July 12, 1932. G. E. STRANDT 1,867,113

MACHINE FOR APPLYING METAL CAPS TO BOTTLES

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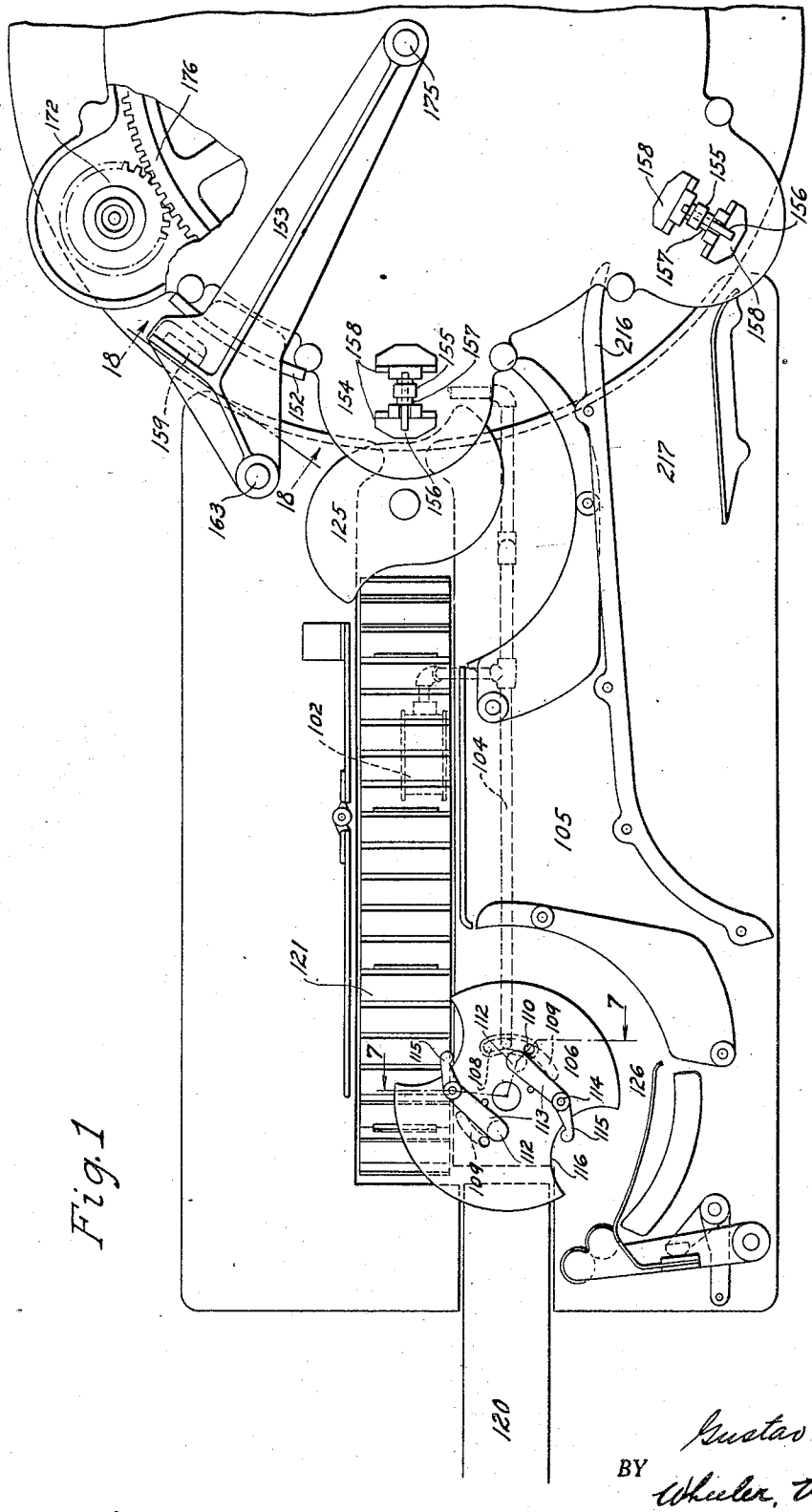


Fig. 1

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MACHINE FOR APPLYING METAL CAPS TO BOTTLES

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Fig.2

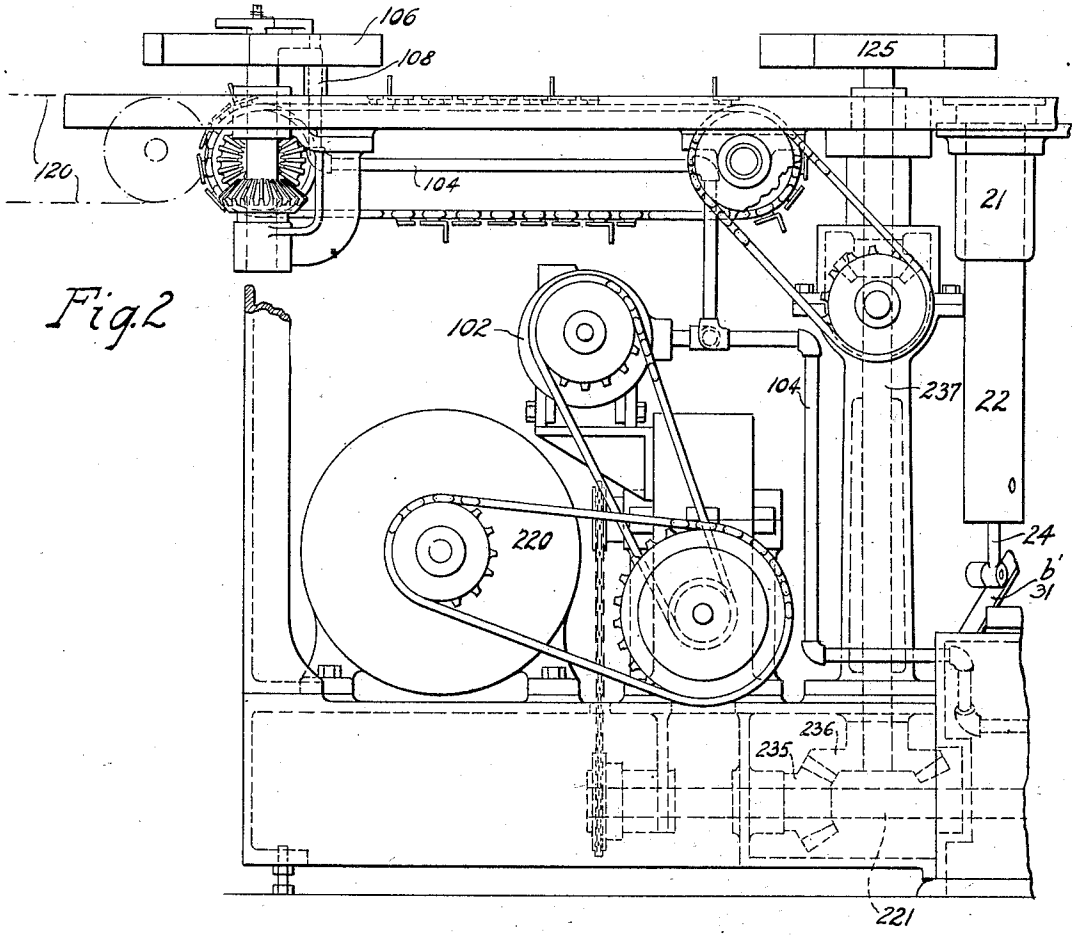
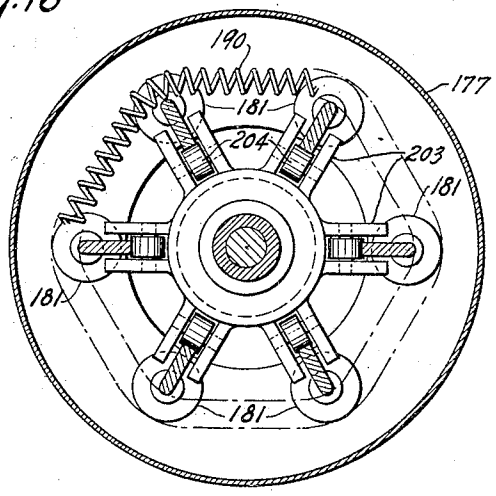


Fig.16



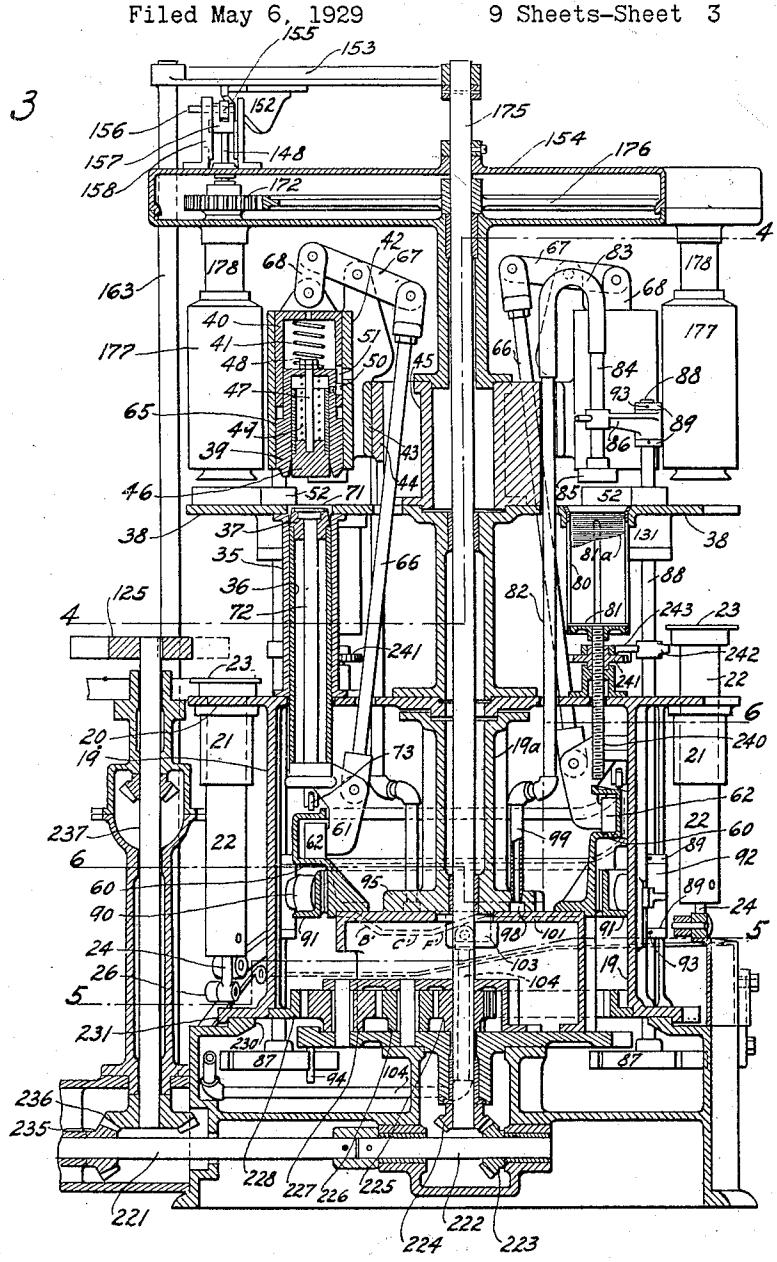
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MACHINE FOR APPLYING METAL CAPS TO BOTTLES

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Fig. 3



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MACHINE FOR APPLYING METAL CAPS TO BOTTLES

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Fig. 4

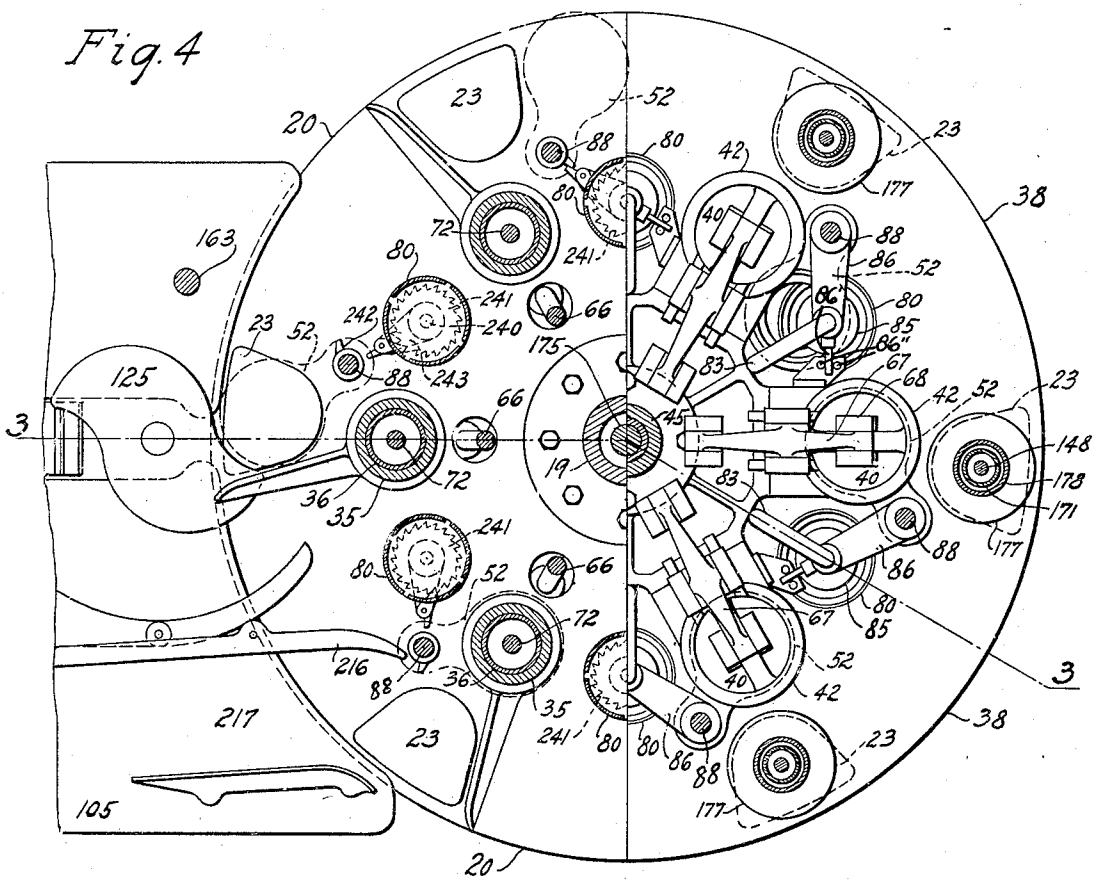
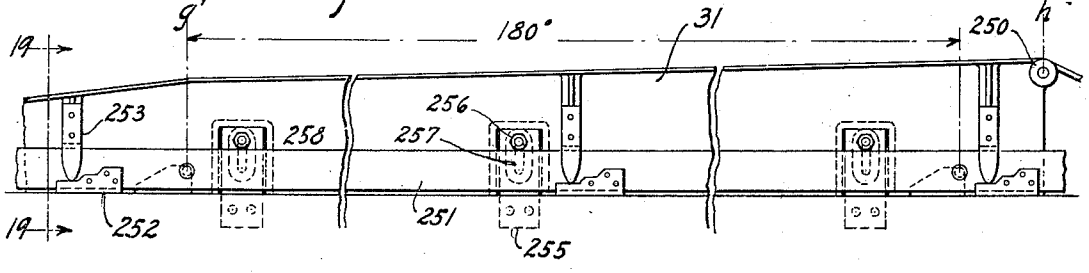


Fig. 17



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MACHINE FOR APPLYING METAL CAPS TO BOTTLES

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Fig. 5

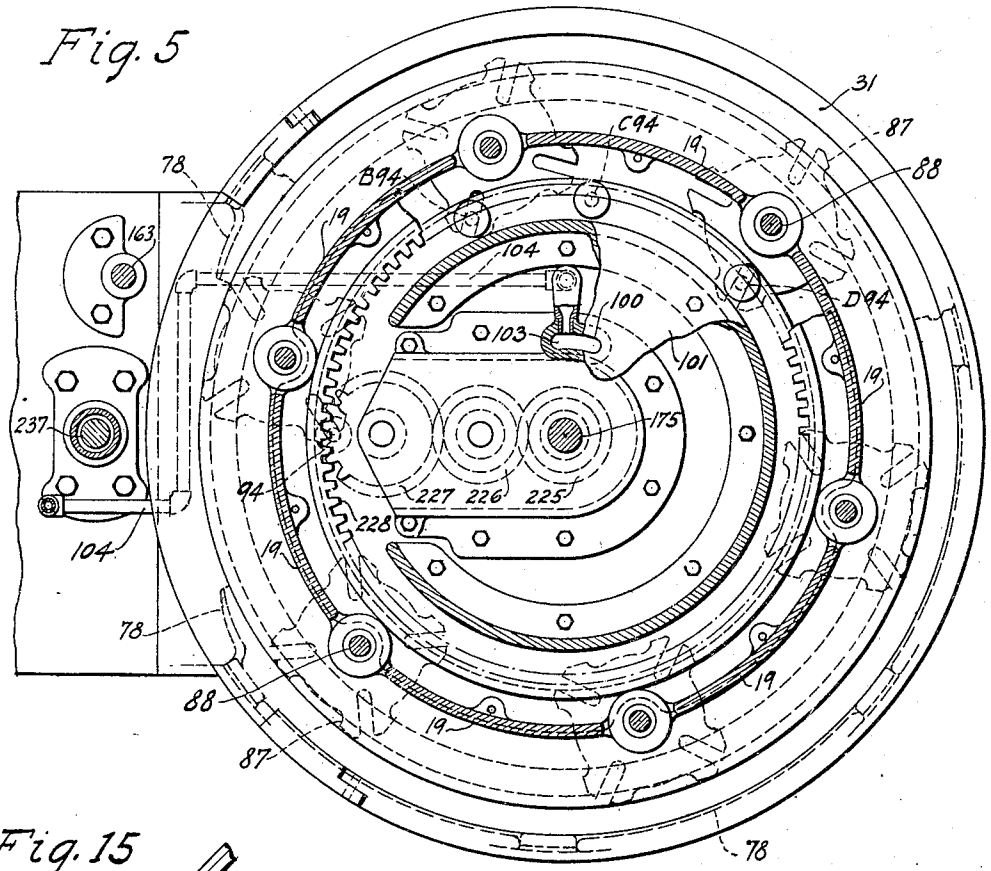


Fig. 15

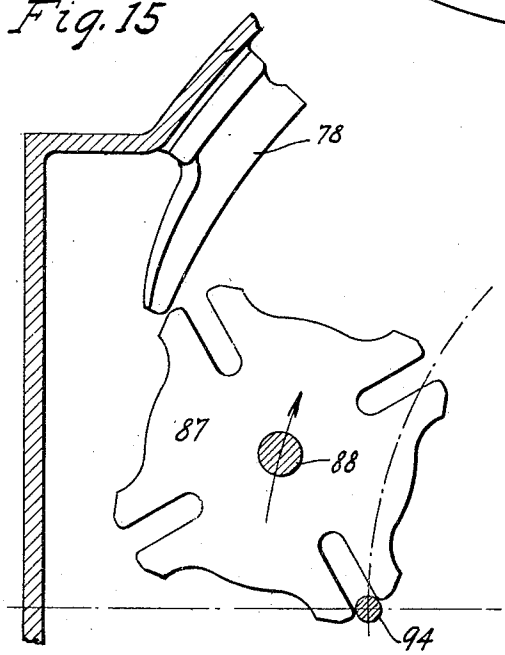
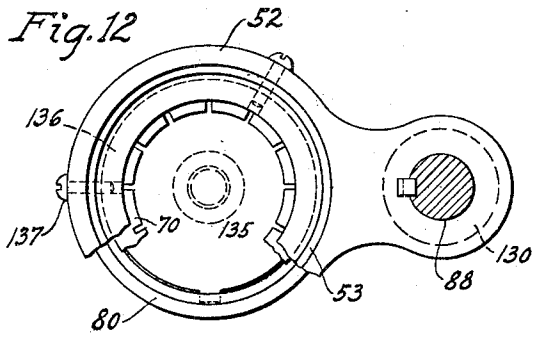


Fig. 12



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Fig. 6

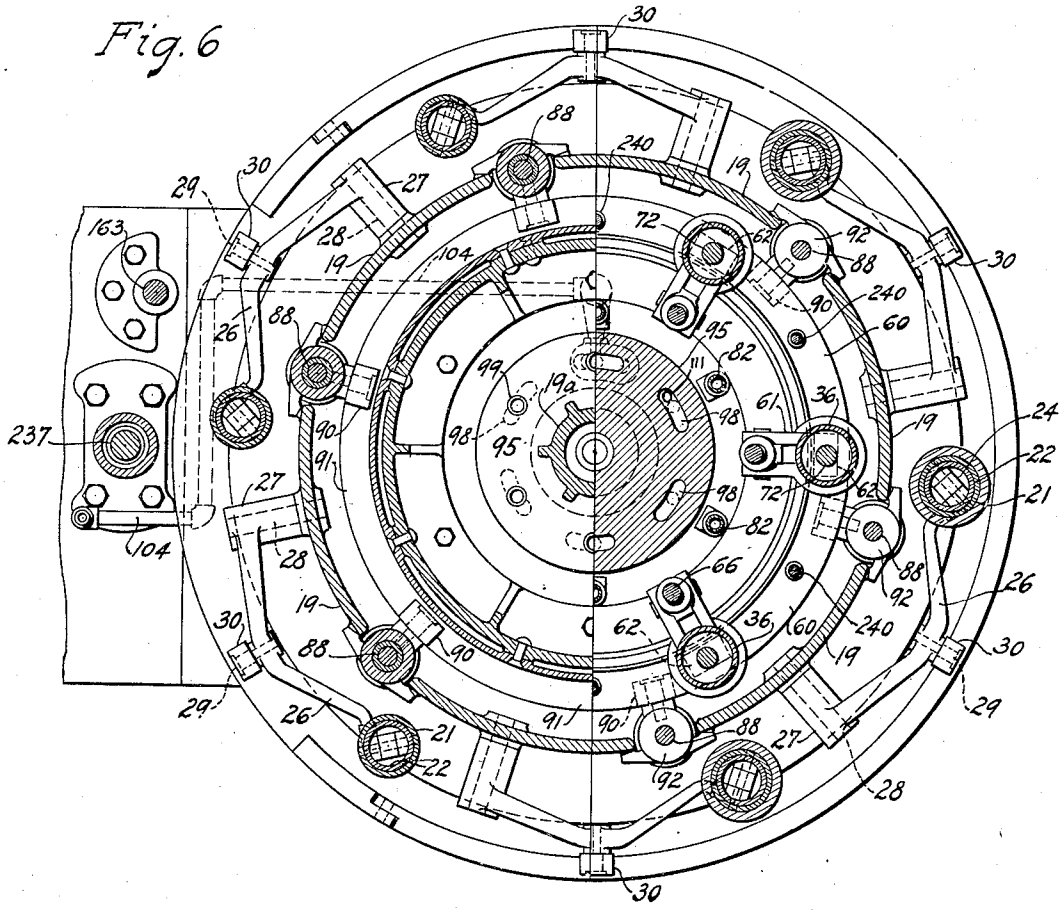
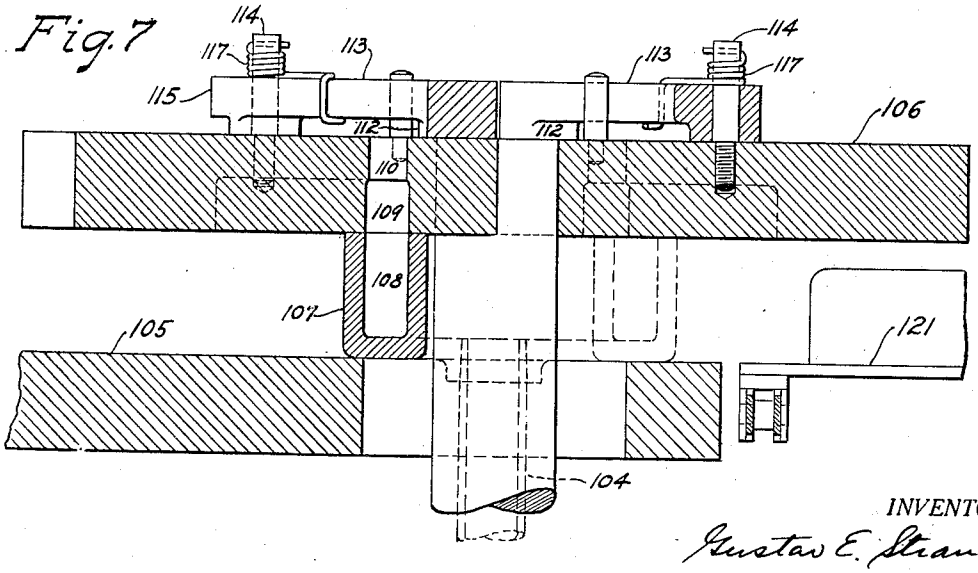


Fig. 7



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MACHINE FOR APPLYING METAL CAPS TO BOTTLES

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Fig. 18

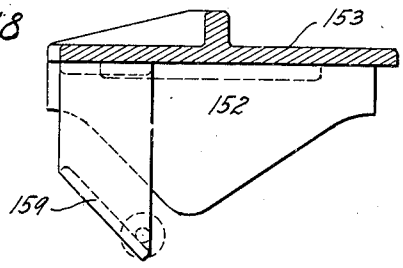


Fig. 8

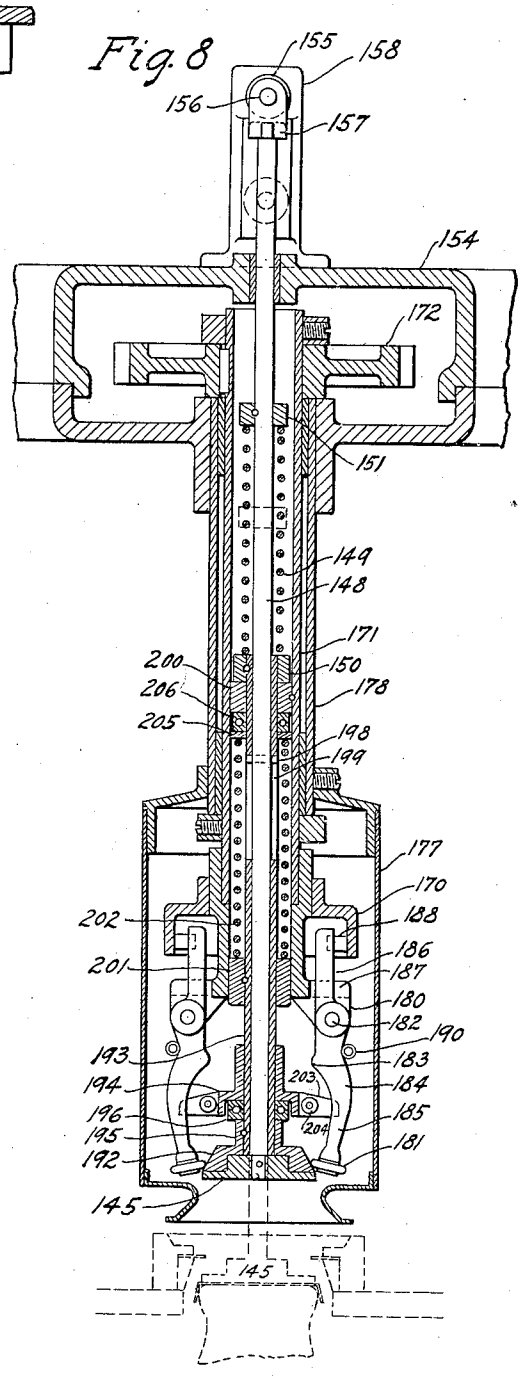
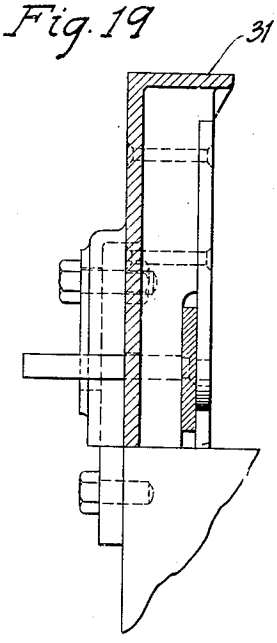


Fig. 19



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MACHINE FOR APPLYING METAL CAPS TO BOTTLES

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Fig. 9

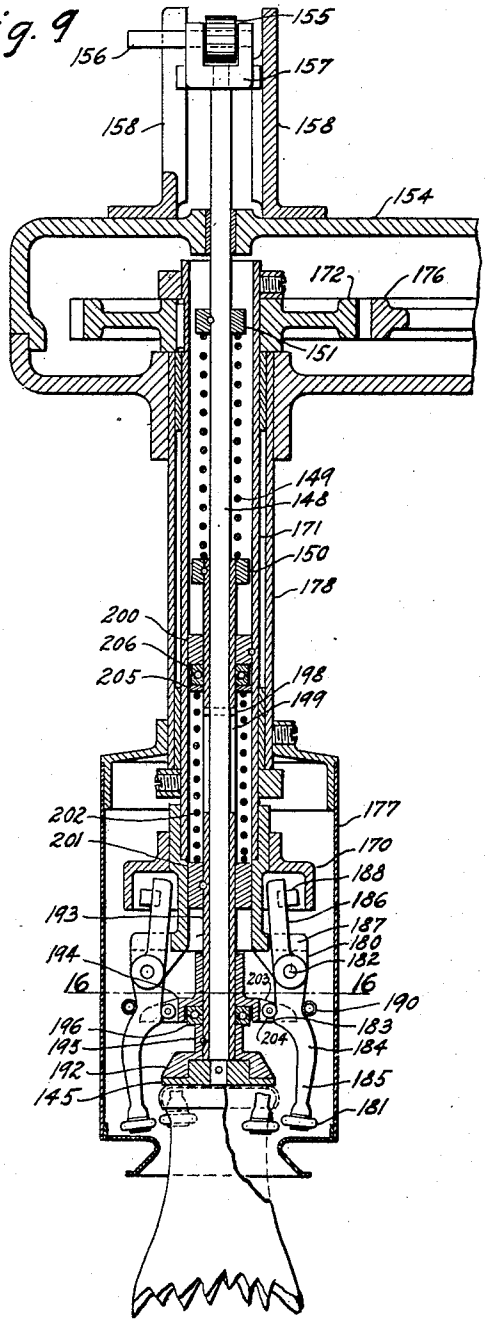


Fig. 10

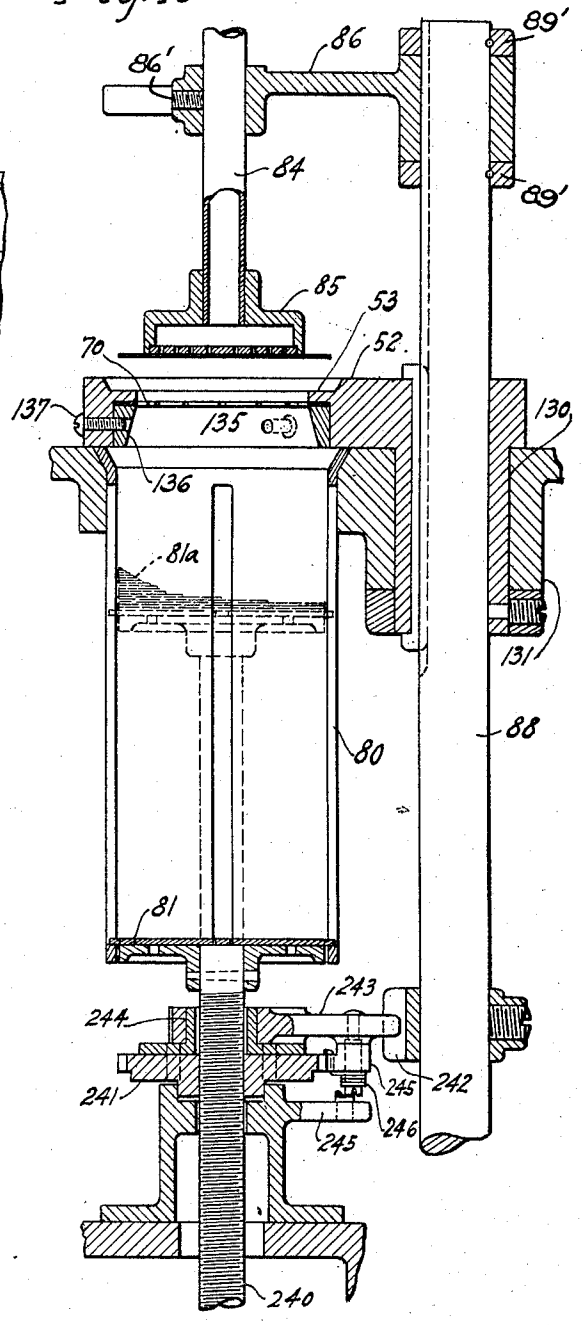
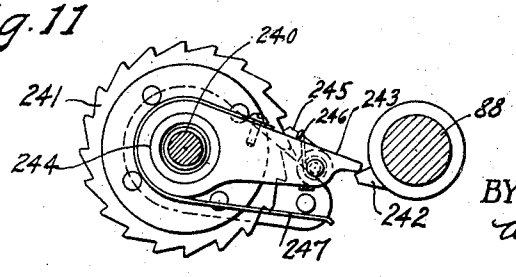


Fig. 11



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Fig. 13

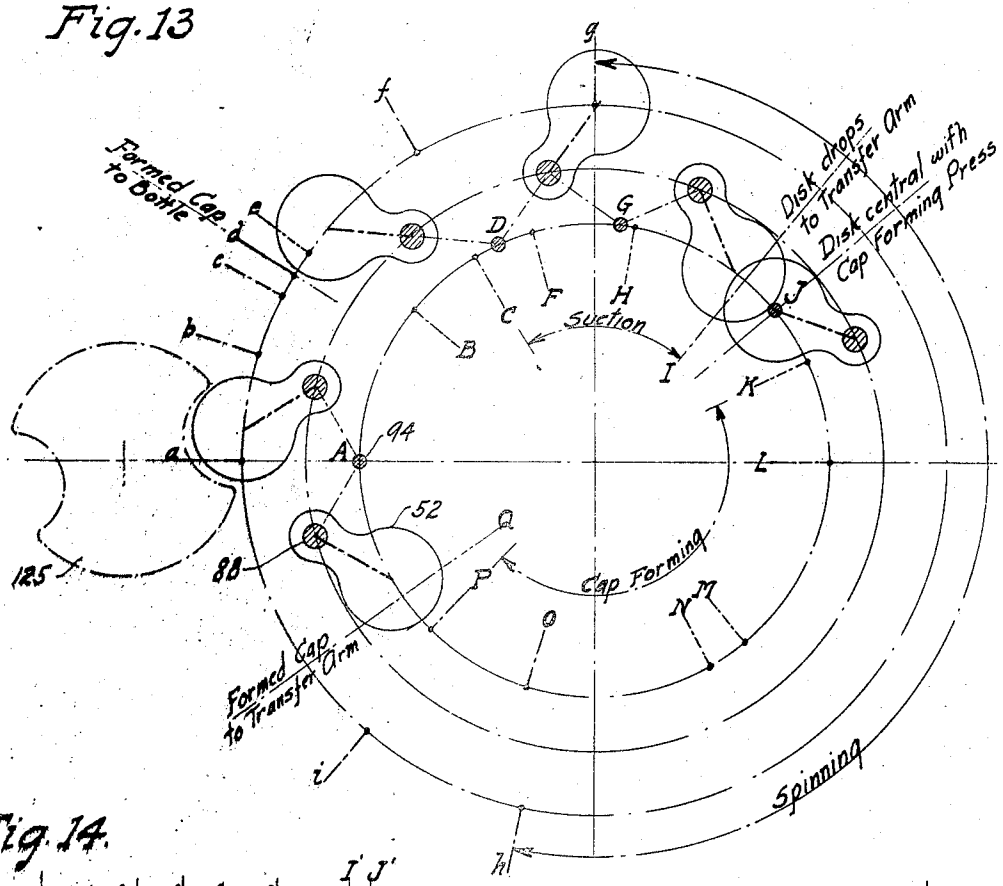
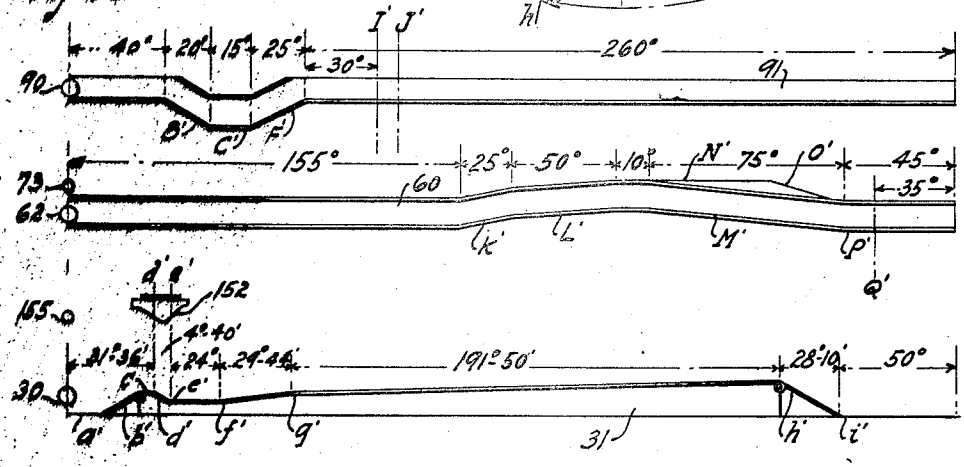


Fig. 14.



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Patented July 12, 1932 1,867,113

UNITED STATES PATENT OFFICE

GUSTAV E. STRANDT, OF MILWAUKEE, WISCONSIN, ASSIGNOR TO CHERRY-BURRELL CORPORATION, OF MILWAUKEE, WISCONSIN, A CORPORATION OF DELAWARE

MACHINE FOR APPLYING METAL CAPS TO BOTTLES

Application filed May 6, 1929. Serial No. 360,696.

This invention relates to improvements in bottle capping machines with particular reference to machines for applying metal caps over bottle mouthpieces containing previously inserted caps or corks.

The primary object of the invention is to provide efficient means for expeditiously applying metal caps to the mouthpieces of milk bottles and similar receptacles which have already received an ordinary inset paper disc cap or cork whereby the metal caps may be utilized to prevent foreign matter, such as dust and other bacteria infected material, from lodging upon the surface of the mouthpiece or upon the cork or paper cap.

A more specific object is to provide means whereby bottles with inset closures may be mechanically conveyed in a continuous order of succession and in association with suitable disc-feeding, cap-forming, transferring and spinning or cap-applying mechanisms, all of which are operative in synchronism along the line of bottle travel and so organized as to allow the various functions to be performed simultaneously as far as possible, in order that the time required for capping each bottle will be but slightly greater than the time required for the longest operation, i. e., the operation of spinning the cap flange into conformity with the bottle mouthpiece.

Other specific objects are to provide means controlled by in-feeding bottles for regulating the feeding of metal discs from a magazine, whereby the disc for capping the bottle will be delivered from the magazine while the bottle is being delivered to the capping machine; to provide transferring mechanism adapted to receive a metal disc from the magazine, convey it to a cap-forming press and then convey the upset cap into a position for registry with the mouth of the bottle underneath a spinning head into which the cap may be forced by an axial movement of the bottle after delivery of the cap to the bottle and removal of the transferring device, the latter being released by a withdrawal of the bottle after the spinning operation has been completed.

Further objects are to provide means whereby a series of bottle-capping operations in successive stages of completion may be simultaneously p rformed and the time interval required for each stage regulated in correspondence with the time required for feeding bottles successively to the machine; to provide means whereby the various operations may be performed in association with a continuously traveling bottle carrier, preferably of the turn-table type; to provide adequate turret controls; and to provide improved suction feeders, transfer carriers, presses and spinning heads, all peculiarly adapted for the accomplishment of the more general purposes, above set forth.

In the drawings:

Figure 1 is a plan view of the infeeding and outfeeding side portion of a machine embodying the invention herein described.

Figure 2 is a side elevation of the infeeding table and associated parts, including one of the bottle supports and a fragment of the turret.

Figure 3 is a vertical sectional view of the turret, drawn generally to line 3—3 of Figure 4.

Figures 4, 5 and 6 are horizontal sectional views, drawn respectively to lines 4—4, 5—5 and 6—6 of Figure 3.

Figure 7 is a detail sectional view of a portion of the infeeding table showing the suction chambers and suction controlling infeeding wheel, the section being drawn to line 7—7 of Figure 1.

Figure 8 is a central vertical sectional view of one of the spinning mechanisms showing the parts in normal position, with dotted lines indicating the ejector position of plate 145.

Figure 9 is a similar view showing the parts as they appear immediately after completing a cap spinning operation.

Figure 10 is an enlarged vertical sectional view of one of the cap magazines and associated parts.

Figure 11 is a detail plan view of the ratchet feed mechanism with its actuating shaft 88 and disc lifting screw, shown in cross section.

Figure 12 is a detail plan view of the transfer arm above an associated cap disk maga-

zine, the carrying portion of the arm being partially broken away to show the top of the magazine, and the operating shaft being shown in cross section.

Figures 13 and 14 are timing diagrams.

Figure 15 is a detail view of the means for rotating shaft 88 and regulating its rotation, said shaft, one of the actuating pins, and a portion of the frame being shown in horizontal section.

Figure 16 is a horizontal section of the spinning mechanism, drawn to line 16—16 of Figure 9.

Figure 17 is a developed view of the cam track 31 and the means for adjusting it to suit the requirements for bottles of differing sizes.

Figure 18 is a detail sectional view of the overarm and cams, drawn to line 18—18 of Figure 1.

Figure 19 is a sectional view, drawn to line 19—19 of Figure 17.

Like parts are identified by the same reference characters throughout the several views.

Before describing the structural features of the machine in detail, a general statement of the functions to be performed will be desirable.

Bottles previously filled and provided with cap discs or corks, will be fed in spaced relation to each other to suitable supports carried by a rotary turret, six such bottle supports being illustrated in the construction shown. In association with each bottle support, the turret is provided with a cap disc magazine, a suction feeder for removing cap discs from the magazine successively, a ratchet feed mechanism for lifting the pile of discs in the magazine to keep the top of the pile at a constant level, a drawing press for upsetting the cap discs to form caps of inverted cup shape, a spinning head for spinning the caps over the mouthpieces of the bottles, and transfer mechanism for receiving the cap discs from the suction feeder, transferring them to the press and again transferring them from the press to a position in registry with the spinning head in a succession of timed operations, performed in each case while the bottle is approaching the point at which the particular cap so formed is to be applied.

Each bottle, in one stage of its approach, automatically controls the operation of a suction feeder associated with the support that is to receive it, and while the bottle continues its approach, a cap disc is lifted by the feeder, transferred to the press to be cupped and then transferred to a position for capping the bottle. Upon reaching the turret, each bottle is lifted by its support to carry its mouthpiece into the open cap or cup-shaped blank. The bottle and cap are then depressed to release the transferring device, the latter being moved to a neutral position, and the bottle is then again lifted to carry its capped mouthpiece into the spinning head for a spinning operation.

After the spinning operation has been completed, the bottle is automatically lowered, after which it is discharged from the machine. In the meantime the transferring device will be returned to a position for receiving another cap disc for a bottle then approaching the machine.

By providing the turret with six bottle supports, and associated feeding, cap-forming and spinning and transferring mechanisms, it is possible to infeed and outfeed bottles at intervals of about one-third of the time required for a single cap-spinning operation, inasmuch as a plurality of spinning operations may be simultaneously in progress in different stages along the circular path in which they are carried by the turret.

In the following detailed description, the turret and its relation to the bottle supports, cap-forming presses, disc feeders, transferring mechanisms and spinning heads will be described in the order here stated, and then the co-ordination and synchronistic operation of these groups of mechanisms with each other and with the infeeding mechanism will be explained.

Bottle supporting and lifting devices.—The rotary turret 19 is disposed for rotation about a vertical axis and it has a table 20 which is provided at uniformly spaced intervals with guide sleeves 21 through which vertically movable tubular slides 22 extend. The upper ends of these slides are provided with bottle-supporting plates 23. The lower ends of the slides 22 are provided with actuating links 24, each of which has an outwardly extending stud to which one end of a lever 26 is pivoted. (Figures 3 and 6).

Each lever 26 has a hub portion 27 which is pivoted to a stud 28 on the turret 19. An intermediate portion of each lever extends outwardly and carries a trunnion 29 upon which a roller 30 is mounted in a position to travel along a camway 31 connected with the frame. The camway is formed to lift and lower each roller at the proper times, thereby actuating the associated lever 26 and transmitting motion to lift slide 22 and its bottle supporting plate 23, as hereinafter more fully explained. These slides 22 descend by gravity when the cam permits.

Cap forming presses.—Adjacent each bottle supporting plate 23 there is a tubular guide 35 for a press plunger 36 (Figures 3 and 6), the upper end of which carries the press die 37, operative through an aperture in an upper table 38 in line with the axis of the matrix 39 of the press.

As shown in Figure 3, the matrix has a reduced shank or upper end portion which is seated in a slide 40 against a compression spring 41 which abuts the upper end of the

slide. The latter is mounted for vertical movement in a supporting guide sleeve 42, carried by a bracket 43 connected with a collar 44 integral with the central turret post member 45.

A disc clamping or ejector head 46 is supported from the top of the matrix member 39 by a hanger 47, the effective length of which is adjustable by means of a nut 48, and a compression spring 49 is interposed between the ejector head and the top of the matrix member 39, whereby the ejector head may be pushed upwardly into the matrix against the pressure of this spring 49 when the cap is being formed. The pressure of the spring may also be utilized to eject the cap after the drawing operation has been completed. The matrix is connected with the slide 40 by a screw 50 which extends through a slot 51 in the guide (Figure 3).

When a cap disc is to be presented to the press, it is conveyed thereto by a transfer arm 52 which has an annular cap disc supporting shoulder 53 (Figures 10 and 12). When a cap is to be formed, the die-head 37 will be lifted by means of its supporting plunger 36 to engage and lift the disc from the transfer arm, and during this movement the slide 40 will be moved downwardly so that the matrix and its clamping ejector head 46 may engage the upper side of the disc substantially simultaneously with the engagement of the die-head 37 with its lower side. These movements are derived from the cam trackway 60 as follows.

A bracket 61 carries a roller 62 which travels along the cam trackway, the bracket being connected with the lower end of the plunger 36, whereby, when the roller 62 registers with an upward incline in its trackway during turret rotation, plunger 36 will be lifted to carry die-head 37 through the opening in the transfer arm to engage the disc. Simultaneously, motion will be transmitted through the link rod 66, lever 67 and link 68 to depress the slide 40 (Figures 3 and 4).

Further upward movement of roller 62 in its travel along the cam track 60, will then compress the spring 49 until the shoulders 65 on the matrix engage the lower end of the slide 40. The matrix 39 will then resume its downward movement while the upward movement of the die-head 37 continues, and the disc will thereupon be forced into the matrix, pushing the clamping ejector head 46 upwardly against the pressure of its spring 49, and forming an inverted cup-shaped cap member.

At this stage, the roller 62 will reach a downwardly inclined portion of the cam track 60 (Figure 14), whereupon the die-head 37 will be withdrawn from the matrix, and the cap will be simultaneously ejected and pressed downwardly by the clamping ejector head 46 to deposit it upon a set of springs 70 preferably comprising sections of a radially slitted rubber annulus projecting inwardly from the sides of the opening in the transfer arm 52. The cap will also be simultaneously stripped from the die-head by a knockout plate 71, supported by a rod 72 from the upper side of the cam track, the lower end of the rod being provided with an anti-friction roller 73, and the upper wall of the cam track being contoured to lift this roller 73 sufficiently to support the knockout plate while the die-head 37 is being retracted from the cap member by the cam and roller 62. The downward movement of the die-head terminates when it has reached the position in which it is illustrated in Figure 3. The knockout plate 71 also reaches that position a little later when its supporting roller 73 reaches a portion of the upper surface of the cam track which permits it to descend to the Figure 3 position.

The cap disc feeders.—The caps are fed to the drawing press from a magazine 80 having a vertically movable bottom or circular disc lifting plate 81, which is actuated by the ratchet mechanism shown in Figure 10 and hereinafter explained. The function of this ratchet mechanism is to raise the lifter plate 81 during each revolution of the turret 19, a distance equal to the thickness of one of the cap discs 81*a* contained in the magazine (Figures 3, 10 and 11).

A suction pipe 82 is secured to the turret 19 and extends upwardly through the tables 20 and 38. At its upper end it has an inverted flexible U-shaped section or gooseneck 83, from which a telescoping pipe section 84 depends, with a suction head 85 at its lower end. The position of the pipe section 84 and suction head 85 is determined by an arm 86 which connects it to a vertically disposed shaft 88, this shaft being actuated vertically by a roller 90, traveling along a cam track 91. The roller 90 is journaled on a stud connected with a sleeve 92, disposed on the shaft 88 between two collars 89, adjustably fixed to said shaft by set screws 93, whereby the field of vertical movement may be determined, although the length of the stroke is determined by the cam track 91. At certain intervals the shaft 88 may be rotated in quarter turn movements when forked wheels 87 at their lower ends engage striker pins 94 to adjust the transfer arms as hereinafter described. Similar collars 89′ are secured to shaft 88 above and below the hub of the arm 86 whereby the shaft 88 may be rotated without actuating the arm. The arm 86 is secured to the suction pipe section 84 by a set screw 86′ best shown in Figure 10. This set screw 86′ has an elongated head loosely engaged between bracketed guide posts 86″ connected with the frame as best shown in Figure 4, whereby these guide posts co-operate with the shaft 88 to prevent lateral displacement of

the arm 86 and the suction pipe when shaft 88 is rotatively adjusted. Rotative adjustments of shaft 88 do not occur when the shaft 88 is raised to lift suction pipe member 84 for delivery of a cap blank.

The suction head 85 is lowered into contact with the top disc in the magazine when roller 90 is depressed by the cam track or allowed by the cam track to descend by gravity for that purpose. The suction is then applied in the manner now to be explained and the top disc will be held to the head while the roller 90 traverses an upward inclination of the cam track (Figure 14) adapted to lift the roller 90, shaft 88 and suction head 85, to remove the disc from the magazine.

To apply the suction at the proper time, the suction pipe 82 is connected with a rotary valve which preferably comprises an annular ported flange 95, integral with the section 19*a* of the turret. The flange or valve 95 is provided with arcuate cavities 98 in its lower face, with each of which a lower pipe section 99 of an associated suction pipe 82 is in communication.

The turret carries one suction pipe 82 and an associated cap disc magazine 80 and drawing press for each bottle support on the turret and there are therefore six arcuate valve cavities 98 in the rotary valve 95 (Figure 6). Once during each revolution of the turret, each valve cavity 98 will register with an opening 100 (Figure 5) in the base plate 101 upon which the valve 95 rests. This opening communicates with a cavity 103 (Figure 3) to which a pipe 104 leads from a vacuum chamber or air exhauster conventionally indicated at 102 (Figures 1 and 2). The suction is broken and the cap disc deposited on the transfer arm when the valve cavity 98 reaches a port 111 in the valve seat, communicating with atmosphere.

The bottle infeeding wheel and its control of the suction line.—To prevent a cap disc from being lifted when a bottle intended to receive it is not being fed into the machine, the pipe 104 is extended underneath the table 105 and infeeding wheel 106 (Figures 2, 5 and 7).

The pipe 104 is connected through the table 105 with a chamber 107 thereon, over the upper surface of which the infeeding wheel 106 turns. This chamber has an arcuate port 108 in its upper surface. The lower face of the wheel 106 is provided with arcuate cavities 109, positioned for successive registration with the port 108 and each of these cavities has a port 110 extending through the upper surface of the wheel 106 and adapted to be closed by a slide valve 112, carried by the arm 113 of a suction controlling lever pivoted to the wheel at 114. This lever has another arm 115 normally projecting into a bottle receiving socket 116, formed in the rim of the wheel.

There are two of these wheel sockets 116, with associated levers and suction controlling valves 112. Springs 117, coiled about the pivot pins 114, urge the levers to valve opening position, each lever being actuated to swing its associated valve over the port 110 when a bottle is pressed into the socket against the arm 115 of such lever. Therefore, no vacuum can be established in the suction line except during the period when one of the valves 112 is being held by a bottle in position to close the port 110.

The infeeding wheel 106 has two bottle receiving sockets 116 which receive bottles from a feedway 120 and deliver them to a conveyor 121 which carries the bottles to the turret in spaced relation to each other and in such timed relation to the movement of the turret that the bottles may be placed successively upon the bottle supporting plates 23 by the two-armed rotary infeeding member 125 (Figure 1).

Bottle feeding conveyors, infeeding wheels and devices for feeding the bottles to supports carried by a rotary turn table, are common in the art relating to bottle filling and capping machines and except for the suction controlling feeders herein described, these parts may be assumed to be of ordinary construction, requiring no further illustration or description, except to point out that the bottles are pushed into the sockets by a resiliently yielding guide 126, which insures sufficient pressure to actuate the levers.

The transfer mechanism.—As heretofore explained, six transfer arms 52 are employed to receive cap discs after their removal from the associated magazines by their respective suction feeders. Each transfer arm then conveys its disc to the adjacent drawing press, and then conveys the upset cap from the drawing press to bottle capping position. The transfer arms each have hubs 130 (Figure 10) splined to one of the six vertical shafts 88, the axis of which is equidistant from the axes or axial lines of the associated disc magazine, press, spinning head and a vertical line through the center of the opening in the transfer arm when the latter is in neutral position, these lines being 90 degrees apart and representing the four positions of the transfer arm. Each shaft 88 is journaled in tubular bosses 131, depending from the table 38, the transfer arms being supported by the upper surface of the table.

Each transfer arm has an opening 135 of sufficient size to allow the mouthpiece of a bottle and its cap to pass therethrough, there being an annular shoulder to support the cap disc when the disc is dropped thereon by the suction head. It has also been explained that after a cap disc has been upset into cup form, it is deposited in this opening 135 and is supported by the annulus 70 each section of which between the slits forms a spring

adapted to yield under light pressure. These springs are supported by clamping collars 136 secured within the transfer arm aperture by set screws 137. The thin rubber springs yield readily under pressure particularly if split radially at intervals as indicated in Figure 15.

As heretofore stated and as shown in Figure 4, each shaft 88 is at the center of a circle which includes the vertical axial lines through an associated cap magazine, drawing press, bottle support and the cap receiving aperture of the transfer arm when in a neutral position, and these axial lines are equidistant from each other, i. e., 90° apart. Therefore, by rotating the shaft 88, step by step in quarter turn movements, the transfer arm may be swung from the neutral position to a position above the cap magazine, then to a position between the punch and die of the drawing press to present the disc for a cap forming operation, and then to a position over the bottle support to allow the cap to be fitted to the mouthpiece of the bottle, after which the next quarter turn of the transfer arm returns it to the neutral position.

After the transfer arm has conveyed a cap disc to the press and then conveyed the upset cap or cup-like blank to a position over the bottle support, a bottle previously placed on such support will be elevated by an upwardly inclined portion (*b'*, Fig. 14) of the camway 31 which lifts the lever 26 associated with that bottle support when the turret carries the lever and its roller 30 along that portion of the trackway. This lifting movement is sufficient to bring the bottle mouthpiece into the cap receiving opening in the transfer arm, between the springs 70, which are supporting the cup-like cap. The cap may then be held to the mouthpiece while the bottle is being retracted, thus delivering the cap from the springs to the bottle, in the manner now to be more particularly described.

A presser plate 145 is normally supported from within the spinning head (Figure 8) by a rod 148 and a coiled spring 149, the lower end of which is seated upon a supporting collar 150 with its upper end bearing against a collar 151 fixed to said rod 148. This rod has an anti-friction roller 155 at its upper end which is, at the proper time, brought by turret rotation into contact with the downwardly curving surface of a stationary cam 152 connected with an overarm 153.

As the roller 155 travels along the downwardly inclined portion of the under surface of the cam, the rod 148 and presser plate 145 are moved downwardly. This occurs immediately after the bottle has been presented in a position to receive the cap, and while the bottle is retracting, with the associated lever supporting roller 30 traversing the portion *d'* of the cam track as shown in Figure 14, the downward movement is sufficient to cause the plate 145 to push the cap partially through the opening in the transfer arm, the springs 70 being forced to retract until the cap is delivered to the bottle.

Thereupon, the roller 155 reaches the upwardly curving under surface of the cam 152, which allows the spring 149 to retract the presser plate to its normal position, thus allowing the transfer arm to complete its cycle by being swung to its neutral position.

The roller 155 has its shaft 156 journaled in a slide 157 guided by brackets 158, and one end of the shaft 156 preferably extends into the path of a reverse cam (Figure 18) or inclined bracket arm 159 to insure the lifting of rod 148 as soon as cam 152 permits (see also Figures 1, 3, 8 and 9).

To insure proper placement of the cap on the bottle mouthpiece by the operation last above described, the camway 31 may be so formed that the mouthpiece of the bottle will be lifted into the transfer arm opening while the cup-like cap is being applied by the presser plate 145. Thereafter, in order to allow the transfer arm to swing to its neutral position, the presser plate 145 will not only be retracted, but the bottle and its cap will also be retracted, this retraction of the bottle being permitted by the downward inclination *d'* of the camway 31 reached by the roller 30 at the proper time. The downward movement of the bottle preferably commences during the downward movement of the presser plate 145 and the latter forces the cap beyond the springs 70 before commencing its own retractive movement.

The presser plate rod 148 is preferably held against rotation by the slide 157 to which it is secured. This allows it to move vertically in the guide brackets 158, connected with the gear casing 154 at the top of the turret as best shown in Figure 3. The overarm 153 is secured to a post 163 at the side of the turret at a short distance from the bottle infeeding mechanism.

After the cap has been pushed through the transfer arm by the plate 145 and thus fully delivered to the retracting bottle, and after the plate 145 has been permitted by the overhead cam to retract under the recoil of its supporting spring, the transfer arm will be swung to neutral position, and by that time the roller 30 will reach the upwardly inclined portion *f'* (Figure 14) of the cam trackway 31. The bottle will then be again lifted and carried into the bell-shaped mouth of the spinner casing for the spinning operation now to be described.

The spinning devices.—Each spinning head 170 is supported by a rotary tubular shaft 171 from a pinion 172 within an arcuate extension of the gear casing 154, and the pinions for each of the six spinning heads are all actuated from a central driving shaft 175,

which extends upwardly through the center of the turret and is provided with a central driving gear 176, this gear being in mesh with the six pinions 172 in sun and planet arrangement. Each spinning head is provided with a spinner casing 177 which is suspended by a fixed sleeve 178 from the gear casing 154 (Figures 8, 9 and 16).

Each spinning head has depending pairs of ears 180 to which levers for supporting the spinning wheels 181 are pivoted at 182. The lower arms of these levers have shoulders 183, below which the intermediate portions 184 of the arms are outwardly and downwardly inclined and the lower portions 185 are downwardly and inwardly inclined, the latter being the portions to which the spinning wheels 181 are journaled. There are six of these wheels (Figure 16). Each alternate arm is preferably longer than the intermediate ones (Figure 9), the wheels travelling in parallel annular paths.

Each lever also has an upwardly extending arm 186, which passes through an open ended slot 187 in the head and has a socketed upper end adapted to abut a non-metallic stop block 188, preferably formed of fiber and adapted to serve as shock cushions and also to limit the inward movement of the spinning wheels. These stops may also assist the pivot pins in holding the levers against lateral displacement. A resilient ring 190, preferably comprising a coiled spring, embraces the lower arms of the levers in the angles formed at the upper ends of the portions 184 and tends to draw these arms inwardly, thus causing the spinning wheels 181 to bear forcibly against a bottle cap when the capped mouthpiece of the bottle is pushed upwardly between these wheels by roller 30 as it traverses the portion f' of the cam track 31.

Thereupon, the roller 30 will move along the portion g' of cam track 31 (Figure 14) and the bottle will be slowly lifted for a spinning operation, the spinning head 170 being rotated by its pinion 172. The wheels 181 will thus spin the cap flange into conformity with the mouthpiece progressively until the bottle has been raised to a point where the wheels operate along the lower margin of the cap flange. This completes the spinning operation and the wheels 181 will then be swung outwardly to an inoperative position by means now to be described.

It will be observed in Figure 8 that the presser plate 145 is normally held against upward movement by an annular block or flange 192, connected with the lower end of a hanger sleeve 193. A spreader 194 for moving the spinning wheels to inoperative position is loosely mounted on the sleeve 193 and is supported from the hub 195 of the block 192 by anti-friction bearings 196, whereby the spreader 194 may freely rotate. The upper bearing member is of course also free to rotate but is held against separation from the lower member by a cage of ordinary type.

The spreader is normally inoperative, but when the spinning operation has been completed as above explained, the bottle support and bottle will continue to be lifted by the cam track 31 and the final upward movement of the bottle support and bottle, brings the spreader 194 into engagement with the shoulders 183 of the spinning wheel levers, thus pushing the lower arms of these levers outwardly in a progressive movement until the spreader has passed above the shoulders 183. In this position it will be temporarily held by the levers under the clamping pressure exerted by the spring 190.

Thereupon, the associated bottle lifting lever and its roller 30 will have reached a depression or downward incline h' in the cam track 31 which allows the bottle support and bottle to descend by gravity to substantially the level at which the bottle entered the machine. This occurs as the bottle approaches the point of final delivery, the turret having then made nearly one complete turn.

The hanger sleeve 193 is held against rotation by a cross pin 198 which extends through the rod 148, with ends loosely engaged in slots 199 in the sleeve. The upper end of the sleeve supports the collar 150, which serves as an abutment for the lower end of the spring 149 as heretofore explained (Figures 8 and 9).

The downward movement of the hanger sleeve is limited by a collar 200, internally secured to the tubular shaft 171. This collar 200 is in the path of the collar 150.

Between this collar 200 and another collar 201, carried by the hanger sleeve, a coiled compression spring 202 is interposed, this spring tending to urge the hanger sleeve downwardly and holding it in a normal position, with collar 150 engaging collar 200 except during spinning operations, at which time the upward pressure exerted by the bottle lifts the flange 192 and hanger sleeve against the pressure exerted by the spring 202. Owing to the fact that the collar 201 and hanger sleeve 193 do not rotate, whereas, the collar 200 rotates with the tubular shaft 171, the upper end of the spring 202 is arranged to abut against a loose collar 205, with anti-friction bearings 206 interposed between it and the collar 200.

During the last mentioned downward movement of the bottle, the hanger sleeve 193 will move downwardly through the spreader 194, and the flange block 192 will therefore continue to press the plate 145 against the bottle cap until the flange and presser plate reach their normal position. Just before this position is reached, the col-

lar 201 will strike the hub of the spreader 194 and push the spreader downwardly below the shoulders 183 of the spinning wheel levers, thereby allowing the spinning wheels to again move inwardly to their normal position in which they nearly bear upon the upwardly and inwardly inclined or beveled face 212 of the flange block 192. The parts then remain in this position until another bottle cap has been swung by the transfer arm underneath the spinning head, and another bottle presented to receive the cap in the manner above described. The cycle of cap placing and spinning operations will then be repeated.

In Figure 16, it will be observed that the spreader 194 comprises a central annulus having a series of radially projecting paired arms 203, the arms of each pair being parallel with each other in the form of a fork and having a roller 204 journaled between them in a position to bear against the associated spinning wheel lever 185.

The cams and other co-ordinating controls.—The cam track 31 controlling the vertical movement of the bottle supports 23, the cam track 60 controlling the movements of the press punch and die members, and the cam track 91 controlling the vertical movements of the suction heads are all supported from the bed or base, and are of a generally circular form with inclinations to higher and lower levels for the purpose of imparting the desired vertical movements to the rollers which travel along their trackways. These inclinations are illustrated by the developed trackway diagrams shown in Figure 14 and their operation and the sequence of their operations can best be explained by a review of the operation cycle also diagrammatically illustrated in Figure 13. Assuming that a bottle is being placed upon one of the bottle supports by the rotary infeeding member 125, shown in Figure 13, and assuming that a cap has been presented over the bottle support and bottle by the transfer arm 52, shown in the diagram, the bottle support will be carried horizontally for a short distance corresponding with the length of the horizontal portion a' of the cam trackway 31 indicated in Figure 14. This portion a' of the cam trackway 31 is the portion which is then being traversed by the roller 30 which controls the movements of the actuating lever 26 to lift and lower the bottle support.

When the roller 30 reaches the steep upward incline b' on the trackway, (Figure 14) it will be rapidly lifted, its motion being transmitted through the lever 26 to lift the bottle until its mouthpiece enters the aperture in the transfer arm to receive the cap as heretofore explained. The bottle support is held in this position until the roller 30 reaches the downward incline d' in the trackway, which allows the bottle to descend with the cap preparatory to a release of the transfer arm and its movement to the neutral position. Immediately after the roller 30 commences to traverse track portion d' the over arm cam 152 actuates the presser plate 145 downwardly to push the cap from the transfer arm and before roller 30 reaches the point e' the roller 155 will have passed cam 152 to allow a retraction of the presser plate 145, thus releasing the transfer arm for a return movement to neutral position.

During these stages of the travel of the roller 30 along the trackway, the bottle support and bottle will have moved from the starting point to the corresponding points a, b, c, d and e on the diagram shown in Figure 13, and the roller 30 will have reached the incline f' on the cam track 31, the transfer arm having been swung out of the way to allow the capped bottle to be moved upwardly to the spinning head. This upward movement will be completed by the time the bottle support reaches the point indicated at G in Figure 13, and the spinning operation will then commence while the bottle is being slowly lifted by the upwardly inclined portion g' of the cam track 31 indicated in Figure 14.

The spinning operation will continue from the time the bottle support passes the point g in the Figure 13 diagram during approximately a half turn of the turret, after which continued upward movement of the bottle while its support is advancing to the point H in the Figure 13 diagram, will lift the spreader 194 above the lever shoulders 183 and the spinning wheels will be swung outwardly by the spreader. The bottle will then be lowered while its associated roller 30 travels along the downwardly inclined portion h' of the cam track 31 to bring the bottle with its completed cap to a proper level for delivery from the turn table. The bottle will be pushed from its support 23 when it is brought into contact with the outfeeding arm 216 which directs it into the passage 217 over the stationary table 105.

While the operations above described are being performed, the mechanisms associated in the same group with the bottle support under consideration will be preparing a cap for the next bottle to be placed on that support, these cap preparing operations being timed and performed in the sequence now to be described.

When the bottle support has traveled approximately 40° from its starting point (A to B in Figure 13), the roller 90 which supports the associated shaft 88 from the cam track 91 will have reached the incline B′ in the cam track 91 (Figure 14), and during the next 20° of turret rotation it will travel down this incline B′, thereby lowering the suction head 85 into the magazine 80. The roller will then travel approximately 15° along the bottom C′ of this depression in the cam track,

and during this time the suction will be applied as heretofore explained, and it will be maintained while the roller traverses the upward incline F′ of the cam track, thus lifting the suction head and the top cap disc from the magazine. The remaining portion of the cam track 91 is horizontal, and the suction head will therefore be held in the raised position until its supporting roller 90 is again brought to the incline B′.

While the roller 90 is traversing the portion B′ of the cam track 91, the forked wheel 87 at the lower end of shaft 88 engages one of the striker pins 94 indicated at D in Figure 13, and swings the transfer arm 52 to its neutral position as indicated at *g* in Figure 13. The center of the transfer arm aperture reaches this position shortly after its shaft 88 and associated roller 90 has reached the top of the upward incline F′ in the cam track 91.

The margin of the forked wheel 87 is flattened or cut away between the fork arms and between the striker pins 94, and the frame or base is provided with arcuate guards 78 (Figure 15) positioned to prevent over-rotation of the shafts 88 and wheels 87, and to also prevent them from shifting out of place when not engaged by the striker pins 94.

Immediately after the transfer arm has reached the neutral position in which it is indicated at *g* in Figure 13, the forked wheel 87 engages another striker pin indicated at G to rotate shaft 88 another quarter turn and carry the transfer arm underneath the disc which has just been removed from the magazine. This movement will be completed while the center of the transfer arm aperture is approaching the point I indicated in the Figure 13 diagram, at which point the suction will be broken to allow the disc to drop from the suction head to the transfer arm as above explained. Thereupon the forked wheel 87 engages the striker pin indicated at J in Figure 13 and the shaft 88 and transfer arm are again rotated a quarter turn to carry the disc to the drawing press for a cap forming operation.

The remaining portion of the cam track 91 being horizontal, and there being no further striker pins 94 between the pin indicated at J and the pin indicated at A in Figure 13, it is obvious that the transfer arm will remain in registry with the punch until its forked wheel 87 reaches the pin 94 at the point A, the shaft 88 being then actuated another quarter turn to carry the cap cup over the next bottle to be placed on the same support 23 while it is passing the infeeding or zero point.

When the punch actuating roller 62 reaches the upwardly inclined portion K′ on the cam track 60 (Figure 14), the punch head 37 will be moved upwardly in a rapid traverse through the aperture in the transfer arm, to lift the disc to the matrix. The roller will then travel along the incline L′ of the cam track, this portion having a less inclination but continuing the upward movement of the punch head to complete the drawing operation. The rapid traverse of the punch head will take place during approximately a 25° rotation of the turret, and the drawing operation will proceed during its next 55° movement. Thereupon the roller 73 will reach the horizontal portion N′ at the top of the cam track 60, thus holding the knockout plate 71 in its raised position while the roller 62 traverses the downwardly inclined portion M′ of the cam track 60 to retract the punch and matrix. During the initial portion of this retraction, the stripper 46 will be actuated by its spring to push the newly formed cap out of the matrix, the matrix being simultaneously lifted by the lever 67 actuated from roller 62 through the link rod 66.

The roller 73 will continue to travel horizontally until the cycle of turret rotation has been nearly completed, whereupon it will reach the cam track incline O′ which allows it to descend to its normal distance of separation from the roller 62. The parts will then remain in the normal position while the turret is completing its cycle, the upset disc or cap cup being deposited upon the transfer arm springs during the downward movement of the knockout plate 71. This cap cup is then ready to be swung by the transfer arm into a position for capping the bottle which controlled the suction at the time that particular cap disc was taken from the associated magazine.

It will be understood from the foregoing description that in each group of mechanisms carried by the turret, cap placing and spinning operations will proceed concurrently with cap disc feeding and shaping operations whereby like work may not only be simultaneously proceeding in different stages in the different groups, but unlike operations may be simultaneously proceeding within each group so that the total time required for capping a bottle will not be greater than that required for applying the cap and spinning it into conformity with the mouthpiece, plus the time required for placing the bottle on the support and removing it from the machine.

Actuating connections.—Power to actuate the machine may be derived from a motor 220 which actuates a main turret driving shaft 221 through suitable sprocket chains and reduction gearing indicated in Figure 2. The shaft 221 is connected with a short shaft section 222 journaled in the base of the turret and provided with a beveled pinion 223 in mesh with a similar pinion 224 secured to the vertical shaft 175 which extends upwardly along the axis of the turret, and drives the

lar 201 will strike the hub of the spreader 194 and push the spreader downwardly below the shoulders 183 of the spinning wheel levers, thereby allowing the spinning wheels to again move inwardly to their normal position in which they nearly bear upon the upwardly and inwardly inclined or beveled face 212 of the flange block 192. The parts then remain in this position until another bottle cap has been swung by the transfer arm underneath the spinning head, and another bottle presented to receive the cap in the manner above described. The cycle of cap placing and spinning operations will then be repeated.

In Figure 16, it will be observed that the spreader 194 comprises a central annulus having a series of radially projecting paired arms 203, the arms of each pair being parallel with each other in the form of a fork and having a roller 204 journaled between them in a position to bear against the associated spinning wheel lever 185.

The cams and other co-ordinating controls.—The cam track 31 controlling the vertical movement of the bottle supports 23, the cam track 60 controlling the movements of the press punch and die members, and the cam track 91 controlling the vertical movements of the suction heads are all supported from the bed or base, and are of a generally circular form with inclinations to higher and lower levels for the purpose of imparting the desired vertical movements to the rollers which travel along their trackways. These inclinations are illustrated by the developed trackway diagrams shown in Figure 14 and their operation and the sequence of their operations can best be explained by a review of the operation cycle also diagrammatically illustrated in Figure 13. Assuming that a bottle is being placed upon one of the bottle supports by the rotary infeeding member 125, shown in Figure 13, and assuming that a cap has been presented over the bottle support and bottle by the transfer arm 52, shown in the diagram, the bottle support will be carried horizontally for a short distance corresponding with the length of the horizontal portion a' of the cam trackway 31 indicated in Figure 14. This portion a' of the cam trackway 31 is the portion which is then being traversed by the roller 30 which controls the movements of the actuating lever 26 to lift and lower the bottle support.

When the roller 30 reaches the steep upward incline b' on the trackway, (Figure 14) it will be rapidly lifted, its motion being transmitted through the lever 26 to lift the bottle until its mouthpiece enters the aperture in the transfer arm to receive the cap as heretofore explained. The bottle support is held in this position until the roller 30 reaches the downward incline d' in the trackway, which allows the bottle to descend with the cap preparatory to a release of the transfer arm and its movement to the neutral position. Immediately after the roller 30 commences to traverse track portion d' the over arm cam 152 actuates the presser plate 145 downwardly to push the cap from the transfer arm and before roller 30 reaches the point e' the roller 155 will have passed cam 152 to allow a retraction of the presser plate 145, thus releasing the transfer arm for a return movement to neutral position.

During these stages of the travel of the roller 30 along the trackway, the bottle support and bottle will have moved from the starting point to the corresponding points a, b, c, d and e on the diagram shown in Figure 13, and the roller 30 will have reached the incline f' on the cam track 31, the transfer arm having been swung out of the way to allow the capped bottle to be moved upwardly to the spinning head. This upward movement will be completed by the time the bottle support reaches the point indicated at G in Figure 13, and the spinning operation will then commence while the bottle is being slowly lifted by the upwardly inclined portion g' of the cam track 31 indicated in Figure 14.

The spinning operation will continue from the time the bottle support passes the point g in the Figure 13 diagram during approximately a half turn of the turret, after which continued upward movement of the bottle while its support is advancing to the point H in the Figure 13 diagram, will lift the spreader 194 above the lever shoulders 183 and the spinning wheels will be swung outwardly by the spreader. The bottle will then be lowered while its associated roller 30 travels along the downwardly inclined portion h' of the cam track 31 to bring the bottle with its completed cap to a proper level for delivery from the turn table. The bottle will be pushed from its support 23 when it is brought into contact with the outfeeding arm 216 which directs it into the passage 217 over the stationary table 105.

While the operations above described are being performed, the mechanisms associated in the same group with the bottle support under consideration will be preparing a cap for the next bottle to be placed on that support, these cap preparing operations being timed and performed in the sequence now to be described.

When the bottle support has traveled approximately 40° from its starting point (A to B in Figure 13), the roller 90 which supports the associated shaft 88 from the cam track 91 will have reached the incline B′ in the cam track 91 (Figure 14), and during the next 20° of turret rotation it will travel down this incline B′, thereby lowering the suction head 85 into the magazine 80. The roller will then travel approximately 15° along the bottom C′ of this depression in the cam track,

and during this time the suction will be applied as heretofore explained, and it will be maintained while the roller traverses the upward incline F′ of the cam track, thus lifting the suction head and the top cap disc from the magazine. The remaining portion of the cam track 91 is horizontal, and the suction head will therefore be held in the raised position until its supporting roller 90 is again brought to the incline B′.

While the roller 90 is traversing the portion B′ of the cam track 91, the forked wheel 87 at the lower end of shaft 88 engages one of the striker pins 94 indicated at D in Figure 13, and swings the transfer arm 52 to its neutral position as indicated at *g* in Figure 13. The center of the transfer arm aperture reaches this position shortly after its shaft 88 and associated roller 90 has reached the top of the upward incline F′ in the cam track 91.

The margin of the forked wheel 87 is flattened or cut away between the fork arms and between the striker pins 94, and the frame or base is provided with arcuate guards 78 (Figure 15) positioned to prevent over-rotation of the shafts 88 and wheels 87, and to also prevent them from shifting out of place when not engaged by the striker pins 94.

Immediately after the transfer arm has reached the neutral position in which it is indicated at *g* in Figure 13, the forked wheel 87 engages another striker pin indicated at G to rotate shaft 88 another quarter turn and carry the transfer arm underneath the disc which has just been removed from the magazine. This movement will be completed while the center of the transfer arm aperture is approaching the point I indicated in the Figure 13 diagram, at which point the suction will be broken to allow the disc to drop from the suction head to the transfer arm as above explained. Thereupon the forked wheel 87 engages the striker pin indicated at J in Figure 13 and the shaft 88 and transfer arm are again rotated a quarter turn to carry the disc to the drawing press for a cap forming operation.

The remaining portion of the cam track 91 being horizontal, and there being no further striker pins 94 between the pin indicated at J and the pin indicated at A in Figure 13, it is obvious that the transfer arm will remain in registry with the punch until its forked wheel 87 reaches the pin 94 at the point A, the shaft 88 being then actuated another quarter turn to carry the cap cup over the next bottle to be placed on the same support 23 while it is passing the infeeding or zero point.

When the punch actuating roller 62 reaches the upwardly inclined portion K′ on the cam track 60 (Figure 14), the punch head 37 will be moved upwardly in a rapid traverse through the aperture in the transfer arm, to lift the disc to the matrix. The roller will then travel along the incline L′ of the cam track, this portion having a less inclination but continuing the upward movement of the punch head to complete the drawing operation. The rapid traverse of the punch head will take place during approximately a 25° rotation of the turret, and the drawing operation will proceed during its next 55° movement. Thereupon the roller 73 will reach the horizontal portion N′ at the top of the cam track 60, thus holding the knockout plate 71 in its raised position while the roller 62 traverses the downwardly inclined portion M′ of the cam track 60 to retract the punch and matrix. During the initial portion of this retraction, the stripper 46 will be actuated by its spring to push the newly formed cap out of the matrix, the matrix being simultaneously lifted by the lever 67 actuated from roller 62 through the link rod 66.

The roller 73 will continue to travel horizontally until the cycle of turret rotation has been nearly completed, whereupon it will reach the cam track incline O′ which allows it to descend to its normal distance of separation from the roller 62. The parts will then remain in the normal position while the turret is completing its cycle, the upset disc or cap cup being deposited upon the transfer arm springs during the downward movement of the knockout plate 71. This cap cup is then ready to be swung by the transfer arm into a position for capping the bottle which controlled the suction at the time that particular cap disc was taken from the associated magazine.

It will be understood from the foregoing description that in each group of mechanisms carried by the turret, cap placing and spinning operations will proceed concurrently with cap disc feeding and shaping operations whereby like work may not only be simultaneously proceeding in different stages in the different groups, but unlike operations may be simultaneously proceeding within each group so that the total time required for capping a bottle will not be greater than that required for applying the cap and spinning it into conformity with the mouthpiece, plus the time required for placing the bottle on the support and removing it from the machine.

Actuating connections.—Power to actuate the machine may be derived from a motor 220 which actuates a main turret driving shaft 221 through suitable sprocket chains and reduction gearing indicated in Figure 2. The shaft 221 is connected with a short shaft section 222 journaled in the base of the turret and provided with a beveled pinion 223 in mesh with a similar pinion 224 secured to the vertical shaft 175 which extends upwardly along the axis of the turret, and drives the

overhead spur gear or sun gear 176 to actuate the spinning heads.

The vertical shaft 175 is provided with a turret actuating gear wheel 225 operating through the intermediate spur gears 226 and 227 to drive the ring gear 228, attached to the lower portion of the turret as best shown in Figures 3 and 5. The base of the machine is provided with an annular bearing 230 over which a turret flange 231 extends. This turret flange is connected with the lower margin of the turret skirting.

The infeeder, including the infeeding wheels 106 and 125, is driven from the main driving shaft 221 through the beveled gears 235 and 236 and vertical shaft 237, the latter being secured directly to the infeeding wheel 125 and arranged to drive the infeeding wheel 106 through suitable gearing and chain connections indicated in Figure 2, but not deemed necessary to be described in detail.

In order to maintain the discs at a constant level, the magazine 80 is provided with a movable bottom or disc lifting plate 81 which is supported by a screw 240 supported and actuated by a ratchet feed nut 241. The shaft 88 is provided with a striker 242 which engages a lever 243 pivoted to the hub 244 of the feed nut 241, and provided with a pivoted dog or pawl 245 which is held by a spring 246 in engagement with the teeth of the ratchet feed nut 241, whereby this feed nut will be actuated step by step once during each revolution of the shaft 88. The pitch of the threads of the screw 240 and the movement of the lever 243 are calculated to produce an upward movement of the disc lifting plate 81, equal to the thickness of one of the discs, whenever the lever 243 is actuated by the striker 242.

A spring 247 is secured to the lever 243 and engages a stop post 248 on the frame arm 249. This spring retracts the lever as soon as it is released from the lug 242, and the post 248 serves as a stop to limit this retractive movement.

In order that the same machine may be employed for capping bottles of differing sizes, it is merely necessary to elevate all those portions of the cam track 31 except the portion a' over which each roller 30 passes without contact during the infeeding and outfeeding movements of a bottle carried by the associated support. This is accomplished by connecting the portion b' to the portion c' at its upper end by a hinge 250 and allowing its lower end to slide on the portion a', and similarly hinging the portion h' to the portion g' at its upper end and allowing its lower end to slide upon the portion a' in the vicinity of the outfeeding arm 216. The roller 30 will reach its lowermost position before the bottle reaches said outfeeding arm, but it does not descend to the track portion a'. It is prevented from doing so by the associated bottle rest 23 which engages the table 20 to limit the downward movement of the plunger 22 and of the roller 30. The track sections above referred to may be raised and lowered by means of a shifter ring 251 which has step blocks 252 which rest upon the base, the ring being rotatable thereon. The vertically movable portion of the cam track has posts 253 which rest upon the blocks 252 and the height of the cam track is therefore determined by the step of the block 252 upon which the posts rest. Brackets 255 on the base have studs 256 loosely engaged in vertical slots 257 in the web 258 of the cam track to prevent the latter from shifting rotatively.

I claim:

1. Apparatus for applying metal caps to bottles, comprising the combination with an endless bottle carrier having groups of cap disc feeding, cap forming and spinning mechanisms, of an apertured transferring cap carrier provided, at the aperture margin, with supporting shoulders for cap discs, and yielding supports for caps formed from said discs, means associated with the bottle carrier for actuating the bottles transversely to their line of travel to carry their mouthpieces into such apertures, and reciprocatory means associated with each spinning mechanism for holding caps to the bottle mouthpieces and pushing them through the aperture in the transferring carrier against the resistance of said yielding cap supports, means, associated with the carrier, for subsequently removing the transferring carrier, and means for again moving the bottle transversely to its line of travel into position for a cap spinning operation by the associated spinning mechanism.

2. Apparatus for applying metal caps to bottles, comprising the combination of a rotary turret provided with spaced groups of cap forming and applying mechanisms arranged in each group with their axes at equal radial distances from a common axial line, a transferring carrier pivoted to the turret in said axial line, and having an apertured supporting portion for blanks and caps, disposed with the center of said aperture also at said radial distance from the common axial line of the group, and means, operable by the turret, for actuating said mechanisms in a cycle of operations and also actuating the transferring carrier at stated intervals to convey the work from one mechanism to the next in the group.

3. Apparatus for applying metal caps to bottles, comprising the combination with an endless bottle carrier, of groups of disc feeding, cap forming and cap spinning mechanisms mounted on the carrier, and arranged with the mechanisms of each group disposed in planes radial to a common axis and equidistant from said axis, a transferring device for each group, pivotally supported by the carrier substantially at said common axis and

provided with an apertured carrying portion movable in a circle substantially coincident with the axes of said mechanisms, and adapted to convey the work from the feeding to the cap forming mechanism, and from the latter to the spinning mechanism in a series of movements timed with reference to the movements of the bottle carrier and the intervals required for the respective operations, means for supporting and moving bottles along the axial lines of the spinning mechanisms, and means, associated with the cap spinning mechanisms, for holding caps to the bottle mouthpieces while delivering them from the transferring devices through the apertures therein.

4. Apparatus for applying metal caps to bottles, comprising the combination with an endless bottle carrier, of groups of disc feeding, cap forming and cap spinning mechanisms mounted on the carrier, and arranged with the mechanisms of each group disposed in planes radial to a common axis and equidistant from said axis, a transferring device for each group pivotally supported by the carrier substantially at said common axis and provided with an apertured carrying portion, movable in a circle substantially coincident with the axes of said mechanisms, and adapted to convey the work from the feeding to the cap forming mechanism, and from the latter to the spinning mechanism in a series of movements timed with reference to the movements of the bottle carrier and the intervals required for the respective operations, means for supporting and moving bottles along the axial lines of the spinning mechanisms, and means, associated with the cap spinning mechanisms, for holding caps to the bottle mouthpieces while delivering them from the transferring devices through the apertures therein, the apertures in the transferring devices being of a size to allow bottle mouthpieces to enter for engagement with the caps.

5. Apparatus for applying metal caps to bottles, comprising the combination with an endless bottle carrier, of groups of disc feeding, cap forming and cap spinning mechanisms, mounted on the carrier and arranged with the mechanisms of each group disposed in planes radial to a common axis and equidistant from said axis, a transferring device for each group, pivoted to the carrier at said common axis and adapted to transfer work successively from the feeding to the cap forming and spinning mechanisms, conveyor mechanism for placing bottles on the carrier in spaced relation to each other, with their axes in line with those of the spinning mechanisms, and means for delivering the work from the transferring device to the bottle mouthpiece, including means for presenting the capped mouthpiece to the spinning mechanisms for a cap spinning operation.

6. In apparatus for applying metal caps to bottles, the combination with a transferring device provided with an aperture through which caps may pass to a bottle mouthpiece, and having resiliently yielding cap supports for normally preventing the cap from dropping through said aperture, of spinning mechanism adapted to progressively compress a cap flange about a bottle mouth piece, a cam actuated presser, associated with the spinning mechanism, for pushing caps past said yielding supports to a bottle mouthpiece to effect a delivery thereof to such mouth piece, means for retracting the presser, and means for removing the transferring device in a sequence of mechanically timed operations preparatory to a spinning operation.

7. Apparatus for applying metal caps to bottles, comprising the combination with an endless bottle carrier and a bottle feeder for placing bottles thereon in spaced relation to each other, of groups of disc feeding, cap forming and cap spinning mechanisms mounted on the carrier, means, actuated by each bottle when approaching the carrier, for controlling the feeding of its own disc to the cap forming mechanism, a transferring device for each group of mechanisms, adapted to convey discs successively to the cap forming and cap spinning mechanisms, and cam controlled means on the carrier for presenting the bottles in position to receive caps and in position for spinning operations thereon.

8. Apparatus for applying metal caps to bottles, comprising the combination with an endless bottle carrier and a bottle feeder for placing bottles thereon in spaced relation to each other, of groups of disc feeding, cap forming and cap spinning mechanisms mounted on the carrier, means, actuated by each bottle when approaching the carrier, for controlling the feeding of its own disc to the cap forming mechanism, a transferring device for each group of mechanisms, adapted to convey discs successively to the cap forming and cap spinning mechanisms, and cam controlled means on the carrier for presenting the bottles in position to receive caps and in position for spinning operations thereon, said cam controlled means being adapted to lift each bottle into position for receiving a cap from the transferring device, followed by a retraction thereof and a subsequent lifting movement of a length sufficient to present the capped bottle mouthpiece to the spinning mechanism, said carrier being provided with means for removing the transferring device from the path of the bottle during said bottle retraction.

9. Apparatus for applying metal caps to bottles, comprising the combination with a turret disposed for rotation about a vertical axis, means for actuating the turret con-

tinuously, groups of disc feeding, cap forming, cap spinning and transferring mechanisms, mounted on the turret, turret controlled means for actuating the transferring mechanisms intermittently to carry the work from the disc feeding to the cap forming and then to the cap spinning mechanism, a bottle feeder for placing bottles on the turret with their axes in line with the axes of the spinning mechanisms, and means adapted to be actuated by each bottle for controlling delivery of the work by the disc feeding mechanism.

10. Apparatus for applying metal caps to bottles, comprising the combination with a turret disposed for rotation about a vertical axis, means for actuating the turret continuously, groups of disc feeding, cap forming, cap spinning and transferring mechanisms, mounted on the turret, turret controlled means for actuating the transferring mechanisms intermittently to carry the work from the disc feeding to the cap forming and then to the cap spinning mechanism, a bottle feeder for placing bottles on the turret, with their axes in line with the axes of the spinning mechanisms, and means adapted to be actuated by each bottle for controlling delivery of the work by the disc feeding mechanism, said transferring mechanism comprising a work support having an aperture of sufficient size to allow a bottle cap to pass therethrough, and provided with resilient cap supporting members in the margin of the aperture adapted to normally support the cap for transferring purposes, together with means, associated with each spinning head, for pressing caps through said apertures to the mouthpieces of registering bottles, and means, associated with the turret, for removing the transferring mechanism after cap delivery and for lifting bottles across the path thereof to the spinning mechanism.

11. In apparatus for applying metal caps to bottles, the combination with a rotary spinning head, of an axially disposed, resiliently supported presser plate, a laterally movable annular member provided with yieldable cap supports, a vertically movable bottle support adapted to present the mouthpiece of a bottle in position for receiving a cap from the annular member, and means for simultaneously depressing the presser plate and bottle support to hold the cap to the bottle mouthpiece while pushing it past the yieldable cap supports to a position permitting a removal of the annular member preparatory to spinning the cap flange into conformity with the mouthpiece.

12. In apparatus for applying metal caps to bottles, the combination with a rotary spinning head, of an axially movable bottle support, adapted to present capped bottles to the spinning head for a spinning operation, mechanical means for conveying caps into the path of a bottle mouthpiece approaching the spinning head, and means for applying the caps to such mouthpieces, said cap conveying means being provided with an intermittingly acting actuator for removing it after deposit of its cap upon said mouth piece and said bottle support being provided with an actuator for retracting the bottle, pending removal of the cap conveying means, and then advancing it to the head.

13. In apparatus for applying metal caps to bottles, the combination with a rotary spinning head, of an axially movable bottle support, means for initially reciprocating the bottle support along the axial line of the spinning head at a distance therefrom, means for applying a cup-shaped cap to the bottle during such reciprocation, an intermittingly acting actuator for removing the cap applying means from its position between the bottle and the spinning head while the bottle and its cap are retracted therefrom, said reciprocating means being formed to subsequently advance the bottle support to carry its capped mouth piece into position for engagement with the spinning head.

14. The combination with a rotary turret provided with a series of spaced spinning mechanisms and bottle supports in axial alignment with each other, means, controlled by the movement of the turret, for forming caps and applying them to the mouths of the bottles, and additional means also controlled by the movement of the turret, for reciprocating bottles into and out of cap receiving position, and then presenting the capped ends to the spinning mechanism for a cap spinning operation.

15. In apparatus for applying metal caps to bottles, the combination with a rotary turret provided with disc feeding, cap forming and spinning mechanisms, bottle supports for presenting bottles to the cap spinning mechanisms, and means for feeding bottles to the bottle supports, provided with means for utilizing the bottle to control delivery of its own cap disc to the cap forming mechanism.

16. In apparatus for applying metal caps to bottles, the combination with a rotary turret provided with a disc containing magazine, a suction feeder for removing discs successively from the magazine, and bottle infeeding mechanism provided with a bottle actuated member controlling the operation of the suction mechanism.

17. In apparatus for applying metal caps to bottles, the combination of a rotary turret provided with groups of spinning heads, cap disc magazines, cap forming presses, suction feeders, one associated with each magazine, for removing cap discs therefrom, a transferring device in each group for conveying such discs to the press and to bottle capping position, and means for feeding bottles to the turret and simultaneously controlling the

operation of the suction feeder in the group of mechanisms for capping that bottle.

18. In apparatus for applying metal caps to bottles, the combination of a rotary turret provided with a series of spaced cap disc magazines and associated mechanisms for upsetting the discs to form caps and for spinning the caps over the mouthpiece of the bottles, and means for utilizing the movement of each bottle to control delivery of a cap disc from the magazine in the group of mechanisms to which that bottle is to be fed for a capping operation.

19. In apparatus for applying metal caps to bottles, the combination with a cap disc magazine, of a pipe line having a suction head movable into and out of the magazine, and a pipe line valve adapted to be actuated by infeeding bottles to control the application of suction to the suction head.

20. In apparatus for applying metal caps to bottles, the combination with a rotary turret, of an annular series of spaced cap disc magazines, a suction head associated with each magazine and movable into and out of the same for removal of cap discs, and a valve carrying member in position to be actuated by infeeding bottles controlling withdrawal of air from each suction head while the bottles are being fed to the turret.

21. In apparatus for applying metal caps to bottles, the combination with a rotary turret, of an annular series of spaced cap disc magazines, a suction head associated with each magazine and movable into and out of the same for removal of cap discs, and a member in the path of infeeding bottles, controlling withdrawal of air from each suction head while the bottles are being fed to the turret, said turret being also provided with a rotary valve for successively connecting the suction heads with a common suction line provided with an air inlet port adapted to be closed by said bottle actuated member when a bottle is in engagement therewith.

22. In apparatus for applying metal caps to bottles, a rotary cap spinning head provided with a series of levers pivoted thereto and each provided with a spinning wheel, means for applying resilient inward pressure to the wheel carrying arms of the levers, a rotary tubular hanger for supporting the spinning head, an interior stop collar fixed thereto, a downwardly urged spring actuated hanger sleeve extending through said collar and with its upper end headed to engage the same, and an upwardly urged spring actuated rod extending through said sleeve, the lower portion of said sleeve having thereon a rotatively mounted spreader for the levers and the lower end of the rod being provided with a cap holder to hold caps to the bottles, pending a spinning operation.

23. In apparatus for applying metal caps to bottles, a cap spinner having in combination, a central rod provided with a presser plate, a non-rotatable tube slidable thereon, and provided with a rotatable spreader, a rotatable tubular shaft encircling said tube, and provided with a cap spinning head and a set of spinning wheels supported therefrom, and means for feeding capped bottles into the annular path of the spinning wheels, together with means for applying resilient upward pressure to the rod from the spreader tube, and other means for applying resilient downward pressure to the spreader supporting tube, the presser plate being adapted to yield under upward pressure exerted by the bottle, and the spreader being adapted to yield with it to a position for actuating the spinning wheels to an inoperative position.

24. In apparatus for applying metal caps to bottles, the combination with a support, a rotary turret thereon provided with an annular series of cap disc magazines, and associated vertically movable suction heads, a centrally located rotary slide valve provided with a series of cavities in one surface and a pipe leading from each cavity to one of the suction heads, a relatively fixed valve seat ported for successive registry with the valve cavities and having a suction main connected with the seat port, and co-operative means on the turret and its support, for lowering each suction head to the contents of its magazine while the associated rotary valve port is in registry with the seat port, and lifting the suction head from the magazine while under sufficient vacuum to retain a cap disc, the suction main being normally open and provided with means for utilizing each bottle to close the main and allow a vacuum to be established therein while the cap disc for that bottle is being withdrawn from its magazine.

25. In apparatus for applying metal caps to bottles, the combination with a rotary bottle carrying turret, of a drawing press for upsetting cap discs, controlled as to operation by movement of the turret, a cap disc magazine and associated feeder at one side of the drawing press, cap spinning mechanism at the other side of said press, and an intermittently movable turret actuated carrier for delivering a disc from the magazine to the press and conveying the cap from the press to a position in line with the cap spinning mechanism.

26. In apparatus for applying metal caps to bottles, the combination with a rotary bottle carrying turret, of a drawing press for upsetting cap discs, controlled as to operation by movement of the turret, a cap disc magazine and associated feeder at one side of the drawing press, cap spinning mechanism at the other side of said press, an intermittently movable turret actuated carrier for delivering discs from the magazine to the press and from the press to a position in line with the cap spinning mechanism, said tur-

ret being provided with a rotary shaft operatively connected to said carrier and adapted for vertical movement independently of said carrier, and means operable by vertical movement of said shaft for elevating cap discs from the magazine to a position for delivery to the carrier.

27. In apparatus for applying metal caps to bottles, the combination with a rotary bottle carrying turret, of a drawing press for upsetting cap discs, controlled as to operation by movement of the turret, a cap disc magazine and associated feeder at one side of the drawing press, cap spinning mechanism at the other side of said press, and an intermittently movable turret actuated carrier for delivering a disc from the magazine to the press and conveying the cap from the press to a position in line with the cap spinning mechanism, together with turret operated means for delivering such caps to bottles and presenting each capped bottle to the spinning mechanism all during a single revolution of the turret and while the latter is in continuous motion.

28. In apparatus for applying metal caps to bottles, the combination with a rotary bottle carrying turret, of a cap disc magazine, a vertically movable suction head, a vertically movable rotary shaft, means controlled by the movement of the turret for intermittently raising and lowering the shaft, additional means for intermittently rotating the shaft step by step, suction head lifting and lowering connections journaled upon the shaft and vertically movable therewith, and a disc carrier splined to the shaft and movable by rotation thereof underneath the suction head to receive a disc therefrom.

29. In apparatus for applying metal caps to bottles, the combination with a rotary bottle carrying turret, of a cap disc magazine, a vertically movable suction head, a vertically movable rotary shaft, means controlled by the movement of the turret for intermittently raising and lowering the shaft, additional means for intermittently rotating the shaft step by step, suction head lifting and lowering connections journaled upon the shaft and vertically movable therewith, and a disc carrier splined to the shaft and movable by rotation thereof underneath the suction head to receive a disc therefrom, means for feeding bottles to the turret, and means controlled in part by the bottles and in part by the turret, for applying suction to the suction head preparatory to lifting the same.

30. In apparatus for applying metal caps to bottles, the combination with a rotary bottle carrying turret, of a cap disc magazine, a vertically movable suction head, a vertically movable rotary shaft, means controlled by the movement of the turret for intermittently raising and lowering the shaft, additional means for intermittently rotating the shaft step by step, suction head lifting and lowering connections journaled upon the shaft and vertically movable therewith, and a carrier splined to the shaft and movable by rotation thereof underneath the suction head to receive a disc therefrom, together with a drawing press and a cap spinning mechanism, the axial lines of which are crossed by the carrier during other step by step rotative movements of said shaft, and ratchet feed mechanism driven by said shaft and adapted to lift the cap discs in the magazine to maintain the pile of discs at a constant level.

31. In apparatus for applying metal caps to bottles, a rotary turret provided with sets of alined bottle supports and spinning heads, and associated cap disc supports, feeders and cap upsetting presses, each of said sets of devices being in combination with a relatively movable work support carried by the turn table, and means for actuating the same to deliver the work from one of said devices to the next.

32. In apparatus for applying metal caps to bottles, the combination of a turret provided with groups of cap forming, applying and affixing mechanisms, a work carrier associated with each group and adapted to be actuated to effect a delivery of the work successively to the members of the group, means for actuating the turn table continuously, and means for actuating the work carrier step by step in a cycle of work carrying and carrier removing movements.

33. In apparatus for applying metal caps to bottles, the combination of a turret provided with groups of cap forming, applying and affixing mechanisms, a work carrier associated with each group and adapted to be actuated to effect a delivery of the work successively to the members of the group, means for actuating the turn table continuously, and means for actuating the work carrier step by step in a cycle of work carrying and carrier removing movements at intervals corresponding substantially with the times required by the respective mechanisms for operation upon the work.

34. In apparatus for applying metal caps to bottles, the combination with a turret revoluble about a vertical axis, of means for continuously revolving said turret, a series of bottle supports and associated cap spinning mechanisms mounted on said turret, and mechanisms associated with the turret and traveling therewith for manufacturing caps during one revolution of the turret, and applying them to the bottles and presenting each bottle to one of the spinning mechanisms during a succeeding revolution of the turret, whereby bottle infeeding and outfeeding operations may proceed continuously at intervals, the duration of which is but a fraction

of the time required for a single cap spinning operation.

35. A revoluble bottle carrying turret provided with cap supplying and cap applying mechanism, in combination with means for delivering bottles to the turret successively, and pneumatic means, controlled by the infeeding bottles, for regulating the cap supply in correspondence with the number of bottles delivered.

36. The combination of a revoluble turret provided with a series of cap spinning heads and a corresponding series of relatively adjustable bottle supports, each spinning head having a tubular driving and supporting hanger, a cap engaging presser plate having an actuating rod extending axially through the hanger, a sleeve mounted to slide upon said rod and controlling the operation of the spinning head, and means, cooperative with the hanger, for normally and yieldingly urging said rod upwardly and said sleeve downwardly, the movements of each being subject to upward bottle pressure and downward cam pressure, controlled as to time by the movement of the turret, a relatively stationary cam for applying said downward pressure once during each revolution of the turret, and cam projections for lifting the bottle supports.

37. A revoluble bottle carrying turret having in combination thereon a rotary spinning head provided with an axially disposed, vertically movable slide rod, spinner means carried by said head, said rod supporting a cap engaging presser plate of sufficient size to clamp an annular portion of a cap between it and a bottle mouth piece, means for adjusting and supporting a bottle in a cap clamping position, a non-rotatable vertically yielding guide tube for the slide rod provided with a seating for the presser plate, and a spinner controller rotatively mounted on the guide tube and adapted to be pushed vertically by the bottle to a spinner retracting position upon completion of a spinning operation.

38. A revoluble bottle carrying turret having in combination thereon a rotary spinning head provided with laterally swinging spinning rollers, a cap disk magazine and cap feeding and forming mechanism, said spinning head being provided with a resiliently yielding, axially movable, non-rotative presser plate adapted to receive an annular portion of a bottle cap in an interposed position between it and a bottle mouth piece, and said magazine, cap feeding and forming mechanism being carried by the turret for operation while traveling therewith.

39. A revoluble bottle carrying turret having in combination thereon a rotary spinning head having laterally swinging spinning rollers, a cap disk magazine and cap feeding and forming mechanism, said spinning head being provided with a resiliently yielding, axially movable, non-rotative presser plate adapted to receive an annular portion of a bottle cap in an interposed position between it and a bottle mouth piece, means for progressively lifting a bottle and its clamping presser plate in the spinning head during a spinning operation, and a spreader rotatively supported from the presser plate and adapted to engage and laterally spread the spinning rollers upon completion of said upward movement of the bottle and presser plate.

40. In a bottle capping machine, a rotary spinning head provided with laterally movable resiliently yielding spinning rollers, a vertically disposed tubular shaft for supporting and rotating said head, a non-rotative resiliently supported tubular slide in said shaft, an axially disposed resiliently supported slide rod to which the tubular slide is connected for independent vertical movement, a cap clamp at the lower end of said slide rod and a spreader rotatively mounted on the slide tube and adapted in one position to move the spinning rollers laterally to an inoperative position.

41. In a bottle capping machine, a rotary spinning head provided with laterally movable resiliently yielding spinning rollers, a vertically disposed tubular shaft for supporting and rotating said head, a non-rotative resiliently supported tubular slide in said shaft, an axially disposed resiliently supported slide rod to which the tubular slide is connected for independent vertical movement, a cap clamp at the lower end of said slide rod and a spreader rotatively mounted on the slide tube and adapted in one position to move the spinning rollers laterally to an inoperative position, said spinning head having an associated cap magazine, a cap feeding mechanism including means for periodically delivering caps underneath the spinning head, to be delivered to a bottle by an independent downward movement of the slide rod, a vertically movable bottle support underneath the spinning head, and means for actuating the spinning head rotatively, and also actuating the bottle support, cap feeding mechanism and cap clamp in timed relation to the capping operations of the spinning head.

42. In a bottle capping machine, a rotary spinning head provided with laterally movable resiliently yielding spinning rollers, a vertically disposed tubular shaft for supporting and rotating said head, a non-rotative resiliently supported tubular slide in said shaft, an axially disposed resiliently supported slide rod to which the tubular slide is connected for independent vertical movement, a cap clamp at the lower end of said slide rod and a spreader rotatively mounted on the slide tube and adapted in one position to move the spinning rollers laterally to an inoperative position, said spinning head having an associated

cap magazine, a cap feeding mechanism including means for periodically delivering caps underneath the spinning head, to be delivered to a bottle by an independent downward movement of the slide rod, a vertically movable bottle support underneath the spinning head, and means for actuating the spinning head rotatively, and also actuating the bottle support, cap feeding mechanism and cap clamp in timed relation to the capping operations of the spinning head while advancing the spinning head, cap magazine and associated parts along a circular path.

43. A bottle carrying turret having mounted thereon a magazine for capping material, cap forming, feeding and applying mechanism, in combination with a feedway for delivering bottles to the turret, fluid controlled means for regulating the supply of caps in correspondence with the number of bottles delivered and a bottle actuated valve associated with the feedway for regulating said fluid control.

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