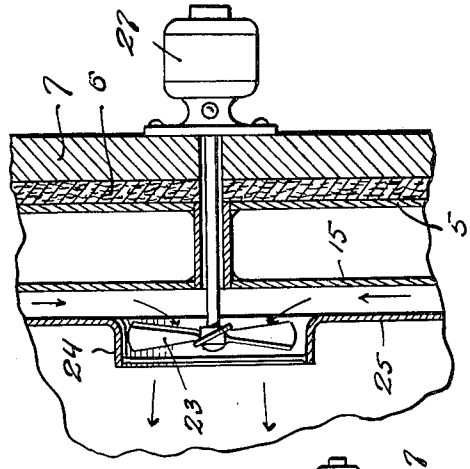
Feb. 8, 1938. O. J. STABBAL 2,107,400

REFRIGERATOR

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Fig. 4.



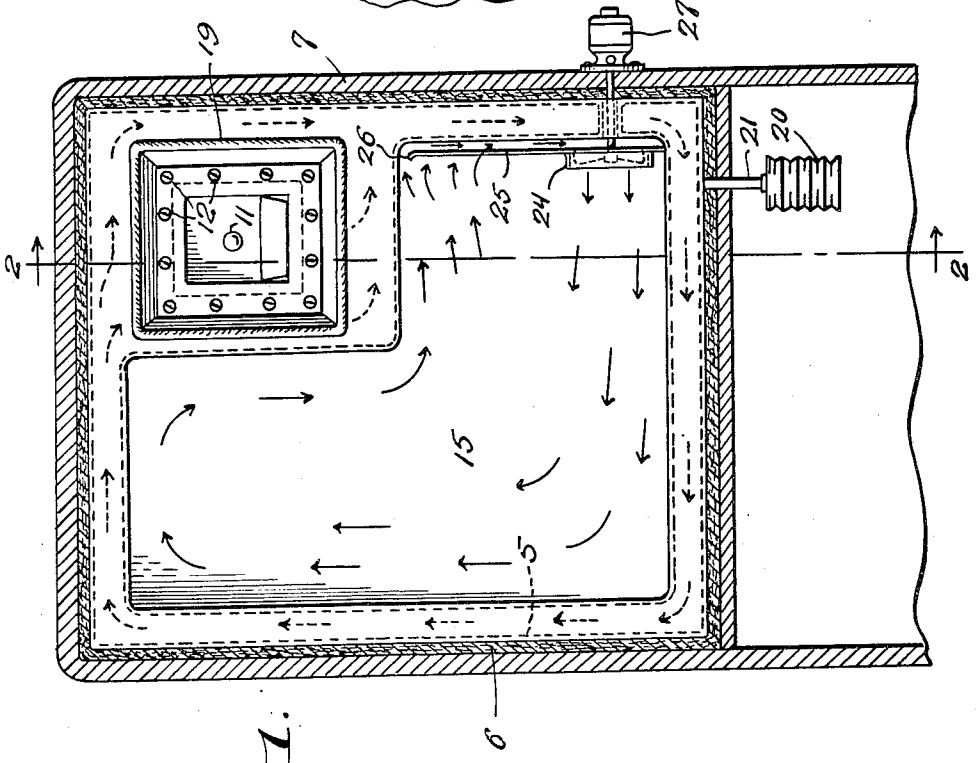


Fig. 1.

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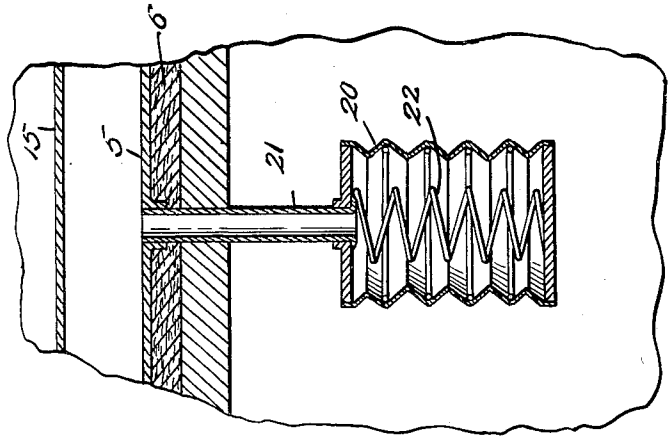
Attorney

Feb. 8, 1938. O. J. STABBAL 2,107,400

REFRIGERATOR

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Fig. 3.



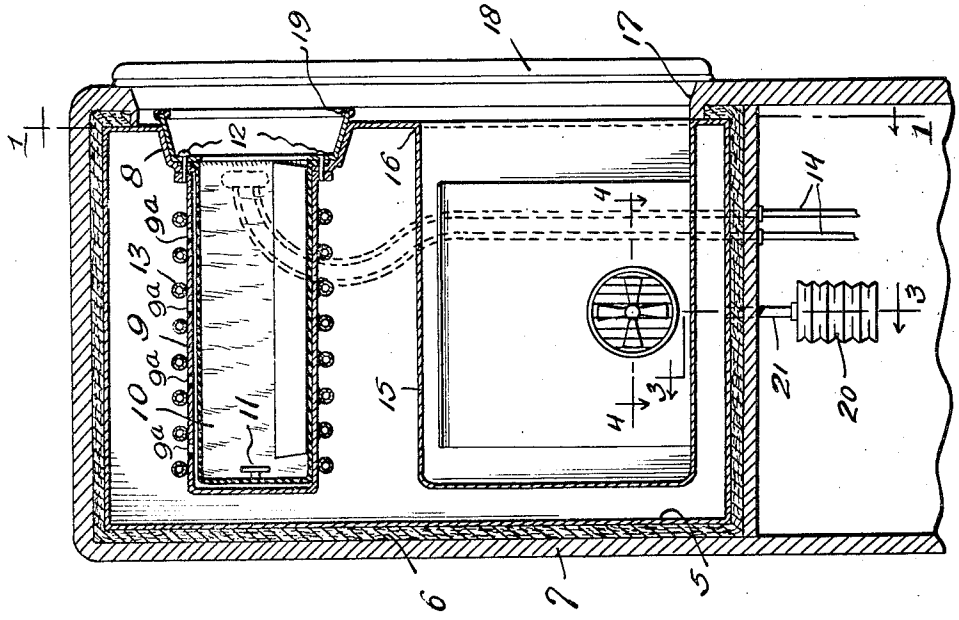


Fig. 2.

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UNITED STATES PATENT OFFICE

2,107,400

REFRIGERATOR

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Application February 3, 1936, Serial No. 62,193

7 Claims. (Cl. 62—116)

This invention relates to a refrigerator of the type in which the food chamber or chambers and the refrigerating element are both located within a heat insulated casing, the temperature within the food chamber or chambers being lowered by air or other gaseous refrigerating medium that is hermetically sealed within the casing and is circulated about the walls of the food chamber or chambers and about the refrigerating element.

The primary object of the present invention is to provide a refrigerator of the above kind which may be built at a very low cost, and which will function efficiently and economically.

In carrying out the present invention, the casing is provided with one or more food receiving or like chambers and has its walls insulated and its interior hermetically sealed from the outer air, the food receiving or like chamber or chambers being accessible from the outside but hermetically sealed from the interior of the casing. The refrigerating element is also located in the interior of the heat insulated and hermetically sealed casing, and is sealed from the food receiving or like chamber or chambers. The casing contains air or other gaseous medium which is employed to absorb heat from the walls of the food receiving or like chamber or chambers and deliver it to the refrigerating element, said air or other gaseous refrigerating medium being caused to circulate about the refrigerating element and the walls of the food receiving or like chamber or chambers with no communication with the external atmosphere so as to continuously perform its heat conveying function without change. Said air or other gaseous refrigerating medium is dry and remains in that hygroscopic condition so that no heat insulating frost can accumulate upon the refrigerating element and cause a reduction in the efficiency of operation.

While the present refrigerator may be used for various refrigerating purposes, I have illustrated the invention embodied in a domestic or household refrigerator designed for preservation of food and the production of ice cubes.

Other important objects and features of the invention will become apparent from the following description when considered in connection with the accompanying drawings, in which:

Figure 1 is a fragmentary vertical sectional view of a refrigerator embodying the present invention, the plane of section being indicated by the line 1—1 of Figure 2.

Figure 2 is a vertical sectional view on line 2—2 of Figure 1.

Figure 3 is an enlarged sectional detail view on line 3—3 of Figure 2; and

Figure 4 is an enlarged fragmentary horizontal section on line 4—4 of Figure 2.

In the illustrated embodiment of the present invention, the casing consists of a suitable sheet metal shell 5 having its walls covered with a suitable heat insulating material 6 and mounted within a suitable cabinet 7. In this embodiment, the casing 5 has an opening in an upper corner portion of its front wall, and the portion of such front wall immediately surrounding said opening is pressed or offset inwardly as at 8. Arranged in the shell 5 of the casing is an ice cube compartment including a perforated outer sheet metal shell 9 having perforations 9a, and an inner rubber or like lining 10 in the form of a flexible sack which may be turned inside out and withdrawn from the shell 9 through the open front end of the latter and the adjacent opening in the front wall of casing shell 5. To facilitate this withdrawal of lining 10, it may be provided at a suitable point with an interior handle 11. The open end of shell 9 and lining 10 are suitably secured as at 12 to the inwardly pressed or offset front wall portion 8 of casing shell 5, so that the interior of the ice cube compartment is hermetically sealed from the interior of casing shell 5, although the interior of said ice cube compartment is accessible from the outside through the open front of said ice cube compartment and the registered opening in the front wall of casing shell 5. A refrigerating coil or equivalent refrigerating element 13 surrounds the shell 9 of the ice cube compartment substantially from end to end of the latter, and this coil or refrigerating element may be supplied with the necessary refrigerant from a suitable source by means of pipes 14 sealed in openings of the casing shell 5 through which they pass.

The front wall of casing shell 5 is provided with another relatively large opening of angular form in elevation that extends beneath and upwardly at the inner side of the ice cube compartment, and an open front food chamber of similar form and location is arranged within the casing shell 5 with the front edges of its top, bottom and side walls connected with the front wall of casing shell 5 at the edges of the last-named opening in said casing shell 5, as indicated at 16, whereby said food chamber 15 is hermetically sealed from the interior of the casing shell 5. At the same time, the interior of food chamber 15 is accessible from the outside through the open front of the latter and the opening in the front

wall of casing 5 with which the open front of food chamber 15 is registered. It will be noted that the ice cube chamber and the food chamber are arranged with their top, bottom, side and rear walls in spaced relation to the corresponding adjacent walls of the casing shell 5 so that air or other gaseous refrigerating medium within the shell 5 may freely circulate about said walls of the ice cube chamber and food chamber to convey heat therefrom to the refrigerating element or coil 13 which closely surrounds the ice cube chamber and is also completely spaced from the adjacent walls of the casing shell 5. It will of course be understood that dry air or other gaseous refrigerating medium is placed in the casing shell 5, and such air or gaseous refrigerating medium will rise as it absorbs heat from the walls of food chamber 15, flowing to the refrigerating coil 13 to have the heat extracted therefrom, and then passing downwardly as indicated by the arrows in Figure 1, to continuously perform this heat absorbing and conveying function. The air or gaseous refrigerating medium will always remain in its dry condition so that no heat insulating frost can accumulate upon the refrigerating coil or element 13 and cause a reduction in the efficiency of operation. This is particularly true as the refrigerating element or coil 13 is hermetically sealed in the casing shell 5 and from the interior of the ice cube compartment, the interior of the food compartment, and the outside atmosphere, and cannot therefore receive moisture from the said chambers or outside atmosphere.

While the flexible sack-like lining 10 of the ice cube chamber may become frosted on the inside, it may be readily withdrawn and turned inside out for de-frosting the same in any suitable way, such as by pouring warm water thereon. The perforated shell 9 of the ice cube chamber permits passage of the air or gaseous refrigerating medium into and out of said shell and in intimate contact with the outer surface of the lining 10, the lining 10 hermetically sealing the interior of the ice cube chamber from the interior of casing shell 5.

The cabinet 7 has a suitable front opening 17 through which access may be had to the interior of the ice cube and food chambers, which opening 17 may be closed by a suitable door 18. In order to exclude the moist air of food chamber 15 from the interior of the ice cube chamber when the door 18 of the refrigerator is closed, a suitable gasket 19 may be provided in surrounding relation to the opening in the front wall of casing shell 5 with which the ice cube chamber is registered, said gasket being arranged to abut the inner face of door 18 when the latter is closed. Defrosting should be sufficiently frequent that a heavy coating of ice may not form on lining 10 and prevent the latter from being manipulated.

Suction means is provided for maintaining a slight vacuum within the casing shell 5 so as to draw the flexible and preferably elastic lining 10 of the ice cube chamber into intimate relation with the inner surfaces of the walls of the outer sheet metal shell 9 of said ice cube chamber. As shown, this suction means may consist of a bellows 20 suitably placed in communication with the interior of casing shell 5, as at 21, and normally yieldingly expanded by means of an internal spring 22. This suction means also has the additional function of admitting additional air or gaseous refrigerating medium into the casing shell 5 when a slight vacuum is created within the latter by lowering of the temperature of the air or other gaseous refrigerating medium in said casing shell 5 when the refrigerator is in operation. Such slight vacuum will cause automatic collapse or partial collapse of bellows 20 by withdrawal of the air or gaseous medium from the latter, thereby preventing any possibility of the walls of shell 9 and chamber 15 from buckling.

In order to minimize condensation of moisture on the inner surface of the food compartment 15 and to more uniformly cool or refrigerate the said food in compartment 15, positive means is provided for circulating the air in and along the walls of said food chamber or compartment 15. As shown, this air circulating means may consist of a fan 23 located at one side of and near the bottom of the food chamber 15 within the latter, and encased by a ring-shaped flange 24 pressed laterally from and in surrounding relation to an opening in the lower portion of a vertical plate 25 arranged parallel with and in slightly spaced relation to the adjacent side wall of the food chamber 15, with its upper edge spaced from the top wall of chamber 15 as at 26. The fan 23 thus discharges the air laterally across the bottom of food chamber 15 so that it may rise and then return across the top of the chamber 15 to the space at 26 and then back to the fan between the plate 25 and the adjacent side wall of chamber 15 as indicated by the arrows in Figure 1. The fan 23 may be suitably driven, as by means of a small electric motor 27 located outside the cabinet 7 and having a power shaft projecting through the adjacent wall of cabinet 7, casing shell 5 and food chamber 15. The food chamber 15 preferably consists of a shell of sheet metal which is a good heat conductor.

It will be understood that the circulation of the air or gaseous refrigerating medium about the ice cube and food chambers is effected on the well known thermo-syphon principle, although positive circulation of such air or gaseous refrigerating medium may be resorted to. Also, while a single food chamber has been illustrated, it will be obvious that the construction may be readily modified to include more than one food chamber. Other details illustrated and described are subject to various modifications without departing from the spirit and scope of the invention as claimed.

It is believed that the advantages and operation of the invention will be readily understood and appreciated from the foregoing description by those skilled in the art. It will be particularly noted that the invention provides a simple, compact and efficient construction capable of economical manufacture and use.

What I claim as new is:

1. A refrigerator comprising a hermetically closed casing containing a refrigerating chamber and a food or like chamber and affording a refrigerating space in surrounding relation to said chambers, said chambers being accessible from the exterior but hermetically closed from the refrigerating space, means to close said chambers from the exterior and to seal said chambers from each other, a refrigerating element hermetically sealed within said refrigerating space adjacent said refrigerating chamber, and a gaseous refrigerating medium sealed within the refrigerating space for circulating in thermal contact with the wall of said food or like chamber and the surface of said refrigerating element, said food or like chamber having an inwardly offset upper

portion affording an enlargement of said refrigerating space within which the refrigerating element and the refrigerating chamber are arranged.

2. A refrigerator comprising a hermetically closed casing containing a refrigerating chamber and a food chamber and affording a refrigerating space in surrounding relation to said chambers, said chambers being accessible from the exterior but hermetically closed from the refrigerating space, means to close said chambers from the exterior and to seal them from each other, a refrigerating element hermetically sealed within said refrigerating space adjacent said refrigerating chamber, and a gaseous refrigerating medium sealed within the refrigerating space for circulating in thermal contact with the wall of said food chamber and the surface of said refrigerating element, said refrigerating chamber comprising a rigid outer perforate shell and an imperforate inner sack-like flexible lining for said shell formed of rubber or the like and adapted to be withdrawn from the latter and turned wrong side out to facilitate de-frosting thereof.

3. A refrigerator comprising a hermetically closed casing containing a refrigerating chamber and a food chamber and affording a refrigerating space in surrounding relation to said chambers, said chambers being accessible from the exterior but hermetically closed from the refrigerating space, a refrigerating element hermetically sealed within said refrigerating space adjacent said refrigerating chamber, a gaseous refrigerating medium sealed within the refrigerating space for circulating in thermal contact with the walls of said chambers and the surface of said refrigerating element, said refrigerating chamber comprising a rigid outer perforate shell and an imperforate inner sack-like flexible lining for said shell formed of rubber or the like and adapted to be withdrawn from the latter and turned wrong side out to facilitate de-frosting thereof, and suction means for automatically producing a slight partial vacuum in the refrigerating space to draw and hold the lining in intimate relation to said outer shell and to automatically relieve a greater partial vacuum within said refrigerating space produced by withdrawal of said lining from its outer shell or by the lowering of temperature within said refrigerating space, whereby buckling of the walls of said food or like chamber is prevented.

4. A refrigerator comprising a hermetically closed casing containing a refrigerating chamber and a food chamber and affording a refrigerating space in surrounding relation to said chambers, said chambers being accessible from the exterior but hermetically closed from the refrigerating space, a refrigerating element hermetically sealed within said refrigerating space adjacent said refrigerating chamber, a gaseous refrigerating medium sealed within the refrigerating space for circulating in thermal contact with the wall of said food chamber and the surface of said refrigerating element, said refrigerating chamber comprising a rigid outer perforate shell and an imperforate inner sack-like flexible lining for said shell formed of rubber or the like and adapted to be withdrawn from the latter and turned wrong side out to facilitate de-frosting thereof, and suction means for automatically producing a slight partial vacuum in the refrigerating space to draw and hold the lining in intimate relation to said outer shell and to automatically relieve a greater partial vacuum within said refrigerating space produced by withdrawal of said lining from its outer shell or by the lowering of temperature within said refrigerating space, whereby buckling of the walls of said food chamber is prevented, said suction means comprising a spring expanded bellows having no communication with the outside atmosphere and communicating with said refrigerating space.

5. A refrigerator comprising a hermetically closed heat insulated casing containing ice cube and food chambers, said ice cube and food chambers being accessible from the exterior but hermetically closed from the interior of said casing, the casing providing a refrigerating space in surrounding relation to said chambers and between the latter, a refrigerating element surrounding said ice cube chamber, a gaseous refrigerating medium sealed within the refrigerating space to circulate in thermal contact with the walls of said chambers and the surface of said refrigerating element, said food chamber having an inwardly offset upper portion affording an enlargement of said refrigerating space within which the ice cube chamber and refrigerating element are arranged, and a motor operated fan in said food chamber for circulating the air in the latter.

6. A refrigerator comprising a hermetically closed heat insulated casing containing ice cube and food chambers, said ice cube and food chambers being accessible from the exterior but hermetically closed from the interior of said casing, the casing providing a refrigerating space in surrounding relation to said chambers and between the latter, a refrigerating element surrounding said ice cube chamber, and a gaseous refrigerating medium sealed within the refrigerating space to circulate in thermal contact with the walls of said chambers and the surface of said refrigerating element, said food chamber having an inwardly offset upper portion affording an enlargement of said refrigerating space within which the ice cube chamber and refrigerating element are arranged, said ice cube chamber comprising an outer perforated shell and an imperforate flexible sack-like lining formed of rubber or the like and adapted to be withdrawn from the shell and turned wrong side out to facilitate defrosting thereof.

7. A refrigerator comprising a hermetically closed heat insulated casing containing ice cube and food chambers, said ice cube and food chambers being accessible from the exterior but hermetically closed from the interior of said casing, the casing providing a refrigerating space in surrounding relation to said chambers and between the latter, a refrigerating element surrounding said ice cube chamber, a gaseous refrigerating medium sealed within the refrigerating space to circulate in thermal contact with the walls of said chambers and the surface of said refrigerating element, said food chamber having an inwardly offset upper portion affording an enlargement of said refrigerating space within which the ice cube chamber and refrigerating element are arranged, said ice cube chamber comprising an outer perforated shell and an imperforate flexible sack-like lining formed of rubber or the like and adapted to be withdrawn from the shell and turned wrong side out to facilitate defrosting thereof, and means to seal the ice cube chamber from the food chamber.

OSCAR JOHN STABBAL.