Jan. 7, 1941. H. MITCHELL 2,227,810

DIE STRUCTURE

Filed Dec. 5, 1938

Fig. 1.

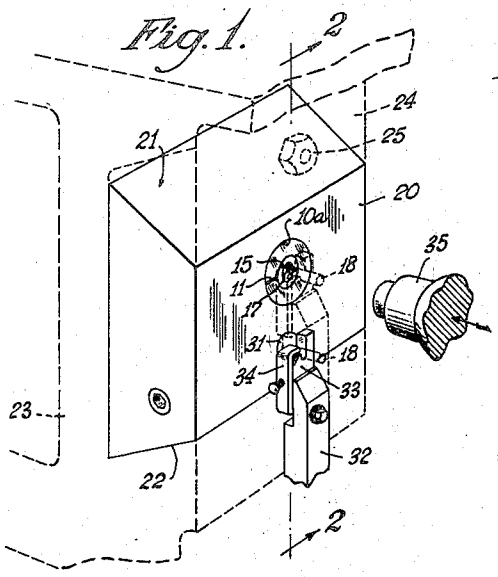


Fig. 4.

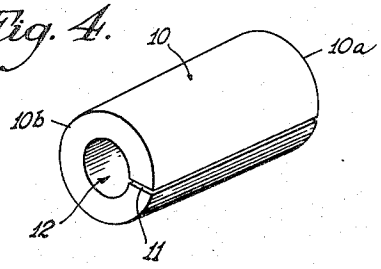


Fig. 5.

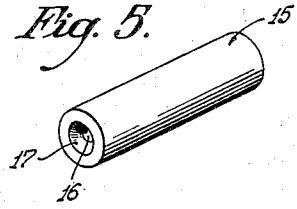
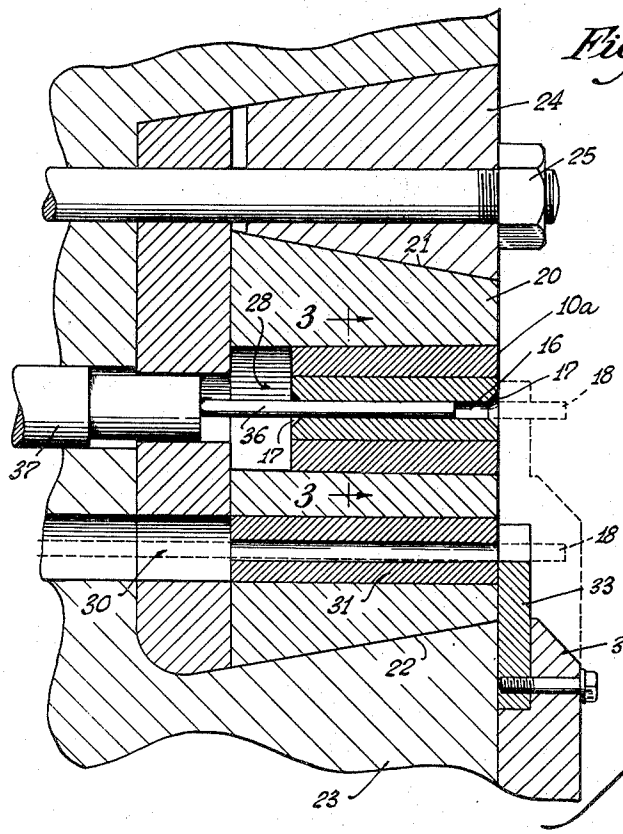
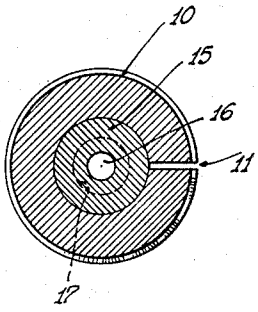


Fig. 3.





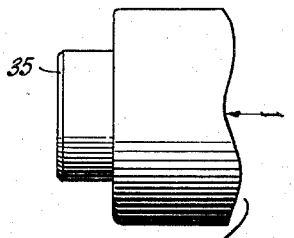


Fig. 2.

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UNITED STATES PATENT OFFICE

2,227,810

DIE STRUCTURE

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Application December 5, 1938, Serial No. 243,959

3 Claims. (Cl. 10—24)

This invention relates to improvements in dies for use in heading machines of the type adapted to make headed screws, rivets, nails and the like, a particular object being the provision of a die which is simple in construction and requires less material than dies of the same class made by the old methods, the improved die having a considerably longer life than the old dies and making a uniform product for a greater number of operations.

Another important object is the provision of improved seating means for mounting a die in a heading machine or other utilization means to eliminate the danger of splitting and other injuries where the die is subjected to great pressure.

Another object is the provision of a die of novel construction comprising a die core and a holder therefor and characterized by the fact that the core may be of reduced size and bulk compared to the holder, the reduced size making it possible to temper or harden the core more uniformly throughout the entire mass thereof than was possible in the older type of die.

Viewed from another aspect, it is an important object of the invention to provide a die consisting of a bushing adapted to fit into a die holder or seat, said bushing being split in an axial direction along one side thereof and having secured in its bore a die plug of substantially less bulk than the bushing and highly tempered, the bushing making it possible to employ a die plug of relatively small mass and thus making it possible to thoroughly temper the plug.

Still another important object is the provision of a bushing having outer peripheral portions tapered for reception in a tapered seat, pressure being applied at one end of the plug corresponding to the larger end of the bushing so that the latter is wedged into the seat proportionately to the pressure applied, so that the die plug will likewise be proportionately gripped by the bushing.

Other objects, advantages, economies, and novel aspects of the invention reside in certain details of construction and operation of the parts of the preferred embodiment, all of which will be made to appear as the following description proceeds in view of the annexed drawing, in which:

Fig. 1 is a perspective view of a die bed in a heading machine with the novel die seated in operative position;

Fig. 2 is a cross section along line 2—2 of Fig. 1, scale being slightly enlarged;

Fig. 3 is a cross section through the die along line 3—3 of Fig. 2 and to slightly enlarged scale;

Fig. 4 is a perspective view of the split bushing; while

Fig. 5 is a perspective view of one form of die plug.

Extruding and heading machines commonly employ a die holder or bed in which a die plug is removably mounted to have pressure applied against the exposed end thereof to form or deform stock which is fed into position before the die or into the die, in cooperation with pressure means, usually some form of plunger. Dies made in accordance with the methods heretofore known have been unsatisfactory because their life is limited due principally to the fact that they cannot be tempered by practical industrial methods to a degree of hardness which will withstand the tremendous pressure applied thereto for any great length of time. In order to give these dies a maximum life, the bulk or mass of a given die could not be reduced beyond a given point, or, stated in other terms, the size of a die for a given operation could not be reduced below a given dimension if the die were to stand up for an appreciable number of operations. In accordance with the former methods, these dies were first tooled and then tempered or hardened and because of their bulk, the tempering of the metal was not uniform throughout its mass, the dies being harder around their marginal portions and softer in directions inwardly from the marginal portions into the body thereof. As a consequence, such dies tend to split under repeated applications of the relatively enormous pressures necessary to extrude or deform metal stock engaged therewith.

The present invention overcomes the foregoing difficulties and provides a die which eliminates splitting, which is of simple construction and which reduces the material required for the entire die assembly, and thus lowers costs, and which moreover makes it possible to provide a more highly and uniformly tempered die which will assure a uniform product over a longer period and for a greater number of operations of the forming machinery.

In one of its preferred forms, the improved die includes a chuck or holder in the form of a metal sleeve 10 (Fig. 4) which is tapered from one end 10*a* inwardly toward its opposite end 10*b* on the outer periphery thereof. The chuck or holder is split as at 11 in an axial direction from the end 10*a* toward the end 10*b* so that

the bore 12 may be said to be somewhat expansible.

The die proper includes an insert or plug 15 (Fig. 5) which in this instance is provided with a bore 16 throughout its length (Figs. 2 and 3 also), the axial ends of the plug in this instance being countersunk as at 17 to provide a heading formation for the manufacture of a flat head rivet or screw or analogous device from rodlike stock 18 which is fed into the outer end of the plug (as illustrated in dotted lines in Fig. 1).

The die insert or plug is dimensioned to fit snugly into the bore 12 of the chuck or holder 10 as shown in Figs. 2 and 3, the opposite ends of the plug being flush with the extremities 10a and 10b of the chuck. With the parts 10 and 15 thus assembled, the forming die is complete and ready for insertion in the die bed or seat.

The invention further contemplates an improved seating means for such dies, such a means comprising: as viewed particularly in Fig. 2, a seating block 20 which may be variously shaped to fit into the die bed or holder in various heading or extruding machines, opposite side portions 21 and 22 of the block being beveled or sloped to fit into a bed 23 in the forming machine, this bed including a keying block 24 secured in place by a locking nut 25 against the side 21 of the seating block to hold the latter immovably in the bed.

The seating block 20 is provided with a bore 26 tapered to receive the chuck or holder 10 of the die so that the outer end portion 10a thereof will lie flush with the outer face of the block 20.

In the operation of the forming machine chosen for illustrative purposes herein, there is a stock feeding channel 30 leading from the bed 23 into register with a feeding sleeve 31 also removably secured in the seating block 20, rodlike stock such as the blank 18 being fed automatically by mechanism not illustrated herein, so that a predetermined length of stock issued from the outer end of the feeding sleeve 31 and is automatically cut off by a shear 32 moving across the opening of the feeding sleeve, the shear being provided with holding means 33 wherein the sheared blank is secured by a spring-urged finger 34 (Fig. 1) while the shear continues movement toward the die to align the blank with the bore 16 of the die insert. When thus aligned, the blank 18 is moved into the bore 16 by timed movement of a plunger 35.

The blank is backed in the die by a combination backing and kick-out rod 36 (Fig. 2) which is urged by a plunger 37 into the bore 16 of the die against the innermost end of the blank in properly timed relation to the movement of the heading plunger 35 so that the outermost end portion of the blank is forced into the tapered or enlarged end portion 17 and constitutes a flat head on a rivet or screw, the knife and holding means meanwhile having been withdrawn from the path of the plunger 35 and the latter withdrawing after formation of the article, and the knock-out plunger 37 thereafter moving forward (to the right) to eject the headed screw or rivet from the die, whereupon the machine is ready for the next cycle of operation.

Due to the taper of the bushing or die holder and the corresponding taper of the seating block 20, the increase in gripping pressure of the bushing on the die insert 15 may be said to be substantially proportionate to the pressure applied by the plunger 35 and is at all times adequate to secure the die in exactly aligned position, the die holder 10 nevertheless being readily removed from its seat 20 when it is to be replaced by a different die. The gripping pressures exerted upon the insert by the bushing or holder are substantially uniformly distributed and this, coupled with the fact that the improved die construction makes possible a complete and effective tempering of the insert, results in a die of exceptional durability and one which will hold its tolerances for a considerably greater number of operations than the old type of die.

The objects and advantages of the invention may be realized in modified forms of construction, and the invention is therefore not to be restricted to any of the precise details recited herein in describing an illustrative embodiment thereof except as may be provided in the appended claims.

Having thus described my invention, what I claim as new and desired to protect by Letters Patent is:

1. A heading die including a holder in the form of a tubular bushing which is split along one side throughout its length, and a tempered die insert of cylindrical form and minimized cross sectional thickness sufficient to facilitate uniform tempering fitted into the tubular portion of said holder, the latter being adapted normally to grip said insert and hold the same securely in place, the slotted formation of the holder providing yieldability thereof in a circumferential sense for removal of the insert.

2. A heading die including a holder of substantially tubular form split along one side throughout its length and having a die insert of minimized cross section to facilitate tempering, said insert being highly tempered and fitted into the bore thereof, said holder having outer peripheral portions tapered from one end toward the other to fit into a correspondingly tapered die seat, pressure being applied to said insert at the larger end of said holder so that the latter will be forced into said seat, the split formation of the holder permitting the same to be tightly contracted about said insert to hold the latter against substantial movement during application of pressure thereto.

3. A tempered heading die for use in a conically tapered seat, said die comprising a holding sleeve having a cylindrical bore and conically tapered outer wall portions adapted to fit into said seat, said sleeve being slit longitudinally to permit expansion and contraction across said bore, and a tempered cylindrical die insert having an optimum minimized cross-sectional thickness rendering the same permeable to tempering and hardening agencies throughout a major part of its bulk, said insert fitting into said bore in the holder and being reinforced and held by the latter when operatively disposed in said seat.

HARVEY MITCHELL.