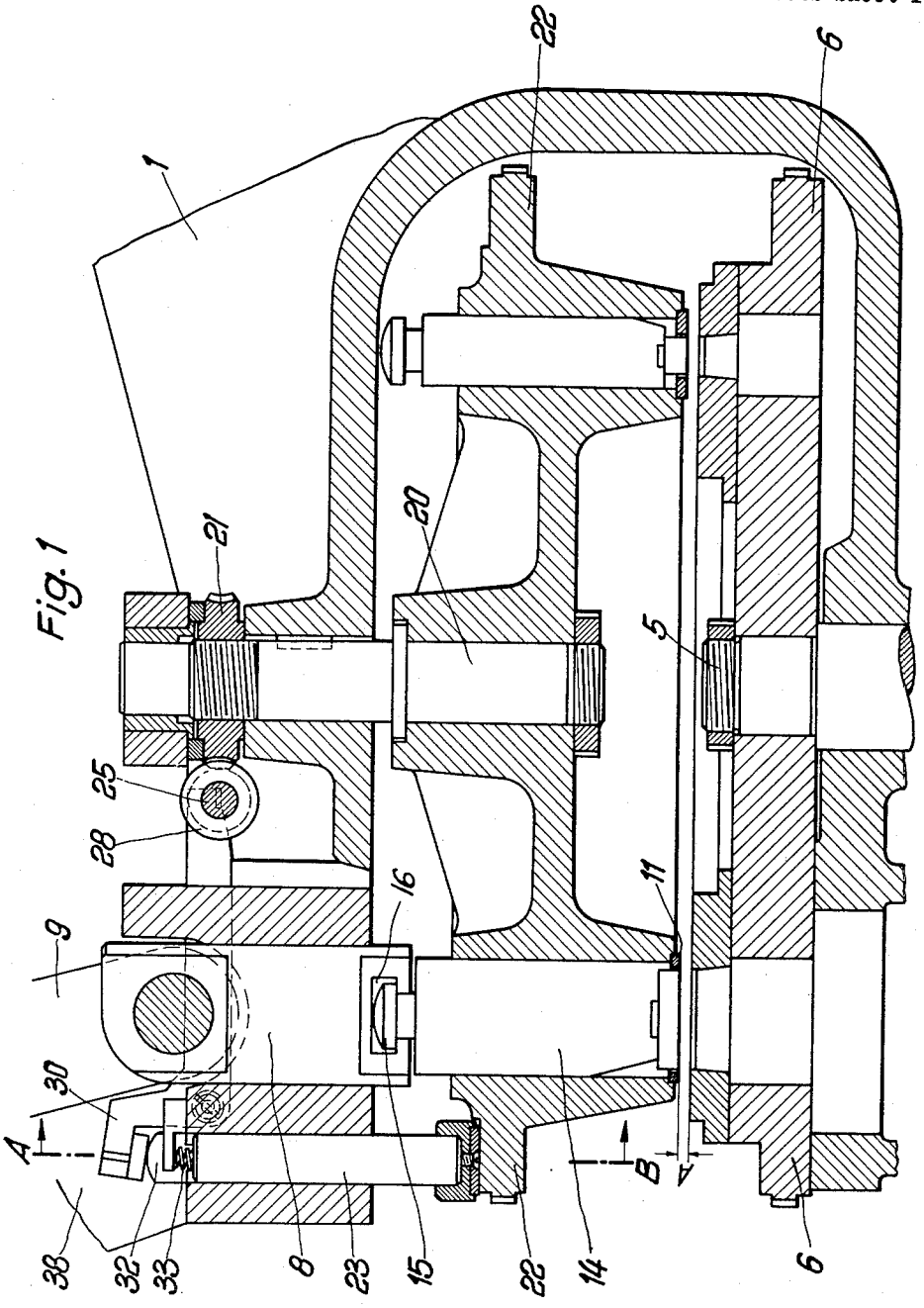
July 7, 1964 W. BREDOW 3,139,779

PUNCH PRESS WITH A ROTATABLE TOOL HEAD

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Fig. 1



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PUNCH PRESS WITH A ROTATABLE TOOL HEAD

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Fig. 2

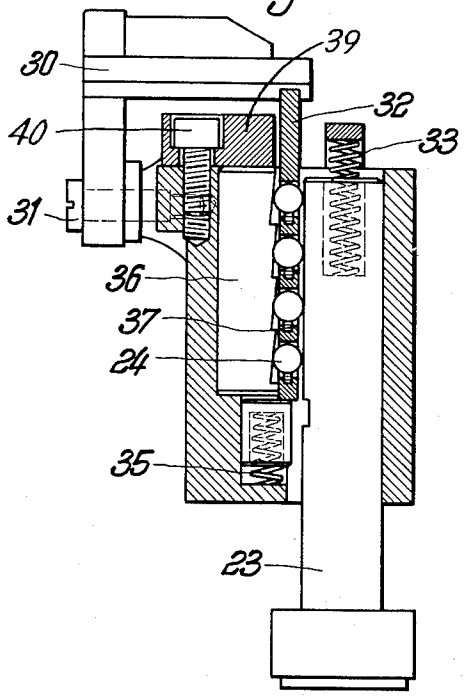


Fig. 3

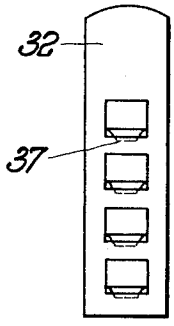
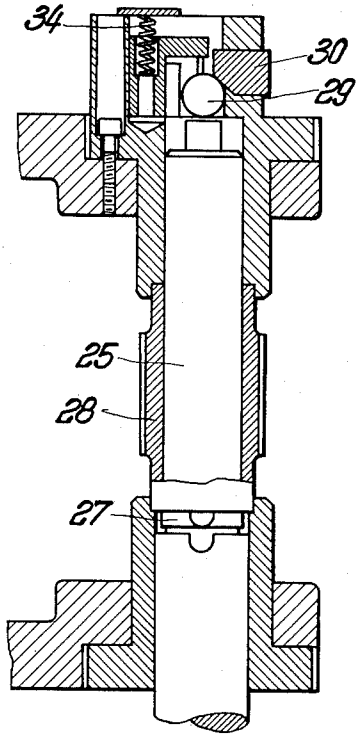


Fig. 5



Inventor:

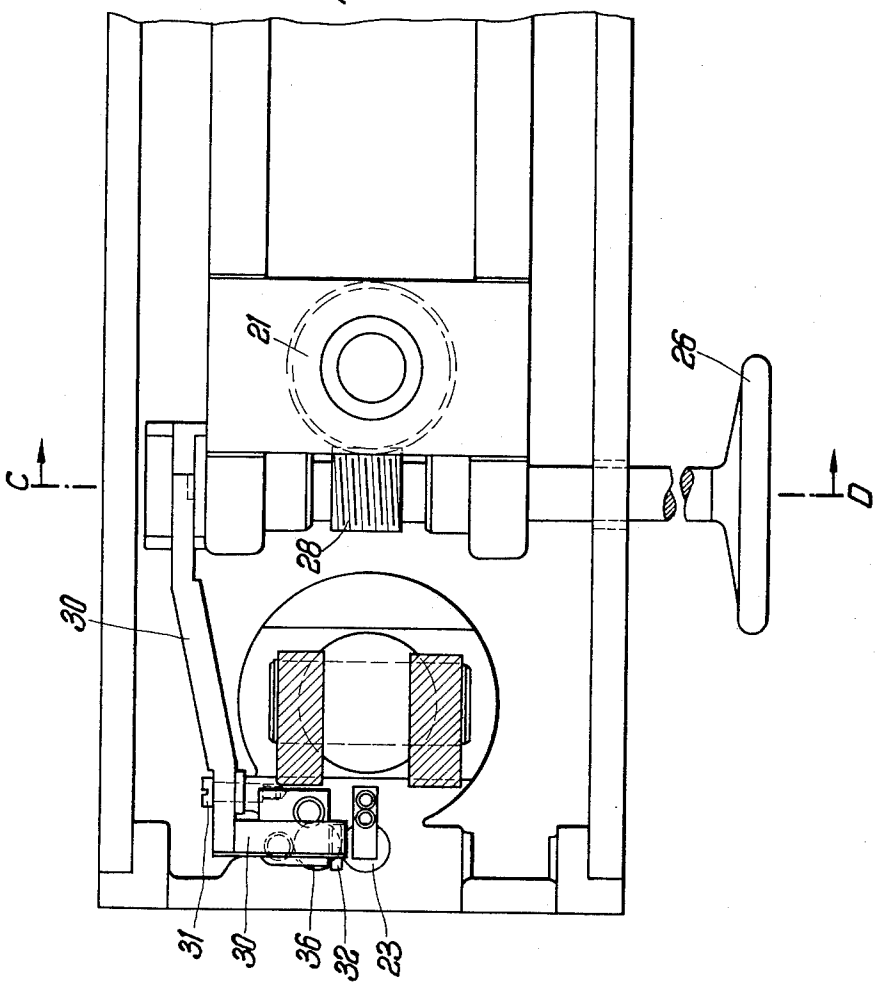
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PUNCH PRESS WITH A ROTATABLE TOOL HEAD

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Fig. 4



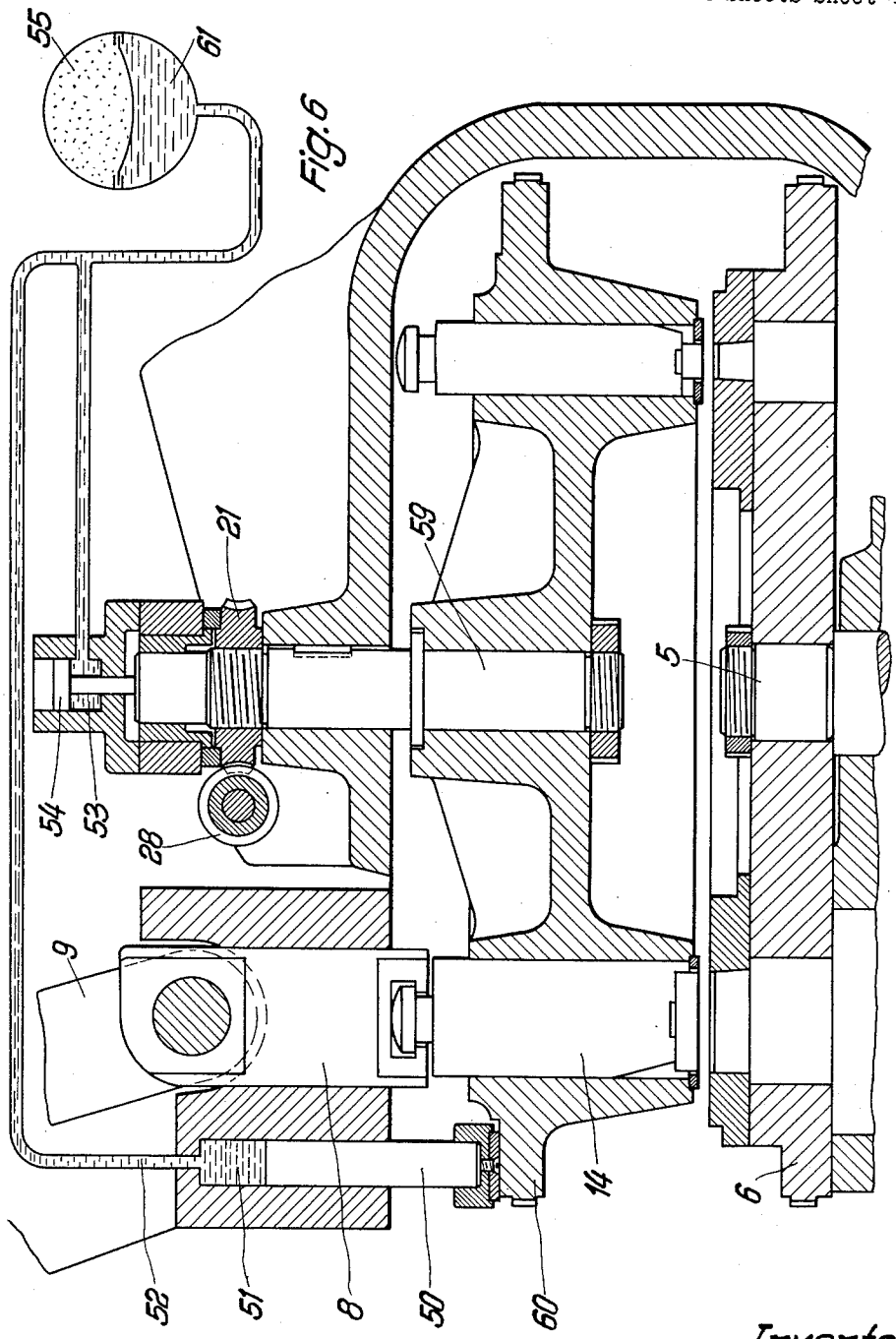
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PUNCH PRESS WITH A ROTATABLE TOOL HEAD

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Fig. 6



Inventor:

United States Patent Office

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PUNCH PRESS WITH A ROTATABLE TOOL HEAD

Walter Bredow, Vormasch 2, Alfeld (Leine), Germany

Filed Nov. 17, 1961, Ser. No. 153,102
Claims priority, application Germany Mar. 10, 1961
6 Claims. (Cl. 83—146)

This invention relates to a punch press with a rotatable tool head and concerns more particularly the provision of an adjustable tool head. In multiple punch presses hitherto known the distance between the punch plate and the rotatable plate containing the dies is not adjustable, in other words this gap must be sufficient to provide space for blanks of the greatest thickness which may be loaded into the press. This involves the drawback that thin sheets tend to bend when the punch is withdrawn. The forces which then arise generate a one-sided load on the punch and affect the accuracy of its alignment.

However, forms of construction are already known in which this drawback is overcome by providing each station with a separate adjustable stripper. The objection to such an arrangement is that each stripper must be individually adjusted to the thickness of the blank and that such adjustments are insufficiently accurate, apart from the fact that time is wasted in making them.

It is therefore an object of the invention to provide a punch press in which the stripper height may be more easily adjusted, by variation of the height of the punch plate as a whole.

It is a further object of the invention to provide a press in which the rotatable punch plate can be elevationally adjusted to conform with the thickness of the work and means are provided to ensure that in every position the tool head or punch plate is fully supported by the machine frame.

The invention therefore consists in that the tool head or punch plate can be raised or lowered by transmission means in relation to the die plate. In a preferred embodiment of the invention the backing pin which transmits the reactive forces engendered by the stripping process to the main machine frame is coupled with the adjusting means for the tool head or punch plate in such manner that, after release of a clutch means, the pin can participate in the movement of the tool head or punch plate and that after re-engagement of the clutch the backing pin will again transmit the reactive stripping thrust to the machine frame. Especially in punch presses equipped with a rotatable punch plate the clutch between the pin and the punch plate may be so constructed that adjustment of the tool head or punch plate is performed by a shaft which, on the one hand, is axially shiftable to bring the worm mounted thereon into engagement with the worm wheel for the vertical displacement of the tool head or punch plate and, on the other hand, by means of a ball and lever disengages the releasable clutch, for instance in the form of a roller type clutch, between the backing pin and the machine frame to permit the backing pin to participate in the displacement of the tool head or punch plate. By the retraction of the shaft into its former position the coupling or roller type clutch between the backing pin and the machine frame is brought into re-engagement.

The mechanical displacement of the backing pin may alternatively be effected by hydraulic means. To this end the backing pin may be embodied in a hydraulic ram connected with a master piston by means of a non-compressible hydraulic fluid, said master piston being rigidly affixed to the pivot pin of the tool head or punch plate. The movement of the punch plate during adjustment is thus directly transmitted to the supporting pin.

The invention will now be more particularly described

by reference to the accompanying drawings which illustrate a punch press equipped with a rotatable tool head.

In the drawings

FIGURE 1 is a side elevation of the rotatable tool head in the gap of the frame of a punch press, and of the adjusting means;

FIGURE 2 is a part sectional view of the adjustable pin and of the adjacent roller type clutch and other neighbouring parts (section taken on the line A—B in FIGURE 1);

FIGURE 3 is a front view of the cage for the roller type clutch;

FIGURE 4 is a schematic plan view of the part of the press shown in FIGURE 1;

FIGURE 5 is a section taken on the line C—D in FIGURE 4, and

FIGURE 6 is a side elevation of an alternative embodiment comprising hydraulic control means.

FIGURE 1 is a side elevation of that part of the frame **1** of the press which contains the rotatable punch plate **22** and the rotatable die plate **6**. The rotatable die plate **6** turns on pivot pin **5** and the punch plate on a pivot pin **20**. The punch **14** which is at the front of the gap in the frame is actuated, for instance, by an arm **9** of a toggle joint mechanism not specially shown in the drawing. The thrust is transmitted by ram **8** to the spherical head **15** of the punch which engages a recess **16** in the bottom end of the ram. The recess **16** is so formed that it positively engages the punch **14** whose position and motion therefore depend only on the position and motion of the ram **8**. The lower end of the punch **14** is encircled by a stripper ring **11** attached to plate **22**. Letter A indicates the clearance between the bottom edge of the stripper ring and the upper edge of the die plate. This clearance is adjustable to the thickness of the pierced blank.

In the illustrated embodiment the rotatable punch plate **22** and the backing pin **23** are simultaneously adjusted to a required clearance A by means of a handwheel **26** (cf. FIGURE 4) which rotates on a shaft located horizontally above the rotatable punch plate **22**, and which is conveniently accessible. The elevational adjustment of the punch plate **22** is effected in that the pin **20** about which the punch plate **22** can revolve is adapted to be raised and lowered by means of a nut **21** which has the form of a worm wheel. Because of the above-mentioned positive engagement of the punch **14** by the ram **8**, adjustment of punch plate **22** leaves punch **14** unaffected, so that the working stroke of the press remains constant. In order to relieve the punch plate **22** from the reactive thrust engendered by the stripping operation a backing pin **23** is provided which directly transmits the reactive thrust to the machine frame **38**. In order to permit this backing pin **23** to participate in the vertical motions of the rotatable punch plate **22** when this is elevationally adjusted, the pin is not rigidly secured to the main frame **38** of the machine. The thrust is transmitted through a releasable roller type clutch **24**. For raising or lowering the punch plate **22** shaft **25** is shifted by means of hand wheel **26** after engagement of coupling **27** to effect the connection with shaft **25** and worm **28**. The shifting of the shaft simultaneously causes ball **29** to deflect a lever **30** about pin **31**. As a result of this deflection of lever **30** the latter pushes the cage **32** of the roller type clutch **24** downwards and thus releases the backing pin **23**, permitting the latter to participate in the motion of tool head **22**. Moreover, in order to permit the backing pin **23** to participate in a downward displacement of the tool head **22** a compression spring **33** is provided which maintains the backing pin **23** in contact with tool head **22**.

When the tool head **22** has been elevationally adjusted

a spring 34 restores shaft 25 into its former position. The roller cage 32 is simultaneously raised by a spring 35, urging the rollers of clutch 24 into simultaneous contact with the wedge faces of a pin 36 which is held in machine frame 38 by a backing plate 39 and bolts 40 and with the sides of the backing pin 23. In the contact region with the rollers the radius of pin 23 may taper in the upward direction in such a way that the contact surface for the rollers is slightly wedge-shaped. In order to ensure that all the rollers of the clutch 24 equally participate in the transmission of thrust each roller is individually urged in the upward direction by a spring 37.

FIGURE 6 illustrates an alternative embodiment of the invention using hydraulic means. In this embodiment the backing pin 50 has the form of a hydraulic ram. The cylinder chamber 51 above the backing pin 50 is connected by a pipe 52 with the cylinder chamber 53 of piston 54. The diameter of cylinder 51 is equal to the effective annular section of cylinder 53. The pipe connects both cylinders and contains a non-compressible medium. In order to make good any losses by leakage the pipe incorporates a storage vessel 55 located in a more elevated position than shown in the schematic drawing.

Rotation of hand wheel 26 causes the threaded worm 28 to be rotated by worm wheel 21. The pivot pin 59 of the tool head 60 is thus raised or lowered. Piston 54 is rigidly connected with pivot pin 59 and therefore participates in the upward or downward motion of pivot pin 59. Since the effective cylinder sections of cylinders 51 and 53 are equal, the backing pin 50 is displaced by the hydraulic fluid through the same distance as piston 54 and in the same direction.

I claim:

1. In a punch press, a rotatable die plate supporting dies, a rotatable punch plate, a plurality of punches slidingly guided in the punch plate, a ram positively engageable with the head of any selected punch on rotation of the punch plate to bring the selected punch to a working position below the ram, the position and motion of the selected punch depending only on position and motion of the ram, a plurality of stripper rings mounted on the underside of the punch plate to strip punched material from the punches, and means for raising and lowering the punch plate relative to the die plate to vary the distance between the stripper rings and the die plate while the distance between the selected punch and the die plate remains the same.

2. The combination claimed in claim 1, in which the means for raising or lowering the punch plate comprises a vertically adjustable pivot pin on which the punch plate turns, which pivot pin is externally threaded, a worm wheel provided with an internal thread, the worm wheel being threaded on the pivot pin and being restrained from vertical motion, a rotatable shaft, a worm on said shaft and engaging the said worm wheel, and means for rotating the shaft.

3. In a punch press, a rotatable die plate supporting dies, a rotatable punch plate, a plurality of punches slidingly guided in the punch plate, a ram positively engageable with the head of any selected punch on rotation of the punch plate to bring the selected punch to a working position below the ram, the position and motion of the selected punch depending only on position and motion of the ram, a plurality of stripper rings mounted on the underside of the punch plate to strip punched material from the punches, means for raising and lowering the punch plate relative to the die plate to vary the distance between the stripper rings and the die plate while the distance between the selected punch and the die plate remains the same, a backing pin bearing between the punch plate and the press frame to prevent lifting of the punch plate, means coupling the backing pin to the press frame, and means operable by the said means for raising and lowering the punch plate to modify the action of the coupling means and to maintain the backing pin in contact with the punch plate during adjustment of the height of the latter.

4. In a punch press, a rotatable die plate supporting dies, a rotatable punch plate, a plurality of punches slidingly guided in the punch plate, a ram positively engageable with the head of any selected punch on rotation of the punch plate to bring the selected punch to a working position below the ram, the position and motion of the selected punch depending only on position and motion of the ram, a plurality of stripper rings mounted on the underside of the punch plate to strip punched material from the punches, a vertically adjustable pivot pin on which the punch plate turns, which pivot pin is externally threaded, a worm wheel provided with an internal thread and threaded on the pivot pin but restrained from vertical movement, a rotatable shaft, a worm engaging the said worm wheel, a normally disengaged coupling between the shaft and the worm, a backing pin bearing on and biased towards the top of the punch plate, a normally engaged clutch coupling the backing pin to the press frame, and a mechanical linkage to release the said clutch on engagement of the said coupling.

5. The combination claimed in claim 4, in which the said clutch comprises one or more rollers disposed in a cage between the backing pin and one or more wedging surfaces in the press frame, each roller being biased towards a wedged condition, and in which a pivoted arm is provided whose ends respectively engage the end of the shaft and the said cage in such a way that axial motion of the shaft in a sense to engage the coupling pivots the arm which displaces the roller cage to a position in which the rollers are not wedged.

6. In a punch press, a rotatable die plate supporting dies, a rotatable punch plate, a plurality of punches slidingly guided in the punch plate, a ram positively engageable with the head of any selected punch on rotation of the punch plate to bring the selected punch to a working position below the ram, the position and motion of the selected punch depending only on position and motion of the ram, a plurality of stripper rings mounted on the underside of the punch plate to strip punched material from the punches, a vertically adjustable pivot pin on which the punch plate turns, which pivot pin is externally threaded, a worm wheel provided with an internal thread and threaded on the pivot pin but restrained from vertical movement, a rotatable shaft, a worm engaging the said worm wheel and mounted on the rotatable shaft, a backing pin bearing on the top of the punch plate, a hydraulic system comprising a hydraulic fluid reservoir, a first cylinder formed in the press frame and in which the upper end of the backing pin moves as a piston under the pressure of hydraulic fluid in the system, a fixed second cylinder, a further piston in the said second cylinder and rigidly attached to the said pivot pin, and hydraulic fluid conduits interconnecting the reservoir and the two cylinders, the said conduits communicating with the cylinder spaces above the backing pin and below the said further piston, and the effective cross-sectional areas of the two cylinders being equal.

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