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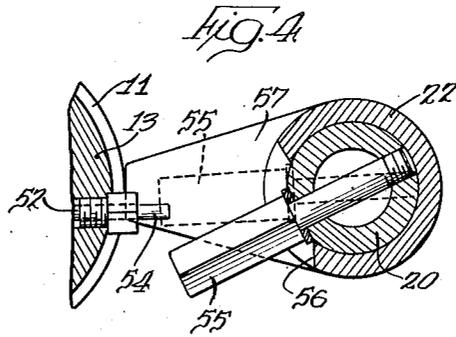
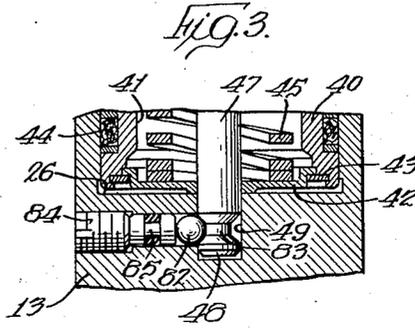
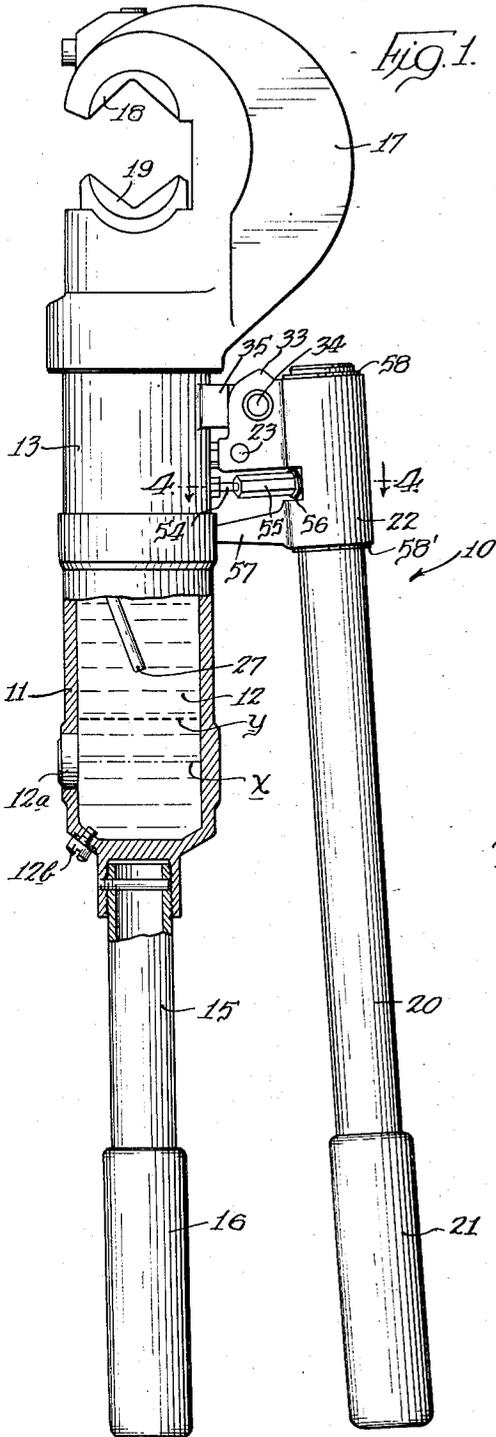
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2,821,877

PORTABLE HYDRAULIC PRESS TOOL

Filed Feb. 2, 1956

2 Sheets-Sheet 1



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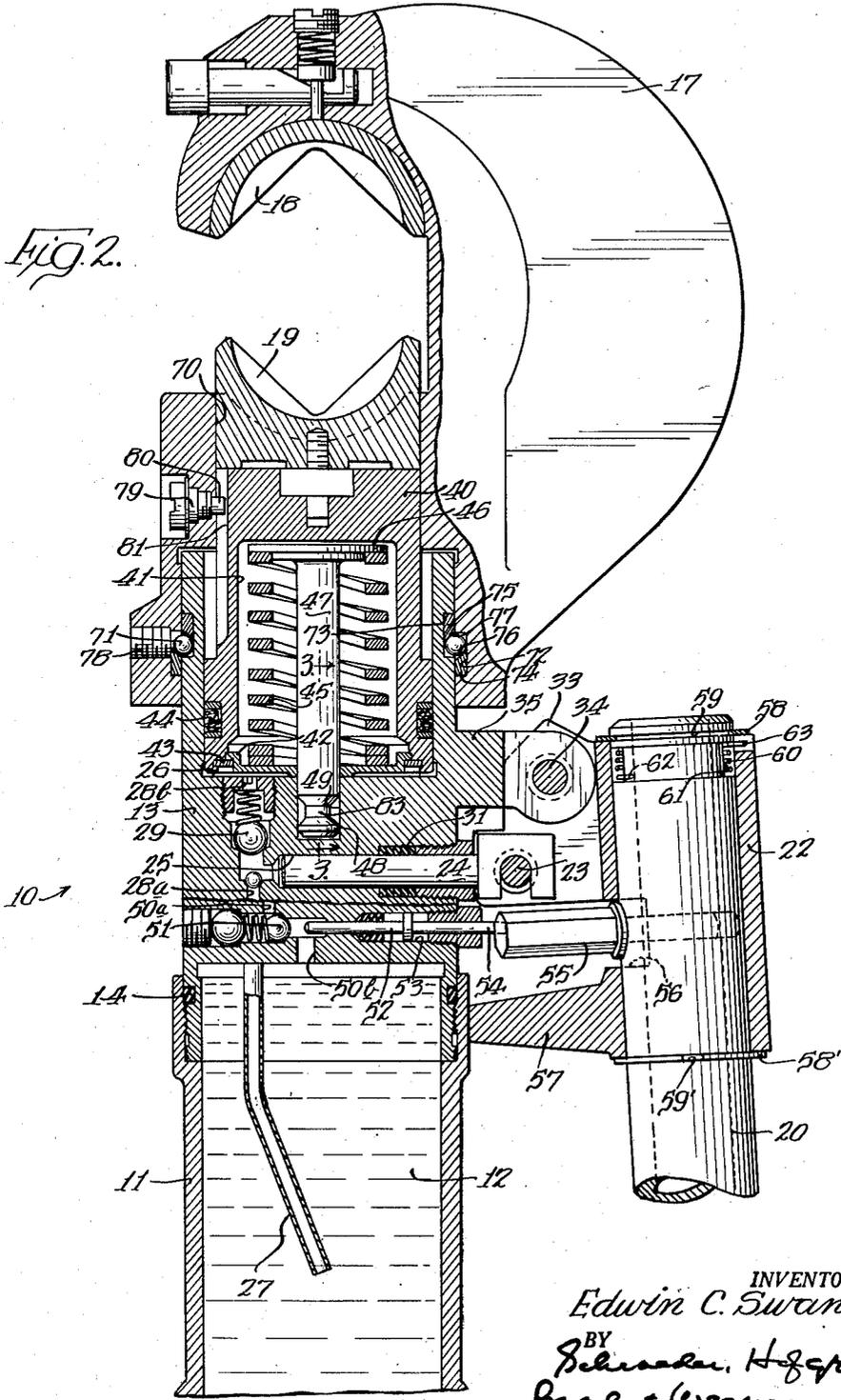
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PORTABLE HYDRAULIC PRESS TOOL

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2 Sheets-Sheet 2



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2,821,877

**PORTABLE HYDRAULIC PRESS TOOL**

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Application February 2, 1956, Serial No. 562,981

16 Claims. (Cl. 81—15)

This invention relates to a hydraulic press and, more particularly, to a portable hydraulic press especially well adapted for exerting a large clamping force.

This invention is an improvement over the hand press disclosed in the copending application of Edwin C. Swanson, Serial No. 462,443, filed October 15, 1954.

The general object of this invention is to provide a new and improved hydraulic press.

Another object of the invention is to produce an improved mounting for the head on the body of a press of the type disclosed in said copending application.

Another object is to produce a press of the character described wherein the volume of the fluid reservoir need not be varied during the operation of the press.

Still another object of the invention is to produce an improved mounting of the pumping handle to provide more convenient means for releasing the fluid pressure in the cylinder.

Still another object of this invention is to provide a new and improved hydraulic hand press of the character described wherein the pumping handle is mounted for rotation about its axis to selectively allow actuation of the pump for the clamping operation and the release of fluid pressure in the cylinder to relieve the clamping pressure on the dies.

Another object of this invention is to provide a portable hydraulic press of the character described wherein a fluid conduit extending between the pump and fluid reservoir terminates in a position wherein the end of the conduit is always immersed in the fluid in any position in which the press is used.

Other objects and advantages will become apparent from the following detailed description taken in connection with the accompanying drawings, in which:

Fig. 1 is a side elevational view of an embodiment of the invention, partially broken away for clarity of illustration;

Fig. 2 is an enlarged fragmentary vertical, stepped sectional view of the upper portion of Fig. 1 taken generally on a plane passing through the axis of the piston and the axis of the pumping handle;

Fig. 3 is a fragmentary vertical, sectional view taken generally along a line 3—3 of Fig. 2; and

Fig. 4 is an enlarged fragmentary horizontal, sectional view taken generally along line 4—4 of Fig. 1.

While the invention herein described is a preferred embodiment, it is not intended to limit the invention to the specific form and arrangement shown, it being contemplated that various changes may be made by those skilled in the art without departing from the spirit and scope of the appended claims.

Referring now to Fig. 1 of the drawings, there is shown a press generally indicated at 10 having a hollow lower body portion 11 providing therein a reservoir 12 to contain hydraulic fluid, utilized to actuate the press. The lower body portion 11 is threadably secured to an upper body portion 13 and means in the form of an O-ring 14 (Fig. 2) is provided to prevent leakage of fluid at the

connection just mentioned. Extending from the lower body portion 11 is a handle 15 having a hand grip 16 thereon, while the upper body portion 13 is provided with a head 17 rotatably mounted thereon and carrying a die 18 adapted to exert a clamping force on a splice positioned between said die 18 and a mating die 19 carried by the upper body portion 13.

As is common in devices of this nature, means are provided for urging the two dies 18 and 19 toward each other with a relatively great force, the means in the particular press shown being a hydraulic pump operated by a movable handle 20 pivotally carried by the upper body portion 13. As seen in Figs. 1 and 2, the movable handle 20 is provided at one end with a handle grip portion 21, with its opposite end being received in a socket-forming member 22 pivotally mounted on the upper body portion 13. The socket-forming member 22 is provided with a pin 23 adapted to be secured to the outer end of a piston 24 (Fig. 2) of the pumping means just mentioned, so that pivotal movement of the handle 20 causes corresponding reciprocatory movement of the pump piston 24.

The pumping means of the present invention includes the piston 24 which is reciprocable in a bore 25 (Fig. 2) formed in the upper body portion 13, which bore communicates with fluid-conducting means interconnecting the reservoir 12 and a cylinder 26 formed in the upper body portion 13. As clearly seen in Fig. 2, the fluid-conducting means includes a conduit 27 opening at one end in the reservoir 12 and opening at its other end into a first portion 28a of a fluid passage formed in the upper body portion 13. The fluid passage has a second portion 28b opening into the cylinder 26. A ball check valve 29 is disposed between the fluid passages 28a and 28b so as to allow fluid to be pumped from the reservoir 12 to the cylinder 26 while preventing reverse fluid flow from the cylinder 26 to the reservoir 12. A packing 31 is provided around the piston 24 in the bore 25 to prevent leakage of fluid around the sides of the piston 24.

In a closed hydraulic circuit wherein high pressures are developed, such as the circuit disclosed herein, it is imperative that no air is introduced into the system. In my copending application, Serial No. 462,443, filed October 15, 1954, I provided means for decreasing the volume of the fluid reservoir as fluid was pumped from the reservoir to the cylinder to prevent the formation of a space in the reservoir unoccupied by fluid. As the press of this invention is intended to be usable in any position wherein the handles may extend vertically upwardly, downwardly or in any position therebetween, means have been provided for preventing air from being introduced into the hydraulic circuit which dispenses with the necessity of varying the volume of the fluid reservoir. By carefully proportioning the fluid volume of the reservoir 12 and the maximum volume of fluid required to move the piston ram 40 to its maximum stroke position, and by positioning the end of the conduit 27 near the center of reservoir 12, I have provided a press construction wherein the fluid in the reservoir 12 no matter in what position the press is held or where in the cylinder 26 the piston ram 40 is disposed. In the embodiment shown, the volumetric capacity of the reservoir 12 is more than twice the volumetric capacity of the cylinder 26 with the piston ram 40 in its maximum stroke position.

As shown in Fig. 1, a sight gauge 12a is shown disposed in the body portion 11 to permit an operator to determine whether the hydraulic system contains the proper amount of fluid. When the press 10 is held vertically with the head 17 extending downwardly, and the piston ram 40 fully retracted, the level of the fluid should be on a line, indicated at x, with the center of the sight

gauge 12a. When the piston ram 40 is shifted to the fully advanced position, the level of the fluid should drop to the level indicated by the line y, it being noted that the end of the conduit 27 remains immersed in the fluid. Fluid may be added to the system by removing a fluid fill plug 12b threadably secured in a hole formed in the body portion 11.

To pivotably mount the socket-forming member 22 on the upper body portion 13, the socket-forming member 22 is provided with a pair of ears 33 which are pivotably secured to a pin 34 in a lug 35 formed integral with and projecting from the upper body portion 13. With the piston 24 of the pump means pivotally and slidably connected to the socket-forming member 22 by the pin 23, pumping movement of the handle 20 reciprocates the piston 24 and pumps fluid from the reservoir 12 into the cylinder 26 under relatively high pressure.

The fluid pressure developed by the pump means is operable to move a piston ram 40 which is slidably mounted in the cylinder 26 upwardly therein. The mating die 19 is secured to the upper end of the piston ram 40 and is thus movable therewith toward the die 18.

As shown in Fig. 2, the piston ram 40 has a bore 41 formed therein which is closed by an end plate 42, the end plate 42 being securely held in position by a snap ring 43. To prevent leakage of the fluid under pressure, sealing means 44 is provided between the cylinder 26 and the piston ram 40.

To automatically open the dies 18 and 19 when the fluid pressure on the piston ram 40 is relieved, the piston ram 40 is normally urged downwardly in the cylinder 26 by resilient means, such as a spring 45. As best shown in Fig. 2, the spring 45 is disposed within the piston bore 41 and has one end bearing against the end plate 42 and the other end bearing against a head 46 of a bolt or rod member 47 which does not move with the piston ram 40. The major portion of the rod member 47 is disposed within the piston bore 41 with an end portion 48 being secured in a bore 49 formed in the upper body portion 13. Thus, upward movement of the piston ram 40 compresses the spring 45 so that when fluid pressure on the piston ram 40 is relieved, the spring 45 acts to urge the piston ram 40 downwardly to the position shown in Fig. 2.

The means disclosed for relieving the pressure on the piston ram 40 include a fluid passage formed in the upper body portion 13 and having a first portion 50a opening into the cylinder 26 and a second portion 50b opening into the reservoir 12. To allow the buildup of fluid pressure in the cylinder 26, the fluid passage is normally closed by a ball check valve 51 disposed between the portions 50a and 50b. To relieve the pressure in the cylinder 26, the check valve 51 is adapted to be opened by an actuator rod 52 slidably mounted in a bore 53 formed in the upper body portion 13. To move the actuator rod 52 by movement of the pumping handle 20, the actuator rod 52 has an end portion 54 extending outwardly of the upper body portion 13 and engageable with an actuating member 55 fastened to the pumping handle 20.

So that the pressure relieving check valve 51 will not be opened by each pumping stroke of the handle 20, the pumping handle 20 is mounted in the socket-forming member 22 for rotation with respect thereto between two positions determined by engagement of the actuating member 55 on the socket-forming member 22 with the sides of a slot 56 formed in the socket-forming member 22. Thus, the handle 20 may be oscillated while in either of two rotatably selected positions with respect to the socket-forming member 22.

In one of these positions (shown in full line in Fig. 4) the actuating member 55 will not engage the actuator rod 52 when the handle 20 is moved, while in the other position (shown in broken line in Fig. 4) the actuating member 55 will engage the actuator rod 52 when the handle 20 is pivoted toward the upper body portion 13, thus opening the check valve 51 and relieving the fluid pres-

sure on the piston ram 40. With this construction, it is extremely easy for the operator while grasping the two handles 15 and 20 to select either of the two positions of the handle 20 without changing his grip at all. A mere flick or twist of the wrist is sufficient. A stop member 57 formed integral with the socket-forming member 22 is engageable with the lower body portion 11 to limit the movement of the handle 20 toward the handle 15 to prevent damage to the pump means and pinching of the operator's fingers.

Although the pumping handle 20 is rotatably mounted in the socket-forming member 22, longitudinal movement of the handle 20 in the socket-forming member 22 is limited by a first snap ring 58 fitted in an annular groove 59 formed in one end of the handle 20 and engageable with one end of the socket-forming member 22 and a second snap ring 58' fitted in an annular groove 59' formed in the handle 20 and engageable with the other end of the socket-forming member 22. In the embodiment shown, resilient means are utilized to normally urge the handle 20 into its pumping position in the socket-forming member 22 rather than into its pressure relieving position. As shown in Fig. 2, this is accomplished by a spring 60 disposed in an annular groove 61 formed in the pumping handle 20 with one end 62 secured to the handle 20 and the other end 63 secured to the socket-forming member 22. Thus, after an operator has relieved the clamping pressure on the dies 18 and 19, merely releasing or relaxing his grip on the handle 20 will allow the handle 20 to be positioned for a clamping operation.

To provide freedom in positioning the dies for a clamping operation while the press 10 is being normally held by the operator, the C-shaped head 17 is rotatably mounted on the upper body portion 13. In the embodiment shown herein, the head 17 is telescoped over the upper end of the upper body portion 13 and has a bore 70 in which the die 19 and the piston ram 40 are slidable. The means for rotatably mounting the head 17 on the upper body portion 13 include a series of ball bearings 71 captively positioned therebetween in an annular recess defined by an internal annular groove 72 formed in the head 17 which opens into an external annular groove 73 formed in the upper body portion 13. Annular rings 74 and 75 are provided in the grooves 72 and 73, respectively, each of the rings filling a portion of its respective groove. The rings 74 and 75 are disposed in their respective grooves so that beveled bearing surfaces 76 and 77 formed respectively thereon are positioned generally parallel to each other. The ball bearings 71 bear against the bearing surfaces 76 and 77, these bearing surfaces thus sustaining the thrust exerted on the bearings 71. The use of these beveled rings 74 and 75 prevents damage to the edges of the grooves 72 and 73, the beveled rings being readily replaceable when worn. The bearings 71 are admitted to the annular recess defined by the grooves 72 and 73 through a plugged bore 78 formed in the head 17.

As the die 18 is mounted in the head 17 and is thus freely rotatable therewith and the die 19 is mounted on the piston ram 40, means are provided to insure that the die 19 will always be in clamping alignment with the die 18. In the embodiment illustrated, such means provide for connecting the piston ram 40 to the head 17 for rotation therewith, and include a bolt member 79 threadably secured in the head 17 and having an end portion 80 engageable in an external longitudinally-extending slot 81 formed in the piston ram 40.

As this construction results in the piston ram 40 being rotatable with the head 17, to prevent rotational stress on the spring 45, the end portion 48 of the rod member 47 is rotatably mounted in the bore 49. As best seen in Fig. 3, this rotatable connection includes a single ball 82 held in engagement in a beveled annular groove 83 formed in the end portion 48 of the rod member 47. The ball 82 allows rotation of the rod member 47 in

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the bore 49 while preventing movement of the rod member 47 out of the bore 49. As shown, the ball 82 may be held in engagement in the beveled groove 83 by a threaded plug 84, sealing means 85 being disposed between the ball 82 and the plug 84 to prevent leakage of fluid from the upper body portion 13.

A suitable over pressure relief valve for the cylinder 26 is shown and fully described in the co-pending application of Edwin C. Swanson, Serial No. 462,443, filed October 15, 1954.

I claim:

1. A hydraulic press comprising, in combination; a body having an open ended cylinder formed therein, a piston slidably mounted in the cylinder, a clamping die at one end of the piston, a head telescoped over the open end of the body, a mating clamping die on the head, means for rotatably mounting the head on the body including a plurality of ball bearings disposed in an annular recess defined by adjacent annular grooves formed respectively on the head and on the body, an annular ring disposed in a portion of each of said grooves, each of said rings having a beveled edge portion, said beveled edge portions of said two rings being arranged in a parallel spaced arrangement so that said ball bearings bear against said beveled edges rather than against the edges of said grooves, and means for moving the piston toward the head to exert a clamping force on a member disposed between the two dies.

2. A hydraulic press of the type described in claim 1 wherein said means for moving the piston toward the head comprises a fluid reservoir formed in the body, passage means opening at one end to the reservoir and at the other end to the cylinder, and reciprocable pumping means associated with the passage means to force fluid under pressure from the reservoir into the cylinder.

3. A hydraulic press of the type described in claim 2 wherein said piston is hollow, a rod member having a relatively large head is disposed substantially within said piston with an end secured in said body, and a spring is disposed about said rod member having one end bearing against the head of said rod member and the other end bearing against one end of the piston so as to normally urge said piston away from said head.

4. A hydraulic press of the type described in claim 3 wherein means are provided for rotating said piston with said head comprising a bolt secured in the head having a projecting portion engageable in an external longitudinally-extending slot formed in the piston and bearing means securing said rod member in the body to allow said rod member and said spring to rotate with said piston.

5. A portable hydraulic press comprising, in combination; a body having a cylinder formed therein, a piston reciprocable in said cylinder, a head mounted on the body portion, a pair of mating clamping dies mounted one on said piston and one on said head, a fluid reservoir formed in the body, and means for pumping fluid from the reservoir to the cylinder to move the piston toward the head for a clamping operation comprising a conduit having one end disposed in the reservoir and the other end connected to a fluid passage formed in the body and opening into the cylinder and reciprocable pump means associated with said fluid passage, the volumetric capacity of said reservoir being substantially greater than the volumetric capacity of said cylinder so that when said piston is fully extended in a clamping operation the level of fluid in said reservoir is lowered to a minimum level, said one end of the conduit being positioned below said minimum fluid level.

6. A hydraulic press comprising, in combination; a body having a cylinder formed therein, a piston reciprocable in said cylinder, a head mounted on the body portion, a pair of mating clamping dies mounted one on said piston and one on said head, a fluid reservoir formed in the body, and passage means for pumping fluid from the reservoir to the cylinder to move the piston toward

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the head for a clamping operation comprising a conduit disposed in the reservoir and reciprocable pump means associated with said fluid passage, the end of said conduit being disposed approximately at the center of the reservoir and the maximum volumetric capacity of the cylinder being less than half the volumetric capacity of the reservoir.

7. A hydraulic press comprising, in combination; a body having a cylinder formed therein, a piston carrying a first die slidably mounted in the cylinder, a head carrying a second die mounted on the body, a fluid reservoir formed in the body, means for pumping fluid from the reservoir to the cylinder to move the piston toward the head for a clamping operation, means for relieving the clamping pressure in the cylinder, a socket member pivotably mounted on the body, and a pumping handle movably mounted in said socket member and selectively movable between a first position for actuating the pumping means and a second position for actuating said pressure relieving means.

8. A hydraulic press as called for in claim 7 wherein said means for relieving the pressure in the cylinder comprises a relief valve operable to establish communication between the cylinder and the reservoir and in which said pumping handle is rotatably mounted in said socket member and is normally rotated by resilient means into said first position.

9. A hydraulic press comprising; a body having a cylinder formed therein, a piston slidably mounted in the cylinder, a clamping die at one end of the piston, a head telescoped on one end of the body, a mating clamping die on the head, means for rotatably mounting the head on the body including an annular recess formed by an internal annular groove in the head and an opposed external annular groove on the body, and a plurality of ball bearings confined in said annular recess and lying at least partially in both of said grooves for rollingly mounting the head and body together and opposing the thrust tending to separate the head and body, and means for moving the piston toward the head to exert a clamping force on a member disposed between the two dies.

10. A hydraulic press of the type described in claim 9 wherein each of said grooves has a beveled edge surface, said beveled surfaces being substantially parallel and arranged so that said ball bearings bear against said beveled surfaces during a clamping operation.

11. A hydraulic press of the type described in claim 10 wherein the beveled surface of the groove on the body is at the edge nearest to the major portion of the head and the beveled surface of the groove on the head is at the edge nearest to the major portion of the body.

12. A hydraulic press comprising, a body having a cylinder formed therein, a piston reciprocable in said cylinder, a head mounted on the body, a pair of mating clamping dies mounted one on said piston and one on said head, a fluid reservoir formed in the body, a fluid passage formed in the body and opening at one end to said cylinder and at the other end to said reservoir, a fluid conduit disposed in said reservoir and having its outlet end connected to said other end of said fluid passage and its inlet end disposed substantially in the center of said reservoir, and means for pumping fluid from said reservoir into said cylinder through said conduit and said passage.

13. A hydraulic press of the type described in claim 12 having a pumping handle mounted on said body for actuating the pump means, a normally closed pressure relief passage formed in the body between the cylinder and the reservoir, means having a portion extending outwardly from the body for opening said relief passage to relieve the pressure in the cylinder, projecting means on said pumping handle for selectively engaging said passage opening means, said pumping handle being rotatably mounted on said body so as to be rotatable between two selective positions, in one of which positions said pro-

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jecting means is engageable with said passage opening means.

14. A hydraulic press as defined in claim 13, having means for rotatably mounting the head on the body including an annular recess formed by an internal annular groove in the head and an opposed external annular groove on the body, and a plurality of ball bearings confined in said annular recess and lying at least partially in both of said grooves for rollingly mounting the head and body together and opposing the thrust tending to separate the head and body.

15. A hydraulic press comprising, in combination; a body having a cylinder formed therein, a piston reciprocable in said cylinder to move a first die toward a second die mounted on the body, a fluid reservoir formed in said body, fluid passage means between said cylinder and said reservoir including a passage formed in the body and a conduit having its input end disposed in the center of said reservoir, and pumping means for transferring fluid under pressure to said cylinder from said reservoir.

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16. A hydraulic press of the type described in claim 15 wherein the volumetric capacity of said reservoir is greater than twice the volumetric capacity of said cylinder so that in any position in which the press is held a drop in fluid level in the reservoir as the piston moves from an open die position to a closed die position does not expose said input end of said conduit.

## References Cited in the file of this patent

## UNITED STATES PATENTS

|           |                     |                |
|-----------|---------------------|----------------|
| 2,158,855 | Eby et al. ....     | May 16, 1939   |
| 2,309,605 | Lee .....           | Jan. 26, 1943  |
| 2,329,385 | Bratz .....         | Sept. 14, 1943 |
| 2,372,942 | Fischer et al. .... | Apr. 3, 1945   |
| 2,693,218 | Freedom .....       | Nov. 2, 1954   |
| 2,722,859 | Stoltz .....        | Nov. 8, 1955   |
| 2,729,063 | Hoadley .....       | Jan. 3, 1956   |
| 2,761,339 | Lazar et al. ....   | Sept. 4, 1956  |