

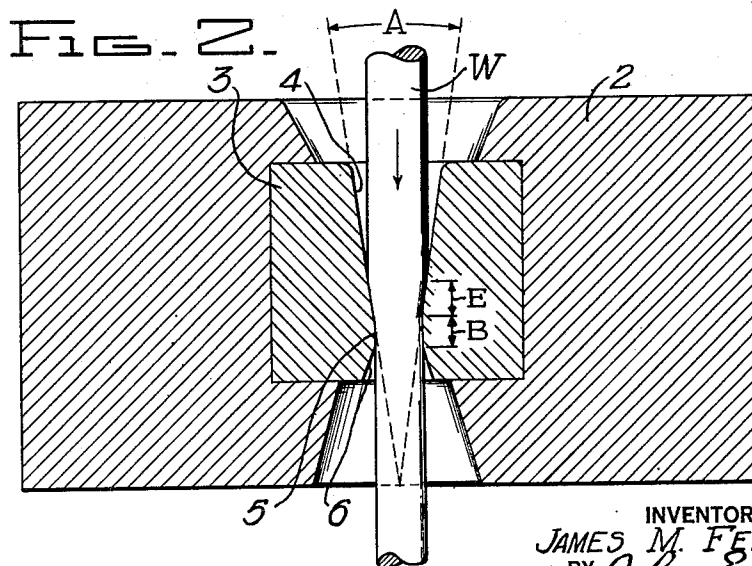
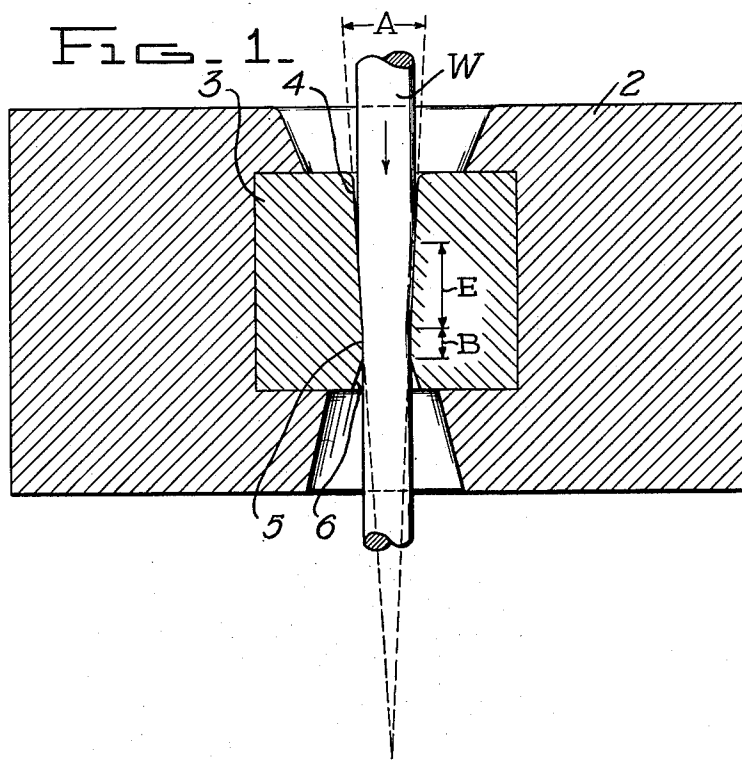
May 23, 1944.

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2,349,652

WIRE DRAWING DIE

Filed Dec. 2, 1942



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UNITED STATES PATENT OFFICE

2,349,652

WIRE DRAWING DIE

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Application December 2, 1942, Serial No. 467,634

7 Claims. (Cl. 205—29)

This invention relates to wire drawing dies and, and particularly, to an improved wire drawing die for drawing galvanized wire and similar coated wire.

In the steel industry difficulty has been experienced in drawing galvanized wire and other coated wire, in that, the zinc coating thereon would tend to be stripped from the surface of the wire as the same was drawn through the reducing die. This is due primarily to the fact that the die on the entrance side would bite into the coated surface and consequently strip the coating from the wire as it passed into the die. The entrance angle of a conventional wire drawing die is approximately from 14 to 24 degrees with an angle of 16 and 18 degrees most commonly being used. It has been found that dies having such large entrance angles stripped the coating from the wire as above stated and were unsatisfactory for drawing wire coated with zinc or other metallic coatings which are softer than the base metal. It is to an improved die having a relatively narrow entrance angle for drawing galvanized and similar coated wire to which the present invention relates.

Accordingly, it is the general object of the present invention to provide an improved die for drawing galvanized wire and the like which has a narrower entrance angle than wire drawing dies heretofore suggested and used, thereby providing an improved finished wire product.

It is another object of the invention to provide an improved die for drawing galvanized wire and the like wherein the length of the main bearing portion of the die bears a definite relation to the diameter of the finished wire and to the entrance angle.

It is a further object of this invention to provide an improved die for drawing galvanized wire and the like wherein the entrance angle of this die bears a definite relation to the tensile strength of the wire being drawn.

It is still another object of the present invention to provide an improved die for drawing galvanized wire and the like which is simple and inexpensive in its construction and, at the same time, a die which is efficient and effective in its use.

Various other objects and advantages of this invention will be more apparent in the course of the following specification and will be particularly pointed out in the appended claims.

In the accompanying drawings there is shown, for the purpose of illustration, an embodiment which my invention may assume in practice.

In the drawing:

Figure 1 is a longitudinal sectional view through the improved wire drawing die of my invention; and

Figure 2 is a similar view through a conventional type wire drawing die.

Referring more particularly to the drawing, there is shown a steel casing or die holder 2 which is usually shrunk, forged or cast around a tungsten carbide drawing die 3, or nib as it is more commonly called. It is the purpose of the casing 2 to aid in supporting the nib or die 3 against the terrific wire drawing stresses which result in the nib or die during actual drawing operations in a manner well known to those skilled in the art. On the entrance side of the die or nib 3 there is provided a tapered portion 4 having an angle A for guiding the wire to be drawn into the die. Centrally of the die, there is provided a bearing portion 5 having a length B and the exit side of the die is relieved as at 6.

In the drawing of galvanized and similarly coated wire, it has been found that in dies having a relatively small entrance angle A that the force applied to the wire to reduce the same by the die as the wire is drawn therethrough approaches a plane perpendicular to the axis of the wire and thus provides a more direct compressive force on the coating thereby forcing it inwardly toward the outer surface of the wire. On the other hand if the entrance angle A is larger, it has been found that the contrary is true and that the plane of the compressive force tends to be at an acute angle with the axis of the wire and consequently the coating tends to be shaved or stripped from the wire.

According to the present invention, as shown in Figure 1 of the drawing, the entrance angle A of the tapered portion 4 is approximately from $3\frac{1}{2}$ to 10 degrees with an angle of 5 to 8 degrees being desirable for most purposes. It has been found that if an entrance angle of greater than 10 degrees is used the zinc or coating will tend to be stripped from the surface of the wire due to the compressive forces exerted by the side walls of the die. Accordingly, it will be seen that the size of the entrance angle A is critical in dies for drawing zinc and similarly coated wire in order to prevent such stripping action.

In the drawing, it will be understood that the dimension E of the tapered portion 4 designates the distance that the outer surface of the wire W contacts the side walls of the tapered portion and that the dimension B designates the length of the bearing portion 5 of the die which sizes the

wire. It will be seen that the diameter of the bearing portion is constant throughout the length thereof with the side walls thereof being substantially parallel to each other. It has been found that the length B of the bearing portion 5 should be approximately from 10 to 50 percent of the diameter of the wire after it has been drawn through the die. In drawing galvanized wire, it has been found that the length of the bearing portion for entrance angles of from $3\frac{1}{2}$ to 6 degrees should be about 10 percent of the diameter of the drawn wire and that for entrance angles of from 6 to 10 degrees the length of the bearing portion should be about 50 percent of the diameter of the finished wire. In other words, the length B of the bearing portion 5 varies directly as the size of the entrance angle A of the tapered portion 4 varies. If the entrance angle is relatively narrow, for example, $3\frac{1}{2}$ to 6 degrees, the length B of the bearing portion should not be much greater than 10 percent of the diameter of the finished wire for the reason that an increased force is necessary to pull the wire through the die. In entrance angles of a greater size the force necessary to pull the wire through the die decreases and consequently longer bearing portions can be used. It will be understood, however, that a bearing portion is not necessary in a wire drawing die but by providing such a bearing portion the life of the die is prolonged and the die will draw wire on size until the bearing portion is finally worn away by the continuous wearing action of the wire on the side walls of the bearing portion.

It will be understood that the actual reduction of the wire W is performed along the dimensions of the tapered portion 4 and that when the wire reaches the bearing portion 5, it is already on size. It is to be noted that in the die of the present invention, as shown in Figure 1, that the length E, or the length that the wire W contacts the side walls of the tapered portion 4 is over twice that as shown in Figure 2 which is a conventional wire drawing die. This is due, of course, to the size of the entrance angle A of Figure 1 which is smaller than that of Figure 2. As hereinbefore stated, it is necessary to provide a die having a relatively small entrance angle for drawing galvanized or similarly coated wire in order to prevent stripping of the zinc or coating from the wire. In the die of my invention as shown in Figure 1 it will be seen that this small entrance angle prevents this stripping action due to the fact that the tapered portion of the die applies a gradual reduction to the coated wire due to the relatively long contact at E while that of the die in Figure 2 is relatively short. The action of the die as illustrated in Figure 1 is a squeezing or gradual wedging action due to the fact that the forces of reduction as applied by the side walls of the tapered portion are substantially perpendicular to the axis of the wire while the forces as applied by the tapered portion as shown in Figure 2 of the conventional die are disposed at an acute angle relative to the surface of the wire. The reducing action as provided by the die as shown in Figure 2 is too abrupt and concentrated in too short a distance E in order to successfully reduce galvanized or coated wire thereby.

In the present invention, it has also been found that as the tensile strength of the wire W adapted to be drawn increases, the size of the entrance angle A of the die must be reduced. In other words, the size of the entrance angle A varies

inversely as the tensile strength of the wire varies. For example, if high carbon, i. e. high tensile strength, galvanized wire is to be drawn, the entrance angle A should be between $3\frac{1}{2}$ and 6 degrees and if low carbon, i. e. low tensile strength, wire is to be drawn, the entrance angle should be between 6 and 10 degrees.

It will be understood that the die of the present invention is adaptable for use for drawing steel wire having a metallic coating which is softer than the base metal as well as galvanized or zinc coated wire. It will also be understood that the teachings of the present invention may be applied not only to dies for drawing round wire but may be practiced in dies for drawing square, hexagonal, and other shaped wire.

As a result of my invention, it will be seen that there is provided a die wherein galvanized or similarly coated wires may be drawn to size without removing the coating therefrom or in any way disturbing the coating which was not possible with dies heretofore used in the wire industry.

While I have shown and described one specific embodiment of my invention, it will be understood that this embodiment is merely for the purpose of illustration and description and that various other forms may be devised within the scope of my invention, as defined in the appended claims.

I claim:

1. A wire drawing die for reducing wire having a metallic coating thereon consisting of a die member having a hole arranged therethrough through which the wire is adapted to be drawn to reduce the same, said hole having a tapered portion arranged on the entrance side thereof which terminates in a main bearing portion having substantially parallel side walls a predetermined length with the side walls of said tapered portion having an angle with each other of approximately from $3\frac{1}{2}$ to 10 degrees, the length of said bearing portion varying directly as the angle of the side walls of the tapered portion varies.

2. A wire drawing die for reducing wire having a metallic coating thereon consisting of a die member having a hole arranged therethrough through which the wire is adapted to be drawn to reduce the same, said hole having a tapered portion arranged on the entrance side thereof which terminates in a main bearing portion having substantially parallel side walls a predetermined length with the side walls of said tapered portion having an angle with each other of approximately from $3\frac{1}{2}$ to 10 degrees, the length of said bearing portion being approximately from 10 to 50 percent of the diameter of the wire after it has been drawn through the die.

3. A wire drawing die for reducing wire having a metallic coating thereon consisting of a die member having a hole arranged therethrough through which the wire is adapted to be drawn to reduce the same, said hole having a tapered portion arranged on the entrance side thereof which terminates in a main bearing portion having substantially parallel side walls a predetermined length, with the side walls of said tapered portion having an angle with each other of approximately from $3\frac{1}{2}$ to 10 degrees, the length of said bearing portion being approximately from 10 to 50 percent of the diameter of the wire after it has been drawn through the die with the length of said bearing portion varying directly as the angle of the tapered portion varies.

4. A wire drawing die for reducing wire hav-

ing a metallic coating thereon consisting of a die member having a hole arranged therethrough through which the wire is adapted to be drawn to reduce the same, said hole having a tapered portion arranged on the entrance side thereof which terminates in a main bearing portion having substantially parallel side walls of a predetermined length with the side walls of said tapered portion having an angle with each other of approximately from $3\frac{1}{2}$ to 10 degrees, the angle of the side walls of said tapered portion varying inversely as the tensile strength of the wire adapted to be drawn varies.

5. A wire drawing die for reducing wire having a metallic coating thereon as defined in claim 4 wherein the length of the main bearing portion is approximately from 10 to 50 percent

of the diameter of the wire after it has been drawn through the die.

6. A wire drawing die for reducing wire having a metallic coating thereon as defined in claim 4 wherein the length of the bearing portion varies directly as the angle of the side walls of the tapered portion varies.

7. A wire drawing die for reducing wire having a metallic coating thereon as defined in claim 4 wherein the length of the main bearing portion is approximately from 10 to 50 percent of the diameter of the wire after it has been drawn and the length of the bearing portion varies directly as the angle of the side walls of the tapered portion varies.

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