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METHOD OF HARD SURFACING METAL BODIES

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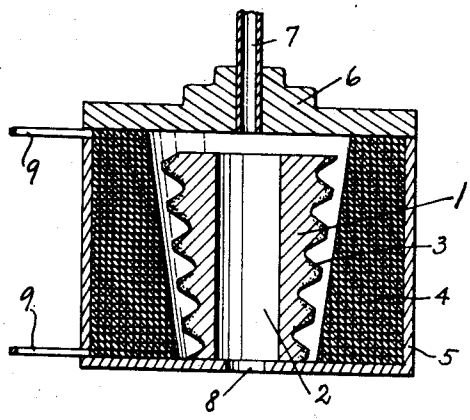

Fig. 1.

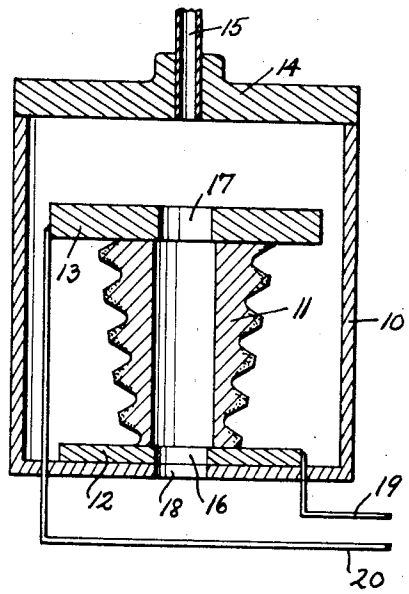

Fig. 2.

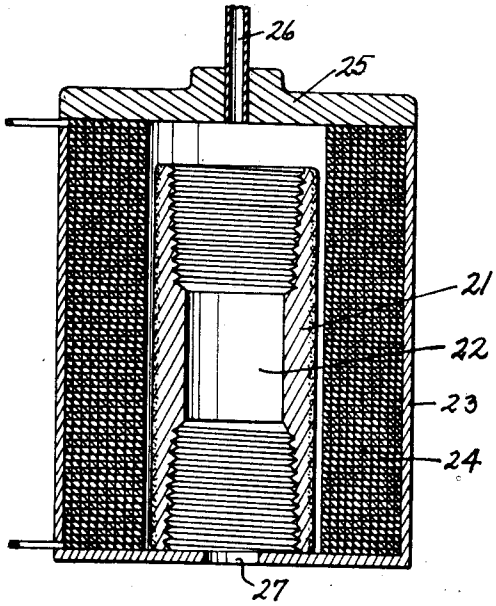

Fig. 3.

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METHOD OF HARD SURFACING METAL BODIES

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2 Claims. (Cl. 219—10)

This invention relates to the hard surfacing of metal bodies. The general object of this invention is to provide a method whereby metal bodies may be cheaply, rapidly and uniformly hard surfaced and to remove from the hard surfacing of metal bodies the usual personal factor.

Other objects and advantages of this invention will become apparent from the following description taken in connection with the accompanying drawing.

In the drawing:

Fig. 1 is a longitudinal cross section through an apparatus and a metal body showing these parts in position for the hard surfacing of the metal body in accordance with this invention.

Fig. 2 is a similar view illustrating a modification.

Fig. 3 is a view similar to Figs. 1 and 2 but showing the hard surfacing of a different form of metal body.

Referring to the drawing, the numeral 1 in Fig. 1 indicates a metal body which in this instance is in the form of a toothed cutter for use on drill bits or the like. It will be understood that this invention is not limited to employment with toothed cutters but may be employed in connection with any metal body on which hard surfacing is required.

In the present instance the metal body is hollow having an opening 2 therethrough and on its outer surface has teeth 3. It is necessary in the case of such a cutter that the teeth be provided with customary hard surfaces and such surfaces have been in the past provided by the embedding of particles of some hard material, such as tungsten carbide, into the metal of the teeth themselves.

Surrounding the cutter just referred to is an electric induction coil 4 which may be carried within a housing 5 or the like. A cover 6 is provided for this housing having a connection 7 through which air or some other material may be blown for a purpose presently to be described. The bottom of the housing is also provided with an opening 8 so that such air or the like may escape therethrough. The induction coil is provided with leads 9 by which it may be connected to a source of high frequency electric current.

It will be noted that the inner conformation of the induction coil is such as to substantially conform both in size and shape to the outer contour of the cutter or other body, which is to be treated.

In the practice of this invention, the metal body 1 is coated first with the hard surfacing material preferably carried in a binder such as resin or some agent which will promote the wetting of the particles of hard surfacing material by the metal of the body being treated when such metal is fused.

After the hard surfacing material has thus been applied to the surface of the body to be treated, it is placed in position within the induction coil, as shown in Fig. 1, and a source of high frequency alternating current is connected to the leads 9. The induction coil 4 then acts in the well known manner as the primary coil of a transformer and induces an electric current of the same frequency in the metal of the body 1.

The high frequency current referred to is of such a frequency that the skin effect as this current passes through the metal body will cause the current to be concentrated in the surface portions of the body. These portions will thus be heated rapidly to a very high temperature and the surface portions only of the body will be fused, whereupon the metal of the body will wet the particles of tungsten carbide or other hard surfacing material so that such particles will bed themselves into the surface of the body. As soon as this takes place the supply of current will be shut off and the body allowed to cool or the body may be quenched. The resulting body will have its surface layer impregnated with the particles of tungsten carbide or other hard surfacing material and the same will have been accomplished without the personal factor ordinarily present in any other manner of hard surfacing such metal bodies.

During the heating of the metal body it may be found desirable to blow air or some similar substance through the body by some suitable means, such as the connection 7. This would positively retard any tendency for the center portion of the body to become unduly heated.

The frequency of the electric current supply necessarily employed may vary over wide limits and these are not susceptible of being exactly defined. However, in most cases frequencies from 300 cycles per second upwardly may be employed and a frequency in the neighborhood of 25,000 cycles per second should prove eminently satisfactory.

In the modified form illustrated in Fig. 2, the induction coil is omitted and instead the housing 10 encloses the cutter 11, which is previously coated in the same manner as above noted and which is then placed in the housing 10 with an electrode 12 in contact with one end and an

electrode 13 in contact with the other end of the cutter. It is noted that the housing 10 has a cover 14 with an inlet 15 for air or the like in the same manner as illustrated in Fig. 1. It is also noted that the electrodes 12 and 13 have openings 16 and 17 therethrough and that the bottom of the housing 10 has an opening 18 therethrough so that the air or the like may pass through the center of the cutter while it is being heated.

In this instance the high frequency electric current, as previously referred to, is connected directly to the electrodes 12 and 13 by means of the leads 19 and 20 respectively so that the high frequency current may be passed directly to the body being heated instead of being induced therein as is the case in Fig. 1.

Except as noted, the method carried out in accordance with Fig. 2 is the same as that described in connection with Fig. 1.

In Fig. 3 there is shown a device that is identical in every substantial particular with that shown in Fig. 1 except that the interior of the induction coil is formed to receive a cylindrical member such as a tool joint 21 or the like which is to be provided with a hard outer surface. This body likewise has an opening 22 therethrough so that air or the like may be blown through the body while it is being heated.

The housing 23, the induction coil 24, the cover 25, the air inlet 26, and the opening 27 in the lower portion of the housing are in substance the same as those disclosed in Fig. 1 except that they are of a conformation such as to receive the object which it is desired to treat.

Having described my invention, I claim:

1. A method of embedding particles of tungsten carbide in the surface of a softer metal body comprising coating the outer surface of said body with particles of tungsten carbide carried in a binder having the property of facilitating wetting of the tungsten carbide particles with the metal of said body when fused, passing an electric current through said coated body at a frequency sufficiently high to produce a skin effect, thereby causing the major portion of the current to be concentrated in the outer coated surface of said body, continuing the passage of the high frequency electric current through said body until the surface of the body which has been coated, and substantially that surface only, but not the tungsten carbide, is fused and the fused metal has wetted the solid particles of tungsten carbide to embed said particles in the surface of the body, whereby said fused body metal constitutes the sole anchoring means for said particles and then immediately stopping the flow of current to permit cooling and hardening of the fused surface.

2. A method of embedding particles of tungsten carbide in the outer surface of a softer metal body of substantially circular section having a bore extending axially therethrough comprising coating the outer surface of said body with particles of tungsten carbide carried in a binder having the property of facilitating wetting of the particles of tungsten carbide with the metal of said body when fused, passing an electric current through said coated body at a frequency sufficiently high to produce a skin effect, thereby causing the major portion of the current to be concentrated in the surface of said body, passing a cooling medium through the bore in said body to cool the inner portion thereof, continuing the passage of the high frequency electric current through said body until the outer surface of the body which has been coated, but not the tungsten carbide, is fused and the fused metal has wetted the solid particles of tungsten carbide to embed said particles in the surface of the body, and then immediately stopping the flow of current to permit cooling and hardening of the fused surface.

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