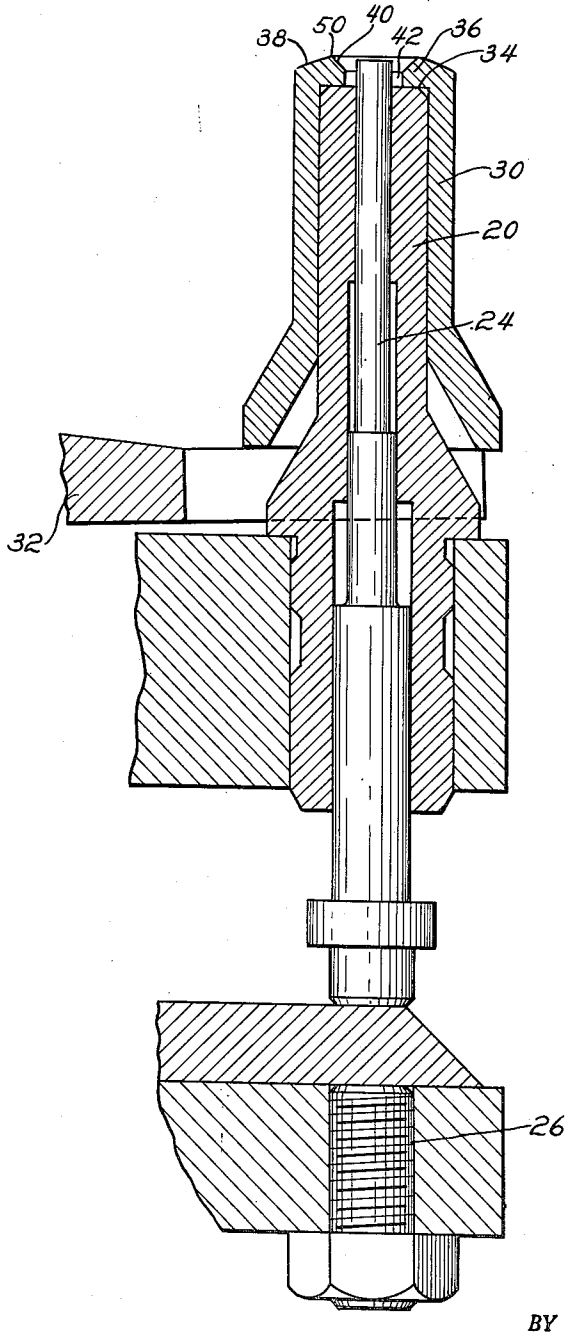
Feb. 10, 1953 L. L. MARCHANT 2,627,766

ANVIL AND STRIPPER FOR PUNCHING AND RIVETING MACHINES

Filed July 25, 1947 2 SHEETS—SHEET 1

Fig. 1



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Filed July 25, 1947 2 SHEETS—SHEET 2

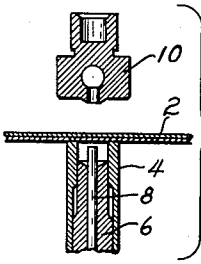


Fig. 2

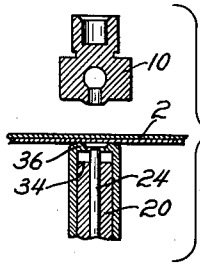


Fig. 7

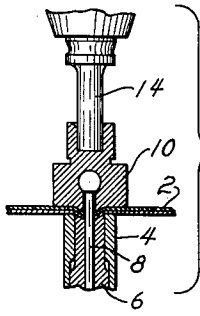


Fig. 3

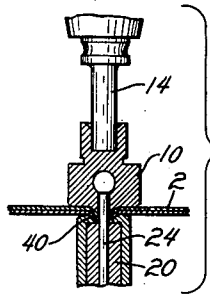


Fig. 8

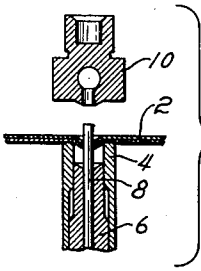


Fig. 4

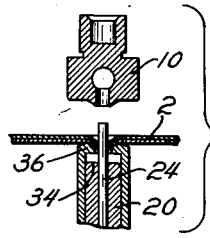


Fig. 9

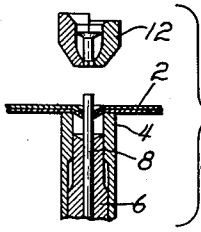


Fig. 5

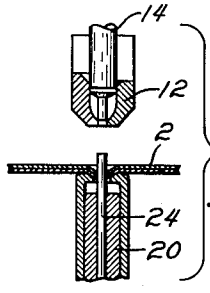


Fig. 10

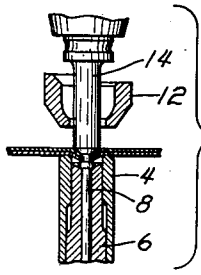


Fig. 6

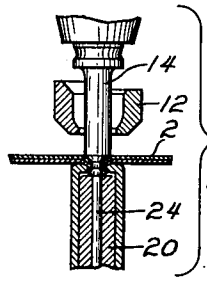


Fig. 11

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ANVIL AND STRIPPER FOR PUNCHING AND RIVETING MACHINES

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Application July 25, 1947, Serial No. 763,476

1 Claim. (Cl. 78—53.5)

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This invention relates in general to automatic punching and riveting machines of the type which operate to punch a rivet hole and form a countersink in one or more work sheets. More particularly, the invention has to do with the anvil and stripper which form parts of such machines.

In the use and operation of known machines of the type to which the invention relates, the work sheets are countersunk by the co-operation of a countersinking tool and a recess in the upper end of the anvil, the sheets are punched simultaneously with the countersinking, the holes are maintained in alignment by the punch while a rivet is brought into position above the holes and then the rivet is inserted into the holes and upset against the anvil. During all of these operations the work sheets are positioned and supported on the upper end of a device known as a stripper, which is a cylindrical member surrounding the anvil and movable to different vertical positions with respect thereto during the succeeding phases of the countersinking, punching and riveting operation.

In known machines of the type referred to the upper end of the anvil is countersunk in order to provide a lower die during the operation of countersinking the work sheets and the upper end of the stripper must accordingly extend no higher than the upper end of the anvil during such operation. However, in such machines the rivet shank is upset within the recess in the upper end of the anvil and in this operation the stripper extends above the upper end of the anvil in order to support the flat parts of the work sheets surrounding the countersunk recess therein. It will be apparent that when the rivet is upset and the shank thereof expands, the walls of the countersunk recess in the work sheets will not be laterally supported as the upper end of the anvil will be vertically spaced from these walls by the upset head of the rivet and the stripper will be spaced outwardly of the entire countersunk recess in the work sheets. This may be seen from an inspection of Figs. 2 to 6, inclusive, of the drawings which illustrate the cycle of operation of a typical machine using an anvil and a stripper of known construction. In Fig. 2 the work sheets 2 are in position on the upper end of the stripper 4 and are positioned above the upper end of anvil 6. The punch 8 is raised above the anvil and below the sheets and the die button 10 is in operating position above the punch. In Fig. 3 the die button has descended, cooperating with the punch to make aligned holes in the work sheets,

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forcing the material of the work sheets surrounding these holes into the countersunk recess in the top of the anvil and forcing the stripper downwardly. In Fig. 4 the die button has raised, permitting the stripper to raise the work sheets away from the upper end of the anvil. The punch is held in the punched holes in the work sheets by friction and keeps these holes aligned. In Fig. 5 the rivet shoe 12, with a rivet therein, has been brought above the lower parts, all of which are in the same position as in Fig. 4. In Fig. 6 the driving plunger 14 has forced the rivet out of the rivet shoe into engagement with the upper end of the punch, forcing the punch downwardly and upsetting the shank of the rivet against the upper surface of the countersunk recess in the anvil. In this rivet heading operation, the stripper is forced downwardly as far as the upset head of the rivet will permit it to go and, in so doing, supports the work sheets adjacent the outer periphery of the countersunk recess therein. It will be apparent that when the shank of the rivet is upset, it will expand against the edges of the aligned holes in the work sheets through which it is passed and it will be obvious from Fig. 6 that during such expansion the lower surface of the countersunk recess in the work sheets will not be supported laterally or in any other way. The fact that the countersunk area of the work sheets is completely unsupported while the rivet shank is expanding against the wall of the openings through the work sheets has been found to cause unsatisfactory appearance and structure and, in particular, has been found to cause an annular ridge to be formed in the work sheets at and outside the area of contact of the stripper.

It has therefore been the principal object of this invention to provide an anvil and stripper assembly and structure for punching and riveting machines which will provide support for the wall of the countersunk recess in the work sheets during the heading of the rivet, whereby the disadvantages and undesirable effects of known anvil and stripper assemblies and structures will be avoided.

Other objects and features of novelty of the invention will be made apparent by the following description and the annexed drawings which, it will be understood, are only illustrative of the invention and impose no limitation thereon not imposed by the appended claim.

Referring to the drawings, in which the same reference numerals refer to like parts,

Fig. 1 is a view, partly in section and partly in

elevation, showing an anvil and stripper formed according to the present invention;

Figs. 2 to 6, inclusive, illustrate various steps in the operation of a typical punching and riveting machine known to the prior art and illustrate particularly the lack of support for the wall of the countersunk recess in the work sheets during the upsetting of the rivet shank, and

Figs. 7 to 11, inclusive, illustrate various steps in the operation of a punching and riveting machine including an anvil and stripper formed in the manner taught by this invention, and particularly illustrate the support provided for the wall of the countersunk recess in the work sheets during the upsetting of the rivet.

Parts of a punching and riveting machine, including an anvil and a stripper constructed according to this invention, are illustrated in Fig. 1 and comprise an elongated generally cylindrical anvil 20 which is supported in an upright position and has an axial opening therethrough within which a punch 24 is slidably received. The punch is adapted to be moved from a lower position in which it rests on an adjusting screw 26 to an upper position, as shown, by the insertion of a wedge 28 beneath the lower end thereof. A stripper 30 surrounds the anvil and is normally supported in a raised position by suitable means such as the air-pressure operated arm 32, in which position the upper end of the stripper supports the sheets 2 which are to be punched.

The anvil is provided with a flat, generally plane un-recessed upper end surface 34 which has no function other than to support parts of the stripper. The upper end of the stripper is provided with an annular inturned flange 36 which overlies, and may be supported by, the flat upper end surface of the anvil. The upper surface of the flange 18 comprises an outer annular part 38 which is inclined downwardly and outwardly at an angle of approximately 3°, for a reason and function which will be described hereinafter, and an inner, annular, substantially frusto-conical surface 40, which is inclined downwardly and inwardly and surrounds and defines a central opening 42 which is concentric with the stripper, anvil and punch and is preferably larger in diameter than the upper end of the punch and must be larger than the upset head of the rivet which is to be formed. In a usual machine, this opening 42 is .015 to .020 inch greater in diameter than the upset head of the rivet. The inner inclined surface 40 co-operates with the die button in the countersinking operation to form a countersunk recess in the work sheets and also abuts and supports the lower wall of the countersunk recess in the work sheets when the rivet shank is being upset.

In Figs. 7 to 11 of the drawings, there are disclosed the successive steps in the operation of a punching and riveting machine having an anvil and stripper formed in accordance with this invention. In Fig. 7 the work sheets 2 are supported on the inturned flange 36 on the upper end of the stripper, the upper end of the punch 24 is raised above the flat upper surface 34 of the anvil 20 and the die button 10 is in position above the work and the punch. In Fig. 8 the driving plunger 14 has forced the die button downwardly against the work, forcing the work and the stripper downwardly and forcing the punch through the work sheets and into the die button. The work sheets have been deformed downwardly about the punch and a countersunk recess has been formed therein between the die button and the inner annular surface 40 of the flange 36 on the stripper. In this position of the parts the flat upper surface of the anvil supports the inturned flange on the stripper. In Fig. 9 the die button has been withdrawn from the work, the stripper has been raised away from the anvil, carrying the work and the punch upwardly with it. In Fig. 10 the rivet shoe 12 has been brought above the work with a rivet therein in vertical alignment with the holes in the work sheet and the driving plunger is in position to force the parts downwardly. The anvil, stripper, punch and work sheets are in the same positions as in Fig. 9. In Fig. 11 the driving plunger has forced the rivet downwardly through the aligned holes in the work sheets, forcing the punch downwardly and upsetting the rivet shank between the upper surface of the anvil and the lower surface of the inturned flange 36 on the stripper.

It will be seen from Fig. 11 that during the upsetting of the rivet shank, as during all other phases of the operation of the machine after the sheets have been punched and countersunk, the lower wall of the countersunk recess in the sheets is supported throughout its entire area by the inner inclined surface 40 of the inturned flange 36 on the stripper. Thus, the expansion of the rivet shank, which must occur on upsetting thereof, is resisted by the inturned flange on the stripper. The inclined wall forming the countersunk recess in the work sheets will be positioned between the rivet shank and the surface 40 and will not be expanded. It has been found that the described structure and arrangement of parts prevents entirely the disadvantages and bad effects inherent in prior structures because of the lack of support of the walls of the countersunk recess during upsetting of the rivet shank.

As stated hereinbefore, the outer annular surface 38 which forms part of the upper surface of flange 36 of the stripper is inclined outwardly and downwardly at a very small angle which, I have found, may be of the order of 3° to the horizontal with good results. If this wall is so inclined there is provided an annular edge 50 between the outer and inner inclined surfaces 38, 40. This edge 50 abuts the lower surface of the work sheets at the outer annular periphery of the countersunk recess therein and, because of the downward and outward inclination of the surface 38, causes the formation of a sharp edge in the upper surface of the work sheets at the periphery of the countersunk recess. It has been found that if the surface 38 is downwardly and outwardly inclined in the disclosed manner, the formation of an annular ridge will be prevented.

While I have described and illustrated but one embodiment of the invention, it will be apparent to those skilled in the art that other embodiments, as well as modifications of that disclosed, may be made without departing in any way from the spirit or scope of the invention, for the limits of which reference must be had to the appended claim.

What is claimed is:

For use in a punching and riveting machine of the type wherein a work sheet is punched to provide an opening for receiving a rivet and is countersunk to provide a recess around said opening through cooperating members including an anvil, a punch and a stripper positioned on one side of the work sheet, and a die member and rivet driving member positioned on the other side of the work sheet; a tool comprising an anvil, a punch and a stripper wherein the anvil is elon-

gated and generally cylindrical and is provided with an axial opening therethrough adapted to slidably receive the punch and has a substantially flat upper end surface, and the stripper is generally cylindrical and surrounds the anvil at and adjacent the upper part thereof and is movable axially with respect to the anvil and has an inturned annular flange at its upper end having a flat inner surface overlying and adapted to rest freely on the flat upper end surface of the anvil and has a central opening therein which is concentric with the punch-receiving opening in the anvil, the outer surface of said flange having a recess therein having an annular downwardly and inwardly inclined wall concentric with and surrounding said opening, said recess adapted to receive the countersunk recess formed in the work sheet supported on said flange to laterally support the wall of said countersunk recess during the riveting operation.

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