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EMERGENCY VALVE

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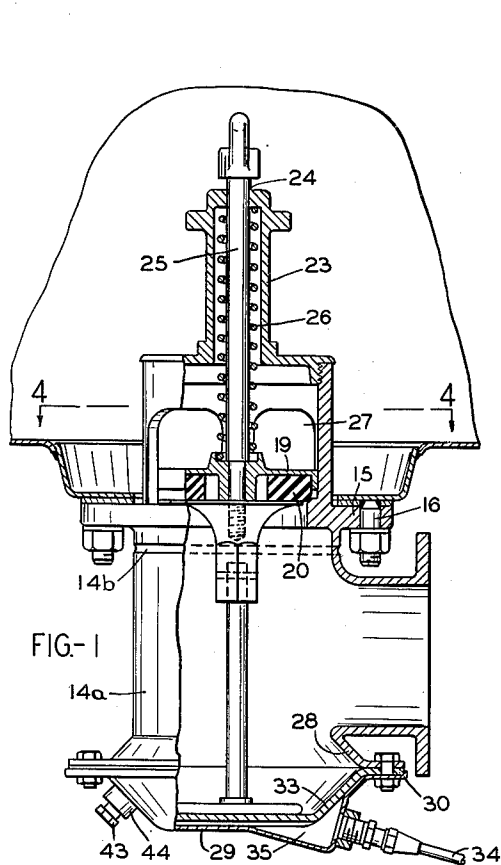


FIG-1

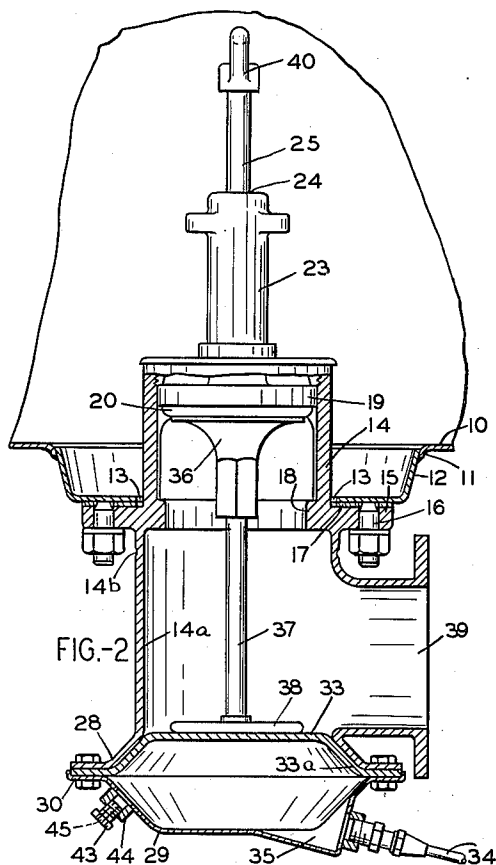


FIG-2

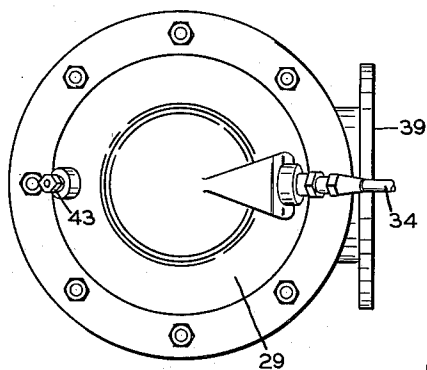


FIG-3

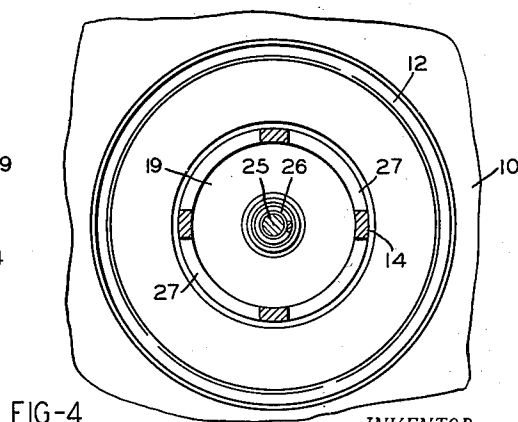


FIG-4

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EMERGENCY VALVE

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Application October 13, 1948, Serial No. 54,335

2 Claims. (Cl. 137—21)

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This invention relates to liquid discharge control valves, and particularly to valves adapted for use in connection with storage or transportation for explosive or inflammable liquids such as gasoline, or the like.

The present application is a continuation-in-part of my previously filed application for Emergency Valve System, Serial Number 706,162, filed October 28, 1946, and now abandoned.

As is well-known to those skilled in the art, such liquids are often carried or stored in multi-chambered tanks, each chamber usually having an individual discharge outlet and a valve control therefor. If the outlet connections are damaged by accident or otherwise, discharge of the contents may result in a disastrous fire with possible personal injury to the attendant, truck driver, or others in the vicinity. In any event such damage to the discharge means probably results in substantial property and oil loss. Various emergency valve structures have heretofore been devised to prevent discharge of the liquid except when the operator is in active control of the discharge.

For such purpose, in addition to the manually controllable valve provided at the usual discharge outlet for each compartment, there is provided, in liquid flow sequence therewith, an additional valve commonly termed an emergency valve, at a relatively inaccessible position in the tank bottom wall so as to be invulnerable to normal injury or shock. The emergency valve thus provided is normally closed so that fluid conduits and connections external thereto may suffer damage without liquid discharge from the tank.

From what has been said so far, it will be apparent that two operations are normally performed by an attendant in order to effect liquid discharge from a storage or transportation tank equipped with emergency valve safety means. Each such tank, or each individual compartment of a multi-chambered tank, is provided with liquid discharge passage means having therein two valves in sequence, namely the usual flow control valve near the outlet end of such passage, and an emergency valve near the tank end of the passage. The order of operating such valves to procure external liquid discharge is not significant, except that both valves must be opened to secure such discharge. It is of course feasible, in the case of a multi-chambered tank, to carry the discharge passages from all the emergency valves to a common outlet manifold, from which manifold further flow may be manually controlled by a single common valve. Nor-

mally the emergency valves are biased, by spring or otherwise, to closed position, and power expenditure under the control of the attendant is required to open the emergency valve.

5 An object of the present invention therefore is to provide novel and improved liquid discharge control structures adapted to be operated by compressed air, and consequently adapted for extremely rapid valve closing operation in times of emergency or stress.

10 A further object of the present invention is to provide an emergency valve which is completely self-contained, and which has no exposed working parts, and no external, movable operating elements.

15 A further object is to provide an emergency valve of such novel internal structure and design that there is no entrapment of stored oil or explosive liquid when the valve is in fully opened position so that complete discharge drainage is assured.

20 A further object is to provide an internal poppet type emergency valve actuated by a diaphragm energized by compressed fluid power, said diaphragm itself constituting a leak proof bulkhead between the discharging liquid, and the diaphragm motive fluid.

25 Other objects and advantages will be apparent from a study of the following specification, in conjunction with the accompanying drawings, in which:

30 Fig. 1 is a view, partly in side elevation and partly in section, showing an embodiment of my valve;

35 Fig. 2 is a view, similar in most respects to Fig. 1, but showing the movable parts in a different operating position;

40 Fig. 3 is a bottom plan view, looking upwardly at the device of Fig. 1; and

45 Fig. 4 is a sectional view taken on the line 4—4 of Fig. 1.

In the drawings, reference character 10 indicates a fragmentary portion of the bottom wall of a fixed or portable tank for the storage or transportation of inflammable or explosive liquid such as gasoline or the like. The wall 10 has a downturned annular flange 11 to which is welded, or otherwise secured, a dished drain pocket 12 which supports the valve assembly now to be described. Drain pocket 12 is provided with a central aperture 13 to receive the upper portion of a valve housing 14. An annular flange on housing 14 is secured to the drain pocket wall by studs 16, and a gasket 17 prevents liquid leakage.

55 Within housing 14 is an internal annular shoulder.

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der 18 upon which a valve head 19 seats downwardly, the head being provided with a resilient facing ring 20. A conical cap or bonnet 23 is threadedly attached on the upper end of valve housing 14 and is perforated at its apex 24 to permit sliding passage of a valve stem 25. Surrounding the stem is a helical spring 26 which biases the valve head downwardly to normally seated position. The valve housing 14 has openings 27 in its wall, within the tank, so as to permit liquid from the tank to flow downwardly between the valve face 20 and seat 18, when the valve is forcibly raised against the bias of spring 26, as will appear.

The valve-opening servomotor mechanism is supported by a generally tubular portion 14a of the valve housing which extends downwardly outside the tank bottom. An opening in the lower end of the valve housing is defined by an outwardly extending flange 28. A pressure head 29 has a corresponding flange 30. The two said flanges 29 and 30 are mutually attached in such manner as to retain therebetween an imperforate flexible diaphragm 33. Air pressure from a suitable pump or reservoir is transmitted through piping 34, and admission of pressure to the chamber 35 below the diaphragm 33 raises the diaphragm from the position shown in Fig. 1 to that of Fig. 2.

Transmission of movement from the diaphragm 33 to the valve head is effected as follows.

The valve stem 25 is threadedly connected to a portion 36 below the valve face. This is engaged by a push rod 37 having a flat base 38 which rests on diaphragm 33. It is apparent that when fluid pressure is admitted to chamber 35 it raises diaphragm 33, push rod 37, and valve head 19 so as to permit liquid in the tank to flow downwardly through openings 27, and past valve seat 18 whence it proceeds through the discharge port 39 to any suitable distribution point under further control (not shown).

A bail 40 is fixed to the top of valve stem 25 above bonnet 23, and may be used for manual operation of the emergency valve, for example by a workman in the tank interior, or by reaching through an upper manhole, if the occasion should arise.

An important and distinctive feature of the invention may be noted from an examination of Fig. 2. When liquid discharge is taking place, the diaphragm 33 is raised sufficiently to insure complete liquid drainage from the valve housing through discharge port 39, and for this reason trapped pockets or pools of liquid are avoided, eliminating future contamination and possible fire hazard.

The specific shape of the pressure head 29, and the mounting and disposal of the diaphragm 33 result in further distinct advantages in the operation of the device. It will be observed that in movement of the diaphragm from its normal valve-closed position of Fig. 1 to its valve-open position of Fig. 2, the area of the free portion of the diaphragm is greater than that of a flat plane coincident with the gripped edges of the diaphragm, and consequently said diaphragm is subjected to no stretch or strain, there being only minor flexure at the annular bending zone 33a at the boundary between the clamped and free portion of the diaphragm.

It may be noted that the valve assembly just described may be handled as a unit, and installed or removed merely by manipulation of the nuts on studs 16. This is extremely convenient both

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in the original installation of the valve, and in possible periodic removal for repair or servicing.

The tubular portion 14a of the valve housing, immediately below the annular flange 15, is provided with a peripheral notch 14b which weakens the structure somewhat at this point. The purpose of this notch is as follows. In case of an accident involving violent impact against the downwardly extending, exposed portion of the emergency valve structure, the underhung portion 14a would shear off, instead of tearing out a portion of the drain pocket or tank bottom. It is apparent that shearing off the portion 14a still leaves the valve head and valve seat in sealing contact, so that the tank contents are not spilled. Loss of the tank contents is not too serious from a financial standpoint, but prevention of fire or explosion from discharged gasoline or other inflammable contents is a very evident advantage.

A fusible plug 43 has a threaded connection with a boss 44 in the wall of pressure head 29. The plug is sealed by a low melting point alloy 45 which melts out in case of fire or abnormal heat in the vicinity of the emergency valve, thereby venting chamber 35 to atmosphere so that not only the valve in question but all other open valves will close immediately (all open valves are interconnected and will close if there is an escape of air at any point) thus stopping flow of flammable liquid.

What I claim is:

1. Liquid discharge control means for a liquid storage tank provided with a discharge aperture in a bottom wall thereof, comprising a valve housing fixed in said aperture and extending partially upwardly within said tank, and partially downwardly without said tank, an annular valve seat within said housing, a valve of the internal poppet type seating downwardly against the peripheral edge of said valve seat, spring means normally biasing said valve to seated position, a pressure head carried on the lower end of said valve housing, a flexible leak proof diaphragm extending transversely of said housing between said pressure head and said valve and having its peripheral edge gripped in leak proof relationship between said pressure head and said housing, and means engageable with said diaphragm and said valve for effecting unseating movement of said valve against the bias of said spring when fluid pressure is admitted to said pressure head, a discharge passage extending laterally from said housing immediately above said diaphragm, the flexible central portion of said diaphragm being at approximately the level of the lowest point of said discharge passage, and the annular portion of the diaphragm radially outwardly of the central portion cooperating, when in valve open position, with the valve housing in such manner as to preclude the formation of a sump below said lowest point of said discharge passage whereby the upper surface of said diaphragm is completely drainable by gravity into said discharge passage when the valve is open to permit downward liquid discharge.

2. Liquid discharge control means for a liquid storage tank provided with a depressed drain pocket in a bottom wall thereof, said pocket having an aperture therethrough, a valve housing having a laterally extending peripheral flange at an intermediate height on its outer wall for fixed, leak proof attachment to the wall of said drain pocket around said aperture whereby an upper portion of said valve housing extends upwardly

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within said tank and a lower portion of said valve housing extends downwardly outside of said tank, an annular valve seat within said housing at an intermediate height therein, a liquid entry aperture in the wall of said housing above said valve seat, a liquid discharge aperture in the wall of said housing below said valve seat, a valve of the internal poppet type seating downwardly on said valve seat, spring means normally biasing said valve to seated position, a pressure head carried on the lower end of said valve housing below said discharge aperture, a flexible leak proof diaphragm secured between said pressure head and said valve housing, and means engageable with said diaphragm and with said valve for effecting unseating movement of said valve against the bias of said spring when fluid pressure is admitted to said pressure head beneath said diaphragm so as to raise said diaphragm, the free central portion of said diaphragm being movable to a level approximately the level of the lowest point of said discharge passage, and the annular portion of the diaphragm radially outwardly of

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the central portion cooperating, when in valve open position, with the valve housing in such manner as to preclude the formation of a sump below said lowest point of said discharge passage whereby the upper surface of said diaphragm is completely drainable by gravity through said discharge aperture so as to prevent liquid entrapment in the bottom of said valve housing.

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