United States Patent

McDonald et al.

[15] **3,694,962**

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[54] **SLIDING DOOR STERILIZER WITH POWER ACTUATED SEAL**

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[73] Assignee: **Sybron Corporation,** Rochester, N.Y.

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[52] **U.S. Cl.** .....**49/477,** 220/46 P

[51] **Int. Cl.** **E06b 7/16**

[58] **Field of Search** .....220/46 P; 49/477, 488, 489, 49/498; 417/76, 151, 178; 141/65, 66; 202/269; 277/34.3; 62/170

[56] **References Cited**

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3,339,785	9/1967	Nugent	220/46 P X
842,100	1/1907	Von Lindenstamm	417/151
1,889,606	11/1932	Lange	220/46 P
2,157,983	5/1939	Glougie	220/46 P
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235,632	12/1944	Switzerland	220/46 P
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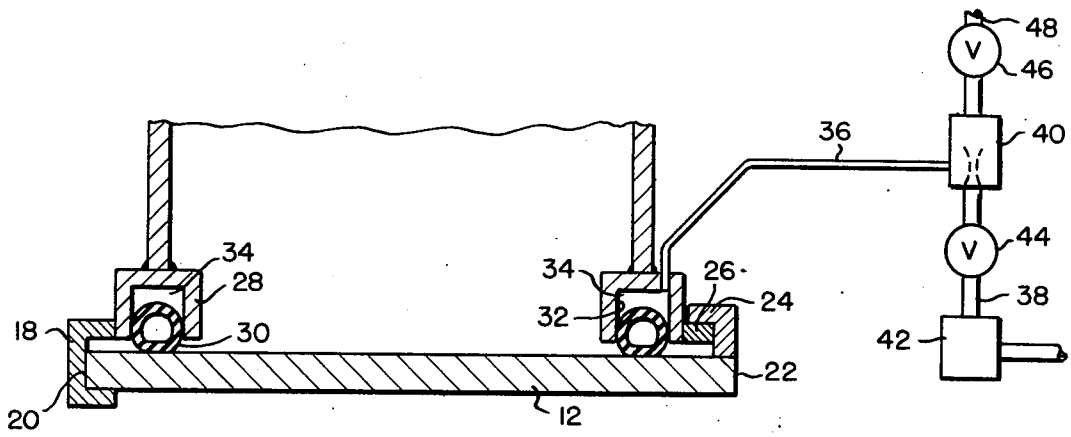
[57] **ABSTRACT**

Disclosed is a sliding door sterilizer having a power operated seal means for sealing between the door closure and the sterilizer opening. The seat for the seal means is pressurized to move the seal against the door and the seat is evacuated to create a partial vacuum for drawing the seal away from the door closure.

2 Claims, 3 Drawing Figures



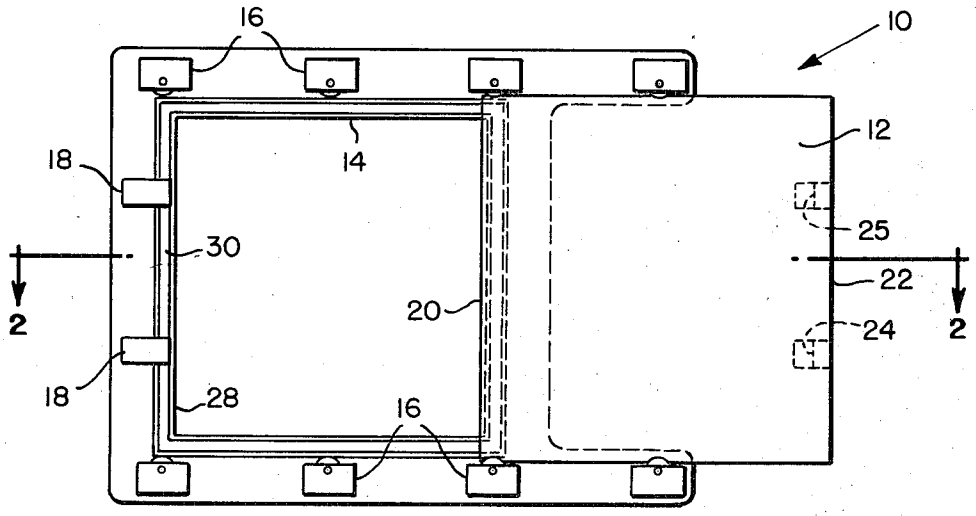


FIG. 1

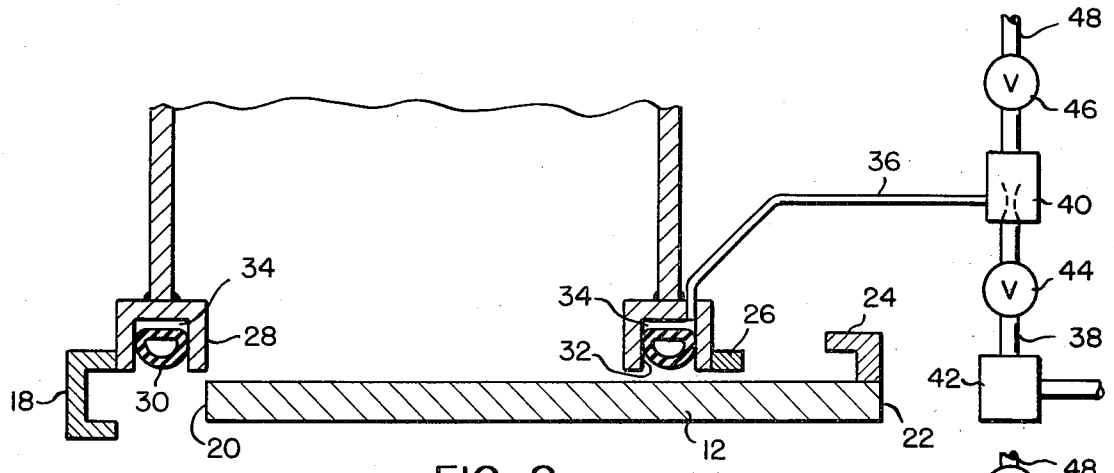


FIG. 2

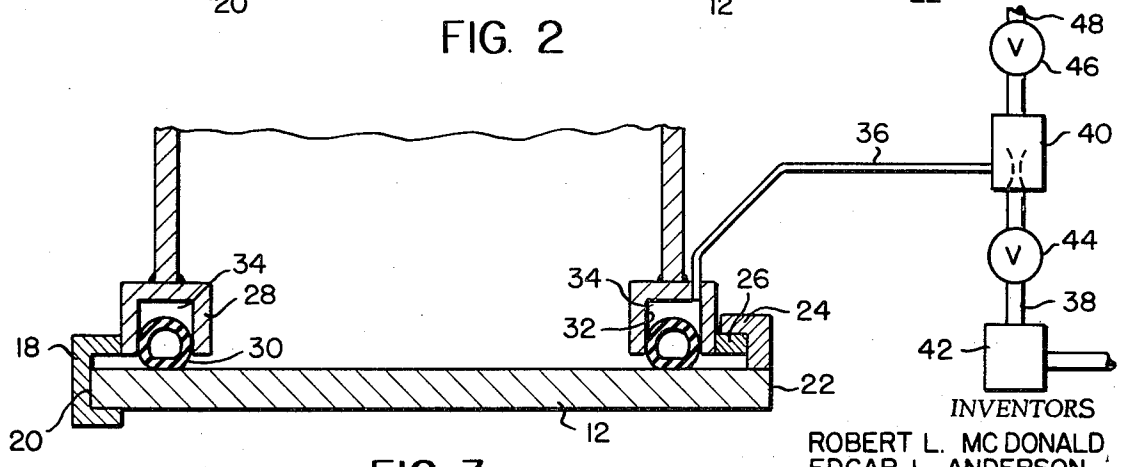


FIG. 3

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SLIDING DOOR STERILIZER WITH POWER ACTUATED SEAL

BACKGROUND OF THE INVENTION

The present invention relates to closure apparatus for a pressure chamber and, more specifically, to a closure for a sterilizer having a power actuated seal means to seal between the door closure and the sterilizer opening.

While the power actuated seal of the present invention may be used with any sliding, hinged or breech-lock door for a pressure vessel, the invention is particularly useful with sliding doors. For example, any pressure chamber apparatus having a sliding door closure, such as certain types of sterilizing apparatus, presents a problem of establishing a seal between the closure and the opening in the pressure vessel. This sealing problem arises because the door must be kept from sliding across the seal member as the door is being moved into place, otherwise, the seal member can be unduly worn due to the sliding friction between it and the door. Several solutions to this problem have been presented. For example, U.S. Pat. Nos. 3,339,785 and 3,352,446 show closure apparatus for a pressure chamber wherein the seal member is inflatable. With such an arrangement, the door is first moved across the opening of the pressure chamber and then the seal member is inflated to establish the seal between the closure and the pressure chamber.

Other seal means not necessarily related to sliding door pressure chambers or sterilizing apparatus employ a movable or deformable seal member which is actuated by a pressure medium to establish a seal. Such arrangements are shown, for example, in U.S. Pat. Nos. 1,889,606 and 2,507,360. In both cases, the seal is broken simply by bleeding off the pressure medium and opening the door. Such systems are not entirely satisfactory, however, in that merely removing the pressure medium may break the seal but does not always remove the seal member from its position against the door. Therefore, as the door slides to an open position, it slides across the seal member. This either causes excessive wear or, in extreme cases, may pull the seal member from its seat. Furthermore, merely bleeding off the pressure medium to equalize the pressure on both sides of the seal member, may not work to break the seal in cases, for example, where the pressure within the chamber is subatmospheric so that the seal is only broken by moving the door.

The present invention overcomes the drawbacks of the prior art in that the seal member is power operated both in seating and unseating the seal member. In the first instance, a positive pressure is applied to move the seal member into a sealing position and in the latter instance a negative pressure is applied to withdraw the seal member from its sealing position prior to opening the door.

SUMMARY OF THE PRESENT INVENTION

The present invention may be characterized in one aspect thereof by the provision of a pressure vessel with an opening in the wall thereof and a sliding closure for the opening; a channel member disposed about the opening in a face-to-face relationship with the closure; a sliding seal member disposed in the channel, the seal member and channel defining a chamber therebetween; and ejector means communicating with the chamber, the chamber being pressurized to drive the seal member into a sealing relationship against the closure and the chamber being evacuated to a subatmospheric pressure by the ejector means to pull the seal member into the channel and away from the closure to break the seal.

OBJECTS OF THE INVENTION

It is an object of the present invention to provide a power actuated seal means for pressure vessel doors.

Another object of the present invention is to provide a simplified, long lasting power actuated seal means for pressure vessels having sliding closures.

A further object of the present invention is to provide a seal means for pressure vessels having sliding closures wherein the seal member is driven against the closure by a positive pressure to establish the seal and then driven away from the closure to break the seal.

Yet another object of the present invention is to provide a seal means for pressure vessels and the like wherein the seal member is moved to an unsealing position prior to opening the sliding door of the pressure vessel.

These and other objects, advantages and characterizing features of the present invention will become more apparent upon consideration of the following detailed description thereof when taken in connection with the accompanying drawings depicting the same.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front elevation view of a pressure vessel having a sliding door and embodying the seal means of the present invention showing the sliding door of the vessel in an open position;

FIG. 2 is a schematic view taken along lines 2—2 of FIG. 1 showing the sliding door in a partly open position with the seal member drawn away from the door; and

FIG. 3 is a view similar to FIG. 2 showing the sliding door in a closed position with the seal members in sealing relationship with the door.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings, FIG. 1 shows the front of a horizontally disposed sterilizer or pressure vessel generally indicated at **10**. Vessel **10** is constructed according to conventional pressurizable vessels, preferably of all steel construction. A door or closure member **12** is adapted for closure of a vessel opening **14**. While closure member **12** is shown as a sliding door, any suitable hinged or breech-lock door may be used to close the vessel opening **14** and the sliding door is shown for purposes of illustration only.

Although not illustrated, it will be understood that any of the conventional control systems for supplying a sterilizing gas, steam or other fluid under pressure and/or for reducing pressure are adaptable for use with the pressurizable vessel herein illustrated.

Any suitable roller or bearing members such as are illustrated at **16** may be provided on the front of the vessel for supporting the closure and for permitting the closure to slide horizontally across the vessel opening

14. It should be understood that while the closure is shown as sliding horizontally across opening it is within the skill of the art to adapt members 16 so that the door may slide vertically across the opening.

A pair or plurality of stop or clamp elements 18 are mounted along one side of the pressure vessel adjacent opening 14. The stop elements 18 are adapted to orient or align the leading edge 20 of door 12 in order to prevent the door from sliding to the left beyond the closed position as illustrated in FIG. 3. The trailing edge 22 of door 12 is similarly provided with stop elements 24 which are adapted to embrace or engage a vertical flange 26 (FIG. 3) fixed to a side wall of the pressure vessel.

Provided on the vessel about opening 14 is an outward opening channel member 28 best illustrated in FIGS. 2 and 3. Channel member 28 can be either fabricated as a separate element and then welded to the vessel as shown or may be made integral the front wall of the vessel by machine or casting a groove in the wall. While it would be understood that this channel could be provided on the door with the opening of the channel facing the front wall of the vessel, it is preferred to provide the channel on the vessel with the channel opening outwardly and facing the door as shown.

Disposed within the channel is a continuous seal member 30 which may be of the silicon rubber or ethylene propylene type or any other suitable material which will withstand both high and low external pressure and the high temperature of sterilization. Seal member 30 may have any appropriate cross section but preferably the seal member 30 is circular in cross section, such as an O-ring, and is hollow. The periphery of the seal member 30 slidably engages the inner wall surface 32 of the channel member so that the seal and channel form a fluid tight chamber 34 located behind the seal member. Communicating with this chamber 34 at one or more points about opening 14 are one or more pressure lines 36 shown schematically in FIGS. 2 and 3. Pressure line 36 is connected by means of a valved conduit and ejector 38, 40 respectively to a source 42 of fluid under pressure. An on-off valve 44, located upstream of the ejector and an on-off valve 46 located downstream of the ejector control flow through conduit 38. The end 48 of conduit 38 is vented for example, to atmosphere.

It should be appreciated that with valve 44 open and valve 46 closed, fluid under pressure may flow through conduit 38, ejector 40 and pressure line 36 to pressurize chamber 34. However, with valve 46 open, the fluid under pressure from fluid source 42 passes through the ejector and is vented to atmosphere wherein the passage of fluid through the ejector draws a partial vacuum in pressure line 36 and chamber 34.

In operation then, and with door 12 in the open position to one side of the vessel opening, articles may be loaded into or out of the vessel through opening 14. With the door in the open position, seal member 30 is in the position shown in FIG. 2, drawn back into the channel member and away from the channel opening. With the vessel loaded, the door is moved across the vessel opening to the closed position, shown in FIG. 3, either manually or by any suitable automatic drive means. In the closed position, the leading edge 20 of the door is engaged with stop elements 18 on the vessel and the stop elements 24 on the trailing edge of the door are engaged with flange 26 on the vessel.

With the door in the closed position, valve 46 is closed to permit fluid from the fluid source 42 to pressurized conduit 38, ejector 40, pressure line 36 and chamber 34. Pressurizing chamber 34 in turn forcibly slides the seal member 30 partly through the channel opening and into a sealing relationship against door 12. With the vessel opening 14 thus sealed, the vessel may be evacuated and any suitable sterilizing gas such as steam may be introduced into the vessel to sterilize the articles.

Once the sterilizing cycle is complete, valve 46 is opened to permit the pressurizing fluid from source 42 to stream through ejector 40 to atmosphere. This creates a negative pressure in pressure line 36 and chamber 34 which forcibly draws the seal member 30 away from door 12. With the seal thus broken, the door may be slid away from the pressure vessel opening to permit removal of the sterilized article.

Thus, it will be appreciated that the present invention accomplishes its intended objects in providing a power actuated seal which is forcibly moved both to establish and to break the seal between the closure and pressure vessel. Since the sliding closure 12 at no time slides across the seal member, longer life of the seal and a greater ease in opening the closure may be expected.

While a preferred embodiment has been shown and described, it will be apparent that the various modifications and changes may be made therein by those skilled in the art. For example, it the sterilizing medium used in the pressure chamber was steam, the source of fluid pressure 42 could be a steam generator to supply steam both to the sterilizing vessel and to pressure line 36. In such cases, the necessary valving would be apparent to one skilled in the art.

Having thus described the invention in detail, what is claimed as new is:

1. In a sterilizing vessel or the like having a wall member with an opening therein, a closure member for said opening and means for bringing said closure member into closing relationship with said opening, a power actuated seal means for sealing said closure member comprising:

a. a channel on one of said members about said opening in facing relationship with the other of said members;

b. a sliding seal member in said channel, said seal member and channel defining a chamber therebetween;

c. a first conduit connected to a supply of fluid under pressure;

d. a valve in said conduit;

e. ejector means in said conduit upstream of said valve; and

f. a second conduit extending between and communicating with said ejector means and said chamber, said valve being closed to pressurize said second conduit and chamber and said valve being opened to pass fluid through said ejector for evacuating said second conduit and chamber wherein pressurizing said chamber slides said seals in said channel into a sealing relationship against the other member and evacuating said chamber slides said seal in said channel away from the other member.

2. Apparatus as in claim 1 wherein said fluid is steam.

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