CUP ORIENTING AND FEEDING DEVICE AND METHOD

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Abstract
A cup orienting and feeding device is disclosed which employs a rotary conical feeder having a circular sidewall. The cups are engaged by a plow adjacent the periphery of the rotary feeder and delivered to a delivery chute and thereafter, in linear alignment with the delivery chute, is a tilting area in which the sidewalls flange outwardly and a ridge is provided in the base to tilt the cups in one direction or the other depending upon the orientation of the cup so that the open end is up. Thereafter the cups continue into a discharge chute which has an overlapping trap flange thus oriented in the open end up condition for delivery to automatic assembly equipment. The method recognizes that the center of gravity of a cup is closer to the top than it is to the open end and thus the tilting of the cup by engaging the skirt at a point closer between the open end than the top, but closer to the open end than the center of gravity, permits the cups to fall in the direction of the tops thus orienting them for delivery into the delivery chute.

11 Claims, 9 Drawing Figures
CUP ORIENTING AND FEEDING DEVICE AND METHOD

BACKGROUND OF INVENTION

With the advent of the aerosol container, and the plastic overcaps which are provided for the same, the mechanization of placing the overcaps or cups on top of the aerosol can requires high speed feeding and orientation of such cups. Also, other cup-like members such as used in the manufacture of lamp bases and the like require such high speed orientation. Vibratory feeders are well known in the art for feeding small parts, but suffer significant disadvantages when high delivery speeds such as 100 to 300 per minute are required.

Where metallic cups or closure caps are employed, devices such as those disclosed in U.S. Pat. Nos. 2,863,588 and 3,065,841 have some utility, but they are limited to the magnetic properties of the metallic cups. Naturally any plastic cups fail to have such metallic properties, and further are quite light in weight and thus more difficult to feed.

OBJECTS OF INVENTION

In view of the foregoing, it is the principal object of the present invention to provide a feeding device and method for plastic cups which, economically, can feed at rates of 100 to 300 per minute where the cup diameter may range from one to three inches and the skirt depth may range from one to three inches.

An additional related and significant object of the invention is to provide such feed rates for plastic cups without inducing extensive agitation and scratching which mars the otherwise shiny finish.

A further object of the present invention looks to the development of the cup feeder which is readily adaptable to varying sizes and interior configurations of plastic cups.

SUMMARY OF INVENTION

A cup feeding and orienting device for cups having a top, a skirt, and an open end is provided which utilizes a rotary feeder, such as a feeder having a rotating conical central member and a peripheral skirt. Tangentially and slightly interior of the periphery of the rotary conical member a means such as a plow is provided for engaging the cups which are spinning within the rotary feeder and delivering the same to a discharge chute which receives the cups in a rolling orientation, that is, oriented on an axis which will permit rolling along the skirt but in random fashion so as to whether the top of the cup is presented outwardly or inwardly. A tipping means is then provided for rollingly receiving the cups from the discharge chute and having a width which is relaxed and then again confined in coordinated relationship with a ramp which is positioned at the lower portion of the tipping means which raises the cup at its skirt at a point between the center of gravity of the cup and its open end thereby permitting the cup to tip with its top portion oriented downwardly. Thereafter, the delivery chute narrows confiningly to the diameter of the cup and, optionally, trap flanges may be provided on the delivery chute to hold the cups in place with the tops up for delivery to an automatic capping machine, or other assembly device. The method stems primarily from the discovery that the center of gravity of the cup is closer to the top than the open end, and that by rollingly presenting the cups to a ramp or incline member while relaxing the confinement, the cups will tip to a bottoms-up or open-top-up position. Pneumatic jet means are also contemplated for accelerating the delivery or movement of the cups to coordinate with the speed from which they are delivered from a rotary confined path and move the same along linearly at a comparable speed.

DESCRIPTION OF DRAWINGS

FIG. 1 is a perspective view of the cup feeding device illustrative of the present invention showing the main frame and tilt box as well as rotary feeder and spinning cone and the discharge orientation.

FIG. 2 is a top broken view of the feeder showing FIG. 1 taken at the portion disclosing the discharge chute, tilting means, and delivery chute.

FIG. 3 is a transverse sectional view of an illustrative cup showing the approximate position of the center of gravity.

FIG. 4 is a transverse sectional view partially enlarged and partially diagrammatic taken along section line 4—4 of FIG. 2 showing the cup as it is preliminarily oriented for delivery from the rotary cone feeder to the discharge chute.

FIG. 5 is a view similar to FIG. 4 but taken along section line 5—5 of FIG. 2 illustrating the cup as it engages the ramp in the tilting means.

FIG. 6 is a downstream view of FIG. 5 taken along section line 6—6 of FIG. 2 showing the cup tilted and beginning its bottoms-up orientation.

FIG. 7 is a transverse sectional view of the far end of the tilting means taken along section line 7—7 of FIG. 2 and showing the cup as being trapped.

FIG. 8 is a further and last transverse sectional view taken along section line 8—8 of FIG. 2 illustrating the cup as finally trapped and confined for delivery through the delivery chute.

FIG. 9 is a section showing an alternative tipping track.

DESCRIPTION OF PREFERRED EMBODIMENT

Turning now to the drawings and more particularly FIG. 1, it will be seen that cup feeder 10 is disclosed having a main frame 11 which supports therein a tilt box 12. A rotary feeder 15 having a central spinning cone 16 is cradled within the tilt box 12. The tilt box 12 is provided with means, not shown, for raising or lowering the angle of the same so that the angle of the plane of rotation of the spinning cone 16 with regard to the horizontal may be varied.

Shown as a tangential portion of the circular wall 14 of the rotary cone feeder 15 is a discharge chute 20. The discharge chute 20 has a cross section approximately that of the cup 1 which is being fed, and is aligned so that the cup 1 is presented to the discharge chute 20 in its rolling orientation. By "rolling orientation" it meant that the cup is in a condition to rotate or roll along the edge of the cup skirt 3 and with the cup top 2 presented either on the left hand or the right side in random fashion. It will be appreciated that at the high speeds involved, the term "rolling" will also contemplate sliding along the skirt 3 as well since, where
pneumatic means are employed to accelerate the motion, the cup may not roll in the fashion one would expect when a beach ball is rolled down a smooth driveway.

As shown particularly in FIG. 4, it will be seen that a take off plow 18 is employed along the upper surface of the spinning cone 16 to engage the cup 1 and to tilt the same into its rolling orientation for presentation to the delivery chute 20. More particularly, it has been found highly desirable to provide a plow groove 19 in the rotary cone 16 in spaced relation to the circular wall 14 so that the plow point 21 can be oriented downwardly into the plow groove 19 so that the upper smooth face of the plow 18 is presented to the cups 1 thereby preventing nicking, gouging, grooving, and any other retardation of the smooth flow of the cups 1 around the circular wall 14 for presentation in their rolling orientation to the discharge chute 20. The plow face 22, particularly as shown in FIG. 4, is angled with the vertical to tip the cup 1 into its rolling orientation gradually as the same moves upwardly and around the curved wall 14 of the rotary feeder 15 in the direction of arrow at the upper portion of FIG. 1 for presentation to the discharge chute 20.

Thereafter, the cups 1 roll down the discharge chute 20 until coming upon the tipping track 25 which has flared sidewalls 26 as shown particularly in FIG. 5. The base of the tipping track 25 identified as base 28 in FIGS. 5, 6, and 7, varies in its configuration as the cup 1 proceeds down the tipping track 25. Simultaneously, a ramp 30 is provided centrally in the base 28 of the tipping track 25, the same being shown with a ridge 31 upon which the rolling engagement of the cup 1 takes place along its skirt 3. Shown particularly in FIGS. 5 and 6, the upwardly extending center line of the ridge 31 is at a position between the center of gravity of the cup 1 and the open end 4 of the cup 1 so that the cup 1 will tilt with its top portion 2 leaning over to engage the flared walls 26 of the tipping track 25. Turning now to FIG. 7, it will be seen that after the tipping is concluded the base 28 is provided with a v-like bottom or a curved upwardly-type bottom so that the trap flanges 32 are engaged the flared walls 26 can come to a reconfiguring orientation, and blend into the delivery chute 35 as shown in FIG. 8.

The delivery chute 35 has a base 36, sidewalls 37, and a continuation of the tipping track trap flange 32 shown as delivery chute trap flange 38. In the configuration as shown in FIG. 8, the cup 1 is completely oriented with its open end up, its top along the base 36, and in a condition for presentation to the automatic assembly equipment.

An alternative configuration of the ridge which is provided at the lower portion of the tipping track 25 is shown in FIG. 9, where the same is an inverted groove 45 provided in the base 28 of the tipping track 25.

To additionally assist in the operation and provide for high feed speeds at the rate of 100 to 300 per minute, it will be observed that an air assist assembly 40 is provided at the portion where the discharge chute 20 has its transition zone into the tipping track 25. A pair of jets are provided which engage a central portion of the skirt 3 of the cup 1 thereby assuring that the same does not bounce or pop out of the open top portion of the tipping track 25 as the same rolls downwardly in engagement with the ramp 30. Additionally, delivery assist 42 is provided between the trap flanges 38 of the delivery chute 35 to give an additional boost or high speed delivery of the cups as they leave the machine through the delivery chute 35. The offset jets 41, therefore, serve a holding and accelerating function, while the air assist of the delivery assist 42 is to speed the discharge.

The Method

The method of feeding cups, of course, presupposes that the cups have a top, a skirt, and an open end so that the cups may be fed at a high speed fashion from a feeding device in which their orientation is random to a delivery or discharge means in which they are fully oriented with the open end of the cup in the upward position.

The method contemplates first rotating a plurality of cups in a random fashion but confined to a circumferential locus so that the same are constantly whirling around, being urged by centrifugal force to the periphery of the circumferential locus.

Thereafter the cups are picked off the confined circumferential locus and then presented in rolling orientation and randomly as to top orientation to a confined linear path. While the confined linear path desirably takes the cross sectional configuration of the cups, in the form of an enclosed chute, it will be appreciated that the confined linear path may be provided by air curtains, or by rails, or by other combinations of air and varying rails and need not be the exact configuration as shown in the mechanism here described of a confined four-sided chute.

Thereafter the method contemplates tilting the cups at a midpoint along the skirt between the center of gravity of the cup and the open end. The tilting as shown in the mechanism above contemplates a ramp, but it will be also appreciated that a fine long stream of air may be employed, or indeed, where the cups are metallic it may be done magnetically. In all events the tilting is required in order that the cups fall outwardly towards their tops, while at the same time permitting the linear confinement of the cups to relax so that as the cups tilt toward the tops the open ends will be presented upwardly, and thereafter again reconfiguring the cups for linear movement after they are tilted to a top upwardly oriented condition. The confinement may be provided, just as in the pickup from the rotary locus, by means of rails, pneumatically, or other means known in the art to fall within the scope of the method herein described.

Further objects and advantages I claim:

1. A cup feeding and orienting device for cups having a top, a skirt, and an open end comprising, in combination, a rotary feeder, tangential orienting means comprising a curved plow for rollingly presenting each cup within the rotary feeder to a discharge, a discharge chute for receiving the cups in rolling orientation with random open end and top orientation, tipping means for rollingly receiving the cups from the discharge chute having a width permitting the cups to tilt from their rolling orientation,
3,710,924

5 pneumatic means for holding down and accelerating said cups positioned along the transition area from the discharge chute to the tipping means and aimed to engage a central portion of the skirt of the cups,

ramp means positioned beneath the cups and within the tipping means for engaging the cup skirt at a point centrally of the cup's center of gravity as the same proceeds through the tipping means thereby tipping the cups toward an open end up orientation, and

da delivery chute confining the thus tipped cups in their open end up orientation.

2. In the cup feeding device of claim 1, said plow having a point oriented below the face of said conical rotary member, and

a groove in said conical rotary member into which said plow point projects thereby presenting the upper portion of the plow to any cups passing by.

3. In the cup feeding device of claim 1, frame means,

a tilt box within the frame means cradling the rotary feeder, and

means for moving the tilt box to adjust the angle of the combined discharge chute, tipping means, and delivery chute.

4. In the cup feeding device of claim 1, said discharge chute, tilting means, and delivery chute having a common longitudinal axis lying in a plane parallel to the plane of rotation of the conical rotary member.

5. In the cup feeding device of claim 1, a deepened central portion of the bottom of said tipping means at the far end of the ramp means.

6. In the cup feeding device of claim 1, said tipping means comprising a track having walls which flare outwardly and then inwardly at the top thus permitting the cup top to tip over against the walls as it rolls down the ramp means.

7. In the cup feeding device of claim 1, a trap flange extending centrally of the upper portion of the side walls of the tipping means at a point near the end of the ramp means.

8. In the cup feeding device of claim 1, a ridge on said ramp means which becomes higher and then lower as the cup skirt rolls down the same and is tipped with the top toward the walls of the tipping means.

9. In the cup feeding device of claim 1, pneumatic means for holding down and accelerating said cups positioned along the transition area from the discharge chute to the tipping means and aimed to engage a central portion of the skirt of the cups.

10. In the cup feeding device of claim 1, pneumatic accelerating means directing an air jet against the cup oriented along the transition area from the tipping means to the delivery chute.

11. In the cup feeding device of claim 1, said rotary feeder having a central conical rotary member, and

a circular side wall adjacent the periphery of said conical rotary member.

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