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CONTAINER FOR STORING FLUID MEDIUM UNDER HIGH PRESSURE

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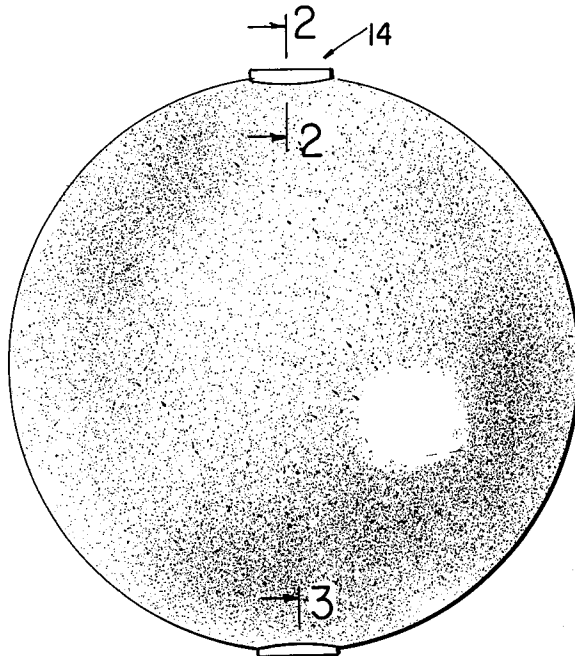


Fig. 1

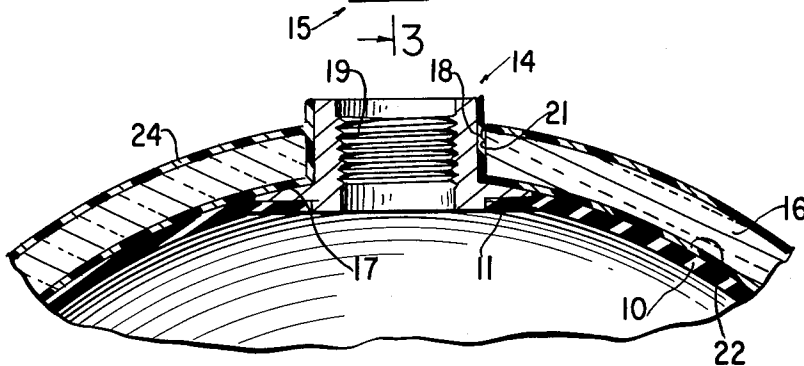


Fig. 2

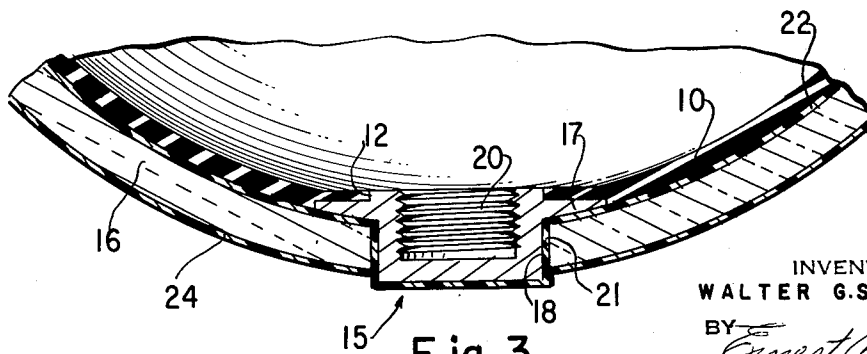


Fig. 3

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CONTAINER FOR STORING FLUID MEDIUM
UNDER HIGH PRESSUREWalter G. Sylvester, West Caldwell, N.J., assignor to
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2 Claims. (Cl. 220—3)

The present invention relates to containers for storing fluid medium under high pressure, and, more particularly, to such containers which comprise an inner shell and an outer shell constructed of a winding of resin impregnated yarn.

Spherical containers of the foregoing type have been developed which have a service life of at least 20,000 cycles when cycled between 0 and 3000 p.s.i.g. at about 70° F. and 60% humidity. However, when such containers are cycled while exposed to a higher temperature and/or high humidity their service life is materially shortened.

Accordingly, an object of the present invention is to provide such containers which have a much longer service life when exposed to high humidity at an elevated temperature than those similarly constructed heretofore.

Another object is to provide such containers without materially increasing the weight thereof.

A further object is to provide such containers which are resistant to moisture.

Other and further objects of the invention will be obvious upon an understanding of the illustrative embodiment about to be described, or will be indicated in the appended claims, and various advantages not referred to herein will occur to one skilled in the art upon employment of the invention in practice.

In accordance with the present invention, it has been discovered that the foregoing objects can be generally accomplished by completely enclosing the outer shell within an envelope of a layer of resinous material such as a coating or covering which within the temperature range of minus 60° F. to plus 200° F. is oil and abrasion resistant, is highly adhesive, has low moisture permeability and has an elongation of at least 15%.

A preferred embodiment of the invention has been chosen for purposes of illustration and description, and is shown in the accompanying drawing, forming a part of the specification, wherein:

FIG. 1 is a side view of a spherical container constructed in accordance with the present invention.

FIG. 2 is an enlarged, fragmentary, sectional view taken along the line 2—2 on FIG. 1.

FIG. 3 is an enlarged, fragmentary, sectional view taken along the line 3—3 on FIG. 1.

Referring to the drawing in detail, there is shown a conventionally constructed spherical container adapted to store fluid medium under high pressure such as 3000 p.s.i.g., for example. The container comprises a spherical inner shell 10 formed of rubber or the like having opposed openings 11 and 12 (FIGS. 2 and 3), a fitting 14 at the opening 11, a fitting 15 at the opening 12, and an outer shell 16 consisting of a resin impregnated fiber glass winding which can be produced on a machine such as shown in United States Patent No. 2,901,190.

The fittings 14 and 15 each have a flange 17 which is secured to the inner shell 10 at the openings 11 and 12, and each have a neck 18 extending radially through the openings in opposite directions to define the poles of the sphere. The fitting 14 has threaded port 19 for entry and discharge of fluid medium into which a control valve (not shown) is adapted to be secured. The fitting 15 has a threaded well or recess 20 but could be provided with a port or opening for receiving a plug or a valve if desired.

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During the application of the winding which provides the outer shell, the threaded portions of the fittings serve as means for securing the inner shell to the mandrel of the winding machine, and the necks 18 of the fittings are engaged by convolutions of the winding. The outermost portions of the necks 18 extend outwardly beyond the outer shell 16 and form opening 21 therein.

The outer shell 16 preferably is constructed of great circle windings of fiber glass impregnated with a standard epoxy resin, and the windings are substantially uniformly distributed by causing the machine to wind a predetermined pattern. The outer shell when cured and dry consists of about 80% fiber glass and about 20% resin.

In accordance with the present invention, an envelope of a resinous coating or covering is applied in a manner to completely enclose the outer shell 16. This can be accomplished by applying and adhering a resinous coating 22 on the outer wall of the inner shell 10 and the necks 18 of the fittings, and at least partially curing the coating to harden the same so that the initial convolutions of the winding will not cut through the coating 22. After the outer shell 16 has been wound onto the inner shell 10 and cured to dry the same, a resinous coating 24 similar to the coating 22 is applied and adhered to the outer shell 16 and the necks 18, whereby the outer shell is now completely enclosed by the resinous coating at the inner wall, the outer wall and the openings 21 of the outer shell through which the necks 18 extend. The openings 21 are sealed by the coating 22 on the necks within the opening and by the coating 24 at the outer portion of the openings whereby moisture cannot get between the inner wall of the outer shell and the outer wall of the inner shell through the openings 21. Preferably, the envelope has a minimum wall thickness of 0.020 inch.

It has been found that the containers of the type disclosed herein can be produced in accordance with the present invention which have a longer service life at high temperature and humidity conditions than those heretofore produced and tested at lower temperature and humidity conditions by using a modified epoxy resin as the coating which provides the envelope.

This modified epoxy resin comprises between 45% and 55% of standard epoxy resin and between 55% and 45% of a so called flexible epoxy resin which contains a curing agent.

The standard epoxy resin is known as "Epon 828" and is produced by Shell Chemical Corporation. This resin has the following properties:

Epoxy value, equivalent/100 gms.	0.180-0.195
Viscosity at 77° F. cps..	100-160
Gardner color	5
Density at 68° F.	1.156

The flexible epoxy resin is known as "Epon X-71" and is also produced by Shell Chemical Corporation. This resin has the following properties:

Epoxy value, equivalent/100 gms.	0.250-0.256
Viscosity at 77° F. cps..	400-600
Gardner color	10-11
Density at 68° F.	0.987

The envelope produced by the blend of these resins, with N-aminoethyl piperazine as a curing agent, is oil resistant, is highly adhesive and has low moisture permeability within the temperature range minus 65° F. and plus 200° F., whereby moisture under high humidity conditions is prevented from penetrating the outer shell and degrading the fiber glass of the winding. The envelope also is highly adhesive and has an elongation of at least 15% within the temperature range, whereby the envelope can withstand cycling without any tendency to crack and

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form openings through which moisture and/or oil could enter.

From the foregoing description, it will be seen that the present invention provides an improved resin impregnated fiber glass container which can be produced in a simple, practical and economical manner.

It will be understood that the details and examples hereinbefore set forth are illustrative only and that the invention as broadly described and claimed is in no way limited thereby.

I claim:

1. A container for storing fluid medium under high pressure comprising an inner shell, opposed fittings secured to said inner shell each having a neck with at least one of said necks being formed with a port for entry and discharge of fluid medium, an outer shell consisting of a cured winding of resin impregnated yarn completely enclosing said inner shell and surrounding a portion of said necks, and an envelope adhered to and completely enclosing said outer shell including the inner and outer walls thereof and the portions surrounding said necks and being adhered to said outer and inner shells and to said necks,

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said envelope consisting of a layer of resinous material characterized in that within the temperature range of minus 65° F. to plus 200° F. the resin is oil and abrasion resistant, is highly adhesive, has low moisture permeability and has an elongation of at least 15%.

2. A container according to claim 1, wherein said envelope has a minimum wall thickness of about 0.020 inch.

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