Patented July 24, 1951

2,561,709

UNITED STATES PATENT OFFICE

2,561,709

DIAMOND-SET TOOL

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No Drawing. Application October 25, 1946, Serial No. 705,793. In Sweden November 16, 1945

2 Claims. (Cl. 51—309)

1

The present invention relates to the manufacture of diamond-set tools, that is to say, tools the cutting edges of which contain diamonds or diamond grains or powder, held in place by means of a preferably metallic binding agent. The methods hitherto known for manufacturing such tools suffer from drawbacks in the one respect or the other.

The object of this invention is to provide a simple and inexpensive method of manufacturing such tools or cutting edges therefor. The product obtained as a result of this method is characterized by a high degree of efficiency and a good utilization of the diamond material.

According to a feature of the invention diamond-set tools or cutting edges therefor are produced from a metallic material mixed with the diamond grains or powder which is caused by sintering and compacting or compressing operations to keep said grains or powder in place.

According to another feature of the invention said metallic material comprises 30–60% of cobalt, 8–28% of tin and the remainder copper, the various elements being allowed to contain normal impurities.

Diamond-set tools manufactured in this way have proved superior in many respects to diamond-set tools manufactured according to hitherto practised methods. The invention is especially applicable to the manufacture of grinding discs but may also be applied to advantage to the manufacture of boring heads and other tools.

The carrying out of the improved method may be varied in many ways. Common to all species is the use as raw material of diamond grains or powder and a metallic powder of the composition above stated. Said ingredients are mixed together, and the mixture obtained is compressed or compacted and sintered. The compression may be carried out in hot or cold state and the sintering operation may be effected simultaneously with or subsequent to the compression. The mixing together of the metallic powder or powders and the diamond powder may be effected in different order. Thus, for instance, according to a preferred form of the improved method cobalt, tin and copper may be pulverized separately and the powders obtained mixed in correct proportions together with an appropriate quantity of diamond powder. According to another form of the improved method the metals copper and tin or cobalt and tin may be first alloyed with each other and the resulting brittle copper-tin alloy or cobalt-tin alloy, as the case may be, pulverized and then the powders obtained mixed together in correct proportions with an appropriate amount of diamond powder.

2

As an alternative, the method may comprise first alloying the metals copper and tin or cobalt and tin, pulverizing the resulting brittle copper-tin alloy or cobalt-tin alloy, and mixing the alloy powder obtained with powdered cobalt or powdered copper in appropriate proportions while adding diamond powder thereto.

Finally, the three metals may be first all alloyed, the alloy pulverized, and the alloy powder obtained mixed with diamond powder.

It is evident that the amount of diamond powder contained in the resulting powdered mass may vary according to the kind of tool to be produced.

The alloy ingredients may be varied within the limits stated, that is 30–60% cobalt, 8–28% of tin and the remainder copper, it being noted that each metal may contain a normal degree of impurities. By changing the proportions of the various metals incoporated the properties of the tool (or cutting edge) may be varied.

In the finished tool the cobalt acts primarily to keep the diamond particles in place, due probably to the fact that cobalt appears to "wet" the surface of the diamond particles. The combination of the bronze (i. e. the copper-tin alloy) with cobalt yields a very pronounced hardness and also a high degree of toughness of the metallic material, in which the diamond grains are embedded. By varying the proportions between cobalt and the bronze it is possible to vary in any degree desired the toughness and the hardness of the metallic material. The larger is the contents of cobalt thereof, the more tough and the more soft will be the metallic structure within the limits stated. Within these limits it also possible to vary the hardness of the metallic material by varying the percentage of copper and tin. The higher is the percentage of tin, the harder will be the metallic structure.

The bronze is comparatively fusible allowing a complete sintering by compressing or compacting the alloy at a rather low temperature. As an example it may be mentioned that a first rate metallic structure may be obtained by compressing or compacting the mixture of diamond and metallic powders under a pressure amounting to 2 ton/cm.^{2} at a temperature of 700–750° C. When ½ ton/cm.^{2} only is used in effecting the compression the sintering temperature should be raised up to 775–800° C.

What I claim is.

1. An abrasive article comprising diamond ma-

terial and a sintered metallic bond therefor consisting of between 30 and 60% of cobalt, between 8 and 28% of tin and the remainder copper.

2. An abrasive article comprising diamond powder and a metallic bond therefor consisting of a sintered powdered mass consisting of between 30 and 60% of cobalt, between 8 and 28% of tin and the remainder copper.

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