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2,224,670

FORGING DIE

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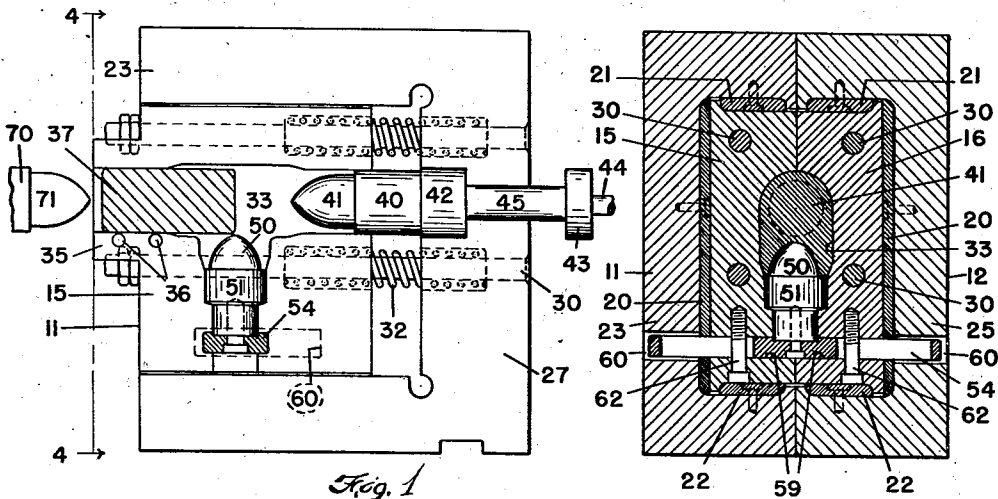


Fig. 1

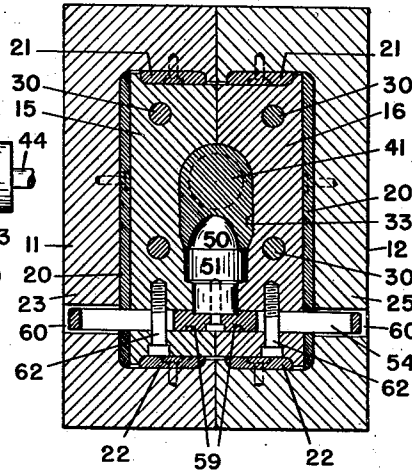


Fig. 3

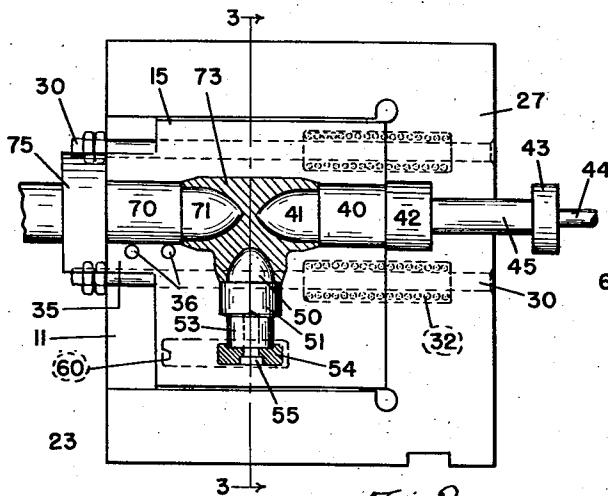


Fig. 2

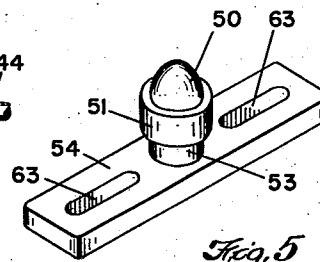


Fig. 5

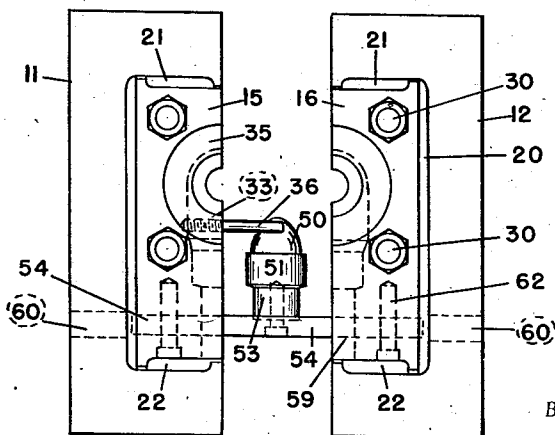


Fig. 4

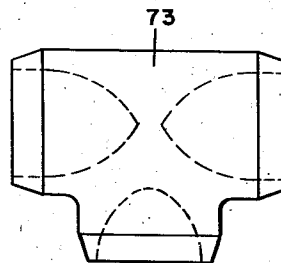


Fig. 6

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FORGING DIE

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5 Claims. (Cl. 78-60)

This invention relates to forging machines for the making of pierced articles and in its present embodiment is shown as applied to a set of dies intended for making pipe fittings on an upset forging machine of the general type to which the forging tools of my Patent No. 2,038,165 are applied.

The objects of the present invention include forging a blank to the desired outside shape while at the same time displacing the greater part of the interior material so as to reduce the amount which must subsequently be taken away by machining; to so position the blank that displacement pressures will be exerted thereon substantially equally on all parts, giving substantially equal tendency of the metal to flow into all parts of the die impression; and furthermore to handle the necessary displacement tools with a minimum of effort on the part of the operator, while insuring that such tools will be in proper position at the beginning and end of the forging cycle.

The specific application of the invention as illustrated comprises holding a piercing tool in such a position with respect to an open pair of gripping dies that it will be held projecting into one channel of the die cavity when such gripping dies are closed.

It is within the scope of the invention to have the piercing tool or its equivalent at an offset position instead of an intermediate position should special circumstances require it, but since the principal use at present contemplated is in connection with the manufacture of pipe fittings such as T's, crosses and L's, the drawing and description disclose that embodiment. Obviously, the number of channels of the die, and the number of piercing tools used, their details and their positioning, will vary with the blank to be formed, such as connections with ends of different diameter, Y connections at special angles, and all the unusual connections for which a demand might arise. To avoid undue multiplicity of drawings only an application of my invention to the forging of T's is illustrated and described in detail.

It will also be appreciated that my invention is applicable to branched pierced forgings other than pipe fittings.

To the accomplishment of the foregoing and related ends, said invention, then, consists of the means hereinafter fully described and particularly pointed out in the claims.

The annexed drawing and the following description set forth in detail certain mechanism embodying the invention, such disclosed means constituting, however, but one of various mechanical forms in which the principle of the invention may be used.

In the accompanying drawing:

Fig. 1 is a side view of a die half, showing the parts in open position and a blank in place, ready for the forging operation;

Fig. 2 is a corresponding view on the parting line of the dies showing the dies closed and the formed blank therein;

Fig. 3 is a view corresponding to Fig. 2 on the plane 3-3 of Fig. 2;

Fig. 4 is a view from the heading tool side looking toward the operator's position or feeding end, showing the dies open, this view being taken on the plane 4-4 of Fig. 1 but omitting the blank;

Fig. 5 is a perspective view of a movable nose support; and

Fig. 6 is a side elevation of the formed blank.

The die assembly, as usual, comprises complementary halves 11 and 12, relatively movable toward and from each other. For convenience of description with reference to a conventional upset forging machine, such as that of U. S. Patent No. 364,208, the half 11 will be considered as the fixed die half and the part 12 as the movable die half. For the specific purpose of the present description, making T's, and therefore requiring floating or sliding dies, the die assemblies are compound, comprising identical sliding die blocks 15 and 16, supported by suitable wearing liners 20, 21 and 22 in housings 23 and 25, and movable along such liners with the travel of the header slide 70 of the forging machine until stopped by the housing backs 27. At the same time the header slide pushes the blank 37 to a location directly above the piercing nose 50 when displacement of the metal begins. The die block impression pieces 15 and 16 are guided by the liners 20, 21 and 22 and are returned to the position of Fig. 1 when the header slide recedes, by springs 32 mounted on the guide rods 30, the return being limited by nuts on the ends of the guide rods.

The die impression 33 is appropriately shaped for the intended work, with three channels in the present embodiment, to form the exterior of a pipe T. The forward end of the impression extends into a throat 35 in which the slug 37 to be forged can be placed to be pushed into the impression by the header 71. Dowels 36 or other appropriate means support the slug until the dies close.

A piercing tool 40 with ogival nose 41, positioning collars 42 and 43, and handle or porter bar 44, closes the rear of the die cavity, being held by engagement of collar 42 and shank 45 with corresponding recesses in the housing backs 27. The collar 43 is axially spaced along the shank 45 a distance outside the backs 27 just slightly less than the distance of return travel of the impression pieces 15-16 from the position of Fig. 2 to that of Fig. 3. The result is that the adhesion of the forging 73 to the piercing nose

41 pulls the entire tool assembly 41-45 forward with the impression pieces, and the springs 32 do not have to break the forging away from the nose at the start of their movement, which they would not be strong enough to do, but just before the movement is completed the collar 43 strikes the backs 27 suddenly, while the other parts are in motion, so that the momentum is sufficient to break the forging loose from the nose. The separation is not great, only about $\frac{1}{4}$ inch or so; thus the forging can be lifted out by the nose 41 on the porter bar 44.

A floating piercing tool 53 fits in the downward branch of the die cavity 33, with its piercing nose 50 projecting upward into the impression channel, and collar 51 closing the channel bottom. This tool is seated upon a cross bar 54 and held to said bar by suitable means such as a filister screw 55.

The cross bar 54 makes a sliding fit in transverse passage 59, through the die blocks 15 and 16. Larger passages 60 through the housings 11 and 12, extending rearwardly to the extent of the travel of the floating die blocks, clear the ends of bar 54. Screws 62 through slots 63 elongated in the bar in the direction of die movement prevent the bar 54 from falling out and center the tool 53 when the dies are open, as shown in Fig. 4.

A traveling ram or header tool 70, shouldered to an ogival nose 71, forces the slug 37 in the impression 33 against the tool 40, and the combined movement of the tool 70 and of the slide blocks 15 and 16 forces the metal to flow around the noses 41 and 50 to fill up the impression and form the completed blank 73 with voids therein as shown in Fig. 6. The header shoulder closes the forward end of the impression and a header collar 75 contacts the forward end of the throat 35, thus limiting the inward travel of the nose 71 and of the header generally, all as shown in Fig. 2, so as to maintain proper dimension in the finished blank 73.

Preferably the side piercer, such as 50, is so placed with relation to the blank 37 that when the header slide 70 pushes the blank fully into the horizontal part of the die impression the mid-length of the blank is opposite nose 50. The result is that when the noses 71 and 41 begin to enter the blank and displace the metal, metal also begins to flow around the nose 50. Thus approximately the same pressure is exerted on all parts of the die impression, and the distance of movement of the metal under displacement flow is substantially equal around all three noses.

It will be apparent that other mechanical devices for holding the blank 37 might be substituted for the dowel pins 36, and that the tool 53 might be mounted on its bar 54 or supported by other means or manually above the cavity 33 to depend therein, instead of below, of course with appropriate change in shape of the cavity, or that pipe crosses could be made with tools both above and below, and so on.

For making L's, simple instead of compound dies are suitable, and obviously the present invention is adaptable to other situations requiring modification in detail from the preferred embodiment shown.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the

mechanism herein disclosed, provided the means stated by any of the following claims or the equivalent of such stated means be employed.

I therefore particularly point out and distinctly claim as my invention:

1. In combination in a forging machine, a forging tool adapted for use in conjunction with a side-opening gripping die, said tool comprising an element adapted to be definitely positioned within the die impression when the die is closed, and adapted to be positioned midway between the impression halves when the die is opened, a bar whereon said element is mounted, the halves of said die being apertured to receive the ends of said bar with a sliding fit, and cooperating stop elements on said bar and said die halves for positioning said element centrally of the die halves when the latter are opened.

2. In combination in a forging machine, a forging tool adapted for use in conjunction with a side-opening gripping die, said tool comprising an element adapted to be definitely positioned within the die impression when the die is closed, and adapted to be positioned midway between the impression halves when the die is opened, a bar whereon said element is mounted, the halves of said die being apertured to receive the ends of said bar with a sliding fit, and cooperating stop elements on said bar and said die halves for positioning said element centrally of the die halves when the latter are opened, die boxes wherein said die halves are longitudinally slidable, and slots disposed longitudinally through the sides of said die boxes opposite the ends of said bars and extending from front to rear throughout the longitudinal amplitude of die travel.

3. In a forging machine having a gripping die housing and a header slide piercing tool adapted to be moved into and out of said housing, the combination of die halves movable in said housing parallel with said header slide piercing tool travel, a bar guided and supported between said die halves and movable transversely with respect to the movement of said die halves, means for locking said bar against movement when said die halves are closed, and an additional die element carried by said bar.

4. In a forging machine having a gripping die housing and a header slide piercing tool adapted to be moved into and out of said housing, the combination of die halves movable in said housing parallel with said piercing tool travel, a second piercing tool guided and movably supported in said housing, said second piercing tool being movable with said die halves and in the same direction, and means for stopping said movement of said second piercing tool while the movement of said die halves continues.

5. In a forging machine having a gripping die housing and a header slide piercing tool adapted to be moved into and out of said housing, the combination of die halves movable in said housing parallel with said piercing tool travel, said die halves being provided with a side opening and two end openings, said piercing tool projecting into one of said end openings, a second piercing tool projecting into the other of said end openings, and a third piercing tool projecting into said side opening and being stationary relative to the first mentioned movement of said die halves.

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