Patented Oct. 27, 1936

2,059,041

UNITED STATES PATENT OFFICE

2,059,041

HARD ALLOYS

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No Drawing. Application April 13, 1931, Serial No. 529,898. In Germany July 8, 1930

3 Claims. (Cl. 75—136)

This invention relates to hard metallic alloys for implements and tools.

It has been known for a long time that elementary boron has a hardness approaching that of diamond. It has, therefore, often been attempted to use boron as a material for tools and implements of all kinds in which great hardness is required. However pure boron when it has been melted, but especially in the sintered condition, is so brittle that hitherto it has not been possible to make use of it in practice. People have, therefore, confined themselves to using boron only as a material to be added to other metals and metal alloys for increasing the hardness.

The invention rests upon the discovery that the great brittleness of boron can be avoided while its hardness is maintained practically unaltered if one or more metals or metal alloys, the melting point of which lies above 1000° C., are added to the boron as additional materials, that is to say the boron remains the foundation material proper. Those metals which easily enter into compounds with boron, such for example as titanium, zirconium, vanadium, chromium, tungsten, manganese, cobalt and iron, have proved particularly suitable as additions.

The shaping of the parts or tools made from the new alloy can be effected by casting the alloy as a liquid into a mould or by pressing and sintering a pulverulent starting mixture, in some cases by hot pressing. The melting or sintering or hot pressing is preferably effected in a neutral atmosphere, for example in argon or hydrogen or even in vacuum. For the production of particularly dense products it has been found to be advantageous to deprive the powder mixture of gases as completely as possible by thorough heating in a vacuum furnace.

In order that the invention may be clearly understood and readily carried into effect, one method of making an alloy in accordance therewith will now be described by way of example.

Pure boron of as fine a grain as possible is intimately mixed with about 15% of zirconium, also in powder form, and heated in vacuum at about 1350° C. until gases are no longer given off. The mixture is then pressed in a press mould to a body of the desired dimensions and is finally preliminarily sintered in vacuum at about 1800° C. As a result the pressed body acquires such a strength and density that it can be worked and brought to the desired final shape. It is then finally sintered at about 2100° C., also in vacuum. During the preliminary sintering and final sintering it is preferable that the gases set free by the heating should be continuously drawn off. If the stated conditions are adhered to the finished product is dense and combines the high hardness of boron with a strength and toughness sufficient for practical use.

What I claim and desire to secure by Letters Patent is:—

1. A hard metallic alloy composed of about 15% of zirconium and about 85% of boron.

2. A hard metallic alloy composed of about 15% of one or more metals selected from the group consisting of titanium, zirconium, vanadium, chromium, tungsten, manganese, cobalt, and iron; the remainder boron.

3. A hard metallic alloy composed of about 15% of an element selected from the group consisting of titanium and zirconium, and about 85% of boron.

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