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KARL SCHRÖTER, OF BERLIN-LICHTENBERG, GERMANY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO GENERAL ELECTRIC COMPANY, OF SCHENECTADY, NEW YORK, A CORPORATION OF NEW YORK

METHOD OF MAKING TOOLS FROM HARD-METAL ALLOYS PRODUCED BY SINTERING

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This invention relates to tools consisting of hard metal alloys produced by sintering and has for its object to simplify and improve the manufacture of such tools.

As a matter of fact, in most cases one does not succeed in bringing such tools into the desired final shape by pressing and sintering alone. Reducing operations, such as filing, grinding, or the like, are usually necessary, this being difficult owing to the hardness of the tools and entailing besides a wear of the working tools whereby the costs of manufacture are very much increased.

In order to obtain the final shape of the tool more easily, the invention provides the following method.

At first, there are made by the application of pressure from a mixture of hard metal carbide powders having a melting point above 2000° C., such as tungsten carbide, and softer powders, such as cobalt, nickel or iron, solid bodies of a shape corresponding approximately to the desired final shape of said tools. These solid bodies are then submitted to a preliminary sintering at a temperature of about 700 to 1100 degrees C. which depends on the contents of softer additional metal powders. With an addition of 5 per cent of cobalt to a tungsten monocarbide, it has for instance proved to be advantageous to maintain the temperature at about 900 degrees C. during the preliminary sintering. The preliminarily sintered bodies are thereupon brought into a shape corresponding as much as possible to the desired final shape of said tools by working them with reducing tools such as files, emery stones or the like. It is possible to carry out this treatment without any considerable difficulties since the bodies possess only a low strength in the said preliminarily sintered condition. In succession to this treatment, the bodies have imparted to them the highest possible hardness by sintering at higher temperatures. This sintering at a high temperature likewise governs itself by the contents of softer additional metals. It lies as a rule between 1300 and 1600 degrees C., preferably at about 1400 degrees C. In case it is not possible to give the bodies the desired final shape already by the treatment carried out between the two heating stages, there is still executed after the sintering at high temperature a finishing treatment designed to remove from the bodies any small projections, burrs or the like still existing on them.

Claims:

1. The method of making tools from hard metal alloys which consists in forming solid bodies from a mixture of very hard metal carbide powders having a melting point above 2000° C. and soft metal powders by the application of pressure, sintering these solid bodies at a temperature from 700 to 1100 degrees C., bringing them into a shape approximating the desired final shape of said tools by working them with reducing tools, and thereupon subjecting them to a sintering at a temperature higher than 1100 degrees C.

2. The method of making tools from hard metal alloys which consists in forming solid bodies from a mixture of very hard metal carbide powders having a melting point above 2000° C. and soft metal powders by the application of pressure, sintering these solid bodies at a temperature from 700 to 1100 degrees C., bringing them into a shape approximating the desired final shape of said tools by working them with reducing tools, sintering them at a temperature higher than 1100 degrees C., and thereupon subjecting them to a finishing treatment for smoothing them.

3. The method of making tools from hard metal alloys which consists in forming solid bodies from a mixture of very hard metal carbide powders having a melting point above 2000° C. and soft metal powders by the application of pressure, sintering these solid bodies at a temperature of about 900 degrees C., bringing them into a shape approximating the desired final shape of said tools by working them with reducing tools and thereupon subjecting them to a sintering at a temperature higher than 1100 degrees C.

4. The method of making tools from hard metal alloys which consists in forming solid bodies from a mixture of tungsten carbide powder and softer metal powders by the application of pressure, sintering these solid bodies at a temperature from 700 to 1100 degrees C., bringing them into a shape approxi-

mating the desired final shape of said tools by working them with redueing tools, and thereupon subjecting them to a sintering at a temperature higher than 1100 degrees C.

5. The method of making tools from hard metal alloys which consists in forming solid bodies from a mixture of tungsten carbide powder and cobalt powder by the application of pressure, sintering these solid bodies at a temperature of 900 degrees C., bringing them into a shape approximating the desired final shape of said tools by working them with reducing tools, and thereupon subjecting them to a sintering at a temperature higher than 1100 degrees C.

6. The method of making tools from hard metal alloys which consists in forming solid bodies from a mixture of tungsten carbide powder and powders of one or more metals of the iron group, by the application of pressure, sintering these solid bodies at a temperature from 700 to 1100 degrees C., bringing them into a shape approximating the desired final shape of said tools by working them with reducing tools, and thereupon subjecting them to a sintering at a temperature higher than 1100 degrees C.

The foregoing specification signed at Berlin, Germany, this second day of July, 1926.

KARL SCHRÖTER.