United States Patent [19]

Waxlax

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[45] **June 26, 1973**

[54] **CONTAINER FILLING MACHINE NOZZLE**

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[73] Assignee: **Horix Manufacturing Company**, Pittsburgh, Pa.

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[52] **U.S. Cl.** **141/59**, 141/115, 141/286, 141/302

[51] **Int. Cl.** **B65b 31/00**

[58] **Field of Search** 141/4–8, 141/39–45, 52–69, 115, 148–150, 263, 264, 270, 275–278, 285, 286, 289, 290, 295, 296, 298, 299, 300, 303, 306, 307, 308, 392, 294

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[57] **ABSTRACT**

Subatmospheric pressure is maintained above the liquid product in the tank of a container filling machine. A vent tube extends up through an outlet in the bottom of the tank and above the liquid level. At the lower end of the tube there is a hollow valve plug that is open at its upper end and has a liquid outlet port and an air inlet port in its side. The lower end of the vent tube communicates with the air inlet port. Surrounding the vent tube and valve plug and normally closing the two ports is a filling tube, the upper end portion of which is slidably mounted in the tank outlet for receiving liquid from it. This tube is slidable upwardly on the valve plug to uncover the two ports. The valve plug also has a passage extending downwardly from its inlet port so that air can enter the vent tube while the ports are closed. Disposed in this passage is a check valve for closing it against downward liquid flow whenever the upper end of the vent tube is exposed to atmospheric pressure.

3 Claims, 5 Drawing Figures

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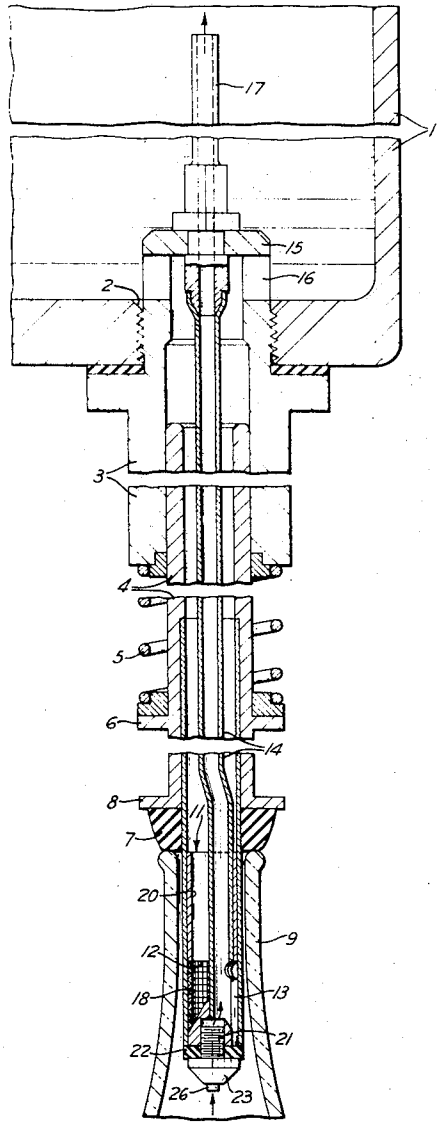

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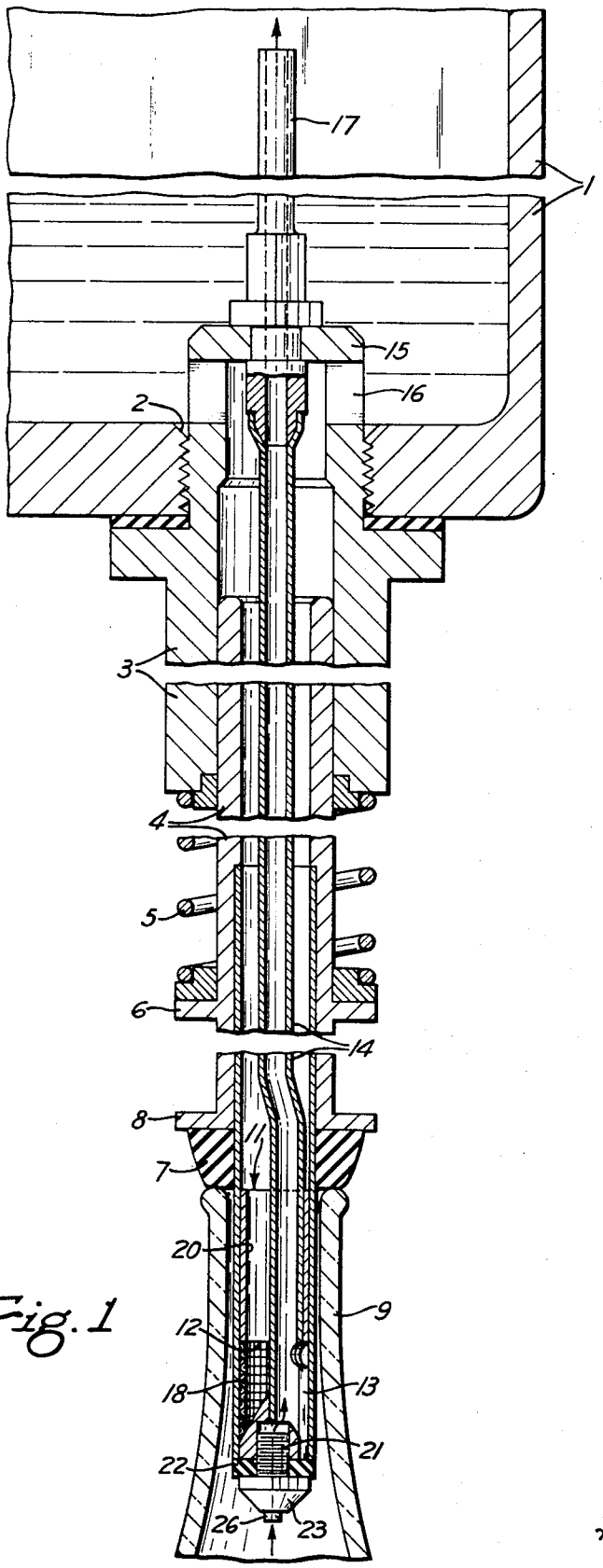

Fig. 1

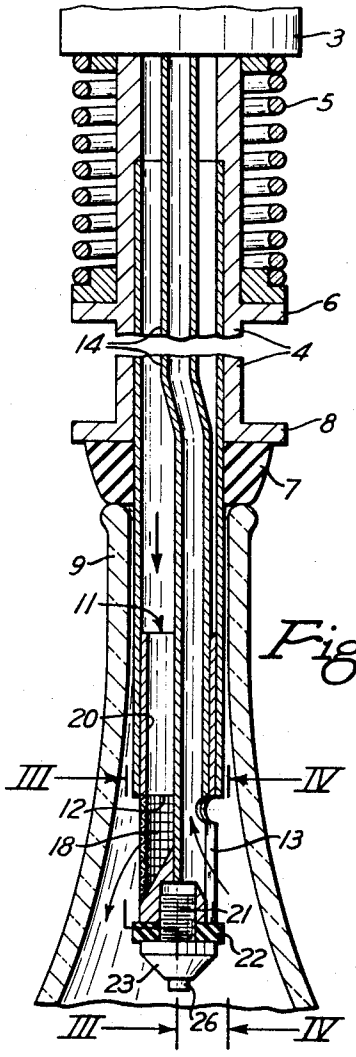

Fig. 2

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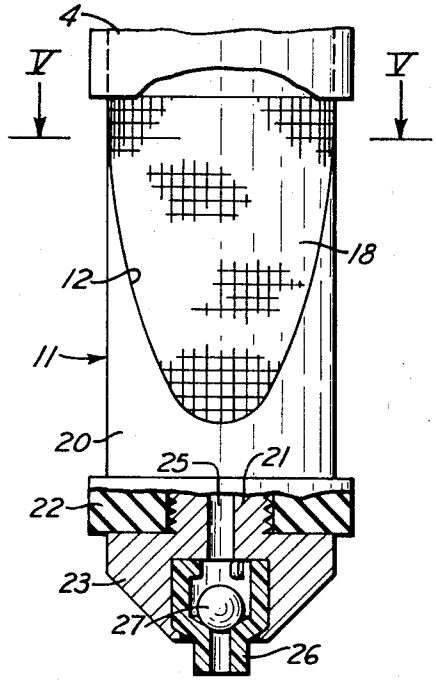

Fig. 3

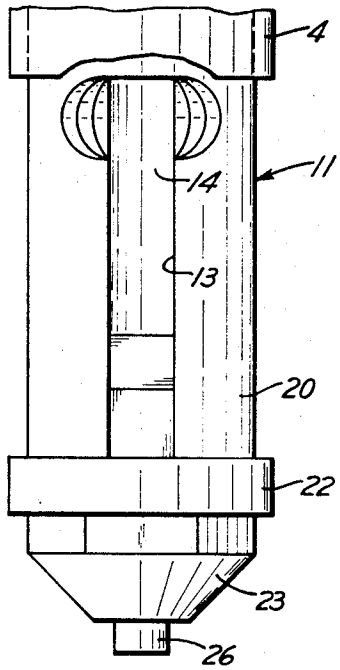

Fig. 4

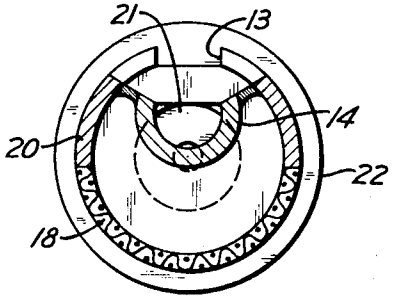

Fig. 5

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CONTAINER FILLING MACHINE NOZZLE

Many container filling machines are provided with nozzles that include a filling tube containing an air vent tube. The lower end of the vent tube carries a valve plug provided in its side with a liquid outlet port and an air inlet port that normally are closed by the lower portion of the filling tube. The vent tube extends up into a low pressure area above the liquid in the tank that feeds the filling tube. When a container is raised up around the lower end of the nozzle it lifts the filling tube far enough to uncover the ports in the valve plug so that liquid can enter the container and air can leave it through the vent tube. When the filled container is lowered and the nozzle is closed there is no flow of air and liquid through it. However, due to the suction at the air inlet and the lack of a seal around the outlet port of the valve plug, liquid tends to leak around the outside of the plug from its outlet to its air inlet and to fill the vent tube. As a result, when the next container moves into filling position the vent tube is inoperative until enough liquid has entered the container to build up the air pressure in there sufficiently to blow the liquid out of the upper end of the vent tube. During this short period the flow of liquid from the plug valve into the container is relatively slow because it is acting against a steadily rising air pressure in the container.

In order to overcome this problem, the lower end of the plug valve is provided with a very small passage that extends upwardly into the air inlet port. With such a passage, when the nozzle is closed, air continues to be drawn up through the vent tube to keep it substantially clear of liquid that has leaked into its lower end. This arrangement has an objection, however, which is that whenever the machine is shut down and the pressure in the tank above the liquid returns to atmospheric, the liquid that leaks into the air inlet port of the valve can now pass down through the lower passage and drip from its lower end.

It is therefore among the objects of this invention to provide a container filling machine nozzle, which maintains an open vent tube at all times but which will not drip when the machine is shut down.

The preferred embodiment of the invention is illustrated in the accompanying drawings, in which

FIG. 1 is a fragmentary central vertical section through the nozzle and a portion of the tank just before filling of a bottle begins;

FIG. 2 is a similar section but with the nozzle open for filling;

FIG. 3 is a greatly enlarged side view of the lower end portion of the open nozzle taken on the line III—III of FIG. 2, with part shown in section;

FIG. 4 is an enlarged side view of the opposite side of the lower portion of the open nozzle taken on the line IV—IV of FIG. 2; and

FIG. 5 is a cross section taken on the line V—V of FIG. 3.

Referring to FIG. 1 of the drawings, the bottom of a liquid product tank 1 of a container filling machine is generally provided with a number of circumferentially spaced outlets in its bottom, only one of which is shown. Screwed upwardly into this outlet 2 is a sleeve 3 that extends downwardly from the tank. Slidably mounted in the sleeve is a vertical filling tube 4 that is urged downwardly by an encircling coil spring 5 compressed between the lower end of the sleeve and a flange 6 on the tube. A sealing gasket 7 encircles the tube directly below another flange 8 on the tube, for engagement with a container, such as the neck 9 of a bottle that is to be filled.

Fitting snugly in the lower end of the filling tube is a hollow valve plug 11 that is open at its upper end. This plug is provided at one side with an outlet port 12 for liquid and at its opposite side with an inlet port 13 for air. The plug is supported in fixed position relative to the tank by means of a vent tube 14 inside the filling tube. The vent tube is considerably smaller than the filling tube to leave plenty of space around it for liquid to flow down through the latter. The lower end of the vent tube extends down into the valve plug and opens laterally into the inlet port 13, which is walled off from the outlet port as shown in FIG. 5. The vent tube extends up above the filling tube and is rigidly mounted in an upper wall 15, with which the upper end of the sleeve is provided within the tank. Between this upper wall and the bottom of the tank the sleeve is provided with lateral openings 16 to admit fluid into the sleeve. The vent tube also has an extension 17 that extends on up through the liquid in the tank and into the area above the liquid. This area is maintained at subatmospheric pressure by a vacuum pump (not shown) connected with the tank.

When a container, such as a bottle, is raised around the lower end of the filling tube into engagement with gasket 7 and then is raised farther, it slides the filling tube up into the tank sleeve 3 against the resistance of coil spring 5. At the same time, the gasket seals the upper end of the bottle. As the filling tube is pushed upwardly into the sleeve, the lower end of the tube uncovers the two ports in the side of valve plug 11 as shown in FIGS. 2, 3 and 4. This allows liquid to pour out of the outlet port of the valve and into the bottle as air is drawn upwardly through the vent tube from inside the container. Rapid filling of the bottle is thereby accomplished. A fine screen 18 covering the outlet port breaks up the solid liquid stream into a myriad of fine streams which create less foaming and frothing in the bottle.

The plug valve 11 includes a cylindrical body 20, to the lower end of which a tip or stud is connected. This stud has a threaded stem 21 that is screwed up into an axial opening in the lower end of the valve body to clamp a sealing gasket 22 between the head 23 of the stud and the lower end of the valve body. The gasket projects radially from the valve body and forms a valve seat for the lower end of the filling tube when the latter is in its lowest or closed position shown in FIG. 1.

In accordance with this invention, the stud has an axial bore 25 through it, and the upper end of the stud-receiving opening in the lower end of the valve body communicates with the lower end of the air inlet port 13. A passage is thus formed between the inlet port and the extreme tip of the plug valve, up through which air will be drawn even when the nozzle is closed, due to the low air pressure in the tank. This keeps the vent tube clear of liquid product so that full-force filling can start the moment the plug valve ports are opened. The resulting reduction in time required for filling each successive container adds up to a considerable amount when thousands of containers are being filled. Inside the axial bore through the stud there is a tiny check valve 26 containing a ball 27 or the like as shown in FIG. 3, that opens upwardly. Therefore, the check valve does not interfere with air flowing up through the

passage. It remains open as long as there is reduced air pressure in the tank. On the other hand, if the machine is shut down and the pressure in the tank allowed to return to atmospheric the check valve will close by gravity and prevent the usual leakage, which occurs between the liquid outlet port 12 and the air inlet port 13, from running down through the stud passage and dripping out of its lower end. This dripless nozzle is a definite improvement over those known heretofore.

According to the provisions of the patent statutes, I have explained the principle of my invention and have illustrated and described what I now consider to represent its best embodiment. However, I desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

1. In a container filling machine, the combination with a liquid tank under vacuum and having a bottom outlet for liquid, of a vent tube of materially smaller diameter than said outlet extending up through it and up above the liquid level in the tank, means holding the tube stationary relative to the tank, a hollow valve plug supported by the lower end of the tube having a materially greater diameter than the tube and having an open upper end, the side of the plug having a liquid outlet port and an air inlet port isolated from each other, the lower end of said tube communicating with said air inlet port, a filling tube surrounding the vent tube and valve plug and normally closing said ports, the upper end portion of the filling tube being slidably mounted in said tank outlet for receiving liquid therefrom, the filling tube being slidable upwardly on the valve plug to uncover said ports so that liquid can flow down through the filling tube and plug and out through said outlet port while air is drawn in through said inlet port and up through the vent tube, the valve plug having an air passage extending downwardly from the inlet port through the lower end of the plug so that air can enter the vent tube while said ports are closed, and an upwardly opening check valve in said air passage normally held open by the vacuum in said tank, the check valve closing said passage against downward flow of liquid therethrough whenever the upper end of the vent tube is exposed to atmospheric pressure, whereby to prevent liquid that leaks between the filling tube and valve plug into said air inlet from dripping from the lower end of the air passage.

2. In a container filling machine according to claim 1, a screen covering said liquid outlet port.

3. In a container filling machine according to claim 1, the valve plug including a body provided with an axial threaded opening through its bottom that opens into said air inlet port, and a stud having a head below said body and a threaded stem screwed into said opening, said stud having an axial bore therethrough forming at least part of said air passage, and said check valve being disposed in said bore.

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