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SINTERED HARD METAL ALLOY

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1 Claim. (Cl. 75—136)

Our invention has for its object a sintered hard metal alloy for tools and working implements.

The practical use of hard metal has developed in such a manner that for machining materials giving short chips, such as grey cast iron, alloys of a composition are used which differs from that of alloys used for machining materials giving long chips, in particular steel. In the first case, that is, for machining grey cast iron, in general alloys are made use of which contain tungsten carbide and metals of lower melting point, such as cobalt, nickel or iron. Sometimes further small additions of chromium, molybdenum and tungsten are recommended for these alloys. The hard alloys intended for machining material giving long chips, in particular steel, contain besides tungsten carbide in the most cases a further hard carbide such as titanium carbide, tantalum carbide or zirconium carbide. The favorable effect of this second hard carbide added to the tungsten carbide consists in that it reduces the cratering action exerted by the tough running-off chip on the face of the hard metal cutting tip of the tool. In practice titanium carbide has been found to be the most advantageous carbide to be added to the tungsten carbide.

Now these alloys containing titanium carbide can be used, it is true, in themselves also for machining materials, giving short chips such as grey cast iron, the running times obtained with these alloys in machining grey cast iron differing but slightly from those of alloys not containing titanium carbide. The alloys containing titanium carbide, however, are somewhat more brittle than the latter so that in this respect they are inferior to them. Therefore, when the hard metal tips in machining grey cast iron are stressed to a comparatively great extent as to their toughness, as, for example, in turning work pieces provided with grooves, hard metals containing titanium carbide exhibit notably shorter running times than those not containing titanium carbide.

For this reason one and the same hard alloy could not be used hitherto with the same good economical effect both for machining steel and grey cast iron, although it would be very advantageous from the standpoint of shop practice to use only one kind of hard alloy for both these purposes. Furthermore, the experiment of increasing the toughness of tungsten carbide alloys containing titanium carbide by increasing the percentage of auxiliary metal such as iron, cobalt or nickel, had no practical success, because the resistance to wear of the alloy is diminished thereby to an undesirable extent.

We have now found that it is possible to obtain a higher toughness of the alloys referred to without any reduction of their resistance to wear. This object is achieved according to our invention by adding to a sintered hard alloy consisting in known manner of a mixture of tungsten carbide, from 5 to 20% titanium carbide, and from 6 to 12% of an auxiliary metal of lower melting point such as iron, nickel or cobalt, further from 0.5 to 2% vanadium carbide and from 0.5 to 2% molybdenum carbide.

In the following are given the compositions of three alloys the first of which is a usual alloy which does not contain titanium carbide and is suited for machining grey cast iron, whilst the second is an alloy which contains titanium carbide and is intended for machining steel, the toughness of this alloy being adapted to that of the first-named alloy by a higher cobalt proportion. The third alloy, finally, has a composition according to our present invention.

	Alloy 1	Alloy 2	Alloy 3
Tungsten carbide	94	81	78.5
Titanium carbide		10	10
Cobalt	6	9	9
Molybdenum carbide			2
Vanadium carbide			0.
Blunting	0.3 mm.	0.4 mm.	0.2 mm.

The values of the wear occurring in the use of these three compared alloys have been measured as blunting on the free face of a turning tool in machining grey cast iron of a Brinell hardness of 200. The cutting speed amounted to 120 m. per minute, the feed was 0.31 mm. per revolution, and the depth of cut was 2.5 mm. As will be seen, the blunting of our new alloy, viz., alloy 3, is even lower than that of the alloy 1 the composition of which hitherto has been considered as particularly advantageous for machining grey cast iron.

As a consequence of its resistance to the cratering effect of the running off chips, which resistance is caused by the titanium carbide content, our new alloy in machining steel is equivalent to the alloy 2 and is far superior to alloy 1. In machining steel, the increased toughness of our new alloy even permits great feeds, for example of 2 mm. per revolution, great depths of cut, such as for example 40 mm., and, besides, comparatively low cutting speeds.

What we claim and desire to secure by Letters Patent is—

A sintered hard metal alloy for tools and working implements, consisting of a mixture of tungsten carbide, from 5 to 20% titanium carbide, from 6 to 12% of an auxiliary metal of lower melting point such as iron, nickel, cobalt, from 0.5 to 2% vanadium carbide, and from 0.5 to 2% molybdenum carbide.

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CERTIFICATE OF CORRECTION.

Patent No. 2,169,090. August 8, 1939.

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It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Second column, line 24, in the table, for "0." read 0.5; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 26th day of September, A. D. 1939.

Henry Van Arsdale,
Acting Commissioner of Patents.

(Seal)