March 25, 1941. E. W. ENGLE ET AL 2,236,288

METHOD FOR MAKING WIRE DRAWING DIES

Filed April 4, 1940

Fig. 1.

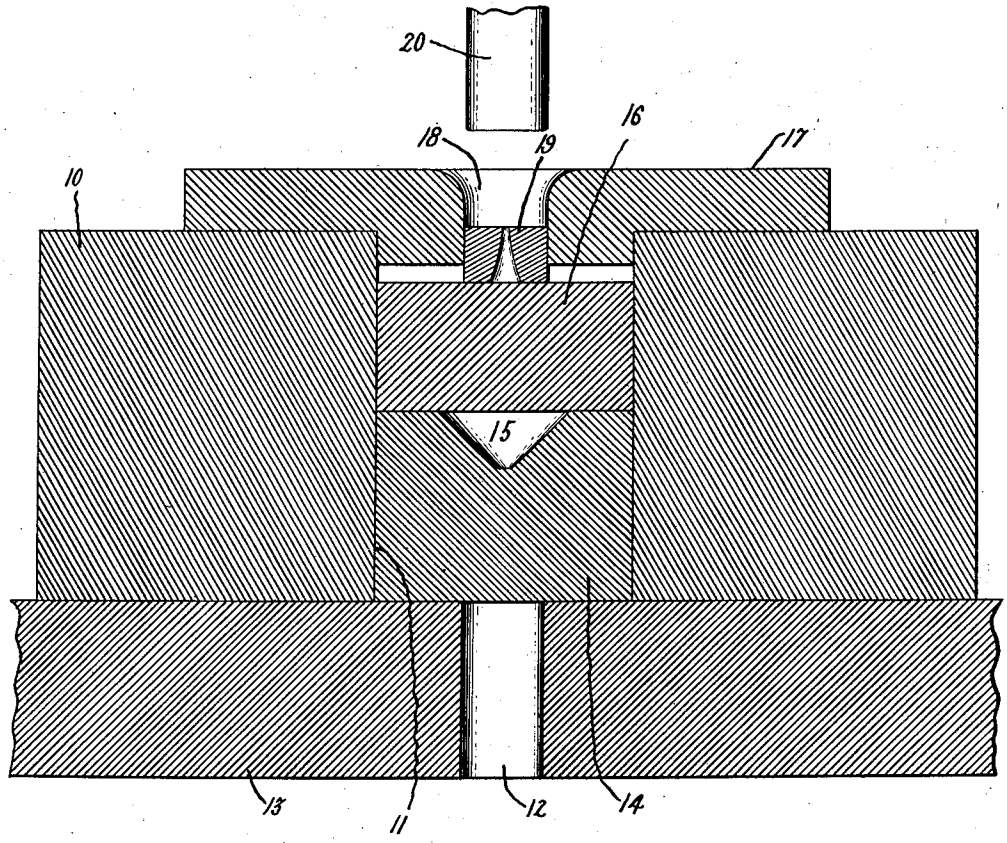


Fig. 2.

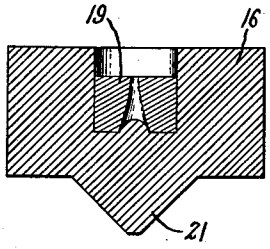


Fig. 3.

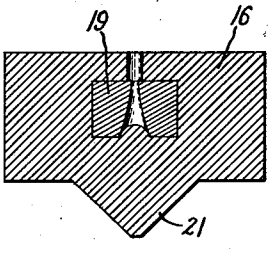
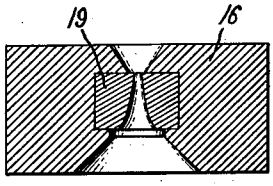


Fig. 4.



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METHOD FOR MAKING WIRE DRAWING DIES

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4 Claims. (Cl. 76—107)

The present invention relates to a method for making wire drawing dies and more particularly to a method for making wire drawing dies in which the hole through the die nib is of very small diameter, for example of the order of about 0.015 inch or less. The prior Engle and Duncan patent application Serial No. 180,078, filed December 16, 1937, of which this application is a continuation in part, discloses and claims a method for making wire drawing dies which method comprises the step of forcing a hard metal nib having a relatively low coefficient of expansion into a softer steel casing slug having a relatively high coefficient of expansion. In the prior process if a cored nib is forced into the steel casing slug the large diameter opening of the core is in contact with the plunger and the small diameter opening is in contact with the steel casing slug. As a result, when the nib is forced into the slug some of the steel from the slug is squirted into the small opening in the cored die. If the cored die has a relatively large opening therethrough the metal which has been forced into the opening shrinks and becomes loose during cooling and no difficulty is encountered in its removal. However, if the die opening which is in contact with the steel casing slug is small, for example of the order of about 0.015 inch or less, the shrinkage of the casing metal forced into this opening is not sufficient to permit its ready removal upon cooling and its elimination is expensive and time consuming.

It is one of the objects of the present invention to provide an improved method for forming small hole wire drawing dies. A further object of the invention is to provide in such a method means for preventing metal from the casing slug entering the small opening in the cored die nib.

The novel features which are characteristic of our invention are set forth with particularity in the appended claims. The invention, however, will best be understood from reference to the following specification when considered in connection with the accompanying drawing in which Fig. 1 is a vertical sectional view of a forging die holder, associated structure and a blank or slug of casing material showing a cored nib and plunger in position prior to forcing the nib into the slug; Fig. 2 is a vertical cross sectional view of the slug and nib after the nib has been forced into the slug; Fig. 3 is a vertical cross sectional view of the slug and nib after the upper portion of the casing slug has been forged over the cored nib while Fig. 4 is a vertical cross sectional view of the finished nib and casing therefor.

Referring more particularly to the drawing, we have indicated at 10 a steel forging die having a central opening 11 therethrough which opening is positioned in alignment with a hole 12 which extends through a support 13. The opening 11 is tapered slightly with the larger diameter at the top of the die. The taper is in general of the order of .020 inch per inch. A steel bottom plate 14 placed in the opening 11 rests on the support 13. The plate 14 has a substantially conical depression 15 in its upper surface.

In operation, a steel casing slug 16 is heated to a suitable forging temperature, for example about 1850 to 2000° F. to make it plastic and then placed in the opening 11 of the forging die and on top of the bottom plate 14. The slug 16 when heated at this temperature fits closely within the opening 11 which limits lateral expansion of the slug. A centering plate 17 having a central opening 18 therethrough is positioned on the upper end of the forging die 10. The opening 18 in plate 17 is coaxial with the opening 11. A cemented carbide cored nib 19 having a substantially conical or bell-shaped opening therein is positioned in the opening 18 of plate 17 and on top of the heated slug 16 so that the largest diameter of the die opening is in contact with the heated slug. Pressure is applied to the nib 19 by a plunger 20 to thereby sink the nib below the top surface of the slug 16. The excess metal in the slug flows into the conical opening 15 in the base plate forming a conical portion 21 on the casing 16. As a result of the flow of metal into the depression 15 only a very small quantity of metal enters the opening in the die nib. The upper end of the casing 16 may be forged over the upper end of the die nib in the manner disclosed in the prior Engle and Duncan patent application Serial No. 180,078.

After the casing 16 has been forged over the end of the nib 19, the casing 16 and enclosed nib are ejected from the forging die by the application of pressure to the base plate 14 through the opening 12 in the support 13. The encased nib may be tempered at about 900° F. to 1250° F. to develop desired properties in the casing steel. The conical metal portion 21 of the casing 16 is now removed, and the desired final form of central opening completed in the die nib and casing 16. A small quantity of metal may enter the lower or large opening in the cored nib when the nib is forced into the slug 16. However, such metal is only loosely held in the opening and drops out when the desired opening is made through the nib and casing. No metal enters the small open-

ing in the cored nib during the process of forming the die.

The hard metal nib 19 preferably is a cemented carbide material. Such carbides have a very low coefficient of expansion. These carbides also are well known and are formed by pressing and sintering the mixed ingredients. They generally consist of one or more hard carbides bonded or cemented together by lower melting point metal. In general, we prefer to employ a cemented carbide nib consisting substantially of tungsten carbide and cobalt, the cobalt content of the cemented carbide generally being less than 20%. The casing slug material employed preferably is a steel having a relatively high coefficient of expansion. A steel suitable for such use is disclosed in our prior application Serial No. 180,078 and may contain about 0.80% to 1.05% carbon, about 0.20% to 0.45% vanadium and if desired up to about 0.5% chromium.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. The method of making a wire drawing die which comprises heating a steel casing slug to a forging temperature, placing said slug in a forging die and on top of a base plate having a depression therein, positioning a cored nib on said slug and in alignment with said depression and applying pressure to said nib to force the nib completely into the heated slug and the excess metal in said slug into said depression to thereby limit the flow of metal into the opening in the nib.

2. The method of making a wire drawing die which comprises heating a steel casing slug to a forging temperature, placing said slug in a forging die and on top of a base plate having a depression therein, positioning a cored nib on said slug, said cored nib having a substantially conical opening therein the widest portion of said opening being in contact with the heated slug, and applying pressure to the cored nib to force the nib completely into said heated slug and the excess metal in said slug into said depression to thereby limit the flow of metal into the opening in the nib.

3. The method of making a wire drawing die which comprises heating a steel casing slug having a relatively high coefficient of expansion to a forging temperature, placing said slug in a forging die and on top of a base plate having a central depression in the upper surface thereof, positioning a cored cemented carbide nib having a relatively low coefficient of expansion on said slug and in alignment with said depression, and applying pressure to the cored nib to force the nib completely into the heated slug and the excess metal in said slug into said central depression to thereby limit the flow of metal into the opening in the nib.

4. The method of making a wire drawing die which comprises placing in a forging die a base plate having a substantially conical depression in the upper end thereof, placing a steel casing slug heated to a forging temperature in said die and on top of said base plate, positioning a cored die nib on said heated slug, said nib having a substantially conical opening extending therethrough, the widest portion of said opening being in contact with said slug and in alignment with said conical depression and applying pressure to said cored nib to force the nib completely into said heated slug and the excess metal in said slug into said conical depression to thereby limit the flow of metal into the opening in the nib.

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