Nov. 17, 1931. A. E. PAYSON ET AL 1,832,473

REFRIGERATING DEVICE

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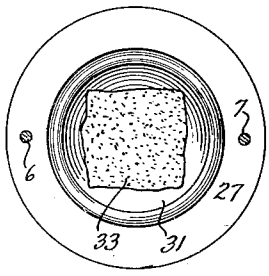


Fig. 3.

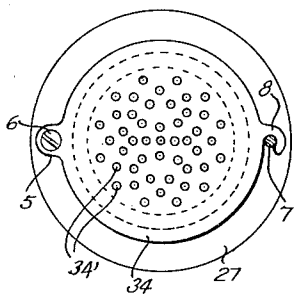


Fig. 2.

Fig. 1.

Fig. 4.

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Fig. 5

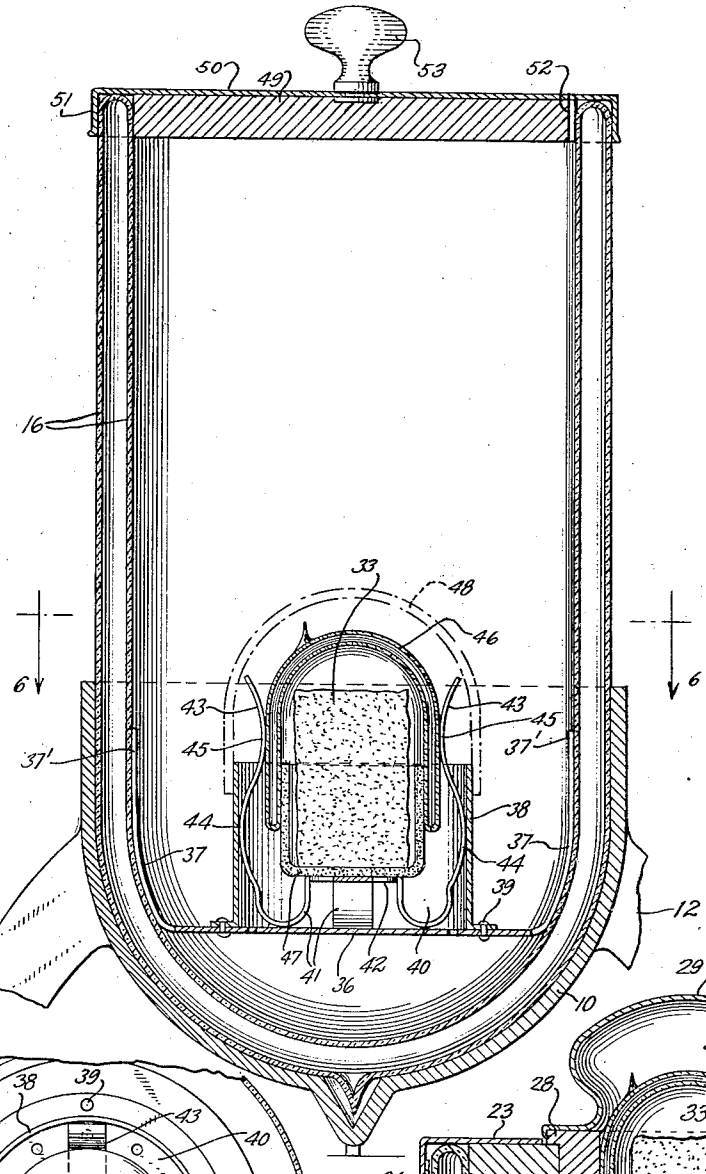


Fig. 6.

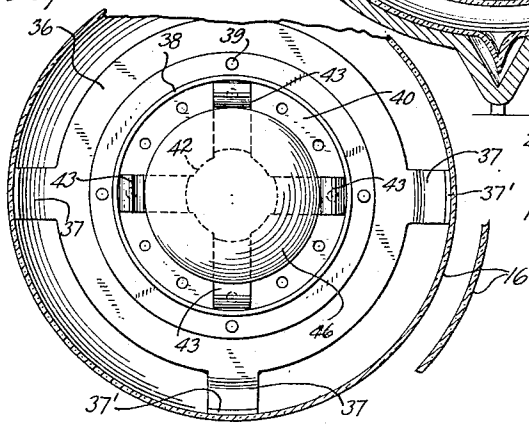
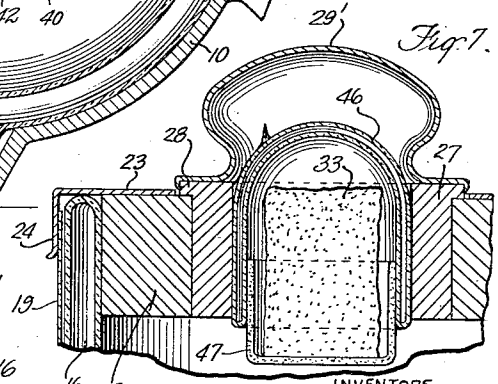


Fig. 7.



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REFRIGERATING DEVICE

Application filed March 12, 1928. Serial No. 260,870.

Our invention is for a self-contained cooling receptacle of novel construction adapted to keep the contents at low temperature. For this purpose we employ a suitable container, preferably a jar of the double-walled vacuum type, provided with a small compartment holding a refrigerating medium. In one embodiment of our invention, this compartment is formed by a double-walled vacuum bottle mounted in the stopper of the receptacle, and the cooling medium is preferably solidified carbon dioxide, commonly known in the market as dry ice. The mouth of the bottle forming the cooling chamber or compartment is closed with a pervious cover through which the carbon dioxide gas escapes gradually into the receptacle, where it instantly expands with lowering of temperature. This cover may be a perforated metal plate (as of aluminum) pivoted so that it can be swung open and closed, or we may use a pervious cup adjustably fitted to expose more or less area for the escape of the refrigerating gas. This enables us to regulate the temperature in the receptacle, as will subsequently be explained more fully. The receptacle is used for storing and dispensing articles (particularly foodstuffs) that must be kept cold.

The various features and practical advantages of our invention will be fully understood from a detailed description of the accompanying drawings, which illustrate several embodiments of our self-contained refrigerating device. In these drawings—

Fig. 1 shows a preferred form of our invention as actually constructed and successfully used, the view being a vertical cross-section approximately through the center;

Fig. 2 is a bottom plan view of the stopper, showing the pivoted perforated disk which closes the ice chamber;

Fig. 3 is a view similar to Fig. 2 with the cover disk removed, this view being a section on line 3—3 of Fig. 1;

Fig. 4 is a sectional fragmentary view on a large scale to show more clearly the connection of the outer jacket to the supporting base in which the jar is supported;

Fig. 5 represents a cross-sectional view of a modified construction in which the refrigerating unit is supported at the bottom of the jar;

Fig. 6 is a transverse cross-section on line 6—6 of Fig. 5; and

Fig. 7 is a fragmentary sectional view of a construction in which the ice chamber in the stopper is closed by an adjustable porous cup.

Referring to Figs. 1–4, there is a base 10 provided with supporting legs 12 which may be cast integral with the base or secured thereto as separate members by suitable fastening means 13. The base 10, preferably of cast metal, is spherical in shape and is provided at the center with a hollow cone-shaped projection 14 which forms a recess 15, for a purpose that will presently appear. A heat-insulated receptacle 16 is firmly supported in upright position on base 10. In the present instance, the receptacle 16 consists of a double-walled vacuum jar of glass, preferably of pyrex glass, or other suitable material. The spherical bottom 17 of the jar fits snugly in the correspondingly shaped body of the supporting base 10. The upper cylindrical portion 10′ of the base engages the cylindrical outer wall of the jar 16, so that the latter cannot tilt on the rounded bottom of the base. As these double-walled glass jars have considerable weight, the jar rests firmly in the base without the need of additional fastening means. It is well known that double-walled vacuum vessels have a projecting tip or tubulation through which the chamber between the walls is exhausted. The jar 16 has a projecting tip 18 at the center of its rounded base, and this tip extends into the central recess 15 of base 10, so that the tip is fully protected against injury.

In some instances it may be desirable or advisable to place a sheet metal jacket or outer casing 19 around the refrigerating jar 16. A simple way to connect the jacket 19 to base 10 is to provide the upper end of the base with an annular recess 20 for receiving the lower end of jacket 19, as clearly shown in Fig. 4. Screws or rivets 21 secure the jacket to the base. The jacket 19 not only protects the glass jar, but conceals the contents of the same and improves the general outward ap-

pearance of the entire device, especially if the jacket is decorated or ornamented with an appropriate design.

A disk 22 secured to the underside of a metal cap 23, as by means of an adhesive or in any other practical way, is inserted in the mouth of jar 16. This disk is preferably of cork or other heat-insulating material and engages the inner wall of the jar in a tight frictional fit. The sheet metal cap 23 is provided with a cylindrical flange 24 adapted to fit over the upper end of jacket 19 and engage the same in frictional contact to make a tight yet separable joint. The free edge of flange 24 is slightly turned outwardly, as shown at 25, in order to facilitate the insertion of disk 23 over jacket 19.

The cork disk 22 has a central opening 26 for receiving a stopper 27 of cork or similar material. The upper end of stopper 27 is formed with a flange 28 adapted to rest on the disk 22. A hollow grip or knob 29, preferably of sheet metal, is attached to the upper end of stopper 27. In the present case the knob 29 has a flange 30, which is spun or turned into holding engagement with the flange 28 of the stopper. A double-walled vacuum bottle 31 is inserted in the axial opening 32 of stopper 27. The bottle 31 fits so tight in the opening that no additional fastening means is needed. The hollow knob or grip 29 performs the double function of a handle for stopper 27 and a protective casing for bottle 31, which holds a refrigerant diagrammatically indicated by the block 33 in Fig. 1. At the present time we prefer to use a refrigerant in the form of solidified carbon dioxide, which is popularly known in the trade as dry ice, but any other practical kind of refrigerant or cooling medium may be employed.

The mouth of the heat-insulated bottle 31 is closed by a disk 34 having perforations 34′ to allow the slow escape of carbon dioxide gas from the bottle. The disk 34, which can be stamped out of sheet aluminum or made in any other practical way, has a lug 5 for receiving a screw 6 carried by the lower end of stopper 27, whereby the disk is pivoted to the underside of the stopper. A screw 7 projecting from the bottom of stopper 27 is arranged to engage a hook 8 on disk 34 for securing the latter in closed position.

The operation of the refrigerating apparatus above described will be clearly understood, but it may be summarized in a few sentences. The heat-insulated jar 16 is adapted to hold foodstuffs and other articles that should be kept at low temperature, such as ice cream confections, certain kinds of candies, yeast cakes, and so on. Solidified carbon dioxide or dry ice is packed into the double-walled bottle 31. This so-called dry ice has a temperature of about 114.5 degrees Fahrenheit below zero. As carbon dioxide gas is formed by slow evaporation of the dry ice, the gas escapes through the perforated disk 34 into jar 16, where it expands and lowers the surrounding temperature. The rate of evaporation of refrigerant 33 depends on the temperature inside the jar and on the degree of perviousness of disk 34. Obviously, the greater the combined area of holes 34′, the faster will the dry ice evaporate. Therefore, by predetermining or regulating the size of holes 34′, it is possible to obtain (within reasonable limits) the desired temperature in receptacle 16. The accumulated expanded gases in the jar pass into the atmosphere when the stopper 27 is removed for access to the contents. The stopper fits in the opening of disk 22 with sufficient looseness to be easily removable, and the opening 26 is big enough to permit the insertion of a hand. It may be advisable to provide a small vent 35 through disk 22 and cap 23 to relieve excessive gaseous pressure in jar 16, in the event of the stopper 27 not being lifted in time to allow the escape of accumulated gas. It should be noticed that the heat-insulated bottle or container 31 prevents the escape of refrigerating gas except through the perforated disk 34.

The modification of Fig. 5 differs from the construction of Fig. 1 mainly in having the refrigerating unit mounted at the bottom of jar 16 instead of in the stopper. The jar 16 of Fig. 5 contains a perforated plate 36 having integral upstanding arms 37 shaped to engage the inner wall of the jar. The upper ends 37′ of the arms 37 extend for a sufficient distance along the cylindrical inner wall of jar 16 to lock the plate 36 against lateral movement on the rounded base of the jar. A cylinder 38 is mounted on plate 36 by rivets 39, or the like, and in the chamber 40 of the cylinder is a spring support indicated as a whole by 41. This support rests on the perforated plate 36, and comprises a central disk 42 and spring arms 43 preferably formed integral with the disk. These arms are so shaped that at 44 they engage the cylinder 38 and at 45 they engage the double-walled vacuum bottle 46, which is similar to bottle 31 of Fig. 1. When the bottle 46 is inserted between the spring arms 43, the free ends of the latter act like resilient levers held at point 44, so that the bottle is firmly gripped and held in position, and yet is easily removed.

The mouth of bottle 46 is closed by a cup-shaped stopper 47, which consists of a material pervious to the passage of gaseous carbon dioxide. The cup 47 is adjustably fitted in bottle 46 so as to expose a predetermined area and thereby regulate the escape of gas. In this way it is possible to control the temperature in jar 16 within a fair range of accuracy. For example, ice cream confections should be kept at about 15° F. above zero to be in nice eatable condition. For yeast cakes,

the temperature ought to be about 40° F. above zero. The pervious cup 47, which rests on supporting disk 42, can be made of various materials adapted to permit the gradual escape of gas. Among such materials we may mention molded wood pulp, cardboard, unglazed porcelain, porous cement, emery, carborundum, granular compressed cork, solid cork with perforations, leather, cloth mounted on a frame fitting into the bottle, and other materials along the same line. What has been said about the operation of the refrigerating unit in Fig. 1 applies to Fig. 5 without the need of repetition. We need only add that the perforated plate 36 allows the evaporated carbon dioxide to pass into the jar. If desired, a removable dome or cover 48 (perforated or solid) may be mounted on cylinder 28 to protect the refrigerating unit. To replenish the bottle 46, it is withdrawn from the spring arms 43 together with the stopper cup 47, leaving the supporting parts 36 and 41 in place, but the whole outfit can be taken out if necessary.

Since the stopper of Fig. 5 does not carry the refrigerating unit, it can be of simpler construction than the stopper of Fig. 1. The jar 16 of Fig. 5 is closed at the mouth by a disk 49 of cork, or similar material, attached to the underside of a sheet metal cap 50, which has a cylindrical flange 51 adapted to fit over the jar 16. A vent 52 in disk 49 and cap 50 relieves excessive gaseous pressure in the jar, as more fully explained in connection with Fig. 1. A knob or other finger piece 53 is attached to cup 50 in any practical way. We need not describe the support for the jar 16 in Fig. 5, because that is substantially the same as in Fig. 1, except that in Fig. 5 we have purposely omitted the outer metal jacket 19.

The modification of Fig. 7 embodies a combination of certain features in Figs. 1 and 5. Like parts in these three figures are indicated by the same reference numerals, and what has been said about Figs. 1 and 5 applies to similar parts shown in Fig. 7, without the need of repetition. In Fig. 7, the stopper 27 carries a double-walled vacuum bottle 46 provided with an adjustable cup-shaped stopper 47. In other words, we have here a stopper like that of Fig. 1 carrying a refrigerating unit like that of Fig. 5. Since the bottle 46 in Fig. 7 does not project so far out of the stopper, the hollow sheet-metal handle 29′ is shorter than handle 29 of Fig. 1. The operation of Fig. 7 will be understood from what we said about Figs. 1 and 5.

Although we have shown and described certain specific constructions, it is understood that our invention is not limited to the details set forth. The underlying principles of our new refrigerating device can be mechanically carried out in various other ways without departing from the scope of the invention as defined in the appended claims.

We claim as our invention:

1. A heat-insulated receptacle provided with a double-walled vacuum bottle for holding solidified carbon dioxide, said bottle being held in inverted position, and a pervious closure for the lower end of said bottle to permit the escape of gaseous carbon dioxide gas downward into the receptacle where it expands and lowers the temperature.

2. A heat-insulated receptacle having a removable stopper provided with an axial opening, a double-walled vacuum bottle tightly fitted in said opening and adapted to hold a refrigerant in the form of solidified gas, a pervious closure for said bottle to allow the gradual escape of gas into the receptacle, and means on the outside of said stopper to enclose said bottle.

3. A refrigerating unit consisting of a stopper adapted to fit into a receptacle and carrying a double-walled vacuum bottle for holding a refrigerant in the form of solidified gas, and a pervious closure for said bottle to permit the escape of gas.

4. A refrigerating unit consisting of a stopper adapted to fit into a receptacle and carrying a double-walled vacuum bottle for holding a refrigerant in the form of solidified carbon dioxide, and a pervious disk mounted on said stopper to close the mouth of said bottle and allow the gradual escape of gas.

5. A refrigerating unit consisting of a stopper adapted to fit into a receptacle and having an axial opening in which a heat-insulated bottle is mounted, said bottle being adapted to contain a refrigerant in the form of solidified gas, and a removable pervous closure for the mouth of said bottle to permit the gradual escape of gas.

6. A refrigerating unit consisting of a cork stopper having an axial hole therethrough in which a double-walled vacuum bottle is frictionally held, said bottle being adapted to contain a refrigerant in the form of solidified gas, the mouth of said bottle being at the bottom of said stopper and the base of the bottle extending beyond the other end of the stopper, a hollow knob mounted on said stopper to cover the projecting base of said bottle, said knob also serving as a handle for the stopper, and a removable pervious closure for the mouth of said bottle to permit the escape of gas.

7. A double-walled vacuum jar having its mouth covered by a disk comprising heat-insulated material, said disk having an opening large enough to permit the insertion of a hand, a stopper removably fitted in said opening, said stopper being provided with an opening in which a double-walled vacuum bottle is supported, said bottle being adapted to hold a refrigerant in the form of solidi-

fied gas, and a pervious closure for said bottle to allow the escape of gas into the jar.

8. A double-walled vacuum jar having a wide mouth, a cork disk fitted over said mouth, said disk having an opening large enough to permit the insertion of a hand, a cork stopper being provided with an axial opening in which a double-walled vacuum bottle is frictionally supported, the mouth of said bottle being at the lower end of said stopper, a pervious closure for said bottle to permit the escape of gas into the jar, and a vent to relieve excessive gaseous pressure in the jar.

9. In temperature-retaining apparatus, the combination of a hollow spherical base, a double-walled vacuum jar supported on said base in upright position, said jar having a spherical bottom fitting into the spherical base, a projecting tip on the spherical bottom of said jar, a recess on said base for receiving said tip, and a refrigerating unit mounted on the upper end of said jar and in thermal communication with the interior thereof.

10. Refrigerating apparatus comprising a hollow spherical base, a double-walled vacuum jar supported on said base in upright position, said jar having a spherical bottom fitting into said base, a projecting tip on the spherical bottom of said jar, a recess on said base for receiving said tip, an outer jacket connected at its lower end to the upper circular edge of said base, a closure for the mouth of said jar, said closure comprising a sheet metal disk having a depending flange adapted to fit over said jacket, a cork attached to the bottom of said disk and adapted to fit into the mouth of said jar, and a refrigerating unit removably mounted on said closure, said unit having a compartment for a refrigerant in the form of solidified gas and having means permitting the escape of gas into the jar.

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