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FORGING MACHINE

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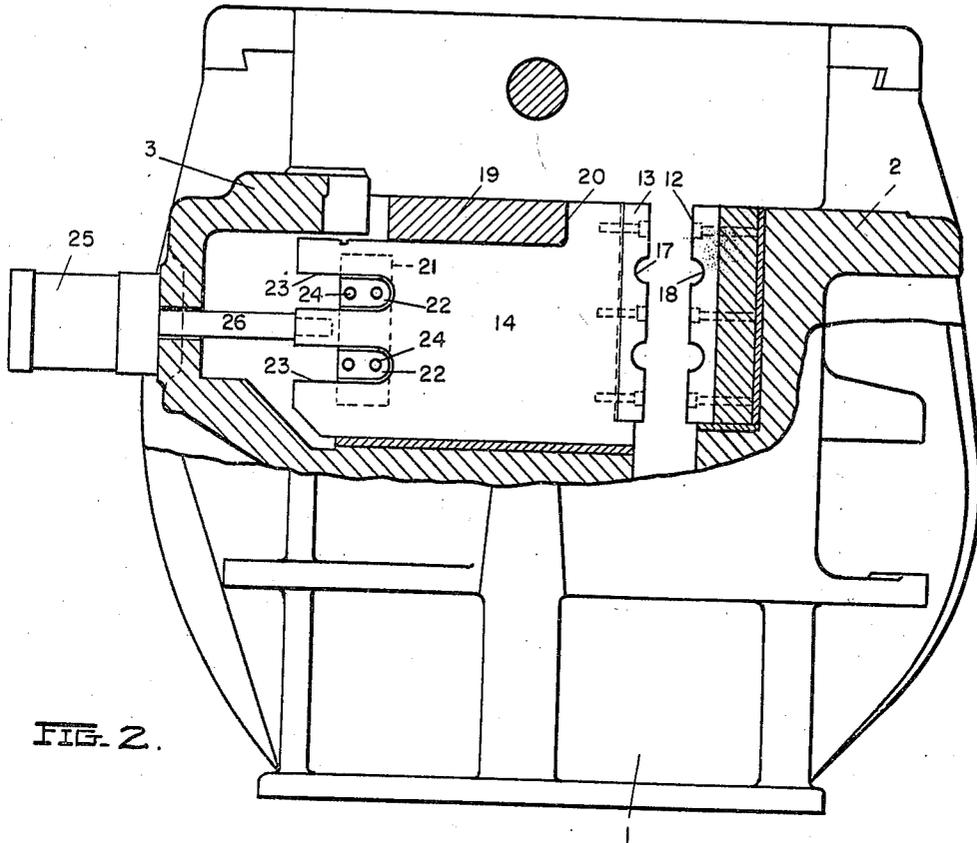


FIG. 2.

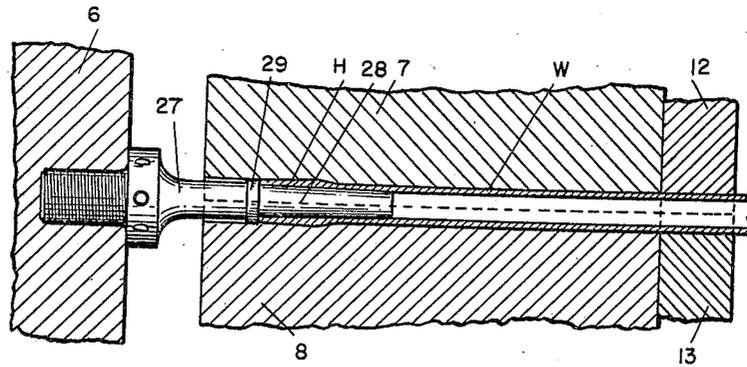


FIG. 4

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## FORGING MACHINE

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6 Claims. (Cl. 78—13)

The present invention relates to a forging machine particularly adapted for the metallic deformation of relatively elongated stock or work-pieces, such as tubes, pipes, rods, bars, and the like, upon the end portion of which it is desired to fashion a relatively thickened, upset portion. The upsetting of the ends of tubing into the form of large flashes or reinforced, thickened ends, such as for the machining of threads thereon, is a particular example of the type of forging work adapted to be performed by the machine of my present invention.

The general object and nature of my invention is to provide an additional or auxiliary gripping die for aligning and holding the shank of an elongated work-piece, such as tubing, during the upsetting operation on the end portion thereof. The gripping pressure per unit area which may be exerted upon a work-piece, such as tubing, must necessarily be limited, as otherwise, there will be a tendency to collapse the work-piece by die pressure. The provision of auxiliary gripping dies results in the maintenance of this pressure per unit area below a safe limit, because it increases the total area throughout which the gripping pressure from both the main and auxiliary gripping dies is exerted. Furthermore, as the work-piece is first positioned in the forging machine and against the stationary gripping die, it must be in proper alignment for the reception of the forming or heading tool on the header slide of the machine.

When forging elongated stock, such as tubing, it so happens that the nose or mandrel on the heading tool will contact the stock, e. g., enter the hollow end of the tube, before the main gripping dies are tightly closed. The provision of the auxiliary dies which can be conveniently brought to closed position prior to that of the main gripping dies, holds the work-piece firmly against any longitudinal displacement resultant from initial contact with the heading tool, prior to complete closing of the main gripping dies. Furthermore, the preliminary gripping of the work-piece by the auxiliary gripping dies effects a proper centering and alignment of the work-piece so that the mandrel or nose on the heading tool will not strike the work-piece at an undesired point and either distort the latter or tend to force it back out of proper position in the dies.

It is a further object of the invention to locate the auxiliary gripping dies herein provided, immediately adjacent the main gripping dies. This has the dual advantage of giving the machine operator more room for manipulation of the work-

piece at the front of the machine, and an opportunity to better aim or position the work-piece with respect to the dies prior to the forging stroke of the machine; and also this positioning of the auxiliary gripping dies reduces to a minimum the improper location or alignment of the work-piece with respect to the main gripping dies which might be due to a slight curvature or distortion in the stock itself.

Still another object of the invention is to mount the movable die half of the auxiliary gripping dies upon a main gripping die backing plate (such as described and claimed in my co-pending application Serial No. 343,785, filed July 3, 1940 and since issued into U. S. Patent No. 2,298,467), with independent power means for reciprocating such backing plate, whereby the auxiliary gripping dies may be so operated as to be in closed position before the main gripping dies and to remain in such position after the opening of the latter, in order to aid in the stripping of the heading tool from the work-piece after the forging blow has been delivered.

Additional objects and advantages of my invention shall become apparent as the following description proceeds.

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 drawings 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 said annexed drawings:

Fig. 1 is a top plan view of the front portion of a forging machine embodying the construction of my invention; Fig. 2 is an end elevational view, partially sectioned along line 2—2 of Fig. 1; Fig. 3 is an enlarged, horizontal sectional view taken through the main and auxiliary gripping dies, and representing the position thereof at the point of initial contact of the heading tool with the work-piece; and Fig. 4 is a view similar to Fig. 3 but representing the parts in position at the end of the forging stroke.

Now referring more particularly to Figs. 1 and 2 of the drawings, the forging machine, of which only the front portion is shown, comprises a base frame 1 which is of substantially box-like construction, supporting and enclosing the moving component parts, and including the vertical side frame members 2 and 3 and the front end

frame member 4. A work-inserting opening 5 provided in the front end frame member 4 is located opposite the end of the reciprocating header slide 6. A stationary main gripping die half 7 is mounted on the side frame member 2 and the movable main gripping die half 8 is carried by the gripping die slide 9, which is adapted to reciprocate in a path normal to that of the header slide 6. The usual toggle link mechanism indicated generally at 10 is connected between the die slide 9, the side frame member 3 and the die slide operating cross head 11.

An auxiliary and stationary gripping die half 12 is located adjacent the main stationary die half 7. A movable, auxiliary gripping die half 13 is carried on the end of the backing or shuttle plate 14. Die cavities, such as indicated at 15 and 16 are provided in the face of the die halves 7 and 8, and similarly contoured and aligned die cavities 17 and 18 are provided in the face of the auxiliary gripping die halves 12 and 13.

A laterally projecting, wing bearing plate 19 carried by the movable gripping die slide 9 extends laterally over the top of the backing plate 14 and is adapted to bear against a horizontal shelf bearing provided in the bed frame. A guide block 21 has a pair of laterally extending lugs 22 which extend through the slots 23 in the left-hand end of the backing plate 14. The block 21 is bolted to the front end frame member 4 by the bolts 24.

A fluid pressure cylinder 25, operated by either hydraulic or pneumatic pressure, is mounted upon the side frame member 3 and has a piston rod 26 connected to the inner end of the backing plate 14. Suitable pressure conduits and a control valve such as a foot treadle (not shown) are connected to the cylinder 25 to operate the piston and piston rod 26 and in turn to reciprocate the backing plate 14 in a path of movement parallel to that of the header slide 9 and in the space between the front side of the latter and the inside wall of the front end frame member 4.

Now referring to Figs. 3 and 4, the operative positions of the heading or upsetting tool 27 carried on the end of the header slide 6 with respect to the main gripping dies 7, 8, the auxiliary gripping dies 12 and 13 and the work-piece W, are illustrated. In the particular illustrative instance, the work-piece W is in the form of a tube and the heading tool 27 has a projecting nose or mandrel 28 and a collar 29 for the purpose of forming the thickened, upset head portion H, on the work-piece W. Thus, in Fig. 3, the tubular stock W has been positioned against the die cavity in the face of the stationary main gripping die half 7, pressure has been introduced to the cylinder 25 to move the backing plate 14 to closed position and to grip the work-piece W between the auxiliary gripping dies 12 and 13. At the same time, the forward end or nose 28 of the heading tool 27 has entered the end of the work-piece W. The preliminary closing of the auxiliary gripping dies 12 and 13 insures a proper alignment of the work-piece W in the main gripping die half 7 so that the mandrel 28 will properly enter the end of the work-piece; and secondly, holds the work-piece W against longitudinal displacement by reason of the frictional engagement or relatively snug fit of the mandrel 28 therewith.

Next referring to Fig. 4, it will be seen that the main gripping die half 8, carried on the end of the gripping die slide 9, has been moved to

completely closed position, effecting a firm grip of the work-piece W and that simultaneously the heading tool 27 has upset the head portion H on the end of the work-piece.

In the final stage of operation, the main gripping die half 8 is first moved to open position while the auxiliary die half 13 remains in closed position, thus holding the work-piece against sidewise movement with the moving die or longitudinal movement in a lefthand direction with the heading tool 27 as it moves back to its original starting position and is stripped from the end of the work-piece W. This insures a proper stripping of the tool from the work-piece, as well as contributing to the safety and convenience of the operator.

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 a forging machine, a header slide, a pair of main gripping dies, located adjacent the end of said header slide, a pair of auxiliary gripping dies located immediately adjacent said main gripping dies and on the side thereof opposite to that of said header slide, a common channel supporting said main and auxiliary dies for opening and closing movement alongside each other, and power means for opening and closing said auxiliary gripping dies independently of said main gripping dies.

2. In a forging machine, a header slide, a main die slide reciprocable at right angles thereto, a gripping die slide reciprocable parallel to and contiguous to but separate from said main die slide, a common channel supporting said main and auxiliary dies for opening and closing movement alongside each other, and power means for reciprocating said gripping die slide independently of said main die slide.

3. In a forging machine, a header slide, a main die slide reciprocable at right angles thereto, a frame surrounding said slides, a gripping die slide separate from and reciprocable parallel and contiguous to said main die slide and located between said frame and said main die slide, said frame having slideways on its inner walls contacting and supporting the outer surfaces of both said main die slide and said gripping die slide and power means for reciprocating said gripping die slide independently of said main die slide.

4. In a forging machine, the combination of a horizontally reciprocable die slide, a movable die carried on the end of said die slide, a backing plate mounted between the vertical side of said slide and the side frame of said machine, said backing plate being movable with respect to the die slide and extending longitudinally from a point beyond the rear end of said slide to a point substantially in alignment with the opposite die carrying end thereof, and an auxiliary gripping die carried on the end of said backing plate.

5. In a forging machine, the combination of a horizontally reciprocable die slide, a movable die carried on the end of said die slide, a backing plate mounted between the vertical side of said slide and the side frame of said machine, said backing plate being movable with respect to said die slide and extending longitudinally from a point beyond the rear end of said slide to a point

substantially in alignment with the opposite die carrying end thereof, an auxiliary gripping die carried on the end of said backing plate and means for longitudinally reciprocating said backing plate independently of said die slide.

6. In a forging machine, the combination of a horizontally reciprocable die slide, a movable die carried on the end of said die slide, a backing plate mounted between the vertical side of said slide and the side frame of said machine, said

backing plate being movable with respect to said die slide and extending longitudinally from a point beyond the rear end of said slide to a point substantially in alignment with the opposite die carrying end thereof, an auxiliary gripping die carried on the end of said backing plate, and a fluid power cylinder and piston connected to said backing plate for reciprocating it in a path parallel to that of said die slide.

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