

June 24, 1958

C. F. SASSERSON ET AL

2,840,337

VALVE STRUCTURE FOR TANKS

Filed July 1, 1954

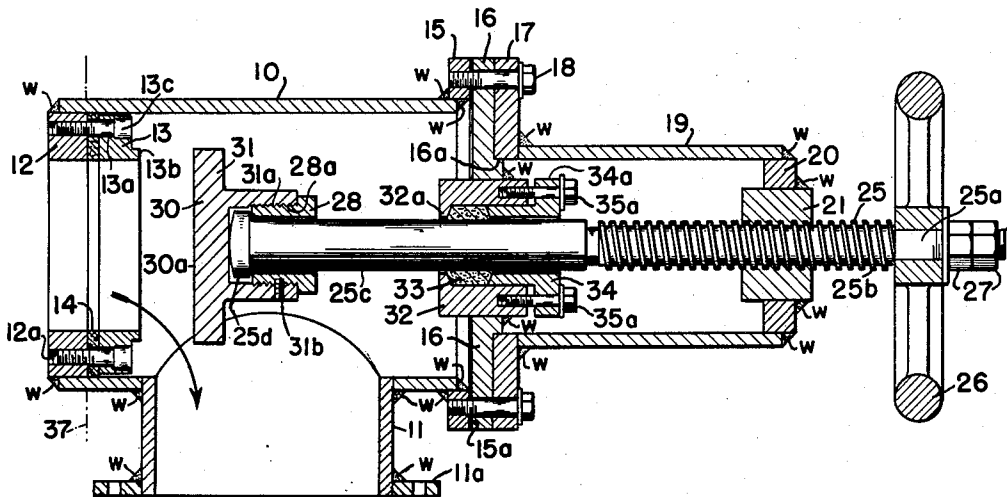


Fig. 1

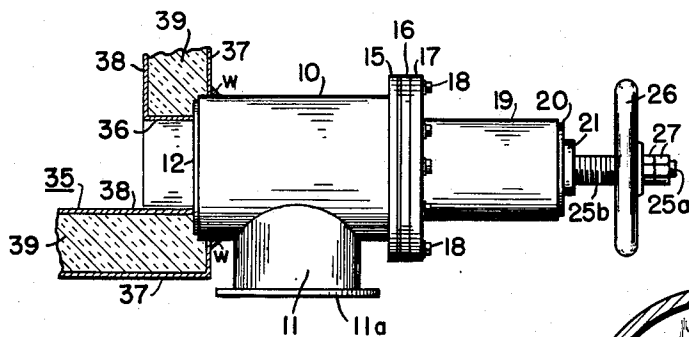


Fig. 3

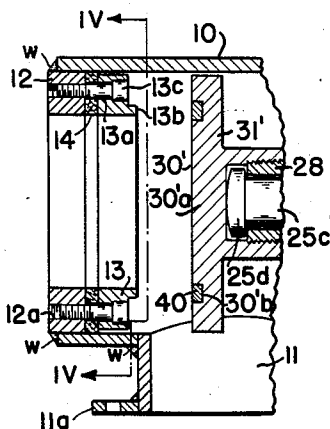


Fig. 2

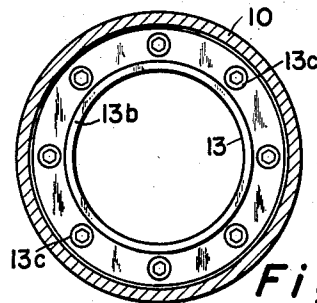


Fig. 4

INVENTORS.
Curtis F. Sasserson &
Harold A. Johnson
BY
Green, McCallister & Miller
THEIR ATTORNEYS

1

2,840,337

VALVE STRUCTURE FOR TANKS

Curtis F. Sasserson and Harold A. Johnson, Warren, Pa.,
assignors to Pennsylvania Furnace and Iron Company,
Warren, Pa., a corporation of Pennsylvania

Application July 1, 1954, Serial No. 440,596

4 Claims. (Cl. 251—86)

This invention relates to fluid control valve units and more particularly, to multi-purpose valve units. The valve unit construction shown and described herein was devised particularly for use on asphalt and oil tanks or containers for trucks or trailers and consequently, will be described from the standpoint of such usage, but it should be understood that it has features which are applicable to valves in general.

The asphalt carried in the tank of a truck must be kept at an elevated temperature, in order that its viscosity will be such that it can be readily removed from the tank and used. A preferred temperature is about 490° Fahrenheit. Elevated temperatures, however, cause expansion of metal parts and the formation of a sludge, thus creating a definite problem with respect to valves for such usage.

Valves which have been commonly used for the removal of the asphalt from the tank of the asphalt truck have, in the past, been located in the bottom of the tank and operated by a wheel on its top. This necessitates the use of a shaft which extends from the top of the tank through the asphalt contents to the valve. With this arrangement, the distortion of the valve parts, particularly of the valve seat and valve head, and the sludge which forms due to elevated temperatures at which the asphalt is carried, causes the valve to stick or clog or prevents it from seating properly. In addition, the operating shaft is easily twisted off, particularly if the valve sticks. If a shaft of a greater diameter is used to overcome this difficulty, it becomes impossible to hand-operate it. The inconvenience encountered when a shaft is broken will be readily apparent.

The difficulties which are caused by maintaining the asphalt at elevated temperatures have been reduced in some cases by carrying the asphalt at temperatures from 200° to 250° F. which, as has already been indicated, is not the temperature range desired.

Difficulties encountered due to the use of the valve operating rod which extends through the asphalt-carrying tank may be eliminated by putting the valve on the rear end of the tank near its bottom. This, of course, does not eliminate expansion and distortion of the metal parts of the valve. As a consequence, frequent grinding jobs on the valve seats are necessary. In addition, dirt, sticks and stones, etc., which are impossible to avoid with asphalt, tend to plug or cock the valve and prevent proper closure.

A truck which is used as an asphalt truck in the summer can be economically employed to carry heating oil (of much lower viscosity than asphalt) in the winter. This presents the problem of providing a valve for the tank which will be effective or easily adapted for use in connection with liquids of different natures and viscosities.

Accordingly, it has been an object of this invention to provide a valve which meets the above-discussed factors and overcomes heretofore encountered difficulties.

Another object of this invention has been to provide a valve unit wherein, deformation of its parts due to temperature changes is reduced to a minimum and wherein,

2

the parts may expand and contract without impairing the effectiveness of the unit.

Another object of this invention has been to provide a valve unit wherein the seat parts may be quickly and easily removed for replacement and wherein, different valve heads may be used interchangeably.

Another object of this invention is to provide a valve of the character discussed which is effective for use with liquids maintained at relatively high temperatures and for use with fluids of a wide range of viscosities.

The objects stated are merely illustrative. These and other objects will become more apparent from a study of the following specification and the accompanying drawing, wherein:

Figure 1 is a side sectional view in elevation taken longitudinally through a valve of our invention;

Figure 2 is a fragmental side sectional view in elevation on the scale of Figure 1 and showing a modified type of valve head which is suitable for use with liquids of a lower viscosity, such as heating oil;

Figure 3 is a reduced side view in elevation and partial section showing the positioning of a valve unit of our invention in the end wall of a tank;

And, Figure 4 is an end section in elevation on the scale of and taken along the line IV—IV of Figure 2.

In carrying out our invention, we have devised a relatively simple control and shut-off valve construction or unit that has a two-part, longitudinally-extending housing to be mounted endwise of the fluid tank or container 35 and with its inlet portion opening in substantial endwise or horizontal alignment with a bottom wall of the tank. The valve unit has an inlet passageway at one end of its forward housing body or part 10 that is defined by an annular valve seat mounting means, end ring or reinforcing band part 12. The mounting means 12 has a fluid passageway therethrough and is securely positioned about and in abutment within the inner periphery or wall of a forward end of the housing body. It extends from such forward end and backwardly towards an annular valve seat means or ring part 13 to protect the latter from immediate or initial contact with fluid entering the inlet from the tank 35.

The valve seat means 13 is removably and somewhat resiliently mounted in a spaced, air-insulated relationship with respect to an adjacent wall portion of and within the forward housing body 10 and remotely of the initial point of introduction of the fluid to the inlet portion, or in other words, behind the mounting part 12, and in a spaced relationship behind a back end face of such part. The means 13 thus has a heat-insulated relationship by reason of its location and mounting. It will be noted that the part 12 is open to the bottom of the container or tank 35 to extend therefrom and is shown located in a remote or spaced relationship with respect to inner walls 38 of the container, closely adjacent its outer walls 37, and in direct contact with insulating material 39 between the inner and outer walls.

The seat means or part 13 is spaced forwardly-inwardly from the part 12 and is insulated therefrom by a heat-insulating, somewhat resilient face gasket 14. It has an opening or passageway for fluid flow therethrough and a substantially planar, end-positioned, seating face or surface that faces towards or into a control chamber defined by the forward housing body 10.

The mounting and connection of the valve unit of our invention is such that fluid or liquid does not flow from the tank 35, directly in line with its vertical head, but at substantially right angles thereto. In addition, the flow of fluid or liquid is substantially a horizontal flow through the inlet of the valve unit and then immediately and, within the control chamber and from control parts of the valve, substantially perpendicular or

at right angles to such initial flow and outwardly through an outlet in the forward housing body 10 that is located immediately adjacent and beneath the inlet thereto. It is thus apparent that liquid or fluid from the tank or container 35 is changed in direction in its flow into, through, and out through the fluid flow passageway of valve unit of our construction, so that it leaves the unit substantially vertically or in the direction of its vertical head in the tank or container.

In controlling and shutting-off fluid flow, we employ a pair of substantially planar or opposed flat seating faces, one of which is carried by the seat ring means 13 and the other of which is carried by a valve head 30. The valve head is removably carried on the end of a valve stem 25 and in such a manner that it is capable of a slight pivot action with respect thereto, in order to accurately seat upon the opposed seating surface or face of the seat ring means 13 and to allow for any slight heat distortion of the parts that may occur due to heat transferred from the tank or from a liquid, such as asphalt. The valve head 30 is easily replaceable for repair and for adapting the unit to the control liquids of different viscosities, compare the type of head of Figure 1 which is suitable for heavier liquids and that of Figure 2 which is suitable for liquids of lighter viscosities and fluids, in general.

The valve stem 25 of our unit is journaled at a remote or back end of the housing body part 10 and adjacent a front end of a second or bonnet housing part 19 and is provided with a stuffing box 32, the sealing action of whose packing 33 is adjustable by means of adjustment bolts 35a, as applied by a slide sleeve or adjustment part 34. In addition, the length of the stem 25 is kept to a minimum from the standpoint of an effective and efficient length for the two-part housing.

Referring particularly to Figure 1 of the drawings, the housing body part 10 is shown of cylindrical construction and open at its opposite ends to receive other parts of the construction. The body 10 also has a bottom opening through its wall that defines the outlet that is located closely adjacent its forward open end which serves as a fluid inlet. Connector part 11 is secured, as by weld metal w, to extend within the outlet to abut portions of the bottom wall which define an outlet opening. The part 11 extends downwardly therefrom and is shown provided with a horizontal flange 11a secured, as by weld metal w.

The body-reinforcing, valve-seat-mounting, banding ring or means 12 of metal construction is secured within the forward end portion of the body 10, as by weld metal w.

In accordance with our invention, insulating gasket 14 of heat resistant and somewhat resilient material, such as asbestos, serves two purposes in view of the mounting and construction of the seat ring means 13. It substantially eliminates direct heat transfer from the mounting means, band or ring 12 and permits a slight relative movement of the seat means or ring 13, so that it, like the valve head part 30, may freely seek and find a good seating engagement when the two parts are moved into a closed seating relationship with each other. This allows for any slight heat distortion of the cooperating parts without adversely affecting their seating relationship.

However, in our construction, the seating parts are so positioned and constructed that maximum heat radiation is provided and minimum heat pick-up is assured. Further, the parts eliminate confined seating portions and thus eliminate the difficulties which have heretofore been encountered in connection with dirt, sticks, stones, etc., which in prior art constructions tend to lodge between the seating surfaces. Also, the positioning of the valve unit endwise and in an outwardly-extending relationship with respect to the tank 35 reduces and minimizes heat transfer from the fluid and from the tank and provides a maximum of heat radiation, particularly as to the critical

working parts of the valve. We thus have been able to provide a valve unit that minimizes distortion and, at the same time, allows for slight heat distortion without destroying the effectiveness of its sealing action; one in which the working parts are easily accessible for inspection, replacement and repair; and one in which such parts have an improved and highly effective and non-clogging seating action. Reversals of fluid flow provided in the use of our construction minimize difficulties which normally arise in connection with an application of a direct, vertical pressure head upon the valve parts and in connection with the operation of such parts.

In accordance with our invention, we provide an effective, foolproof valve unit and mount the unit on a fluid or liquid-carrying tank in such a manner that all requirements are fully met and a full solution to the problem has been attained. That is, our evaluation of the problem involved, has resulted in a novel valve unit and a mounting construction for a fluid-carrying tank which minimizes conduction of heat from the fluid and tank to the valve parts and assures maximum heat radiation from the valve parts, so that deformation of the parts is substantially eliminated. In addition, our valve unit provides a maximum of effectiveness with fluids of a wide range of viscosities and temperatures, enables the valve head and seat to be quickly and easily removed and replaced, and permits some distortion of the valve parts without impairing the effectiveness of the unit. Specific features which contribute to our success in solving the problem at hand are discussed fully in the detailed description of the figures below.

The somewhat resilient, heat-resistant, annular gasket 14 of insulating material, such as glass fibre, asbestos, etc., is shown positioned on the inner face of the metal reinforcing banding ring and mounting means 12 to receive a forward face of the seat means or ring 13, also of metal construction. The ring 13, as shown in Figure 1, has an outer periphery that is spaced from the inner periphery of the wall of the housing part 10 and is thus mounted in position in a spaced and an air-insulated relationship with adjacent metal parts of the valve unit. Suitable socket head, capstand screws or bolts 13c extend through peripherally-spaced holes 13a in the seat means or ring 13 and engage within axially-aligned threaded portions 12a in the banding and mounting means or ring 12 to securely and removably hold the seat ring 13 in abutment with the gasket 14 and in an insulated relationship on the ring 12. The active seating surface of the seat ring 13 is defined by a superimposed, projecting annular end flange, lip or rim 13b whose planar seating face lies outside or endwise of such ring and within the control chamber of the housing body 10.

The housing body 10 which defines the control chamber for the valve is closed off at its back end by a disc-like, bonnet-supporting, partition or isolating wall part 16 that within its inner periphery is adapted to carry the valve stuffing box 32. The rear bonnet body part 19 of cylindrical shape, at its front end carries a mounting flange or plate 17 secured thereto, as by weld metal w. Peripherally spaced-apart bolt and washer assemblies 18 extend through the flange 17, the wall 16, a gasket 15a into a rear flange 15 of the body part 10 and are threadably received by the latter to secure them together, as shown in Figure 1. The flange 15 is secured, as by weld metal w, about the back end of the housing body 10. It will be noted that the part 17 has an inset relationship within the part 16 to abut ledge portion 16a thereof and hold the part 17 in a positively aligned relationship with respect thereto.

The bonnet body 19 at its rear end, has a closure ring or wall 20 secured thereto, as by weld metal w, that carries a valve adjustment neck, block or threaded guide means 21 which is threaded through its axial center to receive an adjustment portion 25b of the valve stem 25. Outer end 25a of the valve stem 25 extends through

a hand wheel 26 and is threaded to receive a nut and washer assembly 27 that securely and non-turnably mounts the wheel 26 in position. Inwardly, beyond the threaded adjustable portion 25b, the stem 25 has a bearing portion 25c which terminates in a somewhat mushroom-shaped, pivot head portion 25d. It will be noted that the front face of the head portion 25d is of curvilinear or convex shape to abut against an inside face or wall of the head part 30.

The partition wall 16, as previously pointed out, carries a stuffing box assembly for the valve stem which comprises, the outer cup-shaped stuffy box part 32 secured, as by weld metal w, to the wall 16. The box 32 has a front rim portion 32a about the bearing portion 25c of the valve stem and behind such rim portion defines a chamber to receive suitable heat-resistant packing 33, such as of asbestos material. The slide sleeve or adjustment part 34 also has an inner periphery, which, like the rim portion 32a, has a slight clearance spacing with respect to the bearing portion 25c of valve stem. The sleeve part has a flange portion 34a through which peripherally-spaced bolt and washer assemblies 35 extend to, at their threaded ends, adjustably engage within the box part 32 and provide a suitably tensioned fluid-sealing pressure upon the packing material 33.

The valve head part 30 has a substantially flat or planar seating face or surface 30a which is adapted to be moved into seating engagement with the substantially parallel seating lip 13b of the seat means or ring part 13. The valve head has a rearwardly-extending mounting sleeve portion 31 that is internally threaded at 31a to threadably engage upon a male threaded portion 28a of a sleeve-like positioning part 28 which, as shown, has a slight clearance spacing within its inner periphery about the bearing portion 25c of the valve stem. A threaded set screw 31b is positioned to extend through the sleeve portion 31 and into the positioning part 28 to securely hold them in an assembled relationship with respect to each other. It will be noted that the internal diameter of the portion 31 and the forward end of the positioning part 28 define a clearance spacing with the pivot head portion 25d of the valve stem. This construction and the clearance spacing provided, enables the valve head part 30 to slightly pivot about the curvilinear face of the head 25d, so that the head part will seek and find an accurate seat upon the seat part 13 when the valve is being closed.

In Figure 3, we have shown how a valve unit of our construction may be mounted on a container or tank 35. As disclosed, the tank has an outlet 36 through its bottom end, as defined by its inner walls 38 and is cut-out about its outer bounding area to receive the body 10 and the part 12 of the valve. As shown, the valve unit may be mounted on outer walls 37 of the tank, as by weld metal w. As disclosed, the end portions of the inner and outer walls 38 and 37 of the tank are cut away, so that insulating material 39 therebetween rests against the forward end of the valve unit.

The type of unit shown in Figure 1 is particularly suitable for a heated relatively heavy viscosity liquid, such as asphalt, but since it only defines metal to metal contacts at its seating surfaces, it may have a slight leakage when a liquid of lighter viscosity or a fluid is employed. In such case, we provide a modified form of valve head 30', see Figure 2, which is of slightly larger diameter, but has the same mounting and general construction as the head part 30 of Figure 1 and is easily replaceable with respect to the latter type. It will be noted that corresponding parts of the head 30' are numbered the same as the parts of the head 30, except that prime affixes are applied. The seating face 30'a has, as shown in Figure 2, an annular inset or groove portion 30'b of rectangular cross-section to receive a gasket ring 40 of suitable somewhat resilient, fabric, rubber or plastic gasket material therein. The seating

contact in this construction is thus provided between the face of the rim or lip portion 13b of the seating ring and the outer, substantially planar face of the inset gasket ring 40.

From the above description and discussed disclosure, it will be apparent that the valve head 30 or 30' can be easily and quickly replaced without disassembling the valve unit by turning the stem 25 until the set screw 31b is in alignment with the outlet connector 11. At such time, the set screw 31b can be loosened or removed and the head part 30 or 30' can then be screwed or turned off with respect to the positioning part 28 by working through the outlet opening. This provides a quick and easy adaptation of a valve unit of our invention to different types of utilizations and as well as easy access to the critical seating faces or surfaces of the seat ring 13 and of the valve head.

We claim:

1. A vehicular tank control valve suitable for liquids of different viscosity and temperature including a relatively high temperature which comprises, a hollow longitudinally-extending integral housing body defining a liquid control chamber therein, said housing body having an inlet portion at one longitudinal end thereof for integral mounting on the tank and a closely adjacent outlet portion at substantially right angles to said inlet portion, said outlet portion being directly open to said inlet portion through the control chamber, a support body secured to project from the opposite end of said housing body, means associated with said support body to close off the opposite end of said housing body and provide a stuffing box and an adjustable guide portion, a valve stem adjustably carried by said adjustable guide portion and having a mounting end portion projecting longitudinally through said stuffing box into the control chamber, a reinforcing ring integrally secured within the inlet portion of said housing body and extending longitudinally therealong to define an inlet passageway, temperature-resistant insulating means on an inner end face of said reinforcing ring, a seat ring positioned in a radially spaced-apart relation with respect to and within the inlet portion of said housing body to insulate said seat ring with respect thereto, said seat ring having a forward end face positioned on said insulating means within the inlet portion at the control chamber, a seating lip on an inner end of said seat ring within the control chamber, mounting means within said seat ring and projecting behind an operating face of said seating lip and into said reinforcing ring to removably secure said seating ring on said reinforcing ring, said mounting means being accessible through said outlet portion for removing said seat ring through said outlet portion from the inside of the control chamber, a valve head operatively mounted on the mounting end portion of said valve stem for limited pivotal movement with respect thereto, and said valve head having a substantially planar forward seating face to engage said seating lip and close off fluid-flow through said reinforcing and seating rings to the control chamber.

2. A valve as defined in claim 1 wherein said mounting means comprises threaded bolts having heads positioned within said seat ring and a threaded portion removably positioned within said reinforcing ring.

3. A valve construction as defined in claim 1 wherein, said valve head has a substantially annular groove portion in its seating face in substantial alignment with said seating lip, and a gasket ring is positioned within said groove portion to directly seat upon said seating lip.

4. A vehicular tank control valve to control a substantially horizontal outflow from the tank and which is suitable for liquids of different viscosity and temperature including a relatively high temperature which comprises, a hollow longitudinally-extending integral housing body defining a liquid control chamber therein and having an inlet portion at one longitudinal end thereof and a closely adjacent outlet portion at substantially right angles to

said inlet portion and directly open to the inlet portion through the control chamber, a bonnet body, said bonnet body having a cylindrical shape of lesser diameter than said housing body and having an outwardly-projecting mounting flange at its front end portion, a closing end wall at the other longitudinal end portion of said housing body, means securing said mounting flange to said closing end wall, a centrally-disposed stuffing box carried by said closing end wall, a threaded guide carried by said bonnet body, a valve stem having a threaded portion adjustably engaging the threads of said guide and having a mounting end portion that projects through said stuffing box and into the control chamber, a valve head mounted on said mounting end portion and having a substantially plate-like forward seating face, a reinforcing and inlet passageway defining ring securely mounted within the inlet portion of said housing body and extending longitudinally along the inner wall thereof and being directly secured thereto, a seat ring positioned within said inlet portion, a heat-resistant insulator ring between an inner end face of said reinforcing ring and an opposed end face of said seat ring, said seat ring having a smaller outer diameter than the inner diameter of the inlet portion of said housing body to provide insulating spacing therebetween, bolts cooperating with said seat ring and projecting into said reinforcing ring to removably secure said seat ring to said reinforcing ring within the control

chamber, said bolts being readily accessible through said outlet portion for removing said seat ring through said outlet portion from the inside of the control chamber, and said seat ring having an opposite end seating face facing beyond said bolts towards said valve head to cooperate therewith and control liquid flow to the control chamber.

References Cited in the file of this patent

UNITED STATES PATENTS

1,175,690	Blakeslee	Mar. 14, 1916
1,298,173	Cadman	Mar. 25, 1919
1,395,018	Soderstrom	Oct. 25, 1921
1,540,380	Wilson	June 2, 1925
1,674,879	Atkinson	June 26, 1928
1,891,374	Ehmann	Dec. 20, 1932
1,899,154	Karrick	Feb. 28, 1933
2,069,588	Mattimore	Feb. 2, 1937
2,100,457	Trott	Nov. 30, 1937
2,192,339	Wilson	Mar. 5, 1940
2,446,767	James	Aug. 10, 1948
2,479,688	Lindgren	Aug. 23, 1949

FOREIGN PATENTS

77,943	Germany	Nov. 19, 1894
580,774	Great Britain	Sept. 19, 1946