April 20, 1965 J. M. CHERRY 3,179,133

ADJUSTABLE FILL HEIGHT VENT TUBE

Filed Sept. 30, 1963

FIG. 1.

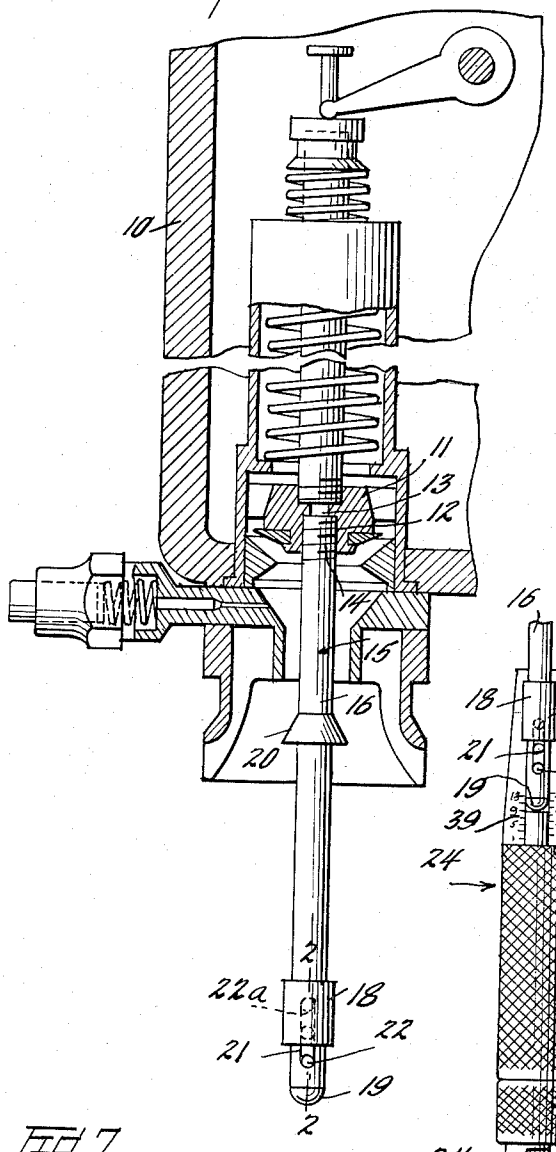


FIG. 2.

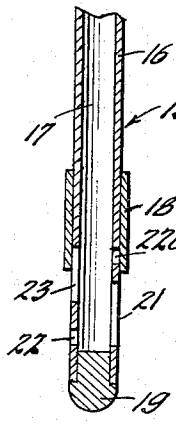


FIG. 3.

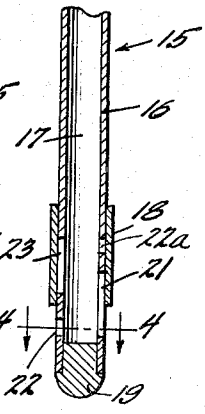


FIG. 4.

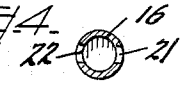


FIG. 5.

FIG. 6.

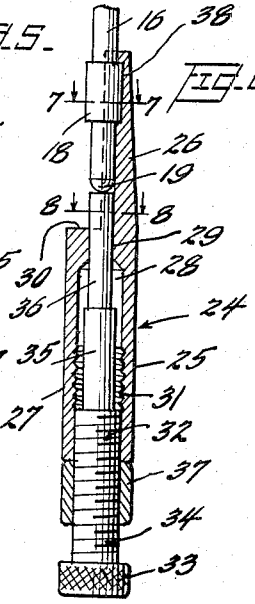


FIG. 7.

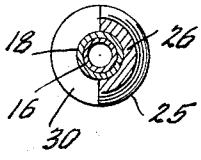
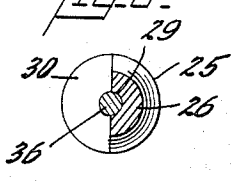


FIG. 8.



INVENTOR

James M. Cherry,

BY Watson, Cole, Grindle & Watson

ATTORNEYS

United States Patent Office 3,179,133 Patented Apr. 20, 1965

3,179,133

ADJUSTABLE FILL HEIGHT VENT TUBE

James M. Cherry, Atlanta, Ga., assignor to The Coca-Cola Company, Atlanta, Ga., a corporation of Delaware

Filed Sept. 30, 1963, Ser. No. 312,637
3 Claims. (Cl. 141—40)

The present invention relates to rotary filling machines of the counter-pressure type, and particularly to filler valve mechanisms of the type described and illustrated in U.S. Patent No. 2,467,684 to G. L. N. Meyer. This invention is more especially directed to an improved vent tube of the general type disclosed in U.S. Patent No. 2,847,043 to W. J. Sommers.

Rotary filling machines of the kind mentioned, employing vent tubes as a part of the filler valve mechanism, are employed for filling containers such as bottles, cans, and the like. Such containers for packaging carbonated soft drinks, beer and some other perishable food products are filled, desirably, to a specific, predetermined fill height. In counter-pressure filling, as is well known, the fill height is determined by the level of the vent aperture in the vent tube.

By the use of filler valve mechanisms such as that disclosed in U.S. Patent No. 2,467,684 and similar valves, the bottle or other container is first counter-pressured with air or CO_2 by the mechanical means described in said patent. As is described therein, the air or CO_2 is admitted into the filler valve body from the head space of the filler bowl by the appropriate valving arrangement. The gas is simultaneously forced downward through the bore of the vent tube, thence out through the small hole or holes drilled laterally through the vent tube near its lower extremity, thence into the bottle.

When the counter-pressure of this gas in the bottle equals the pressure of the gas in the head space of the filler bowl another part in the filler valve assembly automatically opens and permits the flow of the product into the bottle by gravity. In order for this gravity flow of the product to continue, the gas above the liquid level in the bottle is expelled through the small holes drilled laterally through the vent tube, thence up the bore of the vent tube into the head space of the filler bowl.

When the elevation of the product in the bottle is sufficient to cover or close the small lateral hole or vent aperture in the vent tube the exit for the counter-pressure gas in the bottle is thereby closed, causing the gravity flow of the product into the bottle to cease at a time when pressure of the entrapped gas is equal to the pressure exerted by the height of liquid vertically above the vent aperture.

If the filling cycle ended at this time, then accurate fill heights could be obtained regardless of the size, shape or contour of the package. However, since the filling cycle does not end at this point, the necessary remaining steps in the filling cycle cause different fill heights of the product to result in packages or containers of varying size, shape or contour, as will now be explained.

After the flow of the product into the bottle is stopped in the manner described above, it is necessary to "snift" or vent the head space of the container to atmospheric pressure. This release of the head space gas to atmospheric pressure results in an additional volume of the product being released from the inner surfaces of the valve body assembly. This additional volume of product raises the fill height to the desired distance from the "finish" of the bottle.

If the same fill height is required on another bottle having a larger volume in the fill height area of the neck, this additional flow of product caused by snifting will

have a larger volume to be contained in, and the result will be a fill height lower than that desired. Conversely, if another bottle has a smaller volume in the fill height area of the neck than the original bottle, the additional flow of product caused by snifting will result in a fill height higher than desired.

Moreover, modern high speed automated beverage filling equipment is capable of being used flexibly with a variety of different sized containers, all of which have a different vertical height and corresponding different internal capacities, such as 6½ ounce, 8, 10, 12, 16, 26 and 32 fluid ounce sizes. Each size requires a vent tube with its vent aperture at a different position on the side of the tube.

A primary objective of the invention is to provide means for attaining any desirable fill height for any size bottle without the necessity of changing vent tubes, by means of a construction which permits precise adjustment of the height of the vent aperture through an infinite number of positions.

More specifically, it is an object of the invention to provide a vent tube comprising a tubular member having one end adapted for connection to a filler valve mechanism of a rotary filler, at least a portion of the exterior surface of the tubular member being cylindrical, in combination with a sleeve surrounding and closely engaging the said cylindrical portion of the tubular member, the tubular member being provided with slots of appropriate width and length located on different sides of the tube or angularly displaced from each other. It is also a feature of these slots that they be so positioned along the vertical or longitudinal axis of the tube as to cause said slots to overlap, preferably by an amount equal to the slot width, thus forming a through passage the minimum diameter of which equals the width of the slot. At the lower extremity of the lower slot and at the upper extremity of the upper slot a hole is drilled through the wall of the tube opposite or angularly displaced from this portion of this slot.

The above-mentioned sleeve may be adjusted along the tube so as to close off any portion of either the upper or lower slots, or both. The sleeve is preferably of resilient material and is so dimensioned that it will retain the position to which it is adjusted by means of the contractive power of the material of which it is made.

The lower end of the bore of the tubular member is closed by a fixed member permanently attached to the tube.

The sleeve may be adjusted to its proper elevation, so that its lower edge is over either a point on the lower slot on one side of the tube or over a point on the upper slot on the opposite side of the tube, by a mechanical means herein later described. Since the elevation of the lower edge of the sleeve is the factor which controls ultimate fill height, the lower the sleeve is positioned on the tube (as long as it remains within the limits of the slots) the lower is the resulting fill height from the top of the finish of the bottle. Conversely, the higher it is positioned on the tube, the higher the resulting fill height. As can be seen almost an infinite number of positions or adjustments can be had between the limits of the opposing slots. It is this feature which enables this tube to fill to a specified fill height all packages of like size, shape, or contour regardless of what the size, shape, or contour may be. This is not possible with vent tubes of conventional designs.

A further object is the provision, in combination with a vent tube as described above, of a special tool for adjusting the sleeve along the vent tube to such position as to effect achievement of the desired fill height. To assist in this operation the said tool is provided with suitable graduations as described below.

Another object is the provision of said special tool in and of itself.

A most important advantage is reduction in cost of operation of the filling machinery. An example of the economic effect of this is to be understood in considering the inventory problem of a plant having filling machinery using sixty tubes at a cost, for example, of $3.80 each, or $228.00. Some large plants have as many as six of these machines so that in order to start up on 6½ ounce production, they need $1,368.00 worth of vent tubes alone. A plant of this size probably will also produce a king-size product in either 10 or 12 ounce size, a 16 ounce size and a home package of about a 26 ounce size, which will require a stock of tubes for each size; so that for inventory alone for tubes for four sizes, it is necessary to carry an original inventory of $5,472.00 worth of vent tubes with an additional inventory of spare parts necessitated because of the normal breakage and bending of tubes in daily use.

A further advantage is the saving in labor and overhead expense in "down time" provided by the adjustable tubes. It will take one machinery mechanic an hour or an hour and a half to change 60 tubes, necessitating not only the labor cost of his time but the labor cost of the entire production crew who may be idle while the machine is down, and the overhead loss on the equipment while the same is not being used. Production plants of this kind may change tubes once or twice a day as they switch from one size to another, necessitated by the selling conditions of that particular day. By quickly adjusting the fill height of the installed tubes a major portion of this economic loss is avoided.

Another advantage is the provision of flexibility in fill height adjustment between the several vent tubes of a machine. As a practical proposition, beverage delivery valves are temperamental and no matter how finely machined to uniform tolerances, slight wear and malfunction will cause one or more of the delivery valves to vary below or above the desired fill height. The adjustable feature of the present tube provides a quick and easy method of changing the height of the position of the side aperture, thus solving this problem.

A further object is to provide a tube which can be easily cleaned and sanitized to comply with sanitary codes of the various governmental bodies. The sleeve can be easily removed over the lower end of the tube for complete inspection and sanitizing of the sleeve and the tube.

Other and further objects, features and advantages will be apparent from the description which follows, read in connection with the accompanying drawings, in which:

FIGURE 1 is a vertical section through the filler valve mechanism of a rotary filling machine of the counter-pressure type, showing the vent tube of the present invention in elevation;

FIGURES 2 and 3 are fragmentary axial sections through the lower portion of the device of the invention, showing the adjustable sleeve in different positions;

FIGURE 4 is a section on line 4—4 of FIGURE 3;

FIGURE 5 is an elevation illustrating the tool employed for adjusting the sleeve along the vent tube, the tool being shown in the position, relative to the vent tube, which it occupies as the said adjustment is completed;

FIGURE 6 is a view, partly in axial section and partly in elevation, and rotated 90°, of the tool and vent tube portion seen in FIGURE 5;

FIGURE 7 is a transverse section on line 7—7 of FIGURE 6; and

FIGURE 8 is a transverse section on line 8—8 of FIGURE 6.

In order to facilitate an understanding of the invention, reference is made to the embodiment thereof shown in the accompanying drawings and detailed descriptive language is employed. It will nevertheless be understood that no limitation of the invention is thereby intended and that various changes and alterations are contemplated such as would ordinarily occur to one skilled in the art to which the invention relates.

Referring to the drawings, the numeral 10 designates the filler bowl of a rotary filling machine corresponding to that described and illustrated in U.S. Patent No. 2,847,043, to which reference is made for a more detailed description of the operation of the filler value mechanism. The valve 11 is provided with an internally threaded wall 12 surrounding its central bore 13 for engagement with the externally threaded upper end 14 of the vent tube 15 of the present invention.

The vent tube 15 comprises a tubular member 16 provided with a central bore 17 throughout its length, a sleeve 18 and a member 19 permanently closing the lower end of the tube. The tubular member 16 is provided with a spreader element 20 in the conventional manner.

In the illustrated embodiment the tubular member 16 is cylindrical and of uniform diameter throughout. This is conventional and preferable, but for the purposes of the present invention is not essential, it being required only that the external surface of the member 16 correspond in shape and dimension to the internal surface of the sleeve 18 to provide for the necessary cooperation between these two elements. Accordingly, in the illustrated embodiment the sleeve 18 is cylindrical externally and internally, the sleeve being formed of resilient material, for example, a suitable plastic material, and of such internal diameter as to engage the tube 16 sufficiently tightly to prevent inadvertent movement of the sleeve along the tube. The wall of the tube 16 is provided with an axially elongated lower slot 21 near its lower end, a circular aperture 22, of a diameter equal to the width of slot 21, angularly displaced from and preferably opposite the lower end of the slot 21, an axially elongated upper slot 23 and a circular aperture 22*a*, of a diameter equal to the width of slot 23, angularly displaced from and preferably opposite the upper end of slot 23. The slot 23 is angularly displaced from and preferably extends through the wall opposite the slot 21, the lower end of the slot 23 overlapping the upper end of the slot 21 by an amount preferably corresponding to the widths of the two slots, which are equal. Thus, the overlapping portions of the slots 21 and 23 constitute the ends of a through passage having a minimum diameter equal to the width of the slots, the upper and lower ends of which are preferably semicircular. The purpose of the through passage just described, and of the through passage corresponding to the lower end of slot 21 and the circular aperture 22 and the through passage corresponding to the upper end of slot 23 and circular aperture 22*a* is to provide cross-venting in any position of the sleeve 18. Such cross-venting is beneficial to the proper operation of the vent tube and the aforesaid through passages also facilitate cleaning of the vent tubes. Again, they are useful in installing and removing the tubes, since they provide for the insertion therethrough of a pin which may be used for rotating the tube into and out of threaded engagement with the valve 11.

Because of the location of the slots 21 and 23 at angularly displaced and preferably angularly opposite points of the tube 16, the slots have considerably less weakening effect on the tube than if a single longer slot were employed. Also, as described above, this positioning of the slots permits cross-venting when the sleeve 18 is in an upper position and the liquid level is above the aperture 22. Circular aperture 22*a* permits cross-venting when the lower edge of sleeve 18 is at the upper end of slot 23 and the liquid level has risen above the upper end of slot 21.

Rapid and precise adjustment of the sleeve 18 along the tube 16 so as to provide a vent opening at the precise level to result in the desired fill height is possible with the aid of the special tool illustrated in FIGURES 5 to 8,

inclusive. The tool 24 comprises a barrel 25 having a generally semicylindrical upper portion 26 and a generally cylindrical lower portion 27. The outer surface of the upper portion 26 is preferably conically tapered as shown. The barrel 25 is provided with an axial bore 28 of a diameter somewhat larger than that of the tubular member 16, merging with an axial bore 29 of a diameter equal to that of the tube 16. The bore 29 extends from the upper end of the bore 28 through the shoulder 30 forming the upper end of the cylindrical portion 27 and to the upper end of the semicylindrical portion 26, this upper portion of the bore 29 presenting an inner surface which, like the portion 26 of the barrel 25, is semicylindrical. The lower end of the bore 28 is provided with threads 31 to engage a threaded pin 32 having a knurled head 33, a threaded shank 34, a reduced intermediate shank portion 35, and a still further reduced upper shank portion 36 of a diameter substantially equaling that of the tube 16, there being sufficient tolerance between the shank portion 36 and the bore 29 to permit relative axial movement therebetween. A lock nut 37 threaded on the shank portion 34 enables the pin 32 to be secured in its adjusted position relative to the barrel 25.

Near its upper end the semicylindrical portion 26 is provided with a semicylindrical recess 38, coaxial with the bore 29, the semicylindrical recess 38 having an inner surface which corresponds in axial dimension and radius of curvature with the outer surface of the sleeve 18, thus providing a socket in which the sleeve 18 may be engaged for movement along the tube 16 by manipulation of the tool 24 in an axial direction. The lower part of the semicylindrical portion 26 is preferably provided, on its flat face, with numbered graduations as indicated at 39 in FIGURE 5.

To adjust the sleeve 18 to a desired position on the tube 16, corresponding to a desired fill height, the operation is as follows. The lock nut 37 being disengaged from the lower end of the barrel 25, the pin 32 is retracted by counterclockwise rotation until the end of the shank portion 36 is flush with the shoulder 30, or at least sufficiently retracted to permit of the required manipulation. The inner surface of the recess or socket 38 is then engaged with the outer surface of sleeve 18 and a downward movement imparted to the tool such that the lower end of the sleeve 18 is brought to a point below the desired position. The pin 32 is then rotated in a clockwise direction until the upper end of the portion 36 is at a predetermined desired position, preferably as indicated by the graduations 39. The lock nut 37 is then rotated until it engages the lower end of the barrel 25, thus locking the pin 32 in the adjusted position. The tool, with the sleeve 18 snugly engaged within the recess 38, is then moved upwardly until the upper end of the shank portion 36 of the pin 32 engages the closure member 19 at the bottom of the tube 16, this engagement limiting the upward movement of the tool, which is then disengaged from the sleeve 18. If the end-wise position of the pin 32 has been correctly predetermined, the bottom of the sleeve 18 will then be at the precise desired level along the tube 16, to effect the desired container fill height.

From the foregoing description, it will be apparent that the device of the invention will achieve the objects and possess the advantages enumerated above.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. An adjustable vent device comprising a vertically disposed tubular member and formed with a cylindrical outer surface adjacent its lower end and having a plurality of vertically elongated slots extending through the wall thereof in the area of said cylindrical surface, said slots being angularly spaced and horizontally disaligned with an end portion only of each slot disposed at the same level as an end portion of an adjacent slot to form an unobstructed horizontal passage through said tubular member at said level, said tubular member having apertures through said wall at the levels of and angularly spaced from the lower end portion of the lowermost slot and the upper end portion of the uppermost slot, a sleeve having a generally cylindrical inner surface surrounding and closely engaging said cylindrical outer surface, said sleeve having an axial dimension at least substantially equal to the total vertical dimension of said slots, said sleeve being movable along said tubular member to expose said slots to a precise desired extent.

2. A device according to claim 1, said sleeve resiliently gripping said cylindrical outer surface with sufficient force to prevent inadvertent movement of said sleeve relative to said surface.

3. A device according to claim 1, said slots being two in number and being located on opposite sides of said tubular member.

References Cited by the Examiner

UNITED STATES PATENTS

1,453,895	5/23	Swift	81—3
2,063,326	12/36	Meyer	141—57 XR
2,591,071	4/52	Huggins et al.	141—288 XR
2,640,640	6/53	Meyer	141—305
2,688,267	9/54	Schmuldt	81—3
2,847,043	8/58	Sommers	141—305

FOREIGN PATENTS

480,462	8/29	Germany.

LAVERNE D. GEIGER, *Primary Examiner.*