

April 13, 1943.

R. G. MINNS ET AL

2,316,352

VULCANIZING PRESS

Filed July 29, 1939

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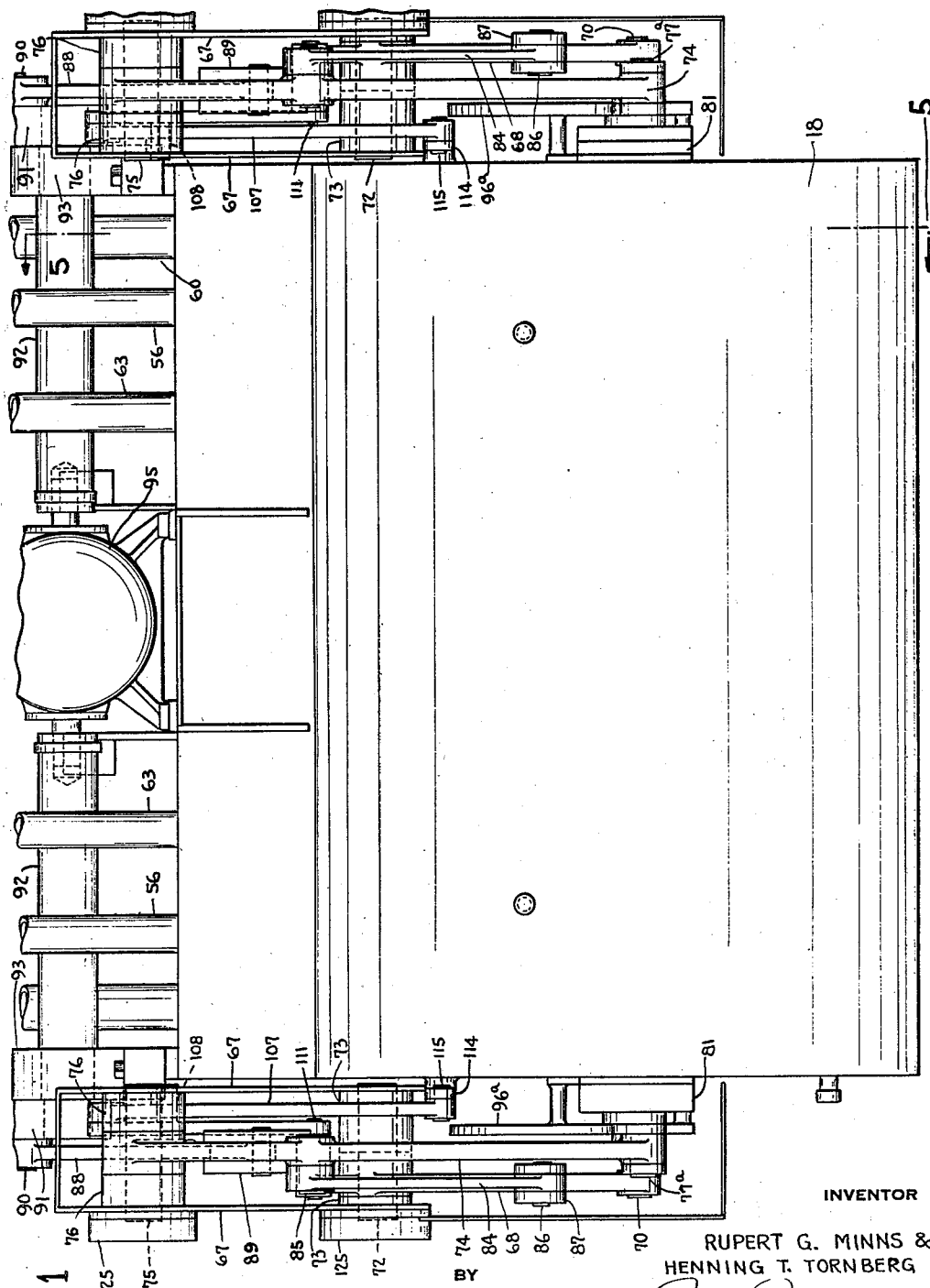


FIG. 1

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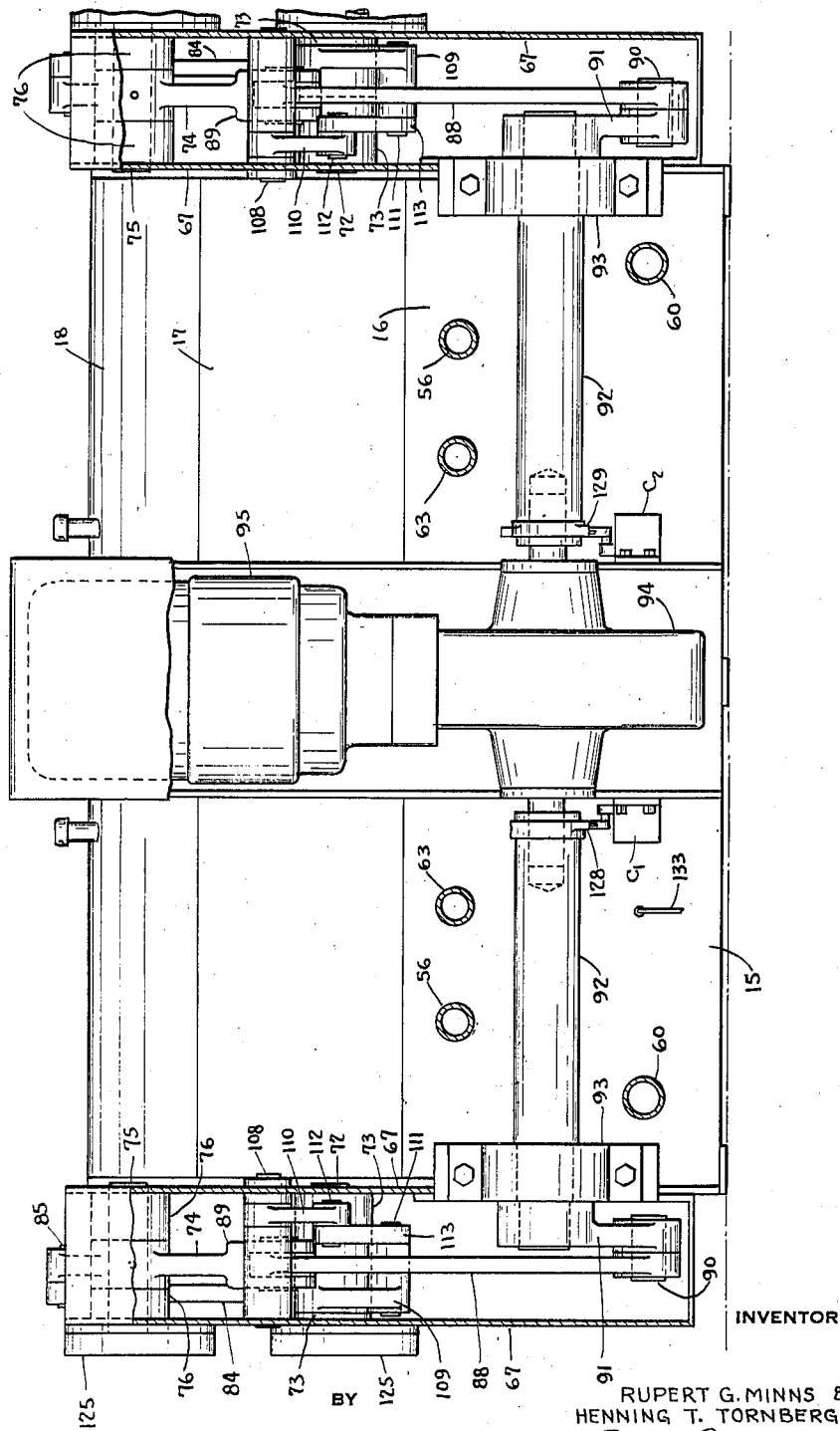
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FIG. 3



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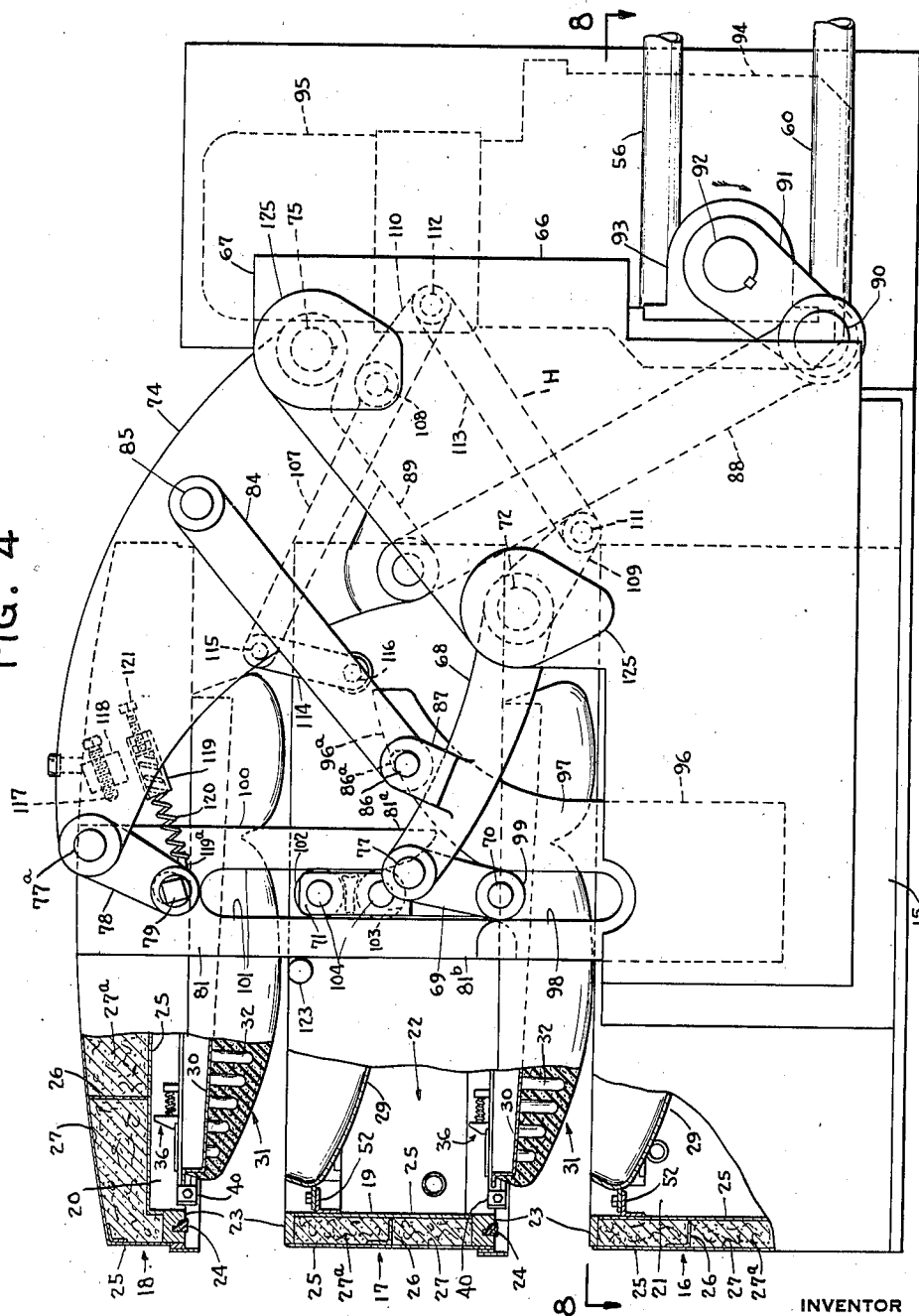
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Fig. 4



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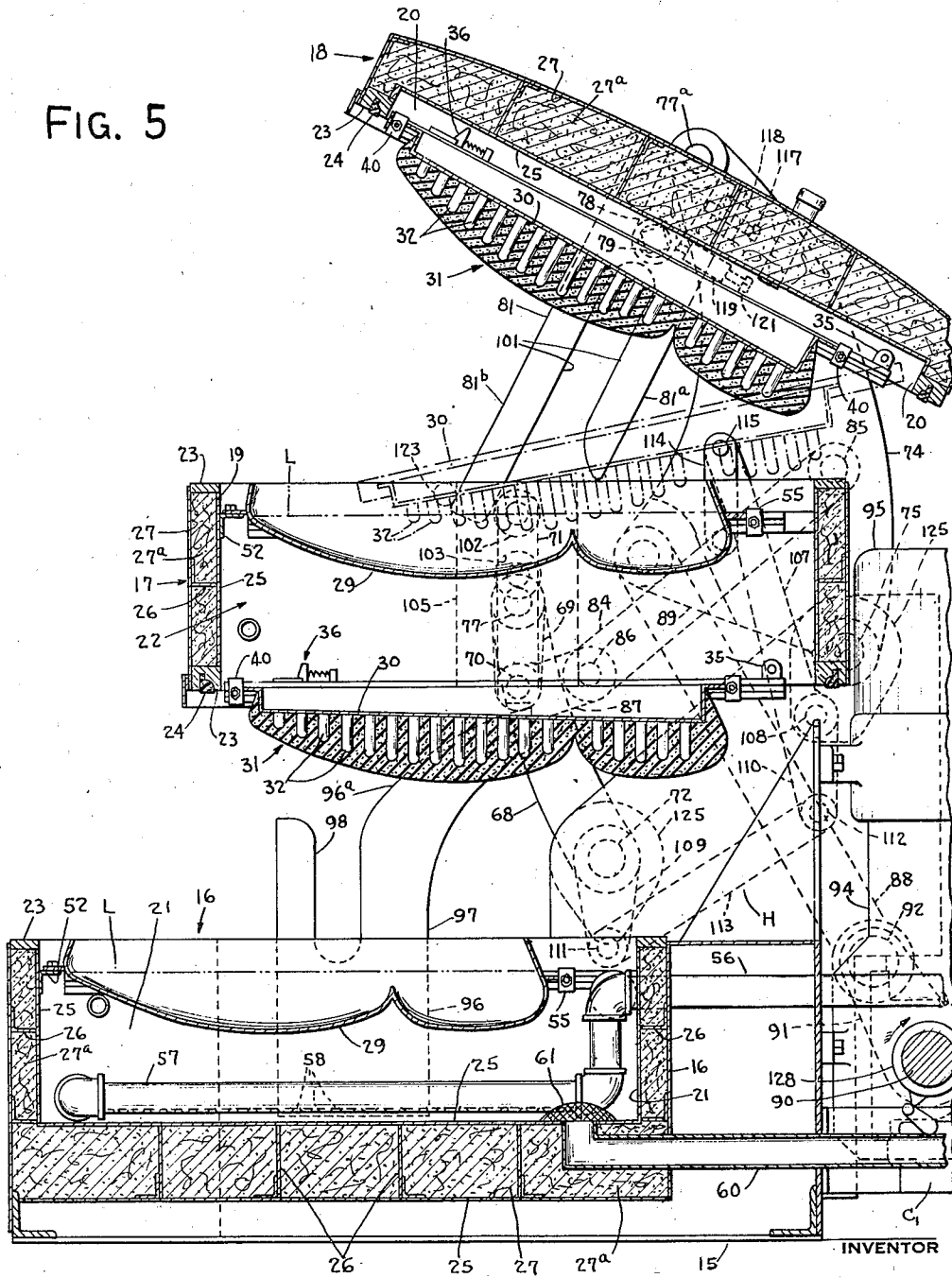
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FIG. 5



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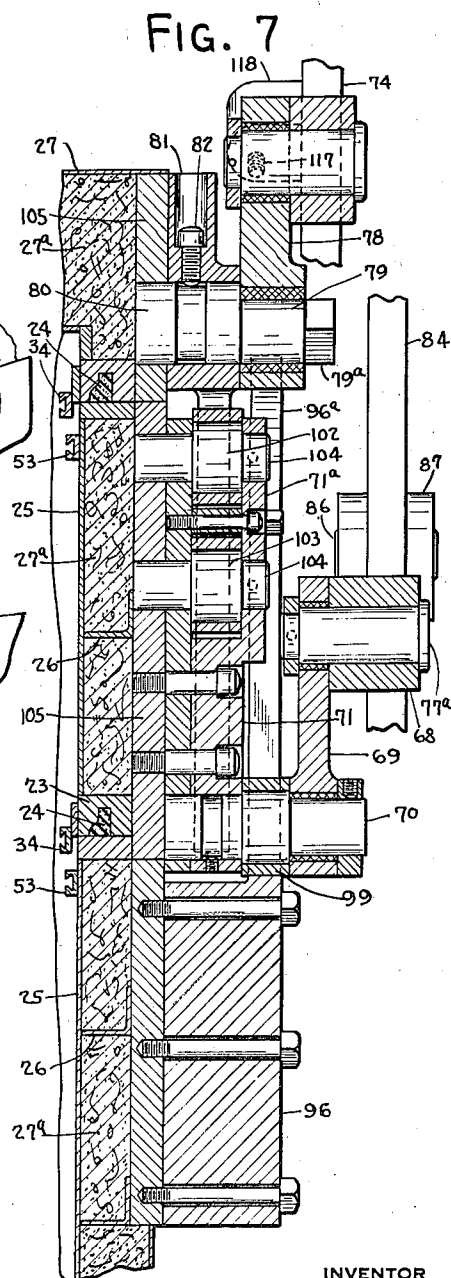
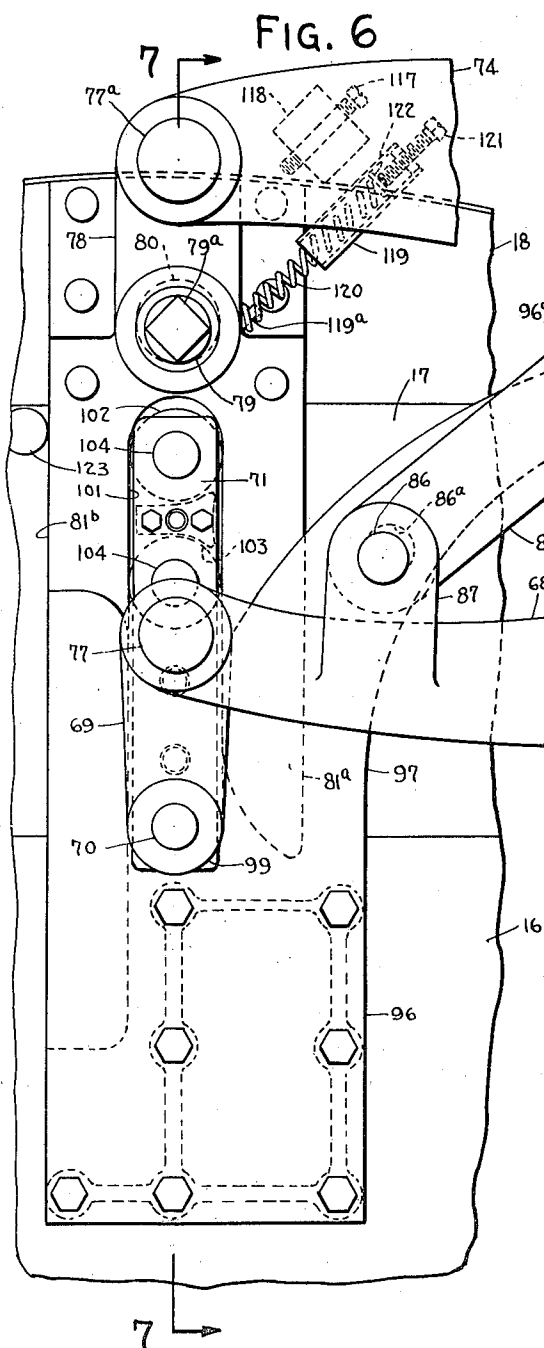
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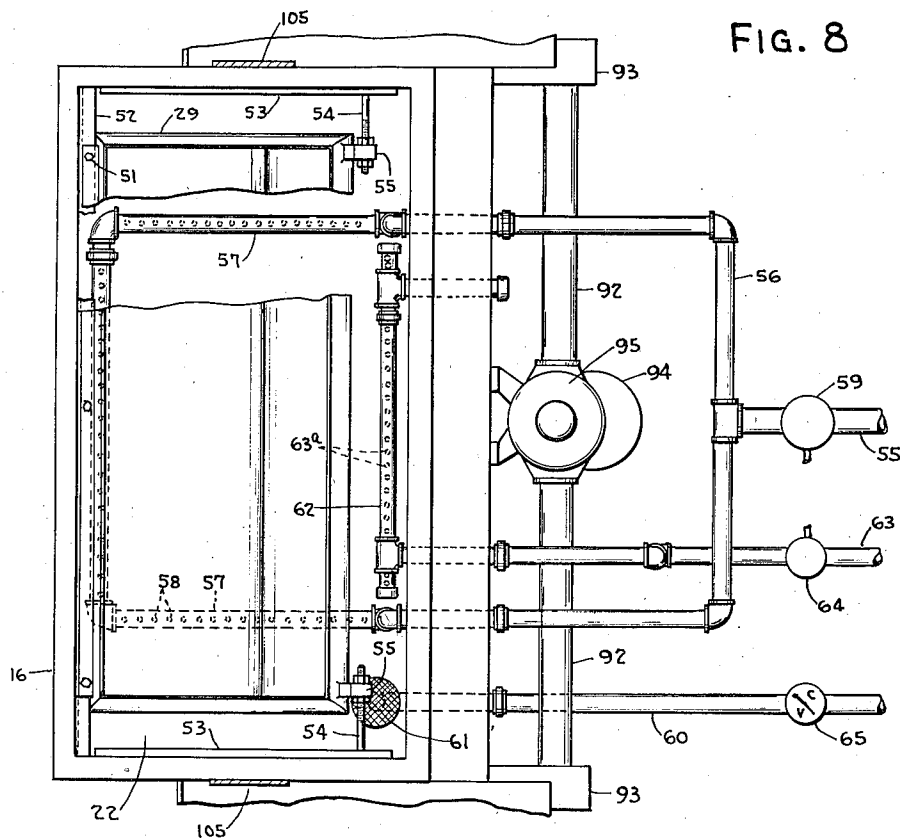
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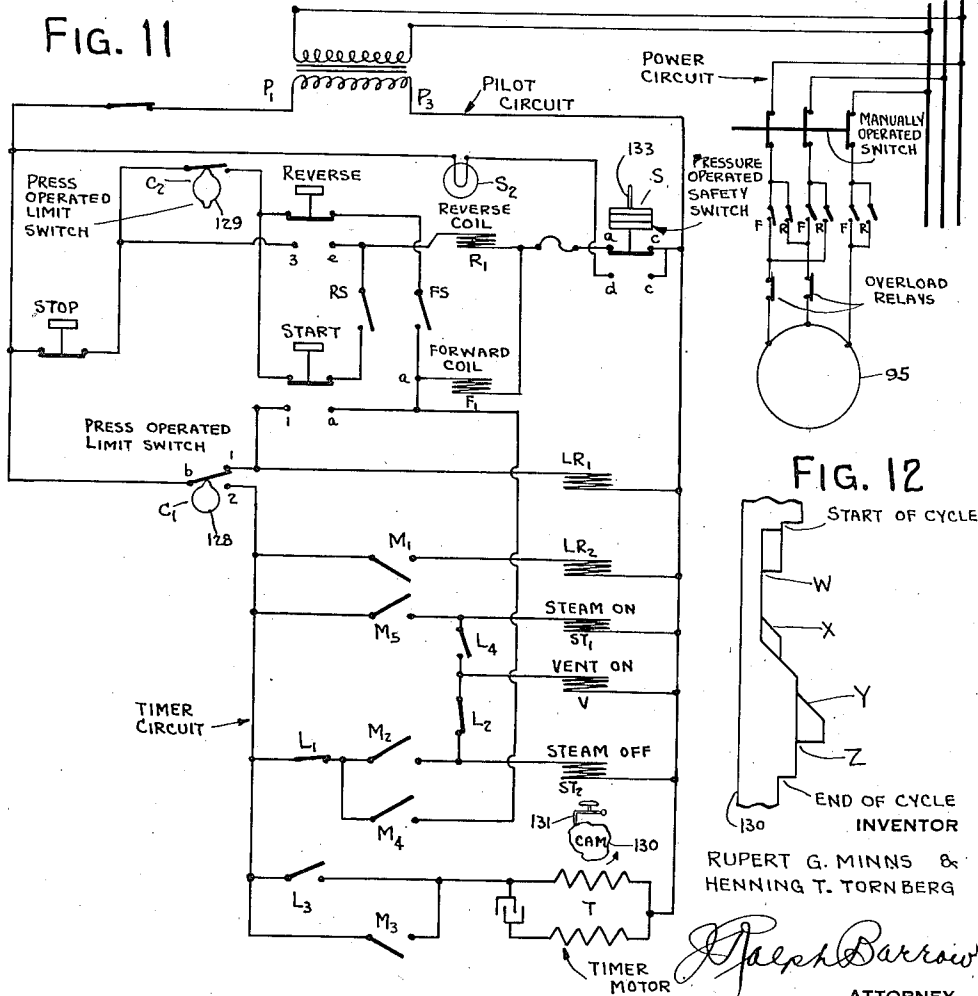
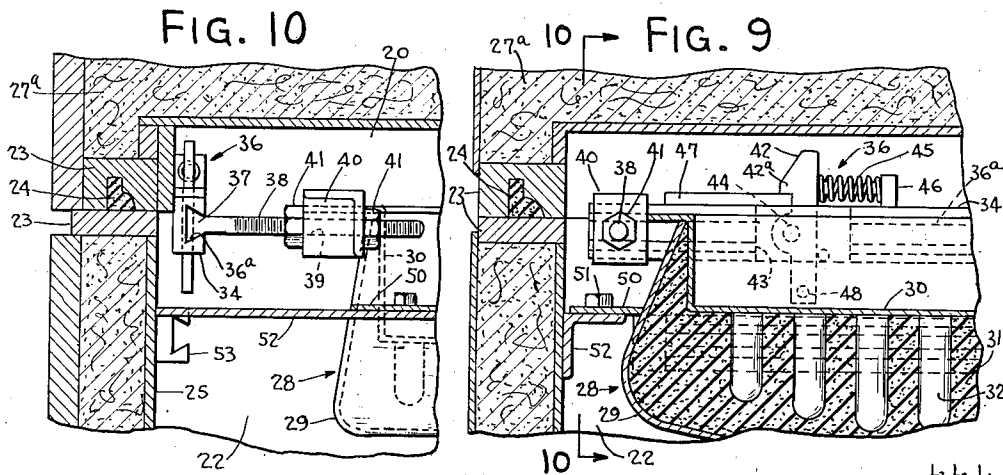
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8 Sheets-Sheet 8



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UNITED STATES PATENT OFFICE

2,316,352

VULCANIZING PRESS

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Application July 29, 1939, Serial No. 287,294

11 Claims. (Cl. 18—17)

This invention relates to vulcanizing presses, and in particular relates to presses for vulcanizing sponge rubber articles, such as vehicle seat cushions, mattresses, or the like.

The general purpose of the invention is to provide an improved press unit of simple, compact and powerful construction, in which a plurality of superposed platens carrying mating mold sections are relatively movable to open positions which facilitate free access to the mold sections, as for example, for pouring liquid compounds, such as beaten latex or chemically treated rubber compounds used in manufacturing sponge rubber articles, into the lower mold cavities without interference from the adjacent platen.

Another object of the invention is to provide a press unit of the character described having means to prevent the press from opening if the steam in the curing chamber thereof is above a predetermined maximum pressure, whereby the press cannot be accidentally opened to cause injury to the operator.

Another object of the invention is to provide a press unit of the character described with means for cooling the mold sections between successive vulcanization periods, and thereby materially increasing the production output of the press in a given period of time.

Another object of the invention is to provide a press of the character described in which the vulcanized articles are quickly cooled to facilitate removal thereof from the press.

Another object of the invention is to provide an improved multiple press for the purposes described and a single prime mover with means for operating the press from such prime mover.

A further object of the invention is to provide a press unit of the character described in which is obviated the use of flexible or other conduits for conveying heating fluid to the movable mold sections or supporting platens thereof.

Still another object of the invention is to provide in such presses simple effective means for causing a plurality of relatively movable platens to be operable to and from registry with each other substantially in parallel, and to be in stepped positions when the press is fully open.

Another object of the invention is to provide, in apparatus of the character described, improved means for facilitating cleaning of the mold sections.

These and other objects will be manifest from the following brief description and the accompanying drawings.

Of the accompanying drawings:

Figure 1 is a top plan view of a closed multiple press unit embodying the invention.

Figure 2 is a side elevation thereof, partly broken away and in section, as viewed from the right of Figure 1.

Figure 3 is a rear elevation thereof, partly broken away and in section.

Figure 4 is an end elevation, similar to Figure 2, but in an intermediate open position, parts being broken away and in section through the cavity members and supporting structure therefor.

Figure 5 is a cross-section taken on line 5—5 of Figure 1, but with the press in fully open condition.

Figure 6 is an enlarged detail view of the cam mechanism for guiding the movable mold member to and from registry.

Figure 7 is a cross-section taken substantially on line 7—7 of Figure 6.

Figure 8 is a cross-section taken substantially on line 8—8 of Figure 4, illustrating the piping arrangements used for heating and cooling the cavity members.

Figure 9 is an enlarged detail cross-section of the latch mechanism shown at the upper left-hand portions of Figures 4 and 5, for releasably retaining the cavity member in its mold section.

Figure 10 is a cross-section taken substantially on line 10—10 of Figure 9.

Figure 11 is a schematic wiring diagram for the press.

Figure 12 is a conventional developed view of a timer cam, which initiates the various operations in the vulcanizing cycle of the press.

Referring to the drawings, the numeral 15 designates a suitable base frame for fixedly supporting a lower platen 16, and above the latter, arranged to be moved to and from superposed registering relation therewith and with each other, may be intermediate and upper platens 17 and 18, respectively. When the press is closed, an opening 19 extending through intermediate platen 17 is arranged to communicate, at the vertically opposite faces of the platen, with cavities or recesses 20 and 21 in the opposing faces of the upper and lower platens 18 and 16, respectively. This provides a single closed steam chamber, indicated generally at 22 in Figure 2. Plates 23, 23 on opposing sides of the respective platens may have flat interengaging faces. Fixed to project slightly from one of such faces in each pair of plates 23, there

preferably is a gasket 24 for contacting the face of the adjacent plate 23 to insure a tight fluid seal between the platens.

The three platens may be fabricated from sheet metal to form spaced walls 25, the latter being reinforced against the internal pressure of chamber 22 by means of stays or braces 26, 26. This provides hollow spaces 27, 27 in the platens completely to surround the chamber 22, these spaces being filled with suitable heat-insulating material 27^a, such as asbestos or asbestos composition, for insulating the chamber from the exterior.

Supported by the platens so as to be enclosed within chamber 22, when the press is closed, may be a pair of molds 28, 28, each comprising a lower female section 29 and an upper mating section 30.

As best shown in Figure 5, the interior surfaces of the mold sections are shaped for forming vehicle seat cushions, indicated at 31, 31, and a series of spaced projecting elements 32; 32 are provided on the underside of each male member for forming recesses in the bottom sides of the cushions to increase the flexibility and riding comfort of the cushion.

The male mold sections 30 are releasably supported at the undersides of the intermediate and upper platens 17 and 18, respectively, to permit swinging them downwardly when the press is fully open, as shown in chain-dotted lines at the top of Figure 5, for the purpose of cleaning scale or other accumulations from the upper surfaces of the sections, thereby to maintain uniform vulcanizing heat at all sides of the molds. For this purpose, bars 34, 34, disposed at opposite sides of the mold sections may be pivoted on pins 35, 35 extending from the end walls of the respective supporting platens 17 and 18, and the forward ends of the bars may be releasably supported by latch mechanisms 36, 36, mounted on the platens. The bars 34 are provided with longitudinally extending dove-tail slots 36^a for receiving cooperating heads 37 of bolts 38 which extend through openings 39 in blocks 40, suitably located on the male sections 30, to support the latter, nuts 41, 41, being threaded on the bolts at opposite sides of the blocks for adjustably retaining the mold sections in the proper centered positions. By shifting the bolts 38 in slots 36^a and adjusting nuts 41 on the bolts, mold sections of a wide range of sizes may be interchangeably mounted in the platens.

Each latch mechanism 36 may have a latch 42 received through a slot 43 in bar 34 and pivoted to the latter at 44, a spring 45 being extended between the latch and a lug 46 on the bar 34, normally to urge a projection 42^a on the latch into engagement with the top edge portion of a plate or lug 47 extending from the supporting platen, thereby to retain the upper or male section 30 of the mold in normal operating position in the platen. To release the latches 42 for swinging male sections about the pivots 35, an operator stationed at the front of the press engages a suitable tool in an opening 48 in the downwardly extending end of the latches and yieldingly swings the latches on pivots 44 to disengage the same from plates 47, thereby allowing the sections to drop to positions for cleaning the top surfaces thereof, best shown by chain-dotted lines in Figure 5.

For supporting the female sections 29 in platens 16 and 17 a flange 50 extending along the front end of each of said sections may be bolted at 51, 51 to angle bars 52 fixed in the respective platens.

Rigidly secured to the end walls of said platens may be slotted bars 53, 53, similar to bars 34 which support the upper sections of the molds, for receiving bolts 54, 54 adjustably secured in blocks 55, 55 fixed on sections 29 adjacent the rearward corners thereof, these bolts 54 also being adjustable in the slots of bars 53 to accommodate sections of various sizes.

As best illustrated in Figure 8, the above described manner of supporting the upper and lower sections of the molds in the platens provides ample space between the molds and the inside walls of the platens for free circulation of vulcanizing or other medium about the same. For supplying vulcanizing steam under pressure to chamber 22, a pipe 55^a from a suitable source of supply (not shown) may terminate in a loop 56, a U-shaped portion 57 of which extends into recess 21 of lower platen 16 to emit the steam from a series of spaced openings 58 about the bottom of the pipe. A valve 59 in pipe 55^a may be automatically controlled by timer mechanism, subsequently to be described in connection with the wiring diagram, to circulate steam within chamber 22 when the press is fully closed. A pipe 60 communicates with a drain 61 in the bottom of recess 21 of platen 16 for draining condensate from chamber 22.

For removing the steam from chamber 22 after each vulcanization period, and for cooling the molds and the vulcanized articles, a pipe 62, having spaced openings 63^a therein, may be suitably supported within recess 21 of platen 16; the pipe 62 being connected to a suitable suction device (not shown) by a pipe 63. A valve 64 in pipe 63 may be controlled by the timer mechanism, to be described later, in coordination with steam valve 59 in pipe 55. This arrangement is such that after each vulcanization period, and while the press is still closed, valve 55 is automatically actuated to cut off the steam supply to chamber 22, while valve 64 is actuated to apply substantial suction to the chamber, thereby drawing off the steam and cooling the mold sections and the contents thereof. A suitable check valve 65 in drain pipe 60 prevents exhausted steam or condensate from being sucked back from pipe 60. At the start of a vulcanization period, suction may be applied in the closed chamber 22 for a few seconds simultaneously with injection of steam therein, to eliminate air and insure uniform circulation of the steam. It is obvious that suction may thus be applied to chamber 22 before injection of steam thereto, for evacuating said chamber, and consequently the spaces between the registering mold sections.

Referring particularly to Figures 1 to 7, the intermediate platen 17 and upper platen 18 may be supported to be moved from the closed registering positions shown in Figure 2, to intermediate parallel open positions, shown in Figure 4, and thence to the fully open positions, as shown in Figure 5, in which latter positions platen 17 may be in parallel, rearwardly stepped, relation to lower platen 16, and upper platen 18 may be in rearwardly stepped relation to platen 17 and tilted rearwardly thereof. This stepped fully open arrangement of the three platens facilitates pouring a liquid, such as liquid rubber latex or other liquid rubber compounds used in manufacturing sponge rubber articles, into the lower mold sections 29, 29 to levels indicated in chain-dotted lines at L, L.

To this end, extending upwardly from base frame 15, at both sides and rearwardly of the

press, may be supporting casings 66, 66 having laterally spaced walls 67, 67. Arms 68, 68 may be pivotally connected, at one end thereof, in casing 66, the free ends of the arms having pivoted thereto at 77, links 69 which extend downwardly to be pivotally connected at points substantially on the transverse center of the press to pins 70, 70 fixed in the lower ends of plates 71, 71, suitably secured to the sides of intermediate platen 17 (see Figures 6 and 7). For pivoting arms 68 to casing 66 pins 72, 72 may be fixed in the ends of the arms to be journaled in bosses 73, 73 in the walls 67.

Arms 74, 74, arranged to be moved in parallelism with arms 68, may have pins 75, 75 fixed in one end thereof to journal in bosses 76 in walls 67 of the casing 66, preferably at points upwardly and rearwardly of pins 72. The free ends of arms 74 may have pivoted thereto at 77^a, 77^a, downwardly extending links 78, 78, similar to links 69 on arms 68, which are pivotally connected to eccentric extensions 79, of pins 80, 80, fixedly retained in plates 81, 81 by means of set screws 82, the plates 81 being suitably secured to the sides of upper platen 18 so that pivots 79 are in substantial vertical alignment with pivots 70 of platen 17 when the platens are in registry. The positions of pins 75, relative to pins 72, are predetermined so that arms 74 will be of such length to swing upper platen 18 upwardly and rearwardly to the relative position thereof shown in Figure 5, in which there is ample clearance for pouring liquid L into the mold section 29 carried on platen 17.

For adjusting upper platen 18 vertically on supporting links 78, accurately to register the same relative to the other platens, and to regulate the amount of "squeeze" pressure applied to the registering faces of the mold sections, eccentric extensions 79 on pins 80 may be provided with squared heads 79^a engageable by a suitable tool (not shown), after set screws 82 have been temporarily loosened to change the centers of the pins relative to the centers of the eccentric extensions.

For maintaining the arms 68 and 74 in parallelism in all positions thereof, links 84, 84 are pivotally connected at opposite ends thereof to pins 85 in arms 74 and to pins 86 in bifurcated lugs 87 on arms 68, pivots 75 and 85 being equidistant from pivots 72 and 86, respectively, and pivots 75 and 72 being equidistant from pivots 85 and 86, respectively, so that lines joining these pivot points always form parallelograms.

Pitmans 88, 88, preferably are pivotally connected at one end to downwardly extending projections 89 on arms 74, intermediate pins 75 and 77, and the other ends thereof are pivotally connected at 90, 90 to crank arms 91, 91, operable to swing the arms 68 and 74, on pivots 72 and 75, in parallelism for opening and closing the press. The cranks 91 may be secured on shafts 92, 92, journaled in bearings 93, 93 on frame 15, and driven through a suitable reduction gearing 94 by a reversing type motor 95.

During the final closing and initial opening movements of the press, it is desirable to move intermediate platen 17 and upper platen 18 vertically in parallelism relative to each other and relative to lower platen 16, for accurate registering of the mold sections 29, 30, and to separate vulcanized articles from the mold sections without damaging the same. For thus guiding intermediate platen 17, between the positions thereof shown in Figures 2 and 4, plates 96, 96, suitably

secured to the sides of lower platen 16, may have upwardly extending bifurcated portions 97, in spaced relation to the sides of intermediate platen 17, providing vertical guiding or cam surfaces 98, 98 for rollers 99, 99, carried by pins 70 on platen 17. Similarly, plates 81 on upper platen 18 may have downwardly extending bifurcated portions 100, 100, providing vertical guiding or cam surfaces 101, 101, for pairs of vertically aligned rollers 102, 103, which are journaled on pins 104, fixed between off-set portions 71^a of plates 71 and spacer plates 105 on the sides of platen 17 (see Figures 7). Plates 71 are slightly narrower than the diameter of rollers 102, 103, to clear the cam surfaces 101 of extension 100.

As cranks 91 are operated to swing arms 68 and 74 on pivots 72 and 75, toward the fully open positions thereof, rollers 99 on pins 70 follow upwardly and rearwardly curving cam surfaces on the rear prongs 96^a of plates 96, with a slight drag to prevent links 69 from swinging on the pivots 77, and therefore preventing lateral swaying of intermediate platen 17. Platen 17 is maintained in parallel with lower platen 16 at all times by means of a system of links operating in cooperation with arms 68, the rollers carried by plate 71 being effective for this purpose only during the initial opening and final closing movements of the press, as previously described. For this purpose arms 107, equal in length to arms 68, are pivoted on pins 108 to the inner walls 67 of casing 66, rearward extensions 109 and 110 on arms 68 and 107, respectively, having links 113 pivotally connected thereto at 111 and 112 to maintain arms 107 in parallelism with arms 68, in all positions of the latter. Links of the same length as links 69 on arms 68 are pivoted at 115 to the forward ends of arms 107 and extend downwardly, pivotally to connect pins 116 extending from the sides of intermediate platen 17 at points rearwardly of the center of the press. The arrangement is such that in all positions of arms 68 and 107 the links 69 and 114 are maintained in parallelism, and therefore platen 17 is at all times prevented from swinging on the pivots 70 to maintain it in parallelism with respect to lower platen 16.

The inner prongs 81^a of plates 81 preferably are shorter than outer prongs 81^b, so that as the arms 74 carry upper platen 18 toward the fully open position thereof, shown in Figure 5, prongs 81^a will disengage rollers 102, 103, while the top rollers 102 will continue to engage cam surfaces 101 on forward prongs 81^b to cause upper platen to tilt on pivots 79 on links 78. As arms 74 approach the fully open position thereof, adjusting screws 117, suitably threaded in bosses 118 on the forward ends of the arms, are arranged to engage the rear edges of links 78 to limit rearward swing of the latter on pivots 79 and thereby hold the platen at a predetermined angle to the horizontal.

Retained between tubular housings 119, fixed on arms 74, and pins 119^a in the lower ends of links 78, may be compression springs 120, yieldingly to urge the links outwardly of the arms 74 to prevent jerking movement of the platen, as it moves in either direction between the positions thereof shown in Figures 4 and 5. The tension of springs 120 may be adjusted by means of screws 121 threaded through the ends of the housings and engaging discs 122, against which the springs abut. Stop pins 123 are provided on the platens 17 to be engaged by the outer edges of prongs 81^b, to prevent springs 120 from

urging the same out of engagement with rollers 102 and 103, in the upper positions of platens 17 and 18.

To obviate binding of links 84 between the arms 74 and 68 when the press is closed, the openings 86^a in the lower ends of the links are elongated to allow a slight relative movement of the arms. In order to take up this slack while the press is opening and closing, spiral springs 124, enclosed in casings 125, 125, have the inner ends thereof engaged in slots 126 in the outer ends of shafts 72 and 75, and the outer ends attached to pins 127 in casings 66 (see Figure 2). This arrangement of the springs 124 also acts to steady the swinging movement of arms 68 and 74 in either direction, and relieves strain on motor 95 when the same is operated to open the press.

The operation of the press for a complete vulcanizing cycle will now be described with reference to the schematic wiring diagram, shown in Figure 11. In this description it is to be assumed that initially the press is in the fully open position shown in Figure 5, with the previously vulcanized seat cushions 31 removed from mold sections 29, and that new batches of treated liquid rubber latex L, or the like, used in making sponge rubber articles, have been poured into the female mold sections 29, 29, as indicated in chain-dotted lines.

Referring particularly to Figure 11, the operator, by pressing the "start" button, momentarily closes contacts 1—a, to connect the pilot circuit P₁—P₃, on one side of the line through contacts a—c on a pressure-operated switch S, and on the other side through 1—b on a pressure-operated limit switch C₁, thereby energizing a forward coil F₁. Energizing coil F₁ closes mechanically interlocked switches F in the power circuit to actuate the motor 95 to close the press. Switch C₁ is normally closed across 1—b by action of a cam 128 on driving shaft 92, when the press is fully open, but as soon as the press starts to close the cam opens 1—b and closes b—2, which remains closed until the press completes a cycle of operation and is again in fully open condition. As soon as the "start" button is released the circuit through 1—a is broken, but in the meantime, actuation of coil F₁ closes a sticker switch FS, and a press-operated cam 129 on drive shaft 92 closes switch C₂, thereby closing a new circuit from P₁, through the "stop" button, switch C₂, the "reverse" button, sticker switch FS, coil F₁, and pressure switch S, to P₃, thus keeping coil F₁ energized, and consequently continuing the operation of motor 95 to close the press.

Previously to pressing the "start" button, the connection across b—1 on switch C₁ maintains a latching relay LR₁ in energized condition to hold switches L₁ and L₂ normally closed, and switches L₃ and L₄ normally open, thus maintaining the timer mechanism in inoperative condition when the press is fully open. When b—2 is closed by the closing movement of the press, as described above, the relay LR₁ is de-energized to open switches L₁ and L₂ and close switches L₃ and L₄, thereby closing a circuit across P₁—P₃, through b—2 on switch C₁, switch L₃, and timer motor T, to start the latter. This starts rotation of a disc cam 130 to actuate a series of mercury switches M₁, M₂, M₃, M₄ and M₅ in predetermined sequence, as will be described.

When the press is fully closed cam 129 on drive shaft 92 again opens switch C₂, thereby de-

energizing forward coil F₁ to open the interlocked switches F and stop motor 95, and at the same time opening sticker switch FS.

As the cam 130 continues to rotate for the curing cycle, switch M₅ is actuated at point W on the cam (see Figure 12) to close a circuit through P₁—P₃, b—2, M₅, and L₄, to energize coils ST₁ and V. This actuates vent valve 64 and steam valve 59 (Figure 8), simultaneously to draw air from chamber 22 and to inject steam therein for a few seconds to assure good circulation of the steam. This preferably takes place after the liquid rubber L in the molds has "jelled" or set a sufficient length of time to expand and fill the mold cavities, by virtue of chemical agents mixed with the liquid.

At point X on cam 130 switch M₅ opens to de-energize coil V. A device in coil mechanism V thereby closes vent valve 64 to stop suction or venting of air from chamber 22, and a lock in coil mechanism ST₁ holds steam valve 59 open to maintain the steam pressure in the chamber.

At Y on cam 130 switch M₁ closes to energize coil LR₂, thereby closing switches L₁, L₂ and opening switches L₃ and L₄, the steam in chamber 22 remaining on. Just before switch L₃ closes, switch M₃ is actuated by cam 130 to maintain the circuit through timer motor T to keep cam 130 rotating to the end of its cycle. Switch M₂ is actuated to close at point Z on cam 130, to close a circuit P₁—P₃, b—2 of switch C₁, latching relay switch L₁ and mercury switch M₂, thereby energizing a coil ST₂ to close valve 59 and shut off the steam supply to chamber 22 (Figure 8). At the same time a circuit is closed through relay switch L₂, energizing coil V to open valve 64 and applying suction through pipe 62. This draws all steam from the chamber 22 and substantially cools the mold parts and vulcanized articles 31, before the press opens.

It is understood that during the curing period the steam in press chamber 22 actuates safety switch S to maintain the press motor operating circuit open across a—c, and closes a circuit across d—c, thereby energizing signal lamp S₂. Hence, the operator will be warned that the press is about to open, when the steam pressure is vented from chamber 22, because the circuit across d—c will be opened and signal S₂ will go out.

When timer cam 130 reaches the end of the curing cycle thereof, mercury switch M₃ is opened to stop timer motor T. At the same instant, switch M₄ is momentarily closed to make a circuit through pilot P₁—P₃, b—2 of switch C₁, relay switch L₁, mercury switch M₄, coil F₁ and safety switch a—c. This energizes coil F₁ again to close switches F in the power circuit to start motor 95 for opening the press. Before the press starts to open, switch M₂ is opened allowing the device in coil V to close vent valve 64 to stop the suction from chamber 22. As soon as the press starts to open, the circuit through switch C₂ and the "reverse" button keeps motor 95 running until cam 129 stops the motor in the fully open condition of the press.

When the press reaches the fully open position (Figure 5), switch C₂ is opened by cam 129 at the rear of the press to stop motor 95, and switch C₁ is actuated by cam 128 to close a pilot circuit across b—1, thereby to hold latching relay coil LR₁ in the "in" position, with switches L₁ and L₂ closed, and switches L₃ and L₄ open, ready for

starting a new cycle of operation of the press, as described.

The safety switch S is of known type having a conduit 133 which communicates with the interior of chamber 22 of the press (see Figure 3). Should an attempt be made to open the press while steam, above a predetermined degree of pressure as low as a fraction of a pound per square inch, remains in the steam chamber, switch S will be actuated to open any of the motor driving circuits to prevent motor from running. Switch S also closes contacts *d-c* to flash a signal at S₂ to give warning that there is steam pressure in chamber 22. Of course, under normal conditions the steam will always be vented from chamber 22 before the press opens, switch S being provided to prevent accidental opening of the press before the pressure in the chamber is below a safe level.

Motor 95 may be reversed at any time, when there is no pressure in chamber 22, by pressing the "reverse" button, closing a circuit through pilot P₁—P₃, the "stop" button 3—*e* on the "reverse" button, reverse coil R₁, and safety switch S, the circuit being held after the motor is started, through reversing sticker switch R_S. Energizing of coil R₁ closes mechanically interlocked switches R in the power circuit to operate motor in reverse. The reversing circuits have no effect on the timer circuits.

The general operation of the press is readily understood in connection with the foregoing description of the wiring diagram. Briefly, it is the usual practice in manufacturing plants to arrange a battery of presses to open in sequence, according to the settings of the press timers, the operator or operators moving from one press to another as they open, stripping the finished cushions 31 from the upper mold sections, and pouring fresh batches of liquid rubber compound L into the lower mold sections 29.

After the cured cushions 31, 31 have been removed from the open press, as shown in Figure 5, the operator pours the liquid L in the cavities of lower mold sections 29, the latter operation being greatly facilitated by the fact that the platens 16, 17 and 18 are in spaced rearwardly stepped relation. Next, he presses the "start" button (Figure 11) which, through various instrumentalities shown in the wiring diagram, starts motor 95, to close the press. The motor swings cranks 91 in clockwise direction (Figure 2) causing link 88 to swing arms 74 and 68, carrying platens 18 and 17, respectively, downwardly in parallelism, the intermediate platen 17 being constantly maintained in horizontal condition to prevent spilling of the liquid L from mold section 29 mounted therein.

As the platens 17 and 18 are moved toward intermediate positions thereof, shown in Figure 4, the cam surfaces on plates 96 at the sides of lower platen 16, and on plates 81, at the sides of the upper platen 18, engage rollers 99, 102, and 103 carried by intermediate platen 17, to guide platens 17 and 18 in vertically superposed parallelism with each other and with lower platen 16. Continued downward movement of platens 17 and 18 to the fully closed positions, shown in Figure 2, brings the adjacent faces 23 of the respective platens into registering relation, the respective pairs of mold sections 29 and 30 then also being in registering relation. When the press reaches the fully closed condition, cam 129 on driven shaft 92 actuates switch C₂ to stop motor 95, the timer motor T in the meantime having been started to operate the timer circuit for a curing cycle.

For a short period before the actual curing process begins, the batches of liquid compound L are allowed to "jell" or set, chemicals of known type in the compound causing expansion of the batches so as to fill all parts of the mold cavities. For a few seconds after the end of the "jell" period, the timer simultaneously actuates valves 59 and 64 on steam supply line 55 and suction line 63, respectively, to vent all air from press chamber 22 and insure free circulation of the steam about the molds 28, 28. The timer then closes vent valve 64 and allows the valve 59 to remain on for a sufficient period of time to cure contents of molds 28 to the shape of the mold cavities.

At the end of the cure the timer closes steam valve 59 and opens suction or vent valve 64, thereby venting the steam from chamber 22, through pipes 62 and 63. The suction is applied in chamber 22 for a short period after the steam is vented for the purpose of cooling the interior chamber, and hence substantially cooling molds 28 and the sponge rubber cushions 31 contained therein. When the parts have been allowed to cool a sufficient length of time to facilitate handling the cured cushions 31, for example, vent valve 64 is closed by the timer. The latter then starts press motor 95 to continue swinging cranks 91 in clockwise direction (Figure 2), for swinging arms 68 and 74 upwardly in parallelism, thereby carrying the platens 17 and 18, initially in vertically superposed parallelism with the horizontal, and then swinging them rearwardly to the stepped positions thereof shown in Figure 5. In the latter positions platen 17 is maintained in parallelism with the horizontal by the parallelogram linkages, indicated generally at H, and platen 18 is tilted rearwardly by action of forward cam surfaces 101, on plates 81, riding on top rollers 102 carried by the intermediate platen 17. When the press reaches this fully open condition the press-operated limit switch C₂ is actuated by cam 129 on shaft 92 to stop motor 95, and the similar cam 128 on shaft 92 actuates limit switch C₁ to reset the timer circuit for a succeeding cycle of operation, timer motor T in the meantime having stopped with timer cam 130 set in proper position for this purpose. The press remains fully open until the "start" button is again pressed.

The rearwardly stepped arrangement of the three platens permits the finished cushions 31 to be readily stripped from the upper or male mold section 30, as well as facilitating ready access for pouring liquid L into the cavities of the female mold section 30, on both the lower and intermediate platens 16 and 17. Since the mold sections are substantially cooled by the venting operation before the press opens, as previously described, the liquid L may be poured substantially as soon as the press is opened, thereby effecting a considerable saving in time usually wasted in waiting for the mold parts to cool. It should be noted that since the intermediate platen 17 is closed in parallelism with the horizontal and with a steady movement due to the action of spiral springs 124 connected to the platen arms 68 and 74, the liquid L will not be spilled from the female mold section 29.

Modifications of the inventions may be resorted to without departing from the spirit thereof or the scope of the appended claims.

What is claimed is:

1. A press of the class described, comprising a plurality of members relatively movable into registry with each other, said members having

recesses therein to form a closed chamber when the members are in registry, mating mold sections, means for supporting said mold sections on said members to be in mating relation within said chamber when closed, and releasable means for securing said sections against pivotal movement on said members, said releasable means being releasable to permit swinging said pivoted sections outwardly of the supporting members thereof when the press is open.

2. A press of the class described comprising a plurality of relatively movable press members adapted to be in superposed registering relation when the press is closed, said members being recessed to form a single closed chamber in the closed position thereof for containing fluid heating medium, a series of mating upper and lower mold sections mounted on said members to provide a plurality of superposed article-forming molds within said closed chamber, means for supporting said members to be relatively movable between said closed position of the press and in open position thereof in which all said members are in vertically spaced and substantially transversely-stepped relation, said stepped relation of the members facilitating pouring article-forming material into said lower mold sections, means for moving said supporting means to open and close the press, and means for maintaining said lower mold sections substantially horizontal in all positions of said members for preventing spilling of article-forming material therein.

3. A press of the class described, comprising upper and lower press members relatively movable vertically into registry with each other, said members having recesses therein to form a single closed chamber when the members are in registry, mating upper and lower mold sections supported in said members to be in mating relation when the press is closed, the upper mold section being mounted to be shiftable downwardly of the upper member for cleaning the upper surfaces of the upper mold section when the press is open, and quickly releasable means for normally securing said upper mold section against shifting downwardly of said upper member.

4. A press of the class described, comprising upper, lower and intermediate members arranged to be in superposed registering relation when the press is closed, a shiftable support for said upper member, a shiftable support for said intermediate member, said shiftable supports being relatively shiftable to move the members thereon from said closed position of the press to an open position in which all of said members are in spaced apart, substantially stepped relation, means for shifting said supports to open and close the press, and means for maintaining said intermediate member in parallelism with said lower member between the open and closed positions thereof, said stepped relation of the members being such that at least a substantial portion of each member is unobstructed from above by the member or members above it.

5. A vulcanizing press of the class described comprising a relatively fixed lower mold member and relatively movable upper and intermediate mold members arranged to be in superposed registering relation when the press is closed, separate arm members for supporting said movable mold members to swing the same in separate upwardly and rearwardly extending arcs about fixed pivots, connecting means pivoted at spaced points to said arm members, and power means connected to one of said arm members for swinging

both said arm members to open and close the press, said arm members being proportioned and arranged with respect to each other for swinging said movable mold members in said separate arcs from said closed positions thereof to positions in which all of the mold members are in spaced apart, substantially stepped relation.

6. A vulcanizing press of the class described comprising a relatively fixed lower mold member and relatively movable upper and intermediate mold members arranged to be in superposed registering relation when the press is closed, separate arm members for supporting said movable mold members to swing the same in separate upwardly and rearwardly extending arcs about fixed pivots, connecting means pivoted at spaced points to said arm members, power means connected to one of said arm members for swinging both said arm members to open and close the press, said arm members being proportioned and arranged with respect to each other for swinging said movable mold members in said separate arcs from said closed positions thereof to positions in which all of the mold members are in spaced apart, substantially stepped relation, and means for maintaining said intermediate mold member in parallelism with said lower mold member between the open and closed positions thereof.

7. A vulcanizing press of the class described comprising a relatively fixed lower mold member and relatively movable upper and intermediate mold members arranged to be in superposed registering relation when the press is closed, a relatively fixed support rearwardly of the press, an arm member pivoted on said fixed support, said intermediate mold member being supported on the free end of said arm member to swing therewith in an upwardly and rearwardly extending arc, a relatively longer arm member pivoted on said fixed support, said upper mold member being pivotally supported on the free end of said longer arm member to swing therewith in a separate upwardly and rearwardly extending arc, a link pivoted at spaced points to said arm members to connect the same, power means connected to one of said arm members for swinging both said arm members to open and close the press, the fixed pivot of said longer arm member being spaced upwardly and rearwardly of the fixed pivot of the shorter arm member and the pivotal connections of said link to said arm members being arranged relative to said fixed pivots whereby said power means is operable to swing said arm members to move said intermediate and upper mold members in said arcs to positions in which all of said mold members are in upwardly spaced, rearwardly stepped relation, and means for maintaining said intermediate mold member in parallelism with said lower mold member.

8. A vulcanizing press of the class described comprising a relatively fixed lower mold member and relatively movable upper and intermediate mold members arranged to be in superposed registering relation when the press is closed, a relatively fixed support rearwardly of the press, an arm member pivoted on said fixed support, said intermediate mold member being supported on the free end of said arm member to swing therewith in an upwardly and rearwardly extending arc, a relatively longer arm member pivoted on said fixed support, said upper mold member being pivotally supported on the free end of said longer arm member to swing therewith in a separate upwardly and rearwardly ex-

tending arc, a link pivoted at spaced points to said arm members to connect the same, power means connected to one of said arm members for swinging both said arm members to open and close the press, the fixed pivot of said longer arm member being spaced upwardly and rearwardly of the fixed pivot of the shorter arm member and the pivotal connections of said link to said arm members being arranged relative to said fixed pivots whereby said power means is operable to swing said arm members to move said intermediate and upper mold members in said arcs to positions in which all of said mold members are in upwardly spaced, rearwardly stepped relation, and means for maintaining said intermediate mold member in parallelism with said lower mold member, the pivots of said link between said arm members being in substantially parallelogram relation with respect to said fixed pivots of the arm members.

9. A vulcanizing press of the class described comprising a relatively fixed lower mold member and relatively movable upper and intermediate mold members arranged to be in superposed registering relation when the press is closed, a relatively fixed support rearwardly of said mold members, an arm member pivoted on said fixed support, a link element pivotally depending from the free end of said arm and pivotally connected at its lower end to said upper mold member to support the same, another arm member pivoted on said fixed support, a link element pivotally depending from said other arm and pivotally connected at its lower end to said intermediate mold member, a link element pivotally connected at opposite ends to said arm members, said arm members being shiftable on the fixed pivots thereof to swing said movable mold members in separate upwardly and rearwardly extending arcs about the fixed pivots of the arm members, and power means for moving said arm members, said arm members being proportioned and arranged with respect to each other to swing said movable mold members in said separate arcs from said closed positions thereof to positions in which all of the mold members are in vertically spaced, substantially rearwardly stepped relation.

10. A vulcanizing press of the class described comprising a relatively fixed lower mold member and relatively movable upper and intermediate mold members arranged to be in superposed registering relation when the press is closed, a relatively fixed support rearwardly of said mold members, an arm member pivoted on said fixed support, a link element pivotally depending from the free end of said arm and pivotally connected at its lower end to said upper mold member to support the same, another arm member pivoted

on said fixed support, a link element pivotally depending from said other arm and pivotally connected at its lower end to said intermediate mold member, a link element pivotally connected at opposite ends to said arm members, said arm members being shiftable on the fixed pivots thereof to swing said movable mold members in separate upwardly and rearwardly extending arcs about the fixed pivots of the arm members, power means for moving said arm members, said arm members being proportioned and arranged with respect to each other to swing said movable members in said separate arcs from said closed positions thereof to positions in which all of the mold members are in vertically spaced, substantially rearwardly stepped relation, means for maintaining said intermediate mold member in parallelism with said lower mold member during movement thereof, and cooperating guide means on said relatively movable mold members operable when the same are between intermediate and closed positions for maintaining the upper mold member in parallelism with the intermediate mold member.

11. A vulcanizing press of the class described comprising a relatively fixed lower mold member and relatively movable upper and intermediate mold members arranged to be in superposed registering relation when the press is closed, a relatively fixed support rearwardly of said mold members, an arm member pivoted on said fixed support, a link element pivotally depending from the free end of said arm and pivotally connected at its lower end to said upper mold member to support the same, another arm member pivoted on said fixed support, a link element pivotally depending from said other arm and pivotally connected at its lower end to said intermediate mold member, a link element pivotally connected at opposite ends to said arm members, said arm members being shiftable on the fixed pivots thereof to swing said movable mold members in separate upwardly and rearwardly extending arcs about the fixed pivots of the arm members, power means for moving said arm members, said arm members being proportioned and arranged with respect to each other to swing said movable members in said separate arcs from said closed positions thereof to positions in which all of the mold members are in vertically spaced, substantially rearwardly stepped relation, and cooperating guide means on said relatively movable mold members operable when the same are between intermediate and closed positions for maintaining the upper mold member in parallelism with the intermediate mold member.

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