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METHOD FOR ATTACHING HARD ALLOYS

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This invention relates to a method and composition for attaching hard metal carbide alloys to supporting metallic bases and also to the combined articles thereby produced.

More particularly, this invention is directed to a method and composition for attaching titanium carbide alloys to the shanks of tools and the like or other supports to provide combined articles where the high wear resisting and cutting qualities of the titanium carbide alloy is taken advantage of.

Hard metallic carbides have been known for some time and their advantageous properties as cutting tips, wear resisting surfaces and the like, put to useful commercial practice. In my copending application Serial Number 202,035, filed April 14, 1938, for Improvements in hard alloys, I have described a new process for producing titanium carbide alloys and new alloys produced by such process. Other titanium carbide alloys have been proposed but in all cases these titanium carbide alloys have presented a very difficult problem in attempts heretofore made to attach these carbide alloys to supporting metals. One of the principal uses of these alloys is as tips for cutting tools and such tools are constructed by attaching the hard alloy tip to what is termed a "shank" usually constructed of iron or steel which may be fastened on a lathe, milling cutter and the like. Unless the alloy can be attached to a base metal it must be used in large pieces and is generally difficult to handle for cutting.

Where the alloy is employed for wear resisting surfaces, electric contact points, and the like, it must be attached to a suitable base.

Heretofore, no satisfactory method was available for attaching high titanium carbide alloys to the supporting metal bases. A number of methods and compositions heretofore found useful for attaching tungsten carbide alloys were tried but none of these could be used with the high titanium carbide alloy which was free from tungsten.

The titanium carbide alloy described in my above identified application comprises a major portion (40% to 98%) of titanium carbide, chromium and an auxiliary metal such as nickel, cobalt or iron. The chromium and the auxiliary metal are present in substantially equal amounts and make up the remainder of the composition subject, of course, to various modifications as described in my copending application. Other titanium carbide alloys have been proposed having somewhat similar original compositions. As is understood, titanium carbide has a very high

percentage of carbon compared with other metal carbides such as tungsten carbide.

I have found that titanium carbide alloys and particularly those described in my application which contain chromium and an auxiliary metal may be attached or brazed to a metal shank, by employing as a brazing alloy a composition of copper, chromium and the same auxiliary metal as is used in the titanium carbide alloy. For example, a titanium carbide alloy comprising 75% titanium carbide, approximately 17 parts of nickel and 8 parts of chromium can be attached to a shank with a powdered braze which is an alloy formed by melting together a composition comprising 50% copper, 25% chromium and 25% nickel. The percentage of copper in the braze alloy can be substantially increased or slightly decreased and may vary from as low as 40% copper to as much as 90% but preferably is within the range of about 50% to 80%. The remainder of the brazing composition is preferably about equal parts of chromium and the particular auxiliary metal of the titanium carbide alloy, such as nickel in the present instance. Within the proportions of copper given there would be from five to thirty percent of chromium and from five to thirty percent of nickel. The relative proportions of the chromium and the auxiliary metal may be varied as desired provided an effective amount of both is retained. Increasing the proportion of copper lowers the temperature of brazing but when too high weakens the joint. The brazing alloy is formed by melting the metallic constituents together and may be cast in very thin sheets for use or in large bars which latter are broken down into a powder. Other methods of forming small particles of the alloy are, of course, possible.

Where the titanium carbide alloy comprises iron or cobalt as the auxiliary metal, the braze alloy must include the same auxiliary metal to provide a satisfactory attachment of the metal carbide to the shank.

As an illustration:

To attach a tip to a tool shank, the shank is first machined to provide a recess of suitable dimensions for receiving the tip and is then cleaned to remove all foreign material and particularly grease or oil. A suitable flux of the type commonly used for brazing as for example "Handy" flux or other flux for cleaning metallic surfaces such as those having a fluoride or borax base is put on the shank at all portions with which contact will be made with the tip. Similarly, the metal carbide alloy tip is coated with

the flux particularly on the surfaces which will contact with the shank. The brazing alloy, if powdered, may be sprinkled on the flux on either the shank or the tip or both. If in the form of a thin sheet, the brazing alloy may be laid on the recessed surfaces of the shank. The tip is then placed in proper position on the shank and conveniently may be held in this position by encircling the shank and the tip with a copper wire although this is usually not essential.

When the shank and tip have been properly prepared and fixed in relative position, they are both heated, conveniently, by placing them within an induction furnace to heat them to a temperature sufficient to melt the brazing alloy. When this temperature is attained the tool is removed from the furnace and pressure applied to hold the tip in position on the shank while the brazing alloy cools and "welds" the two members together. Final shaping and sizing is attained by grinding. When properly brazed the hard alloy and base become unitary. The bond is permanent and withstands grinding or other finishing operations, as well as forces applied in normal use.

It will be evident that many variations in the process and composition are possible within the scope of this invention. For example, instead of heating the shank and tip in an induction furnace, they may be brought to proper temperature to melt the brazing alloy by using an acetylene or other gas torch, preferably with a neutral or reducing flame. Instead of an induction furnace an electric resistance furnace might be employed. It is also possible to secure the adhesion of the prepared pieces by the equivalent of electric welding which produces sufficient heat to melt the brazing alloy.

After the tip and shank have been cooled while under pressure to hold them together, further cooling should preferably be accomplished very slowly as by covering or immersing it in powdered graphite, lime or the like as is well known to produce slow cooling and avoid surface oxidation.

The invention is not, of course, limited to forming tools but can be used in any case where the titanium carbide alloys are to be attached to supporting metals usually having an iron base. The underlying principles of the invention involving the inclusion in the brazing alloy of the auxiliary metals of the hard metal alloy are applicable to other than titanium carbide alloys. For example, hard metal alloys comprising carbides, silicides, tellurides, and borides of tungsten, tantalum or metals of the fourth, fifth and sixth groups of the periodic table or mixtures of these, together with the auxiliary metals of such hard metal alloys may be brazed to a base metal by incorporating the auxiliary metal or metals in the brazing alloy.

What is claimed is:

1. The process for attaching a titanium carbide alloy containing an auxiliary metal to a metallic base which comprises fluxing the contact surfaces, interposing a brazing alloy comprising between forty and ninety percent of copper, with five to thirty percent of chromium and five to thirty percent of the auxiliary metal, melting the brazing alloy and maintaining the titanium carbide alloy in position on the base until the brazing alloy is solidified.

2. The method for attaching a titanium carbide alloy comprising titanium carbide, chromium and an auxiliary metal to a metallic base which comprises fluxing the contacting surfaces, interposing a layer of a brazing alloy comprising between forty and ninety percent of copper, five to thirty percent of chromium and five to thirty percent of the same auxiliary metal as is in the titanium carbide alloy, heating to melt the brazing alloy and cooling the base and titanium carbide alloy while they are retained in position.

3. The method for attaching a titanium carbide alloy comprising titanium carbide, chromium and nickel to an iron base which comprises fluxing the contacting surfaces, interposing a layer of a brazing alloy comprising between forty and ninety percent of copper, with five to thirty percent of chromium and five to thirty percent of nickel, heating to melt the brazing alloy and cooling the base and titanium carbide alloy while they are retained in position.

4. An alloy for brazing a metal carbide alloy containing an auxiliary metal to a metallic base comprising from 40% to 90% copper and the remainder chromium and the auxiliary metal of the metal carbide in substantially equal amounts.

5. An alloy for brazing a metal carbide alloy containing an auxiliary metal to a metallic base comprising from 50% to 80% copper and the remainder ten to twenty-five percent of chromium and ten to twenty-five percent of the auxiliary metal of the metal carbide.

6. An alloy for brazing a titanium carbide alloy containing an auxiliary metal to an iron base comprising from 50% to 80% copper and the remainder chromium and the auxiliary metal of the metal carbide in substantially equal amounts.

7. An alloy for brazing a hard metal alloy containing titanium carbide, chromium and nickel which comprises 50% to 80% copper, and the remainder substantially equal amounts of chromium and nickel.

8. An article of manufacture comprising a hard metal alloy of titanium carbide and an auxiliary metal brazed to a supporting metallic base with a brazing alloy containing between forty and ninety percent of copper with five to thirty percent of the same auxiliary metal and the remainder chromium.

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