(54) Title: APPARATUS FOR APPLYING BASE CUPS TO BOTTLES

Apparatus for assembling base cups (C) onto bottles (B) includes an assembly wheel (14) that has a plurality of pockets (38) on the periphery thereof and a plurality of clamping fluid cylinders (24) supported on an upper support plate (22) and aligned with the pockets. The assembly wheel is positively driven by a drive motor (44, 46) which also drives a bottle-infeed mechanism (16) and a cup-infeed mechanism (18), as well as an ejector mechanism (20). The cup infeed mechanism includes an indexable carrier (90) that indexes each cup at a glue-applying station (100), where the cup is raised and simultaneously rotated while glue is being applied in an annular pattern to the inner surface of the cup. The cup and bottle have movement along paths which merge where the bottle is then forced into the cup through a pressurized source to a clamping cylinder (24) and held in that position while the glue sets.
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APPARATUS FOR APPLYING BASE CUPS TO BOTTLES

DESCRIPTION

Technical Field

The present invention relates generally to commercial machines for producing beverage containers and, more specifically, to machines for assembling base cups to the bottom of plastic bottles having rounded bottoms.
Background Prior Art

Bottles and cans have been the primary source of packaging beer and soft drinks for many decades. One type of plastic bottle that has been marketed successfully and has received favorable acceptance is the two-liter plastic bottle that has a closure which can be resealed. This package is used extensively in packaging soft drinks and other beverages. One specific type of bottle that is now available is a blow-molded PET plastic bottle that has a rounded or semi-spherical bottom and a threaded neck which receives a closure. A base cup is secured to the bottom of the bottle to provide stability for the package during storage, shipment and use.

In line with the acceptance of the plastic bottle with a separate base cup, machinery has been developed for producing such units, and examples of such machinery are disclosed in U.S. Patent Nos. 4,132,584 (Aidlin) and 4,300,966 (Hoffman). The earlier patent to Aidlin discloses a transport turret that has a plurality of stations on the periphery thereof, and base cups are supplied from a conveyor while separately-formed plastic bottles are supplied from another conveyor to the stations. Glue is applied to the base cups and the cups and bottles are clamped for a short duration sufficient for the glue to partially set and interconnect the elements, after which the units are ejected. The Aidlin machines have the turret driven intermittently.
through a drive motor and gear and chain arrangements.

The Hoffman patent discloses a similar machine wherein base cups are fed to a turret which has a plurality of pockets and is indexed at an adhesive-applying station and a bottle-insertion station. Pressurized air is used to clamp the bottle and cup until the adhesive sets.

Advertising literature and machinery specifications profess speeds of 100 and 80 ppm, respectively, for the machines, but actual use by the Assignee of the present invention has shown that it is difficult to maintain such production speeds for extended periods of time. Furthermore, it was determined that the drive system requires substantial maintenance and requires considerable down-time regularly.

Thus, there remains a need for a machine of this type that has greater production speeds and less maintenance than existing equipment, and at the same time maintains positive control of the finished product.

**Summary of the Invention**

According to the present invention, a machine has been developed which can maintain positive control of base cups and bottles throughout the assembly cycle. The machinery is designed so that there is a synchronized relation between the base cup and a bottle at all times and the base cup and bottle are
positively gripped at all times to minimize any possible mis-alignment between the two during the assembly cycle.

More specifically, the machine includes a rotatable turret or assembly wheel supported on a base and driven by a drive motor with a cup-infeed mechanism also supported on the base and driven by the same drive motor, along with a bottle feed mechanism. Both the cup and the bottle sources of supply are provided by pneumatic conveyors to the respective stations.

The cup-feeding station consists of a carrier or starwheel which has a plurality of peripheral pockets and is rotated and indexed through indexing gear arrangement driven by the common motor drive for the entire system. A glue-applying station is positioned in radial alignment with the pockets and includes an annular holder or sleeve which is axially reciprocable and continuously rotated to lift and rotate the cup while glue is being applied from a source above the cup.

The annular holder or carrier is freely rotatable on an upper end of a hollow shaft guided for movement on the base. A crank is pivoted on the base and has one end connected to the shaft with a cam follower on the opposite end engaging a cam driven by the common drive motor. The annular holder is continuously rotated by a separate drive motor.

A transfer wheel is rotated on the base by the common drive and positively transfers the cup with the applied glue from
the carrier to the assembly wheel and positioned under the bottle, which is positively located in the assembly wheel by a pocket and a guide system.

Brief Description of Several Views of Drawings

FIG. 1 is a plan view of the base cup applicator machine;

FIG. 1A is a schematic illustration of the assembly wheel;

FIG. 2 is a cross-sectional view of the cup infeed mechanism as viewed along line 2-2 of FIG. 1;

FIG. 3 is a cross-sectional view of the glue-applying station as viewed along line 3-3 of FIG. 1;

FIG. 4 is a view similar to FIG. 3 showing the cup in the raised position and glue being applied;

FIG. 5 is a fragmentary side elevation of a part of bottle conveyor system; and,

FIG. 6 is an end view of the bottle conveyor system.

Detailed Description

While this invention is susceptible of embodiment in many different forms, there is shown in the drawings and will herein be described in detail a preferred embodiment of the invention with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the
broad aspect of the invention to the embodiment illustrated.

FIG. 1 of the drawings shows the machine, generally designated by reference numeral 10, including a base 12 that has a turret 14 rotatable thereon, along with a bottle-feeding station 16, a cup-feeding station 18, and a removal or discharge station 20.

Turret or assembly wheel 14 includes an upper support plate 22 which supports a plurality of cylinders 24 around the periphery thereof. Each of the cylinders 24 has a hollow piston rod 26 (FIG. 2) reciprocated therein. Piston rod 26 is spring-biased to a return position and is extended through fluid pressure applied from a source (not shown) through conduits 28 and a rotary valve arrangement 30.

Turret or assembly wheel 14 also has a lower flat plate 32 and a pair of intermediate plates 34 and 36 interconnected by posts 37, with plates 34 and 36 having a plurality of recesses 38, which define pockets for the bottle, as illustrated in FIG. 2.

Three guide rails 40, two of which are aligned with plates 34 and 36 define an outer guide surface so that the bottle will be positioned in the pockets 38 by friction, as will be described later. The rotating turret consists of upper support plate 22, lower flat plate 32, intermediate plates 34 and 36 and gear 42 and rotates about fixed center shaft 21.

The large drive gear 42, fixed to lower flat plate 32, is driven by a motor 44.
through index box 96, drive shaft 102, gear box 46 and small drive gear 48, so that the assembly wheel is continuously and positively rotated when motor 44 is energized.

Bottles B are fed from a source along a path defined by a pneumatic conveyor 50 to the bottle-infeed station 16. The pneumatic conveyor 50 consists of a pair of spaced conduits 52 having inwardly-directed openings 53 and connected to a source of pressurized air through a hose 54. Pneumatic conveyor 50 also includes an upper guide plate 56 having an elongated slot 58 which receives the reduced neck portion of the bottle (see FIG. 6) so that the bottle is suspended on plate 56 and is moved along the path by the pressurized air exiting through the openings in the pair of conduits 52. A retractable stop member 60 may be interposed at the end of the path to hold the array of bottles and control the movement into the infeed station 16.

Connected to guide plate 56 and positioned after the open end of guide slot 58, but before retractable stop member 60 (see FIG. 5), is alternate bottle feed gate 61, which consists of spring members 63 which are rigidly connected to one end of a slot in guide plate 56 and held by spring force on the other end, such that slight upward force from a bottle will deflect spring member 63 and allow that bottle to be inserted into guide slot 58, thus providing an intermediate and momentary alternate bottle supply port to the primary supply at the open end of guide slot 58.
The bottle infeed station 16 consists of a starwheel 62 that has fingers 64 defining pockets 66 for the respective bottles. A pair of arcuate guide rails 68 extend around a portion of the starwheel 62 and between plates 34, 36. Starwheel 62 is driven through a gear (not shown) in mesh with the large drive gear 42.

Thus, the continuously-rotating starwheel 62 picks up respective bottles B adjacent the outer end of arcuate guide rail 68, whereupon the bottles are under positive control at all times as they are transferred through bottle-feeding station 16 and into the assembly wheel 14. The bottles are gripped in a like manner between pocket 38 and the arcuate guide rail 40.

Base cups are likewise supplied from a source (not shown) through a pneumatic conveyor 70, illustrated in detail in FIG. 2. A pneumatic conveyor 70 consists of a rectangular conduit 72 having a plurality of openings 74 created by deflecting tabs 76 from the body of the metal forming the conduit.

Side guide rails 80 and top bars or guide bars 82 (FIG. 1) define a partially-enclosed space for the base cups C and direct them along a path towards the base cup-infeed station 18. A blower 84 is connected to the end of conduit 72 so that pressurized air will lift the cups C above the surface of the conduit 72 and move them along a path, indicated by the arrow in FIG. 2, towards the cup-infeed station 18. A retractable stop 86 at the end
of conveyor 70 prevents cups from entering carrier 90 until the appropriate time.

The cup-infeed station 18 includes a generally circular carrier 90 that has a plurality of pockets 92 formed on the periphery thereof. Each of the pockets is configured substantially the same as the periphery of the cups so that the cups are placed in full engagement in the pockets by the pressurized pneumatic fluid in conduit 72.

An arcuate guide bar 94 extends partially around the periphery of the carrier 90, as shown in FIG. 1, so that the cups are under positive control during the indexing of the carrier 90.

The carrier 90 is driven by an indexing gear box 96 to index the pockets at a glue-applying station 100, which will be described in further detail later. The indexing gear box 96 is driven by motor 44.

A dead plate 104 extends from the end of the conveyor 70 around the periphery of the carrier 90 to the assembly wheel and defines a support surface for the cups C as they are being indexed to various locations around the periphery of the carrier 90. A sensor mechanism 106 may be positioned adjacent the periphery of the carrier 90 to sense the presence or absence of a cup in each of the pockets as the associated pocket is aligned with the sensor to assure glue application only when a cup is located in the proper place at the proper time, as will be explained later.
The cup-infeed station also includes a transfer wheel 110 supported on a shaft 112 mounted to the base 12 and transfer wheel 110 consists of a plurality of radially-extending fingers. Shaft 112 is positively driven through a gear (not shown) that is in mesh with the main drive gear 42 so that the continuously-rotating transfer wheel 110 will engage the cups while in the pockets 92 and drive the base cups below a respective bottle B. This movement is again controlled by an arcuate guide rail 116 that extends from the edge of the carrier 90 and into the periphery of the assembly wheel.

The details of the glue-applying station 100 are illustrated in FIGS. 3 and 4 and include an annular holder or carrier 120 that is supported on the upper end of a reciprocable shaft 122 with suitable bearings 124 interposed between the carrier and the shaft. The shaft 122 is supported on guide bars 127 and reciprocated vertically through a crank 126 that has a clevis arrangement 128 on one end thereof, which extends on opposite sides of the shaft 122 and receives a slide block 130 fixed to the shaft 122. The opposite end of crank 126 has a cam follower 132 rotatable thereon, which is in continuous engagement with a cam 134 that is fixed to shaft 102 and the output shaft of index box 96. The cam 134 is configured such that the shaft and annular holder 120 are in the raised position, illustrated in FIG. 3, for approximately one-half revolution of shaft 102,
as shown in FIG. 4, and in a lowered position for approximately one-half revolution.

Annular holder or carrier 120 may be continuously rotated through a small drive motor 140 having a gear 142 on its output shaft, which is constantly in mesh with a gear 144 defined on the periphery of annular holder or carrier 120. Annular holder 120 is aligned with an opening 146 in dead plate 104 so that as the carrier is raised, it will engage the lower surface of the cup and raise the cup above the dead plate 104 and simultaneously rotate the cup through motor 140. Preferably, the cup is held onto the carrier through a vacuum source 148 that is in communication with the space adjacent the upper end of the carrier through the shaft 122, which is hollow.

While the carrier is in the raised position and is being rotated to rotate the cup, glue is applied to the interior of the cup from a glue-applying mechanism 150, as shown in FIG. 4. The glue-applying mechanism 150 may, for example, be of the type manufactured by Nordron Corp., Schaumburg, Illinois, as Model 18, with a Nordron Model H20A gun and a single orifice nozzle controlled by a Nordren Model CT-6 time interval control.

Usually, the base cups C are configured to have an annular raised portion or ridge 152 that defines a support point for positively supporting the container in the holder. As illustrated in FIG. 4, the glue applicator 150 is aligned with the upper
surface of this annular ridge 152 so that glue is being applied to the entire surface while the cup is being rotated. Alternately, the drive motor 140 and gear 142 may be disabled and glue applicator 150 aligned with the center of vertical shaft 122. In this configuration, a dot-type glue pattern may be applied.

The operation of the mechanism is believed to be apparent from the above description, but will be briefly summarized at this point. Plastic bottles are fed from a source into the open end of guide slot 58 and are moved along the guide slot 58 by the pressurized air within conduits 52 so that the bottles are moved along a path to the end of the conveyor where the movement is interrupted by retractable stop 60. At the same time, cups are delivered from a source (not shown) onto the upper surface of the conduit 72, and the pressurized air lifts the cups off the surface of the conduit and moves them along the path defined by the guide rails 80 and 82 to the end of the conveyor, where movement is interrupted by stop 86.

At an appropriate time, and provided both a cup and matching bottle are available, the lead cup is released by retracting the stop 86, and the cup moves into engagement with the now-stationary pocket 92 on the indexing starwheel 90. The indexing of starwheel 90 will remove the cup from the end of the path defined by the conveyor 70 onto dead plate 104 and subsequent indexes will move it first in front of the sensor mechanism 106 and next to


glue station 100. During this movement, the cups are under positive control, being frictionally gripped between pockets 92 and the arcuate guide rail 94. When a cup stops in front of sensor mechanism 106, bottle stop 60 retracts and the bottle moves into engagement with the leading edge of the pocket 66 on the continuously-rotating starwheel 64. The starwheel 64 and guide 68 are configured and positioned such that the bottle is under positive control and is in frictional engagement with the guide rail 68 and the starwheel 64 as it is being driven towards the assembly wheel 14.

The moving bottle B and the respective moving pockets 38 are aligned with each other so that the bottle is completely engaged with the surfaces defining the recesses 38 as it enters the area inside the leading edge of guide bar 40. When the bottle is in full engagement with the arcuate surfaces 38, the bottle is frictionally gripped between the guide bars 40 and the plates 34 and 36, as it is being moved by the assembly wheel 14.

At the glue-applying station 100, the cups are lifted and simultaneously rotated while glue is applied to the ridge 152. Thereafter, the cups are lowered onto the dead plate 104 and indexed towards transfer wheel 110, which picks up the respective cups and moves them along the dead plate 104 onto base plate 32 horizontally aligned with dead plate 104 and in direct alignment below the
bottles in the respective pockets 38, again being under positive control through the guide rail 116. Once the cup is positioned below the bottle B, the hollow piston rod 26 is extended by pressurized air in cylinder 24 and forces the bottle down into the base cup into engagement with the ridge 152 where glue was applied. The assembled bottles and base cup remain under clamping pressure until just prior to the discharge station 20, where pressure is removed from clamping cylinder 24.

The discharge station or removal means 20 again includes a rotatable carrier 170 that has a plurality of pockets 172 on the periphery thereof and is again continuously driven through a gear (not shown) in mesh with main drive gear 42 so that the assembled base cup and bottle are positively removed and are guided along guide bar 174 and exit through a shoot arrangement 176.

Thus, it will be seen that the present invention provides a positive control of the cups and the bottles at all times throughout the cycle of assembly and the direct gear engaging drive for all of the mechanisms from a single drive motor allows for accurate synchronized control movement of the cup and the bottle throughout the assembly cycle. Since the bottle and cup are always positively gripped between a stationary guide rail and a movable support member, there is no possibility of misalignment that may result in jamming of parts, which results in destruction of the product. In fact, the positive control has
significantly reduced the normally resulting scrap material in the production of these types of bottles.

It should be noted that the entire system could easily be computer-controlled in conjunction with sensor 106, and it will be appreciated that other types of controllers could also be used.

Since most of the components are rather standard components of the drive system, very little maintenance is required for the entire system.
CLAIMS

1. Apparatus for assembling base cups onto bottles, comprising a base having a rotating turret supported thereon; drive means on said base having a gear drive connected to said turret, said turret having a plurality of peripheral stations, each having a clamping means associated therewith; first conveyor means for delivering a continuous supply of base cups along a first path toward said turret; second conveyor means for delivering a continuous supply of bottles along a second path toward said turret; an adhesive-applying station on said base at an end of said first path, said adhesive-applying station including a rotatable carrier having a plurality of pockets for receiving base cups from said first path; indexing means driven by said drive means for intermittently rotating said carrier to align respective pockets with said first path to receive base cups therein, intermittently-actuated adhesive applicator means above said carrier, and positive transfer means between said adhesive-supplying station and said turret for transferring bottles are positively and continuously supplied in synchronized relation to said peripheral stations for clamping by said clamping means to adhere said base cups and bottles; and discharge means for removing containers with applied base cups from said peripheral stations.
2. Apparatus as defined in Claim 1, in which said adhesive-applying station includes a rotatable and vertically-reciprocable holder aligned with said pockets, motor means for rotating said holder and means for momentarily lifting said holder with a base cup thereon while adhesive is being applied from said applicator means.

3. Apparatus as defined in Claim 1, in which said first conveyor means includes an apertured conduit having a pressurized fluid source in communication therewith and guide rail means associated therewith so that said fluid source moves with base cups along said first path.

4. Apparatus as defined in Claim 3, in which said second conveyor means includes a pair of spaced apertured conduits in communication with a pressurized fluid source, and plate means defining an elongated support slot between said conduits for receiving a portion of said bottle to suspend said bottles between said conduits.

5. Apparatus as defined in Claim 4, in which said plate means is interrupted along a portion of said slot to define a gap with a deflectable member extending across said gap so that bottles can be manually inserted by deflecting said member.
6. Apparatus as defined in Claim 4, further including first and second retractable stop means adjacent the ends of said first and second paths and means for simultaneously retracting said stop means so that a bottle enters said second transfer means at the same time a base cup enters said rotatable carrier.

7. Apparatus as defined in Claim 1, in which said second transfer means includes a starwheel rotatable on said base and an arcuate guide rail extending above said base and partially surrounding said starwheel so that bottles are frictionally gripped during transfer from said second path to said turret.

8. Apparatus as defined in Claim 7, further including guide rail means on said base partially surrounding said turret between said second transfer means and said positive transfer means so that bottles are frictionally gripped in suspended positions in said peripheral stations and said base cups are moved under said bottles.

9. Apparatus as defined in Claim 8, further including a dead plate positioned under said carrier and said positive transfer means between the end of said first path and said turret so that said cups are guided under positive control from said first path to said peripheral stations.
ll. Apparatus for assembling base cups onto bottles, comprising a base having an assembly wheel rotatably supported thereon, said assembly wheel having a plurality of bottle-receiving stations thereon and clamping means associate with each station; drive means on said base for continuously rotating said assembly wheel; first conveyor means for delivering a continuous supply of base cups along a first path toward said assembly wheel; first transfer means at the end of said first path driven by said drive means and including a fixed guide rail means on said base and a rotatable transfer wheel for frictionally gripping said bottles for movement from said first path to pockets on said assembly wheel; second conveyor means for delivering a continuous supply of bottles along a second path toward said assembly wheel; second transfer means at the end of said second path driven by said drive means and indexable to a plurality of positions; said second transfer means including fixed guide rail means on said base for frictionally gripping said base cups; a glue applicator station aligned with one of said positions for applying glue to said base cups; and third transfer means driven by said drive means for moving base cups from said second transfer means to said assembly wheel below said bottles so that said clamping means can be actuated to clamp said bottles onto said base cups.
10. Apparatus as defined in Claim 10, further including guide rails extending partially around said carrier and said positive transfer means so that base cups are frictionally gripped while being moved from said first path to said peripheral stations.
INTERNATIONAL SEARCH REPORT

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all)*

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC (4): B29C 65/52
U.S. CL: 156/423, 497, 567, 578; 406/86, 88; 29/DIG. 78

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Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched *

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<tbody>
<tr>
<td>Y</td>
<td>US, A, 4,441,955 (Richardson) 10 April 1984 See Figures 1, 3, 4.</td>
<td>1, 11</td>
</tr>
<tr>
<td>Y</td>
<td>US, A, 4,384,907 (Aidlin) 24 May 1983 See Figures 1-5, stop means 18, dead plate 84, and curved guide 86.</td>
<td>1, 2, 6-11</td>
</tr>
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<td>Y</td>
<td>US, A, 4,365,915 (Neuman) 28 December 1982 See column 2, lines 10-36 and column 6, line 39 to column 7, line 15.</td>
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<td>Y</td>
<td>US, A, 4,300,966 (Hoffmann) 17 November 1981, See Figure 12.</td>
<td>1, 2, 11</td>
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<td>Y</td>
<td>US, A, 4,284,370 (Danler) 18 August 1981, See Figure 5.</td>
<td>4</td>
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<tr>
<td>Y</td>
<td>US, A, 4,132,584 (Aidlin) 2 January 1979, See air nozzles 42 and stop means 37.</td>
<td>3, 6</td>
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<tr>
<td>Y</td>
<td>DE, A, 2,916,822 (Kronseider) 6 November 1980, See curved friction surface 27.</td>
<td>7, 8, 10, 11</td>
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IV. CERTIFICATION

Date of the Actual Completion of the International Search ² | Date of Mailing of this International Search Report ²

03 June 1986 | 13 JUN 1986

International Searching Authority ¹ | Signature of Authorized Official ¹

TSA/US | Michael G. Wityshyn

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