DEVICE FOR SHUTTING OFF THE RETURN GAS LINE OF COUNTERPRESSURE FILLING ELEMENTS OF MULTI-CHAMBER VESSEL FILLING MACHINES

Inventors: Heinrich Zeimet, Bingen-Budesheim; Alfred Rentel, Bad Kreuznach-Winzenheim; Horst Monz, Bad Kreuznach, all of Germany

Assignee: Seitz-Werke G.m.b.H., Bad Kreuznach, Germany

Filed: Dec. 17, 1971

Appl. No.: 209,097

Foreign Application Priority Data
Dec. 19, 1970 Germany................. P 20 62 669.1

U.S. Cl. 141/39, 137/199, 141/46
Int. Cl. B65b 31/00
Field of Search 141/46, 39, 59, 302; 137/199

References Cited
UNITED STATES PATENTS
2,357,245 8/1944 Williams et al. 137/199
2,527,849 10/1950 Ranney 137/199
2,902,044 9/1959 Sherer et al. 137/199
3,081,788 3/1963 Lewis 137/199
3,200,992 8/1965 Maxwell 137/199

Primary Examiner—Houston S. Bell, Jr.
Attorney—Walter Becker

ABSTRACT

A device for shutting off the return gas conduit of a counterpressure filling device, which comprises a flow chamber interposed in the gas return conduit and communicating with a valve chamber interposed in said gas return and preceding said flow chamber while a load or weight body movable in said flow chamber sets upon the valve member in said valve chamber. This load body is adapted by means of its weight to adjust the valve body so that the latter occupies its opening position in which it is arrested by said load body. On the other hand, liquid rising in the valve chamber and from there into the flow chamber brings about lifting of the control member and movement of the valve member into closing position to shut off communication of the valve chamber with the flow chamber.

12 Claims, 2 Drawing Figures
DEVICE FOR SHUTTING OFF THE RETURN GAS LINE OF COUNTERPRESSURE FILLING ELEMENTS OF MULTI-CHAMBER VESSEL FILLING MACHINES

The present invention relates to a device which is arranged in the return gas path of counterpressure filling elements, as they are employed for multi-chamber vessel filling machines. Such a device is adapted in response to the rising of the liquid in the conduits of the filling element to shut off the return gas line after the filling operation has been completed.

It is known to design the shut-off devices arranged in the return gas path of counterpressure filling elements, as float valves while the flow chamber is formed by a widened portion of the return gas conduit effected in the filling element. Inserted into the flow chamber is a buoyant body of low weight, in most instances in the shape of a hollow ball or a float which is, to a major extent, cylindrical and which has oppositely thereto arranged a valve seat which is provided within the range of that conduit section which leads from the chamber to the atmosphere or to a machine chamber.

Experience has shown that the buoyant body of the heretofore known valves of the type involved are, when high filling pressures and high filling speeds are involved, lifted onto the valve seat already by the return gas displaced by the pressed-on vessel, and with foaming beverages are lifted onto the valve seat, especially by the foam carried away with the return gas being withdrawn, so that said buoyant bodies occupy a shut-off position, as a result of which the filling operation is affected or prematurely terminated. Moreover, it has been observed that when relieving the vessel, the return gas expands in a shock-like manner from the flow chamber into the material being filled whereby, above all, carbonic acid containing liquids foam and foam over in a non-controllable manner and bring about undesired losses in the respective liquid being filled in. Furthermore, the foam which has entered the flow chamber, and the remaining liquid bring about that the light float bodies stick in their shut-off position and keep the return gas path closed so that it will be necessary periodically to blow through the return gas conduit in order to assure a precise filling of the vessels.

It is, therefore, an object of the present invention to provide a device for turning off the return gas line of counterpressure filling elements of multi-chamber vessel filling machines, which will avoid the above outlined drawbacks.

This object 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 illustrates a longitudinal section through a counter-pressure filling element for multi-chamber filling machines which is equipped with a shut-off device according to the present invention.

FIG. 2 shows the shut-off device of FIG. 1 on a considerably larger scale than the latter. More specifically, the present invention, in realizing the above objects has selected a new principle while abandoning the principle employed with heretofore known shut-off devices. In particular, the present invention is based on the finding that a non-floating body inserted in a widened conduit section will generally not be moved out of its respective position and lifted by a gas current which at high speed expands into this widened conduit section or chamber, while such movement and lifting, however, may be effected under certain conditions by means of a liquid current which is under pressure and flows in a narrow conduit. Accordingly, the present invention provides a shut-off device which is characterized by a flow chamber connected to the discharging conduit section and communicating with the valve chamber. Said flow chamber has associated therewith a load or weight body which is inserted in the interior of the chamber with an annular gap relative to the wall of the chamber and which acts on the valve body. This load or weight body is adapted by means of its weight to adjust the valve body so that it occupies its opening position in which it is arrested by said load or weight body. When the valve body is supposed to occupy its closing position, the load or weight body is adapted to be lifted by the pressure of the liquid rising in the flow chamber. This makes it possible that the return gas flows upwardly from the vessel to be filled through the valve chamber and the flow chamber while not being affected by the valve body and the load or weight body. The foam which in this way is carried along does not affect the opened valve. Only the liquid which, after the filling operation has been completed, rises from the valve chamber into the flow chamber brings about that the non-floating load or weight body is lifted so that the valve body engages the valve seat and blocks the return gas path. In this way, the shut-off device is non-sensitive against shocks in the rising liquid flow and thus operates safely and reliably and, after the vessel has been relieved, automatically returns to its opening position.

According to a specific embodiment of the present invention the flow chamber is expediently arranged vertically above the valve chamber and communicates with the latter through a cutout which is provided in a partition between the two chambers. As load or weight body it is suggested to employ a solid body which is confined on all sides by plane and/or curved surfaces. This solid body has an extension which extends through said cutout into the valve chamber and is operable to act upon the valve body.

According to a further feature of the invention, the length of the said extension of the load or weight body is so selected that in its opening position, the valve body rests on a border area of the valve chamber, and that the load or weight body while maintaining said annular gap stands substantially free in the flow chamber.

According to a further development of the invention, the extension arranged on the load or weight body may be rigid or flexible and may have its free end carrying the valve body. Similarly, it is possible according to the invention to design the extension of the load or weight body rigid or flexible, and for actuation by said free end to provide a freely movable valve body in the valve chamber.

According to an advantageous embodiment of the invention, the load or weight body is primarily cylindrical while the valve body is spherical. Both said load or weight body and said valve body are solid bodies and consist of specifically heavy material, preferably of stainless steel.

According to a further feature of the invention, the partition with the cutout is, at that side which faces toward the heavy or weight body, provided with a conical depression, whereas the oppositely located surface
of the load or weight body is conical. The circumference of the cylindrical load or heavy weight body may be provided with a groove extending in the direction of its longitudinal axis. Finally, the conduit section which leads away from the additional chamber is, by means of an adjustable connecting member connected to a pressureless annular machine chamber.

Referring now to the drawing in detail, the filling element which is connected to the filling container 10 of the not specifically illustrated multi-chamber filling machine is in FIG. 1 designated with the reference numeral 11 and has associated therewith a filling pipe 12. The arrangement furthermore comprises a liquid valve 13 which is arranged in the fluid conduit 14 which leads from the container 10 to the filling pipe 12. The filling pipe 12 has a return gas conduit 15 which, on the side of the vessel, is provided with a channel 16, said conduit 15 continues within the housing 11 in upward direction and leads into a valve chamber 17. For purposes of connection to the chamber 17 there is expediently provided an annular groove 18 from which radial bores 19 lead to the chamber 17 (FIG. 2). In chamber 17 there is provided a valve body 20 in the form of a solid ball while a valve seat 21 is arranged on a bore 22 which leads from the upper chamber confinement to an additional chamber 23.

Inserted into the flow chamber 23 and vertically arranged above the valve chamber 17 is a substantially cylindrical weight body or control member 24 so that a lateral annular gap 38 exists between the outer periphery of the body 24 and the respective adjacent inner periphery of the walls confining the chamber 23. The circumference of the weight body 24 which is likewise made of solid material, preferably of stainless steel, is in the direction of its longitudinal axis provided with a groove 25 while the conical bottom side has an extension 26 extending through bore 22 and into chamber 23. The extension 26 has connected thereto the valve body 20 which is likewise made of high grade steel. The valve chamber 17 has its bottom portion closed by a screw 28 which forms a chamber confining wall on which the valve body 20 rests in the opening position of valve 20, 21. The extension 26 is so dimensioned that between the conical bottom side of body 24 and the partition 27 located between the two chambers and the bore 22 there is provided a bottom gap 39 which corresponds at least to the width of the annular gap 38. To this end, the partition 27 has that side thereof which faces the body 24 provided with a depression 27a corresponding to the conical surface of body 24.

Screw 28 comprising a seal abutment means 29 forms a component of an insert 30 which is adapted to be screwed into the housing 11 with further seals 31. The insert 30 expediently comprises the valve chamber 17 and the partition 27 between chambers 17 and 23 and closes the larger chamber 23 toward the bottom.

From that end of chamber 23 which is located opposite the insert 30, a further strand or branch 32 of the return gas line 15 leads via an adjustable throttling member 33 into an annular chamber 34 which is arranged on the filling container 10 and communicates with the atmosphere. It is the annular chamber 34 into which lead the gas return conduits of the remaining filling elements of the machine.

The arrangement furthermore comprises a conduit 35 which is connected to the discharging conduit section 32. The conduit 35 leads to a relief valve in the form of a piston slide or valve spool 36 and forms a component of a relief conduit 37 which is arranged in the filling element 10 below the liquid valve 13.

The shut-off device according to the invention operates as follows: To be understood that the filling operation is, by the incoming liquid displaced from a pressurized vessel passes first through the section 15 of the return gas conduit 15, 32 into the valve chamber 17. The valve 20, 21 is kept open by the load or heavy weight body or control member 24 and permits the gas to pass through bore 22 into the flow chamber 23 from which it unimpededly passes from the body 24 through the bottom gap 39 into lateral annular gap 38 into the discharging conduit section 32 and from there into the annular chamber 34. The groove 25 arranged on body or control member 24 prevents the foam parts carried away by the return gas flow from forming a closed foam ring within the chamber 23, which foam ring lifts the body 24 in spite of its relatively high weight.

When the vessel has been filled, the filling liquid rises in the conduit section 15 and through valve chamber 17 and bore 22 passes into the chamber 23. The different cross-sectional conditions in front and behind the bore 22 bring about that the rising filling liquid is accelerated by this opening and flows into the chamber 23 while instantaneously acting upon the lower conical surface of the supporting body 24. In this way, the specifically heavier body 24 is lifted within the chamber 23 while the valve body 20 at seat 21 reaches its closing position and shuts off bore 22 in which position the valve body is held until the vessel is pressure relieved. In the meantime, through the conduit section 32 which leads to the pressureless annular chamber 34 and is kept continuously open by means of throttle 33, atmospheric pressure will build up in chamber 23.

After a vessel relief by upward stroke of the slide valve 36, the conduit system below valve 20, 21 expands likewise to atmospheric pressure so that the liquid in the conduit section 15 will in a recoil-free manner empty into the vessel. With equal pressure prevailing on both sides of bore 22, the automatic opening of valve 20, 21 will be effected in which the valve body 20 is by the weight of body 24 kept away from valve seat 21 and is arrested on the lower chamber confinement. The filling liquid which has passed into the chamber 23 returns to the vessel.

According to the specific embodiment shown in the drawing, the extension on the load or heavy weight body is rigid, and at its free end there is firmly arranged the solid valve body so that the latter in response to the actuation of the load or heavy weight body by the rising liquid will automatically be moved into the closing position on the valve seat, and after effected relief will in the same manner move into opening position. For this automatic control of the valve body it may be expedient to make the extension flexible so that the valve body will occupy its closing position practically unaffected by the load or heavy weight body.

It is, of course, to be understood that the present invention is, by no means, limited to the specific example shown in the drawing, but also comprises any modifications within the scope of the appended claims. Thus, the invention also employs embodiments in which the extension of the load or heavy weight body is rigid or flexible while no fixed connection exists with the valve body. In such instances, the valve body which custom-
arilly comprises a hollow or solid ball or a cylindrical float and in its opening position is fixed by the extension, will after release by the lifted load or heavy weight body automatically occupy the closing position on the valve seat. Its return and arresting in the opening position is also in this instance effected automatically by the load or heavy weight body.

What we claim is:

1. For use in connection with a multi-chamber vessel filling machine, a counterpressure filling device having return gas conduit means adapted to be connected to atmospheric pressure, means forming a valve chamber interposed in said conduit means, means forming a flow chamber interposed in said conduit means and located behind said valve chamber when looking in the direction of flow of the return gas through said valve chamber, passage means forming part of said return gas conduit means and adapted to effect communication between said valve chamber and said flow chamber, a valve member arranged in said valve chamber and adapted for controlling communication through said passage means, said valve member being movable from an open position in which said valve chamber permits communication with said flow chamber through said passage means to a closed position in which said valve member closes off communication between said valve chamber and said flow chamber through said passage means, and a control member movably arranged in said flow chamber and operable by its weight to continuously urge said valve member away from its closed position, said valve member being operable to move to its closed position in response to liquid rising in said valve chamber and from there into said flow chamber.

2. A device according to claim 1, in which said flow chamber is arranged vertically above said valve chamber, and which includes partition means separating said valve chamber from said flow chamber while containing said passage means, said control member having an extension passing through said passage means for engagement with said valve member.

3. A device according to claim 2, in which said control member is formed by a solid body.

4. A device according to claim 2, in which said valve member and said control member are spaced from each other by said extension so as to keep the bottom portion of said control member spaced from the adjacent wall surface of said partition means, and in which the outer periphery of said control member is spaced from the adjacent inner wall surface of said flow chamber so as to define therewith an annular passage communicating with the space between the bottom portion of said control member and the top portion of said partition means.

5. A device according to claim 2, which includes seal abutment means arranged in said valve chamber, and in which said extension has such a length that the valve member when in its opening position rests on said seal abutment means while holding the bottom portion of said control member vertically spaced from the top surface of said partition means.

6. A device according to claim 2, in which said extension is firmly connected to said valve member.

7. A device according to claim 2, in which said extension is at least somewhat flexible.

8. A device according to claim 2, in which said control member has a substantially cylindrical contour, and in which said valve member has a spherical contour, both said control member and said valve member being solid bodies of stainless steel.

9. A device according to claim 2, in which the top side of said partition means flare conically, and in which the bottom side of said control member tapers conically.

10. A device according to claim 1, in which said control member has its periphery provided with groove means extending in the direction of movement of said valve member from its opening position to its closing position.

11. A device according to claim 1, in which said filling device includes a housing and in which said flow chamber is defined in part by a recess in said housing and in part by an insert detachably extending into said recess and including said valve chamber, and detachable screw means screwed into said insert and having its inner end arranged opposite and in axially spaced relationship to said passage means to form a wall of said valve chamber.

12. A device according to claim 1, which includes a chamber with atmospheric pressure therein, and also includes adjustable throttling means interposed in said conduit means between said flow chamber and said chamber with atmospheric pressure therein.