Sept. 20, 1966 L. F. BENDER 3,273,514

FLUID CONVEYING APPARATUS

Filed June 17, 1965 3 Sheets-Sheet 1

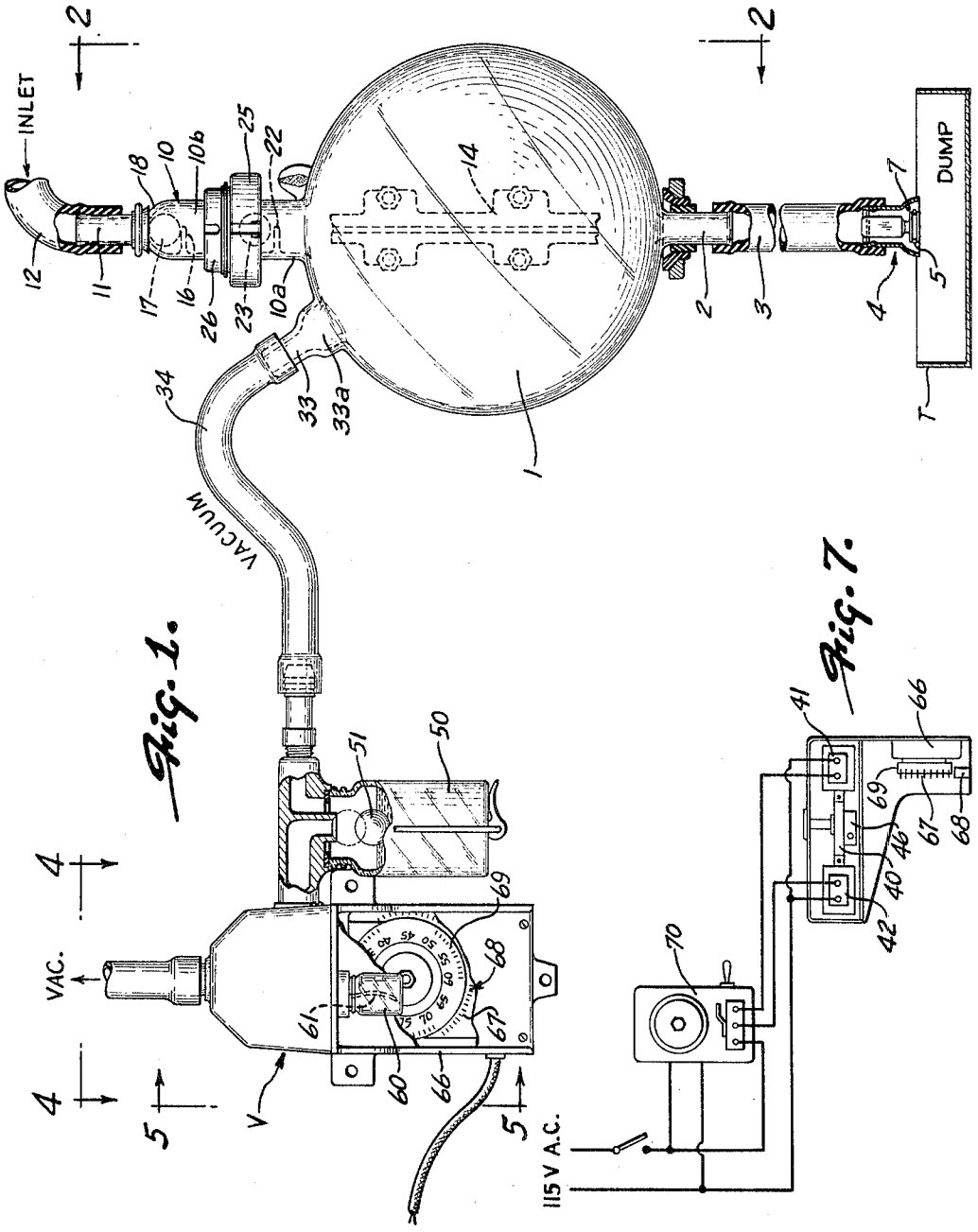


Fig. 1.

Fig. 7.

INVENTOR.
LLOYD F. BENDER
BY
James E. Nilles
ATTORNEY

Sept. 20, 1966 L. F. BENDER 3,273,514

FLUID CONVEYING APPARATUS

Filed June 17, 1965 3 Sheets-Sheet 2

Fig. 3.

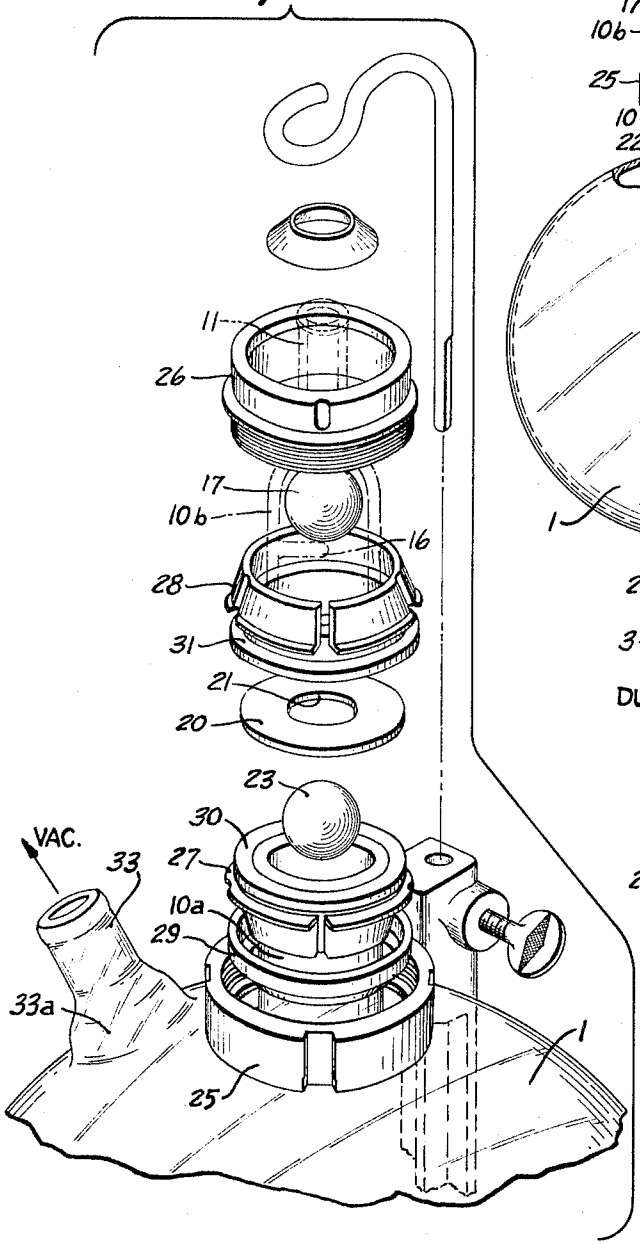
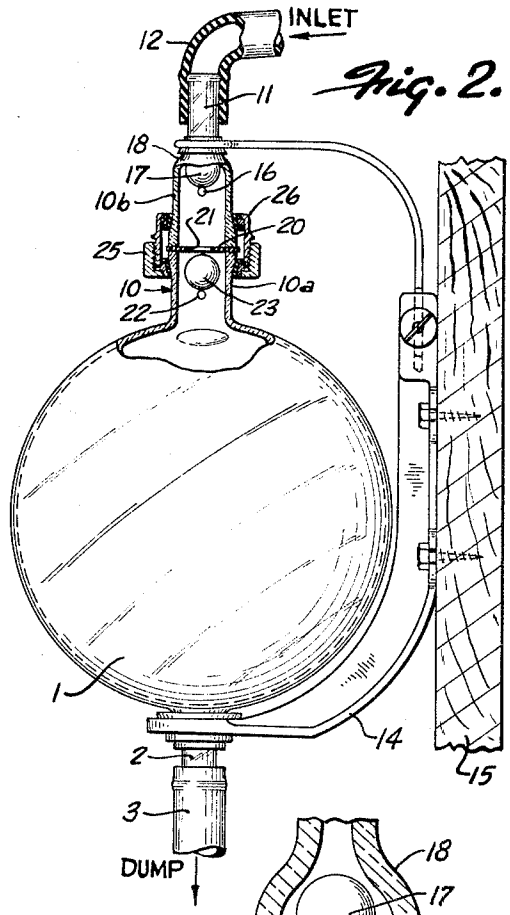


Fig. 2.



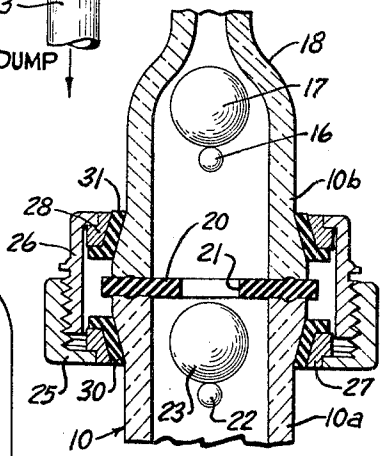


Fig. 6.

INVENTOR.
LLOYD F. BENDER
BY
James E. Nilles
ATTORNEY

Sept. 20, 1966 L. F. BENDER 3,273,514

FLUID CONVEYING APPARATUS

Filed June 17, 1965 3 Sheets-Sheet 3

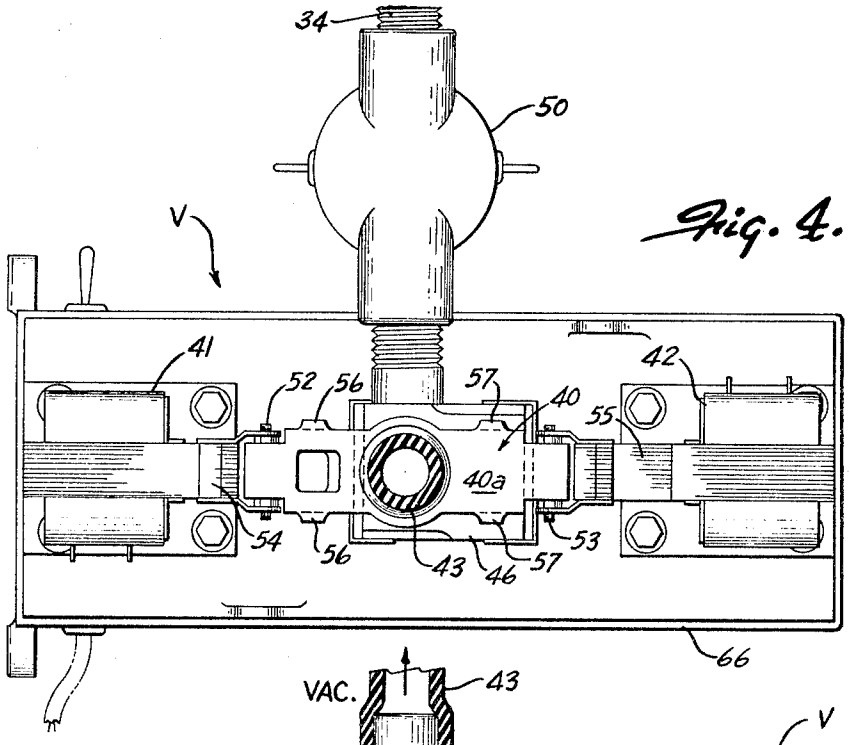


Fig. 4.

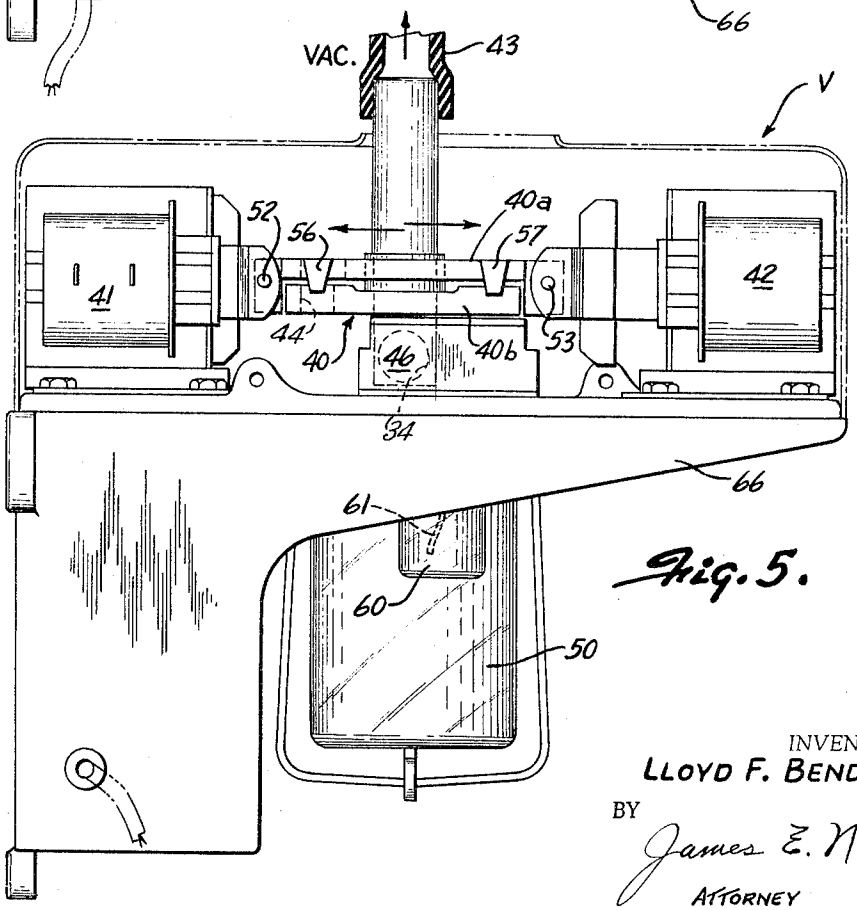


Fig. 5.

INVENTOR.
LLOYD F. BENDER
BY
James E. Nilles
ATTORNEY

United States Patent Office

3,273,514

Patented Sept. 20, 1966

3,273,514

FLUID CONVEYING APPARATUS

Lloyd F. Bender, Hayward, Wis.

Filed June 17, 1965, Ser. No. 464,628
8 Claims. (Cl. 103—236)

This invention relates to dairy equipment or the like and more particularly to fluid handling equipment for conveying fluid, such as milk or orange juice for example, and which can be cleaned in place.

Equipment for handling fluids of this character must comply with rigid sanitary laws and must be capable of complete cleaning.

One aspect of the present invention is to provide efficient fluid conveying apparatus which provides fast flow, has no moving parts (except for check valves) which are actually located in the fluid flow, and is readily and completely cleaned-in-place. Furthermore, the present apparatus handles the fluid gently, which is important in the case of milk to prevent undue churning which would tend to turn the milk into butter; on the other hand, when the apparatus is used for in-place cleaning, the cleaning solution is caused to completely cover and wash the entire inner surface of the vessel.

These and other objects and advantages of the present invention will appear as this disclosure progresses, reference being had to the accompanying drawings, in which:

FIGURE 1 is an elevational view of fluid conveying apparatus made in accordance with the present invention, certain parts being shown as broken away and in section for clarity;

FIGURE 2 is another elevational view taken along line 2—2 in FIGURE 1, certain parts being shown in section;

FIGURE 3 is an exploded, perspective view on an enlarged scale of the upper portion of the vessel shown in FIGURES 1 and 2;

FIGURE 4 is a plan view of the valve mechanism shown in FIGURE 1, the view being taken generally from the line 4—4 in FIGURE 1 but on an enlarged scale;

FIGURE 5 is an elevational view of the valve mechanism taken along line 5—5 in FIGURE 1 but on an enlarged scale;

FIGURE 6 is an enlarged, sectional view of the upper part of the vessel;

FIGURE 7 is a wiring diagram of the electric timer and solenoids which operate the slide valve mechanism.

Referring in greater detail to the drawings, the fluid vessel 1 is spherical in shape and is made of transparent material such as glass which contributes to insuring cleanliness. The vessel has an integrally formed fluid discharge conduit 2 at its lower end to which is attached a flexible conduit 3 of any desired length. Conduit 3 has a one-way valve 4 at its lower end which closes when the vessel is subjected to vacuum, the O-ring 5 of the shiftable valve element 6 sealing against the inner surface of the flared end member 7. Valve 4 opens to permit fluid in the vessel to dump by gravity when the vessel is subjected to atmosphere.

A fluid inlet conduit 10 is located at the upper side of the vessel and is made separable to permit assembly of the parts and facilitate cleaning, inspection and repair. The uppermost end 11 of the conduit is of reduced diameter, and receives the fluid supply conduit 12. Fluid is thus delivered to the vessel from any source, such as a conventional milk line in a barn or a tank of fluid.

A suitable bracket 14 secures the vessel at any desired height to a building member 15, and the vessel rests on the lower end of the bracket and is held as taught in my U.S. Patent 3,186,428 which issued on June 1, 1965.

The inlet conduit 10 has an integrally formed projection or pin 16 extending into its upper end on which a ball

17 rests. This ball is made of plastic and when it rises it seals against the shoulder 18 formed by the reduced end 11, thus sealing the inlet conduit and preventing fluid from leaving the vessel by returning through line 12, as will appear. In other words, the ball 17 acts as a one-way check valve and prevents line 12 from emptying when the vessel is opened to atmosphere for dumping of the fluid therein.

A washer 20 is located in the conduit 10 intermediate its length and has an aperture 21 which is of smaller diameter than the internal diameter of the conduit 10. A projection or pin 22 is formed integrally in the neck and extends therein below the washer, and a ball 23 is located between the washer and pin 22, for purposes that will appear later.

The conduit 10 is formed in two sections 10*a* and 10*b*, and the washer 20 is firmly held therebetween. The sections are detachably held together in sealed relationship by the two threaded collars 25 and 26 which draw the split rings 27 and 28 and collar 29 together and toward each other and cause the rubber gasket 30 and 31 to bear tightly against the conduit 10.

A vacuum conduit 33 is formed integrally in the top of the vessel and extends at an incline therefrom. An enlarged portion 33*a* prevents fluid from being sucked into the attached vacuum conduit 34 as taught in my co-pending U.S. application Serial Number 443,055, filed March 26, 1965, and entitled "Milk Line Equipment" and reference may be had to that application if a more complete explanation of the position and shape of the vacuum inlet is thought to be either necessary or desirable.

Means are provided for alternately subjecting the vessel to vacuum to thereby draw fluid through inlet conduit 12 to fill the vessel, and then subjecting the vessel to atmospheric pressure to cause the fluid to dump via conduit 3 into the tank T. This means includes a slide valve V which has a shiftable slide 40 that is actuated by solenoids 41 and 42. The slide 40 is connected to the vacuum line 43 and the latter shifts with the slide 40. Conduit 43 is connected with a source of vacuum pressure (not shown) and when it and the slide 40 have been slipped by solenoid 41 and are in one position (as shown in FIGURES 4 and 5) vacuum is applied to the vessel. When solenoid 42 shifts the slide to the other position, the hole 44 in the slide registers with the conduit 34 via valve block 46 and thus opens the vessel to atmosphere.

A moisture trap 50 having a checkball 51 is interposed in line 34 between vessel 1 and the valve V.

The slide 40 is made of two parts 40*a* and 40*b* which slide together as a unit and insure that a good seal is provided between the slide 40 and block 46.

Part 40*a* is secured at each end by pins 52 and 53 to the plungers 54 and 55 of the respective solenoids. Part 40*a* also has guide arms 56, 57 along its sides which embrace or straddle part 40*b* to maintain lateral alignment between these two parts of the slide.

Conduit 43 is secured directly to part 40*b* and can move slightly towards and away from part 40*a*. This permits part 40*b* to bear tightly against the block when the vacuum is being applied to the vessel. Otherwise the pivot connections of the slide to the solenoid plunger may prevent this tight abutting relationship of the slide and block 46.

A lubricating bottle 60 having a wick 61 maintains the slide lubricated and silent in operation.

The action of the solenoids is timed by an electric timer 66 which can be set to operate the solenoids in any desired time intervals. This timer may be of the one minute repeater type which has a series of adjustable tabs 67, each representing one second, which tabs can be manually set so as to clear or abut against a microswitch 68 as the

timer wheel 69 rotates. The timer includes an electric motor 70 which drives the wheel in the known manner.

In operation, the timer is set to provide the desired interval of time during which the vessel is subjected to vacuum. During this time the dump valve 4 is closed and fluid is drawn from the conduit 12 into the vessel. As the fluid is passing through the inlet conduit 10, the ball 23 causes it to follow the entire interior wall of the vessel, that is, it distributes the fluid evenly around the interior of the vessel. This prevents the fluid from pounding against the bottom of the vessel. This gentle handling of the fluid is important when handling milk because excessive churning tends to turn the milk into butter. This distributing action of ball 23 is also desirable when a cleaning solution is being handled to insure complete cleaning action. During this time ball 17 just sets on pin 16 and permits fluid to flow downwardly past it.

When the vessel is substantially full, the timer then causes solenoid 42 to shift the valve slide 40 to align hole 44 with the conduit 34, thus placing the vessel under atmospheric pressure. This immediately permits valve 4 to open and dump fluid. At the same time ball 17 rises and immediately closes off conduit 12. The rising of the ball 17 is facilitated and insured by the washer 20 which causes the formation of a pool of fluid in the upper portion of inlet conduit 10, thus causing a sufficient floating action of ball 17 to permit it to immediately be drawn up to block conduit 12. In other words, the washer retards the downward flow of fluid sufficiently to permit it to build up slightly above the washer and lets the ball 17 go up quickly to check the return flow back through conduit 12.

The present invention provides a highly efficient, fast acting, simple apparatus with no moving parts in the fluid other than two balls, and which can be easily and completely cleaned in place after being used to convey fluid from one location to another.

Various modes of carrying out the invention are contemplated as being within the scope of the following claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention.

What is claimed is:

1. Fluid conveying apparatus comprising, a vessel having a fluid inlet conduit at its upper end, a fluid outlet conduit at its lower end, and a vacuum conduit adjacent its upper end, said fluid inlet conduit having a one-way check ball to prevent flow of fluid from said vessel and also having distributor means comprising a shiftable ball in said inlet conduit to distribute the fluid around the vessel as it flows into the vessel, said outlet conduit having a one-way fluid discharge valve which closes when said vessel is subjected to vacuum and opens when said vessel is open to atmosphere; and shiftable valve means for alternately placing said vacuum conduit and consequently said vessel in communication with a source of vacuum and with the atmosphere.

2. Apparatus as defined in claim 1 further including flow retarding means in said inlet conduit and beneath said one-way check ball to cause a fluid build up beneath said ball and floating of the latter to facilitate upward movement thereof to the closing position.

3. Apparatus as defined in claim 2 further characterized in that said retarding means is a washer having internal diameter less than that of said inlet conduit.

4. Apparatus as defined in claim 1 further characterized in that said valve means includes a valve block and a shiftable element having two parts, one of said parts abutting in sealing relationship with said block and having a vacuum supply conduit secured thereto for shifting therewith.

5. A generally spherical, glass, fluid conveying vessel having a fluid inlet conduit at its upper end and extending in an upward direction, a fluid discharge conduit at its lower end, and a vacuum conduit adjacent its upper end; said inlet conduit having a one-way check ball in its upper end which prevents flow of fluid from said vessel, a second ball in said inlet conduit and beneath said check ball and arranged to distribute fluid as it flows downwardly, and a fluid flow restrictor in said inlet conduit and located between said balls to cause a fluid build up beneath said check ball to facilitate closing thereof.

6. The vessel as defined in claim 5 further characterized in that said inlet conduit is comprised of two separable sections, and said restrictor is a washer located between and held by said sections.

7. The vessel as defined in claim 5 including two projections formed integrally in said inlet conduit, one projection located beneath each of said balls to support and restrict movement of the balls and in a downward direction but not impede flow of fluid in said conduit.

8. A generally spherical, glass, fluid conveying vessel having a fluid inlet conduit at its upper end and extending in an upward direction, said inlet conduit being comprised of two separable sections, a fluid discharge conduit at its lower end, and a vacuum conduit adjacent its upper end; said inlet conduit having a one-way check ball in its upper end which prevents flow of fluid from said vessel, a second ball in said inlet conduit and beneath said check ball and arranged to distribute fluid as it flows downwardly; two projections formed integrally in said inlet conduit, one projection located beneath each of said balls to support and restrict movement of the balls and in a downward direction but not impede flow of fluid in said conduit; and a fluid flow restrictor washer in said inlet conduit and located between said balls and secured between said sections to cause a fluid build up beneath said check ball to facilitate closing thereof.

References Cited by the Examiner

UNITED STATES PATENTS

1,656,124	1/1928	Melotte	119—14.46
3,052,190	9/1962	Bender	103—236
3,091,252	5/1963	De Forest Jones	103—236
3,224,413	12/1965	Patterson	119—14.07
3,227,139	1/1966	Gass et al.	119—17
3,228,374	1/1966	Sampson et al.	103—236

MARTIN P. SCHWADRON, *Primary Examiner.*

W. J. KRAUSS, *Assistant Examiner.*