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H. B. HULL

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REFRIGERATING APPARATUS

Filed June 27, 1930

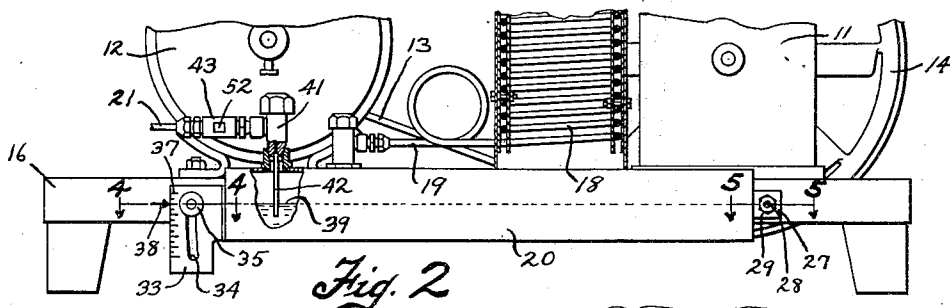


Fig. 2

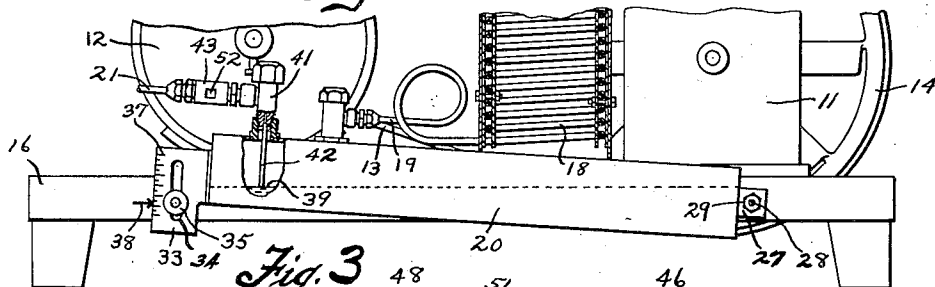


Fig. 3

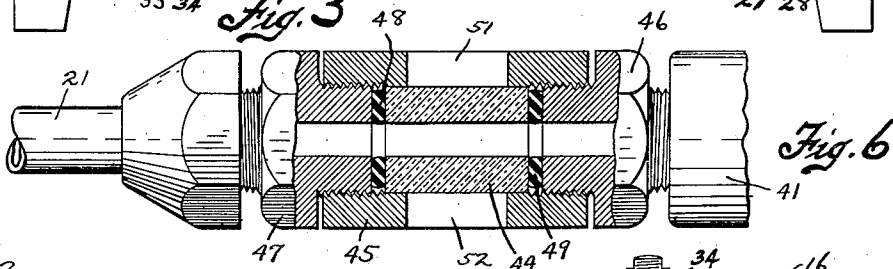


Fig. 6

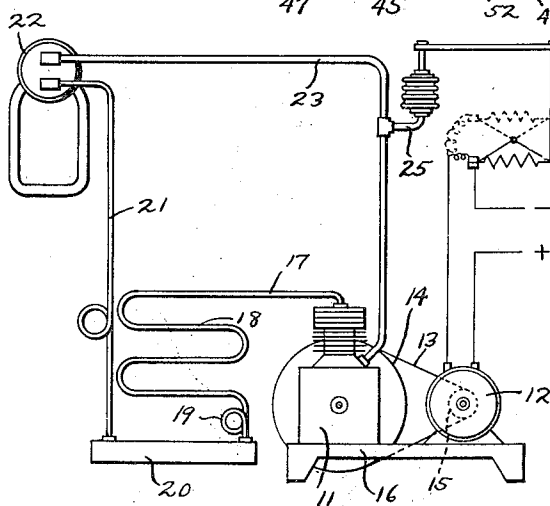


Fig. 1

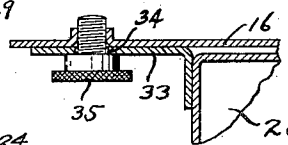


Fig. 4

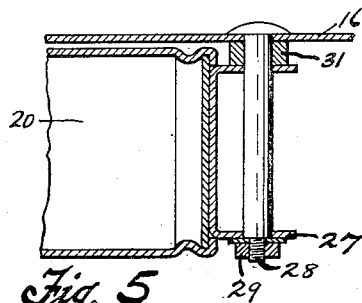


Fig. 5

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REFRIGERATING APPARATUS

Application filed June 27, 1930. Serial No. 464,304.

This invention relates to refrigerating systems.

In refrigerating systems wherein there is contained a quantity of volatile refrigerant it frequently happens that, after such systems have been placed in operation or after they have operated for long periods of time, some refrigerant may escape therefrom undetected and cause inefficient operation of the system. Heretofore, under such conditions, there has been no known method of or apparatus for definitely determining how much refrigerant was contained or sealed within a system without pumping the refrigerant therefrom and measuring or weighing it.

It is to apparatus for determining the quantity of refrigerant in refrigerating systems to which my invention relates, having for one of its objects the provision of improved means whereby the amount of refrigerant sealed in the system can be readily, definitely and easily determined at any time.

Another object of the invention is to provide a system having a pivotal or tiltable portion wherein, a quantity of liquid refrigerant may collect, for circulation through the system, and to equip that portion of the system with a scale or suitable device which will accurately record the amount of liquid refrigerant therein.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred form of the present invention is clearly shown.

In the drawings:

Fig. 1 is a diagrammatic showing of a refrigerating system in which the present invention may be employed;

Fig. 2 is a side view of the refrigerant circulating unit showing my improved apparatus mounted thereon in normal operating position;

Fig. 3 is a view similar to Fig. 2 showing my improved apparatus in a tilted position;

Fig. 4 is an enlarged sectional view of a portion of the apparatus taken on the line 4—4 of Fig. 2;

Fig. 5 is an enlarged sectional view of a portion of the apparatus taken on the line 5—5 of Fig. 2; and

Fig. 6 is an enlarged sectional view of a sight glass coupling employed in the system.

Referring to the drawings, Fig. 1 discloses a refrigerating system comprising a compressor 11 and a motor 12, which drives the compressor through a belt 13 and pulley wheels 14 and 15, mounted on a base 16. Connected by a pipe 17 to the compressor is a condenser 18 which receives compressed refrigerant from the compressor, cools and liquefies the refrigerant which then flows through a pipe 19 into a receiver 20. The pulley wheel 14 may have fan blades formed therein for causing air to circulate over the condenser 18. A pipe 21 connected to the receiver 20 directs the liquefied refrigerant to a cooling unit or evaporator 22 adapted to be located in a compartment to be cooled. A predetermined quantity of liquid refrigerant is maintained within the evaporator 22 under control of a float valve (not shown) which float valve may be of the type shown in the patent to Osborn, 1,556,708, filed October 13, 1925. Refrigerant evaporated in the evaporator 22 returns to the compressor through a gaseous return conduit 23. A switch 24 connected with the conduit 23 by pipe 25 controls the starting and stopping of motor 12 in response to pressures within the system.

In carrying out my invention for determining the quantity of liquid refrigerant in a portion of the system I provide on the refrigerant circulating unit a tiltable or pivotally mounted receiver having a scale at one end thereof and a sight glass in the liquid supply pipe extending from the receiver to the evaporator. I mount the receiver to the unit base by securing a U-shaped member 27, to one end of the receiver 20, (see Fig. 5) in any suitable manner such as by welding it to the end of the receiver. Each leg of the U-shaped member 27 is provided with an opening which is adapted to be received by a stud 28 secured to and protruding from the side of base 16. The end of stud 28 is of smaller diameter and is threaded to receive

a lock nut 29 to pivotally secure the member 27 to the base 16. A collar 31 is located between the side wall of base 16 and the member 27 to separate the receiver from the base.

5 A plate 33 secured to the other end of receiver 20 (see Fig. 4) is provided with an elongated opening 34 which receives a thumb screw 35. Thumb screw 35 is threaded into a threaded opening in the side wall of base 16 and tiltably clamps plate 33 against the base to hold the receiver in any desired position. Plate 33 has a graduated scale 37 provided along its edge (see Fig. 2) which registers with a stationary pointer or the like 38 provided on the side of base 16. Pipe 19 has a loop formed therein so as to provide a flexible connection of the condenser with the receiver and thus permit movement of the receiver. A similar loop may also be provided in pipe 21 if desired.

A valve fitting 41, communicating with the pipe 21 and secured to the receiver 20, has a pipe 42 extending downwardly therefrom into receiver 20 to a point normally below the liquid refrigerant level 39 therein. A sight glass coupling, generally designated at 43, has one of its ends secured to the fitting 41 while its other end receives the pipe 21. Sight glass coupling 43 comprises a thick walled glass cylinder 44 (see Fig. 6) clamped in a metal cylinder 45 by couplers 46 and 47 which are threaded into cylinder 45. Between the glass 44 and the couplers 46 and 47 are located two washers 48 and 49 made of rubber or other suitable material, which can be compressed without breaking the glass 44 to seal the sight glass coupling 43 from leaks. The metal cylinder 45 protects the glass 44 from being broken and has two small openings 51 and 52 to permit visibility through the sight glass coupling 43. It is thus apparent that I have provided a refrigerant circulating unit with a tilting receiver together with a sight glass which will withstand abnormal pressures, the utility of which will now be explained.

One acquainted with the refrigerating system described knows how much liquid refrigerant is contained in the evaporator 22 and its connecting pipe 21 to the receiver 20. The amount of gaseous refrigerant in the system is also known. It is therefore only necessary to establish the amount of liquid refrigerant contained within the receiver to determine whether the system is operating without sufficient refrigerant therein. According to this invention the scale 37 may be graduated to indicate pounds to definitely show the amount of liquid refrigerant in the receiver at the time refrigerant gas bubbles begin to flow into the liquid refrigerant line 21 to the evaporator 22.

Should the amount of refrigerant contained in a system of the type described be doubtful it is an easy, and simple task to defi-

nitely determine exactly how much refrigerant is in the system in the following manner. The receiver is of such length that a slight upward movement of its movable end will cause a substantial decrease in the level of liquid refrigerant contained in that end. During operation of the refrigerant circulating unit thumb screw 35 may be loosened and the end of receiver 20 may be moved or tilted up slightly. This movement of the receiver is for the purpose of lowering the level 39 of liquid refrigerant in the receiver to a point even with or below the end of outlet pipe 42 (see Fig. 3) so that gaseous refrigerant may enter the pipe 42 and line 21. During this upward movement of receiver 20 the sight glass coupling 43 should be observed and as soon as bubbles of gaseous refrigerant are seen to begin to flow through coupling 43 the upward movement of receiver 20 should be stopped. By referring to the scale 37 at this moment the stationary pointer 38 will indicate on the scale the exact quantity of liquid refrigerant in the receiver. Knowing the quantity of refrigerant in other portions of the system one can now, without guessing, definitely determine the quantity within the entire system. If the system is lacking refrigerant the correct amount thereof can be added to insure efficient operation thereof. It is to be understood that after refrigerant has been added to the system the receiver can be moved or tilted farther up in the same manner as before stated and the quantity of refrigerant in the system can be again checked if this quantity is doubtful.

It is thus apparent from the foregoing description that I have provided a refrigerating system having a means for readily and definitely determining the quantity of refrigerant therein without the necessity of disconnecting any portion thereof. Furthermore I have provided a refrigerant circulating unit having a portion thereof, which contains a quantity of liquid refrigerant adapted to be circulated through the system, pivotally or tiltably mounted. Therefore in installations where the unit is permanently secured to a cabinet or in case the unit is of excessive weight the receiver of the unit can be easily tilted for the purpose hereinbefore described.

While the form of embodiment of the present invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. A refrigerating apparatus comprising in combination, a refrigerant circulating unit including a container for a quantity of liquid refrigerant, said container being pivotally mounted to said unit, means communicating with said container for detecting the flow of refrigerant therefrom, and

means associated with said container for indicating the quantity of liquid refrigerant therein upon movement of the container.

2. A refrigerating apparatus comprising
5 in combination, a refrigerant circulating unit including a container for a quantity of liquid refrigerant, said container being pivotally mounted to said unit, a sight glass communicating with said container for detecting the flow of refrigerant therefrom,
15 and means associated with said container for indicating the quantity of liquid refrigerant therein upon movement of the container.

3. A refrigerating apparatus comprising
15 in combination, a refrigerant circulating unit including a container for a quantity of liquid refrigerant, said container being pivotally mounted to said unit, means communicating with said container for detecting the flow of refrigerant therefrom, and
20 a scale associated with said container for indicating the quantity of liquid refrigerant therein upon movement of the container.

4. A refrigerating apparatus comprising
25 in combination, a refrigerant circulating unit including a container for a quantity of liquid refrigerant, said container being pivotally mounted to said unit, a sight glass communicating with said container for detecting the
30 flow of refrigerant therefrom, and a scale associated with said container for indicating the quantity of liquid refrigerant therein upon movement of the container.

5. A refrigerating apparatus comprising
35 in combination, a refrigerant circulating unit including a container for a quantity of liquid refrigerant, said container being tiltable, means communicating with said container for detecting the flow of refrigerant
40 therefrom, and means associated with said container for indicating the quantity of liquid refrigerant therein upon tilting of the container.

6. A refrigerating apparatus comprising
45 in combination, a refrigerant circulating unit including a container for a quantity of liquid refrigerant, said container being tiltable, a sight glass communicating with said container for detecting the flow of refrigerant
50 therefrom, and means associated with said container for indicating the quantity of liquid refrigerant therein upon tilting of the container.

7. A refrigerating apparatus comprising
55 in combination, a refrigerant circulating unit including a container for a quantity of liquid refrigerant, said container being tiltable, means communicating with said container for detecting the flow of refrigerant there-
60 from, and a scale associated with said container for indicating the quantity of liquid refrigerant therein upon tilting of the container.

8. A refrigerating apparatus comprising
65 in combination, a refrigerant circulating

unit including a container for a quantity of liquid refrigerant, said container being tiltable, a sight glass communicating with said container for detecting the flow of refrigerant therefrom, and a scale associated with said
70 container for indicating the quantity of liquid refrigerant therein upon tilting of the container.

9. A refrigerating apparatus comprising
75 in combination, a motor, a compressor and a condenser mounted on a base, a receiver containing a quantity of liquid refrigerant, said receiver being pivotally mounted to said base, means communicating with said receiver for detecting the flow of refrigerant therefrom,
80 and means associated with the receiver for indicating the quantity of liquid refrigerant therein upon movement of the receiver.

10. A refrigerating apparatus comprising
85 in combination, a motor, a compressor and a condenser mounted on a base, a receiver containing a quantity of liquid refrigerant, said receiver being pivotally mounted to said base, a sight glass communicating with
90 said receiver for detecting the flow of refrigerant therefrom, and means associated with said receiver for indicating the quantity of liquid refrigerant therein upon movement of the receiver.

11. A refrigerating apparatus comprising
95 in combination, a motor, a compressor and a condenser mounted on a base, a receiver containing a quantity of liquid refrigerant, said receiver being pivotally mounted to said base, means communicating with
100 said receiver for detecting the flow of refrigerant therefrom, and a scale associated with said receiver for indicating the quantity of liquid refrigerant therein upon movement of the receiver.

12. A refrigerating apparatus comprising
105 in combination, a motor, a compressor and a condenser mounted on a base, a receiver containing a quantity of liquid refrigerant, said receiver being pivotally mounted to said
110 base, a sight glass communicating with said receiver for detecting the flow of refrigerant therefrom, and a scale associated with said receiver for indicating the quantity of liquid refrigerant therein upon movement of the
115 receiver.

In testimony whereof I hereto affix my signature.

HARRY B. HULL

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