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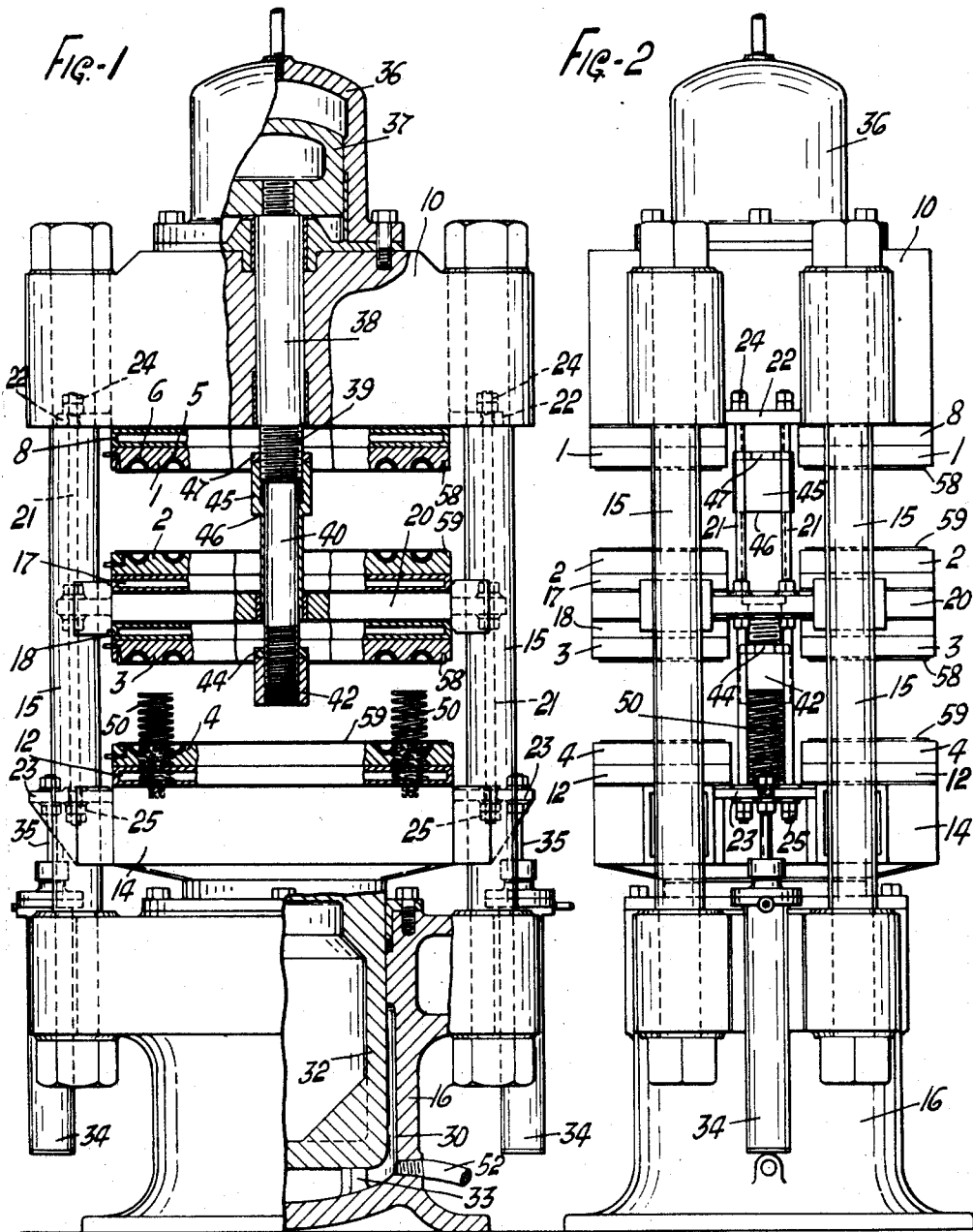
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PRESS FOR VULCANIZING PLAY BALLS AND SIMILAR ARTICLES

Filed April 15, 1939

3 Sheets-Sheet 1



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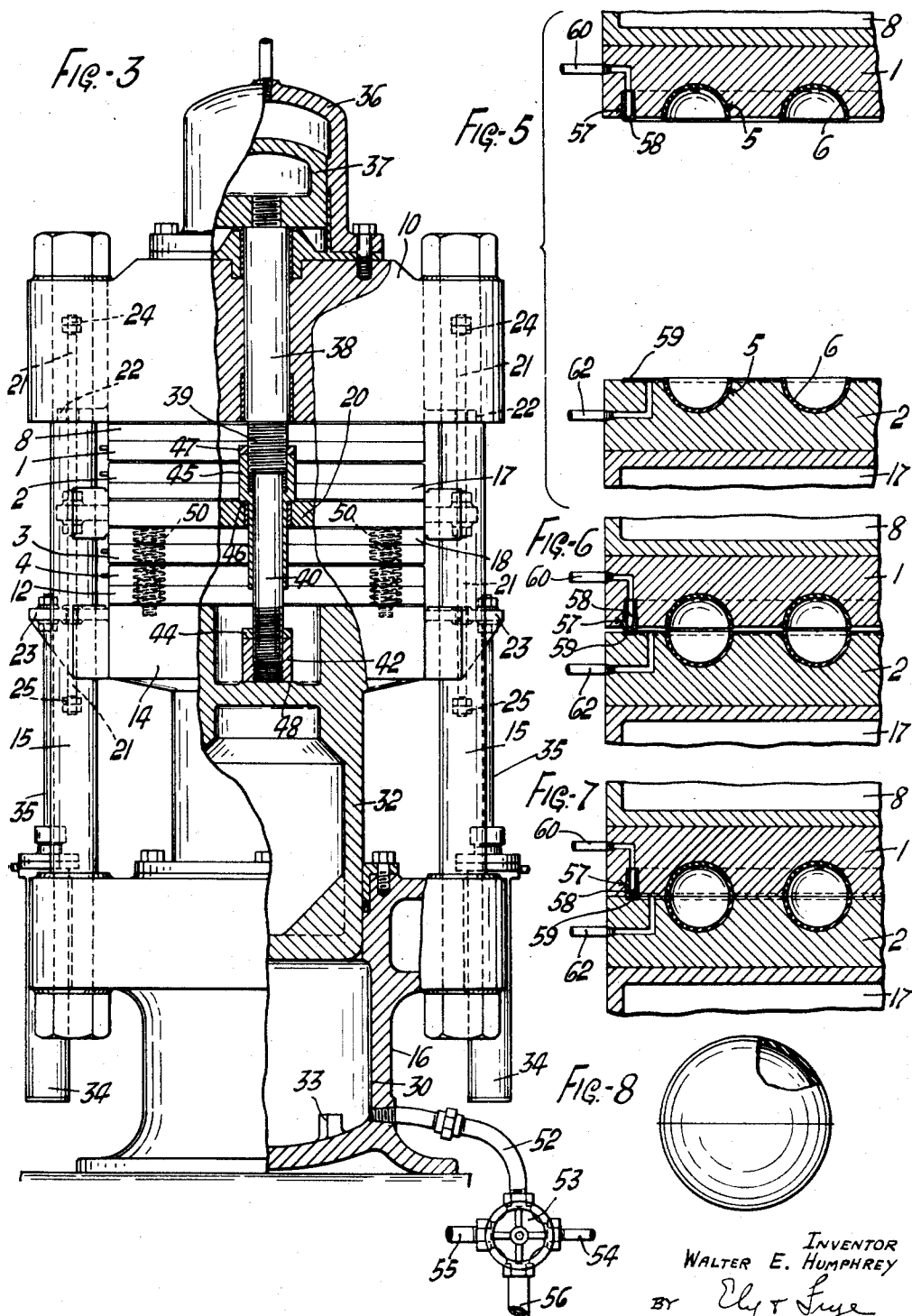
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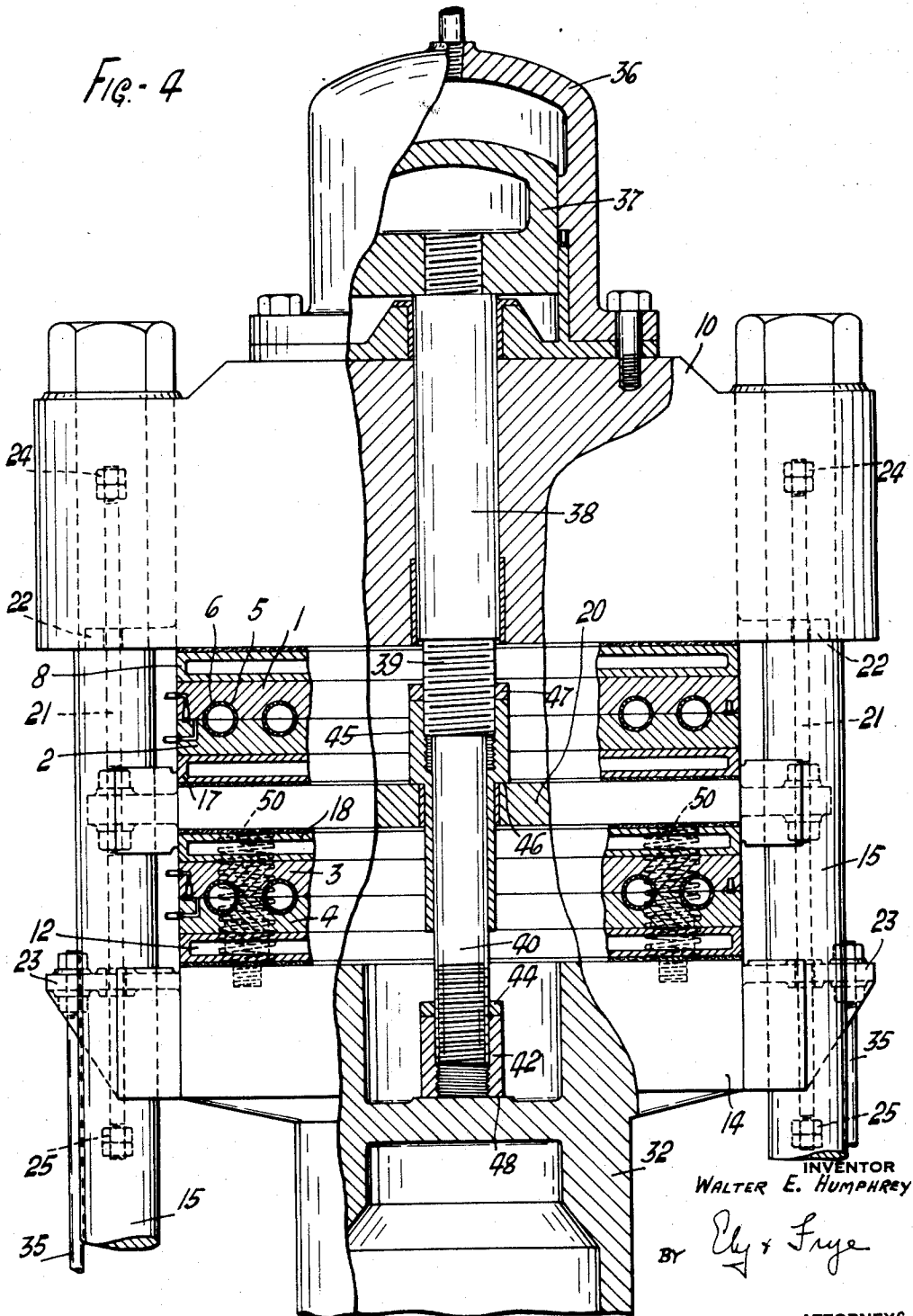
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Fig. 4



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PRESS FOR VULCANIZING PLAY BALLS AND
SIMILAR ARTICLES

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Application April 15, 1939, Serial No. 268,000

6 Claims. (Cl. 18-17)

The present invention relates to presses for use in vulcanizing hollow objects wherein the objects are filled with gas or fluid under pressure and vulcanized in that condition. While the press is intended for the manufacture of hollow rubber play balls, such as may be used as centers for tennis balls, the principles of the invention may be more widely extended and used in similar or analogous fields. The description and drawings show a press of the type herein covered which is especially adapted for the particular purpose specified, but it will be appreciated that the showing is by way of illustrating the best known or preferred form of the invention and changes and modifications may be incorporated in other embodiments without departing from the essential elements of the invention.

The press shown herein is particularly adapted for carrying out the process for curing play balls shown in my copending application, Serial No. 243,929, filed December 5, 1938. Briefly stated this process consists in forming two hemispherical play ball sections which may be partially cured if desired, it being advantageous to semi-cure the sections in an ordinary platen press to conserve the time required in the press illustrated herein. These sections are placed in oppositely facing cavities in opposed mold plates, which are then brought together to partially and approximately closed position, a narrow space intervening between the opposed edges of the ball sections. The space about the ball sections and between the faces of the mold plates is then closed off or sealed by a fluid tight barrier and the fluid under pressure, generally air, is admitted to the space between the mold plates and flows into the open cup-like ball sections. While the barrier is maintained, the mold sections are brought together under heavy pressure, so that the edges of the ball sections are forced into intimate contact and which join or fuse together under the pressure and heat of vulcanization.

The press of this invention is preferably made in dual or double form with superposed pairs of mold sections to permit the use of a battery of molds, so that the operations may be more economically carried forward. In the specific embodiments of the invention a single pair of mating mold elements may be used.

Other objects and advantages of the improved press design will become apparent from the description, taken in connection with the disclosures contained herein, which will be understood to represent the best known or preferred form of the invention.

In the drawings:

Fig. 1 is a front elevation of the press in fully open position, portions thereof being in section or broken away better to show the operating parts;

Fig. 2 is a side view of the press in the same condition;

Fig. 3 is a front elevation with the mold plates brought together in their partially closed position, that is, the position which the parts occupy while the pressure is being admitted to the hollow ball sections;

Fig. 4 is a view, somewhat enlarged, of the upper portion of the press with the mold sections brought together for the vulcanizing operation;

Fig. 5 is an enlarged detail of the mold sections in open position as in Figs. 1 and 2;

Fig. 6 is a view of the parts in the position of Fig. 3;

Fig. 7 as in the position of Fig. 4; and

Fig. 8 is an enlarged view of the completed hollow ball.

Referring first to the details of the process and particularly to the steps which are covered in the copending application referred to above, the press is adapted and intended, in the form shown, to operate upon two sets or banks of molds so that two sets of balls are cured in a single operation.

The upper pair of molds is indicated by the numerals 1 and 2 representing top and bottom mold elements, and the lower pair of molds by the numerals 3 and 4. In these mold sections are provided the hemispherical cavities 5, facing each other in which the uncured or partially cured rubber ball sections 6 are placed, the arrangement being such that each rubber section will project to a limited extent beyond the face of its mold section, so that as the mold faces are brought together the edges of the rubber segments of each ball will be brought into firm engagement and the rubber thus forced together so that a tight seam or splice is made about the completed ball.

In the form shown, the upper mold section 1 is attached to a heated or steam platen 8 which is carried upon the underside of the stationary press head 10. The lower section 4 is attached to the heated platen 12 which is carried in the upper side of a movable press head 14, which is slidably mounted on the main supporting pillars 15 which extend from the stationary press head 10 to the supporting base 16. The mold sections 2 and 3 are attached to heated platens 17 and 18, carried by the top and bottom sides of an inter-

mediate or floating plate 20 which is also guided for movement upon the pillars 15. When the press is fully opened, as shown in Figs. 1 and 2, the plate 20 is supported in its intermediate position by pairs of rods 21 to which it is secured. These rods are extended to pass through webs 22 on the upper press head 10 and webs 23 on the movable press head 14. On the upper ends of the rods are the lock nuts 24 by which the location of the floating plate 20 is fixed when the press is open. On the lower ends of the rods are located the lock nuts 25 which serve to draw down the floating plate 20 as the press is opened.

In the base 16 of the press is located the cylinder 30 in which is mounted the hydraulic ram 32 upon which is carried the movable press head 14. This ram is supported in its lowermost position by lugs 33 on the base of cylinder 30. At the sides of the base are located two smaller cylinders 34 which are intended to operate as draw-back cylinders, the rams within these cylinders being connected by tie rods 35 to the movable press head.

On the top or stationary press head is located a high pressure cylinder 36 in which is a ram 37, depending from which is the central rod or post 38 slidably mounted in the upper press head. At about the point where the rod 38 projects from the press head it is reduced and provided with a threaded area 39, and below this point it is further reduced as at 40. At its lower end the rod is screw-threaded and on this portion is adjustably mounted a collar 42 held in adjusted position by the lock nut 44. On the threaded area 39 is adjustably mounted a sleeve 45 held in position by the lock nut 47. The sleeve is reduced as at 46 and then extended to pass through an opening in the floating plate 20. As shown in Figs. 3 and 4, the adjustable collar 42 is arranged to be received in a depression in the movable press head and to contact the surface thereof at the point 48 when the lower press head is brought to the position in which the mold sections are substantially closed and when the ball segments are to receive the fluid pressure. Similarly, the shoulder 46 contacts the upper face of the floating plate 20.

The distance from the under face of the upper press head in the shoulder 46 is approximately $\frac{1}{8}$ of an inch greater than the combined thickness of the molds 1 and 2 and their steam platens. Likewise, the distance from the shoulder 46 to the lower surface of the collar 42 is approximately $\frac{1}{8}$ of an inch greater than the combined thickness of the floating plate 20 and the mold sections 3 and 4 and their steam platens. The dimension of $\frac{1}{8}$ of an inch is given as illustrative only and may be adjusted in either case by the adjustments of the sleeve 45 on the rod 38 and the adjustment of the collar 42 on the reduced end of the rod 38. It is sufficient in each case to provide the passage between the opposing faces of the pairs of mold plates to the interior of the ball, allowing for the projection of the ball segments beyond the faces of the mold plates and permitting the unobstructed passage of the fluid pressure into the ball segments. The purpose will be further understood from an examination of Fig. 3 in which the mold sections are shown in their spaced relation ready for the admission of the fluid pressure to the interior of the ball segments, for in that view no movement of the rod 38 has taken place, but the shoulder 46 is in contact with the floating plate 20 and the collar

48 is in contact with the upper face of the ram or movable press head.

For the successful operation of the press, it is essential that the two pairs of mold plates be each spaced apart when the press is in the condition shown in Fig. 3 and unless means were provided to lift the floating plate as the ram reached the position of Fig. 3, the lower pair of mold plates would close together, while the upper mold plates would be separated twice the allotted amount, or with the figure of $\frac{1}{8}$ of an inch as given, the pair of lower mold plates would be in contact, while the upper pair were spaced $\frac{1}{4}$ of an inch. When, however, both pairs of mold plates are to be brought into contact this spring means for the lower mold plates must become ineffective.

The problem stated has been solved by the provision of two heavy coil springs 50 which are carried in the lower or movable press head and project sufficiently above its surface to contact with and be compressed by the intermediate or floating plate as the press reaches the intermediate position. The springs are sufficiently strong to lift the intermediate plate until it is arrested by contact with the shoulder 46.

The upper or high pressure ram 37 is under a constant given pressure of a very substantial degree, approximately 1000 lbs. per square inch being employed in operative press structure. The lower ram 32, however, is arranged to have two pressures exerted upon it, a high pressure and a low pressure. These pressures are admitted through the line 52 and the three-way-valve 53, the high pressure line being indicated, for example, at 54 and the low pressure line at 55; 56 is intended to represent the exhaust. The low pressure may, for example, be approximately 300 lbs. per square inch and the high pressure 1000 lbs. per square inch, it being observed that the ram 32 is greater in area than the ram 37 so that its total effective pressure is sufficient to overcome the pressure on the constant pressure ram 37.

It will be understood that the press may be inverted or even may be in a horizontal position without changing the principles of the invention.

Referring now to the details of the mold plates which have been briefly described. Each pair of mold plates has one plate with a sealing member thereon adapted to seal the space between the mold plates when they are brought into the intermediate position so that pressure will be retained in the space communicating with the ball segments. As shown, each top plate is provided with a downwardly facing channel 57 in which is inserted a flexible U-shaped gasket or packing ring 58 which is movable therein. This packing ring should be made of asbestos composition, asbestos, or some other heat resisting material so that it will withstand the heat of the steam platens required to vulcanize the balls. This gasket and its receiving channel extends completely around the plate and encloses all of the ball cavities 5 and is adapted to contact a complementary sealing ring 59 in the opposing plate. A source of fluid pressure indicated by the pipe 60 is let into the channel at one or more points by which pressure is applied to project the gasket into sealing relation with the ring 59 when the plates are in the intermediate or partially closed position shown in Fig. 6.

Into the space between the mold plates and within the gasket is also let a pipe line 62 with one or more outlets to the space between the mold plates so that when the parts are in the

position shown in Fig. 6, fluid under pressure, admitted to the space through the pipe 62, will flow into the cup-shaped ball segments through the space between their edges.

After the admission of the required fluid pressure the press is completely closed for the vulcanizing operation. This is accomplished by admitting the high pressure to the ram 32, which due to its larger area overcomes the constant pressure on the ram 37 and closes the mold plates together against the stationary head plate. This operation compresses the springs 50, closing the space between the lower pair of mold plates, raises the floating plate 20 and closes the upper pair of mold plates. This position is shown in Fig. 4. During the vulcanizing operation the pressure to the lines 60 and 62 may be shut off, although it is advisable that these operations be not performed until the end of the vulcanizing operation and until vulcanization has progressed sufficiently to insure a permanent seam about the ball.

After the requisite vulcanizing period the high pressure on the ram 32 is relieved and the lower ram will return to its original position, the intermediate plate being suspended on the lock nuts 24. In order to insure that the parts return to their original position, pressure may be admitted to the pull-back rams 34 which will overcome any tendency for the plates to stick or bind on their slideways.

The cured balls with the edges of the segments vulcanized together may then be removed.

It is obvious that the control valves for the various pressure lines, i. e., the low and high pressures to the ram 32, the pressure to the pull-back cylinders 34 and the pressure to the lines 60 and 62 which seal and inflate the ball segments, may be controlled by any standard timing mechanism, instead of being manually operated. The pressure on the ram 37 is constant.

It should also be stated that before the ball segments are placed in position, their edges should be buffed and cemented so that the bond between the segments will be closely knit and no leakage in the balls will be observed. When the plates are opened the balls will expand to a degree determined by the thickness of the stock and the pressure employed. This expansion of the balls will facilitate their removal from the mold cavities. It should also be stated that the pressure on the line 60 to the sealing gasket should exceed somewhat the internal pressure for the balls admitted through the line 62 to prevent blowing out of the gasket.

It will be understood that while the invention has been described for the manufacture of play balls, it is by no means confined to that particular article, but may be extended to other hollow pressure-filled articles, toys or the like.

What is claimed is:

1. A press for vulcanizing hollow pressure filled articles comprising an intermediate mold plate and opposing mold plates on either side thereof and forming two pairs of cooperating mold

plates, cavities in the mold plates, a movable barrier for each pair of plates and surrounding the cavities therein, means to project the barriers to form a fluid tight chamber between each pair of mold plates, means to introduce fluid pressure within the barriers, yielding means to hold the plates in spaced relation with the barriers in chamber forming position, and means to overcome the yielding means and to force the mold plates into contact.

2. A press of the type specified comprising two mold plates with opposing cavities, a constant pressure ram having means associated therewith to arrest the movement of one of the plates at a point where the mold faces are out of contact, in partially closed position, a second ram opposed to the constant pressure ram acting upon the other plate, means to supply fluid under two different pressures selectively to the second-named ram, the pressure of the lower pressure fluid being insufficient to overcome the pressure on the first-named ram whereby the movement of the second-named ram is arrested and the pressure of the higher pressure fluid being sufficient to overcome the pressure acting on the first named ram and bring the mold faces in contact.

3. A press in accordance with claim 2 provided with means to introduce fluid pressure between the mold faces when in partially closed position.

4. A press for vulcanizing hollow pressure filled rubber articles comprising a stationary press head, a movable press head, a plate intermediate the press heads, means to suspend the intermediate plate between the press heads in fully open position, but to permit it to move toward the stationary press head, pairs of molds with opposing cavities on the press heads and the intermediate plate, spring means between the movable press head and the intermediate plate, a constant pressure ram having associated therewith a stop for arresting the movement of the intermediate plate, a ram for the movable press head, means to supply fluid under two different pressures selectively to the second named ram, the pressure of the lower pressure fluid being insufficient to overcome the pressure on the first-named ram whereby the movement of the second-named ram is arrested and the pressure of the higher pressure fluid being sufficient to overcome the pressure acting on the first-named ram and bring the mold faces in contact.

5. A press in accordance with claim 4 having means to introduce fluid under pressure between the mold faces when in partially closed relation.

6. A press in accordance with claim 4 having a yielding barrier surrounding the molds and means to introduce fluid pressure between the mold faces and within the area surrounded by the barrier when the molds are in partially closed relation.

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