March 28, 1967 W. HÜGI 3,311,049

HYDRAULIC PRESS

Filed Oct. 18, 1965 2 Sheets-Sheet 1

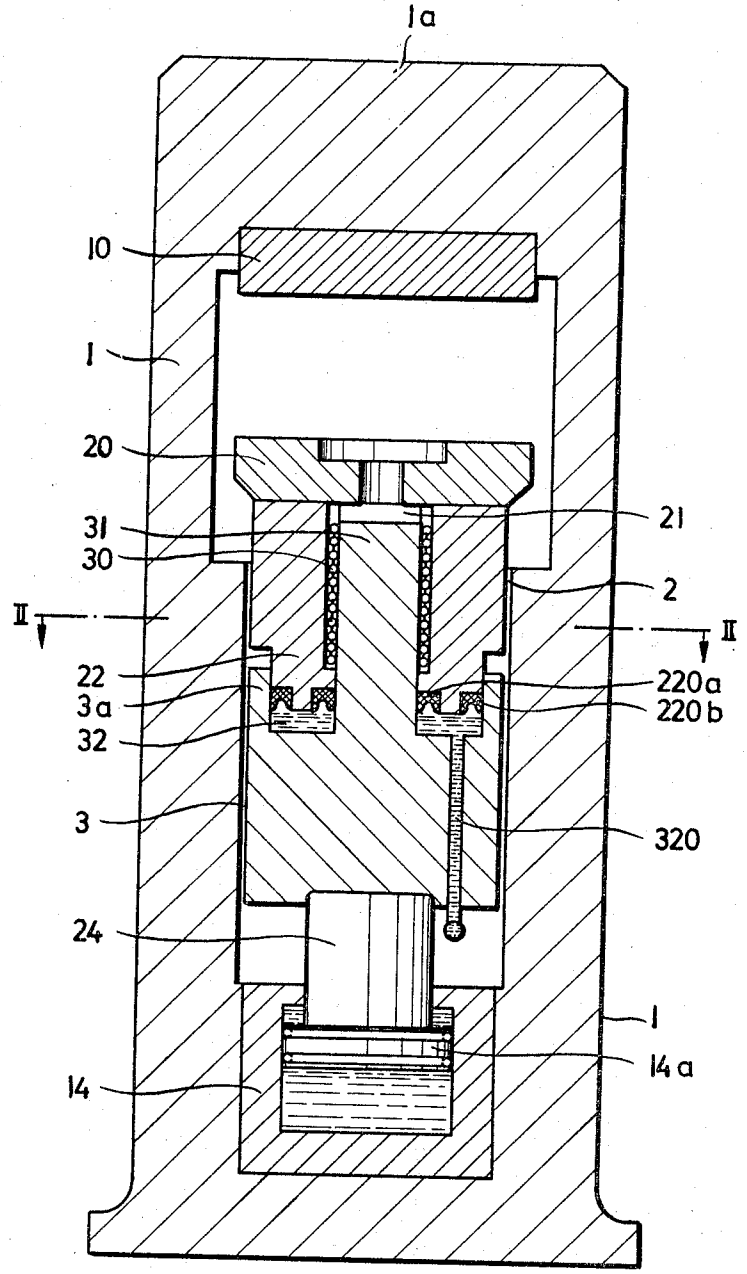



FIG. 1

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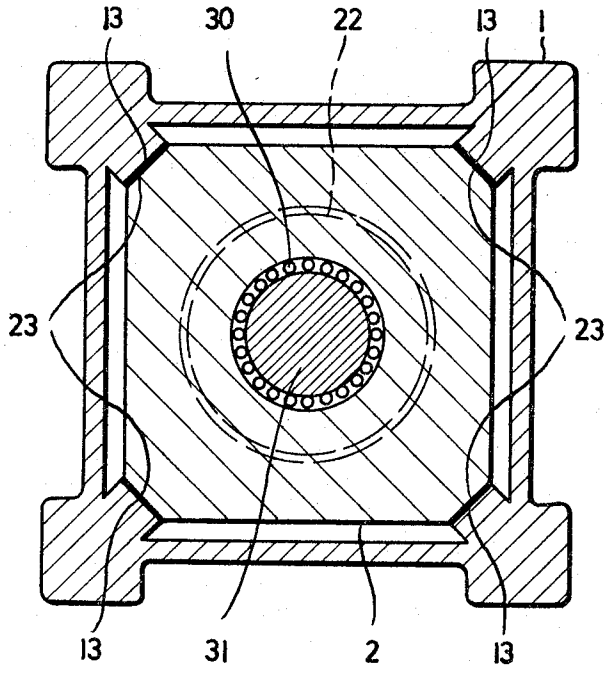



FIG. 2

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# HYDRAULIC PRESS

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10 Claims. (Cl. 100—269)

The present invention relates to presses in general, and more particularly to improvements in hydraulic presses which may be utilized for stamping, punching, forging or similar treatment of metallic or nonmetallic workpieces. Still more particularly, the invention relates to improvements in hydraulic stamping or like presses of the type wherein a ram assembly is reciprocable toward and away from a fixed tool carrier.

In presently known presses of the above outlined character, the tool supporting slide or ram is mounted for movement with reference to a second slide or ram which is used to engage a blank and to hold it against the carrier. The tool supporting slide is then moved against the blank to carry out a stamping or punching operation. The means for guiding the tool supporting slide with reference to the second slide includes an annulus of short guide rods. Such constructions were found to be unsatisfactory, not only because the guide rods cannot prevent uncontrolled displacements of the tool supporting slide, but also because the press is too expensive.

Accordingly, it is an important object of the present invention to provide an improved hydraulic press wherein the ram assembly is properly guided during movement toward and away from a fixed carrier, wherein the two slides of the ram assembly are coupled for relative movement in a very simple manner, wherein the ram assembly is mounted in the frame in such a way that each slide is invariably held against uncontrolled movement with reference to the frame and with reference to the fixed carrier, and wherein the two slides form a very simple and compact ram assembly.

Another object of the invention is to provide a hydraulic press of the just outline characteristics which may be mounted in different positions of inclination, which can be positioned in such a way that finished workpieces and/or scrap which is removed from finished workpieces can be evacuated by gravity, and wherein a single guide member sufficies to control movements of one slide with reference to the other slide.

A further object of the invention is to provide a hydraulic press which, though particularly suited for stamping, can be used with advantage for other types of treatment of individual blanks, of continuous strips or of sheet-like workpieces.

Still another object of the invention is to provide a hydraulic press which may be operated in a fully automatic way, which is of rugged and compact design, and which may be rapidly and conveniently converted to carry out different types of stamping, punching, forging or analogous operations.

Briefly stated, one feature of my present invention resides in the provision of a hydraulic press which comprises a rigid frame, a table or carrier fixedly mounted in the frame, a ram assembly including a first slide which is reciprocable in the frame in directions toward and away from the table and a second slide which is disposed between the first slide and the table, centrally located first guide means provided on the slides for movably supporting the second slide so that the latter is movable with reference to the first slide in directions toward and away from the table, a first hydraulic cylinder and piston unit for moving the ram assembly with reference to the frame, a second hydraulic cylinder and piston unit for moving



the second slide with reference to the first slide, and second guide means for guiding the ram assembly with reference to the frame. The second guide means includes at least three external surfaces provided on the ram assembly and extending in parallelism with the direction of movement of the slides, and complementary surfaces provided on the frame. Each external surface abuts against and is slidable along one of the complementary surfaces.

The first guide means preferably comprises a plunger provided on one of the slides (for example, on the first slide) and extending into a bore provided in the other slide, and a cylindrical antifriction bearing which surrounds the plunger and is accurately fitted into the bore.

The second cylinder and piston unit preferably comprises an annular piston provided on the other slide and surrounding the plunger, and a cylinder provided on the one slide and reciprocably receiving the piston. The first cylinder and piston unit preferably comprises a double-acting cylinder which is fixed to the frame opposite the table, and a piston whose piston rod is coupled to the first slide.

The novel features which are considered as characteristic of the invention are set forth in particular in the appended claims. The improved hydraulic press itself, however, both as to its construction and its mode of operation, together with additional features and advantages thereof, will be best understood upon perusal of the following detailed description of a specific embodiment with reference to the accompanying drawings, in which:

FIG. 1 is a vertical section through a hydraulic stamping press which embodies my invention; and

FIG. 2 is a horizontal section substantially as seen in the direction of arrows from the line II—II of FIG. 1.

Referring now to the drawings in details, FIG. 1 illustrates a hydraulic stamping press which comprises a rigid upright frame **1** having a top frame member or crosshead **1***a* whose underside is fixedly connected with a first tool supporting table or carrier **10**. This table **10** can support one or more readily exchangeable stamping tools. The press further comprises a ram assembly which is composed of two relatively movable slides or carriages **2** and **3**. These slides are movable up and down, i.e., in directions toward and away from the table **10**, and the slide **2** is disposed between the table **10** and the slide **3**. The top portion of the slide **2** supports a second tool supporting table or carrier **20** which faces the table **10** and is provided with suitable grooves or ways for removably supporting one or more complementary stamping tools, not shown.

The two slides are coupled by first guide means which includes a centrally located plunger **31** provided on the slide **3** and extending into a complementary blind bore **21** provided in the slide **2**. The plunger **31** is surrounded by a cylindrical antifriction bearing **30** whose cage is accurately fitted into the annular gap between the periphery of the plunger **31** and the surface surrounding the blind bore **21**. The axis of the plunger **31** is parallel with the direction of movement of the slides **2** and **3** toward and away from the table **10**. In the illustrated embodiment, the axis of the plunger **31** is vertical.

The means for moving the slide **2** with reference to the slide **3** comprises a hydraulic cylinder and piston unit which includes an annular cylinder **3***a* defined by the upper end portion of the slide **3** and an annular piston **22** defined by the lower end portion of the slide **2**. The piston **22** is slidable in the cylinder **3***a* and defines therewith a cylinder chamber **32** which can receive hydraulic pressure fluid through a supply channel **320** machined into the lower part of the slide **3**. The means for controlling the flow of hydraulic fluid through the channel **320** is of conventional design and is not shown in the

drawings. The annular piston **22** is slidable on the plunger **31** and carries two annular gaskets **220***a*, **220***b* which prevent bleeding of hydraulic fluid into the bearing **30** and along the internal surface of the annular cylinder **3***a*. The chamber **32** is of annular shape.

A second guide means for the ram assembly including the slides **2** and **3** is shown in FIG. 2. This second guide means comprises four external surfaces **23** which are provided on the slides **2** and **3**, and an equal number of complementary internal surfaces **13** provided on the frame **1**. Each external surface **23** is in abutment with and slides along one of the complementary surfaces **13**. It will be seen that the slides **2** and **3** are of rectangular cross-sectional outline and that the external surfaces **23** are provided at the four corners of the ram assembly. In some instances, it is sufficient to provide external surfaces only on the slide **2** or **3**. The press should be provided with at least three pairs of surfaces **13**, **23**.

A second hydraulic cylinder and piston unit is provided for moving the ram assembly including the slides **2** and **3** toward and away from the table **10**. This second unit includes a double-acting cylinder **14** which is fixed to the frame opposite the table **10**, a piston rod **24** which is coupled to the slide **3**, and a piston **14***a* which is connected to the piston rod **24** and is reciprocable in the cylinder **14**. The means for supplying hydraulic pressure fluid to the upper and lower chambers of the cylinder **14** is of known design and is not shown in the drawings.

In operation, the lower slide **3** carries out full working strokes and transmits the main force to the stamping tools. When the upper slide **2** reaches a blank which is placed between the tables **10** and **20**, the unit including the annular piston **22** holds the blank in requisite position with a force which may be adjusted by changing the pressure prevailing in the annular cylinder chamber **32**. The lower chamber of the double-acting cylinder **14** continues to receive hydraulic fluid so that the piston rod **24** causes the slides **2**, **3** to move toward the table **10** whereby the table **20** comes to rest on the plunger **31** and the tools complete the stamping operation.

While the drawings show a vertical stamping press, it is often preferred to mount the press in horizontal position so that the axis of the plunger **31** is horizontal. Such a horizontal stamping press is identical in construction with the vertical stamping press shown in the drawing, the only difference being that it is arranged with its slides moving in a horizontal direction. This is of advantage because the finished stampings and/or the material which has been severed from the finished stampings may be allowed to descend by gravity. In other words, when the press is horizontal, there is no need to provide means for ejecting and/or transferring finished articles and scrap once the ram assembly including the slides **2** and **3** has been caused to perform a return stroke.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can, by applying current knowledge, readily adapt it for various applications without omitting features which fairly constitute essential characteristics of the generic and specific aspects of my contribution to the art and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.



What is claimed as new and desired to be protected by Letters Patent is:

**1.** A hydraulic press, comprising a frame; a carrier fixedly mounted in said frame; a ram assembly including a first slide reciprocable in said frame toward and away from said carrier and a second slide disposed between said carrier and said first slide; centrally located first guide means provided on said slides for movably supporting said second slide so that the latter is movable with reference to said first slide toward and away from said carrier; a first cylinder and piston unit for moving said assembly with reference to said frame; a second cylinder and piston unit for moving said second slide with reference to said first slide; and second guide means for guiding said assembly with reference to said frame, including at least three external surfaces provided on said assembly and extending in parallelism with the direction of movement of said slides, and complementary surfaces provided on said frame, each of said external surfaces abutting against and being slidable along one of said compleemntary surfaces.

**2.** A press as set forth in claim **1**, wherein said first guide means comprises a plunger provided on one of said slides and extending into a bore provided on the other slide, and a cylindrical antifriction bearing surrounding said plunger.

**3.** A press as set forth in claim **2**, wherein said plunger is integral with said first slide.

**4.** A press as set forth in claim **2**, wherein said second cylinder and piston unit comprises an annular piston provided on said other slide and surrounding said plunger, and a cylinder provided on said one slide and reciprocably receiving said piston.

**5.** A press as set forth in claim **1**, wherein said first and second guide means are horizontal.

**6.** A press as set forth in claim **1**, wherein said external surfaces are provided on each of said slides.

**7.** A press as set forth in claim **1**, wherein said slides are of polygonal cross section and said external surfaces are provided at the corners of said slides.

**8.** A press as set forth in claim **7**, wherein said slides are of rectangular cross section and said external surfaces are provided at each of the four corners of said slides.

**9.** A press as set forth in claim **1**, wherein said first cylinder and piston unit comprises a double-acting cylinder fixed to said frame opposite said carrier, a piston reciprocably received in said cylinder, and a piston rod connecting said piston with said first slide.

**10.** A press as set forth in claim **1**, wherein said second slide comprises a second carrier which faces said first named carrier.


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