Sept. 21, 1948. J. A. TANSLEY 2,449,917

SURFACE TREATMENT OF METAL

Filed March 19, 1945

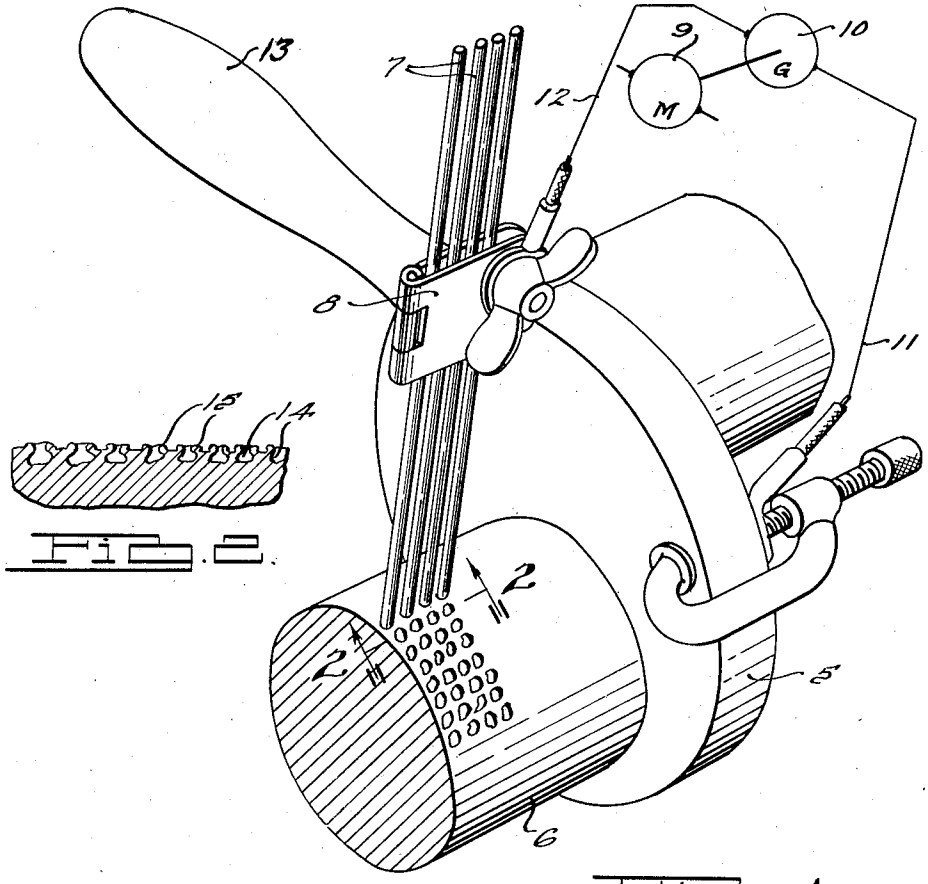


Fig. 1.

Fig. 2.

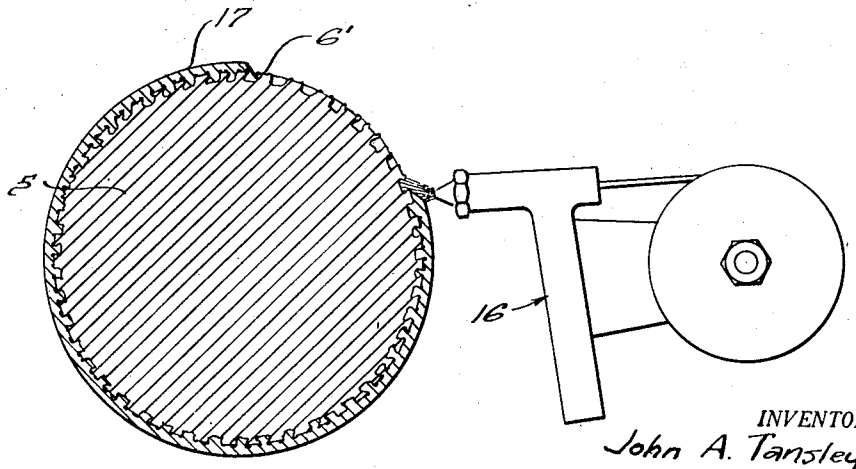


Fig. 3.

INVENTOR.
John A. Tansley
BY Harness & Harris
ATTORNEYS.

Patented Sept. 21, 1948

2,449,917

UNITED STATES PATENT OFFICE

2,449,917

SURFACE TREATMENT OF METAL

John A. Tansley, New Castle, Ind., assignor to Chrysler Corporation, Highland Park, Mich., a corporation of Delaware

Application March 19, 1945, Serial No. 583,481

4 Claims. (Cl. 219—15)

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This invention relates to improvements in the preparation of a metallic surface for receiving a coating of metal or other material.

The operating life of machine parts such as shafts and the like can be extended by the formation or rebuilding of bearings or like working surfaces of the parts. In this operation a layer or coating of metal is applied to such surfaces by spraying, for example, in the well known manner, and it is essential that such coating be fixedly adhered or secured in place. For this purpose the surface to be coated is roughened preparatory to receiving the coating.

An object of this invention is the provision of an improved method for roughening a surface preparatory to application of a coating thereto, and more particularly to create a surface having the desired characteristics for this purpose without the necessity for the application of a similar or dissimilar metal to such surface. Preferably in carrying out the foregoing, portions of the metallic surface are relatively displaced to create a surface pattern including a multiplicity of pits and projections characterized by shapes and sizes to effectively interlock with the coating and hence provide a high degree of fixation for the latter. Such pits are of a magnitude sufficient to receive portions of the coating therein and are characterized by restricted entrant necks, and a typical projection varies in size from a minimum adjacent the base to a maximum outwardly therefrom.

In accordance with the invention a piece of work having a surface to be roughened and an infusible electrode are positioned in an electrical circuit with a source of electrical energy and then alternately relatively moved into and out of such proximity as to respectively create and break an electric arc therebetween. Successive selected areas of the surface are thus treated under conditions of current flow in the circuit sufficient to displace portions of the metal at the surface incident to creating and breaking the arc between the work and the electrode. In this operation a highly concentrated heat is applied to relatively small successive areas of the surface which in effect fuses the metal at these areas, producing pits and displacing the metal in the form of projections adjacent the pits. The electrode being infusible, there is no deposition of the metal or other material on the surface and the latter retains its original metallic characteristic.

In practice no specialized equipment is necessary inasmuch as a suitable electrode, for example carbon, may be attached to a holder connected to

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conventional arc welding equipment, and a series of arcs made with successive areas of the surface to be treated.

Preferably, a relatively small pencil-like infusible electrode is employed to work over the metallic surface to create the electric arc. However, the size of the electrode may vary depending somewhat on the size of the pit desired.

For a typical embodiment of the invention, reference is made to the accompanying drawing, in which:

Fig. 1 is a view in perspective illustrating application of the invention to a bearing surface of a crankshaft.

Fig. 2 is an enlarged fragmentary sectional view illustrating the bearing surface after roughening thereof.

Fig. 3 is a view, partly in section, showing the application of a coating to the surface shown in Fig. 2.

Referring to Fig. 1, a crank shaft 5 has a bearing surface 6 which is to be resurfaced by a metallizing coating, this surface having been reduced by grinding or machining to allow for the proper thickness of the coating. The crankshaft may be supported in any suitable manner for operation on the surface 6 thereof by the mechanism including one or more carbon electrodes 7, as desired, supported in a holder 8 connected to electric arc welding equipment. The latter includes an electrically driven motor 9, driving a generator 10 having a first conductor 11 connected to the crankshaft 5 and a second conductor 12 connected to the holder 8. The holder 8 is provided with a handle 13 by which the electrodes 7 are moved relative to the surface 6 to be operated on. If desired, the work to be operated on may be suitably moved to bring successive areas thereof into registration with the electrodes. In operation the electrodes are alternately moved into and out of such proximity to the surface 6 as to alternately create and break an electric arc therebetween, the electrodes being moved about the surface to subject succesive areas thereof to the arc. The metal of the surface is subjected to relatively high temperature fusing the same and causing displacement thereof as the arc is alternately made and broken. Displacement of the metal produces a pit as shown at 14, the pit being characterized by a dimension which is smaller adjacent the surface than at the bottom or base of the pit, thus in effect producing a restricted entrant neck or opening. The pits so produced are of a magnitude sufficient to receive therein the material of the coating. The metal

displaced in producing the pits is deposited on the surface in the form of projections, as shown at 15, of various shapes and sizes. In most instances the metal displaced moves to the surface in the form of a globular-like body and hence the projections 15 are mostly round and have a neck, somewhat smaller than the main body thereof, attached to the surface.

The depth of the pits and the height of the projections are controlled by the amount of voltage, the length of the arc produced and the physical characteristics of the metal. For operation on ferrous metals a current of 30 to 40 volts and 150 amperes is satisfactory. If desired, the surface may be treated by alternately making and breaking contact with the electrode although the latter method is not believed to be as satisfactory in all respects as that had by the creation of an arc as aforesaid.

The surface 6' so operated on has a pattern including pits characterized by restricted neck entrants and projections of a type which facilitate interlocking engagement with the resurface coating. In this roughening of the surface no similar or dissimilar metal is added thereto and but little if any of the metallic surface is lost.

In Fig. 3 there is shown a metal spray gun apparatus, generally designated by the numeral 16, for applying a coating 17 to the reconditioned surface 6'. Apparatus of this type is well known and in general metal is fed to a heating zone from which the metal is propelled in molten or heat plastic condition against the surface to be sprayed. The sprayed metal interlocks with the pits and projections of the roughened surface to fixedly secure the coating in position.

The method is equally applicable for conditioning the surface of either hard or soft metals for the application thereto of a coating of metal or such other material as may be desired.

Although but one specific embodiment of the invention has herein been shown and described, it will be understood that various changes in the size, shape and arrangement of parts may be made without departing from the spirit of the invention.

I claim:

1. The method of preparing a surface of a metallic article for receiving a layer of metal to be fixed thereto which comprises positioning said article and a carbon electrode in electric circuit with a source of electric energy, relatively moving said article and electrode alternately from one spaced relationship to another spaced relationship to respectively create and break an electrical arc therebetween, and subjecting successive selected areas of said surface to the arc so created under conditions of current flow sufficient to fuse the metal at said selected areas and to displace at least a portion of such fused metal into projecting relationship from other areas of said surface adjacent said selected areas.

2. The method of preparing a surface of a metallic article for receiving a layer of metal to be fixed thereto which comprises alternately creating and breaking an electrical arc between selected areas of the surface of said article and an infusible electrode having an intensity sufficient to fuse the metal at said selected areas and to displace at least a portion of such fused metal into projecting relationship from other areas of said surface adjacent said selected areas.

3. The method of roughening a metallic surface to facilitate interlocking of a coating therewith, which comprises the steps of relatively moving said surface and an electrically charged infusible electrode as to alternately make and break an electrical arc therebetween having an intensity sufficient to fuse the metal at said surface and to displace such fused metal from one portion of said surface into projecting relationship from another portion of said surface adjacent the first portion, and so further relatively moving said surface and electrode as to successively subject selected portions of said surface to the arc so made to thereby create from the metal at said surface a pattern including pits at said one portion and projections at said adjacent portions.

4. The method of preparing a surface of a metallic article for receiving a layer of metal to be fixed thereto which comprises arranging said surface and an infusible electrode in electric circuit with a source of electric energy capable of creating an arc therebetween having an intensity sufficient to fuse the metal at selected portions of said surface and to displace at least some of such fused metal to an adjacent portion of said surface, and alternately making and breaking such arc.

JOHN A. TANSLEY.

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