Oct. 22, 1963 T. C. KING 3,107,810

DOOR LOCKING MECHANISM FOR HIGH PRESSURE AUTOCLAVES

Filed May 14, 1962 2 Sheets-Sheet 1

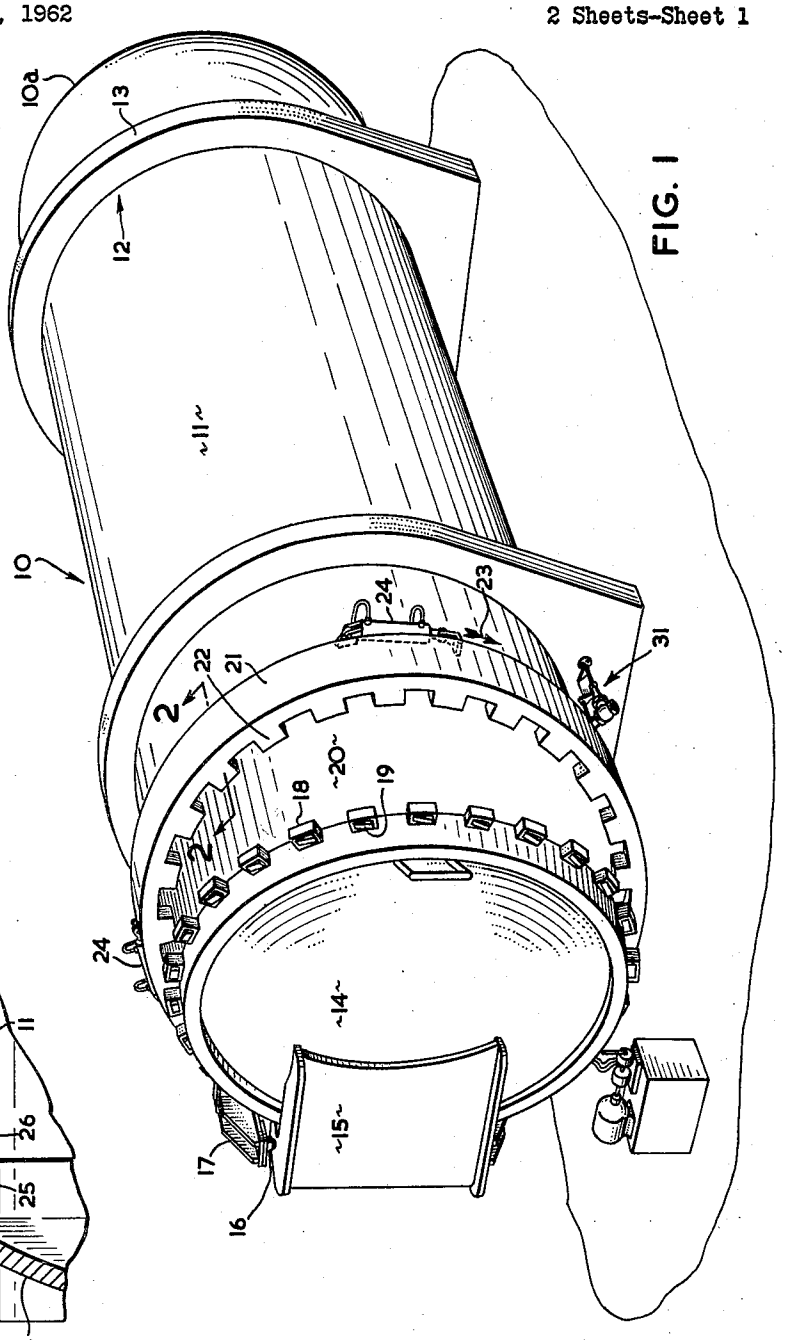


FIG. 1

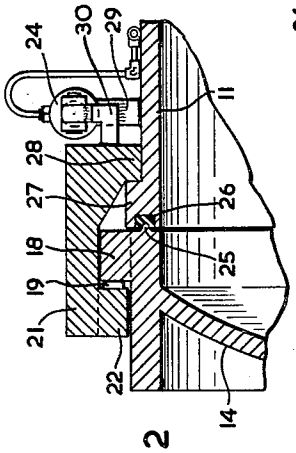


FIG. 2

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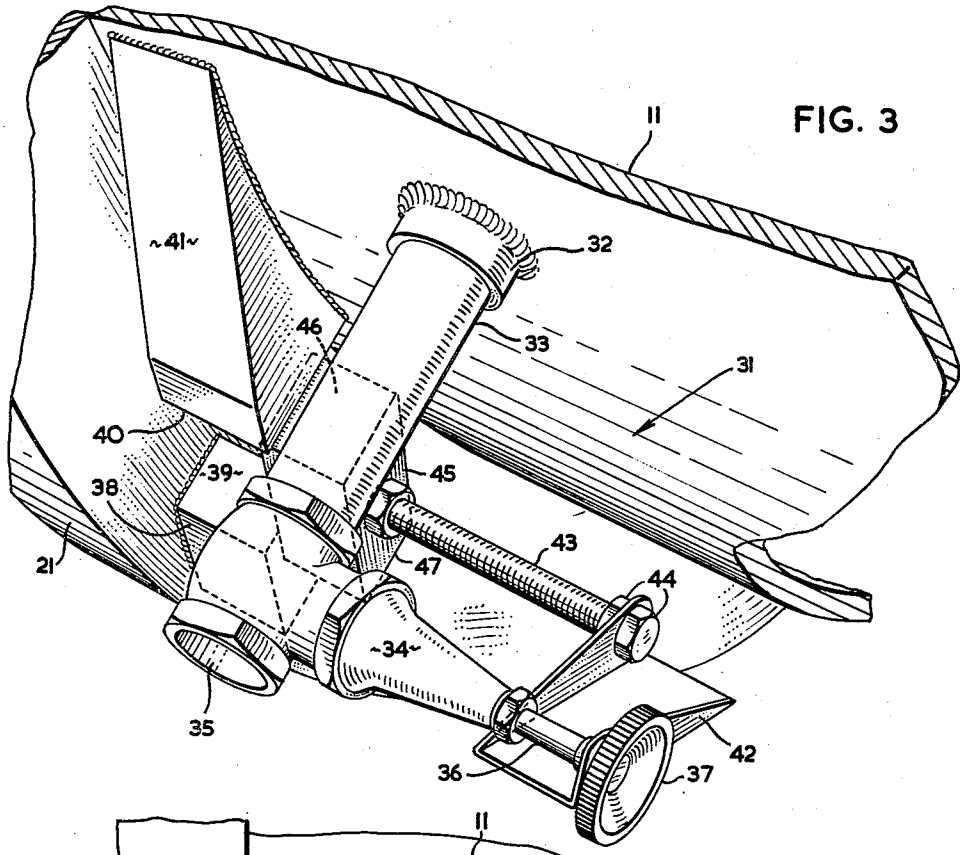


FIG. 3

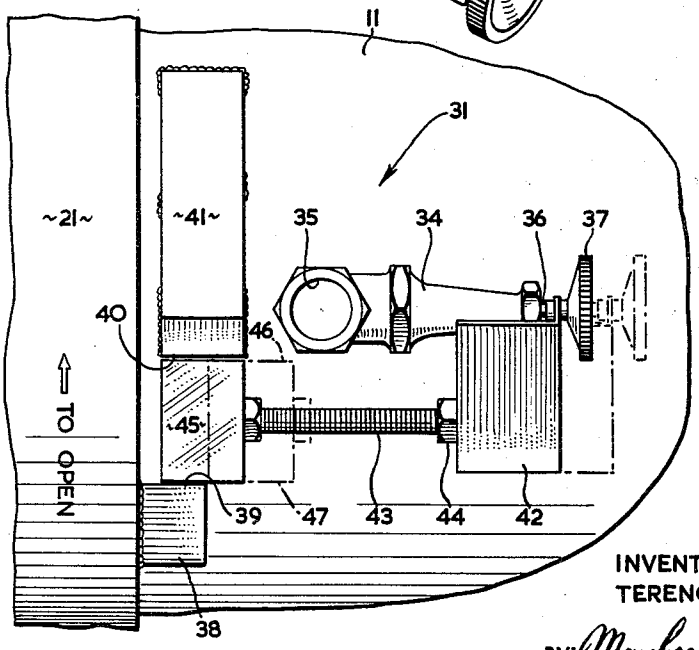


FIG. 4

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DOOR LOCKING MECHANISM FOR HIGH PRESSURE AUTOCLAVES

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1 Claim. (Cl. 220—55.3)

The present invention relates to locking means for the doors of high pressure autoclaves and, in particular, to a safety lock whereby it is made impossible to open this door while the interior of the autoclave is at a super-atmospheric pressure.

The present invention has, as its primary object, the provision of such locking means which are mechanical in nature and positive in function and which reduce, to the absolute minimum, the possibility of mal-function.

The invention will be described in detail with reference to a preferred embodiment which is illustrated in the accompanying drawings in which like reference numerals denote like parts in the various views and in which:

FIGURE 1 is a perspective view of one form of autoclave to which the present invention may be applied;

FIGURE 2 is a section view taken along line 2—2 of FIGURE 1 but showing the door in the closed position rather than in the open position of FIGURE 1;

FIGURE 3 is a detailed perspective view of part of the locking mechanism of the present invention; and

FIGURE 4 is a further detailed view of the locking mechanism of the present invention.

Turning now to the drawings and, in particular, to FIGURE 1 the invention will be described with reference to one form of autoclave which is generally illustrated by the reference character 10. In this case (although the present invention is not limited to this or any particular type of autoclave) the autoclave comprises a cylindrical body portion 11 which is closed at end 12 by a hemispherical end wall 13. Suitable supporting structure 10*a* may be provided as is necessary or desirable in any particular case.

At the other end of the autoclave there is provided a door 14 carried by a hinge comprising a movable bracket 15 pivoted about hinge pins 16 which, in turn, are carried by stationary brackets 17 suitably secured to the cylindrical wall 11 of the autoclave 10. It will be seen that the door 14 is provided with a multiplicity of radially outwardly extending lugs 18 each of which, on its outer face, is provided with a wedge or ramp surface 19.

Carried by the cylindrical wall 11 of the autoclave 10 is an annular member 21 surrounding the end opening 20 of the autoclave, the annular member 21 being capable of rotation through a small arc about the axis of the cylindrical body portion of the autoclave 10. The annular member 21 is provided with a multiplicity of radially inwardly extending lugs 22 which are spaced apart by a distance slightly greater than the width of each of the lugs 18 carried by the door. Thus, when the door is to be closed, the annular member 21 is positioned in such a way that each of the lugs 18 may pass between two of the adjacent inwardly extending lugs 22 on the annular member. In order to lock the door the annular member is then rotated in the direction of the arrow 23 by means of the hydraulic jack 24 (there are three hydraulic jacks 24 although only two may be seen in FIGURE 1) so that the lugs 22 on the annular member engaging the wedge or ramp surfaces 19 on the lugs 18 of the door cause the door 14 to assume a very tightly closed position as can be seen in FIGURE 2. The door 14, in FIGURE 2 can be seen with its lugs 18 engaged

by the lugs 22 of the annular member 21 with the wedges 19 lying between the two serving to force the door into a tightly closed position so that a bead 25 carried by the door may engage and deform a resilient gasket 26, thereby constituting an air tight seal between the wall 11 of the autoclave 10 and the door 14. It will be noted, in FIGURE 2, that the annular member 21 cannot move axially in a direction which would permit the door to open by virtue of the engagement between a radially outwardly extending flange 27 carried by the wall 11 of the autoclave and an inwardly extending annular flange 28 constituting an integral part of the annular member 21. In FIGURE 2 it may also readily be seen how the hydraulic jacks 24 act, at one end, upon brackets 29, stationary, and fixed on the wall 11 of the autoclave and brackets 30 carried by and movable with the annular member 21.

Once the door of the autoclave has been closed, the interior may be connected to a source of high pressure whereupon the pressure within the autoclave may be elevated to any desired level above the ambient atmospheric pressure. It will be appreciated that, in the absence of some safety mechanism, the hydraulic jacks 24, acting on the downward slope of the ramps 19 may be capable of rotating the annular member 21 towards the position where the door could open even while the pressure within the autoclave was at an elevated level. If this were to happen, the door would violently be flung open by the pressure within the autoclave with almost certain damage to the mechanism and a risk of serious injury to anyone standing nearby.

The prior art has contemplated the elimination of this problem by various interlocking hydraulic circuits which are intended to prevent the supply of pressurized fluid to the jacks in a "door opening" direction while the interior of the autoclave is under pressure. Such hydraulic circuits, however, are usually controlled by manually operable valves and, as a result, the possibility of human error is not eliminated.

By means of the present invention, however, this human error is believed to be eliminated by the provision of an exhaust valve located in the wall 11 of the autoclave in the manner shown at 31 in FIGURE 1, the exclusive valve having associated therewith a positively acting mechanical lock.

The mechanical lock arrangement can conveniently be seen in FIGURES 3 and 4 which illustrate a fragment of the mechanism of FIGURE 1 in the area of the exhaust valve 31. The wall 11 of the autoclave can be seen to be provided with an aperture surrounded by a collar 32 to which is secured a pipe 33 which, through the valve 34 communicates with the atmosphere by means of the vent 35. The valve 34 may be of the gate, disc or needle variety and, for the purposes of the present invention, it is preferable that it be of a kind which is operated by an axially movable spindle 36 which, in the present case, is internally threaded within the valve 34 so that rotation of the hand wheel 37 will cause axial movement of the spindle 36 which will, in turn, either open or close the valve 34 depending upon the direction of this movement.

The annular member 21 is shown, in FIGURE 3, to carry an abutment 38 which is of such a height that its face 39 lies in an interfering path with the face 40 of an abutment 41 carried by the wall 11 of the autoclave. The abutments 38 and 41 are so located on their respective members that their faces 39 and 40 are spaced apart when the annular member 21 is in the "door closed" position. They are, in fact, spaced apart by a distance equal to the distance through which the annular member 21 must travel in moving from the "door closed" position to the "door opened" position. Contact between faces

39 and 40 of the two members may constitute a stop which will accurately position the annular member relative to the door to permit the lugs 18 to pass between the lugs 22 in the annular member so that the door may be opened.

The locking arrangement contemplated by the present invention is provided by means of a bracket 42 which is carried by the spindle 36 of the valve 34 and which, in turn, carries a link 43 which, at one end, is secured to the bracket 42 by means of the bolt 44. At its other end, the link 43 is secured by means of a threaded arrangement to a locking block 45 which is so dimensioned that it is provided with two opposed faces 46 and 47 spaced apart a distance such that it neatly fits between the faces 39 and 40 of the abutments 38 and 41 when these two abutments are spaced apart by virtue of the annular member occupying the "door closed" position.

The locking block 45 is, as will readily be apparent, moved from a first position between the two abutments to a second position clear of at least one of the abutments by the axial movement of the spindle 36 of the exhaust valve 34. The exhaust valve 34 is so arranged that when the hand wheel 37 is rotated so as to move the spindle 36 inwardly of the valve in order to close the valve the locking block 45 is moved between the two faces 39 and 40 of the two abutments 38 and 41. Thus, when the valve 34 is closed the locking block lies between the two faces of these two abutments and positively prevents their approach to one another which prevents the annular member from moving towards the "door opened" position.

If it is desired to open the door of the autoclave, it is first of all, absolutely necessary to remove the locking block 45 from between the faces 39 and 40 of the abutments 38 and 41. This can only be achieved by withdrawing the spindle 36 from the valve 34 which, in turn, opens the valve 34 at the same time and exhausts the elevated pressure within the autoclave to atmosphere and thereby ensures that the pressure within the autoclave falls to atmospheric pressure before the annular member 21 can be moved from the "door closed" to the "door opened" position.

From the above description of the present invention it will be readily appreciated that it is impossible to open the door of the autoclave unless the interior of the autoclave is in communication with atmospheric pressure and, hence, the door cannot be opened while the interior of the autoclave is at an elevated pressure relative to the ambient atmosphere. Similarly, pressure cannot be built up within the autoclave until the annular member 21 has been positively locked in the "door closed" position by the insertion of the locking block 45 between the faces 39 and 40 of the abutments 38 and 41 and this insertion automatically is accompanied by the closing of the exhaust valve without which the pressure within the autoclave cannot be raised.

It is believed that this invention possesses a very high degree of safety and reduces to the minimum the possibility of human error in the operation of the device.

While the invention has been described with reference to a preferred embodiment it is obvious that the particular type of autoclave disclosed has no relevance to the present invention and that minor modifications in the structure and arrangement of various parts can be made within the scope of the appended claim.

What I claim as my invention is:

In a high pressure autoclave having an opening, a door adapted to close the opening, an annular member carried by the autoclave and surrounding the opening, the annular member being capable of rotation through a small arc between a first position in which means carried by the annular member engage co-operating means on the door to prevent its removal and a second position in which the means carried by the annular member disengage the means on the door to permit its removal; locking means to positively prevent rotation of the annular member from the first to the second position when the interior of the autoclave is at an elevated pressure relative to the ambient atmospheric pressure comprising an abutment having a bearing face on the annular member and an abutment having a bearing face on the autoclave, said two bearing faces being directly opposed from one another along the arc of a circle concentric with the arc of rotation of the annular member, said abutments being spaced apart from one another when the annular member is in the first position, and being adapted to lie substantially face-to-face when the annular member is in the second position, an exhaust valve in the wall of the autoclave to maintain the pressure therein when the valve is closed and to release the pressure therein when the valve is opened, a locking block adapted to lie between the bearing faces of the two abutments to prevent the abutment on the annular member from approaching the abutment on the autoclave and therefore to prevent the annular member from moving from the first position towards the second position and means to interconnect the valve and the locking block to move it between the abutment as the valve is closed and to remove it from between the abutment as the valve is opened.

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