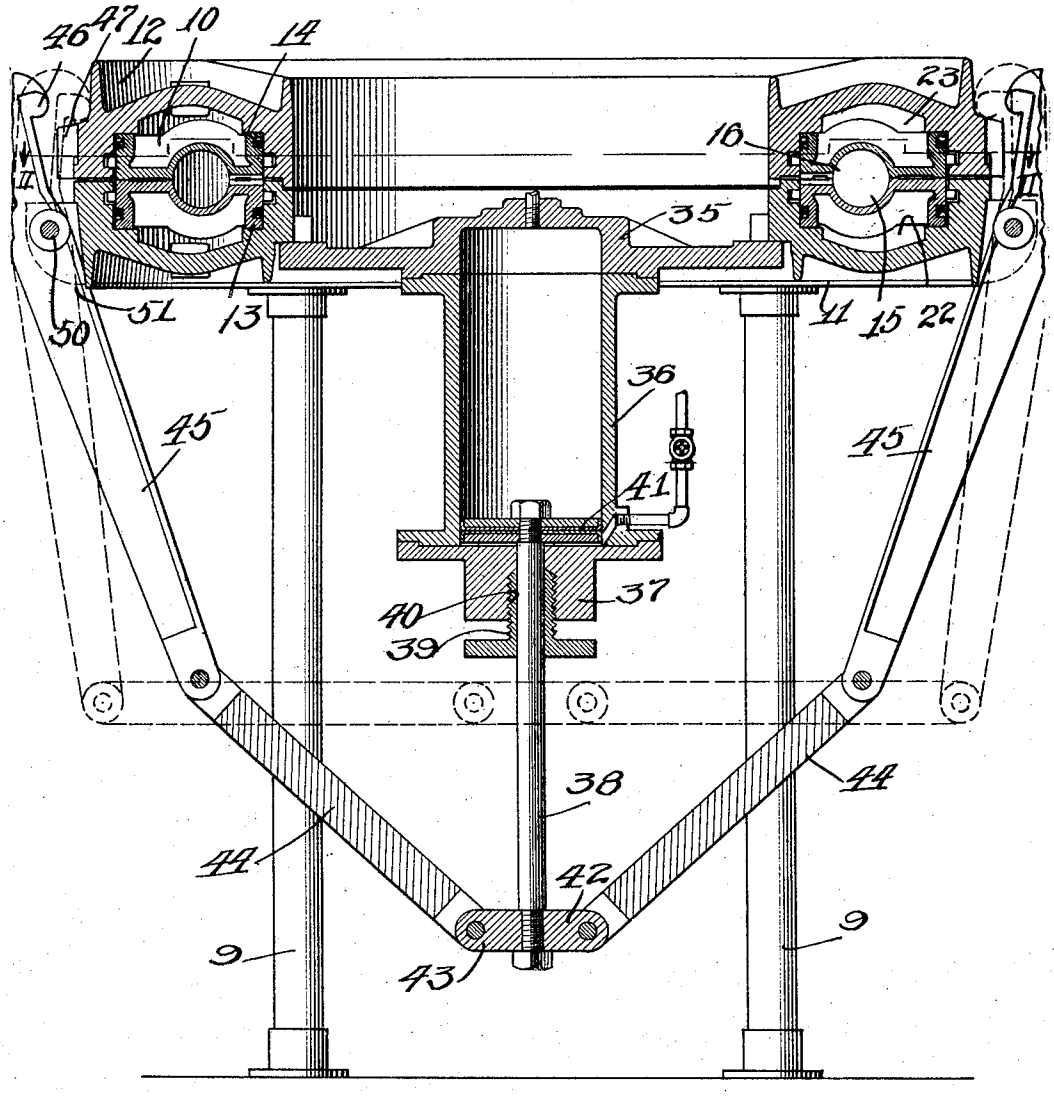
Sept. 6, 1932. A. R. KRAUSE 1,875,816

VULCANIZER WITH INTERCHANGEABLE SHELL

Filed Oct. 28, 1929 3 Sheets-Sheet 1

Fig. 1



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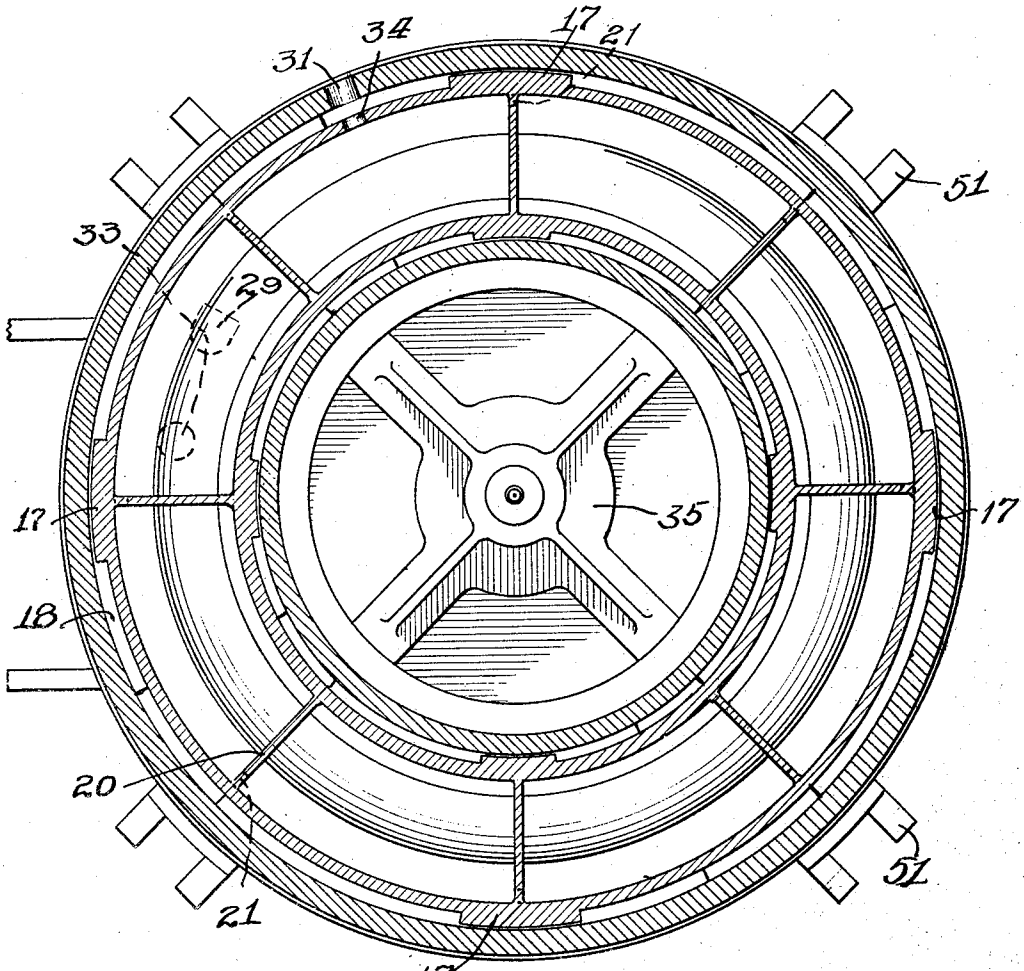

FIG. 2

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VULCANIZER WITH INTERCHANGEABLE SHELL

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Fig. 3

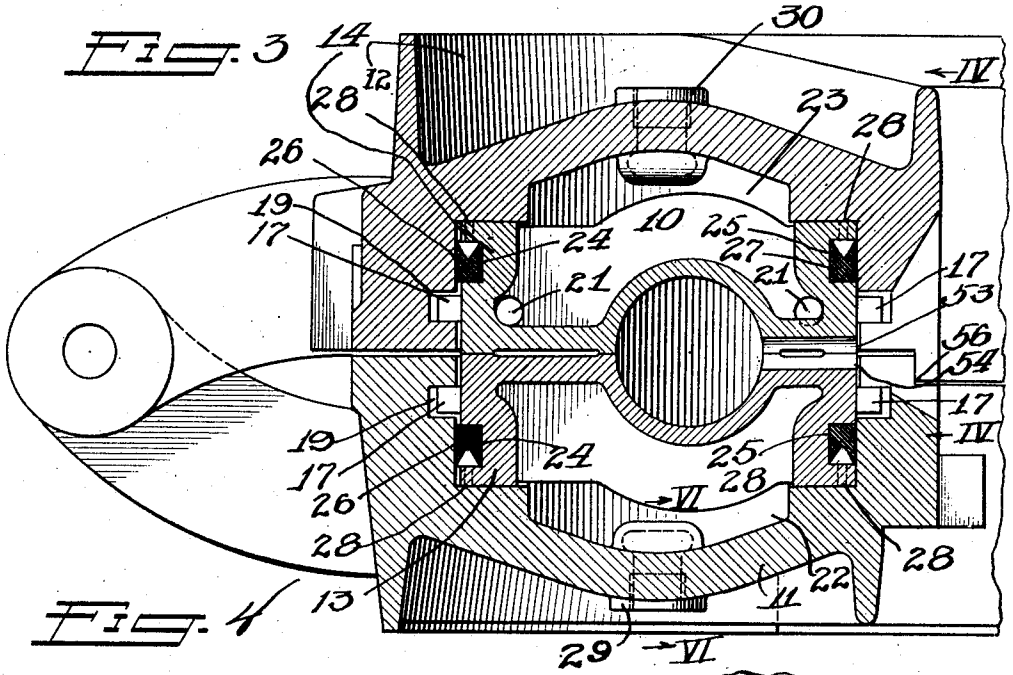


Fig. 4

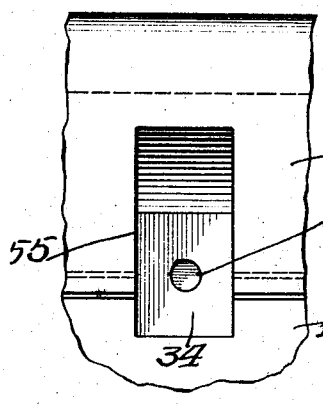


Fig. 5

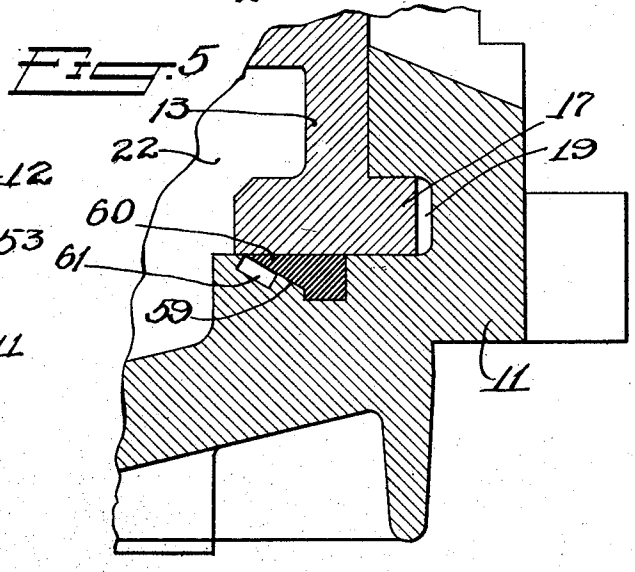
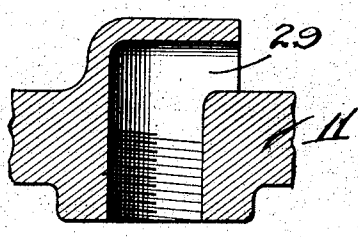


Fig. 6



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UNITED STATES PATENT OFFICE

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VULCANIZER WITH INTERCHANGEABLE SHELL

Application filed October 28, 1929. Serial No. 402,846.

This invention relates to a vulcanizer with interchangeable shell, and more particularly to vulcanizers with interchangeable shells adapted for use in the vulcanizing of tubes and tires.

An object of the present invention resides in the provision of an improved device for sealing a shell within the mold or casing sections of vulcanizers and the like.

Another object of this invention is to provide an improved locking device for locking the shell in the vulcanizer.

Still another object of this invention is to provide a device for sealing and locking the shell in the vulcanizer without the aid of locking bolts or the like.

A further object of this invention is to provide a fluid operative device for sealing and locking a shell in the mold sections or casings of vulcanizers and the like.

A still further object of this invention is to provide a vulcanizer of such a construction that any one of a plurality of different size or shape shells may be readily and easily sealed and locked or detached from the cooperable mold sections or casings of the vulcanizer.

In accordance with the general features of the present invention, there is provided a two part vulcanizer, one part of which is movable relative to the other. Each of the parts of the vulcanizer is so constructed that any one of a plurality of different size or shape shells may be readily and easily sealed and locked or detached from the cooperable mold sections or casings of the vulcanizer.

Other and further important objects of this invention will be apparent from the disclosures in the drawings and specification.

The invention is illustrated in the drawings and hereinafter more fully described.

On the drawings:

Figure 1 is a vertical sectional view of a vulcanizer embdying the features of this invention, certain parts thereof being shown in elevation.

Figure 2 is a fragmentary plan view partly in section taken substantially on the line II—II of Figure 1, looking in the direction indicated by the arrows.

Figure 3 is an enlarged fragmentary vertical view partly in section taken adjacent to the hinge section of the vulcanizer and illustrating the arrangement of the parts of this novel vulcanizer.

Figure 4 is an enlarged fragmentary end view taken on the line IV—IV of Figure 3, looking in the direction indicated by the arrows and illustrating the aperture for the accommodation of the valve of the tube.

Figure 5 is an enlarged fragmentary vertical sectional view illustrating another form of the detachable shell locking and sealing device and gasket of this invention.

Figure 6 is a fragmentary sectional view taken on the line VI—VI of Figure 3, looking in the direction indicated by the arrows, and illustrating a steam inlet opening or port of this novel vulcanizer.

As shown on the drawings:

The reference character 9 designates legs for supporting a fixed mold section or part 11. These legs 9 may be four in number and may also be equidistantly spaced from each other. Hingedly connected to the fixed mold section or part 11 is a mold section 12 disposed above the fixed section.

Positioned in the mold is a shell 10 which may be replaced by other shells of different sizes or shapes depending upon the character of the tube or tire to be vulcanized. This shell comprises two parts 13—14, one being disposed in each mold section. Also each part has a circular groove 15—16 which is adapted to cooperate with the groove in the other part when the mold is closed so as to form a ring-like vulcanizing chamber for the tube or tire.

Each of the parts 13 and 14 is provided with four integral lugs 17 that fit into recesses or openings 18 of each of the mold sections 11 and 12 (Figure 2).

The mold sections 11 and 12 are provided with a ring-like groove 19 that communicates with the recesses or openings 18. The lugs 17 of the parts 13 and 14 are inserted into the openings or recesses 18 and rest on a lower portion of the ring-like grooves 19. The parts 13 and 14 are locked in position by rotating the parts in such a manner that the lugs 17 of

the liner parts move inside the ring-like grooves 19 so that the lugs 17 are out of communication with the openings 18 of the mold.

The lower portion of the part 13 and the upper portion of the part 14 are provided with a plurality of reinforcing ribs 20, as illustrated in Figure 2. Each of the ribs 20 of the part 14 is provided with an opening 21 to allow the circulating steam or other fluid to flow from one rib compartment to another. Each of the mold sections is provided with an annular chamber 22—23 for receiving and retaining the fluid for heating, locking and sealing the parts of the mold sections during the vulcanizing operation.

The parts 13 and 14 are each provided with ring-like grooves 24 and 25 adapted to receive annular gaskets 26 and 27 having a V-shaped cross-section. The annular V-shaped gaskets 26 and 27 are positioned in the grooves 24 and 25 so that their peripheral surface is in contact with a portion of the mold sections 11 and 12.

The V-shaped groove in each of the annular gaskets 26 and 27 disposed in the part 13 extends downwardly while the V-shaped groove in each of the annular gaskets 26 and 27 located in the part 14 extends upwardly. The lower face of the part 13 and the upper face of the part 14 are provided with a plurality of drilled holes 28 that extend from the faces of the parts into the ring-like grooves 24 and 25 communicating with the V-shaped grooves of the gaskets 26 and 27.

The chamber 22 formed between the inner portion of the part 13 and the mold 11 and also the similar chamber 23 formed between the inner portion of the part 14 and the mold 12 are connected through integral L-shaped connections 29—30 to the outside center portions of the molds 11 and 12. Since the L-shaped connections 29—30 are substantially identical in construction it is thought that the detailed illustration of one of them in Figure 6 will suffice for both. The outside portion of each of the L-shaped connections 29—30, as illustrated in Figure 6, is provided with a threaded opening for receiving a pipe which is adapted to be connected to the usual steam or heating fluid supply line.

The mold 11 of the vulcanizer is provided with a steam outlet opening 33 (Figure 2) located in the same rib section as the steam inlet opening 29. The steam outlet opening 33 communicates with the inside of the chamber 22 and is connected in the usual way to a steam outlet pipe (not shown). Chamber 23 of mold 12 is connected with a steam outlet opening 31 through an opening 34 extending through the wall of the part 14.

Each of the parts 13 and 14 is provided with a groove 53—54 (Figures 3 and 4). These two grooves 53—54 cooperate with each other when the sections are in engagement to define a transverse cylindrical opening for the accommodation of the valve stem of the tube being vulcanized within the vulcanizer at any given time. This valve stem opening communicates with a rectangular recess 55 formed in the cooperating mold parts 11 and 12 (Figure 4) which affords access to the valve stem. Attention is directed to the fact that the annular mold parts at their inner edges as shown in Figure 3 have a shouldered engagement at 56 so as to enable the part 12 to properly seat on and tightly engage part 11.

The mechanism used to open and close my mold may be of any suitable construction but I preferably employ the fluid operated system disclosed in the copending application of Messrs. Hutchens and Krause, Serial No. 336,767, filed February 1, 1929, for this purpose. I shall now proceed to describe enough of this system so as to render clear how the opening and closing of the mold may be effected.

Disposed centrally of the vulcanizer and bolted to the stationary mold section 11 is a cylinder head plate 35 which serves to define the upper end of cylinder 36 suitably connected thereto. The lower end of the cylinder 36 has suitably secured to it a closure block 37 through which extends a piston rod 38.

A packing or gland 39 mounted on an intermediate portion of the piston rod 38 is threadedly secured in a recess 40 of the block 37. A piston 41 movable within the cylinder 36 is fastened to the upper end of the piston rod 38. The lower end of the rod 38 has fastened to it a spider 42, which comprises a plurality of radially extending arms 43 each of which is pivotally connected to the lower end of a link 44. When the piston 41 is in its lowermost position (Figure 1) the links 44 extend upwardly and diagonally from the spider 42. The upper end of each of the links 44 is pivotally attached to the lower end of a lever 45. The lever 45 is formed with a hook 46 at its upper end, shaped to engage the top of a lug 47 formed integral with the movable mold section 12. A pin 50 disposed within an integral bracket 51 of the fixed mold section 11 pivotally supports the lever 45 in position.

When the piston 41 is moved to its uppermost position within the cylinder 36, the levers or clamping members 45 are each moved to a vertical position and the links 44 are disposed in a horizontal plane at substantially right angles to the levers 45, thereby locking the hooks 46 in clamping engagement with the shoulders or lugs 47 of the movable mold section 12. In other words, when the linkage and levers are in the dotted position shown in Figure 1, the movable mold section 12 is clamped in cooperation with the stationary or fixed section 11.

Normally when the vulcanizer is inoperative, the piston 41 is disposed at the extreme

lower end of the cylinder 36, as illustrated in Figure 1, and when it is desired to operate the piston within the cylinder for locking the mold sections together, the piston 41 is moved upwardly by the pressure of a fluid, which may be either steam or air, admitted into the cylinder 36 from any suitable source of steam or air supply. This piston may be moved either up or down as the case demands by the steam to unclamp or clamp the mold parts in cooperation.

The operation of this vulcanizer is briefly as follows:

After the upper movable mold section 12 is pivotally raised away from the fixed section 11, parts 13 and 14 conforming to the shape of the tube or tire to be vulcanized are placed into the mold sections 11 and 12 in such a manner that the lugs 17 of the parts 13 and 14 are inserted into the openings 18 of the mold sections 11 and 12. It is to be understood that the shells or parts 13 and 14 are interchangeable with other shells of different sizes and shapes whereby my vulcanizer may be used to vulcanize different types and sizes of tubes or tires.

The rotation of the parts 13 and 14 in either direction will move the integral lugs 17 in the grooves 19 of the mold sections 11 and 12 so that the lugs 17 are out of alignment with the recesses 18. The lugs 17 of the parts 13 and 14 when disposed in the groove 19 out of alignment with the recesses or openings 18, lock and retain the liners or shells in position in the mold.

The tube or tire, whichever is to be vulcanized, is placed in the annular semi-circular groove 15 in the lower shell 13. The upper and movable mold 12 is then lowered so that the annular semi-circular grooves 15 and 16 of the shells cooperate with each other to define an annular pocket conforming with the shape of the tire or tube located therein.

After the mold sections 11 and 12 are in cooperation with each other, steam is admitted into the lower part of the cylinder 36 forcing the piston 41 upwardly within the cylinder causing the link members 44 and 45 to be moved to the position as shown by the dotted lines in Figure 1, thus clamping the mold parts in cooperation.

The chambers 22 and 23, formed between the interior of the molds 11 and 12 and the interior of the parts 13 and 14, are then connected through the L-shaped openings 29—30 in the parts 13 and 14 to a source of steam or other heating fluid.

The steam thus admitted into the vulcanizer circulates about the ribbed compartments through the openings 21 of the ribbed sections 20 in such a manner that the pressure of the circulating steam will move the parts 13 and 14 toward each other so that the face of the part 14 firmly and tightly abuts against the face of the part 13.

The forcing of the faces of the parts 13 and 14 in abutment with each other rigidly secures the integral lugs 17 in a locked position in the ring-like groove 19 of the mold sections 11 and 12.

The firm abutting of the face of the part 14 against the face of the part 13 leaves small clearance openings or spaces between the inner face of the parts and the adjacent portions of the mold sections 11 and 12 for allowing the steam in the chambers 22 and 23 to flow through the openings 28 into the V-shaped grooves of the gaskets 26 and 27 disposed in the annular ring grooves 24 and 25 of the parts 13 and 14.

The pressure of the steam circulating in the V-shaped grooves of the gaskets 26 and 27 forces the outer lipped portion of the gaskets in firm contact with portions of the walls of the mold sections 11 and 12, thereby firmly sealing the parts 13 and 14 in the mold sections to prevent the steam from escaping from the inside of the vulcanizer.

The condensate collecting in the compartments of the chamber 22 flows through the openings 21 in the ribs 20 and is forced out with the circulating steam through the openings 34 in the vertical wall of the part 14, and through the outlet opening 31 of the mold section 12 (as illustrated by the dotted line in Figure 3) into a flexible outlet pipe of a steam return line (not shown). The condensate collecting in the bottom inside portion of the mold section 11 is forced out with the circulating steam through the outlet opening 33 (Figure 2) into a steam return line (not shown).

The steam admitted into the chambers 23 and 22 not only performs the function of maintaining the parts in a locked and sealed position, but also is used for heating the parts for the vulcanizing of the tube or tire located in the vulcanizing sections of the mold.

It is to be observed that the steam pressure in the chambers 22 and 23 forces the faces of the cooperative semi-circular parts firmly together so that no configuration or projecting seams appear on the vulcanized tires or tubes.

It can readily be seen that this novel method of interlocking and sealing the lugs of the parts in the ring groove mold sections increases the efficient operation of the vulcanizer, inasmuch as it provides a means of speedily and easily inserting and removing the shell parts fom the vulcanizer thereby eliminating the laborious task of tightening or removing bolts or screws which are ordinarily used to hold shells in the conventional vulcanizer in place.

The mold sections of the vulcanizer are of such a construction that any one of a plurality of different size or shape shells conforming to the tire or tube to be vulcanized may be readily and easily sealed and locked

to or detached from the cooperable mold sections or casings of the vulcanizer.

Figure 5 illustrates a modification of this invention in which a wedge-shaped gasket ring 60 is disposed in a groove 59 of the mold 11, instead of being disposed in ring-like grooves in either of the parts 13 and 14. The lugs 17 of the part 13 are secured in the groove 19 in the same manner as illustrated in the preferred form of this invention. The mold 11 is provided with an annular groove 59 into which an annular wedge-shaped gasket 60 is located having its horizontal side in contact with the lower face of the part 13.

The mold 11 is also provided with a rectangular groove 61 that lies adjacent and parallel with the tapered end of the gasket 60. This groove 61 permits steam to flow through the groove and against the slanting face of the gasket 60 to seal the shell part to the mold section 11.

In the modified form of this invention, the shell part 13 is sealed to the mold section 12 by means of the steam that circulates through the chamber 22 and also flows through the rectangular groove 61 in the mold section 11. The pressure of the steam circulating in the rectangular groove 61 in the mold section 11 forces the wedge-shaped gasket 60 firmly in contact with the lower face of the part 13, thereby forming a sealed joint to prevent the steam in the chamber 22 from escaping from the interior of the vulcanizer.

When it is desirable to change the shell parts in the vulcanizer for other shell parts so that different size or shape tubes or tires may be vulcanized, the change can be speedily and easily accomplished by raising the movable mold section 12 and shutting off the flow of steam into the chambers 22 and 23.

After the steam ceases to flow into the chambers 22 and 23 the steam pressure against the parts 13 and 14 is decreased so that the mold shells can then be easily rotated until the lugs 17 on each of the shell parts 13 and 14 are in alignment with the openings 18 that communicate with the grooves 19 in the face of the mold sections 11 and 12. When the lugs of the shell part sections are in alignment with the openings 18 of the mold sections, the shell parts may be lifted from the mold sections.

Now, of course, it is to be understood that while the invention is illustrated and described in detail in its preferred form, the invention is not to be thus limited but only insofar as defined by the scope and spirit of the appended claims.

I claim as my invention:

In a vulcanizer, a mold, a shell in said mold, a flexible ring in said shell said ring being substantially rectangular in cross-section and having a V groove in one surface, substantially the width of the face, one face of the ring adjacent the V groove being in engagement with said mold, means for interlocking said shell to said mold, and fluid pressure means for holding said shell and said mold in a locked position, said shell having ducts leading to the V groove in said ring through which fluid under pressure may pass to enter the groove and compress said flexible ring to seal said shell to said mold.

In testimony whereof I have hereunto subscribed my name at Eau Claire, Eau Claire County, Wisconsin.

ARNOLD R. KRAUSE.