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Mistarz et al.

[11] **3,735,896**

[45] **May 29, 1973**

[54] **JAW-OPERATED CUP DISPENSING MECHANISM AND METHOD**

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[73] Assignee: **Koehring Company,** Milwaukee, Wis.

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[21] Appl. No.: **154,079**

[52] **U.S. Cl.** **221/210**

[51] **Int. Cl.** **B65g 25/00**

[58] **Field of Search** 221/210, 211, 223, 221/221, 251, 220

[56] **References Cited**

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Primary Examiner—Stanley H. Tollberg
Attorney—Andrew J. Beck and Charles W. Walton

[57] **ABSTRACT**

A dispenser for cup-like articles rotates a plurality of stacks of the articles through a circular path. Each stack is normally supported by a jaw mechanism which engages the lowermost article of the stack. At one angular portion about the axis of rotation of the dispenser, the jaw mechanism associated with each stack is actuated to release the articles, and at this portion of the path a vertically reciprocable receiver moves into contact with the lowermost article in the stack. An extra increment of upward motion is imparted to the receiver for readjusting the stack. Then the receiver moves downwardly carrying the lowermost article of the stack with it. The jaw mechanism closes again to engage the next article in the stack, while the receiver recedes to separate the lowermost article entirely from the stack. At another angular location, the separated article is transferred from the dispenser by a star wheel mechanism. The jaw mechanisms are cam operated, and means are provided for temporarily inactivating the cam mechanism when it is desired to continue rotation of the dispenser without delivering articles therefrom.

17 Claims, 10 Drawing Figures

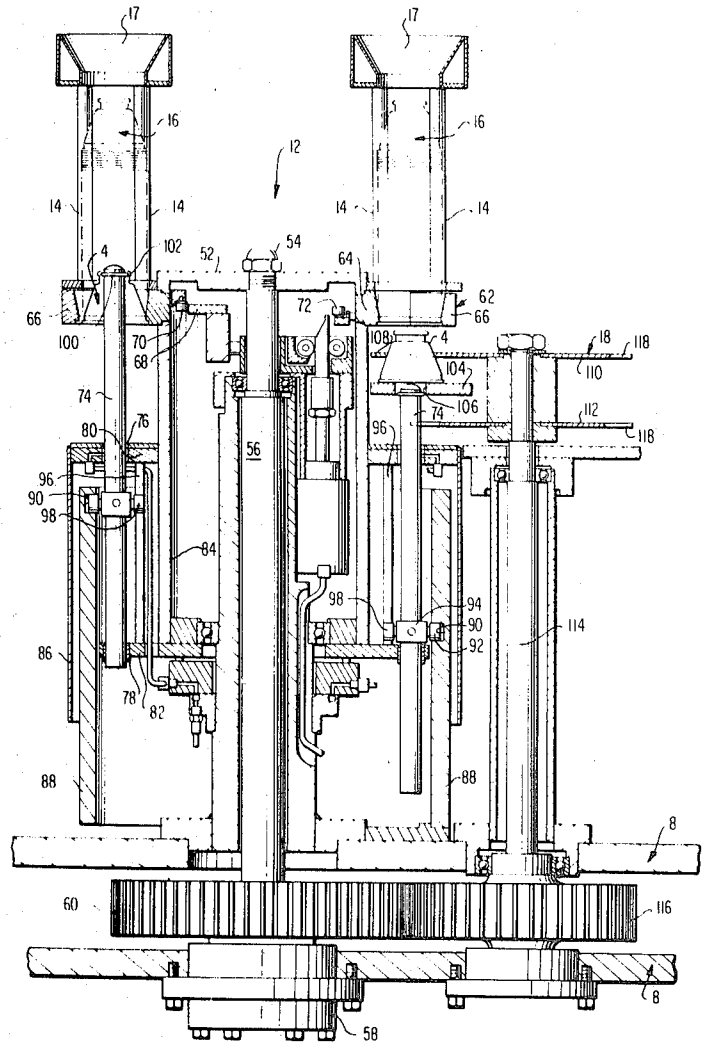
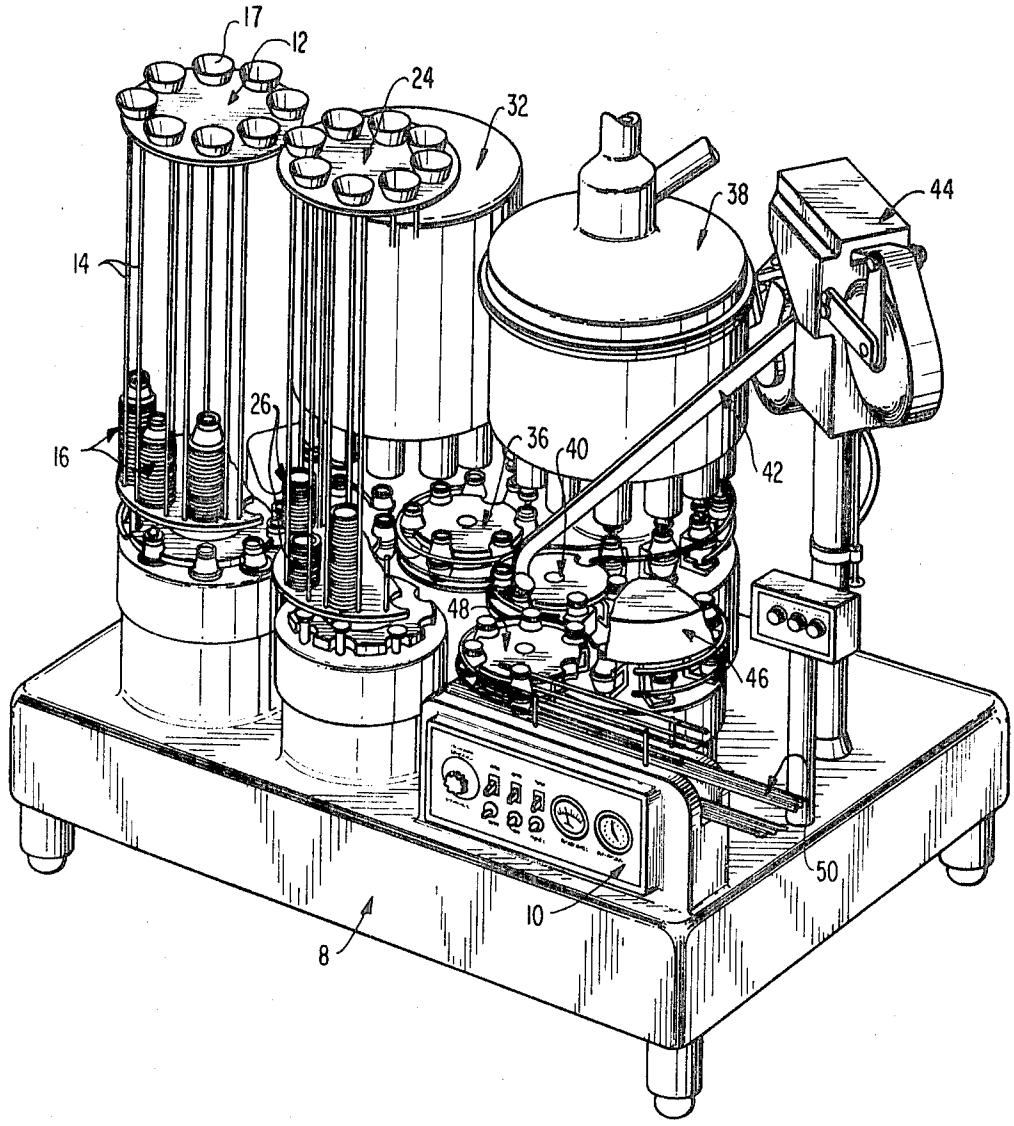


FIG. 1



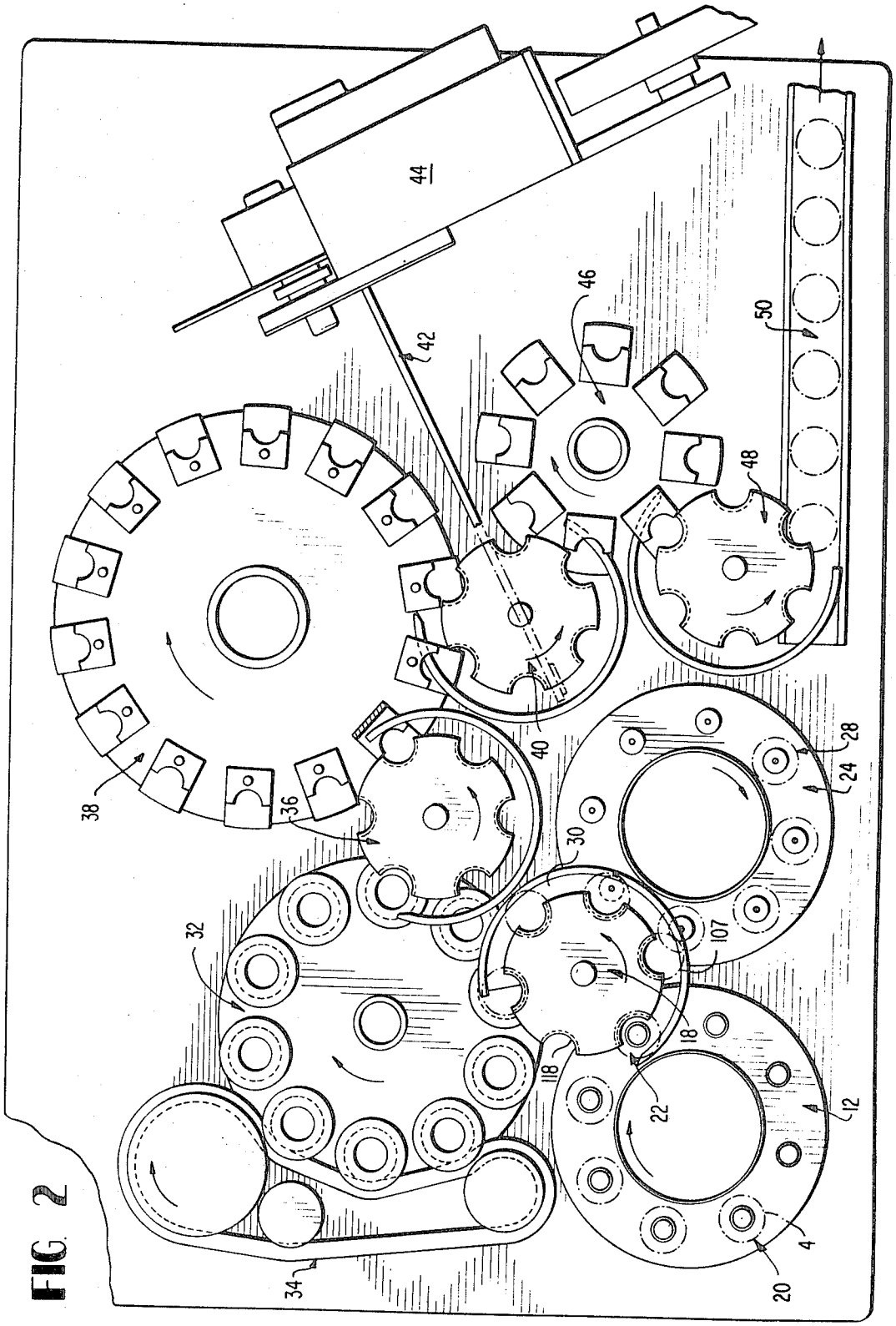
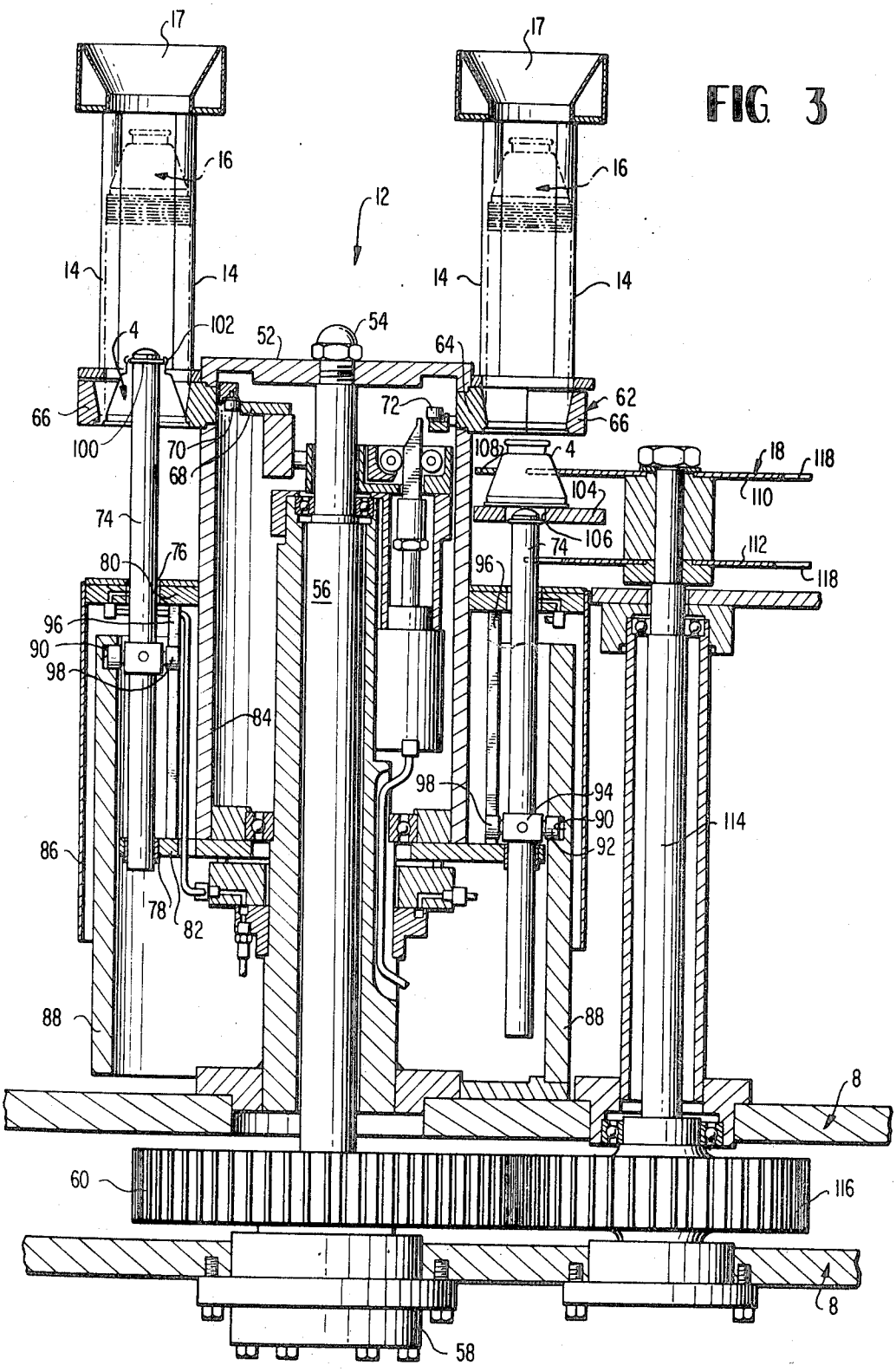


FIG. 2

FIG. 3


17
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12
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72
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74
106
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112
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76
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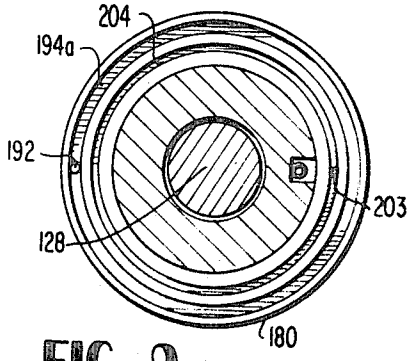
204
194a
192
203
128
180

FIG. 9

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17
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24
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144
120
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168
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128
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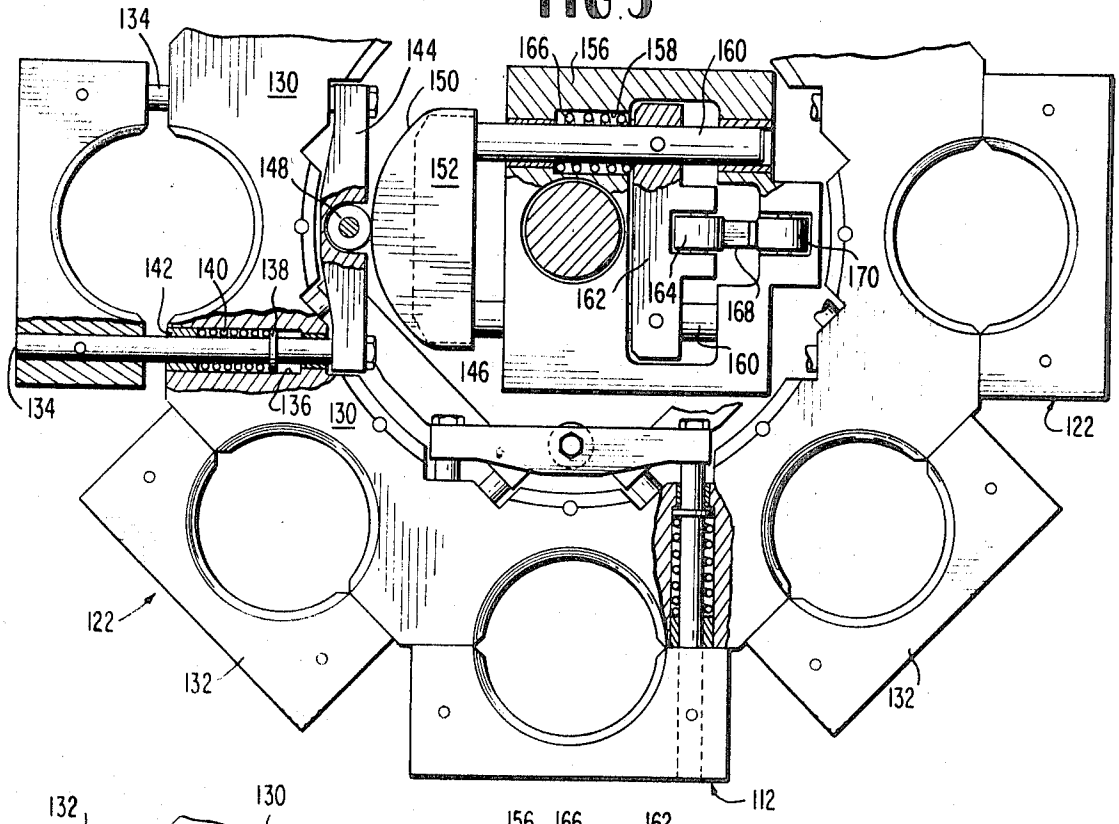
FIG. 4

FIG. 5



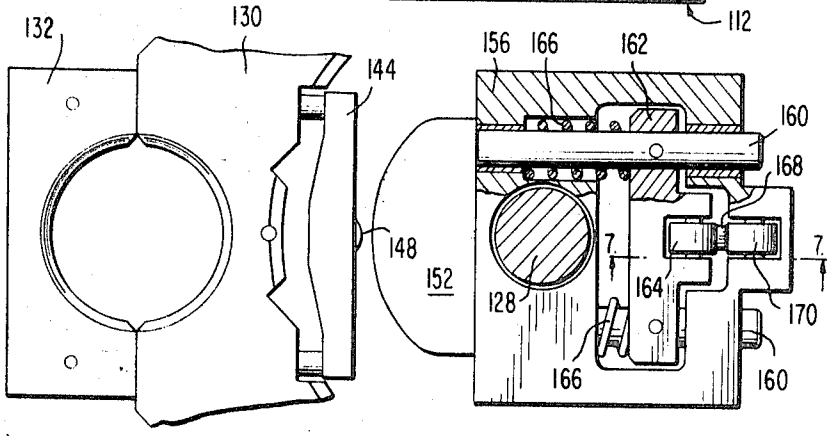
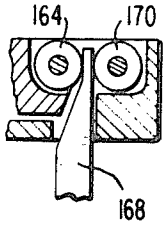


FIG. 6

FIG. 7



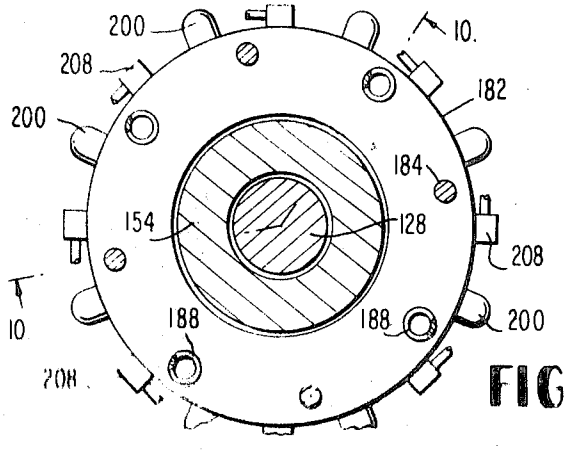
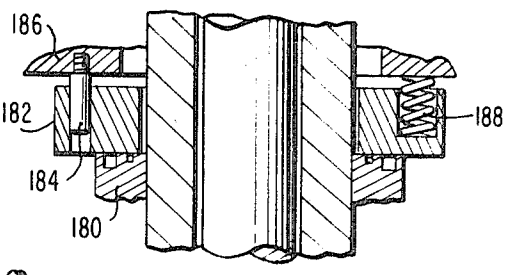


FIG. 8

FIG. 10



JAW-OPERATED CUP DISPENSING MECHANISM AND METHOD

CROSS REFERENCE TO RELATED APPLICATIONS

The disclosure of this application is related to the disclosures of applications Ser. No. 154,061; 154,062; 154,058, and 154,060, respectively entitled "Trapped Cam Assembly, " "Heat Sealing Apparatus and Method", "Automatic Plastic Bottling System and Method", and "Pedestal Assembly" of common inventorship and filed concurrently herewith.

BACKGROUND OF THE INVENTION

This invention relates to a continually rotating mechanism having stacks of cup-like articles thereon, each of said stacks having a selectively operable jaw mechanism which releases the lowermost article at a particular angular position of the rotating mechanism. This invention specifically relates to a bottle half dispensing operation utilizable in a system for assembling plastic bottles and filling and sealing the same.

Prior art dispensing mechanisms wherein stacks of cups are continually rotating to be released at a particular angular position generally include relatively complicated cup releasing mechanisms for removing the lowermost cup in a stack. Devices of this sort often use finger-type mechanisms for separating the lowermost cup in a stack while holding the remainder of the stack from being released. The rotating magazine usually passes a stationary releasing device disposed at one point about the outer periphery of a stacking magazine. These releasing devices sometimes damage the lowermost cup as it is being released because of the differing relative motions of the travelling cup and the stationary release.

An additional problem sometimes encountered in releasing cups is "hanging up" of the stack as the lowermost cup is pulled therefrom. Thus, it is possible for a magazine full of cups not to be in a proper releasing position. Additionally, it is possible for the cups to suddenly return to their proper position and become misaligned thereby causing cup deformation. With plastic cups especially there is an additional tendency for the cups to stick together, causing downward movement of more than one cup at a time.

Moreover, since many of the prior art devices provide for the gravity release of the lowermost cup after it is pried from the stack, there is a tendency toward problems in alignment of the cup after it has left the stack. It can be appreciated that high speed container handling requires accurate alignment and spacing of the articles being operated upon. This accurate alignment has not been possible in using the releasing devices of the prior art.

It should be additionally noted that the gravity release of cups from a stack can tend to bruise or damage the lower ends of the falling cups. This is especially troublesome when cup height and angle are important in a subsequent assembly step.

SUMMARY OF THE INVENTION

This invention has as a principal object the provision of a method and apparatus for accurately and positively releasing a lowermost cup-like article from a travelling stack of such articles with a minimum of cup damage and with a maximum of reliability.

An additional object of the invention is to provide a high speed cup releasing device wherein the individual release cup portions and their associated receiving means are moving at the same speed.

A more particular object of the invention is to provide a system in which a plurality of stacks of cup-like articles are moved about a circular path and in which jaw means are actuated upon the passage of each stack through a certain portion of the circular path to release the lowermost article of the stack and then engage the next one, while the released article is being lowered under the control of a receiving means.

It is an additional object of the invention to provide a rotating cup-like article dispensing device wherein the vertically extending stacks of articles are periodically realigned to insure proper stacking.

In a preferred form the apparatus of the invention includes a rotatable support which carries at spaced intervals about its peripheral portion vertical guides for stacks of nested cup-like articles. Jaw means are carried by the support beneath each of the stacks and serve to press laterally against and hold the lowermost article of each stack. Vertically reciprocable article receivers also are carried by the rotatable support and one of these receivers is disposed beneath each of the stacks of articles. As the support rotates a stack past a certain portion of the circumference of the circle transversed thereby, the jaw means and the receiver associated with that stack are actuated. The jaw means open momentarily to release the lowermost article of the stack, and the receiver is elevated to receive such article. Then the receiver recedes downwardly. The jaw means close upon the next article in the stack and the receiver continues downwardly to separate the lowermost article and make it available for transfer from the circular path at another location along that path.

Suitable cam means for actuating the jaw means may be located radially inwardly of the paths of the stacks of articles and may be stationary. With this arrangement the jaw means have cam followers associated therewith for engaging the cam means during rotation of the rotatable support. In order to provide ample space for a large number of jaw actuating cam follower mechanisms, the present invention provides for the use of vertically elongated cam means and cam follower mechanisms located at different vertical levels for serving adjacent ones of the stacks of articles.

The invention also makes provisions for rendering the cam means inoperable to actuate the jaw mechanisms whenever such may be desired. This feature makes it possible to continue the rotation of the support without releasing any of the articles from their stacks, so that subsequent processing stations of the machine may be cleared.

The cup-like article receivers reciprocable vertically beneath the stacks of articles may have different configurations, depending upon the particular type of cup-like article being handled. In a bottling system two types of cup-like articles are employed and these preferably are handled by different types of receivers. The container bottom halves are disposed in their stacks with their closed end facing downwardly, and for these, a receiver having a flat top and means for transmitting a vacuum to the area of that top are preferred. The container top halves are open at both ends and they are arranged in their stacks with their small ends directed upwardly. These small end portions of the container

top halves have internal grooves however, and a preferred receiver for use with such container top halves includes a disc or ring which may be projected into the internal groove portion of the container half. In both of these instances, the receivers are capable of exerting downwardly directed forces on the lowermost cup-like articles associated therewith in order to assure separation of such articles from the stacks of articles.

A more complete understanding of these and other features and advantages of the invention will be gained from a consideration of the following detailed description of an embodiment illustrated in the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a machine for dispensing upper and lower plastic container halves from nested stacks thereof in accordance with the invention, joining these container halves together to make milk containers, filling the containers, and affixing caps onto the tops of the containers.

FIG. **2** is a somewhat diagrammatic plan view of the machine of FIG. **1**.

FIG. **3** is a vertical cross sectional view through the container top half dispensing unit of the machine of FIGS. **1** and **2**.

FIG. **4** is a vertical cross sectional view through the container bottom half dispensing unit of the machine of FIG. **1**.

FIG. **5** is a partial horizontal cross sectional view along the line **5-5** in FIG. **4**, with portions being broken away to reveal certain details of the construction.

FIG. **6** is a horizontal cross sectional view similar to FIG. **5** but showing the jaw actuating cam in an inactive position thereof.

FIG. **7** is a detailed vertical cross sectional view taken along the line **7—7** in FIG. **6** and illustrates a portion of the means for inactivating the cam of FIGS. **5** and **6**.

FIG. **8** is a horizontal cross sectional view along the line **8-8** in FIG. **4**, illustrating a portion of the vacuum supply system for the article receivers.

FIG. **9** is a horizontal cross sectional view taken along the line **9—9** in FIG. **4** and illustrating another portion of the vacuum supply for the receivers.

FIG. **10** is a detailed vertical cross sectional view taken along the line **10—10** in FIG. **8** and illustrating the coaction of the components illustrated in FIGS. **8** and **9**.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Although the present invention is, in its broader aspects, usable in various applications where it may be desired to dispense cup-like articles one at a time from a vertical stack of such articles, the invention is especially suited for use in a milk bottling system of the type illustrated in FIGS. **1** and **2**. This system dispenses upper and lower milk container halves from stacks, positions the container lower halves properly with respect to container upper halves, welds the halves together, fills the containers with milk, and caps and seals the open tops of the filled containers. The various constructional and operational features of the machine are disclosed in detail in the several patent applications referred to above and the disclosure of each of them is incorporated herein by reference.

The containers are of configurations generally similar to that shown in United States Pat. No. D 204,170. These containers are assembled from separate fabricated container top halves **4** and container bottom halves **6**, with the two halves of each container being welded together at the middle of the container. Both the container top halves **4** and the container bottom halves **6** are cup-like in configuration, and it will be helpful in this description to refer at times to them as "cup-like articles".

The machine is in the form of a base or table structure **8** carrying thereon a control panel **10**, a series of processing stations and means for transferring the container portions to and from the various processing stations. The processing stations are all rotatable units, and transfers between stations are accomplished through rotating star wheels, permitting the compact and efficient arrangement indicated in FIG. **1** of the drawings.

The first processing station is that which supplies or dispenses the container top halves **4**. This container top half supply unit or denester **12** will be described in detail below. It will suffice here to mention that it includes means for holding eight vertical stacks of nested container top halves **4** and delivering the container top halves therefrom one at a time for subsequent processing. As illustrated, groupings of vertical rods **14** constitute guides for the several stacks **16** of nested container top halves and additional container top halves may be supplied to each of the stacks **16** through funnel means **17** at the top of the unit **12**. The several stacks **16** are arranged in a circle and the whole is rotated about the axis of this circle.

Means below the stacks **16** of nested container top halves operates at one angular portion of the circle to remove the bottom container from each stack as that stack passes through such portion. Then the removed container top half is transferred from the top denester unit **12** onto a star wheel device **18** (FIG. **2**). This sequence is indicated in FIG. **2**, wherein the top denester unit **12** is shown to be rotating in a clockwise direction and where a container top half portion **4** is indicated to have been removed from the bottom of one of the container stacks at location **20** and transferred from the top denester **12** to the star wheel **18** at another angular location **22**.

The container bottom halves are supplied from a dispenser unit **24** which is similar in its functions to the top container half supply unit or denester **12**. Here again eight stacks **26** of nested container bottom halves **6** are located in a circular path and the stacks are revolved about the axis of this circle. As indicated in FIG. **2**, the bottom denester **24** rotates in a clockwise direction, a container bottom half **6** is removed from the bottom of each stack **26** as that stack rotates past an angular location **28**, and the individual container bottom halves **6** are transferred to the star wheel **18** in the zone of tangency between the units.

The star wheel **18** is of course a dual level device. The container top halves **4** are moved along an intermediately located support surface **30**, while the container bottom halves **6** are disposed below the surface **30** but in vertical alignment with corresponding ones of the container top halves **4**.

As the star wheel **18** rotates in a counterclockwise direction, it brings the vertically aligned container halves to a spin welder unit **32**. Here the container

halves 4 and 6 are received on individual holders and moved clockwise about a circular path. During one angular portion of this path, the holders for the container bottom halves are brought into contact with a drive belt 34 which serves to spin each of the container bottom halves at high velocity about its own axis. During this same time interval, the top edge of the container bottom half and the bottom edge of the container top half are brought together vertically. Since the container top half is not rotating about its own axis but the container bottom half is rotating in this fashion, a great deal of heat is generated by friction as the edges come into contact with each other. This heat serves to weld the thermoplastic material and provide a strong joint between the container edges.

The joined together container halves remain on the spin welder unit 32 for a sufficient time to permit adequate cooling of the newly formed joint. Then the containers are transferred one by one onto a star wheel unit 36 which delivers them to a filler unit 38.

The filler unit also is a rotating assembly. It receives the open topped containers at uniformly spaced locations about its periphery and revolves the containers through an arcuate path. A supply of the material, such as milk, to be introduced into the containers is located above the container support level of the unit, and as the containers move about the central axis of the unit they are raised individually into operative relationship to filler nozzle means which also rotate about the axis of the unit and which are disposed in vertical alignment with the container support stations. As each container is brought into operative relationship to the overlying filler nozzle, milk begins to flow into the container, and the time during which the container is allowed to remain in inoperative relationship to the filler nozzle may serve to establish the quantity of milk introduced into the container. Thereafter, the container is lowered from contact with the filler nozzle and transferred from the filler unit 38 to another star wheel device 40.

While under the control of the star wheel device 40, each of the now filled containers passes beneath the end of a container closure or cap supply device 42. This device 42 receives caps formed in a mechanism 44 and disposes one such cap over the open top of each of the filled containers.

The filled containers with the caps resting thereon then move one by one onto the periphery of a heat sealer unit 46. As each filled container moves clockwise about the central vertical axis of the heat sealer unit 46, the cap thereon is brought into contact with a heater to cause the cap to be sealed to the remainder of the top opening in the thermoplastic container.

Thereafter, the sealed filled containers are delivered from the heat sealer unit 46 onto a star wheel device 48 and transferred to a delivery conveyor 50. The delivery conveyor 50 carries the filled and sealed containers to another location for such further processing as may be desirable in arranging them for shipment or the like.

Having explained generally the overall operation of the bottling system, it will be helpful now to return to the apparatus for supplying the container halves.

Referring particularly to FIG. 3 of the drawings, it will be seen that the rods 14 which form the guides for the stacks 16 of upper container halves 4 are carried by a platform 52 secured by screw thread means 54 to the upper end of a rotating shaft 56. Bearing means located within a bearing housing 58 serve to mount the shaft 56 for rotation on the frame means 8 of the machine, and a lower end portion of the shaft 56 has a drive gear 60 secured thereon.

The container top halves 4 taper vertically and they are open at both of their ends. These cup-like articles are arranged in the several stacks 16 with their smaller ends directed upwardly.

The larger, lower, end portion of the lowermost container 4 in each stack 16 is normally gripped by jaw means designated generally by the numeral 62. Similar jaw means are employed in the container top half supply means and will be described in greater detail below. It will suffice at this point to note that the jaw means for each stack of cup-like articles includes an inwardly disposed jaw member 64 carried by the rotating platform 52 and an outwardly disposed jaw member 66 which is movable radially with respect to the jaw member 64.

The movements of the jaw member 66 relative to the jaw member 64 are brought about by cam means 68 which does not rotate with the shaft 56 and which is contacted by cam follower means 70, 72 connected to the movable jaws 66. During one portion of the path of a stack 16 about the axis of the central shaft 56, the cam follower means associated therewith will be out of contact with the cam means 68 and the movable jaw 66 associated therewith will be in gripping engagement with the large end portion of the lowermost container half 4 in the stack. Such a relationship is illustrated at the right in FIG. 3 of the drawings. During another portion of the path of each stack about the central axis on shaft 56, the cam follower associated therewith will be pressed outwardly by the cam means 68 and the movable jaw 66 will be moved radially outwardly as indicated at the left portion of FIG. 3. When a jaw 66 is moved outwardly relative to the corresponding jaw 64, the whole of the jaw means 62 on the container halves of the stack is released, and in the absence of some other instrumentality for supporting the stack, it would move downwardly through the space between the jaws 64 and 66.

Such uncontrolled downward movements of the container halves are undesirable, and the present invention makes provisions for receiving and controlling the container halves as they are released by the jaw means 62. A receiver means appropriate for the container top half dispenser of FIG. 3 is in the form of a vertically reciprocable rod 74, sometimes referred to in the art as a pecker. One such rod extends vertically beneath each of the stacks 16 of container upper halves, being mounted for vertical reciprocation by bearing means 76 and 78 carried by plates 80 and 82 attached to a vertical cylinder 84 rigid with the rotating platform 52 of the apparatus. A cylindrical shroud 86 is attached to the outer edge of the plate 80 and provides a cover for the mechanical parts associated with the peckers. Within the shroud 86 there is a stationary cylinder 88 which is rigidly mounted on the frame 8 and which has a cam groove 90 extending around its inner surface. A cam follower roller 92 is carried by a block 94 fixed on each pecker rod 74 and rides in the cam groove 90. Since the level of the cam groove 90 above the base 8 changes as one proceeds about the axis of the central shaft 56, the cam follower rollers riding in this cam groove 90 are caused to move up and down as the stacks revolve about the axis of this central shaft.

The peckers **74** are prevented from rotating about their own axes so as to assure that the cam follower rollers **92** will not be displaced inadvertently from the stationary cam groove **90.** To this end, means **96** is attached to the rotating bearing plate **80** and provided with vertical slots or openings adjacent the angular locations of the several bearings **76.** These slots cooperate with follower rollers **98** on the blocks **94** attached to the peckers **74** and hold the peckers against substantial rotation about their own axes.

The upper end portion of each of the peckers **74** is provided with a radially protruded rim or ring portion **100** for cooperation with a groove-like configuration **102** near the small upper end of each container upper half **4.** See in this connection the left portion of FIG. **3** where a pecker **74** has been elevated to bring its rim portion **100** into mating relationship with respect to groove **102** on the interior of the lowermost container half **4** of a stack **16.**

The sequence of operations of the container top half supply unit **12** of FIG. **3** will now be reviewed for purposes of clarity. As the central shaft **56** rotates, each of the stacks **16** moves in a circular path about the axis of the shaft. As a given stack **16** moves away from the zone **22** (FIG. **2**) of tangency between the supply unit **12** and the transfer star wheel **18,** its jaw means **62** will be in a closed condition such as that indicated to the right in FIG. **3** and its receiver **74** will be in a lowered position without having any container top half associated therewith. However, continuation of the movement of this stack **16** along the circular path will bring the cam follower **92** into a rising portion of the cam track **90** and will bring the cam follower on the jaw means **62** into contact with the cam means **68.** At about the location **20** (FIG. **2**) the pecker lip **100** will have engaged the groove **102** in the lowermost container top half of the stack and the movable jaw **66** will have moved outwardly to release the grip of the jaw means upon the container half.

The pecker preferably is given an extra increment of upward motion during this period when it is initially supporting the stack **16.** This extra increment of upward motion momentarily lifts the stack **16** relative to the guide rods **14** and permits the stack to readjust and realign itself in the guide means. Then the pecker beings its downward movement. The jaw means also begins to close, and the movable jaw **66** comes into gripping engagement with the lower end portion of the next container half in the stack just after the lower end of the container half on the pecker **74** has cleared the jaw means.

Upon continued rotation of the shaft **56,** the pecker **74** with the container half thereon moves into cooperative relationship with respect to the upper surface of a platform **104** having an opening **106** therein for receiving the pecker **74.** The pecker **74** moves downwardly through the opening **106,** under the influence of the cam track **90,** to bring the lower edge of the container half into contact with the upper surface of the platform **104.** Upon continued downward movement of the pecker **74,** the pecker ring **100** is disengaged from the container half groove **102** and the container half is ultimately freed from the pecker **74** as illustrated at the right in FIG. **3.**

The freeing of the container top half **4** from the pecker **74** occurs at about the location **22** (FIG. **2**) where the container top half moves into the zone of action of the star wheel **18.** Stationary guide rails **107** are disposed beyond the periphery of the star wheel **18,** and an end portion of the upper one of these guide rails is designated **108** in FIG. **3.** The inner surface of the end portion **108** of the upper guide rail **107** curves about the axis of the star wheel **18** and guides the dispensed container top half **4** off the supply unit **12** and onto the star wheel unit **18.**

The star wheel unit **18** includes upper and lower rotatable plates **110** and **112** fixed to a rotatable shaft **114** rotatably mounted on the frame **8** of the machine. The shaft **114** is driven by a gear **116** which meshes with the gear **60** on the central shaft **56** of the container top half supply unit **12.** As a result of this intermeshing gear relationship, the peripheries of the units **12** and **18** move at the same speed.

The peripheries of the upper and lower star wheel plates **110** and **112** have arcuate cutout portions **118** therein at intervals corresponding to the intervals between adjacent ones of the stacks **16** on the container top half supply apparatus **12.** A dispensed container top half **4,** such as that illustrated at the right in FIG. **3,** is guided into one of these cutouts **118** and moved by the upper star wheel plate **110** about the star wheel axis, with the bottom edge of the container top half being shifted off the platform **104** of the supply apparatus **12** and onto a platform **30** (FIGS. **2** and **4**) of the star wheel device **18.**

Container bottom halves **6** are supplied to the cutouts **118** in the lower star wheel plate **112** by the dispenser shown in detail in FIG. **4.** This dispenser is similar in most respects to the dispenser **12** for the container upper halves. The unit **24** also includes stack guides **14** for locating vertical stacks **26** of nested container halves about a peripheral portion of a rotating platform **120,** jaw mechanisms **122** for engaging and releasing the lowermost container halves in the stacks, and vertically reciprocable receivers **124** for the released container halves. The drive gear **126** on the main shaft **128** of the unit **24** meshes with the drive gear **116** for the star wheel device **18** to assure proper correlation of the speeds of the cooperating devices.

The jaw mechanisms **122** and the means for operating them are shown in greater detail in FIGS. **5, 6** and **7.** Each jaw mechanism **122** includes an inner jaw portion **130** fixed with respect to the rotating platform **120** and an outer jaw portion **132** movable radially with respect to the inner jaw portion **130.** As shown best in FIG. **5,** the several inner jaw portions **130** may be formed from a block which surrounds a space occupied by the central shaft of the apparatus. However, this particular arrangement is not essential and if desired the inner jaws may take the form of separate members.

Each outer jaw **132** is attached to a pair of pins **134.** These extend inwardly through bores in the adjacent inner jaw portions **130.** It is preferred that the bores **136** for receiving the pins **134** attached to one of the outer jaws **132** be disposed at a vertical level different from that occupied by the bores for receiving the rods **134** attached to the next adjacent ones of the outer jaws **132.** This arrangement is indicated in FIG. **5** where the inner end portions of the pins **134** associated with the outer jaw **132** at the lower left portion of the view are beneath the bores for the rods **134** associated with the outer jaws at the left of the view and also at the bottom of the view.

The portion of each pin 134 located within a bore 136 has a collar 138 fixed thereon, and a compression spring 140 is confined between the collar 138 and an end block 142 for the bore. With this arrangement, the rods 134 tend to be moved inwardly to close the outer jaws 132 on the inner jaws 130.

The inner ends of the pins 134 are secured to yokes which connect together the two pins 134 associated with a given jaw mechanism. Alternate ones 144 of these yokes are disposed at a upper level, and intermediate ones 146 of these yokes are disposed at a lower level. This permits considerable overlap between adjacent yokes 144 and 146 and makes it possible to accommodate a relatively large number of stacks of nested container halves in the machine.

Each of the yokes 144 and 146 carries at a mid portion thereof a rotatable cam follower 148 which may contact a curved vertical surface 150 of a cam member 152 as the jaw mechanisms 122 revolve about the axis of the central shaft 128. When the cam member 152 is in the position illustrated in FIGS. 4 and 5, it causes each cam follower 148 to move outwardly as the corresponding jaw mechanism rotates past the cam. Outward movement of the cam follower 148 in turn causes outward movement of the pins 134 against the bias of the spring 140 to shift the outer jaw 132 away from the adjacent inner jaw 130. The net effect of these operations is to release the gripping action of the jaw mechanism 122 on the lowermost container half of the stack as the stack moves past the cam 152.

However, there are times when it is not desirable that container halves be released from the stacks 26 as these stacks revolve about the axis of the shaft 128. All of the various operating stations and transfer stations of the machine shown in FIGS. 1 and 2 are geared together so that the unit 24 rotates as long as the other units such as the filler 38 and the cap sealer 46 are being operated. When it is desired to bring a bottling operation to an end, therefore, it is desirable that provisions be made for permitting rotation of the container half supply units 12 and 24 without releasing container halves therefrom. In this way, the machine may be cleared of container halves and incompletely processed containers before it is uncoupled from the power supply.

In order that the cam 152 may be deactivated when desired, it is mounted for movement relative to the stationary portions of the unit 24. A stationary center column 154 of the apparatus carries at its upper end a stationary block 156 having openings 158 for receiving reciprocable mounting shafts 160 attached to the cam 152. Mid portions of the mounting shafts 160 have fixed thereon yoke means 162 carrying a cam follower roller 164, and the yoke means 162 is urged to the right as viewed in FIG. 5 by springs 166 located in the openings 158 in the block 156.

A wedge member 168 is interposed between the cam follower roller 164 and a backing roller 170 rotatably mounted on the block 156. The lower end portion of this wedge member 168 is attached to a ram 172 reciprocable vertically by a hydraulic cylinder 174.

When the wedge member 168 is in its lowered position (FIGS. 6 and 7), the springs 166 urge the yoke 162 and the mounting shafts 160 to the right as viewed in FIGS. 5 and 6 to remove the cam 152 from the paths of the cam followers 148 on the jaw mechanisms 122. With the parts in such positions, container halves are not released from the stacks as stacks revolve about the central axis of the dispensing apparatus. When however the cylinder 174 is actuated to move the wedge member 168 into its raised position (FIGS. 4 and 5), the cam follower 164 is moved to the left as viewed in FIG. 5, and the cam 152 is positioned to be contacted by the cam followers 148 of the jaw mechanisms 122 as the jaw mechanisms rotate about the central axis of the dispensing apparatus.

Returning to FIG. 4, it will be observed that the container halves being dispensed by the unit 24 have shapes which are different from the container halves dispensed by the unit 12 of FIG. 3. The container bottom halves 6 supplied by the unit 24 have closed smaller ends, and they are arranged in the stacks 26 so that their smaller ends face downwardly.

It also will be observed that the container half receivers 124 in FIG. 4 differ from the peckers 74 of FIG. 3. The receivers 124 for the container lower halves are hollow shaft members having vacuum fittings 176 communicating with their lower ends and having flat top stage portions 178 at their upper ends.

The cam and follower system for moving the receivers 124 vertically during rotation of the central shaft 128 does not differ from that employed in the apparatus of FIG. 12, and the system need not be described again here. It will suffice to note that the stage portion 178 of a receiver 124 moves upwardly to engage the bottom of a container lower half 6 as the jaw mechanism 122 immediately above that receiver opens. An extra increment of upward motion of the receiver 124 jostles the overlying stack 26 to permit readjustment of the stack within the guide 14, and then the receiver begins to move downwardly.

During this interval, vacuum is applied to the interior of the receiver 124 to attract the bottom of the container half 6 and hold it on the stage 178. Vacuum continues to be applied in this fashion at least until the engaged container half 6 reaches the area from which it is to be transferred to the star wheel device 18. The jaw mechanism 122 of course closes again after a small amount of downward movement of a receiver 124 to engage the large top edge of the next container half in the stack 26, and continued downward movement of the receiver with the vacuum applied separates the lowermost container half 6 from the stack.

The vacuum system, and also a lubrication system for the bearings in which the receivers 124 are mounted, are illustrated in FIGS. 4, 8, 9 and 10. The stationary center post 154 of the unit 24 has a ring 180 secured thereto, and another ring 182 is connected by pins 184 to the rotating plate 186 which carries the lower bearings for the receivers 124. These rings 180 and 182 have fluid passages therein, and the lower face of the upper ring 182 is pressed downwardly against the upper face of the lower ring 180 by spring means 188 (FIG. 10).

A vacuum supply line 190 leads to a vertical passage 192 through the lower ring 180, and this passage 192 communicates with an annular groove in the top face of the ring 180. This groove 194 communicates with passages 196 in the upper rotating ring 182 as this ring rotates relative to the lower ring 180. Lines 198 lead from fittings 200 on the ring 182 to the fittings 176 at the lower ends of the receivers 124 to complete the flow paths from the supply line 190 to the interiors of the receivers.

The lubricant supply system is somewhat similar to the vacuum supply system. A supply line **202** leads to a passage **203** in the lower ring **180** and this passage communicates with a groove **204** in the upper surface of the ring **180.** Passages **206** in the rotating upper ring **182** lead to locations adjacent the annular groove **204** and transmit lubricant out to fittings **208** connected by lines **210** to fittings **212** for delivering the lubricant to the bearing areas.

Both the lubricant supply system and the vacuum supply system described above envision that the supplies will be continuous. However, it is preferable in some instances to shut off the vacuum during a portion of the travel of each receiver about the axis of the center shaft **128.** As indicated in FIG. **9,** for example, a groove **194***a* in the upper surface of the lower ring **180** may have a circumferential extent less than **360** degrees. In this instance, there is no communication between a channel **196** in the upper ring **182** over that interval during which the corresponding receiver **124** is moving from a location just prior to the point of tangency between the units **24** and **18** to a location just prior to that at which the receiver stage moves into contact with a container half. By shutting off the vacuum in this area where it is not needed, some economies and other improvements are effected.

Still other modifications and variations within the spirit of the invention will be evident to persons skilled in the art. It is intended therefore that the foregoing detailed description of certain embodiments be considered as exemplary only and that the scope of the invention be ascertained from the following claims.

What is claimed is:

1. Apparatus for supporting cuplike articles in a stack and dispensing the same one at a time comprising:

holding means operable engageable and disengageable with the lowermost article in the stack;

article receiving means beneath the stack being movable toward and away from the lowermost article in the stack;

actuation means for actuating said holding means and said article receiving means for raising said receiving means into article receiving position and disengaging said holding means from said lowermost article and for then lowering said receiving means with the lowermost article of the stack thereon and engaging said holding means with the next article in the stack to hold the same and permit the article on the receiving means to be separated downwardly from the stack; and

support surface means beneath the level of the lowermost article in the stack in the path of movement of the article on the receiving means for intercepting such article while said receiving means is still moving downwardly to assure separation of such article from said receiving means.

2. Apparatus for supporting cuplike articles nested in a plurality of stacks and dispensing the same one at a time from the stacks comprising:

rotatable support means;

a plurality of article stack guide means on said support means spaced apart about a peripheral portion thereof;

holding means carried by said support means beneath each of said stack guide means and being operable engageable and disengageable with the lowermost article in the stack;

article receiving means beneath each of said stack guide means being movable vertically toward and away from the lowermost article in the stack thereabove; and

actuation means for actuating said holding means and article receiving means associated with each of said stacks as said support means moves such stack through a predetermined angular portion of the circular path thereof for raising such receiving means into article receiving position and disengaging such holding means from the lowermost article and for then lowering such receiving means with the lowermost article of the stack thereon and engaging such holding means with the next article in the stack to hold the same and permit the article on said receiving means to be separated downwardly from the stack.

3. Apparatus according to claim **2** wherein the holding means associated with each stack includes an outer holding member and spring means for urging said outer holding member inwardly into engagement with the lowermost article of the stack, and wherein said stationary means operable upon said holding means includes a cam located inwardly of said holding means and having a cam surface for moving an outer holding member outwardly as said holding member moves past said surface.

4. Apparatus according to claim **3** wherein a cam follower support is operatively connected to each of said outer holding members and wherein alternate ones of said supports are disposed at a level above the level of the intermediate ones of said supports with portions of adjacent supports being disposed in overlapping relation about the axis of rotation of said rotatable support means.

5. Apparatus according to claim **3** wherein a cam follower support is operatively connected to each of said outer holding members and wherein a cam follower is rotatably mounted on each of said supports.

6. Apparatus according to claim **2** wherein said holding means are provided with cam follower means, wherein said stationary means operable upon the holding means includes a cam surface normally disposed in the path of said cam follower means, and wherein means are provided for shifting said cam surface out of the path of said cam follower means and preventing actuation of said holding means during selected intervals.

7. Apparatus according to claim **2** wherein each of said article receiving means is a pecker having a ring on its upper end portion for cooperating with an internal groove on an article which is to constitute the upper half of a plastic container.

8. Apparatus according to claim **2** wherein each of said article receiving means is a hollow rod having a flat stage on the upper end thereof for engaging the bottom of an article which is to constitute the lower half of a plastic container and wherein vacuum is applied through said hollow shaft to adhere the article to said stage.

9. Apparatus according to claim **8** wherein means is provided for releasing the vacuum supply to each of said receiving means during a portion of the path thereof.

10. A method of individually dispensing a cuplike article from a generally vertical stack of such articles by utilizing a first and second holding means to support

and positively move the articles comprising the steps of:

positioning the article in a dispensing position by utilizing the first holding means;

releasing the article from said first holding means and engaging the article with the second holding means;

moving the second holding means and article downwardly to lower the article from the stack while simultaneously supporting the remainder of the stack with the first holding means; and

arresting the downward movement of the article and lowering further said second holding means to assure separation of such article from said second holding means.

11. A method of individually dispensing a cuplike article from vertical stacks of such articles comprising the steps of:

selectively raising an article receiving member normally associated with a holding member into article engaging position;

opening a holding mechanism associated with each of said stacks and allowing said stack to rest on the receiving member;

incrementally continuing the raising of said receiving member to shift said stack upwardly a short distance to prevent jamming due to misalignment of the stack;

incrementally lowering said stack a predetermined distance;

closing the holding mechanism to restrain further lowering of the stack;

further lowering said lowermost article captured by the receiving member to separate that article from the stack; and

transferring said separated article out of the dispenser.

12. A method according to claim **10** including the step of penetrating a hollow article to insure positive capture thereof.

13. A method according to claim **10** including the step of applying a vacuum through the receiving member to assure positive capture of the lowermost article of the stack.

14. Apparatus according to claim **1** additionally comprising means for shifting each article laterally relative to said support surface means after it has been separated from said receiving means.

15. Apparatus according to claim **1** wherein said article receiving means includes a vertically reciprocable member aligned with the axis of the stack, wherein said support surface means includes an opening for receiving said vertically reciprocable member, and wherein said actuating means acts upon a lower portion of said vertically reciprocable member to lower such member below the level of the article intercepting surface of said support surface means.

16. Dispensing apparatus for handling tapered container top halves, each being open at its ends and each being provided with an annular groove on the interior thereof near its smaller end, said apparatus serving to store a supply of such container top halves in a nested stack within which the individual container top halves are disposed with the smaller ends up and serving to dispense such container top halves one at a time from the bottom of the stack, said apparatus comprising:

holding means operably engageable and disengageable with the external surface of the lowermost container half in the stack;

a rod member having a ring on its upper end portion and being movable to raise said upper end portion into the lowermost container half of the stack to bring said ring into engagement with said groove; and

actuation means for actuating said holding means and said rod member for raising said ring into container half receiving position and disengaging said holding means from the external surface of said lowermost container half, for lowering said rod member and engaging said holding means with the container half next above said ring, and for lowering further said rod member to withdraw the container half engaged by said ring from said stack.

17. Dispensing apparatus for supporting cuplike articles nested in a plurality of stacks and dispensing the same one at a time from the stacks comprising a plurality of article stack guide means spaced apart along a horizontal closed path, means for moving said stack guide means through said closed path, holding means beneath each of said stack guide means, said holding means being movable through said closed path with said stack guide means and being operably engageable and disengageable with the lowermost article in the adjacent stack, article receiving means beneath each of said stack guide means being movable both horizontally through said closed path and vertically toward and away from the lowermost article in the stack thereabove, actuation means for actuating the holding means and article receiving means associated with each of said stacks as such stack moves through a predetermined portion of said path for raising such receiving means into article receiving position and disengaging such holding means from the lowermost article and for then lowering such receiving means with the lowermost article of the stack thereon and engaging such holding means with the next article in the stack to hold the same and permit the article on said receiving means to be separated downwardly from the stack, and means for separating the removed article from said receiving means and moving such article laterally at another portion of said closed path.

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