

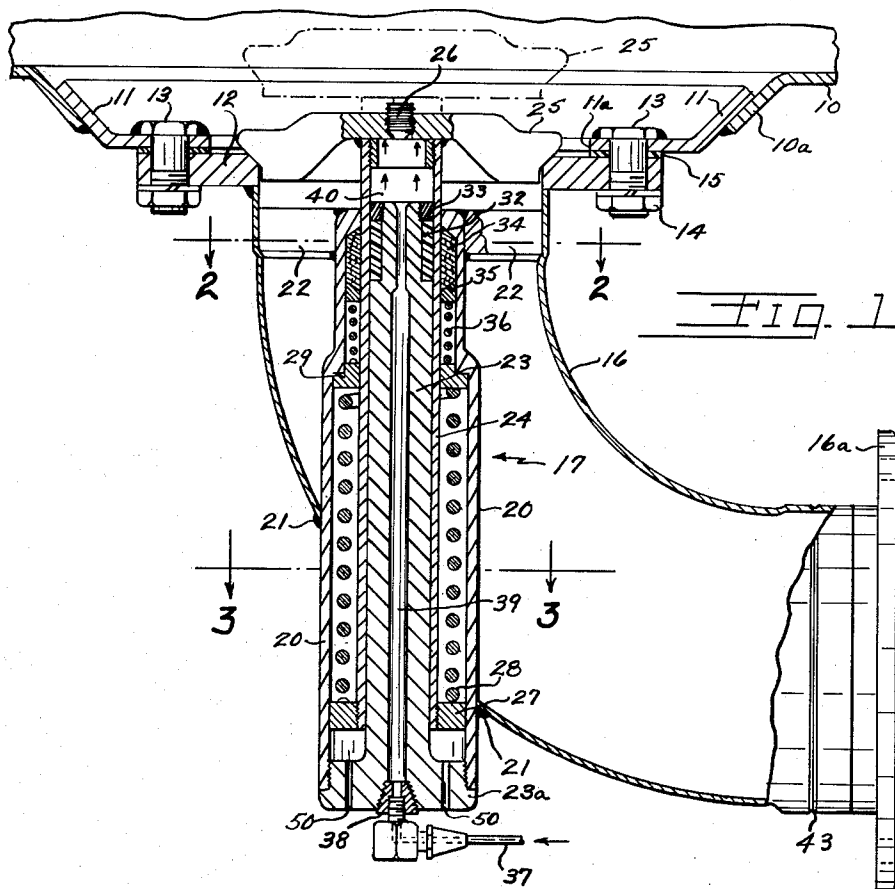
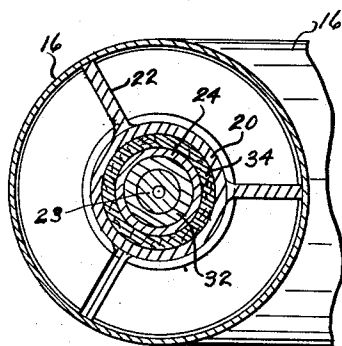
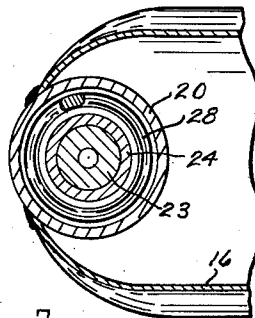
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J. H. DE FREES
CHEMICAL EMERGENCY VALVE

3,065,949

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2 Sheets-Sheet 1



INVENTOR.
JOSEPH H. DEFREES

BY
Meyer, Baldwin, Dran & Young
ATTORNEYS

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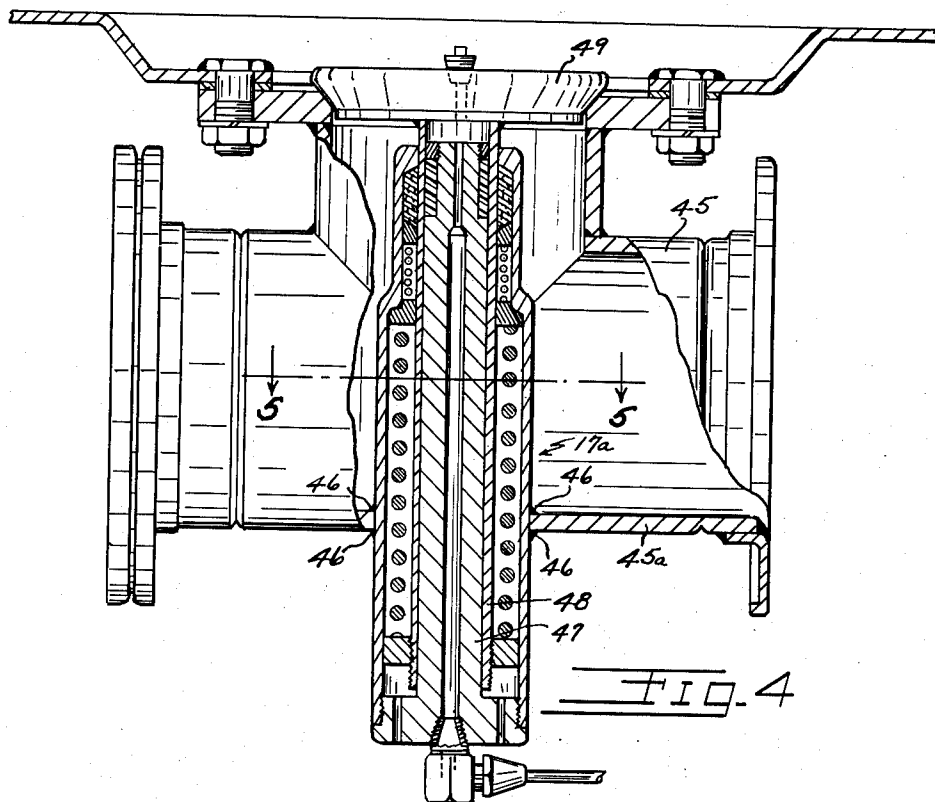
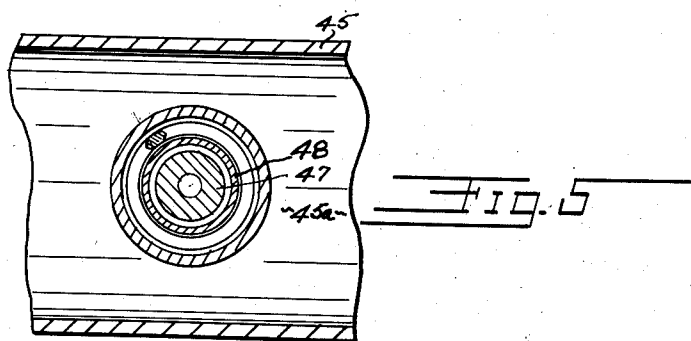
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INVENTOR.

JOSEPH H. DE FREES

BY

Meyer, Baldwin, Doran & Young

ATTORNEYS

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CHEMICAL EMERGENCY VALVE

Joseph H. De Frees, 414 Liberty St., Warren, Pa.

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5 Claims. (Cl. 251-62)

This invention relates to novel and improved valve structures particularly adapted for the control of liquid flow from stationary or movable tanks or the like. One specific use for which I have found the valve to be adapted is the control of discharge flow from single or multi-compartment tank trucks or trailers which are used for gasoline or oil transportation and chemicals. Valves of this nature are termed "emergency valves" when, as is customary, they are provided with means for the prevention of accidental or unintended discharge of flammable or explosive contents, the valve being provided with means for positively maintaining the valve in closed position in case of fire, or an accident which damages piping, such as roll over of the tank in a traffic accident.

The Interstate Commerce Commission has established safety regulations for liquid discharge means on tanks which transport flammable or poisonous liquids. It is required that each tank be equipped with an emergency valve provided with an automatic shut-off in case of fire; that the valve retain the product in the tank in case of damage to exterior discharge piping; that the valve have a remote closing device if the usual shut-off control is engulfed in flames.

The hauling of chemicals has increased tremendously in the past few years. It has been found necessary to thoroughly clean the tanks after each load to avoid possible contamination. There are cases on record where a load of chemicals has been damaged by vapors from a previous load, and in one instance a dozen drops of water damaged four thousand gallons of a chemical liquid. It is therefore of the highest importance that a valve structure be susceptible to ready cleaning by reason of a smooth surface exposed to the discharging liquid with no depressions to trap residual fluid.

Previous emergency valves have presented an almost impossible situation from a cleaning standpoint with their exposed springs, cages, and bonnets, etc.

An object of the present invention is to provide a novel emergency valve structure which permits great simplification in the cleaning operation.

A further object of the invention is to provide an emergency valve structure in which practically all the working parts are enclosed, so as to be out of contact with the liquid being charged, carried or discharged.

A further object of the invention is to provide an emergency valve structure which completely protects the liquid load from contact or contamination with leakage from the valve operating pressure fluid.

Other objects and advantages will be apparent from a study of the following description of several embodiments of the invention, in conjunction with the following drawings, in which:

FIG. 1 is a vertical sectional view taken axially through an emergency valve structure constructed in accordance with the present invention.

FIGS. 2 and 3 are horizontal sectional views taken respectively on the lines 2-2 and 3-3 of FIG. 1.

FIG. 4 is an elevational view, partly broken away and in section, showing another adaptation of the invention.

FIG. 5 is a sectional view taken on the line 5-5 of FIG. 4.

The drawings show a fragmentary portion 10 of the bottom wall of a liquid transportation tank. The wall 10 has a downturned flange 10a which is welded to a sheet metal sump 11 constituting a drain pocket. The drain

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pocket has a central aperture 11a, to the periphery of which I attach an annular flange 12 by bolts 13 and nuts 14. A leakproof ring gasket 15 is compressed between flange 12 and the drain pocket periphery.

The flange supports a conduit elbow 16 through which liquid is discharged, the elbow having a connector flange 16a for attachment thereto of further liquid-carrying piping.

A unit 17 comprising an emergency valve, and valve control means, is carried on elbow 16 and is disposed mainly within but partially without said conduit. The conduit has a fitted aperture to permit outward extension of the lower end of the valve unit, to facilitate connection to a fluid power source, as will appear.

To eliminate confusion in subsequent terminology, let me say that in conventional usage, in a cylinder-piston cooperating assembly in which there is relative movement between piston and cylinder, the piston is the moving element. This of course is not necessarily so, but the usual procedure is here mentioned since in describing the present valve control unit I will term a fixed member the piston, and a movable member the cylinder, both these members are located co-axially within a cylindrical housing whereby to simplify the cleaning problem as aforesaid.

The unit 17 will now be more specifically described. It comprises a housing 20 fixed in leakproof fashion in the aperture in the wall of conduit elbow 16, being retained by welding 21 around the aperture edge. The inner upper end of the housing 20 is positioned and retained by spider legs 22 within the upper part of the elbow. A piston 23 has an enlarged end portion 23a screw-threaded to a secure attachment to the lower end of housing 20. A cylinder 24 is slidably carried on the elongated shank of piston 23, and the cylinder at its upper end has a screw-threaded connection to a valve head disc 25 which is downwardly seatable on the peripheral edge of flange 12. This valve disc is perforated and threaded to receive a bleed plug 26 for a purpose to hereinafter appear.

Cylinder 24 carries on its lower outer end a spring-backing nut or washer 27 which has a snug sliding fit within housing 20 and serves as an end abutment for a compression spring 28. The upper end of spring 28 abuts against a rabbeted washer 29 which seats on an inner shoulder of housing 20.

The normal tendency of spring 28 is to bias cylinder 24 and valve head 25 downwardly so that the valve head seats in sealing relationship against flange 12 so as to prevent discharge of liquid from the tank.

The sliding relationship between the piston 23 and the cylinder 24 is rendered leakproof by packing 32 retained and compressed by a packing nut 33. Around its outer face the cylinder is sealed by packing 34 backed up by a packing gland 35 and a compression spring 36 which has a rear abutment against the washer 29 previously mentioned.

Hydraulic pressure fluid through a pipe 37 can be supplied through a bored plug fitting 38 and through an axial bored passage 39 in piston 23 so as to enter cylinder head 40. Bleed plug 26 may be removed to permit escape of all air, and is replaced as soon as the pressure fluid reaches the plug aperture. This needs to be done only once, when initiating use of this particular valve control.

In operation the procedure is as follows. When it becomes desirable to discharge liquid from the tank any suitable hydraulic fluid is introduced through pipe 37 into bore 39 and pressure head 40, thereby raising valve disc 25 against the bias of spring 28. The liquid contents are then discharged through elbow 16. Closure of the valve disc 25 is effected by terminating hydraulic pres-

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sure at a manual control point by means of an inlet-exhaust type of valve (not shown) which permits spring 28 to expand, reducing the volume of the pressure head and forcing the hydraulic fluid backwardly to the exhaust point.

A shear zone, consisting of an annular groove 43 to reduce the wall thickness, is provided so that understructure may readily tear off in case of accident. Even on an assumption that the accident will damage the valve control unit 17, the valve disc 25 will be maintained in closed position, as long as the tank remains upright, by gravity pressure. If gravity pressure is not effective because the tank rolls upside down, then the liquid will not flow out because the aperture is uppermost.

FIGS. 4 and 5 show an adaptation of the invention to a T outlet from a liquid transportation or storage tank. In this arrangement the unit generally designated as 17a is fixed in the bottom wall 45a of the conduit T section 45 and is welded all around at 46, inside and outside. The piston 47, cylinder 48 and valve disc 49 are all similar to the corresponding elements in FIGS. 1-3.

The invention of course is susceptible to the various desirable safeguards which have been developed by experience. The hydraulic fluid line 37 may have, in spur connection thereto, a low-melting point plug which melts and vents the pressure upon development of dangerously high temperatures near the tank. A remote control vent valve may be provided for instantaneous manual operation in case of a fire which prevents access to the usual emergency valve controls.

The present arrangement is such that should any leakage of hydraulic fluid occur past packing 32 it will be discharged through weep holes 50 (FIG. 1) rather than into the zone of discharge of product liquid flow. Should any leakage of the product liquid occur past packing 34 and downwardly, it will also be discharged through weep holes 50.

What is claimed is:

1. Tank discharge means for a liquid-containing tank having a bottom wall, a discharge port in said bottom wall, and a discharge pipe in flow communication with said port and leading away from said tank, said discharge means including a valve and a valve operating unit, said valve being seatable in sealing relationship in said port and said operating unit including an imperforate shell completely outside and below said bottom wall and extending through the wall of said discharge pipe and having a portion outside said wall, and a portion within said discharge pipe in registry with said port, said operating

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unit further including a cylinder-piston co-operating couple within said shell, said cylinder having a power head chamber enlargeable and contractable by relative movement between said cylinder and said piston, the movable member of said couple being extendable out of said shell towards said port, and means operatively uniting said valve and said movable member whereby to open said valve when fluid power is admitted to said power head chamber.

2. Tank discharge means as defined in claim 1 wherein said cylinder is the movable member, and said piston has an axial bore therethrough through which bore said fluid power is admitted to said power head chamber.

3. Tank discharge means as defined in claim 2 wherein biasing means is provided to return said cylinder to valve-closed position upon cutting off fluid power to said power head chamber.

4. Tank discharge means for a liquid-containing tank having a bottom wall, and a discharge port in said bottom wall, said discharge means including a valve and valve operating means, said valve being seatable in said port and said valve operating means depending outwardly from said port and comprising a cylindrical body having a peripheral housing shell completely outside and below said bottom wall, and a piston within said shell, the shell and piston being coaxial but providing an annular space therebetween, means for closing said space at the outer ends of said shell and piston, a tubular cylinder disposed coaxially with said piston and said shell in said annular space and being slidable on said piston, the inner end of said cylinder being closed, means for admitting pressure fluid to said cylinder whereby to produce relative movement between said cylinder and said piston, means establishing an operative connection between said valve and the power unit consisting of said cylinder and said piston whereby such relative movement moves said valve towards or from sealing position.

5. Discharge means of the type defined in claim 4 wherein the means for admitting pressure fluid to said cylinder includes an axial bore in said piston through which the pressure fluid enters to contact the inner end of said cylinder.

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