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OIL SEPARATOR FOR REFRIGERATING SYSTEMS

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Fig. 1.

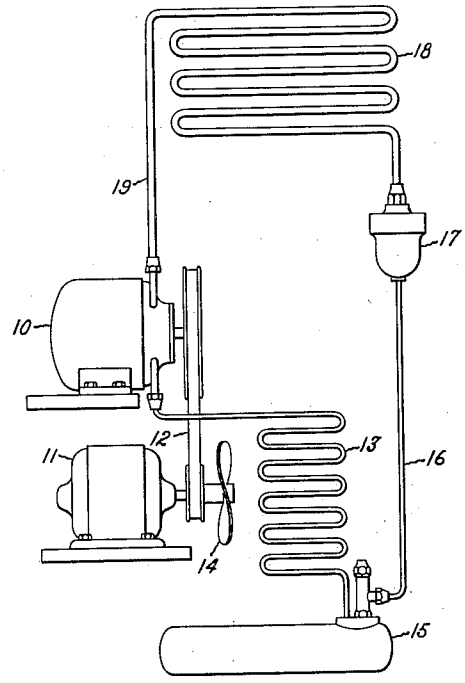
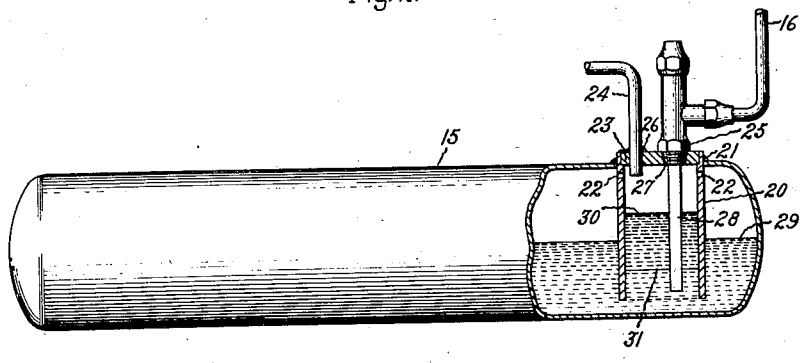


Fig. 2.



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OIL SEPARATOR FOR REFRIGERATING SYSTEMS

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5 Claims. (Cl. 62—115)

My invention relates to oil separators for refrigerating systems.

In refrigerating systems of the mechanical type it is a common practice to employ a quantity of lubricating oil in the compressor case in order to insure proper lubrication of the moving parts of the compressor. In such systems it frequently happens that lubricating oil in a finely divided state is discharged from the compressor with the compressed refrigerant and enters the liquid receiver which is provided for the accumulation of liquid refrigerant flowing from the condenser before it is admitted to the evaporator. In refrigerating machines employing refrigerants such as sulphur dioxide in which oil may become entrained it has been found that oil separates by gravity from the liquid refrigerant in the receiver and is trapped there, and that under some conditions of operation, there does not remain in the compressor case sufficient oil for lubrication purposes.

It is an object of my invention to provide a refrigerating system having a liquid receiver provided with an oil separator and arranged so that trapping of oil within the liquid receiver is prevented.

Further objects and advantages of my invention will become apparent as the following description proceeds, and the features of novelty which characterize my invention will be pointed out in the claims annexed to and forming a part of this specification.

For a better understanding of my invention reference may be had to the accompanying drawing in which Fig. 1 is a diagrammatic view of a refrigerating system embodying my invention, and Fig. 2 is a detailed sectional view of the liquid receiver shown in Fig. 1.

Referring now to Fig. 1, I have shown a refrigerating system of the compression type including a compressor 10 driven by a motor 11 through a belt 12. Gaseous refrigerant, such as sulphur dioxide, compressed in the compressor 10, is liquefied in a condenser 13. The condenser is cooled by a fan 14 mounted on the shaft of the motor 11. The liquid refrigerant flows from the condenser to a liquid receiver 15 and then through a conduit 16 and a flow-controlling device or expansion valve 17 to an evaporator 18. The refrigerant in the evaporator 18 is vaporized upon absorption of heat from the compartment to be cooled, and the vaporized refrigerant returns to the compressor through a conduit 19. In order that the compressor 10 shall be properly lubricated, a quantity of lubricating oil is introduced into the compressor case which is connected in the closed refrigerant circuit. The lubricating oil is selected so that when entrained in the liquid refrigerant it will separate by gravity when allowed to stand. Lubricating oil enters the receiver 15 in a finely divided state suspended in the liquid refrigerant and gradually rises and collects on top of the liquid refrigerant.

In accordance with my invention, I provide an arrangement for separating by gravitation oil which may be discharged by the compressor from the liquid refrigerant in a restricted portion of the liquid receiver and for withdrawing the oil and allowing it to pass through the expansion valve to the evaporator when a predetermined quantity of oil has collected within the restricted portion of the receiver.

Referring now to Fig. 2, which is a detailed sectional view of the liquid receiver, I provide an upright cylindrical baffle 20 at one end of the cylindrical receiver 15. The baffle 20 is mounted in an opening at the top of the receiver 15 and is welded thereto, as shown at 21, and extends downwardly toward the bottom of the receiver enough space being left between the baffle and the bottom of the receiver to provide communication between the receiver and the inside of the baffle. At the upper end of the baffle 20 close to the top of the receiver 15, I provide holes 22 which furnish communication between the upper portion of the receiver and the upper portion of the baffle and equalize the pressures in the receiver and inside of the baffle. A circular closure plate 23 is secured in the upper end of the baffle 20 and has mounted therein an inlet connection 24 and an outlet connection 25. The inlet connection 24 is welded to the plate 23 at 26 and opens into the baffle 20 near the upper end thereof. The outlet connection 25 is secured to the plate 23 by threaded connection 27 and is provided with a tube 28 extending down into the baffle 20 almost to the end thereof. The tube 28 is the liquid line of the refrigerating system and communicates directly with the conduit 16 leading to the expansion valve or flow-controlling device 17.

During the operation of the refrigerating system shown, liquid refrigerant with oil suspended therein enters the receiver through the tube 24, the liquid refrigerant in the receiver being maintained substantially at the level indicated at 29 in the main portion of the receiver 15. The oil which enters the baffle 20 collects and floats on top of the refrigerant within the baffle and, since the density of the oil is less than the density of

the liquid refrigerant, the oil will float at some level 30 above the level 31 of the liquid refrigerant in the baffle 20, the level 31 being lower than the level 29 of the refrigerant in the main portion of the receiver. The dimensions of the baffle 20 are such that the mixture of oil and refrigerant will be confined to the baffle until the oil has separated by gravitation from the refrigerant. The liquid refrigerant from which the oil has separated is displaced into the main portion of the receiver when a mixture of liquid and oil is admitted at the top of the baffle. The gaseous refrigerant in the baffle 20 and in the main portion of the receiver 15 will be at the same pressure due to the holes 22 at the top of the baffle 20, which permit ready communication between the main portion of the receiver and the inside of the baffle 20, and hence the pressure of the gaseous refrigerant will not affect the relative heights of the liquids in the receiver and in the baffle. As the oil continues to collect within the baffle and as the liquid refrigerant is withdrawn from the receiver through the liquid line 28, the level 31 of the liquid refrigerant within the baffle will become lower, and when sufficient oil has collected, the line 31 will be at the lower end of tube 26 and oil will then be admitted to the liquid line. As has been pointed out, no oil will flow into the main portion of the receiver 15, since all globules of oil entering the baffle 20 will rise to the surface and will not flow with the refrigerant into other parts of the receiver. The level 29 will be maintained substantially constant since the area of the receiver 15 is made large enough to allow a considerable flow of liquid refrigerant without substantial change in the level thereof. This arrangement prevents trapping of oil in the receiver and at the same time insures a sufficient quantity of lubricating oil at all times for proper lubrication of the moving parts of the system.

It is apparent from the foregoing that I have provided a simple and rugged device for separating lubricating oil from the refrigerant in a refrigerating system and for preventing the trapping of oil and consequent impairing of the lubrication.

While I have shown and described my invention as embodied in a mechanical refrigeration system of a specific type, I do not desire my invention to be limited to the specific construction shown and described, and I intend in the appended claims to cover all modifications within the spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent in the United States is:

1. A refrigerating system including a compressor, means for lubricating said compressor, said means producing entrainment of lubricant in the refrigerant discharged from said compressor, a liquid receiver, an upright cylindrical baffle having openings at the top and bottom thereof and arranged in said receiver, said openings providing communication between the interior of said baffle and said liquid receiver both above and below the level of liquid refrigerant in said liquid receiver, means arranged near the top of said baffle for admitting liquid refrigerant and lubricant from said compressor within said baffle, and means for removing liquid from within said baffle and below the level of liquid refrigerant in said receiver.

2. A refrigerating system including a compressor and a case therefor, means including a body of lubricant in said case for lubricating said compressor, said means producing entrainment of lubricant in the refrigerant discharged from said compressor, a liquid receiver, an upright cylindrical baffle arranged within said receiver and having openings at the top and bottom thereof, said openings providing communication between the interior of said baffle and said liquid receiver both above and below the level of liquid refrigerant in said liquid receiver, means arranged near the top of said baffle for admitting refrigerant and lubricant entrained therein from said compressor to said receiver within said baffle, and means opening into said receiver within said baffle and above the lower opening therein for removing liquid refrigerant and lubricant from said receiver.

3. A liquid receiver for refrigerating systems including a closed vessel, an upright cylindrical baffle arranged within said vessel and communicating with said vessel near the top and bottom of said baffle, an inlet connection opening near the top of said baffle, and an outlet connection opening into said receiver within said baffle above the bottom opening therein and below the normal level of liquid refrigerant within said receiver.

4. A liquid receiver for refrigerating systems including a closed vessel, an upright cylindrical baffle arranged within said vessel and communicating with said vessel near the top and bottom of said baffle, an inlet connection opening near the top of said baffle, and a liquid line entering said receiver and opening within said baffle above the lower opening therein.

5. A liquid receiver for refrigerating systems including a closed vessel, means including an upright cylindrical baffle arranged within said vessel and communicating with said vessel near the top and bottom of said baffle for preventing trapping of oil in said receiver, an inlet connection opening near the top of said baffle, and means including a liquid line communicating with said receiver within said baffle above the lower opening therein for removing liquid refrigerant and oil from said receiver.

ALBERT A. RALSTON.