The combination of a pressurizable chamber and a closure device comprised of a closure member operable to close an opening in a wall of the chamber, a sealing member operable to seal the opening when the closure member is disposed in the opening and a plurality of locking members movable radially outwardly of the opening so as to lock the closure member against movement outwardly of the opening due to pressurization of the chamber; the locking members when in their locking position abutting the closure member and having portions thereof engaging in corresponding recesses in that portion of the wall surrounding the opening. The locking members may be moved automatically by means of jacks.

5 Claims, 2 Drawing Figures
CLOSURE DEVICE FOR SEALING AN OPENING IN A WALL OF A PRESSURIZABLE CHAMBER

The invention relates to closure devices and in particular to the combination of a pressurizable chamber and a closure device for sealing an opening in a wall of the chamber.

According to the invention, there is provided the combination of a pressurizable chamber having an opening in a wall thereof and a device for sealing the opening, the device including a closure member for closing the opening, a sealing member for sealing the opening when the closure member is in its operative position, and a plurality of locking members movably radially of the opening so as to lock the closure member against movement outwardly of the opening due to pressurization of the chamber, the locking members when in their locking position abutting the closure member and having portions thereof engaging corresponding recesses in that portion of the wall surrounding the opening.

An embodiment of the invention will now be described by way of example only with reference to the accompanying drawings, in which:

FIG. 1 is a longitudinal section of the combination of a pressurizable chamber wall and closure device according to the invention, and

FIG. 2 is a part plan looking in the direction of the arrows II—II in FIG. 1.

Referring to the drawings, the combination includes a pressurizable chamber consisting of a wall formed from a number of layers which may be circumferentially reinforced so as to withstand high internal pressures. The chamber wall includes a ring 2 of enlarged thickness and defines a cylindrical opening; the ring is secured to the remainder of the wall by any known method, in this case by welding.

A closure device for the opening includes a cylindrical member 3 capable of withstanding the pressure inside the chamber 1 and freely slidable along the axis of the opening due to a clearance 4 left between the cylindrical member and the inner wall of the ring 2. Sealing between the member 3 and the inner wall surface 21 defining the opening is provided, for example, by a resilient cord 5 disposed in a lateral groove 6 of the member 3.

The member 3 has a conical outer surface 7 against which a plurality of locking members 8 are disposed. The locking members 8 can slide radially of the opening along the outer surface 7 of the plug and their profile extending towards the inner surface 21 of the ring 2 is provided with a plurality of notches 9 engaging in corresponding grooves 10 formed in the surface 21.

When the chamber is pressurized the pressure is taken by the member 3 which tends to move out of the opening and thus bears on the grooves 10 by means of the locking members 8. In this condition, the pressure effect is exerted only in the zone bounded by the gasket and the ring 2 is dimensioned only to withstand the background effect. The force is transmitted continuously over a circle formed by the locking members 8.

The profile of the outer surface 7 of the plug and of the notches 9 is so determined that the locking members are held in place simply by the effect of the pressure applied to the member 3. In the case of FIG. 1, the surface 7 is a frusto-conical surface and the notches are parallel to the surface 7.

When the pressure inside the chamber ceases, the member 3 no longer exerts any force on the locking members 8 and the latter can then be withdrawn. To this end, the locking members comprise at least two segments 81 (FIG. 2) spaced apart by gaps 1 so that the surfaces 810 being parallel. Each gap 1 is provided with a further locking member 82 having parallel side surfaces and of a width substantially equal to that of the gap 1; the outer profiles of the segments and of the further locking members comprise identical notches and thus form a continuous ring when all the segments and members are in place. When the pressure ceases, the members 82 are first removed by sliding in the gaps 1 and then the segments 81 can be shifted towards the center by a distance slightly greater than the thickness of the notches 9 so that the member 3 can slide along the opening axis.

When the opening axis is vertical, the locking members are displaced in a substantially horizontal plane and the closure device can then be moved manually or, for example, by a travelling crane, depending upon the weight of the device.

When the device has to be moved quickly or when the aperture axis is horizontal, it is preferable to move the locking members by means of a special arrangement, an example of which is shown in FIG. 1.

The member 3 shown in FIG. 1 is moved along the opening axis by means of a jack 11 pivotally connected to the member 3 and to a fixed point. Two groups of jacks 181 and 182 are secured to the jack 11 and one group is pivotally connected to the segments 81 while the other group is pivotally connected to the members 82.

The jacks may be mechanical or hydraulic, hydraulic control enabling the rapid and simultaneous movement of the member 82 and segments 81 to be performed easily.

When the closure device is to be opened, the jacks 182 are actuated to withdraw the members 82 and then the segments 81 are withdrawn by the jacks 181 and the released member 3 can then be lifted by means of the jack 11.

To close the opening, the same operations are carried out in the reverse sequence. After the chamber has been pressurized, the locking members are held in place by the pressure effect and the pressure in the jacks 181 and 182 can be released.

In the case of FIG. 1, the jacks 181 are not parallel to the surface 7 so that the member 3 has to be displaced towards the interior of the chamber by means of the jack 11 to enable the segments 81 to be withdrawn. This arrangement provides additional security since the plug can be displaced only when the pressure inside the chamber is low enough.

The invention, of course, is not limited to the details of the above-described embodiment which could be modified without departing from the scope of the invention as defined by the appended claims.

For example, the means for controlling the movement of the locking members as described hereinabove may be replaced by any means performing the same function. For example, the segments 81 and members 82 could be connected, by links, to two sleeves sliding axially one after the other to provide successive displacement of the wedges and segments.

Also, the locking members need not necessarily form a continuous ring but could be spaced apart by a distance sufficient to allow their simultaneous radial displacement, the system for controlling the displacement of the locking members providing a more rapid displacement of the members 82 than of the segments 81.

In addition, the outer profile of the notches of the locking members could be designed to allow them to be disengaged by rotation about their base.

Finally, the entire control circuit for the movement of the locking members may, of course, be rendered automatic.

I claim:

1. The combination of a pressurizable chamber having an opening in a wall thereof and a device for sealing the opening, the device including a closure member for closing the opening; a sealing member for sealing the opening when the closure member is in its operative position, and a plurality of locking members movably radially of the opening so as to lock the closure member against movement outwardly of the opening due to pressurization of the chamber, the locking members when in their locking position abutting the closure member and having portions thereof engaging corresponding recesses in that portion of the wall surrounding the opening, the locking members including at least two spaced segments having gaps therebetween each gap being occupied by a further slidable locking member having parallel side surfaces and of a width approximately equal to that of the gap.

2. The combination according to claim 1, and including means for controlling the radial movement of the locking members.
3. The combination according to claim 2, wherein said means is operable to successively cause the displacement of each further slidable locking member and then the displacement of the first mentioned locking members to enable the closure member to be removed from the opening.

4. The combination according to claim 3, wherein said means includes two groups of jacks connected to a fixed point and pivotally connected respectively to the further locking members and to the first mentioned members, the two groups of jacks being actuated successively.

5. The combination according to claim 2, wherein said means is operable to cause a faster displacement of the further members than that of the first mentioned members.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,667,649 Dated June 6, 1972

Inventor(s) Georges Thillet

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

[73] Assignee: B.V.S., Grenoble, France.

Signed and sealed this 24th day of October 1972.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR. ROBERT GOTTSCALK
Attesting Officer Commissioner of Patents