APPARATUS FOR CLEANING RECEPTACLES PNEUMATICALLY

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This invention relates to a process and apparatus for cleaning receptacles pneumatically and has particular reference to a process and apparatus whereby bottles and the like are freed of dust and similar foreign matter preliminary to filling.

Both new and old bottles accumulate dust when permitted to stand for any length of time and, even when new, dust and lint from inside the carton get into the bottles before these empty receptacles are delivered to the bottling line. This dust settles on the interior walls because the bottles are not sealed or covered while awaiting use. Deposition of dust is of increased amount where the bottles are kept in atmospheres laden with extraordinary high contents of dust and other solid particles. Also, in the case of new bottles, small particles of foreign matter frequently accumulate during the process of manufacture.

Some of the processes and machines now in use for removing the dust and other foreign matter from the bottles and other receptacles employ compressed air. In some instances the bottles are evacuated and this vacuum is employed from inside and through the bottles.

Among the objects of this invention is to provide a process and apparatus designed to overcome disadvantages incident to prior processes and apparatus, and to accomplish these results readily, efficiently and inexpensively.

A further object of this invention is to provide an apparatus for conveying bottles and similar receptacles through the automatic process of pneumatically cleaning the bottles.

A further object of this invention is to provide a process and apparatus which may also be operated as part of a single unit for both cleaning the bottles or other receptacles and then filling the same.

Other, further and more specific objects of this invention will become readily apparent to persons skilled in the art from a consideration of the following description when taken in conjunction with the accompanying drawings wherein:

Fig. 1 is a cross-section along line 1—1 of Fig. 2, showing a bottle carrier of my device and also showing, in plan, portions of the conveying means to and from the carrier.

Fig. 2 is a vertical cross-section along line 2—2 of Fig. 1.

Fig. 3 is an enlarged, fragmental, detail section along line 3—3 of Fig. 2, showing the disposition of the suction ports and conduits and the pressure ports and conduits of my apparatus.

Fig. 4 is a detail section along line 4—4 of Fig. 3, showing the suction port which communicates with an exhaust chamber and pressure ports which communicate with a compressed air chamber.

Fig. 5 is a detail section along line 5—5 of Fig. 3, showing the suction ports which communicate with conduits opening into the bottles when undergoing pneumatic cleaning and the pressure ports which communicate with the nozzles disposed to inject air into the bottles undergoing pneumatic cleaning.

Fig. 6 is a detail section through the carrier along line 6—6 of Fig. 2, showing the relative positions of the bottles conveyed to and from the carrier during a stage of the transfer. In this view, the hub of the carrier is shown in elevation.

Fig. 7 is a detail, perspective view, showing the positions of the guiding paddles of the rotating carrier relative to the incoming conveyor and the discharge belt when passing over and adjacent to this conveyor and the discharge belt.

Fig. 8 is a fragmental, schematic, plan view illustrating the passage of the bottles from the rotating carrier onto the discharge belt and the discharge of bottles from the incoming conveyor to the rotating carrier when the bottle about to be transferred from the incoming conveyor to the rotating carrier is disposed in a given position relative to the paddle members of the carrier.

Fig. 9 is a view similar to Fig. 8 and showing the bottle about to be transferred from the incoming conveyor to the rotating carrier disposed in a position other than that of the bottle about to be transferred in Fig. 8.

The apparatus comprises the rotatable carrier, designated as a whole by the reference numeral 2, which is adapted to revolve within the housing 4. This housing is provided with the peripheral portion 6, the front end 8 and the rear portion 10. This front portion is preferably provided with removable parts, in order to give access to the interior of the housing.

The rotatable carrier has a hub 12, loosely mounted on the shaft 14, and a plurality of arms or paddles 16 projecting radially from the hub 12. These paddles are preferably of wood and may be covered with felt, if desired. Air nozzles 18 also extend outwardly and radially from the hub 12, and are disposed between the shanks or stems 20 of adjacent paddles. Each nozzle 18 is fastened into the hub 12 and communicates at its inner end with a conduit or duct 22 which terminates in the port opening 24.
other conduit or duct 26 through the hub 12 is provided adjacent to each of the ducts 22. Each duct 26 has at one end the port openings 42, 44 and 46, which extend to its corresponding bottle seat 30, which is also secured in the hub 12. I prefer to have each nozzle 18 project through this end of its conduit 26 and extend beyond its bottle seat 30.

A rear face-plate 32 bears against the hub 12 and is disposed so that the hub may rotate with respect to this face-plate. A conduit 34 connected to a compressed air chamber (not shown) branches into a plurality of individual conduits 36, 38 and 40, which extend into the face-plate 32 and terminate in the port openings 42, 44 and 46, respectively. A conduit 48 connected to a vacuum chamber (not shown) also extends into the face-plate 32 and terminates in the arcuate port opening 50.

When the hub 12 is rotated with respect to the face-plate 32, each of the pressure ports 24 on the hub 12 registers in turn with the pressure ports 42, 44 and 46 of the face-plate 32. Also during this revolution, each of the vacuum ports 28 registers successively with the long arcuate vacuum port 58 in the face-plate 32. Each of the ports 28 may be in a substantially portion of each cycle of revolution, and several of these ports 28 simultaneously register with the port 50.

A clutch sleeve 52 is keyed to the shaft 14 and is provided with a friction facing 54. On the end of the shaft 14 is fastened a spring-plate 56. A spring 58, coiled about the shaft 14, bears against the spring plate 56 and the front cover-plate 60 of the hub 12, and serves to hold the hub 12 and rear face-plate 32 together with proper pressure to prevent the contacting faces 54 and 56 from rubbing. By means of the bolts 62 threaded engaging the bores 64 in the plate 60, the clutch sleeve 52 may be moved to effect frictional engagement with the hub 12, so that the hub 12 will turn with the sleeve 52 and shaft 14. This frictional pressure should be enough to receive the hub 12 during ordinary operation, but not too great to prevent the shaft 14 and sleeve 52 from turning independently of the hub 12 when the carrier is prevented from turning by congealing of bottles. The inner ends of the bolts 62 bear against the diameter of the shaft which has diametrically opposite notches 67 into which project the reduced ends 68 of the shoulder lugs 69 which are secured to the plate 60.

The paddles 16 are connected to the hub 12 by the shanks 93. These paddles are provided with the sloping forward end faces 76 and the sloping rearward end faces 72. The side faces 74 and 76 of the paddles are slightly sloped from the perpendicular to the axis of rotation of the carrier. The distance between the faces 70 and 72 of adjacent paddles is such as to permit the bottle or other receptacle to be closed to rest therein with a small amount of clearance.

Power is transmitted to the shaft 14 by means of the sprocket wheel 78, sprocket chain 80, sprocket wheel 82, shaft 84, worm wheel 96 and worm 88 from the main drive shaft 90 supported in the bearings 91. Power from this main drive shaft 90 is also transmitted to the sprocket wheel 92, sprocket chain 94, sprocket wheel 98 and shaft 98 to the mutilated bevel gear 108. During a portion of its revolution, this mutilated gear 108 engages and drives the bevel gear wheel 102. The bevel gear 102 drives the shaft 104 which transmits the power through the worm 106 to the worm wheel 108 and shaft 110. When this shaft 110 revolves it turns the roller 111 which drives the wide belt conveyor 112 serving as a loading table. The belt 120 moves with the gear 112 in engagement therewith, thereby driving the middle belt conveyor 118, which is driven on the pulley 120 fastened to the shaft 122, which is also fastened to the gear 118. The belt 110 also drives the roller 124 upon the shaft 116 also in engagement with the belt 120.

The incoming belt conveyor 128 is driven by the pulley 126, also mounted on shaft 122 and adjacent to the pulley 120.

The belt 112 moves only when the section of teeth on the mutilated gear 100 meshes with the gear 102. The movement of these gears is regulated so that the belt 112 will travel forward at the desired intervals a sufficient distance to transfer onto the continuously moving incoming belt 128 one row of the bottles 130 previously dumped onto the loading table or belt 112. These bottles are carried forward by the belt 128 between the guide rails 132 and the casing 4 and are deflected by the spring guide 134 onto the middle conveyor 118. When each bottle 130 has moved completely upon the middle conveyor 118, it assumes a position on the conveyor 118 in continuity registry with the port 50 and rides therein through a revolution of the carrier and is then discharged upon the conveyor 118, which delivers it to the discharge conveyor 136, from which it passes onto a filling apparatus (not shown).

There is provided a partition wall 138 diagonally across the top of the conveyor 118. This partition 138 is nearly parallel to the spring guide 134 on the incoming side and the spring guide 140 on the outgoing side. By reference to Fig. 8, it will be seen that the bottle 130 has been guided onto the middle carrier 118 and between adjacent paddles 16. In this case, the bottle 130 is shown as delivered to the end of the chute formed by the spring guide 134 and diagonal wall 138 just at the time it could conveniently enter between adjacent paddles 16 and be carried around by the carrier. The angularity of the faces 70 and 72 of the paddles serves to properly guide and assist in receiving and carrying the bottles forward by the carrier. It will be noted that the spring guide 134 is diametrically opposite stethoscope 131 and is fastened against the casing 4 by the rod 142 and its surrounding spring 143 resting between the stops 144 and 145. The spring guide 140 is hinged at 146 and is held against the casing 4 by means of the rod 147 and its surrounding spring 148 resting between the stops 149 and 150.

If the bottle 130 reaches the end of the chute before the adjacent paddles 16 are in position to properly receive the bottle, there will be a slight crowding of the bottles as shown in Fig. 9 and the spring guide 134 will temporarily yield and then, aided by the sloping face 14 of the paddle 16 immediately ahead of the bottle 130, will force the bottle 130 slightly backward and direct it between the adjacent paddles which are then in proper position to receive it. The spring guide 140 serves the same purpose on the outgoing side and also rotates for the bottles leaving the carrier. It is hinged in order to allow yielding movement in case of crowding of the bottles, which occurs very seldom.

As the bottles are carried around by the carrier, they begin to slide radially downward when the bottles reach the position of bottle 130 shown in Fig. 9. These bottles bears against the neck of the bottle, and the mouth of the bottle resting against the corresponding seat 30, which is preferably of soft material, such as rubber, rubber composition,
The bottles tend to remain in this position, relative to the nozzle and seat, for nearly the entire upper half of the path of movement of each bottle by the carrier during which time gas-tight communication is established between the interiors of the bottles and the vacuum or low-pressure suction chamber.

When the bottle reaches a position near its uppermost point of travel on the carrier, it will be inverted and at this point the vacuum port opening 23 corresponding to the seat 30 on which this bottle rests will register with the end 151 of the arcuate port opening 56 and the bottle will be subjected to continuous suction until this port 28 passes the end 152 of the vacuum port 50. During this suction period, the bottle will be substantially inverted and will be held against its seat by its inverted position and also the suction of the bottle. During the time when the suction port 28 of this bottle is in registry with the vacuum port 50 in the face-plate 32, the pressure port 24 projecting into this bottle will successively register with the corresponding pressure ports 42, 44 and 46 in the face-plate 32. This will cause puffs of air to enter the bottle while it is under suction. By providing these air puffs at the time the bottle is under suction and inverted, I am able to obtain far greater efficiency of cleaning than is provided by other pneumatic cleaners.

In the preferred practice of my invention, each of the bottles undergoing cleaning is subjected, while in inverted position, to suction before, during and after each puff of air introduced into the bottle. In this way, the foreign matter—and especially the very minute light particles of lint—are effectively removed. Where the bottles are to be filled with certain beverages, such as wines, liquors and cordials, thorough removal of the lint is important, because it is most desirable that there be no floating solids in these liquids.

My apparatus operates quietly, efficiently with low power consumption and with negligible breakage of bottles. By having the carrier of my device practically vertical—i. e. revolving about a substantially horizontal shaft—instead of using a horizontal carrier revolving about a vertical shaft, I am able to introduce the bottles with the bottoms down, clean the bottles in inverted position and discharge the bottles with the bottoms down. The automatic feed, including the use of the wide belt feeding the bottles onto the narrow belt, effects a saving in operating expense as well as speeding up of the operation.

The apparatus is compact and requires less space than other devices of comparable capacity and volume of receptacles handled. It is also simple to repair and uses to a large extent parts that are commonly found in stock in supply shops or shelves.

The present invention is not limited to the specific details set forth in the foregoing examples which should be construed as illustrative and not by way of limitation, and in view of the numerous modifications which may be effected, therein without departing from the spirit and scope of this invention. It is therefore intended that only such limitations be imposed as are indicated in the appended claims.

I claim as my invention:

1. An apparatus for cleaning receptacles, facing structure having a suction port connected for communication with an exhaust chamber and a plurality of pressure ports connected for communication with a compressed air chamber, a carrier disposed to move relative to said suction port and said pressure port, a seat upon said carrier for a receptacle adapted to register with said suction port during part of the rotation of said carrier when the bottle is inverted in said receptacle, a conduit on said carrier having one terminal adapted to register with said suction port during part of the movement of said carrier and the other terminal of said conduit disposed at said seat, and another conduit on said carrier having one terminal adapted to register with said suction port and said pressure port during part of the movement of said carrier and the other terminal of said conduit being in communication with a nozzle and disposed to inject air into a receptacle upon said seat when suction is applied to the interior of said receptacle through said first-named conduit.

2. In an apparatus for cleaning bottles, facing structure having a suction port connected for communication with an exhaust chamber and a plurality of pressure ports connected for communication with a compressed air chamber, a carrier disposed to rotate relative to said suction port and said pressure ports, a plurality of seats upon said carrier for said bottles adapted to register with openings in said bottles, each of said seats having a conduit extending therefrom through said carrier and having its other terminal adapted to register with said suction port during part of the rotation of said carrier when the bottle is inverted upon said seat and a nozzle at each of said seats and disposed to inject air into a receptacle upon said seat when suction is applied to the interior of each of said receptacles through said conduits and each of said nozzles being connected to a conduit extending therefrom through said carrier to a terminal port adapted to register successively with said suction ports during said part of the rotation of said carrier when the bottle is inverted upon its seat and the terminal of the former conduit is in registry with said suction port.

3. In an apparatus for cleaning bottles, facing structure having an elongated, arcuate, suction port connected for communication with an exhaust chamber and a plurality of pressure ports connected for communication with a compressed air chamber, a carrier disposed to rotate relative to said suction port and said pressure port, a plurality of seats upon said carrier for said bottles adapted to register with openings in said bottles, each of said seats having a conduit extending therefrom through said carrier and having its other terminal adapted to register with said suction port during part of the rotation of said carrier when the bottle is inverted upon said seat and a nozzle at each of said seats and disposed to inject air into a bottle upon said seat when suction is applied to the interior of each of said bottles through said conduits and each of said nozzles being connected to a conduit extending therefrom through said carrier to a terminal port in substantial radial alignment with the terminal of the former conduit and adapted to register with said pressure port during said part of the rotation of said carrier when the bottle is inverted upon its seat and the terminal of said former conduit is in registry with said suction port.

4. In an apparatus for pneumatically cleaning receptacles, a rotatable carrier, a member adjacent to said carrier, said carrier being in close, facial contact with and rotatable with respect to said member at their common communication with a compressed air chamber, a conveyor disposed to move relative to said suction port and said pressure port, a seat upon said conveyor for a receptacle adapted to register with said suction port during part of the movement of said conveyor and the other terminal of said conduit disposed at said seat, and another conduit on said conveyor having one terminal adapted to register successively with said pressure ports during said part of the movement of said conveyor and the other terminal of said conduit being in communication with a nozzle and disposed to inject air into a receptacle upon said seat when suction is applied to the interior of said receptacle through said first-named conduit.
means for effecting communication between said elongated port and a suction chamber, a small port in said member at the contacting face and in the vicinity of said elongated port, means for effecting communication between said small port and a supply of compressed air, a small port in said member at the contacting face and in the vicinity of said elongated port, means for effecting gas-tight communication between said member and the interior of a receptacle on said carrier undergoing cleaning, another small port in said carrier at the contacting face adapted to register with said small port in said member during the rotation of said carrier, a nozzle on said carrier for injecting air into said receptacle on said carrier and means for effecting communication between said small port in said member and said injector when suction is applied to the interior of said receptacle through said first-named small port in said carrier.

5. In an apparatus for pneumatically cleaning receptacles, a rotatable carrier, a member adjacent to said carrier, said carrier being in close, facial contact with and rotatable with respect to said member at their contacting faces, an elongated arcuate port in said member at the contacting face, means comprising a conduit through said member for effecting communication between said elongated port and a suction chamber, a plurality of small ports in said member at the contacting face and in the vicinity of said elongated port, means comprising a conduit through said member for effecting communication between said small ports and a supply of compressed air, a plurality of small ports in said carrier at the contacting face, at substantially equal radial distance from the axis of revolution of said carrier and adapted to register in turn with said elongated port in said member during the rotation of said carrier, means for effecting gas-tight communication between said ports on said carrier and the interiors of receptacles on said carrier undergoing cleaning, a plurality of other small ports in said carrier at the contacting face, at substantially equal radial distance from the axis of revolution of said carrier and adapted to register in turn with said small ports in said member during the rotation of said carrier, an air injecting nozzle on said carrier for each receptacle on said carrier and means for effecting successive communication between said small ports in said member and said injectors when suction is applied to the interior of said receptacle through said first-named conduit.

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