July 22, 1969 J. W. CROTHERS ET AL 3,456,483

ANVIL DEVICE

Filed June 28, 1966

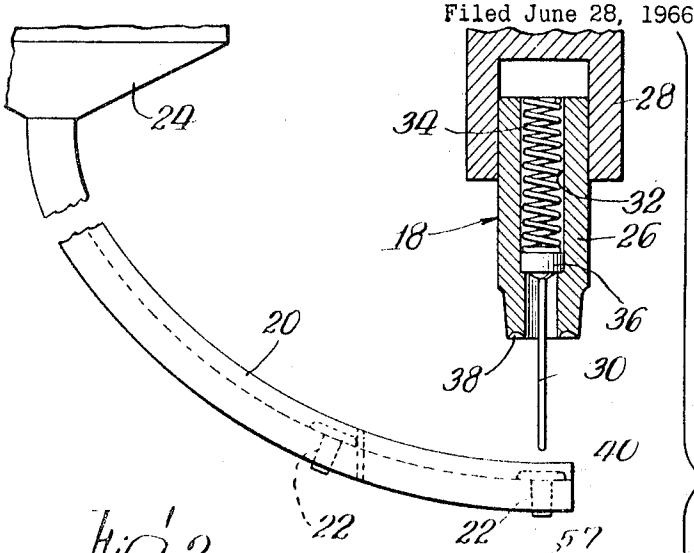


Fig. 2.

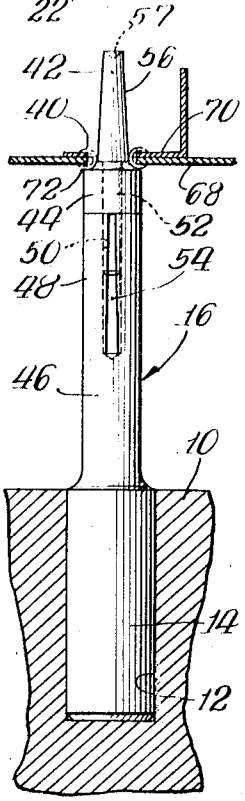


Fig. 1.

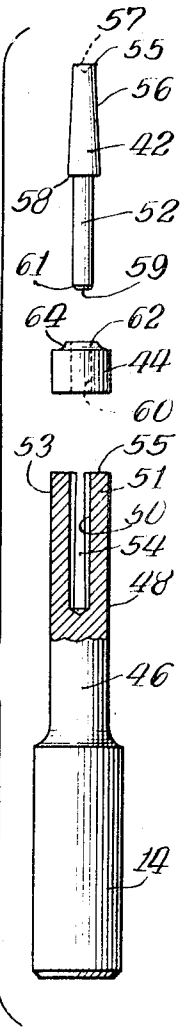
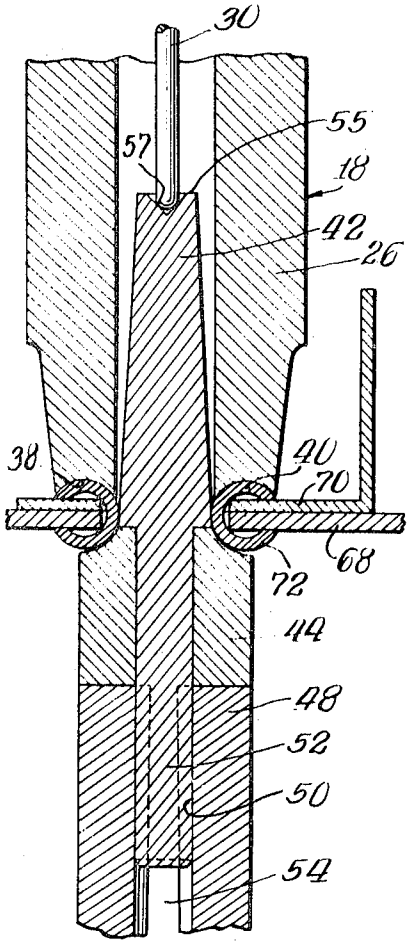


Fig. 3.



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ANVIL DEVICE

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U.S. Cl. 72—478 9 Claims

ABSTRACT OF THE DISCLOSURE

An anvil device for setting or clinching an eyelet and the like, including a conically shaped pilot portion to slidably receive the eyelet thereon, a separable annular flaring insert adapted for cooperation with the pilot portion to flare an end of the eyelet radially outwardly upon engagement therewith, and a shank portion adapted to releasably support the pilot portion and the flaring insert.

This invention relates generally to an anvil device and more particularly to an eyelet setting or clinching anvil.

It has heretofore been the practice in designing and constructing anvils and, in particular, anvils for use in setting or flaring eyelets, to make the anvils of a one-piece construction. Conventionally, such one-piece anvils are made of tool steel, machined to close tolerances and heat treated in an attempt to impart the desired physical properties to the anvil. The various portions of the anvil which assist in the flaring of eyelets require different hardness or toughness in order to resist wear or breakage of the particular portions. With one-piece anvil constructions, it is necessary to settle for a compromise heat treatment that is not necessarily the best for all wear points on the anvil. This uniform compromise heat treatment leads to excessive breakage and premature wear with consequently high costs of production through replacement expenditures.

It is the primary object of the subject invention to overcome the above disadvantages inherent in prior anvil devices by providing an anvil which allows the various portions of the anvil to be given the proper hardness and toughness to thereby eliminate excessive breakage and premature wear.

A feature of the present invention is to provide an anvil comprising separable portions wherein each portion may be given its proper characteristics of hardness and toughness to resist wear and breakage.

Another feature of the present invention is to provide an anvil which allows for ease of assembly and disassembly to thereby allow individual separable portions of the anvil to be individually replaced upon breakage or excessive wear.

A further feature of the present invention is to provide an anvil having a support shank which supports other portions of the anvil and which shank includes means to allow ready disassembly of the anvil for replacement of individual components thereof.

Another feature of the present invention is to provide an anvil device that may be cooperatively associated with eyelet supply means and a set-cup assembly to define efficient eyelet setting apparatus.

Another feature of the present invention is to provide an anvil which is economical to manufacture and highly efficient in operation.

Further objects and advantages of our invention together with the organization and manner of operation thereof, may best be understood by reference to the following description taken in connection with the accompanying drawing, in the several figures of which like reference numerals identify like elements, and in which:

FIGURE 1 is a vertical view, partly in section, showing

the anvil of the present invention supported in an operative position and cooperating with a set-cup assembly to introduce eyelets onto the anvil;

FIGURE 2 is a fragmentary vertical view, partly in section, showing the anvil in cooperation with the set-cup assembly after an eyelet has been clinched upon two members to be joined; and

FIGURE 3 is a vertical view, partly in section, illustrating the anvil of the subject invention in disassembled relation.

Referring now to the drawing, a support mounting **10**, which may form a part of any machine or apparatus with which the present invention is used, has a cylindrical recess **12** adapted to receive a lower cylindrical portion **14** of an anvil, shown generally at **16**. The anvil **16** is positioned to cooperate with a set-cup assembly, shown generally at **18**, and an eyelet guide **20** to effect clinching of eyelets or rivets **22**. The eyelets are fed by gravity from a hopper **24** through the guide **20** to a position where they are introduced onto the anvil **16** as will be described hereinbelow.

Referring to FIGURE 1, the set-cup assembly **18** is of conventional construction and includes a tubular set-cup **26** which is fixedly secured to a support member **28** for vertical up and down movement. The set-cup **26** slidably receives a pick-up pin **30** within a central recess **32** therein. The pick-up pin **30** is biased downwardly within the recess **32** by a coil spring **34** which acts against an upper portion **36** of the pick-up pin. The set-cup **26** has a generally concave annular end surface **38** which serves to engage a flared portion **40** on the eyelets **22** when the set-cup assembly is moved downwardly.

The anvil **16** comprises an upper pilot portion **42**, a flaring insert **44**, and a shank portion **46**. The shank **46** has a lower cylindrical portion **14** which is received within the support member **10** as hereinabove described. An upper cylindrical portion **48** of the shank **46** is preferably made coaxial with the lower portion **14** and may have any length suitable to a production installation, while providing sufficient column strength to resist axial loading of the shank. A coaxially disposed cylindrical bore **50** is provided in the upper end **48** of shank **46** to receive a cylindrical portion **52** of the pilot **42** and has a depth greater than that necessary to fully receive the cylindrical portion **52** when in assembled position. The upper portion **48** of shank **46** includes a longitudinal slot **54** which extends radially through the upper portion **48** to intersect the peripheral surface thereof and the axial bore **50**. The slot **54** creates two upstanding leg or wall portions **51** and **53** in the upper portion **48** of shank **46** which are bent inwardly toward each other causing the central bore **50** therein to be narrower at the upper portion adjacent the end surface **55** than at its lower extremity. The leg portions **51** and **53** form a biased frictional gripping engagement with the cylindrical portion **52** of the pilot **42** when in assembled position to thereby retain the pilot **42** within the shank **46**. Noting FIGURE 1, the slot **54** intersects end surface **55** and has a longitudinal length equal to that of bore **50**. A space will thus be provided between the lower end of the portion **52** and the bottom of slot **54** when in assembled position to allow a separating tool to be inserted therein for disassembling the anvil. It will be understood that more than one slot may be provided in shank **46** if the shank is made of a diameter sufficient to maintain the necessary support strength.

The pilot portion **42** of anvil **16** includes a frustoconical peripheral surface **56** which tapers outwardly when considered in a direction downward along the axial length from the upper end thereof. The peripheral surface **56** is formed coaxial with the longitudinal centerline of the lower cylindrical portion **52**. The cylindrical por-

tion 52 has a smaller diameter than the diameter of the frusto-conical surface 56 adjacent the cylindrical portion 52 so as to form a radial shoulder 58 therebetween (FIGURE 3). A beveled edge 61 is preferably provided on the lower end of pilot 42 to assist in guiding the cylindrical portion 52 into bore 56 of shank 46. A generally V-shaped or conical recess 57 is provided in the upper end 55 of pilot 42 to recieve the lower end of pick-up pin 30 and assist in proper alignment of the guiding pin and the anvil 16 during a flaring or clinching operation.

The flaring insert 44 comprises a generally annular member having a central bore 60 extending therethrough which has a diameter such that it will slidably and snugly receive the lower cylindrical portion 52 of pilot 42 therethrough when in assembled relation. An upper end surface 62 of insert 44 abuts the radial shoulder 58 of pilot 42 when the insert is assembled on the cylindrical portion 52 and has an annular area equal to that of the shoulder 58. An annular surface portion 64 on insert 44 defines a generally arcuate surface adjacent end surface 62 and forms a contiguous outwardly directed arcuate curved surface with the frusto-conical surface 56 of pilot 42 when in assembled position on portion 52. The annular arcuate surface 64 cooperates with surface 56 to flare the tubular end of an eyelet 22 when the eyelet is brought into abutting engaging relationship therewith as it is forced downward upon the pilot portion 42.

The above described separable portions comprising the anvil 16 are made of material suitable to withstand the forces created in flaring and clinching eyelets and have a toughness and hardness adequate to resist breakage and premature wear. For example, the pilot portion 42 and the flaring insert 44 are preferably made of a high carbon, high chrome, high nickel steel with the pilot portion 42 being heat treated to a shock resistant hardness of Rockwell C 54–56, while the flaring insert 44 is heat treated to a wear resistant hardness of Rockwell C 61–63. The shank 46 is preferably made of drill rod steel hardened to Rockwell C 45–50 to thereby result in high toughness and impact loading resistance properties.

The separable members of the anvil 16 are assembled by mounting the flaring insert 44 onto the cylindrical portion 52 of pilot 42 and thereafter inserting the cylindrical portion 52 into the central bore 50 of shank 46. The upstanding leg portion 51 and 53 of upper portion 48 of shank 46, having been previously bent inwardly, frictionally engage and grip the cylindrical portion 52 of pilot 42 to thereby hold pilot portion 42, flaring insert 44, and shank 46 in fixed assembled relation. The assembled anvil 16 may then be inserted into the supporting member 10 in a position to underlie the guide channel 20 which serves to guide hollow eyelets 22 into position for downward movement onto the pilot portion 42 of the anvil. Two work pieces, such as plates 68 and 70 (FIGURES 1 and 2) may be positioned adjacent to and overlying the arcuate surface 64 of flaring insert 44 in any conventional manner, which plates 68 and 72 are to be secured together by a clinched eyelet. When the plates are in position over the anvil 16, the set-cup assembly 18 is moved downwardly whereupon pick-up pin 30 is passed through the center of a hollow eyelet 22 and thereafter contacts the conical recess 57 in pilot portion 42 to guide the eyelet 22 downward onto the frusto-conical surface 56. Continual downward movement of the set-cup 26 causes the annular concave surface 38 thereof to engage the flange 40 on the eyelet to thereby force the eyelet downwardly upon the pilot portion 42 whereupon the lower end of the eyelet will be flared or set outwardly upon engaging the radially extending surface 64 of flaring insert 44. The flared end of the eyelet will curl back upon itself such that a continuous curled surface 72 is formed which cooperates with the upper flange portion 40 to thereby clinch the two plates 68 and 70 together.

With the above described anvil being comprised of separable portions, it can be readily appreciated that any one of the individual separable portions could be replaced very easily upon unexpected failure or excessive wear with the resultant decrease in expense attendant prior art unitary constructions.

While a particular embodiment of our invention has been shown and described, it will be obvious to those skilled in the art that changes and modifications may be made without departing from the invention in its broader aspects, and, therefore, the appended claims cover all such changes and modifications as fall within the true spirit and scope of my invention.

We claim:

1. An anvil device for setting a tubular eyelet comprising a pilot portion adapted to slidably receive the eyelet in coaxial relation thereon, a flaring means associated with said pilot portion in fixed relation therewith and adapted to flare an end of the eyelet radially outwardly when the eyelet is moved longitudinally of said pilot portion to engage said flaring means, said flaring means having a higher Rockwell hardness than said pilot portion to provide high wear resistance, and a separable shank portion adapted to releasably support said pilot portion and said flaring means, said shank portion having a lower Rockwell hardness than said flaring means to provide high impact loading resistance.

2. The device as defined in claim 1 wherein said flaring means comprises a separable annular member disposed in coaxial relation with said pilot portion and having a generally radially extending arcuate surface thereon to engage said end of the eyelet for flaring it radially outwardly upon engagement therewith.

3. The device as defined in claim 1 wherein said pilot portion includes a generally frusto-conical peripheral surface to receive said end of the eyelet in coaxial sliding relation thereon and a radial shoulder axially disposed from the outer end of said pilot portion to engage said flaring means, said peripheral surface diverging outwardly along the length of said pilot portion from said outer end to initiate flaring of said end of the eyelet prior to engagement of the eyelet with said flaring means.

4. An anvil device for setting a tubular eyelet comprising a pilot portion adapted to slidably receive the eyelet in coaxial relation thereon, a flaring means coaxially disposed on said pilot portion at a position axially removed from the outer receiving end thereof and including an annular radial arcuate portion forming a contiguous surface with said pilot portion to effect radial outward flaring of an end of the eyelet when the eyelet is moved longitudinally of said pilot portion to engage said flaring means, and a shank portion adapted to support said pilot portion and said flaring means.

5. An anvil device for setting a tubular eyelet comprising a pilot portion adapted to slidably receive the eyelet in coaxial relation thereon, a flaring means associated with said pilot portion to flare an end of the eyelet radially outwardly when the eyelet is moved longitudinally of said pilot portion to engage said flaring means, and a shank portion adapted to support said pilot portion and said flaring means, said shank portion comprising a member separable from said pilot portion and said flaring means, said shank portion having a longitudinally extending bore therein to receive said pilot portion in supporting relation.

6. The device as defined in claim 5 wherein said shank portion includes a longitudinally extending radial slot intersectiong said bore and the outer peripheral surface of said shank to allow wall portions of said shank portion to be bent inwardly whereby said bore will be tapered and thereby frictionally grip said pilot portion in assembled position.

7. The device as defined in claim 6 wherein said longitudinally extending bore and slot are of greater length than the length of said pilot portion received within said bore to allow a separating tool to be inserted between

the bottom of said longitudinally extending slot and the bottom end of said pilot portion whereby said pilot portion may be separated from said shank portion.

8. The device defined in claim 7 wherein said pilot portion includes a generally frusto-conical surface to slidably receive the eyelet thereon, and wherein said flaring means comprises a separable annular member coaxially disposed on said pilot portion and includes an annular radially extending arcuate surface associated with said frusto-conical surface of said pilot portion to effect flaring of the eyelet, said pilot portion and said flaring means being supported by said shank portion.

9. In combination: an anvil device for setting a tubular eyelet comprising a pilot portion adapted to slidably receive the eyelet in coaxial relation thereon, a flaring means associated with said pilot portion to flare an end of the eyelet radially outwardly when the eyelet is moved longitudinally of said pilot portion to engage said flaring means, and a shank portion adapted to support said pilot portion and said flaring means, said shank portion comprising a separable portion including means to releasably support said pilot portion and said flaring means, said shank portion further including a slot therein for receiving a separating tool to facilitate disassembly of said shank portion from said pilot portion and said flaring means; means to support a supply of eyelets to be set or flared, said means including guide means to position the eyelets preparatory to setting; and a set-cup assembly adapted to engage an eyelet when in said preparatory position and to cooperate with said anvil device to effect a setting of the eyelet.

References Cited

UNITED STATES PATENTS

382,924	5/1888	Wilcox	72—479 X
954,821	4/1910	Romm	29—211
1,218,801	3/1917	Pickles	72—479
1,502,868	7/1924	Muther	74—464
3,199,182	8/1965	Harris et al.	29—211

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