Feb. 5, 1957 E. H. STRATTON ET AL 2,780,384

DOOR MOUNTING FOR AUTOCLAVES AND THE LIKE

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FIG. 2

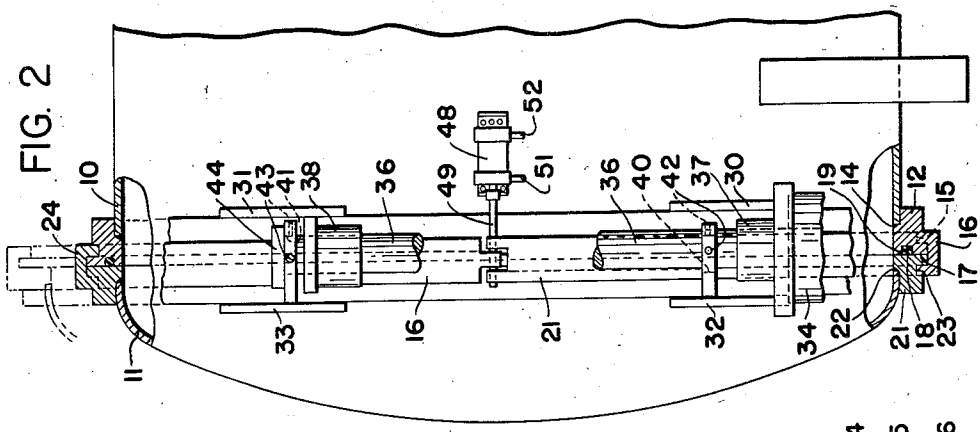
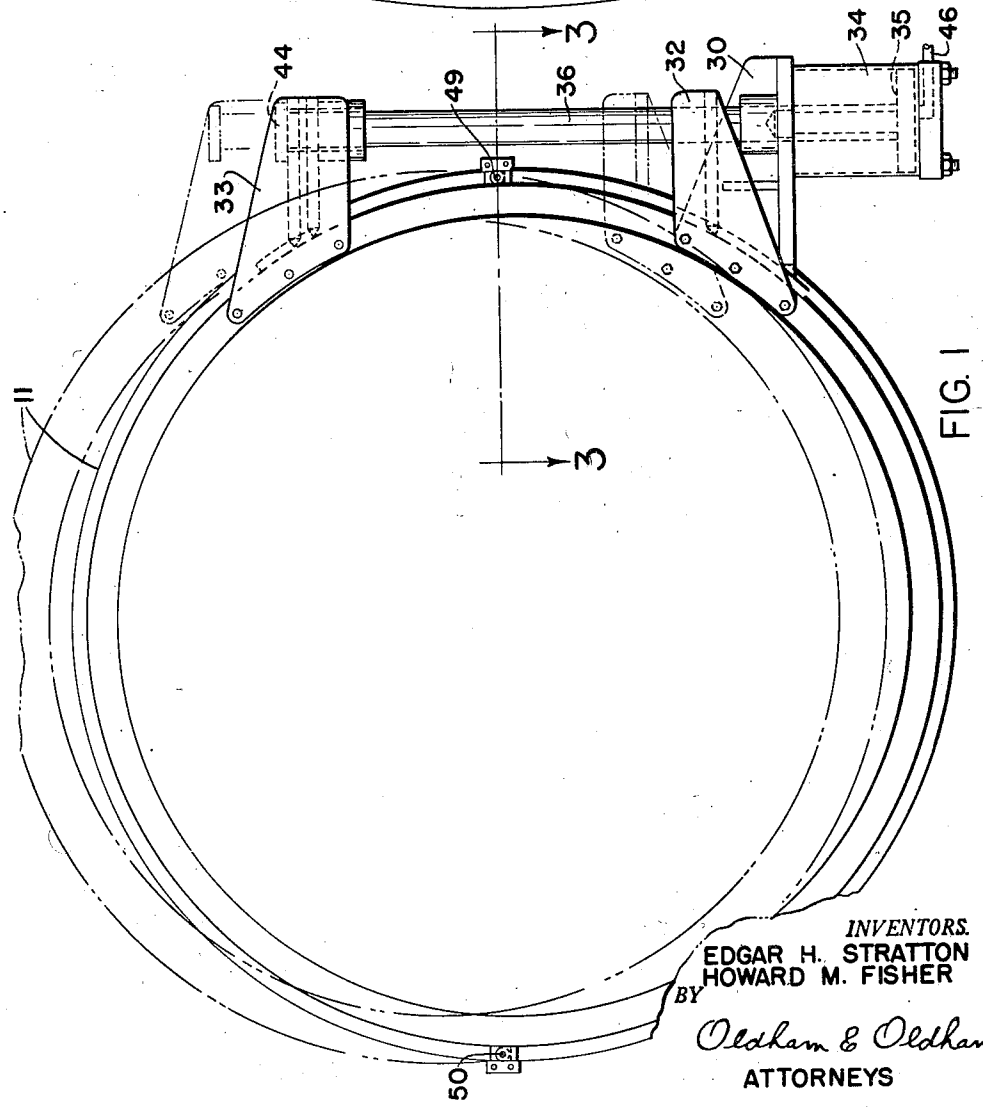


FIG. 1



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DOOR MOUNTING FOR AUTOCLAVES AND THE LIKE

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FIG. 4

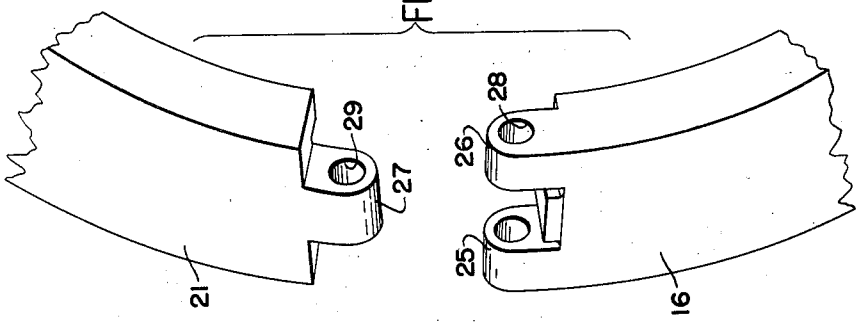
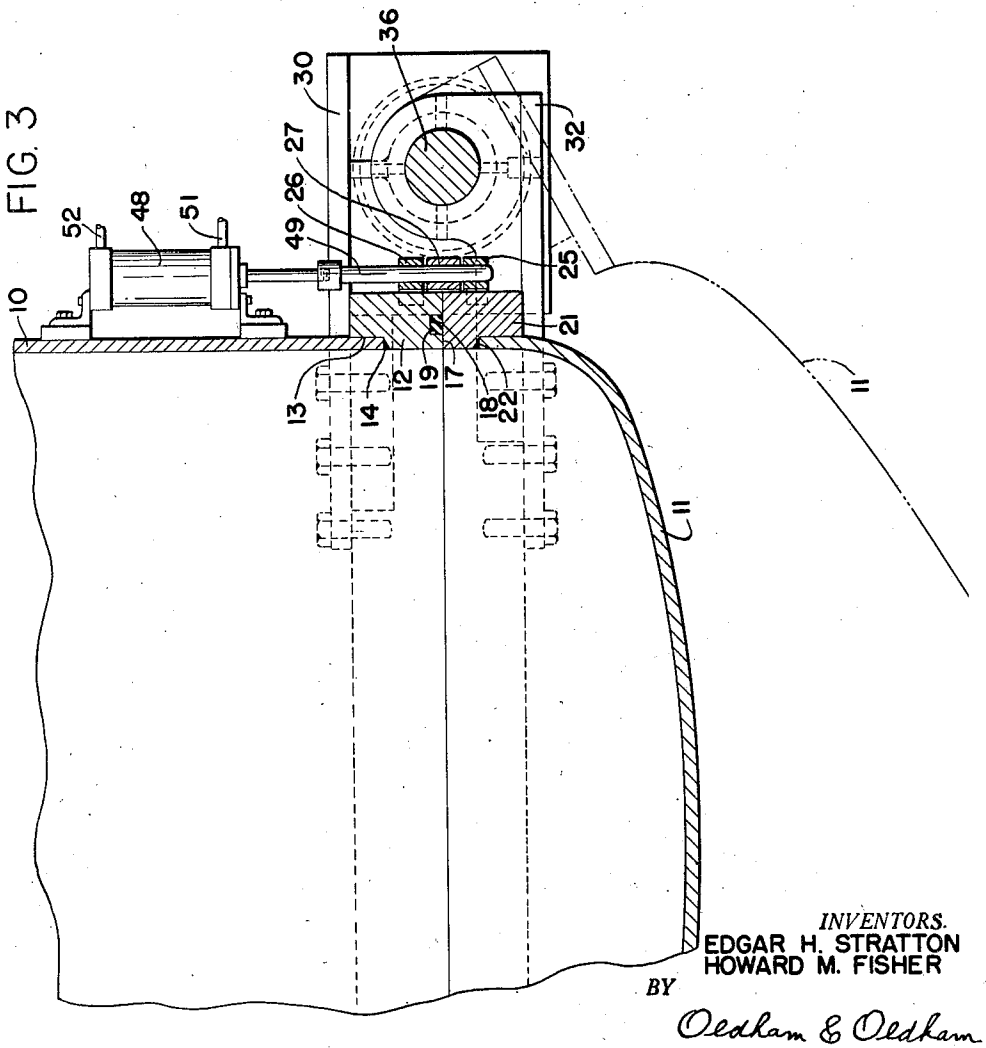


FIG. 3



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DOOR MOUNTING FOR AUTOCLAVES AND THE LIKE

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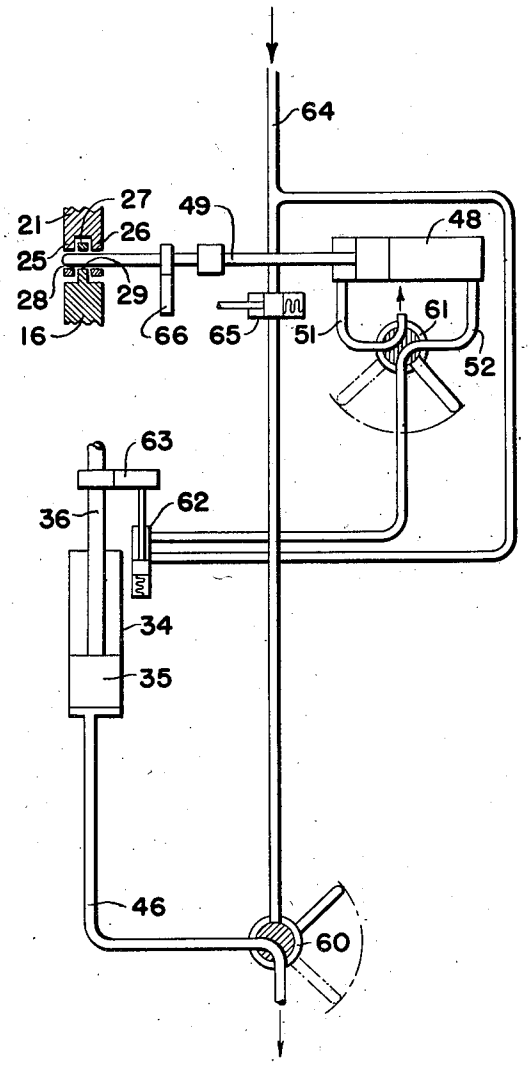

FIG. 5

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2,780,384

Patented Feb. 5, 1957

2,780,384

DOOR MOUNTING FOR AUTOCLAVES AND THE LIKE

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Application December 10, 1954, Serial No. 474,502

7 Claims. (Cl. 220—38)

This invention relates to door mountings for autoclaves and the like, and especially to such doors as are engageable with the autoclave by sliding movement. The invention is especially useful in the construction of autoclaves, vulcanizers and processing vessels adapted to be operative under fluid pressure or vacuums.

Heretofore it has been proposed to provide an autoclave and a door therefor in which a circular opening was provided having an annular sealing face with an inwardly-directed overhanging lip or flange about substantially 180 degrees of its circumference and an outwardly-directed flange about the remainder of its circumference for cooperation with a door having complementary inwardly and outwardly directed flanges of semicircular extent by sliding engagement in a direction lateral of the opening.

While the lateral sliding door has been successfully employed where means was provided for moving the door completely to one side of the door opening by a single straight-line movement, the removal of the door by slight lateral movement followed by a swinging or hinging movement has heretofore presented certain difficulties in bringing the door into proper relation by a swinging movement for slidably engaging the autoclave and such misalignment has resulted in damage to the sealing faces.

Such combined swinging and sliding movements of the doors have also presented difficulties, especially where the doors were of great weight.

Furthermore, it has been found difficult to provide autoclave door rings of large dimensions from castings as the material was found to be not of uniform consistency and to contain blow holes and other defects.

This invention aims to overcome the foregoing and other difficulties.

It is an object of the invention to provide a swing type door mounting which will permit sliding of the door in and out of locking engagement without damage thereto and in exact alignment with the door opening.

Another object of the invention is to provide for power operated sliding movement of the door along its hinging axis.

A further object of the invention is to lock the door securely in place against accidental displacement and to provide an interlock between the movements of the door and the movements of the locking means.

Still another object of the invention is to provide for forming the locking and sealing members of rolled steel material with a minimum amount of machining.

These and other objects will appear from the following description and the accompanying drawings.

Of the drawings:

Fig. 1 is an end elevation of an autoclave and its door construction in accordance with and embodying the invention, the closed position of the door being shown in full lines and the raised or unlocked position thereof being shown in dot and dash lines;

Fig. 2 is a side elevation thereof in closed position,

the raised position being indicated by dot and dash lines, parts of the autoclave being broken away and parts shown in section;

Fig. 3 is a sectional view taken on line 3—3 of Fig. 1;

Fig. 4 is a detail perspective view of the meeting ends of the locking members; and

Fig. 5 is a valve and piping diagram of the lifting and locking mechanism.

Referring to the drawings, the numeral 10 designates the cylindrical body of the autoclave formed of sheet steel and the numeral 11 designates the door body of domed shape also formed from sheet steel. About the open end of the cylindrical body 10 a ring 12 of rolled steel is provided welded in endless form. The ring 12 is counterbored at 13 to receive the wall of the body 10 which is welded to the ring as at 14. The ring 12 is also formed with an outwardly open groove 15 for receiving a lock ring member 16 and with a true sealing face 17 having a circumferential groove 18 for receiving an annular sealing gasket 19. The lock ring member 16 is of U-shaped cross-section, and is of rolled steel curved to the curvature of the autoclave and having an extent to span a little more than 180 degrees of circumference. One flange of the member is sealed in the groove 15 of the ring 12 and is bolted or welded in place therein about the lower half of the autoclave. Its opposite flange is spaced axially of the sealing face 17.

The door body 11 is provided with a reinforcing ring 21 similar to the ring 12 minus the groove for the sealing gasket. It is secured to the margin of the door body by welding 22 and has an outwardly open groove 23. A lock ring member 24 of U-shaped cross-section and of semi-annular extent, similar to ring member 16 has one of its parallel flanges seated in the groove 23 about the upper half of the door and bolted or welded to the ring 21, its opposite flange being adapted to engage to the groove 15 of the autoclave.

The ends of the ring members 16 and 24 are formed with knuckles 25, 26 and 27, respectively, and extend past each other in intercalated relation, as seen in Fig. 4 at each side of the autoclave for receiving locking pins, the knuckles being formed with apertures 28, 29 in alignment for this purpose. The door is adapted, as hereinafter described to be swung into alignment with the opening in the autoclave but offset vertically thereof as indicated by the dot-and-dash positions in Figs. 1 and 2, and may then be lowered into axial alignment as indicated by the full lines with the flanges of the locking members engaging in the grooves of the opposite rings.

For mounting the door for swinging movement, and for providing vertical movement of the door in the plane of the opening, a pair of hinge brackets 30, 31 are secured to the autoclave at one side of the opening, and a pair of hinge brackets 32, 33 are secured to the door. A single-acting fluid pressure operated cylinder 34 is secured to lower hinge bracket 30 of the autoclave. Its piston 35 is fixed to a piston rod or hinge pin 36 and extends upwardly through bearings 37, 38 mounted on the lower and upper brackets 30, 31 respectively, of the autoclave for vertical movement therethrough.

The door hinge brackets 32, 33 have aligned openings 40, 41 therethrough of larger diameter than the rod 36. A multiplicity of set screws 42 extend radially of the opening 40 through the wall of the bracket thereabout and engage the rod or hinge pin 36 for adjusting the door. A similar adjusting means comprising radial set screws 43 are mounted on the bracket 33. A cap plate 44 is secured to the bracket 33 and spans the opening 41 in engagement with the upper end of rod 36 for sustaining the weight of the door. By adjustment of screws 42, 43 the door may be adjusted axially of the autoclave to align its sealing face with that of the autoclave and also

radially of the opening in a lateral direction to align it laterally with the opening in the autoclave for swinging movement about the axis of the rod **36** as a pivot.

A pipe **46** at the lower end of cylinder **34** may be connected to a supply of pressure fluid whereby the rod **36** and with it the door may be raised by pressure and lowered by dead weight from the full line position of Figs. 1 and 2 to and from the dot-and-dash line position thereof. In the dot-and-dash line position, the flanges of the lock ring members will be disengaged from their mating locking grooves and the door may be swung about the axis of rod **36**.

For locking the door, a pair of double acting pressure fluid operated cylinders, such as **48**, are mounted at diametrically opposite positions on the autoclave with their pistons **49**, **50** in alignment with the apertures **28**, **29** of the locking ring members. Pipes **51**, **52** are connected to opposite ends of the cylinders for connection alternately through a suitable control valve **61**, to a source of fluid pressure and an exhaust for advancing and retracting the rods **49**.

If desired, the cylinders **34** and **48** may be so connected to the fluid pressure supply lines as to provide an interlocking system so that the lock pins **49**, **50** may not be advanced or withdrawn unless the door **11** is in lowered position, and the door **11** cannot be raised unless the lock pins **49**, **50** have been withdrawn. For example as shown in Fig. 5, the cylinder **34** may be controlled by a hand operated reversing valve **60** and the cylinder **48** controlled by a hand operated reversing valve **61**. A normally closed valve **62** mounted on the hinge bracket **30** in a position to be opened by a stop **63** attached to the rod **36** may be connected between the fluid pressure supply line **64** and the supply port of valve **61**. The arrangement is such that except when the rod **36** is in its lowermost position, pressure supply to valve **61** is shut off and lock rod **49** may not be moved in either direction.

A similar normally closed valve **65** may be mounted on the autoclave in a position to be opened by a stop **66** on rod **49** and may be connected between the fluid pressure supply line **64** and the supply port of valve **60**. The arrangement is such that except when rod **49** is withdrawn from the apertures **28**, **29** of the locking ring members, no fluid pressure is supplied to valve **60** and cylinder **34** and the door **11** cannot be raised.

With the locking rod **49** withdrawn, valve **65** is opened and the door may be raised or lowered by operating reversing valve **60**, and with the door lowered, which opens valve **62**, locking rod **49** may be advanced or withdrawn by operating reversing valve **61**. One valve **61** may be used for operating both cylinders controlling locking pins **49** and **50** in unison.

The operation of the apparatus will be apparent from the above description.

Variations may be made without departing from the scope of the invention as it is defined by the following claims:

I claim:

1. A door mounting for an autoclave or the like said door mounting comprising an annular member secured to the autoclave to define a door opening, an annular member secured to the periphery of the door for sealing engagement with the first said member, said members each having in opposite portions separated by a diameter thereof a semi-annular radial outwardly directed flange and a semi-annular radial inwardly open groove for engaging the other by sliding movement across said door opening in a direction perpendicular to said diameter, hinge brackets secured to said autoclave with their hinge axis perpendicular to said diameter and to one side of the door opening, hinge brackets on said door in alignment with the first said brackets, a hinge pin mounted through aligned apertures of all said brackets and supporting said door for swinging movement, and power operated means associated with said hinge pin for moving said door across said door opening for engaging and disengaging said flanges and grooves.

2. A door mounting for an autoclave or the like said door mounting comprising an annular member secured to the autoclave to define a door opening, an annular member secured to the periphery of the door for sealing engagement with the first said member, said members each having in opposite portions separated by a diameter thereof a semi-annular radial outwardly directed flange and a semi-annular radial inwardly open groove for engaging the other by sliding movement across said door opening in a direction perpendicular to said diameter, hinge brackets secured to said autoclave with their hinge axis perpendicular to said diameter and to one side of the door opening, hinge brackets on said door in alignment with the first said brackets, a hinge pin mounted through aligned apertures of all said brackets and supporting said door for swinging movement, and a fluid pressure operated cylinder associated with said hinge pin for moving said door across said door opening for engaging and disengaging said flanges and grooves.

3. A door mounting for an autoclave or the like said door mounting comprising an annular member secured to the autoclave to define a door opening, an annular member secured to the periphery of the door for sealing engagement with the first said member, said members each having in opposite portions separated by a diameter thereof a semi-annular radial outwardly directed flange and a semi-annular radial inwardly open groove for engaging the other by sliding movement across said door opening in a direction perpendicular to said diameter, hinge brackets secured to said autoclave with their hinge axis perpendicular to said diameter and to one side of the door opening, hinge brackets on said door in alignment with the first said brackets, a hinge pin mounted through aligned apertures of all said brackets and supporting said door for swinging movement, said hinge pin having a piston secured thereto, a single acting fluid pressure cylinder about said piston for moving said door across said door opening for engaging and disengaging said flanges and grooves.

4. A door mounting for an autoclave or the like said door mounting comprising an annular member secured to the autoclave to define a door opening, an annular member secured to the periphery of the door for sealing engagement with the first said member, said members each having in opposite portions separated by a diameter thereof a semi-annular radial outwardly directed flange and a semi-annular radial inwardly open groove for engaging the other by sliding movement across said door opening in a direction perpendicular to said diameter, hinge brackets secured to said autoclave with their hinge axis perpendicular to said diameter and to one side of the door opening, hinge brackets on said door in alignment with the first said brackets, a hinge pin mounted through aligned apertures of all said brackets and supporting said door for swinging movement, means for moving said door axially of said hinge axis to permit passing of the interengaging flanges during a hinging movement, the brackets of one of said members having apertures larger than said hinge pin and encompassing it, and means adjustably mounted on the last said brackets and engaging said hinge pin within said apertures for providing aligning adjustment of said door and said opening.

5. A door mounting for an autoclave or the like said door mounting comprising an annular member secured to the autoclave to define a door opening, an annular member secured to the periphery of the door for sealing engagement with the first said member, said members each having in opposite portions separated by a diameter thereof a semi-annular radial outwardly directed flange and a semi-annular radial inwardly open groove for engaging the other by sliding movement across said door opening in a direction perpendicular to said diameter,

hinge brackets secured to said autoclave with their hinge axis perpendicular to said diameter and to one side of the door opening, hinge brackets on said door in alignment with the first said brackets, a hinge pin mounted through aligned apertures of all said brackets and supporting said door for swinging movement, means for moving said door axially of said hinge axis to permit passing of the interengaging flanges during a hinging movement, the brackets of one of said members having apertures larger than said hinge pin and encompassing it, and sets of centering means adjustably mounted on the last said brackets and engaging said hinge pin within said apertures for providing aligning adjustment of said door and said opening.

6. A door mounting for an autoclave or the like, said door mounting comprising an annular member of roll-forged material secured to the autoclave to define a door opening, an annular member of roll-forged material secured about the periphery of the door for sealing engagement with the first said member, each of said members having a radially inwardly directed annular groove in its periphery spaced from its sealing face to define an outwardly directed flange therebetween, a pair of semi-annular locking ring members of U-shaped cross section, each locking ring member being of roll-forged material and having one of its parallel flanges secured in a groove of one of said annular members by welding and its opposite flange spaced from the sealing face of that member to provide a groove extending about substantially one half circumference for receiving the outwardly directed flange of the other annular member, said annular members being engageable with each other by relative movement cross wise of said opening in a direction perpendicular to the plane of the meeting ends of said semi-annular locking ring members, hinge members for hinging said door to said autoclave for swinging movement about an axis perpendicular to said plane of the meeting ends, said hinge members engaging a hinge pin secured to at least one of said hinge members, and power operated means associated with said hinge pin for moving it axially to provide such relative crosswise movement.

7. A door mounting for an autoclave or the like, said door mounting comprising an annular frame member secured to the autoclave about an opening therein, an annular door member secured to the periphery of the door for seating engagement with the first said member, said members being interlockingly engageable with one another by sliding movement of one across the other by reason of semi-annular mating grooves and flanges on said members, said door member being also hinged to said frame member for swinging movement toward and from said frame member about an axis parallel to the direction of such sliding movement, means on the hinge mechanism for moving said door axially of the hinge axis in said sliding movement, a locking pin for holding the member against such sliding movement, and fluid pressure means for providing sliding movement of said door and locking and unlocking movements of said locking pin, said fluid pressure means having interlocking control valves to prevent withdrawal of said locking pin except in the mating position of said door and frame members and to prevent sliding movement of said door member when said locking pin is in locking position.

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