Sept. 7, 1943. O. G. FERRIER 2,328,794

WIRE DRAWING DIE COMPACT AND METHOD OF MAKING DIES

Filed March 31, 1941

Fig. 1.

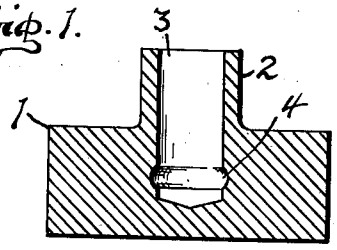


Fig. 3.

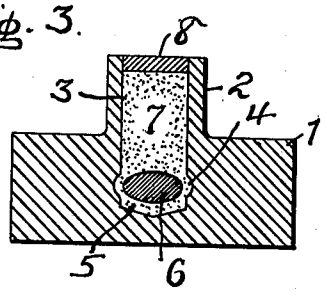


Fig. 2.

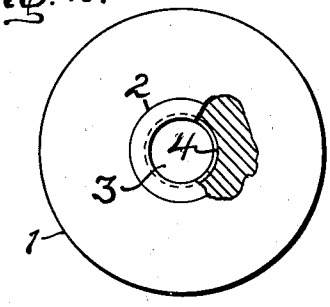


Fig. 4.

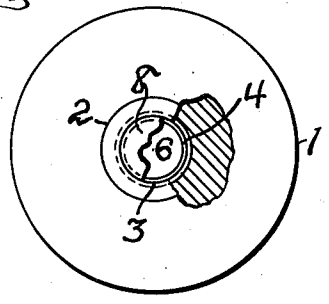


Fig. 5.

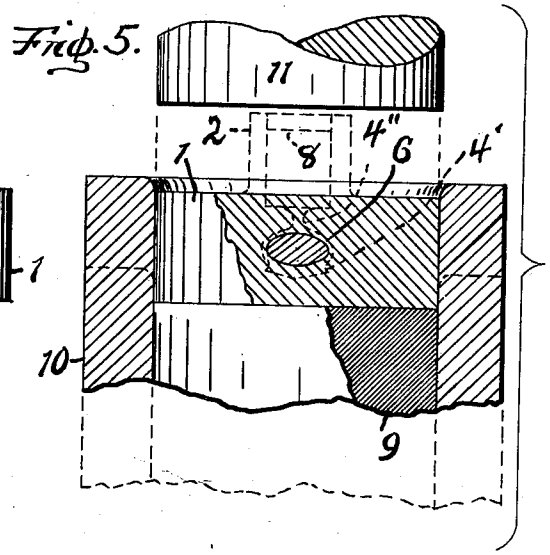
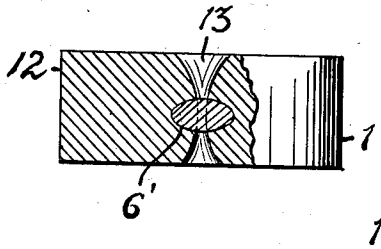


Fig. 6.



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WIRE DRAWING DIE COMPACT AND METHOD OF MAKING DIES

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5 Claims. (Cl. 76—107)

This invention relates to improvements in a wire drawing die and method of making same, and pertains to that type of die structure in which a highly refractory die body, such as a diamond, is confined firmly within an encasement formed of a metal or alloy characterized by its hardness and great resistance to internal displacement at normal temperature, the purpose being to establish the refractory die body definitely in a state of fixity in a predetermined position within an encasement in a manner to afford substantially unyielding support by the casing for the die body wherefore to circumvent expansion of the body in any direction.

Ordinarily, in use of a die structure of this character, the die body is subjected to outward radial pressure and also force in the wire-drawing direction during passage of a wire therethrough, and is also subjected to great frictional heat occasioned by the labor of the wire as it is drawn through the die body and attenuated during the drawing operation. The stress imposed upon the die body, unless completely supported uniformly and rigidly restrained from expansion, frequently results in fracture of the die body which renders it useless. It is therefore the purpose of the present invention to reduce the liability of the die body to become shattered.

An object of the instant invention, in order to attain this purpose, is to afford an encasement for the die body so constituted as to initially encompass a refractory member completely with the material of which the casing is composed and to establish substantially non-yielding universal support for said member, thus to obviate unequal strain thereon.

Another object of the invention is to afford a method of surrounding a die body with an encasement in such manner as to assure intimate contact of the material, of which the encasement is composed, with the refractory member completely about its entire exterior, and thus rigidly support the body uniformly within the encasement against relative movement in all directions.

Other objects and advantages of the invention appear in the following description.

An illustrative embodiment of the invention is shown in the accompanying drawing, in which:

Fig. 1 is an elevational view in central section of an encasement for a die body as initially formed;

Fig. 2 is a top plan view projected from Fig. 1, partly cut away;

Fig. 3 is an elevational view in central section of the encasement in its initial form, and with a refractory member and enveloping material therefor disposed therein, as arranged preliminary to fixation operations;

Fig. 4 is a top plan view projected from Fig. 3, partly cut away;

Fig. 5 is an elevational view, partly in section showing the refractory member therein and the encasement re-formed, and including fragments of apparatus by which the die structure is reduced to an intermediate stage; and

Fig. 6 is an elevational view, partly in section showing the die structure completed.

The illustrative embodiment of the invention consists in making a wire drawing die constituted of a highly refractory die body provided with an axial opening extending therethrough and firmly established within an enveloping encasement by which expansion of the die body in all outward directions is rigorously counteracted thereby to circumvent bursting or cracking of the die body.

In making the die structure, there is initially formed a block made of an extremely hard ductile metal or alloy, such for example, as the product commonly known as "Monel" metal, shaped to have a cylindrical base 1 with a concentric upstanding neck 2, the diameter of which is substantially smaller than that of the base, there being made in the block an axial bore 3, open through the top of the neck and terminating at its bottom at a point spaced from the lower end of the base. Preferably, there is formed in the wall of the bore an annular recess 4 located at a point spaced above the bottom of the bore. There is then deposited and packed in the bore a quantity of pulverulent material of the same metallic character as that of which the block is composed to form a bed 5, upon which is seated a highly refractory member 6, such as a diamond, that, when subsequently pierced as hereinafter related and lapped, constitutes a die body 6'. After the refractory member has been placed upon the bed 5 and accurately centered thereon, axially with respect to the bore, downward pressure is applied upon the member to assure the desired situs. A cover 7 consisting of an additional amount of like pulverulent metal is introduced into the bore until the bore is filled therewith to a point spaced from the top of the neck. A circular plate 8 is then placed in the top of the bore to closely confine the pulverulent metal therein, thus to preserve the situs of the assembled parts.

The compact, consisting of the encasement in

its initial form, the refractory member, the deposited pulverulent material, and the plate disposed therein, bodily is heated, and then superheated until the compact is susceptible to reshapement when confined and compressed.

To carry out the compacting operation there is provided a stationary anvil 9 around the upper end of which is disposed a vertically movable ring 10 adapted to encompass the base 1 of the block when the block is seated upon the anvil. A ram 11 is arranged in axial alinement with the anvil and ring and is provided with suitable mechanism (not shown) for applying movement to the ram so as to enter the ring and forcefully compress the block and the assemblage of parts into a cylindrical form 12. During the operation of compressing the block and its pulverulent content about the die member the wall of the bore in the solid metallic base 1 at points above and below the horizontal medial plane of the die member is forced radially inward at right angles to the axis thereof thus forming corresponding annular ledges 4' and 4'' that respectively underlie and overlie the rim of the die member. And during the compressing operation the pulverulent material constituting the bed 5 and cover 7 and the neck 2 with the plate 8 are firmly invested into and become a solid part of the cylindrical form 12.

The retaining ring 10 is moved axially upon the anvil by means of any suitable appliance (not shown), so that when the ring is lowered the compressed block may readily be removed from the anvil, after which the form is pierced and lapped to provide a die opening 13 in the usual manner to complete the drawing die.

Variations from the particular construction above disclosed may readily be made by exercise of engineering skill without departure from the spirit or scope of the invention, and the following claims are intended to be inclusive of such vairations.

What I claim is:

1. A compact for forming a wire drawing die consisting of a block formed of a solid hard ductile metal or alloy shaped to have a base with a concentric upstanding neck and an axial bore open through the top of the neck and terminating at its bottom at a point spaced from the lower end of the base, there being an annular recess in the wall of the bore located at a point spaced above the bottom of the bore, a bed formed of pulverulent material of the same character as that of which the block is composed packed in the bottom of said bore, a refractory member disposed on said bed, centered with respect to said bore, and located approximately in the plane of said recess, a cover of like pulverulent material for said member packed in said bore, and a plate in said neck to secure the situs of said block, the member and the pulverulent material, the compact being such that when heated to a high temperature and subjected to axial pressure while laterally confined, said neck, the contained pulverulent material and plate become invested in said base and said member is closely confined thereby.

2. A compact for forming a wire drawing die consisting of a block formed of a solid hard ductile metal or alloy initially shaped to have a base with a concentric upstanding neck and an axial bore open through the top of the neck and terminating at its bottom at a point spaced from the lower end of the base, a bed formed of pulverulent material of the same character as that of which the block is composed packed in the bottom of said bore, a refractory member disposed on said bed, centered with respect to said bore, a cover of like pulverulent material for said member packed in said bore, and a plate in said neck to secure the situs of said block, member and pulverulent material, the compact being such that when heated to a high temperature and subjected to axial pressure while laterally confined, said neck, the contained pulverulent material and plate become invested in said base and said member is closely confined thereby.

3. A compact for forming a wire drawing die consisting of a block formed of a solid hard ductile metal or alloy initially shaped to have a base with a concentric upstanding neck and an axial bore open through the top of said neck and terminating at a point spaced from the lower end thereof, pulverulent material of the same character as that of which the block is composed disposed in said bore, a refractory member imbedded in said material centered axially with respect to said bore, and a plate confining within said bore the invested material and refractory member therein.

4. The method of making a wire drawing die in which a highly refractory member is situated and closely confined by a surrounding encasement, said method including the formation of a hard metallic block shaped initially to have a base and an upstanding neck provided with a bore that extends into and terminates within said base at a point spaced from the lower end thereof, inserting in said bore a bed formed of pulverulent material similar in character to that of which said block is composed, positioning on said bed a refractory member disposed axially with respect to said bore, inserting in said bore similar pulverulent material to cover said member, confining said material and the imbedded member in said block, heating said block and its contents to a high temperature, subjecting the block while heated to external pressure to invest said neck and content thereof into said base, and subsequently piercing and lapping the composite mass thus formed to provide a die opening therethrough.

5. A compact for forming a wire drawing die consisting of a block formed of a solid hard ductile metal or alloy initially shaped to have a base with a concentric upstanding neck and an axial bore open through the top of said neck and terminating in said base at a point spaced from the lower end thereof, pulverulent material of the same character as that of which the block is composed disposed in said bore, and a refractory member imbedded in said material centered axially with respect to said bore.

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