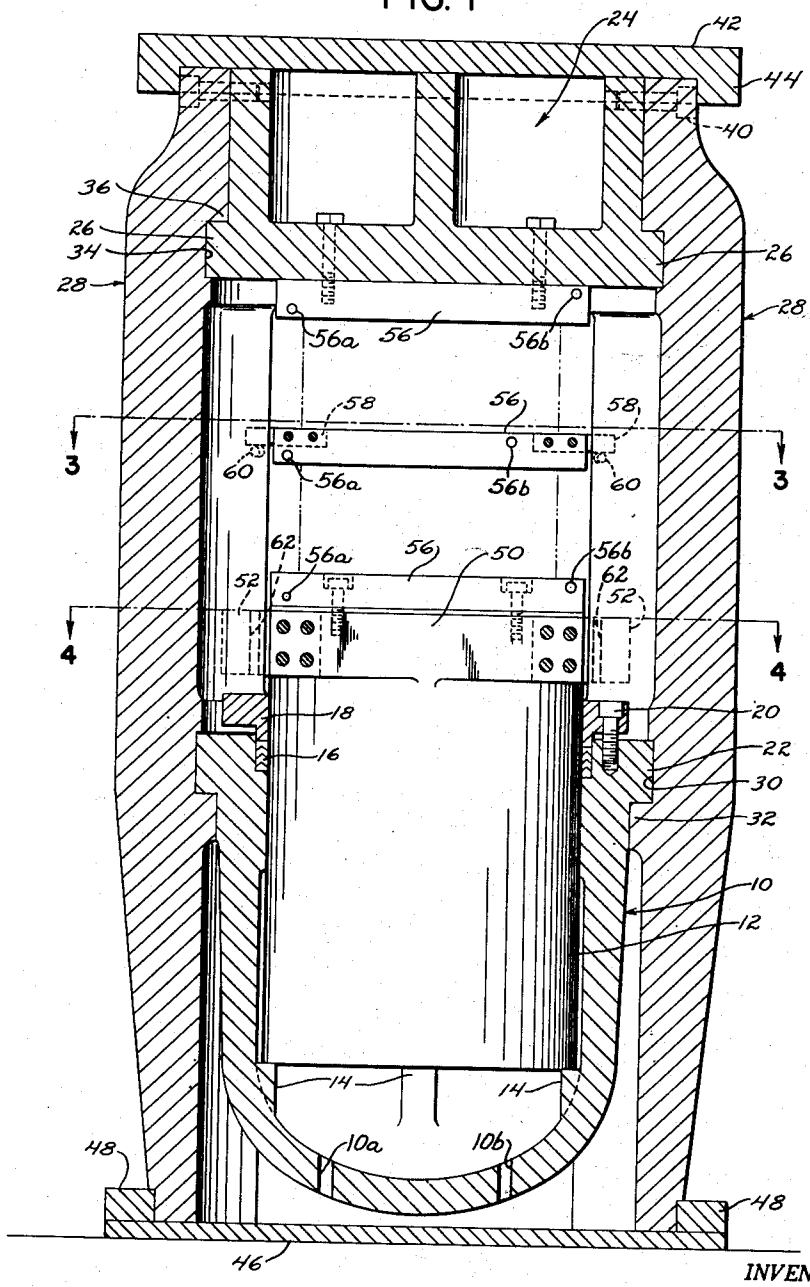
Oct. 6, 1953 J. A. MULLER 2,654,310

CURVED SIDE PLATE HYDRAULIC PRESS

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3 Sheets-Sheet 1

FIG. 1



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FIG. 2

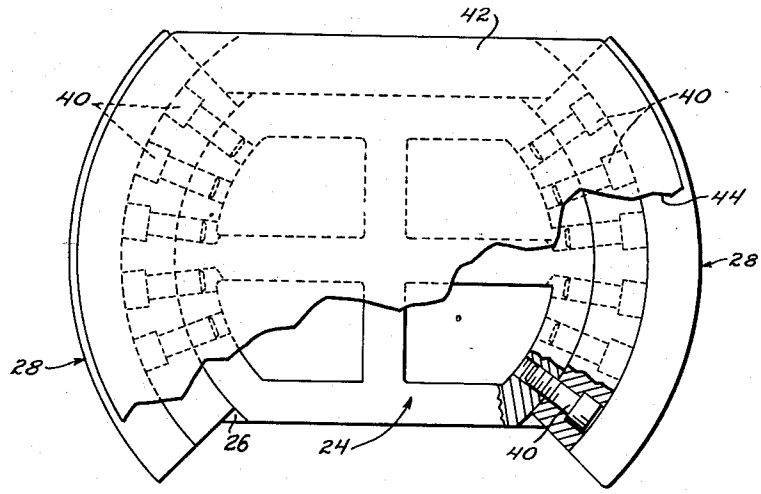
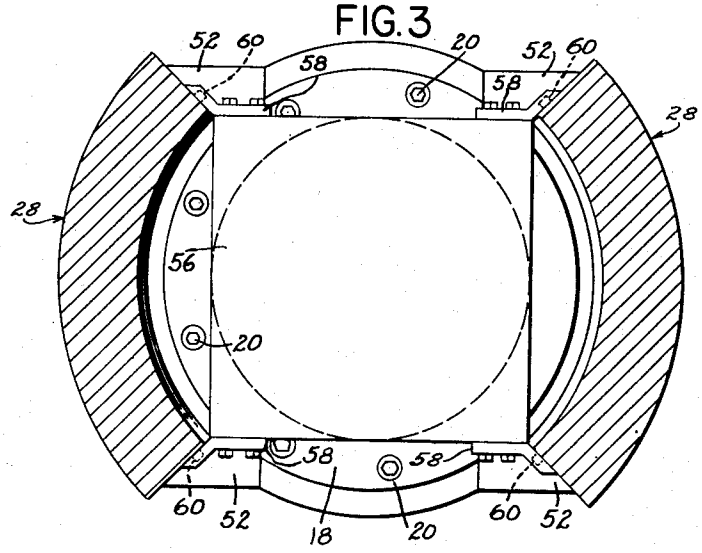


FIG. 3



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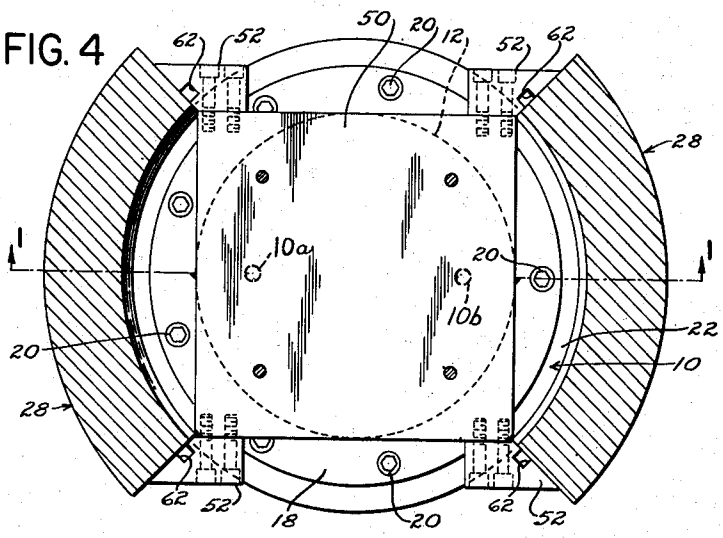
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FIG. 4



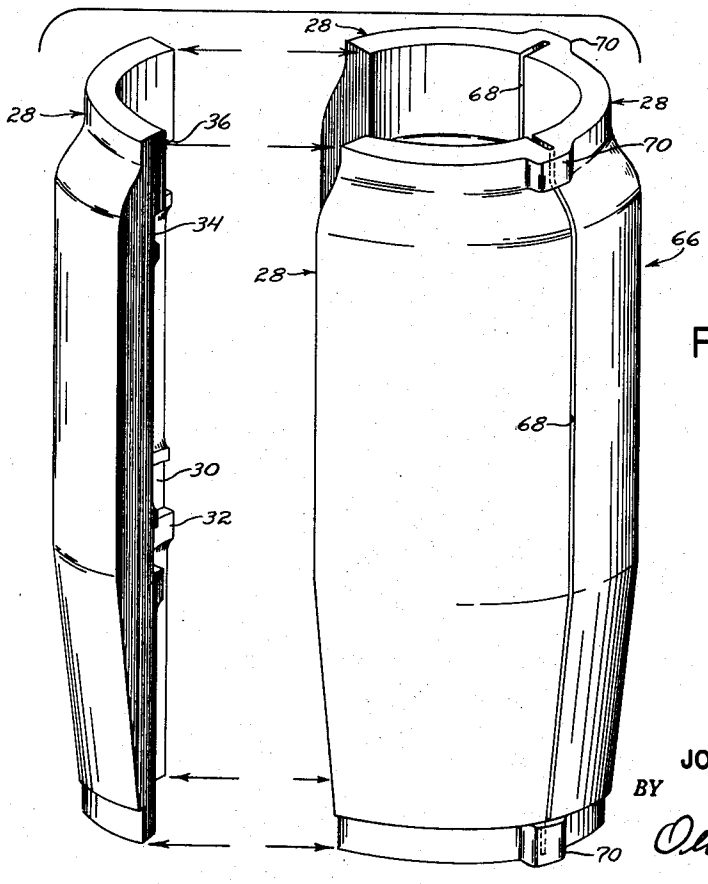


FIG.5

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CURVED SIDE PLATE HYDRAULIC PRESS

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Application October 22, 1949, Serial No. 122,977

5 Claims. (Cl. 100—269)

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This invention relates to hydraulic presses, and, more particularly, is concerned with hydraulic presses including a press head and a ram-carrying cylinder supported in opposed relation by curved side plates formed to the curvature of the cylinder, and to improved methods for manufacturing presses of this type.

It has been the standard and usual practice in the manufacture of hydraulic presses to secure and support a ram-carrying cylinder and a head in opposed relation by means of flat side plates, and this practice is not particularly objectionable when relatively low pressure operations are to be performed. However, when presses of heavy tonnage are constructed, the ratio of the unit platen pressure to the unit hydraulic pressure can be no better than one to two with the standard straight side plate type hydraulic presses. This makes the size of the press base as compared to the working area of the press platens relatively large.

It has also been the practice, heretofore, to provide separately cast press heads and press beds which are connected together by tie bolts. Such tie bolts cause strain concentrations, are apt to interfere with the press openings if positioned for greatest mechanical strength, and casting and machining operations on the press head and bed are often complicated and expensive.

An improved press structure avoiding and overcoming at least certain of the prior art difficulties is disclosed and claimed in my Patent No. 2,403,822, and an improved manufacturing method is described in my Patent No. 2,348,403. I have discovered still further improvements to the press structure and manufacturing method described in the aforesaid patents, and such improvements are the subject matter of this application.

It is the general object of my invention to avoid and overcome the foregoing and other difficulties of and objections to prior practices by the provision of an improved hydraulic press having curved side plates supporting the press head and ram-carrying cylinder whereby the ratio of unit platen pressure to the unit hydraulic pressure can be improved to the ratio of 1.5708 to two, for example, whereby the operating pressures of the press in comparison to its size are notably improved.

Another object of my invention is the provision of a hydraulic press characterized by high operating pressures, unusually good safety factor strength margins, avoidance of strain concentrations, and simplicity and inexpensiveness of construction and maintenance.

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Another object of my invention is to provide an improved manufacturing method for hydraulic presses, and, particularly, curved side plates for hydraulic presses and emphasizing ease and rapidity of manufacture, the use of a minimum number of parts, the use of uniform cross section elements insuring sounder castings, reduction of deflection under load, and facility of alignments of parts.

The foregoing objects of my invention, and other objects which will become apparent as the description proceeds, are achieved by the provision of a hydraulic press including a cup-shaped cylinder having a circular flange adjacent its top, a ram slidably mounted in the cylinder, a press head having diametrically opposed arcuate flanges adjacent its bottom, a pair of curved side plates, each extending through approximately ninety degrees and formed to the curvature of the cylinder and head, each side plate having grooves receiving the flanges of the head and cylinder to position the head and cylinder in opposed parallel relation, and means securing the lower and upper ends of the side plates in a locking relationship with the cylinder and press head respectively.

In accordance with the method of my invention, four side plate quadrants are cast simultaneously, the side plates being connected during the casting operation, for example, by integral lugs to form a cylindrical shell. The cylindrical shell is turned as a unit and surfaces are machined inside and outside the shell, whereupon the lugs are cut through to provide two pairs of curved side plates.

For a better understanding of my invention, reference should be had to the accompanying drawings wherein:

Fig. 1 is a vertical sectional view, taken on line 1—1 of Fig. 4, and illustrating the construction of an improved hydraulic press incorporating the invention;

Fig. 2 is a plan view, partially broken away, of the press of Fig. 1;

Fig. 3 is a horizontal cross-sectional view taken substantially on line 3—3 of Fig. 1;

Fig. 4 is a horizontal cross-sectional view taken substantially on line 4—4 of Fig. 1; and

Fig. 5 is a perspective view illustrating the method of manufacturing the quadrant-shaped circular side plates incorporated in the invention.

Having particular reference to the drawings, the numeral 10 indicates generally a hydraulic pressure cylinder of substantially cup shape, and slidably receiving a cylindrical ram 12. The cylinder 10 is preferably cast, and being of uniform cross section, this insures sounder castings. Lugs

14 may be cast on the inside near the bottom of the cylinder 10, which lugs serve to support the ram 12 in its most downwardly position. Packing 16 is received in a suitable aperture in the cylinder 10, and a clamping ring 18, engaging with the packing 16, is secured by a plurality of adjustable screws 20 to the cylinder 10 at circumferentially spaced points. The cylinder 10 is likewise formed adjacent its upper end with a circular flange or shoulder 22 adapted to be engaged by the side plates of the press, all in the manner hereinafter described in detail. Ports 10*a* and 10*b* are provided in a base portion of the cylinder 10 for passage of fluid to and discharge of fluid from the cylinder.

The numeral 24 indicates generally a press head which is generally a casting, and which can be cast solid, or with a plurality of pockets for lightening purposes. The press head in the embodiment shown includes arcuate end portions of quadrant extent and flat sides. The head is provided with diametrically opposed arcuate flanges 26 of quadrant extent, and the press head is adapted to be positioned with its lower face in opposed parallel relation to the top surface of the cylinder 10.

To support the cylinder 10 and head 24, I employ curved side plates, indicated as a whole by the numeral 28, each side plate being of substantially quadrant extent in plan view and being formed with a groove 30 and a shoulder 32 for engaging with the flange 22 of the cylinder 10, and with a groove 34 and a shoulder 36 for engaging with the flange 26 of the press head 24.

An important feature of the invention is that the inside curvature of each of the curved side plates 28 corresponds to the outside curvature of the upper portion of the cylinder 10 and the press head 24 whereby a very positive supporting action by the side plates with respect to the cylinder 10 and press head 24 is achieved over diametrically opposed portions and throughout substantially ninety degrees. In order to secure the side plates 28 in position, cap screws 40 may be employed to fasten substantially the extreme upper end of the side plates to the press head. Thus, the relatively short turning moment between the flange 26 and the shoulder 36, when the press is under load, is counteracted by the relatively long moment arm of the screws 40. A cap plate 42 having downwardly directed arcuate shoulders 44 of quadrant extent may be positioned over the top of the press to further secure and hold the side plates 28 in association with the press head 24. When the top plate 42 is employed, the number and strength of the screws 40 can be reduced or eliminated.

The lower ends of the side plates 28 are held against movement apart, and with the shoulders 32 and groove 30 in engagement with the circular flange 22 by providing a bottom plate 46 upon which the lower ends of the side plates rest, and with arcuate shoulders 48 of subtantially quadrant extent in plan view being secured to or cast integrally with the plate 46, the shoulders 48 engaging with the lower outside ends of the side plate 28 in the manner shown in Fig. 1. It will be noted that the moment arm from the lower ends of the side plates 28 to the interlocking shoulders 32 and circular flange 22 is quite long, whereby any turning movement between the shoulders 32 and the circular flange 22, as occasioned by the press loads, is overcome.

The ram 12 has secured to its top, or cast integrally therewith, a platen portion 50 of substantially square shape. In the form of the invention illustrated, the platen 50 is cast integrally with the ram and provides a square upper surface. Secured to the platen 50 are gibs 52 which are adapted to engage with the side edges of the side plates, which are appropriately machined to provide guides for the movement of the platen 50 and ram 12.

Positioned between the press head 24 and the platen 50 may be, if desired, a plurality of press plates or shelves 56, which usually are steam heated and have ports 56*a* and 56*b* provided therein for passage of heating fluid to and from the shelves 56, at least the center shelf having brackets 58 secured to its ends, which brackets are adapted to engage with pins 60 carried by the side plates 28 so at least the center shelf 56 is held against moving downwardly beyond the positions illustrated, but is free to move upwardly. The gibs 52 may be slotted, as at 62, to permit the passage of the gibs over the pins 60, if this ever should be necessary. The top and bottom shelves 56 are secured to the head 26 and the ram 12, respectively, as by screws in the manner illustrated.

An important part of the invention is the method of manufacturing the curved side plates of the press. This method is illustrated in Fig. 5, from which it will be seen that the side plates are cast as a cylindrical shell indicated as a whole by the numeral 66. The cylindrical shell is adapted to be cut longitudinally at four spaced points to provide two pairs, that is four, of quadrant-shaped side plates 28, and this may be achieved by coring slots 68 into the shell. Lug portions 70 cast with the shell will hold the quadrants together so that the entire shell can be machined as a cylinder simultaneously in the areas to form facing or finished portions of the side plates, for example the groove 30, the shoulder 32, the groove 34, and the shoulder 36. After the cylindrical shell 66 has been machined, the lugs 70 are cut off to form the curved side plates 28.

From the foregoing, it will be recognized that the various objects of my invention have been achieved by the provision of an improved rugged, relatively inexpensive, high pressure press having a minimum of size and a minimum of parts. The ratio of the unit platen pressure to the unit hydraulic pressure is noticeably improved over a straight side plate press. The overall size of the press is smaller than a straight side plate press having the same platen area and pressure. Deflections are less and better load distribution is obtained than in conventional prior art presses, and manufacturing and maintenance are simplified. The press of the invention provides relatively wide openings between the side plates for loading and unloading the press, and machining of the press parts and assembly are characterized by simplicity, ease, and inexpensiveness.

While in accord with the patent statutes I have specifically illustrated and described one best known embodiment of the invention, and the method of manufacture thereof, it is to be particularly understood that I am not to be limited thereto or thereby, but that the scope of my invention is defined in the appended claims.

I claim:

1. A hydraulic press including a cup-shaped cylinder having an arcuate flange adjacent its top, a ram slidably mounted in the cylinder, a press head having curved ends and having diametrically opposed arcuate flanges of substan-

tially quadrant extent adjacent its bottom, a pair of curved side plates each extending through approximately ninety degrees and formed to the curvature of the cylinder and head, each side plate having grooves receiving the flanges of the head and cylinder to position the head and cylinder with their adjacent faces in an opposed parallel relation, a top plate and a bottom plate for the press, and arcuate shoulder means of substantially quadrant extent associated with each of the top and bottom plates for securing the lower and upper ends of the side plates in a locking relationship with the cylinder and press head respectively.

2. A hydraulic press including a cup-shaped cylinder having an arcuate flange adjacent its top, a ram slidably mounted in the cylinder, a press head having curved ends and having diametrically opposed arcuate flanges of substantially quadrant extent adjacent its bottom, a pair of curved side plates each extending through approximately ninety degrees and formed to the curvature of the cylinder and head, each side plate having grooves receiving the flanges of the head and cylinder to position the head and cylinder with their adjacent faces in an opposed parallel relation, a top plate and a bottom plate for the press, and means associated with each of the top and bottom plates for securing the lower and upper ends of the side plates in a locking relationship with the cylinder and press head respectively.

3. A hydraulic press including a substantially circular cylinder and a head having portions of substantially arcuate shape, a ram slidably received in the cylinder for movement to and from the head, a pair of curved side plates engaging with diametrically opposed portions of the cylinder and head and supporting the cylinder and head with their adjacent faces in a spaced substantially parallel relation, each side plate being curved to substantially the contour of the portions of the cylinder and head with which it engages and extending in such engagement through substantially a quadrant, interlocking shoulder means between the side plates and the cylinder and head, said shoulder means being positioned near the top of the cylinder and near the bottom of the head, and means engaging with substantially the extreme bottoms and substantially the extreme tops of the side plates for holding them against movement apart, and to hold the interlocking shoulder means in engagement.

4. A hydraulic press including a cup-shaped cylinder, a ram slidably mounted in the cylinder, a press head having portions of substantially arcuate shape, at least one of said portions being of substantially the same external diameter as one portion of the cylinder, a pair of curved side plates each extending through approximately ninety degrees and formed to the curvature of the common diameter portions of the cylinder and head, cooperating groove and flange means formed on the side plates and the cylinder and head to position the cylinder and head on the side plates with their adjacent faces in an opposed parallel relation, a top and a bottom plate for the press, and arcuate shoulder means on each of the top and bottom plates for securing the upper and lower ends of the side plates in locking relationship with the head and the cylinder respectively.

5. A hydraulic press as in claim 4 wherein the cooperating groove and flange means are spaced axially of the press from both the top and the bottom plates, and wherein the head and the cylinder have external portions of the same diameter snugly engaging the side plates.

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