

Dec. 17, 1935.

L. B. VAN IKE

2,024,490

DRY ICE REFRIGERATION BY CONDUCTION

Filed June 9, 1934

3 Sheets-Sheet 1

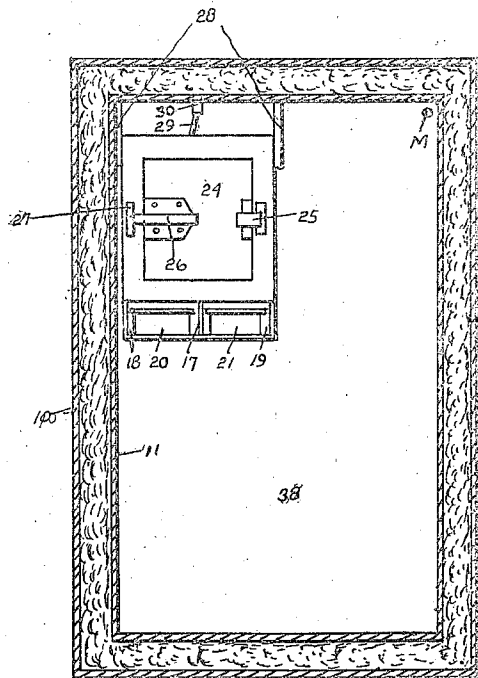


Fig. 1.

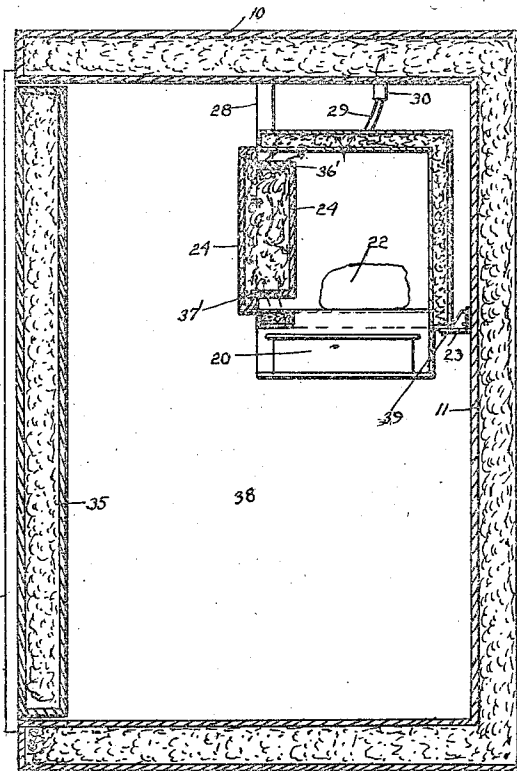


Fig. 2.

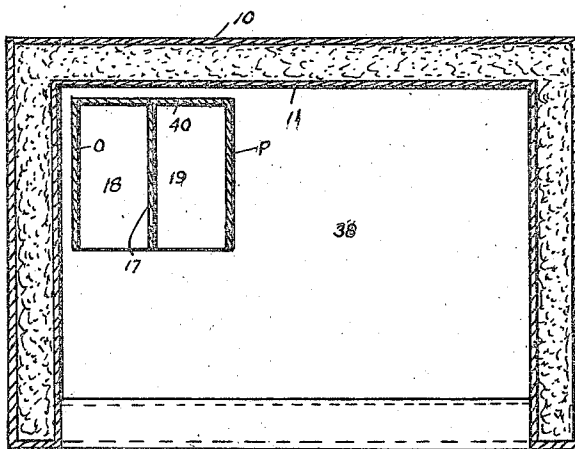


Fig. 3.

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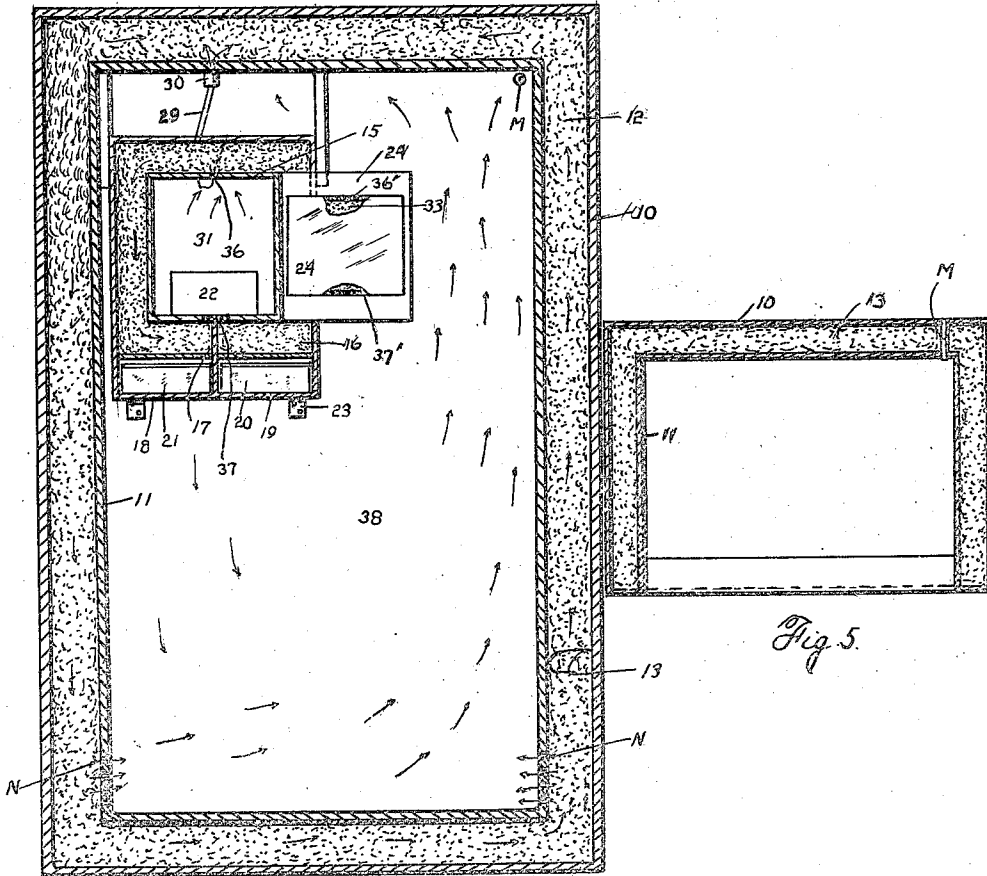


Fig. 4

Fig. 5

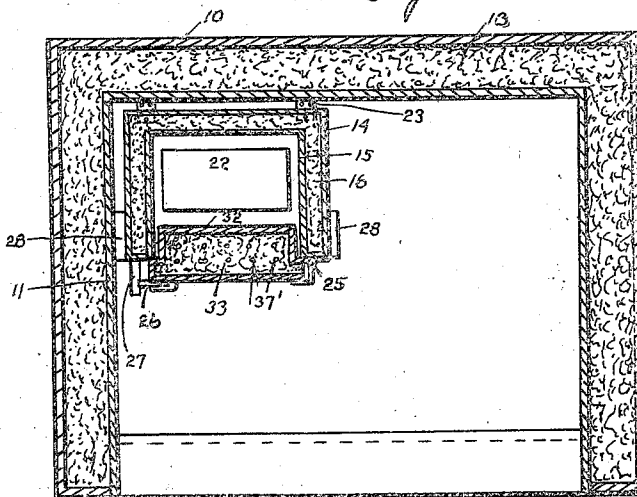


Fig. 6

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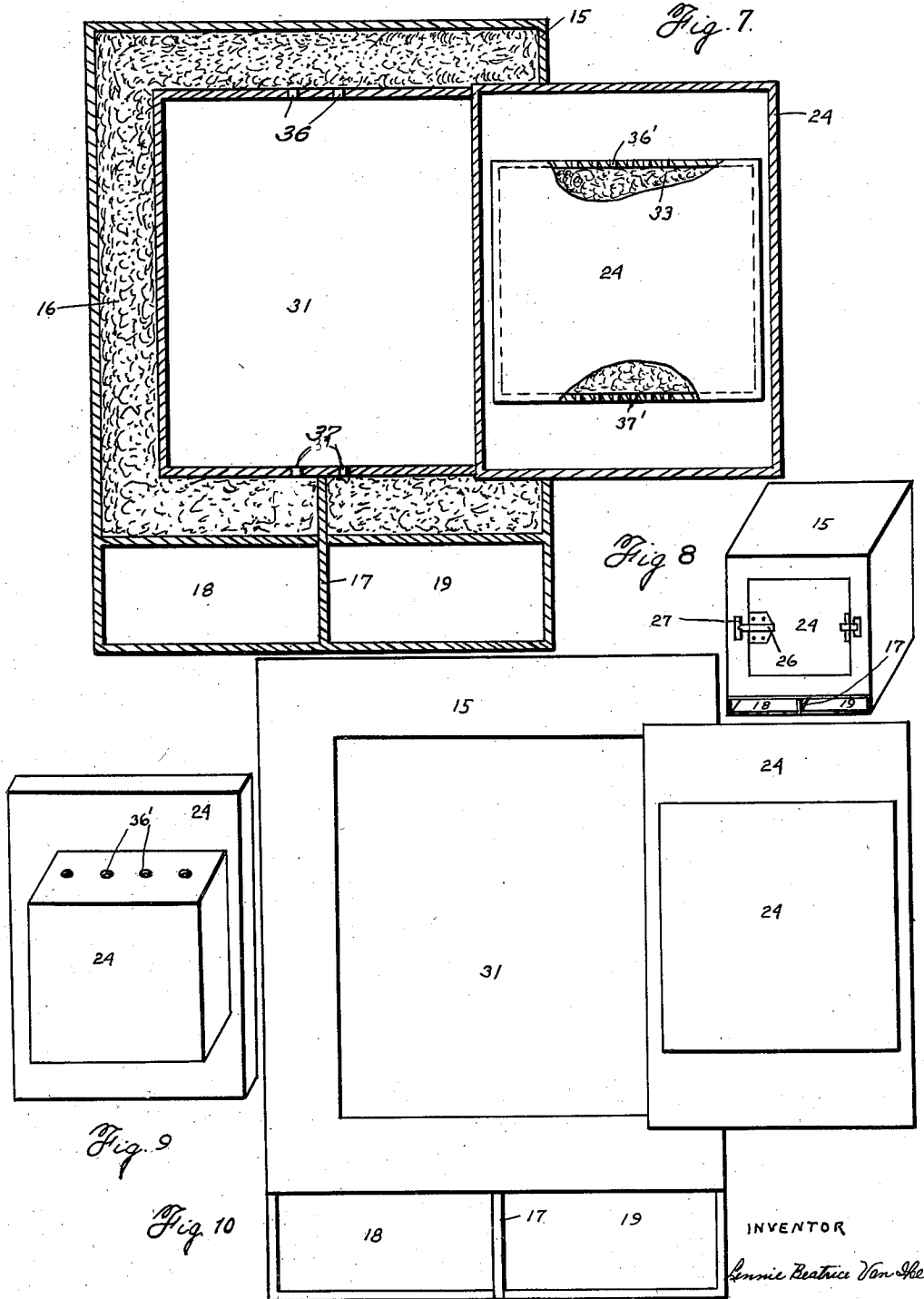
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DRY ICE REFRIGERATION BY CONDUCTION

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UNITED STATES PATENT OFFICE

2,024,490

DRY ICE REFRIGERATION BY
CONDUCTION

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Application June 9, 1934, Serial No. 729,835

14 Claims. (Cl. 62—91.5)

This invention relates to improvements in refrigeration and more particularly to dry ice refrigerators.

One of the objects of the present invention is to provide a simple, efficient and inexpensive apparatus designed to employ carbon dioxide in solid form or dry ice as it is conventionally called in a manner designed to effect a heat exchange by means of direct conduction.

In an application filed by me in the Patent Office on the day of April 30th, 1934, Serial Number 723,013 I disclosed a construction of refrigerator for dry ice characterized by the consideration that refrigeration is brought about by radiation as well as by convection but in the case of my present invention it is brought about by conduction peculiarly.

Another object of the present invention is to provide a dry ice refrigerator in which dry ice is employed for the purpose of making it a simple task to locate the refrigerating means in an ice box or refrigerator case while attaining a maximum degree of frigidity.

A further object of the present invention is to provide a dry ice refrigerator with a dry ice box disposed in a corner of the main refrigerator case in such a manner as to provide a free untrammelled large area in which may be dissipated the carbon dioxide gas for cooling the contents of the refrigerator.

A still further object of this invention is to provide, in a refrigerator employing dry ice, a dry ice box designed to receive the solid carbon dioxide, and to support pans containing cooling media, and further arranged to disseminate the carbon dioxide gas in an insulating jacket lining the walls of the main refrigerator.

A final object of this invention is to provide a dry ice box attachment for properly insulated refrigerators accommodated for the circulation of carbon dioxide gas which is provided with a door of special construction so shaped and designed as to permit passage of carbon dioxide gas from the food compartment of the box thereinto and therethru when the door is closed.

With the above and other objects in view my invention consists in the combination, arrangement and details of construction disclosed in the drawings and then more particularly pointed out in the appended claims.

In the drawings, wherein similar reference characters designate similar parts throughout the respective views,

Figure 1 is a vertical section taken transversely of the refrigerator case, showing the dry ice box therein, in front elevation,

Figure 2 is a vertical section taken longitudinally of the refrigerator case, showing the dry ice box in vertical section,

Figure 3 is a horizontal section of the refrigerator case showing a cross-section of the cooling

tray stand,

Figure 4 is a vertical section of the refrigerator case showing the dry ice box in vertical section with its door, partly in section, open,

Figure 5 is a view similar to Figure 3 but showing the gas exhaust pipe,

Figure 6 is a horizontal section of the refrigerator case showing the dry ice box in cross section.

Figure 7 is a fragmental section of the dry ice box shown with its door open and as a complete unit,

Figure 8 is a perspective view of the dry ice box with the door closed,

Figure 9 is a perspective view of the door for the dry ice box, and

Figure 10 is a front elevation of the dry ice box with its door open.

In the drawings, which are merely illustrative of my invention I disclose a refrigerator case of double wall construction consisting of the outer case 10 and the inner case 11 with a jacket 13 extending between both walls and filled with a suitable light porous insulating material 12 which may be hair adapted particularly to allow the gas of carbon dioxide to flow in and around said jacket. The inner case 11 at its lower end is provided with a series of holes N communicating with the jacket 13 at its lower portion. There is a pipe M bridging the two walls forming the outer and inner cases, at the upper end of the refrigerator by means of which carbon dioxide gas filling the interior 38 of the food compartment of the refrigerator may escape to the atmosphere.

I provide as a new article of manufacture and adjunct for the type of jacketed refrigerator hereinbefore set forth a dry ice containing box also of double wall construction so as to provide the outer case or box proper 14 and an inner case or ice chamber 15 with a jacket between the outer and inner case filled with the insulation 16 of the same kind as the insulation filling jacket 13 already described.

Extending or depending downwardly from the bottom of the inner case is a vertical medial conductor plate or partition 17 which projects thru the jacket of the box to a point below the bottom of the outer case of the box, and here a metal frame is built in such a way as to provide oppositely arranged side walls O and P also connected to the box as conductor plates, and a back wall 40, the bottom wall of this frame extending across the conductor partition on either side thereof so that there is provided a pair of compartments 18 and 19 in which are slidably and detachably supported cooling trays or the like 20 and 21 respectively. Solid carbon dioxide or ice designated 60

22 is placed in the hollow ice compartment 31 of the box 14.

Brackets or the like supports 23 are secured to the lower part of the box for supporting the box in spaced relation from the walls of the inner case of the refrigerator, and cleats 28 secured to the upper part of this inner case and to the upper part of the box also serve to support this box in the upper part of the refrigerator case and to one side thereof preferably. Any other means of support could just as well be used.

I provide a door of special construction for closing the ice compartment or interior 31 of the dry ice box. The door broadly designated 24 is of a hollow construction and is suitably hinged as at 25 upon the box. Any suitable locking means 26 may be employed to lock the door in closed position relatively to the box which may be of a slidable or swinging type as desired. A keeper 27 for the locking means is shown. There is an outlet pipe 29 whose lower end opens into the jacket of the box at the upper part of its outer case, and whose opposite end is connected to a nipple 30 which opens out of the inner case of the refrigerator box and into the jacket surrounding the inner box.

The hollow door 24 has its outer hollow part designed to overlap the outer door edge when the door is closed and it is formed with a box-shaped member 32 containing hair insulation or the like 33; this member 32 projects into the compartment 31 of the box when the door is closed in such a manner that it is spaced from all sides of the inner case of the box 14 to allow flow of carbon dioxide fumes exuded from the solid CO₂ located at 22 in this box. The upper and lower parts of the inner case or chamber 15 of the box are formed with holes 36 and 37 respectively and the upper and lower parts of the hollow member 32 of the door is also formed with holes 36' and 37' respectively, or only the upper part of the inner case of the box may be formed with holes, if desired. 39 designate fasteners for securing the brackets 23 upon the box 14.

In operation, the lines of arrows in Figure 4 will show the manner in which the contents of the refrigerator case may be cooled. This case is closed by the front door 34 also having a box 35 in which porous insulating material is found. The cooling trays 20, 21 are inserted with their liquid contents into compartments 18 and 19 of the dry ice containing box. The frigid temperature maintained in the interior compartment 31 of the box is the means of lowering the temperature of the conductor plate or partition 17 which extends downwardly from the highly cooled bottom of the inner case of the box upon which the solid CO₂ rests. Hence the outer door 34 of the main refrigerator may be opened to get at the contents thereof without disturbing the door 24 of the ice box itself, which remains closed at this time and is opened only for replenishing the dry ice. The conductor partition and other parts of the cooling tray supporting stand or frame becomes highly cooled and remains cool and thus imparts a heat exchange to the contents of the trays 20 and 21 freezing the same quickly and effectually. The carbon dioxide gas emanating from the dry ice 22 flows out of holes 36, 37 of the inner case 15 of the box into the jacket and flows into the bottom holes 37' of the member 32 of the door into its jacket and thence out of the upper holes 36' back into jacket of the box. The gas may now escape by way of pipe 29 and nipple 30 into the jacket 13 of the refrigerator

case, keeping all the walls thereof cool, and flowing thru ports N at the lower end of the case 11 into the food compartment 38 keeping its contents cool, and ascending to the top of this case escapes out of the vent pipe 29 to the atmosphere.

From the foregoing it will readily be seen that the dry ice box is adapted to be inserted as a complete finished unit into a refrigerator cabinet or case and properly supported therein. It is primarily designed to replace the water ice or the mechanical cooling unit for the purpose of refrigeration and food preservation.

I do not confine myself to the exact details of construction save as pointed out in the appended claims.

What I desire to claim and secure by Letters Patent is:—

1. A device as described consisting of a main refrigerator case, an interior case supported in spaced relation to the main case and providing a continuous jacket between both cases, a porous light insulation filling the jacket and allowing free circulation of carbon dioxide gas, a dry ice box mounted fixedly in the upper part of the interior case, a door for said box having a compartment therein adapted to contain gas, means providing a jacket with contained insulation around the dry ice box for the circulation of carbon dioxide gas therein, there being intercommunication between the jacket of the two cases and the ice box jacket for continuous flow of said gas, a door closing the ice box, and means establishing carbon dioxide gas communication between the door compartment when closed and the interior of the dry ice box.

2. A device as described consisting of a main refrigerator case, an interior case between which and the main case exists a jacket, a hairy insulation filling said jacket allowing passage of carbon dioxide gas, a dry ice box mounted in the upper part of the interior case, a pipe connecting the top of the box and the jacket to allow passage of gas out of the box into the jacket, means supporting the box in the interior case, a door closing the ice box, and a central forwardly projecting compartment upon the inner side of the door containing a porous insulation, the upper and lower parts of the mentioned compartment being spaced from the upper and lower parts of the interior of the box and having ports allowing passage of gas.

3. A device as described consisting of a refrigerator case having an interior marginal jacket containing a gas-passage-allowing insulation, and providing an inner case, an imperforate dry ice box mounted in the upper part of the inner case spaced below the top of this case, a pipe connecting the box and inner case and opening out into said jacket, an inner box in the dry ice box providing between itself and the outer box a jacket also containing an insulation allowing passage of gas, means closing the interior of the ice box, a tray depending from the ice box and a conductor plate dividing the tray into several tray-receiving pockets.

4. In combination with a dry ice refrigerator having its wall insulated and accommodated to the passage of carbon dioxide gas, a contained dry ice box spaced out of contact with the interior walls of the refrigerator, a pipe connecting the top of the ice box with the insulated walls of the refrigerator, a jacket around the walls of the ice box containing a gas-passing insulation conducting gas into said pipe and thereout, a depending conductor plate on the interior food-

holding compartment of the ice box projecting below the box, and compartments walled upon the conductor plate for holding trays in proximity to said conductor plate, and an insulated door closing the interior compartment of the ice box.

5 In combination with a dry ice refrigerator having its walls insulated and accommodated to the passage of carbon dioxide, and providing a jacket around the interior chamber thereof, a dry ice box mounted in the upper part of said chamber spaced out of contact with the walls thereof to allow free circulation of carbon dioxide gas therearound and therebelow, inside of the chamber and in said jacket, means establishing communication between the jacket and the box, an insulation-containing jacket in the box allowing gas to pass out of the box by way of such means to said jacket, a door closing the interior of the box, a forwardly projecting insulation containing box upon the inner side of the door disposed wholly within the box when the door is closed, and means establishing communication between the interior of the box and the interior of the jacket box for the passage of carbon dioxide gas.

6 A device as described consisting of a refrigerator case of double wall construction with a jacket therebetween filled with hair, a dry ice box secured in spaced relation inside of the case and also of double wall construction with a jacket therebetween filled with hair, a door closing the ice box and having a hollow member filled with hair with means of communication with the interior of the box when the door is closed, a conductor plate depending medially from the bottom of the box, said box and conductor plate supporting cooling trays, and a pipe connection between the jacket of the box and the jacket of the case.

7 A device as described consisting of a refrigerator case of double wall construction with a jacket therebetween filled with hair, the opposing walls of the inner part of the case at its lower end having holes whereby carbon dioxide gas flowing in the hair of the case jacket may enter the interior of the case and flow upwardly, an atmospheric vent for the gas flowing upwardly in the refrigerator, and a dry ice holding box in the upper lateral part of the case carrying therebelow a cooling tray holder and thereabove a pipe for passing the gas out of the box into the case jacket.

8 A device as described consisting of a refrigerator case of double wall construction with a jacket therebetween filled with hair, the inner wall having holes at its lower end and both walls being connected at the upper end of the case with a vent pipe for gas flowing out of the holes upwardly in the case, and a dry ice containing box supported in said case at the upper part thereof and also having a hair filled jacket therearound and an inner case, with means of passing carbon dioxide gas out of the box case by way of the box jacket into the jacket of the first case for circulation of the gas in both jackets.

9 A device as described consisting of a refrigerator case of double wall construction with a jacket therebetween filled with hair, the inner wall of which has holes at its lower end, and both walls of which at their upper end have a vent pipe opening out of the case, extending thru said

jacket, and a dry ice containing box mounted at the upper end of the case having a jacket extending therearound filled with hair and having an inner case formed at its upper and lower portions with holes, a door closing the interior case of the box, and a pipe bridging the upper end of the box and the jacket of the case.

10 As a new article of manufacture a dry ice box consisting of an outer and inner case, having a jacket therebetween filled with a porous soft insulation material, a door of hollow construction consisting of an outer part overlapping the door opening of the box when the door is closed and an inner part filled with the same insulation material and projecting into the inner case of the box and having upper and lower holes communicating with the interior of the inner case.

11 As a new article of manufacture a dry ice box of double wall construction with a jacket therebetween filled with hair, the inner wall providing an ice compartment solely, an insulated door closing the compartment and having a hollow member projecting therinto and communicating with the interior of the compartment, a conductor plate extending downwardly from the bottom of the box, and conductor plates connected laterally of both sides of the conductor plate and to the box to provide cooling tray receiving stands.

12 As a new article of manufacture a dry ice containing box of double wall construction providing a jacket therearound and therebetween filled with hair and an inner ice compartment whose upper and lower portions have holes communicating with the jacket, a door closing the compartment and provided with a forwardly projecting box entering the compartment when the door is closed and being spaced from the walls of the latter and also having holes on its upper and lower portion whereby carbon dioxide gas exuded by the dry ice may flow thru the box of the door and into the jacket of the box.

13 As a new article of manufacture a dry ice box consisting of an outer case and an inner case the jacket between which is filled with hair, the upper and lower parts of the inner case having holes communicating with said jacket, a pipe opening into the jacket of the box at the upper end of the latter, and a door of hollow formation consisting of a hollow part overlapping the door front when the door is closed and a hollow receptacle containing hair and formed with holes at its upper and lower portion communicating with the inner case.

14 As a new article of manufacture a dry ice box adapted for insertion and support in a refrigerator of jacketed construction, and composed of an outer and inner case with a porous soft insulation disposed therebetween, the inner case having holes at its upper and lower portion so carbon dioxide gas from dry ice may pass out of the inner case into said jacket, an outlet pipe on the box allowing gas to pass thereout, a conductor plate depending from the bottom of the inner case and passing thru the insulation, a metal frame connected to opposing sides of the conductor plate and providing two stands for slidably receiving and holding cooling trays, and a back wall closing said stands.

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