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REFRIGERATING SYSTEM

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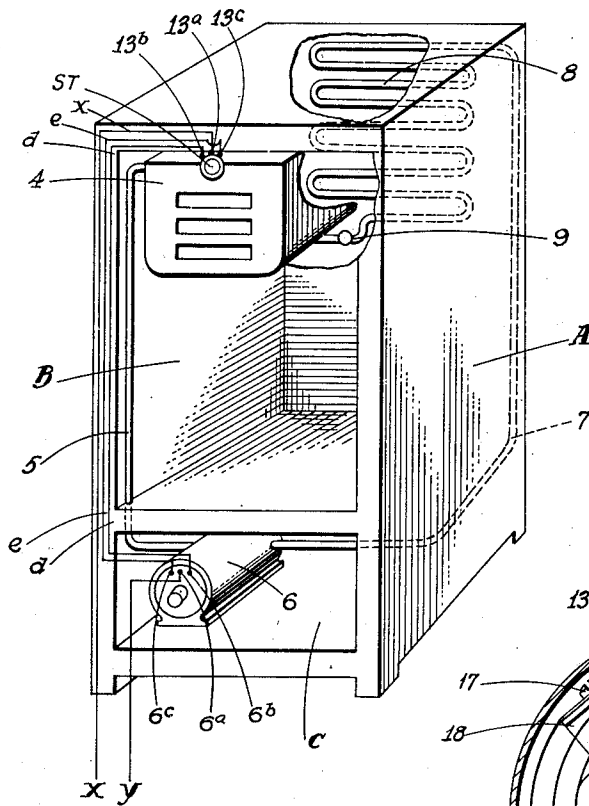


Fig. 1

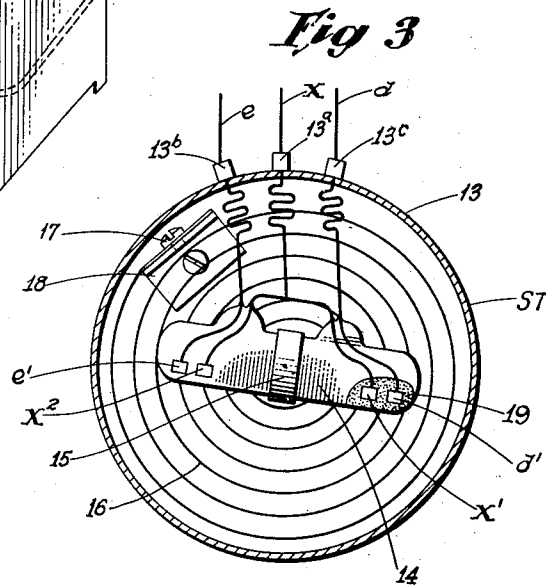
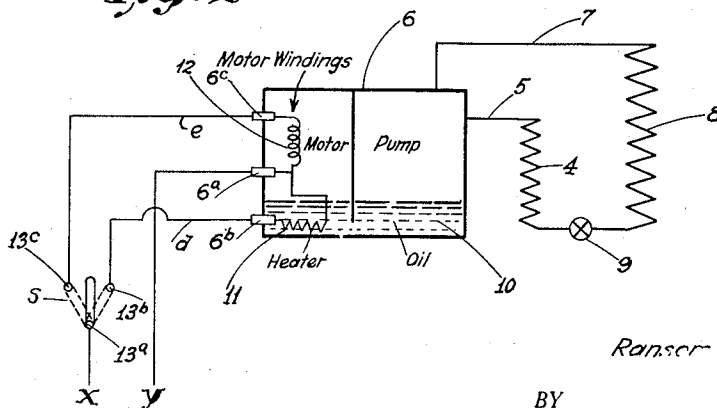


Fig. 3

Fig. 2



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REFRIGERATING SYSTEM

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6 Claims. (Cl. 62-4)

This invention relates to refrigeration and more particularly to refrigerating systems of the evaporator-compressor-condenser type for circulating a refrigerant substance in a closed cycle.

5 Systems of the above type require lubrication for the moving parts of the motor and of the pump or compressor. If the lubricant is substantially insoluble in the refrigerant, as in some systems which use sulphur dioxide as the working substance, the lubricant will separate out by gravity. When a lubricant and a refrigerant are chosen which are perfectly soluble in each other, as methylene chloride or carbon tetrachloride for the refrigerant and a hydrocarbon or petroleum oil for the lubricant in accordance with the disclosures of certain of my prior patents including No. 1,698,938, dated January 15, 1929, difficulties follow from the tendency of the cool oil in the pump reservoir or sump to pick up the refrigerant thus depleting the supply of the latter in the evaporator and thinning out the oil sufficiently to impair lubrication. Prior methods for overcoming the above disadvantages have been effective during operation periods but have not provided for shut-down periods.

25 Among the objects of the present invention are to maintain more nearly constant the proportions of components in a system using a lubricant which is wholly soluble in the refrigerant, to keep the oil from taking up undue amounts of refrigerant when the system is shut down or upon starting, and to improve, to simplify, and to render more efficient prior known systems and apparatus.

35 The present invention insures constant conditions in the system by providing means during shut-down periods to keep the oil in the pump warmed to a point where little refrigerant will dissolve in it but to make such means inoperative when the pump is in operation. By preference an electric heater is provided in the oil sump for operation in alternation with the electric motor which drives the pump. If the system is controlled by a thermostat or the equivalent, auxiliary contacts are provided thereon so that on interruption of the motor circuit the heater circuit is closed and vice versa. Thus the oil is kept warm enough to remain thick or undiluted and the supply of refrigerant in the evaporator is not diminished when operation is resumed after a shut-down, since the refrigerant vapor will not dissolve in the warm oil.

In order to illustrate the invention one concrete embodiment thereof is shown in the accompanying drawing, in which:

Fig. 1 is a perspective view of a self-contained household refrigerating outfit with the doors of the cabinet removed and certain parts broken away to disclose the refrigerating apparatus;

Fig. 2 is a diagrammatic showing of both the refrigerating and electric circuits; and

Fig. 3 is an enlarged transverse sectional view through the casing of the thermostatic control.

Fig. 1 shows the invention embodied in a self-contained refrigerating outfit comprising a refrigerator cabinet A having a refrigerating or food storage compartment B and an apparatus compartment C therebeneath. The refrigerating compartment B has in its upper left hand corner a conventional evaporator 4 from which extends a pipe 5 to the inlet side of the pump of a sealed motor pump unit 6 disposed in the present instance in apparatus compartment C. Discharge pipe 7 from the pump leads to a condenser 8, which in the present instance is mounted upon the back of cabinet A. From condenser 8 the working substance is fed back into evaporator 4 through a suitable expansion device 9. The apparatus so far described is wholly conventional and the parts thereof may be of any suitable or desired type.

Since the motor and the pump within motor pump unit 6 may be of any desired type, no attempt is made to illustrate them either in the perspective showing of Fig. 1 or in the diagrammatic showing of Fig. 2. To insure adequate lubrication of the moving parts within the motor pump unit 6, the same has a sump containing a body of oil 10. By preference the refrigerant and the oil are chosen to be mutually and wholly soluble in each other. A heater 11, preferably of the electric type, is disposed in oil reservoir 10 for the purpose of driving out any refrigerant which may be in solution and for keeping the body of oil warm so that when the motor starts up the refrigerant vapor will not condense into the oil sump or reservoir 10. Heater 11 is operated only during shut-down periods. Automatic means, in the present instance thermally operated, are arranged for controlling the operation of both heater 11 and the motor of motor pump unit 6. In the wiring arrangement disclosed in Figs. 1 and 2, one of the electrical mains *x* leads directly to the control means, indicated generally at S in Fig. 2, while the other main *y* enters the motor pump unit through an insulated duct 6a and branches to connect both with heater 11 and with the motor windings 12. From heater 11 a lead *d* extends through duct 6b in the motor pump unit to the control means

and a similar lead *e* extends from the other end of the motor windings through a duct 6c to the control means.

Control S may be of any suitable or desired type, one form of control being disclosed in Fig. 3 and its location shown in Fig. 1. By preference the control is operated automatically by the heat of the box and takes the form of a thermostat ST (Figs. 1 and 3), having a casing 13 with insulated ducts therethrough 13a, 13b, and 13c for main *x* and leads *d* and *e*, respectively. Within casing 13 a switch of the "Contactor" type is mounted, comprising a sealed glass tube 14 having a band 15 about its central portion securing tube 14 to the free inner end of a coil 16 of bi-metallic spring metal, the outer end of which is fastened by suitable means such as a screw 17 to a bracket 18 secured to the back of casing 13. Within tube 14 is a mass of mercury 19 which moves from one end of tube 14 to the other as the tube is inclined through the action of the thermostatic coil 16 and serves to establish contact between terminals *x'* and *d'* on the one hand and terminals *e'* and *x²* on the other. Main *x* after it enters thermostat casing 13, branches to connect with terminals *x'* and *x²* while leads *e* and *d* lead directly to terminals *e'* and *d'*, respectively.

From the above it will be apparent that heater 11 is operated only when the pump motor is not in operation, i. e., during the shut-down periods of the refrigerating apparatus, that the heater will keep the body of oil 10 warm and substantially undiluted by refrigerant, and that inasmuch as the body of oil is not allowed to become cold the refrigerant vapor will not condense into it when the motor pump unit is put into operation. It is especially to be noted that the present invention aims to keep the oil thick and undiluted by heat which is the direct opposite of the general procedure in which heat is applied to keep oil thin.

While the invention has been herein disclosed in what is now considered to be a preferred form, it is to be understood that the invention is not limited to the specific details thereof but covers all changes, modifications, and adaptations within the scope of the appended claims.

I claim as my invention:

1. In an intermittent motor-driven compression refrigerating system utilizing a refrigerant

and a lubricant mutually soluble in all proportions and having a body of said lubricant in a sump in said compressor for lubricating the latter, heating means for said body of lubricant, and means for alternately operating said heating means and the motor.

2. In a refrigerating system having an evaporator, a pump, and a condenser connected together to form a closed circuit, an electric motor for operating said pump, a reservoir for oil in said pump for lubricating the latter, an electric heater in said reservoir, and means for alternately supplying electricity to said heater and to said motor.

3. In a refrigerating system having an evaporator, a pump, and a condenser connected together to form a closed circuit, an electric motor for operating said pump, a reservoir for oil in said pump for lubricating the latter, an electric heater in said reservoir, and a thermally operated switch for alternately supplying electricity to said heater and to said motor.

4. In a refrigerating system having an evaporator, a motor-pump unit, a condenser forming a closed thermodynamic circuit, said unit having a body of lubricant therein, said system utilizing a refrigerant wholly soluble in said lubricant, a heater in said body of lubricant, and means for operating said heater only when said motor-pump unit is not in operation.

5. A self-contained refrigerating outfit comprising a cabinet having a refrigerating chamber, an evaporator within said chamber, a motor-pump unit and a condenser outside said chamber but connected to said evaporator to form a closed cycle system, said unit having an oil sump and a heater therein, said system using a refrigerant wholly soluble in the oil in said sump, and means in said chamber controlled by the temperature thereof for automatically operating said unit and said heater in alternation.

6. A refrigerating outfit comprising a cabinet having a refrigerating chamber, an evaporator within said chamber, a motor-pump unit and a condenser outside said chamber but connected to said evaporator to form a closed-cycle system, said unit having an oil sump and an electric heater therein, and a thermally operated switch for intermittently supplying electric current to said heater.

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