

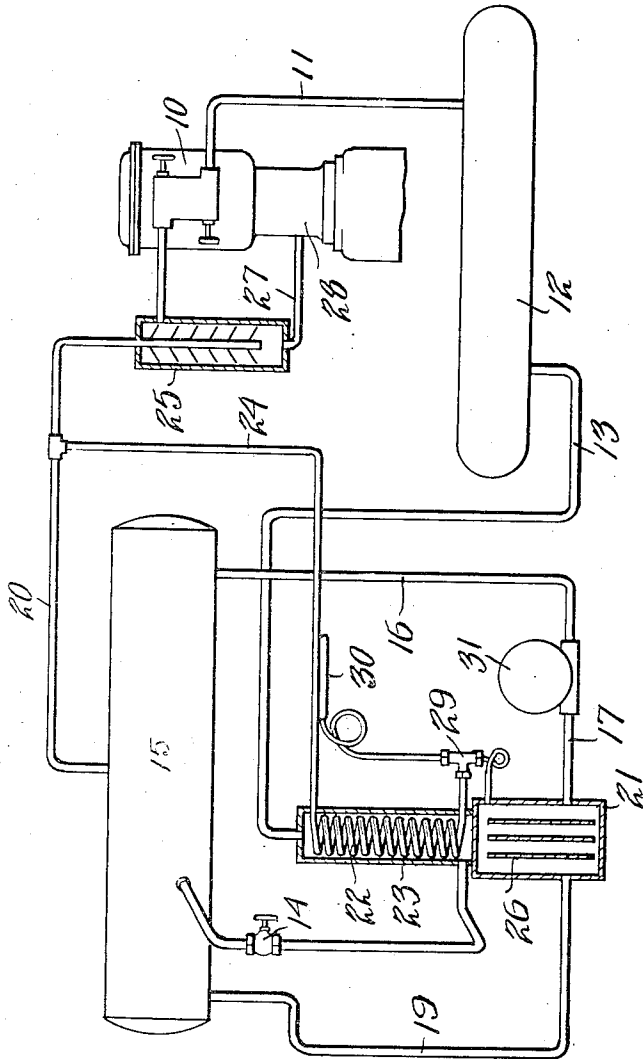
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OIL RECOVERY DEVICE

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OIL RECOVERY DEVICE

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This invention relates to method and means for removing oil or other impurities from a volatile liquid. While not limited to use with a refrigerating system the invention does have particular application to the removal of oil from the liquid refrigerant in a refrigerating system.

An object of the invention therefore is to provide a means and method of removing oil from a more volatile liquid and to carry out the process while the liquid is being circulated in performing its regular function in the system in which it is an operative element.

Referring to the accompanying drawing on which similar reference characters indicate similar parts,

The single figure is an elevation of the invention applied to a refrigerating system.

In systems where fluids are circulated, such as in refrigerating plants, lubricating oil from the compressor is frequently distributed through the piping of the system. The presence of oil on the low temperature side of the system is particularly undesirable as it results in a lower heat transfer, lower efficiency and impairs operation of the plant. In some cases this oil may be drained directly out of the system but in other instances, especially where it is soluble in the refrigerant or where it is lighter than the refrigerant and hence floating on the top of the refrigerant, draining out of the oil is not efficient.

In our invention we remove oil from any portion of the system and return it to the crank case or compressor or to any other vessel from which it may be drained out of the system. We accomplish this by taking out a mixture of oil and refrigerant from such points in the system as where the oil concentration is likely to be highest and pass this oil through a heat exchanger where the mixture of oil and some refrigerant present in the oil is heated. The refrigerant gas developed by the heating is delivered to the suction of the compressor after separating it from the oil and the oil is returned to the compressor crank case or disposed of in some other suitable way.

In the drawing reference character 10 indicates a refrigerant compressor in which refrigerant is delivered through a pipe 11 into a condenser and liquid refrigerant receiver 12. From this receiver liquid refrigerant is delivered through pipe 13 through vessel 23 and through expansion valve 14 into an evaporator 15. Liquid refrigerant from some portion of the evaporator 15 is drawn out through pipe 16 by a pump 31 and forced by the pump through line 17 through oil separator 21 and pipe 19 back into the evaporator. The oil separator 21 contains a plurality of baffle plates 26 which plates or screens assist in freeing the refrigerant from the oil. In the system as illustrated the oil is lighter than the liquid refriger-

ant and hence floats to the top of the vessel 21. Oil from the top of the vessel 21 together with such refrigerant as may be mixed with it is expanded through an expansion valve 29 into a coil 22 within the vessel 23 where the oil and refrigerant mixed with it is raised in temperature by the hot liquid refrigerant from the line 13. This heating evaporates the refrigerant in the oil and the oil and the gaseous refrigerant pass off through the line 24 into the line 20 through which line the oil and gas pass into an oil separator 25. Here the oil is separated from the gaseous refrigerant and drops to the bottom of tank 25 from which point it passes through line 27 to the crank case 28 of the compressor. The gaseous refrigerant mixed with the gas returning through the line 20 is delivered into the suction of the compressor 10. The expansion valve 29 is operated by a thermostat 30 which is placed in heat exchange relation with the suction line 24 so that the valve 29 opens only when the pipe 24 is relatively warm and closes when the pipe 24 is cold, thus automatically feeding oil or refrigerant to coil 22 and preventing liquid refrigerant from passing to the suction line 20 to the compressor 10.

While the automatically operated valve 29 is found to be a convenience it is not absolutely essential, as any kind of expansion valve may be used in place of the valve 29. If the oil in the oil separating chamber 21 is heavier than the refrigerant in this chamber the line passing to valve 29 will be positioned near the bottom of the chamber instead of at the top as shown in the form illustrated. In the form illustrated a pump is shown for circulating the refrigerant from and back to the evaporator 15. This develops a pressure upon the separated oil and refrigerant in the chamber 21 to force it through the coil 22 and pipe 24 into the suction line 20. If the points from which the oil is to be moved are sufficiently elevated above the compressor the flow of oil can be controlled by gravity and the pump may be found unnecessary. When operating on the low side of the refrigerating system a pump may be used to circulate the oil and the refrigerant mixed with it through the coil 22 without use of the pump 31 for circulating refrigerant from and back to evaporator 15. Again attention is called to the fact that, while, for the purpose of convenience, the system has been defined in its use with a refrigerating system, in the removal of oil from the refrigerant, the invention is not limited to such a system or to the removal of oil. Other impurities such as water or brine may be present and the system is intended to cover the removal of such or other liquid impurities. There are other processes where the separation of oil from the liquid is found necessary. The invention is held broad

enough to cover the removal of oil or other liquid impurities from any liquid in which it is mixed and from which it is desired to have it removed.

It will be obvious to those skilled in the art that various changes may be made in our device without departing from the spirit of the invention and therefore we do not limit ourselves to what is shown in the drawing and described in the specification, but only as indicated by the appended claims.

Having thus fully described our said invention, what we claim as new and desire to secure by Letters Patent, is:

1. In a refrigerating system having a body of liquid refrigerant with oil mixed therein, means for circulating the refrigerant containing the oil, means for heating a portion of the mixture to evaporate the refrigerant from the oil, means for delivering the mixture of evaporated refrigerant and oil to a suction line leading to a compressor, a liquid separator in said line for delivering the oil to some portion of the compressor for lubricating said compressor and for delivering the vaporized refrigerant to the suction of the compressor, substantially as set forth.

2. In a refrigerating system an oil separator comprising means for withdrawing oil from a portion of the system wherein oil is in a concentrated form, means for vaporizing the refrigerant from the oil, and means controlled by the temperature of the vaporized oil and refrigerant mixture for controlling the passage of the oil and refrigerant through the heating system, substantially as set forth.

3. In a refrigerating system, a compressor, a condenser, an evaporator, an oil separator, means for circulating oil laden refrigerant from said evaporator through said separator and directly back to said evaporator, means for drawing off oil from said separator, means for evaporating refrigerant therefrom and delivering said evaporated refrigerant to the suction of the compressor and the oil to the crank case of said compressor, substantially as set forth.

4. That improvement in the art of refrigeration which comprises withdrawing a quantity of oil and refrigerant from an accumulation in the system, reducing its pressure, and controlling said withdrawal in accordance with the temperature of fluid withdrawn.

5. That improvement in the art of refrigeration which comprises withdrawing oil and refrigerant mixture a large portion of which is oil from an accumulation in the system, and stopping said withdrawal when the decrease of the proportion of oil reaches a predetermined amount.

6. That improvement in the art of refrigeration which comprises withdrawing a mixture the greater portion of which is oil and the lesser portion of which is refrigerant from an accumulation in the system, and reducing said withdrawal when the withdrawn mixture becomes substantially all refrigerant.

7. That improvement in the art of refrigeration which comprises removing oil and refrigerant from a body of oil and refrigerant and controlling such removal in accordance with the quantity of refrigerant withdrawn.

8. That improvement in the art of refrigeration which comprises removing oil and refrigerant

from an accumulation in a refrigerating system, and controlling such removal in accordance with the ratio of oil and refrigerant withdrawn from the accumulation.

9. That improvement in the art of refrigeration wherein a liquid refrigerant is evaporated, which comprises withdrawing oil and refrigerant from an accumulation in a system and utilizing the refrigerant withdrawn to cool the refrigerant supply prior to evaporation.

10. That improvement in the art of refrigeration comprising removing oil from an accumulation and returning it to a place to be used and controlling said removal by the evaporative temperature of the mixture of oil and refrigerant removed.

11. That improvement in the art of refrigeration comprising removing oil from an accumulation and returning it to a place to be used and controlling said removal by the evaporative temperature of the mixture of oil and refrigerant, and passing said mixture in heat exchange relation with incoming liquid refrigerant from a source of supply.

12. In a refrigerating system including compressing, condensing and evaporating means, means for precooling a mixture of oil and liquid from the condenser by liquid refrigerant withdrawn from an accumulation in the system, and means for controlling the flow of said mixture through the precooling means in accordance with the evaporation of liquid from the mixture passing through the precooler.

13. Removing oil and refrigerant from an evaporative system, subjecting it to heat exchange with freshly condensed refrigerant, reducing the pressure of the withdrawn fluid, and controlling said removal by the temperature of the mixture of oil and refrigerant.

14. That improvement in the art of refrigeration comprising removing oil and refrigerant from a compression system, and returning the oil to the crankcase of the compressor for reuse in the system, reducing the pressure of the withdrawn fluid, and controlling said removal by the temperature of the mixture in heat exchange relation with liquid from the condenser.

15. In a refrigerating system containing a refrigerant and a lubricant, means for accumulating a body of the refrigerant and lubricant, means for withdrawing refrigerant and lubricant from such accumulation, and means for varying the amount of withdrawn liquid in proportion to the amount of refrigerant therein, and means for passing the withdrawn liquid in heat exchange relation with refrigerant at a warmer temperature in the system for cooling the same.

16. In a refrigerating system containing a refrigerant and a lubricant, means for accumulating a body of the refrigerant and lubricant, means for withdrawing refrigerant and lubricant from such accumulation, and means for varying the amount of withdrawn liquid in proportion to the amount of refrigerant therein, means for passing the withdrawn liquid in heat exchange relation with refrigerant at a warmer temperature in the system for cooling the same, and means for discharging the withdrawn liquid into the suction line of the system.

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