United States Patent [19]

Hooks

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[45] **July 3, 1973**

[54] **BOTTLE ORIENTOR**

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[52] **U.S. Cl.** ..... **198/33 AB,** 198/43 B

[51] **Int. Cl.** **B65g 47/24**

[58] **Field of Search** ..... 198/33 AB, 33 AA, 198/33 R, 33 AD; 193/43 A, 43 B, 43 C, 43 D

[56] **References Cited**

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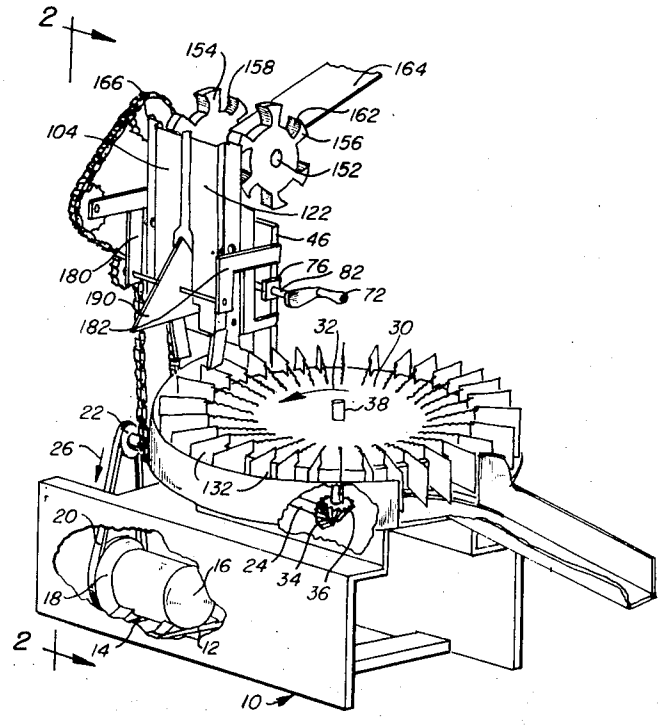
[57] **ABSTRACT**

A mechanical bottle orientor is disclosed in which bottles, having their necks disposed in either of two directions and aligned horizontally are tipped to be oriented with their bottoms downwardly and deposited in pockets in a rotary table in position to be filled.

5 Claims, 7 Drawing Figures



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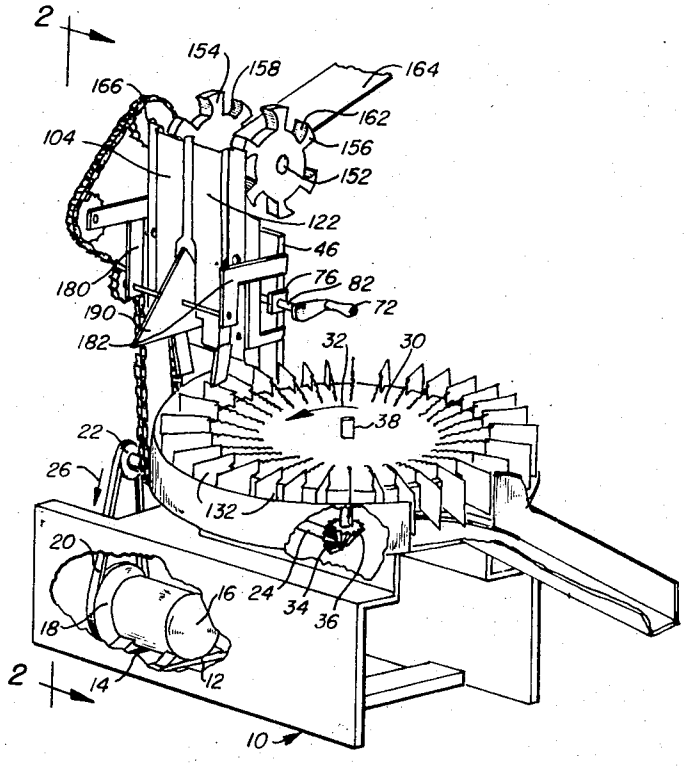

FIG. 1

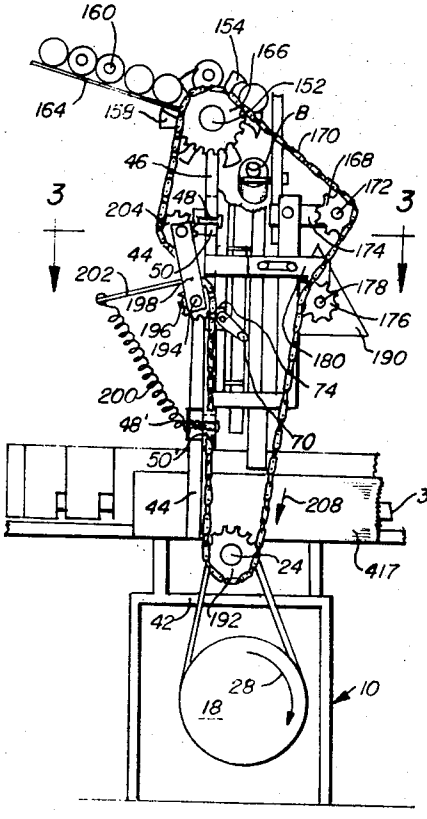

FIG. 2

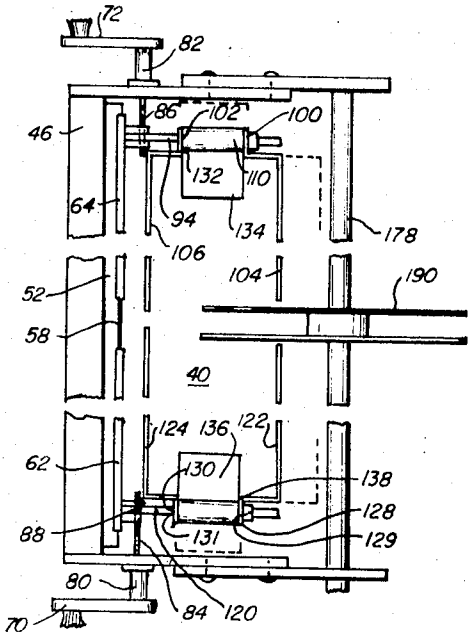

FIG. 3

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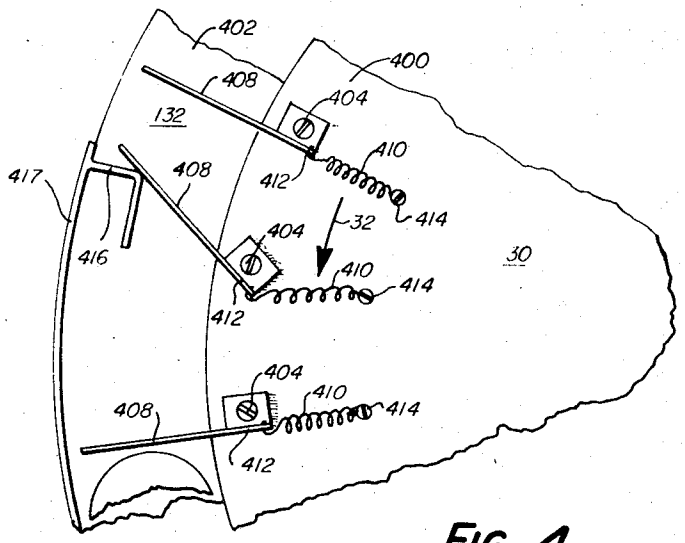

FIG. 4

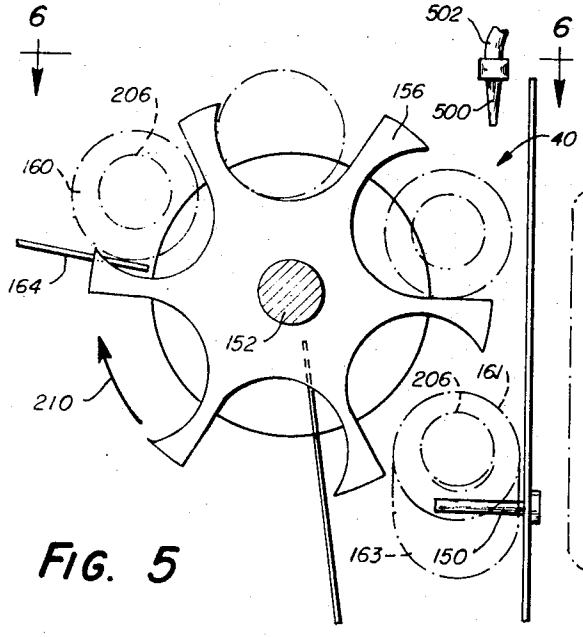

FIG. 5

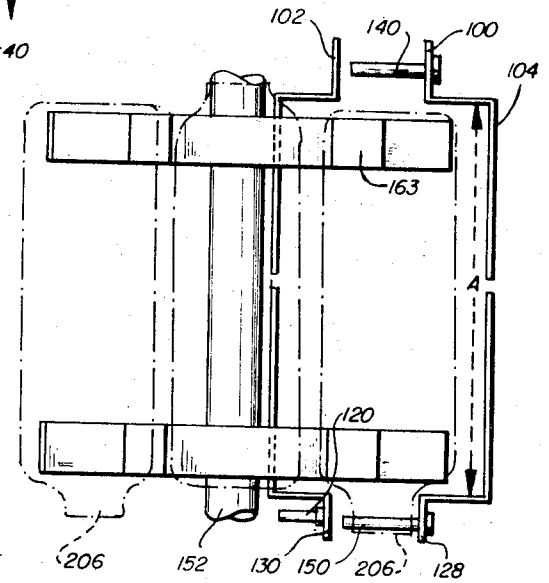

FIG. 6

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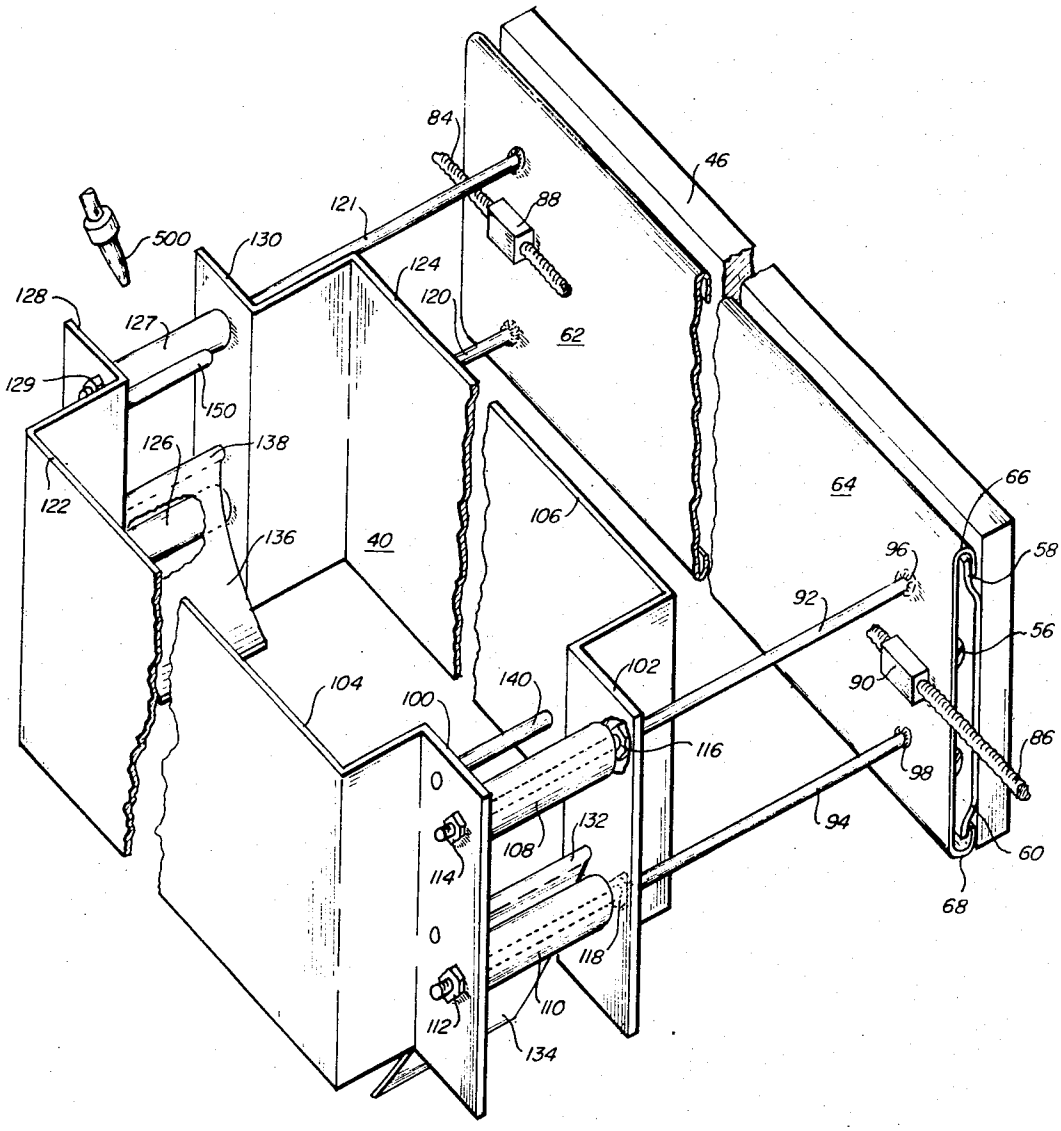

FIG. 7

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BOTTLE ORIENTOR

Various devices for orienting bottles are well known; however, with the advent of great quantities of plastic bottles, particularly plastic bottles of small or medium dimensions, the rapid orientation of these bottles with their openings upright has proved to be a problem because of the extreme light weight of the bottles and the rapid operation of the bottling machines.

This invention is directed toward a bottle orienting device in which bottles with their necks disposed in either of two directions with their longitudinal axis horizontal are oriented with their longitudinal axis vertical and with their bottle opening or necks disposed upwardly.

One object of the invention is to provide such a bottle orienting device which insures the positive orienting of such bottles at a rapid rate.

Another of the objects of the invention is to overcome the sometimes erratic performance of previous devices which when used on light weight plastic bottles often require one or more attendants to correct mistakes made by the orientor.

These and other objects of the invention will be apparent to those skilled in the art from the following description and drawings in which:

FIG. 1 is a perspective view of the device with portions broken away,

FIG. 2 is a side elevation taken generally along the line 2—2 of FIG. 1,

FIG. 3 is an enlarged view of the chute taken along line 3—3 of FIG. 2,

FIG. 4 is an enlarged view of a portion of the receiving turntable,

FIG. 5 is a partly schematic view of the upper end of the chute taken from one side,

FIG. 6 is a view taken along the line 6—6 of FIG. 5, and

FIG. 7 is an enlarged view in perspective of the chute.

As shown in FIG. 1, the device comprises a base frame 10 supporting on two of its cross-braces 12 and 14 a prime mover such as the electric motor 16. The motor 16 drives a pulley 18 connected by the belt 20 to the pulley 22 fixed to the main drive shaft 24. The motor 16 drives the pulleys and belts in a direction indicated by the arrows 26 and 28 in FIGS. 1 and 2. The operation of the motor through the main drive shaft 24 operates the turntable 30 in the direction indicated by the arrow 32. This is accomplished by means of a pair of beveled gears 34 and 36 in mesh with each other and fixed respectively to the shaft 24 and the shaft 38. The table 30 is suitably supported by the central shaft 38 mounted in bearings (not shown). The table 30 is arranged to receive oriented bottles from the bottom of a chute generally indicated at 40 in a manner more fully described hereinafter.

As best shown in FIG. 2, the upper portion 42 of the frame 10 supports a flat vertical member 44 extending upwardly from the base 10 adjacent to the periphery of the rotary table 30. Mounted to the vertical member 44 is a sub-frame 46. The sub-frame 46 supports the chute 40 and is adjustable vertically with respect to the fixed frame member 44 by means of bolts 48, 48'. The bolts 48, 48' pass through slots 50, 50' respectively in the sub-frame 46 and into tapped holes in the frame member 44, thus permitting the vertical adjustment of the sub-frame 46 with respect to the frame 44 and the table 30. In this way bottles of different heights may be accomodated, so long as bottles of different heights are not intermixed in any particular operation with the single adjustment of the sub-frame 46 with respect to the table 30 and the frame member 44. That is to say that the sub-frame 46 can be adjusted for any height. In FIG. 2 certain upper portions of the chute members, hereinafter described, are broken away for clarity and in order to show a dropping bottle B.

As shown in FIGS. 3 and 7 the sub-frame 46 supports a guide support 52 the guide and support 52 is generally flat in the area indicated by the numeral 54 and is secured by any suitable means to the support 46 as, for example, by means of screws 56. At its upper end the guide support 52 has a flange 58 extending nearly the width of the sub-frame 46 and forming therewith a generally "U" shaped channel opening upwardly. On its lower edge the sheet metal strip 52 which serves as a guide support for the chute has a flange 60 forming with the sub-frame 46 a downwardly opening "U" channel 60.

Two sliding members 62 and 64 are arranged to embrace the flanges 58 and 60. As shown in FIG. 3, the embracing members 62 and 64 are arranged left and right with each of the same arranged to embrace the flanges 58 and 60. The member 64, for example, is shown in FIG. 7 as having an downwardly directed "U" shaped upper edge 66 embracing the flange 58 and the lower edge of the member 64 has an upwardly extending "U" shaped edge 68 embracing the flange 60. The member 62 is similarly shaped to embrace the flanges 58 and 60.

The members 62 and 64 support respectively the left and right halfs (lower and upper as viewed in FIG. 3) of the chute 40 as more fully described hereinafter. Since the bottles may be of different heights, the members 62 and 64 are arranged for adjustment toward and away from each other by means of a pair of cranks 70 and 72 which pass rotatably through support members 74 and 76 respectively (see FIGS. 2 and 1 respectively). The members 74 and 76 are fixed on the left and right sides respectively (as viewed in FIG. 1) of the sub-frame 46. The shafts 80 and 82 respectively have threaded end portions 84 and 86 passing through nuts 88 and 90 fixed respectively to the sliding supports 62 and 64. Thus, by rotating either or both of the cranks 70 and 72 the sliding supports 62 and 64 may be moved toward and away from each other. Fixed to the sliding support plate 64, as shown in FIG. 7, are two vertically spaced threaded rods 92 and 94. These threaded rods 92 and 94 are fixed to the plate 64, for example, by welding as shown at 96 and 98 respectively. The outer ends of the rods 92 and 94 pass through openings in two metal flanges 100 and 102 of two metal chute members 104 and 106 respectively. The complimentary chute members 104 and 106 comprise one-half of the chute 40 and have their respective flanges 100 and 102 spaced apart along the threaded members 92 and 94 by means of the cylindrical spacer members 108 and 110. The flanges 100 and 102 are clamped tightly against spacer members 108 and 110 by means of threaded nuts 112, 114, 116, and 118 on the threaded rods 92 and 94. The nuts 114, 116, for example, clamp the spacer 108 between the flanges 100, 102 on the threaded rod 92. Similarly, the nuts 112, 118 tightly embrace the flanges 100 and 102 therebetween with the spacer 110 between the flanges 100, 102.

On the other side of the chute a similar set of rods **120, 121** support complimentary chute members **122, 124.** The arrangement is essentially identical to that above described for the opposite side of the chute and includes spacers **126, 127** clamped between the flanges **128, 130** respectively of the chute members **122, 124** by means of nuts such as nuts **129, 131** on rod **120.**

It will be seen that the cooperating chute members **104, 106** and the complimentary pair of cooperating chute members **122, 124** comprise a substantially rectangular chute **40** which may be adjusted in a number of ways to accomodate bottles of various shapes and dimensions. As mentioned above, operation of the crank **70** will move the chute half comprised of the chute members **122, 124** toward or away from the chute half comprised of the chute members **104, 106,** which in turn may be moved toward or away from the first half (the chute members **122, 124**) by means of the crank **72.** This adjustment adapts the chute **40** to bottles of various thicknesses the spacer blocks **108, 110, 126, 127** may be replaced with blocks of greater or lesser width by removing the appropriate nuts on the supporting rods **92, 94, 120,** and **121.** The spacer blocks may then be replaced with blocks of selected size and the nuts replaced.

Additionally, in order to insure that the lower end of the chute **40** aligns properly with the cups **132** in the table **30,** the entire chute **40** may be adjusted forward and backward with respect to the sub-frame member **46** by means of the nuts on the threaded rods **92, 94, 120, 121.**

Also mounted between the flanges **100, 102** of the guide chute members **104, 106** on a bolt **132** is a downwardly and inwardly extending light sheet metal guide strip **134.** On the opposite side of the chute **40** a complimentary guide strip **136** extends downwardly and inwardly from its mounting bolt **138** extending between the flanges **128, 130** respectively of the guide chute members **122, 124.** The flanges **128, 130, 100** and **102** define bottle neck-receiving slots in the fore and aft ends of the chute.

Above the guide strips **134, 136** are tripper mechanisms for engagement with the neck of a bottle. As shown in FIG. **6** these trippers or obstructions comprise rods, or bolts, **140, 150** extending inwardly toward the flanges **102, 130** respectively from the flanges **100, 128.** These trippers **140, 150** may, if desired, extend the full width of the space between the flanges, but for simplicity it is preferred that they extend only approximately three quarters or more of the way across the space between the flanges. It is only necessary that the trippers **140, 150** extend beyond the center of the distance between the flanges **100, 102,** and **128, 130** in whatever position (or width of bottle) the flanges **100, 102,** and **128, 130** are arranged with respect to each other by means of the spacer blocks.

Also mounted from the sub-frame **46** above the chute **40** is a horizontal shaft **152** supporting two star wheels **154, 156.** These star wheels **154, 156** are arranged to receive in their respective pockets **158, 162** plastic bottles **160** fed to the star wheel from a chute **164.** The shaft **152** also carries on one end thereof a sprocket **166** fixed thereto and engaged by a chain **170.** The chain **170** is also trained about a sprocket **168** mounted on a suitable stub shaft **172** in turn supported from a suitable portion **174** of the sub-frame **46.**

The chain **170** is also trained inside a sprocket **176** fixed to a shaft **178** which is journaled in two portions **180, 182** of the sub-frame **46.** A star wheel or rotor of triangular shape **190** is fixed intermediate the ends of the shaft **178** to rotate within the chute **40** between the inner ends of the chute members **104, 122.** This serves to time the drop of the bottles onto the rotary table beneath, as more fully disclosed below.

The chain **170** is also trained about a sprocket **192** fixed to the main drive shaft **24.** The chain **170** also passes through a chain tightening mechanism comprising a stub shaft **194** suitably mounted in the base frame segment **44** and having thereon the sprocket **196.** Rotatable about the shaft **194** is a wheel supporting member **198** which is pulled counterclockwise (in FIG. **2**) about the shaft **194** by means of a spring **200** attached at one end to the frame member **44** and at the other end to a bar **202** extending outwardly from the pivoted member **198.** At its upper end the pivoted member **198** rotatably supports a wheel **204** which bears against the inner side of the chain **170** to tighten the same under the urging of the spring **200.** It will be seen that despite the numerous adjustments made or possible in the device, adequate slack is provided in the chain **170** such that all sprockets are constantly engaged and operating by virtue of the chain tightening mechanism just described.

As shown in FIG. **4** the rotating table **30** has an upper level **400** and lower level **402** about its periphery. The lower level **402** is aligned beneath the outlet of the chute **40.** Pivoted at a plurality of points **404** to the upper level **400** are a plurality of spring urged paddles **408** which are urged by springs **410** attached to the rearward ends **412** of the paddles **408** and also afixed at **414** to the top surface **400** of the table **30.** As the table **30** moves the outer ends of paddles **408** come into contact with a fixed cam **416** attached to an arcuate fence **417** which is fixed to a suitable portion of the fixed frame **44** (see FIG. **2**). This causes the paddles **408** to swing backwardly one at a time against the urging of the springs **410** just as the preceding pocket **132** comes beneath the outlet of the chute **40.** This slightly enlarges the pocket **132** just prior to receiving the bottle. After having passed beneath the chute **40** the paddles **408** will pass by the stationary cam **416** and, under the urging of the springs **410** will spring back into place firmly holding the bottles in upright position in pockets **132.** Suitable mechanism, shown only schematically in FIG. **1** may be provided for removing the bottles from the turntable.

It has been found that while the device works to orient well in excess of 100 bottles per minute depending upon the speed of the machine, in the range much above about 150 per minute, the bottles do not fall through the chute **40** fast enough to keep up with the speed of the machine. Accordingly, for higher speeds a compressed air jet **500** fed by a suitable air hose **502** from a source of compressed air (not shown) is provided above the chute **40** and blowing downwardly through the chute **40** generally in the center thereof to speed the bottles downwardly in their gravitational fall. With the use of such compressed air, the machine speed may be doubled or even tripled over that without the use of the same.

OPERATION OF THE DEVICE

In operation bottles, preferably of plastic, are fed to

the device down the feed chute **164** (see FIG. **5**). It will be noted that the bottles have already been oriented with their longitudinal axes horizontal but that the neck or opening **206** in the bottles **160** may face in either of two directions (toward or away from the viewer in FIG. **5**). The motor **16** is operated to drive the pulley **18** which in turn drives the belt **20**, pulley **22** and main drive shaft **24**. The main drive shaft **24** will rotate the rotary table **30** in the direction of the arrow **32** and will also move the chain **170** in the direction of the arrow **208**. This will cause the shaft **152** to rotate moving the star wheels **154, 156** in the direction of the arrow **210**. The pair of star wheels **154, 156** cooperate to pick up a bottle in their cooperating pockets **158, 162**, and rotate the bottle clockwise about the shaft **152** as viewed in FIG. **5**. The bottle will then be dropped down the chute **40** by gravity. The chute **40**, of course has been so adjusted that the distance "A" shown in FIG. **6** is only slightly greater than the distance from the shoulder **161** to the bottom **163** of the bottle. The star wheels **154, 156** are aligned with this dimension of the chute and, accordingly, the neck **206** of the bottle will extend laterally outwardly in the space between the flanges **100, 102** or the space between flanges **128, 130** depending upon which way the bottle was fed by the chute **164**. As the bottle **160** drops by gravity its neck **206** will strike either the tripper mechanism **114** or the tripper **150** permitting the bottom portion of the bottle to swing downwardly in the chute and precede the neck down the chute. In this way the bottle will be oriented with its neck opening upwardly.

As the bottle proceeds down the chute it is guided toward the center by means of the flexible guide strips **134, 136** which may, if desired, be adjustable toward each other at their bottoms by any suitable mechanism, not shown. As the bottle proceeds down the chute **40** its bottom will strike one of the inwardly projecting points of the triangular spacing timer **190** which is provided in order to more accurately time the drop of the bottle into the receiving pockets **132** of the rotary table **30**. As the spacer triangle **190** is rotated by the chain **170** it will permit the bottle to make the remainder of the downward drop into the pockets **132** of the rotating table **30**.

I claim:

1. A bottle orientor for orienting plastic bottles having a bottom end and an opposite neck end adjacent the shoulder of the bottle therein comprising means for dropping individual bottles downwardly with said neck end disposed initially laterally of the direction of drop, a chute confining said bottles during the drop, the chute having opposite fore and aft ends to confront and guide the bottom end of the bottle and the shoulder of the bottle, and each of the fore and aft ends of the chute having an upright neck-receiving slot oriented upright to receive and pass the neck end of the bottle downwardly, a pair of stationary obstructions, each disposed in a respective neck-receiving slot and engaging the neck only of the dropping bottle to retard the neck of the bottle during the drop thus to permit the bottom end of the bottle to precede the neck end downwardly through the chute, and means beneath the chute to receive the individual oriented bottles bottom end down.

2. The device of claim **1** including an air nozzle above the chute and directing air downwardly through the chute and medially between the fore and aft ends of the chute for aiding in the moving said bottles downwardly.

3. The device of claim **2** in which said receiving means includes a plurality of moving pockets, and means for timing the drop of individual bottles into said pockets.

4. A high speed bottle orientor for orienting light weight plastic bottles having a bottom end and an opposite neck end adjacent the shoulder of the bottle comprising an upright chute having a top end with an open interior conforming approximately to the size and shape of the bottles and to receive the bottle in horizontal position and pass the bottle downwardly, the chute having means disposed in the path of the bottles for engaging the neck only of dropping bottles to retard the neck of the bottle during the drop to permit the bottom end of the bottle to precede the neck end downwardly, means beneath the chute to receive the individual oriented bottles bottom end down, means supplying bottles in substantially horizontal position to the top of the chute and including a ramp over which the bottles are passed and directed toward the upper end of the chute, and a pair of rotary driven star wheels turning on a horizontal axis and disposed between said ramp and the upper end of the chute, said star wheels being spaced from each other and having bottle receiving compartments spaced about the periphery thereof and revolving adjacent the ramp to receive bottles therefrom and to deliver the bottles into the upper end of the chute, the star wheels successively lifting the bottles from the ramp and thereafter dropping the bottles into the chute for orienting.

5. A bottle orientor for orienting light weight plastic bottles having a bottom end and an opposite neck end adjacent the shoulder of the bottle comprising means for dropping individual bottles downwardly with said neck end disposed initially laterally of the direction of drop, a chute receiving and confining the bottles during the drop, the chute having opposite fore and aft ends to confront and guide the ends of the bottle, means disposed in the path of the bottles for engaging the neck only of dropping bottles to retard the neck of the bottle during the drop, thus permitting the bottom end to precede the neck end downwardly through the chute, the chute also having opposite sidewalls extending between said fore and aft ends, one of said sidewalls having an upright opening therethrough adjacent the bottom of the chute, a generally triangular plate-like rotor extending through the opening in the wall and into the chute and lying substantially transversely of the wall and in an upright position, means mounting the triangular rotor for rotation on a horizontal axis at the exterior of the chute so as to successively revolve the corners of the triangular rotor into and out of the chute, the triangular rotor sequentially obstructing and clearing the interior of the chute so as to temporarily hold and then release for dropping the plastic bottles as they fall in upright position after having been oriented with the bottom end down and means beneath the chute to receive the individually oriented bottles bottom end down.

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