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REFRIGERATOR BOX AND SYSTEM OF REFRIGERATION

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FIG. 1.

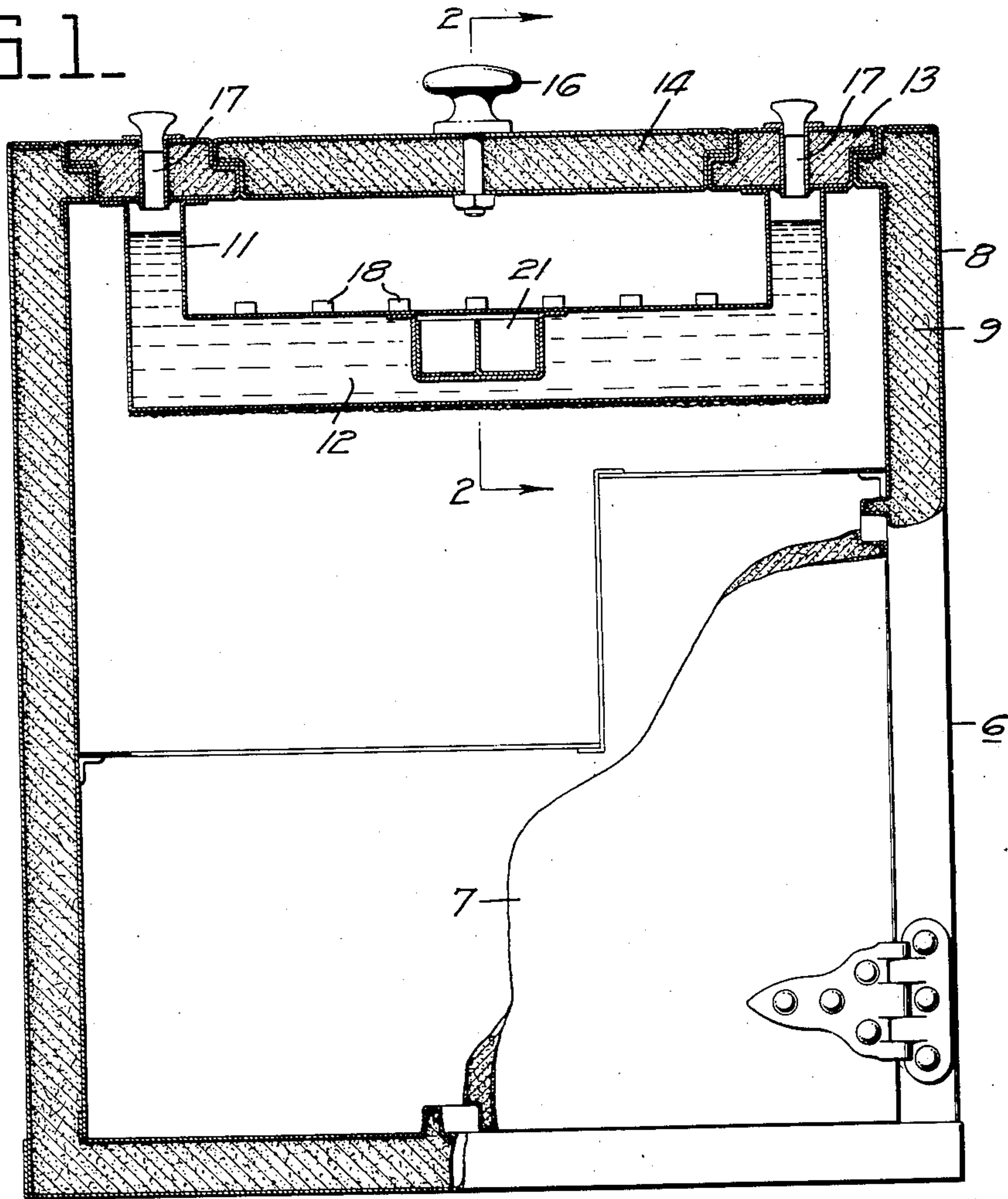
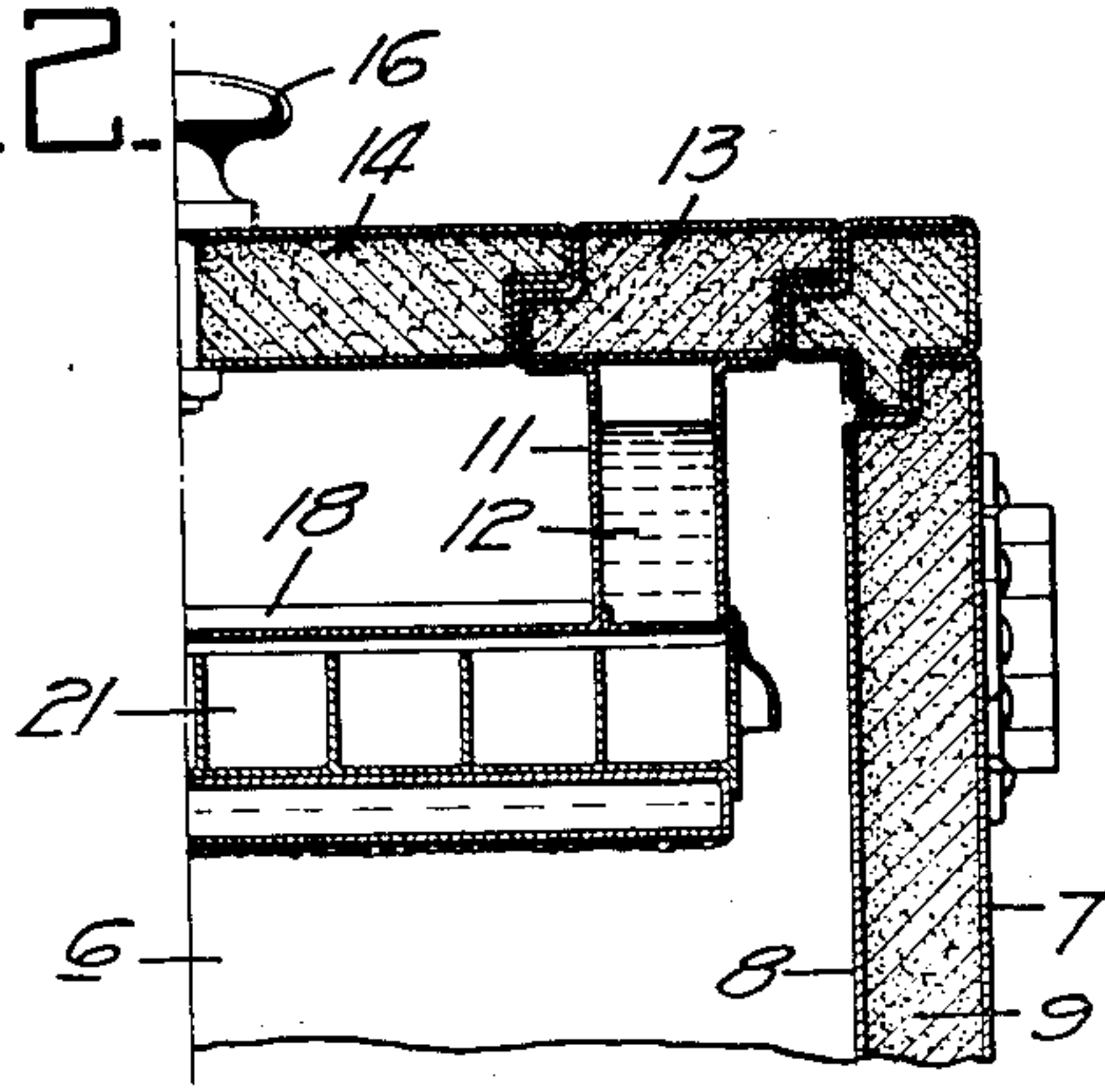


FIG. 2.



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REFRIGERATOR BOX AND SYSTEM OF REFRIGERATION

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This invention relates to a refrigerator box or other receptacle construction and system of refrigeration, particularly a construction and system wherein an extremely low temperature refrigerant such as solid carbon dioxide is employed. As is well known, carbon dioxide, when in the solid form, sublimates at a temperature of approximately minus 110.2° F. This material is now becoming commercially available at a price which, when considered upon a refrigerating basis, approximates that of water ice. Besides being relatively low in price, the material possesses certain inherent characteristics which make it very desirable as a refrigerant. Thus the material can be secured very cheaply as a by-product of fermentation processes and can be readily transported due to its relatively low weight. When packed in suitable container, the product can be handled with ease and does not involve the messiness and other disadvantages attendant upon the use of ice such as having to provide a drain for the water. Further, the material is very much more efficient from a refrigerating standpoint inasmuch as the physical change taking place in the material makes available a greater heat absorbing capacity than does the physical change of water from the form of ice to liquid.

It is in general the broad object of the present invention to provide a refrigerator box construction suitable for the employment of a low temperature refrigerant such as carbon dioxide and a suitable system for the employment of such refrigerant.

By virtue of the extremely low temperature available with solid carbon dioxide, the use of the material in such quantities as to produce a practical refrigerating effect in a refrigerator box usually results in the contents of the box being frozen or cooled to an impractical degree. In accordance with the present invention, I provide a construction and a system of refrigeration by means of which the temperature of the solid carbon dioxide is controlled and tempered to the desirable domestic refrigerating temperatures which usually approximate 40° F.

Another object of the invention is to provide a refrigerator box construction system by means of which very low temperature refrigerants can be successively adapted to domestic refrigerating temperatures.

The invention possesses other advantageous features and objects some of which, with the foregoing, will appear in the following wherein I have outlined the preferred form of the refrigerator box construction and system embodying my invention. The box construction illustrated in the drawing forming a portion of this specification exemplifies merely a preferred form of construction and is not to be taken as limiting the invention, it being understood that the invention, as defined in the claims, is to be accorded a range of equivalents and a scope consistent with the state of the prior art.

In the drawing, to which mention has been made above, Figure 1 is a side elevation illustrating a refrigerator box embodying my invention, the box being partially cut away to show the construction in detail.

Figure 2 is a section taken along the line 2—2 of Figure 1.

In accordance with my invention, a suitable refrigerating box indicated generally at 6 and having a hinged door 7 is provided. This box has been shown as comprising a shell 8 in which a relatively poor heat conducting material 9 is inserted. The box construction per se can be of any desirable type as long as the desired heat insulating qualities and properties are available.

In accordance with my invention I provide a suitable receptacle or container 11 for receiving the solid carbon dioxide or other low temperature refrigerant and this container is preferably formed by a fluid container 12, the fluid container 12 being so adapted that it can receive and support in heat transmitting relationship to the refrigerator box, a supply of the low temperature refrigerant. The form of the container can be varied to accord with the packing of the separate refrigerating packages in the receptacle 11.

The fluid container 12 is preferably carried upon a removable section 13 of the box so that the container can be removed with readiness

for cleansing or de-icing when desired. Another removable section 14 of the box is positioned over the interior of the container 12 so that a supply of the refrigerant can be readily inserted upon lifting the section 14 by means of the handle 16. The handle 16 is preferably of a considerable weight so that the several sections are well sealed. If desired, a small vent can be formed in the handle for the escape of CO₂ vapor. Section 13 carries and supports sections 14 in position on the outer container. Section 13 can be removed by means of suitable grips or handles, not shown, section 14 being readily removed thereby at the same time since it is carried by section 13. Section 14 is separately removable by handle 16.

The fluid container 12 is conveniently formed of sheet metal or other material and is so provided that fluid can be admitted to the container through ducts 17 positioned in the section 13 so that fluid can be inserted or withdrawn when desired. The ducts 17 also provide for the expansion of the fluid in the container 12 so that when it forms into the solid form as that of ice, the container will not be ruptured.

The fluid container provides, in effect, an insulated shell extending about the low temperature refrigerant so that the rate of heat transmission to the refrigerant is reduced to a low rate. This results in the temperature in the refrigerator box being maintained at a desirable refrigerating temperature such as 40° F. By filling the fluid container 12 with a suitable fluid such as water, the refrigeration of the box is produced, in effect, by a block of ice. The water in the container is subsequently frozen by the refrigerant and since ice is a relatively poor heat conductor, the temperature of the refrigerator medium for the box is substantially limited to that of a constantly available block of ice. Further, when the supply of refrigerant runs low, if ever, the latent heat supplied to the ice in the fluid container 12 is available for refrigerating the box upon the ice melting. The water or other material in the container, solidified or cooled to a low temperature by the solid carbon dioxide, thus maintains the heat transmission rate to the refrigerant at a low value while preventing the low temperature refrigerant from cooling the products to be refrigerated to too low a temperature. The material in the container thus serves the three fold purpose of (1) limiting heat transmission to the refrigerant, (2) limiting cold absorption by the products to be refrigerated and (3) providing a source of cold if the refrigerant relied upon fails temporarily.

I found it desirable to provide a plurality of spacers 18 upon the interior of the container so that the refrigerant package is maintained spaced from the container, thus providing for a certain amount of circulation.

As is best shown in Figure 2, a removable drawer 21 is provided for insertion into the fluid container, the container being adapted for reception in heat transmitting relationship of the drawer. Water can be inserted into this drawer and subsequently frozen so that ice cubes are available.

It is believed to be apparent from the foregoing that I have disclosed a novel form of refrigerator box and a refrigerator system. In practise, these have proven themselves particularly adapted for the use of low temperature refrigerants and have much to commend themselves in view of the relatively constant refrigeration made possible and in view of the greater ease and facility of handling such refrigerants as compared to ice. Thus, the container encasing the refrigerant can be made as a unit separate from the refrigerator so that it can be readily removed or replaced. This construction lends itself to the facile refrigeration of boxes of fish, thermos bottles and other types of material containers wherein refrigeration is desirable in a simple, convenient and thorough manner.

I claim:

1. In a refrigerator box, a fluid container carried by a first removable section of the box, a fluid in said container, and a second section of the box removable directly over said container so that a refrigerant can be placed upon said container to receive heat transmitted from within said box through said fluid in said container to said refrigerant.

2. In a refrigerator box, a poor heat insulating shell carried by a first removable section of the box, a second section of the box being removable directly over the shell so that a refrigerant can be placed upon the shell to receive heat transmitted from the box through the poor heat insulating shell to the refrigerant.

3. Refrigerating apparatus including an outer container having an open top and side, a hinged door for closing said open side, an inner container adapted to receive a low temperature refrigerant as solid carbon dioxide and to close said open top, said inner container including means to reduce refrigerating effect of said refrigerant to substantially that of ice and to maintain refrigeration of said outer container when said refrigerant is exhausted from said inner container.

4. Refrigerating apparatus including an outer container having an open top and side, a hinged door for closing said open side, an inner container adapted to receive a low temperature refrigerant as solid carbon dioxide and to close said open top with said refrigerant supported in only heat transmitting relationship to said outer container, said inner container including means to reduce refrigerating effect of said refrigerant to sub-

stantially that of ice and to maintain refrigeration of said outer container when said refrigerant is exhausted from said inner container.

5 5. Refrigerating apparatus including an outer container having an open top and side, a hinged door for closing said open side, an inner container adapted to receive a low temperature refrigerant as solid carbon dioxide
10 and to close said open top, said inner container including a body of water to reduce refrigerating effect of said refrigerant to substantially that of water ice and to maintain refrigeration of said outer container when
15 said refrigerant is exhausted from said inner container.

6. Refrigerating apparatus including a heat insulating outer container open at the top thereof, an inner container adapted to be
20 positioned on said outer container to close said open top and to depend into said outer container, said inner container being adapted to receive a refrigerant as solid carbon dioxide and support said refrigerant out of contact with the interior of said outer container,
25 and a cover for said inner container.

7. Refrigerating apparatus including a heat insulating outer container for products to be refrigerated, a refrigerant container
30 positioned in heat absorbing relation to said outer container, said inner container being adapted to receive a refrigerant as solid carbon dioxide, and including means to reduce refrigerating effect of said refrigerant to substantially that of ice and to maintain substantially refrigeration of products in said outer container when said refrigerant is exhausted from said refrigerant container.

8. Refrigerating apparatus including a
40 heat insulating outer container open at the top thereof, an inner container adapted to be positioned on said outer container to close said open top and to depend into said outer container, said inner container being adapted
45 to receive a refrigerant as solid carbon dioxide and support said refrigerant out of contact with the interior of said outer container, said inner container carrying a body of liquid as water to reduce refrigeration of
50 the interior of said outer container to substantially that of a block of water ice, and a cover for said inner container.

In testimony whereof, I have hereunto set my hand.

55 JOHN H. WOOLL.