FILLER SPOUT WITH BOTH A VALVE MEMBER AND A SECONDARY SHUTTER AND WITH AN ACTUATOR ELEMENT BETWEEN THEM

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Appl. No.: 12/904,418

Filed: Oct. 14, 2010

Foreign Application Priority Data

Oct. 15, 2009 (FR) 0904946

Publication Classification

Int. Cl. B65B 1/04 (2006.01)

U.S. Cl. 141/301

ABSTRACT

A filler spout comprising a tubular body having mounted therein a valve member extending in register with a valve seat, and a secondary shutter disposed downstream from the valve member and connected thereto, the body including a constriction in register with the secondary shutter, an internal magnetic actuator element being connected to the valve member and being associated with external actuator means arranged to move the internal element between a position in which the valve member is closed and a position in which the valve member is open, wherein the internal actuator element is mounted between the valve member and the secondary shutter, and the tubular body includes means giving access to the internal actuator element.
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FIELD OF THE INVENTION

[0001] The present invention relates to an electromagnetically-controlled filler spout.

BACKGROUND OF THE INVENTION

[0002] A filler spout is known, in particular from document WO 01/40098, that comprises a tubular body in which there are mounted a valve member extending in register with a valve seat and a secondary shutter that is connected to the valve member and that extends in register with a constriction in the tubular body. The assembly comprising the valve member and the secondary shutter is connected to an actuator.

[0003] Cylinder type actuators exist having a rod that is connected to the valve member and extending outside the tubular body upstream from the valve member. The use of an actuator of that type requires a tubular body of complex shape in order to enable the actuator to be connected to the valve member, while preserving sealing of the liquid transport circuit.

[0004] Electromagnetic actuators are also known that comprise a magnetic actuator element extending upstream from the valve member and connected to the valve member by an axial coupling member. The electromagnetically-controlled actuator has a coil that extends outside the tubular body and that is powered so as to generate a magnetic field suitable for moving the magnetic actuator element. Access to the internal actuator element, e.g. for maintenance purposes, then requires the entire circuit to be emptied.

OBJECT AND SUMMARY OF THE INVENTION

[0005] An object of the invention is to propose a filler spout solving the above problems.

[0006] For this purpose, the invention provides a filler spout comprising a tubular body having mounted therein a valve member extending in register with a valve seat, and a secondary shutter disposed downstream from the valve member and connected thereto, the body including a constriction in register with the secondary shutter, an internal magnetic actuator element being connected to the valve member and being associated with external actuator means arranged to move the internal element between a position in which the valve member is closed and a position in which the valve member is open, wherein the internal actuator element is mounted between the valve member and the secondary shutter, and the tubular body includes means giving access to the internal actuator element.

[0007] Thus, because the filler spout is closed by the valve member, it is possible to access the internal actuator element without it being necessary to empty the entire filler spout and the circuit for transporting liquid to which the filler spout is connected.

[0008] In an advantageous version of the invention, the internal actuator element is connected to the secondary shutter by releasable attachment means, and the constriction is fitted to the tubular body by releasable attachment means.

[0009] The valve member and the secondary shutter are thus mounted in separate body elements that are connected together by a releasable attachment member, thereby enabling various combinations of valve member and shutter member to be set up quickly in order to adapt the filler spout to containers for filling having different neck diameters or to liquids presenting different viscosities.

[0010] Advantageously, the internal actuator element is connected to the valve member by releasable attachment means and/or the tubular body includes a detachable segment in register with the internal actuator element.

[0011] The internal actuator element may be separated from the valve member in the context of a maintenance operation, for cleaning purposes or in order to be replaced. Removal of the tubular body segment in register therewith gives access to the internal actuator element and also makes it possible to change the actuator assembly, e.g. in order to replace it with elements of different dimensions.

[0012] In a particular method of actuation, the internal element includes at least one permanent magnet and the external actuator means comprise:

[0013] at least one permanent magnet magnetically coupled with the permanent magnet of the internal element; and


[0015] Thus, the permanent magnets serve to connect the external actuator to the internal actuator element by magnetic coupling. The movement of the internal actuator element is not the direct result of variation in a magnetic field to which it is subjected, but is provided by moving the external permanent magnet that is magnetically coupled to the permanent magnet secured to the internal actuator element. Although it is entirely possible to use electromagnetic actuation, in general such utilization presents limits that stem mainly from the fact that the force exerted on the internal actuator element by the external electromagnetic actuation is directly proportional to the dimensions of the coil. This makes the coil bulky and difficult to put into place around filler spouts that are connected to liquid circuits in which the pressure may be as great as two bars. In addition, the force of a magnetic field decreases with temperature, which means that it is not possible to use electromagnetically-controlled actuators for filling hot substances. Magnetic actuation by means of a permanent magnet does not present those limits or presents them to a lesser extent, thereby making it advantageous to use a magnet.

[0016] In a particular embodiment, the internal element comprises a support having portions that are adjacent to a wall defining the tubular body and portions that are set back from said wall, with the element including a permanent magnet in each of its portions adjacent to the wall, and preferably:

[0017] the support has a cross-section that is rectangular with its short sides forming the portions adjacent to the wall; and

[0018] the wall of the tubular body presents an outline that is circular.

[0019] This embodiment possesses a structure that is simple to make. In addition, the internal actuator element and the tubular body are of cross-sections that allow large flow sections to be left for the liquid, thereby limiting any risk of turbulence that might disturb the flow.

[0020] Advantageously, the secondary shutter and the constriction present relative dimensions and relative positioning such that when the valve member is closed the secondary shutter presents clearance relative to the constriction that is
just sufficient to retain a liquid contained in the body between the valve member and the secondary shutter by means of capillarity.

[0021] Without running any risk of interfering with the closure action of the valve member, this enables the filler spout to retain a sufficient quantity of substance to avoid finity formation of the jet of substance when the valve member is opened.

[0022] Under such circumstances, and preferably, the internal element is connected to the valve member by a coupling member presenting axial lost motion.

[0023] It is thus possible for opening of the valve member to be offset relative to opening of the secondary shutter.

[0024] Also preferably, the coupling member also presents radial lost motion.

[0025] This makes it possible to increase manufacturing tolerances and to simplify assembly.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026] Other characteristics and advantages of the invention appear further on reading the following description of a particular embodiment of the invention and of variants thereof, given with reference to the accompanying figures, in which:

[0027] FIG. 1 is a perspective view of the filler spout, with some zones being drawn in transparency, the valve member in the closed position;

[0028] FIG. 2 is an axial section view of a filler spout of the invention with the valve member in the open position;

[0029] FIG. 3 is a view on a larger scale and in perspective of a zone III in FIG. 2;

[0030] FIG. 4 is a view on a larger scale of a zone IV in FIG. 2, showing the internal actuator element in transparency;

[0031] FIG. 5 is a view analogous to the view of FIG. 1 showing another variant of the outlet member of the filler spout; and

[0032] FIG. 6 is a diagrammatic fragmentary view of the assembly comprising the valve member, the internal actuator element, and the secondary shutter showing the releasable attachment means for attaching the internal actuator element to the valve member.

MORE DETAILED DESCRIPTION

[0033] With reference to FIGS. 1 to 4, the filler spout of the invention comprises a structure 100 having mounted thereon a tubular body 1 having three body elements 1.1, 1.2, and 1.3 that are connected together by quick coupler means represented symbolically at 2. The body elements 1.1, 1.2, and 1.3 respectively contain elements that perform a shutter function, a control function, and an outlet nozzle or secondary shutter function of the filler spout of the invention.

[0034] The control function is performed by an internal magnetic actuator element 3 mounted to slide in the body element 1.2. The magnetic actuator element 3 comprises a support 4 having guide portions 4.1 adjacent to the wall of the body element 1.2 and set-back portions 4.2. The support 4 in this example is rectangular in section having short sides that form the guide portions 4.1. The guide portions 4.1 of the support 4 serve to guide the support 4 accurately inside the body element 1.2 and they co-operate with the set-back portions 4.2 to define passages allowing a substance to flow between the support 4 and the inside face of the body element 1.2. The guide portion 4.1 house permanent magnets 5. The body element 1.2 is made of a non-magnetic material and it is surrounded by an annular permanent magnet 6 that is mounted to slide on the body element 1.2, and that is associated with an actuator 7. The actuator 7 is a linear electromagnetic actuator having a rod connected at one end to a crank lever 8 that is mounted on the structure 100 to pivot about an axis that is perpendicular to the filler spout and that possesses an opposite end having a fork 9 engaged on an annular slider 10 that is mounted on the body element 1.2 and on which the annular permanent magnet 6 rests. The external actuator means include an abutment 29 that is adjustable in position along the tubular body 1 to define a bottom position for the slider 10. The abutment 29 in this example comprises a screw of axis parallel to the tubular body 1 and that is engaged in the slider 10 and that bears against the structure 100.

[0035] The body element 1.1 contains a valve member 11, in the form of a ball in this example, which member is associated with coupling means, in this example a control rod 15 connecting the valve member 11 to the internal actuator element 3, the valve member being mounted to slide in a cylindrical bore 12 of the body element 1.1. The control rod is screwed into the support 4 and into the valve member 11. In its bottom portion, the bore 12 includes a chamfer 13 forming a seat for the valve member 11 and it has longitudinal channels 14 formed therein that extend upstream from the chamfer 13 to allow liquid to pass when the valve member 11 is in the open position.

[0036] The body element 1.3 contains a secondary shutter 21 that is fastened by coupling means to the internal actuator element 3. By way of example, the coupling means comprise a rod 22 having ends screwed respectively into the secondary shutter 21 and into the internal actuator element 3. In this embodiment, the secondary shutter 21 has an elongate conical bottom portion 23 extending in register with a conical constriction 24 in the body element 1.3.

[0037] In order to assemble the filler spout, the valve member 11 fitted with the control rod 15 is mounted in the body element 1.1. The internal actuator element 3 and the body element 1.2 are then assembled thereto, and finally the secondary shutter 21 and the body element 1.3.

[0038] In the closed position of the filler spout, as shown in FIG. 1, it should be observed that the dimensions and relative positioning of the conical portion and of the constriction 24 are designed so that when the valve member is in the closed position, as shown, the conical portion 23 of the secondary shutter is spaced apart from the constriction 24 with clearance that is just sufficient to ensure that capillarity retains the substance contained in the body elements 1.2 and 1.3. The abutment 29 of adjustable position along the tubular body 1 serves to define a bottom position for the slider 10 and thus enables the bottom position of the internal element 3 to be adjusted, thereby adjusting the position of the secondary shutter 21 relative to the constriction 24.

[0039] The external actuator is controlled by a stepper motor that co-operates with a system for measuring the amount of substance that has entered into the dispenser for filling in order to ensure that the stream received matches the programmed stream. It should also be observed that during a maintenance operation, the operator can open the valve member by lifting the permanent magnet 6 by hand.

[0040] In the embodiment shown in FIGS. 1 and 2, the elongate portion 23 of the secondary shutter 21 co-operates with the constriction 24 of the body element 1.3 to provide a passage that ensures that a flow of the substance is maintained under laminar conditions. Such a secondary shutter is useful for packaging a substance that has a tendency to froth if its flow is turbulent, such as milk.

[0041] FIG. 5 shows another variant embodiment in which the secondary shutter 31 is of smaller height, thereby making it possible to reduce the overall size of the resulting assembly.
when there is no need to ensure a laminar flow of the substance at the outlet from the spout.  

Naturally, the invention is not limited to the embodiments described and variants may be applied thereto without going beyond the ambit of the invention, as defined by the claims.  

In particular, the means for coupling the internal actuator element 3 to the secondary shutter and/or the means for coupling the internal actuator element 3 to the valve member may be rigid as shown in FIGS. 1 to 4, or may have provision for axial or radial lost motion as shown in FIG. 6. Under such circumstances, the coupling means comprise a C-shaped bracket 30 connected to the valve member 11 by a link rod 31. The branches of the bracket surround a peg 32 comprising a rod 32 fastened to the support 4 and a head 32.2 engaged in the bracket 30. The peg 32 is secured to the magnetic actuator element 3 and the rod 32.1 and the head 32.2 are mounted in the bracket 30 with radial lost motion such that accurate sliding of the internal actuator element 3 in the body element 1.2 and accurate sliding of the valve member 11 in the body element 1.1 are unaffected even if the body elements 1.1 and 1.2 are not mounted accurately on the same axis. It is thus possible to dissociate the valve member 11 and the internal actuator element 3 by a simple lateral offset between them. It is possible to use other coupling members presenting radial lost motion, e.g. a bayonet coupling member. Axial lost motion makes it possible for the movements of the secondary shutter 21 and of the valve member 11 to be offset in time.  

In a variant, the valve member 11 may be cylindrical, frustoconical, or disk-shaped and it may be provided with a skirt in which notches are formed so as to cause the flow rate to vary more progressively when the valve member is opened or closed.  

The valve member 11 may be provided with a stationary gasket or with a gasket that is axially movable.  

The internal actuator element is shown as being rectangular in section so as to allow liquid to pass along either side thereof while its magnets are encapsulated at its ends close to the walls of the chamber, thereby facilitating cleaning. The internal actuator element may have sections of other shapes, in particular cylindrical or polygonal. It is also possible to envisage an internal actuator element that is pierced in its center with magnets being encapsulated at its periphery, the complementary magnets being situated over the entire outside portion of the tube formed in this way.  

For ease of construction, the chamber shown is circular in section, however it is possible to envisage a chamber that is polygonal in section.  

Although the invention is particularly adapted to systems that perform filling by weight with a programmed flow rate, the invention can be used in other filler systems, such as systems having a constant-level buffer vessel.  

The structure of the actuator means described above is independent of the disposition of the internal element between the valve member and the secondary shutter. Even through the structure described above for the actuator means is particularly advantageous in the invention, other actuator means could be used, e.g. electromagnetic means.  

What is claimed is:  

1. A filler spout comprising a tubular body having mounted therein a valve member extending in register with a valve seat, and a secondary shutter disposed downstream from the valve member and connected thereto, the body including a constriction in register with the secondary shutter, an internal magnetic actuator element being connected to the valve member and being associated with external actuator means arranged to move the internal element between a position in which the valve member is closed and a position in which the valve member is open, wherein the internal actuator element is mounted between the valve member and the secondary shutter, and the tubular body includes means giving access to the internal actuator element.  

2. A spout according to claim 1, wherein the internal element and the secondary shutter are arranged so as to allow the valve member to remain closed while the internal element and the secondary shutter are not attached to the spout.  

3. A spout according to claim 1, wherein the internal actuator element is connected to the secondary shutter by releasable attachment means, and the constriction is fitted to the tubular body by releasable attachment means.  

4. A spout according to claim 2, wherein the internal actuator element is connected to the valve member by releasable attachment means and/or the tubular body includes a detachable segment in register with the internal actuator element.  

5. A spout according to claim 1, wherein the internal element includes at least one permanent magnet and the external actuator means comprise:  

at least one permanent magnet magnetically coupled with the permanent magnet of the internal element; and  

movement means for moving the permanent magnet of the external actuator means.  

6. A spout according to claim 5, wherein the internal element comprises a support having portions that are adjacent to a wall defining the tubular body and portions that are set back from said wall, the element including a permanent magnet in each of its portions adjacent to the wall.  

7. A spout according to claim 6, wherein the support is of rectangular cross-section with short sides forming the portions adjacent to the wall.  

8. A spout according to claim 7, wherein the wall of the tubular body presents an outline that is circular.  

9. A spout according to claim 5, wherein the external actuator means comprise a linear electromagnetic actuator having a rod connected at one end to a crank that is mounted on a structure secured to the body to pivot about an axis perpendicular to the body and that possesses an opposite end provided with a fork engaged on an annular slider that is mounted on the body and on which the permanent magnet rests.  

10. A spout according to claim 9, wherein the external actuator means comprise an abutment that is adjustable in position along the tubular body in order to define a bottom position for the slider.  

11. A spout according to claim 5, wherein the permanent magnet of the external actuator means is annular in shape and surrounds the body.  

12. A filler spout according to claim 1, wherein the secondary shutter and the constriction presents relative dimensions and relative positioning such that when the valve member is closed the secondary shutter presents clearance relative to the constriction that is just sufficient to retain a liquid contained in the body between the valve member and the secondary shutter by means of capillarity.  

13. A spout according to claim 1, wherein the internal element is connected to the valve member by a coupling member presenting axial lost motion.  

14. A spout according to claim 13, wherein the coupling member also presents radial lost motion.