Dec. 31, 1940. G. E. FRANCK 2,226,851

CHARGING MECHANISM

Original Filed April 11, 1938

Fig. 1.

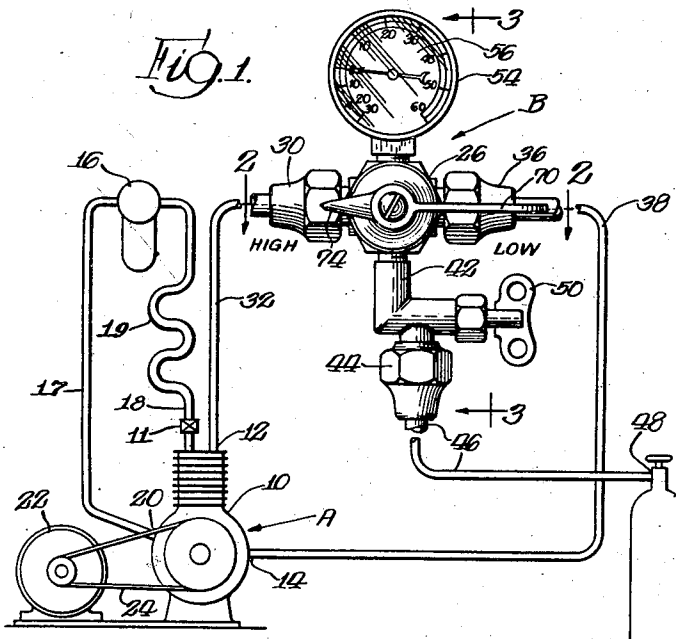


Fig. 3.

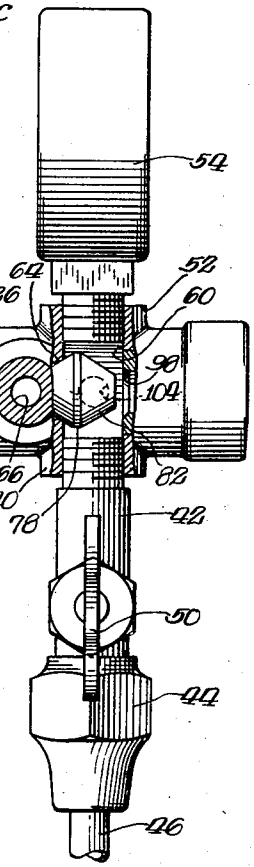
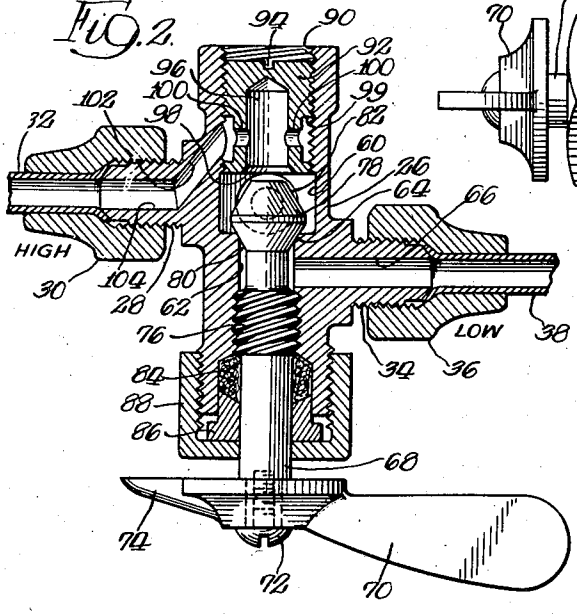


Fig. 2.



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CHARGING MECHANISM

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Original application April 11, 1938, Serial No. 201,370. Divided and this application October 10, 1938, Serial No. 234,211

8 Claims. (Cl. 62—115)

My invention relates to valved charging mechanisms and particularly mechanisms using valve devices in charging refrigeration systems with a gaseous refrigerant. This application is a division of my co-pending application for a Charging valve, Serial No. 201,370, filed April 11, 1938.

Among the objects of my invention is the provision of a valve device and charging system of extemely simple design which serves all of the purposes required of a charging valve and one which is relatively simple and inexpensive to manufacture.

Another object is the provision in a new and improved charging mechanism of a valve device for a refrigeration system which has the parts and the handle so arranged that an operator may be able to tell at a glance exactly how the valve is adjusted.

Still another object is the provision in a charging mechanism of a new and improved double acting charging valve device including provision for attachment to an auxiliary supply tank for charging a refrigeration system which can be adjusted through a fraction of a revolution in order to change the setting of the valve from a position for unloading the tank to a position for filling the tank, there being also provided a separate shut off means for disconnecting the auxiliary supply tank and a gauge operable to indicate either high pressure or low pressure conditions depending upon the setting of the valve.

With these and other objects in view, my invention consists in the construction, arrangement and combination of the various parts of my device whereby the objects contemplated are attained as hereinafter more fully set forth and pointed out in my claims and illustrated in the accompanying drawing in which:

Figure 1 is a front elevation of the charging mechanism with parts of a refrigeration system and the connecting lines, shown diagrammatically.

Figure 2 is a horizontal section of the valve device taken on the line 2—2 of Figure 1.

Figure 3 is a side elevation of the valve device on the line 3—3 of Figure 1 with the central portion broken away to show the valve chamber and some of connections thereto.

In refrigeration systems in common use today for household and commercial installations, the parts consist primarily of a motor driven compressor with an evaporator connected thereto containing a charge of refrigerant gas which flows continuously from the compressor through a condenser, thence through the evaporator and back again passing through suitably valved connecting lines. Some refrigerant gases in common use are sulphur dioxide, methyl chloride, freon and others. These gases ordinarily are very volatile in character and when introduced into a refrigeration system, must be very carefully handled. The method in general of charging a system with a fresh supply of gas is to connect a cylinder of condensed gas to a valve on the low pressure side of the compressor, then start the compressor and open the connection between the cylinder and the compressor so that the compressor will draw the gas therefrom.

Other occasions may arise where it is desirable to unload the system of the gas and in the case of refrigerant gases which may be poisonous or which may be relatively expensive, it is not desirable to dissipate it into the atmosphere. Therefore, means need be provided for collecting the gas again. Such a means consists in its simplest form of another empty tank connected to the high pressure side of the compressor. When the connection has been made and the connecting line emptied of air, it is opened to the tank and the compressor is operated. By its own power the compressor forces the refrigerant gas from the system into the empty cylinder wherein it is compressed and collected.

Owing to the characteristic volatility of refrigerant gases and their oftimes poisonous character, valves of a very special design must be used in order to properly control the flow during charging or emptying operations.

Furthermore, these valves must be of an extremely tight construction and to provide this it is the custom to use positive seating needle valves rather than the ordinary plug type valves which are suitable only for low pressure use.

In order to reduce the size and weight of such a valve device and make it convenient to use, it becomes advisable to incorporate into the device a double acting valve seating in either of two positions but so constructed that it is absolutely tight. In the embodiment of my invention there is shown a single double acting valve device having a body which may be connected at one point to the high pressure side of a compressor, at another point to the low pressure side and at still another point to a charging cylinder. In addition a gauge is provided for indicating either high pressure or low pressure as the case may be. The valve device is equipped with a handle having a pointer adapted to point toward either the

high pressure or emptying connection or the low pressure or filling connection when the valve is opened for these connections respectively.

Reference is herein made to my copending application, Serial No. 201,370, filed April 11, 1938, devoted specifically to the valve construction per se.

As shown in the drawing, the character A indicates a refrigeration system of the standard type comprising a conventional compressor 10 having a high pressure side connection comprising a conventional shut off valve 11 for the refrigeration system. From the shut off valve 11 a tubing line 18 conducts the refrigerant gas to a condenser 19, thence to an evaporator 16 and through a tubing line 17 to a connection on the low pressure side at 20. A motor 22 is supplied to drive the compressor by means of a belt 24.

The reference character B indicates a charging valve device and the character C a tank for extra refrigerant fluid.

The charging valve device itself consists of a body 26 provided at one side with a threaded boss 28 upon which is secured a nut 30 for clamping thereto a length of tubing 32 connected to the compressor at an outlet 12 on the high pressure side of the refrigeration system. On the opposite side of the body in a position slightly forward, there is provided a threaded boss 34 equipped with a nut 36 adapted to clamp thereto a length of copper tubing 38 which is connected to the compressor at the low pressure side of the refrigeration system at a point 14.

Upon still another side of the body below the valve device as shown in Figure 1 there is an internally threaded boss 40 to which may be connected a shut off valve 42 of the "needle" valve variety and connected to the shut off valve by means of a nut 44 is a tubing line 46 which terminates at the upper end 48 of the charging cylinder C. A handle 50 is provided on the shut off valve for opening it and closing it while the main charging valve is being set.

On the upper side of the body there is still another internally threaded boss 52 upon which is mounted a gauge 54 having a face 56 graduated above and below the zero reading so that pressure may be measured, as is customary in pounds, and a vacuum, measured in inches. The calibrations, of course, are arbitrary.

Within the body 26 of the valve there is provided a common central chamber 60 which has a short passage 62 at the front side thereof and a valve seat 64 at the entrance thereto. The passage 62 is directly connected with another passage 66 partly within the threaded boss 34 connected to the low pressure side of the system. It is also to be noted that the central chamber 60 is directly connected to the gauge, the shut off valve and the high pressure side.

Protruding from the forward side of the valve is a stem 68 upon which is mounted a handle 70 held by a screw 72 and equipped with a pointer or indicator 74 which in Figure 1 is shown pointing towards the high pressure connection. The valve stem extends inward through the passage 62 and is threaded in an outer extension of the passage by means of a triple thread connection 76 so provided in order to produce a great longitudinal movement of the valve with a minimum rotational adjustment. At the inner end of the stem 68 there is provided a valve 78 having a forward conical face 80 adapted to seat against the low pressure seat 64 and a rearward conical face 82. The valve stem is held in place by means of a packing 84, a packing ring 86 and packing nut 88 in order that the valve may be tightly sealed against any possible escape of the volatile refrigerant.

At the rear of the central chamber 60 there is provided a threaded passage 90 into which is threadably screwed a plug 92 provided with a screw driver slot 94 for adjusting it inwardly or outwardly. The plug has a central depression 96 provided at its forward end with a valve seat 98 cooperable with the rearward conical portion 82 of the valve. Surrounding the plug is an annular recess 99 with passages 100 connecting the recess with the central depression. On the left side of the valve body there is a drilled passage 102 communicating between the threaded passage 90 at a point adjacent the annular recess and a passage 104 in the threaded boss 28 directly connected to the high pressure side of the system.

In assembling the valve mechanism the stem 68 is inserted from the rear and secured tightly against the forward or low pressure valve seat 64. In this position the low pressure side is closed and the high pressure side will be open. The handle 70 can then be mounted upon the valve stem in position so that the indicator 74 points toward the open high pressure connection. To complete the adjustment the valve stem 68 is rotated 180° so that the indicator 74 points toward the low side connection. This rotation will cause the valve to open the low side and occupy a position wherein the high side should be closed. Accordingly, the plug 92 is screwed into the threaded aperture 90 until its valve seat 98 is pressed tightly against the conical portion 82 and the adjustment so made positively positions the throw of the valve stem. The plug 92 is then sweated, soldered or otherwise sealed in position in order to freeze it tightly in place and seal the valve against escape of the refrigerant gas. By the operation thus described there is provided a needle valve which has a limited definite throw from a high position to a low position so constructed that the operator can tell at a glance which way the valve is set.

Operation of the device as here described presumes it to be connected as shown to a well-known refrigeration system including, for example, a conventional type of compressor having internal valves. Initially the flow through the pipe 18 is shut off by means of the stop valve 11. Then when the compressor is started it will evacuate a substantial portion of the air initially in the system by withdrawing it from the pipe 18, condenser 19, evaporator 16 and expel it outwardly through the pipe 32. To assure expulsion of the air the forward face of the valve 78 is seated against the valve seat 64 and with the pipe line 46, initially opening into the atmosphere air may be expelled through the open valve 42.

Having evacuted the air, except perhaps for a small quantity which may later be purged by conventional methods, the valve 42 is closed and the pipe line 46 is attached to tank C. The valve 78 may now be shifted so that the rear face contacts the seat 98, the valve 42 again opened and as the compressor continues to operate gas will be drawn from the tank into the system through the pipe line 38. When the operation is complete valve 42 is shut off and valve 78 is left closed against seat 98, for example, to shut off the charging line against any by-passing of fluid or pressure.

When emptying the system of refrigerant gas,

the handle 70 will be shifted so that the pointer 74 is directed toward high position. The valve 78 will then be seated upon the valve seat 64 closing the line 38 to the passage of refrigerant gas. Then with the valve 11 shut off and the compressor operating gas will be drawn from the system and expelled outwardly through the line 32, the charging valve B, the shut off valve 42 and thence into the tank C.

Should it be desired manual shut off valves of conventional design may be used where the pipe lines 32 and 38 are attached to the compressor. By shutting off such valves the charging unit may be removed at any time without it being necessary to empty the system of refrigerant gas.

Should it be desired to empty the compressor the valve will be shifted so that the indicator points to the high side connection. The gauge will immediately register the high side pressure in pounds above the zero reading and when this pressure reaches a desired amount the shut off valve, meanwhile having been closed, will be opened, allowing the refrigerant to be driven from the compressor into the empty auxiliary tank C.

Another position is possible and becomes desirable if something should go wrong in the refrigeration system, necessitating that the pressure on the evaporator, for example, be relieved. Should such a circumstance occur, the valve handle 70 can be rotated part way around so that the valve is midway between a high position and a low position. With a setting of this sort, refrigerant gas from the compressor will be bypassed through the valve from the high pressure side to the low pressure side, thereby relieving any undue strain upon the refrigeration system.

There has therefore been provided a simple, compact charging valve device which is suitable for all charging operations and one which is easily installed and readily operated by persons having a limited experience or knowledge of refrigeration systems.

Some changes may be made in the construction and arrangement of the parts of my device without departing from the real spirit and purpose of my invention and it is my invention to cover by my claims any modified forms of structure or use of mechanical equivalents which may be reasonably included within their scope.

I claim as my invention:

1. The combination of a refrigerant circuit and an apparatus for charging and discharging refrigerant respectively into and from said circuit comprising means forming a source of pressure equipped with connections respectively at the high pressure and low pressure sides, an auxiliary tank for refrigerant, a charging valve mechanism having one connection to the high pressure side, another connection to the low pressure side and a third connection to the auxiliary tank, a two way valve in said mechanism adapted to be turned to a position to open a passage from the high side to the tank and a position to open a passage from the low side to the tank.

2. The combination of a refrigerant circuit and an apparatus for charging and discharging refrigerant respectively into and from said circuit comprising a compressor equipped with valved connections respectively at the high pressure and low pressure sides, an auxiliary tank for refrigerant, a charging valve mechanism having one connection to the high pressure side, another connection to the low pressure side and a third connection to the auxiliary tank, a valve in said mechanism adapted to be turned to a plurality of positions, one to open a passage through the connection from the high side to the tank, and one to open a passage through the connection from the low side to the tank and one to by-pass the system from high side to low side.

3. The combination of a refrigerant circuit and an apparatus for charging and discharging refrigerant respectively into and from said circuit comprising the combination of a power driven compressor equipped with connections at the high pressure and low pressure sides respectively, and an auxiliary tank for refrigerant, a charging valve mechanism having one connection to the high pressure side, another connection to the low pressure side and a third connection to the auxiliary tank, a valve in said mechanism adapted to be turned to a plurality of positions one to open a passage from the high side to the tank, and one to open a passage from the low side to the tank, an auxiliary shut off valve cooperable with the mechanism adapted to control the connection to the auxiliary tank for closing flow therebetween during manipulation of said first valve.

4. The combination of a refrigerant circuit and an apparatus for charging and discharging refrigerant respectively into and from said circuit comprising a power driven compressor equipped with valved connections at the high pressure and low pressure sides respectively, and an auxiliary tank for refrigerant a charging valve mechanism having one connection to the high pressure side, another connection to the low pressure side and a third connection to the auxiliary tank, a valve in said mechanism adapted to be turned to a plurality of positions one to open a passage from the high side to the tank, and one to open a passage from the low side to the tank, an auxiliary shut off valve cooperable with the mechanism adapted to control the connection to the auxiliary tank for closing flow therebetween during manipulation of said first valve and a gauge for the valve mechanism operable in all positions of said first valve.

5. The combination of a refrigerant system and an apparatus for charging and discharging refrigerant respectively into and from said system comprising a power driven compressor equipped with connections respectively at the high pressure and low pressure side, an auxiliary tank for refrigerant, a charging valve mechanism having one connection to the high pressure side, another connection to the low pressure side and a third connection to the auxiliary tank, a valve in said mechanism adapted to be turned to a plurality of positions, one to open a passage from the high side to the tank, one to open a passage from the low side to the tank and one to by-pass the system from high side to low side, an auxiliary shut off valve cooperable with the mechanism adapted to control the connection to the auxiliary tank for closing flow therebetween during manipulation of said first valve and a gauge for the valve mechanism operable in all positions of said first valve.

6. The combination of a refrigerant circuit and an apparatus for transferring refrigerant thereto or therefrom; said refrigerant circuit including a compressor having a high and a low side; said apparatus including a flow control apparatus, a container, a first and a second conduit connecting the high and the low sides, respectively, of the compressor to the flow control structure and a third conduit connecting the container to the flow control structure; said flow control structure comprising a body having a chamber therein, a

port, means connecting said port to the third mentioned conduit, a second port communicating with the conduit connected to the low side of the compressor, a third port commuicating with the conduit connected to the high side of the compressor, a pair of valve seats communicating with said chamber, and a valve located in said chamber and movable from one seat to the other to selectively disconnect said container from the high side or the loss side of said compressor.

7. The combination of a refrigerant circuit and an apparatus for transferring refrigerant thereto or therefrom; said refrigerant circuit including a compressor having a high and a low side, a condenser and an evaporator; said apparatus including a flow control apparatus, a container, a first and a second conduit connecting the high and the low sides, respectively, of the compressor to the flow control structure and a third conduit connecting the container to the flow control structure; said flow control structure comprising a body having a chamber therein, a port, valved means connecting said port to the third mentioned conduit, a second port communicating with the conduit connected to the low side of the compressor, a third port communicating with the conduit connected to the high side of the compressor, a pair of valve seats confronting each other and communicating with said chamber, and a valve located in said chamber and movable from one seat to the other to selectively disconnect said container from the high side or the low side of said compressor.

8. The combination of a refrigerant circuit and an apparatus for transferring refrigerant thereto or therefrom; said refrigerant circuit including a compressor having a high and a low side, a condenser and an evaporator; said apparatus including a flow control apparatus, a container, a first and a second conduit connecting the high and the low sides, respectively, of the compressor to the flow control structure and a third conduit connecting the container to the flow control structure; said flow control structure comprising a body having a chamber therein, a port, independent valved means on the body connecting said port to the third mentioned conduit, a second port communicating with the conduit connected to the low side of the compressor, a third port communicating with the conduit connected to the high side of the compressor, a pair of valve seats in axial alignment with each other and at opposite sides of said chamber, and a two faced valve located in said chamber and movable from one seat to the other to selectively disconnect said container from the high side or the low side of said compressor and having an intermediate position to connect said low side with said high side.

GEORGE E. FRANCK.