April 15, 1941. J. L. FLETCHER 2,238,635

REFRIGERATOR CABINET

Filed Dec. 13, 1938

Fig. 1.

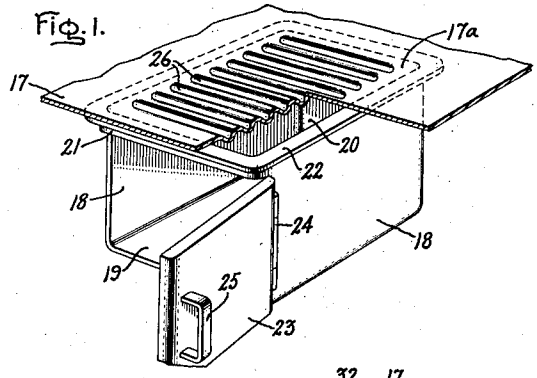


Fig. 2.

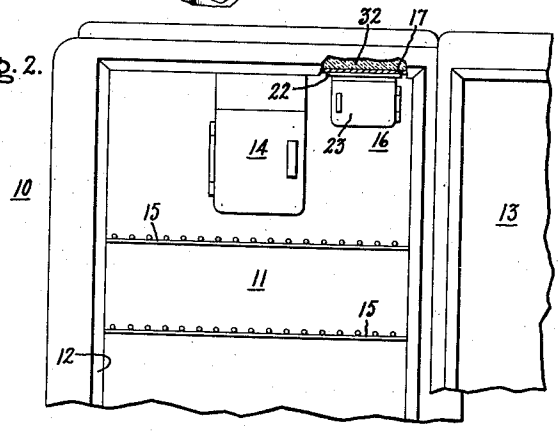
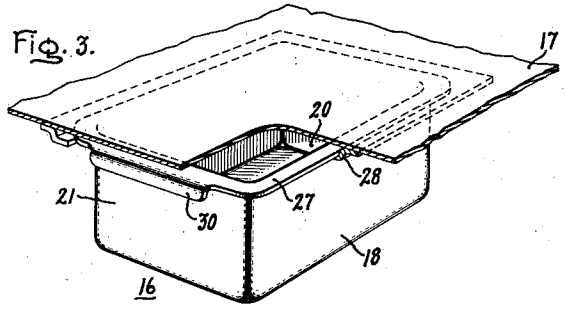


Fig. 3.



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2,238,635

UNITED STATES PATENT OFFICE

2,238,635

REFRIGERATOR CABINET

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8 Claims. (Cl. 62—1)

My invention relates to refrigerator cabinets and more particularly to compartments used within refrigerator cabinets for the purpose of maintaining foods such as butter and the like at a temperature higher than that within the main portion of the cabinet.

In order that food stuffs may be properly preserved it is necessary to maintain the cabinets in domestic refrigerators at a temperature much lower than that at which butter spreads easily. When butter is kept in the refrigerator cabinet, it is necessary that it be warmed up before it is in condition for serving at a table. Thus, the air in a refrigerated compartment of a household refrigerator is usually maintained at an average temperature between 40° F. and 45° F. for general refrigeration purposes. An average temperature within this range may be maintained in the refrigerated compartment by the convection currents of air set up therein by a cooling unit or refrigerant evaporator located in the upper portion of the refrigerated compartment. In the usual refrigerator this result is obtained by maintaining the temperature of the surface of the evaporator considerably below 32° F. as, for example, approximately 20° F. While a storage atmosphere having a temperature within the range mentioned is satisfactory for the preservation of foods in general, a storage atmosphere having a higher temperature range as 55° F. to 60° F. is more satisfactory for the preservation of butter and the like over relatively short periods of time.

Accordingly, it is an object of my invention to provide an improved construction and arrangement of a food storage receptacle in the refrigerated compartment of a refrigerator which is adapted to maintain a storage atmosphere therein having a higher temperature than the air circulated in the refrigerated compartment.

Another object of my invention is to provide a food storage receptacle for the refrigerated compartment of refrigerators having walls for impeding heat transfer therefrom by radiant heat to the walls of the refrigerated compartment or bodies or cooling unit therein.

It is also an object of my invention to provide a food storage receptacle for the refrigerated compartments of refrigerators having walls for impeding heat transfer therefrom by radiant heat to the walls of the refrigerated compartment and the cooling unit and bodies therein and a wall for promoting heat transfer between a wall of the refrigerated compartment and the receptacle.

Further objects and advantages of my invention will become apparent as the following description proceeds and the features of novelty which characterize my invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

For a better understanding of my invention reference may be had to the accompanying drawing in which Fig. 1 is an enlarged perspective fragmentary view of one form of receptacle embodying the principles of my invention; Fig. 2 is a fragmentary front elevational view of a household refrigerator having a refrigerated compartment provided with a food storage receptacle of the type shown in Fig. 1; and Fig. 3 is an enlarged perspective fragmentary view of a modification of the food storage receptacle shown in Fig. 1.

Referring to the drawing, in Fig. 2, I have shown a household refrigerator 10 provided with heat insulated walls defining a refrigerated compartment 11 having an opening 12 in the front wall thereof and a heat insulated door 13 for the opening 12. The refrigerator is cooled by a refrigerating machine including a cooling unit or refrigerant evaporator 14 arranged in the upper portion of the refrigerated compartment. Only the evaporator 14 is illustrated and any suitable refrigerating apparatus may be employed. Spaced-apart shelves 15 are supported on the side walls of the refrigerated compartment 11 below the evaporator 14 and are preferably of open wire work construction so as not to interfere with circulating currents of air set up by refrigerant evaporator 14 in the refrigerated compartment 11.

A food receptacle or butter compartment 16 is provided in the refrigerating compartment 11 adjacent the top wall 17 of the refrigerated compartment 11. The food receptacle, as best shown in Fig. 1, is provided with a bottom wall 19 and an upwardly directed marginal wall comprising side walls 18, a rear wall 20 and a front wall 21, the marginal wall being preferably arranged for direct contact with the top wall 17 in order to obtain a good heat exchange relationship therewith. As shown in Fig. 1, this result is obtained by providing the walls 18, 20 and 21 with flanges 22 which are secured to the top wall of the refrigerated compartment 11 in any suitable manner as by welding. Thus, the portion 17a of top wall 17 forms a cover for the open topped receptacle or container 16. In order to gain access to the interior of receptacle 16 I have provided a door 23 pivotally supported

as by a hinge 24 for closing the opening in the front wall 21. A handle 25 is provided to facilitate operation of the door 23.

The air within the refrigerated compartment 11 is maintained at a temperature of approximately 40° F. by the circulating currents of air set up in the refrigerated compartment 11 by the refrigerant evaporator 14. This temperature is obtained by maintaining the temperature of the surface of the evaporator 14 considerably below 32° F., for example, 20° F. Under such conditions I have found that the warmer air rising into the upper portion of the refrigerated compartment 11 into contact with the top wall 17 of the refrigerated compartment 11 has a temperature of approximately 50° F. Following the customary practice, the evaporator 14 is spaced a small distance from the top wall 17 so that a layer of comparatively warm air tends to remain adjacent the top wall 17. Since the density of warm air is less than that of cool air, there is no tendency for this layer of warm air to descend and since the cold portions of the evaporator 14 are below this layer, the air cooled by the evaporator 14 tends to fall so that there is no cooling agent available to substantially cool off this comparatively warm layer of air. As a result, the top wall 17 of the refrigerated compartment 11 tends to remain relatively warm, that is, approximately 50° F. to 55° F. under the above assumed conditions whereas the other walls defining the refrigerated compartment 11 are cooled by the circulating air to a temperature within a few degrees of the average box air temperature. The temperature of the top wall 17 is further increased by the heat which penetrates the surrounding insulation 32 from the exterior of the refrigerator 10. Inasmuch as the flanges 22 of the receptacle 16 are in good heat exchange relationship with the top wall 17 of the refrigerated compartment 11, the walls being preferably formed of a material having relatively good heat conductivity characteristics, it will be apparent that the walls of the receptacle 16 tend to be comparatively warm, also, due to the flow of heat from the top wall 17 to the walls of the receptacle 16.

By reason of these conditions, I have found that a storage atmosphere can be maintained in the interior of the receptacle 16 which has a temperature considerably above 40° F. even though the temperature of the exterior of the evaporator is at 20° F. by minimizing the heat transfer between the walls 18, 19, 20 and 21 of the receptacle 16 and the other bodies and the evaporator 14 in the refrigerated compartment 11 and also by increasing the heat transfer from the portion 17*a* of the top wall 17 of the refrigerated compartment 11 to the receptacle 16. This result is accomplished by providing the receptacle 16 with the exterior surface presented toward the interior of the refrigerated compartment 11 having a relatively high coefficient of reflection of radiant heat and consequently a relatively low coefficient of absorption of radiant heat in order to impede the transfer of heat between the receptacle 16 and the other bodies and cooling unit 14 in compartment 11 and providing the surface of portion 17*a* of the top wall 17 which is presented toward the interior of receptacle 16 with a surface having a relatively high coefficient of absorption of radiant heat in order to promote heat transfer from the portion 17*a* of top wall 17 of the refrigerated compartment into the interior of receptacle 16.

For example, the receptacle or compartment 16 may be formed of sheet aluminum and the top wall 17 of the refrigerated compartment 11 may be formed of sheet iron. The top wall 17, or at least that portion 17*a* of the top wall 17 which is adjacent the receptacle 16 and serves as a cover therefor is preferably provided with an enamel coated surface. The color of the enamel is of no particular importance as far as the effect upon the emission coefficient of the lower surface of the top wall 17 is concerned as radiant heat is absorbed, practically, to an equal degree by all colors of enamel. It will be understood, of course, that this is true only of low frequency radiant heat emitted from relatively low temperature bodies as distinguished from high frequency solar radiation. All of the bodies present in the refrigerated compartment 11 including the side and bottom walls of the refrigerated compartment 11, the shelves 15 and the articles supported on the shelves have a temperature well within the range of relatively low temperature bodies referred to and emit only low frequency radiant heat.

I have found that a receptacle of the above construction having a vertical cross section of approximately 3'' x 3'' and a length of approximately 5½'' gives excellent results when arranged in a refrigerated compartment of a household refrigerator in which the surface temperature of the evaporator is maintained at 20° F. With this arrangement, a temperature of approximately 55° F. to 60° F. may be maintained readily in the interior of the receptacle in spite of the fact that the air circulating in the refrigerating compartment 11 is only approximately 40° F.

During the operation of the refrigerator, compartment 16 will be maintained at a temperature intermediate that of the main refrigerated compartment 11 and that of the air surrounding the cabinet 10 and sufficient heat will be extracted from the receptacle 16 to properly preserve the butter but there will be sufficient transfer of heat into the compartment 16 so that the butter will be preserved at a temperature substantially higher than that of the refrigerated compartment 11 and the consistency of the butter will be satisfactory for spreading. Further I have found that this arrangement is satisfactory when employed in any refrigerating compartment of conventional size.

It will be obvious that the relation of the size of the receptacle 16 to the area of the top wall 17 of the refrigerated compartment 11 is an important factor in determining the temperature within the receptacle 16. Thus, for a given size receptacle the greater the ratio of the area of top wall 17 to the volume of receptacle 16 the higher will be the temperature of receptacle 16 with respect to the average box air temperature.

An increase in the temperature obtained within the reecptacle 16 may be provided by increasing the heat transfer area of the portion 17*a* of top wall 17 of the refrigerated compartment as by providing corrugations 26 or depending fins. It is obvious that the air circulating within the receptacle 16 picks up additional heat by means of convection because of the increased area.

While I have shown in Figs. 1 and 2 a receptacle 16 having a door 23 adapted to receive a butter container, it will be obvious that there are other ways of constructing the butter receptacle. A modification of the arrangement shown in Fig. 1 is shown in Fig. 3 in which modification the

vertical walls of the receptacle 16 are provided with outwardly directed flanges 27 adapted to slide on tracks or slideways comprising depending and inwardly directed flanges 28, the flanges 28 extending around the side walls 18 and the rear wall 20 of the receptacle 16 and being suitably secured to the top wall 17 of the refrigerated compartment 11 as by welding. With this arrangement the receptacle 16 may be entirely removed from the refrigerated compartment 11 and placed on the table. If desired, the flanges 28 may be formed to depend sufficiently to allow considerable freedom of movement of flanges 27 between flanges 28 and top wall 17. In such a case, it will be apparent that flanges 28 close the space between top wall 17 and the receptacle 16 on three sides. In order to close the corresponding space on the front of receptacle 16, the front wall 21 of the receptacle 16 may be provided with a portion extending above the remaining walls of the receptacle 16 for engagement with the top wall 17. A handle portion 30 may be provided, and may be fastened to the receptacle 16 in any suitable way. In Fig. 3 portion 30 is shown integral with a portion of flange 27. It will be obvious also that, if desired, the receptacle 16 may be provided with a top wall or cover, the cover being secured to top wall 17 of the compartment 11 in heat exchange relation therewith.

Since the leakage of heat into a refrigerated compartment varies greatly due to the variation of temperature with the seasons of the year, it may be desirable to provide some arrangement for increasing the temperature of the receptacle 16 above the degree obtained by the above-described means. For example, a thermostatically controlled electric heater may be placed within the receptacle 16. In some cases it might be desired to increase the heat transfer between the receptacle 16 and the refrigerated compartment 11 in which case the receptacle 16 may be provided with openings closed by dampers which may be adjusted manually or controlled thermostatically.

While I have shown a particular embodiment of my invention in connection with refrigerator cabinets, I do not desire my invention to be limited to the particular construction shown and described and I intend in the appended claims to cover all modifications within the spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In combination with a refrigerator provided with walls defining a compartment and having a cooling unit associated therewith, a food storage receptacle arranged in the upper portion of said compartment and supported by a wall thereof, a substantial portion of the exterior surfaces of said receptacle presented towards said cooling unit and the interior of said compartment having a relatively high coefficient of reflection of radiant heat to impede heat transfer between said receptacle and the walls of said compartment, bodies stored in the compartment, and the cooling unit therein.

2. In combination with a refrigerator provided with walls defining a compartment and having a cooling unit associated therewith, a food storage receptacle arranged in said compartment adjacent a wall thereof, said receptacle being so constructed and arranged that a wall of said compartment forms a side of said receptacle, the surface of a substantial portion of said wall adjacent to and presented toward the interior of said receptacle having a relatively high coefficient of absorption of radiant heat to promote heat transfer from said adjacent wall of said compartment to said receptacle, the exterior surface of a substantial portion of said receptacle presented towards the remaining walls of said compartment and said cooling unit therein having a relatively low coefficient of absorption of radiant heat to impede heat transfer between said receptacle and said remaining walls of said compartment and the bodies and the cooling unit therein.

3. In combination with a refrigerator provided with walls defining a compartment and having a cooling unit associated therewith, a food storage receptacle arranged in said compartment adjacent a wall thereof, the surface of a substantial portion of said wall adjacent to and presented toward said receptacle having a relatively high coefficient of absorption of radiant heat to promote heat transfer from said adjacent wall of said compartment to said receptacle, the exterior surface of a substantial portion of said receptacle presented towards the remaining walls of said compartment and said cooling unit therein having a relatively low coefficient of absorption of radiant heat to impede heat transfer between said receptacle and said remaining walls of said compartment and the bodies and the cooling unit therein.

4. In combination with a refrigerator provided with walls defining a compartment and having a cooling unit associated therewith, a food storage receptacle arranged in said compartment adjacent a wall thereof, the surface of that portion of said adjacent wall of said compartment presented toward said receptacle having a relatively high coefficient of absorption of radiant heat to promote heat transfer from said adjacent wall to said receptacle, the exterior surface of said receptacle which is presented toward said cooling unit and the remaining walls of said compartment and the bodies therein having a relatively low coefficient of absorption of radiant heat to impede heat transfer between said receptacle and said remaining walls of said compartment and the bodies and cooling unit therein.

5. In combination with a refrigerator provided with walls defining a compartment and having a cooling unit associated therewith, a food storage receptacle having a bottom wall and an upwardly directed marginal wall providing an open top, the upper portion of said marginal wall being arranged in heat exchange relationship with the top wall of said compartment, the surface of that portion of said top wall presented toward the interior of said receptacle having a relatively high coefficient of absorption of radiant heat to promote heat transfer from said top wall to said receptacle, the exterior surface of the walls of said receptacle presented toward the remaining walls of said compartment and the cooling unit and bodies contained therein having a relatively low coefficient of absorption of radiant heat to impede heat transfer between said receptacle and the walls of said compartment and the bodies and the cooling unit therein.

6. In combination with a refrigerator provided with walls defining a compartment and having a cooling unit associated therewith, a food storage receptacle having a bottom wall and an upwardly directed marginal wall providing an open top, the upper portion of said marginal wall being arranged in heat exchange relationship with the top wall of said compartment, the surface of

that portion of said top wall presented toward the interior of said receptacle having a relatively high coefficient of absorption of radiant heat to promote heat transfer from said top wall to said receptacle, said portion of said top wall including an arrangement for substantially increasing the effective area thereof to provide an increased heat transfer by convection currents of air from said top wall to said receptacle, the exterior surface of the walls of said receptacle presented toward the remaining walls of said compartment and the cooling unit and bodies contained therein having a relatively low coefficient of absorption of radiant heat to impede heat transfer between said receptacle and the walls of said compartment and the bodies and the cooling unit therein.

7. In a refrigerator provided with walls defining a compartment and having a cooling unit associated therewith, slideways depending from the top wall of said compartment and a receptacle slidable with respect to said slideways, the surface of that portion of said top wall of said compartment presented toward said receptacle having a relatively high coefficient of absorption of radiant heat to promote heat transfer from said top wall to said receptacle, the exterior surface of the walls of said receptacle presented toward the remaining walls of said compartment and the cooling unit and bodies contained therein having a relatively low coefficient of absorption of radiant heat to impede heat transfer between said receptacle and the walls of said compartment and the bodies and cooling unit therein.

8. In combination with a refrigerator provided with walls defining a compartment and having a cooling unit associated therewith, a food storage receptacle arranged in the upper portion of said compartment and supported in heat exchange relation with a wall thereof, a substantial portion of the exterior surfaces of said receptacle presented towards said cooling unit and the interior of said compartment having a relatively high coefficient of reflection of radiant heat for impeding the transfer of heat between the receptacle and the walls of the compartment, bodies stored in the compartment and the cooling unit therein, said walls in the vicinity of said receptacle being formed of relatively good heat conducting material for conducting heat to the portion of the wall on which the receptacle is supported.

JAMES L. FLETCHER.