March 17, 1964 J. H. DE FREES 3,125,320

GUSHER EMERGENCY VALVE

Filed Jan. 13, 1960 2 Sheets-Sheet 1

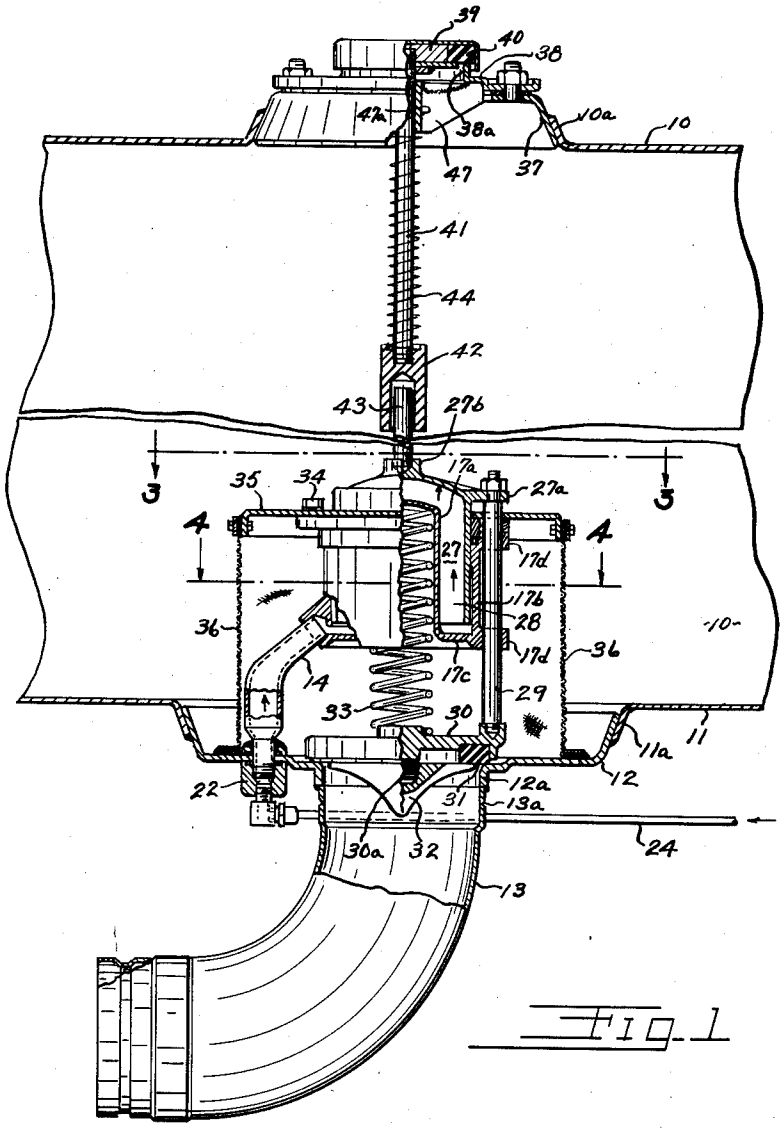


FIG. 1

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Filed Jan. 13, 1960 2 Sheets-Sheet 2

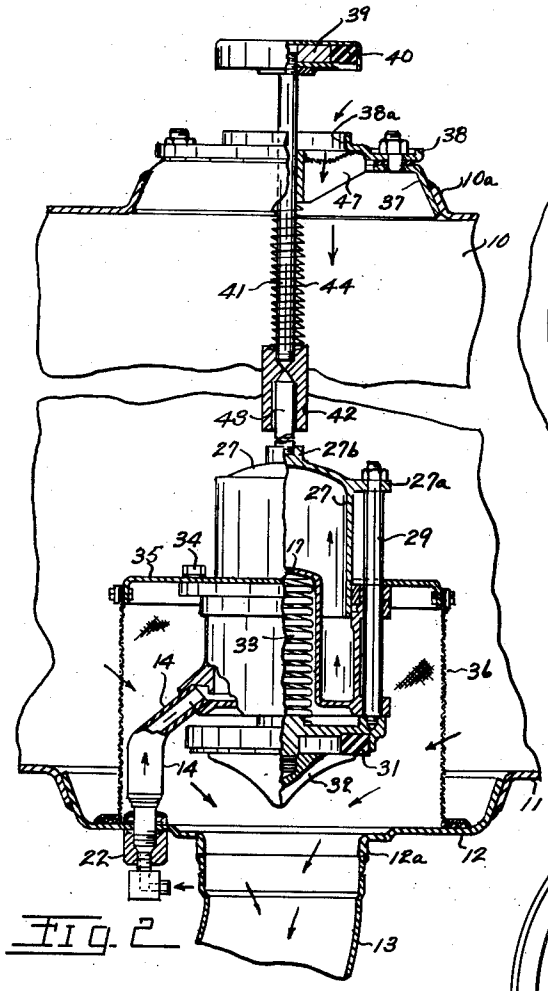


FIG. 2

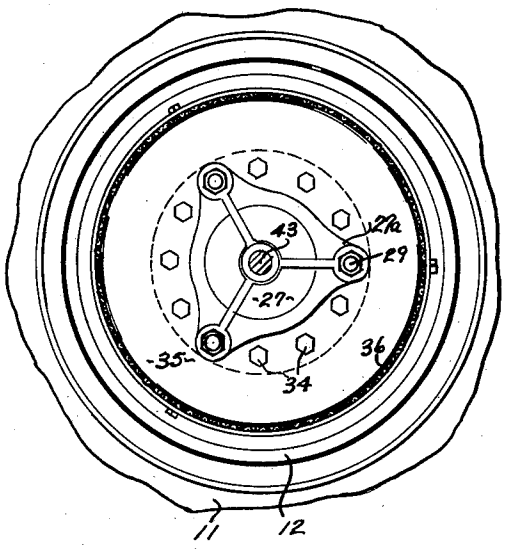


FIG. 3

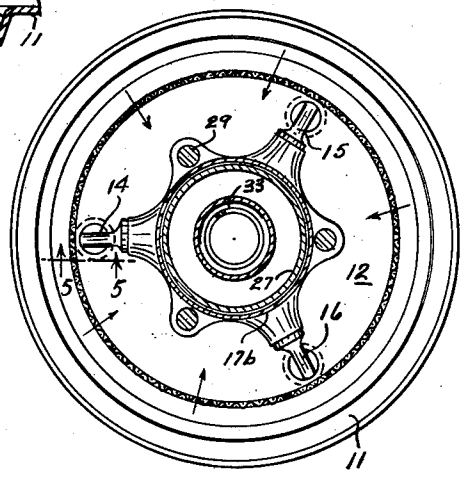


FIG. 4

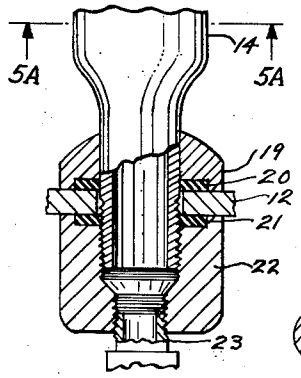


FIG. 5

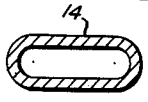


FIG. 5A

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United States Patent Office 3,125,320 Patented Mar. 17, 1964

3,125,320

GUSHER EMERGENCY VALVE

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Filed Jan. 13, 1960, Ser. No. 2,211
4 Claims. (Cl. 251—62)

The invention relates to novel and improved liquid discharge control means particularly adapted for use in connection with containers for the storage or transportation of liquids of any kind, and particularly explosive or inflammable liquids such as gasoline or the like. My novel discharge means can also be used as a charging control valve in a bottom loading system.

Liquid storage or transportation tanks generally have a bottom discharge or outlet opening and a valve control therefor. If the outlet connections are damaged by accident or otherwise, discharge of the contents might result in a disastrous fire with possible serious injury to the attendant, truck-driver, or others in the vicinity. So-called emergency valve structures have therefore been devised to prevent any discharge of the liquid except when the operator is in conscious control of the discharge operation.

Such emergency valve is usually in a relatively inaccessible position, for example immediately within the tank bottom, so as not to be susceptible to normal injury from collision or the like. In liquid flow communication with the emergency valve is a conventional operator-controlled valve, and both this valve and the emergency valve, being in series in the direction of liquid flow, must be opened to permit liquid discharge from the container.

It is customary, in the case of a multi-chambered tank, to carry the discharge passages from all the emergency valves to a common manifold at which point flow from each compartment may be controlled at a single operator's control box.

An object of the present invention is to provide an emergency valve which is structurally and functionally new, and improved in performance.

A further object of the invention is to provide an emergency valve having a higher normal discharge flow rate than heretofore obtainable.

A further object of the invention is to provide an emergency valve which reduces turbulence and consequently increases efficiency during discharge flow.

A further object of the invention is to provide an emergency valve having an exceptionally large screening area around the discharge port.

A further object of the invention is to provide an emergency valve in which the valve seat forms part of the compartment drain pocket.

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

FIG. 1 is a vertical sectional view through an emergency valve and cooperating vent valve constructed in accordance with my invention, some parts being shown in fragmentary side elevation.

FIG. 2 is a view similar to FIG. 1 but showing some parts in a different operating position.

FIGS. 3 and 4 are horizontal sectional views taken respectively on the lines 3—3 and 4—4 of FIG. 1.

FIG. 5 is an enlarged sectional detail view partly in section and partly in side elevation with parts broken away, of the lower end of a supporting leg as shown in FIGS. 1 and 2, the part in side elevation being as seen from the direction of the arrows 5—5 in FIG. 4.

FIG. 5A is a sectional view taken on the line 5A—5A of FIG. 5.

Referring now to the drawings I show the upper wall

portion 10 and lower wall portion 11 of a tank compartment which may be circular or elliptical in vertical transverse section. The lower wall is apertured to provide an outturned flange 11*a* to which is integrally welded a drain pocket 12 of dished contour. This drain pocket in turn is centrally apertured to provide a discharge port defined by flange 12*a*. A discharge elbow 13 is welded to flange 12*a*. The elbow has a peripheral groove 13*a* establishing a break line, or zone of reduced strength, at which the lower part of the elbow may shear off if the tank rolls over or is otherwise involved in a collision.

My emergency valve structure is supported on the floor of the drain pocket on three legs 14, 15 and 16, the leg 14 being hollow to provide an air passage for a purpose to appear hereinafter.

A cylinder 17 is carried on legs 14, 15 and 16. Cylinder 17 has concentric inner and outer walls, 17*a* and 17*b* respectively, joined by a bottom wall 17*c*. The cylinder legs 14 are integrally connected to boss projections of the lower wall 17*c*, and the lower ends of the legs pass through the floor of the drain pocket 12 and are secured in any suitable way. The hollow leg 14 passes through a cupped ring 19 containing a sealing ring 20, through the drain pocket floor, through another sealing ring 21, and is then secured by a threaded nut 22. The ring 19 is welded to the cylindrical portion of leg 14 at 19. A nipple 23 establishes flow communication between the hollow interior of leg 14 and a conduit 24 (FIG. 1) to a source of compressed air (not shown).

A cupped piston 27 is movable vertically in sliding contact with the inner surface of cylinder wall 17*b* so as to provide a chamber 28 within the piston, and in communication with the passage in leg 14. It will be apparent that when compressed air is supplied through conduit 24 it flows through leg 14 into chamber 28 and tends to raise piston 27 with results to soon become apparent.

Three lugs 27*a* on piston 27, spaced 120° apart, are bored to receive the upper ends of three connecting rods 29. These connecting rods pass slidably downwardly through fitted bores in lugs 17*d* extending outwardly from cylinder wall 17*b*. The lower ends of the connecting rods have a screw threaded connection with a valve disc 30 which carries a resilient facing ring 31 which seats on the shoulder of flange 12*a*. The facing ring is held in place by a nut 32 which threads onto a boss 30*a* of disc 30.

A compression spring 33 is contained between disc 30 and the inner surface of the head of piston 27. Attached to the top of cylinder 17 by bolts 34 is a cover plate 35 from which depends a screen 36 which is connected around its bottom edge to the floor of the drain pocket 12.

At the top of the tank compartment is a vent valve assembly, the specific structure of which can be varied, and which will be characterized only briefly. An inverted, dishd member 37 is welded to an upturned flange 10*a* of wall 10. Member 37 carries a plate 38 which has an annular flange 38*a* which serves as a valve seat for a valve head 39 having an annular sealing gasket 40 which seats on flange 38*a*. This valve is operated by a depending valve stem 41 which has a loose coupler 42 attached to its lower end. Coupler 42 is a block having an oversized downwardly opening bore into which a rod 43 is loosely inserted. Rod 43 is attached to a boss 27*b* on the outer top surface of piston 27. A helical spring 44 surrounds valve stem 41.

Member 38 carries a spider 47 which has a central hub 47*a* through which stem 41 has a sliding fit. Spring 44 is compressed between hub 47*a* and block 42 so as to normally maintain vent valve 39 in closed position, as shown in FIG. 1.

Operation of the discharge valve is as follows: When

the tank is in unloading position, and a flow connection has been established between elbow 13 and a receptacle to be loaded, air is admitted from a compressed air source to pipe 24. This air enters chamber 28 through leg 14, and moves piston 27 upwardly. This has several effects, as seen in FIG. 2. The first effect is the opening of vent valve 40 against the bias of spring 44. The second effect is the upward lifting of the three connecting rods 29, which in turn lift valve disc 30 against the bias of spring 33. Liquid in the tank rushes through the large screen area 36 and then past legs 14, 15, 16, and downwardly through elbow 13. As soon as the air supply through pipe 24 is cut off and vented the discharge valve and the vent valve will close. As noted in the sectional view of FIG. 5 the legs past which the liquid must flow are of flattened oval shape and are well outside the discharge orifice so as to reduce or entirely prevent swirling or turbulence of the liquid. As is known to everyone who has observed liquid discharge from a sink, wash bowl, bath tub, etc., swirling of discharging liquid materially slows down the rate of out flow. The present structure affords a large screening area, a large discharge area, and swirl preventing valve supports. The structure is also distinctive to the extent that the valve is attached to the drain pocket by three legs, one of which serves as an air duct to the pressure chamber of the piston. An additional efficient and simplified feature is the incorporation of the valve seat as an integral part of the drain pocket.

A distinctive feature of my invention resides in the fact that the legs 14, 15 and 16 are elongated in transverse section, the longest transverse direction extending in the direction of liquid flow so as to interpose the least possible obstruction to liquid flow and thereby minimize turbulence and swirling. Preferably, as best shown in FIGS. 5 and 5A, the cross sectional contour is of an oval shape, the major axis of the oval extending radially towards the axis of the discharge port. For this reason the obstructing area of the legs is only a minor fractional amount of the total discharge area between the legs. The arrows in FIGS. 2 and 4 indicate the direction of discharge flow.

What is claimed is:

1. Means of the character described for controlling liquid discharge from a walled enclosure having a drain pocket depression in a lower wall portion thereof and a port aperture in said depression, said port aperture in said depression having a peripheral edge portion adapted to serve as a valve seat, an emergency valve structure disposed within said enclosure above and adjacent to said port, said valve structure comprising a cylinder, a plurality of legs supporting said cylinder and attached to said drain pocket at respective locations spaced around said port, a piston movable in said cylinder, a discharge valve adapted for vertical movement, into and out of sealing relationship with said valve seat, means establishing an operative connection between said piston and said valve whereby appropriate movement of said piston lifts said valve out of sealing engagement with said valve seat, one of said legs having a passage therethrough to establish air flow communication with said cylinder, and means for admitting compressed air to and through said passage when said valve is to be opened, each of said legs being of elongated transverse sectional contour, the longest dimension of the transverse section extending in the direction of liquid discharge flow to said port whereby to reduce turbulence and promote swirl-free liquid discharge, said legs being within said enclosure on the in-flow side of said port.

2. Means of the character described for controlling liquid discharge from a walled enclosure having a drain pocket depression in a lower wall portion thereof and a port aperture in said depression, said port aperture in said depression having a peripheral edge portion adapted to serve as a valve seat, an emergency valve structure disposed within said enclosure above and adjacent to said port, said valve structure comprising a cylinder, a plurality of legs supporting said cylinder and attached to said drain pocket at respective locations spaced around said port, a piston movable in said cylinder, a discharge valve adapted for vertical movement, into and out of sealing relationship with said valve seat, means establishing an operative connection between said piston and said valve whereby appropriate movement of said piston lifts said valve out of sealing engagement with said valve seat, one of said legs having a passage therethrough to establish air flow communication with said cylinder, and means for admitting compressed air to and through said passage when said valve is to be opened, each of said legs being of elongated oval contour in transverse section, the major axis of said oval section extending in the direction of liquid discharge flow to said port whereby to reduce turbulence and promote swirl-free liquid discharge, said legs being within said enclosure on the in-flow side of said port.

3. A sanitary safety valve structure for controlling fluid discharge from an enclosure including a mounting base having a fluid passage port therethrough with a peripheral edge portion forming a valve seat, said valve structure being adapted to be disposed within said enclosure and comprising a cylinder, a plurality of legs for supporting said cylinder and attached to said base spaced around said port, a piston within said cylinder, a valve adapted for movement into and out of sealing relationship with said valve seat, means operatively connecting said piston and said valve whereby appropriate movement of said piston lifts said valve out of sealing engagement with said valve seat, at least one of said legs having a passage therethrough forming a communication between an external source of fluid pressure and the interior of said cylinder, and means for admitting pressure fluid to and through said passage for operating said piston when said valve is to be opened, each of said legs being of elongated transverse sectional contour with the longest dimension of the transverse section extending in the direction of discharge flow to said port thereby to reduce turbulence and to promote swirl-free discharge, said legs being adapted to be within said enclosure interiorly of said port.

4. Means of the character described for controlling liquid discharge from a walled enclosure having a drain pocket depression in a lower wall portion thereof and a port in said depression, a valve seat around the enclosure side of said port, an emergency valve structure disposed within said enclosure over and adjacent to said port, said valve structure comprising a cylinder, a plurality of legs supporting said cylinder spaced around said port and arranged within said enclosure, a piston movable in said cylinder, a discharge valve adapted for movement into and out of sealing relationship with said valve seat, means providing an operative connection between said piston and said valve whereby appropriate movement of said piston lifts said valve out of sealing engagement with said valve seat, one of said legs having a passage therethrough to establish air flow communication with said cylinder, and means for admitting compressed air to and through said passage when said valve is to be opened, each of said legs being of elongated transverse sectional contour with smoothly rounded edges, the longest dimension of the transverse section extending in the direction of discharge flow to said port whereby to reduce turbulence and promote swirl-free liquid discharge.

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