

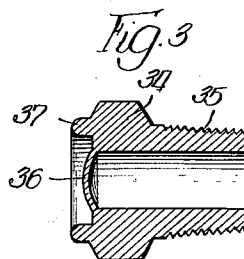
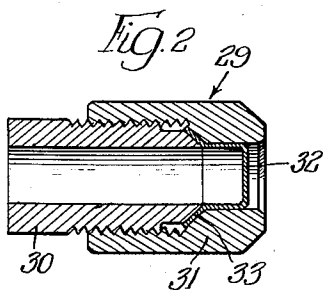
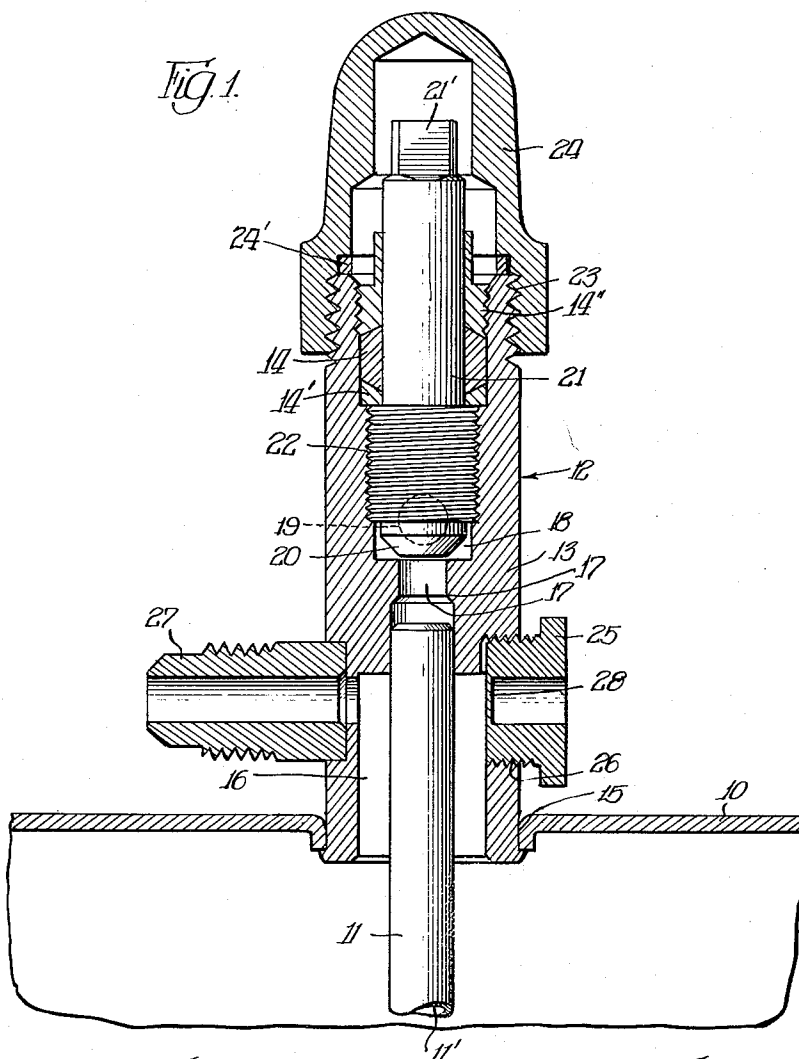
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MANUALLY ACTUATED VALVE WITH SAFETY FITTING

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MANUALLY ACTUATED VALVE WITH
SAFETY FITTING

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This invention relates to improvements in valves, in particular to a three-port valve having primary utility in a refrigerant system, in association with the liquid refrigerant receiver between the condenser and the expansion valve and coil.

It is an object of the invention to provide a valve for refrigerant or like fluid compression systems which embodies in a single unit novel means for performing plural functions of admitting and controlling exit of the refrigerant or working fluid from the receiver, as well as safeguarding the system during operation, which functions have heretofore been performed by a plurality of separate installations.

A further object is to provide a simple, inexpensive and readily applied valve which, when associated with the standard dip tube of a refrigerant or related fluid receiver, serves to provide separated intake and discharge chambers for incoming and withdrawn liquid, with a rupturable and/or fusible blow-out element insuring safety at all times in the operation of the receiver and associated system.

The foregoing statements are indicative in a general way of the nature of the invention, but other and more specific objects will be apparent to those skilled in the art upon a full understanding of the construction and operation of the device.

Various embodiments of the invention are presented herein for the purpose of exemplification, but it will be appreciated that the invention is susceptible of incorporation in other modified forms coming equally within the scope of the appended claims.

In the drawings,

Fig. 1 is an enlarged fragmentary view in section illustrating the improved multi-port valve of this invention operatively associated with a tank, refrigerant receiver or like pressure container; and

Figs. 2 and 3 are sectional views illustrating modified or alternative forms of rupturable and/or fusible elements adapted to be associated with the valve in substitution for the corresponding element shown in Fig. 1.

In the usual construction of refrigerant receiver tanks to which liquid refrigerant is returned from the condenser, separate fittings or valved connections are employed to control the discharge of liquid to the receiver from the condenser and the withdrawal of liquid from the receiver, to be forwarded to the expansion and evaporating means. It is desirable to provide a

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pressure relief element in the line, preferably in association with the receiver, to insure safety under excessive pressure conditions which may arise in the operation of the system, and to this end it has been proposed to incorporate such a rupturable or fusible element in one or another of the several standard liquid inlet and discharge fittings.

By the present invention I provide a multi-port valve which is primarily intended for association with a refrigerant receiver as a single valve unit, in which the unit is mounted in juxtaposition to and in communication with the conventional liquid discharge dip tube of the receiver and in which said dip tube coacts with the valve unit in providing separated inlet and discharge chambers in a novel manner. A rupturable and/or fusible blow-out element is constructed as a part of said valve unit in such manner that the receiver and system as a whole are protected from undue pressure in the receiver, or from undue heat generated in operation. While features of the invention are well adapted for use in connection with storage tanks or containers other than refrigerant receivers, it is in connection with the latter that the valve unit has demonstrated marked advantages; therefore, the valve will be described in that setting.

Referring to the drawings, the reference numeral 10 in general designates a standard refrigerant receiver having a hollow dip tube 11 extending thereinto beneath the surface of liquid therein for the withdrawal of such liquid from the receiver when required, as controlled by the valve unit in question.

The valve of the invention is designated 12, consisting of a housing 13 adapted at its lower end to be secured with a pressure-tight seal in an aperture 15 at the top of the receiver 10. With slight modification this connection may be made at any other appropriate point on the receiver other than the top thereof.

The valve housing 13 is axially bored to provide a cylindrical lower inlet chamber 16 of substantial diameter and axial length. A restricted cylindrical throat 17 coaxially communicating with the chamber 16 serves to connect that chamber, in normal operation, with an upper counter-bored discharge chamber 18. The dip tube 11 is fixedly secured at its upper end in the throat 17, preferably with a force fit, and thereby serves to subdivide the chamber 16 in effect into an annular inlet space communicating directly with the interior of the receiver 10 and a tubular discharge conduit 11', internally of the tube 11,

which leads from below the liquid level to throat 17 and upper discharge chamber 18 in the valve housing. A restriction 17' in throat 17 serves as an upper stop for tube 11 in the assembly thereof. A discharge pipe 19 leading to the refrigerator expansion valve and evaporator coil is in communication with chamber 18 above throat 17, which latter serves as a seat for a valve member 20. Member 20 is a shut-off valve, having a stem 21 which is threadedly engaged at 22 with the inner wall of the valve housing and extending upwardly above the top of the latter. The housing is externally threaded coaxially of the stem at 23 for the reception of a closure or protective cap 24, with a washer or gasket 24' interposed, and the top of the stem 21 is shaped at 21' to receive a wrench or like actuating tool for the opening and closing of valve 20. A leak-proof seal along stem 21 is attained by means of a soft metal packing collar 14 surrounding the stem and is axially and radially compressed around the stem, against a conical faced ring 14', by a compression nut 14'' telescoped on the stem and threaded internally in the housing. It will be understood that valve 20 is normally open to discharge liquid from conduit 11' to the coil of the system, but is closed against throat 17 when it is desired to shut off the system.

A threaded rupturable and/or fusible blow-out element 25 is replaceably associated with the valve in a tapped opening 25 which communicates with the annular inlet chamber 16 at a point diametrically opposite an inlet fitting 27 opening to said chamber. This fitting is secured in the valve housing by a soldered force fit and will in operation be communicated by a liquid flow line with the refrigerant condenser of the system.

In operation, condensed liquid flows through the inlet fitting and annular chamber 16 to be collected in the receiver and withdrawn therefrom to the expansion valve through the dip tube 11 and a connecting line including throat 17, chamber 18 and pipe 19. Receivers of the type under consideration normally operate at pressures in the neighborhood of 175 pounds per square inch; and should the pressure in the receiver 10 rise dangerously above that value, the blow-out element 25 is designed to yield and relieve the excess of pressure. Said element, in the embodiment shown in Fig. 1, takes the form of an integral, molded metal or plastic element having a central, thin, membrane-like wall 28 on the side toward chamber 16 which is relatively weak and adapted to yield to the excess pressure. The thickness and area of this wall will vary in accordance with the strength of the particular material employed, these being matters which are readily ascertainable by those skilled in the art. Likewise, provisions other than a relatively thin wall may be incorporated in element 25 to impart rupturability. If desired, the material of the element 25 may also be of thermally fusible character, melting at and above a predetermined maximum temperature to relieve pressure and halt operation of the system.

In Fig. 2 I illustrate a modified embodiment of blow-out element, generally designated 29, which may be employed in substitution for the element 25 of Fig. 1. In this form there is provided a fitting 30 which may have a press and soldered fit at one end in the valve housing 13 at the same location as the element 25. A hollow nut-like clamping tip 31 is threaded on the opposite end of the fitting to clamp therebetween the separate cap-like rupturable and/or fusible blow-out element 32. The latter has a frusto-conical annular

skirt 33 engageable between correspondingly shaped surfaces on the fitting and clamping nut for this purpose; and will be stamped from an adequately thin gauge of sheet metal, molded from a plastic, or otherwise fabricated. A material may be employed which will soften and rupture at a predetermined maximum temperature and pressure condition.

In Fig. 3 I illustrate a further special and highly effective, modified embodiment of blow-out element, in the form of an integral, one-piece fitting 34 of plastic or metal of the desired qualities. This fitting is threaded at 35 for reception in the valve body and has an outwardly curved or convex, relatively thin, membranous blow-out wall 36 on the end thereof opposite the valve body in the operative position of the fitting. An integral annular rib or bead 37 surrounds the member 36, projecting axially outwardly beyond the same, so as to serve as a protective bumper or shield for the latter, safeguarding the same from accidental rupture.

It is to be understood that I contemplate the use of a rupture element for the purpose of safeguarding the receiver 10, or a system with which it is associated, from the effect of either excessive pressure or excessive temperature, or both, as circumstances may require. Hence, when the terms "rupture" and "rupturable" or their equivalent are employed in the claims to follow, they should be construed to cover an element which is yieldable due to mechanical or structural failure, as under excess pressure, or by fusing or destruction under excessive temperature, or under the effect of both phenomena.

I claim:

1. A valve comprising a hollow valve body having an internal valve chamber, a further chamber spaced from said valve chamber in axial alignment therewith and opening to the exterior of said body, and a passage communicating said chambers with one another, a straight tubular element extending through said further chamber and terminating externally thereof, said element being in sealed communication with one end of said passage to provide inner and outer supply and discharge spaces within said further chamber on opposite sides of the wall of said tubular element, said passage terminating at its opposite end in a valve seat coaxial with said tubular element and facing said valve chamber, a shut-off valve threadedly engaged with said body for movement in said valve chamber coaxially of the latter and said tubular element and into and out of engagement with said valve seat, thereby controlling said passage, said body having an inlet port opening to said outer space of said further chamber and a discharge port through the side wall of said valve chamber, and a replaceable, readily rupturable element carried by said body in exposed relation to said outer chamber space.

2. A valve construction comprising a hollow tubular body sub-divided internally to provide a valve chamber and a further chamber in axial alignment with said valve chamber which opens to the exterior of the body, said body being provided with an axial passage adapted to communicate said chambers, which passage terminates at one end in an annular valve seat facing said valve chamber, a straight tubular element extending axially through said further chamber and terminating externally thereof, said tubular element being in sealed communication with the end of said passage opposite said

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valve seat and serving to sub-divide said further chamber into concentric inner and outer spaces, said body having ports through the side wall thereof opening respectively to said valve chamber and to the outer space of said further chamber, and a shut-off valve member threadedly engaging said body for movement in said valve chamber coaxially of the latter and said tubular element and into and out of sealing engagement with said valve seat.

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