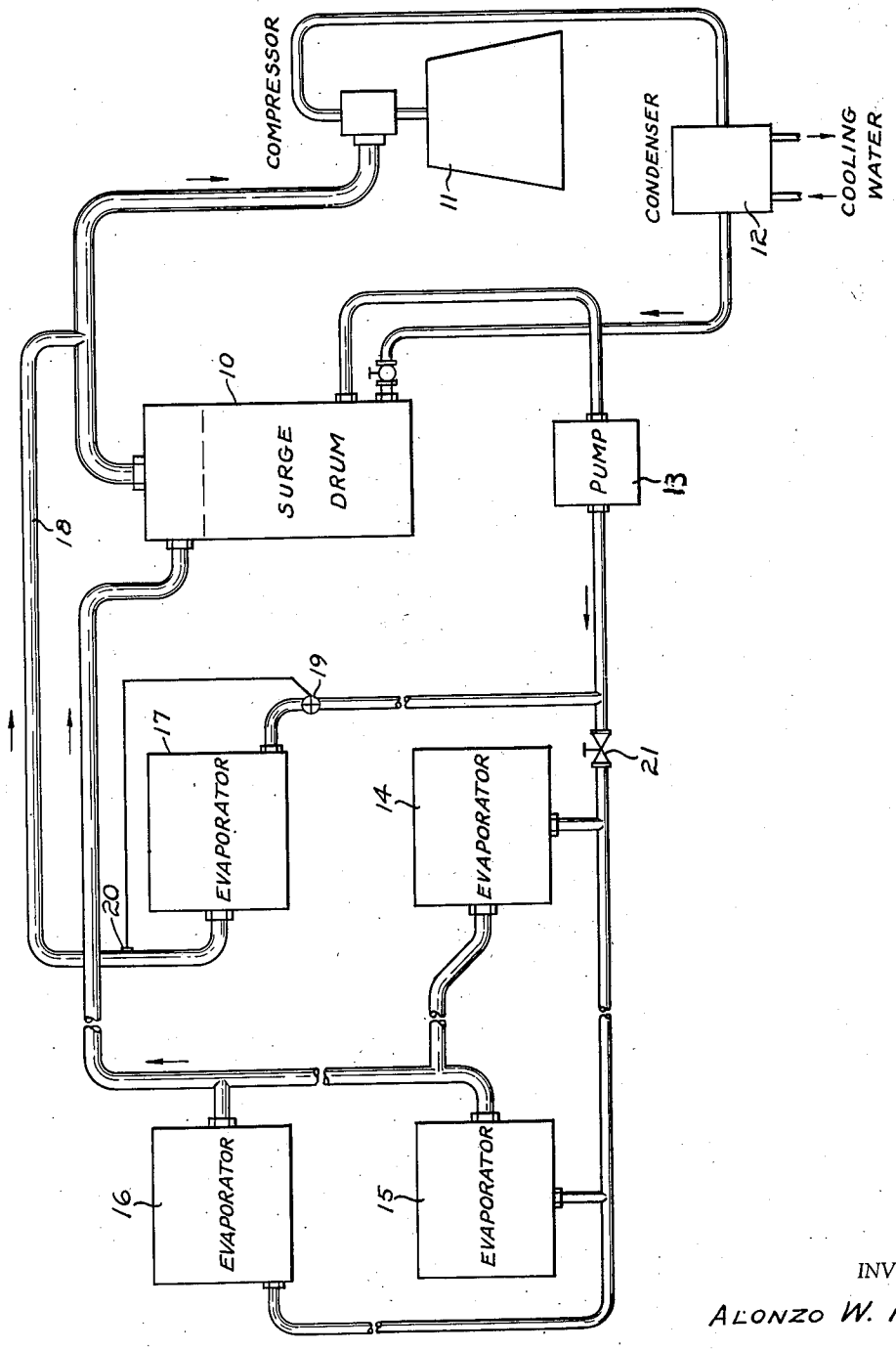
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OIL REMOVAL SYSTEM FOR REFRIGERATION APPARATUS

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OIL REMOVAL SYSTEM FOR REFRIGERATION APPARATUS

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4 Claims. (Cl. 62—3)

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This invention relates to refrigeration apparatus and more particularly to oil removal systems in apparatus designed to provide extremely low temperatures for low temperature storage of food products or for test rooms and the like.

It has been determined that refrigeration systems best adapted to extreme low temperature applications are those which employ a surge drum as a storage receptacle for liquid refrigerant supplied by a compressor, and in which the liquid refrigerant in the surge drum is circulated, preferably by means of a small positive displacement type pump, to conventional evaporators.

The problem of oil removal is unfortunately as much of a problem in apparatus of this type as in any conventional refrigeration system. There are numerous devices shown in the prior art for effecting a separation of oil from the refrigerant and returning it to the compressor. Refrigerants of the Freon group are all readily miscible with lubricating oils and it is with apparatus using such refrigerants with which the instant invention is concerned. My prior Patent No. 2,617,265 illustrates one form of apparatus for achieving the desired results in apparatus of this type. The apparatus shown in that patent makes use of the waste heat from the motor which drives the pump to operate a small oil still which may or may not be constructed as a part of the surge drum itself. The preferred embodiment of the apparatus of this invention, however, would include locating both the pump and the oil still evaporator within the refrigerated space.

This invention has at its object the provision of apparatus for effecting a separation of oil from the refrigerant and returning it to the compressor in a simple and novel manner. In general, this invention applies to plural evaporator systems and makes use of one of the evaporators in the cold space to serve also as an oil still. A complete understanding of this invention may be had from reading the following specification in conjunction with the attached sheet of drawing, the single figure of which shows in diagrammatic form a preferred embodiment of the apparatus.

Referring now to the drawing, the surge drum 10, compressor 11 and condenser 12 are connected together by closed conduits so that the compressor may function to supply liquid refrigerant to the lower portion of the surge drum 10 and to withdraw gaseous refrigerant from the upper portion of the drum. Operation of the compressor may be controlled in any convenient manner, as for example by a float switch in the drum to maintain therein a predetermined level of liquid refrigerant.

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The remainder of the refrigerant circuit includes a pump 13 and a plurality of evaporators 14, 15, 16 and 17. The pump 13 may conveniently be of the positive displacement hermetic liquid type. Closed conduits connect the inlet of the pump with the lower portion of the surge drum, and the outlet of the pump with the inlet of each of the evaporators. It will be understood that any number of evaporators could be used and the four shown in the drawing are for illustrative purposes only. Also, as indicated in the drawing, the evaporators may be located at substantial distances from each other. Evaporators 14, 15 and 16 have their outlets connected to a common return conduit which connects them to the upper portion of the surge drum 10. Evaporator 17, however, has its return conduit 18 connected to the suction line of the compressor. Admission of refrigerant to evaporator 17 may be controlled by a conventional thermal expansion valve 19 and bulb 20. Obviously, an equally workable arrangement would be to substitute a capillary tube for valve 19. Such a tube, of course, would have to be accurately proportioned for a specific design balance.

In the operation of the system therefore, the evaporator 17 functions both as an evaporator to cool the refrigerated space and as an oil still to separate oil from the refrigerant. By virtue of its separate return connection to the suction line of the compressor, the separated oil is carried through the return conduit 18 and back to the suction inlet of the compressor.

In order to assure a proper working pressure for this evaporator, a valve 21 is provided in the outlet conduit from the pump 13. This valve is positioned beyond the point where the evaporator 17 inlet conduit is connected to the outlet of the pump 13. This serves then to provide a slightly higher feed pressure in the line to evaporator 17 than in the lines to the remaining evaporators and valve 19 will therefore function in normal fashion. In other words, valve 21 produces a pressure difference to assure feeding refrigerant through control valve 19. Also, while indicated as a valve in the drawings, 21 could take any known form of restricting means.

From the foregoing, it will be apparent to those skilled in the art that the apparatus herein disclosed comprises a new and useful oil return system especially adapted for use in connection with a specific type of refrigeration system applicable generally to the extreme low temperature field. The novel features are set forth with particularity in the appended claims.

I claim:

1. A refrigeration system comprising in combination: a surge drum; compressor means; condenser means; conduit means connecting said surge drum, compressor and condenser for furnishing liquid refrigerant to the lower portion of said drum and removing gaseous refrigerant from the upper portion of said drum; a plurality of evaporators; a pump connected to supply liquid refrigerant from said drum to said evaporators; means for establishing a pressure in the refrigerant supply line to one of said evaporators higher than the pressure in the supply line to the other evaporators; means for controlling the admission of refrigerant to said one evaporator; a closed conduit connecting the outlet of said one evaporator to the suction side of said compressor; and a common return conduit connecting the outlets of the remainder of said evaporators with said surge drum; wherby said one evaporator functions also as an oil still to return oil to the compressor.

2. In a refrigeration system of the type in which a compressor maintains a body of liquid refrigerant in a surge drum and in which a pump is connected to feed refrigerant to a plurality of evaporators; an oil return system comprising: means connecting the outlet side of one of said evaporators to the suction side of the compressor; means for establishing a greater pressure in the feed line to said one evaporator than in the lines to the other evaporators; means for controlling the admission of refrigerant to said one evaporator, and means providing a common return for refrigerant to the surge drum from the remaining evaporators.

3. A refrigeration system comprising in combination: a surge drum; a compressor; a condenser; means including closed conduits connecting said drum, compressor and condenser in a closed refrigerant circuit whereby said compressor will function to maintain a body of liquid refrigerant in the base of said drum and withdraw gaseous refrigerant from the upper portion of said drum; a plurality of evaporators; a pump; a closed conduit connected between the inlet of said pump and the lower portion of said surge drum; a second closed conduit connected between the outlet of said pump and the inlet of said evaporators; valve means positioned in said second conduit beyond the inlet to one of said evaporators; a third conduit connected between the outlet of said one evaporator and the suction side of said compressor; a thermal expansion valve connected in the inlet line of said one evaporator; and conduit means connected between the outlets of the other evaporators and the upper portion of the surge drum.

4. A refrigeration system as defined by claim 1 in which the pump is a positive displacement hermetic liquid type.

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References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
2,032,230	Small et al.	Feb. 25, 1936
2,154,905	Kagi	Apr. 18, 1939
2,223,882	Beline	Dec. 3, 1940
2,570,979	Phillips	Oct. 9, 1951

OTHER REFERENCES

Air Conditioning and Refrigeration News, Sept. 1, 1952, p. 10.