

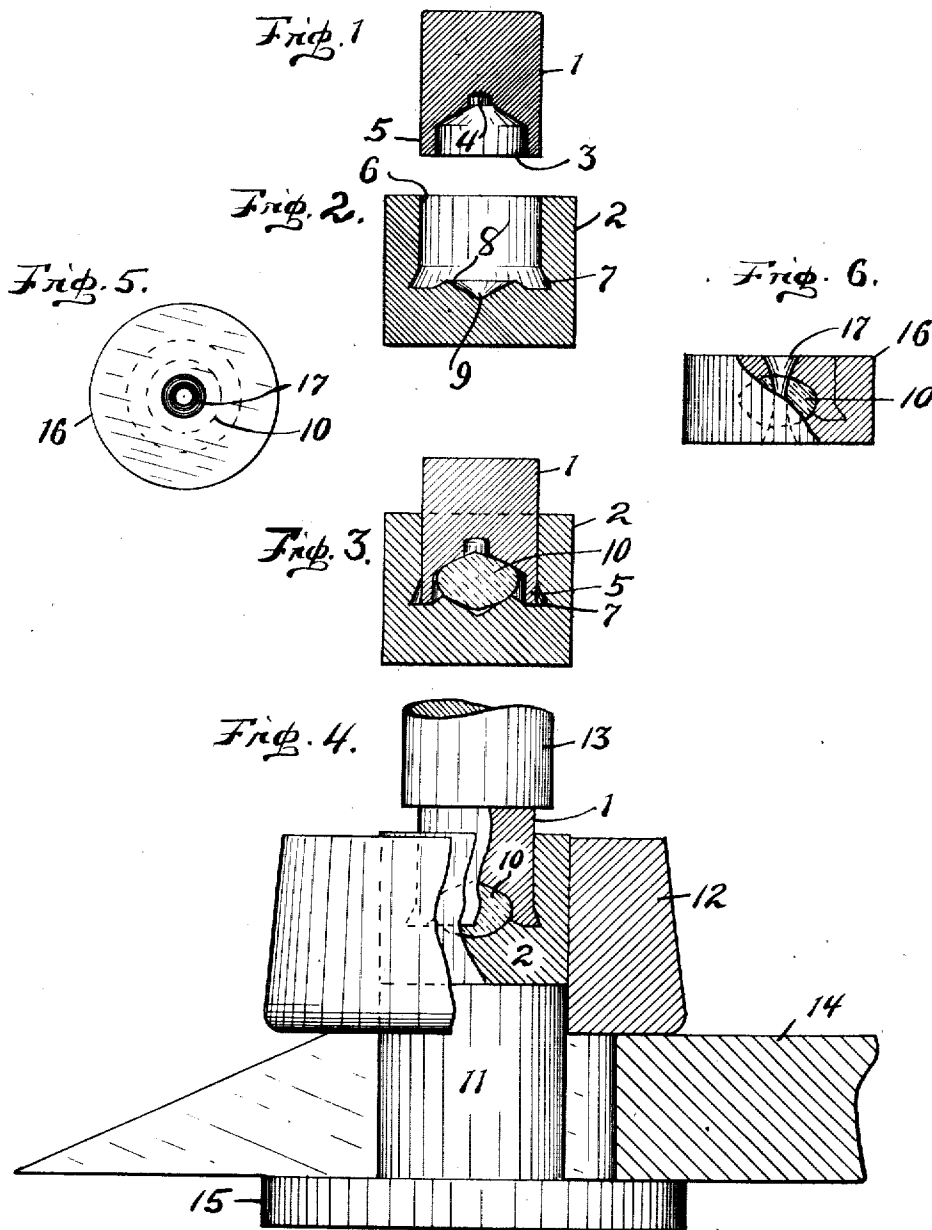
Aug. 29, 1939.

H. C. WYLAND

2,171,323

DIE AND METHOD OF FORMING

Filed Oct. 29, 1927



Harry Clinton Wyland INVENTOR
BY
H. G. Burns ATTORNEY

UNITED STATES PATENT OFFICE

2,171,323

DIE AND METHOD OF FORMING

Harry Clinton Wyland, Fort Wayne, Ind., assignor
to General Cable Corporation, New York, N. Y.,
a corporation of New Jersey

Application October 29, 1927, Serial No. 229,774

22 Claims. (Cl. 76—107)

This invention relates to improvements in drawing die encasements and method of making same, and the object thereof is to surround a die body, for example a diamond, with a retaining body of metal as an encasement therefor preliminary to the forming of a wire drawing die, in such manner that the exterior walls of the die body will be firmly sustained thereby against outward pressure after the die body is drilled and subjected to use. Another object is to afford a method of encasing a die body in metal, that is simple, and by which the maintenance of the die body in a definite position within the encasement during the formation of said encasement therefor, is accomplished.

These objects are accomplished by the construction of an illustrative embodiment shown in the accompanying drawing and by the method herein disclosed, in which drawing,

Fig. 1 is a vertical section of an investment plug for forming part of an encasement;

Fig. 2 is a similar view of a shell for forming another part of the encasement;

Fig. 3 is a vertical section showing the shell with the plug and a diamond positioned therein at a preparatory stage in forming the encasement;

Fig. 4 is an elevation showing the shell, plug and diamond, in another stage of forming the encasement, and showing also portions of apparatus employed during the investment of the plug about the diamond within the shell, parts being broken away;

Fig. 5 is a plan view of the encasement when completed; and

Fig. 6 is an elevation of the completed encasement, a portion thereof being broken away.

The characters appearing in the description refer to parts shown in the drawing and designated thereon by corresponding characters.

The invention comprises a metal encasement for a die body such as a diamond to be used as a die for drawing wire, and the method by which the encasement for the diamond is formed thereon. The encasement is constituted of two members, an investment plug 1 and a shell 2, both of which are formed of metal such as steel, or an alloy capable of being shaped in a mold when heated and subjected to pressure.

The plug 1, is of cylindrical form, and cavernous at its lower end, there being an axial pocket 3 that tapers upwardly with an extended vertex 4 formed therein, and an annular flange 5 of uniform thickness forms the lower end of the plug.

The shell 2 is of cylindrical form and of greater

external diameter than that of the plug, and is cavernous in its upper portion, there being formed an axial pocket 6 for the reception of said plug, the lower end of which pocket is undercut as indicated by 7. Also, in said shell at the bottom of the pocket is formed an annular seat 8 with a downwardly tapering vertex 9, which seat is axially aligned with the shell.

A diamond 10 which is to form the die is positioned centrally upon the seat 8, and the plug 1 is inserted in the pocket so that its flange 5 encompasses the diamond. The compact thus formed constituted of the plug, shell and diamond, is subjected to heat by applying a blow torch thereto, or by any other suitable method, and while in a glowing state of temperature the heated compact is placed upon a suitable anvil 11 and within a retaining ring 12, that completely encompasses the shell 2, and while the compact is still in a more or less plastic condition, the plug is rammed into the pocket upon and about the diamond by applying force against the top of the plug, any suitable means being employed for the purpose, such as an arbor press, the plunger 13 of which is shown in Fig. 4. During the ramming process the retaining ring 12 is sustained in an elevated position about the shell 2 by means of a prop 14 that is removably positioned between the bottom of the ring and the base 15 of the anvil, so that the shell is confined by the ring and its cylindrical form and diameter are preserved. The pressure thus applied to the plug is imparted to the diamond which is thereby caused to become imbedded upon the seat in the shell and in the metal of the plug, the flange of which plug thereby becomes invested in the undercut portion of the pocket and about the diamond, so that the cavity within the shell is completely filled by the diamond and the plug. Upon removal of the prop 14, the ring may be lowered to effect removal therefrom of the compact.

As the lower end of the plug, due to the ramming operation, extends into the undercut portion of the pocket in the shell, the plug is firmly held in place about the diamond and in the shell, and thus the diamond is firmly encased upon its seat within the shell and by the invested metal.

The compact is then dressed in a lathe to form the encasement 16, and a die orifice 17 is made through the encasement and diamond contained therein, as in the usual practice.

What I claim is:

1. A compact for forming a die, consisting of two cavernous metallic members, the cavity in the

larger of said members having an undercut portion, the other of said members having an extending portion about its cavity, said members being compressed together, one within the other, said extended portion being invested in said undercut portion, and a refractory die body encased thereby.

2. A compact for forming a wire drawing die, consisting of two cavernous metallic members, the cavity in one of said members having initially an undercut portion, the other of said members having a part extending into said undercut portion, said members being compressed together, one within the other, so that the inner member expands and occupies the undercut portion of the outer member, and a refractory die body disposed within the cavities of said members, said members forming an unyielding encasement about said body.

3. A compact for forming a wire drawing die consisting of a cavernous metallic shell having formed therein at the bottom of its cavity a seat cupped, said cavity having an undercut portion surrounding said seat, a refractory die body disposed upon said seat, and a metallic plug forcibly invested in said shell and completely filling said cavity about said die body so that said shell and plug form an encasement for said body.

4. A wire drawing die consisting of two cavernous metallic members compressed together, one disposed within the cavity of the other, the cavity of the external member having an undercut portion that is filled by the other member, and a refractory die body encased by said members and centered in the cavity of the larger member by the cavity of the smaller member, there being a die aperture extending through said body and members.

5. The method of making a compact for a die, that consists in forming a metallic shell with a seat at the bottom of its cavity, and with an undercut portion of said cavity encompassing said seat, placing a refractory die body upon said seat, investing a metallic plug in said cavity to thereby confine said body upon said seat, applying heat to said shell and plug to thereby reduce said shell and plug to a state of plasticity, circumferentially confining said shell, and applying force to said plug while said shell and plug are in a plastic state and the shell is thus confined against lateral expansion to thereby compress said plug about said seat and the body and form a non-yielding encasement about said die body.

6. The method of making a compact for a die, that consists in forming a metallic shell with a seat at the bottom of its cavity, placing a refractory die body upon said seat, investing a metallic plug in said cavity to thereby confine said body upon said seat, applying heat to said shell and plug to thereby reduce said shell and plug to a state of plasticity, circumferentially confining said shell, and applying force to said plug while said shell and plug are in a plastic state and the shell is thus confined so as to compress the lower part of said plug around said seat and die body to thereby form a non-yielding encasement about said die body.

7. The method of making a compact for a die, that consists in confining a refractory die body by placing said body in a metallic shell and closing said shell with an investment plug, heating said shell and plug to a state of plasticity, circumferentially confining said shell, and applying force to said plug while said shell and plug are in a plastic state and the shell is thus confined against

lateral expansion so that the lower part of said plug is compressed in said shell around said die body to form a non-yielding encasement therefor.

8. The method of making a wire drawing die, that consists in forming a cavernous metallic body, placing a refractory die body in the cavity of said metallic body, closing said cavity with a metallic investment plug, heating said metallic body and plug to a state of plasticity, circumferentially confining said metallic body against lateral expansion, and applying force to said plug to thereby encase the major portion of said die body in said plug and completely fill the cavity about said die body.

9. A compact for forming a wire drawing die consisting of a cavernous metallic shell having formed therein at the bottom of its cavity an elevated, cupped seat, a refractory die body disposed upon said seat, and a metallic plug permanently invested in said shell and having an enlarged portion that encompasses said body and also the upper portion of such seat and completely fills said cavity so that said shell and plug form a solid encasement for said body.

10. A compact for forming a wire drawing die comprising a cavernous metallic shell having formed therein at the bottom of its cavity a cupped seat for holding a refractory die body centrally of the cavity, an undercut region surrounding said seat, a refractory die body mounted on the seat, and a plug having a cavity in one end thereof forcibly invested into the metallic shell and filling the shell around the refractory die body, the cavity in said plug cooperating with the seat in the shell to hold the die body centrally of the assembly.

11. A shell for receiving and firmly holding, in association with a plug member, a refractory die body, said shell comprising a metallic member having an undercut cavity in one wall thereof, and a raised central portion at the bottom of the cavity, said raised portion having its top surface cupped to form a centering seat for the refractory die body.

12. The method of making a compact for a wire drawing die which comprises positioning a refractory die body in a metallic shell with a relatively thin annular metallic wall surrounding the die body between the die body and the shell, and compressing the annular wall along its longitudinal axis thereby causing the metal of the wall to flow and spread and engage both the die body and the shell and firmly secure the parts together.

13. The method of mounting a refractory die body in a body of metal which comprises forming an undercut aperture in the body of metal, positioning a refractory die body within the aperture, forming a metal plug which will enter and substantially fill the aperture entrance, placing the metal plug in the aperture, and pressing the plug against the die member while holding the die member stationary in the aperture thereby causing the metal of the plug to flow and spread about the die member and into the undercut portion of the aperture to firmly engage the die body and the surrounding body of metal.

14. The method of forming a drawing die, including the steps of positioning a nib in a hollow plug, disposing said plug in a die holder, and applying compression force to said plug in wire drawing direction to thereby increase the thickness of the wall of the plug and firmly secure the parts together.

15. The method of forming a drawing die, in-

cluding the steps of positioning a hard, wear-resisting member within a hollow plug disposed within a die holder, and applying compression force to said plug in wire drawing direction to thereby increase the thickness of the wall of the plug and firmly secure the parts together.

16. The method of forming a drawing die, including the steps of positioning a refractory wire drawing die body in a hollow metal casing, simultaneously heating the casing and die body and while they are hot applying substantial compression force to said casing solely in the direction of axial movement of wire through the die while confined in a die holder to thereby increase the thickness of the wall of the casing and contract the inner wall of the casing against the die.

17. The method of forming a drawing die, including the steps of positioning a refractory wire drawing die body in a hollow metal casing which substantially surrounds the die body except for one exposed side, simultaneously heating the casing and die body and while they are hot applying substantial compression force to said casing in a direction perpendicular to the open side of the casing while confined in a die holder to thereby increase the thickness of the wall of the casing and to cause circumferential contraction of the casing as it is compressed, whereby the circumferential contraction of the inner wall of the casing places the die body under compression.

18. The method of forming a drawing die, including the steps of positioning a wire drawing die body in a hollow deformable steel casing, heating the casing and die body, and then hot-forging the casing by applying substantial compression force to said casing solely in a wire drawing direction while confined in a die holder to thereby increase the thickness of the wall of the casing and to upset the casing and cause it to place the die body under compression.

19. A method of forming a drawing die, which includes positioning a hard wire drawing die body of material having low tensile strength in a sleeve-like casing member of steel having high tensile strength but deformable, heating the

sleeve and die body, placing the sleeve and die body in a holder, and while the sleeve and die body are still hot, forging the casing member by upsetting the end of the sleeve in a wire drawing direction.

20. The method of forming a drawing die including the steps of: positioning a wire drawing die body in a hollow metal casing, heating the casing and die body and while they are hot applying compression to said casing solely in a wire drawing direction to upset the casing against the ends of the die body while in a die holder whereby the wall thickness of the casing is increased and the radial contraction of the inner casing wall combined with said upsetting places the die body under combined axial and radial compression.

21. A method of forming a drawing die including the steps of: positioning a wire drawing die body in a cup-shaped steel casing, heating the casing and die body and while they are hot applying compression to the casing in the direction of axial movement of wire through the die to upset the open end of the casing against the corresponding end of the die body while confined in a die holder whereby the wall thickness of the casing is increased and the radial contraction of the inner casing wall combined with said upsetting places the die body under combined axial and radial compression.

22. A method of forming a drawing die including the steps of: positioning a wire drawing die body in a cup-shaped steel casing of attenuated wall thickness adjacent the open end, heating the casing and die body and while they are hot applying compression to the casing solely in a wire drawing direction to upset the open end of the casing against the corresponding end of the die body while confined in a die holder whereby the wall thickness of the casing is increased and the radial contraction of the inner casing wall combined with said upsetting places the die body under combined axial and radial compression.

HARRY CLINTON WYLAND.

CERTIFICATE OF CORRECTION.

Patent No. 2,171,323.

August 29, 1939.

HARRY CLINTON WYLAND.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, first column, lines 22 and 23, claim 3, for "seat cupped" read cupped seat; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 10th day of October, A. D. 1939.

(Seal)

Henry Van Arsdale,
Acting Commissioner of Patents.

cluding the steps of positioning a hard, wear-resisting member within a hollow plug disposed within a die holder, and applying compression force to said plug in wire drawing direction to thereby increase the thickness of the wall of the plug and firmly secure the parts together.

16. The method of forming a drawing die, including the steps of positioning a refractory wire drawing die body in a hollow metal casing, simultaneously heating the casing and die body and while they are hot applying substantial compression force to said casing solely in the direction of axial movement of wire through the die while confined in a die holder to thereby increase the thickness of the wall of the casing and contract the inner wall of the casing against the die.

17. The method of forming a drawing die, including the steps of positioning a refractory wire drawing die body in a hollow metal casing which substantially surrounds the die body except for one exposed side, simultaneously heating the casing and die body and while they are hot applying substantial compression force to said casing in a direction perpendicular to the open side of the casing while confined in a die holder to thereby increase the thickness of the wall of the casing and to cause circumferential contraction of the casing as it is compressed, whereby the circumferential contraction of the inner wall of the casing places the die body under compression.

18. The method of forming a drawing die, including the steps of positioning a wire drawing die body in a hollow deformable steel casing, heating the casing and die body, and then hot-forging the casing by applying substantial compression force to said casing solely in a wire drawing direction while confined in a die holder to thereby increase the thickness of the wall of the casing and to upset the casing and cause it to place the die body under compression.

19. A method of forming a drawing die, which includes positioning a hard wire drawing die body of material having low tensile strength in a sleeve-like casing member of steel having high tensile strength but deformable, heating the

sleeve and die body, placing the sleeve and die body in a holder, and while the sleeve and die body are still hot, forging the casing member by upsetting the end of the sleeve in a wire drawing direction.

20. The method of forming a drawing die including the steps of: positioning a wire drawing die body in a hollow metal casing, heating the casing and die body and while they are hot applying compression to said casing solely in a wire drawing direction to upset the casing against the ends of the die body while in a die holder whereby the wall thickness of the casing is increased and the radial contraction of the inner casing wall combined with said upsetting places the die body under combined axial and radial compression.

21. A method of forming a drawing die including the steps of: positioning a wire drawing die body in a cup-shaped steel casing, heating the casing and die body and while they are hot applying compression to the casing in the direction of axial movement of wire through the die to upset the open end of the casing against the corresponding end of the die body while confined in a die holder whereby the wall thickness of the casing is increased and the radial contraction of the inner casing wall combined with said upsetting places the die body under combined axial and radial compression.

22. A method of forming a drawing die including the steps of: positioning a wire drawing die body in a cup-shaped steel casing of attenuated wall thickness adjacent the open end, heating the casing and die body and while they are hot applying compression to the casing solely in a wire drawing direction to upset the open end of the casing against the corresponding end of the die body while confined in a die holder whereby the wall thickness of the casing is increased and the radial contraction of the inner casing wall combined with said upsetting places the die body under combined axial and radial compression.

HARRY CLINTON WYLAND.

CERTIFICATE OF CORRECTION.

Patent No. 2,171,323.

August 29, 1939.

HARRY CLINTON WYLAND.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, first column, lines 22 and 23, claim 3, for "seat cupped" read cupped seat; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 10th day of October, A. D. 1939.

(Seal)

Henry Van Arsdale,
Acting Commissioner of Patents.