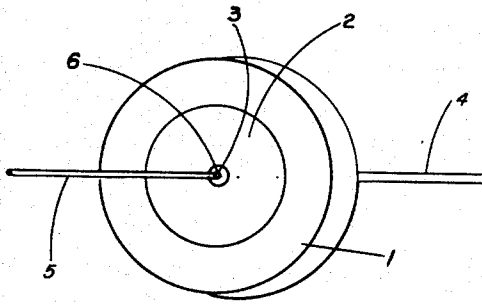


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METHOD OF MANUFACTURING DIAMOND DIES INCORPORATED  
IN SHROUDS AND MOUNTED IN SETTINGS  
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## METHOD OF MANUFACTURING DIAMOND DIES INCORPORATED IN SHROUDS AND MOUNTED IN SETTINGS

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1 Claim. (Cl. 205—21)

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This invention relates to diamond dies incorporated in metal shrouds and mounted in metal settings. The shroud and the setting in which the diamond together with the shroud is mounted are known to be of great importance in enabling a diamond die, to be used for wire drawing, the metal shroud being understood to mean the metal which partly shrouds the drilled diamond and grips it, and the metal setting being understood to mean the metal in which the diamond die provided with a metal shroud is mounted. If the diamond die is shrouded with cast iron admixed with 3% silicon, so-called stove cast iron, and is then set in stainless steel, for example 18/8 nichromium steel, a diamond die is obtained in which the diamond is held most securely. However, it has been found that nevertheless in the case of certain types of wire the shroud may become inefficient and the diamond may become detached from the shroud and the setting.

An elaborate investigation has established that the stove cast iron may be corroded due to the formation of an electro-chemically active element between the metals from which the shroud and the setting of the drawing diamond are built up and the drawn wire in the drawing liquid preferably used for this purpose. Such an element may also be formed when, for example, copper particles from the drawing liquid deposit on the metals of the shroud and the setting.

According to one aspect of the invention a method of drawing metal wires through a diamond die using a drawing emulsion the die being provided with a metal shroud and mounted in a metal setting, is characterized in that the wire is drawn through a die shrouded and mounted in metal such that the electrochemical potential of these metals in relation to the metal to be drawn, measured in the drawing emulsion, is insufficient to give rise to loosening of the diamond in the shroud due to corrosion. A further aspect of the invention is the production of diamond dies for use in this method.

According to one embodiment of the invention for drawing copper wire, use is made of a diamond die in which the diamond is shrouded by cast iron containing nickel in a percentage between 10 and 35% and is mounted in a setting of 18/8 nichromium steel. Such forms of

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cast iron have an expansion coefficient which is only little different from that of stove cast iron, so that a firm grip on the drawing diamond is safeguarded, and in addition this particular cast iron is sufficiently fluid at non-excessive casting temperatures, so that the diamond is not corroded. This cast iron rich in nickel is preferably admixed with phosphorus to a content of about 2%, with the result that the permitted thinness fluidity at the melting point is further increased and the melting point is further lowered. According to the composition of the cast iron rich in nickel and the pH-value of the drawing liquid the potential difference in relation to copper and 18/8 nichromium steel is in the order of from 10 to 50 millivolts negative, but it may also be ensured that the potential difference in relation to copper and 18/8 nichromium steel is positive. In these circumstances the copper may corrode, but seeing the very small time of the copper wire in the corroding medium this is not regarded as very important. As an example cast iron rich in nickel for use in the method according to the invention may be mentioned.

Other objects and advantages of the invention will be apparent from the following description of the accompanying diagrammatic drawing in which the single figure is a perspective view of a diamond die according to the invention.

The die shown in the drawing comprises an annular holder or setting 1 which encloses a matrix or shroud 2 in which is mounted a diamond 3 provided with a bore 6. A wire 4 and 5 of different cross sections is shown being drawn through the die.

### Example I

|    | Per cent  |
|----|-----------|
| Ni | 14.8      |
| Cr | 1.8       |
| Cu | 6.6       |
| Si | 1.96      |
| Mn | 0.53      |
| P  | 1.67      |
| C  | 2.68      |
| Fe | Remainder |

In the temperature range from 0 to 600° C. this cast iron has an expansion coefficient of on an average  $18 \times 10^{-6}$  and in a drawing emulsion having a pH-value 9.09 it has in relation to copper

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a potential difference of -9 millivolts and in relation to 18/8 nichromium steel a potential of -35 millivolts.

In a drawing emulsion having a pH-value of 9.74 these values are +1 and -3 millivolts respectively.

#### Example II

Composition of the cast iron:

|          | Per cent  |
|----------|-----------|
| Ni ----- | 19.2      |
| Cr ----- | 2.3       |
| Cu ----- | 0         |
| Si ----- | 2.04      |
| Mn ----- | 0.43      |
| P -----  | 1.6       |
| C -----  | 2.75      |
| Fe ----- | Remainder |

In a temperature range from 0 to 600° C. this cast iron has an expansion coefficient of  $12.6 \times 10^{-6}$  on an average and in a drawing emulsion having a pH-value 9.09 it has in relation to copper a potential difference of -57 millivolts and in relation to 18/8 nichromium steel a potential difference of -83 millivolts. In a drawing emulsion having a pH value 9.74 these values are -7 and -19 millivolts respectively.

#### Example III

Composition of the cast iron:

|          | Per cent  |
|----------|-----------|
| Ni ----- | 29.3      |
| Cr ----- | 2.3       |
| Cu ----- | 0         |
| Si ----- | 1.79      |
| Mn ----- | 0.44      |
| P -----  | 1.62      |
| C -----  | 2.55      |
| Fe ----- | Remainder |

In a temperature range from 0 to 600° C. this cast iron has a coefficient of expansion of

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$15.8 \times 10^{-6}$  on an average and in a drawing emulsion having a value of pH 9.09 has in relation to copper a potential difference of -15 millivolts and in relation to stainless steel of -8 millivolts and in a drawing emulsion having a pH-value of 9.74 these values are +34 and +21 millivolts respectively.

A diamond die provided with a shroud of cast iron rich in nickel according to any of the above-mentioned examples and mounted in a setting of 18/8 nichromium steel does not become inefficient and the diamond does not become detached when copper wire is drawn in a drawing emulsion having a pH-value of 9.09 or 9.74 respectively.

What we claim is:

In the drawing of copper wire in the presence of a drawing emulsion of a pH value of 9.09 to 9.74 by the use of a diamond die shrouded in cast iron set in a mounting of 18-8 nichromium steel, the method of preventing die corrosion comprising the addition of nickel to the cast iron and relating the per cent of nickel, in the range of 10-35% to the pH value of the emulsion so that the resultant electro-chemical reaction between the component die parts and the copper wire in the pressure of the emulsion shall not exceed 100 millivolts.

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