Nov. 22, 1966 J. J. YINDROCK 3,286,735

UNLOADING VALVE

Filed Feb. 10, 1964 3 Sheets-Sheet 1

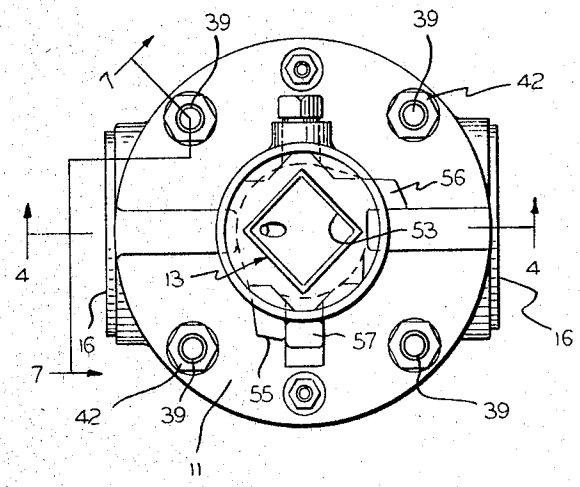


FIG. 2

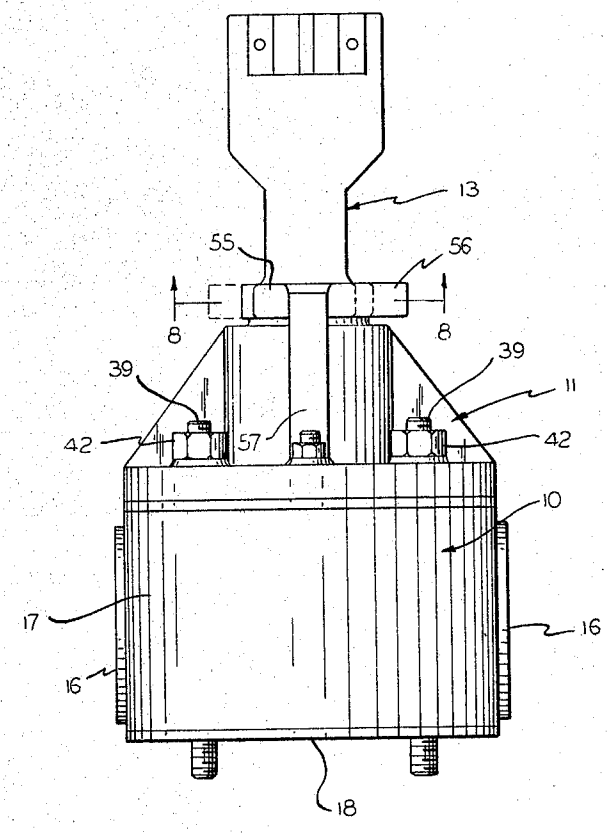


FIG. 1

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UNLOADING VALVE

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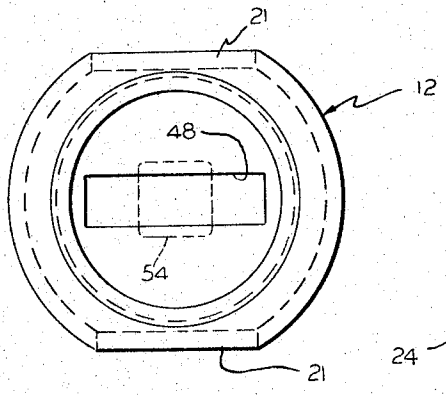


FIG. 6

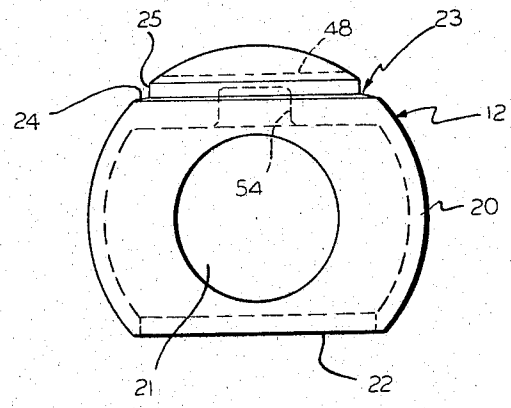


FIG. 5

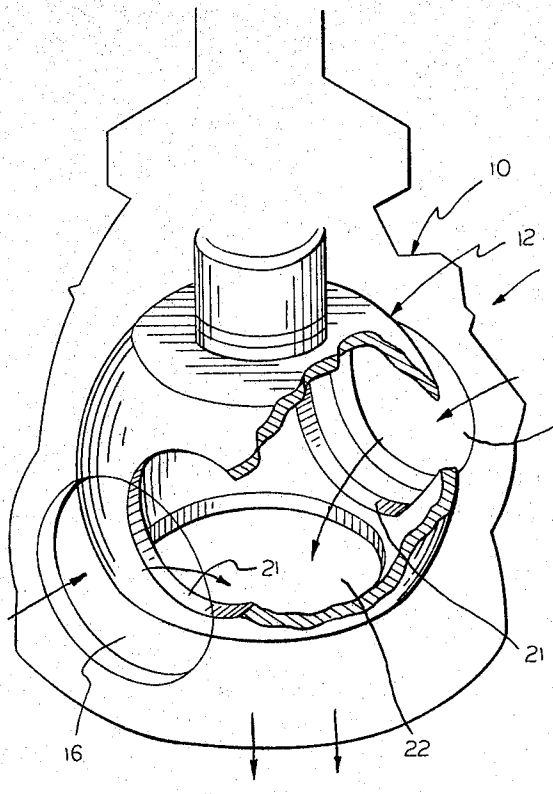


FIG. 3

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UNLOADING VALVE

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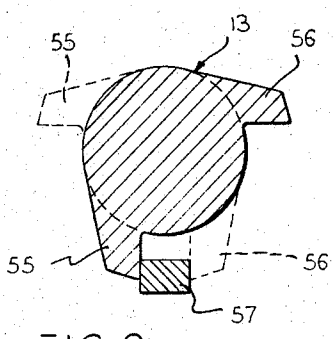


FIG. 8

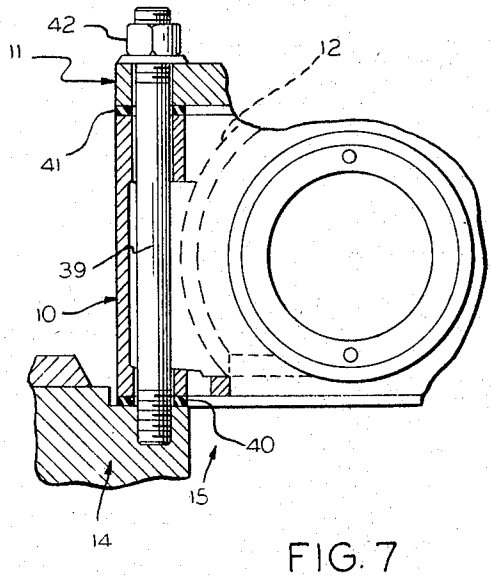


FIG. 7

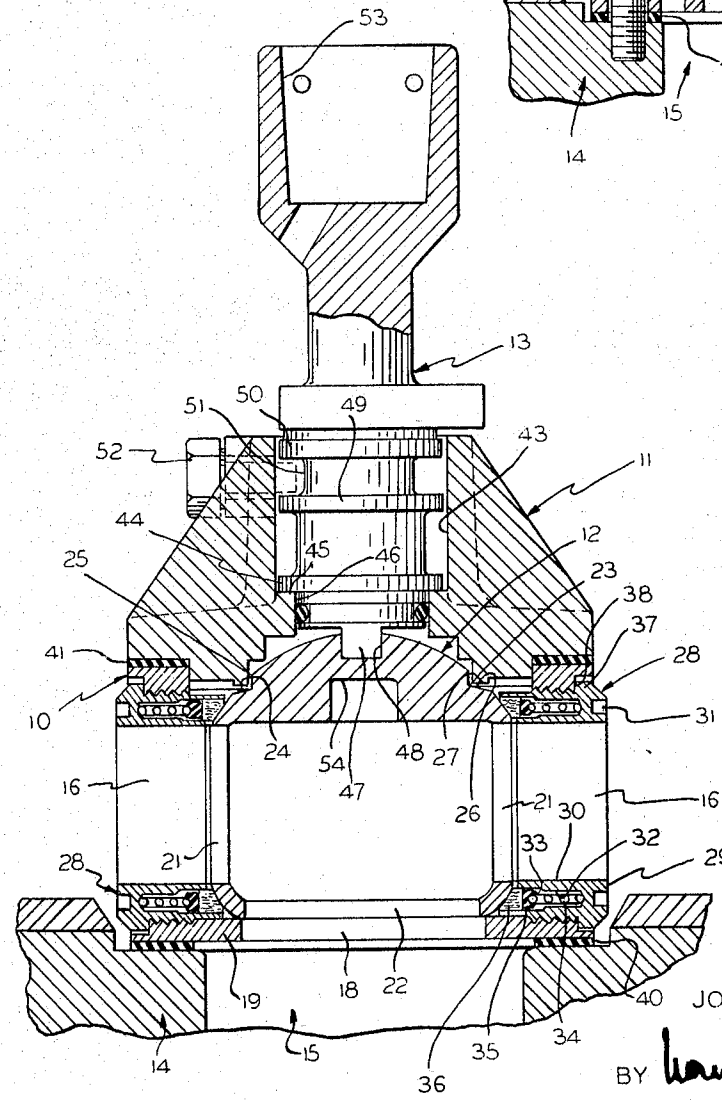


FIG. 4

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3,286,735

UNLOADING VALVE

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Filed Feb. 10, 1964, Ser. No. 343,515
5 Claims. (Cl. 137—625.41)

This invention relates in general to a valve, and more particularly to a valve adapted to be used for unloading a railroad tank car, although other uses and purposes may be apparent to one skilled in the art.

Heretofore, many difficulties have existed in the operation and maintenance of tank car unloading valves, such as they have not been completely leakproof, have required considerable time for opening and closing, and have not been satisfactory for use with all types of commodities. Further, heretofore known valves have had low unloading capacities.

Accordingly, it is an object of the present invention to provide an improved railroad tank car unloading valve that obviates the above named difficulties.

Another object of this invention resides in the provision of a tank car unloading valve that is positively leakproof, composed of a few number of parts, capable of being quickly and easily opened and closed, and easily repairable.

Still another object of this invention is in the provision of a tank car unloading valve having a relatively high unloading capacity, and including a body and ball valve member that need only be rotated 90° between fully open and fully closed positions.

A further object of this invention is to provide a tank car unloading valve, wherein the valve body cavity is free to drain or empty upon closing of the valve to overcome the problem heretofore existent with commodities which may tend to set up.

A still further object of the present invention is in the provision of a tank car unloading valve including a body with a rotatable ball valve member having a pair of opposed openings and an outlet, whereby the inside of the ball member is at low pressure since the valve is open to pressure on both sides.

Another object of this invention is to provide an improved tank car unloading valve having an improved seal mechanism that provides normal expansion of the valve parts and is capable of creating a tight seal when the valve is in closed position as created by the pressure differential across the seal mechanism.

Still another object of this invention is to provide a tank car unloading valve, wherein a body is provided therein with a rotatable ball member in sealing relation with the body such that when the valve is in closed position, the pressure of the tank car contents is stopped at the inside diameter of the valve seat.

Another object of this invention is in the provision of a tank car unloading valve including a body having a rotatable ball valve member therein and a valve stem protruding from the body, and wherein means is provided for opening the valve in an emergency should the valve stem be disconnected from a source of power.

A further object of this invention resides in the provision of an improved tank car unloading valve that includes a body having a rotatably mounted ball valve member therein, wherein the ball valve member is held in both horizontal and vertical positions so it will not become unseated during switching of the tank car or upon shocks and stresses incidental to transportation of the car.

Other objects, features and advantages of the invention will be apparent from the following detailed disclosure, taken in conjunction with the accompanying sheets of

drawings, wherein like reference numerals refer to like parts, in which:

FIG. 1 is a front elevational view of the valve according to the present invention;

FIG. 2 is a top plan view of the valve shown in FIG. 1;

FIG. 3 is a somewhat diagrammatic perspective view of the valve according to the present invention, with some parts broken away for purposes of clarity and to show the direction of fluid flow when the valve is in open position;

FIG. 4 is a vertical sectional view taken substantially along line 4—4 of FIG. 2, and showing some parts in elevational view, and showing how the valve would be mounted on a tank car;

FIG. 5 is an end elevational view of the ball valve member as removed from the valve and looking at one of the inlets;

FIG. 6 is a top plan view of the ball valve member shown in FIG. 5;

FIG. 7 is a detail sectional and end elevational view, partly fragmentary, and taken substantially along line 7—7 of FIG. 2; and

FIG. 8 is a detail transverse sectional view taken substantially along line 8—8 of FIG. 1, and showing the means for properly rotating the ball valve member between open and closed positions.

Referring now to the drawings and particularly to FIGS. 1–4, the valve of the present invention includes generally a valve body **10**, a cover **11**, a ball valve member **12**, and a ball stem **13**. The valve is illustrated in FIGS. 4 and 7 in mounting relation on a tank car bottom wall **14** having an opening **15** therein. Thus, the valve is carried within the tank car and is at all times in direct contact with the contents therein.

The valve body **10** is generally cylindrical and is provided with diametrically opposed inlets **16** arranged in the side walls **17**, and an outlet **18** formed in the bottom wall **19** and along an axis perpendicular to the axis of the inlet **16**. Further, the outlet **18** is somewhat greater in size than the inlets **16**.

The cover **11** defines with the body **10** a cavity for receiving the ball valve member **12**. This valve member includes a spherical side wall **20** having a pair of diametrically opposed inlet openings **21** therein. An outlet opening **22** is provided in the bottom of the spherical wall **20** wherein the axis of the opening is perpendicular to the axis of the inlet openings **21**. The upper end of the ball valve **12** is notched at **23** to define a slightly outwardly and downwardly inclined shoulder **24** and a vertically positioned cylindrical guide face **25**. The shoulder **24** coacts with an opposing annular shoulder **26** formed on the cover **11**, while the cylindrical guide face **25** coacts with a cylindrical guide face **27** formed on the cover **11**. The guide faces **25** and **27** guide movement of the ball valve member **12** as it rotates about its vertical axis. The outlet opening **22** is always in communication with the body outlet **18** since the axis of rotation of the ball valve member **12** is coincident with the axis of the body outlet **18**. In the open position, the inlet openings **21** of the ball valve member are axially aligned with the inlet **16** of the valve body to provide communication between the cavity in the ball valve member and the interior of the tank car, and ultimately the outlet opening **15** of the tank car. Rotation of the ball valve member **12** 90° or one-quarter of a turn brings the inlet openings **21** out of communication with the body inlet **16** and so that the solid sections of the spherical wall **20** close off communication between the body inlet **16** and the body outlet **18**.

Preferably, the body **10** and cover **11** are made of

malleable iron, while the ball valve member **12** is made of steel, although other materials may be employed.

In order to provide a leakproof seal between the ball valve member **12** and the body **10** at the body inlets **16**, a seal mechanism **28** is provided. Inasmuch as the body inlets **16** are identical on opposite sides of the valve body, and the sides of the ball valve member inlet openings **21** are identical, the seal mechanisms **28** are similarly identical. Each seal mechanism **28** includes a sleeve-like gasket nut **29**, externally threaded to be threadedly received in an inlet opening **16**. The internal bore **30** extending through the gasket nut is substantially the same dimension as the ball valve member inlet **21**. Preferably, the gasket nut is made of seamless steel tubing, although it may be otherwise constructed of other materials. Socket openings **31** are provided along its exterior face for receiving appropriate wrenches to remove and insert the seal mechanism in the valve body. An annular groove **32** is formed in the gasket nut **29** and extends longitudinally thereof, and widens at **33** prior to opening at the inner end of the gasket nut. Within the annular groove **33**, an encapsulated coil spring **34** is positioned to bottom on the blind end of the groove. Preferably, the spring **34** is encapsulated in Teflon. A spring retainer **35**, annular in shape, is arranged at the free end of the spring **34**, and provided on one radial face with a recess for receiving the spring, while the other radial face engages against a radial face of an annular ball gasket **36**. The face on the ball gasket **36** opposed to its radial face is formed to intimately engage the external surface of the ball valve member **12**. The ball gasket **36**, the spring retainer **35** and the spring **34** are all received within the annular groove formed in the gasket nut **29** and held in position against movement out of alignment therewith when in engagement with the ball valve member **12**. Further, the spring **34** would be of such a size as to constantly exert a force against the ball gasket **36** when the seal mechanism **28** is properly mounted in the valve body **10**. The annular gasket **36** is sized to engage around the periphery of the inlet opening **21** when the inlet opening **21** is in alignment with the body inlet **16**. A radially extending flange **37** is formed on the gasket nut **29** to engage against a shoulder **38** on the valve body **10** and limit the inward position of the seal mechanism **28**. It can readily be appreciated that repair or replacement of the seal mechanism can easily be made if so desired. Further, with the seal mechanisms **28** in position, they form some support for the ball valve **12** to hold it in proper position within the valve body **10**. Further, the lower end of the ball valve **12** rests against the bottom wall **19** of the body as particularly shown in FIG. 4.

The annular gasket **36** is preferably made of a flexible material such as glass-fiber, reinforced Teflon.

The valve of the present invention may be mounted in any suitable manner on the bottom of a tank car, and as shown is mounted by providing a plurality of stud bolts **39** that extend through the valve body **10** as well as the cover **11** and are threadedly held in tapped bores in the tank car bottom wall **14**. Suitable gasket means **40** is provided between the tank car bottom wall **14** and the valve body **10** to define a sealing relationship therebetween. Similarly, a gasket **41** is provided between the body **10** and the cover **11** for sealing purposes. Nuts **42** are received at the upper ends of the stud bolts **39** for holding the cover **11** and body **10** in assembled relationship with respect to the tank car bottom wall **14**.

The cover **11** is provided with a bore **43** for receiving the ball stem **13**. The ball stem includes a radial flange **44** that engages against an annular shoulder **45** formed by a diametrically reduced bore **46** below the bore **43**. The lower end of the ball stem **13** is provided with a diametrically extending blade **47** that is received within a diametrically extending socket or groove **48** formed in the top of the ball valve member **12**, thereby effecting a connection between the ball stem **13** and the ball valve member **12**.

A pair of axially spaced flanges **49** and **50** are provided on the ball stem **13** above the flange **44** to define an annular groove **51**. A stem retaining screw **52** is received in the upper end of the cover **11**, the inner end of which freely enters the groove **50** of the ball stem to prevent removal of the ball stem **13** from the valve.

At the upper end of the ball stem **13**, a wrench receiving socket **53** is adapted to receive a wrench that would normally have a long operating rod which would extend to the top of the tank car and be accessible for operating the valve. Should the operating rod become broken, a suitable wrench may be inserted through the tank car bottom wall opening **14**, the body outlet **18**, the ball valve member outlet opening **22** and fitted into the socket **54** formed at the underside of the top of the ball valve member and within its cavity. Thereafter, operation of the wrench in the socket **54** will effect opening or closing of the valve.

In order to determine the open and closed position of the valve, a pair of lugs **55** and **56** (FIG. 8) are formed on the ball stem to coact with a stop **57** formed on the cover **11**, whereby the valve is in open position when the lug **55** engages against the stop **57** as shown in solid lines in FIG. 8, and in closed position when the lug **56** engages against the stop **57** as shown in dotted lines in FIG. 8. The lugs **55** and **56** are formed relative to the positioning of the stop **57** in order to provide the full extreme open and closed positions as set forth. Thus, when the lug **55** engages the stop **57**, the ball valve member inlet openings **21** are in alignment with the body inlets **16**. And it can be appreciated that only one-quarter of a turn or a 90° turn is necessary to condition the valve between fully open and fully closed position.

It will be understood that modifications and variations will be effected without departing from the scope of the novel concepts of the present invention, but it is understood that this application is to be limited only by the scope of the appended claims.

The invention is hereby claimed as follows:

1. A tank car unloading valve comprising, an upstanding substantially cylindrical body having a pair of diametrically opposed and axially aligned inlets in the side wall adapted to be in communication with the contents of a tank car and an outlet in the bottom wall in communication with the exterior of the tank car, said outlet axis extending perpendicular to the axis of the inlets, a cover secured on the body having a bore therethrough, a ball valve member rotatably mounted in said body and having a pair of diametrically opposed inlet openings in the side wall aligning with the body inlets when the valve is in open position and an outlet opening in the bottom that is constantly in communication with the body outlet, a ball stem extending through said cover bore to the outside of the valve and being coupled to the ball valve member for driving same between open and closed positions, and an emergency wrench-receiving socket on said ball valve member accessible through the outlet opening and body outlet.

2. A tank car unloading valve as defined in claim **1**, and means sealing the body inlets with the ball valve member.

3. A tank car unloading valve as defined in claim **2**, wherein said sealing means includes a gasket ring in engagement with said ball valve member, means for resiliently urging said gasket ring against said ball valve member, and means on said body for holding said gasket ring and resilient urging means.

4. A tank car unloading valve as defined in claim **3**, wherein said resilient urging means includes a coil spring and said holding means includes a nut removably held by said body having an axial groove guidably receiving said spring and gasket ring.

5. A tank car unloading valve as defined in claim **1**, and means on said ball stem coacting with means on said cover to limit rotation of the ball valve member and de-

fine at the extreme limits the fully open and fully closed positions thereof.

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