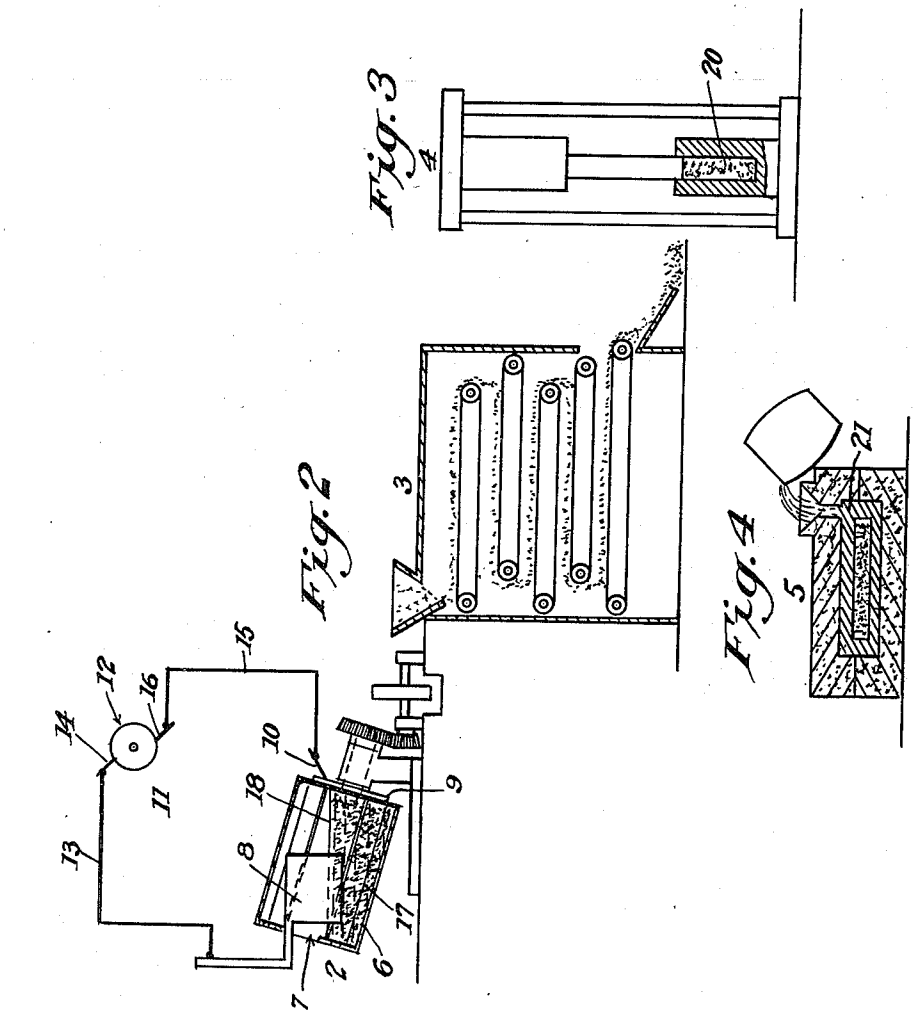
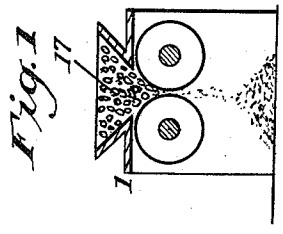
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PROCESS OF FORMING METALLIC CARBIDES AND STEEL INTO FINISHED SHAPES

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PROCESS OF FORMING METALLIC CARBIDES AND STEEL INTO FINISHED SHAPES

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2 Claims. (Cl. 29—148)

This invention relates to a process of combining metals, and more particularly to a process of combining metallic carbides for forming products with hard surfaces, such as cutting tools.

Heretofore the combining of carbides has been done by taking fine powered carbides and mixing them with powdered cobalt metals, and then pressing the mixture together under high pressure.

In combining carbides it is important that each particle of the materials to be combined be coated entirely and evenly, but this is not possible to do by mixing the carbides with the softer materials, no matter how carefully the mixing may be done. Another difficulty in mixing the carbides with the softer materials is that the coating materials are subject to oxidation when ground fine, so that such a coating would prevent the making of a bond and therefore would not be so ductile as if each particle were completely coated with pure metal. Furthermore it is impossible by mixing the carbides to coat the same with several layers of pure metals.

The general object of my invention is to provide a process of coating the particles of different carbides completely and evenly with pure metal, and combining the coated particles of said carbides together in a strong bond.

Another object is to provide a process of the character stated by which the particles of the different carbides are coated with pure metal by electro metallurgy.

Another object is to provide a process of the character stated by which the particles of the carbides may be coated with several layers of pure metals, for example with copper, nickel and chrome, or with silver, copper and chrome, in any suitable order, each coating being in the form of a thin separate layer, but upon being heated become plastic and may be partially or entirely combined under pressure.

By my process different combinations of carbides can be made, for example, tungsten carbide can be coated with copper, or a molybdenum carbide can be coated with copper and the two mixed together in different ratios according to the class of work desired, or should the material be required to be softer powdered iron or powdered steel may be coated with a softer or more ductile metal and mixed in proportions desired.

Other objects and advantages of my invention will appear hereinafter.

Fig. 1 is a diagrammatic view of the grinder for grinding the carbides in the use of my process.

Fig. 2 is a diagrammatic view of the plating machine and drier for plating and drying the carbides in the use of my process.

Fig. 3 is an elevation, partly in section, of the press for pressing the dried carbide into briquettes in the use of my process.

Fig. 4 is a vertical section of the mold in which the briquettes are placed and metal cast around the same, in the use of my process.

In practicing my process I may employ an apparatus, such as illustrated in the annexed drawing, which forms a part of this specification, and in which drawing the figures are a diagrammatic longitudinal section of said apparatus.

Referring more particularly to the drawing the apparatus illustrated therein includes a grinder 1, a plating machine 2, a drier 3, a press 4 and a mold 5.

The plating machine 2 may include an inclined rotary drum 6, provided with an opening 7 in its higher end, an electrode 8 extending into said drum through said opening 7, a collector ring 9 on the lower end of said drum, a brush 10 wiping said collecter ring, and an electric circuit 11 including a direct current generator 12, a lead 13 extending from the positive pole 14 of said generator to said electrode 8, and a lead 15 extending from said brush 10 to the negative pole 16 of said generator. The electrode 8 is made of the metal with which the particles of the carbides are to be coated for combining the carbides in the manner hereinafter more fully described.

I practice my process by the apparatus above described as follows:

The carbides 17 are first ground in the grinder 1 into particles of suitable size. The ground carbides are then introduced into the drum 6 of the plating machine 2, through the opening 7 in the higher end of said drum. A suitable quantity of a liquid electrolyte 18 is then introduced through the opening 7 into the drum 6 so that said electrolyte covers the carbide 17 and the level of the electrolyte 18 rests above the level of the carbide, with the electrode 8 depending into said electrolyte. The drum 6 is then rotated and an electric current is passed through the electrolyte 18 by means of the generator 12 and its circuit 11 in which circuit is included said electrolyte, the current passing from said generator through lead 13, electrode 8, electrolyte 18, drum 6, collector ring 10 and lead 15 back to said generator, whereupon that portion of the electrode 8 depending into said electrolyte 18 is decomposed into the electrolyte and is applied to the surfaces of the particles of the carbide as the electrolyte and carbide are agitated by the rotation of the

drum 6, thus coating or electroplating the surfaces of the particles of carbide completely and evenly. The coated carbide is then removed from the drum 6 and placed in the drier 3 where the coating is dried and hardened on the particles of the carbide. The dried carbide is then removed from the drier 3 and placed in the press 4, which presses said carbide into briquettes 20. The briquettes 20 are then removed from the press 4 and placed in the mold 5 in which a suitable metal 21, such as steel or iron, is cast around the briquettes, and the product is further treated as hereinafter more fully described.

This process applies to the metallic carbides of chrome, manganese, tungsten, molybdenum, vanadium or iron and titanium or a combination of these metals such as, for instance, a combined tungsten, molybdenum and vanadium.

These carbides being very hard are exceedingly brittle; therefore in this process they are broken up into a very fine powder, 100 mesh or finer.

It is now necessary to combine these carbides together by the use of ductile metals which in many cases may be the pure metal of the same carbide. For instance, while tungsten and chrome carbides are very hard the pure metals are very tough. Therefore, by this process I coat each small particle with pure metal or a combination of metals.

By my process, I may coat the above mentioned carbides with silver, chrome, nickel, copper, cobalt, manganese, molybdenum, tungsten iron or other metals. It being necessary that these metals are tough requires over 1000 degrees Fahr. to melt them and are subject to being deposited by electro-metallurgy.

Or for certain uses, I may coat them with a combination of the above. For example, I might first coat the particle with copper, then silver, then nickel and then chrome according to the desired materials I wish to obtain.

After completely coating each little particle separately, I may carry on the process until the electro-deposition combines the particles. After this is done, the material may be dipped into or combined with a de-oxidizing flux, such as sodium, phosphate, borax or aluminum, or sodium nitrate or a combination thereof.

The material is now pressed into different shapes as desired for working cold. After being pressed into shape, these pieces may be subjected to further electro-deposition so that the porous material will be filled up with pure ductile metals.

These pressed shapes or forms can now be inserted into casting molds and the steel or iron holders are cast around them.

These pieces are now subjected to the following process: They are heated in a furnace to a heat according to their requirements but which will be from 1000 to 2500 degrees Fahrenheit and they are immediately put into a die press which will form them into the finished shapes.

The procedure of pressing them in a hydraulic press preferably after being heated to the desired temperature is to compress the carbides with their ductile coating into a solid mass at the same time to combine them with the steel around them which is used as a holder.

I do not confine the process to putting the inserts into a mold and casting the material around them and afterwards pressing them into shape. This could be done by inserting them into a steel form and then subjecting them to the heat and pressing them into shape. Or, a still further quantity of powdered material, which is very ductile, and is coated similarly as the coating of the carbides may be pressed around the insert and then the total amount heated and formed under the same procedure.

I claim:

1. The process which consists of grinding carbides into particles of suitable size, rotating the said ground particles and simultaneously electroplating the particles of carbide completely and evenly, then drying the electroplated particles, combining the carbides with a deoxidizing flux, then pressing said carbides into a suitable shape, then electroplating to fill up the porous material with pure ductile metals, casting steel around the coated pressed shape, and finally heating and pressing the cast blank into finished shape.

2. The process which consists of grinding carbides into particles of suitable size, rotating the said ground particles and simultaneously electroplating the particles of carbide completely and evenly, then drying the electroplated particles, combining the carbides with a deoxidizing flux, then pressing said carbides into a suitable shape, then electroplating to fill up the porous material with pure ductile metals, casting steel around the coated pressed shape, and finally heating the product from 1,000 to 2,500 degrees F. and pressing the cast blank into finished shape.

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