July 3, 1951 L. E. SODERQUIST 2,559,377

PRESS FOR VULCANIZING MECHANICAL ARTICLES

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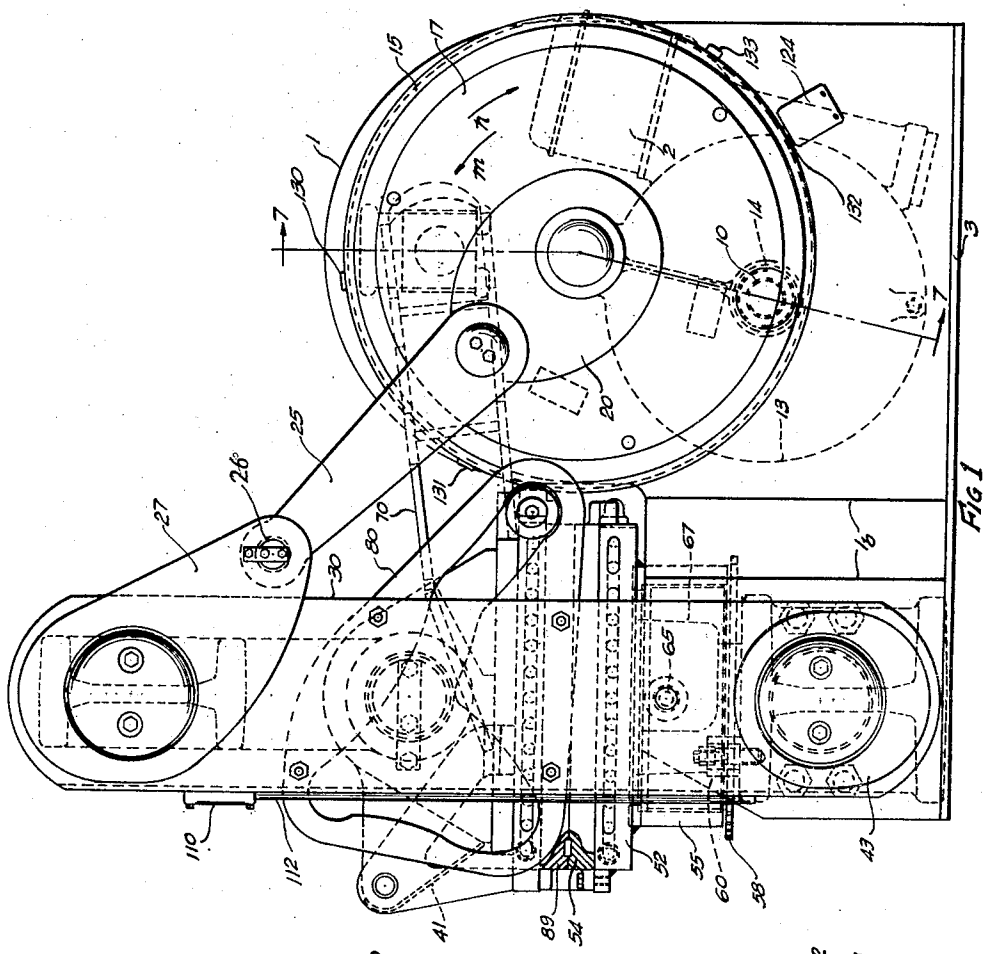


FIG 1

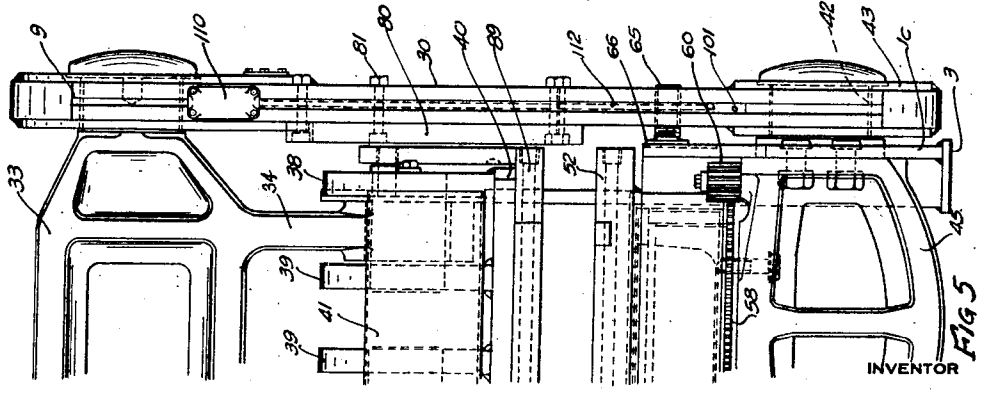


FIG 5

INVENTOR

LESLIE E SODERQUIST

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PRESS FOR VULCANIZING MECHANICAL ARTICLES

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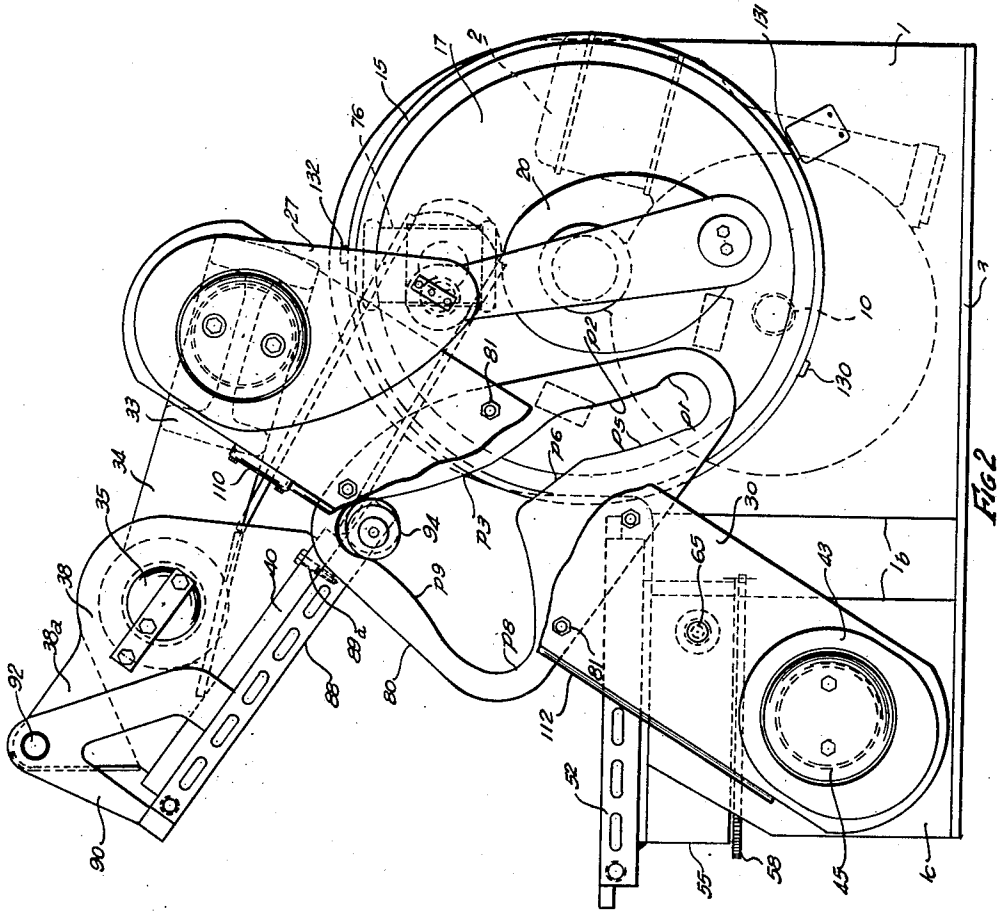


FIG 2

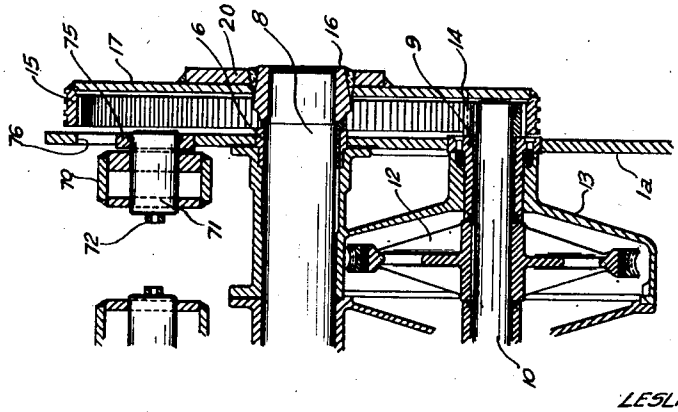


FIG 7

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PRESS FOR VULCANIZING MECHANICAL ARTICLES

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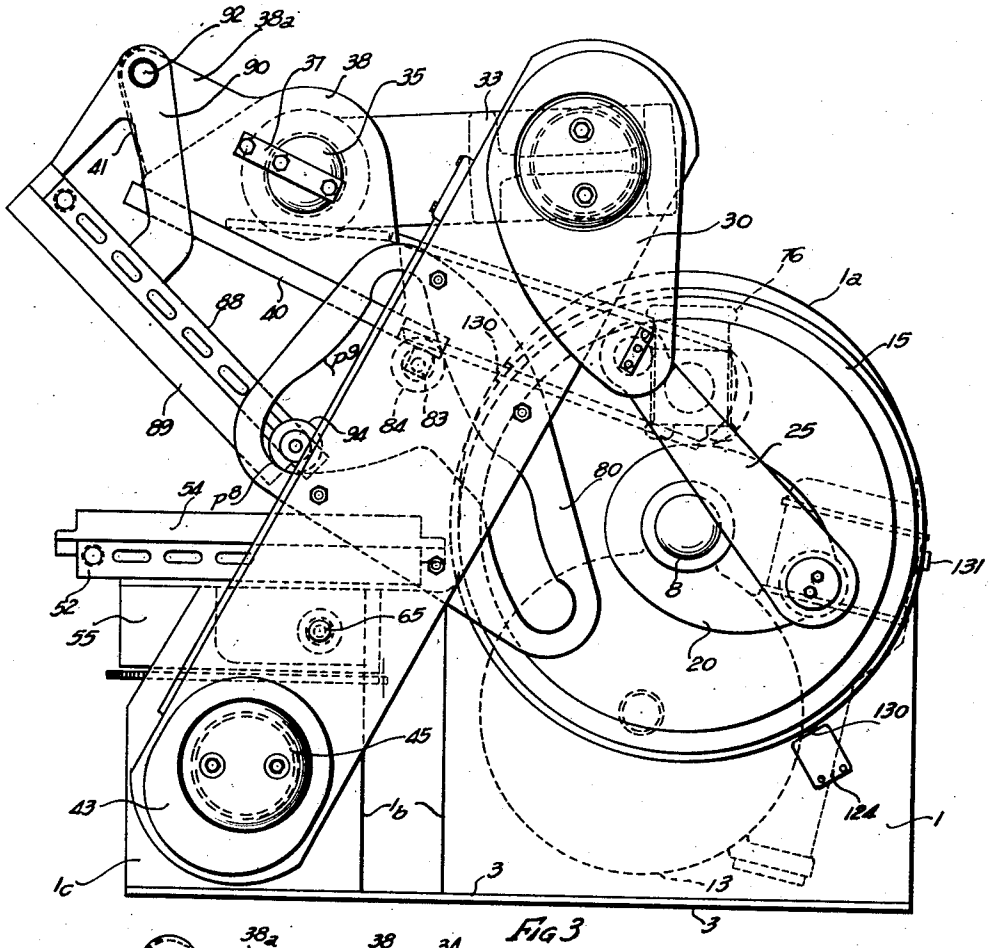


FIG 3

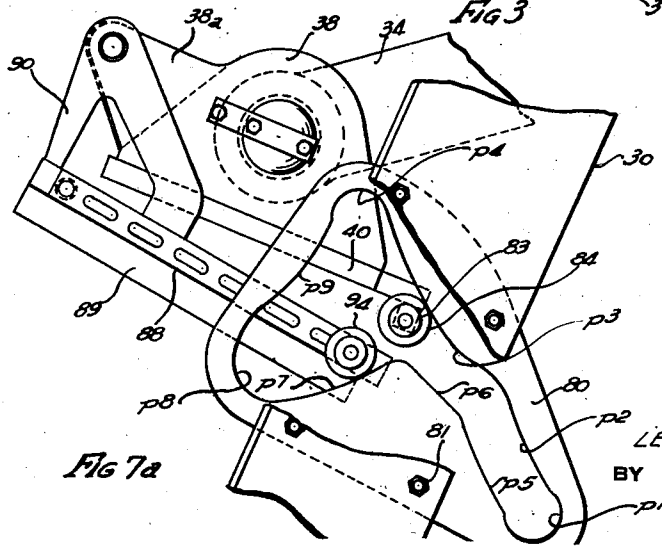


FIG 7a

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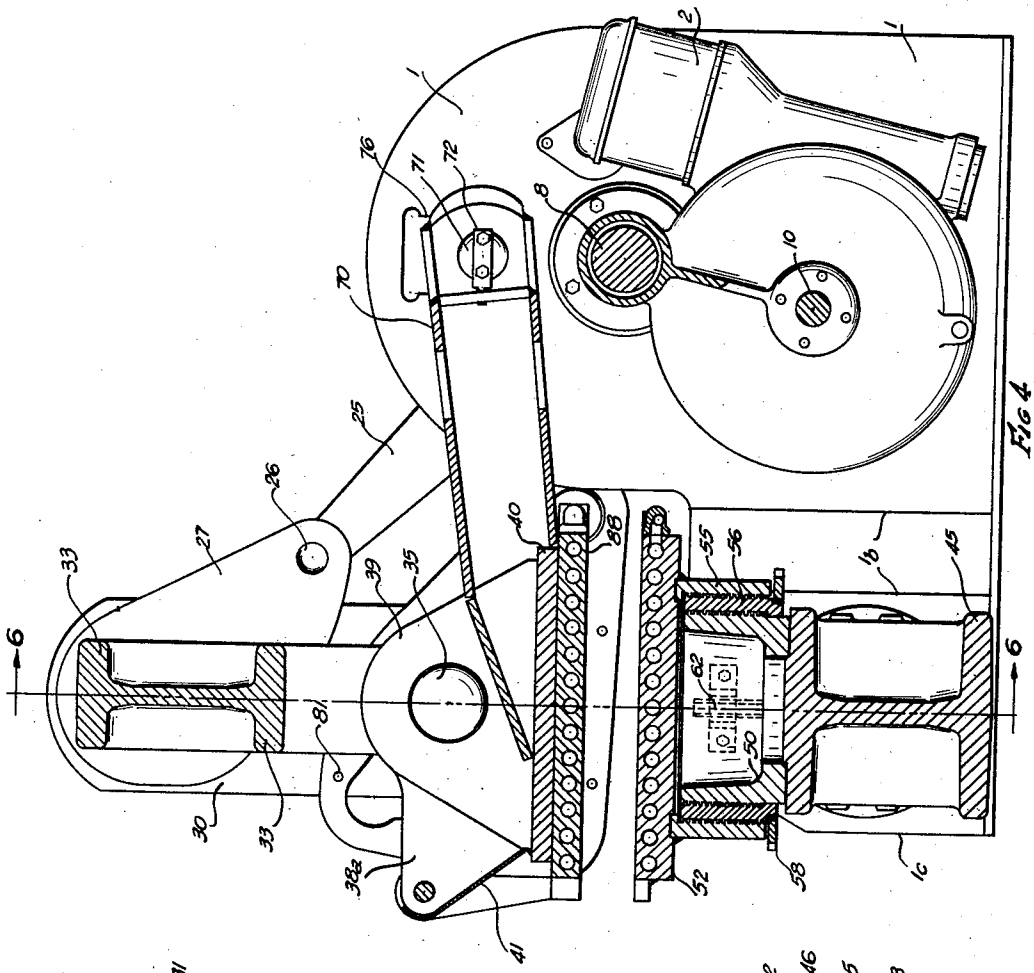


FIG 4

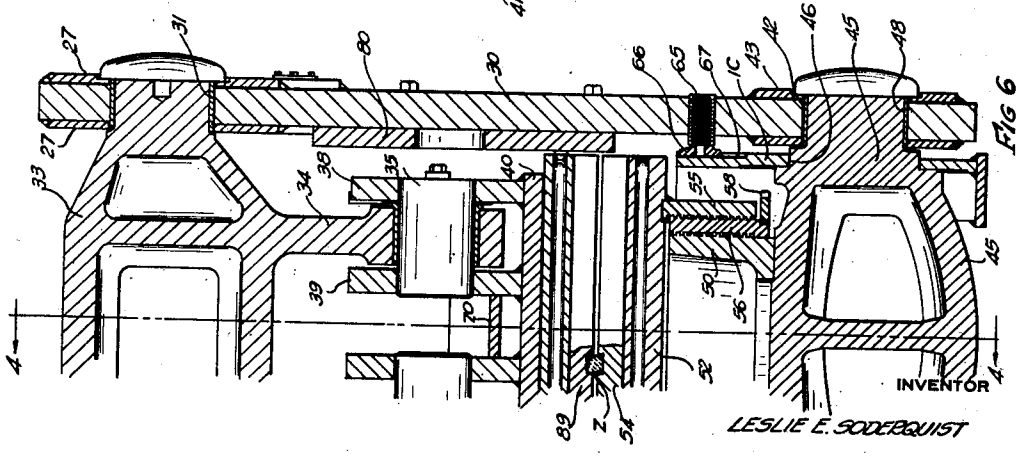


FIG 6

INVENTOR

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PRESS FOR VULCANIZING MECHANICAL ARTICLES

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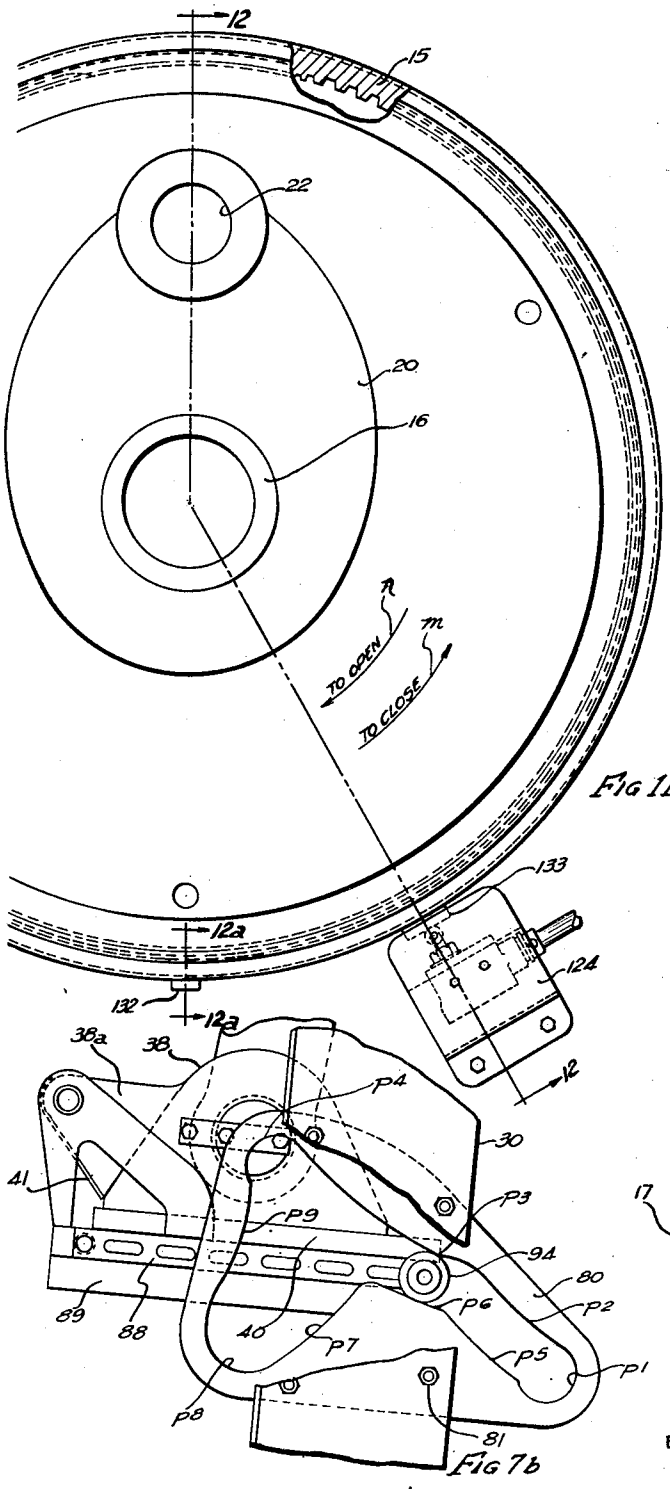


Fig 11

Fig 7b

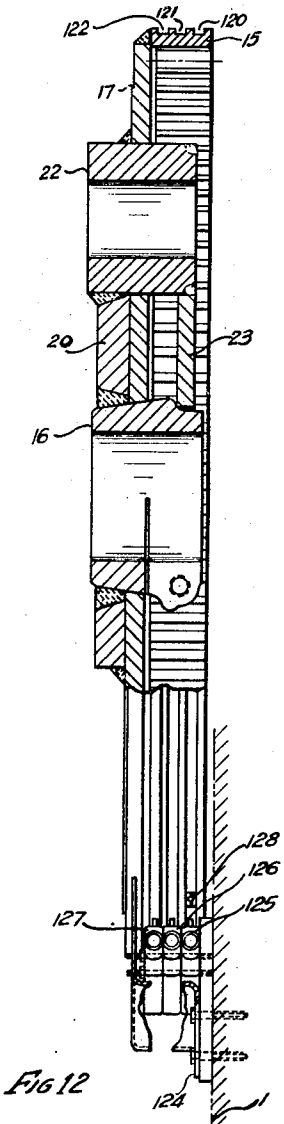


Fig 12

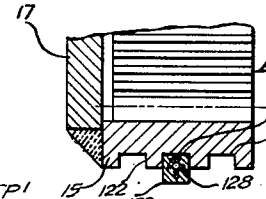


Fig 12a

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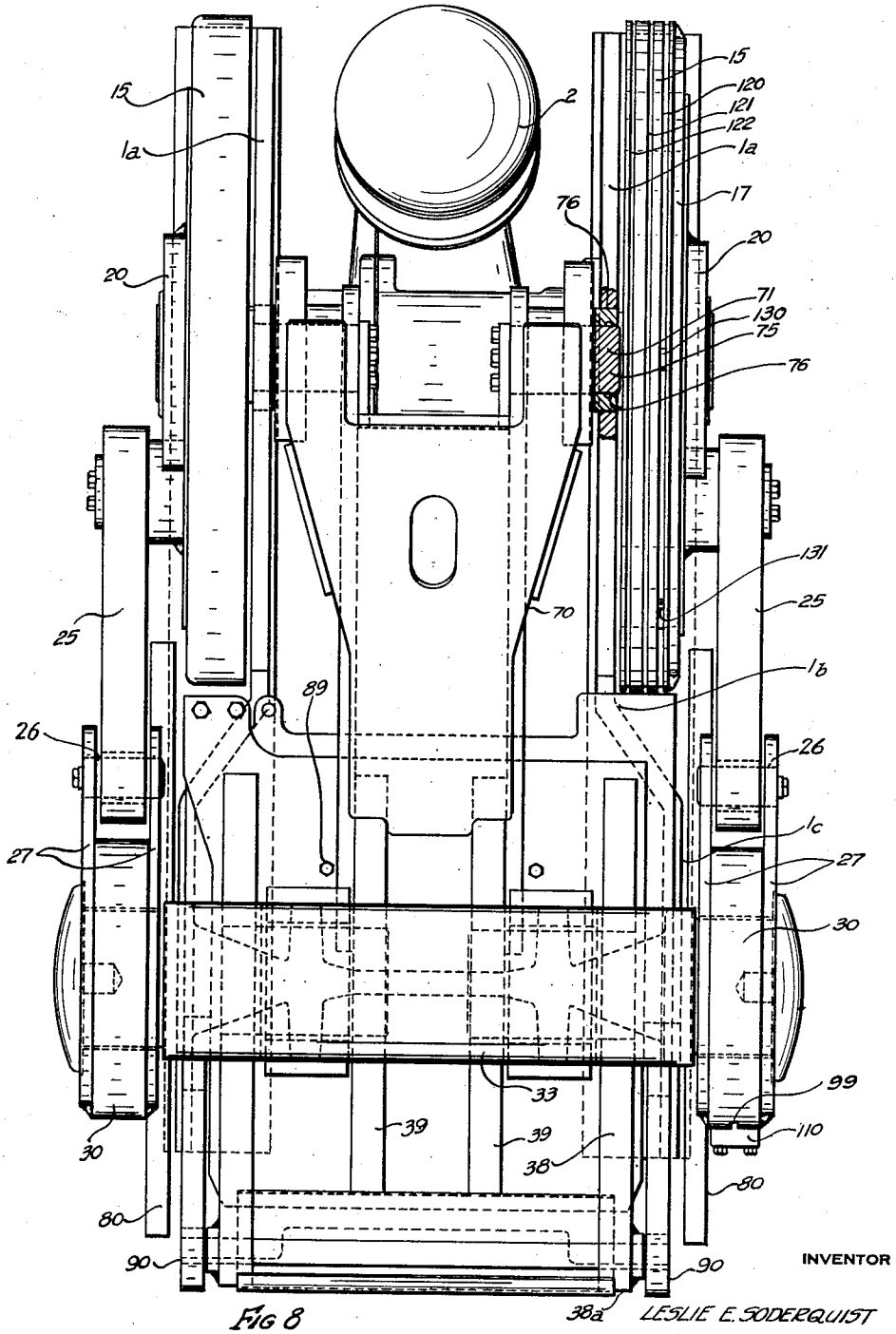


FIG 8

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PRESS FOR VULCANIZING MECHANICAL ARTICLES

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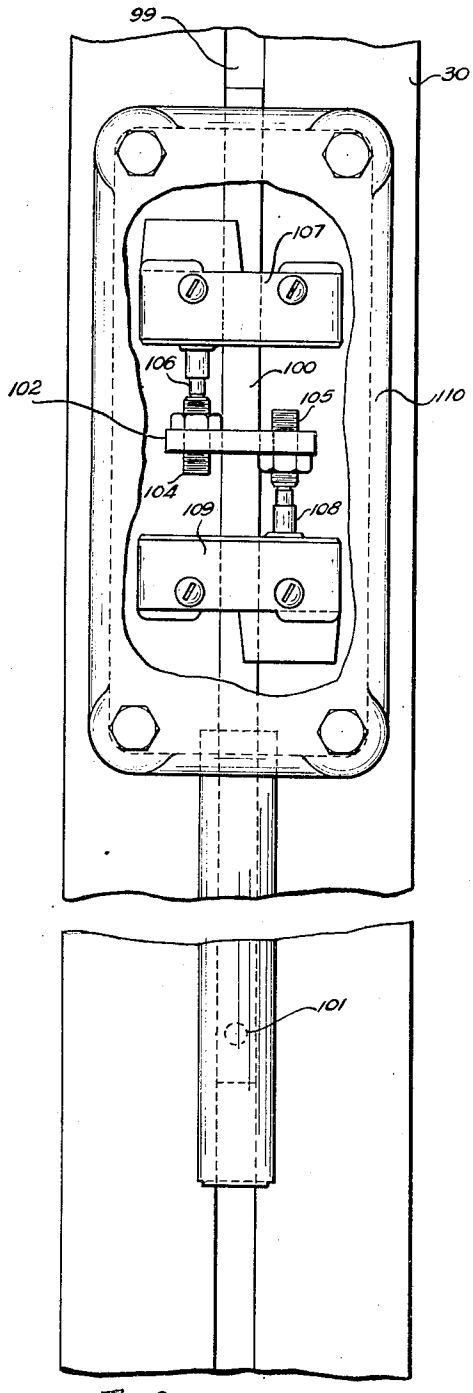


Fig 9a

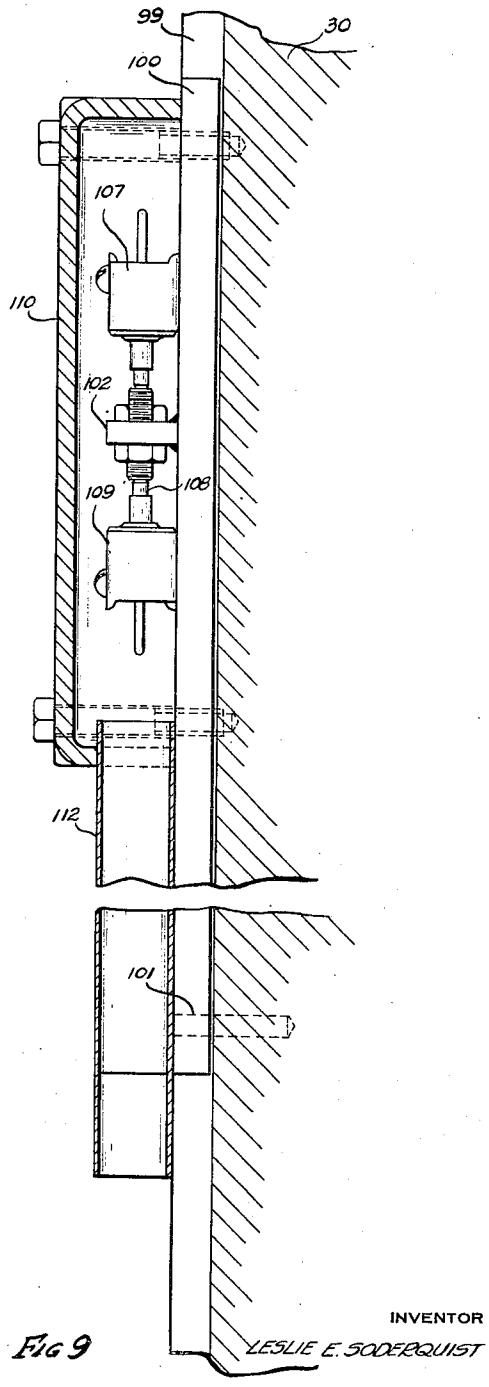


Fig 9

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PRESS FOR VULCANIZING MECHANICAL ARTICLES

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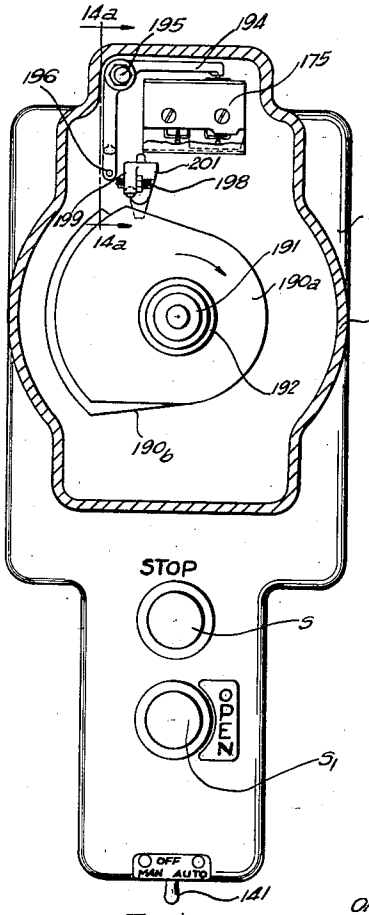


FIG 13

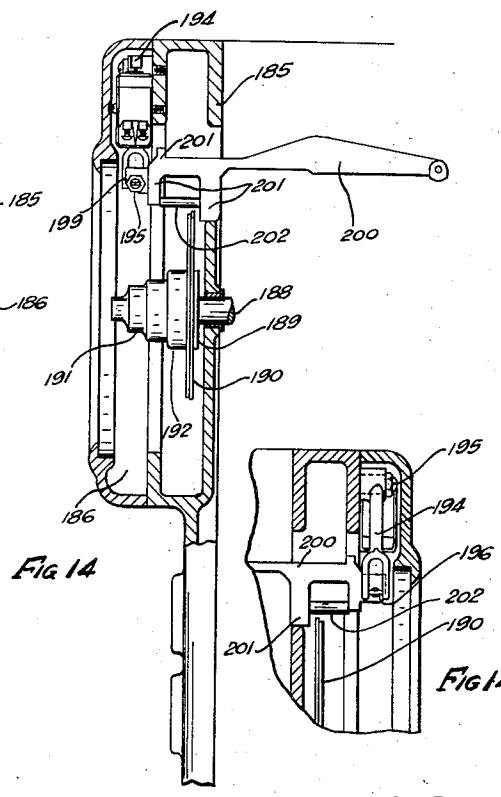


FIG 14

FIG 14a

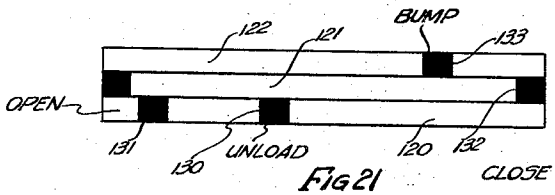


FIG 21

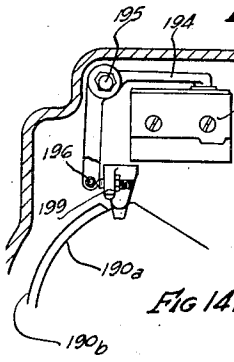


FIG 14b

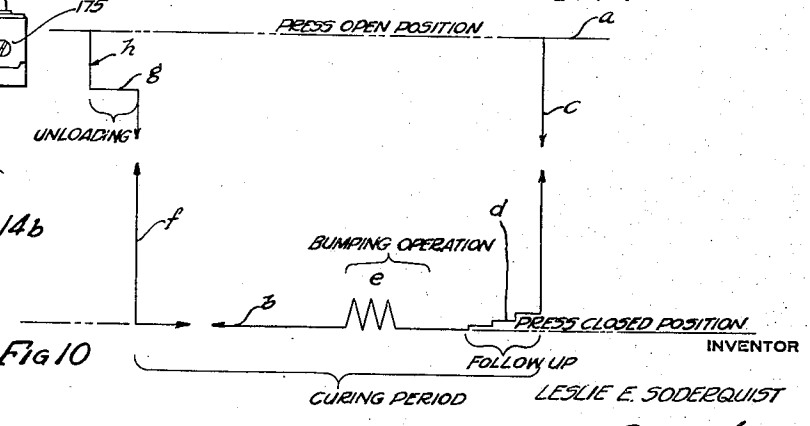


FIG 10

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July 3, 1951 L. E. SODERQUIST 2,559,377

PRESS FOR VULCANIZING MECHANICAL ARTICLES

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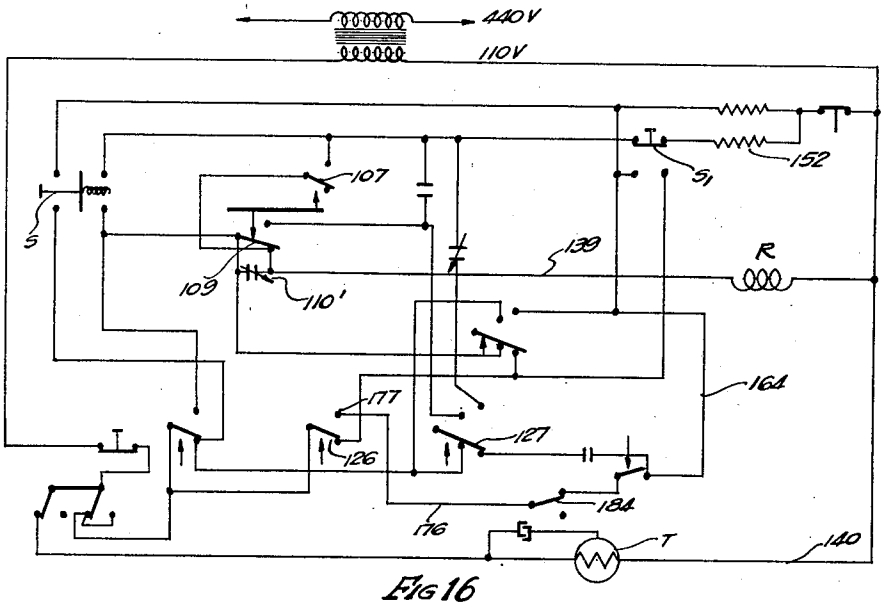


FIG 16

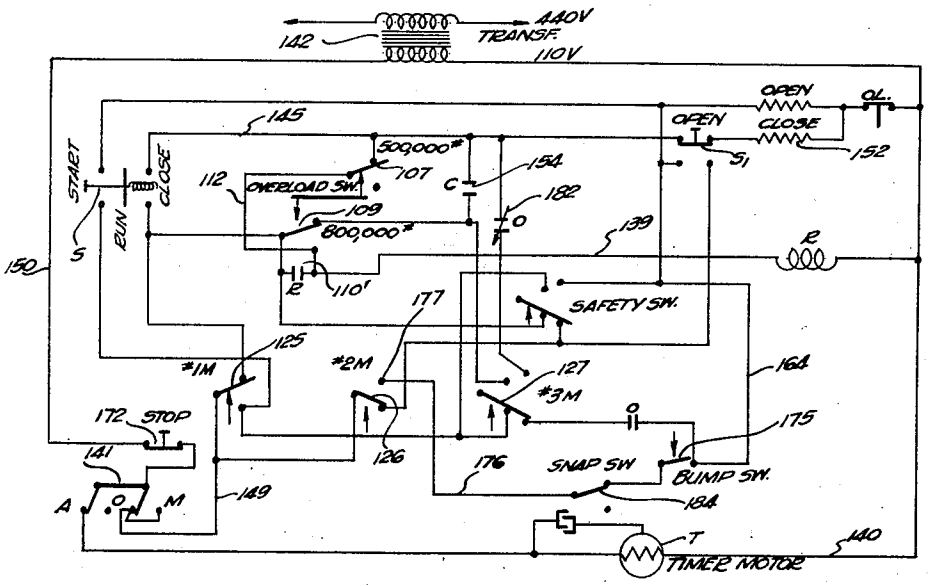


FIG 15

INVENTOR

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July 3, 1951 L. E. SODERQUIST 2,559,377

PRESS FOR VULCANIZING MECHANICAL ARTICLES

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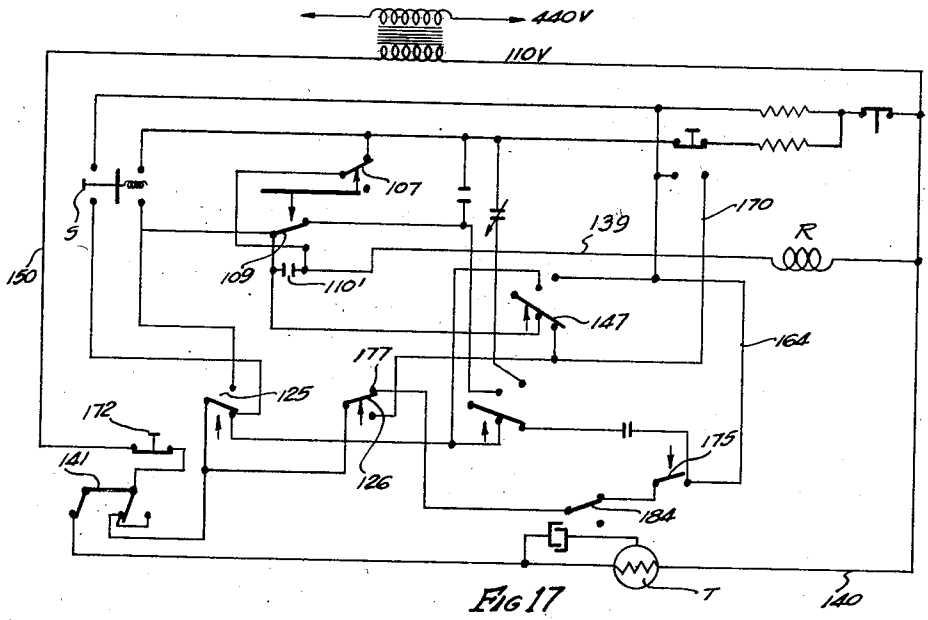


FIG 17

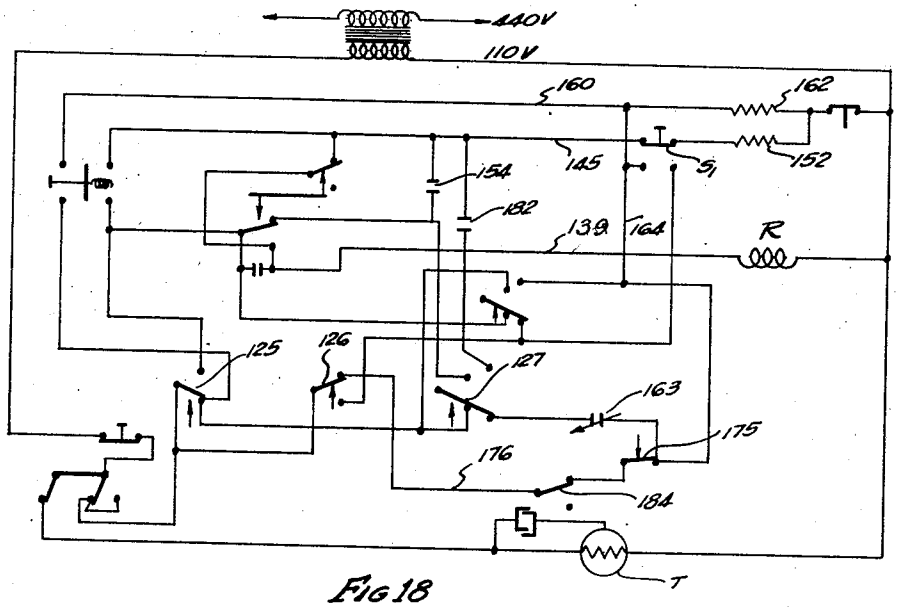


FIG 18

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July 3, 1951 L. E. SODERQUIST 2,559,377

PRESS FOR VULCANIZING MECHANICAL ARTICLES

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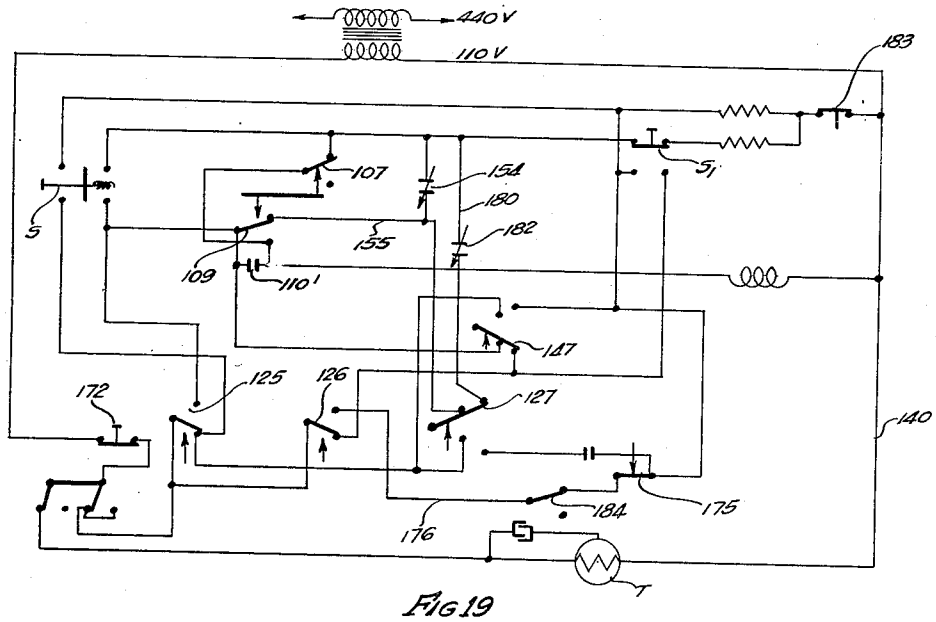


FIG 19

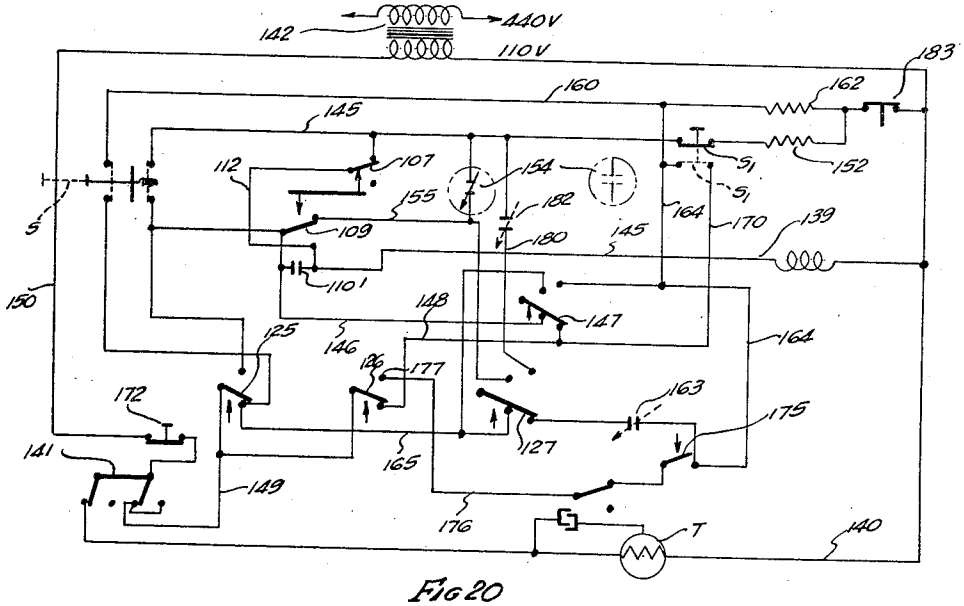


FIG 20

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Patented July 3, 1951

2,559,377

UNITED STATES PATENT OFFICE

2,559,377

PRESS FOR VULCANIZING MECHANICAL ARTICLES

Leslie E. Soderquist, Akron, Ohio, assignor to The McNeil Machine and Engineering Company, Akron, Ohio, a corporation of Ohio

Application February 6, 1947, Serial No. 726,912

12 Claims. (Cl. 18—16)

1

This invention has for its object the designing of a pratcical, mechanically operated press primarily intended for the vulcanization of articles known in the art as "mechanical goods." This expression covers an extensive variety of articles such as rubber heels, soles, rubber automobile fittings and also hard rubber goods of all types. Articles of this type are vulcanized in molds under pressure exerted by the press and it is quite common to employ molds having multiple cavities so that a multiplicity of the articles can be cured at one time.

These goods are usually made of uncured stocks which at room temperatures are comparatively stiff and unyielding. The stock is generally died out in rough blanks of a volume approximating the volume of a mold cavity, but with very little effort to approach the shape of the cavity. These stocks will soften under the heat of vulcanization and will ultimately flow under heat and pressure so as to fill out the cavities.

Due to the foregoing, it has heretofore been the practice to employ hydraulically-actuated presses in the vulcanization of goods of this character because the hydraulic pressure acts to follow-up the molds as the stock gradually softens, and although the mold may not close completely at the start of the operation, as the stocks soften the mold is brought to a complete closed condition by the continuing pressure exerted by the hydraulic ram.

This distinctive action of mechanical goods stocks has made it impractical heretofore to employ mechanically operated presses in this particular field. Hydraulic presses have many disadvantages, one of the principal ones being the difficulty in making the rams and connections leakproof. A press room equipped with hydraulic presses is always messy, in addition to which the pressure apparatus requires extensive supervision and maintenance.

A mechanically operated press which would be adaptable for this type of work would obviate many of the troubles and inconveniences attendant upon the manufacture of mechanical goods. The difficulty in adapting mechanically operated presses, such as used in the vulcanization of tire casings, to the field of mechanical goods, is that the press operating mechanisms have fixed cycles which bring the mold sections to the final closed position at the end of each closing movement. Whenever a press of this type has been used in the production of "mechanical goods" it has been found that the resistance of the stock would either stall the press before the molds were closed or so great a strain would be placed on the operating mechanism, as to break some part of the press.

2

The press shown herein is, so far as known, the first practical and operative mechanically-operated press for molding and curing "mechanical goods." This result is obtained because the press is equipped with a control and operating mechanism which will bring the press to a stop on its closing movement when the resistance set up by the stock reaches a predetermined limit.

One of the objects of the invention is to provide means responsive to the stresses created in closing the press which will stop the closing movement when the resistance reaches the predetermined limit.

The complete press shown and described is equipped with means which, as the stock softens and the stresses recede, causes the press to resume its closing movement. This causes the press to close in a series of steps with the softening of the stock.

The complete "follow up" is accomplished by providing reacting means responsive to the strain on the press members which arrests the closing operation before the resistance of the stock becomes so great as to endanger the press. As the resistance lowers due to the softening of the stock, the strain responsive means is relaxed and the press closing mechanism is again set in motion until the resistance causes the responsive means to re-arrest the closing operation.

The mechanism shown and described herein accomplishes a still further purpose peculiar to this type of molding. Stocks for mechanical goods and hard rubber stocks give off gases while being cured, and it is advisable to open the mold slightly, particularly during the early part of the cure, to permit these gases to escape from the mold cavities. This operation of opening the molds momentarily is known in the trade as "bumping." The mechanism shown herein causes the mold to separate slightly after the mold is fully closed, as many times as may be necessary to release the gas entrapped within the mold.

It is a further object of the invention to provide a press of this type which will facilitate the removal of the finished goods and the preparation of the molds for the next operation. Frequently the goods will stick in the upper mold section and have to be removed therefrom by the operator. The press shown herein is provided with means by which the upper mold section automatically drops at a point in advance of the fully opened position so that the upper mold section is presented at a convenient angle to the

operator so that he can pick out any articles which have stuck in the upper mold section and swab the mold surface with the cleaning and lubricating compound. The press stops at this position on the opening movement, and when the operator has removed any cured goods adhering to the upper mold section and prepared the mold surfaces, he presses a button and the press moves to its fully opened position, the upper mold section being raised so that it is wholly out of the way and does not interfere with the loading and lubricating of the lower mold section for the next curing cycle.

The above are the principal objectives of the improved press construction shown and described herein, although other advantages will be attained as will be understood as the description proceeds. It will also be understood that while the press is designed primarily for the vulcanization of rubber goods, it is not limited to this particular branch of the plastic molding industry and may be used for the molding of other types of plastics.

The mechanism shown and described is the best known and preferred form of the invention, but this is not intended as limiting the scope of the invention to this embodiment, as modifications and variations may be adopted. As one modification it is possible to dispense with the "follow up" and by merely combining the safety feature which will arrest the press when the stresses reach a dangerous point with the "bumping" feature the press may be successfully used in the molding of certain types of mechanical goods.

As the press shown herein is the first press adapted for this type of work in which mechanically operated closing means is provided, the invention is entitled to a substantial scope to cover similar presses which utilize the principles of the invention while departing from the details embodied in the form shown. For example, the press shown is a toggle operated press in which the upper platen or press head rocks as it is moved to and from its closed position, but the press may operate in a straight line between its extreme positions. Also, the press is illustrated as of the type in which the lower platen is stationary while the upper platen is moved, but the art is familiar with presses in which both platens partake of the opening and closing movements and also in which the lower platen alone moves, and it would not amount to a departure from certain features of the invention to apply them to presses of either alternative type.

A complete press with all of the improved features is shown in the drawings.

Fig. 1 is a side elevation of the press in closed position.

Fig. 2 is a similar view showing the press in fully opened position, the upper mold carrier being elevated. In this view, as in several others, the molds have been omitted.

Fig. 3 is the press at its unloading position, showing how the upper mold is made accessible to the operator by the lowering of the upper mold carrier.

Fig. 4 is a longitudinal vertical section of the press in closed position on the line 4—4 of Fig. 6.

Fig. 5 is a front elevation of the right-hand side of the press.

Fig. 6 is a section on the line 6—6 of Fig. 4. In this view is shown in exaggerated form the manner in which blanks of a stiff stock will prevent the mold from closing.

Fig. 7 is a section through the press-operating mechanism on the line 7—7 of Fig. 1, showing one side of the operating mechanism, it being unnecessary to show both sides as the main driving mechanism is merely duplicated on the other side of the press.

Fig. 7^a is a view showing the upper mold carrier in an intermediate position.

Fig. 7^b is a similar view showing the platen in the position it assumes when the press is near its closed position.

Fig. 8 is a plan view of the press.

Fig. 9 and 9^a are a longitudinal section and a plan view, respectively, showing the strain mechanism which controls the progressive closing of the press as the resistance set up by the stock relaxes.

Fig. 10 is a diagrammatic view showing a typical path followed by the upper platen during a curing cycle.

Fig. 11 is a side view of one of the main crank gears, in this case the right-hand crank gear, showing the limit switch operating means for the press motor.

Fig. 12 is a section on the line 12—12 of Fig. 11.

Fig. 12^a is a detail section on the line 12^a—12^a of Fig. 11.

Fig. 13 is a longitudinal section and Fig. 14 a transverse section through that portion of the timer switch which controls the period during which "bumping" occurs.

Fig. 14^a is a section on the line 14^a—14^a of Fig. 13.

Fig. 14^b is a fragmentary view showing the position of the timer switch parts during "bumping."

Figs. 15 to 20 inclusive are diagrams of typical electric wiring for accomplishing the several steps in the preferred operation;

Fig. 15 shows the condition of the circuits when the press is fully opened; Fig. 16 when the press is overloaded and the closing movement has been arrested by the resistance of the stock; Fig. 17 when the press is fully closed; Fig. 18 when the press is being opened to "bump" the molds; Fig. 19 when the press is closing from bumping; and Fig. 20 shows the condition of the circuits when the press is running, the full line position of the starting switch showing its position during the closing movement of the press and the dotted line showing its position during opening movement.

Fig. 21 is a diagrammatic view showing the arrangement of the limit switch control operations.

The platen movement

In order to explain more clearly the many features of press operation, reference will first be made to Fig. 10 which shows in diagram a typical path followed by the upper platen of a press equipped with all of the controls to give both the "follow up" and a subsequent "bumping" operation. There is no attempt in this view to show actual dimensions of platen travel.

In Fig. 10 the location of the upper platen in its fully opened position is indicated by the line *a* and in its fully closed position by the line *b*. The line *c* represents the initial closing movement of the press. The series of steps *d* represent the successive pauses and advancements which occure during the "follow up" as the closure of the press is interrupted by the resistance of the stock. Three successive steps are illustrated, but the number of steps may be greater or less, depend-

ing upon the speed at which the stock softens under the combined effects of heat and pressure. The limits at which the press stops and then resumes its closing movement are determined by the adjustment of the strain device to be more fully described, but by reference to the wiring diagrams (Figs. 15–20), it will be seen that 800,000 lbs. has been selected as the resistance at which the press stops its closing movement and 500,000 lbs. at which it resumes its closing movement.

The offsets *e*, which occur after the press is closed and which usually occur at the fore part of the curing period, represent the movement of the platen as the mold is "cracked" during the "bumping" operation.

At the end of the curing period, represented by the left-hand end of the line *b*, the upper platen rises along the line *f* until it reaches the level *g*, which corresponds to the position of Fig. 3. It remains in that position until the operator has removed the articles which cling to the upper mold section and swabs that section; then the operator presses the starter button and the platen follows the line *h* until it reaches the level *a* when it comes to a full stop ready for removing articles from the lower mold section, swabbing the lower mold and reloading.

The press construction

The press is carried by two heavy plates, one on either side of the press and indicated as a whole by the numeral 1. The main body of each plate is indicated at 1a and the space between the plates houses the reversible motor indicated at 2 and the driving gear, to be described. Forwardly, the plates 1 are flared outwardly along the vertical lines 1b and are lowered in height so that at 1c the forward ends of the plates form the support for the lower stationary platen. Along their lower edges the side plates are welded to horizontal foundation plates 3.

In the vertical portions 1a of the side plates are located the bearings 6 for the main shaft of the press, indicated at 8. Below the shaft 8 and located in bearings 9 in the side plates is the drive shaft 10 (Fig. 7). This shaft 10 is keyed to a worm gear 12 which meshes with a worm (not shown) driven by the motor 2. The driving gears are enclosed in a housing indicated at 13. The ends of the shaft 10 are keyed to pinions 14 which mesh with internal gears cut in the inner rims of large driving gears 15 welded to hubs 16 on the ends of the shaft 8 by face plates 17. One of these gears acts as a means for controlling the limit switches which stop the motor when the press is fully opened or fully closed. The right-hand gear has been selected for this purpose and will be described more in detail later. The main gears 15 rotate in the direction of the arrow *m* in closing and in the direction of the arrow *n* in opening (Fig. 1).

To the face plate of each gear and surrounding the hub 16 is welded a crank arm 20 in the outer end of which is formed a bearing sleeve 22 which projects through the plate 17 and is braced to the hub 16 by a welded plate 23 (Fig. 12).

Pivotally mounted in each bearing 22 is the lower end of a link 25, the upper end of which projects between and is pivoted at 26 to two parallel plates 27. Each pair of plates 27 is located at the sides of and welded to the upper ends of one of the main toggle arms indicated at 30.

These arms 30, located at opposite sides of the press, constitute elements of the toggle by which the press is opened and closed and by which the immense pressure is exerted on the molds. These arms are made of a very heavy steel which, however, has the property of stretching slightly under the very heavy tension which is exerted as the molds close together on the stock. The arms are identical except that one, here shown as the right-hand arm, has been selected to carry the strain responsive device by which the closing of the press is arrested when the load on the press mechanism reaches the predetermined safety limit. The drawings also show the additional controls by which the "follow up" may be secured, if this refinement is adopted.

Across the upper ends of the arms 30 and pivotally mounted in bearings 31 therein is the heavy yoke 33 from which depend the parallel arms 34 in the lower ends of which are journaled the heavy transverse shafts 35. The yoke 33 constitutes the second element of the toggle mechanism 30—33. The ends of each shaft 35 enter bearings formed in two vertical parallel plates 38 and 39 and are fixed by straps 37 to the plates 38. The plates 39 which are located inwardly of the press are substantially triangular, as shown in Fig. 4, but the outer pair of plates 38 are formed with forwardly extending portions marked 38a which form the bearings for the rocking upper mold carrier, to be described. Welded to the lower edges of the four plates 38—39 is the fixed upper platen 40. A cover plate 41 is mounted over the outer edges of the plates 38.

The lower end of each arm 30 is provided with a transverse bearing 42, the arm being reinforced at this point by plates 43 welded about the bearing. A transverse beam 45 mounted in openings 46 in the side plates 1c is provided with trunnions 48 received in the bearings 42. The beam forms the anchorage for the lower ends of the arms 30 and on its upper side is seated a heavy ring-shaped sleeve 50 which constitutes the support for the lower or stationary platen 52. This platen is cored as shown for the circulation of steam by which the requisite heat is applied to the lower half of the mold, indicated at 54. This mold section, which is removably secured to the stationary platen in the usual manner, is provided with cavities for the goods to be cured and, in accordance with the usual practice, this is normally a multiple cavity mold.

As the mold sections require accurate adjustment in order that they may properly meet when the press is fully closed, the sleeve 50 is threaded externally and the platen 52 is attached to a second sleeve 55 spaced from the sleeve 50 and threaded internally but in the opposite direction. An intermediate internally and externally threaded sleeve 56 engages the threads on the inner and outer sleeves and is provided with a ring gear 58 which meshes with an operating and adjusting pinion 60 mounted on one corner of the transverse beam 45. The platen is prevented from turning by any suitable means which may be a guide on the sleeve 55 and a guide rail extending from the left-hand side plate as indicated at 62 in Fig. 4. The mechanism just described forms a convenient means for securing accurate adjustment between the two mold sections.

In order to provide for accurate alignment of the platens, each arm 30 carries near its lower end an adjusting screw 65, the end of which is reduced and carries a footer 66 which bears against a finished surface 67 formed in the side plate and of sufficient extent to permit the footer

to move over the plate from full open to full closed press positions.

The upper platen mechanism

In order to guide the upper platen in its movement while the press is opening and closing, an arm 70 is attached to the upper platen and extends rearwardly to a point above the shaft 8. The detailed construction of this arm does not need to be described, it being sufficient to state that, in the form shown, it is made up of a number of plates welded together and welded at its forward end to the upper platen. The rear end of the arm 70 is forked to provide bearings for two shafts 71, each of which is held in position by a strap 72 attached to the inside of the forks. The outer end of each shaft carries a guide shoe 75 which is movable vertically in slots 76 cut in the side plate 1 (see Fig. 7).

When the press is fully opened, as shown in Fig. 2, the shoes 75 are at the bottom of the slots, but as the toggle links 30 approach the vertical position, the shoes 75 move upwardly in the slots momentarily and then drop down to approximately their original position. This combination of mechanical movements causes the platen 40 to rock from its tilted position shown in Fig. 2 to a position in exact parallelism with the lower platen as the press approaches its closed position and maintains this parallelism until the press is fully closed.

A further factor governing the movement of the upper platen 40 is one of the two cam guides which are indicated as a whole by the numeral 80. In the press as shown the cam guide for the platen 40 is on the left. In Figs. 2 and 7a, the side arms 30 are broken away to show the configuration of the cam plates, which is the same for both plates. Each cam guide is a flat plate attached to the inside of an arm 30 by bolts 81. Cut in each plate is a cam guideway of the peculiar shape shown in the several views.

At the rear left corner of the platen 40 is a depending bracket 83 in which is mounted a roller 84 which moves in the left hand cam guide. This surface starts at the recess p^1 (Fig. 7a), continues as a comparatively straight surface p^2, then has bulge p^3, and terminates in the recess p^4. When the press is fully closed, the roller 84 rests at p^1, and when it is fully opened, it rests at p^4, the intermediate cam surfaces holding the platen 40 in its proper position during the entire cycle of opening and closing the press.

It will be noted that the member 40 which has been referred to as the upper platen, is, in reality, a false platen, the heated platen element corresponding to the element 52 being a supplementary cored platen 88 to which the upper mold section 89 is removably attached. This supplementary platen is so arranged and constructed that it tilts downwardly as the press is opening for the purpose set forth previously.

For this purpose the supplementary platen is carried by two brackets 90 on the outer side of the platen 40 and pivotally supported on the extensions 38a by a transverse shaft 92. The inner right-hand corner of the supplementary platen is provided with a roller 94 which travels over the lower portion of the cam groove in the right-hand cam plate 80. It will be seen that the rollers 84 and 94 on the moving upper platen 40 and the rocking platen 88, respectively, do not interfere because they move in different cam plates. When the press is fully closed, the roller 94 rests on the recess p^1 of its cam plate and this brings the two platens together. As the press starts to open, the roller 94 moves over the surfaces p^5—p^6 of the cam groove which are parallel to the surfaces p^2 and p^3 and this keeps the platens together and parallel to the bottom platen up to approximately the point shown in Fig. 7b. As the press continues its opening movement from this point, the roller 94 follows the descending surface p^7 until it reaches the recess p^8, which is the time that the press is partially open at the line g in Fig. 10. At this point the opening movement stops and the upper mold is presented to the operator as shown in Fig. 3.

After the operator has removed the articles from the upper mold, he causes the press to continue its movement toward the full open position. During movement of the rocking platen 88 from unloading to full open position, the roller 94 is in contact with the vertical arched surface p^9 of the cam groove and the reaction created thereby lifts the rocking platen 88 until the roller 94 rests in the recess p^4 in alignment with the roller 84, bringing the two platens together again at the top of the opening movement, as shown in Fig. 2. On closing, the roller 94 follows the cam surfaces p^9 to p^5, the latter end of the movement bringing the rocking platen against the fixed platen 40 as the mold sections approach.

In molding certain types of goods which do not tend to stick in the upper mold section, the platens 40 and 88 may be bolted together, as shown at 89a in Fig. 2, in which case these two platens move as a single element.

The press arresting and "follow up" mechanisms

The means by which the closing movement of the press is arrested when the resistance offered by the stock approaches the safety limit will now be described. As the complete press in shown, this will also include the means by which the "follow up" is obtained.

The underlying principle of the control mechanism is that a press of the type shown herein, or, indeed, any other press, is subjected to high stresses when it is attempted to force the press to close against excessive resistance such as caused by many blanks of a stiff stock. Such a condition is illustrated in Fig. 6 where one of the blanks of uncured stock Z is shown between two partially closed mold sections. The resistance to further closing offered by one blank is multipled as many times as there are separate mold cavities. This resistance is reflected in the stretching or yielding of the toggle links, levers and other parts of the press under the heavy load. Even such heavy and apparently unyielding elements as the toggle links 30 will stretch under loads which are created by attempting to close the molds together against stocks such as employed in goods of the types specified.

It should be distinctly understood that other parts of the press than the links 30 exhibit the property of stretching or yielding under such extreme stresses and while an element 30 has been selected for the purposes of the present description, it is not intended to confine the invention in its broader aspects to the use of this particular element as the strain responsive element which controls the closing movement of the press.

Referring now to the particular means shown herein, the side links 30 of this particular press will exhibit the property of stretching several thousandths of an inch when the load between

the yoke 33 and the lower beam 45 is between 800,000 and 500,000 lbs. This is sufficient to operate micro-switches mounted on a side arm to stop and start the press motor at the stated limits, respectively.

Either side arm 30 may be selected for the purpose and the drawing shows the strain responsive elements located on the right-hand link.

Referring particularly to Figs. 9 and 9a, the front edge of the arm 30 is provided with an open groove 99 extending the length of the link and in this groove lies a long steel bar 100 which is pinned at its lower end to the side arm by the pin 101. The location of this pin is shown in Fig. 5. The groove is slightly wider and deeper than the bar so that the balance of the bar 100 is free of the arm and may float thereon. It will be seen that as the arm stretches under the load imposed thereon or relaxes as the load is relieved, any point near the upper end of the bar will shift over the surface of the arm. This relative movement between a point on the arm and a point on the bar is utilized to actuate micro-switches which stop and start the motor in response to the strains exerted on the press and reflected in the elongation of the side arm.

At a point near the upper end of the bar 100 is welded a cross piece 102 and on one side of the bar there is threaded in the cross piece the adjustable stud 104 which is headed toward the top of the arm 30, and on the other side of the bar is the threaded stud 105 which is pointed toward the lower end of the arm. Stud 104 is adapted to contact the operating button 106 of a micro-switch 107 and the stud 105 is adapted to contact the button 108 of a second switch 109 as hereinafter described. Both micro-switches are attached to the arm 30. A cover plate 110 is secured to the arm 30 to house the switches and a conduit 112 is also mounted on the arm and serves as a conduit for the wires which lead from the switches.

The switch 107 is the low limit switch, that is to say that when this switch is closed the circuits to the press motor will be maintained and the press will continue to move. The switch 109 is the top limit or overload switch, that is to say that when this switch is opened the circuits to the motor will be open and the motor will stop, halting the operation of the press. When the arm 30 is not under excessive strain, both switches 107 and 109 are closed. Such a condition is shown in Fig. 15.

When, however, the strain on the link passes its predetermined low limit, here shown as 500,000 lbs., the switch 107 has been moved by the lengthening of the arm 30 to such an extent that the switch 107 has been opened. The stud 105 is set so that it does not come into contact with the button 108 of the high limit switch until the load on the link reaches the predetermined high limit, which, as noted above, is selected in this case as 800,000 lbs. During the period that the resistance is building up from 500,000 to 800,000 lbs. the press motor is operating by the current provided through the switch 109. When, however, the resistance reaches the high limit all current to the operating motor 2 is cut off by the opening of the switch 109. When the overload switch 109 is shifted to open position a secondary or holding circuit associated with the switch 109 is closed through relay R, line 139, switch 109, line 146, safety switch 147, line 148, switch 126, line 149, to switch 141 and return line 150, which holds it in open position until operating conditions are restored in which switch 109 is desired to be closed. Such a holding circuit is shown in the various figures (15 to 20) at 110', and includes a contactor which is closed by relay R as soon as switch 109 reaches its open position, as shown in Fig. 16. This is the only position of switch 109 in which the holding circuit 110' is operative. When the resistance in the arm drops to the low limit, say 500,000 lbs., the stud 104 strikes the button 106 which closes the switch 107 and the motor is again started up. The complete operation requires that the high limit switch be again closed and this is accomplished because the switch 109 is biased to closed position and because the holding circuit 110' for that switch is shunt circuited through a line 112 which connects the circuit 110' to the pole of the low limit switch 107, and thereby shortly thereafter closes switch 109 with switch 107.

This closing of switch 107 provides a circuit through line 145, switch 107, shunt line 112, holding circuit 110, line 146, safety switch 147, line 148, switch 126, line 149, to switch 141 and return line 150. In line 145 is a coil 152 which is now being energized to close the gap between the plates of sticker switch 154, which plates are quickly closed but which are subject to delayed action when opening. As soon as switch 107 is closed and the circuit is established through shunt line 112, the effect of the relay R on the holding circuit 110 is weakened and gradually the latter circuit becomes non-effective, at which time switch 109 quickly returns to closed position due to its biased arrangement. At the moment that holding circuit 110 becomes non-effective and switch 109 returns to closed position, the circuit which included holding circuit 110 is broken, thus temporarily rendering coil 152 incapable of acting on the plates of sticker switch 154. But since the latter plates are delayed in their opening action, switch 109 returns to its closed position before these plates can open, and a new circuit is established through line 145, sticker switch 154, line 155, switch 109, line 146, safety switch 147, line 148, switch 126, line 149 to switch 141 and return line 150. As soon as this new circuit is established, coil 152 is again being energized to hold the plates of sticker switch 154 in closed position, and as hereinafter explained, the closing of sticker switch 154 completes the power circuit to the motor 2, to continue the closing movement of the press.

It will thus be seen that when the resistance to press closing reaches the upper limit, the press will cease to operate. If the "follow up" is not to be used, this overload switch only is employed and the restarting of the motor may be done manually. If, however, the automatic "follow up" is desired, as in the preferred form shown, the motor will be automatically connected to its source of power when the resistance drops to the predetermined low limit. This is due to the fact that the overload switch is not effective to stop the motor until the resistance reaches the high level, and during the period that the resistance is dropping from that high level to the low level, the motor is idle, but starts up again when the low level is again reached.

The limit switches

Presses of the type shown herein are provided with a push button S which normally remains in the neutral shown in Figs. 15 to 19. This button is pressed by the operator to start the press operations when the molds are fully loaded and the

press is to be closed. A limit switch is also provided which shuts off the prime mover when the press has reached its fully closed position. In the present case, when the mechanism just described as the "follow up" is used, the press will usually reach its fully closed position only after several interruptions due to the resistance of the stock.

As soon as the press is started on its closing movement, an automatic timing device comes into play. The timing device may be of any well known type, that shown in applicant's prior Patent No. 2,321,326, June 8, 1943, being adaptable for the purpose. In the press illustrated here this device is operated by a constant speed motor which operates continuously, the timing mechanism therein being connected to the motor by a clutch operated concurrently with the actuation of the starter button S. The timing motor, when engaged, operates a cam disk which, after a predetermined rotation moves the starter button S to a position where it operates a contactor to close the power circuit and the motor now rotates in reverse direction to open the press. The position of the starter button in the two running operations is shown in Fig. 20.

In the particular press shown here the timing device is also provided with a cam which in conjunction with a limit switch performs the "bumping" operation, referred to above, shortly after the mold is fully closed.

The automatic control shown herein further contemplates the use of a second limit switch operative when the press reaches the unloading or *g* position in Fig. 10 to stop the press before it reaches its fully open position. After the workman has performed the operations during unloading, he presses a second button S' which closes a circuit operating a contactor to close the power circuit to the motor **2** until the press is fully opened, whereupon the second limit switch again comes into action to stop the press.

The means selected to control the stopping of the press at the open and closed positions and also the bumping operation is one of the main gears **15**, in this case the right-hand gear.

As will be seen in Figs. 7, 8 and 12 the periphery of the right-hand gear **15** is provided with three grooves which are indicated, from right to left, as **120**, **121** and **122**. Secured to the plate **1** adjacent the lowerside of the gear in a bracket or housing **124** are three switches **125**, **126** and **127** provided with push buttons which are in alignment with the several grooves respectively. The order of the switches is immaterial but for the present purpose the switch **125** may be considered as the opening limit switch which breaks the circuit to the motor when the press has reached the unloading position and again when the press reaches its fully opened position. The switch **126** is the closing limit switch which arrests the movement of the press when it reaches its fully closed position. The switch **127** is the bumping switch which participates in the repeated opening and closing of the press during the cure. These switches are also marked 1M, 2M, 3M respectively on the wiring diagrams.

These several switches are operated by blocks set in the proper grooves on the gear so that the switches are operated when the press is in its correct position for the switches to function. As shown in Fig. 12[a] each block is split from its under surface and a threaded expansion screw **128** is received therein by which the block is clamped in its properly adjusted location on the periphery of the gear **15**. The location of these several switch operating blocks is shown in Fig. 1 and their timed relation is shown in Fig. 21. In the groove **120**, which coincides with the opening limit switch is set a block **130** which in Fig. 1 is at about the 12 o'clock position around the gear. When the press reaches the unloading position, however, as shown in Fig. 3, this block is at the control box **124** and has opened the switch **125**. The block for again actuating the switch **125** when the press is fully opened is indicated at **131** in the groove **120**. In Fig. 1 this block is at about the 10 o'clock position but reaches the control box when the press is fully opened as shown in Fig. 2.

The block for actuating the switch **126** for stopping the motor when the press is fully closed is located in the groove **121** and is designated by the numeral **132** and is coincident with the control box **124** when the press is fully closed, as in Fig. 1.

The block **133** for depressing the bumping switch **127** is set in the groove **122** and is spaced somewhat in advance of the block **132** depending upon the distance to which the mold is to be opened or "cracked" during bumping. Due to the fact that the bumping circuit is normally open, this switch is effective only during a portion of the curing cycle and only for a short period after the press is actually closed.

In the several wiring diagrams the direction in which the switches are moved by the several blocks on the main gear **15** is shown by the arrows applied thereto.

It is unnecessary to describe the construction and operation of the timing mechanism for devices of this nature are well known in the art and are standard equipment made and sold by a number of concerns. The timer is operated by a synchronous motor T which is shown in the various wiring diagrams on a secondary circuit **140** which receives current constantly so that the timer motor is continuously operated. If it is desired to by-pass the timer for special operations when the timer control is not desired, a throw-out switch **141** is provided. The relay R for the timer motor is located in a line **139** extending from the overload switches to the line **140**.

It may be noted at this point that the circuits for the various controls are shown as 110 v., current being supplied from the main 440 v. line to the motor T through a transformer **142**. It should also be noted that the power circuit, as distinct from the control circuit, of the motor **2**, is separate from the circuits shown.

Assuming that the press is fully opened and the circuits are in the condition shown in Fig. 15, and the mold cavities are filled, the operator presses the spring loaded starter button S to the right, which starts the motor **2**, and at the same time connects the motor T with the timing devices.

As shown in Fig. 15, the movement of the switch S to the right, i. e. to the dotted line position in Fig. 20, closes the line **145**, through the switch **125**, line **149**, switch **141** and return line **150**. In the line **145** is the coil **152** which is now being energized to operate a closing sticker switch **154** which completes the power circuit to the motor **2**, and also closes the gap between the plates of switch **154** in the control circuit. This is sufficient to cause the block **131** to leave the switch **125** which now shifts from the position shown in Fig. 15 to that shown in Fig. 20 and the current flows from line **145** through switch **154**,

line 155, the overload switch 109, line 146, safety switch 147, line 148, switch 126, to the line 149, switch 141 and return line 150. During the time that coil 152 is energized, it enables the sticker switch 154 to complete the circuit through the shunt line 155 so that current is maintained in the motor closing circuit during the closing operation and the push button may be released immediately when the press has started, said push button returning to its neutral position indicated by the term "Run" in Fig. 15.

The operation of the overload switches 107 and 109 has already been described, it being noted here that the line 155 is connected to one pole of the overload switch 109 and that the low limit switch is connected to the line 145.

When the press reaches its fully closed position the switch 126 is moved by the block 132 to open position as shown in Fig. 17 and the motor operating circuit is broken at this point.

When the full time for curing has elapsed the timer acts upon the starter button S and moves it to the left dotted line position shown in Fig. 20. The clutch in the timer is disconnected at the same time. Current now flows over the line 160, through the switch 125, line 149, switch 141 to the return line 150. In the line 160 is the coil 162 which is being energized to operate the opening sticker switch 163 which completes the power circuit to the motor 2 to start the opening of the press, and also closes the gap between the plates of switch 163 in the control circuit. The sticker switch 163 is located in the line 164 which connects with switch 127 and line 165 to the switch 125. This condition continues until the block 130 opens the switch 125 when the press is at unloading position, whereupon the conditions of Fig. 15 are reproduced, switch 126 having returned to its initial position as the press began its opening movement.

After the workman has performed the necessary operations at the unloading position he presses a second spring loaded button S' which is normally across the line 145 but which is now moved to the dotted line position shown in Fig. 20. This connects the line 170 with the line 164. The line 170 is also connected with the line 148 at the safety switch 147, and the circuit is completed through switch 126, line 149, switch 141 and line 150. A brief pressure on the switch S' is sufficient to start the motor by closing switch 163 to operate the press to move the block 130 off the switch 125 permitting the latter to return to its Fig. 20 position. Movement of switch 125 to its Fig. 20 position re-establishes the original press opening circuit through switch 125, and the return of button S' breaks the circuit that included line 170. Thus, normal opening of the press is resumed and continues until the block 131 again stops the press by opening the switch 125 at the fully opened position.

The safety switch 147 is moved only in case of accident during closing. Devices for throwing safety switches are well known and need not be described or shown. When moved in the direction of the arrow applied thereto in the various wiring diagrams, it reverses the direction of the motor instantly. These circuits are clearly shown and need not be described.

A push button switch 172 is located at any convenient point, here shown as in the common return line 150, by which the operator can stop the movement of the press at any point without preventing its continued operation when the button is released.

The bumping operation

The opening bumping operation is performed through a special switch 175 which is located in a circuit which opens the press. This switch is open during the entire period of press operation except during the bumping operation. In conjunction with this switch the switch 127, which is actuated by the block 133, brings the press back to its closed position.

This special bumping circuit switch is indicated at 175 in the wiring diagrams and its actual position and construction is shown in Figs. 13 to 14b. As shown, it connects the line 164 with a line 176 which leads to a pole 177 of the switch 126. It will be seen by an inspection of Figs. 17 and 18 that when the press is fully closed and the switch 175 is closed an opening circuit is provided through these instrumentalities. This opening circuit includes coil 162, line 160, line 164, switch 175, line 176, switch 126, line 149, switch 141 and return line 150. A second circuit leads from line 149, through switch 125, line 165, switch 127, to line 164, which circuit will be established as soon as the plates of switch 163 move together by energization from coil 162. As soon as switch 175 is closed as in Fig. 18, coil 162 will be energized to operate switch 163 to start the motor to open the press and to move the plates of switch 163 together to complete said second circuit. As soon as the press begins to open, block 132 moves away from switch 126 and the latter returns to its open position (Fig. 19) and breaks the opening circuit that included switch 175, without, however, affecting the said second circuit which permits the press to continue its opening movement. Since, in this second circuit is located the switch 127, when the block 133 strikes this switch the latter moves to its Fig. 19 position breaking the second circuit and arresting the opening movement of the press. In its Fig. 19 position, switch 127 connects line 180, leading from line 145, with line 155. In line 180 is a spring biased sticker switch 182, the plates of which are held apart by the energization of coil 162 during the opening of the press, but as soon as the opening circuit is broken and coil 162 de-energized, the spring action closes the plates of switch 182. Thus, a temporary closing circuit is set up (Fig. 19) that includes coil 152, line 145, line 180, switch 182, switch 127, line 155, switch 109, line 146, safety switch 147, line 148, switch 126, line 149, switch 141 and return line 150. As soon as this temporary closing circuit is established, coil 152 is energized to start the motor 2 to close the press and the plates of switch 154 are moved together to connect line 145 directly to line 155. As the press moves to closed position, block 133 will move out of contact with switch 127 and the latter will return to its Fig. 18 position, breaking the temporary closing circuit, but since the regular closing circuit has been re-established through switch 154, the closing movement of the press continues until the switch 126 is again moved by the block 132 from the position shown in Fig. 19 to that shown in Fig. 18, whereupon the closing circuit is broken and the opening circuit re-established.

It will be seen, therefore, that during the period that the switch 175 is closed, as shown in Figs. 18 and 19, the press will oscillate between fully closed position and partially open position over a spaced determined by the setting of the block 133. This is shown in Fig. 21 as the space between the area marked 133 and the right-hand area marked 132.

The time during which the switch 175 is closed and, therefore, the period during which bumping takes place and consequently the number of bumps, is controlled by the timer as will be more fully described, reference being directed particularly to Figs. 13 to 14b.

In the line 176 is a snap switch 184 which can be thrown so as to by-pass the bumping switch altogether in the event no bumping is desired. An overload circuit breaker 183 is located at a convenient point in the circuits.

The timer is located at any point convenient to the operator as he stands at the press. The timer box or casing, which houses the motor T and the various control elements operated thereby, is indicated at 185. It is built with a compartment 186 which houses the bumper control mechanism. The main control shaft of the timer is marked 188, this being driven at slow speed by the motor T when the operating clutch is engaged so that it completes a full revolution with each cycle from the start of the press on its closing movement to the point where it begins its opening movement concurrently with the opening of the clutch.

On the shaft 188 is a flange 189 against which the cam, indicated as a whole by the numeral 190, is located. This cam is preferably composed of two flat plates or disks rotatable relatively to one another about the shaft 188 and held in adjusted position by a nut 191 on a screw threaded portion of the shaft which presses against the block 192 to hold the two disks in their proper adjusted position. The cam 190 is made up of the two disks 190a and 190b, the working edge portion of the latter having a slightly greater radius than the radius of the former.

The switch 175 is normally open, as indicated in all of the wiring diagrams except Figs. 18 and 19. Over the switch 175 and normally out of contact with it is the horizontal arm of an angular switch operating lever 194 pivoted at 195 in the housing. The vertical arm of lever 194 extends to a point adjacent the cam 190 where it is forked as shown in Fig. 14a and carries a transverse pin 196. This pin is located in the path of an adjustable set screw 198 carried in a lug 199 formed on the outer end of a lever 200. The lever 200 is provided on its outer end with a depending fork 201 in which is mounted a roller 202 which lies in the path of the composite cam 190.

When the bumping operation is inactive the lever 200 rests with one of the forks 201 on the top of a wall of the housing as shown in Fig. 14, at which time the edges of the cam disks 190a and 190b are out of contact with the roller 202. Shortly after the cam 190 starts to move in the direction of the arrow in Fig. 13, as it will when the timer starts in operation, the high part of disk 190a passes under the roller 202 and lifts the lever 200 to the point where the end of the screw 198 strikes the pin 196 which rocks the lever 194 and closes the switch 175. The bumping operation will therefore continue as long as the roller 202 is in contact with the cam disk 190a. This position of the parts is shown in Fig. 14b and will continue for a period dependent upon the relative positions of the disks 190a and 190b.

When the shaft 188 has rotated so that the disk 190b reaches the roller 202 the screw 198 will pass above the pin 196 and the lever 194 will drop down again to its normal position opening the switch 175 and "bumping" will cease.

Résumé

The press being in the position shown in Fig. 2, and the molds being properly cleaned and lubricated, and the cavities in the lower mold being filled with blanks of uncured stock, the operator presses the button S which starts the press on its closing movement. The same operation also connects the timing motor with the various movable time control devices. The actuation of the starter button engages the sticker switch 154 and the motor continues its movement after the button S is released.

As the molds close on the stock, the resistance offered by the stock increases as explained, but the press continues its closing movement until the resistance reaches the predetermined high level selected as 800,000 lbs., at which point the closing movement of the press is arrested by the operation of the overload switches shown in Figs. 9 and 9a. This is due to the relative movement between the bar 100 and the arm 30 on which it is carried, the latter stretching under the load exerted by the resistance of the stiff stock. The circuits to the motor are broken in the manner described. If the "follow up" is used the press will remain immovable until the stock has softened sufficiently to reduce the load on the arms 30 to the selected low limit, here 500,000 lbs., whereupon the closing circuit will be reestablished and the press will resume its closing movement until the resistance again reaches the high level. This intermittent closing will continue until the press is fully closed.

When the press reaches its fully closed position the block 132 opens the closing circuit and the press remains closed during the period determined by the timer, except for the bumping operation, if this is employed.

As explained, the bumping operation occurs only during the interval that the cam disk 190a keeps the bumping circuit switch 175 in operation for a sufficient period to release the gases from the molds. The number of distinct bumping operations is determined by the time interval during which the cam surface 190a is in contact with the bumping switch lever 200.

When disk 190b comes into play bumping ceases and the press remains closed until the timer moves the switch S to the dotted line position of Fig. 20, whereupon the timing motor clutch is disconnected and the motor 2 is reversed and the press starts its opening movement. This movement continues until the block 130 opens the switch 125 which arrests the press in the position shown in Fig. 3.

During the opening movement the movable platen 88 has, through the action of the cam plate 80, dropped to the position shown in Fig. 3 so as to provide easy access to the upper mold section. When the upper mold is freed of articles adhering thereto and is properly swabbed the operator presses the button S' and the press resumes its opening movement, the platen 88 being picked up and restored to parallelism with the platen 40. When the press reaches its fully open position the block 131 opens the circuits through the switch 125.

During the travel from open to closed position and return the upper platen 40 has been guided in its movement by the arm 70 and by the cam 80. As the two platens approach their closed position the movable platen 88 is restored to its position in contact with the platen 40. As the platens near their final closed position the upper platen is parallel to the lower platen and during the final closing movement the upper platen moves in a straight line. This action is assured by the

joint action of the various upper platen guiding means.

It will thus be seen that a wholly new and novel press has been designed which makes it thoroughly practical to cure goods of the types specified in mechanically operated presses. While the description and drawings have been detailed so as to give a full exposition of the best known and preferred form of the invention, it is not intended to limit the invention to the specific embodiment shown and described. The strain gage as the elements shown in Figs. 9 and 9a are sometimes called is a novel means of controlling a mechanically operated press so that it adapts itself to the particular type of molding operations which this press is intended to perform without endangering the press. When the full complement of switches shown in these views are employed the press simulates the "follow up" action of a hydraulic press.

While the various elements of the press shown cooperate in combination to achieve the results specified in the most efficient manner, it will be obvious that the several elements may also be employed individually and it is not intended that the invention shall be limited to the simultaneous use of all of the features shown and described.

What is claimed is:

1. In a press of the character described, a base, a mold section fastened to said base, a toggle mechanism for opening and closing the press comprising an arm pivoted to the base, a swinging link pivoted on the end of said arm, a platen pivoted on the end of said link, a swinging mold-support mounted on a horizontal axis on the platen and to which a second mold section is fastened, a cam secured to the arm, and a cam follower on the mold support and movable over the cam by the operation of the toggle mechanism, said cam being shaped so as to raise and lower the mold support during the closing and opening of the press respectively.

2. In a press of the character described, a base, a mold section fastened to said base, a toggle mechanism for opening and closing the press comprising an arm pivoted to the base, a swinging link pivoted on the end of said arm, a platen pivoted on the end of said link, a swinging mold-support mounted in a horizontal axis on the platen to which a second mold section is fastened, a cam secured to the arm and a cam follower on the mold support and movable over the cam by the operation of the toggle mechanism, said cam being shaped so as to lower the mold-support during a part of the opening movement of the press and to raise the mold-support during the final portion of the opening movement.

3. A press for molding plastic materials comprising a base, a mold section attached to the base, a movable platen above the base, means to raise and lower the platen to open and close the press, a mold support hinged to the platen, a second mold section carried by the support, means operative during the opening of the press to rock said mold-support to present the mold at an inclined angle with respect to the platen when the press is partially open and to move the mold support into parallelism with the platen at the end of the opening movement, and means to arrest the opening movement of the press in said partially open position.

4. A press for molding plastic materials comprising a base, a mold section attached to the base, a movable platen above the base, means to raise and lower the platen to open and close the press, a mold support hinged to the platen on a horizontal axis, a cam and a cam follower operative during press operation to lower the mold support away from the platen while the press is in partially open condition and to move the mold-support into parallelism with the platen when the press is at either limit of its movement and means to arrest the opening movement of the press when the press is partially open and the mold-support is in a lowered position.

5. A press for molding plastic materials comprising a base, a mold section attached to the base, a movable platen above the base, means to raise and lower the platen to open and close the press, a mold support hinged to the platen on a horizontal axis, a cam and a cam follower operative during press operation to lower the mold support away from the platen while the press is in partially open condition and to move the mold-support into parallelism with the platen when the press is at either limit of its movement, and means to arrest the opening movement of the press when the press is partially open and the mold support is in a lowered position and to arrest the press at either extreme of its movement.

6. A press for molding plastic materials comprising a base, a mold section attached to the base, a movable platen above the base, means to raise and lower the platen to open and close the press, a mold support hinged to the platen, a second mold section carried by the support, means operative during the opening of the press to rock said mold-support to present the mold at an inclined angle with respect to the platen when the press is partially open and to move the mold support into parallelism with the platen at the extremes of the opening and closing movements, and means to arrest the opening movement of the press in said partially open position.

7. A press for the treatment of plastic stocks having relatively movable platens, complementary mold sections carried by the platens, a motor, mechanical connections operated by the motor to close and open the press, mechanism carried by a member of the press responsive to the strain in said member exerted by the resistance of the stock on approach of the platens prior to complete closure thereof to arrest the motor when said strain reaches a predetermined value, and means responsive to a decrease in the strain in said member to cause the motor to resume its closing movement.

8. A press for the treatment of plastic stocks having relatively movable platens, complementary mold sections carried by the platens, a motor, mechanical connections operated by the motor to close and open the press, said connections including a toggle link extending across the mold sections, mechanism carried by said toggle link responsive to the strain in said toggle link exerted by the resistance of the stock on approach of the platens prior to complete closure thereof to arrest the motor when said strain reaches a predetermined value, and means responsive to a decrease in the strain in said toggle link to cause the motor to resume its closing movement.

9. A press for the treatment of plastic stocks having relatively movable platens, complementary mold sections carried by the platens, a motor, mechanical connections operated by the motor to close and open the press, said connections including a toggle link extending across the mold sections, a floating bar attached near one end to said toggle link, mechanism carried by said toggle link and actuated by relative move-

ment of said bar and toggle link in response to the strain in said toggle link exerted by the resistance of the stock on approach of the platens prior to complete closure thereof to arrest the motor when said strain reaches a predetermined value, and means actuated by relative movement of said bar and toggle link in response to a decrease in the strain in said toggle link to cause the motor to resume its closing movement.

10. In a press, a pair of mating heated mold sections having cavities therein for molding plastic stocks, an electric motor, mechanical connections between the motor and the mold sections to draw the sections together over the stock in the mold cavities, circuit breaking means controlling the circuit to the motor, mechanism carried by a member of the press responsive to the strain in said member exerted by the resistance of the stock on approach of the mold sections prior to complete closure thereof to open said circuit breaking means when said strain reaches a predetermined value, and to hold said circuit breaking means open until the strain in said member decreases to a second predetermined value, and means thereafter responsive to said decrease in the strain in said member to close said circuit breaking means.

11. In a press, a pair of mating heated mold sections having cavities therein for molding plastic stocks, an electric motor, mechanical connections between the motor and the mold sections to draw the sections together over the stock in the mold cavities, said connections including a link, circuit breaking means controlling the circuit to the motor, mechanism carried by said link responsive to the strain in said link exerted by the resistance of the stock on approach of the mold sections prior to complete closure thereof to open said circuit breaking means when said strain reaches a predetermined value, and to hold said circuit breaking means open until the strain in said link decreases to a second predetermined value, and means thereafter responsive to said decrease in the strain in said link to close said circuit breaking means.

12. In a press, a pair of mating heated mold sections having cavities therein for molding plastic stocks, an electric motor, mechanical connections between the motor and the mold sections to draw the sections together over the stock in the mold cavities, said connections including a link, a floating bar attached near one end to said link, circuit breaking means controlling the circuit to the motor, mechanism carried by said link and actuated by relative movement of said bar and link in response to the strain in said link exerted by the resistance of the stock on approach of the mold sections prior to complete closure thereof to open said circuit breaking means when said strain reaches a predetermined value, and to hold said circuit breaking means open until the strain in said link decreases to a second predetermined value, and means actuated by relative movement of said bar and link in response to said decrease in the strain in said link to thereafter close said circuit breaking means.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,979,246	Bast	Nov. 6, 1934
2,054,476	Derry et al.	Sept. 15, 1936
2,095,299	Thweatt et al.	Oct. 12, 1937
2,260,966	Brundage	Oct. 28, 1941
2,293,815	Gates	Aug. 25, 1942
2,349,916	Stacy	May 30, 1944
2,367,242	Stacy	Jan. 16, 1945