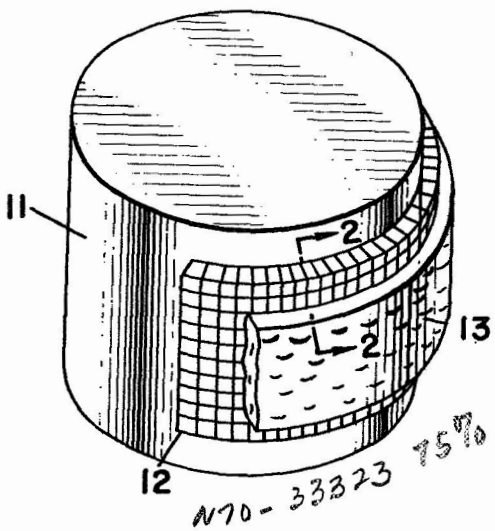
Dec. 12, 1961

D. L. BURROWS

3,012,407

INSULATING STRUCTURE

Filed Dec. 20, 1960



N70-33323 15%

FIG. 1

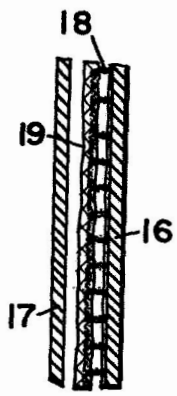


FIG. 3

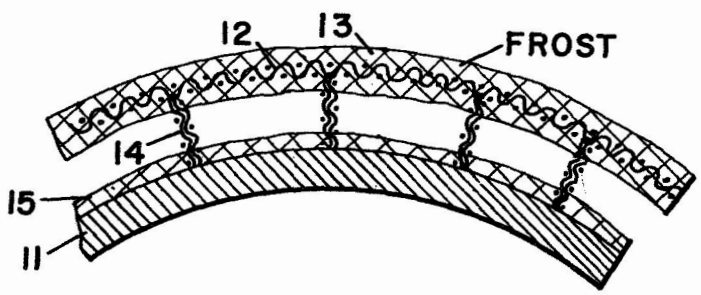


FIG. 2

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United States Patent Office 3,012,407 Patented Dec. 12, 1961

3,012,407

INSULATING STRUCTURE

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Filed Dec. 20, 1960, Ser. No. 77,256
3 Claims. (Cl. 62—45)
(Granted under Title 35, U.S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

This invention relates generally to an insulator for receptacles confining low temperature materials like liquid oxygen, liquid hydrogen, or liquid nitrogen.

The prior art art had difficulty in insulating receptacles like metal containers and tubular metal pipes which confined low temperature materials because of the formation of ice in the conventional insulating materials like cork and fiber-glass. Although conventional insulating materials were usually satisfatcory for the initial use of the receptacle, the frost which formed within the insulating material during this initial period of activity melted when followed by a period of nonuse and the resulting water was unable to drain out of the insulation. Consequently, upon later use of the receptacle the water froze and formed ice which tended to destroy the insulating material and to act as a thermal conductor. It was found, therefore, that better results could be obtained by having receptacles bare of insulating coverings and letting the frost which accumulated on the outside of the receptacle act as the insulating material. However, frost formed on the bare outside surface of a receptacle had the disadvantage of being easily blown off by ambient air movement or being easily shaken off when subject to vibrations. The present invention overcomes these prior difficulties by providing a frost layer spaced from the receptacle which is not easily blown off or shaken off and is a more efficient insulating barrier during use than heretofore known.

It is therefore an object of this invention to provide a receptacle with a frost insulating barrier of high efficiency.

Another object is to provide a receptacle with a frost and air insulating barrier.

It is also an object to provide a receptacle with a screen covering which collects frost thereon.

A further object is to provide a metal receptacle confining a low temperature material with a metal screen which is spaced from a confining wall of the receptacle.

Other objects and many attendant advantages of the present invention will be apparent from the following detailed description when taken together with the accompanying drawings in which:

FIGURE 1 is an illustration of the receptacle with portions of the wire screen and frost removed to show the relationship thereof.

FIGURE 2 is a sectional view taken on line 2—2 of FIGURE 1.

FIGURE 3 is a sectional view of a double wall receptacle showing the wire screen therein.

The receptacle 11 is shown as a container confining a low temperature material like liquid oxygen, liquid hydrogen or liquid nitrogen. On its outside surface is placed a metal screen 12 made up of a plurality of sections of ordinary screen wire fabric of the type usually

found on windows to prevent insects and other bugs from coming through the window. The mesh size of the screen 12 is limited only to the extent that it must be small enough for frost crystals to form thereon and cover the openings. As best shown in FIGURE 2 the screen 12 is spaced from the outside surface of the receptacle by ribs 14 of a similar screen material. In the example shown, the ribs 14 are made by portions or flanges of approximately 7/16 inches in depth which are bent from each screen section. The sections are joined together by suitable means, for example by a weld, to make the screen 12. The ribs 14 of the screen 12 act as thermal conductors whereby frost crystals 13 form on and about the screen 12 and thereby create an air pocket between the outside surface of the receptacle 11 and the surface frost 13. The screen 12 may be permanently attached to the outside surface of the receptacle 11 or merely held in place by tensioning the screen 12 about the receptacle 11. When moisture in the ambient air crystallizes on the screen 12 and forms the frost layer 13, some frost 15 will usually form on the receptacle 11. The amount of the frost 15 is small however since most of the moisture in the air would crystallize out on the screen before it reaches the receptacle 11.

A modification is shown in FIGURE 3 in which the container or pipe has a double wall and the screen 18 is fastened to outside surface of the confining wall 16 in a manner similar to screen 12. The outside wall 17 acts as a protecting cover for the screen 18. Frost 19 forms on the screen material when the low temperature material is introduced into the container or pipe whereby an air pocket is created between the inside wall 16 and the surface frost 19.

The screen has certain inherent advantages. Its flexibility permits a portion of the screen to be crushed down to the surface of the receptacle without stopping the effectiveness of the remaining portions. Further, the frost when melted will not be confined when the receptacle is shut down so as to form ice when low temperature materials are again introduced into the receptacle. Also, since the frost forms on and about the screen so as to be interlocked therewith, it will not easily be blown off by air currents or shaken off by receptacle vibrations.

Obviously, many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore, to be understood that within the scope of the apepnded claims the invention may be practiced other than as specifically described.

What is claimed is:

1. An insulating structure comprising: a receptacle wall confining a low temperature material, a plurality of elongated channel shaped metal screen sections arranged in abutting relationship on said wall so as to form a smooth outer screen surface, and a crystallized water layer forming a frost layer on and about said outer screen surface whereby an air pocket is formed between said frost layer and said wall.

2. An insulating structure comprising: a wall confining a low temperature material, a screen material spaced from said wall by a plurality of spaced ribs, and a layer of frost on and about said screen whereby an air pocket is formed between said wall and screen.

3. An insulating structure comprising: a metal wall confining a low temperature material, and a screen metal wire fabric spaced from said wall by a plurality of rib means adapted to act as thermal conductors between said

fabric and said wall whereby frost will form on and about said fabric.

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