Jan. 10, 1939. G. R. STUART 2,143,806

CONTINUOUS CAPPING MACHINE

Filed June 9, 1937 4 Sheets-Sheet 1

FIG. 1.

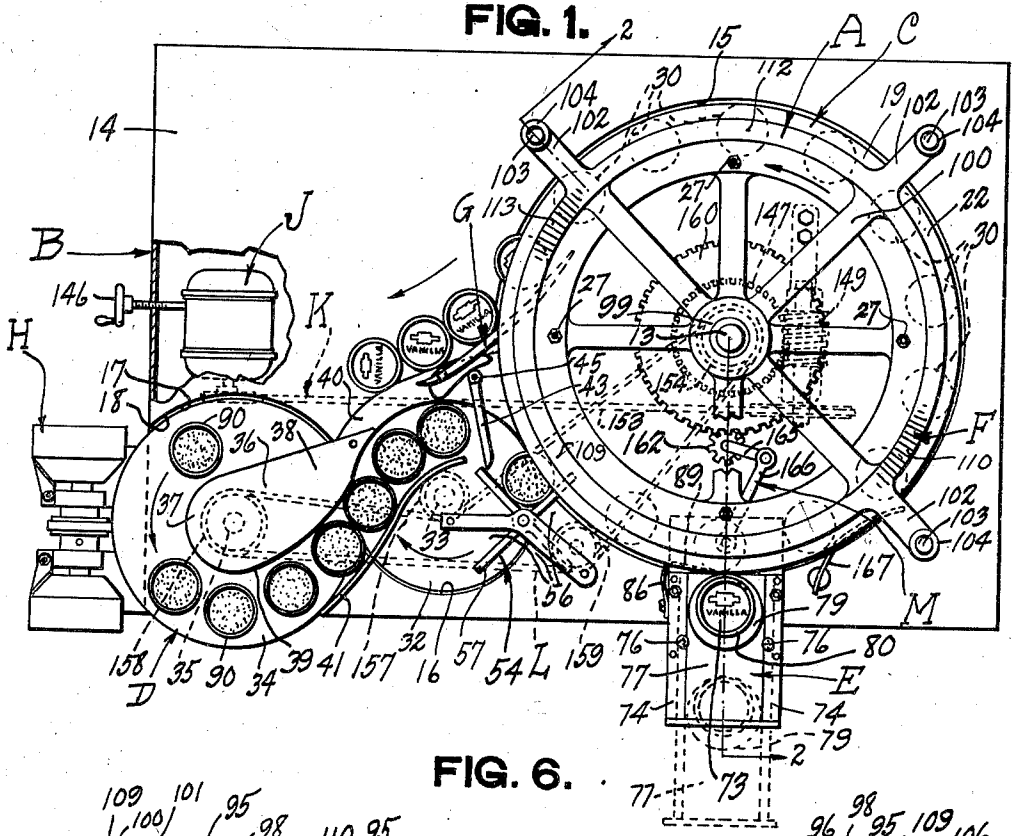
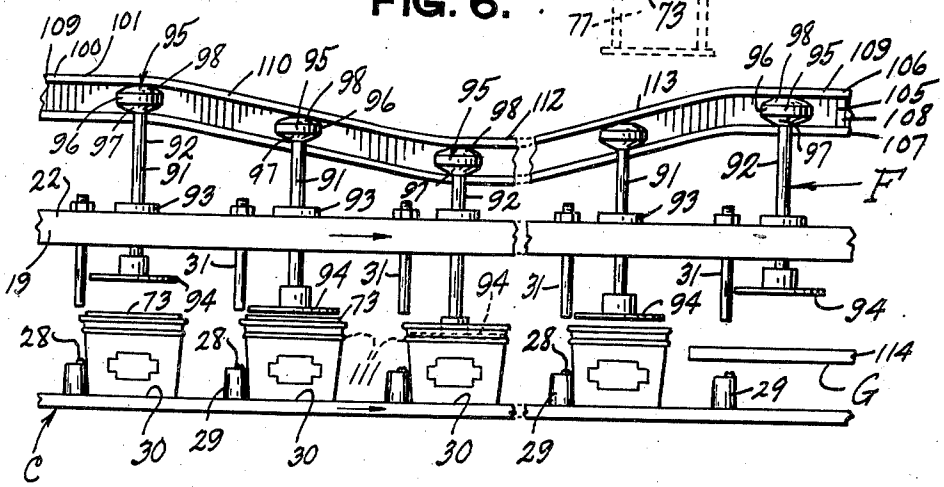


FIG. 6.



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CONTINUOUS CAPPING MACHINE

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FIG. 2.

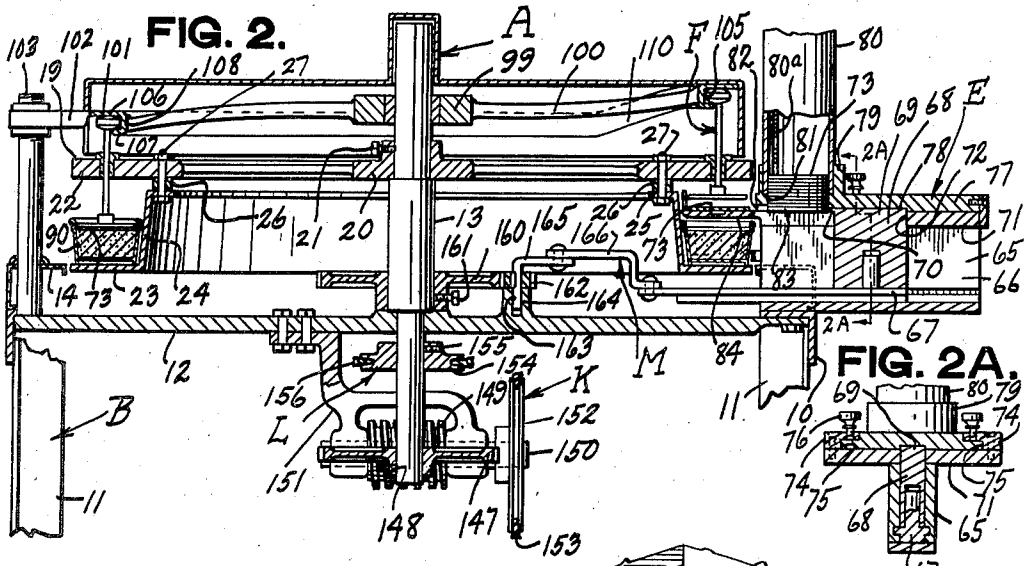
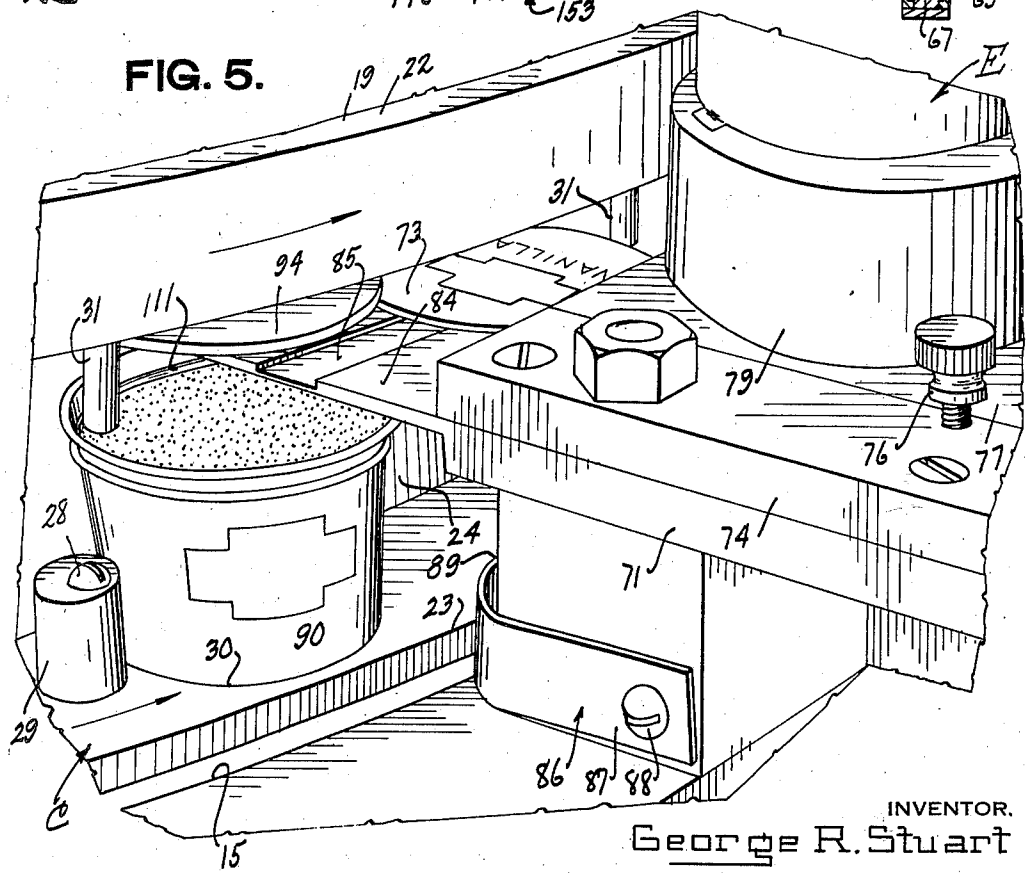


FIG. 2A.

FIG. 5.



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CONTINUOUS CAPPING MACHINE

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FIG. 3.

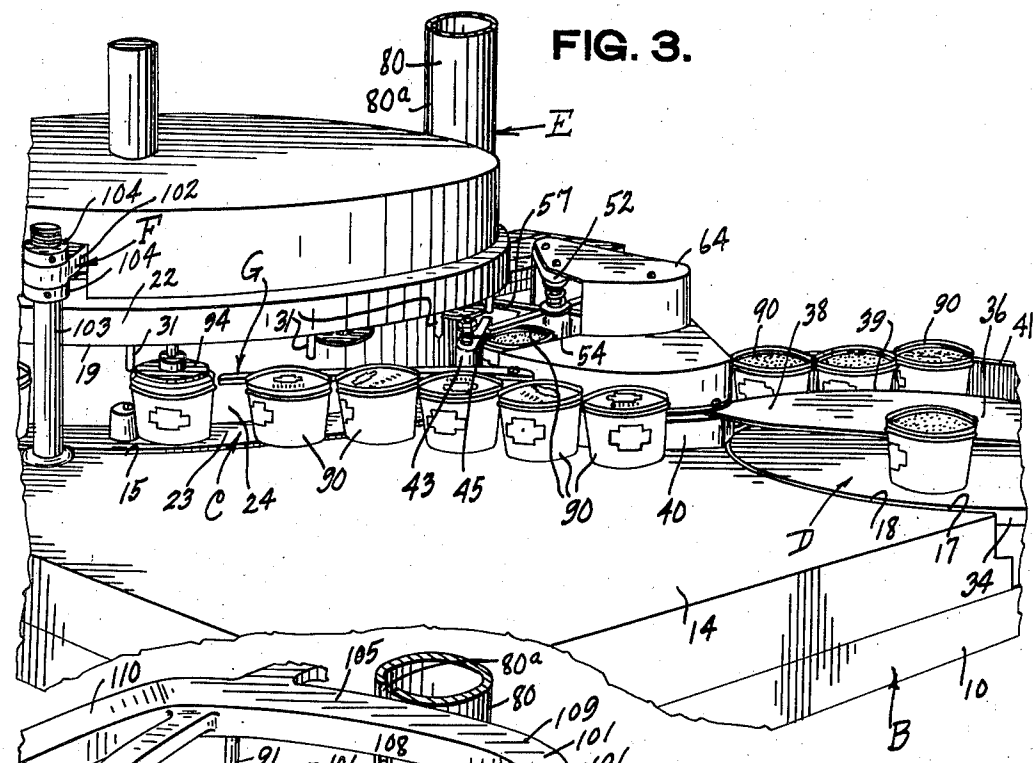
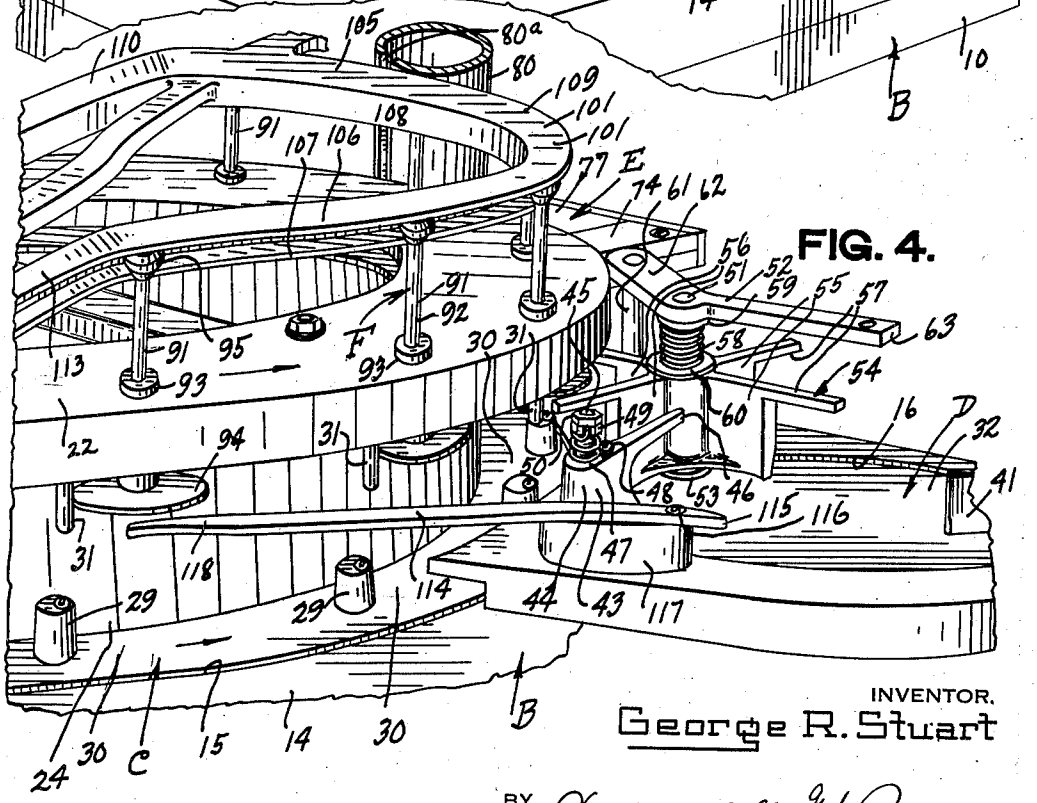


FIG. 4.



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CONTINUOUS CAPPING MACHINE

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FIG. 7.

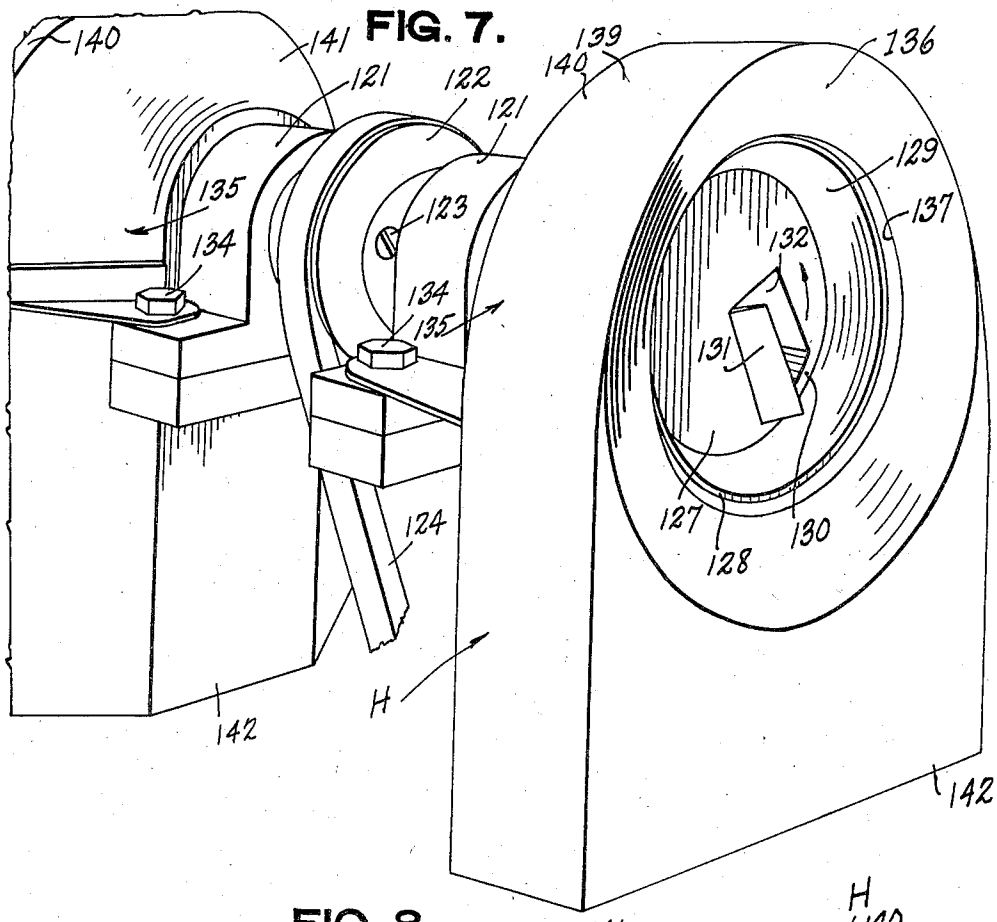
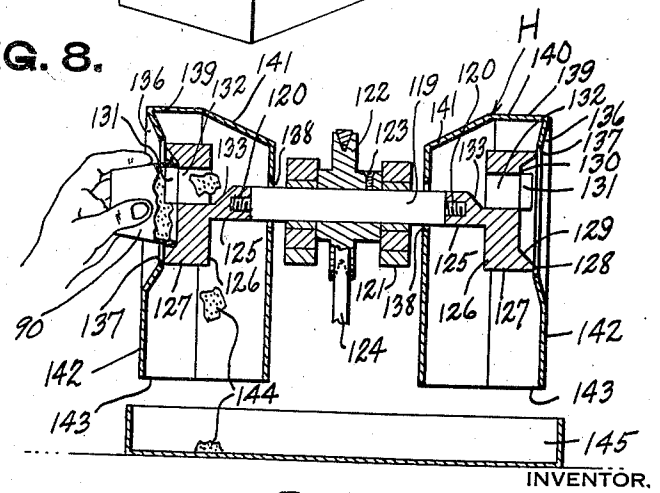


FIG. 8.



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Patented Jan. 10, 1939 2,143,806

UNITED STATES PATENT OFFICE

2,143,806

CONTINUOUS CAPPING MACHINE

George R. Stuart, Knoxville, Tenn.

Application June 9, 1937, Serial No. 147,342

10 Claims. (Cl. 226—92)

The present invention relates to improvements in filling and closing portable receptacles and more particularly to a continuous capping machine for applying closure caps to containers.

The primary object of the invention is the provision of an improved automatic continuous capping machine.

Another object is to provide an improved continuous capping machine including a container feeding means, a cap feeding means, and means intermittently actuating the container feeding means and cooperable with the cap feeding means to correctly position a cap on each container.

A further object of the invention is to provide a conveyor for automatically supplying containers to the capping machine at regular intervals, even though the containers may be supplied to the conveyor at irregular intervals.

A still further object is to provide an improved arrangement of cap feeding means.

Yet another object of the invention is to provide an improved device for leveling the material in the containers, and removing any excess material therefrom, prior to capping of the containers.

Another object is to provide cap seating means arranged to dwell in contact with seated caps for a time sufficient to permit gradual escape or adjustment of container pressures liable to unseat the caps.

Other objects and advantages of the invention will be apparent from the following detailed description, taken in connection with the accompanying drawings, forming a part of this specification and in which drawings:—

Figure 1 is a plan view of the improved continuous capping machine and showing the improved material leveling device secured thereto.

Figure 2 is a vertical cross sectional view of the machine, taken on the line 2—2 of Figure 1.

Figure 2A is a detail vertical cross sectional view taken on the line 2A—2A of Figure 2.

Figures, 3, 4 and 5 are fragmentary perspective views of the machine.

Figure 6 is a view in elevation showing a fragmentary development of the machine.

Figures 7 and 8 are perspective and vertical sectional views, respectively, of the improved material leveling device preferably associated with the continuous capping machine.

In the drawings, wherein for the purpose of illustration is shown a preferred embodiment of the invention, and wherein similar reference characters designate corresponding parts throughout the several views, the letter A may generally designate the improved capping machine, which may include a base B, revolubly supporting a container carrier C, means D for feeding containers to the carrier, means E for feeding caps to the containers, means F for pressing the caps into the containers, a deflector G for diverting the containers from the carrier onto the base, and means H for leveling material in the containers and removing any surplus material therefrom. Drive mechanism for the machine may include a motor J, motion transmitting means K operatively connecting the motor and container carrier, motion transmitting means L operatively connecting the carrier and container feed means, and motion transmitting means M operatively connecting the carrier and cap feed means.

The base B may include a suitable rectangular frame 10, preferably of angle iron, horizontally supported as by legs 11, and carrying a transverse member 12 revolubly supporting a vertical shaft 13. Over the frame 10 is secured a stationary table 14, preferably formed of non-corrosive sheet material, provided with a relatively large circular opening 15, concentric to the shaft 13, a relatively small circular opening 16 tangent to the opening 15 and an intermediate sized opening 17 at a corner of the table having an arcuate edge 18 tangent to the opening 16.

Referring to the container carrier C in detail, the same may include a wheel 19, fixed at its hub 20 to the shaft 13 as by set screw 21, and provided with an annular rim 22. The carrier C may further include an annular plate 23, having an upstanding inner flange 24 provided at its upper end with an inturned annular flange 25 secured in spaced relation beneath the rim 22 as by sleeves 26 and bolts 27, so that the annular plate 23 is supported in the opening 15 and substantially flush with the table 14. The upstanding inner flange 24 may be in the form of an upwardly convergent conic section, if desired. Secured in upwardly projecting relation to the annular plate 23 as by screws 28 is a plurality of spaced apart eccentric abutments 29, which may also be in the form of upwardly convergent conic sections, if desired. These abutments divide the annular plate into a circular series of container-accommodating zones 30. Rigidly secured in depending relation to the rim 22 is a plurality of spaced apart pins 31, one over each of said abutments.

In order to supply each of the zones 30 with a container to be capped, means D is provided,

and may comprise a relatively small disc 32 fixed to a rotatable vertically disposed shaft 33 in the opening 16, and substantially tangent to the annular plate 23; and a somewhat larger disc 34 fixed to a rotatable vertically disposed shaft 35 in the opening 17, and substantially tangent to the smaller disc 32. Positioned over the larger disc 34 is a flat wide horizontally disposed container guide 36 having a concentrically disposed arcuate body portion 37 and a radially disposed shank portion 38 forming a guiding edge 39 leading to the periphery of the smaller disc 32. This guide 36 may be secured to an annular stationary segment 40 projecting from the table 14 adjacent one side of the smaller disc 32. Secured to the table 14 at the opposite side of the disc 32 and in uniformly spaced relation to the guiding edge 39 is a wall 41 extending from the periphery of the larger disc 34 to a position laterally of the center of the smaller disc 32 so that annular segmental paths are formed on the discs 32 and 34, communicating with each other through a path defined by the edge 39 and wall 41. A gate 43, pivotally mounted at one end 44, as by pin 45, extra-circumferentially of the disc 32, is preferably spring urged to a position whereby its opposite free end 46 traverses the path formed on the smaller disc 32. For instance, a coil spring 47 encircling the pivit pin 45 may be secured at one end to the gate, as by screw 48, and at its opposite end may be secured to a tension adjusting nut 49 threaded on the upper end portion of the pin 45 and secured in any desired adjusted position by means of a lock nut 50, as shown in Figure 4. Pivotally mounted adjacent the carrier C, as by pin 51 extending between upper and lower brackets 52—53 respectively, is a star wheel 54, provided with intersecting radially disposed walls 55, forming opposite right angular pockets 56; and fingers 57, extending radially outwardly from the walls 55, so that the pins 31, upon rotation of the carrier C, will successively engage the fingers 57, for intermittently advancing the star wheel. Preferably, the fingers 57 are disposed in a horizontal plane common to the free end 46 of the gate so that upon each advancement of the star wheel, one of its fingers will engage and swing the gate 43 at its free end 46. Interposed between the upper bracket 52 and the star wheel, and encircling the pivot pin 51, is an expansion coil spring 58 for pressing upper and lower washers 59—60, respectively, into frictional contact with the bracket and the star wheel, for dampening excessive rotation of the star wheel. The bracket 52 may be supported by a standard 61 and may include legs 62—63 radially disposed with respect to the pin 51, serving to bear the upper end of the pin 51 and to support a suitable cover or safety guard 64.

Means E for feeding caps to the containers is preferably positioned adjacent the carrier C, beyond means D in the direction of movement of the carrier, and may include a channel base 65 forming a slideway 66, radially of the carrier C, in which is mounted an elongate slide 67 carrying a reciprocable member 68 having its upper end portion 69 extending above the slideway and provided with a lug 70 projecting laterally of the upper end portion 69 in the direction of the carrier C. The base 65 may include a horizontally disposed stationary plate 71 provided with a slot 72 through which the upper end portion 69 extends with the lug 70 projecting above top surface of the plate 71, a distance no greater than the individual thickness of the caps 73. Secured to opposite sides of the plate 70, are upstanding strips 74, having oppositely undercut inner sides 75 forming a slideway radially beyond the carrier C, in which is releasably secured, as by set screws 76, a plate 77, provided with a groove 78 on its under side, for accommodating the projecting upper end portion of the reciprocable member 68. By releasing the screws 76, the plate 77 may be removed from the slideway, or partially withdrawn as shown by broken lines in Figure 1. This plate 77 may include an upstanding sleeve 79, supporting a vertical tube 80 in which a stack of caps 73 may be positioned, one over another. This tube may be provided with a vertical slot 80a so that container caps provided with conventional laterally projecting pull tabs (not shown) may be accommodated, if desired. Preferably, the plate 77 is provided with a cylindrical opening 81 forming a downward continuation of the tube 80, and a lateral passageway 82 at the lower end of the cylindrical opening 81, so that the lowermost cap 83 may rest upon the top surface of the plate 71 and, upon reciprocation of the member 68, will be moved by the lug 70 through the passageway 82, and onto a shelf 84 forming an extension of the plate 71. Preferably, the shelf 84 is positioned over a segment of the annular series of container-accommodating zones 30 of the carrier C, over the path of the containers in said zones and slightly above the plane of the top edges of the containers. In the top surface of the shelf 84, a transverse groove 85 may be provided through which the lower ends of pins 31 pass, as the carrier C rotates, so that the shelf 83 is successively swept free of caps 73 by the pins. A flat spring 86 may be secured at one end 87 as by screw 88 so that its opposite end 89 will extend alongside the carrier C beneath the shelf 84 and in frictional contacting relation to the side walls of the containers 90, tending to retard movement of the containers and thereby insuring firm contact of the containers with the abutments 29, so that the containers will be correctly positioned in the zones 30. It will thus be seen that, with suitable means M, which will subsequently be described, for reciprocating the member 68, once for each container passing beneath the shelf 84, the caps 73 will be successively positioned on the shelf and, upon emergence of the containers from beneath the shelf, one after another, the pins 31 will successively sweep the caps from the shelf so that an individual cap will fall upon each container.

Referring now to means F for pressing the caps into the containers 90, the same may include a series of spaced apart plungers 91, having vertically disposed cylindrical stems 92, reciprocably mounted as by bearing sleeves 93, in the rim 22, and positioned one over each container-accommodating zone 30. At their lower ends, the stems 92 may each be provided with a plunger disc 94, of a size no greater than the size of the caps 73, and at their upper ends, the stems may terminate in heads 95, each including a cylindrical intermediate portion 96, a lower downwardly convergent portion 97 and a top upwardly convergent portion 98. Encircling the upper end of the vertical shaft of the carrier C, and forming a bearing therefor, is the hub 99 of a stationary spider wheel 100 having a rim 101 provided with radially projecting arms 102 adjustably mounted on the threaded upper ends of posts 103 between nuts 104. Preferably, the rim 101 forms a channel-shaped camway 105 in which the plunger

heads 95 slide as the carrier C rotates, and may include an upper flange portion 106 extending over the portion 93 of the plunger head, for lowering the plunger, a relatively narrower lower flange portion 107 terminating beneath the portion 97 of the plunger head adjacent the stem, for elevating the plunger, and a web portion 108 connecting the inner peripheries of the flange portions 106—107. The camway 105 includes a portion 109 sufficiently elevated to sustain the plunger discs 94 above the lower ends of the pins as the plungers pass the star wheel 54 and the shelf 34, so that the plungers will not interfere with the co-action of the pins with the star wheel and the shelf. Just beyond the shelf the camway is provided with a declining portion 110, which depresses the plungers so that the caps 73 are forced into the mouths of the containers 99 and are seated in annular internal sockets or grooves 111 of the containers. The camway may also include a portion 112 connecting the lower end of the declining portion 110 to an inclined portion 113, adapted to successively elevate the plungers to their normal level above the lower ends of the pins. As shown in Figure 1, the cam portion 112 is relatively long and comprises approximately 180° of the entire spider wheel 106, so that the plungers are caused to dwell in their depressed position for a substantial portion of the cycle of operation of the machine.

Container deflecting means G may be positioned adjacent the carrier C somewhat beyond the inclined portion 113, in the direction of movement of the carrier, to deflect the containers from the carrier, after the plungers have been elevated out of engaging relation with the container mouths. The deflector may comprise an elongate strip 114 secured at one end 115 as by screw 116 to a stationary portion 117 of the machine, and obliquely crossing the path of movement of the containers on the carrier C, the free end 118 of the strip extending in a direction counter to the direction of rotation of the carrier C.

Positioned adjacent the container feeding means D is a device H, for leveling material in the containers and removing any excess material therefrom, prior to capping. Referring more particularly to Figures 7 and 8, the device may include a shaft 119 supported intermediate its reduced threaded ends 120, by spaced apart bearings 121, on opposite sides of a suitable pulley 122, fixed to the shaft as by set screw 123, and connected as by belt 124 to a preferably independent motor (not shown). Secured at opposite ends of the shaft 119 as by co-axial internally threaded bosses 125 and projecting from the inner end faces 126 are cylindrical disc-like spinners 127 provided at their outer end faces 128 with inwardly convergent conical annular rims 129 terminating in annular seats 130 against which the mouth ends of filled containers may be positioned. Each spinner is provided with a radially disposed cutting and leveling blade 131 positioned between its annular seat 130 and the axis of the spinner, and projecting obliquely outwardly from the plane of the annular seat with its free end extending in the direction of rotation of the spinner. Adjacent the leading side of each blade 131 is a slot 132 extending through the spinner and forming an outlet passageway therethrough for conducting excess material from the container to the inner end face 126 of the spinner. The slot 132 may terminate at its inner end in an oblique surface 133 extending from the axis of the cylindrical member at its juncture with the boss, and which may be formed by obliquely cutting away a portion of the boss adjacent the cylindrical member. Over each spinner is secured as by cap screws 134, a housing 135 provided with an inwardly convergent conical annular recess 136 terminating in an aperture 137 encircling the spinner adjacent its outer end face. A suitable opening 138 may also be provided for accommodating the shaft 119. While the housing at its upper end portion 139 may comprise a cylindrical portion 140 and a conical portion 141, the lower end of the housing preferably depends to form a skirt 142 having an opening 143 in its base through which excess material 144 may fall into a suitable container 145. This fill-leveling and overload-removing device forms the subject-matter of my divisional application Serial Number 175,966.

The motor J, preferably electrically-operated, may include a brush regulating crank 146, for adjusting the speed of rotation.

Means K, connecting the motor to the carrier C, as shown in Figures 1 and 2, may include a worm wheel 147, secured as by set screw 148 to the lower end of carrier shaft 13, meshing with a worm 149 fixed to shaft 150 rotatably carried by a suitable bracket 151. Secured to the shaft 150 is a pulley 152 driven, as by belt 153, from the motor J.

As for means L, connecting the carrier C and container feed means D, the same may include a pulley 154, secured as by set screw 155 to the carrier shaft 13, carrying a belt 156 which is trained about driven pulleys 157—158 suitably fixed to shafts 33 and 35, respectively, of discs 32 and 34, and an idler pulley 159, in a manner that counter-clockwise rotation of the carrier shaft 13 will rotate disc 32 in a clockwise direction and the disc 34 in a counter-clockwise direction.

Means M operatively connecting the carrier C and cap feed means E preferably includes a spur gear 160, secured to the shaft 13 as by set screw 161, and meshing with a spur pinion 162 keyed to a vertically disposed crank shaft 163 rotatably carried at its lower end in a suitable bearing 164, and provided with a crank 165 at its upper end. Pivotally secured to the free end of this crank is a pitman 166, operatively connected to the elongate slide 67 for imparting reciprocatory movement to the member 68. The ratio between the number of teeth in spur gear 160 and spur pinion 162 may be in proportion as the number of zones 30 of the carriers C is to one, so that the member 68 will be reciprocated during each cycle of rotation of the carrier wheel a number of times equal to the number of container-accommodating zones of the carrier.

The operation of the improved machine will now be briefly described. The containers, after being filled by any suitable means (not shown) are positioned one by one with their mouths in contact with the annular seats 130 of the spinners, the blades 131 of which will remove the excess material 144 which will pass through the slot 132 and fall through the opening 143 of the skirt 142 into the container 145. As two spinners are provided, one at each end of the shaft 119, two operators may be employed for this work, if desired, each at an opposite end of the device, and adjacent the container feed means D. After the material in each container has been leveled, the operator may place the container on the disc 34 of the feed means D, so that the same may be conveyed to the disc 32 along the path defined by

the guides 36 and 41 to the gate 43, normally positioned across the path. Referring to Figure 1, a series of containers 90 are shown resting on the discs 32 and 32. As long as the gate 43 is closed, a frictional slipping action will occur between the container bottoms and the discs. By arranging the larger disc in advance of the smaller disc, containers deposited on the larger disc at irregular intervals will tend to overtake previously deposited containers before reaching the gate 43, thereby tending to insure a continuous supply of containers at the gate. As the carrier C rotates, pins 31 will intermittently advance the star wheel 54 in a clockwise direction, which will thereupon swing the gate 43 to permit the disc 32 to convey a container beyond the gate. Continued rotation of the star wheel will release the gate which will thereupon return to its normal position across the path of the containers under the influence of spring 47. The container beyond the gate will be conveyed by the disc 32 into one of the pockets 56 of the star wheel. As another pin engages the star wheel, the gate will again open to pass another container to the star wheel, as the latter, in advancing a further step, brushes the previously passed container into a zone 30 of the carrier C. As the containers thus deposited on the carrier C pass beneath the shelf 84, they are positioned by the spring 86 in contacting relation with the abutments 29 so that the containers co-axially align with the plungers 91, which are in their elevated position and pass over the shelf. Reciprocable member 68, actuated by means M, successively positions container caps 73 on shelf 84, which are each swept off by a pin 31, so that a cap falls upon each container in correct registration with the continer mouth. Beyond the cap feed means E, an additional spring 167 may be provided to brush against the containers so that, as the plungers 91 are depressed, by the declining portion 110 of the camway 105, the containers will tend to remain adjacent the abutments 29, directly below the plunger discs 94. After the caps are pressed into the containers, the plungers are elevated by the inclined portion 113 of the camway, and the containers are then deflected by means G, from the carrier C onto the table 14, adjacent the container feed means D, so that, if desired, a single operator standing adjacent one of the spinners 127 may not only operate the spinner and place the uncapped containers on the disc 34, but also remove the capped containers from the table for packing or storage. Normally, however, the machine, in actual reduction to practice, has a capacity so great as to require the services of at least four operators in leveling and feeding the uncapped containers and in removing and packing or storing the capped containers.

Various changes may be made to the form of invention herein shown and described, without departing from the spirit of the invention or the scope of the following claims.

I claim:

1. In a machine for capping containers, a rotatable carrier and means for successively supplying containers to said carrier including a rotatable container supporting disc substantially tangent to the carrier and with which disc said containers tend to rotate when supported by the disc, a gate pivoted at one end extra-circumferentially of the disc so that its opposite free end may extend over the disc to prevent rotation of the containers with the disc, means urging the free end into the path of movement of said containers, a star wheel positioned in the path of movement of containers on said disc, and having fingers each adapted to engage the free end of said gate to swing said gate out of the path of movement of said containers, said fingers swinging successively across the path of movement of said containers and toward said carrier whereby to successively transfer containers from said disc to said carrier, and means rotatable with said carrier intermittently actuating the star wheel.

2. In a machine for capping containers, a rotatable carrier provided with an annular series of container-accommodating zones, means including a star wheel for successively supplying containers one to each of said zones, a cap-supporting shelf beneath which said containers pass in succession as the carrier rotates, and spaced-apart pins secured to the carrier and arranged to intermittently actuate the star wheel and to successively sweep caps off said shelf onto the containers passing therebeneath.

3. In a machine for capping containers, a turntable provided with upper and lower decks, spaced-apart abutments on the lower deck defining an annular series of container-accommodating zones, plungers reciprocably carried by the upper deck one over each of said zones, intermittent feed means for supplying containers one to each of said zones as the turntable rotates, including a star wheel, intermittent feed means for supplying caps to the containers in said zones including a cap-supporting shelf beneath which said containers pass as the turntable rotates, said shelf being provided with a groove, and spaced-apart depending pins having free lower ends, carried by the turntable one for each of said zones; each of said pins being arranged to intermittently actuate said star wheel to feed a container to one of said zones, and further to traverse said shelf with its free lower end projecting into said groove, to feed a cap to a container in one of said zones.

4. In a machine of the character described, a movable carrier provided with an endless series of container-accommodating zones, means for successively supplying containers to said carrier including a conveyor supporting and tending to advance containers resting thereon into adjacent relation to said carrier, and a star wheel positioned in the path of movement of the containers on the conveyor and in overlapping relation to the series of zones of the carrier, for successively shifting containers from the conveyor to the carrier as the star wheel turns, means successively supplying caps to the containers as the carrier moves, including a shelf beneath which the containers pass as the carrier moves, and pins movable with said carrier one for each of said zones, intermittently advancing the star wheel to cause containers to be fed one to each of said zones of the carrier, and sweeping the shelf so that caps successively positioned thereon will be caused to fall one on each of said containers, as they pass beneath the shelf.

5. A continuous capping machine for capping the top ends of containers, comprising a rotatable carrier provided with an annular series of container-accommodating zones, means for successively supplying containers to said carrier including a rotatable container-conveying disc adjacent the carrier and with which disc said containers tend to rotate when supported thereon, and a star wheel positioned in the path of movement of said container-accommodating zones of the carrier for successively shifting containers from the disc to the carrier upon rotation of the star wheel, reciprocable plungers mounted on

said carrier one over each of said zones, means reciprocating said plungers upon rotation of the carrier, means successively supplying caps to the tops of said containers as the carrier rotates, including a shelf beneath which the containers pass as the carrier rotates, means for successively positioning caps on the top of the shelf, means rotatable with the carrier intermittently advancing the star wheel and sweeping said shelf, whereby to first cause a container to be fed to the carrier and then a cap to the top of the container, prior to downward movement of the plunger positioned over the zone of said container, and a deflector successively diverting said containers from said zones subsequent to downward and upward reciprocation of said plungers.

6. In a machine of the class described, the combination with a base provided with a slot, and including a shelf at one end of the slot, said shelf being provided with a groove, a vertical tube carried by the base with the lower end of the tube over the slot for holding a stack of caps one over another with the lowermost cap of said stack superjacent the slot, said base being provided with a lateral aperture at the lower end of the tube, adjacent the shelf, and of a size to permit passage of the lowermost cap from the stack to the shelf, a reciprocable member in the slot having an upper end portion projecting from said slot a distance no greater than the thickness of the lowermost cap, said end portion engaging the edge of said cap and moving the cap through said aperture onto the shelf, a container carrier conveying a series of containers beneath the shelf, pins movable with said carrier, one for each of said containers for sweeping said shelf, as each container passes therebeneath, said pins each having a free end adapted to extend into said groove, and means imparting a reciprocating motion to said member for each container that passes beneath the shelf.

7. In a machine for capping containers, a turntable provided with an annular series of container-accommodating zones, means successively feeding containers to said zones, means successively feeding caps onto the containers in said zones, a series of plungers over said zones for seating said caps with respect to said containers, and cam means depressing said plungers to seat said caps and retaining the plungers so depressed during approximately 180° rotation of the turntable and subsequently elevating said plungers.

8. In a machine of the character described, a movable carrier provided with an endless series of container-accommodating zones, means for successively supplying containers to said zones including a turn-table supporting and tending to move containers resting thereon in an arcuate path of a given radius leading toward the movable carrier, means intermittently arresting movement of the containers toward the movable carrier and arranged to permit the passage of a container from the turn-table to each of said zones, a second turn-table for supplying containers to the first turn-table, said second turn-table supporting and tending to move containers resting thereon in an arcuate path of a greater radius than said given radius, and means guiding containers from the arcuate path of the second turn-table to the arcuate path of the first turn-table, whereby containers subsequently supplied to the second turn-table will tend to overtake previously-supplied containers along said arcuate paths.

9. In a machine of the character described, a movable carrier provided with a series of container-accommodating zones, means for successively supplying containers to said carrier including a turn-table of a given radius having an annular marginal portion supporting and tending to move, at a given rate of speed, containers resting thereon in an arcuate path toward the movable carrier, means intermittently arresting movement of the containers toward the movable carrier and arranged to permit the passage of a container from the turn-table to each of said zones, a second turn-table of a radius greater than the radius of the first turn-table, for supplying containers to the first turn-table, said second turn-table having an annular marginal portion substantially tangent to the marginal portion of the first turn-table, supporting and tending to move, at a rate of speed greater than said given rate, containers resting thereon, in an arcuate path toward the first turn-table, and means deflecting containers from the second turn-table to the first turn-table, whereby containers subsequently supplied to the second turn-table will tend to overtake previously-supplied containers along said arcuate paths.

10. In a machine for capping containers, a carrier including an upper and a lower horizontal support, spaced-apart vertically disposed plungers reciprocably mounted in the upper support, spaced-apart abutments on the lower support defining a series of zones beneath said plungers for the accommodation of containers to be capped, said abutments being formed by solids of revolution having their axes vertical, and cap screws eccentric to said vertical axes and releasably fixing said abutments to the lower support, whereby upon orientation of said abutments about said cap screws the location of said zones is shifted to position containers of different diameters in co-axial alignment with said plungers.

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