Nov. 24, 1936. T. F. STACY 2,062,043

HYDRAULIC PRESS

Filed June 26, 1935

Fig. 1.

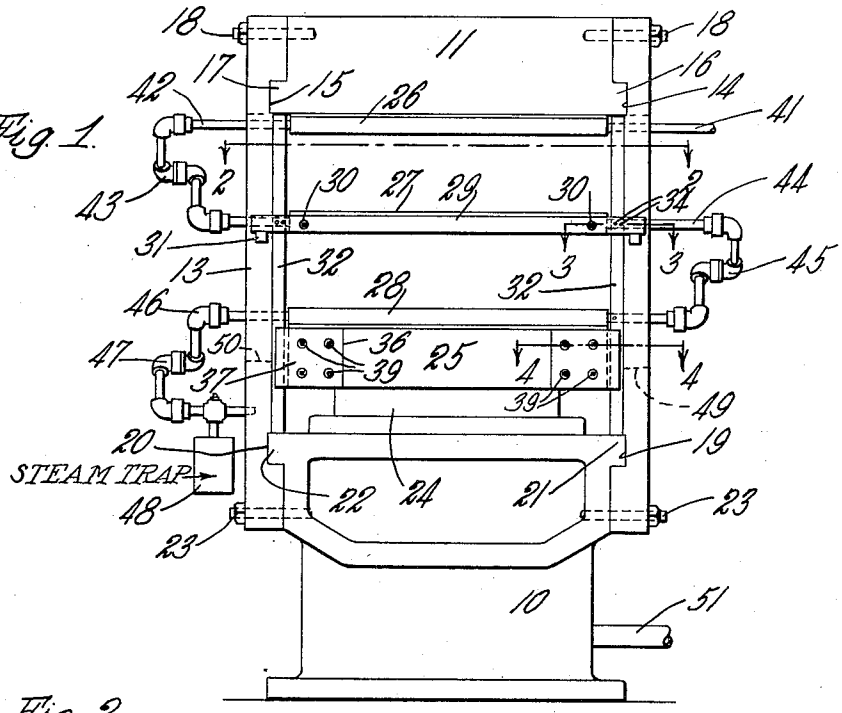
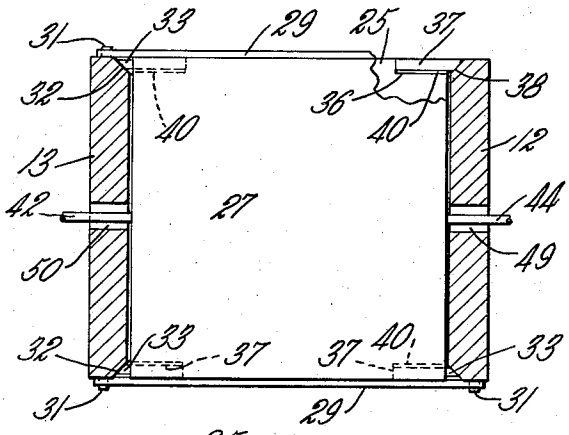


Fig. 2.



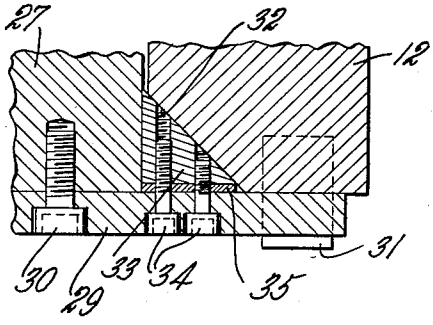


Fig. 3.

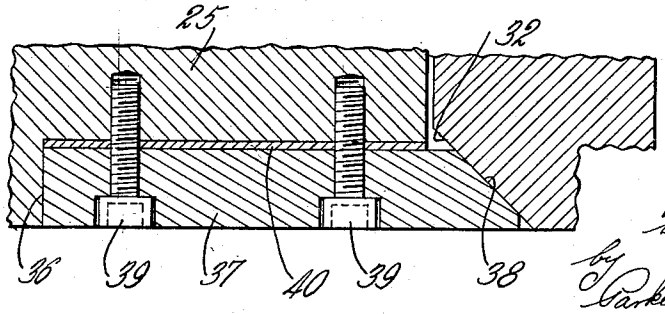


Fig. 4.

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HYDRAULIC PRESS

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Application June 26, 1935, Serial No. 28,502

6 Claims. (Cl. 18—17)

This invention relates to presses, and particularly to hydraulic presses of the hot plate type.

In presses of the type employed to subject articles to high pressures, while heating the articles, it has been quite common practice to utilize round columns or strain rods in connecting the base and the head, with Babbitt bearing guides on the columns for the platens. The babbitt of such guides becomes very hot due to the steam in the plates between which the pressing takes place, and the hot Babbitt becomes soft, so that it rapidly wears and hammers out, with the result that very soon there is no effective guide at all for the platens. The nuts also tend to loosen under repeated stresses which makes it difficult to guide the platens with freedom, yet with a minimum of clearance.

When no guides are provided for the platens or press plates, or when the Babbitt bearings become worn, or when nuts on strain rods loosen unevenly, the press plates and platen will often jump or move, sidewise or laterally, when pressure comes on them because there is nothing to hold them in line. Frequently this lateral or sidewise jump or movement will shear off pins in the two halves of the molds in which an article is being pressed and heated, and this shearing causes a misalignment between the two halves of the mold. Where the molds are fastened permanently in the press, the mold sections mate very closely, which makes it necessary that the platen and press plates be accurately guided with a minimum of clearance, yet without binding.

An object of this invention is to provide an improved press, with which the platen and press plates will be guided accurately in the pressing movements with a minimum of lateral play at all times, with which substantial lateral movements of the platen and press plates during their travel in a pressing direction will be prevented, with which the press plates and platen may be guided in their travel accurately and without binding and undue friction, with which the application of heat to the press plates or platens during use will not interfere with the guiding of the platens and press plates or injure the guides, and which will be exceptionally simple, practical and durable in construction, and inexpensive.

Another object of the invention is to provide an improved press with which adjustment of the fit or clearance between the guides and the platens or press plates may be made for aligning the platens or press plates, and in compensating for wear.

Another object of the invention is to provide an improved hydraulic press of the hot plate type, which will accomplish each or any of the foregoing objects in a simple and practical manner, and with which the clearance between the platens and guides will have a minimum of change during use.

Other objects and advantages will be apparent from the following description of an embodiment of the invention, and the novel features of the invention will be pointed out particularly in the appended claims.

In the accompanying drawing:

Fig. 1 is a front elevation of a hydraulic press of the hot plate type, which has been constructed in accordance with this invention.

Fig. 2 is a sectional plan of the same, the section being taken approximately along the line 2—2 of Fig. 1;

Fig. 3 is a sectional plan, on a larger scale, of a portion of the press at one of the intermediate press plates, the section being taken approximately along the line 3—3 of Fig. 1; and

Fig. 4 is a sectional plan, on a larger scale, of a portion of the press at the platen, the section being taken approximately along the line 4—4 of Fig. 1.

In the illustrated embodiment of the invention, the press includes a base 10, a head 11, and a pair of heavy side plates 12 and 13 connecting opposite sides of the base with corresponding opposite sides of the head 11. The plates 12 and 13 are relatively broad, compared with their thickness, take the place of the usual strain rods, and function as members that connect the head 11 to the base and space it therefrom. The side plates are provided with transverse grooves 14 and 15 extending across their inner faces, but spaced a substantial distance from the upper ends of the plates.

The head 11 is provided with ribs 16 and 17 along the lower edges of its ends, abutting the inner faces of the plates 12 and 13, and entering and fitting the grooves 14 and 15. Screws or bolts 18 have shanks passing through the plates 12 and 13, adjacent the upper ends of the plates, and threaded or anchored to the head 11 adjacent the upper face thereof. By locating the screws or bolts 18 at a substantial distance from the ribs 16 and 17, the stresses on the bolts 18 due to flexing of the side plates at the grooves 14 and 15 will be reduced.

The side plates 12 and 13 are also provided,

somewhat above their lower ends, with transverse grooves 19 and 20 which extend across the side plates on their inner faces, and the base 10 is provided with ribs 21 and 22 which fit and enter the grooves 19 and 20. Bolts or screws 23 pass through apertures in the lower ends of the side plates and are threaded or otherwise anchored in the base 10. By disposing the bolts or screws 23 a substantial distance away from the ribs 21 and 22, the stress on the bolts 23, due to flexing at the side plates at the grooves 19 and 20, will be reduced.

The base 10 contains a hydraulic cylinder or chamber (not shown) in which a ram or piston 24 is mounted to reciprocate. The ram or piston 24 extends upwardly and outwardly above the base and is connected to and operates a platen 25 that is disposed in the space bounded by the base 10, the head 11, and the side plates 12 and 13. A fixed press plate 26, preferably of the hot plate type, is secured against the under face of the head 11. One or more intermediate press plates or platens 27 may be disposed between the head 11 and the platen 25, one only being shown for simplicity. This press plate or intermediate platen 27 may also be of the hot plate type. A press plate 28, preferably of the hot plate type, may also be fixed to the upper face of the platen and becomes a part thereof for travel therewith.

A bar 29 is fixed to the front and rear edges of each intermediate press plate or platen 27 (see Figs. 1, 2 and 3), the bar being removably attached to the plate 27 in any suitable manner, such as by screws 30, Fig. 3. The bars 29 are longer than the plate 27 and overlap or extend along the side edges of the side plates 12 and 13, and normally rest upon pins 31 which are fixed to the side edges of the side plates 12 and 13, to limit the downward movement of the intermediate plate 27, as shown in Fig. 1.

Both side edges of the side plates 12 and 13 are bevelled off at their corner edges along their inner faces, so as to provide bevelled outwardly facing guide surfaces 32. Guide shoes 33, shown as triangular in cross section, are anchored against the inner face of the endwise projecting portions of the bars 29, and have faces abutting against the bevelled faces 32. The shoes 33 are removably anchored to the bars 29 in any suitable manner, such as by screws 34 which pass through the bars 29 and are threaded into the shoes.

The shoes, as so carried by the bars 29, present beveled faces which substantially fit the beveled faces 32 of the side plates, and provide relatively broad contacting faces. One or more shims 35 may be removably disposed between each shoe and the bar 29 so that by varying the thicknesses of the shims 35, or the number of the shims, or both, the clearance between the abutting beveled faces of the shoes and side plates may be varied and controlled.

The platen 25, at each corner, is provided with a notch 36 which receives a shoe 37 that extends endwise beyond the platen and is provided with a beveled face 38 that fits and abuts against the adjacent beveled face 32 of the side plate. The shoes 37 are removably secured to the platen in any suitable manner, such as by screws 39 which pass through the shoes and are threaded into the platen. One or more shims 40 may be disposed between each of the shoes 37 and the bottom of the notch 36, and by varying the number of shims, or the thickness of each shim, or both, the clearance between the beveled end of each shoe 37 and the adjacent beveled face 32 may be varied and controlled. It will be noted that the beveled or corner edges 32 on the side plates 12 and 13 face outwardly in different directions, so that the shoes bear against the side plates in four different directions. The shoes and the beveled faces 32 of the side plates, provide close and accurate guides for the press plates or platens in their travel toward and from the head 11, and prevent substantial lateral movement of the press plates or platens during their travel toward and from the head 11 under the actuation of the ram 24.

Any suitable means may be provided for heating the press plates 26, 27 and 28, and by way of example a steam pipe 41 is connected to one end of the uppermost and fixed press plate 26, so as to communicate with passages in the interior of the plate 26. Such press plates 26, 27 and 28 are disclosed and claimed, for example, in United States Patent to Polley 1,929,824 issued Oct. 10, 1933 to which reference may be had for a more complete disclosure of one example of such heated press plates. The other end of the fixed press plate 26 may be connected by a pipe 42, having a flexible coupling 43 therein, to the adjacent and next lower movable press plate 27. The other end of the press plate 27 is similarly connected by the pipe 44, having a flexible connection 45 therein, to one end of the press plate 28 which is carried by the main platen.

The other end of the plate 28 is connected by a pipe 46, having a flexible coupling 47 therein, to a steam trap 48. The steam entering the upper plate 26 through pipe 41, will heat that plate and the unused steam and any condensation will descend through pipe 42 to the next lower plate 27 and after heating it, will descend through pipe 44 to the plate 28 carried by the main platen. The steam and condensation, after heating plate 28, will descend through the pipe 46 to the steam trap 48. Thus each of the press plates will be heated, and the flexible connections will permit movement of the press plates or platens 27 and 28 toward and from the fixed plate 26.

The side plates may be provided with vertically elongated slots 49 and 50 through which the pipes 41, 42, 44 and 46 extend and along which those pipes move during travel of the platens or plates 25 and 27 toward and from the head 11. A press with such flexible connections for heating the press plates, is disclosed in my copending application Ser. No. 708,276 filed Jan. 25, 1934, to which reference may be had for a more complete disclosure of suitable means for heating the press plates and of the slots in the side plates through which the steam pipes pass.

In use a separate fluid under pressure is supplied to the cylinder in the base 10, such as by a pipe 51, Fig. 1, and this pressure forces the piston or ram 24 upwardly so as to carry the main platen 25 upwardly.

The articles to be pressed, however, are disposed on the upper faces of the plates 27 and 28, and as the platen 25 starts upwardly it will elevate the plate 28 and the articles to be pressed that are carried thereby, until they engage the lower faces of the plate 27. During further upward travel of the platen 25, the plate 27, which until now has been resting upon the pins 31, will also be carried upwardly, together with articles to be pressed that have been resting upon the upper face of the plate 27.

When the articles on the plate 27 engage the under face of the press plate 26, further movements of the plates 27 and 28 will be relatively

small, and the building up of pressure, in the base 10, upon the ram or piston 24 will subject the articles carried on the plates 27 and 28 to high pressures while they are being heated from the press plates 26, 27 and 28 between which the articles are compressed. At the conclusion of the pressing operation, the operating fluid in the base 10 is allowed to escape, and thereupon the main platen 25 and the piston 24 will then descend.

During this descent the intermediate, movable plate 27 will descend also, carrying therewith the articles that have been resting thereon while being pressed, but when the plate 27 again engages with the pins 31, its descent will be checked and further downward movement of the main platen 25 will carry with it the plate 28 and separate it from the plate 27 until the relative positions such as shown in Fig. 1 are reached. The articles that were compressed are then removed from the plates 27 and 28, and further articles to be pressed are placed on these press plates 27 and 28 and the operation repeated.

The shoes 33 and 37 are made of hard metal, and the side plates 12 and 13 are also made of hard metal, so that we have a face to face contact of hard metals at the guides, which materially reduces normal wear, and such materials are not affected by heat from the press plates which heretofore have ruined and destroyed the Babbitt bearings that have been sometimes provided heretofore on the strain rods to guide the platens. The guide shoes will prevent lateral movements of the press plates or platens to any substantial extent, yet the press plates or platens will be free to move without restriction in the path toward and from the head 11, so that there will be no lateral or sideways jumping of the press plates when pressure comes on them, and the sections of the molds carried by the different press plates will always mate very closely when brought together.

Where strain rods are used to connect the base and head, the head and base are held against separation by adjustable nuts on said rods. The stresses exerted on the strain rods in use, have a tendency to loosen the nuts, but this loosening of the nuts is uneven, and consequently it is difficult to keep the frame formed of the strain rods, the base and the head from weaving and twisting and from having substantial lateral movement which, in the case of beveled guides, causes binding between the platens and the guides. Therefore, unless the clearance between the guides and the platens is considerable, there is always a recurring tendency of the guides to bind the platens, and if the clearance is substantial, then there is difficulty due to varying misalignment between the sections of the molds as they are brought together.

By the use of the beveled guides it is possible to obtain a very close and fine adjustment of the clearance between the guides and platens, but where the beveled guides are provided on strain rods, or on housings mounted on the strain rods, such closeness of clearance is impractical due to the loosening of the nuts on the strain rods and the lateral weaving and twisting of the frame in use. When the head and base are firmly connected by heavy side plates on each side, and especially when the head and base have tongue and groove or other interfitting or interlocking connections with the side plates, particularly with the interlocking tongues and grooves running crosswise of the side plates, a very rigid frame is provided which has a minimum of twisting and weaving in use, and with which loosening of the frame during use is reduced to a minimum, making it possible to utilize the advantages of the beveled guides effectively.

Thus, with this press construction, the beveled guides make it possible to provide a close clearance between them and the platens which does not change materially during use, and with which there is no binding, whereby all danger of misalignment between the sections of the molds is eliminated. Such a construction is also extremely strong, so as to withstand the extremely high pressures now commonly employed in hydraulic presses, yet the cost is relatively small, because the additional housings with beveled guides commonly employed on the strain rods are unnecessary.

By the use of shims, the necessity of great accuracy in the fitting of the press plates to the side plates and to the platen is eliminated because by varying the thicknesses of the shims, and the number of them, or both, one can very easily fit the shoes to the side faces on the guide plates so as to give just the desired amount of clearance, and when wear occurs between the shoes and the side plates, compensation may be made to restore the desired clearance merely by adjusting the number and thickness of the shims. The replacement of the guide shoes is also a simple matter if replacement should ever become necessary after long use.

In determining the location of the bolts 18 and 23, the following rule is satisfactory:

The distance from the bolts 18 and 23 to the adjacent keys, ribs or tongues 16, 17, 21 and 22 is such that an external bending moment in one of the plates, equal approximately to the product of said distance times the maximum total load carried by the bolts at one end of that side plate, shall equal the internal bending moment in the plate at a slot or groove. This internal bending moment in the plate is equal approximately to the load carried by a key, times half the depth of the keyway. The bolts shall be of sufficient size and number to safely carry the loads thereon.

It will be obvious that various changes in the details, materials and arrangements of parts, which have been herein described and illustrated for the purpose of explaining the nature of the invention, may be made by those skilled in the art within the principle and scope of the invention as expressed in the appended claims.

I claim as my invention:

1. In a hydraulic press, a base end, a head end, heavy plates at opposite sides of the base end and connecting and spacing apart said base end and said head end, said ends having direct interfitting engagement with the plates which resist separation of said ends, a ram, at platen disposed in the space between said ends and moved by said ram towards and from one of said ends, cooperating mating molds carried partly by said one of said ends and partly by said platen, the side edges of said plates being beveled between said ends, guide shoes detachably carried by said platen adjacent the corners thereof and having bevel faces engaging with the beveled edges of said plates for guiding the platen towards and from said one of said ends and preventing substantial lateral movement of the platen during its said guided travel, and shims removably disposed between said shoes and said platen, whereby the fit of said shoes against said members may be varied by varying the thicknesses of the shims.

2. In a hydraulic press of the type using cooperating mating dies, carried partly by the platen and partly by the frame, a base end, a head end, heavy plates spaced apart by said ends and having interfitting engagement therewith which prevents separation of said ends, a ram, a platen disposed in the space between said ends and moved by said ram towards and from one of said ends, the side edges of said plates being beveled, and guide shoes carried by said platen and fitting by a close clearance, against said beveled edges for guiding the platen and preventing substantial lateral movement of said platen during its travel.

3. In a hydraulic press, a base end, a head end, heavy plates connecting and interlocking with opposite sides of the base end and with corresponding sides of said head end and spacing apart, but tying together, said ends, a ram, a platen disposed in the space between said ends and moved by said ram toward and from one of said ends, cooperating mating dies carried partly by said platen and partly by said one of said ends, the side edges of said plates between said ends being beveled off along the inside faces of the plates, and guide shoes removably carried by said platen and bearing against the beveled portions of said plates for guiding the platen and preventing substantial movements thereof laterally of its direction of travel.

4. In a hydraulic press of the type using cooperating mating dies carried partly by the platen and partly by the frame, a base end, a head end, plates connecting and interlocking with opposite sides of the base end to corresponding sides of said head end and spacing but tying together said ends, a ram, a platen disposed in the space between said ends and moved by said ram toward and from one of said ends, the side edges of said plates being beveled along the inside faces of the plates, guide shoes removably carried by said platen and having beveled faces bearing against the beveled portions of said plates for guiding the platen and preventing substantial movements of said platen laterally of its direction of travel, and removable shims interposed between the shoes and the platen, whereby the fit of the shoes to the plates and the clearance between them may be varied by varying the thicknesses of the shims.

5. In a hydraulic press of the type in which articles are pressed and heated in cooperating mating dies, carried partly by the platen and partly by the frame, during the pressing operation, a base end, a head end, heavy plates at opposite sides of the base end and interlocking with and connecting said ends to form a frame, said plates having their side edges beveled off, a ram, a platen disposed in the space between said ends and moved by said ram towards and from said head, guide shoes carried by said platen and having hard metal faces engaging with the beveled edges of said plates for guiding the platen along the plates and preventing substantial lateral movement of the platen during its travel, and means for heating the pressing faces of said platen and frame, whereby articles may be pressed between said frame and platen and heated while so pressed.

6. In a hydraulic press, a base end, a head end, a pair of plates keyed to opposite sides of said ends to form therewith a rigid frame, a platen disposed in the space defined by said plates and said ends, said plates having their side edges between said ends beveled off to provide outwardly facing beveled guides, shoes carried by the platen and having beveled ends fitting said beveled guides for guiding said platen toward and from said head, and preventing substantial lateral movement of the platen during its travel, means for moving said platen, and mating, heated dies carried partly by said platen and partly by the frame, the cooperating faces of said shoes and plates being of hard metal, whereby the fit of said shoes to said plates will be unaffected by heat received by said platen and said frame.

THOMAS F. STACY.