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CRYOGENIC STORAGE TANKS

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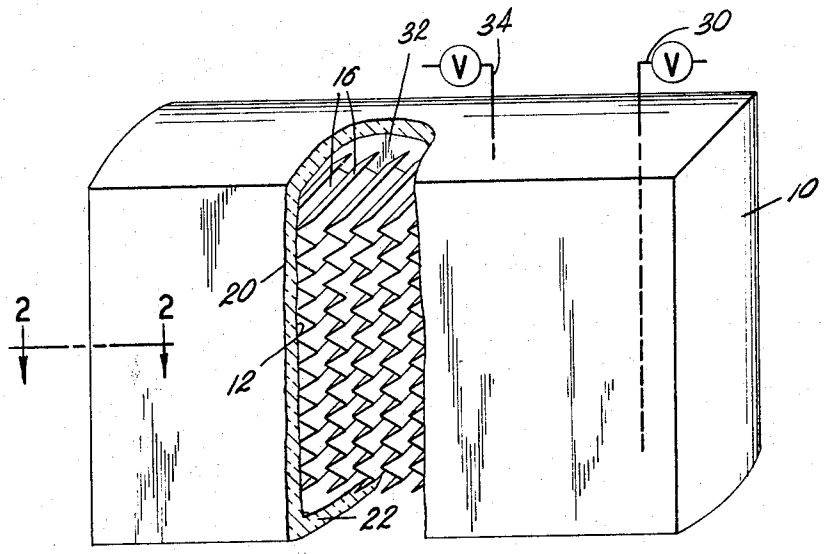

FIG.1.

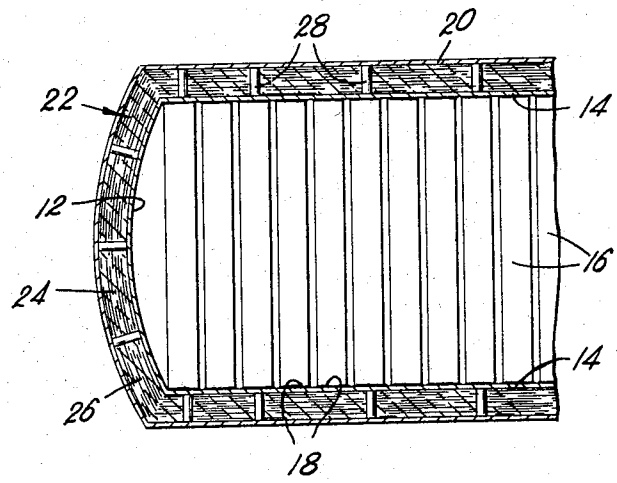

FIG.2.

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CRYOGENIC STORAGE TANKS

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ABSTRACT OF THE DISCLOSURE

A substantially rectangular parallelepipedal shaped double wall container wherein the inner wall is somewhat flexible and is provided with corrgated metallic tension members located between and connected to opposed portions of said inner wall by brazed joints between the end edges of the corrugations and said opposed wall portions.

This invention relates to cryogenic storage tanks, and more particularly such tanks which are used for supplying cryogenic fluid to preserve the quality of food products in transit.

The invention is concerned with a substantially rectangular parallelepiped-shaped vacuum walled portable storage tank for cryogenic material. Such tank is provided with fluid-tight somewhat flexible inner and outer impervious walls of metal, such as aluminum, having a vacuum space therebetween containing an insulating blanket composed of layers of glass fiber sandwiched between reflective sheets of metallic foil, and pegs of nonmetallic material located between said walls in spaced holes in said blanket for preventing said walls from collapsing toward one another due to the vacuum in the space therebetween. Such inner walls of metal, forming sidewalls, a top and a bottom, provide an inner container for the cryogenic material. The invention provides in combination with such tank spaced metallic tension members located between and connected to the sidewalls of the said inner container, and means connecting said tension members to said inner container walls consisting of brazed joints between the end edges of the corrugations of the tension members and the sidewalls of the container, whereby the walls of the structure are strengthened against internal pressure without adversely affecting the fluid-tight integrity of such inner walls.

Prior to the invention, most cryogenic storage tanks of the flat-walled type were made by fusion seam welding aluminum web plates to the inner walls to form lap, butt and edge joints. Such joints had to be tested in the finished tank for possible leakage before use, and any leaks repaired.

One of the main objects of this invention is to minimize such fusion seam welding, to thereby reduce leak potential, while at the same time shortening the time to make the tank, and increasing the wall strength thereof.

In the present case, internal plates and/or fins of metal are brazed to the inner surface of the inner container by furnace or bath brazing, and serve only as tension members when the tank is in use, subject to internal outward pressure from the cryogenic material therein, and to the vacuum between the inner and outer walls of the tank. By the *brazed* construction, the inner walls of the tank are left intact, minimizing the possibility of leakage through such walls, which is present in the case of fabricating many parts with fusion welds.

In the drawings:

FIGURE 1 is a perspective view of a cryogenic storage tank illustrative of the invention, parts of the tank being broken away to show the novel internal construction thereof; and

FIGURE 2 is a fragmentary cross-sectional view of such tank taken on line 2—2 of FIGURE 1.

One embodiment of the invention is illustrated by FIGURE 1, showing a generally rectangular-shaped cryogenic tank **10**. Inner container **12** comprises opposite walls **14** connected by corrugated sheet-like tension members **16**, the opposite edges of which are brazed thereto at **18**. The container **12** is surrounded by outer casing **20** which is similarly shaped and spaced from the inner tank to provide an insulation space which is filled with load bearing insulation **22** and evacuated. Such load bearing insulation preferably consists of alternate layers **24** and **26** of glass fiber and metal foil with holes for pegs **28** of low heat conductive nonmetallic material which withstand the vacuum load of the outer casing.

Conduit means **30** are provided for filling and discharging cryogenic liquid **32** from the inner container. Venting means **34** are also provided for discharging cryogenic vapor therefrom. A desired pressure of up to about 50 p.s.i.g. working pressure, for example, is maintained in the tank **10**. Liquid nitrogen is the preferred cryogenic liquid.

Tension members **16** preferably extend across the short dimension of inner tank **12**, and may be corrugated, as shown, or have some similar shape to aid in assembly and brazing. For example, they may comprise thin aluminum sheets about 1/32" thick and corrugated on about 6" pitch and spaced about 2" apart. Such tension sheets are preferably oriented so as to provide vertical compartments, but do not extend all the way to the top and bottom walls so as to provide communication between the compartments.

The invention reduces the cost of making the tanks, by making mass production thereof possible inasmuch as all of the brazed tension joints may be made in one furnace or salt bath glazing operation. Also, the strength of the entire assembly is increased for a given thickness of the inner and outer walls, by virtue of the tension members within the inner cryogenic container, and the need for fusion seam welding of aluminum is considerably reduced in constructing the new tanks.

What is claimed is:

1. In a vacuum insulated substantially rectangular parallelepipedal shaped double walled portable storage tank for cryogenic material, comprising a fluid-tight somewhat flexible inner wall and an impervious outer wall spaced from and surrounding said inner wall providing therebetween a vacuum space, wherein said inner wall is formed of flat panels of metal to provide an inner container havside walls, a top and bottom; the combination therewith of spaced corrugated metallic tension members located in said inner container between and connected to said sidewalls of said inner container; and means connecting said tension members to said inner container sidewalls, said means consisting of brazed joints between the end edges of the corrugations and the inner container sidewalls.

2. In a cryogenic storage tank the combination of claim **1**, and insulation located in such vacuum space.

3. In a cryogenic storage tank the combination of claim **1**, and an insulating blanket composed of layers of glass fiber sandwiched between reflective sheets of metallic foil, and load bearing pegs of nonmetallic material located in spaced holes in said blanket.

4. In a cryogenic storage tank the combination of claim **1**, in which said tension members are corrugated sheets and connect the side walls of the inner container to each other through brazed joints along the edges of each member.

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