United States Patent

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[72] Inventors **Hans Reichert**
Rehborn;
Alfred Rentel, Winzenheim, both of,
Germany

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[73] Assignee **Seitz-Werke G.m.b.H**
Bad Kreuznach, Rineland, Germany

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[54] **FILLING ELEMENT FOR COUNTERPRESSURE FILLING MACHINES**
9 Claims, 5 Drawing Figs.

[52] **U.S. Cl.** **141/39,** 141/58, 141/64, 141/198, 141/286, 251/140
[51] **Int. Cl.** **B67c 3/06**
[50] **Field of Search** 251/140; 141/39, 40, 46, 49, 52–54, 56, 57, 58, 63, 64, 198, 227, 286

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Primary Examiner—Laverne D. Geiger
Assistant Examiner—Edward J. Earls
Attorney—Walter Becker

ABSTRACT: A filling unit for counterpressure container-filling machines with loading and return gas conveying tube means and with an electromagnetically controllable liquid control valve, in which the liquid control valve has a shaft surrounded by electromagnetic means, and in which the tube means comprises two coaxially arranged tubular members electrically insulated from each other and respectively provided with contact members adapted to be interconnected by liquid in the container being filled at the end of the filling operation to thereby close the energizing circuit for the electromagnetic means to cause the latter to stop further supply of filling liquid to the container.

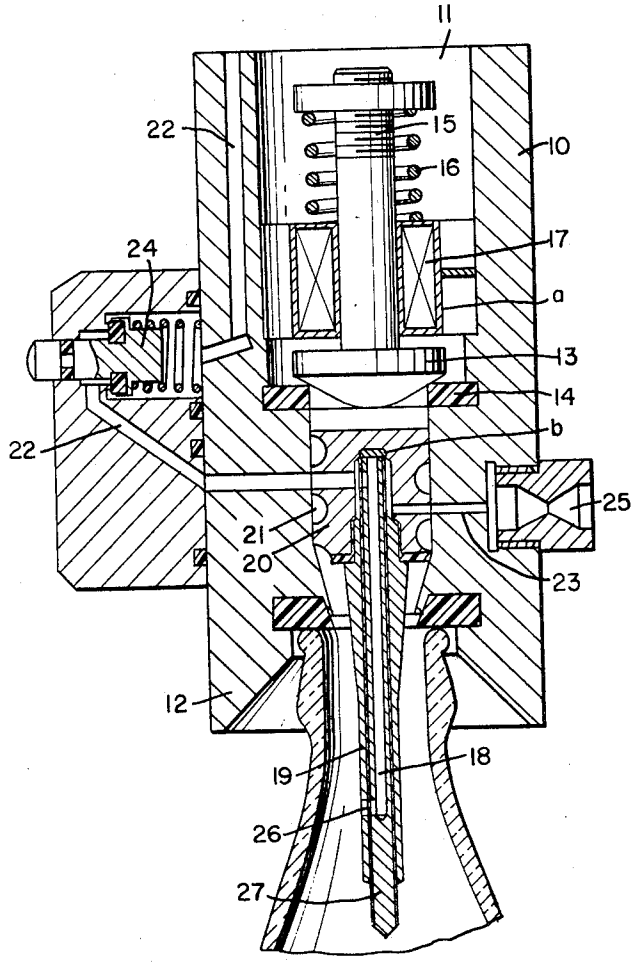


FIG. 1

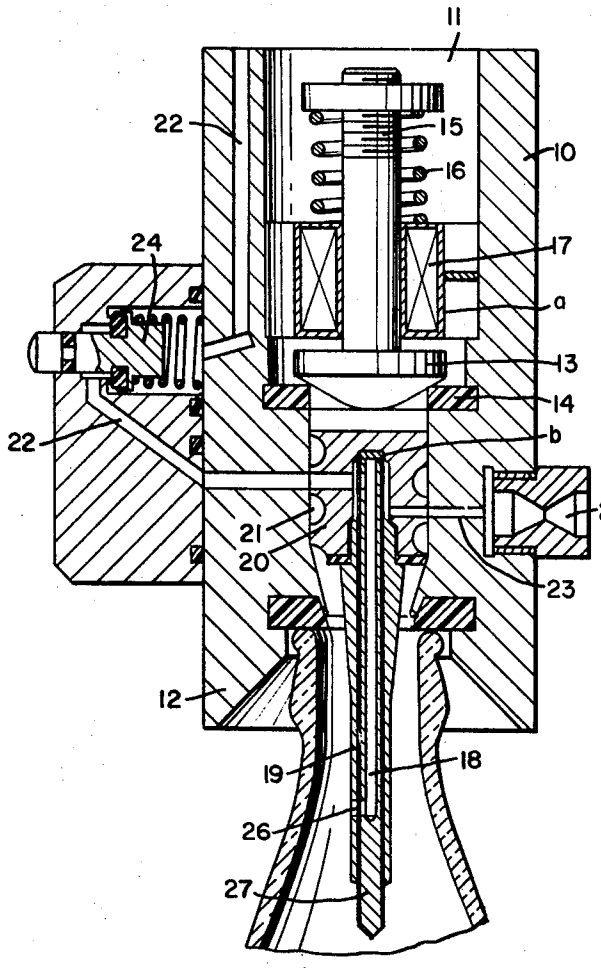
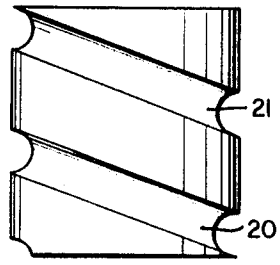


FIG. 2



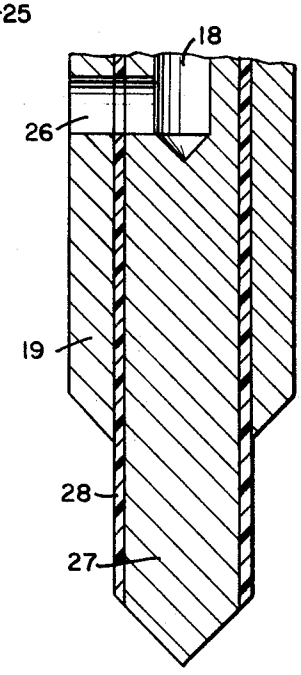


FIG. 3

INVENTORS
HANS REICHERT
ALFRED RENTEL

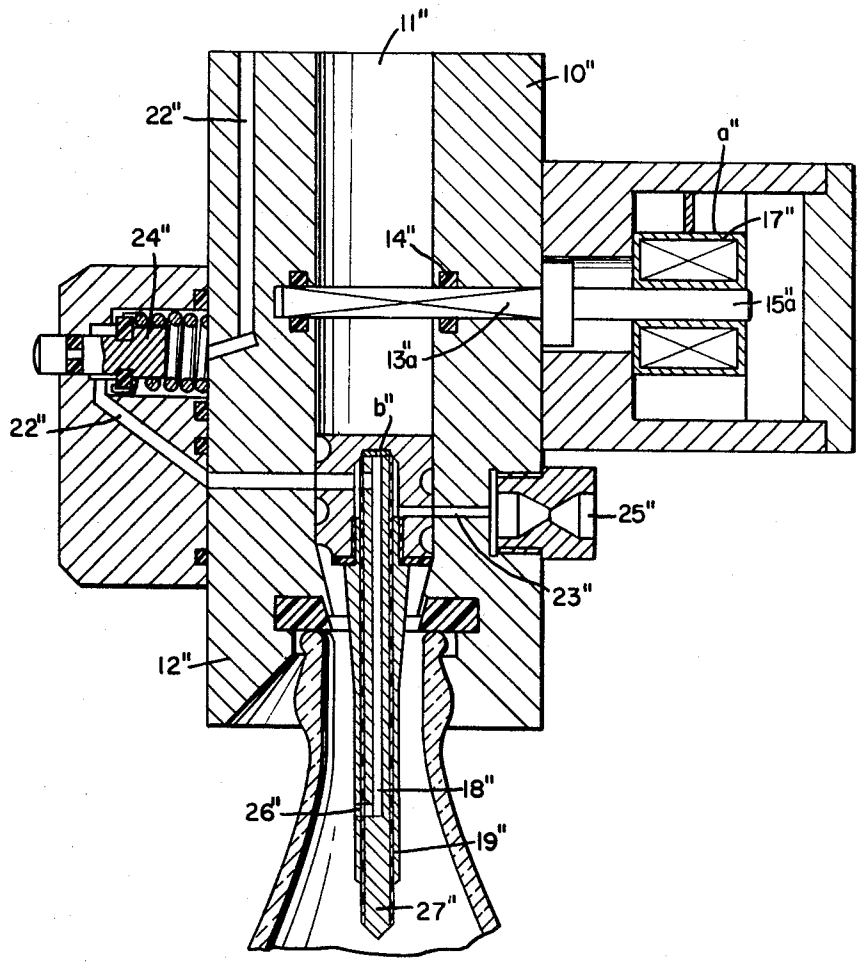


FIG. 5

INVENTORS

HANS REICHERT
ALFRED RENTEL

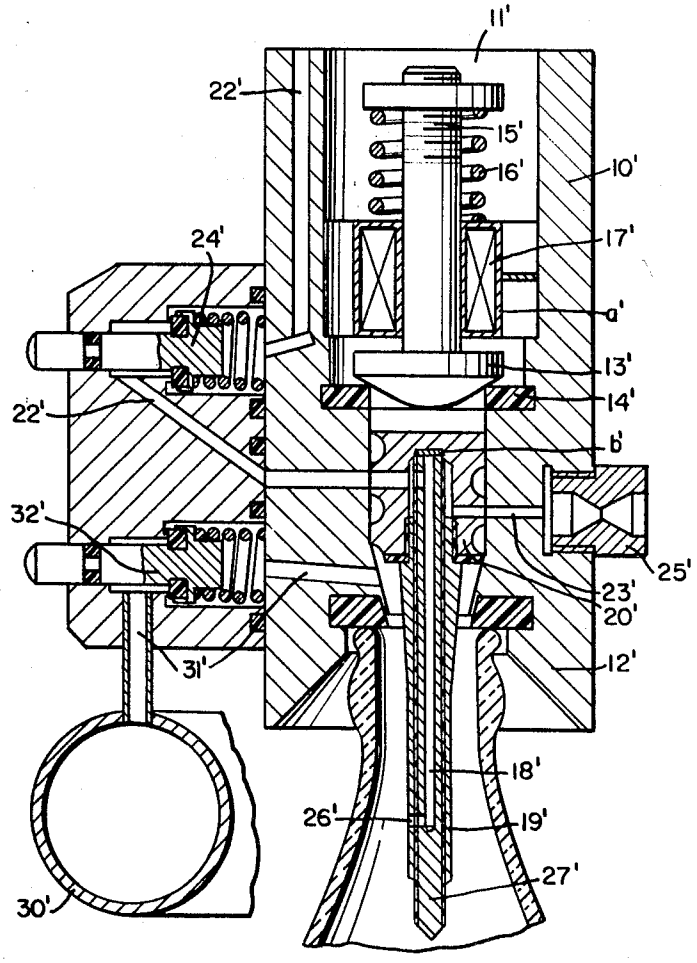


FIG. 4

INVENTORS

HANS REICHERT
ALFRED RENTEL

FILLING ELEMENT FOR COUNTERPRESSURE FILLING MACHINES

The present invention concerns a filling element for counterpressure filling machines, and, more specifically, concerns a filling element for filling liquids containing carbonic acid into bottles or similar vessels while being provided with an electromagnetically controllable valve for liquids.

With filling elements of the above-mentioned type a plurality of which are mounted on the central liquid container of the filling machine and are customarily equipped with a loading (Spanngas) and return gas pipe and a valve for liquids, the electromagnets for controlling the valves are located outside the liquid containers. With this arrangement, the magnetic flux for adjusting the valves to their effective or ineffective position is forced to penetrate the container wall and in most instances, also the adjacent liquid layer. Such an arrangement has the drawback with regard to the control that its effectiveness and precision are greatly reduced.

It is, therefore, an object of the present invention to provide a filling element for counterpressure filling machines, which will overcome the above-mentioned drawbacks.

It is another object of this invention to provide a filling element of the above-mentioned type which will be simple in construction, precise, and highly effective.

These and other objects and advantages of the invention will appear more clearly from the following specification in connection with the accompanying drawings, in which;

FIG. 1 shows a filling element in section;

FIG. 2 illustrates a detail of said filling element;

FIG. 3 is a further detail of the filling element;

FIG. 4 represents a section through a filling element equipped with an auxiliary device; and

FIG. 5 is a section through a modified filling element according to the invention.

A filling element according to the present invention is characterized primarily in that the respective electromagnets associated with the filling elements act directly upon the closure member of the valve for the liquid. The filling element is furthermore characterized in that the loading and return gas tube is below its connection directed laterally with regard to the bottle wall. The filling element is preferably, radial thereto, provided with an extension of an electrically conductive material. The filling element is over the entire length of the tube and with a major portion of the extension inserted into a mantle pipe which is conductively connected to the magnet and is insulated relative to said mantle pipe.

Referring now to the drawings in detail, the filling elements according to FIGS. 1, 4 and 5 respectively have corresponding structure identified by reference numerals without a prime, with a prime and with a double prime. Filling elements in FIG. 1 have a cylindrical housing 10 with a passage 11 for the liquid, which passage is adapted to be connected to a liquid container (not shown) of a counterpressure filling machine of a standard type. Within said passage 11, which has a smooth bore for obtaining favorable flow conditions and which extends downwardly to a connection 12 for centering an engaging the bottles under pressure, there is provided a liquid controlling valve. This valve which is arranged in the upper portion of the passage 11 comprises a closure member 13 and a valve seat 14. The closure member 13 which is provided with a shank 15 is acted upon by a spring 16. The shank 15 is furthermore surrounded by an electromagnet 17 provided with an electric conductor *a* and directly acting upon the closure member 13. Below the valve 13, 14 and located in the liquid path 11 there is provided a tube arrangement comprising an inner tube 18 and an outer tube 19. The length of the tube 19 is shorter than that of tube 18. Both tubes 18 and 19 are coaxially arranged in a fitting 20 located in the liquid path 11. The fitting 20, as shown in FIG. 2, is provided with circumferential helical grooves 21.

The tube 18 serves as loading and return gas tube. To this end tube 18 has its upper end which is mounted in the fitting 20 connected to a loading gas passage 22 in housing 10 and to a return gas passage 23. In the passage 22 which leads to a liquid container there is interposed a customary loading gas valve 24 the closure member of which is adapted in a manner known per se to be actuated by means of a cam. The return gas passage 23, on the other hand, leads into the open air and has its exit end provided with a throttle 25 mounted on the housing 10. The end of said loading and return gas pipe 18 which is inserted in the fitting 20 is additionally connected to a current conductor *b*.

The lower end of the loading and return gas tube 18 which protrudes from the fluid path has a connection 26 which is located in conformity with the height to which the bottles are to be filled. This connection 26 is arranged laterally with regard to the bottle wall and expediently extends radially with regard to the interior of the tube. Below the passage 26, the tube 18 has an extension 27 of electrically conductive material which ends in a point. The electrically conductive material may be the same metallic material from which the tube 18 is made. The entire tube 18 including the extension 27 is, as shown in FIG. 3, surrounded by an insulating layer 28 which may consist of a synthetic material. The only portion which is not covered by the insulating layer 28 which insulates tube 18 relative to the pipe 19 is the tip of the extension 27, which tip protrudes with a predetermined length from the surrounding tube 19.

The filling element according to FIG. 4 differs from the filling element according to FIG. 1 in that it is provided with a device for introducing inert gas into the still-pressed-on bottles when the valve 13',14' is closed. This device substantially comprises an annular chamber 30' for the inert gas and also comprises a gas passage 31' with inserted gas valve 32' adapted to be actuated from the outside, said gas passage 31' leading from said annular chamber 30' to the fluid passage 11' within the area of the pressing connection 12'.

Prior to placing filling elements of FIGS. 1 and 4 in operation, the current conductors, *a'* and, *b'* are connected to a low voltage source. In this connection, the closure member, 13' of the liquid valve 13, 14, 13', 14' respectively remains closed under the effect of the static pressure of the liquid in the container of the filling machine arranged thereabove. The bottle now pressed against the member 12, 12' is through the intervention of the actuated loading gas valve 24, 24' by means of the loading gas coming in from the liquid container through the passage 22, 22' and the gas tube 18, 18' preloaded to the liquid pressure. When pressure equilibrium exists between the pressure in the pressed on bottle and the pressure in the liquid container, the valve 24, 24' turns off the supply of loading gas, and under the effect of spring 16, 16' the valve member 17, 17' opens the liquid passage 11, 11' so that the liquid flows from the latter into the bottle. The displaced loading gas escapes through passage 26, 26', gas tube 18, 18', passage 23, 23' and throttle, 25,25' into the atmosphere.

When the liquid has reached the lower end of the mantle pipe 19, 19' conductively connected to the magnet 17, 17' the filling material will by means of the noninsulated tip of the tube extension 27, 27' form the contact for the now closed circuit between the magnet 17, 17', the mantle pipe 19, 19' and the return gas pipe 18, 18'. As a result, the magnet 17, 17' is excited and returns the valve member 13, 13' to its closing position. Subsequent to the completion of the supply of liquid, the filled bottle is withdrawn from the filling element and leaves the machine in customary manner.

By means of the filling element according to FIG. 4, the filled bottle is, prior to its withdrawal provided with an inert gas. The pressure gas shock which is conveyed by valve 32' from the annular chamber 30' through passage 31' into the bottleneck displaces the loading gas above the passage 26' through throttle 25' into the atmosphere while the liquid valve 13', 14' is closed. By this step of filling the bottleneck with an inert gas, the filled in liquid is effectively protected against oxidation.

The filling element according to FIG. 5 is substantially similar to the filling element according to FIGS. 1–3. A difference exists merely inasmuch as the electromagnet 17'' is arranged outside the liquid path 11'' on the housing while the closure member 13'' affected by the electromagnet 17 is in the form of a flat side. This slide 13a'' is likewise provided with a shank 15a'' surrounded by the electromagnet 17''. In view of the elimination of the spring force acting upon the closure member, it will be appreciated that with the embodiment of FIG. 5, a switch impulse is required following the preclamping of the pressed on bottle in order to move the magnet 17'' into position for opening the closure member 13a''. This impulse is expediently initiated by a control cam arranged on the machine frame, which cam acts upon a customary switch. The return of the closure member after the effected filling of the bottle to the closing position of FIG. 4 is then effected in the manner described in connection with the filling element of FIG. 1, by the filling material which excites the magnet 17 again.

It is of course, to be understood, that the present invention is, by no means, limited to the particular constructions shown in the drawings, and that the invention is defined by the appended claims.

We claim:

1. An electromagnetically controllable filling unit for counterpressure liquid- dependent container-filling machines, which includes: housing means comprising a member having vertical liquid conveying first passage means adapted to be connected at its upper end to a source of liquid and to convey liquid from said source to a container to be filled, said member including engaging means surrounding the lower end of said first passage means for engaging the mouth of the container to be filled, first valve means arranged within said first passage means and operable to move into open position to permit filling liquid to flow into said container to be filled, electromagnetic means in said first passage means directly associated with said first valve means and operable when energized to close said first valve means to thereby close off the flow of filling liquid into the container to be filled, tube means arranged within said first passage means between said first valve means and said engaging means and having a portion protruding from said housing means into said container and having an opening into and in communication with the interior of the container to be filled, said protruding portion being provided with contact means electrically connected to said electromagnetic means and operable when engaged directly internally by liquid to close the energizing circuit for said electromagnetic means, second passage means adapted to be connected with a source of gas under pressure and communicating with the interior of said tube means, second valve means interposed in said second passage means and adapted to be closed when a desired fluid pressure has been established in said tube means, and means for relieving fluid pressure from the container being filled in conformity with the filling of said container with liquid.

2. An electromagnetically controllable filling unit according to claim 1, in which said first valve means is operable automatically to move into open position in response to the establishment of substantial pressure equilibrium between the fluid pressure on opposite sides of said first valve means.

3. An electromagnetically controllable filling unit according to claim 1, in which said tube means has an inner tubular section of electrically conductive material, an outer tubular section of electrically conductive material, and electrically insulating material between said outer and said inner tubular sections, one of said tubular sections being longer than the other tubular section so as to extend to a different extent into a container to be filled.

4. An electromagnetically controllable filling unit according to claim 3, in which said inner tubular section is the longer tubular section and has its outer end formed by a solid exposed element.

5. An electromagnetically controllable filling unit according to claim 3, in which said opening extends radially with regard to said tube means and extends through said inner tubular section and through said insulating material and said outer tubular section.

6. An electromagnetically controllable filling unit according to claim 1, in which the means for relieving fluid pressure from the container being filled is formed in combination by conduit means communicating with the interior of said tube means and leading to the atmosphere, and in which throttle means are interposed in said conduit means.

7. An electromagnetically controllable filling unit according to claim 1, in which said first valve means comprises a shaft, and in which said electromagnetic means surrounds a portion of said shaft.

8. An electromagnetically controllable filling unit according to claim 7, in which said electromagnetic means is arranged in said first passage means, and which includes spring means continuously urging said first valve means to move to its open position.

9. An electromagnetically controllable filling unit according to claim 1, which includes means adapted to be connected with a source of inert gas and communicating with said tube means for displacing therefrom gas conveyed thereto through said second passage means.