Aug. 13, 1940. F. L. BRONSON 2,210,971

DISCHARGE VALVE

Filed Jan. 24, 1939

Fig. 1.

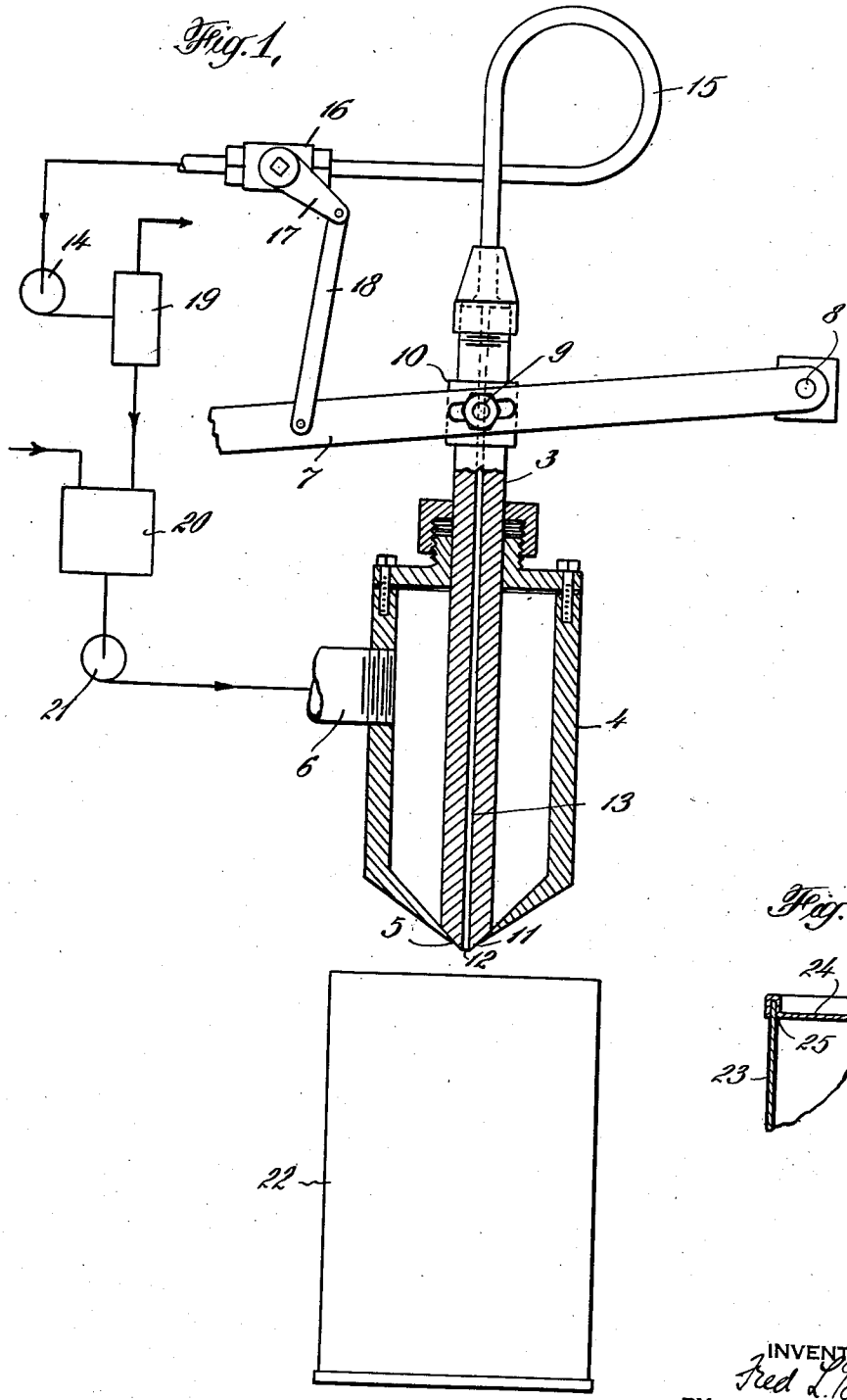


Fig. 2.

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Patented Aug. 13, 1940 2,210,971

UNITED STATES PATENT OFFICE

2,210,971

DISCHARGE VALVE

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Application January 24, 1939, Serial No. 252,607

5 Claims. (Cl. 221—84)

This invention relates to the elimination of drip and splatter in the operation of liquid discharge valves, particularly those used in filling and measuring machines. The invention provides a simple and rugged valve effective for this purpose.

The valve of this invention comprises a chamber with a downwardly opening discharge port and a hollow plunger moving through the chamber adapted to close this port at the lower end of its travel. The valve is opened and closed by raising and lowering this plunger. The lower end of the plunger is provided with a tip projecting through the port when the valve is closed, that is, at the lower end of the plunger's travel. This tip serves to establish the stream of discharging liquid at the instant of opening of the valve and to maintain this stream, when the valve has been opened, until the instant of closing of the valve. The tip on the plunger is provided with an opening communicating with the interior of the plunger which in turn is connected with a pump or exhauster for reducing the pressure within the interior of the plunger over the lower part of its travel. When the valve is closed, the film of liquid forming on the tip of the plunger as the discharging stream of liquid is broken by the closing of the valve is educted through the hollow plunger. The projecting tip on the plunger causes the stream to break cleanly. Thus, through the cooperation of the projecting tip and the pressure reduction through the opening in the tip, in this assembly, drip and splatter are eliminated.

An automatically operated closure for rendering the pressure reducing means inoperative except over the lower part of the plunger's travel is with advantage provided in the connection between the interior of the plunger and the pump or exhauster. Any interference with the flow of discharging liquid when the valve is open is thus avoided. The pump or exhauster is, with advantage, arranged to discharge through a separator from which liquid educted through the plunger is returned to the valve chamber.

A valve embodying the invention is illustrated, diagrammatically, in elevation and partly in section and with parts broken away, in Fig. 1 of the accompanying drawing. A fragmentary section through a container closure is illustrated in Fig. 2.

Referring to Fig. 1 of the drawing: The hollow plunger 3 is arranged to travel on a vertical axis through the valve chamber 4 and to close the discharge port 5 opening downwardly through the lower end of the valve chamber at the lower end of its travel. The liquid to be discharged through the valve assembly is supplied, under appropriate pressure, through connection 6. The plunger 3 is raised and lowered, to open and to close the valve, by the operating lever 7 fulcrumed at 8 and engaging a stud 9 on a collar 10 secured to the plunger. The tip 11 on the lower end of the plunger 3 projects through the port 5 when the lower end of the plunger is seated on the inside face of the port closing the valve. An opening 12 in the tip of the plunger 3 communicates with the intake side of a pump or exhauster 14 through the hollow interior passage 13, the flexible connection 15 and the closure 16. A ported plug in the closure 16, connected to the lever 7 through crank 17 and link 18, is arranged to close the connection between the pump or exhauster 14 and the interior of the plunger 3 when the operating lever 7 is raised and to open this connection when this lever is lowered. The body of the valve chamber 4, the fulcrum 8 and the body of the closure 16 are maintained in fixed position, relative to each other, by appropriate support. The pump or exhauster 14 discharges through separator 19 from which liquid educted through the opening in the tip of the plunger 3 is returned to receptacle 20. The liquid to be discharged through the valve assembly is supplied to the valve chamber 4 from this receptacle 20, for example either by means of a pump 21 or by so positioning the receptacle 20 that the necessary head is imposed on the liquid.

The diameter and slope of the inside face of the port 5, the diameter and length of travel of the plunger 3, the extent of projection of the tip 11 when the valve is closed, and the diameter and degree of pressure reduction through the opening 12 in the tip 11 are adjusted with respect to the character of the liquid to be discharged, the rate of discharge and the speed of operation of the valve in any particular application. The operating lever 7 may be operated automatically by means of weighing mechanism, time mechanism, or the like, when the valve is used, for example, in filling or measuring applications.

The operation of the valve of the invention, as exemplified by the embodiment illustrated in the drawing, is as follows: To fill a container 22 with a measured quantity of a liquid supplied to the valve chamber 4 under a substantially constant head through connection 6, the con-

tainer is placed centrally beneath the port 5, the valve being closed, the lever 7 is raised for a predetermined time or until a predetermined weight of liquid has run into the container, for example, and the lever 7 is then lowered. As the lever 7 is raised, the closure 16 cuts off the connection between the pump or exhauster 14 and the interior of the plunger 3. At the same time, as the lower end of the plunger 3 leaves its seat on the inside face of the port 5, the liquid within the valve chamber 4 begins to flow through the port into the container. As this flow is initiated, the tip 11 of the plunger projects through the port and thus establishes a cleanly flowing stream of liquid directed downwardly into the container. As the lever 7 is lowered, it cuts off the flow of liquid, interrupting it as the lower end of the plunger 3 seats on the inside face of the port 5. When this point of plunger travel is reached, the tip 11 projects through the port 5 and in this position guides the end of the liquid stream established by the interruption so that it follows the stream established when the valve was open without substantial disturbance and consequently without splatter. At the same time, the closure 16 opens the connection between the pump or exhauster 14 and the opening 12 in the tip of the plunger 3 thus effecting the eduction, through the interior of the plunger, of the final film of liquid left on the projecting tip of the plunger. Any liquid remaining on the rim of the port 5 follows this film on the tip 11 to the opening 12. Splatter and drip are thus eliminated.

Splatter and drip are always an annoyance and inconvenience as an incident to the operation of liquid discharge valves and in some applications become major difficulties. For example, in one method of packaging lubricating oil, a ring of sealing compound is applied to the interior of the upper rim of a container open at the upper end, a measured quantity of lubricating oil is then run into the open end of the container through a liquid discharge valve and a cover is pressed into the open end of the container, the cover being sealed to the rim of the container by means of the previously applied ring of sealing compound. As will be apparent, the success of this operation is entirely dependent upon the cleanliness and continuity of the ring of sealing compound at the instant of impression of the cover. The situation is illustrated in Fig. 2, 23 being the upper part of the wall of the container, 24 being the cover and the ring of sealing compound being applied to the interior of the upper rim of the container at 25. Any splatter involved in the operation of the liquid discharge valve, including any splatter resulting from drip from the valve into the filled container, produces a high proportion of imperfect seals in the application of this method. The advantageous application of the valve of the invention, however, is not limited to this instance exemplifying its advantages in one aspect. It is of general application, and its advantages in the elimination of drip and splatter are as varied as its application.

I claim:

1. A valve mechanism comprising a chamber with a downwardly opening discharge port, a hollow plunger moving through said chamber adapted to close said port at the lower end of its travel having a tip projecting through said port when at the lower end of its travel and having an opening through said tip communicating with its interior, means for reducing the pressure within the interior of the plunger, and means operable to connect the interior of the plunger to the pressure reducing means over the lower part of the travel of the plunger only.

2. A valve mechanism comprising a chamber with a downwardly opening discharge port, a hollow plunger moving through said chamber adapted to close said port at the lower end of its travel having a tip projecting through said port when at the lower end of its travel and having an opening through said tip communicating with its interior, pressure reducing means, a connection between the interior of the plunger and the pressure reducing means, and means in the connection for controlling flow therethrough.

3. A valve mechanism comprising a chamber with a downwardly opening discharge port, a hollow plunger moving through said chamber adapted to close said port at the lower end of its travel having a tip projecting through said port when at the lower end of its travel and having an opening through said tip communicating with its interior, means for reducing the pressure within the interior of the plunger over the lower part of its travel, and means for returning to said chamber liquid educted through said plunger.

4. A valve mechanism comprising a chamber having a downwardly opening discharge port, a hollow plunger movable within the chamber and adapted to close said port at the lower end of its travel, the plunger having a tip projecting through said port when the plunger is near the lower end of its path of travel, the tip having an opening communicating with the interior of the plunger, pressure reducing means connected to the interior of the plunger, a valve in the connection between the pressure reducing means and the interior of the plunger for controlling flow through the connection, and means for moving the plunger and operating said valve to open the connection only when the plunger is near the lower end of its path of travel.

5. A valve mechanism comprising a chamber having a downwardly opening discharge port, a hollow plunger within the chamber movable to and from a position in which it closes the port, the plunger having a tip which projects through the port when the plunger is near said position, the tip having a central opening leading to the interior of the plunger and an outer wall tapering toward said opening, pressure reducing means communicating with the interior of the plunger through a connection, means for controlling flow through the connection, and means operable to move the plunger to and from said position and to operate the flow control means, the connection being opened only when the plunger is close to said position.

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