

[72] Inventor **Claude R. Wallick, Jr.**
Louisville, Ky.
[21] Appl. No. **749,690**
[22] Filed **Aug. 2, 1968**
[45] Patented **June 28, 1971**
[73] Assignee **American Standard, Inc.**
New York, N.Y.

2,869,173 1/1959 Van Hartesveldt et al. 18/16(H)
3,287,950 11/1966 Grankowski 100/269(A)
3,323,806 6/1967 Smith et al. 277/188X
3,468,261 9/1969 Schmierer 92/102X

Primary Examiner—Lester M. Swingle
Attorney—Sheldon H. Parker

[54] **EXTRUSION PREVENTION MEANS**
10 Claims, 1 Drawing Fig.

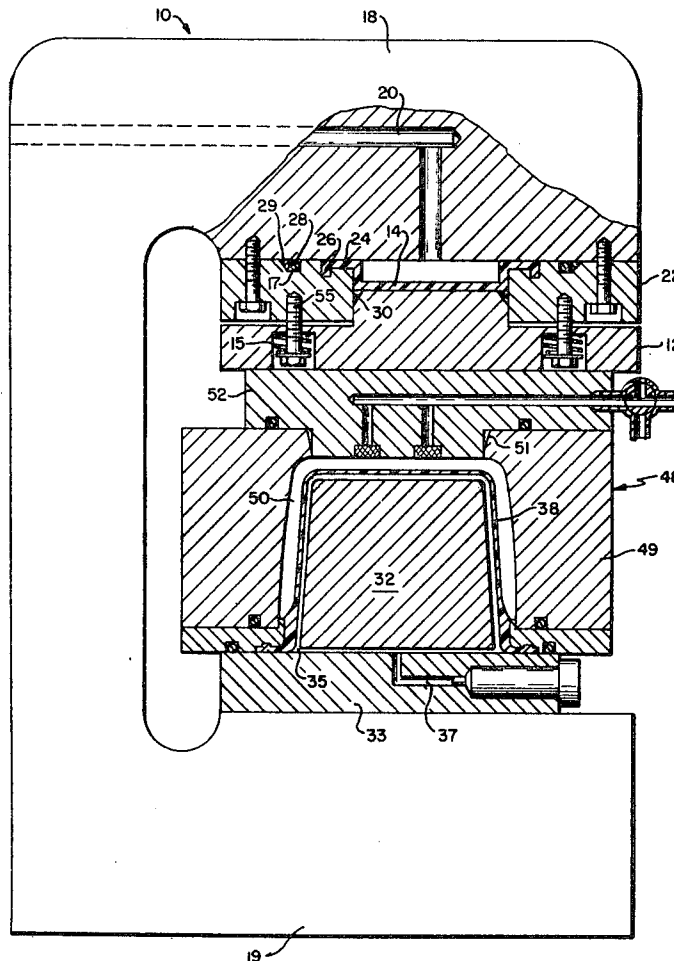
[52] U.S. Cl. 269/25,
18/16R, 92/101
[51] Int. Cl. B25b 1/18,
B22c 15/28
[50] Field of Search 269/25, 26;
92/98, 99, 101, 102, 100, 168; 18/16 (H)(C), 16
(M), 30 (LM), (Flexible & Fluid Digest);
100/231, 269 (A), 295; 144/281.1; 277/188

[56] **References Cited**

UNITED STATES PATENTS

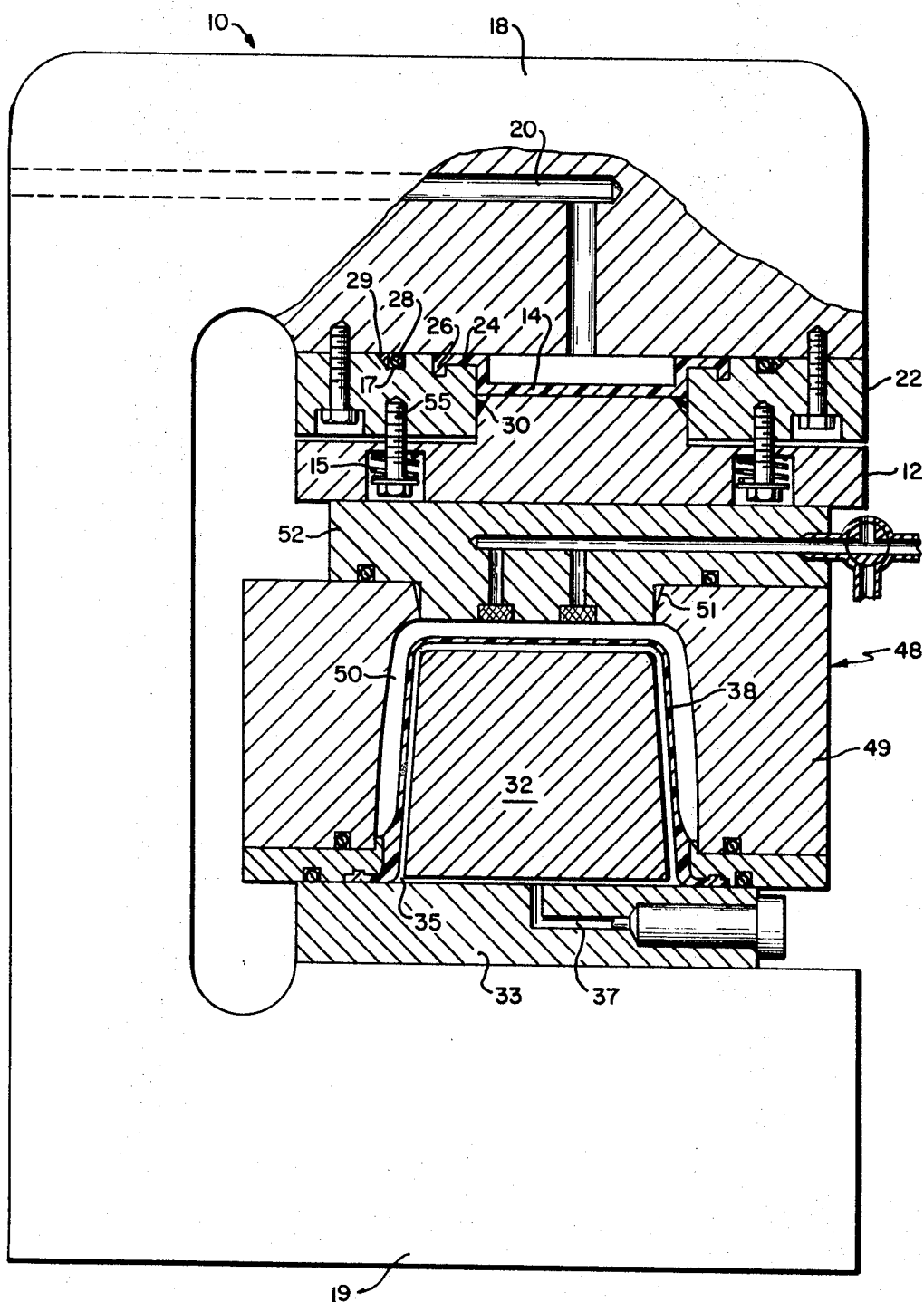
2,612,419 9/1952 Reynolds 92/101X
2,675,699 4/1954 Tilden 269/25X

ABSTRACT: The invention relates to a hydraulic press, which has a pair of jaws at least one of said jaws having a movable platen, said movable platen being movably secured to said jaw by fastening means therebetween; a flexible membrane having a peripheral, extending rib and being fastened to said jaw by fastening means and positioned intermediate said movable platen and said jaw, and pressure means in communication with the flexible member. A groove is provided between said at least one jaw and said fastening member intermediate the end wall thereof and said flexible member, said groove having disposed therein first sealing means and second sealing means, said first sealing means adapted to prevent the extrusion of hydraulic fluid from said apparatus during pressing and said second sealing means adapted to prevent extrusion of said first sealing means from the apparatus during pressing.



PATENTED JUN 28 1971

3,588,080



INVENTOR

CLAUDE R. WALLICK, JR.

BY

Sheldon H. Parker

ATTORNEY

EXTRUSION PREVENTION MEANS

This invention relates to an improved elastomeric isostatic clamp bag for isostatic clamp devices. More particularly the present invention relates to an improved elastomeric isostatic clamp bag for an isostatic clamp device useful for impressing thin walled sharp cornered ceramic sanitary ware.

Sanitary ware currently being made has usually been formed by using standard slip casting procedures whereby slip is poured into plaster molds. After setting, the plaster mold is removed and the ware removed, dried, fired and glazed. This procedure is slow and requires considerable manual skill and takes up much space.

Attempts heretofore made to isostatically press sanitary ware have encountered various problems such as the slowness of the process due to the size and weight of the molds and the large volume of hydraulic fluid that is required in presently used pressure vessels.

Another disadvantage in isostatically pressed ware has been that the outer surface requires finishing after pressing. A further difficulty has been the maintaining of adequate seals in the mold to resist the pressurized hydraulic fluid used in the high pressure chamber.

Furthermore most conventional isostatic vessels have an elaborate screw-in cap device to contain the high pressures usually encountered. However such an arrangement demands extensive lifting devices and special threads.

It is therefore an object of this invention to provide an improved technique for forming sanitary ware which lends itself to fast operation and results in sanitary ware which will have a uniform density, uniform shrinkage and minimum drying shrinkage and a cross section of which will be relatively thin.

An equally important object of this invention is to manufacture sanitary ware that does not require further finishing before glazing and firing.

An additional object of this invention is to produce a casting that will not crack or craze during firing.

An equally important object of this invention is to provide molds that can be adequately sealed against high pressure leakage.

An additional object of this invention is to provide molds which produce a surface finish on the cast object that does not require finishing.

A further object of this invention is to provide an improved rapid load and unload dry bag high pressure clamping device for increasing the speed and throughput of an automated isostatic pressing vessel.

A still further object of the present invention is to provide a clamping device which is self-aligning and lends itself to extremely high production with predicted unique low fatigue values inherent in its geometry.

Another object of the present invention is to provide a bag clamping device in which extrusion of the bag from the device during pressing is prevented.

In accordance with the present invention, in combination with an apparatus for isostatically pressing ware having a baseplate, a core attached to the baseplate, a flexible membrane in close combination with the core, a fastening means to securely seal the membrane to the baseplate, a mold having a cavity therein and an opening through which a material can be added to the mold a plate and a supporting member, the plate movably attached to the supporting member, the plate filling the opening in the mold, a clamp having jaws adapted to bear against the baseplate and the supporting member, at least one of the jaws having a movable platen adapted to intimately contact the supporting member, the movable platen being detachably secured to the jaw by means of a fastening member therebetween; a flexible membrane tapering into a thinner wall portion terminating at a downwardly extending rib and fastened to the movable platen by the fastening member and positioned intermediate the movable platen and the jaw, and pressure means in communication with the flexible membrane, the improvement comprising a groove in the top wall of the fastening member intermediate the outer and inner

sidewalls thereof and the downwardly extending rib, the groove having dispersed therein first sealing means and second sealing means, the first sealing means adapted to prevent the extrusion of the flexible membrane from the apparatus during pressing. And the second sealing means adapted to prevent the extrusion of the first sealing means from the apparatus doing the pressing.

The invention is not limited to the production of ceramic ware but can also be applied to pressing of pulverulent materials including ceramics, plastics and metal powders or discreet combinations of the same.

The aforementioned related objects, features and advantages of the present invention will be more fully understood as the description of the invention proceeds, particularly when taken together with the accompanying drawing which illustrates a vertical cross section of a mold secured in a pressurized clamping device in accordance with the principles of the present invention.

Referring now to the drawing there is shown a mold 48 in combination with an external clamping means 10 thereby forming its own pressure vessel, hence the described embodiment involves only a minimum amount of hydraulic fluid thus reducing the volume of fluid that must be moved for each pressing thereby speeding the process.

The mold 48 consists of walls 49 of sufficient thickness to withstand pressures needed to isostatically form ceramic ware. The mold 48 contains a cavity 50 into which the core 32 and membrane 38 are inserted. Sufficient clearance is maintained between the membrane 38 and the inner walls of the mold 48 to allow the introduction of a granulated ceramic mixture. This is accomplished through an opening 51 in the mold 48 opposite the opening through which a core is inserted. A typical vibrating device can be used to aid the introduction of the granulated ceramic material. After the ceramic mixture has been introduced into the mold, the opening 51 is closed by insertion of an upper plate 52.

The movable platen 12 is in contact with a flexible membrane 14. The flexible membrane 14 is held in turn in intimate contact with one of the jaws 18 by a clamping device 22. In communication with the flexible membrane 14 is a pressure source 20. The flexible membrane 14 terminates in a restricted portion or thinner wall 24 which a downwardly extending rib 26 is attached to the thinner wall 24. This is designed such as to maintain an adequate seal and to produce properly formed ceramic ware. To prevent the pressure source 20 from leaking between the clamping device 22 and the jaw 18 when subjected to pressure, the clamping device 22 is provided with a groove 17 positioned in the top wall thereof intermediate its outer sidewall and the rib 26. Situated within the groove 17 is a first sealing means or O-ring 28 which is adapted to prevent the extrusion of the hydraulic fluid during the pressing operation. Adjacent the O-ring 28 and also within the groove 17, is a second sealing means 29 having a generally wedge or triangular shape and of soft to medium hardness and which is adapted to prevent the extrusion of the O-ring 28 during the pressing operation. In order to prevent the flexible membrane 14 from extruding out between the clamping device 22 and the movable platen 12, there is a support means 30 which is cast in place and positioned on the upper corner of the platen 12 adjacent the inner sidewall of the clamping device 22. The wedge shaped support means 30 must be a relatively rigid material, for example, an epoxy, in order to fill the gap created between members 12 and 22 as pressure is applied.

As shown in the figure when the assembled mold 48 is placed between the clamp jaws 18, 19, the jaws bear against the base plate 33 and the flexible membrane 14. Hydraulic fluid is pumped through the passageway 37 to the channels 35 in the core or on the surface of the core 32. Hydraulic fluid also flows through passageway 20 to the flexible bag whereby the bag transfers a force through the movable platen 12 which in turn makes a short downward stroke to clamp the mold 48 between it and the lower clamp jaw 19. Pressure is also ex-

erted on the hydraulic fluid which in turn exerts pressure on the flexible membrane 38. The flexible membrane 38 forces and compresses the ceramic mixture against the inner mold walls 49 forming the ceramic ware. A smooth exterior surface is thus obtained by pressing the ceramic mixture against the smooth mold walls. This eliminates the finishing operation. After the ware has been formed, the hydraulic pressure is released and hydraulic fluid withdrawn from the mold. Also, springs 15 return the clamp or movable platen 12 to its normal position when pressure is released. As the membrane 38 returns to its original position a clearance is left between the interior of the formed ceramic ware and the membrane 38.

The mold 48 is then removed from the clamp mechanism and the baseplate 33 released from the mold. The core and formed ceramic ware are then removed from the mold cavity 50. The formed ceramic ware is removed from the core and is ready for firing.

The sealing means of the present invention can be manufactured from any resilient or semiresilient material. However, it is advantageous that the wedged shaped movable support means be manufactured from epoxy resins and the remaining sealing means be of thermoplastic materials such as polyvinyl resin, polyvinyl chlorides, polyurethanes, etc.

The pressure at which the sealing means of the present invention are used are on the order of 15,000 pounds per square inch; means higher pressures can be used.

It is to be understood that the invention hereinabove described is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawing, since the invention is capable of other embodiments and of being practiced or carried out in various ways within the scope of the invention.

Also it is to be understood that the phraseology or terminology employed is for the purpose of description and not of limitation.

I claim:

1. In a hydraulic press apparatus comprising a pair of jaws at least one of said jaws having a movable platen, said movable platen being movably secured to said jaw by fastening means therebetween; a flexible membrane having a peripheral, extending rib and being fastened to said at least one jaw by fastening means and positioned intermediate said movable platen and said at least one jaw, and pressure means in communication with the flexible membrane, the improvement comprising a groove between said at least one jaw and said fastening means intermediate an outer sidewall thereof and

said flexible membrane, said groove having disposed therein first sealing means and second sealing means, said first sealing means adapted to prevent the extrusion of hydraulic fluid from said apparatus during pressing and said second sealing means adapted to prevent extrusion of said first sealing means from the apparatus during pressing.

2. The apparatus of claim 1 wherein said first sealing means comprises an O-ring.

3. The apparatus of claim 2 wherein said second sealing means comprises a wedge-shaped member.

4. The apparatus of claim 3, wherein said O-ring is positioned between said wedge-shaped member and said flexible membrane.

5. In a hydraulic press apparatus having a pair of opposing jaws, at least one of said jaws having a movable platen adapted to move away from said at least one jaw, said movable platen being movably secured to said jaw by fastening means including a fastening member therebetween; a flexible membrane fastened to said at least one jaw by said fastening member and positioned intermediate said movable platen and said jaw, and pressure means in communication with the flexible membrane, the improvement comprising a groove between said at least one jaw and said fastening member intermediate said flexible membrane and the outer periphery of said fastening member, said groove having disposed therein an O-ring and a generally triangular-shaped sealing means, said O-ring adapted to prevent the extrusion of hydraulic fluid from said apparatus during pressing and said generally triangular-shaped sealing means adapted to prevent extrusion of the O-ring from the apparatus during pressing, and a generally triangular-shaped relatively rigid support means positioned at the intersection between said flexible membrane, said movable platen and said fastening member.

6. The apparatus of claim 4 wherein said O-ring comprises a polyvinyl resin material.

7. The apparatus of claim 4 wherein said wedge-shaped member is of thermoplastic material.

8. The apparatus of claim 1 wherein said movable platen has support means associated therewith proximate an inner sidewall of said fastening member whereby the extrusion of said flexible membrane out between said platen and said fastening member is prevented.

9. The apparatus of claim 7 wherein said first and second sealing means is polyvinyl resin material.

10. The apparatus of claim 8 wherein said support means is an epoxy resin material.

50

55

60

65

70

75