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TUBE PENETRATION FOR CRYOGENIC SHIELD

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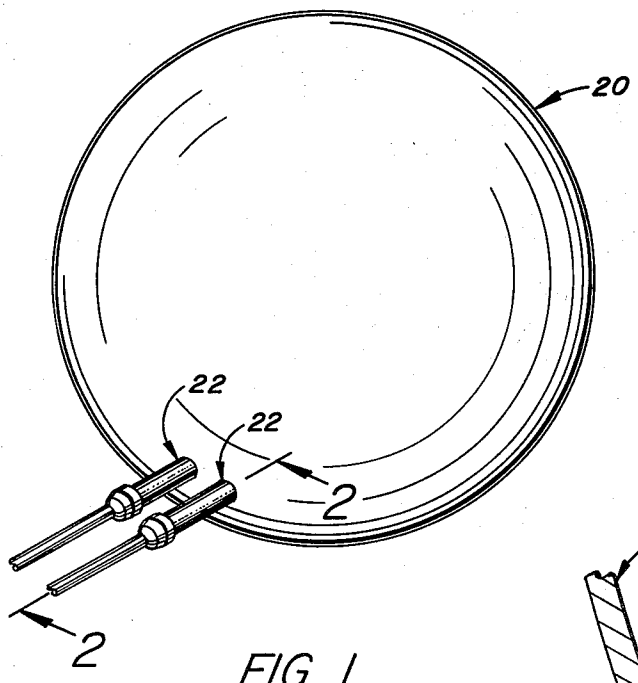

FIG. 1

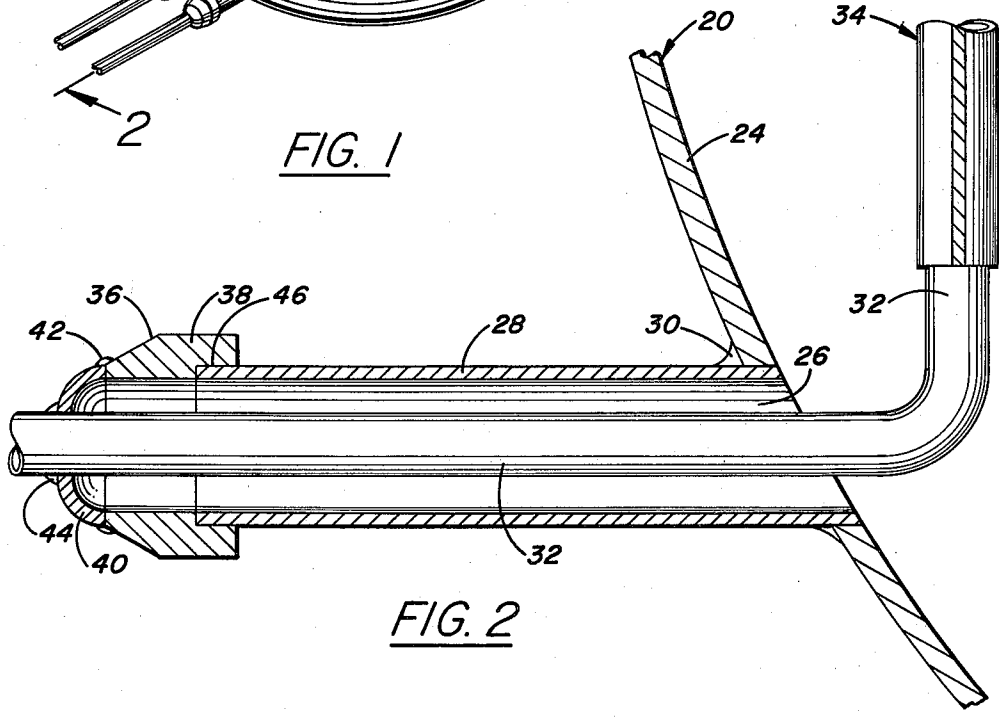

FIG. 2

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TUBE PENETRATION FOR CRYOGENIC SHIELD

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This invention relates to cryogenic vessels, space chambers and the like, and particularly to a novel conduit outlet construction for passing a conduit through the walls of such an apparatus.

In general, in the construction of cryogenic vessels, space simulation chambers and other cold insulated chambers it is necessary to pass conduits for delivery or the release of refrigerants or other fluids through a relatively heavy structural wall that must resist high external loads when the chamber or vessel is evacuated. Heavy chamber walls of this nature are generally formed of ferrous metal sheets such as stainless steel or the like, and for reasons of high thermal conductivity required by heat sinks for space simulation chambers, it is necessary to use refrigerant conduits formed of a metal having high thermal conductivity, such as aluminum.

In prior art apparatus of this type, it has been the practice to directly connect the aluminum conduits within the chamber with steel conduits extended through the steel wall in sealed relationship therewith with the junction between the internal aluminum conduit and the external steel conduit lying inaccessibly within the chamber. Moreover, when the steel and aluminum conduits are joined at a welded junction, in order to obtain an absolute leakproof seal, likelihood of failure at the welded junction is always present due to the difficulty of making and maintaining a leakproof welded junction between dissimilar metals.

In accordance with the present invention, a novel conduit outlet construction is provided by mounting an outwardly extending steel tubular shield at an opening through the structural wall and extending the internal non-ferrous refrigerant conduit from within the vessel outwardly through a tubular shield to the refrigerator or othe cryogenic apparatus.

Since the tubular shield and structural wall are formed of similar or identical ferrous metals, there is no problem in welding a leakproof seal at their junction.

At the outlet of the tubular shield a prefabricated bonded junction is utilized between the stainless steel shield and the aluminum refrigerant conduit by means of an annular closure formed of aluminum which can be later very effectively welded at the aluminum conduit.

It will now be understood that when the prefabricated bonded junction between dissimilar metals is lying exterior of the structural wall of the vessel, the junction is always readily accessible for the repairing of leaks and, moreover, due to the unique construction later described in detail herein the junction between dissimilar metals is never subjected to relatively high line pressures necessarily present in the conduit.

It is, therefore, an object of the present invention to provide a conduit outlet construction of the type described that reduces the pressure differential across a welded sealed junction between dissimilar metals.

It is another object of the present invention to provide a conduit outlet construction of the type described that is always readily accessible for the quick and efficient repairing of leaks that may occur during operation.

In the drawings:

FIG. 1 is a perspective view of a typical vessel or shield utilizing the conduit outlet construction of the present invention; and

FIG. 2 is a side sectional view of the outlet construction of the present invention, the section being taken along the line 2—2 of FIG. 1.

Referring in detail to the drawings, FIG. 1 illustrates a typical cryogenic vessel or space simulation chamber indicated generally at 20 that includes a plurality of conduit outlet assemblies constructed in accordance with the present invention and indicated generally at 22.

The vessel or space simulation chamber 20 comprises an outer structural wall 24 provided with an opening 26 and a tubular shield 28 is joined to wall 24 at a welded junction 30.

Wall 24 and tubular shield 28 are preferably formed of ferrous metal, such as stainless steel, for structural reasons and a tube in conduit 32 that passes outwardly through the opening of tubular shield 28 is formed of aluminum or other metal of high thermal conductivity, since it comprises a portion of heat sink shield 34, the primary function of which is to absorb as much heat as possible from a test specimen mounted within the chamber 20.

The outer end of tubular shield 28 is closed by an annular closure indicated generally at 36, that includes an annular aluminum member 38 joined to a cup-shaped aluminum member 40 at a prefabricated fused junction 42. Member 40 is in turn in sealed surrounding relationship with conduit 32 at a welded junction 44.

In view of the above, it will be understood that the only junction of dissimilar metals occurs between the stainless steel tubular shield 28 and annular closure 36 as seen at 46. This junction 46 is the only junction that must be made between dissimilar metals and is factory prefabricated by suitable steel-aluminum bonding techniques. By way of example, bonded junction 46 can be formed with epoxy resin or other suitable dissimilar metal bonding material known to the art.

In operation, in the event leakage occurs from the environment into the evacuated vessel, it is almost certain to occur at bonded junction 46 formed between the dissimilar metals of shield 28 and closure 36. Since junction 46 is exterior of the chamber, the leak can be readily detected and it is readily accessible for easy repairing.

It should be further pointed out that since the steel to aluminum junction 46 is never subjected to high line pressures, as would be the case if a welded junction were made along conduit 32, there is less chance of leakage occurring than if junction 46 were subjected to relatively high line pressures.

While the form of embodiment of the present invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claim which follows.

I claim:

A cryogenic vessel comprising, in combination, a ferrous metal wall means forming an evacuated sealed chamber and including an opening; a tubular shield of the same

metal as said wall means enclosing an annular evacuated insulating space and having its inner end secured to said wall means by a fused junction and an outer end; a conduit formed of a non-ferrous metal extending through said opening in said wall means and disposed coaxially through said shield portion in spaced insulated relationship therewith and including a portion extending beyond the outer end of said tubular shield, means to rigidly connect in fluid tight relationship, said outer end of said tubular shield to said extending portion of said conduit comprising a closure member of a non-ferrous metal having substantially the same coefficient of expansion as that of said conduit, said closure member being fused to said conduit and bonded to said tubular shield.

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