

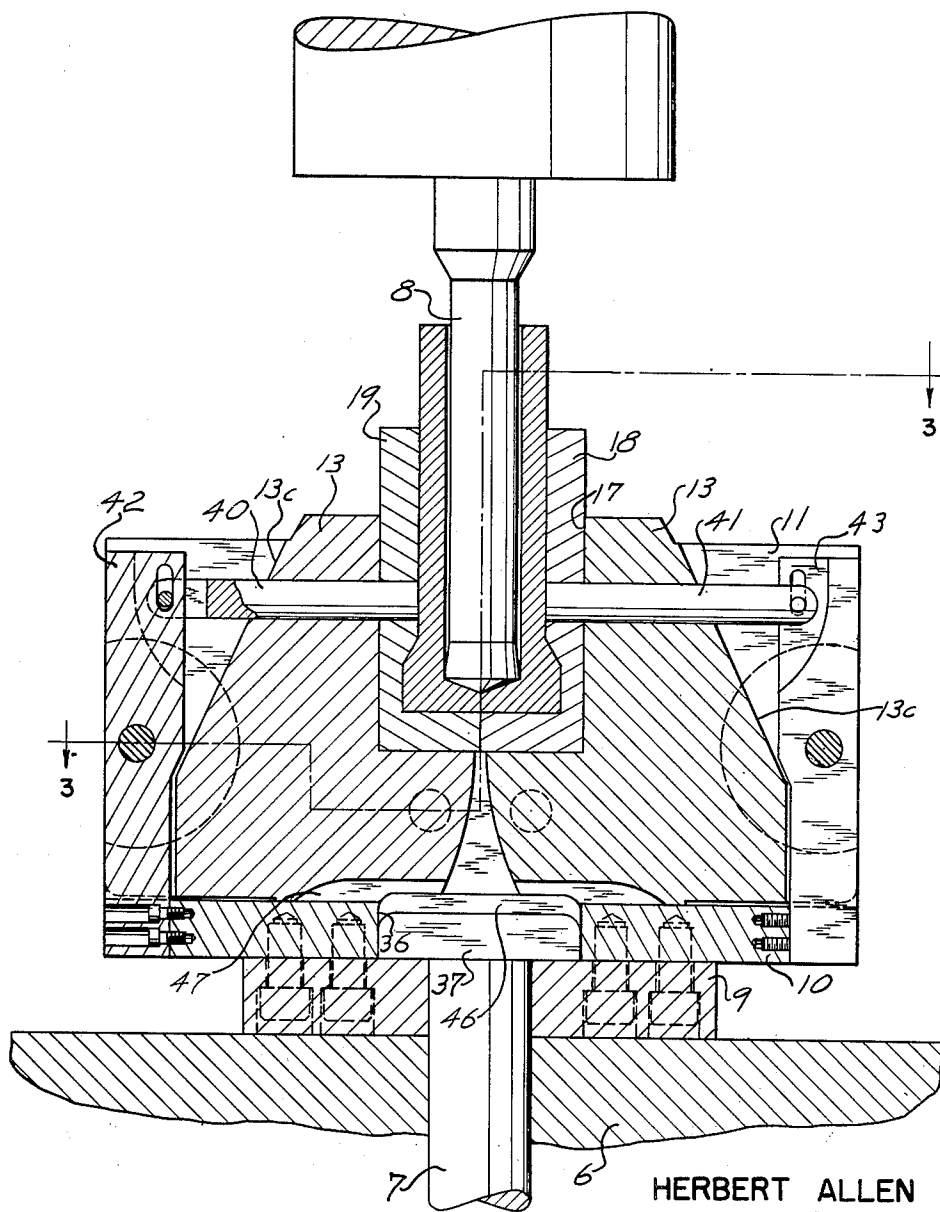
Feb. 1, 1955

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DIE HOLDER

2,700,906

Filed Oct. 30, 1950

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

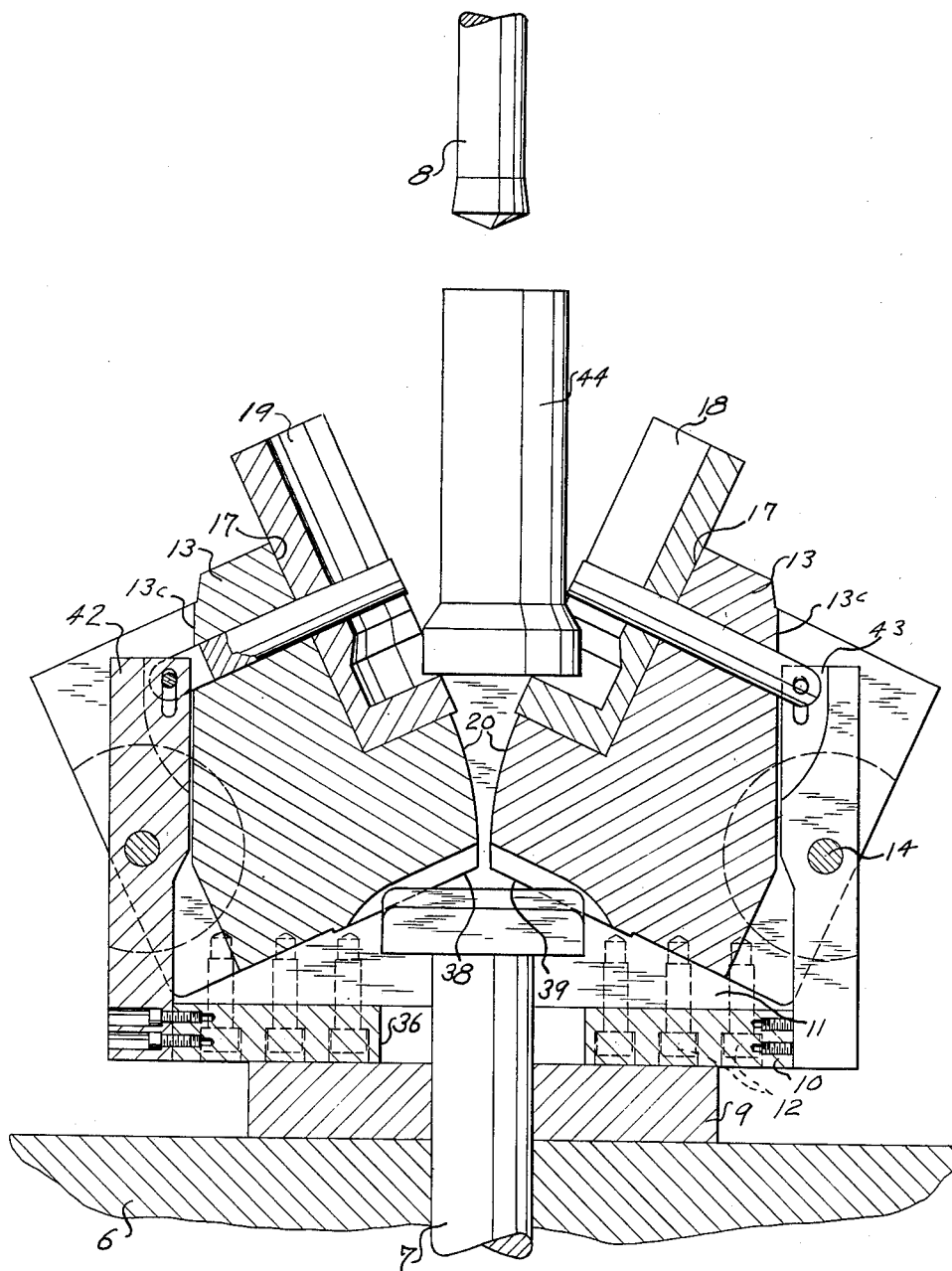


Fig. 2

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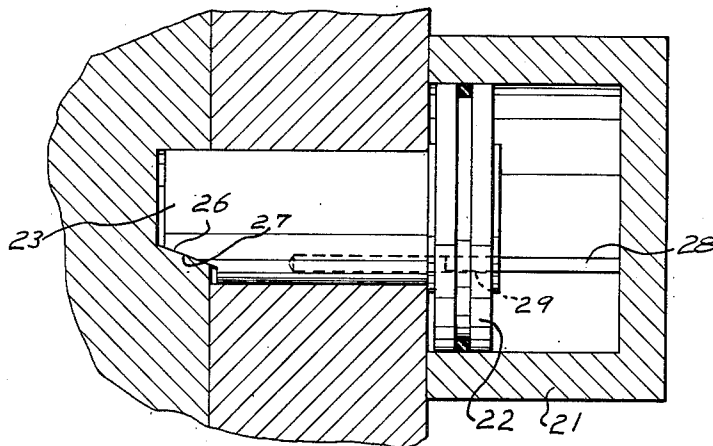
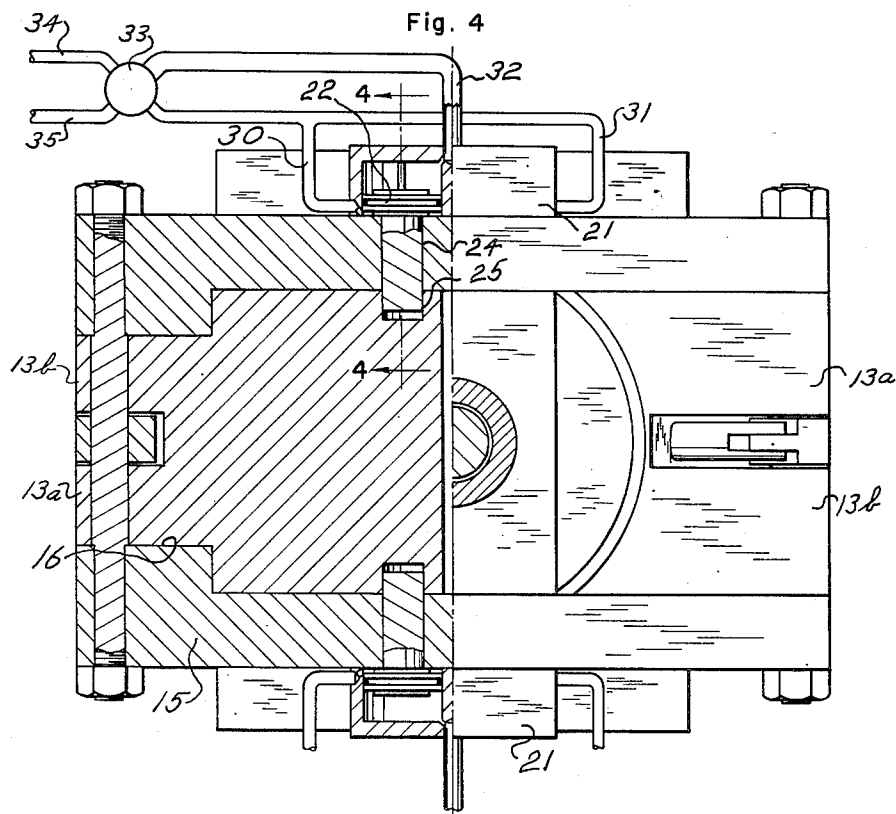


Fig. 3

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1 Claim. (Cl. 78—60)

This invention relates to improvements in die holders and refers more particularly to die holders for forging operations with separable type dies.

In forging certain type of articles, it is necessary to use split dies in order that the dies may be separated to facilitate removal of the forging. In certain types of presses side rams are provided for holding the die halves together during a forging operation and the rams are retracted after the forging operation so that the die halves may be separated. However, many presses do not have the side rams and a die holder must be provided which will resist the forces which tend to separate the split dies while the forging operation proceeds and which will permit ready separation of the dies to facilitate removal of the completed forging.

An object of this invention is to provide a die holder for split dies wherein the forces to which the die holding members are exposed during a forging operation are partially counterbalanced against each other so as to reduce the tendency of the dies to separate.

Another object is to provide a die holder with pivoted holding members wherein the pivots are located relative to the die cavity so that the forces acting on the holding members due to a forging operation produce torques tending to rotate the members about their pivots which are largely counterbalanced.

A further object is to provide a die holder having members which are pivoted for swingeing movement from a forging position to a separated position wherein the forces acting against the bottom of the die cavity produce torque tending to swing the members in one direction and the forces acting laterally from the walls of the die produce forces acting against the members tending to rotate them in an opposite direction whereby the resultant torque to which the members are exposed in a forging operation is not great.

Still another object is to provide a die holder of the character described wherein detent means may be provided for locking the die members in forging position.

A still further object is to provide a die holder of the character described having knock out members to facilitate removal of finished forgings.

Other and further objects of the invention will appear as the description proceeds.

In the accompanying drawings which form a part of the instant specification and are to be read in conjunction therewith, and wherein like reference numerals are used to indicate like parts in the various views:

Fig. 1 is a vertical sectional view illustrating die holding apparatus embodying this invention and showing fragmentary parts of a press;

Fig. 2 is a view similar to Fig. 1 but illustrates the holding apparatus in forging knock out position;

Fig. 3 is a top plan view partially in section of the apparatus shown in the preceding figures; and

Fig. 4 is a view taken along the line 4—4 in Fig. 3 in the direction of the arrows.

The invention in general comprises a support to which are pivotally mounted holding members having recesses which in one position of the members provide a die receiving cavity and in another position separate the dies whereby forging may be readily released. The arrangement is such that the members are freely swingable between these two operative positions and the pivots for the members are so related to the die cavity that the forces acting against the die members produce very little, if any, resultant torque tending to rotate the die holding

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members from forging position to knock out position. Detent means may be provided for retaining the die holding members in forging position. Also, a forging knock out means may be utilized in conjunction with the apparatus so that as the members are swung to knock out position the forging is automatically removed from position within the die halves.

In the drawings portions of a press are shown to illustrate the manner of use of the die holder of this invention. The numeral 6 designates the bottom slide of a press and the knock out ram is shown at 7. At the upper end of the drawings there is shown at 8 the press punch.

The support means for the die holder may be mounted upon an adapter plate 9 carried by the bottom slide and comprises a bottom member 10 with upright side parts 11 secured along two sides of the bottom part by the plurality of cap screws 12. The holding members 13 are pivoted to the support means for swinging movement between the position of rest upon the bottom of the support means as shown in Fig. 1, and an elevated knock out position as shown in Fig. 2.

The holding members are mounted upon the support means by hinge pins 14 which extend between the side walls 11 and through apertures extending transversely of the holding members. In order to provide a large bearing surface between the holding members and the side walls it is preferable to form these with trunnions. This may be accomplished by forming the side walls with cylindrical bearing parts 15 which fit in cylindrical recesses 16 formed in the holding members. Actually the cylindrical members and recesses are approximately semi-circular but do provide cylindrical bearing surfaces upon which the holding members are supported.

The holding members are provided with recessed portions 17 which cooperate with the members in rest position to provide a die cavity in which the die parts 18 and 19 of a separable die may be disposed. The bottom and wall surfaces of recesses 17 support the die parts 40 which may be secured therein by any suitable means as will be well understood by those skilled in the art.

In order that the die holding members may be freely rotatable for knock out purposes but will not be rotated due to forces developed in forging, the pivots for the holding members are carefully positioned relative to the die cavity so that the downward forces produce torques tending to rotate the members in one direction and the lateral forces acting against the walls of the recesses 17 produce torque tending to rotate the members in the opposing direction. By this means the resultant torque may be controlled so as to be very small. Also the holding members must be formed with cylindrical portions 20 which are struck upon a radius about the pivots or hinge pins centers 14. This permits free rotation of the holding members.

The hinge pins or pivots are preferably located relative to the cavity so that their centers reside in a horizontal plane about upon a level with the bottom of the die cavity. The surfaces 20 should extend downwardly from this plane which includes the hinge pins centers.

With the die holder in accordance with this invention the forging operation may be carried out with substantially no resultant torque tending to cause the holding members to rotate in knock out position. However, when unusually high forgings are to be produced which require extra long dies, the lateral forces acting against the walls of the die in a direction to rotate the holding members to open position are effective against a rather long moment arm. In order that the devices may be positively locked in forging position to avoid any possibility of rotation of the members to open position, it is desirable to provide a detent means for securing the members in position of rest against the bottom of the support means.

This detent means may include cylinders 21 secured on each side of the support means, each one providing double cylinders. Within the cylinders are mounted pistons 22 having pin extensions 23 extending through registering openings in the side walls of the support means and the holding members. These openings are designated at 24 and 25, respectively. Corresponding irregular surfaces 26

and 27 may be formed upon the openings 25 and pin 23, respectively, so that the pins will be tightly wedged into locking position. To maintain these irregular surfaces in proper alignment, guide pins 28 may project parallel to the axis of the cylinders in which the pistons 22 are mounted. The pins 28 extend through openings 29 in the pistons and inasmuch as these pins are off center relative to the piston it maintains them in proper orientation.

A suitable means may be provided for reciprocating the pistons and locking pins. This means may include connections 30, 31 and 32, for supplying power fluid, as for example compressed air, to the ends of the cylinders. Also, the same connections will exhaust spent power fluid and a suitable four-way valve may be employed for directing the power fluid and exhaust fluid to and from the cylinders. This four-way valve is shown schematically at 33 connected to lines 34 and 35 which may lead to a suitable source of power fluid and exhaust, respectively.

Means are provided for effectively swinging the holding members to open or knock out position and for simultaneously knocking the finished forging from position within the dies. This means cooperates with the knock out ram 7 and includes a square opening 36 in the bottom member of the support means. The knock out ram may have a square head 37 which fits within the opening 36 and this head engages the surfaces 38 and 39 of the holding members to force them from their Fig. 1 to their Fig. 2 position. The ram head 37 is provided with a rib 46 which engages the seats 47 to prevent rotation of the ram. Of course, the locking pins 23 must be retracted in order to permit separation of the holding members.

The knock out means may be provided by pivoting knock out pins 40 and 41 to the support, the pins extending through openings in the holding members and registering openings in the die parts 18 and 19. The pivot for the knock out pins preferably reside in slots formed in uprights 42 and 43 secured to the bottom or base of the support means. Suitable cap screws are provided for securing the uprights in place. These uprights have openings for receiving the hinge pins 14 and reside between yoke arms 13a and 13b formed on the respective holding members. The yoke arms between the members are formed upon an inclined line 13c whereby the die holders 13 may be rocked upon the hinge pins 14 without interference. This allows the holding members to be rotated to a Fig. 2 position. From the Fig. 2 showing, it is apparent that the ends of the knock out pins 40 and 41 engage the forging shown at 44 to knock it from the die as the holding members are retracted.

It is thought that the operation of the invention is apparent from the foregoing description. The die parts 18 and 19 are secured in the holding members, residing in the cavity provided by recesses 17. The members 13 are then moved to their Fig. 1 position and the four-way valve 33 manipulated to supply power fluid to move the detent means into locking position. A suitable billet is then placed within the dies and the usual blocking and extruding operations are carried out. In Fig. 1 the finished forging is shown and it is obvious that because of the enlarged head at the lower end of the forging that it cannot be removed from the dies without separating them.

This removal is accomplished by manipulating four-way valve 33 so that power fluid enters the cylinders in back of pistons 22 through lines 30 and 31. This retracts the locking pins and then knock out ram 7 is moved upwardly to force the holding members into Fig. 2 position. Simultaneously with the rocking of the holding members about their pivots the knock out pins push the forging from the die parts so that it may be readily removed.

During the actual forging operation the downward force which is transmitted from the punch 8 through the forging material and dies to the holding members, tends to rotate them downwardly but this downward rotation

is resisted by the support bottom. The lateral forces transmitted by the extruding metal to the walls of the die receiving cavity produce a torque about the pivots for the holding members which tend to rotate the holding members toward open position. However, the pivot is so positioned relative to the cavity that the torque tending to open the members is substantially counter-balanced by the torque tending to rotate the members in the opposite direction. This is true because the pivots are located with their axes in a horizontal plane substantially level with the bottom of the die receiving cavity. Thus, the moment arm for the downward forces or component of forces is very long compared to the moment arm of the laterally acting forces. Where the forgings are to be made in extremely long dies, the effective moment arm for the laterally acting forces is somewhat lengthened and in order to provide positively against any possibility of rotation of the holding members toward open position, the detent means is provided. However, under any circumstances the resultant force or torque tending to open the holding members will not be great so that no undue strain is placed upon the detent means.

It will be seen that the objects of this invention have been accomplished. There has been provided a die holding apparatus for use with separable type forging dies upon presses which are not equipped with side rams. The arrangement is such that high production rates may be maintained. The construction is such that the downward forces produced in the forging operation counter-balance the laterally acting forces which tend to separate the die parts. There has been provided die holding apparatus which is rugged, economical, and of utility in maintaining a high production rate in forging operations.

It will be understood that certain features and sub-combinations are of utility and may be employed without reference to other features and subcombinations. This is contemplated by and is within the scope of the claim.

As many possible embodiments may be made of the invention without departing from the scope thereof, it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

The invention having been described, what is claimed is:

A die holder for separable type forging dies comprising a support means made up of a bottom portion with upright side walls rigidly secured thereto; die holding members each pivoted by pivots to the upright side walls so as to be swingable upwardly therebetween from a position of rest upon the support bottom portion; the die holding members having recesses which, with the die holding members in rest position, cooperate to provide a die receiving cavity; the pivots for said die holding members being spaced upwardly from the support bottom portion; and knockout pins pivoted to the support means for upward swinging movement about axes offset upwardly from the pivot axes of the die holding members, said pins extending through openings in the die holding members to facilitate removal of forgings.

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