METHOD AND MACHINE FOR SIMILARLY ARRANGING OPEN-TOPPED CONTAINERS OR THE LIKE

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This method relates to a method and a machine for similarly arranging relatively small articles such as containers, and, more particularly, relates to a method and mechanism for erecting indiscriminately arrayed articles such as open-topped containers so that all of such containers wind up on a filling table or the like with the same ends turned upwardly. The method and apparatus according to the invention is designed to arrange articles, each of which has a body section of substantially uniform cross section, and an outwardly extending peripheral lip or other protrusion at or near one end, the minimum horizontal dimension of the lip or protrusion across the article and the height dimension of the article being different and the article body extending between substantially parallel planes of its bottom and its top, with a "major axis," or generally central line of the body, extending normal to at least the plane of one of its ends, i.e., its top or bottom. As used herein, the term "minimum horizontal dimension of the lip across the article" (or "container") means the minimum length of a horizontal projection of the outer edge or edges of the outwardly extending lip, protrusion or series of protrusions and this distance is equal to the spacing between a pair of parallel plates brought into contact with the article and parallel to its major axis.

Various mechanisms for sorting and arranging containers or the like have been proposed in the past in an effort to effect automation in the filling of such containers. Although many of these mechanisms have proved successful in accomplishing this purpose, the cost of such mechanisms due to their relative complexity, is often prohibitive of their use. Further, many of the prior art devices intermittently fail to successfully complete the intended operation of disposing of the container open end up, in order to receive the filling material whereby the substantially continuous surveillance of a skilled operator is normally required.

It is, therefore, the principal object of the present invention to provide an improved container arranging or erecting mechanism.

It is a further object of the invention to provide an extremely efficient, yet relatively inexpensive erecting mechanism, which mechanism is capable of uninterrupted operation for substantially indefinite periods of time without disposing a container wrong side up on a filling table or the like.

Another object of the present invention is to provide a mechanism for similarly orienting or arranging containers of the class described which is dependable and continuous in operation, and which involves a minimum of moving mechanical parts which are likely to require frequent repair or replacement.

It is a still further object of the invention to provide a container erecting mechanism which is so constructed that containers may be randomly dumped into a hopper at one portion of the mechanism and the containers will exit from another portion of the mechanism with their open ends all facing in the same direction.

It is yet another object of this invention to provide a method for arranging randomly disposed articles into position with the same end of all of them turned in the same direction.

More particularly, a further object of the invention is the provision of a machine of the character described having novel, continuous traveling conveyor means including a grooved edge adapted to receive containers from a trough operatively associated with a supply hopper, the conveying means being effective to thereafter selectively deliver such containers to discharge means for final orientation thereof.

Other objects and advantages will in part be apparent and will in part appear hereinafter.

For a better understanding of the nature and objects of the invention, reference should be made to the following detailed description and accompanying drawings, in which:

FIG. 1 is a view in front elevation of a machine embodying the present invention;
FIG. 2 is a vertical sectional view taken along the line 2—2 of FIG. 1;
FIG. 3 is a fragmentary, vertical sectional view taken along the line 3—3 of FIG. 1 and shown on an enlarged scale;
FIG. 4 is a still further enlarged, fragmentary, vertical sectional view taken along the line 4—4 of FIG. 3;
FIG. 5 is a fragmentary, detailed view in perspective showing a portion of the apparatus illustrated in FIGS. 1, 2 and 3;
FIG. 6 is a fragmentary, vertical sectional view taken along the line 6—6 of FIG. 1 and shown on an enlarged scale;
FIG. 7 is a fragmentary, detailed view in perspective of parts of the apparatus illustrated in FIGS. 1, 2 and 6;
FIG. 8 is a further enlarged, fragmentary, vertical sectional view taken from the position indicated by the line 8—8 of FIG. 7; and
FIG. 9 is a fragmentary, detailed view in perspective of a portion of the apparatus illustrated in FIG. 1 and constituting a continuation of the right side of FIG. 7; FIG. 9 also showing a portion of a turntable as illustrative of mechanism onto which containers are delivered by apparatus embodying the invention.

In general, the apparatus embodying the invention as shown and described herein comprises a supply hopper for the reception of indiscriminately arrayed containers and from which the containers tumble downwardly onto a plurality of horizontally extending spaced rods which are vibrated in such a manner as to move the containers forwardly along the rods and across the machine. These rods deliver the containers to a substantially vertically disposed trough comprising a pair of parallel plates which are spaced from each other a distance slightly greater than the lesser of (1) the minimum horizontal dimension of the lip across the container and (2) the height dimension of the container; but the plates are spaced a distance which is less than the greater of such two dimensions. The trough includes means which cooperate with the plates to dispose containers received therebetween with their midpoints lying in a plane equidistant between the two plates and, in the specific embodiment of the drawings, with major axes parallel to each other, but with their tops or bottoms randomly directed oppositely to each other. The term "midpoint" as used herein means a point on the major axis of the article or container which is midway between the two ends of the body.

A continuous, traveling conveying means is positioned so that at least one edge thereof passes adjacent the outlet of the trough at a first portion of its path of movement, with the plane of the edge being disposed particularly to the major axes of the container during such portion of its path of movement. The edge of the conveying means comprises two elements which in turn have a series of substantially identical, similarly spaced
notches, the elements being arranged in close side-by-side, in-phase relationship during the said first portion of the path of movement thereof, is greater than the minimum horizontal dimension of the container body adjacent to the lip but less than the minimum horizontal dimension of the lip across the body, whereby the containers are guided into the notches with their bodies received in the notches, their tops and bottoms randomly directed oppositely to each other and their lips randomly disposed adjacent the outer surfaces of the conveyor edge elements. The mechanism additionally includes means for separating the edge elements from each other in a direction parallel to the major axes of the containers during a second portion of the path of movement of the conveyor means whereby each container is pulled out of the notch in one of the elements and carried with the other of the elements, depending upon which side of the edge of the conveyor means its lip is disposed. Finally, means are provided near the second portion of the path of movement of the conveyor means for removing containers from each of the elements separatively from the conveyor means of the other of the elements and for conveying the separatively removed containers relative to each other into similar arrangement.

As previously mentioned, the machine according to the invention is adapted to similarly arrange erect lipped articles in which the minimum horizontal dimension of the lip of each article across the article and the height of the article are different. This difference in dimensions is, in effect, the only restriction or limitation on the size or shape of articles which can be successfully orientated by the instant mechanism, as will subsequently become apparent. In this respect, although the inventors of the instant mechanism, can be said to be familiar with the erecting of cylindrical containers, it should be understood that such description is for purposes of illustration only and is not to be considered as limiting.

Further, as was previously mentioned, the machine according to the present invention is adapted for use in containers containing other machinery or apparatus such as, for example, mechanisms for delivering up ended containers to a filling machine. No illustration, however, is made of the particular machine or apparatus which will be associated with the mechanism constituting the present invention since such associated apparatus does not form a part of the present invention.

Referring now more particularly to the drawings, reference numeral 11 indicates generally the supporting structure or frame for the apparatus and includes a leg or post 12, one of which is not shown, at each corner thereof. A supply hopper, indicated generally at 13, is supported at the top of the frame 11 for receiving a plurality of small containers 14 in random disorientation. The hopper 13 has a rearwardly sloping bottom 15 (FIGS. 2 and 3), the rearmost edge of which terminates short of a vertical rear wall 16 and then extends vertically downwardly a short distance to provide a laterally extending chute 17 across the rear of the apparatus.

Each of the containers 14 is of the type previously described, i.e., each comprises a body portion and a lip adjacent its open top, the minimum horizontal dimension of the lip across the container and the height of the container being greater than the height of the container. Each of which is cylindrical and includes a body portion 14a (FIGS. 4 and 5) and an outwardly extending peripheral lip 14b adjacent its open top, the outside diameter of lip 14b of each of the containers 14 being greater than the height of the container. For specific container 14, the lip 14b is made in two pieces, each less than semi-anular in extent and functions as a thread for a screw-on cap. It is to be noted, that the "lip," or outward projection, can be continuous or can be made up of grooves or protrusions, such as tips or knobs.

A fringed gate 18 (see FIGS. 2, 3 and 4) is mounted at the rear edge of the hopper bottom 15, forming a front side for the chute 17 and comprises a plurality of resilient fingers 19 for resisting the passage of more than one layer of the containers 14 as they travel over the plurality of laterally spaced, forwardly extending, parallel rods 20. The rods 20 are spaced from each other a distance slightly smaller than the height of the containers 14 so as to prevent the containers 14 from falling down between the rods 20 and are mounted upon a vibrator plate 21. The vibrator plate 21 is driven by a side-to-side reciprocating vibrating mechanism indicated generally at 22, which mechanism is mounted on suitable support posts 23 comprising a portion of the main frame 11. The mechanism 22 vibrates the rods 20 so as to move the containers 14 forwardly along the rods toward the front of the apparatus whereupon they fall into a trough indicated generally at 24 (see FIGS. 3 and 5).

The front ends of the spaced parallel rods 20 are welded or similarly mounted on tips 25 (see FIG. 5) between adjacent semicircular grooves 26 that are cut in an upwardly turned flange of an angle bar 27. The bar 27 extends across the main side of the trough 24 and supports a horizontal shelf 28 which lies in a plane lower than the bottom of the grooves 26 and which overlies the rear side of the trough 24. When the containers 14 engage the curved edges of the grooves 26 the great majority of them are turned to fall onto the shelf 28 with their open ends either up or down. Vibration of the shelf 28 with the rods 20 causes the containers to slide off of the front edge of the shelf 28 and to fall onto a curved apron 29 which forms the rear of the trough 24. Almost all of the containers land on their top or bottom surfaces rather than on their cylindrical sides and slide forwardly along the apron 29 into the chute 24, as illustrated in FIGS. 3 and 5 by the containers labeled "A."

The apron 29 curves forwardly and downwardly until it reaches parallelism in a vertical plane and the lower portion of a curved plate 30 defining the front portion of the trough 24. The parallel bottom parts of the apron 29 and plate 30 are spaced horizontally a distance only slightly greater than the lesser of the minimum horizontal dimension of the lip 14b across the container 14 and the height dimension of the container. In the particular embodiment of the invention illustrated, the lesser dimension is the height of the container 14. The horizontal distance between the apron 29 and plate 30 is smaller than the greater of such dimensions, such greater dimension in this case being the outside diameter of the lip 14b.

Due to this narrow restriction, the containers 14 can only pass through the lower extension of the trough 24 lying on their sides as shown by the container indicated in the drawings at "B."

An agitator indicated generally at 31 runs constantly throughout the sorting operation in order to agitate the containers 14 falling into the trough 24 to prevent them from becoming cocked and jammed between the apron 29 and plate 30 and to assure that they pass through the trough 24 in the desired arrayed position. The agitator comprises an endless chain 32 having a plurality of spaced fingers 33 fixed thereto, and is driven by means of a motor 34 suitably mounted on the frame 11 to move the flily through a horizontal arrangement of the mass of containers at the top of the trough 24.

The trough 24 empties downwardly into a compartment 35, defined by a pair of parallel plates 36 and 37 which are spaced from each other substantially the same distance as are the plates 29 and 30 i.e., a sufficient distance to allow the containers 14 to fall onto their cylindrical sides, but an insufficient distance to permit the containers to fall therethrough lying either on their tops or bottoms.
The rear plate 36 substantially closes the front of the apparatus between the bottom of the trough 24 and a lower, horizontal frame member 38. The front plate 37 of the compartment 35 extends downwardly parallel to the plate 36, but covers only about half of the area of the compartment. In the particular embodiment illustrated in the drawings, the front plate 37 is formed of a rigid, substantially transparent material so as to enable the viewing of the orientating operation in this area.

A downwardly sloping rod 39 extends across the machine from the upper right end of the trough 24 (FIG. 1) between the plates 36 and 37 and has a return end 40 at a point about two-thirds or three-quarters of the distance across the machine. A curved rod 41, also extending between the plates 36 and 37, forms the left side and a part of the bottom of the remaining portion of compartment 35. The rods 39 and 41 close the bottom of the space between the plates 36 and 37 except for an opening, generally indicated at 42, which overlies a portion of the path of movement of a continuous conveying means such as a multi-part wheel, indicated generally at 43.

The wheel 43 is mounted between the plates 36 and 37 by a shaft 44 (FIG. 6) suitably journaled by bearing 45 carried on the plate 36 and extends through a notch 46 (FIG. 7) in the right edge of the plate 37. The wheel 43 comprises two circular discs 47 and 48 of the same shape and size and mounted side-by-side. The rear disc 47 is fabricated from any suitable stiff material, such as steel, while the front disc 48 is fabricated from a flexible and resilient material such as rubber or plastic. The discs 47 and 48 have a series of substantially semicircular notches 49 and 50 in their edges and the discs are mounted in phase on the shaft 44 so that a single groove is formed by each pair of aligned notches 49 and 50. The diameter of the notches, i.e., the width thereof along the path of movement of the wheel 43 is slightly larger than the minimum horizontal dimension of the container body 14a adjacent its lip 14b, which, as previously mentioned, is merely the body diameter; but the notch width is slightly smaller than the minimum horizontal dimension of the lip 14b across the container, i.e., the particular outside diameter of the lip 14b.

The container 14 which are arrayed between the plates 36 and 37 move through the opening between the return rod end 40 and the rod 41 and drop into the grooves formed by the aligned pairs of notches 49 and 50 with their open ends at either the front or back of the compartment 35, in other words, with their lips 14b randomly disposed adjacent the outer surfaces of the two discs 47 and 48.

A hand knob 51 (FIG. 6) is secured on the front of the shaft 44 and a pulley 52 is keyed on the shaft 44 and driven by a belt 53 which is also engaged with a pulley 54 mounted on jack shaft 55. The shaft 53 is geared through a suitable reducer indicated generally at 56 to a drive shaft 57 of a motor 58. The motor 58 and reducer 56 are mounted on a horizontal tilting table 59, connected by a rod 60 to a bell crank 61 and a handle 62 at the front of the machine for clutching the drive of the wheel 43.

A downwardly and forwardly inclined separator 63 (FIGS. 1, 6 and 7) is mounted on the front of the front wall 36 by a bracket 64. The separator 63 extends upwardly between the discs 47 and 48 in the upper right quadrant of rotation or travel thereof at the right of the front plate 37. The separator 63 has a curved upper end 65 which is parallelly parallel the curvature of the discs 47 and 48 but does not extend about the peripheries of the notches 49 and 50 therein so that no contact is made by the separator 63 with the containers 14 carried in the notches 49 and 50. The separator 63 is cantilevered outwardly and downwardly away from the plane of the stiff disc 47 at an angle of approximately 10 to 30 degrees. As the wheel 43 is rotated, the separator 63 and the stiff disc 47 being thus separated axially therefrom in this portion of its path of movement. The separator 63 is angled forwardly enough to separate the discs 47 and 48 a distance slightly greater than the vertical height of the containers 14 at the point of furthest separation of the discs 47 and 48 (see FIGS. 6 and 8). As soon as the discs 47 and 48 rotate beyond the lower edge of the plate 66, the flexible or resilient lip 67 returns to its side-by-side adjacent relationship with the stiff disc 47.

A pair of arcuate, axially diverging guides 66 (FIG. 7) overlie the peripheries of the discs 47 and 48 during that portion of their travel when they are being separated from each other in order to prevent the containers 14 before being jared upwardly out of the notches 49 and 50. Similarly, an arcuate guide 67 extends along adjacent the notches 50 of the flexible disc 48 to prevent the containers 14 carried thereby from slipping axially out of the notches 50 toward the front and containers 14 retained by their lips 14b in the notches 49 of the stiff disc 47 are prevented from rearward displacement by the plate 36. The guides 66 and 67 are secured to posts 68 which are mounted on the plate 36.

A pair of inclined, open guide ways, generally indicated at 69 and 70, extend away from the ends of the arcuate guides 66 and 67 at the point at which the discs 48 and 49 are separated from each other to the greatest extent. Each of the guide ways 69 and 70 consists of a rail 71, 72, 73 and 74, or 75, 76, 77 and 78, respectively. The two guide ways 69 and 70 are generally parallel to each other with their upper inner rails 71 and 75 (FIG. 7) connected at their upper ends and extending between the discs 47 and 48 to form a diverter 79. As the containers 14 are moved by the discs 47 and 48 with their open tops turned outwardly, their bottoms engage the diverter 79 and each container 14 is guided into the upper open end of the respective one of the guide ways 69 and 70. The lowermost rail 74 or 78 of the guide ways 69 or 70 extends into the space between the separated discs 47 or 48 adjacent the inner surface of the disc and to a depth approximately the same as the depth of the notches 49 and 50. As each of the containers 14 is moved in its disc 47 and 48, it engages the respective rail 74 or 78 and is guided out of the notches 49 or 50 whereupon it runs by gravity down the guide way. The guide ways 69 and 70 are mounted on the plate 36 by a bracket 80 which spaces the four rails of each guide way and which has openings 81 therethrough generally corresponding in shape to the outline of the containers 14 as they are oriented by the rails at the bracket location.

Each of the openings 81 has a notch 82 at its outer bottom side through which the lip 14b of the containers 14 pass. The other two rails 72 and 73 or 76 and 77 provide the other two margins of the guide ways. The rails of the guide ways 69 and 70 are held in proper spacing by spacers 83, 84, 85 and 86 (FIGS. 7 and 9) which are located along the guide ways. The guide ways 69 and 70 are twisted inwardly toward each other down their lengths so as to rotate or turn the containers 14 in opposite directions. The containers 14 received in the guide way 69 originally have their open tops turned backwardly against the plate 36 and, as they roll down the guide way 69, are rotated upwardly toward the front to turn their tops up. Conversely, the containers 14 received in the guide way 70 originally have their open tops turned to the front of the apparatus and, as they roll down the guide way 70, are rotated in a reverse direction. Comparison of the relative orientation of the containers 14 indicated at "C," "D," "E" and "F" in FIGS. 7 and 9 shows the opposite twist of the guide ways 69 and 70 and how the containers 14 are "erected" as they roll down their lengths. The two guide ways 69 and 70 are held in spaced relationship at their lower ends by a spacing plate 87 and an end gate 88 both of which rest on the surface of the element onto which the containers 14 are discharged. In this case a tumbling 89. At the speed plates 87, the containers 14 in both of the guide ways 69 and 70 are erected with their open tops turned up. If the con-
containers 14 were to be discharged onto a linearly moving conveyor, the rails of the guideways would extend only a slight distance beyond the plates 87. In the embodiment of the drawings, however, the guideways 69 and 70 turn through approximately a 90° turn and the containers 14 are moved out of the gate 88 by the turntable 89. The rails 71 and 73, which at their upper ends are brought together to form the diverter 79 (FIG. 7), are cut off short just above the turntable 89 at their lower ends (FIG. 9).

The turntable 89 is rotatably mounted on a vertical post 90 and is driven by a capstan 91 (FIG. 1) mounted on a shaft 92 of a motor 93 which is shown as mounted on a swinging plate 94. The plate 94 pivots on a vertical axis and is connected by a link 95 to a hand lever 96 at the left front of the machine so that the capstan 91 may be moved into and out of engagement with the turntable 89.

In order to fully disclose all the novel features of the invention, a complete operating cycle of the particular embodiment shown will now be described. A plurality of containers 14 is poured in the hopper 13 and fed downwarsdly therein under the action of gravity to the laterally extending chute 17 at the rear of the apparatus (FIGS. 2 and 3). The fringed gate 18 operates to resist the passage of more than one layer. The containers 14 enter the plates 17 and onto the vibrating rods 20. The rods 20 carry the containers 14 forwardly across the machine (FIGS. 4 and 5), through the grooves 26 in the bar 27, onto the shelf 28 whence they fall onto the arcuate surface of the apron 29 and slide into the trough 24. While almost all of the containers slide over the apron 29 on either their tops or bottoms, a few may "hang up." The fingers 33 (FIG. 1) move continuously through the upper wider part of the trough 24 to lift and reorient any "cocked" containers 14. Because of the spacing between the plates 36 and 37 (FIG. 6), the containers 14 fall through the trough 24 on their sides and become piled or stacked up in this arrangement in the compartment 35 with their major axes parallel to each other.

The lowermost layer of containers 14 in the compartment 35, i.e., those containers lying on the rods 39 and 41, falls by gravity and the force imposed thereupon by the weight of the containers resting above, into the grooves in the edge of the wheel 43 which are formed by the circumferentially aligned notches 49 and 50 in the discs 47 and 48. A switch 97 having a feeler 98 extends into the compartment 35 in order to sense the presence of containers 14 therein and to control the vibro movement to prevent the compartment 35 from becoming overcrowded with containers 14.

All of the containers 14 falling into the grooves in the edge of the wheel 43 are arranged with their open ends turned forwardly, i.e., with their lips 14b located adjacent the outer surface of the disc 45 (see containers designated "G" in FIGS. 7 and 8), or their open ends turned backwardly, i.e., with their lips 14b adjacent the outer surface of the disc 47 (see containers designated "H" in FIGS. 7 and 8). The containers 14 remain in this arrangement as the flexible disc 45 engages the canted surface of separator 63, which bends the flexible disc 48 away from the rigid disc 47 (FIGS. 6, 7 and 8). If the container 14 is positioned in the groove with its lip 14b adjacent the outer surface of the rigid disc 47, it remains with the rigid disc 47 due to its lip preventing forward movement thereof with the resilient disc 45 (container "H," FIGS. 7 and 8). If, on the other hand, the container is positioned in the groove with its lip 14b adjacent the outer surface of the flexible disc 48, such container is pulled forwardly by the separating disc 48, out of the notch 49 in the stiff disc 47 and will be carried by such resilient disc (container "G," FIGS. 7 and 8).

The containers 14 which are discharged by the stiff disc 47 are discharged therefrom into the upper end of the guideway 69 (FIG. 7) upon being lifted out of their notches by contact with the lowermost rail 74 of the guideway. In a similar manner, the containers 14 which are carried by the resilient disc 48 are discharged into the upper end of the guideway 70.

At the point where the discs 47 and 48 discharge the containers 14 into the open upper ends of the guideways 69 and 70, the containers 14 are all arranged in parallelism, with their open tops open and lying on their sides. It is, therefore, only necessary to then erect the containers by twisting them in opposite directions through an angle of approximately 90°. This is accomplished by the twisting of the rails forming the guideways 69 and 70, the containers 14 being turned thereby as they roll down the guideways and being discharged therefrom with their open ends turned upwardly. The containers 14 are then ready for delivery to a filling apparatus or the like.

The particular embodiment of the invention which has been described is designed for handling open topped cylindrical containers having radially extending lips adjacent their open tops and height less than the diameter of their lips.

Containers or other configurations, such as rectangular or square in plan, or having heights greater than the minimum horizontal dimensions of their lips, can also be arranged and oriented by mechanisms embodying the invention, it being necessary only that the containers have lips or other outward protrusions at or near one end, or at least nearer to one end than the other, and that the two critical dimensions be different. The minimum horizontal dimension of the lip or protrusion across the container must be either larger or smaller than the height of the container. Of course, when containers of cross section other than circular or square are being handled, the grooves in the edge of the conveying means must be appropriately shaped.

While conveying means consisting of a wheel formed from two discs is shown in the drawings, various other conveyors, such as belts, links, etc., may be employed; the inventive concept comprising the two relatively movable notched elements which receive the articles, move axially relative to each other, and separately discharge the containers as determined by the side on which their lips are located. Furthermore, such conveying means may be disposed or arranged at any desired angle to the outlet portion of the trough or compartment, it only being necessary that the edge portion thereof containing the notches or grooves for receiving the containers from such trough or conduit be located in and move along a plane which is substantially perpendicular to the major axes of the containers at that portion of its travel where the containers are inserted in the notches. Although constructing one of the edge elements from a resilient material is a preferred manner of providing for the separation thereof from the other of the edge elements, due to the simplicity thereof, any other separation system such as diverging guides or springs can be employed if desired. Throughout this specification and in the appended claims the invention is described as relating to the arrangement and/or orientation of containers, described as "open topped" and, for the most part, the lips have been stated to be located at or adjacent the open tops. Of course, the lip or ridge could also be located at or near the bottom of such a container and the upper part of the container body could have a smooth or substantially uniform upper portion. In handling such a container, a machine embodying the invention could be so arranged as described, the change being merely to twist the container guideways oppositely to turn the lip down and the other end of the container up. The lip or other outward protrusion or series of protrusions could also be located along the body, nearer to one end than the other by a distance such that when two oppositely arranged guideways are parallel to each other, the lips are spaced far enough to permit the grasping of the containers by the separating means, i.e., the discs 47 and 48."
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Machines embodying the invention may also be employed for orienting objects other than containers; such as, for example, flanged bushings or bearings, circular items with smaller diameter hub portions and other objects meeting the primary definition:

1. A body having width, height, and depth.
2. An outwardly extending peripheral lip, or other protrusion or peripheral series of protrusions located at or nearer one end of the body, i.e., top or bottom in the final arranged and oriented position.
3. A difference between—
   (a) Minimum horizontal dimension of the lip or protrusion across the body, and
   (b) Height of the body when in the arranged and oriented position.

It is the difference between dimensions (a) and (b) which enables the arrangement of the objects with their major axes parallel and their tops and bottoms (or ends) extending in opposite directions. It is Point 2 above which enables the randomly and oppositely directed objects to be axially moved by the separable elements of the conveying means and their discharge into the twisted guideways by which they are all arranged with same end up or down in the same direction.

All of the foregoing modifications and variations are considered to be within the purview and scope of the invention as defined by the appended claims and the method of the invention comprises operative steps carried out by various mechanisms designed according to such modifications and variations.

I claim:

1. A method of orienting identical articles, each having top and bottom ends lying in at least generally parallel planes, a body of generally uniform cross section with a peripheral surface extending generally parallel to its major axis, from a random disposition to a position wherein all of said top ends extend in the same direction, said articles also having portions protruding outwardly from said peripheral surfaces and all spaced axially away from the midpoints of said articles in the same direction, said articles having portions protruding outwardly from said peripheral surfaces and all spaced axially away from the midpoints of said articles in the same direction, said articles having portions protruding outwardly from said peripheral surfaces and all spaced axially away from the midpoints of said articles in the same direction.

2. A method according to claim 1 and the step of grasping each of said articles in said second group of articles adjacent the inner side of said protruding portions and moving each of said articles in said first group of articles relative to said second group of articles along its said axis and turning each of said articles in said first group and each of said articles in said second group until the said flat ends thereof all extend in the same direction.

3. A method of orienting identical containers each having top and bottom ends lying in at least generally parallel planes, and a body of uniform cross section with peripheral surfaces extending parallel to its major axis, from a random disposition to a position wherein all of said tops extend upwardly, said containers also having lips protruding outwardly from said peripheral surfaces adjacent said tops, said method comprising arranging said containers in a first position with their tops randomly extending in opposite directions and located in spaced parallel planes and their midpoints located in a common plane whereby each of a first group of said articles has its said protruding portion offset from its said midpoint in a first direction and each of a second group has its said protruding portion offset in the opposite direction, grasping each of said first group of articles adjacent the inner side of said protruding portions and moving each of said articles in said first group of articles relative to said second group of articles along its said axis and turning each of said articles in said first group and each of said articles in said second group until the said flat ends thereof all extend in the same direction.

4. A method for similarly arranging identical articles each having a body of substantially uniform cross sectional normal to its major axis, top and bottom ends lying in at least generally parallel planes, a lip at least near one of its ends, and a difference between the height of said body and the minimum width of said lip across said body, said method comprising, arranging said articles with their top and bottom ends randomly directed in opposite directions and lying in spaced parallel planes, placing each of said articles in a pair of notched elements the notches of which are aligned and spaced from each other axially of said article, with the lips of said articles randomly disposed adjacent the outer sides of said notched elements, moving said elements in a path generally normal to the axes of said articles and concomitantly separating said elements axially of said articles for withdrawing each of said articles from the notches in that one of said elements against the outer surface of which the lip of such article is not disposed, separately removing said elements from each of said separated elements and oppositely turning each separately removed article until the top ends thereof are directed in the same direction.

5. A method according to claim 4 including moving the notched elements through circular neighboring paths, axially displacing one of said elements through a portion of said path and removing the articles from each of said elements while in said axially separated portions of said paths.

6. A method according to claim 4 including arranging the articles with their major axes parallel at the time of arranging said articles with their top and bottom ends in parallel spaced planes.

7. A machine for similarly arranging containers, each of said containers having a body portion, two spaced generally parallel ends, one of which is a top, and an outwardly extending peripheral lip adjacent one of its ends, the minimum horizontal dimension of said lip across said body and the height dimension of said container being different, said machine comprising, in combination, a hopper for the reception of indiscriminately arranged containers, a trough comprising a pair of parallel plates spaced from each other a distance slightly greater than the lesser of such dimensions but smaller than the greater of such dimensions, means cooperating with said plates for disposing said containers therebetween with their tops and bottoms randomly directed oppositely, said trough having an inlet operatively associated with said hopper for receiving containers therefrom and an outlet, continuous traveling conveying means, one edge of said conveying means being operatively associated with said outlet at at least a first portion of its path of movement, the plane of said edge being disposed perpendicularly to the major axes of the containers during at least said first portion of its path of movement, said edge of said conveying means comprising two elements, the edges of said elements having a plurality of substantially identical, similarly spaced notches, said elements being arranged in side-by-side, in-phase relationship during said first portion of said path of movement whereby each pair of aligned notches, the width of said notches in a direction along said first portion of said path of movement being greater than the minimum horizontal dimension of said container body adjacent said lip and less than the minimum horizontal dimension of said lip, said outlet including means for conveying said containers in said conveying means with their bodies received in said notches and their lips randomly disposed adjacent the outer surfaces of said elements, means for separating said edges
of said elements from each other during a second portion of the path of movement thereof, and said elements separated in such second portion of said path of movement for removing containers from each of said elements separately from the containers removed from the other of said elements and for turning said separately removed containers relative to each other into similar arrangement.

8. A machine in accordance with claim 7 in which one of said elements is composed of a flexible material.

9. A machine in accordance with claim 8 in which said means for separating the edges of said elements comprises a canted plate which extends between the edges of said elements during said second portion of the path of movement thereof.

10. A machine in accordance with claim 7 in which said means for removing containers from each of the elements includes a pair of oppositely twisted guideways.

11. A machine in accordance with claim 10 in which each guideway consists of a plurality of spaced rails, said rails being respectively adjacent the top end, bottom end and both sides of the container movable along said rails, and said rails being twisted spirally around a median line along the length of the guideway.

12. A machine in accordance with claim 7 in which said continuous traveling conveying means comprises a rotatably mounted wheel.

13. A machine in accordance with claim 12 in which said wheel comprises a pair of circular discs of the same size and shape mounted axially side-by-side, one of said discs being composed of a stiff material and the other of said discs being composed of a flexible material, both of said discs having a plurality of circumferentially arranged notches in their peripheries whereby a groove is formed by each pair of aligned notches.

14. A machine for similarly arranging open-topped containers, each of said containers having a cylindrical body portion and an outwardly extending peripheral lip adjacent to its top, the diameter of said lip across said container being greater than the height of said container, said machine comprising, in combination, a hopper for the reception of indiscriminately arranged containers, a trough comprising a pair of parallel plates spaced from each other a distance slightly greater than the height of the containers but smaller than the diameter of the lips of such containers, means cooperating with said plates for disposing said containers with their major axes parallel to each other, said trough having an inlet operatively associated with said hopper for receiving containers therefrom and an outlet, a wheel, means for rotatably mounting said wheel so that the periphery of one of said discs being composed of a resilient material and the other of said discs being composed of a stiff material, said discs having a plurality of circumferentially aligned, substantially semicircular notches in their peripheries, the diameter of said notches being slightly larger than the diameter of the body of the container, but slightly smaller than the diameter of the container lips whereby containers are received in the said notches from said outlet with their lips being disposed adjacent the outer surface of the wheel at either side thereof, means for axially separating the resilient periphery of said one disc from the periphery of said stiff disc during a portion of the path of travel of the wheel whereby containers with their lips adjacent the outer surface of the wheel have the resilient periphery carried therewith and containers with their lips adjacent the outer surface of said stiff disc remain with said stiff disc, and means effective to separately receive containers disposed in the notches of said separated discs and to turn said containers relative to each other with their open tops similarly arranged.

15. In a machine of the class described having a supply hopper for identical articles to be similarly arranged and mechanism for feeding articles from said hopper and orienting said articles into first position with their major axes parallel and their tops and bottoms randomly directed in opposite directions, each of said articles having body of substantially uniform cross section normal to such major axis and an outwardly extending peripheral lip at least near an end of said body, the improvement comprising a pair of parallel spaced elements movable through paths at least a first portion of which passes near said mechanism in plan normal to such major axes of said articles in such first position, the edges of said elements toward said mechanism having a series of spaced notches therein with the notches in said pair of elements being aligned and in phase, means for guiding articles from said mechanism in said first position into said notches with their lips randomly disposed adjacent the outer surfaces of said elements, means for moving said elements, means for relatively separating the notched edges of said elements axially from each other a distance sufficient to remove each article, means for rotating said article, the outer surface of which its lip is not disposed, means adjacent a second portion of the path of movement of said conveyor where the edges of said elements are so separated for separately removing said articles from said elements and means for oppositely turning said separately removed articles for arranging all of said articles with their tops directed in the same direction.

16. Apparatus for orienting identical articles each of which has at least one substantially flat end, a major axis at least generally normal to said end and a body of generally uniform cross section with peripheral surfaces extended at least generally parallel to said major axis, from a random disposition to a position wherein all of said ends extend in the same direction, said articles also having portions protruding outwardly from said peripheral surfaces and all spaced axially away from the midpoints of said articles in the same direction axially, said apparatus comprising means for arranging said articles in a first position with their flat ends randomly extending in opposite planes and their midpoints lying in a common plane, whereby each of a first group of said articles has its said protruding portion offset from its said midpoint in a first direction and each of a second group has its said protruding portion offset in a second direction, means for engaging each of said first group of articles adjacent the inner side of said protruding portion, means for moving said engaging means in the direction of said protruding portion of each of said articles in said first group of articles into contact with said protruding portion of each of said articles in said first group to move each of said articles in said last named group along its axis relative to said second group of articles, means for turning each of said articles in both of said groups until the flat ends thereof all extend in the same direction.

17. Apparatus for orienting articles of the class described comprising, in combination, a pair of parallel, horizontally spaced, vertical plates, said plates being spaced horizontally a distance equal to the height of said articles, means for feeding articles randomly toward the spaces between said plates, means for said articles between said plates with their corresponding ends randomly directed in opposite directions, means for serially releasing articles from between said plates, means for shifting said articles relative to each other in the directions of their corresponding ends and means for turning said axially shifted articles relative in each surface for directing their corresponding ends in the same direction.

18. Apparatus according to claim 17 in which the
means for shifting the articles relative to each other comprises an element for grasping the bodies of all articles having their corresponding ends directed in one direction and moving said articles axially relative to the remainder of said articles.

19. A machine for similarly arranging containers, comprising a hopper, a pair of parallel plates operatively associated with said hopper for receiving containers therefrom, means cooperating with said plates for disposing said containers therebetween with their tops and bottoms randomly directly oppositely, a continuous traveling conveying means, one edge of said conveying means being operatively associated with said plates at least a first portion of its path of movement, the plane of said edge being disposed perpendicularly to the major axes of the containers during at least said first portion of its path of movement, said edge of said conveying means comprising two elements, the edges of said elements having a plurality of substantially identical, similarly spaced notches, said elements being arranged in side-by-side, in-phase relationship during said first portion of said path of movement whereby a groove is formed by each pair of aligned notches, means for guiding said containers into said notches with their bodies received in said notches and their ends randomly disposed adjacent the outer surfaces of said elements, means for separating said edges of said elements from each other during a second portion of the path of movement thereof to move one of said elements into engagement with a portion of each container in a group having the same ends facing in the same direction to shift each container in said group along its major axis, and means at such second portion of said path of movement for removing containers from each of said elements separately from the containers removed from the other of said elements and for turning said separately removed containers relative to each other into similar arrangement.

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