United States Patent

Berman

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[54] PRESSURE VESSEL

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[52] **U.S. Cl.** **220/3**, 220/39, 220/46

[51] **Int. Cl.** **B65d 41/04**, B65d 53/00

[58] **Field of Search** .....220/3, 39, 46; 285/331; 18/16 R, 34 R

[56] **References Cited**

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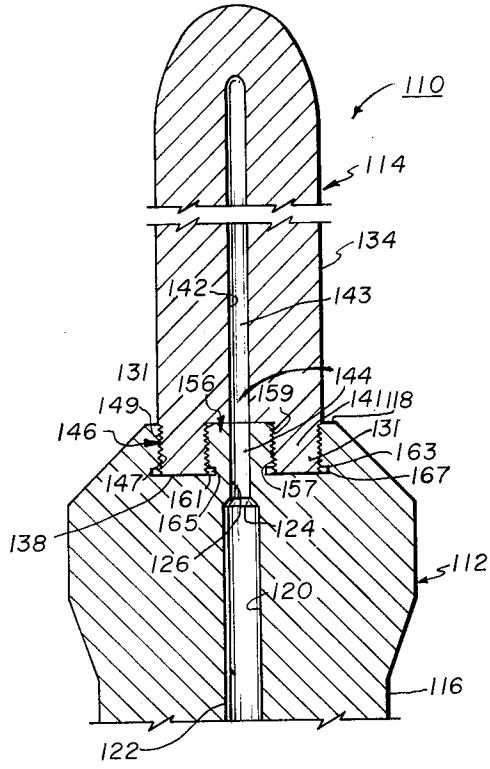
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[57] **ABSTRACT**

A combined closure and vessel adapted for operation at relatively high pressures is provided with an outer fastening means and an inner means. The location of the means enables the inner means to counteract the bending moment about the outer means.

1 Claims, 2 Drawing Figures



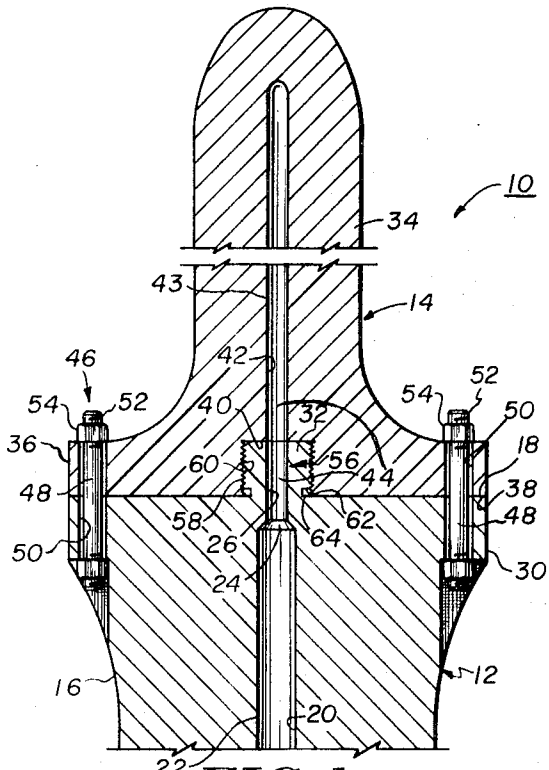


FIG. 1

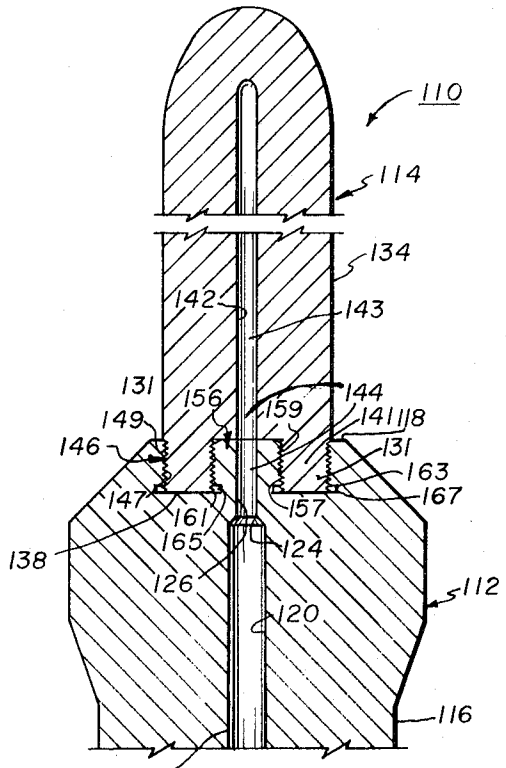


FIG. 2

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PRESSURE VESSEL

BACKGROUND OF THE INVENTION

For the maintaining of relatively high pressures in the neighborhood of 200,000 p.s.i., and greater, vessels with closures are formed having wall thicknesses that are substantially greater than the internal cross-sectional area of the vessel. It has been a practice to utilize bolted flanges along the outer periphery of the vessel and closure. In view of the substantially large wall thickness of the vessel and closure, a corresponding large moment of force is created about the bolts, and this results in bending of the closure. Another practice has been to utilize a threaded closure along the inner periphery of the vessel. In view of the substantially large wall thickness of the vessel a large moment of force is created about the threaded area. The object of the present invention is to provide a vessel with a closure with additional fastening means in order to counteract the moment of force generated from within the pressurized vessel about the end flanges. This has been achieved by providing additional fastening means which straddle the line of action of the longitudinal force created within the internal chamber of the pressure vessel.

SUMMARY OF THE INVENTION

In accordance with illustrative embodiments demonstrating features and advantages of the present invention there is provided a combined closure and vessel adapted to maintain high operating pressures. The combined closure and vessel comprises a cylindrical vessel wall defining a vessel chamber and a cylindrical closure wall defining a closure chamber, with the closure wall being capable of mating with the vessel wall. There is provided outer fastening means which are exteriorly located with respect to the vessel wall and closure wall to secure the closure to the vessel with the vessel chamber in flow communication with the closure chamber to form a unified, pressurized chamber. Inner fastening means are located between the outer fastening means and the unified chamber such that the inner fastening means counteract the bending moment of force about the outer fastening means which is generated by the pressure in the unified pressurized chamber.

BRIEF DESCRIPTION OF THE DRAWINGS

The above brief description, as well as further objects, features and advantages of the present invention will be more fully appreciated by reference to the following detailed description of presently preferred but nonetheless illustrative embodiments in accordance with the present invention, when taken in connection with the accompanying drawings wherein:

FIG. 1 is a front sectional view of the closure and a portion of a pressure vessel, embodying a first embodiment of the fastening means of the present invention; and

FIG. 2 is a front elevational view of a pressure vessel demonstrating a further embodiment of the fastening means of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. 1 there is shown a combined closure and vessel capable of maintaining relatively high operating pressures, generally designated by the reference numeral **10**, which comprises a shell section **12** that is sealed by a closure section **14**.

The shell section **12** is defined by an outer cylindrical wall **16** and a top circular wall **18**. For the sake of simplicity, the bottom wall of shell section **14** has not been shown in the drawings. The shell section **12** is formed with an internal chamber **20** which is bounded by an outer cylindrical wall **22**, a necked down wall **24**, and an inner cylindrical wall **26**. Extending outwardly from the wall **16** is an annular shoulder **30**, and a cylindrical stud section **32** extends upwardly from circular wall **18** in a position coaxial with respect to the internal shell chamber **20**.

The closure section **14** is defined by an outer wall **34** having a generally cylindrical configuration which is closed at one end and integrally formed with a shoulder **36**. The bottom of shoulder **36** is bounded by a circular wall **38** which is capable of being brought into mating contact with top circular wall **18**, and a central socket **40** extends upwardly from circular wall **38** for receiving the cylindrical stud section **32**. The closure section **14** is formed with an internal closure chamber **42** which is bounded by a cylindrical wall **43** that is sized in accordance with the internal diameter of inner cylindrical wall **26**. Thus, it is possible to insert the stud section **32** into the central socket **40**, as will hereinafter be more fully described, such that the shell chamber **20** is brought into flow communication with the closure chamber **42** to form a unified internal chamber **44**.

Outer fastening means **46** are provided to secure the closure section **14** to the shell section **12** which includes stub bolts **48** mounted in through bores **50** which are formed in the shoulder **30** and **36**. Each of the stub bolts **48** are formed with external threads **52** for threadable engagement with a pair of end nuts **54**.

An inner fastening means **56** is located between the outer fastening means **46** and the unified internal chamber **44**. The inner fastening means **56** include external threads **58** formed along the outer surface of stud section **32** and internal threads **60** formed along the inner surface of central socket **40**, such that the stud section **32** can be brought into threadable engagement with the central socket **40** for fastening the closure section **14** onto the shell section **12**. It is preferable to form the external threads **58** and internal threads **60** with a helical thread configuration. For the purpose of sealing the closure **14** with respect to the shell section **12**, the stud section **32** is formed with an annular recess **62** for receiving a ring gasket **64**, which is preferably fabricated from a sufficiently flexible material which can be stretched over the external threads **58** in order to be positioned within the annular recess **62**. When the stud section **32** is completely threadably engaged in the central socket **40**, and the stub bolts **48** are secured in through bores **50**, the inner fastening means **56** will counteract the bending moment of force about the outer fastening means **46** which is generated by the pressure in the unified internal chamber **44**.

In FIG. **2** there is illustrated a further embodiment of the invention in which corresponding parts have been designated by the same reference numerals as part of a "100" series. In this form of the invention there is shown a combined closure and pressure vessel generally designated by the reference numeral **110** which comprises a shell section **112** that is sealed by a closure section **114**.

The shell section **112** is defined by an outer, substantially cylindrical wall **116** and top circular wall **118**. The shell section **112** is formed with an internal chamber **120** which is bounded by an outer cylindrical wall **122**, the necked down wall **124**, and an inner cylindrical wall **126**. Extending downwardly from circular all **118** is an annular socket section **131** which is in a position that is coaxial with respect to the internal shell chamber **120**.

The closure section **114** is defined by an outer wall **134** having a generally cylindrical configuration which is closed at one end and formed with a bottom circular wall **138**. An annular stud section **141** extends upwardly from circular wall **138** for being received in the annular socket section **131**. The closure section **114** is also formed with an internal closure chamber **142** which is bounded by a cylindrical wall **143** that is sized in accordance with the internal diameter of inner cylindrical wall **126**. Accordingly, it is possible to insert the annular stud section **141** into the annular socket section **131** as will hereinafter be more fully described, such that the shell chamber **120** is brought into flow communication with the closure chamber **142** to form a unified internal chamber **144**.

Outer fastening means **146** is provided to secure the closure section **114** to the shell section **112** which includes internal threads **147** formed in the annular socket section **131**, and ex-

ternal threads **149** formed along the outer periphery of annular assume section **141**. An inner fastening means **156** is located between the outer fastening means **146** and the unified internal chamber **144**. The inner fastening means **156** includes internal threads **157** formed along the inner periphery of annular socket section **131** and external threads **159** formed along the inner periphery of annular stud section **141**. It is preferable to form the internal threads **147**, **157** and external threads **149**, **159** with a helical thread configuration which is suitably dimensioned for allowing the annular stud section **141** to be threaded into the annular socket section **131**. For the purpose of sealing the closure **114** with respect to the shell section **112**, the annular socket section **131** is formed with an inner annular recess **161** and an outer annular recess **163** for respectively receiving an inner ring gasket **165** and an outer ring gasket **167**. When the annular stud section **141** is completely threadably engaged in the annular socket section **131**, the inner fastening means **156** will counteract the bending moment of force of the outer fastening means **146** which is generated by the pressure in the unified internal chamber **144**.

A latitude of modification, change and substitution is intended in the foregoing disclosure and in some instances some features of the invention will be employed without a corresponding use of other features. Accordingly, it is appropriate that the appended claims be construed broadly and in a manner consistent with the spirit and scope of the invention herein.

What is claimed is:

1. A combined closure and vessel adapted to maintain relatively high operating pressures comprising a cylindrical vessel wall defining a vessel chamber, said vessel wall formed with an annular socket defined by an outer cylindrical wall spaced apart from an inner cylindrical wall coaxial with said vessel chamber, a cylindrical closure wall defining a closure chamber with said closure wall being capable of mating with said vessel wall, outer fastening means exteriorly located with respect to said vessel wall and closure wall to secure said closure to said vessel with said vessel chamber in flow communication with said closure chamber to form a unified pressurized chamber, inner fastening means located between said outer fastening means and said unified chamber such that said inner fastening means counteracts the bending moment of force about said outer fastening means which is generated by the pressure in said unified pressurized chamber, said inner fastening means including an annular stud section defined by an outer cylindrical wall spaced apart from an inner cylindrical wall integrally formed with said closure wall and coaxial with said closure chamber such that said annular stud section can be received in said annular socket, said outer fastening means including threads formed on the outer cylindrical wall of said stud section and the outer cylindrical wall of said annular socket for threadable engagement, and said inner fastening means including threads formed on the inner cylindrical wall of said stud section and the inner cylindrical wall of said annular socket for threadable engagement, said annular socket formed with an inner annular recess spaced apart from an outer annular recess, an inner annular gasket positioned in said inner annular recess, and an outer annular gasket positioned in said outer annular gasket, such that said closure chamber and said vessel chamber are sealed when said threadable engagement is completed.

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