Sept. 5, 1939. O. S. McGUFFEY 2,171,588

SAFETY MEANS FOR REFRIGERATING UNITS

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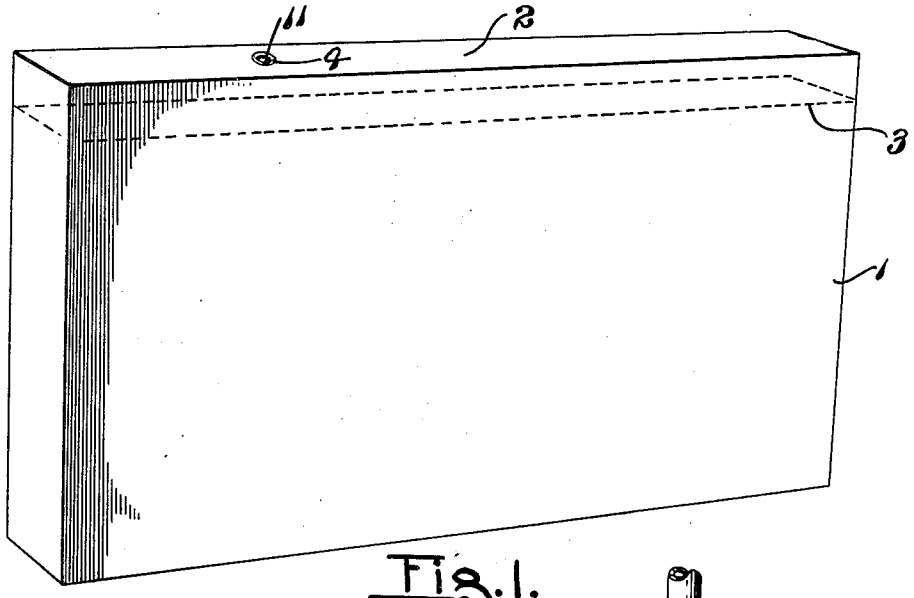


Fig. 1.

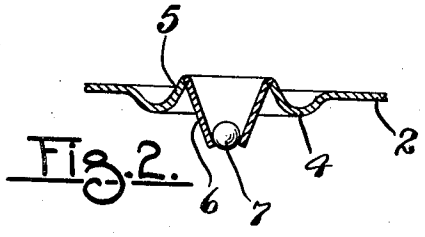


Fig. 2.

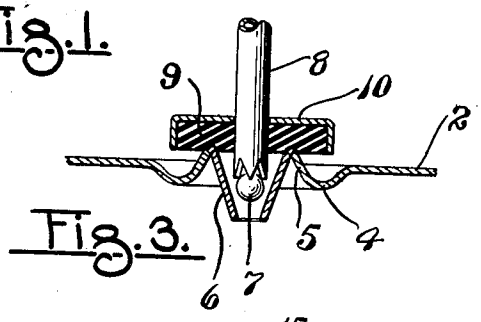


Fig. 3.

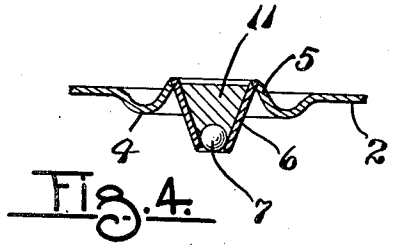


Fig. 4.

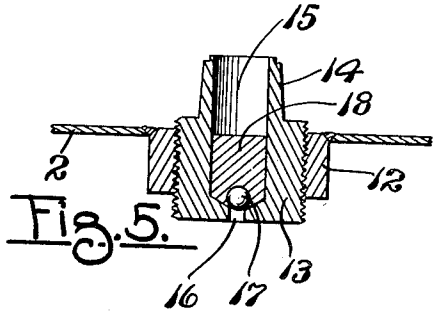


Fig. 5.

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SAFETY MEANS FOR REFRIGERATING UNITS

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2 Claims. (Cl. 62—1)

This invention relates to safety means in connection with eutectic holding refrigerating units. Such units in structure, and as they have been manufactured and sold, comprise a container or casing usually having parallel sides, ends and top and bottom made from sheet metal and welded or otherwise so constructed as to be air-tight and capable of withstanding heavy pressures. A coil through which a refrigerating or heat extracting fluid is circulated is located within the housing, having an inleading pipe at one end of the coil and an outlet pipe at the other for suitable connection with a mechanical refrigerating apparatus, including compressor, condenser and the like. Also, within the container or casing and covering the coil is an eutectic solution which upon the attainment of a predetermined low degree of temperature through extraction of heat therefrom, freezes and becomes ice. The melting of the ice extracts heat from the surrounding atmosphere of the room or truck body or any other enclosed space where the unit is installed.

The eutectic solution which is contained within the housing or casing described has a large quantity of water when it is in liquid form, which water under the influence of sufficient heat would become steam and thereupon produce a pressure within the sheet metal container similar to the boiler pressure of steam within a steam generating boiler. The strength of the sheet metal housing or casing is such that it does not readily rupture, and before such rupture might occur, allowing the escape of the steam, there may be produced a very heavy pressure of steam within the sheet metal casing, thereby increasing the temperature at which the water will begin to be converted into steam. For example, in a boiler if the pressure is merely that of the atmosphere at sea level the water boils and converts to steam at 212° F., but if the pressure generated by the accumulation of steam within the boiler reaches 100 pounds per square inch above atmospheric pressure then the boiling point of the water is increased far beyond 212° F. so that it will not convert to steam until at a high degree of temperature. Should there accur a rupture in the boiler so as to drop the pressure from, for example, 100 pounds per square inch above atmospheric pressure to atmospheric pressure, the great quantity of heat stored within the water, which itself would be far above 212° F., causes a substantially instantaneous conversion of a considerable quantity of the water into steam with resultant explosive effects.

The refrigeration units are many times installed in motor truck bodies. Trucks are quite as subject to accident as are all other motor vehicles, and frequently catch fire after such accidents. Also, the units after they are manufactured may be stored in a warehouse until required for installation after a sale thereof, with a resultant danger of being exposed to fire in case the warehouse burns. Under either of these conditions there is a strong possibility that the eutectic solution within the sealed sheet metal container will be exposed to a high heat, with the generation of steam therein which if it reached a pressure sufficient to rupture the container would then act in exactly the same way as with a bursting boiler and with like damaging effect.

It is a primary object and purpose of the present invention to provide a very practical and simple safety means in connection with the refrigerating units which operates, when they are subjected to a predetermined temperature, preferably slightly below the temperature at which water will boil under normal atmospheric pressure, to unseal a unit in which steam may generate under the influence of heat and permit the free escape of steam as it generates, and thus insure against any danger of explosions similar to boiler explosions.

The invention also contemplates a novel and practical method of obtaining this safety sealing of the refrigerating units. An understanding of the invention and the means used to secure the same, together with the structure embodying such invention may be had from the following description, taken in connection with the accompanying drawing, in which:

Fig. 1 is a perspective view showing generally a refrigerating unit of the type to which my invention is applied.

Fig. 2 is a fragmentary enlarged section illustrating a safety outlet to the unit in accordance with my invention.

Fig. 3 is a section similar to Fig. 2, illustrating the manner in which air is exhausted from within the refrigerating unit.

Fig. 4 is a like section showing the safety outlet sealed by a fusable material which will melt at a predetermined and relatively low temperature, and

Fig. 5 is a like sectional view showing a modification in structure but attaining the same results in the same manner.

Like reference characters refer to like parts in the different figures of the drawing.

The containing unit or casing 1 is generally of

a rectangular paralleopiped form, having parallel vertical sides, with ends and a bottom and a top 2 extending between the edges of the sides, all joints being welded or otherwise connected in such a manner as to provide a completely sealed enclosure and one capable of withstanding a heavy pressure. The refrigerating coil which is housed within this unit in practice is not shown herein.

In practice the casing or container is filled approximately 90% full with the eutectic solution, there being a dotted line indication at 3 of an upper level of the solution. An opening is made preferably in the top 2 around which a strengthening embossed groove 4 is pressed with the metal extending upwardly and inwardly to the edges of the opening having substantially conical sides 5. In this opening a conical or funnel-like member 6 is inserted and is welded at its upper edges to the edges of the parts 5 where such edges come together, so that the inwardly extending funnel member 6 is in effect integrally connected with the parts 5 of the top or upper side 2. The funnel member 6 is of largest diameter at its upper end and the sides converge toward their lower ends, there being a relatively small opening at the lower end of the funnel. A ball 7 is dropped into the funnel the size of the ball being such that it is larger than the lower opening in said funnel 6.

Air is exhausted, as through a pipe 8 (Fig. 3) which is connected with any suitable air exhausting machine, and at its free end passes through a rubber washer 9 which is housed in a sheet metal inverted cup 10. The lower exposed side of the rubber is pressed against the welded joint between the parts 5 and 6. The end of the pipe 8 is notched as shown so that during the air exhausting operation, if the ball 7 is lifted to the end of the pipe, as may occur, it does not stop the outward passage of the air being withdrawn from the container 1. When the air has been exhausted to the required degree, in practice such that the external pressure of the air is substantially fourteen pounds per square inch, the air exhausing apparatus is removed. The ball 7 in its lower position and particularly with the resultant air pressure against it from the outside provides a sufficient temporary seal against air entrance for a short period of time, during which the funnel 6 is filled with a molten, relatively low melting point substance indicated at 11. Such substance may be a solder alloy which will melt at approximately 200° F. or within an approximate range of 190° to 210° F. It is further contemplated that a suitable paraffin wax, meltable at about the same temperature might be used as an equivalent. This provides a permanent seal over the ball 7 insuring against air leakage into the container of the solution.

With such construction, in the case of a fire to which the unit is exposed, the low melting material at 11, melting as it does at a temperature of about 200° F. will soon melt and become liquid. Then in the event that the heat causes the liquid solution within the container to generate vapor or stem, so that the pressure within the unit reaches slightly above the pressure of the atmosphere at the outside, the ball 7 or any liquid material caused by melting the part 11 is easily forced upward and outward providing a vent for the steam as it is produced within the unit, relieving the pressure and insuring that there will never be any liquid superheated to any degree of temperature well above the temperature required for vaporization at atmospheric pressures. This eliminates all danger from explosions similar to boiler explosions which with the units not equipped with such safety device is very liable to occur, inasmuch as said units many times are capable of withstanding a test of inner pressure of 200 pounds per square inch without failure. And if such pressure was attained through the generation of steam before failure of the unit, there would then result an enormous substantial instant generation of steam when the failure did occure with resultant explosive dangers.

In Fig. 5 a somewhat modified form of structure is shown. The opening in the upper side 2 has an interiorly threaded nut or sleeve 12 inserted therethrough and welded in place. Through this sleeve a plug 13 is threaded, the upper end having a reduced neck at 14. There is a cylindrical opening 15 provided from the upper end of the neck 14 nearly to the bottom of the plug 13, with a reduced opening 16 extending through to the lower side of the plug. The upper end of the reduced opening 16 may be normally closed by a ball valve 17.

With this structure the air is exhausted in the same manner as first described and later a melted metal solder or equivalent material, shown at 18, cast within the opening 15 the same as the funnel 6 has the sealing lower temperature melting material 11 cast therein.

There are many variations in specific detail of structure which may be resorted to for embodying and attaining the results of the invention. The invention is very useful and practical. It is particularly useful in connection with the refrigerating units after they have been installed in the bodies of refrigerating trucks. The burning of a truck, when it is involved in an accident, is a frequent happening and the danger to the public is great in such case, particularly as there is generally no realization of the possibilities of danger present from anything of a nature similar to a boiler explosion.

While the disclosure has been primarily with reference to a solution in which the principal liquid ingredient is water the invention is quite as applicable in connection with other eutectic solutions having a different principal liquid ingredient. The melting of the fusible sealing plug in any case should be approximately or perhaps slightly less than the temperature at which said principal liquid ingredient is converted into vapor at atmospheric pressures. The invention is not to be restricted necessarily to water eutectic solutions but has a broader scope and is to be considered comprehensive of all forms of structure and methods coming within the scope of the appended claims which define the invention.

I claim:

1. In combination with a refrigeration unit including an air-tight container partially filled with liquid and having the air removed from the remainder of the space therein, safety means comprising an opening in one of the walls of said container, a funnel shaped member extending inwardly through said opening, the smaller end of said member being lowermost, a ball in said member to cover the opening in the bottom thereof, and a body of material having a relatively low melting point in said member and covering said ball.

2. A combination of elements as defined in claim 1, said melting point ranging from 190° F. to 210° F.

ORTON S. McGUFFEY.