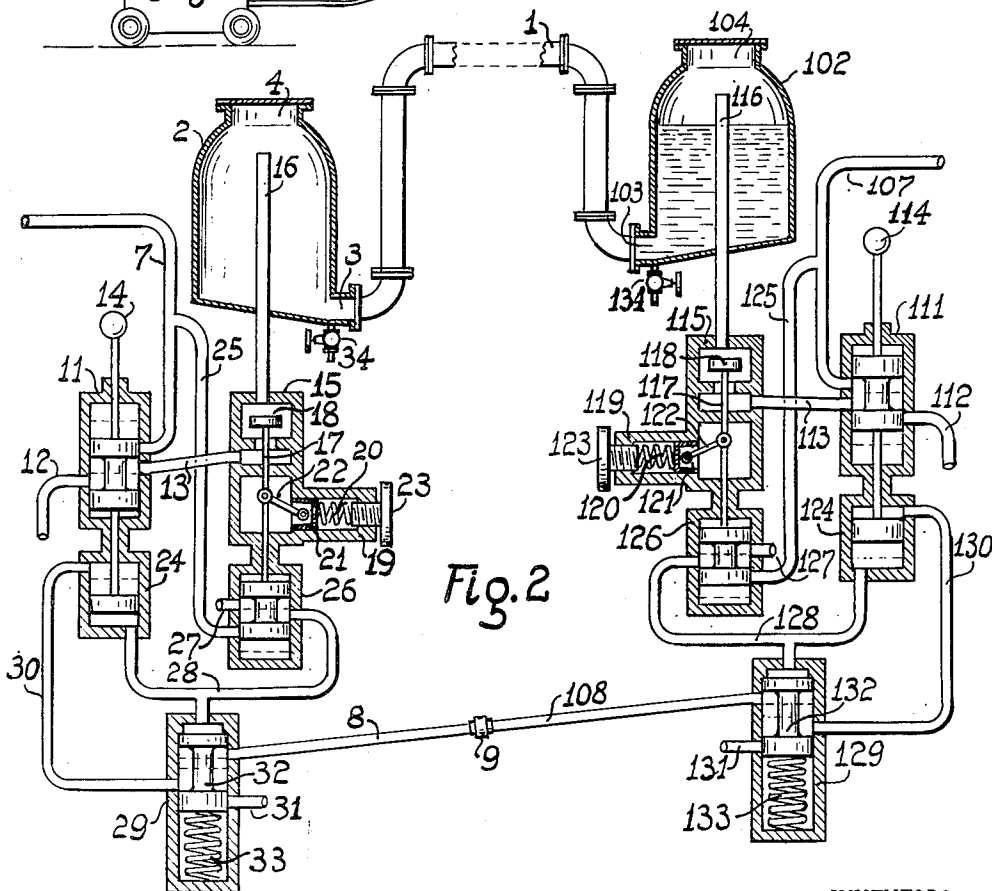
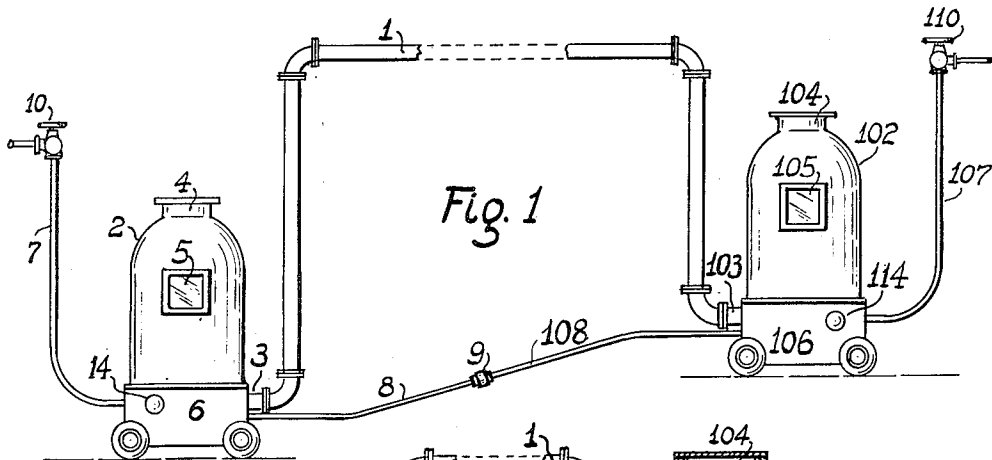


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APPARATUS FOR CLEANING PIPE LINES

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APPARATUS FOR CLEANING PIPE LINES

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This invention relates to apparatus for cleaning pipe lines, and has particular utility in dairies, where the sanitary regulations prescribe the daily cleaning of all milk carrying pipes, and where the present practice is to completely disassemble, every day, all milk carrying pipes and equipment to obtain the required sanitary cleaning.

The principal object of this invention is to eliminate this laborious and expensive disassembly by providing an apparatus which can accomplish the required sanitary cleaning of the pipe lines, and also other dairy equipment, without their disassembly.

Another object of this invention is to provide an apparatus for the cleaning of pipe lines which, consisting of two independently portable units, can be conveniently applied to pipe lines of various lengths and forms, even when the terminals are located on different floors or in different buildings.

Another object is to provide an apparatus for the cleaning of pipe lines in which the flow of the cleaning fluid is reversed automatically, so that the cleaning action is continued automatically until satisfactory result is obtained.

A further object is to provide an apparatus for the cleaning of pipe lines, which is economical in the use of the cleaning fluid, as the same fluid is forced through the pipe line repeatedly until its cleaning effect is fully utilized, which can be determined by inspection through a window in the tanks.

Other objects and advantages of the invention will be apparent during the course of the following description.

In the accompanying drawing, forming a part of this application, wherein for the purpose of illustration, is shown a preferred embodiment of the invention,

Figure 1 is an external view of the apparatus embodying the invention,

Figure 2 is a diagrammatic sectional view of the same.

The apparatus, embodying this invention, consists of two, independently portable units, which can be easily transported for connection to the terminals of the pipe line to be cleaned.

The general arrangement of the apparatus is clearly illustrated in Fig. 1 of the drawing, wherein the numeral 1 designates the pipe line, the ends of which are connected to the outlets 3 and 103 of the tanks 2 and 102, respectively. These tanks are equipped with filling openings 4 and 104, having air-tight covers, and inspection windows 5 and 105, respectively. The tanks are mounted on

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cabinets 6 and 106, which in the preferred form, are equipped with wheels for greater mobility. Air lines 7 and 107 connect the tanks to the manually operated shut-off valves 10 and 110 of the compressed air supply, and the tanks are also connected with each other by pilot air lines 8, 108 and coupling 9. These air lines are preferably of flexible tubing.

Cabinets 6 and 106 contain the control mechanism of the apparatus, a preferred form of which is illustrated in Fig. 2 of the drawing. As the two independently portable units of the apparatus are perfect duplicates in every respect, a detailed description of one of the units will be sufficient for the understanding of the principle of the invention.

Referring to Fig. 2 of the drawing, air line 7 conducts the compressed air to control valve 11, which is connected to an exhaust pipe 12 and also to a pipe 13 leading to the check valve 15, from which pipe 16 leads into the interior of the tank 2.

The control valve 11 has open and closed positions. In the open position it permits the air to pass from air line 7 to pipe 13; in the closed position it closes the passage from air line 7 and opens the passage from pipe 13 to exhaust pipe 12. Handle 14 is used for the manual operation of the control valve 11, it also serves as a position indicator.

Adjoining pipe 13 is check valve 15, which, in the preferred form, comprises a housing, having a valve seat, a valve stem 17, slidably mounted in said housing, carrying the valve head 18, having two positions: normal and active positions. In the normal position, the valve head 18 is raised above the valve seat, giving a free passage between pipes 13 and 16. In the active position, the valve head is lowered to the valve seat, closing the passage between pipes 13 and 16.

Another function of the check valve is to operate the pilot circuit, hereinafter described, and for that purpose, the valve stem 17 is extended outside of the housing for mechanical connection to the pilot actuating valve 28.

In the preferred form of the check valve 15, the housing has a cylindrical extension 19, enclosing a spring 20, exerting an axial pressure on piston 21, which is slidably mounted in said cylindrical extension 19. Said piston 21 is mechanically coupled with valve stem 17, by a link 22, in such manner that the pressure of the spring produces an upward force on the valve stem 17 when the valve head 18 is in the normal or open position, which force tends to oppose the closing of the valve head 18. This upward force is a maximum when the

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valve head 18 is in the normal or open position and decreases as the valve head moves downward; finally, when the valve head 18 reaches the active or closed position, link 22 being substantially perpendicular to the valve stem 17, said upward force will be approximately zero. The pressure of the spring 20 may be regulated by means of screw 23.

It is an essential feature of the check valve 15 that the pipe 16 is so located that an air current flowing from pipe 16 into the housing of the check valve 15 produces a downward force on the valve head 18, which, at given pressure and velocity, is sufficient to move the valve head from the normal position into the active position, against the opposition of the action of the spring 20, hereinbefore described. Said downward force of the air current is greatly increased by the presence of particles of the cleaning fluid in the air.

Another essential feature of the check valve 15 is that when the valve head 18 is in the active or closed position, it will remain in that position until a reverse air current will build up sufficient pressure to raise the valve head 18, and move it, with the help of the spring 20, into the normal or open position.

Referring to Fig. 2 of the drawing, the numeral 26 designates the pilot actuating valve, which is connected to the pilot supply pipe 25, branching off from air supply line 7, also to exhaust pipe 27 and to outlet pipe 28. Said valve 26, being operated by the valve stem 17, has normal and active positions, corresponding to the two positions of the check valve 15. In the normal position of valve 26 pipe 25 is closed, and pipe 28 communicates with pipe 27. In the active position of valve 26 the air passage is open from pipe 25 into pipe 28. Said pipe 28 is bifurcated, one of the branches leading to the lower inlet of the operating cylinder 24, the other branch to the directing valve 29. On one side, said directing valve 29 is connected to pipe 30, leading to the upper inlet of operating cylinder 24, also to the exhaust pipe 31 and pilot line 8, on the other side.

In the preferred form, the directing valve 29 comprises a cylindrical housing, containing a slidably mounted sliding valve 32 and a spring 33, which tends to keep said sliding valve 32 in the normal position, shown in Fig. 2, in which pipe 30 and the pilot line 8 are in communication. When compressed air is conducted from pipe 28 into the directing valve 29, the air pressure moves the sliding valve 32 downward, against the pressure of spring 33, into the active position, in which the compressed air can pass from pipe 28 into the pilot line 8, and, at the same time, free passage is provided from pipe 30 to exhaust pipe 31.

The independently portable unit of the apparatus, connected to the other end of the pipe line 1, is an exact duplicate of the unit herein described, and corresponding parts are designated by the same numerals plus 100.

The preferred method of operation of the invention is as follows:

The outlets 3 and 103 of the two portable units are connected to the opposite ends of the pipe line 1. Then, supply air lines 7 and 107 are connected to the compressed air supply valves 10 and 110, and the pilot lines 8 and 108 are connected by coupling 9. Then, after closing the control valves 11 and 111 by means of handles 14 and 114, respectively, the filling opening 104 of tank 102 is opened and the cleaning fluid is deposited in tank 102. After this, the filling opening 104 is closed by the air-tight cover, and the control valve

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111 is moved into the open position by handle 114, starting the cleaning operation.

In this operating position, shown in Fig. 2 of the drawing, the compressed air will flow from the air line 107, through the control valve 111, into pipe 113, and, through the open check valve 115, and pipe 116, into the tank 102. Then, the compressed air will force the cleaning fluid from tank 102 through the pipe line into the other tank 2. During this operation, the air contained in the tank 2 and in the pipe line 1, being gradually displaced by the cleaning fluid, will escape through pipe 16, the open check valve 15, pipe 13 and exhaust pipe 12. The velocity of this escaping air is so low that the check valve 15 will not be affected.

When, however, the transfer of the cleaning fluid, from tank 102 to tank 2, is completed, the compressed air from supply air line 107 will continue to flow through the pipe line 1, will enter through outlet 3 and will rise through the column of the cleaning fluid contained in tank 2. This air current, finding very little frictional resistance in its path, will attain a very high velocity, to such an extent, that entering the check valve 15, through pipe 16, the impact of this air current, augmented by particles of the cleaning fluid carried by the air from tank 2, will force the valve head 18 down to the valve seat, closing the further escape of the air, and moving the pilot actuating valve 26 into the active position. As a result of this, said valve 26 will admit compressed air from pipe 25 into pipe 28, a part of which will flow to the lower port of the operating cylinder 24, and the other part will flow into the directing valve 29, where, by forcing down the sliding valve 32, will gain entrance into the pilot line 8 and 108, and from there, the air will flow through the open directing valve 129, and pipe 130, into the upper port of the operating cylinder 124. In this position, the compressed air, acting on the pistons of the operating cylinders 24 and 124, will move the control valves 11 and 111 into the reversed positions. The result of this will be a reversed air flow from supply line 7, causing the transfer of the cleaning fluid from tank 2, through the pipe line 1, back to tank 102. When this transfer is completed, the check valve 115 will come into action to reverse the position of the two control valves, as herebefore described, causing the transfer of the cleaning fluid through the pipe line in the opposite direction. This alternate flow of the cleaning fluid is continued automatically until the cleaning fluid is fully utilized, which can be determined by inspection through windows 5 and 105. Then, both control valves will be closed, by handles 14 and 114, and the used cleaning fluid will be discharged through drain valves 34 and 134.

Following this, the operation may be repeated with a new charge of the required cleaning fluid.

It is to be understood that the form of the present invention, herewith shown and described, is to be taken as a preferred example of the same, and that various changes in the shape, size and arrangement of parts may be resorted to, without departing from the spirit of this invention, or the scope of the subjoined claims.

We claim:

1. An apparatus for cleaning a pipe line, comprising, a pair of independently portable closed tanks for holding the cleaning fluid, with outlets connected to opposite ends of the pipe line; air supply lines adapted to conduct compressed air, alternately, to one of said tanks, in order to

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force said cleaning fluid, through the pipe line, into the other tank; a pair of control valves, inserted into said supply lines, each adapted to regulate the flow of compressed air into one of said tanks, said control valves having open and closed positions, and are arranged to be in opposite positions during the cleaning operation of said apparatus; a pair of check valves, inserted into said supply lines, having normal and active positions, one of said check valves being adapted to be moved into the active position when the flow of air reaches a given velocity in one direction, and to be returned into the normal position when said flow of air is reversed, and the other of said check valves being adapted to be moved into the active position when the flow of air reaches a given velocity in the opposite direction, and to be returned into the normal position when said flow of air is reversed; pilot circuit means, interconnecting said control valves and check valves, adapted to reverse the positions of said pair of control valves when one of said check valves is moved into the active position.

2. The apparatus of claim 1 in which said check valves are adapted to provide an open passage for the air flow in the normal position, and to close said passage in the active position.

3. The apparatus of claim 2 in which said control valves, when in the closed position, will connect the respective tanks to exhaust pipes for the exit of the air flow.

4. The apparatus of claim 3 in which each of said check valves is inserted between one of the tanks and the respective exhaust pipe, and is adapted to be moved into the active position by the impact of the air and of the particles of the cleaning fluid, flowing from said tank toward said exhaust pipe, at given velocity.

5. The apparatus of claim 3 in which said pilot circuit means comprises two actuating means, each operable by one of said check valves; two operating means, each operatively connected with one of said control valves, and

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adapted to reverse the positions of one of said control valves; and transmitting means interconnecting said actuating means and operating means, and adapted to transmit the effect of said actuating means to said operating means, so as to reverse both control valves.

6. The apparatus of claim 3 in which said pilot circuit means comprises two actuating valves, each operable by one of said check valves; two operating cylinders, each connected to one of said control valves, and adapted to reverse the positions of one of said control valves; and pilot line means interconnecting said actuating valves and said operating cylinders, and adapted to conduct fluid means under pressure, from either of said actuating valves to both of said operating cylinders, in order to reverse the positions of both of said control valves.

7. The apparatus of claim 6 in which said pilot line means comprises a single pilot tube and two directing valves connected to the ends of said pilot tube, and adapted to conduct compressed air, in alternate directions, from either of said actuating valves to the operating cylinder at the opposite end of said pilot line means.

8. The apparatus of claim 7 in which each of said actuating valves is mechanically connected to one of said check valves, and is so adapted that, when a check valve is moved into the active position, the connected actuating valve will conduct the compressed air into both of said operating cylinders, causing the reversing of the positions of both of said control valves.

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