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Fig. 1

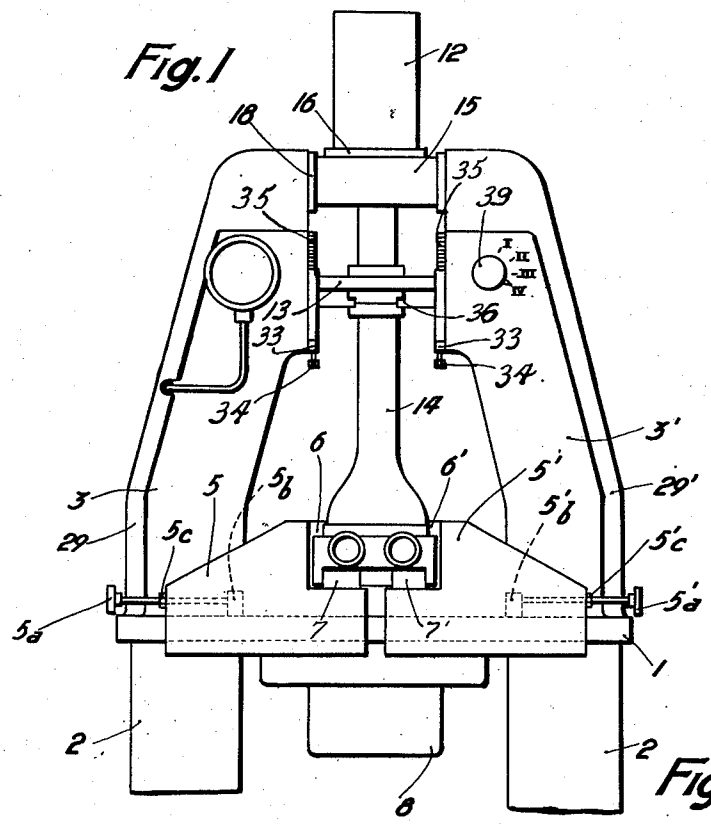


Fig. 5

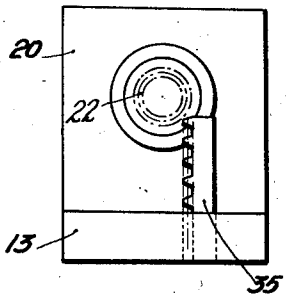
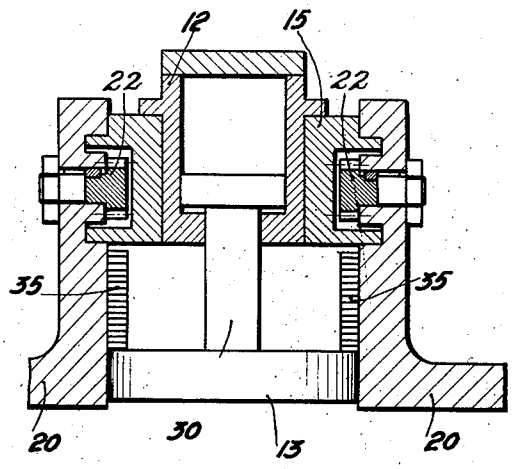


Fig. 4



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Fig.2

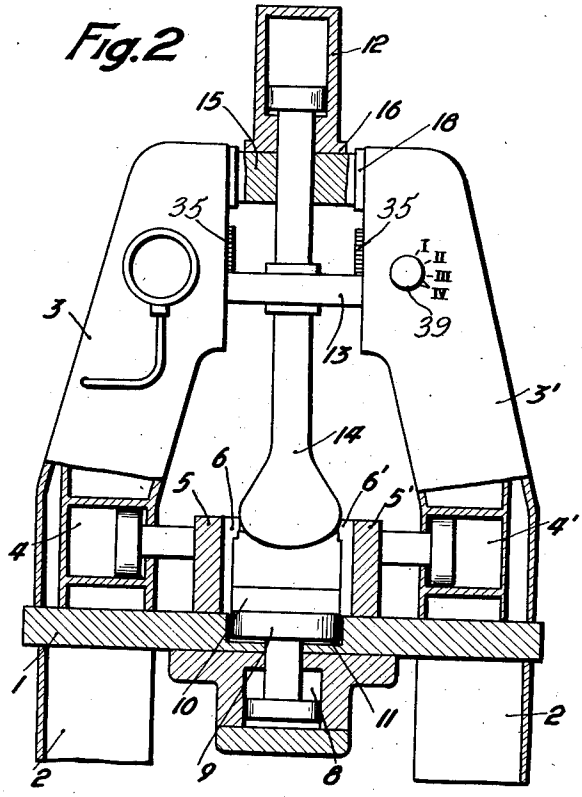


Fig.3

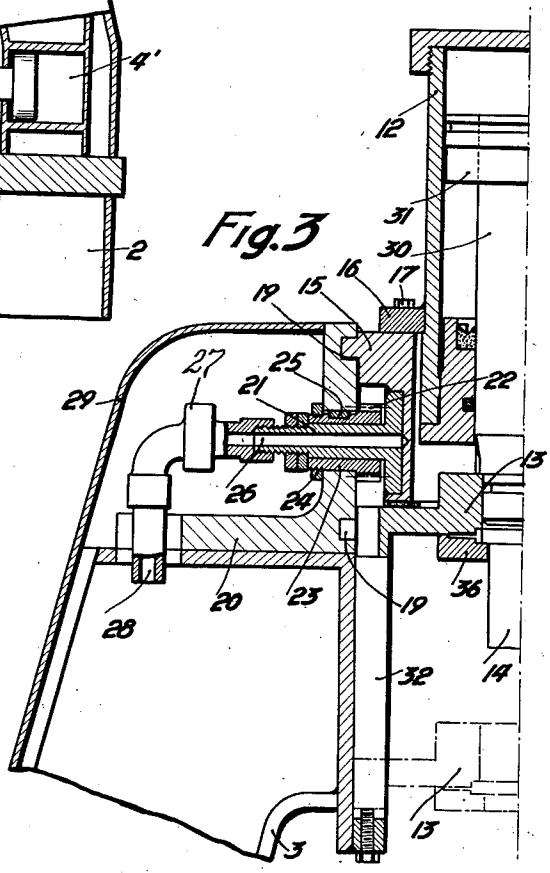
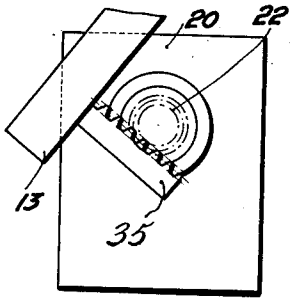


Fig.6



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Fig.7

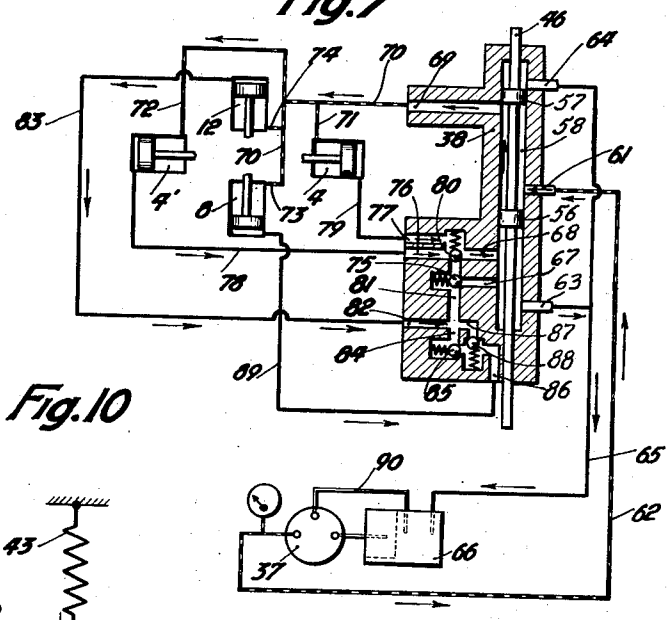


Fig.8

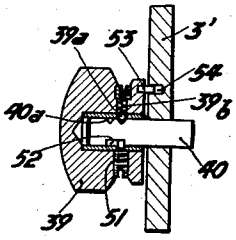


Fig.10

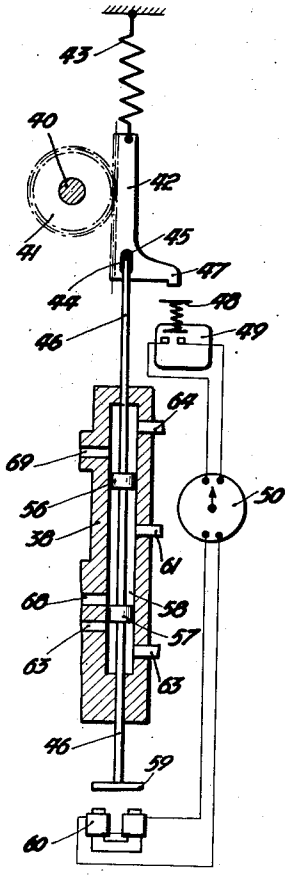


Fig.9

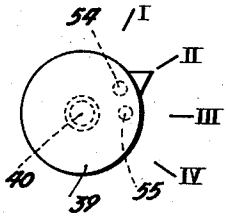
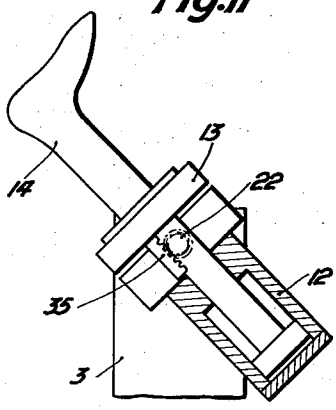


Fig.11



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Fig. 12

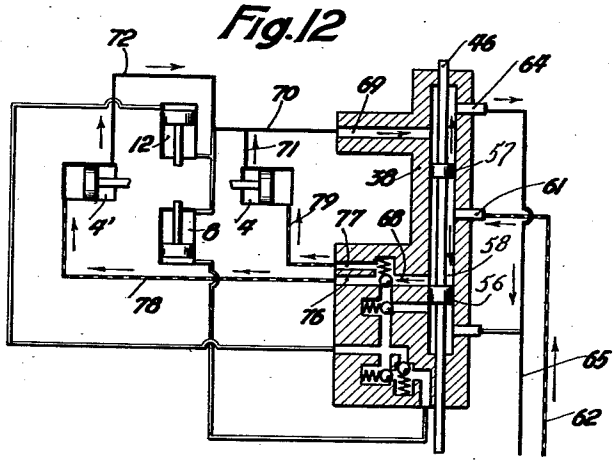


Fig. 13

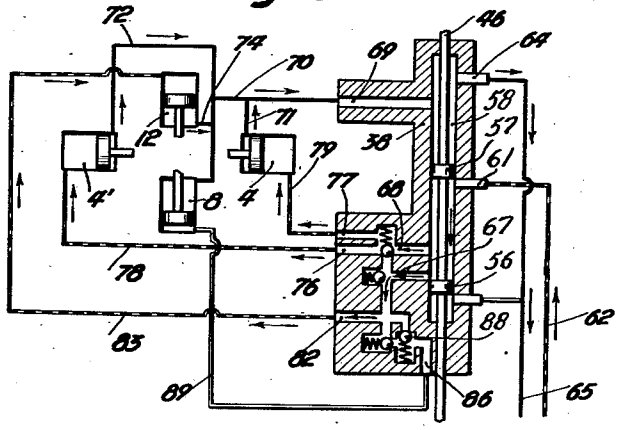
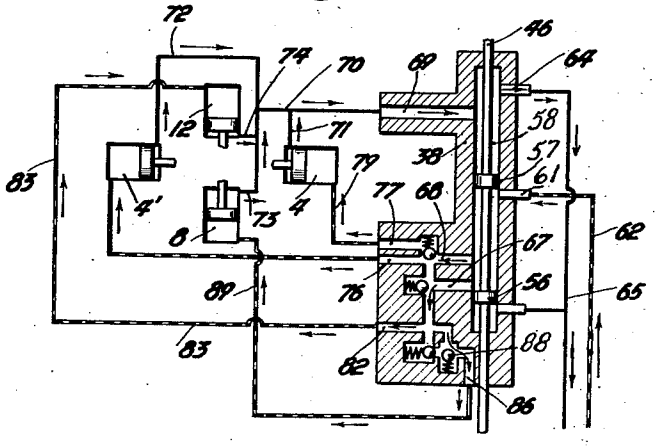


Fig. 14



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Fig. 15

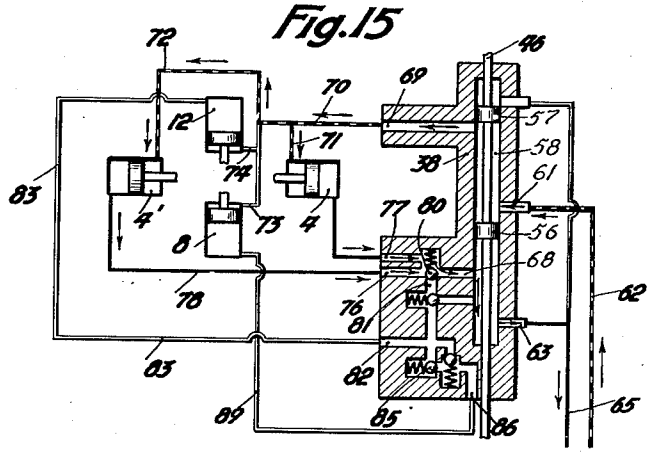


Fig. 16

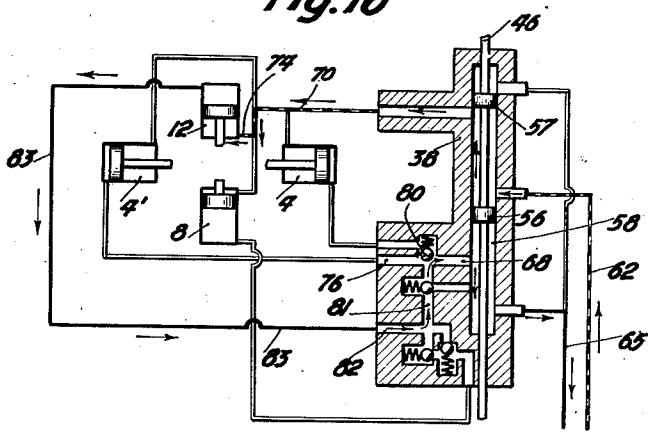
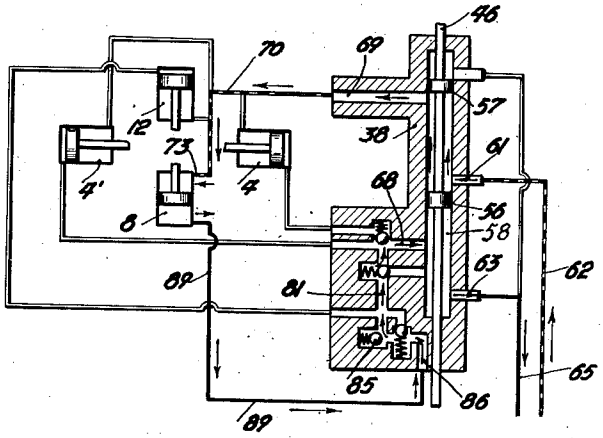


Fig. 17



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United States Patent Office

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VULCANISING PRESS

Christian Canat, Chalabre, France

Application March 1, 1955, Serial No. 491,364

Claims priority, application France October 25, 1954

2 Claims. (Cl. 18—17)

The present invention relates to a hydraulic press for the vulcanisation of footwear on shapes. Presses are already known in which a shape carrying the leg of the boot co-operates with a mould consisting of three moving parts which are separated from each other or are brought together simultaneously during the opening or the closing of the mould.

In this type of machine, the lower part of the mould is located in its final position as soon as the mould is closed and it is necessary to use a pre-formed sole, and this necessitates a first operation which increases the cost of the total treatment.

In addition, the shape rises vertically above the mould, but remains in a position which does not assist in any way the taking-out and the re-insertion of the shape, which necessitates the dismantling of the shape in order to carry out these operations. Certain machines enable the shape to be rotated, but this operation has to be carried out manually.

Finally, the movements of the four members, even when they are effected by means of hydraulic jacks, are controlled wholly by manual means.

The invention has for its object to provide a hydraulic press which incorporates very definite improvements with respect to presses already existing.

This press comprises essentially a mould made up of three members: two lateral members corresponding to the peripheral part of the sole of the boot and carried by jaws which slide on the table of the press, a lower or bottom member corresponding to the sole of the boot itself and moved vertically with respect to the table, the said mould co-operating with a shape which carries the leg of the boot with which the sole is to be vulcanised after the four members referred to above have been brought together, the shape being moved vertically in the opposite direction to the lower member above-mentioned, these four members being each moved by a double-acting hydraulic jack and the hydraulic circuits of the four jacks which correspond to them being controlled by means of a block valve with a single control. The upper jack which moves the shape is rotatably mounted about a horizontal axis and automatically causes rotation of the shape in order to bring it into a position which facilitates the taking out and the re-insertion of the shape when, the vulcanisation of a boot being completed, the moving plate of the said jack, which is provided with two racks, arrives at a certain level above the table of the press and when the said racks engage with two fixed pinions mounted on the arms which carry the jack. The arrangement of the mould enables the raw material to be directly employed in its granular form which avoids the usual pre-forming of the sole and results in an appreciable economy.

The dividing-up of the closure of the mould into two stages enables the two lateral parts to be closed first in practice, whilst the sole-carrying base of the mould is held below the level which it must finally occupy during the vulcanisation process. In its lowermost position, the

bottom creates in the mould a space, the volume of which is greater than the volume of the raw material with which it is to be filled, this remaining always at a level below that of the lips of the mould.

The rotatable mounting of the upper jack which carries the shape enables the latter to pivot automatically when it reaches a certain level above the mould in its upward travel, the shape then taking up at the end of the operation a position which considerably facilitates the taking-out and the re-insertion of the shape without having to remove the shape from its support. In addition to the saving of time which is effected, this arrangement also avoids the errors of adjustment which may constantly arise during the dismantling and re-assembly of the shape. This maintenance of precision in the position of the shape with respect to the mould contributes to an improvement in the quality of the work.

This precision is also obtained by means of excellent guiding control of the plate which carries the shape and which is moved by the upper jack.

The jacks may be actuated partly by hand but also automatically under the control, on the one hand, of the pressure created in the hydraulic circuit and, on the other hand, of a time-control arrangement.

Thus, the upward movement of the sole-carrier bottom of the mould is obtained automatically by the effect of the difference of pressure produced in the hydraulic circuit when the shape has been brought into position between the closed lateral parts, and above the granular moulding material. On the other hand, the separation of the lateral parts, the upward movement of the shape and the downward movement of the bottom of the mould are obtained automatically by the simple action of the pressure obtained in the hydraulic return circuit after the time-control itself has automatically caused these successive operations to start.

The said control block valve comprises two slide valves moving inside a cylinder and coupled to a single rod actuated by a control button which enables the said slide-valves to be given different positions with respect to conduits leading into the said cylinder and comprising, on the one hand, a central conduit connected to a supply pipe containing fluid under pressure and two end conduits connected to the return piping system of the fluid, and on the other hand, a conduit connected to the front chambers of the four jacks to ensure the admission of fluid into the said chambers or its exhaust, a conduit connected directly to the rear chambers of the two lateral jacks which may thus operate simultaneously, and a conduit supplying the rear chambers of the upper and lower jacks through selectively-acting flap-valves, the said chambers operating in succession and independently of the lateral jacks.

The control knob acts on the rod which is rigidly fixed to the slide-valves through the intermediary of a pinion engaging with a toothed rack.

The control knob and the valve-carrier rod may take up four positions and may be mechanically interlocked in the two intermediate positions, whilst in one of the extreme positions corresponding to the complete closure of the mould, they are locked by means of an electro-magnet energised from a circuit controlled by a timing mechanism which is set in operation by a switch operated by the rack when the knob is moved to the said extreme position.

The rack and the valve-carrier rod are continuously urged upwards by a spring acting in opposition to the electro-magnet and causing the rack and the valve-carrier rod to move upward when the electro-magnet is no longer energised, the position thus given to the valves enabling automatic selection to be made of the operations of open-

ing of the mould by the action of the flap-valves as a function of the pressure of the fluid in the return circuit.

The timing device holds the rack and the valve-carrier rod locked in position through the medium of the electromagnet during the entire period of heating for vulcanisation.

The press constructed in conformity with the invention is described in detail in the course of the description which follows and with reference to the attached drawings in which:

Fig. 1 is a diagrammatic view in elevation of the said press in the completely closed position during the vulcanisation process.

Fig. 2 is an identical view with partial cross-sections.

Fig. 3 is a detail view in cross-section, and to a larger scale, of the upper part of the press.

Fig. 4 shows diagrammatically in cross-section the method of mounting of the upper jack.

Fig. 5 shows diagrammatically the respective position of the members which cause rotation of the upper jack when the said jack has arrived at the bottom end of its travel.

Fig. 6 is an identical view, the upper jack being here at the end of its upward travel.

Fig. 7 shows diagrammatically in cross-section the block-valve which controls the hydraulic circuit of the jacks.

Fig. 8 shows in cross-section and in outline the control knob of the press.

Fig. 9 shows a front view of the said knob.

Fig. 10 is a view in diagrammatic cross-section of the control device for the block-valve.

Fig. 11 shows diagrammatically the upper jack in the position of taking-out and re-insertion of the shape.

Figs. 12 to 17 are diagrams showing the various circuits created by the block-valve which controls the hydraulic circuit.

The press constructed in accordance with the invention is constituted by a table **1** of steel (Figs. 1 and 2) carried on a framework **2** of sheet steel suitably folded so as to form an interior casing, and on which are fixed two hollow arms **3** and **3'** of cast-iron, which form an arch above the table.

Inside the two arms **3** and **3'** are arranged jacks **4** and **4'** respectively, mounted horizontally, the shafts of the pistons of which act on two jaws **5** and **5'** which slide on the table **1** so as to form a clamp or vice. The jaws carry the lateral parts **6** and **6'** of the mould on their inner faces. The said parts slide in slide-ways **7** and **7'** of the dove-tail type formed on the jaws **5** and **5'** so as to enable the individual adjustment of the position of the parts **6** and **6'**, as between each other and with respect to the other members of the mould. After adjustment, the said parts are locked in position by means of bolts screwed into the jaws.

Two screws **5***a* and **5'***a* which terminate in knurled knobs screw into the two jaws on either side of the arms **3** and **3'** and on each side of the machine in order to limit the travel of the said jaws when the jacks **4** and **4'** bring them close to each other. The free extremities of the screws may to this end come into abutment with stop members **5***b* and **5'***b* carried by the table **1**. Locking nuts **5***c* and **5'***c* enable the screws **5***a* and **5'***a* to be locked in their adjusted positions. This limit of travel is necessary in order to centre the two lateral parts of the mould.

Below the table **1** is fixed a further jack **8**, the piston shaft of which is directed vertically and acts on a plate **9** which carries the lower part **10** of the mould. The plate **9** may thus be raised or lowered under the action of the lower jack **8**. In its lower position, it is received in a central space **11** formed in the table **1**.

At the upper part of the arms **3** and **3'** is mounted a jack **12** the piston shaft of which acts on a plate **13** which receives the shape or the core **14**. The jack **12** can turn

about a horizontal axis together with the plate **13** and the shape which it supports. To this end, the body of the jack **12** (see Fig. 3) is mounted on a yoke **15** the central bore of which permits the passage of the lower part of the jack. A flange **16**, rigidly fixed to the body of the jack enables the latter to be fixed on the yoke **15** by means of bolts **17**.

The yoke **15** is provided at each side with a circular bearing surface **18** which is engaged in a circular groove **19** formed in the vertical arm of a right-angle bracket **20** fixed to the top of each of the arms **3** and **3'**. On the yoke **15** is fixed a pivot **21** which passes through a pinion **22** on a tube **23**. The tube **23** itself passes through the bracket **20** and receives a nut **24** which holds the pinion **22** in position. A key **25** prevents the pinion from rotating.

The pivot **21** is provided with a central bore **26** and its threaded end enables it to be coupled to a rotary coupling **27** which puts the bore **26** in communication with a piping system **28** belonging to the hydraulic control system of the press. The piping system **28** and all the other pipes which terminate at the jacks **4**, **4'** and **8** are arranged in the arms **3** and **3'** and are thus concealed from view while at the same time they are readily accessible, the said arms being fitted with removable hoods **29** and **29'**.

The bore **26** of one of the pivots **21** is put in communication, by means of conduits (not shown), with one of the chambers of the cylinder of the jack **12**. The other chamber is put in communication with the bore **26** of the pivot **21** located on the other side of the press.

At the lower part of the shaft **30** of the piston **31** of the jack **12** is fitted the plate **13** which is intended to receive, in a suitable slide-way system, the shape **14**. The said plate slides under the impulsion of the piston **31** between two slides **32** fixed on each of the arms **3** and **3'**. A stop member **33** provided with an adjusting screw **34** enables the travel of the plate **13** towards the base to be limited at the position shown in chain-dotted lines in Fig. 3, on each side of the press.

On each of the sides of the plate **13** is mounted a rack **35** (see Fig. 1) which is intended to come into engagement with the corresponding fixed pinion **22** when the said plate is moved upwards by the jack and has reached a certain level above the table. It will immediately be seen that when the plate reaches this level and continues to rise under the thrust of the jack **12**, the racks **35** engage with the fixed pinion **22** and are forced to rotate around these latter, carrying with them in their rotation the assembly formed by the jack **12**, the plate **13** and the shape **14**. The said assembly will then take up, at the end of the travel of the jack, the position shown in Fig. 6.

The shape or the core **14** is mounted on the plate **13** by means of fixing members **36** (see Figs. 1 and 3).

The press is completed by an electric heating equipment with thermostatic control for 24 volts which ensures the heating of the mould to effect the vulcanisation, and by an electric pump set **37** (see Fig. 7) which provides the necessary pressure for the hydraulic circuit supplying the jacks, either directly or through the intermediary of an accumulator. One electric pump set can supply a number of presses.

The hydraulic circuit of the jacks is controlled by a control block valve **58** disposed in one of the arms of the press. This control block is actuated by means of a knob **39** (see Figs. 1 and 8) located, for example, in the right-hand arm **3'** of the press and accessible on the front wall of this arm.

The knob **39** (see Figs. 8 to 10) is mounted on the end of a shaft **40** on which is keyed a pinion **41** engaging with a toothed rack **42**. The latter is constantly urged upwards by means of a spring **43** fixed on the arm **3'**. At its base, the rack is provided with an elongated slot **44** in which a pivot **45** rigidly fixed to a rod **46** is

adapted to slide. In addition, the rack **42** is extended laterally by a finger **47** arranged so as to be able to come up against the push-rod **48** of a switch **49** in the bottom position of the rack.

The switch **49** operates in the circuit of a time-delay device **50**, the function of which will be seen later. The knob **39** is keyed on the shaft **40** by means of a key or a grub-screw **51** which slides in a slot **52** formed in the shaft. It is provided on its rear face with a stud **53** which may engage in either of two blind holes **54** and **55** formed in the wall of the arm **3'**. The knob **39** may thus be brought at will into two positions in which the stud **52** is free from either of the holes **54** or **55**, or is engaged in one of the latter. It will be seen that the knob may take up two positions in which it is locked. A ball **39***a*, loaded by a spring **39***b* engages in two blind holes **40***a* formed in the shaft **40** in order to mark the positions of the knob on the shaft in the longitudinal sense of the latter.

In order to ensure the control of all the movements of the four jacks, four positions must be provided for the knob **39**. These four positions are shown in Fig. 9 and are indicated by the Roman figures I, II, III, and IV.

It will be clear that by rotating the knob **39**, the pinion **41** is turned at the same time and this in its turn moves the rack vertically. The movements of the rack are transmitted to the rod **46** which carries valves **56** and **57** sliding in a cylinder **58** so as to form a distribution slide-valve inside the block **38**.

The rod **46** is extended below the valve **57** to pass through the base of the block **38**. It is provided at its extremity with a small iron plate **59** in the alignment of which is arranged an electromagnet **60**, the energisation of which is controlled by the timing device **50**.

The control block valve **38** (see Fig. 7) comprises six conduits leading into the cylinder **58**. A central conduit **61** connected by a piping system **62** to the motor-pump set **37** supplies fluid under pressure. Two conduits **63** and **64**, connected to a piping system **65** provide for the return of the fluid to the reservoir **66** of the supply installation. Two conduits **67** and **68** enable the cylinder **58** to be connected to the rear chamber of each of the jacks **4**, **4'**, **8** and **12**. A conduit **69** enables the cylinder **58** to be connected to the rear chamber of each of the said jacks by means of a main piping system **70** to which are coupled the piping systems **71**, **72**, **73** and **74**, coming from the jacks.

The conduit **67** is shut-off by means of a flap-valve or a ball **75** subjected to the pressure of a spring calibrated at 10 kg., for example. The conduit **68** is divided into two conduits **76** and **77**, the first of which is connected through a piping system **78** to the rear chamber of the jack **4**, and the second through a piping system **79** to the rear chamber of the jack **4'**, or vice-versa.

The conduit **68** may be put in communication, by the action of a valve or a ball **80** to which is applied the thrust of a spring calibrated at 10 kg., for example, with a further conduit **81** arranged in parallel with the cylinder **58**. The conduit **81** is sub-divided into three channels: a conduit **82** coupled through a piping system **83** to the rear chamber of the upper jack **12**; a conduit **84** communicating by the action of a ball controlled by a spring calibrated at 20 kg., for example, with a conduit **86**; and finally a conduit **87** closed by a ball **88**, also subjected to the pressure of a spring calibrated at 20 kg., and which conduit may thus communicate with the conduit **86**. The latter is connected through a piping system **89** to the rear chamber of the lower jack **8**.

The operation of the whole assembly of the press by the simple control of the knob **39** is as follows:

When the knob **39** is set in such a way that its indicator is opposite the graduation I (see Fig. 9), its stud **53** cannot engage in either of the holes. The said knob is thus placed in its forward position on the shaft **40**. The rack **42** is drawn upwards by the spring **43** and the rod **46** is also retained in its upper position.

In this position, the two valves **56** and **57** are located in the cylinder **58** of the block-valve **38**, as shown in Fig. 7. It will be seen in this figure that if the motor-pump set **37** is operating, the fluid passes through the supply piping system **62**, the conduit **61**, the cylinder **58**, the conduit **69**, the piping system **70** and passes, through the secondary piping systems **71**, **72**, **73** and **74**, to the front chambers of the four jacks **4**, **4'**, **8** and **12**, which are thus maintained in the position of rest, that is to say their pistons are at the extreme limit of their inward travel.

In this position, the lateral parts **6** and **6'** of the mould are separated from each other, the plate **13** of the upper jack **12** is at its upper position and is directed with the shape **14**, as shown in Fig. 11, to the position at which the shape is removed, and finally, the plate **9** together with the lower part **10** of the mould is in its lower position.

When the knob **39** is turned into the position II and its stud **53** is engaged in the first hole **54** (see Fig. 9), the rod **46** and in consequence the valves **56** and **57** are brought into the position shown in Fig. 12.

It will be seen that the fluid then passes through the piping system **62**, the conduit **61**, the cylinder **58**, the conduit **68**, and then through the two conduits **76** and **77**, and through the piping systems **78** and **79** respectively, reaches the rear chambers of the jacks **4'** and **4**. The fluid causes the closure of the lateral parts **6** and **6'** of the mould. The fluid under pressure in the front chambers of the jacks flows out through the piping systems **72**, **71**, **70**, the conduit **69**, the cylinder **58**, the conduit **64** and the piping system **65**.

When the lateral parts **6** and **6'** are completely closed on the lower part of the mould, the filling of the cavity thus created is effected.

The leg having been placed on the shape **14**, the knob **39** may then be changed over to its position III, in which it is retained by the stud **53** in engagement with the hole **55** (see Fig. 9). The rod **46** and the valves **56** and **57** are then brought into the position shown in Fig. 13. In this position, the fluid passes through the piping system **62**, the conduit **61**, the cylinder **58**, the conduit **68** which supplied the jacks **4** and **4'** through the conduits **76** and **77** as in Fig. 12, but the fluid passes, in addition, through the conduit **67**, the conduit **82** and, through the piping system **83**, reaches the rear chamber of the upper jack **12**, the piston of which then begins to move downwards. The compressed fluid in the front chamber passes out through the piping system **74**, the piping system **70**, the conduit **69**, etc.

As it descends, the plate **13** rotates with the shape **14** around fixed pinions **22** and the shape arrives at the vertical working position before the end of the downward movement of the plate. When the plate reaches the abutments **34**, it is blocked and the pressure rises in the piping system **83**, the conduit **82** and the whole of the hydraulic supply circuit. When the pressure rises to a sufficient value, the ball **88** which has until this moment been held by the force of its spring against its seating, is pushed away and the fluid finds a new passage through the conduit **86** which has previously been shut-off by the said ball. From this conduit **86**, the fluid passes to the rear chamber of the lower jack **8** (see Fig. 14) through the piping system **89**. The fluid ejected from the front chamber rejoins the piping system **70** through the pipe **73**.

The jack **8** then raises the plate **9** which carries the lower part of the mould and which presses the moulding material against the upper shape.

When the mould is thus completely closed and the material is to be subjected to the vulcanisation process, the knob **39** is set at its position IV, at which it is not manually locked. For this purpose, the knob is pulled

towards the front so as to free its stud **53** from the hole **55** and is then fully turned until the finger **47** of the rack **42** (see Fig. 10) presses against the push-rod **48** of the switch **49**. The latter closes the circuit of the timing device **50** which, in its turn, energises the electro-magnet **60**, thereby attracting the blade **59** located at the end of the rod **46**, and holds it in the attracted position.

The elongated slot **44** enables the rack **42** to move upwards by an amount sufficient to remove the contact of its finger **47** with the push-rod **48**.

After the period of time required for vulcanisation, the timing device opens the circuit of the electro-magnet **60** which frees the blade **59** and thus releases the rod **46** and the rack **42**. The latter moves upwards again to its upper position with the said rod **46** under the action of the spring **43**.

The valves **56** and **57** then take up the position shown in Fig. 15. In this position, the fluid can pass through the piping system **62**, the conduit **61**, the cylinder **58**, the conduit **69**, the piping system **70** and, through the piping systems **71** and **72**, arrives at the front chambers of the jacks **4** and **4'**. It also reaches, through the piping systems **73** and **74**, the front chambers of the jacks **8** and **12**, but the rear chambers of these two jacks are connected to the block valve **38** through the piping systems **89** and **83** which terminate in the conduits **86** and **82**, the communication of which with the return piping system is cut-off by the balls **85** and **80**, whilst the return path is entirely free for the jacks **4** and **4'**.

The jacks **4** and **4'** thus open alone, in the first place, the lateral parts **6** and **6'**. When these parts are fully open, the pressure in the return circuit increases and becomes sufficient to force back the ball **80**, the spring of which is calibrated, for example, to 10 kg. so that it yields before the ball **85**, the spring of which is calibrated at 20 kg. The result is that the upper jack **12** is able in its turn to lift the plate **13** with the shape **14**, the circuits being established as shown by the arrows in Fig. 16.

Finally, when the piston of the jack **12** has reached the end of its travel, the pressure again rises in the return circuit and the ball **85** is forced back, thus providing a passage for the fluid contained in the rear chamber of the lower jack **8**. The plate **9** of this jack then again takes up its position of rest in the opening **11** of the table **1**. The pressure in the hydraulic circuit still rises and the motor-pump then delivers into a by-pass circuit **90** established by a pressure-regulating flap-valve (not shown).

It will be clear that the machine in accordance with the invention, as described above in its application to the manufacture of boots or shoes of rubber, may also

be utilised in the manufacture of similar articles of plastic material. The sole may then be moulded by injection, a supplementary jack being provided in order to effect the injection of the plastic material into the sole mould, after the closure of this latter and the application of the shape to it.

What I claim is:

1. In a hydraulic press for vulcanising foot wear on shapes comprising a mould constituted by two horizontally-movable lateral members and a vertically-movable mould base and a shape adapted to carry the leg of the boot or the like and vertically-movable in the opposite direction to the said mould base, a double-acting hydraulic jack for actuating each of the four components above-mentioned, a single control means for operating the hydraulic circuit of the four jacks, two toothed racks disposed on the moving plate of the jack which carries the said shape, two fixed pinions rigidly attached to the frame of the said press and arranged at a height such that the said racks come into engagement with them when the said shape-carrying movable plate reaches a certain height above the table of the said press, the jack being mounted on a horizontal axis so as to be able to rotate about the said axis when the said racks engage with the said pinions, whereby the said shape is caused to pivot towards the front of the press.

2. In a hydraulic press in accordance with claim 1, a spring tending to force the said toothed rack and the valve-carrying rod upwards in opposition to the said electro-magnet so as to cause upward movement of the said rod as soon as the electro-magnet is no longer energised, two toothed racks arranged on the moving plate of the shape-carrying jack, two fixed pinions rigidly attached to the frame of the said press and disposed at a height such that the said racks come into engagement with the said pinions when the said moving plate which carries the shape reaches a certain height above the table of the press, the jack being mounted on a horizontal axis so as to be able to rotate about the said axis when the said racks engage with the said fixed pinions and thereby to cause the said shape to pivot towards the front of the press.

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