Jan. 31, 1933. C. E. L. LIPMAN 1,895,806

REFRIGERATOR

Filed Sept. 2, 1930 3 Sheets-Sheet 1

Fig. 1.

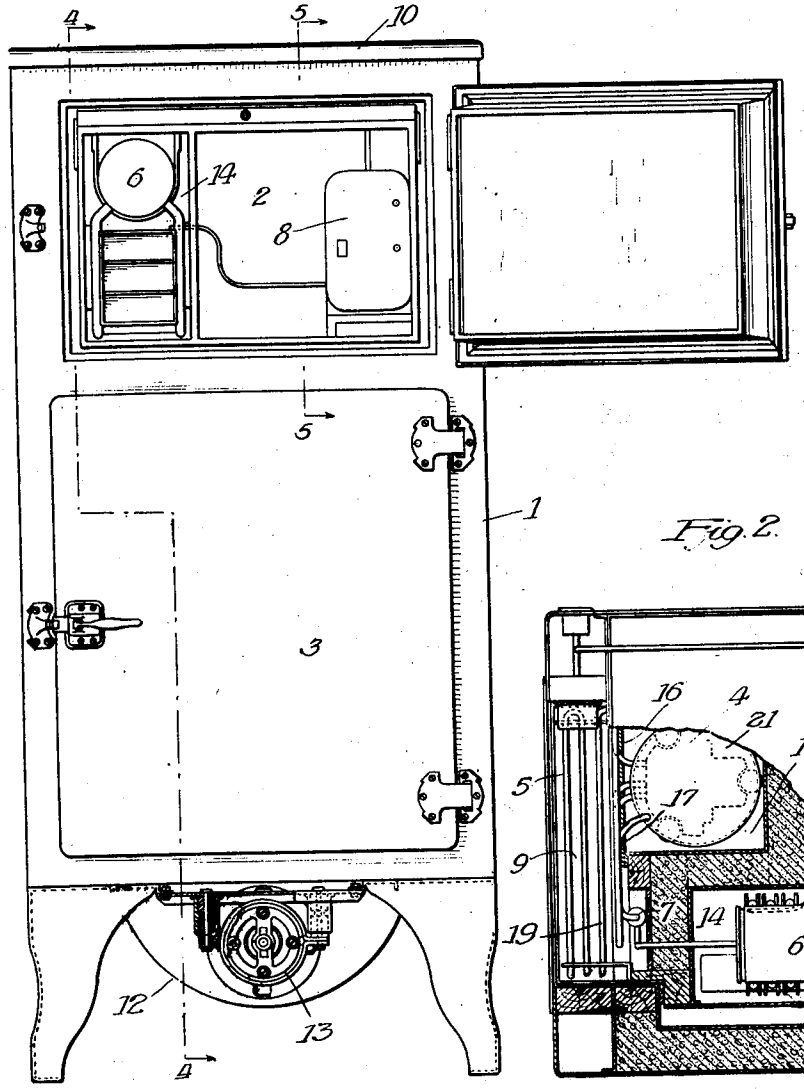



Fig. 2.




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Fig. 3.

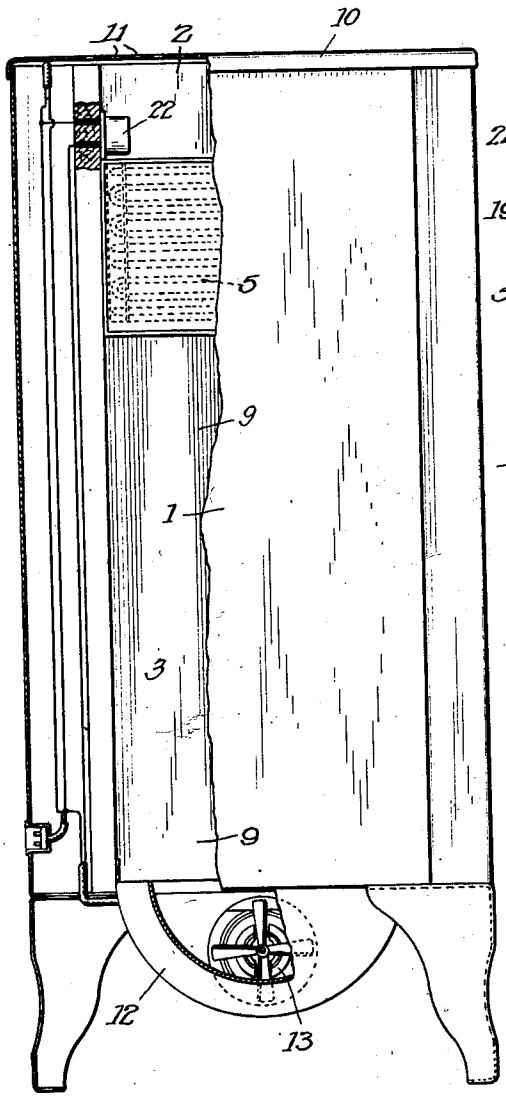
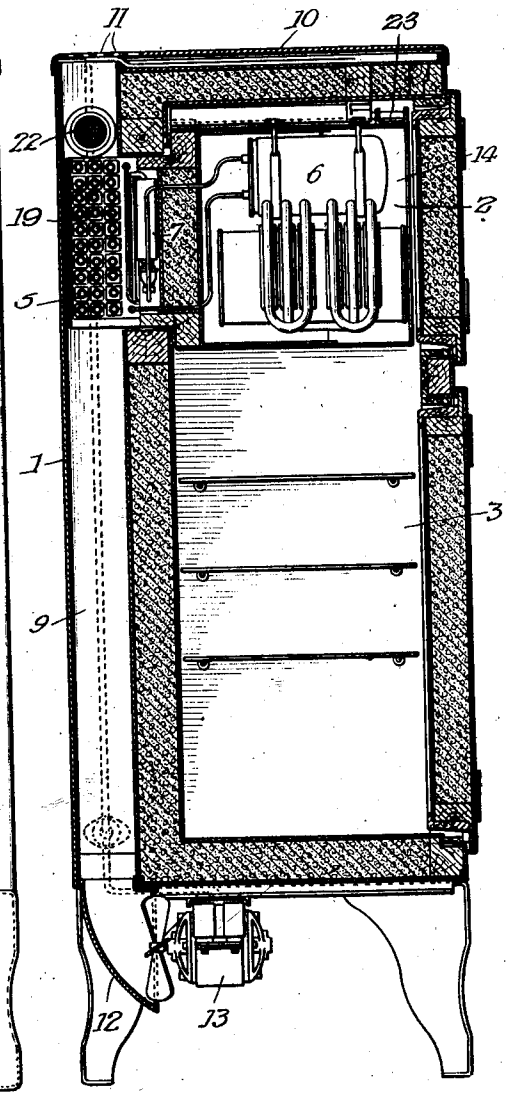



Fig. 4.




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Fig. 5.

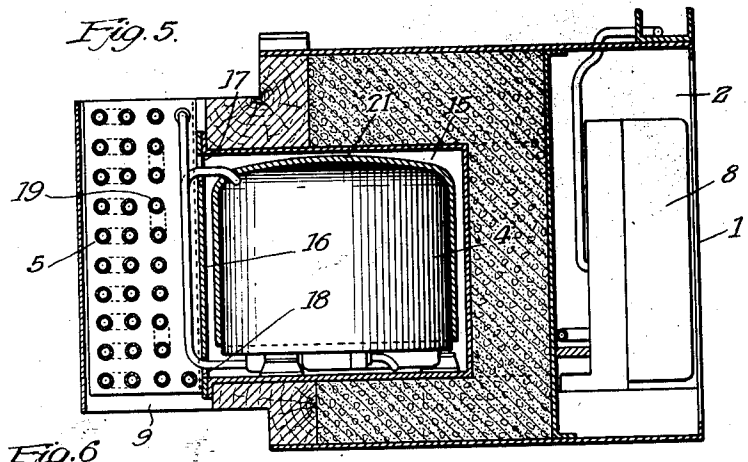
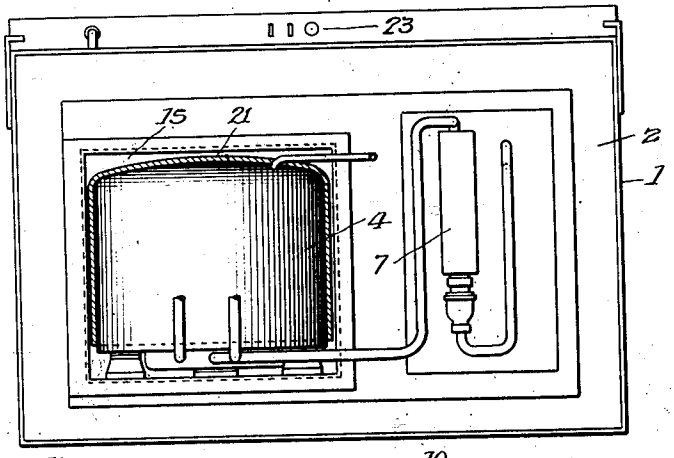



Fig. 6



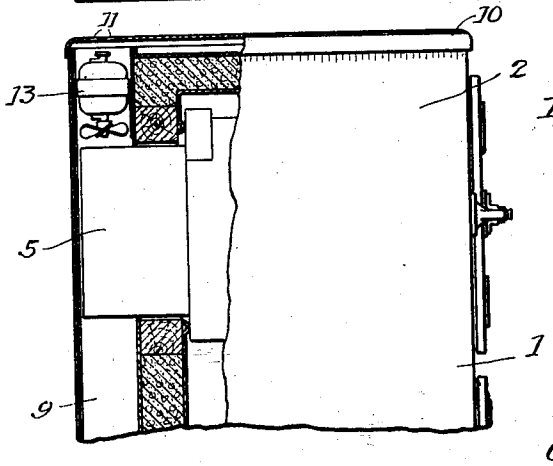




Fig. 7.

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Patented Jan. 31, 1933

1,895,806

# UNITED STATES PATENT OFFICE

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## REFRIGERATOR

Application filed September 2, 1930. Serial No. 479,389.

This invention relates to refrigerating systems and devices such as household refrigerators although it will be manifest that the invention may be applied to refrigerators and systems of any type and size.

One of the difficult problems of a satisfactory refrigerating system and particularly of a system suitable for use as a household refrigerator is the proper cooling of the refrigerating unit, that is, the motor-compressor and condenser. Other problems closely associated therewith are the prevention of absorption of the refrigerant in the lubricating oil particularly during idle periods of the compressor and the prevention of a large starting load after an idle period.

It is the purpose of this invention therefore, to provide for the proper insulation and cooling of the various elements of the system, to prevent the absorption of refrigerant in the lubricating oil and to prevent large starting loads after an idle period of the compressor.

It is also an object of this invention to deaden the noise of operation of the system preferably by the same medium utilized to accomplish one or more of the foregoing purposes of this invention.

According to this invention the motor compressor unit is insulated and yet cooled sufficiently to maintain the unit at the proper temperature during both running and idle periods. It has been found satisfactory to mount the unit within an insulated compartment of the cabinet and to provide an air flue for conducting air over the desired elements of the system in proper quantities. Means may also be employed either independently of or in conjunction with the compartment and flue for preventing too great a cooling of the oil during idle periods of the compressor.

A better understanding of this invention will be obtained from the following description of one embodiment of this invention given in connection with the drawings, in which:

Fig. 1 is a front elevation of a refrigerator embodying a system and cabinet constructed in accordance with this invention.

Fig. 2 is a horizontal section through the top of the refrigerator with certain parts cut away to illustrate the internal construction of the cabinet.

Fig. 3 is a rear elevation with one wall partially broken away.

Fig. 4 is a section on line 4—4 of Fig. 1.

Fig. 5 is a section on line 5—5 of Fig. 1.

Fig. 6 is a rear elevation of the motor compressor unit with the oil cooler, condenser and guard removed.

Fig. 7 is a fragmentary view partly in section of a modified form of my invention.

Referring more particularly to the drawings and to the form of this invention shown in Figs. 1 to 6, there is illustrated a refrigerator including a system constructed in accordance with this invention and mounted in a cabinet 1, having an upper division 2 constructed to house the evaporating unit, condenser and motor compressor unit. The lower compartment 3 is provided with the usual shelves and is designed to constitute the usual refrigerating compartment for foodstuffs.

The refrigerating system may be of any suitable construction and as illustrated comprises a motor compressor unit 4 of the type claimed in my copending application Serial No. 535,638 filed May 7, 1931, arranged to deliver refrigerant to a condenser 5 from which the refrigerant is delivered to an evaporator 6 and returned to the compressor through an unloading device 7. The usual regulating device 8 is employed for regulating the temperature of the refrigerator and for controlling the operation of the motor compressor.

The refrigerator cabinet is formed at its rear with an air flue 9 extending the full height of the cabinet being terminated at its upper end by the top 10 of the refrigerator which is perforated as at 11 at that portion overlying the duct to permit the flow of air therethrough. The lower end of the duct terminates in an open end provided with a curved shroud 12. At the lower end a fan 13 is placed and arranged to direct air into the duct and upwardly therethrough.

The upper division of the refrigerator cab-

inet is divided into a compartment 14 arranged to receive the evaporator 6 and an insulated compartment 15 arranged to receive the motor compressor unit 4. The compartment 15 opens into the flue 9 but is substantially thermally sealed therefrom by a sheet or guard of insulating material 16 provided with apertures 17 and 18 (Figs. 2 and 5) to permit the passage of the necessary connections from the motor compressor unit. The apertures are also of sufficient size to permit a limited circulation from the air duct into and out of the compartment 15. The oil cooling coils 19 and condenser 5 are placed in the duct or flue 9 adjacent the upper end thereof where they will be in the direct path of the flow of air directed by fan 13 through the flue. The air rising in flue 9 passes over the coils 19 and 5 and discharges through the opening 7, a certain portion of the air passing through apertures 17 and 18 and thus circulating through compartment 15.

From the above it will be seen that the condenser and cooling coils are in a position to be cooled sufficiently whereas the motor compressor unit is within an insulated chamber or compartment where it will not be cooled beyond a desired point particularly when the motor compressor is idle.

In addition to placing the motor compressor unit in an insulated compartment the motor compressor is further heat insulated by means of a cover 21 of some insulating material such as asbestos, elastic fleece wool rubber sponge composition or other insulating material. This will further prevent cooling of the compressor during idle periods and will also act as a sound deadener to minimize the noise of operation.

It is desirous to prevent undue cooling of the motor compressor unit which may readily occur during idle periods in order to prevent cooling of the oil. Cooling of the lubricating oil has two detrimental effects, one being the thickening of the oil which places heavy loads upon starting of the motor and the other being that cooled oil has a tendency to absorb the refrigerant particularly $SO_2$. The oil thereby loses its lubricating qualities.

According to the foregoing construction the insulated compartment and the cover 21 prevents undue cooling of the motor particularly during idle periods while the cooling of the oil during running periods maintains the motor compressor unit at proper temperature during these latter periods. The apertures 17 and 18 can be so proportioned and designed as to permit a certain and limited amount of circulation to the chamber 15 to prevent over-heating.

The refrigerator is also provided with a thermostat control 22 for controlling the operation of fan 13 in accordance with the temperature conditions of the condenser and cooling coils. The entire refrigerating unit including the evaporator, compressor unit, regulating device, unloader, condenser, and oil cooling coils may be removed as one unit. The electrical connections to the fan and motor are so arranged through a plug connection 23 (Fig. 6) that the circuit to the fan is also broken when the unit is removed.

Referring to the modification shown in Fig. 7 the construction and arrangement is similar to that previously described with the exception that the fan 13 is placed at the top of the air flue 9 instead of at the bottom thereof and the shroud 12 is accordingly omitted.

It is obvious that many changes may be made in the details of construction without departing from the spirit and scope of the invention as defined in the claims appended hereto.

I claim:

1. A refrigerator comprising a cabinet having a compartment in the upper portion thereof, a motor compressor unit disposed in said compartment, an air flue in communication with said compartment and extending to the lower portion of said cabinet and opening exteriorly of the cabinet at its lower end, and a fan arranged to induce a flow of air therethrough.

2. A refrigerator comprising a cabinet having a compartment in the upper portion thereof, a motor compressor unit disposed in said compartment, means for insulating said motor compressor unit, and an air flue in communication with said compartment and opening exteriorly of the cabinet.

3. In a sealed refrigerating system, a sealed refrigerating unit including a motor compressor unit and means for insulating said unit to maintain said unit at a substantially predetermined temperature during idle and running periods.

4. A refrigerator comprising a cabinet having an insulated compartment in the upper portion thereof, a motor compressor unit disposed in said compartment, an air flue in communication with said compartment and extending to the lower portion of said cabinet and opening exteriorly of the cabinet at its lower end, and a fan adjacent the bottom of the flue to induce a flow of air therethrough.

5. A refrigerator comprising a cabinet having an insulated compartment in the upper portion thereof, a motor compressor unit disposed in said compartment, an air flue in communication with said compartment and extending to the lower portion of said cabinet and opening exteriorly of the cabinet at its lower end, and a fan adjacent the top of the flue to induce a flow of air therethrough.

6. In a refrigerator cabinet, a compartment in the upper portion thereof adapted to receive a refrigerating unit, an air flue in communication with said compartment and

extending to the lower portion of said cabinet and opening exteriorly of said cabinet at its lower end and means for establishing a circulation of air through said flue and compartment and means for controlling the flow of air through said compartment.

7. In a refrigerator cabinet, a compartment in the upper portion thereof adapted to receive a refrigerating unit, means for insulating said unit, an air flue in communication with said compartment and extending to the lower portion of said cabinet and opening exteriorly of said cabinet at its lower end, means for establishing a circulation of air through said flue and means for admitting a restricted portion of air through said compartment.

8. In a refrigerating system, a motor compressor, a condenser for liquefying the compressed refrigerant, an evaporator for receiving the liquefied refrigerant, means for cooling the lubricating oil for said compressor during running periods of said compressor and means for insulating said compressor and lubricating oil contained therein.

9. In a refrigerator cabinet, an insulated compartment in the upper portion thereof adapted to receive a refrigerating unit including a motor compressor, an air flue extending from said compartment to the lower portion of said cabinet and opening exteriorly of said cabinet at its lower end, means for establishing a circulation of air through said flue and through said compartment, and an insulating cover for said motor compressor.

10. In a sealed refrigerating system, a casing, a motor compressor unit sealed within said casing, a condenser for liquefying the compressed refrigerant, an evaporator for receiving the liquefied refrigerant and means for preventing the lubricating oil from absorbing appreciable amounts of refrigerant comprising an insulating hood surrounding said casing.

11. In a sealed refrigerating system, a casing, a motor compressor unit sealed within said casing, a condenser for liquefying the compressed refrigerant, an evaporator for receiving the liquefied refrigerant and means for preventing the lubricating oil from absorbing appreciable amounts of refrigerant comprising an insulating hood surrounding said casing.

12. In a refrigerator, a cabinet having a thermally insulated compartment therein, a compressor in said compartment, and means for circulating a predetermined amount of air through said compartment, whereby the lubricating oil for said compressor is maintained substantially at a predetermined temperature.

13. In a refrigerator, a cabinet having a thermally insulated compartment therein, a compressor in said compartment, an air duct in communication with said insulated compartment for circulating air therethrough, and means for restricting the flow of air through said compartment, whereby the lubricating oil for said compressor is maintained substantially at a predetermined temperature.

14. In a refrigerator, a cabinet having a thermally insulated compartment therein, a compressor in said compartment, an air duct in communication with said insulated compartment for circulating air therethrough, and means for restricting the flow of air through said compartment, said means comprising a partition between said duct and compartment having apertures therethrough, whereby the lubricating oil for said compressor is maintained substantially at a predetermined temperature.

15. In a refrigerator, a cabinet having a thermally insulated compartment therein, a compressor of a refrigerating apparatus disposed in said compartment, and an air flue arranged to receive part of the refrigerating apparatus, said flue opening exteriorly of said cabinet and being in communication with said compartment.

16. A refrigerator comprising a cabinet having an insulated compartment, and an air duct in communication with said compartment and exteriorly of said cabinet and a refrigerating unit including a motor, compressor and condenser disposed within said cabinet and removable therefrom in a horizontal direction as a unit, said motor and compressor being normally positioned with said insulated chamber and said condenser being normally positioned within said air duct.

17. A refrigerator comprising a cabinet having an insulated compartment, and an air duct in communication with said compartment and exteriorly of said cabinet and a refrigerating unit including a motor, compressor and condenser disposed within said cabinet and removable therefrom in a horizontal direction as a unit, said motor and compressor being normally positioned within said insulated chamber and said condenser being normally positioned without the insulated compartment.

18. In a refrigerating system, a motor compressor, a condenser for liquefying the compressed refrigerant, an evaporator for receiving the liquefied refrigerant, and insulating means for said motor compressor arranged to maintain the motor compressor substantially within a predetermined temperature range during idle periods of said compressor to maintain the lubricating oil therein at desired temperatures.

19. In a refrigerating system, a motor compressor, a condenser for liquefying the compressed refrigerant, an evaporator for receiving the liquefied refrigerant, means for extracting some of the heat occasioned by

operation of said motor compressor during running periods to maintain the motor compressor at desired operating temperatures, and insulating means arranged to maintain the motor compressor substantially within a predetermined temperature range during idle periods of said compressor to maintain the lubricating oil therein at desired temperatures.

20. In a refrigerating system, a motor compressor, a condenser for liquefying the compressed refrigerant, an evaporator for receiving the liquefied refrigerant, and means for insulating the lubricating oil arranged to maintain it substantially at a predetermined temperature during idle periods of the motor compressor to prevent the lubricating oil from absorbing appreciable amounts of refrigerant during said period.

21. In a refrigerating system, a motor compressor, a condenser for liquefying the compressed refrigerant, an evaporator for receiving the liquefied refrigerant, means for cooling the lubricating oil for said compressor during running periods of said compressor, and insulating means arranged to maintain the lubricating oil substantially within a predetermined temperature range during idle periods of the motor compressor to prevent the lubricating oil from absorbing appreciable amounts of the refrigerant during idle periods of the compressor.

In witness of the foregoing I affix my signature.

CARL E. L. LIPMAN.