United States Patent

Nalbach

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[45] **Mar. 21, 1972**

[54] ARTICLE-ORIENTING APPARATUS

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[52] **U.S. Cl.** ..... **198/33 AA**
[51] **Int. Cl.** **B65g 47/24**
[58] **Field of Search** ..... 198/33 AA, 232; 221/169, 156

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Primary Examiner—Edward A. Sroka
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[57] **ABSTRACT**

An apparatus for orienting and feeding lightweight articles, such as, empty plastic bottles. The apparatus includes a hopper for receiving and holding plastic bottles. The floor of the hopper is defined by a stationary cover which is spaced from the hopper's side wall to allow a bottle to be positioned between the side wall and the cover. A rotary drum having its axis of rotation offset from the vertical is positioned below the cover and extends beyond the periphery of the cover to the side wall of the hopper. The rotary drum has a plurality of chutes fixed thereon. Each chute has a portion movably positioned between the edge of the cover and the hopper side wall for receiving bottles. Since the axis of rotation of the drum is offset from the vertical, the chutes carry bottles from a lower portion of the hopper to an upper point, where each bottle falls down its respective chute onto a shelf. The chutes move the respective bottles along the shelf until the bottles come to the end of the shelf and the bottles drop to a second shelf. The chutes move the bottles along the second shelf until the bottles come to the end of the second shelf, when the bottles transfer onto a moving conveyor. The conveyor and the drum move at a speed such that the speed of the bottle is not changed when it is deposited on the conveyor.

21 Claims, 16 Drawing Figures

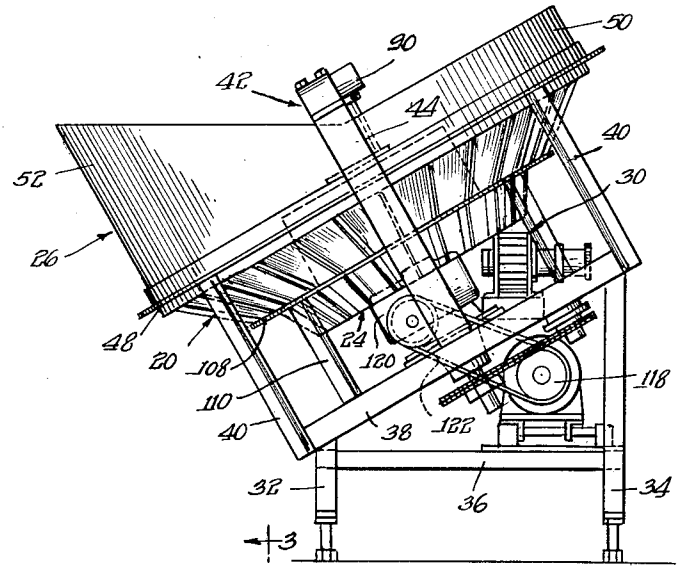

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Fig. 1.

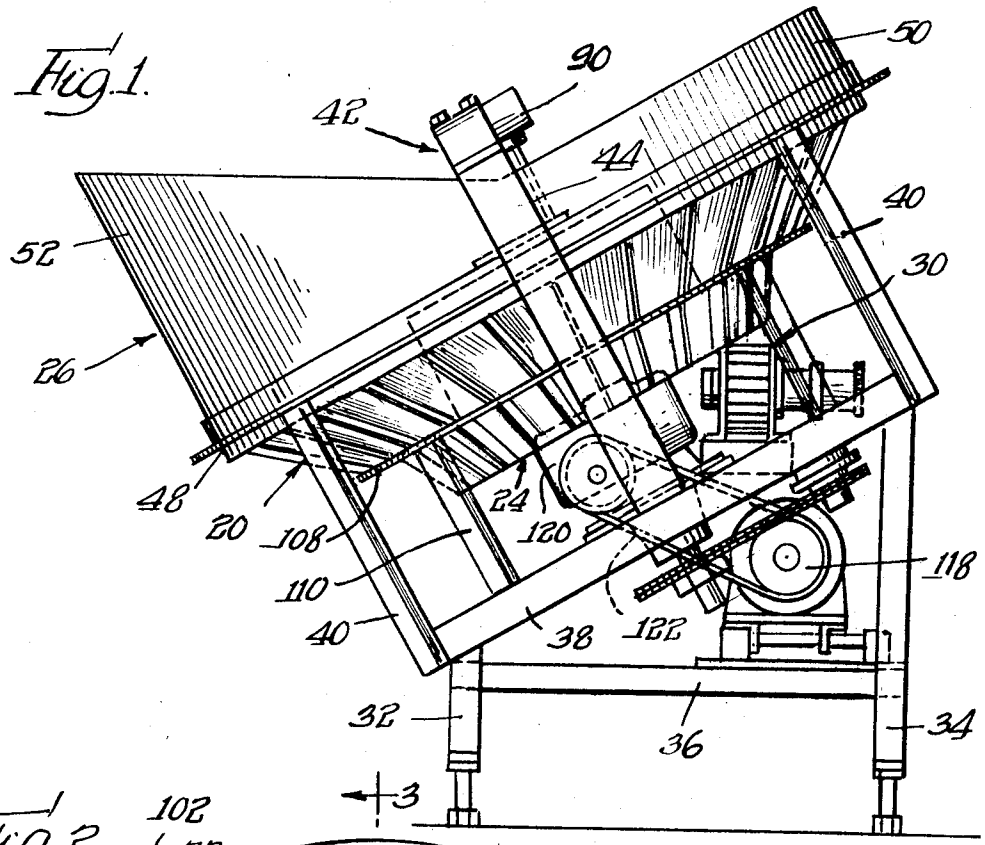
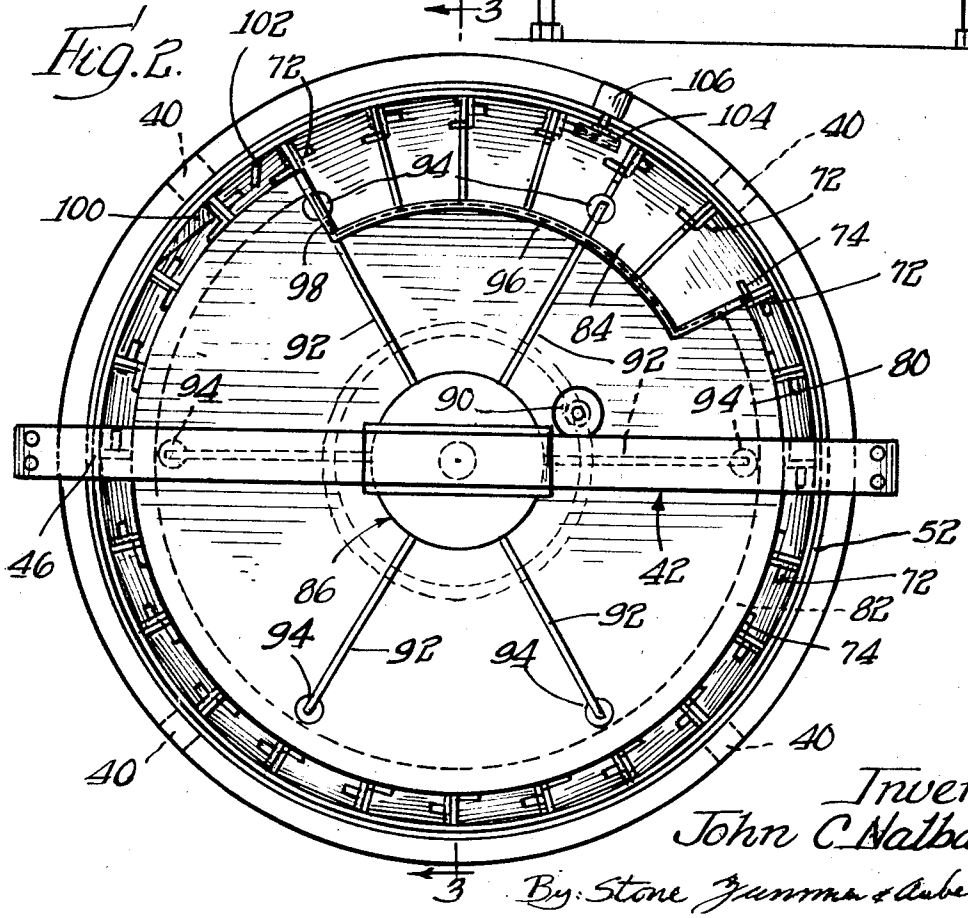


Fig. 2.



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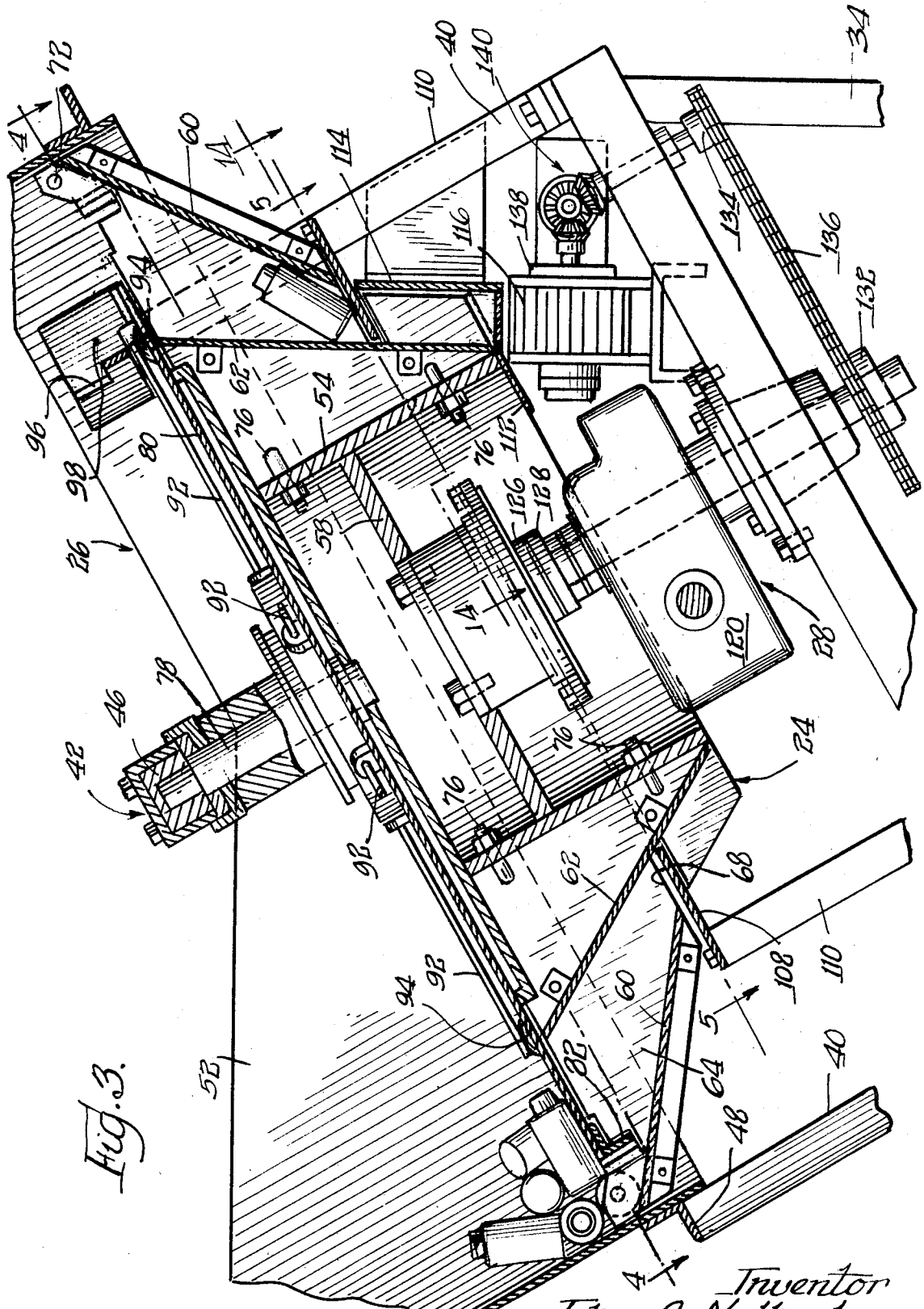

Fig. 3.

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Fig. 4.

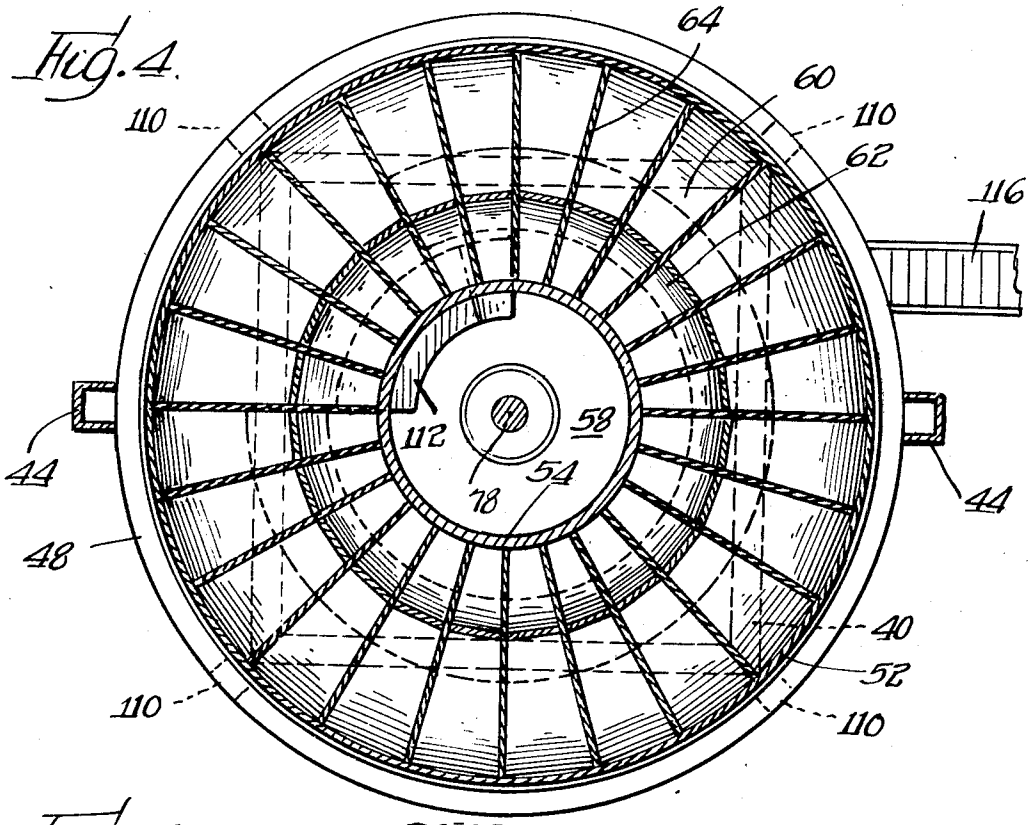

Fig. 5.

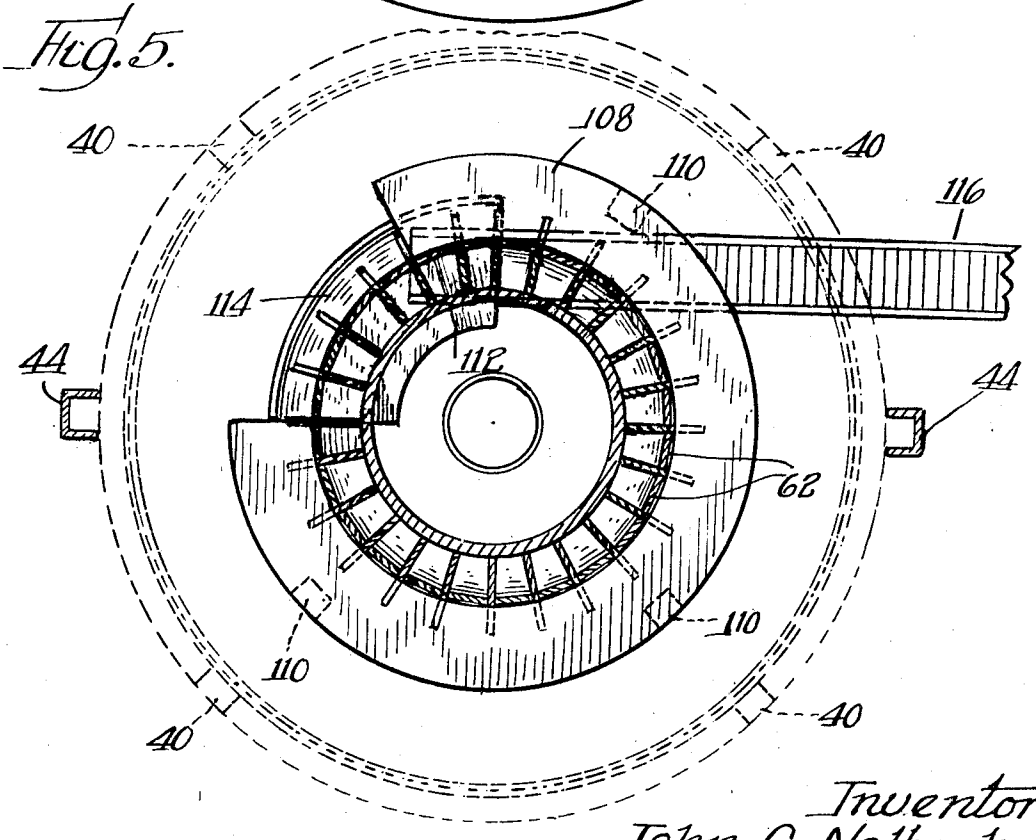

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Fig. 6.

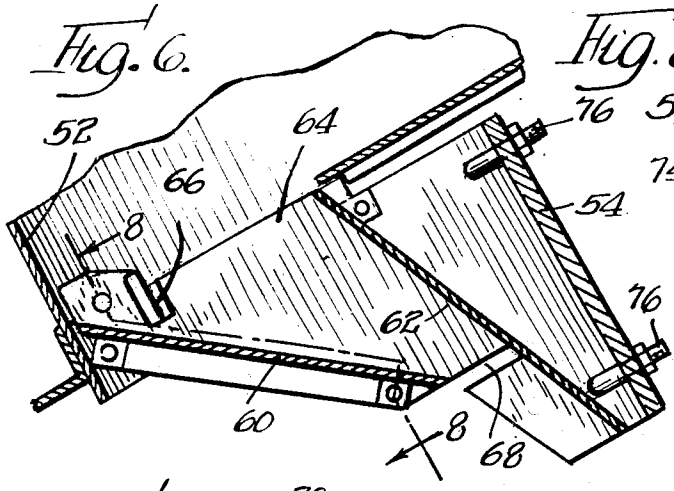

Fig. 8.

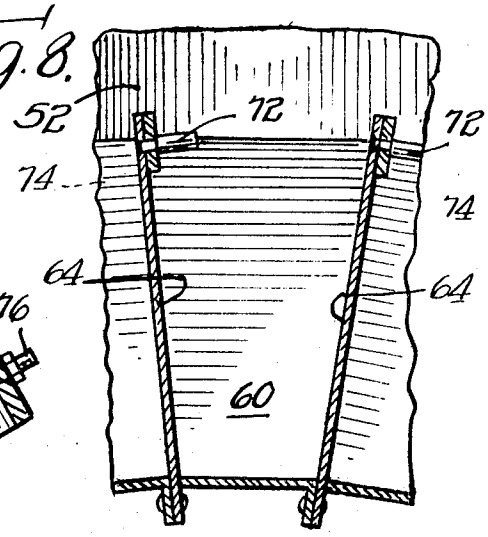

Fig. 7.

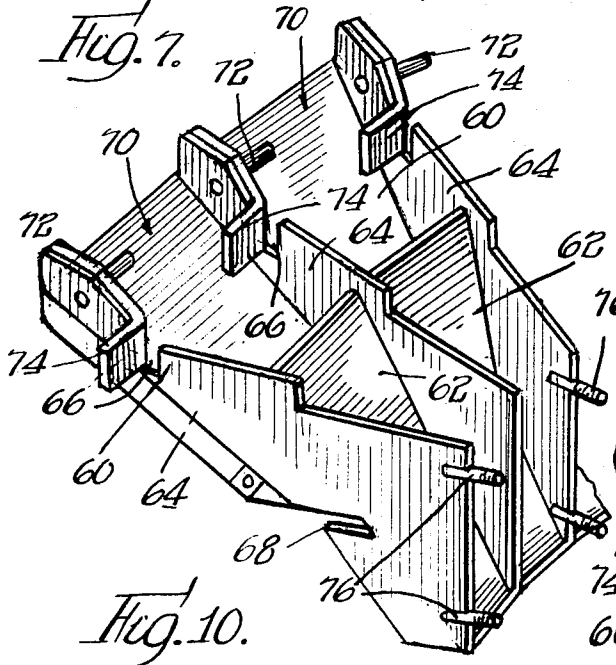

Fig. 9.

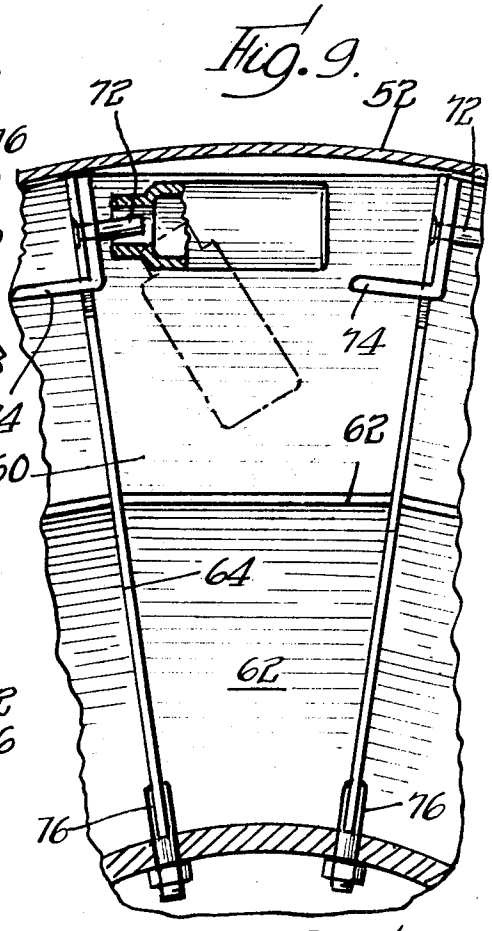

Fig. 10.

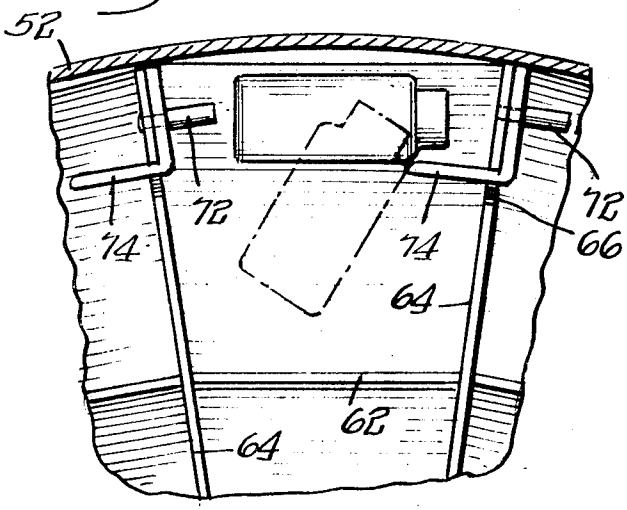

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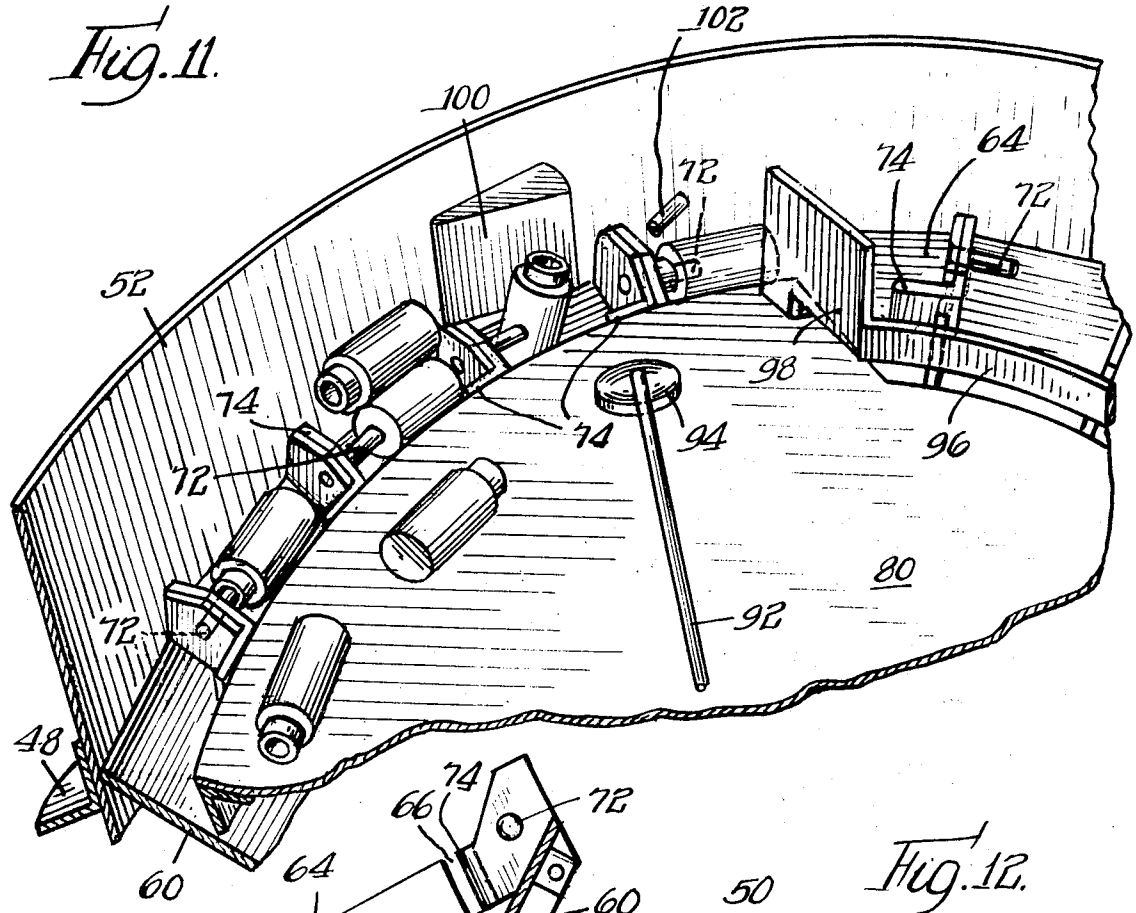
Fig. 11.



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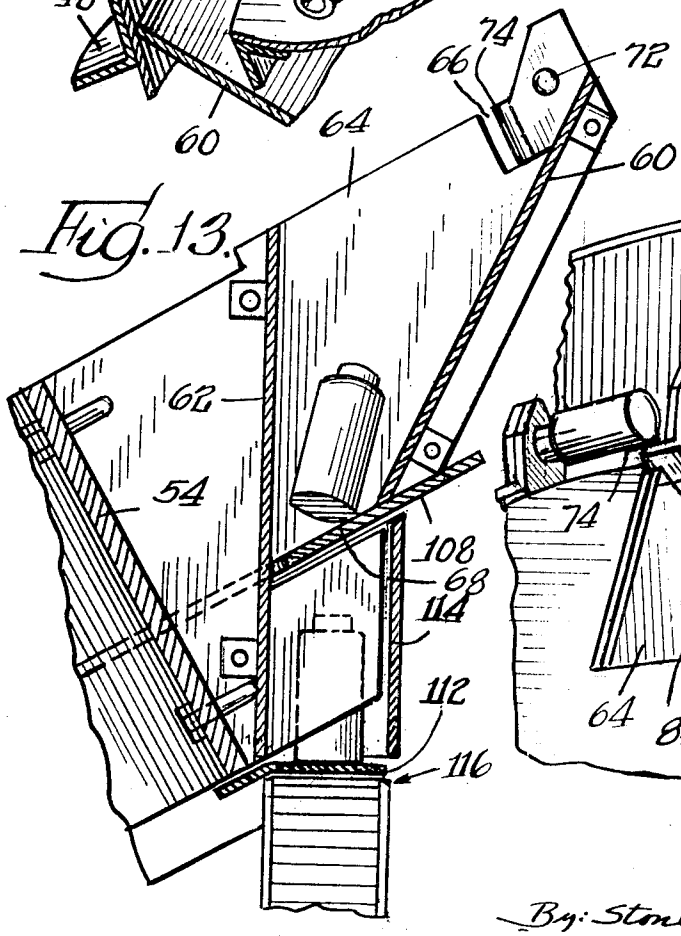

Fig. 12.

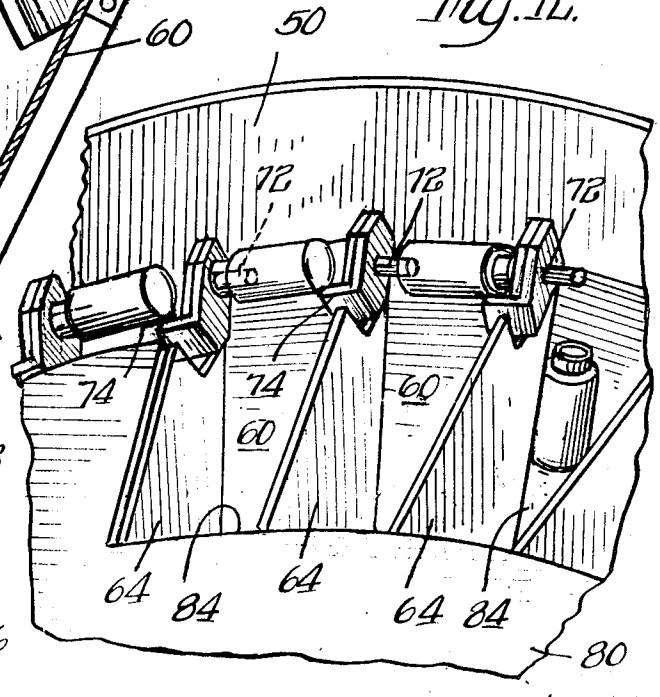

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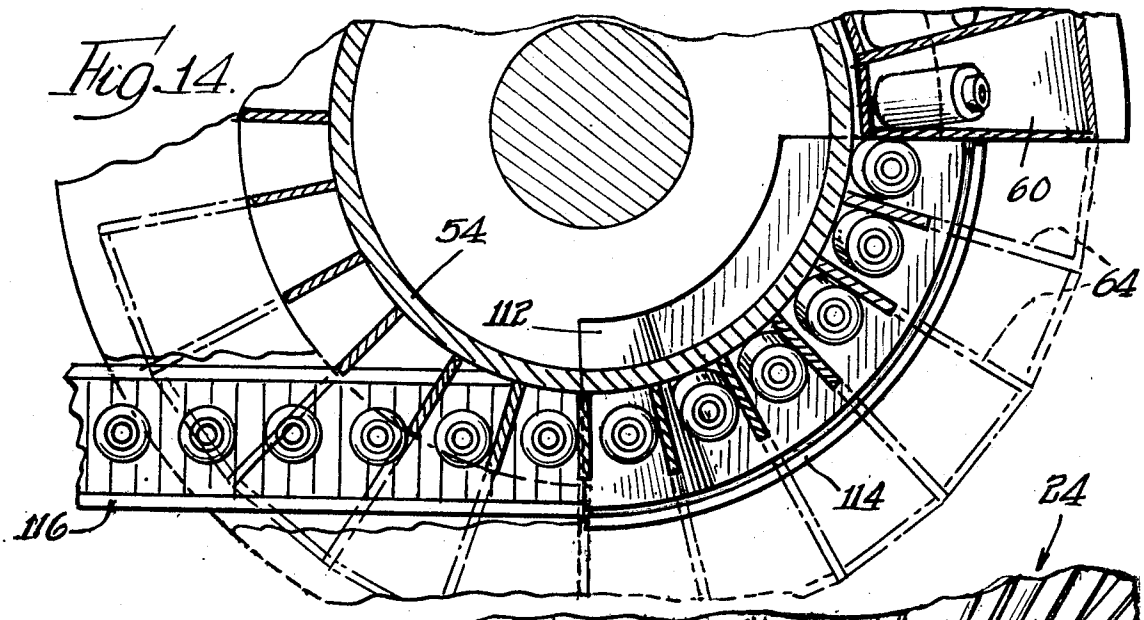
Fig. 14.



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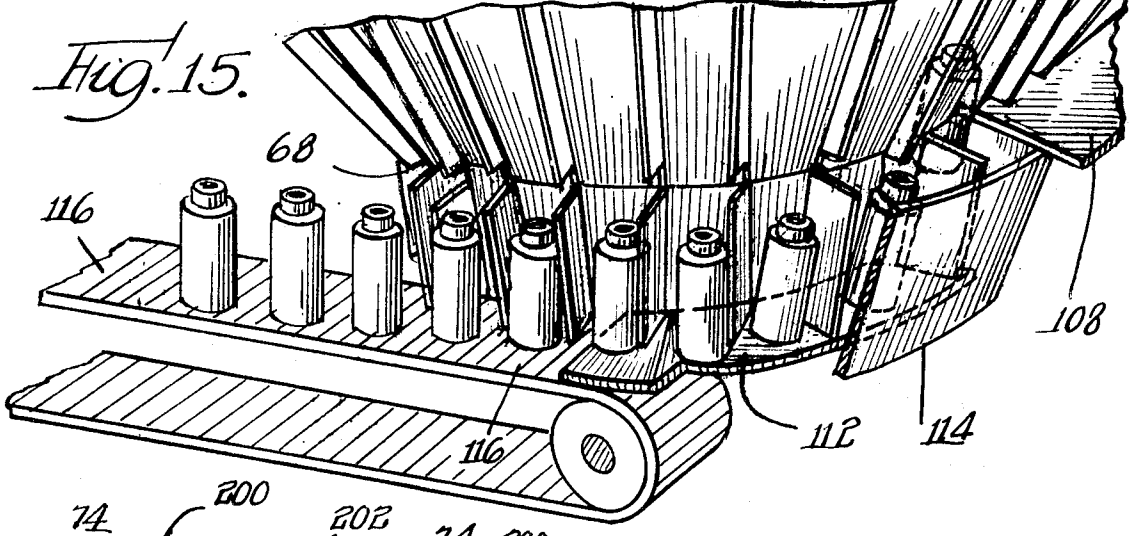
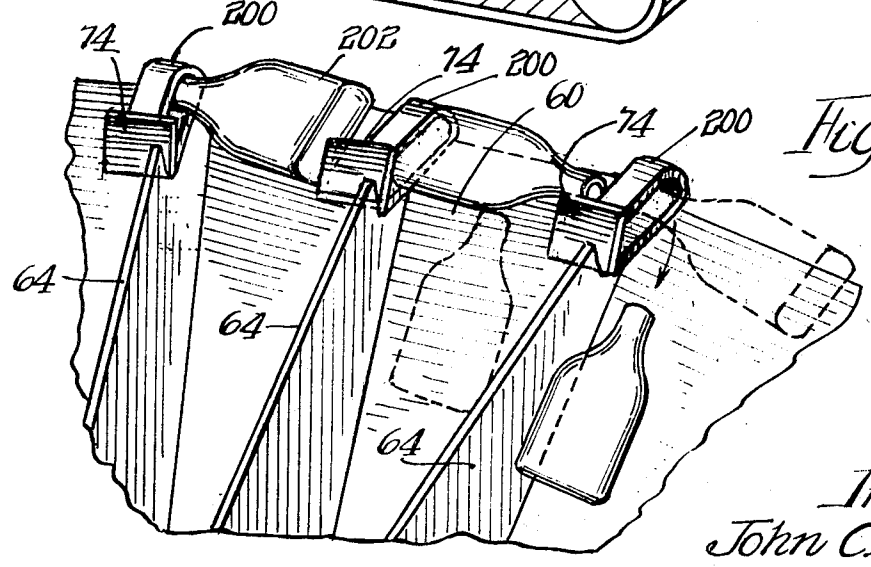


Fig. 16.



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ARTICLE-ORIENTING APPARATUS

BACKGROUND OF THE INVENTION

The use of plastic bottles in packaging has increased substantially since the plastic bottles weigh less and are less expensive than glass bottles. The use of automatic filling equipment for glass bottles has reached a high state of development in that a particular piece of equipment may fill and cap large quantities of bottles in a relatively short span of time.

One of the reasons that plastic bottles are less expensive than glass bottles is that plastic bottles may be handled much easier. For instance, a given plastic bottle may be made on a multi-cavity mold, which is part of an injection molding machine. The completed plastic bottles receive minimum handling in that the plastic bottles may be placed into a container in a random arrangement and are ready for shipment.

It may be appreciated that glass bottles are ordinarily packed in a cardboard container with cardboard separators between the bottles. The empty glass bottles are delivered to the customer, who unpacks the glass bottles and fills them. The glass bottles may be handled quite easily because the glass bottles are all pointed in one direction. It is necessary only to remove the glass bottles and place them on the filling equipment since the glass bottles are properly oriented. As was pointed out above, the plastic bottles are not oriented inasmuch as it is not necessary for them to be packed in a container having separators. The plastic bottles must be oriented properly for the bottles to be filled by automatic filling equipment.

SUMMARY OF THE INVENTION

The present invention provides an improved apparatus for orienting lightweight articles, such as, empty plastic bottles. The apparatus generally includes a large hopper which is particularly adapted to receive randomly arranged empty plastic bottles. A generally circular cover forms the floor of the hopper, but the cover is spaced from the side walls of the hopper. A plurality of movable chutes is positioned along the periphery of the cover. Each of the chutes has a portion positioned between the cover and the side wall. A plastic bottle cannot drop down its respective chute except at a specific location. The plastic bottles are carried in pockets of the chutes from the bottom of the hopper to an upper portion of the hopper before the bottles drop down their respective chutes. The bottles in the chutes fall onto a shelf in an upright attitude. The chutes move the bottles along the shelf until the bottles reach the end of the shelf and drop down to a second shelf. Then the bottles are moved along the second shelf by the chutes until they come to the end of the second shelf and they are deposited upon a longitudinal conveyor.

It is a principal object of this invention to provide an improved plastic bottle orienting apparatus which may readily and conveniently orient empty plastic bottles.

It is another object of the present invention to provide an improved lightweight article-orienting device which operates automatically and continuously.

It is still another object of the herein-disclosed invention to provide an improved lightweight article-orienting device which is inexpensive to manufacture and easy to maintain.

Other objects and uses of the present invention will become readily apparent to those skilled in the art upon a perusal of the following specification in light of the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of an article-orienting apparatus embodying the herein-disclosed invention;

FIG. 2 is a plan view of the hopper of the article-orienting apparatus shown in FIG. 1;

FIG. 3 is an enlarged cross-sectional view of a portion of the apparatus shown in FIG. 2, taken on Line 3—3 of FIG. 2;

FIG. 4 is a cross-sectional view taken on Line 4—4 of FIG. 3;

FIG. 5 is a cross-sectional view taken on line 5—5 of FIG. 3;

FIG. 6 is a side elevational view of one of the chutes of the apparatus shown in FIG. 1;

FIG. 7 is a perspective view of a pair of chutes which constitute a portion of the drum, which drum is part of the apparatus shown in FIG. 1;

FIG. 8 is a cross-sectional view taken on Line 8—8 of FIG. 6, showing a portion of one of the chutes;

FIG. 9 is a plan view of a portion of one chute, showing a plastic bottle about to drop down the chute and showing the plastic bottle partially broken away in order to show the stud of one of the chutes positioned in the mouth of the bottle to effect a turning of the bottle in the proper direction;

FIG. 10 is a figure similar to FIG. 9, but showing a plastic bottle in an attitude wherein the neck of the bottle is positioned in engagement with a stop;

FIG. 11 is an enlarged fragmentary perspective view of a portion of the apparatus shown in FIG. 1, showing plastic bottles being carried toward a recess in the cover;

FIG. 12 is a perspective view showing plastic bottles dropping down the chute;

FIG. 13 is a cross-sectional view showing the interior of the chute and showing a plastic bottle dropping to a first shelf;

FIG. 14 is a cross-sectional view taken on Line 14—14 of FIG. 3, also showing the conveyor;

FIG. 15 is a perspective view of a portion of a drum and parts of a conveyor with parts broken away, showing the plastic bottles dropping onto a second shelf and then being carried by the chute walls to a conveyor; and

FIG. 16 shows a modified construction of a portion of the chute, showing an apparatus for aligning containers having narrow necks.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, and especially to FIG. 1, a plastic bottle feeder generally indicated by numeral 20 is shown therein. The feeder generally includes a stationary frame 22, a drum 24 rotatably mounted on the frame, a hopper 26 mounted on the frame above the drum, and a drive 28 mounted on the frame and connected to the drum for rotating the drum. A longitudinal conveyor 30 is drivingly connected to the drive 28 and moves at a speed which is synchronized to the speed of rotation of the drum.

The frame 22 is conventional in its construction, and the frame includes a pair of legs 32 and a pair of longer legs 34. The legs are interconnected by conventional cross-braces 36. An upper frame 38 is mounted on the upper ends of legs 32 and 34. Since the pairs of legs are of different lengths, the upper frame is inclined at a 30° C. angle relative to the horizontal. The upper frame includes a plurality of posts 40 which support the hopper 26. A bridge 42 is connected to the frame 38 and is inclined from the vertical by an angle of 30°, as may be seen in FIG. 1. The bridge includes a pair of columns 44 which are fixed to frame 38 and are offset from the vertical. The columns 44 support a transverse support 46 which extends across and over the hopper 26.

The hopper 26 includes a circular frame 48 which is supported by the posts 40. Mounted on the frame 48 is a cylindrical side wall 50 which extends completely around the frame. The side wall 50 has a raised retainer wall 52 formed integral therewith, which provides a receptacle portion of the hopper. The retainer wall 52 is positioned on the lower side of the side wall 50 so that the receptacle portion is on the lower side of the hopper. When articles are placed in the hopper, they fall down to the lower portion of the hopper by gravity so that articles are kept in the receptacle portion.

Looking now to FIG. 3, which shows the drum in greater detail, it may be seen that the drum 24 includes a cylindrical frame 54 with a plurality of chutes 56 attached thereto. The cylindrical frame 54 is fixed to a drive plate 58, which is in turn connected to the drive 28. The drum is also inclined from the vertical, and its axis of rotation is offset 30° from the vertical.

The construction of the chutes which are mounted on the outside wall of the cylindrical frame **54** and form the outer periphery of the drum may be best seen in FIGS. **7**, **8** and **9**. Each chute has an outside wall **60** and an inside wall **62** between a pair of side walls **64**. Each side wall has a cover groove **66** formed therein for receipt of the cover and a shelf groove **68** in the lower portion. The cover groove **66** is spaced from the outer periphery of the chute a distance slightly greater than the width of the plastic bottles to be handled by the apparatus. Mounted on the upper portion of each of the chutes is a bottle aligner **70**. Each bottle aligner consists of a stud **72** extending from one side wall and a retainer wall **74** mounted on the opposite wall and extending toward the stud **72** for engagement with a bottle, as will be described hereinafter. The chutes are interconnected, since adjacent chutes have common side walls, to make a continuous cylindrical device. The interconnected chutes are secured to the cylindrical frame **54** by a plurality of threaded studs **76**. A pair of threaded studs **76** is fixed to alternate side walls and extend outward from the edge of the respective side wall. The studs **76** are positioned in apertures in the cylindrical frame **54** and are held thereto by conventional nuts. There are, in this instance, **24** chutes which constitute a part of the drum **24**.

A pedestal **78** is fixed to the center of the transverse support **46**. The pedestal **78** has its central axis aligned with the axis of rotation of the drum. A circular cover **80** is suspended from the pedestal and is positioned immediately above the drum. The diameter of the cover **80** is slightly less than the diameter of the hopper side wall to allow a portion of the chutes to be positioned between the cover and the side wall. The cover **80** has a frame **82** extending along a portion of its periphery and positioned in the cover groove **66** of the chutes. The frame **82** extends downward into the chutes to prevent bottles from going down the chutes at positions where the cover and frame **82** extend to the cover groove. The cover terminates at the cover groove **66** for a substantial portion of the cover **80**. The cover has a recessed portion **84** which extends over an arc of 90° of the cover periphery. Looking now to FIG. **2**, the position of the recessed portion **84** relative to the drum and frame is shown therein. As was mentioned above, the frame **38** is tilted 30° to the horizontal, thereby also tilting 30° to the horizontal the frame **48** of the hopper. Thus, there is one portion of the hopper which is higher than the remainder. Taking the highest portion of the hopper as a 12 o'clock position, the recessed portion **84** of the cover **80** commences 30° prior to the top or 12 o'clock position of the hopper and terminates 60° after the 12 o'clock position for a complete 90° arc. The recessed portion **84** extends radially inward to approximately the inside wall of the adjacent chute.

An agitator **86** is mounted on the pedestal **78** above the cover **80** to rotate immediately above the cover. The agitator includes a hub **88** mounted on the pedestal. The hub **88** is driven by an air motor **90** which is mounted on the transverse support **46** of the bridge. Extending radially outward from the hub **88** are six equally angularly spaced agitator arms **92**. Each arm has mounted on its free end a disc **94**, which provides a rounded end to each arm.

A retainer wall **96** is mounted on cover **80** and is positioned along the opening formed by the recessed portion **84**. The retainer wall **96** has a front deflector wall **98** fixed to the cover **80**, with one edge of the wall **98** coterminating with the edge of the cover. The retainer wall extends along the periphery of the recessed portion so that an object may not pass into the opening other than those objects which are carried by the chutes through the space between the front deflector wall and the side wall **50** of the hopper. A portion of the retainer wall is raised above the cover to allow the arms **92** of the agitator to pass under the retainer wall **96** where the retainer wall extends within the arc of rotation of the agitator.

Mounted on the side wall **50** and spaced away from the front deflector wall **98** in a counterclockwise direction is a plow **100**. The plow is spaced above the chutes but is engageable with the bottles which are loaded double or in a vertical attitude. Between the plow and the wall **98** is an air jet **102** which is connected to a source of air for blowing off misaligned containers. A brush **104** is mounted on the side wall **50** adjacent to the recessed portion of cover **80** and approximately 30° in a clockwise direction from the top or 12 o'clock position of the hopper, as may be seen in FIG. **2**. The brush **104** is rotated by an air motor **106** to disengage plastic bottles carried in the chutes which fail to fall so that they will fall down the respective chutes, as will be described hereinafter.

When the plastic bottles fall down their respective chutes, they fall onto a stationary first shelf **108** which is shown in FIG. **4**. The first shelf **108** is flat and defines a portion of an annulus in that it is complete except for a 60° opening. The first shelf is received in the shelf grooves **68** of the chute side walls **64**, and the shelf extends from a point 30° counterclockwise from the 12 o'clock position, or the top position of the hopper, and then around to a point 270° clockwise from the top position, as may be seen in FIG. **4**. The first shelf is supported by a plurality of shelf legs **110** which are fixed to the frame **38**. Though the first shelf is flat, it defines a plane which is inclined to the horizontal by 30°.

A second shelf **112** is positioned below the first shelf and immediately below the chutes. The second shelf forms a portion of an annulus but only a 90° arc, as may be seen in FIG. **5**. The second shelf extends from a point 90° counterclockwise from the top or 12 o'clock position of the hopper and extends to the 12 o'clock or top position. The second shelf is also flat, but, as was pointed out above, is positioned immediately below the chutes. It too defines a plane which is inclined to the horizontal by 30°. The centers for the first and second shelves are aligned with the axis of rotation of the drum.

A retainer wall **114** is fixed relative to the second shelf and curves around a portion of the drum with the second shelf and extends longitudinally along one side of the conveyor. The conveyor **30** is positioned below the highest portion of the second shelf. The conveyor **30** includes a belt **116** for carrying the plastic bottles in a longitudinal direction.

The source of power for both the drum and the conveyor **30** is the drive **28**. The drive **28** includes an electric motor **118** mounted on frame **22**. The motor **118** is connected to a speed reducer **120** through a belt **122**. The speed reducer has a double-ended output shaft **124**. The speed reducer **120** is mounted on the frame **38** so that the angle of the output shaft **124** is at 30° from the vertical and is aligned with the axis of rotation of drum **24**. Connected to the upper end of the output shaft **124** is a torque limit clutch **126**, which is connected to the drive plate **58** for rotating the drum. The clutch **126** includes a clutch plate **128**, below which is positioned a normally closed microswitch **130**. The microswitch **130** controls the current to motor **118**. If an undue load is placed on the drum, the clutch will disengage and allow the plate **128** to drop into engagement with the microswitch, thereby interrupting the flow of current to the motor **118** and stopping rotating of the drum and movement of the conveyor.

Mounted on the other end or lower end of the output shaft **124** is a drive sprocket **132**, which is connected to a sprocket **134** through a chain **136**. Adjustment idlers may be used in connection with this chain; however, these are not shown herein. The sprocket **134** is connected to a conveyor drive **138** through conventional shafts and gearing **140**. The drive of the drum and the drive of the conveyor are so arranged that the tangential speed of the lower portion of the chutes is substantially equal to the longitudinal speed of the conveyor belt. It may be appreciated that this is done by an appropriate selection of sprocket sizes and gearing.

The instant plastic bottle feeder **20** operates in the following manner. The electric motor **118** drives the double-ended output shaft **124** through the speed reducer **120**. The drum **24** is connected to the output shaft **124** and is rotated in a clockwise direction, as viewed in FIG. **2**. While the drum is rotated in a clockwise direction, the top of the conveyor belt is moved to the right, as viewed in FIG. **4**. As was mentioned above, the speed of the drum and the speed of the conveyor belt are

synchronized, that is, the tangential speed of the bottom portion of the drum, which moves over the second shelf, is equal to the longitudinal speed of the conveyor. While the electric motor **118** drives the drum and conveyor, the air motor **90** is energized to rotate the agitator arms **94** in a counterclockwise direction. The air motor **106** is also energized to rotate the brush **104**.

A plurality of randomly-arranged identical plastic bottles is deposited in the hopper **26** behind the retainer wall **52**. The plastic bottles remain in the lower portion of the hopper, and individual plastic bottles fall into each of the pockets defined by each chute and the edge of cover **80**, as shown in FIG. **11**. The agitator arms continue to rotate through the plastic bottles in order to move the plastic bottles relative to the pockets. It may be appreciated that if the plastic bottles were allowed to remain in a randomly arranged attitude, it would be possible for the bottles to bridge across the pockets, that is, no bottle would fall into the pockets, thereby preventing the pockets from becoming loaded and preventing bottles from being carried upward.

The plastic bottles falling into the pockets ordinarily fall with the mouth either extending in the direction of rotation or away from the direction of rotation. Inasmuch as the drum is rotating constantly in a clockwise direction, as a bottle falls into a pocket it is carried upward toward the recessed portion **84**. In the event that more than one bottle should be carried in a pocket, the extra bottle will be knocked out of the pocket by the plow **100**, which is positioned before the front deflector wall **98**. A stream of air from the air jet **102** also serves to align properly the plastic bottles. Any plastic bottles which are removed by the plow **100** or by the air stream fall back down to the bottom of the hopper by gravity.

The plastic bottles in the pockets are carried past the front deflector wall **98** and to the recessed portion of the cover **80**. The plastic bottles then may drop down the chute because the stationary frame of the cover no longer prevents the bottles from sliding down the chute. As the plastic bottles drop down the chute, they always drop down bottom first since each pocket contains a container aligner.

The container aligner includes the stud **72** and the retainer wall **74**, as mentioned above. When the plastic bottle reaches the recessed portion with the mouth of the bottle facing the stud **72**, as shown in FIG. **9**, the bottom portion of the bottle drops first because the bottom is not held by the retainer wall **74**, while the stud **72** remains in the mouth of the bottle until the bottle falls bottom first off the stud. On the other hand, if the bottle falls into the pocket with the mouth of the bottle behind the retainer wall **74**, as shown in FIG. **10**, it may be seen that the bottom of the bottle engages the stud **72**, and thus the stud holds the mouth of the bottle behind the retainer wall. Once the bottle enters the recessed portion, where it is no longer held in the pocket, the bottom of the bottle drops down first since the mouth of the bottle is retained by the retainer wall. In either event, the bottom of the bottle always goes down first.

In the event that should any of the bottles fail to fall by the time they reach the position wherein the brush **104** is located, the rotating brush brushes the bottle out of the pocket so that it will fall down its respective chute and not be carried back around for another trip through the other bottles.

When a bottle falls from its pocket, gravity carries it downward, and it slides along the outside wall **60** of its respective chute. The side wall **64** continues to push the bottle in a circle about the axis of rotation. The plastic bottle falls down until the bottom engages the first shelf **108**, which is received in the shelf slots **68** of the chutes. The bottle now slides along the first shelf, being urged along by the side wall **64**. The bottle then reaches the end of the first shelf, and the bottle drops down to the second shelf **112**, as shown in FIG. **14**.

When the bottle drops down to the second shelf, it is held in position by the side walls **64**, the inside wall **62** of the chute, and the retainer wall **114** inasmuch as the chute outside wall terminates just above the shelf groove **68**. The bottle then slides along the second shelf, being pushed by the side wall of the chute until the bottle reaches the end of the second shelf. Inasmuch as the second shelf extends below the first shelf at one position, it is possible for two plastic bottles to be in the same chute at the same time, one being held by the first shelf and the other by the second shelf. This condition can only exist for 30° of rotation of the drum. When the plastic bottle reaches the end of the second shelf, which is above the belt **116** of the conveyor, the plastic bottle slides off the second shelf onto the conveyor. This is a very critical transfer.

There are many forces tending to unbalance the bottle during the bottle's transfer from the second shelf to belt **116** of the conveyor. The plastic bottle leaves its circular motion with the drum and is changed to a linear motion with the conveyor. The inertia force due to rotation with the drum tends to tip the bottle over outwardly from the drum. There is also an inertia force of tending to tip the bottle forward. The plastic bottle is not moving in a flat plane. Rather, its plane of motion is 30° from the horizontal so the plastic bottle comes up and is in effect righted with the vertical if the bottle were viewed in a plane perpendicular to a radial line extending through the point where the transfer occurs. The side walls of the respective chute, the inner wall of the chute, and the retainer wall **114** cooperate with each other and the bottle to keep the bottle upright during transfer and immediately thereafter. All of the above-mentioned forces are acting on the bottle simultaneously during the bottle's transfer from the shelf to the belt. It is important to note that arrangement of the end of the second shelf in relation to the conveyor belt is such that there is no change in instant velocities when the bottle is transferred. When the bottle leaves the rotating drum, it leaves in a straight line tangentially of the circular path, and the straight line is the direction of movement of the conveyor. Since the speeds of the drum and conveyor are identical at the transfer point, there is no other upsetting force applied to the bottle. Once the bottle is deposited on the conveyor belt, which is moving at the same speed as the speed of the drum so that there is no effective change of speed of the bottle and the bottle is prevented from tipping immediately after the transfer, the bottle is in a stable upright attitude and is carried away from the drum by the belt.

The present device has a tendency to reduce the effect of inertia upon the bottles in view of the fact that a bottle starts out at a substantial distance from the center of the drum; and as it falls from the pocket to the first shelf and then from the first shelf to the second shelf, it keeps moving closer and closer to the center of the drum so that inertia has a smaller effect on the plastic bottle because the speed of movement of the bottle is constantly reduced.

Once the bottles are placed on the belt of the conveyor and are provided support during their initial stay on the conveyor to overcome all extraneous forces operating on the bottles, the bottles then are carried away from the sanctuary of the side walls of the chute and the retainer wall **114**. The conveyor then moves the plastic bottles to a location where they are handled further.

Although the plastic bottle feeder **20** has been described as one which is used for plastic bottles having wide mouths, it may be simply and easily adapted for plastic bottles having narrow mouths. FIG. **16** shows an arrangement of chutes having a container aligner which aligns narrow mouth bottles. All that need be done is to replace the pins **72** with receptacles **200**. Then narrow mouth bottles such as bottles **202** may be received in the pockets for delivery and proper orientation, that is, the bottles being discharged into the chutes with the bottoms down.

When the plastic bottle **202** is positioned in the pocket with the mouth of the bottle behind the retainer wall **74**, the bottom of the bottle engages the receptacle **200**. Thereby, the bottom of the bottle falls down first when it enters into the recessed portion of the cover. On the other hand, when the bottles are reversed so that the mouth of the bottles are in the receptacle, the bottom of the bottle does not lie behind the

retainer wall 74, and the bottom of the bottle falls down first. The remainder of the operation of the plastic bottle feeder is identical to that described above.

Although a specific embodiment of the herein-disclosed invention has been shown in the accompanying drawings and described in detail above, it is readily apparent that those skilled in the art may make various modifications and changes in the device described herein without departing from the spirit and scope of the present invention. It is to be expressly understood that the instant invention is limited only by the appended claims.

What is claimed is:

1. An apparatus for orienting lightweight articles comprising, a hopper for receiving and holding randomly-positioned articles, a rotatable drum positioned generally below the hopper, said drum having a plurality of chutes communicating with the hopper, said drum having its axis of rotation offset from the vertical, a stationary shelf positioned adjacent to the drum and cooperative with the chutes for retaining articles in the chutes for a prescribed arc of rotation of the drum, and a conveyor positioned adjacent to the drum for receiving articles from the chutes, said conveyor traveling at substantially the same speed as the chutes at the point where the articles are transferred from the chutes to the conveyor.

2. An apparatus for orienting lightweight articles as defined in claim 1, including a fixed cover mounted above the plurality of chutes to prevent articles from going down the chutes except at a selected position, said cover having an opening to allow articles to go down the respective chutes at a selected position.

3. An apparatus for orienting lightweight articles as defined in claim 2, including a plow fixedly mounted adjacent to the cover opening for removing excessive articles as the articles are carried toward the opening in the cover.

4. An apparatus for orienting lightweight articles as defined in claim 2, including a retainer fixedly connected relative to the cover and surrounding the opening in the cover to prevent articles from entering the chutes other than those carried by the chute.

5. An apparatus for orienting lightweight articles as defined in claim 2, including a bridge fixed relative to the hopper, said bridge supporting the fixed cover.

6. An apparatus for orienting lightweight articles as defined in claim 1, including a drive connected to the rotatable drum for rotating the chutes and a clutch connecting the drum with the drive, said clutch being disengageable when an excessive load is placed on the drum.

7. An apparatus for orienting lightweight articles as defined in claim 6 wherein the drive for driving the drum is also connected to the conveyor for moving the conveyor and the drum at a synchronized speed.

8. An apparatus for orienting lightweight articles as defined in claim 6, including a switch connected to the clutch for interrupting a source of power to the drive when the clutch is disengaged.

9. An apparatus for orienting lightweight articles as defined in claim 1, including a second shelf positioned below the chutes and below the first-mentioned shelf, said second shelf extending to the conveyor for supporting articles in the chutes being carried to the conveyor.

10. An apparatus for orienting lightweight articles as defined in claim 9 wherein each chute has a pair of side walls and an inner wall, each chute has an outer wall in that portion of the chute above the first shelf, each chute being open on its outer side below the first shelf.

11. An apparatus for orienting lightweight articles as defined in claim 1, including an article aligner mounted in each chute to orient all the articles in one direction when the articles go down the respective chutes.

12. An apparatus for orienting lightweight articles as defined in claim 1, including a plurality of rotating agitator arms positioned in the hopper to agitate the lightweight articles.

13. An apparatus for orienting plastic bottles comprising, a hopper having one side lower than the opposed side for holding a plurality of randomly-arranged plastic bottles, a rotatable drum having a plurality of chutes communicating with the hopper to receive the plastic bottles, said drum having its axis of rotation offset from the vertical, and a stationary cover positioned above the chutes, having its outer periphery defining a bottle-carrying pocket with each chute when the chute is positioned adjacent to the lower side of the hopper, said cover having a recess in the side adjacent to the higher side of the hopper to open the bottle-carrying pocket of each chute as the chute moves past the recess to allow a plastic bottle carried in the pocket to drop down the cute.

14. An apparatus for orienting plastic bottles as defined in claim 13, including, a stationary shelf positioned below the cover and extending below the recess in the cover, said stationary shelf cooperative with each chute to retain a plastic bottle in the chute in a selected attitude.

15. An apparatus for orienting plastic bottles as defined in claim 14 wherein the recess in the stationary cover extends over an arc of 90°, which arc commences 30° prior to the highest point of the cover in the opposite direction from the direction of rotation of the drum, said stationary shelf defining an arc of 300°, which arc commences at the same radial position as the commencement of the arc of the recess, and a second stationary shelf positioned below the chutes and positioned below the first-mentioned stationary shelf, said second stationary shelf defining an arc of approximately 90°, which arc commences at the same radial position as that at which the first-mentioned stationary shelf terminates, whereby plastic bottles fall first from the pocket to the first-mentioned stationary shelf, and, as the articles move further around, they fall to the second stationary shelf and are oriented to an upright attitude.

16. An apparatus for orienting plastic bottles as defined in claim 13 wherein the angle of offset between the axis of rotation and the drum and the vertical is less than 31°.

17. An apparatus for orienting plastic bottles as defined in claim 13, including a rotating brush mounted on the hopper adjacent to the recess in the cover for discharging plastic bottles out of the pockets.

18. An apparatus for orienting articles comprising, a hopper having one side lower than the opposed side for holding a plurality of randomly-arranged articles, a rotatable drum having a plurality of chutes movably communicating with the hopper to receive articles from the hopper, said drum having its axis of rotation offset from the vertical, and a stationary shelf cooperative with the chutes to control movement of an article in each chute.

19. An apparatus for orienting articles as defined in claim 18, including a plurality of agitator arms rotatably mounted in the hopper for agitating the lightweight articles in the hopper.

20. An apparatus for orienting articles as defined in claim 18 wherein the stationary shelf extends into the chutes, and including a second stationary shelf positioned below the chutes and below the first-mentioned stationary shelf.

21. An apparatus for orienting articles as defined in claim 18 wherein each chute has a pair of side walls and an inner wall, each chute having an outer wall in that portion of the chute positioned above the stationary shelf.

* * * * *

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,650,368 Dated March 21, 1972

Inventor(s) John C. Nalbach

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 2, Line 50, after "30°", delete --C.--

Signed and sealed this 15th day of August 1972.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents