United States Patent [19]

Campbell et al.

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[54] **BOTTLE ALIGNMENT DEVICE FOR BOTTLE FILLING MACHINES**

[76] Inventors: **Robert L. Campbell,** 15805 Hickory Hill Drive; **Daniel A. Roatcap,** 13007 Sunnybrook Lane, both of La Mirada, Calif.

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[52] **U.S. Cl.** **141/371,** 141/165, 141/373

[51] **Int. Cl.** **B65b 3/04,** B67c 3/26

[58] **Field of Search** 141/165, 166, 269, 141/312, 370, 371, 372, 373, 374, 291, 353

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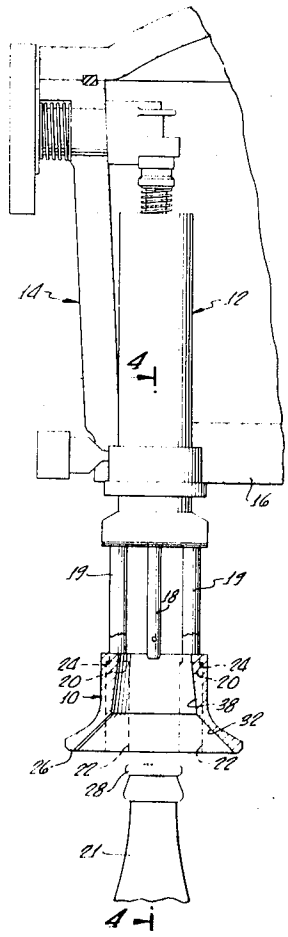
Primary Examiner—Houston S. Bell, Jr.

Attorney—Fowler, Knobbe & Martens

[57] **ABSTRACT**

A bottle alignment device for bottling machines which reciprocates along vertical guides which are mounted on the filling valve head so that no contact is made between the device and the filling tube, thereby allowing the filling or vent tube to be small in diameter to increase clearance with the bottle opening, and allowing the bottle to be sealed using a single stationary sealing gasket.

10 Claims, 5 Drawing Figures



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SHEET 1 OF 2

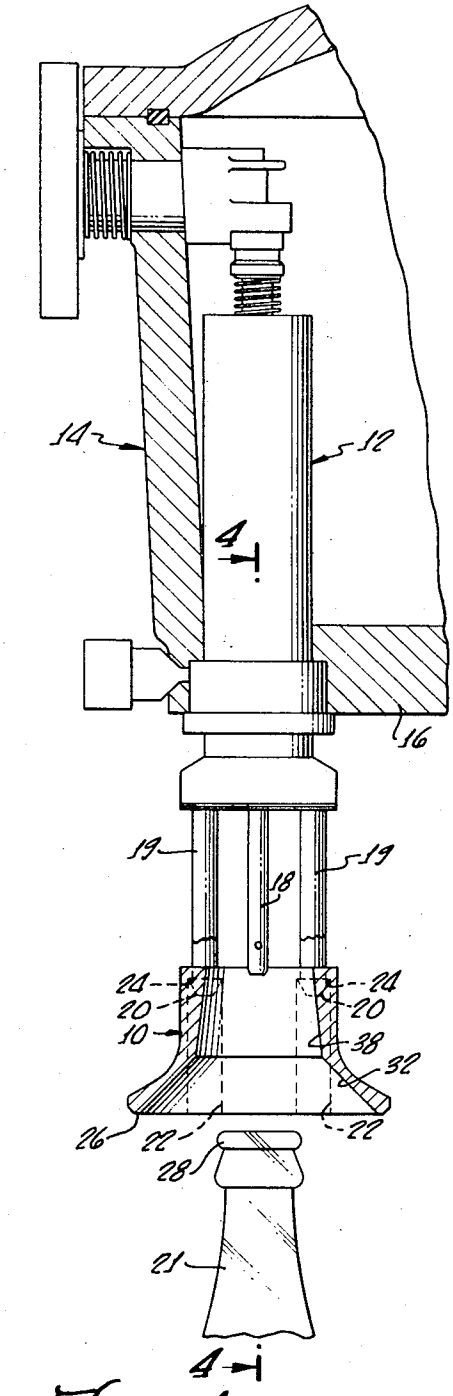


FIG. 1.

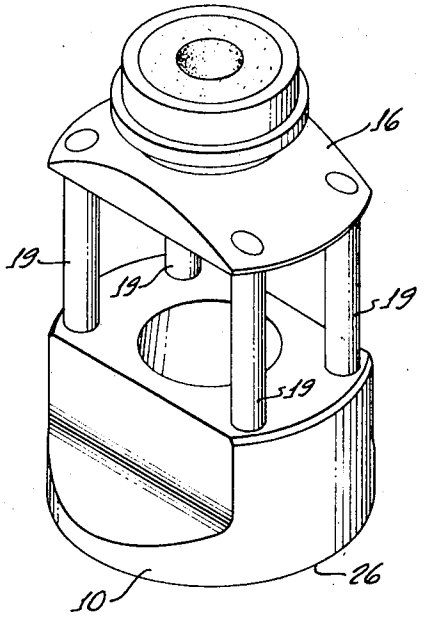


FIG. 2.

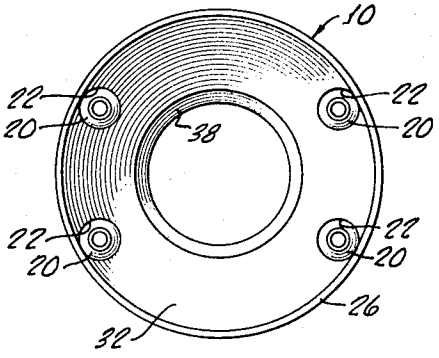


FIG. 3.

INVENTORS.
ROBERT L. CAMPBELL
DANIEL A. ROATCAP
BY
FOWLER, KNOBBE
& MARTENS
ATTORNEYS.

FIG. 4.

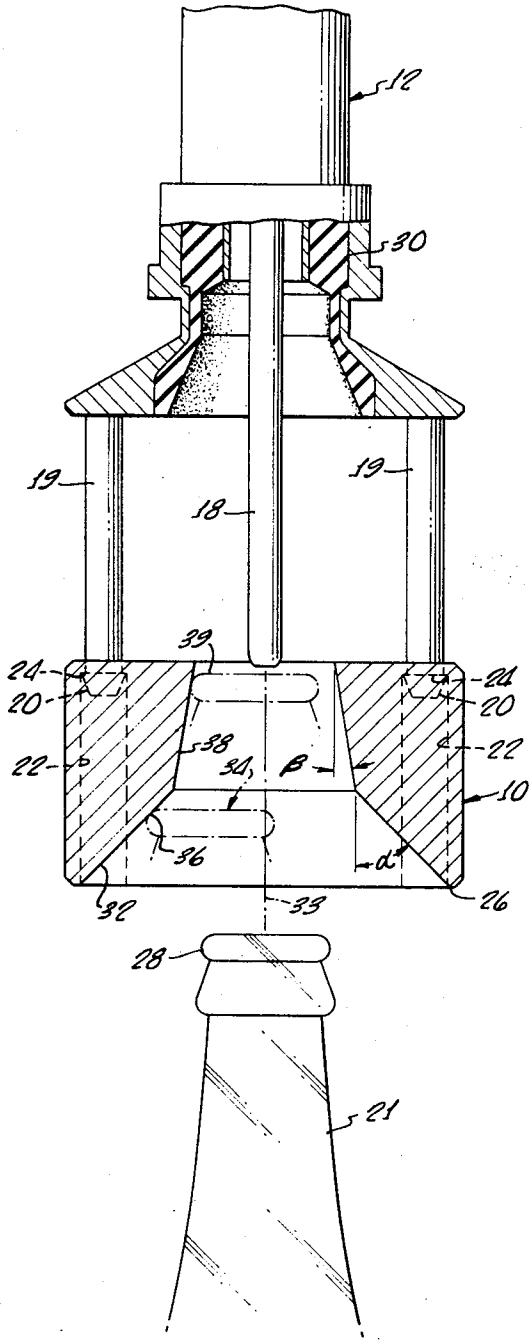
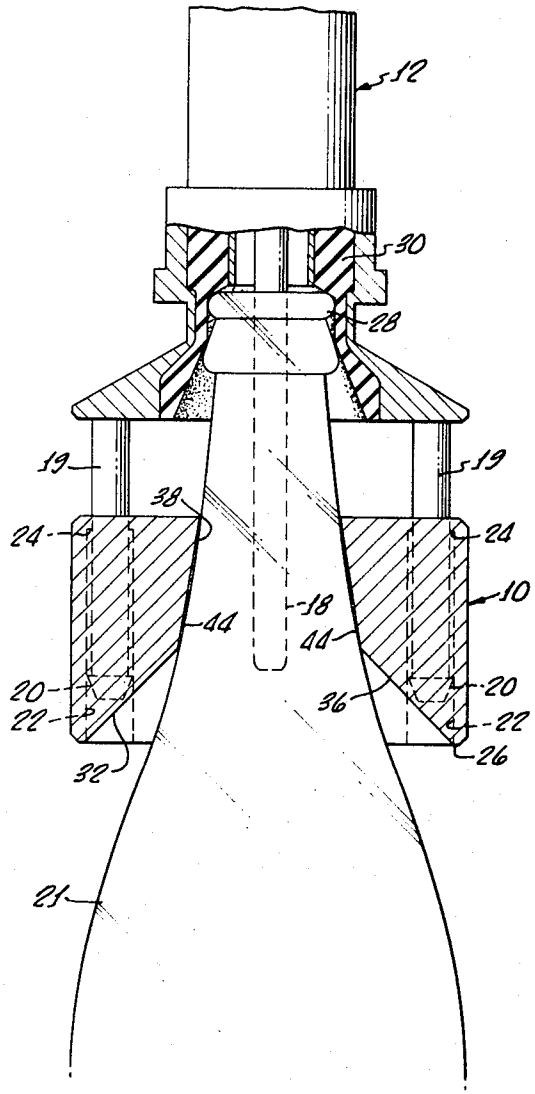


FIG. 5.



INVENTORS.
ROBERT L. CAMPBELL
DANIEL A. ROATCAP
BY
FOWLER, KNOBBE
& MARTINS
ATTORNEYS.

BOTTLE ALIGNMENT DEVICE FOR BOTTLE FILLING MACHINES

BACKGROUND OF THE INVENTION

This invention relates to high speed bottle filling machines, such as those which are used to fill carbonated beverage bottles, and more particularly to a bottle alignment device for such a bottle filling machine which assures that bottles which are raised to surround the extremity of a filling or vent tube do not contact the tube, thereby avoiding chipping and breakage of the bottles.

In high speed bottle filling machines, bottles are commonly fed into stirrups which hold the bottles as they are elevated to a position where the neck of the bottle surrounds the extremity of a tube. This tube may be used to conduct liquid into the bottle, or to vent gas from the bottle as liquid is conducted into the bottle from another opening, or for both. As the bottles are raised, the extremity of the filler or vent tube must enter the relatively small neck opening of the bottle and extend toward the inside bottom surface of the bottle. Once the bottle has been raised and has engaged a sealing ring, the liquid, usually a beverage, may be forced into the bottle through the filler tube while the bottle is vented through a separated orifice in the sealing ring. Alternatively, the bottle may be vented using a vent tube which enters the bottle, as liquid flows into the bottle through an orifice adjacent to or surrounding the vent tube. In each of these systems, the tube which is inserted into the bottle typically acts as a portion of the bottle filling apparatus as well as a sensing device to determine when the bottle is filled to a predetermined level.

As the empty bottle is lifted in the stirrup, there is danger of contact between the neck of the bottle and the vent tube, which can cause damage to the bottle such as chipping or breaking, and can occasionally damage the tube itself. It has therefore been found advantageous in the past to utilize alignment devices in the shape of bells for aligning the bottle prior to insertion of the tube and to guide the bottle during tube insertion. The inside surface of such a device is used to cam the neck of the bottle as the bottle is raised. Such centering bells as were typically used in the prior art were either mounted in a stationary position relative the filling machine, or vertically reciprocated along the tube. The vertical reciprocation on the filling or vent tube was found to allow the use of the centering bell to align the bottle both prior to and during insertion of the vent tube into the bottle.

In order to allow this reciprocation of the centering bell on the vent tube itself, the vent tube had to be made substantially stronger than would normally be necessary, usually by increasing the outside diameter of the vent tube itself. Such diametrical increase reduces the clearance between the vent tube and the mouth of the bottle to be filled and therefore increases the likelihood of contact between the tube and the bottle. Likewise, reciprocation of the centering bell on the vent tube typically required that the sealing gasket which is used to seal the bottle from the outside atmosphere during filling be reciprocated with the centering bell. This not only increased the weight of the centering bell, thereby interfering with rapid reciprocation, but required that an additional seal be designed into the apparatus between the centering bell and the filling head

to assure that the system would be sealed during bottle filling when the centering bell is in the raised position. These systems therefore substantially complicate the bottle filling system and reduce the reliability of the bottle sealing mechanism without reducing the likelihood of contact between the bottle and the vent or filler tube to a satisfactory extent.

SUMMARY OF THE INVENTION

The present invention, on the other hand, assures bottle alignment through the use of a centering bell which is reciprocally mounted from the filling valve head rather than from the filling or vent tube. This invention therefore allows the centering bell to guide the bottle around the extremity of the filling or vent tube both prior to and during insertion of the tube without interference with the normal operation of the gasket seal or alterations to the filling or vent tube. The centering bell depends below the extremity of the filler tube and receives the neck of the bottle as the bottle is raised prior to insertion of the filling or vent tube. Camming surfaces on the inside of the alignment bell guide the bottle into alignment as the bell is raised so that, by the time the neck of the bottle reaches the extremity of the filling or vent tube, the axis of the bottle is aligned with the axis of the centering bell. The centering bell then engages the bottle at a point below the neck of the bottle and is raised thereby along guides mounted on the filling valve head to maintain bottle alignment until the bottle reaches the filling position, at which position the bottle neck is in contact with the normal gasket seal of the filling apparatus.

The centering bell of the present invention therefore aligns the bottle prior to and during insertion of the filling or vent tube, but operates without interfering with the normal operation of the filling apparatus so that the normal gasket seal and the normal filling apparatus may be used.

These and other advantages of the present invention are best understood by reference to the following description of the preferred embodiment which is shown in the drawings in which:

FIG. 1 is a elevation view, partially in section, of the centering bell of the present invention installed on a bottle filling machine and positioned above a bottle to be filled;

FIG. 2 is a perspective view of the centering bell as it is attached to the filling valve head;

FIG. 3 is a plan view of the bottom of the centering bell of the present invention;

FIG. 4 is a sectional view of the filling valve head and centering bell of the present invention positioned over a bottle prior to the elevation of that bottle; and

FIG. 5 is a view similar to FIG. 4 but showing the apparatus of the present invention after the bottle has been raised to the filling position.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring first to FIG. 1, a centering bell 10 in accordance with the present invention is installed below a valve body 12 which is mounted within the filling reservoir 14 of a circular high speed bottle filling apparatus. Such a filling apparatus normally includes a large plurality of such filling valves 12, typically approximately fifty in number. During operation of the machine, the reservoir 14 will contain liquid in which the valve 12 is

partially immersed, so that operation of the valve will control flow of the liquid from the reservoir **14**.

The valve body **12** is mounted on a base member or valve head **16** in which the valve and valve seat (not shown) are located. This valve head **16** is in turn mounted on the fluid reservoir **14**.

A vent tube **18** is mounted within the valve body **12** and passes through the valve head **16**. In the preferred embodiment the bottle filling apparatus uses the tube **18** as a vent tube rather than as a filling tube, and fluid is allowed to flow from the reservoir **14** into a bottle **21** through openings in the valve head **16** which are adjacent to the vent tube **18**. Air or other gas is vented from the bottle **21** during filling through the vent tube **18**.

Referring now to FIGS. **1–3**, the unique cooperation of the valve head **16** and centering bell **10** of the present invention may be described. Dependent from the valve head **16** and attached thereto are four similar guides in the form of rods **19** having enlarged caps **20** at their extremities. The rods **19** may be fixed to the valve head **16** by any suitable method of attachment, such as welding. The centering bell **10** includes four cylindrical holes **22** which have a sufficiently large diameter to slidably receive the enlarged caps **20** of the rods **19**. The upper extremities of these cylindrical holes **22** are reduced in diameter to form an annular ridge **24** having an inside diameter which is just large enough to slidably receive the rods **19** but through which the enlarged caps **20** of the rods **19** will not pass. In order to make the centering bell **10** removable from the rods **19** for cleaning and maintenance, it has been found advantageous to make the enlarged caps **20** of the rods **19** removable therefrom so that the centering bell **10** may be slid onto the rods **19** and the enlarged ends **20** thereafter attached. A threaded connection between the rods **19** and caps **20** may be used for this purpose. The upper surface of the caps **20** will thereafter contact the annular rim **24** so that the centering bell **10** may reciprocate, under the force of gravity, only to a predetermined extent, that is, only until engagement of the caps **20** on each of the rods **19** and the annular rim **24** associated therewith.

As can be seen most clearly in FIGS. **1** and **4**, the position of the centering bell at the lowest end of its reciprocation is such that substantially all of the centering bell **10** is below the lower extremity of the vent tube **18**. This allows the centering bell **10** to coact with the bottle **21** through the majority of the elevation of the bottle **21**, so that alignment of the bottle **21** by the time the bottle **21** reaches the extremity of the vent tube **18** is assured. More specifically, the lower rim **26** of the centering bell **10** is positioned just above the upper extremity of the neck **28** of the bottle **21** as that bottle **21** is initially engaged by the stirrup (not shown) in the bottle filling apparatus. The bottle **21** is later raised in the stirrup by the bottle filling apparatus so that the neck of the bottle **21** will engage a sealing gasket **30** (see FIG. **4**) within the valve head **16**. It is the purpose of the centering bell **10** of the present invention to align the bottle **21** during this elevation so that, as the neck **28** of the bottle **21** reaches the lower extremity of the vent tube **18**, the inside diameter of the neck **28** will clear the lower extremity of the vent tube **18** without the neck **28** contacting the vent tube **18**.

With particular reference to FIG. **4**, the use of the camming surfaces within the centering bell **10** to align the bottle **21** may be described. A first conical camming surface **32** within the centering bell **10** is preferably formed such that the conical axis is at an angle α of 45° from the axis **33** of the centering bell **10**. The position of a bottle **21** which is offcenter in its stirrup is shown in phantom lines at **34**. The neck **28** of this bottle at **34** will contact the camming surface **32** as shown at the print **36** and this contact will force the neck **28** of the bottle toward the center of the centering bell **10**. This camming surface **32** is used for an initial coarse alignment of the bottle **21**.

A secondary conical camming surface **28** is preferably formed such that the conical axis is at an angle β of 8° from the axis **33** of the centering bell **10** and serves to accomplish the fine alignment of the bottle **21** before insertion of the vent tube **18**. A bottle **21** is shown at a position **39** within this secondary conical camming surface **38**, being aligned prior to insertion of the tube **18**.

Once the centering bell **10** has aligned the bottle **21** so that insertion of the tube **18** into the bottle **21** may be properly accomplished, the bottle **21** will be further elevated by the filling apparatus to the position shown in FIG. **5** wherein the neck **28** of the bottle **21** is in contact with the sealing gasket **30** so that filling may take place. In the apparatus shown the tube **18** acts as a vent tube and the liquid with which the bottle is to be filled enters the bottle through an orifice **42** surrounding the vent tube **18** under the control of a valve (not shown) in the valve head **16**. It will be noted from FIG. **5** that before the bottle **21** reaches its maximum elevation it will engage the centering bell **10** along the bottle surfaces **44** and will raise the centering bell **10** some distance along the rods **19**. During normal operation, the centering bell **10** will remain at its initial position with the caps **20** engaging the annular ridge **24** during alignment of the bottle, being lifted from its initial position only upon engagement of the bottle surface **44** with the centering bell **10**. In order to accomplish this, the centering bell **10** is sufficiently heavy to maintain its initial position. It will be understood, however, that the centering bell **10** will reciprocate vertically a slight degree prior to engagement with the surfaces **44** with the centering bell **10** if the bottle **21** is badly misaligned, but this reciprocation will not raise the centering bell **10** to a sufficient degree that both of the camming surfaces **32** and **38** cannot coact with the neck **28** of the bottle **21** prior to insertion of the tube **18** therein.

The centering bell **10** will not be raised a sufficient amount during normal reciprocation to contact the valve head **16**, so that this reciprocation of the centering bell **10** does not interfere with the normal seating of the neck **28** of the bottle **21** against the sealing gasket **30**, and therefore does not interfere with the normal filling operation of the bottle **21**.

It has been found that the centering bell **10** of the present invention is most advantageously machined with polyethylene, although this device may be made from any substance which is sufficiently heavy, or which is biased to assure alignment of the bottle as it coacts with the centering bell **10** during the raising of the centering bell **10** from its lowermost position. It is also advantageous that the material that is used for the camming surfaces **32** and **38** be sufficiently soft so that the centering bell **10** itself will not cause chipping upon contact with the bottle **21**.

I claim:

1. An alignment device for aligning bottles to be filled on a bottle filling apparatus as said bottles are elevated to a filling position, comprising:

a valve head mounted to said apparatus at a location above said bottle;

a tube, designed for insertion into the neck of said bottle, said tube being mounted on said apparatus and passing through said valve head; and

an alignment device including camming surfaces for aligning said bottles with said tube during elevation of said bottles by said apparatus, said alignment device being reciprocally mounted on said valve head independent of said tube so that it will not interfere with normal operation of said tube, said alignment device having an opening for passage of said bottles, said opening being small enough to insure reciprocation of said alignment device during normal elevation of said bottles.

2. An alignment device for aligning bottles to be filled on a bottle filling apparatus as said bottles are elevated to a filling position as defined in claim 1 additionally comprising:

a sealing gasket mounted on said valve head in a stationary position relative said valve head and designed to seal the mouth of said bottle when said bottle is in the elevated position during filling of said bottle, said sealing gasket being separate from said alignment device so that reciprocal movement of said alignment device does not interfere with the operation of said sealing gasket.

3. An alignment device for aligning bottles to be filled on a bottle filling apparatus as said bottles are elevated to a filling position as defined in claim 1 wherein said camming surfaces comprise:

a first extended conical camming surface which initially engages said bottle during elevation to introduce coarse corrections in the alignment of said bottle; and

a second, distinct extended conical camming surface which contacts said bottle subsequent to contact of said bottle with said first camming surface for introducing fine corrections in the alignment of said bottle.

4. An alignment device for aligning bottles to be filled on a bottle filling apparatus as said bottles are elevated to a filling position as defined in claim 3 wherein the axis of said first conical camming surface is at an angle of 45° with the axis of said alignment device and the axis of said second conical camming surface is at an angle of 8° with the axis of said alignment device.

5. An alignment device for aligning bottles to be filled on a bottle filling apparatus as said bottles are elevated to a filling position as defined in claim 1, additionally comprising:

a plurality of guides dependent from said valve head and remote from said tube; and

means on said alignment device for engaging said guides, thereby guiding said alignment device during reciprocal movement relative said valve head.

6. An alignment device for aligning bottles to be filled on a bottle filling apparatus as said bottles are elevated to a filling position as defined in claim 1 wherein said alignment device is reciprocally mounted on said valve head so that contact between said alignment device and said valve head does not occur during normal reciprocation.

7. An alignment device for aligning bottles to be filled on a bottle filling apparatus as said bottles are elevated to a filling position, comprising:

a valve head having a sealing gasket for sealing said valve head to the neck of said bottle said sealing gasket mounted in a stationary position relative said valve head and said filling apparatus;

a tube which is inserted into said bottle during said elevation; and

a vertically reciprocal centering bell for guiding the neck of said bottles around said tube, said bell designed to reciprocate during each normal elevation of a bottle to said filling position.

8. An alignment device for aligning bottles to be filled on a bottle filling apparatus as said bottles are elevated to a filling position as defined in claim 7 wherein said centering bell engages each of said bottles below the neck thereof so that said centering bell does not interfere with the engagement of said stationary sealing gasket with the neck of said bottle.

9. An alignment device for aligning bottles to be filled on a bottle filling apparatus as said bottles are elevated to a filling position as defined in claim 7 wherein said centering bell is reciprocally mounted on said valve head, said centering bell being dimensioned to allow passage of the neck of said bottle totally therethrough, but dimensioned to engage each bottle below the neck thereof.

10. An alignment device for aligning bottles to be filled on a bottle filling apparatus as said bottles are elevated to a filling position as defined in claim 7 wherein said tube is a vent tube and wherein the liquid to be placed in said bottle flows into said bottle from an orifice situated between said sealing gasket and said tube.

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