

June 27, 1939.

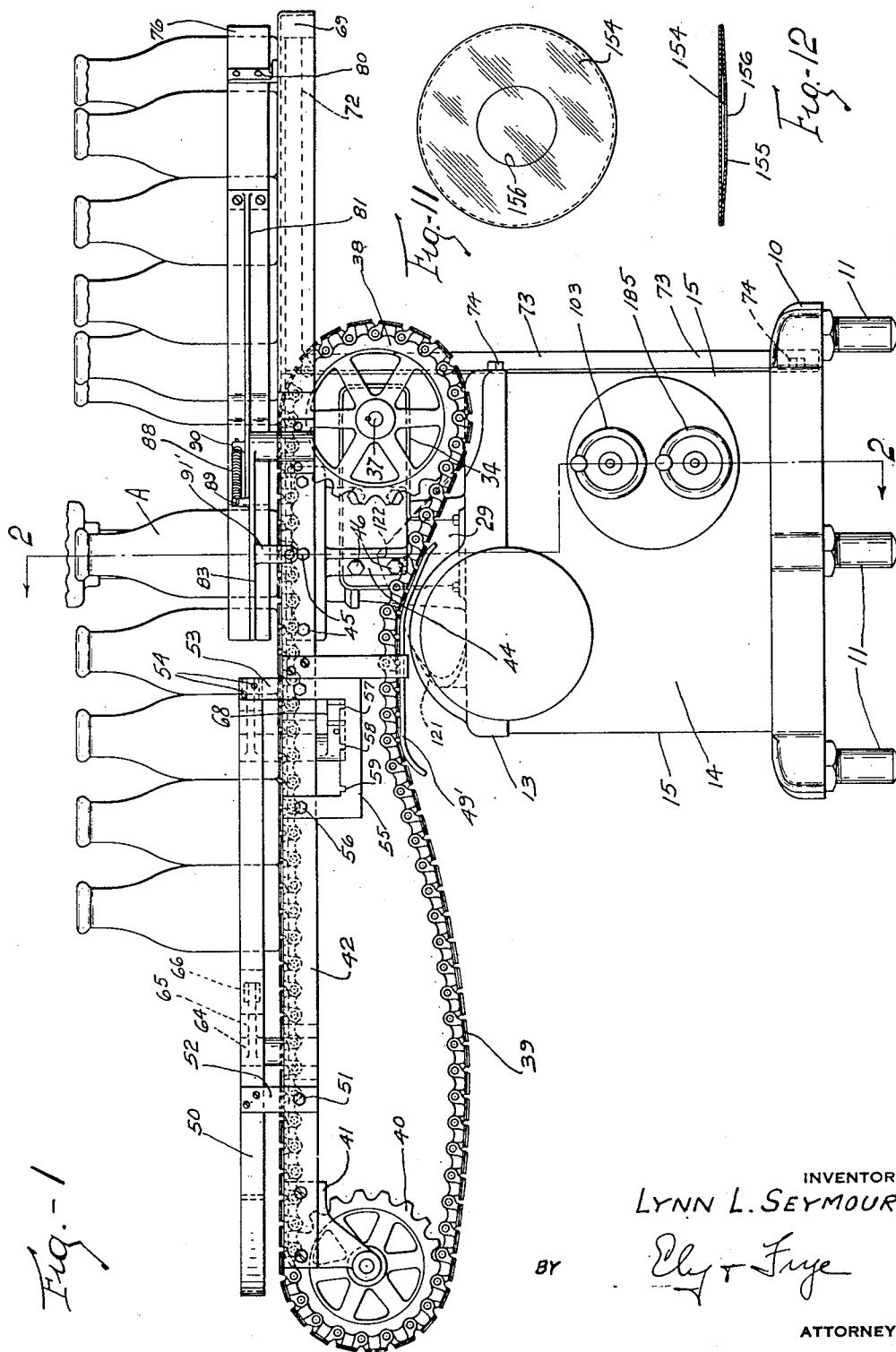
L. L. SEYMOUR

2,164,026

BOTTLE CAPPING APPARATUS

Filed Feb. 23, 1938

8 Sheets-Sheet 1



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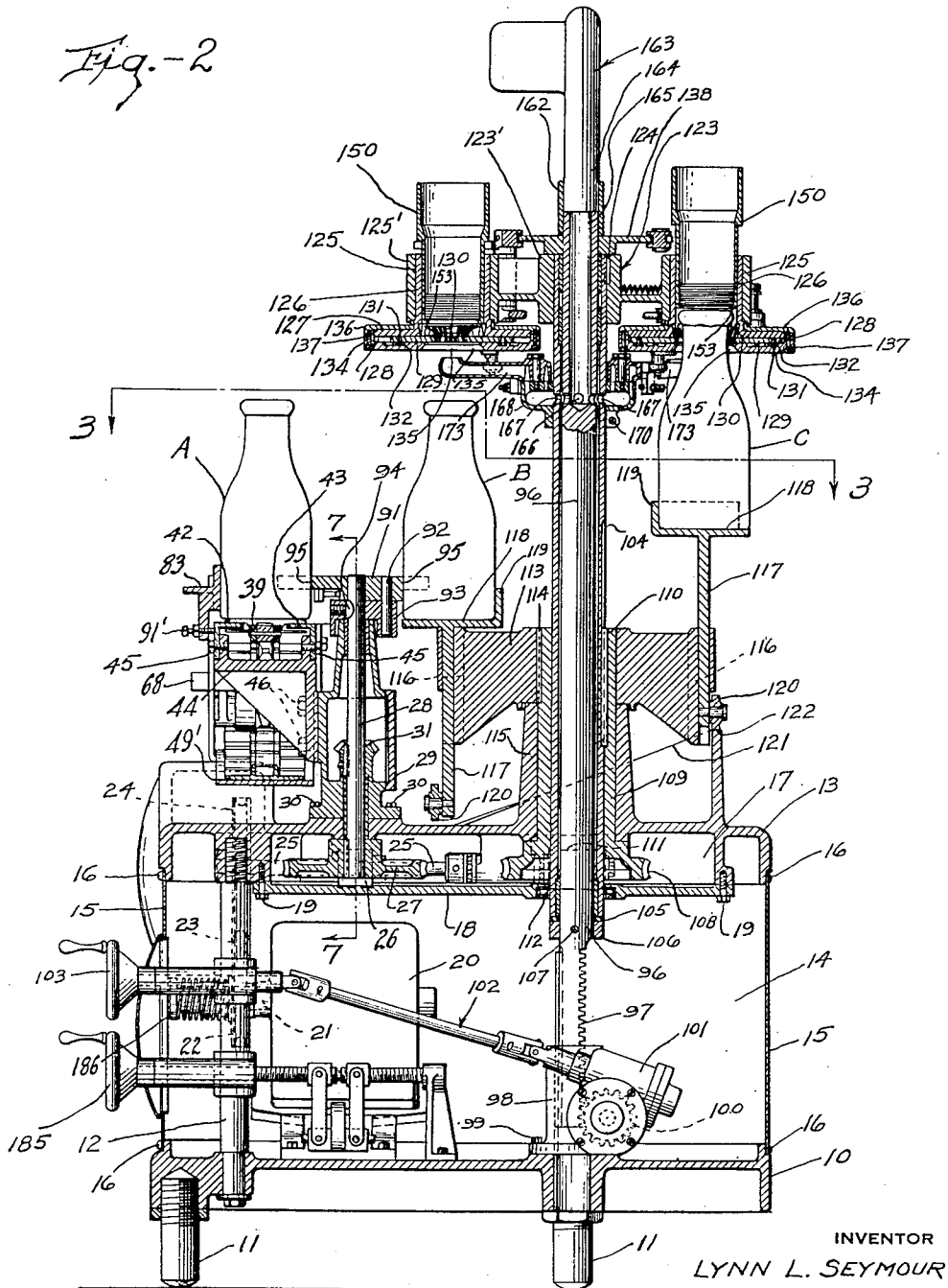
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BOTTLE CAPPING APPARATUS

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Fig.-2



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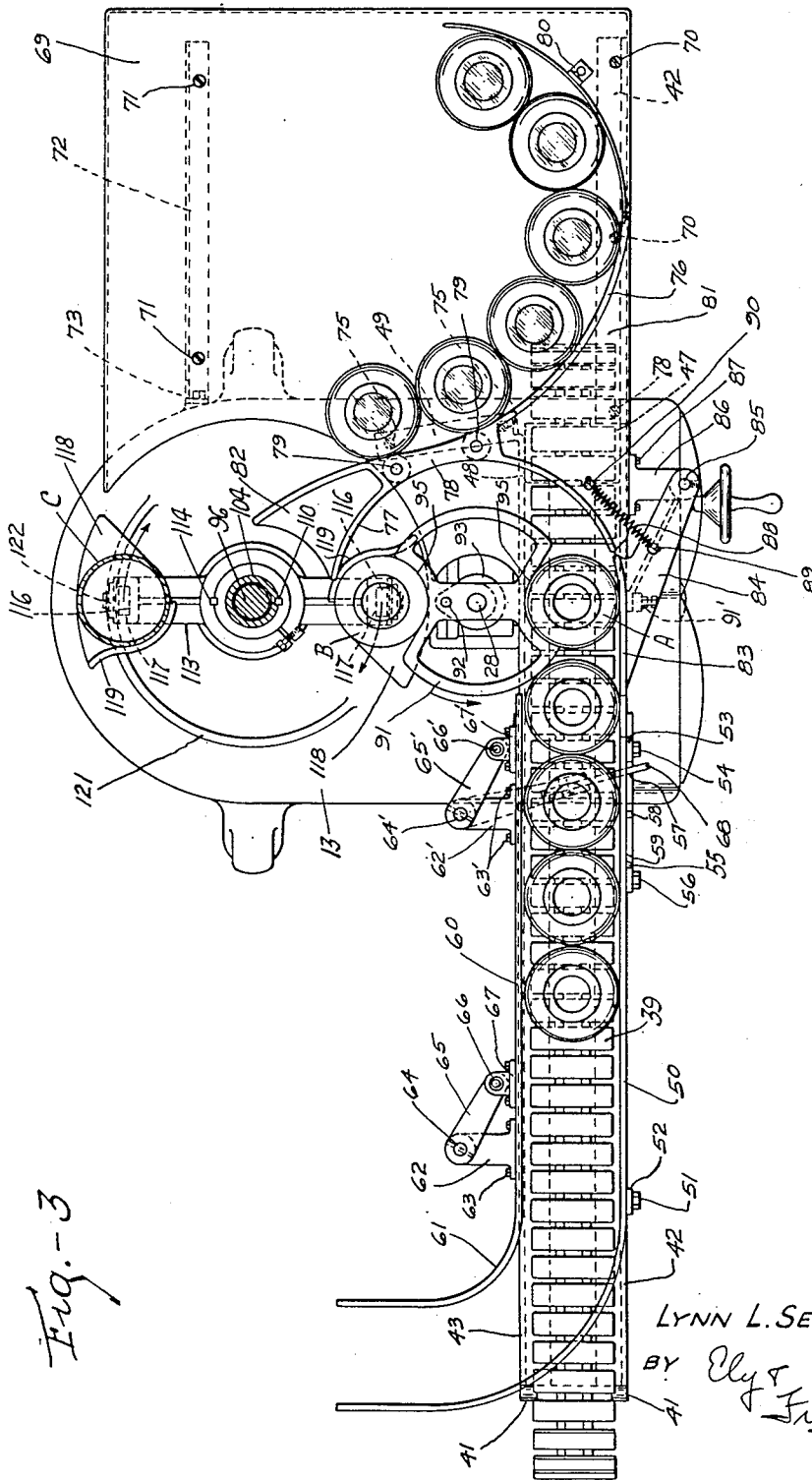
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8 Sheets-Sheet 3



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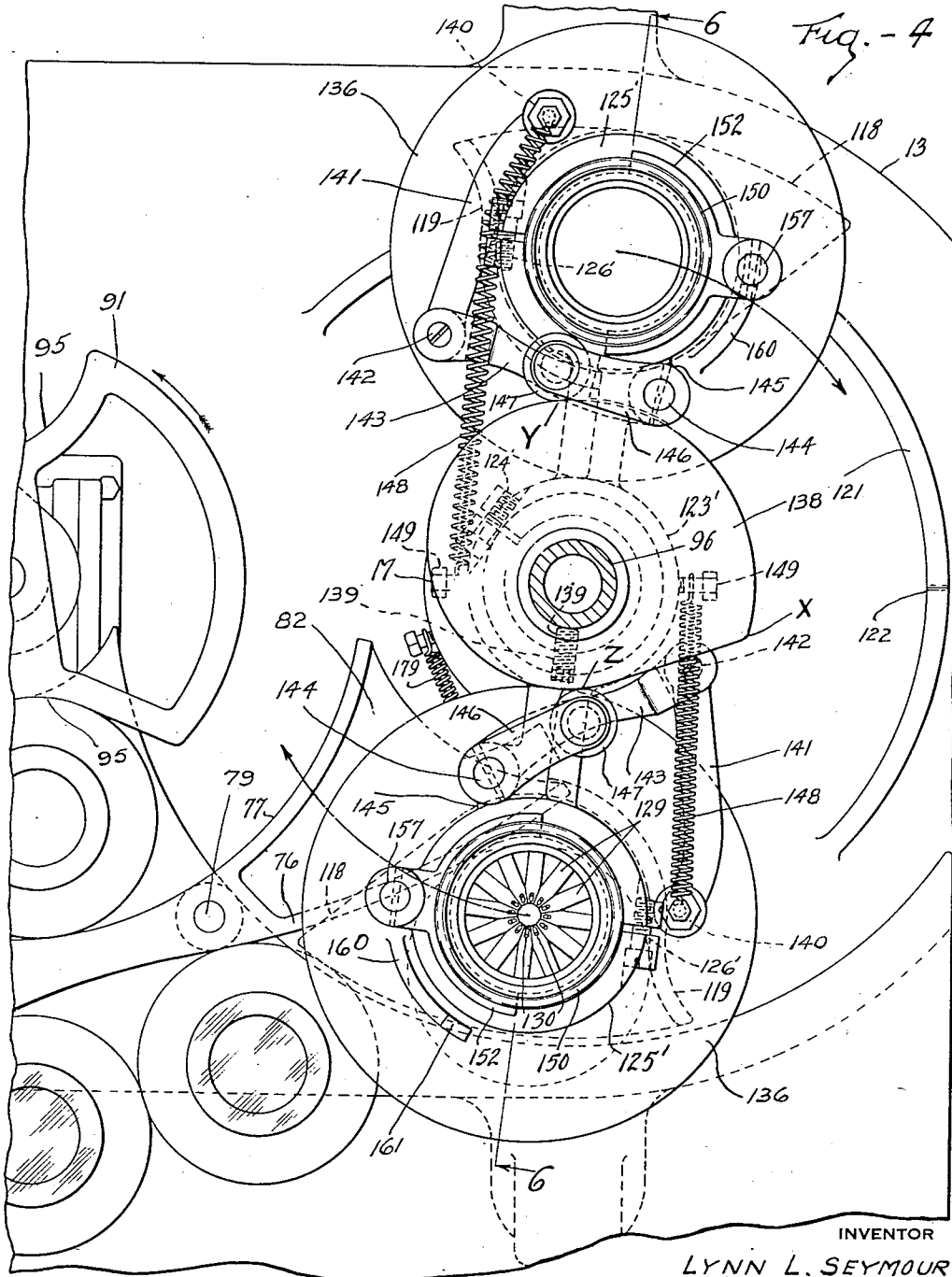
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8 Sheets-Sheet 4



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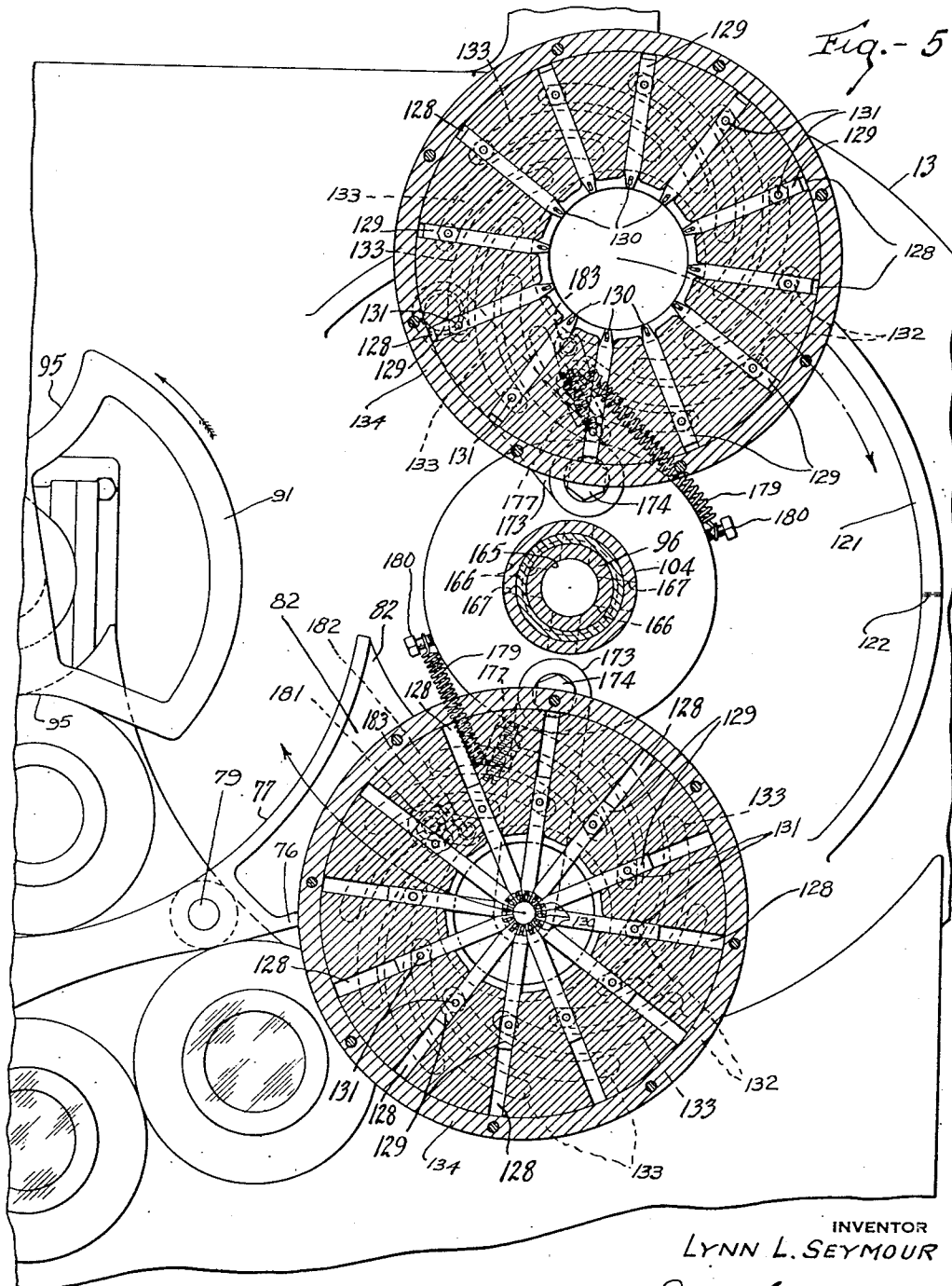
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BOTTLE CAPPING APPARATUS

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BOTTLE CAPPING APPARATUS

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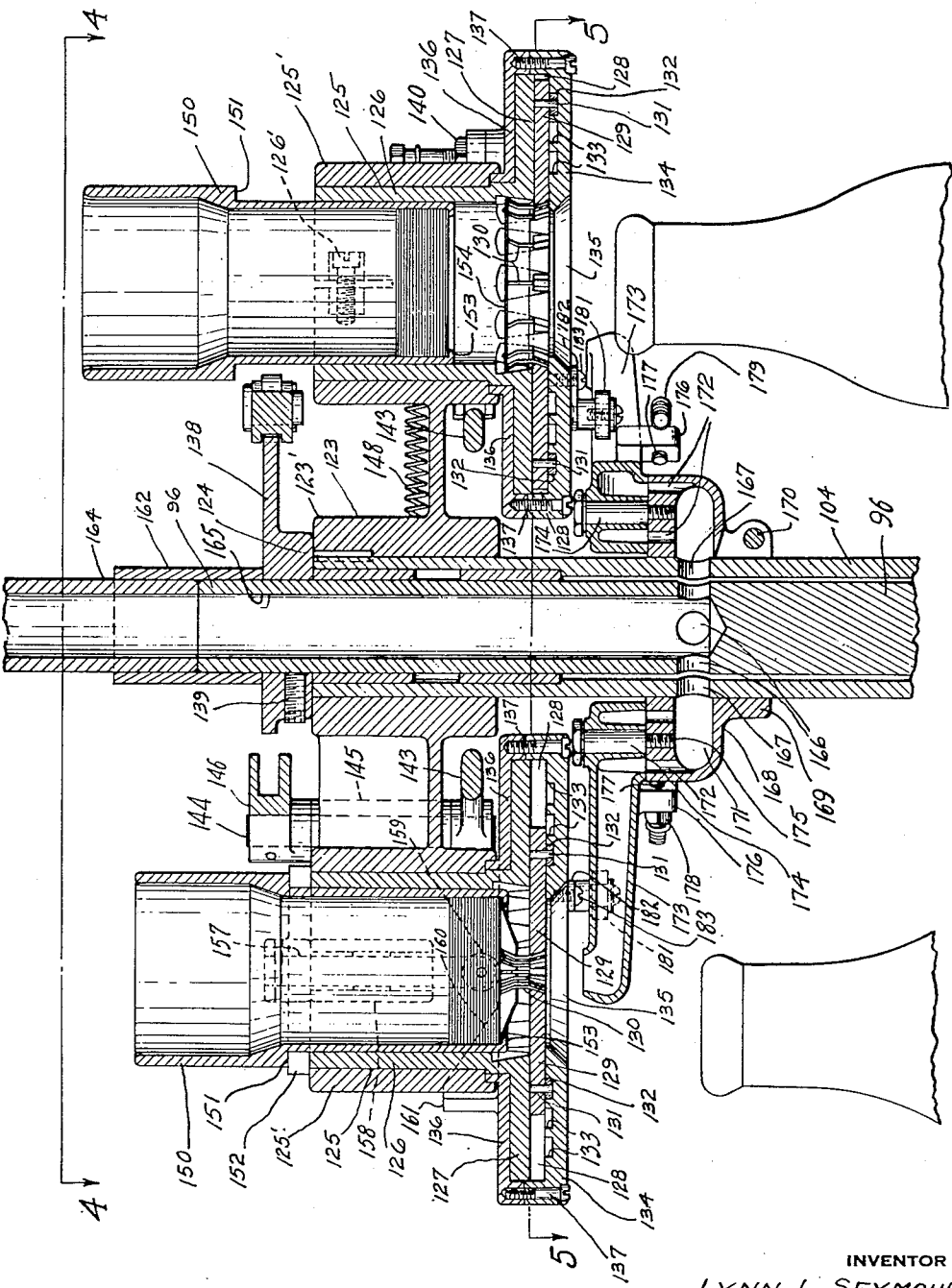


Fig. -6

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BOTTLE CAPPING APPARATUS

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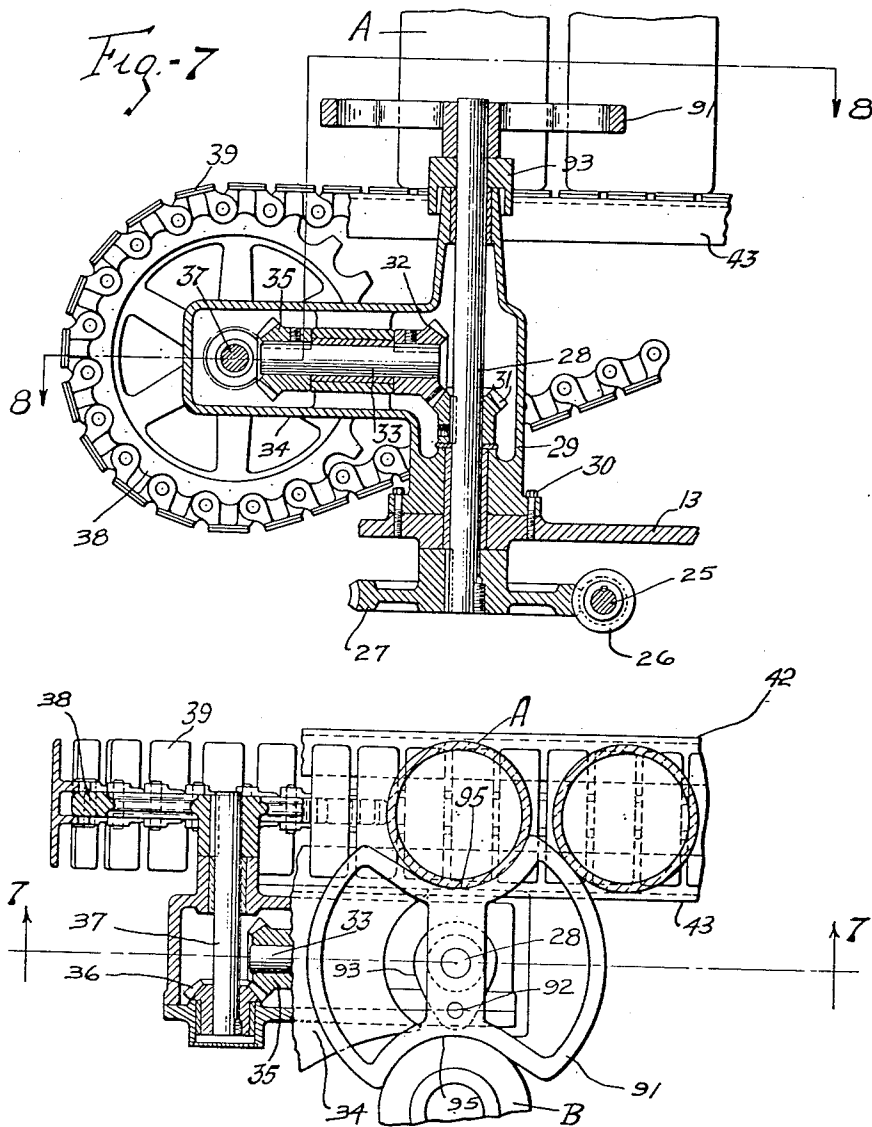


Fig. 8

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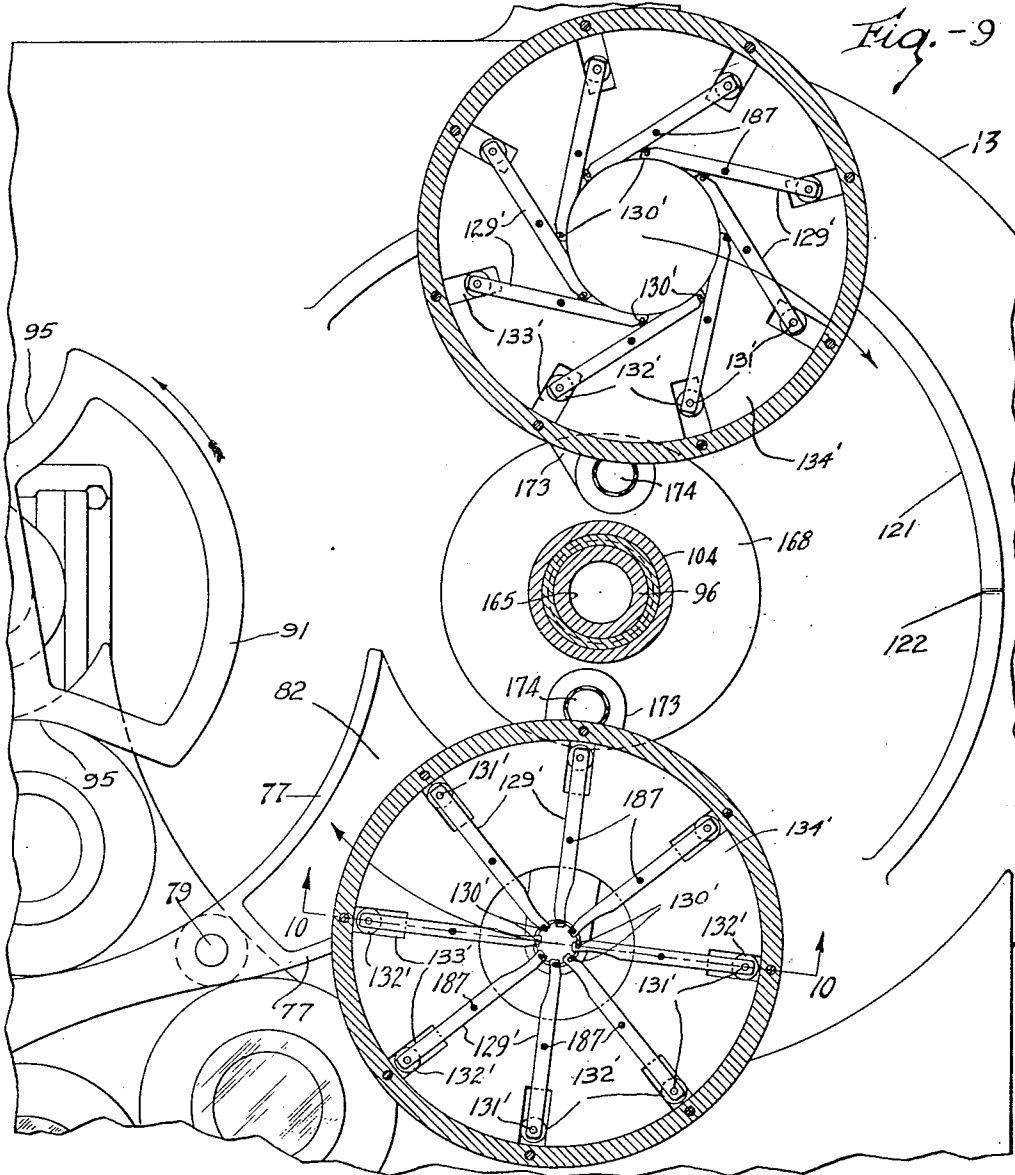
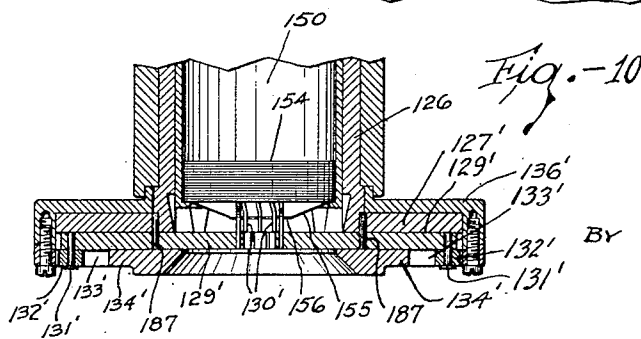
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BOTTLE CAPPING APPARATUS

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8 Sheets-Sheet 8



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UNITED STATES PATENT OFFICE

2,164,026

BOTTLE CAPPING APPARATUS

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Application February 23, 1938, Serial No. 191,984

16 Claims. (Cl. 226—81)

This invention relates to improvements in bottle capping apparatus and more particularly to apparatus for applying flexible caps to milk bottles and the like.

The apparatus preferably is adapted for use in applying caps of the type comprising substantially parallel top and bottom portions, the latter having an opening therein to receive a plurality of fingers which grip the bottom portion of the cap, spreading same into a skirt whereby the cap may be placed on a bottle. Also, the apparatus is preferably for use with caps of the aforesaid type made of a film that satisfactorily stretches, for example, of a rubber hydrohalide film, such as is disclosed in Calvert Patent No. 1,989,632, January 29, 1935, which product is obtainable on the market under the trade name "Pliofilm." It will be obvious, however, that the apparatus may also be used with caps formed of other materials, such as compounds of rubber or combinations of such compounds with "Pliofilm." Furthermore, the invention is incorporated in an apparatus of the duplex type, but it will be apparent the invention may be utilized in other types of apparatus.

The objects of this invention are to provide means for continuously feeding bottles to be capped; to provide means for adapting the apparatus to different sizes of bottles, such as quarts, pints and half pints; to continuously pass the bottles beneath a magazine containing caps; to prepare the lowermost cap in said magazine for application to a bottle by providing novel means for forming the bottom of the cap into a skirt which will fit over the head of a bottle; to direct a current of heated air into the magazine to assist in forming a skirt out of the lower portion of the cap and to render the material of the latter more pliable; to pass the head of the bottle through the plane of the cap to apply the latter to the bottle and simultaneously remove the cap from the skirt forming means; to raise the magazine out of the path of the skirt forming means and of the bottle when the latter receives the cap; and to continuously pass the capped bottles out of the apparatus.

Other objects and advantages will become apparent from the following description taken in conjunction with the accompanying drawings.

In the drawings,

Figure 1 is a front elevation of the lower portion of the apparatus,

Figure 2 is a vertical sectional view taken partly on line 2—2 of Figure 1 and including the upper portion of the apparatus,

Figure 3 is a section taken substantially on line 3—3 of Fig. 2, with some parts shown in top plan,

Figure 4 is an enlarged detail view taken substantially on line 4—4 of Figure 6, and showing some parts in top plan,

Figure 5 is an enlarged sectional view taken substantially on line 5—5 of Fig. 6,

Figure 6 is an enlarged sectional view taken substantially on line 6—6 of Fig. 4,

Figure 7 is a sectional view taken substantially on line 7—7 of Fig. 2,

Figure 8 is a similar view taken substantially on line 8—8 of Fig. 7,

Figure 9 is a sectional view showing a modified form of means for expanding the caps,

Figure 10 is a sectional view taken substantially on line 10—10 of Fig. 9,

Figure 11 is a plan view of one of the caps, and

Figure 12 is a sectional view through one of the caps.

Referring to the drawings (Figs. 1 and 2) the numeral 10 designates the base of the apparatus which is supported on a plurality of spaced legs 11. A plurality of vertical supporting members 12 extend upwardly in spaced relation from base 10 and support the main frame 13. The space 14 between base 10 and the main frame 13 is enclosed by walls 15 secured as at 16, and this space is used to house some of the operating parts of the apparatus which will be later referred to. Also, a housing 17 is formed in the main frame 13 to receive the operating parts which are preferably run in oil, and this housing is closed by a plate 18 secured thereto as at 19.

A motor 20 is suitably mounted in the space 14 and has a rotatable shaft 21 on which is fixed a V-pulley 22 which carries a V-belt 23. The latter engages and drives a V-pulley 24 fixed on a drive shaft 25 which will be termed the main drive shaft. Shaft 25 extends into housing 17, being suitably journaled in bearings carried by the main frame and is arranged in driving engagement with means for continuously delivering bottles to be capped.

As shown (Fig. 7) shaft 25 carries a worm gear 26 which meshes with a worm wheel 27 fixed to a rotatable vertical shaft 28 (Figs. 2 and 7) suitably journaled in the main frame 13 and in a housing 29 secured to the upper surface of the main frame as at 30. Intermediate its ends shaft 28 has fixed thereto a bevel gear 31 which meshes with a similar gear 32 (Fig. 7) fixed on one end of a rotatable horizontal shaft 33 suitably journaled in an extension 34 of housing 29. The

other end of shaft 33 has fixed thereon a bevel gear 35 which meshes with a similar gear 36 (Fig. 8) fixed on one end of a rotatable shaft 37, also journaled in extension 34, and the opposite end of shaft 37 has a sprocket wheel 38 fixed thereon which rotates outwardly of the gear housing.

Sprocket wheel 38 drives a chain or link-belt 39 (Fig. 1) which passes over an idler sprocket 40 rotatably mounted in spaced brackets 41 depending from one end of spaced angle irons 42 and 43 which in turn are supported on a bracket arm 44 as at 45. Bracket arm 44 is supported as at 46 (Figs. 1 and 2) on housing 29. Angle irons 42 and 43 serve to support the upper reach of the conveyor belt 39 whereby bottles may be conveyed to the capping portion of the apparatus. As clearly shown in Fig. 3, angle iron 42 extends across the front of the machine and has a cut-out portion 47 to permit the conveyor belt to pass downwardly around sprocket 38, while angle iron 43 has its horizontal portion cut out as at 48 to permit the belt to pass downwardly and this iron is bent back to provide an angularly arranged portion 49 for a purpose to be described. The lower reach of belt 39 may be supported on a suitable shelf 49' arranged as in Fig. 1 to prevent interference of the belt with other parts of the apparatus.

Throughout a portion of its length, angle iron 42 is provided with an upwardly extending outer guard rail 50 supported at one one point as at 51 on a bracket 52. A similar bracket 53 supports the inner end of the guard rail as at 54, but the latter bracket is extended below the angle iron and is formed into a rectangular member 55, additionally supported at 56 (Fig. 1). Three notches 57, 58 and 59 are formed in member 55. An inner guard rail 60 is arranged on angle iron 43, both rails preferably being curved as at 61 (Fig. 3) to permit the entrance of bottles onto conveyor belt 39. Guard rail 60 preferably is adjustably secured to member 43 so as to permit movement toward and from rail 50 whereby the rails can be made to accommodate different sizes of bottles, such as quarts, pints and half pints.

As clearly shown in Fig. 3, a bracket 62 is secured to angle iron 43 by bolts 63 and a pin 64 is secured in this bracket. Pivoted at one end of the latter pin is a link 65, the other end of which is pivoted to a pin 66 carried in a bracket 67 secured to rail 60. A bracket 62', similar to bracket 62, is spaced from the latter and secured to angle iron 43 by bolts 63', and a pin 64' is pivotally mounted in this bracket. A link 65' is secured at one end to pin 64' and at its other end is pivoted to pin 66' carried by bracket 67' which in turn is secured to rail 60. Also secured at one end to pin 64' is a lever 68 which extends under the angle irons and which has its opposite end adapted for insertion in one of the slots 57, 58 or 59. In Fig. 3 it is shown in slot 57 and the rails are far enough apart to receive quart bottles. The action of lever 68 and link 65' is a bell crank action and movement of this lever sufficient to turn pin 64' will move link 65'. Through the latter, rail 60 will be moved toward or from rail 50 and since link 65 is also pivoted to rail 60, the movement of link 65 will be similar to that of link 65'. Hence, if it is desired to use pint bottles, lever 68 is moved to slot 58 which movement brings the rails closer together, and for half pints this lever will be in slot 59, thus moving rail 60 farther inwardly. Reverse movement of lever 68 changes the spacing between the rails accordingly.

As more clearly shown in Figs. 1 and 3 a table or platform 69 is arranged with its upper surface in substantially the same horizontal plane as the upper surface of the conveyor belt 39. This table is supported across its front by angle iron 42, being secured to the latter by screws 70. At its rear, table 69 is supported as at 71 on a horizontal supporting member 72 which extends from a vertical angle iron 73 secured to the base and main frame by bolts 74. An additional support for table 69 is afforded by the portion 49 of angle iron 43 to which the table is secured by screws 75. Table 69 is of a contour which will not interfere with the movable parts of the apparatus, yet will provide support for the bottles when necessary, for example, when the bottles leave the conveyor belt to be delivered to the capping means and after the bottles have been capped and are removed from the movable parts of the apparatus.

Secured to and arranged above table 69 are additional guard or guide rails 76 and 77 which are preferably curved and arranged as shown in Fig. 3. These rails may be joined in a common supporting section 78 which may be secured to the table by securing means 79. Rail 76 may also be secured to the table as at 80 and strengthening webs 81 and 82 may be arranged outwardly of the section 78. Between one end of rail 77 and the adjacent end of rail 50 a flexibly mounted rail section 83 is arranged in alinement with the adjoining rails. As shown in Fig. 3, rail section 83 has an arm 84 secured thereto or formed integral therewith, which arm is pivoted to a pin 85 mounted in one end of a bracket 86 secured to table 69 as at 87. A coil spring 88 has one end 89 secured to arm 84 and its opposite end is secured at 90 to the web 81, said spring being adapted to normally urge rail section 83 toward the conveyor belt, but allowing movement of the section away from the belt against the action of the spring. However, there is a stop member 91' (Fig. 1) depending from section 83 which is adapted to engage angle iron 42 and prevent inward movement of the rail section beyond the plane of alinement with adjoining rails, as shown in Fig. 3. The purpose of rail section 83 will be later referred to.

The conveyor belt 39 is adapted to convey the bottles to a point opposite rail section 83, at which point a bottle feed wheel 91 is arranged to engage each bottle, and move it from the conveyor onto another part of the apparatus. Wheel 91 is removably fixed on the upper end of shaft 28 (Fig. 2) for rotation with the latter shaft. A pin 92 secured in wheel 91 extends into a bearing member 93 arranged on top of housing 29 and keyed to shaft 28 as at 94 whereby rotation of bearing member 93 will effect rotation of wheel 91. The outer periphery of the latter wheel is provided with two oppositely disposed cut-out portions 95 each of which, as the wheel rotates, engages a bottle on belt 39 and moves it counter-clockwise as viewed in Fig. 3 for approximately 180°, guard rail 77 being utilized as a guide in the movement of the bottle, while a portion of table 69 serves as a support for the bottle until it reaches the next part of the apparatus. Wheel 91 is made in various sizes with cut-out portions 95 altered to accommodate bottles of quart, pint or half pint size and each wheel 91 carries its own pin 92. Such wheel may readily be changed on shaft 28 by displacing pin 92 and removing the wheel, placing a new wheel on the shaft and replacing its pin 92.

As long as a bottle is in proper position on belt 75

39 to be engaged by one of the cut-out portions 95, such bottle will be properly carried from the conveyor by the feed wheel. But, if a bottle should be out of place so that it is engaged by the periphery of the feed wheel between the cut-out portions, such bottle will be forced against the guard rail and if the latter were stationary breakage might result. However, by flexibly mounting rail section 83 I provide against breakage by allowing the rail to give away sufficiently at this point to force the bottle out of danger. Continued rotation of the feed wheel will eventually bring one of the cut-out portions into proper position to pick up the bottle and when such position is reached, spring 88 will force the rail section 83 back into its normal position and force the bottle into the cut-out portion so that the bottle can be moved from the conveyor belt in the manner intended for its removal.

Referring again to Fig. 2, numeral 96 indicates a vertical elevating shaft having a rack 97 on its lower end which extends into a housing 98 bolted to base 10 as at 99. Housing 98 also encloses a rack gear 100 the teeth of which mesh with the teeth of rack 97. Gear 100 is connected with suitable gearing (not shown) in housing 101 which in turn is connected through suitable shafts and joints, indicated as a whole by the numeral 102, to a hand wheel 103 mounted in the front of the apparatus. The arrangement is such that elevating shaft 96 may be manually raised and lowered by turning hand wheel 103, so as to adapt this portion of the apparatus to receive quart, pint or half pint bottles.

Rotatably mounted on shaft 96 is a column 104, the lower end of which extends into space 14 and bears against a washer 105 supported on a thrust collar 106 mounted on shaft 96 by a pin 107. A worm gear 108 is suitably mounted for rotation in housing 17 and has an elongated hub portion 109 extending upwardly from the main frame 13, said hub portion being keyed to column 104 as at 110 to rotate the latter. Since column 104 will be raised and lowered with shaft 96, an elongated keyway is utilized in the connection with gear 108 whereby this connection will not be disturbed by vertical movement of the column. Gear 108 is in driving engagement with drive shaft 25 through suitable gearing 111 whereby column 104 will be rotated from the main drive shaft 25. As previously stated, the operating parts of the apparatus enclosed in housing 17 are adapted to be run in oil, and an oil seal 112 is arranged around column 104 to prevent leakage of oil past the column.

A bottle rotor 113 is also keyed to hub 109 at its outer end as by means of key 114 and this rotor rests against the upper end of a projection 115 on the main frame 13. If desired a suitable bearing may be placed between the rotor and projection 115. At diametrically opposite points rotor 113 is formed with vertical openings 116 each of which slidably receives a leg 117 of a bottle table 118 flanged as at 119 to prevent displacement of bottles placed thereon. The lower end of each leg 117 is provided with a cam roller 120 which engages a cam track 121 located on the main frame 13. When the roller 120 shown at the right in Fig. 2 is at the high point 122 on cam 121, the other roller is out of contact with the cam, the arrangement being such that when rotor 113 is rotated in a clockwise direction as viewed in Fig. 3, the roller 120 at the left in Fig. 2 will gradually ride up cam 121 and raise its associated table 118 together with the bottle there-

on until the high point on the cam is reached. From this high point the roller is quickly returned to its lowest position so as quickly to lower the bottle. In Figs. 1, 3, 4 and 5 the high point of the cam is indicated at 122 and it will be readily observed that the time required to lower the roller is much less than is required to raise it to its high point. Both rollers 120 alternately operate in the same manner, thus alternately raising and lowering tables 118 and the bottles thereon.

Also keyed to column 104 for rotation therewith is a capper frame 123 secured to the end of column 104 by a key 124. Capper frame 123 may be additionally secured to column 104 by forming the hub 123' as a split sleeve held tightly in engagement with the column by screw 124' (Fig. 4) in the customary manner. At diametrically opposite points, capper frame 123 is provided with vertical bores 125 each of which receives a tubular member 126 having an annular base plate or flange 127, each member 126 and its flange being suitably secured in a bore 125 so as to rotate with the capper frame and to be incapable of any relative movement with respect to the capper frame. Preferably the portions 125' of the capper frame, in which bores 125 are formed, are constructed as split sleeves which are held tightly in engagement with tubular members 126 by means of screws 126' which hold the split portions together (Fig. 4).

Each flange 127 is provided with a plurality of radial slots 128 (Figs. 5 and 6), each of the latter slots slidably receiving a radially movable cap expanding arm 129. Each arm 129 has a vertically arranged finger 130 on the inner end thereof, and intermediate its ends each arm 129 carries a pin 131 having a roller 132 on its lower end. Each roller 132 travels in an arcuate slot 133 formed in a lower housing member 134 which is provided with a central beveled opening 135. A centrally apertured upper housing member 136 is secured at its outer edge to member 134 by means of bolts 137, and the arrangement is such that each flange 127 is substantially enclosed in a pair of housing members 134, 136, as more clearly shown in Fig. 6. For convenience, the structure associated with each bore 125 will be referred to as a whole as a capping head, so that in this instance two oppositely arranged capping heads are provided.

Since each pair of housing members 134, 136 are associated with the capper frame 123 they will, of course, rotate with such frame and in order to secure radial movement of the expander arms 129 some means must be provided to effect relative movement between housing members 134, 136 and flange 127 whereby rollers 132 will move in the arcuate slots 133. In this instance this relative movement is obtained by the use of a cam 138 which is fixed to shaft 96 above the upper end of column 104. Preferably a screw 139 is utilized to hold cam 138 in engagement with shaft 96 and against rotation.

As more clearly shown in Fig. 4, a stud or bolt 140 is secured to and extends upwardly from each housing member 136, and one end of a link 141 is pivoted to each stud. The opposite end of each link 141 is pivoted to a pin 142 which also pivotally receives one end of a lever 143, and the opposite end of each of the latter levers is fixed to the lower end of a vertical rock shaft 144 suitably mounted in bosses 145 carried by the capper frame 123. The upper end of each rock shaft 144 has one end of a short lever arm 146 fixed thereto and the opposite end of each arm 146

carries a pivotally mounted roller 147 adapted to bear against cam 138. A coil spring 148 is secured between each stud 140 and a stud 149 carried by the hub portion of caper frame 123.

As will be apparent, movement of each lever arm 146 in response to movement of each roller 147 will rock each shaft 144 causing the latter to swing levers 143 in a path of movement similar to the path of movement of arms 146. Obviously, the swinging movements of levers 143, through pins 142, will move each link 141, and since the latter are secured to housing members 136, a relative turning movement will be effected between each pair of housing members 134, 136 and each flange 127 arranged between these housing members. This relative turning movement is sufficient to move rollers 132 in their respective arcuate slots 133, thereby causing radial movement of fingers 130 and arms 129 in radial slots 128, because rollers 132 are carried by arms 129 and the path of movement of arms 129 is confined to slots 128. When one set of arms 129 are at the inner end of their movement, as shown at the bottom of Figs. 4 and 5, coil spring 148 associated with this set of arms is in its normal position, and any relative turning movement of the associated flange 127 and its housing members 134, 136 will be against the tension of this spring, so that the tendency of this spring is to return the fingers to their inner position. The other coil spring 148 affects the other set of fingers in the same manner.

As the caper frame 123 rotates, rollers 147 will be in constant engagement with cam 138 which has its outer periphery designed to effect relative turning movement between each flange 127 and each pair of housing members 134, 136, thereby effecting radial movement of arms 129 and fingers 130. This cam, referring to Fig. 4, has a uniform radius from point X to point Y and gradually decreases in radius from the latter point to point Z which is the low point on the cam. From point Z the cam surface extends in substantially a straight line to point X. Accordingly, since cam 138 is stationary, rollers 147 will rotate around the cam as the caper frame rotates. As each roller 147 reaches the low point Z on the cam, fingers 130 and arms 129 associated therewith are at the inner end of their movement, as shown in the lower part of Figs. 4 and 5. Since rotation of the caper frame is in a clockwise direction, as indicated by the arrows in Fig. 4, each roller 147 as it leaves the low point Z will be in contact with the surface of the cam between the latter point and point Y, thereby gradually moving arms 129 and fingers 130 radially outwardly until point Y is reached, at which time the arms and fingers will have reached the outer end of their movement, as indicated in the upper part of Figs. 4 and 5. Leaving point Y, the rollers 147 are in contact with the portion of the cam between the latter point and the point X, which portion is of constant radius, whereby the fingers and arms will remain in their outer position during this portion of travel of the rollers 147. Leaving point X, the rollers quickly drop to point Z to effect a quick return of the fingers and arms to their inner position.

As most clearly shown in Figs. 2 and 6, a tubular magazine 150 is carried in each tubular member 126. Intermediate its ends, each magazine has an annular shoulder 151 which rests on a forked arm 152 which in turn rests on the upper end of tubular member 126. In its lowermost position, each magazine extends into the plane of upper

housing member 136, as shown at the left in Fig. 6, and each has a slightly inturned flange or ledge 153 which supports a stack of caps, preferably of the type shown in Figs. 11 and 12, having substantially parallel top and bottom portions 154 and 155 respectively, each bottom portion having a central opening 156 therein. Each stack of caps is arranged as shown at the left in Fig. 6 whereby fingers 130 extend into the opening 156 in the lowermost cap. During outward radial movement of fingers 130, as previously described, these fingers are in engagement with the bottom portion of the lowermost cap and spread same into a skirt which is adapted to fit over the head of a bottle.

Each magazine 150 is adapted to be raised from the position shown at the left in Figs. 2 and 6 to the position shown at the right in said figures, so as to be out of the path of movement of the bottles as well as out of the way of the expanding fingers. This is accomplished by raising each forked arm 152 upon which the magazines rest. Arms 152 are each mounted on the upper end of a vertically reciprocating rod 157 slidable in a boss 158 formed on the outer surface of the portions 125' of caper frame 123 (Fig. 6). Each rod 157 has a roller 159 mounted on its lower end which is adapted to engage a cam track 160 (Figs. 4 and 6) arranged on the upper surface of each housing member 136. When the latter is turned relative to flange 127 (as viewed in the lower portion of Fig. 4) it will move in a clockwise direction and cam track 160 will move under roller 159, forcing the latter up the cam track to its high point 161 at which point the magazine will be raised as shown at the right in Figs. 2 and 6. It will also be noted from the upper portion of Fig. 4 that roller 159 reaches the high point on cam 160 at the same time its associated roller 147 reaches point Y on cam 138, and roller 159 remains at the high point 161 during the travel of roller 147 from point Y to point X on cam 138, thus holding magazine 150 elevated during such travel of roller 147. As roller 147 moves from point X to point Z, its associated roller 159 will move down track 160 returning magazine 150 to its lower position. Each magazine 150 is raised and lowered alternately in the manner described.

As shown in Figs. 2 and 6, shaft 96 extends above cam 138 and a coupling member 162 is fitted on the end of this shaft to receive the lower end of a hot air blower indicated as a whole by numeral 163. The shank 164 of the blower is hollow and communicates with the hollowed end portion 165 of shaft 96. At the lower end of hollowed portion 165 lateral passages 166 are formed which communicate with similar passages 167 formed in column 104. Passages 167 communicate with an air distributor housing 168 suitably mounted on column 104 so as to rotate with the latter. In this instance the lower portion 169 of the distributor housing is formed as a split sleeve held tightly in engagement with column 104 by screw 170 in the conventional manner. An annular air chamber 171 is formed in housing 168 and a plurality of vertical passages 172 communicate between this chamber and the rear ends of a pair of hollow nozzle members 173 each of which is adapted to communicate with one of the magazines 150. Each nozzle member 173 is mounted for limited rotation on housing 168 by means of pins or bolts 174 which have their lower ends 175 threaded into housing 168.

As will be obvious, heated air is adapted to pass down the shank of the blower through the

various passages and into nozzles 173 from which it is directed into the magazines 150. Each nozzle 173 is independently mounted and is associated with one of the capping heads. As shown at the left in Fig. 6, when fingers 130 are at the inner end of their movement, the outlet end of nozzle 173 is directly beneath opening 156 in the lowermost cap in the magazine. Heated air is, therefore, directed into opening 156 and causes the bottom portion of the cap to separate slightly from the top portion thereof as illustrated at the left in Fig. 6. Also, the heat renders the cap material more pliable when "Pliofilm" is used. This separation of the bottom portion of the cap from the top portion enables fingers 130 more readily to engage the bottom portion and form it into a skirt as the fingers move radially outwardly.

To insure proper alinement of nozzles 173 with the magazines when it is desired to heat the caps therein, a depending lug 176 is formed on each nozzle adjacent its inner end, and each lug 176 threadably receives an adjustable screw 177 having a lock nut 178 thereon to lock the screw in desired position whereby one end of each screw will engage the outer portion of housing 168 and limit the turning movement of each nozzle in one direction as shown in Fig. 6. Turning movement of each nozzle 173 in the opposite direction is opposed by a coil spring 179 arranged between each screw 177 and a bolt 180 secured to housing 168 (Fig. 5). The normal tendency of each spring 179 is to urge the end of screw 177 in engagement with housing 168 and thus to hold the nozzles 173 in proper alinement with the magazines 150.

After the lowermost cap in the stack has been expanded to receive a bottle it is necessary to move the nozzles 173 out of alignment with the magazines so as not to interfere with the passage of the bottle into the capping head to receive the cap. This movement of the nozzles is obtained by means of rollers 181 mounted on the free ends of links 182 adjustably secured to the lower surface of each housing member 134, as at 183 (Figs. 5 and 6). Each roller 181 functions with its associated nozzle 173 whereby when housing member 134 is turned relative to flange 127, roller 181 will contact the nozzle intermediate its ends and swing it out of alinement with magazine 150 against the action of spring 179, as clearly shown at the right in Fig. 6. Thus, as long as housing member 134 is turned whereby fingers 130 are expanded to stretch the lower portion of the cap, the associated nozzle 173 will be held out of the path of movement of the bottle which is to receive the cap. As soon as each capped bottle is lowered from the capping head and while each housing member 134 returns to its initial position, springs 179 will return nozzles 173 to proper alinement with the magazines so that heated air may be directed into contact with the next caps in the stacks. When the apparatus is operated in temperatures sufficiently high to render the "Pliofilm" pliable enough without using the current of hot air, or when material other than "Pliofilm" is used in the caps, the air distributed means may be dispensed with and it can be readily removed from the machine without disturbing any of the remaining parts.

In the lower left hand corner of Fig. 2 I have shown a hand wheel 185 associated with speed changing mechanism, indicated as a whole by numeral 186, but since the details of this mechanism form no part of the present invention, fur-

ther reference thereto is not believed to be necessary.

The operation of my apparatus is thought to be apparent from the foregoing description, but a brief statement of its operation will permit a more thorough understanding of the invention. The motor 20 is started and through the main drive shaft 25, the conveyor belt 39 begins to operate through its connections with shaft 25, and simultaneously the bottle feed wheel 91 will begin to rotate through its connections with shaft 25. Likewise, bottle rotor 113, the capping heads and the air distributor will simultaneously rotate since they are all mounted on column 104 which is rotated through connections with shaft 25. Thus, all the rotatable parts of the apparatus driven from shaft 25 are operated simultaneously.

Of course, shaft 96 has been manually adjusted to raise or lower the capping heads to accommodate quarts, pints or half pints, depending upon the size to be run through the apparatus, and stacks of caps are arranged in each magazine 150. Bottles to be capped are placed on the conveyor belt 39, which has had its guide rails properly adjusted to receive quarts, pints or half pints, as will be understood. When the first bottle reaches a point of the conveyor belt opposite bottle feed wheel 91 it is engaged by one of the cut out portions 95 and conducted to one of the tables 118 which is timed in its rotation to be at the proper position to receive a bottle from the feed wheel. Each table 118 is in predetermined alinement with one of the capping heads and retains this alinement at all times, so that as soon as a bottle is deposited on one of the tables 118 it will be in position directly beneath one of the capping heads as shown in Fig. 2, ready to be elevated to receive a cap.

As soon as one table 118 receives the first bottle to be capped it turns, together with its associated capping head, in a clockwise direction as viewed in Fig. 3, and roller 120 begins to ride up cam track 121 to raise the table and bottle, whereby at the time the table has turned approximately 180° the bottle will be in the position shown at the right in Fig. 2, the head of the bottle having passed through the plane of the cap and having removed the cap from fingers 130. As the head of the bottle engages the cap and removes it from the fingers, the cap fits in place on the bottle, the upper portion 154 extending across the top of the bottle, while the lower portion 155 grips the bead of the bottle to hold the cap in place. If the bottle should not be properly centered on table 118, the top of the bottle will engage the beveled sides of opening 135 in housing member 134 and become properly centered so as to freely pass into the capping head.

At the time the first bottle is deposited on one table 118 and it is desired to use the hot air distributing means, the hot air nozzle 173 above said table is in alinement with the magazine 150 above said table, so as to direct air into the opening 156 in the lowermost cap in the magazine, as indicated at the left in Fig. 2. When the capping head above the first bottle deposited on table 118 begins to turn, roller 147 associated with said head will be at point M (Fig. 4) on cam 138 and will move toward point Y. As previously explained, fingers 130 are at the inner end of their movement when roller 147 is at point Z on cam 138. Hence, at point M the fingers will be partly expanded, and this expansion continues until roller 147 reaches point Y, because of the relative movement between housing members 134, 75

136 and flange 127 which moves arms 129 and fingers 130 radially outwardly to stretch the bottom portion of the cap. When this roller 147 reaches point Y the bottom portion of the cap has been properly expanded and no further outward radial movement of fingers 130 is possible or necessary. At the time roller 147 reaches point Y, the bottle on table 118 is just below the fingers 130, as shown at the right in Fig. 6. As fingers 130 remain in their expanded position during travel of roller 147 from point Y to point X on cam 138, the bottle is permitted to continue upwardly through the plane of the cap held by the fingers to receive said cap.

In order to permit unobstructed passage of the bottle through the plane of the cap, the nozzle 173 has been moved out of the path of movement of the bottle by roller 181 which engages the nozzle during relative turning movement of housing member 134 and flange 127. Likewise, this relative turning movement has caused cam track 160 to pass beneath roller 159 and raise magazine 150, together with the caps therein except the cap held by fingers 130, to the position shown at the right in Figs. 2 and 6, out of the way of the top of the bottle which is to receive a cap and out of the way of the expanding fingers. As the magazine moves upwardly the cap held in fingers 130 will be withdrawn from the lower end of the magazine and held in proper position on the fingers to receive the top of the bottle. If, after receiving a cap, the bottle top should move upwardly far enough to engage the lower end of the magazine, the latter can easily be raised by the bottle so as to prevent any jamming of the mechanism.

After receiving a cap, the bottle with table 118 descends as roller 120 moves down cam track 121. As previously explained, the descent of roller 120 from the high point 122 on cam 121 is accomplished quickly in order to get the capped bottle out of the way as soon as possible. Hence, continued rotation of table 118 will bring the capped bottle around to a point adjacent the inner end of guard rail 76 by which it will be swept from table 118 and deposited on stationary table 69 to be gathered up for distribution in the usual manner.

When roller 147 has reached point X on cam 138, the capped bottle will be clear of the capping head and nozzle so that the latter may be returned to its initial position and fingers 130 may be returned to their inner position ready to receive the next cap when the magazine is lowered to its initial position. This return of fingers 130, nozzle 173 and magazine 150 is accomplished while roller 147 is moving from point X to point Z on cam 138. When roller 147 reaches point Z the capping head, nozzle and table 118 will have made about three quarters of a revolution and upon reaching point M a complete revolution will have been made, so that the table 118 will be in position to receive another bottle from the feed wheel 91.

Since the present apparatus is a duplex machine, when the first bottle is deposited on one of the tables 118, the other cut-out portion 95 in the bottle feed wheel 91 (see Fig. 3) will be in position to engage the next bottle on conveyor belt 39 and deposit it on the other table 118. The latter will then carry this second bottle through the same cycle of operations described in connection with the first bottle, and the second bottle will be capped and deposited on table 69 in the same manner as the first bottle. In order

to clarify the operation, in Fig. 2 I have shown the first bottle in three positions A, B and C. Position A shows the bottle on the conveyor belt as it is engaged by feed wheel 91, position B shows it just after it has been deposited on table 118, and position C shows it inside the capping head with a cap thereon. Thus it will be seen that the first, third, fifth, etc., bottle will be deposited on one table 118 and moved into the associated capping head, while the second, fourth, sixth, etc., bottle will be deposited on the other table 118 and moved into its associated capping head. Thus, I have provided an apparatus which will continuously cap bottles which are delivered to it and deposit the capped bottles ready for further use. While the apparatus is of the duplex type, it will be obvious that the invention is not limited to such type and the apparatus may be made to accommodate either one or a plurality of bottles at a time. In the event the air distributing means is not used it may be disconnected from the apparatus without affecting the operation of the remaining parts.

In Figs. 9 and 10 I have shown a modified form of mechanism for expanding the bottom portion of the cap. In this modification a plurality of expander arms 129' having vertical fingers 130' are pivoted as by means of pins 187 to flange 127' which is approximately half as thick as flange 127, although the combined thickness of flange 127' and arms 129' is preferably equal to the thickness of flange 127 whereby flange 127' and arms 129' may be readily fitted into the space between housing members 134' and 136' which is equal to the space between housing members 134 and 136. At their outer ends each arm 129' carries a pin 131' on which is mounted a roller 132' which is radially movable in a relatively short radial slot 133' formed in housing member 134'.

When this arrangement is utilized in place of the expanding fingers previously described, relative turning movement between housing members 134', 136' and flange 127' will cause rollers 132' to move radially in slots 133' thereby effecting a pivotal movement of arms 129' instead of the radial movement obtained by arms 129. Arms 129' will move from the position shown at the bottom of Fig. 9 to the position shown at the top of said figure and will expand the bottom portion of the cap to the same extent as fingers 129, as will be apparent.

While I have illustrated and described the preferred embodiments of my apparatus, it will be apparent that the invention is not so limited, and various modifications may be made within the spirit of the invention and within the scope of the subjoined claims.

What is claimed is:

1. A bottle capping machine for applying flexible caps having a substantially flat top portion and a substantially parallel bottom portion provided with an axial opening therein to uncapped bottles or receptacles, comprising means for supporting an uncapped bottle, means for receiving and supporting a stack of axially aligned caps for application to said bottles, means engageable with the bottom portion of the lowermost cap in said stack for forming said bottom portion into a skirt and for expanding the opening in said bottom portion to a size sufficient to permit the head of a bottle to pass therethrough, and means for moving the head of a bottle through the expanded opening in said lowermost cap and continuing the movement of said bottle through the plane of said cap to remove the latter from its expanding

means and leave it in position on the head of said bottle.

2. A bottle capping machine for applying flexible caps having a substantially flat top portion and a substantially parallel bottom portion provided with an axial opening therein to uncapped bottles or receptacles, comprising means for supporting an uncapped bottle, a movable magazine for receiving and supporting a stack of axially aligned caps for application to said bottles, means engageable with the bottom portion of the lowermost cap in said stack for forming said bottom portion into a skirt and for expanding the opening in said bottom portion to a size sufficient to permit the head of a bottle to pass therethrough, means for moving the head of a bottle through the expanded opening in said lowermost cap and continuing the movement of said bottle through the plane of said cap to remove the latter from its expanding means and leave it in position on the head of said bottle, and means for moving said magazine out of the path of movement of said bottle.

3. A machine for applying flexible caps to bottles or receptacles, comprising a magazine for receiving a plurality of caps in stack formation, a suitable receptacle support arranged beneath the magazine, means operable for stretching and holding stretched the lowermost cap of the stack radially outwardly, and means for moving the head of a receptacle through the plane of said stretched cap to deposit the cap on said head and continuing the movement of said head beyond the plane of said cap to remove the latter from its stretching and holding means.

4. A machine for applying flexible caps to bottles or receptacles, comprising a magazine for receiving a plurality of caps in stack formation, a suitable receptacle support arranged beneath the magazine, means operable for stretching and holding stretched the lowermost cap of the stack radially outwardly, means for moving the head of a receptacle through the plane of said stretched cap to deposit the cap on said head and continuing the movement of said head beyond the plane of said cap to remove the latter from its stretching and holding means, and means for moving said magazine out of the path of movement of said receptacle.

5. In bottle capping apparatus, in combination, means for supporting in stack formation a plurality of flexible caps having a substantially flat top portion and a substantially parallel bottom portion provided with an axial opening therein, a plurality of fingers operable to engage the bottom portion of the lowermost cap in said stack and to form said bottom portion into a skirt and to expand the opening in said bottom portion to a size sufficient to permit the head of a bottle to pass therethrough, a housing for said fingers, and means effecting relative movement between said fingers and housing to operate said fingers, said last named means comprising a cam, a roller operated by said cam, and connections between said roller and said housing to turn said housing relative to said fingers.

6. In bottle capping apparatus, in combination, means for supporting a plurality of flexible caps in stack formation, a plurality of fingers operable to expand and hold expanded at least a portion of the lowermost cap in said stack, a housing for said fingers, and means effecting relative movement between said fingers and housing to operate said fingers, said last named means comprising a cam, a roller operated by said cam, and

connections between said roller and said housing to turn said housing relative to said fingers.

7. In bottle capping apparatus, in combination, means for supporting a plurality of flexible caps in stack formation, a plurality of radially movable fingers operable to expand and hold expanded at least a portion of the lowermost cap in said stack, a housing for said fingers, and means effecting relative movement between said fingers and housing to move said fingers radially, said last named means comprising a cam, a roller operated by said cam, and connections between said roller and said housing to turn said housing relative to said fingers.

8. In bottle capping apparatus, in combination, means for supporting a plurality of flexible caps in stack formation, a plurality of pivotally movable fingers operable to expand and hold expanded at least a portion of the lowermost cap in said stack, a housing for said fingers, and means effecting relative movement between said fingers and housing to pivot said fingers, said last named means comprising a cam, a roller operated by said cam, and connections between said roller and said housing to turn said housing relative to said fingers.

9. In bottle capping apparatus, in combination, means for supporting a plurality of flexible caps in vertical stack formation, a housing having an axial opening therein arranged beneath said means with said opening in alinement with the lowermost cap in said stack, a plurality of horizontally moveable fingers arranged in said housing and operable in said opening to engage and expand at least a portion of the lowermost cap in said stack, and means for operating said fingers, said last named means comprising a cam, a roller operated by said cam, and connections between said roller and said housing to turn said housing relative to said fingers.

10. In bottle capping apparatus, in combination, means for supporting a plurality of flexible caps in vertical stack formation, a housing having an axial opening therein arranged beneath said means with said opening in alinement with the lowermost cap in said stack, a plurality of horizontally movable fingers arranged in said housing and movable radially in said opening to engage and expand at least a portion of the lowermost cap in said stack, and means for operating said fingers, said last named means comprising a cam, a roller operated by said cam, and connections between said roller and said housing to turn said housing relative to said fingers.

11. In bottle capping apparatus, in combination, means for supporting a plurality of flexible caps in vertical stack formation, a housing having an axial opening therein arranged beneath said means with said opening in alinement with the lowermost cap in said stack, a plurality of horizontally movable fingers arranged in said housing and pivotally movable in said opening to engage and expand at least a portion of the lowermost cap in said stack, and means for operating said fingers, said last named means comprising a cam, a roller operated by said cam, and connections between said roller and said housing to turn said housing relative to said fingers.

12. In bottle capping apparatus, in combination, a capping head including a tubular member having a base flange thereon, a housing for said flange and having an axial opening in alinement with the bore of said tubular member, a plurality of horizontally arranged fingers carried by said flange and moveable toward and away from the axis of said tubular member, and

means for moving said fingers, said means comprising a stationary cam, a roller operated by said cam, and connections between said roller and said housing to turn said housing relative to said fingers.

13. In bottle capping apparatus, in combination, a capping head including a tubular member having a base flange thereon, a housing for said flange and having an axial opening in alignment with the bore of said tubular member, a plurality of horizontal fingers carried by said flange and moveable radially toward and away from the axis of said tubular member, and means for moving said fingers, said means comprising a stationary cam, a roller operated by said cam, and connections between said roller and said housing to turn said housing relative to said fingers.

14. In bottle capping apparatus, in combination, a capping head including a tubular member having a base flange thereon, a housing for said flange and having an axial opening in alignment with the bore of said tubular member, a plurality of horizontal fingers carried by said flange and pivotally movable toward and away from the axis of said tubular member, and means for moving said fingers, said means comprising a stationary cam, a roller operated by said cam, and connections between said roller and said housing to turn said housing relative to said fingers.

15. In bottle capping apparatus, in combination, a conveyor for continuously delivering bottles to be capped, a rotatable and vertically movable table for receiving a bottle to be capped, a feed wheel for transferring a bottle from said conveyor to said table, a rotatable capping head

in alignment with said bottle on said table, a magazine containing caps in stack formation mounted in said capping head, a rotatable hot air directing means carried below said capping head and arranged to deliver heated air against the stack of caps in said magazine, means for rotating said table, bottle, air directing means and capping head in unison, means for moving said table and bottle upwardly during rotation to cause the top of said bottle to enter said capping head and receive the lowermost cap in said stack, and means for moving said hot air directing means out of the path of movement of said bottle.

16. In bottle capping apparatus, in combination, a conveyor for continuously delivering bottles to be capped, a pair of rotatable and vertically movable tables for receiving bottles to be capped, a feed wheel for transferring bottles from said conveyor alternately to said tables, a pair of rotatable capping heads in alignment with said bottles on said tables, a magazine containing caps in stack formation mounted in each capping head, a rotatable hot air directing means carried below each capping head and each arranged to deliver heated air against one of the stacks of caps in said magazines, means for rotating said tables, bottles, air directing means and capping heads in unison, means for moving each table and bottle alternately upwardly during rotation to cause the top of each bottle alternately to enter its respective capping head and receive the lowermost cap in the respective stack, and means for moving each hot air directing means out of the path of movement of its respective bottle.

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