United States Patent Office 2,789,073 Patented Apr. 16, 1957

2,789,073

METHOD OF HEAT TREATMENT OF CARBIDE TIPS FOR TOOLS TO INCREASE THEIR WORKING LIFE

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No Drawing. Application August 24, 1953, Serial No. 376,259

5 Claims. (Cl. 148—13)

This invention relates to heat treatment of carbide tips for tools to increase their working life.

It is common practice in sintering carbide tips to use extremely high temperatures. Notwithstanding this fact, I have discovered that by special subsequent heat treatment at temperatures in excess of 2350° F., followed by quenching in oil or the like, life of a carbide tip can be increased from two to ten times without making any change whatever in the hardness of the tip. My method is equally applicable to soft, medium and hard carbide tips. It is equally applicable to tungsten carbide, tantalum carbide and titanium carbide tips. These are commonly made by sintering the finely divided carbides with cobalt.

My preferred treatment is as follows:

I first pre-heat the carbide tip or tips in a furnace which is in operation at about 1500° F. The work is allowed to stay in the pre-heat until its temperature is uniformly that at which the furnace operates. Depending on the temperature of the furnace and the weight of the work, the time may be from one minute to ten minutes or thereabouts.

The work is then transferred to a high temperature electric furnace which is in operation at a temperature in excess of 2350° F. and desirably between 2350° F. and 2500° F. Again the work is allowed to remain in the high heat furnace until it is uniformly heated to the temperature at which that furnace is set. Depending on the mass of the work, this will ordinarily take from one minute to about ten minutes.

The work is then withdrawn and quenched. I prefer to use quenching oil of a type which is able to withstand high temperature without being destroyed thereby. The tips remain in the oil until cooled approximately to the temperature of the ambient air. The oil does not heat appreciably because, in practice, I use quite a large tank of the quenching oil.

There is rarely much evidence of scale formation, but there may be some. If the work has a rough finish, I may sandblast it to remove any scale. If the work is already highly finished, I may subject it to a vapor blast, comprising extremely fine abrasive in suspension in water or other carrier liquid. This removes any scale without destroying the finish or dimension of the carbide tip.

While the temperature of the pre-heat is not critical, I find that no substantial increase in tip life results from the heating unless the work is finally raised to a temperature of at least about 2350° F. The preferred temperature is 2380° F., or over. I have not experimented to determine whether there is a top limit, but I have successfully used temperatures of 2400° F. to 2500° F. I believe the practical top limit is in excess of 2500° F.

When raised to any temperature below an approximate heat of 2350° F., the tip seems to be substantially unchanged. However, when the work is treated at a temperature in excess of 2350° F., the working life of the tip is prolonged from two to ten times as compared with

otherwise identical tips without this treatment. The results have nothing whatever to do with the temperature to which the tip may have been raised during sintering. Even when tips have been subjected during sintering to temperatures as high as those here used, or even higher, the tip does not have the life of the tip of the present invention, in which the heat treatment is subsequent to the cooling which follows sintering. Large users of carbide tips for whom I have heat treated tips on a demonstration basis have confirmed the tremendously increased life of the treated tips, but their metallurgists have been unable to detect any change in overall hardness or in microscopic structure. Therefore, the reason for the greatly increased life is, as yet, unknown.

Socalled soft tips remain soft notwithstanding my heat treatment and hard tips remain hard. Metallurgists have been unable to detect the slightest change other than the greatly increased effective life of the tip. In the respect that no change in overall hardness results from heat treatment in accordance with this invention, the method herein disclosed differs radically from any previously known heat treatment.

I claim:

1. The method of heat treating a carbide tip containing finely divided carbides sintered with cobalt to prolong its working life, which method consists in raising the temperature of a tip otherwise in readiness for use to at least the approximate temperature of 2350° F., holding the tip at said temperature until all portions thereof are substantially uniformly at such temperature and thereafter quenching the tip.

2. A method of heat treating for the prolongation of its effective life a carbide tip containing finely divided carbides sintered with cobalt and which is otherwise substantially complete and in readiness for mounting, which method comprises subjecting the tip to pre-heat, raising the temperature of the tip from its pre-heating temperature to a temperature in excess of about 2350° F. holding the tip at the latter temperature until all portions thereof are substantially uniformly at such temperature and thereafter quenching the tip.

3. A method of heat treating for the prolongation of its effective life, a previously sintered carbide tip containing finely divided carbides sintered with cobalt and otherwise in readiness for mounting, which method comprises subjecting the tip to pre-heat, raising the temperature of the tip from its pre-heating temperature to a temperature between 2350 F. and 2500° F., and subsequently quenching the tip in oil.

4. The method of heat treating a carbide tip containing finely divided carbides sintered with cobalt to prolong its effective life, which method comprises raising the temperature of a carbide tip which is otherwise complete and in readiness for use to a temperature in excess of about 2350° F., reducing the temperature of the tip to a value at which it can be handled, and thereafter blasting the tip to remove any evidence of scale.

5. The method recited in claim 4 in which temperature reduction is effected by immersion in a quenching liquid.

References Cited in the file of this patent

UNITED STATES PATENTS

1,728,909	Schroter	Sept. 17, 1929
2,162,574	Dawihl	June 13, 1939
2,171,391	Boecker	Aug. 29, 1939

OTHER REFERENCES

"Treatise on Powder Metallurgy," vol. 2, by Goetzel, pages 130, 131.