crossheads and are carried in guides 83 secured to the outer frame members 1, as shown in Figure 1. The lower ends of these slide bars 82 are connected by a slot and pin, or similar connection, with rock arms 84 rigidly secured to a transverse shaft 85 passing completely through the machine. A rock arm 86 is rigidly secured to the shaft 85 intermediate its ends and between the side frames, as shown in Figure 5, and is provided with a pin and roller 87, (see Figures 5, 3, 1) which fit within a cam groove 88 carried by the cam member 89 so that as the shaft 90 rigidly secured to the combined cam and gear 64 rotates, such arm and shaft will be given rocking motion.

The capping mechanism further comprises a transverse bar 91 (see Figures 1, 4, 7 and 7A), which joins the crossheads. A plurality of plungers 92 are rigidly carried by this transverse bar and are provided with a large disc-like head 93 at their lower ends, as may be seen from Figures 7 and 7A. These rods pass through apertures in cylindrical portions 94 secured to the frame 95. This frame, as will be seen, is hung from the rods 92, as clearly shown in Figures 7 and 7A, and thus when the rods move the frame 95 moves, unless otherwise supported. The frame is provided with a plurality of funnel-shaped, or flared, members 96 which contact with the mouths of the bottles, as shown in Figures 7 and 7A when the frame is lowered, thus allowing the discs 93 of the plungers 91 to force caps 97 frictionally held in the cylindrical portions 94 into the mouths of the bottles. The caps are slid into the compartments 94 through slots 98 and are carried in the vertical magazines 99 supported from such compartments 94. Means for feeding the caps from the magazines into the compartments 94 comprise a plurality of flat thin plates 100 which are provided adjacent each end with curved cutout portions 101. These plates are each fastened to a transverse bar 102 and are preferably strengthened adjacent their central portions by auxiliary plates 103. They are adapted to slide beneath the magazines 99 and are of slightly less thickness than the thickness of one of the caps 97, so that as they pass beneath the magazines they will slide a cap from such magazines through the slot 98 into the compartment 94. The rod or bar 102 is set down within a channel 104 formed longitudinally of the frame 95, as shown in Figure 8, and is thus guided. At its ends it is forked and carries rollers 105 and 106. These rollers contact with reversely inclined cam members 107 and 108 respectively, as the frame 95 is moved upwardly or downwardly, and thus the bar 102 is positively reciprocated first in one direction and then in the other for each complete oscillation of the cross bar 91.

It will be noted from the construction described and illustrated in Figures 1, 4, 6, 7, and 8, that the capping mechanism operates simultaneously upon two rows of bottles.

It frequently happens that the bottles are of slightly different heights and obviously this contributes in the machines as heretofore constructed, to the breaking of the bottles. However, this defect is fully guarded against by providing individual resilient seats for each of the bottles adjacent the filling and capping mechanism, as shown in Figures 3 and 4. These seats are provided by forming the table 6 with a plurality of depressed cylindrical portions 109 formed in two rows beneath the filling and capping mechanisms. Within these cylindrical members slidably mounted sleeves 110 are positioned which are resiliently urged upwardly by means of helical springs 111. The upward stroke is limited by means of a bolt 112, as shown in Figure 3, so that each individual member may be independently adjusted. The upper portions of the slidable sleeves 110 are provided with seats or flat plates 113 integral therewith upon which the bottles rest, as shown in Figure 3.

It is to be noted that the shaft 90 projects beyond one of the side frame members 1 and is provided with a beveled gear 113′ meshing with a second beveled gear 114. This second beveled gear is carried by a bracket 115 from the side frame member and is slidably

splined to a vertical shaft 116 which carries at its upper end a beveled gear 117. This shaft is provided with a collar 118 which rests upon the top of a bearing 119 secured to the table 6, as may be seen from Figure 3. A beveled gear 120 meshes with the bevel gear 117 and is carried by a transverse shaft 121 provided with a cam 122. This cam 122 operates a rock lever 123 provided with a pin and roller fitting within the slot in the cam 122. This arm 123 forms one portion of a bell crank lever. The other portion 124 thereof (see Figures 1 and 5) is connected by means of an adjustable pitman 125 with a rock lever 126. This last rock lever carries a pawl 127 which engages the teeth of a ratchet wheel 128, rigidly fastened upon the shaft 10.

It will be seen, therefore, that the table may be adjusted vertically and yet feeding motion will be regularly imparted to the bottle feeding mechanism.

It will be seen that a bottle filling and capping machine has been provided in which the bottles are fed in multiple rows straight through the machine across a flat table and that the bottles are not elevated or moved during capping or filling. It will further be seen that means are provided for elevating the table to accommodate any size of bottles and that automatic means are provided for gripping or engaging the bottles and positioning their centers correctly upon adjustment of the height of the table, so that the bottles properly aline with the filling and capping devices.

It will further be seen that individually controlled means have been provided for filling and capping the bottles and that the means are associated with these mechanisms so as to prevent shattering or cracking of the bottles, due to variations in height or other inequalities.

It will further be seen that the valve mechanism hay be most readily removed and that in fact a single valve, if desired, may be readily removed and replaced or cleaned as desired.

It is further to be noted that the machine will operate successfully whether it is filled to its entire capacity, or whether one or more rows of bottles only are passed through the machine.

It is to be particularly noted that the travel of the bottles is slow and although the capacity of the machine is very much greater than those heretofore constructed, that there is less tendency of upsetting the bottles or spilling the contents from such bottles, due to the particular manner in which they are advanced than in machines which advance the bottles singly and at a relatively rapid rate.

Although the invention has been described in considerable detail, it is to be understood that it may be variously embodied and is therefore to be limited only as claimed.

I claim:

1. A bottle capping machine comprising a table, means for advancing bottles in a step by step manner across said table in a plurality of rows, capping mechanism for capping two rows of bottles at a time comprising a reciprocatory member, a plurality of cap manipulating plungers rigidly carried thereby, a body portion hung from said plungers and adapted to contact with the top of said bottles, a plurality of vertical magazines for said caps arranged in proximity to said plungers, a plurality of blades adapted to simultaneously extract a cap from each of said magazines, a transverse bar rigidly attached to said blades with the blades projecting from opposite sides thereof, and cam mechanism for positively moving said bar back and forth with reference to said body portion.

2. A bottle capping machine comprising side frame members, a horizontal table vertically adjustable between said side frame members, means for advancing bottles along said table in a step by step manner, capping means mounted above said table, means for vertically reciprocating said capping means, said capping means including a body portion hung from a plurality of cap manipulating plungers, said cap manipulating plungers being positively connected with said means for reciprocating the cap mechanism and said body portion being adapted for contact with the tops of said bottles, a plurality of reservoirs for said caps mounted adjacent said plungers, a slide provided with recesses adapted to register alternately with said reservoirs and said plunger, said slide projecting from the ends of said body portion, and cams carried by said side frames for operating upon the ends of said slide to reciprocate such slide when said body capping means is elevated or lowered.

In testimony that I claim the foregoing I have hereunto set my hand at Milwaukee, in the county of Milwaukee and State of Wisconsin.

GEORGE A. FULLIPS.