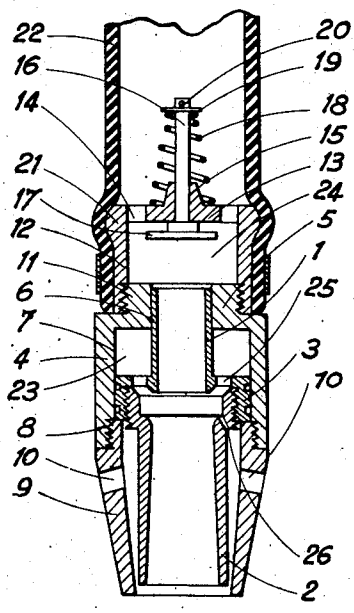
March 1, 1955 O. FROIDEVAUX 2,703,195

DISCHARGE CHECKING NOZZLE

Filed April 25, 1950 2 Sheets-Sheet 1

Fig.1.



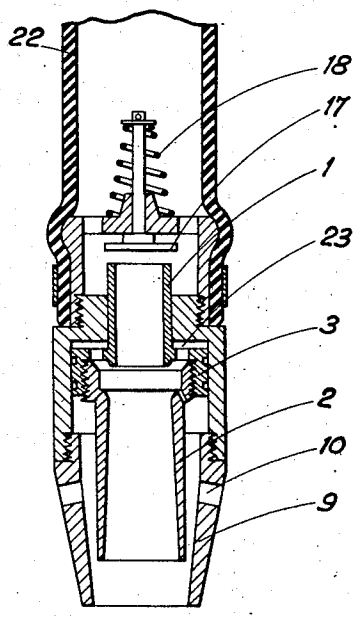


Fig.2.

Fig.3.

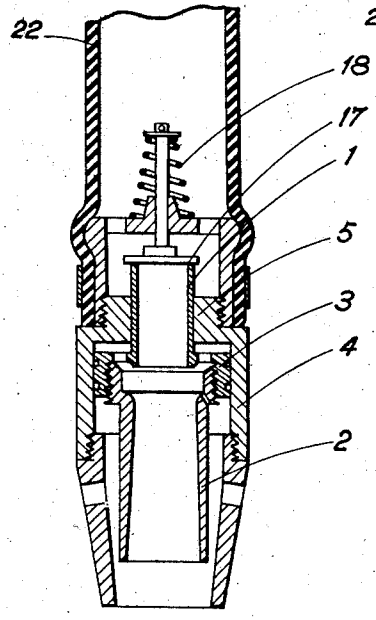
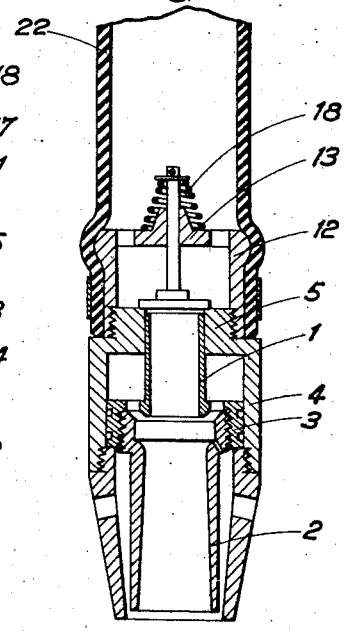


Fig.4.



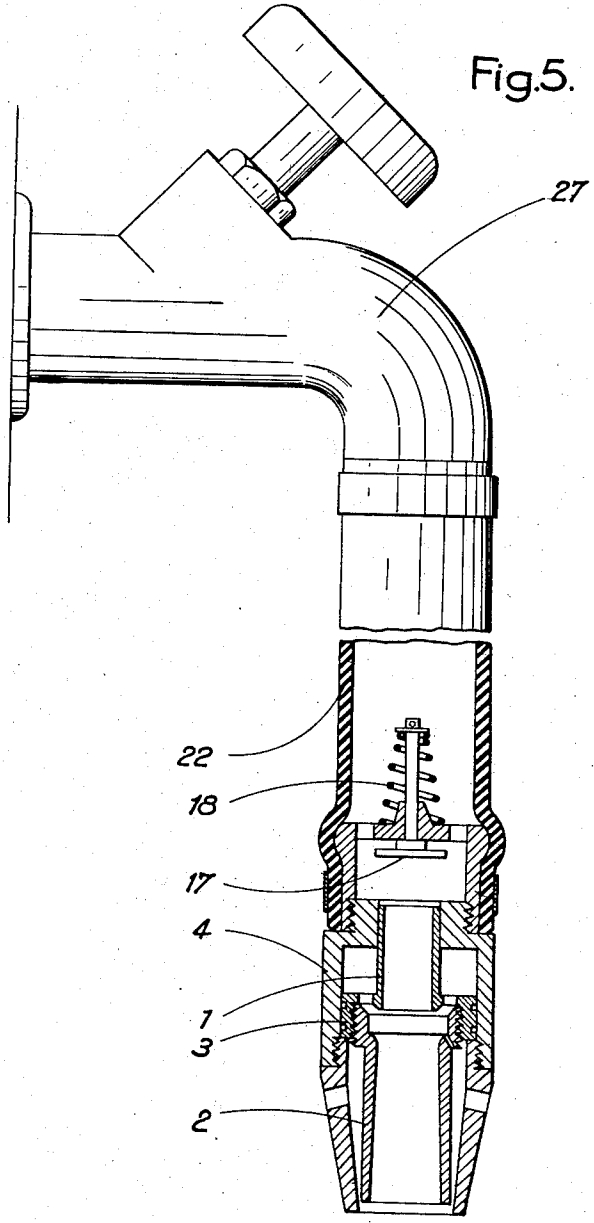
Inventor
Oscar Froidevaux
By Robert E. Burns
Attorney

March 1, 1955 O. FROIDEVAUX 2,703,195

DISCHARGE CHECKING NOZZLE

Filed April 25, 1950 2 Sheets-Sheet 2

Fig.5.



Inventor
Oscar Froidevaux
By Robt E Burns
Attorney

United States Patent Office 2,703,195
Patented Mar. 1, 1955

2,703,195

DISCHARGE CHECKING NOZZLE

Oscar Froidevaux, Antony, France, assignor to Tecalemit, Societe Anonyme, Paris, France, a body corporate

Application April 25, 1950, Serial No. 157,862

Claims priority, application France May 27, 1949

3 Claims. (Cl. 226—127)

This invention relates to a liquid discharge-controlling nozzle adapted to be fitted to the end of a liquid-supply conduit provided with a shut off valve which can cut off the supply of liquid to the nozzle.

An object of the invention is to provide a liquid discharge-controlling nozzle which will stop the discharge of the liquid as soon as the liquid previously discharged from the nozzle reaches a predetermined level in a container in which it is being collected. The nozzle may therefore be allowed to operate without attention and will automatically shut off the liquid stream when the liquid in the container has reached the desired level. This nozzle is characterized by the combination of a tubular jacket or casing, a nozzle member longitudinally-movable in the jacket for receiving the flowing stream of liquid through a central bore, the nozzle member cooperating with the jacket to define a fluid-tight chamber which is variable in volume as the nozzle member slides longitudinally in the jacket, means for creating a vacuum in the chamber by the action of the liquid being discharged through the movable nozzle-member, means responsive to the vacuum created in the chamber to produce a longitudinal motion of the movable nozzle-member when the liquid in the container reaches the predetermined level, and a fluid-pressure responsive check valve in the jacket for longitudinal motion therein. The check-valve is adapted to move towards the movable nozzle-member to close its central bore whenever the movable nozzle-member is moved by the action of the vacuum responsive means.

More particular objects and advantages of the invention will be evident from the following description in which reference is had to the appended sheets of drawings wherein,

Fig. 1 is an axial sectional view of a nozzle embodying features of the invention, showing the nozzle in position for full flow of liquid and showing the relative positions of the nozzle member and the associated check valve;

Fig. 2 is a similar view of the nozzle, the upper portion of the movable nozzle member being in a position closer to the check valve owing to the presence of a vacuum in the chamber;

Fig. 3 is a similar view in which the check valve is shown at the moment it enters into closing engagement with the movable nozzle member;

Fig. 4 is a similar view showing the check valve in its full closed position; and

Fig. 5 is an elevational view, partly in section of the nozzle assembled with a hose provided with a shut-off valve upstream of the nozzle.

As shown in the drawing, the movable nozzle-member of the nozzle illustrated comprises a tubular inlet portion 1, a diverging outlet portion 2, and a short intermediate enlarged portion threadedly engaged with an external sleeve 3.

The nozzle member is slidably positioned in a tubular jacket or casing 4 provided with a transverse end wall 5 having an axial bore 6 in which the inlet portion 1 of the movable nozzle-member is slidably guided, while the sleeve 3 is slidably guided in the bore 7 of the main body of the tubular jacket 4 in the manner of a piston and cylinder.

The tubular jacket 4 is provided at its open discharge end with internal threads 8 which are engaged by a protecting end piece 9 which has an annular row of air-intake holes 10 formed in its side wall. When the nozzle is used, the end piece 9 is partially inserted in the container being filled (not shown) with the air-intake holes 10 at the level to which it is desired to fill the container.

The transverse end wall 5 of the jacket 4 is provided with an external thread 11 for reception of a cap 12 having a top end wall 13 provided with a circular row of passageways 14 and with a central bore 15 in which the stem 16 of a check valve 17 is slidably guided. The check valve 17 is retained in its normal open position by a spring 18 which draws the valve against the direction of flow of liquid through the nozzle. The spring 18 is retained between the end wall 13 of cap 12 and a lock ring 19 held on the end of valve stem 16 by a pin 20.

Cap 12 is formed with an external annular enlargement or rib 21 to facilitate retention of the nozzle in the end of a delivery hose which may be a rubber hose 22. A shut-off valve 27 (see Fig. 5) is provided upstream of the nozzle to control the flow of liquid into hose 22.

A vacuum chamber 23 is defined interiorly of the tubular jacket 4 adjacent the transverse end wall 5, the volume of the chamber 23 being varied by the relative position of the movable nozzle-member, and the sleeve 3 carried by it. The cap 12 defines a chamber 24 above end wall 5 in which both the top part of inlet portion 1 and the check valve 17 are displaceable.

Vacuum chamber 23 communicates with the bore of the movable nozzle-member through air-passageways 25, while a free annular space is provided between outlet portion 2 and protecting end piece 9. A relatively small passageway 26, the purpose of which will be explained hereinafter, provides communication between vacuum chamber 23 and the portions of the nozzle accessible to the atmosphere.

Assuming that the liquid delivery hose 22 is closed by the shut-off valve 27, the operation of the device is as follows:

The shut-off valve 27 is opened and the liquid flows into the nozzle through the passageways 14 in the end wall 13 of cap 12, the check valve 17 being retained by the return spring 18 in its inoperative position against the stop provided by the solid central portion of end wall 13 of cap 12 (Fig. 1). The liquid flows toward the container to be filled (not shown), through the chamber 24, and through the movable nozzle member. The movable nozzle member operates normally in dry wall conditions, i. e. in such a manner that no vacuum is created in the vacuum chamber 23 during the normal filling of the container by reason of the air-intake provided for the chamber 23 by the air-intake holes 10, the passageway 26 and the passageways 25.

When the liquid in the container reaches the desired level which coincides, as previously mentioned, by the position of the air-intake holes 10 in the end piece 9 of the nozzle, the stream of liquid wets the inner wall of the outlet portion 2 of the movable nozzle member and, as a result, the air present in the annular chamber 23 is suddenly sucked out. Due to the action of atmospheric pressure upon the bottom of the sleeve 3 on the movable nozzle member the latter is pushed upwardly towards the check valve 17 against the direction of flow of the liquid (Fig. 2).

As the nozzle member approaches the check valve 17 and as a consequence of the throttling of the passageway between the check valve and the inlet to the nozzle member, the pressure on the top of valve 17 increases while the pressure below it decreases. Finally, the pressure on the upper side of the check valve becomes sufficient to overcome the action of spring 18, and the valve is driven into engagement with and finds a temporary seat on the top edge of the inlet portion 1 (Fig. 3). Thereafter the liquid pressure acts with full force upon the top of the check valve 17, with the result that this valve and the movable nozzle-member are forced downwardly by the stream until the bottom of valve 17 engages the top of the transverse end wall 5 of the tubular jacket 4 where it remains until the shut-off valve 27 which controls the flow of liquid upstream of the nozzle is closed (Fig. 4).

During the filling operation, the movable nozzle member is kept in the position shown in Fig. 1 by the combined action of gravity and of the pressure applied to the

annular surface of the upper edge of the inlet portion **1** of the movable nozzle member. The movable nozzle member is moved to the position shown in Fig. 2 as soon as atmospheric pressure acting on the enlargement **3** exceeds the force exerted on the upper edge of the inlet portion **1** plus the weight of the movable nozzle-member **1, 2, 3**. When the pressure exerted upon the check valve **17** is released as a consequence of the closing of the shut-off valve **27**, the check valve is lifted back into engagement with the end wall **13** of the cap **12** by the action of the spring **18**, and the device is ready for a new filling operation.

As described, the movable nozzle-member operates under dry wall conditions, no vacuum is created within the annular chamber **23** during the normal course of filling the container. However, when the flow of liquid is first begun, an undesired wetting of the inner wall of the diverging portion **2** may occur due, for example, to the bursting of an air pocket carried along by the liquid under pressure, and this might result in an untimely priming of the movable nozzle-member. Such a possibility is prevented by the provision of the small-diameter hole **26** through which the vacuum chamber **23** is in communication with the atmosphere. As long as the member is not flooded, air can flow in through said hole **26** and untimely creation of the vacuum is prevented.

The movable nozzle member may also operate wet wall conditions with air being constantly sucked out of the annular chamber **23** through the holes **25**. However, a vacuum cannot be created within chamber **23** since the air sucked out of it is immediately replaced by air that flows in freely through the hole **26**. This occurs until the nozzle member becomes flooded as the liquid level reaches the holes **10**. At that time air can no longer reach chamber **23** through hole **26** so that the device acts as if no hole **26** were provided, and the vacuum created in chamber **23** becomes fully effective to actuate the device to shut off the flow of liquid.

What I claim is:

1. A liquid discharge nozzle for automatically stopping the discharge of the liquid into a container in which the nozzle is at least partially inserted as soon as the liquid in the container reaches a predetermined level, said nozzle comprising a tubular jacket, a nozzle member having an axial bore mounted for axial sliding movement inside said jacket and defining a chamber in said jacket variable in volume upon sliding movement of said nozzle member, the wall of said nozzle member having passageways formed therein for connecting said chamber with the bore of said member, means for permitting access of air to said chamber, a check valve mounted for axial movement relative to said jacket and positioned upstream relatively to said nozzle member, said check valve being engageable with said nozzle member upon relative movement of said valve and said nozzle member to close the axial bore of the nozzle member and thereby cut off the supply of liquid to said nozzle member, said nozzle member moving upstream toward said check valve when access of air to said chamber is prevented by the rising level of the liquid in said container.

2. A liquid discharge nozzle for automatically stopping the discharge of the liquid into a container in which the nozzle is at least partially inserted as soon as the liquid in the container reaches a predetermined level, said nozzle comprising a tubular jacket, a transverse wall in said jacket having an axial bore, a nozzle member having an axial bore mounted for axial sliding movement inside said jacket and having a portion in fluid-tight engagement with the bore of said wall, an external annular portion on said nozzle member, said annular portion being positioned downstream in relation to said wall and being in fluid-tight engagement with the inner surface of the wall of the tubular jacket to define a chamber in said jacket adjacent said wall and surrounding said portion of said nozzle member, the wall of said nozzle member having passageways formed therein for connecting said chamber with the bore of said member, means for permitting access of air to said chamber, a check valve mounted for axial movement relatively to said jacket and positioned upstream relatively to said nozzle member, said check valve being engageable with said nozzle member upon relative movement of said valve and said nozzle member to close the axial bore of the nozzle member and thereby cut off the supply of liquid to said nozzle, said nozzle member moving upstream toward said check valve when access of air to said chamber is cut off by the rising level of the liquid in said container.

3. A liquid discharge nozzle for automatically stopping the discharge of the liquid into a container in which the nozzle is at least partially inserted as soon as the liquid in the container reaches a predetermined level, said nozzle comprising a tubular jacket, a transverse wall in said jacket having an axial bore, a nozzle member having an axial bore mounted for axial sliding movement inside said jacket and having a portion in fluid-tight engagement with the bore of said wall, an external annular portion on said nozzle member, said annular portion being positioned downstream in relation to said wall and being in fluid-tight engagement with the inner surface of the wall of the tubular jacket to define a chamber in said jacket adjacent said wall and surrounding said portion of said nozzle member, the wall of said nozzle member having passageways formed therein for connecting said chamber with the bore of said member, means for permitting access of air to said chamber, an extension at the discharge end of said jacket for enclosing the downstream portion of said nozzle member, said extension defining an annular space with the wall of said nozzle member and being formed woth apertures communicating with said space, a check valve mounted for axial movement relatively to said jacket and positioned upstream relatively to said nozzle member, said check valve being engageable with said nozzle member upon relative movement of said valve and said nozzle member to close the axial bore of the nozzle member and thereby cut off the supply of liquid to said nozzle, said nozzle member moving upstream toward said check valve when access of air to said chamber is cut off by the rising level of the liquid in said container.

References Cited in the file of this patent

UNITED STATES PATENTS

2,244,947 Hargiss ---------- June 10, 1941