Oct. 6, 1936. L. CASPER 2,056,919

ELECTRICAL CONTACT

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Fig. 1.

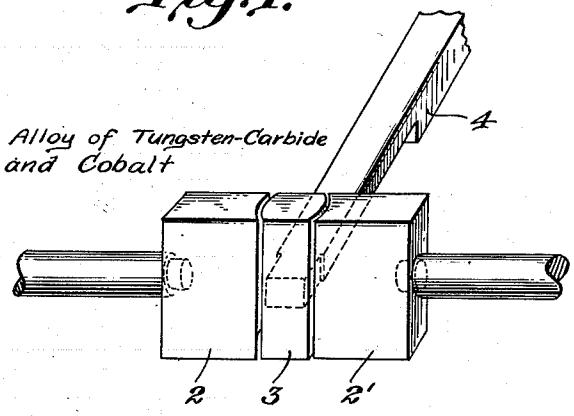
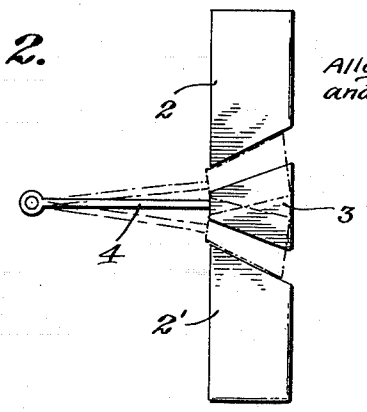


Fig. 2.



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ELECTRICAL CONTACT

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2 Claims. (Cl. 200—166)

This invention relates to electrical contacts particularly adapted for vibratory contacts of high speed instruments such as relays employed in telegraph systems.

For many years platinum and alloys of platinum and iridium were used for the electrical contacts of telegraph relays and transmitters in which steady and unfailing signaling under high speed operation is essential. More recently contacts of tungsten have been employed. Under prolonged use it has been found necessary to give contacts made of any of the aforementioned materials unremitting attention and maintenance involving filing and burnishing of the contact faces. In the case of tungsten, which is a hard tough metal, the pitting and accumulation of oxide makes it necessary to grind the contact points or faces.

The object of my invention is to overcome these difficulties encountered in the use of contacts heretofore employed by providing contact points that require no burnishing, filing, grinding or other redressing over long periods. In fact tests have been made with contacts made in accordance with my invention or discovery which were in continuous service in a high speed polarized relay for more than a year and a half without requiring any attention whatever.

I have found that contact points constructed of an alloy consisting of tungsten carbide, with a carbon content of from 4 to 10 per cent, when sintered with an auxiliary metal having a considerably lower melting point, (a metal of the iron group, iron, cobalt or nickel), possesses properties superior to any contact materials heretofore known. As is known by metallurgists, the effect of the auxiliary metal is to reduce the sintering point of the body to such an extent that it occurs at temperatures which lie in the neighborhood of 1000 degrees below the melting point of the pure carbide. I have found that an alloy of tungsten carbide with cobalt, the latter forming more than 3% but not more than 20% of the total content of the alloy gives results that are entirely satisfactory.

As is known to metallurgists, this alloy is formed by subjecting an admixture of the tungsten carbide and cobalt in powdered form to hydraulic pressure of between 200 and 800 kg. per sq. cm. the resulting molded body being then sintered. The auxiliary metal acts to cement the particles of the carbide, which apparently gives strength and toughness to the finished article.

While this alloy has been used for certain purposes on account of its high degree of hardness, especially in connection with abrading and cutting tools, it has not been known to possess properties which adapt it for the electrical arts.

I have discovered that contact points or electrodes made of an alloy of tungsten carbide and cobalt, such as described above, are particularly free from any oxide deposit such as formed on the contact surfaces of tungsten contacts. Inasmuch as a layer of oxide is practically an insulator the freedom from oxide formation is a decided advantage.

Owing to the very great hardness of the alloy, the wear on the engaging faces of the vibrating contacts is negligible, whereas contacts of platinum-iridium must be burnished at least once in every twenty-four hours and filed at intervals. Likewise contacts of tungsten must be ground with a stone every few days. Again I have found that the homogenous character and granular composition of this alloy tends to reduce the effect of sparking at the contact surfaces to a negligible quantity. Furthermore, due perhaps to the high fusion point of this alloy, I have found that there is no tendency of the contacts to weld or stick together.

These characteristics and properties of an alloy of tungsten carbide and cobalt, which I have discovered, render the alloy peculiarly adapted for use as electrical contacts and superior to any material heretofore employed.

In telegraph transmission especially that of high speed telegraphy in which signals are transmitted at speeds ranging from 40 cycles per second to 100 cycles per second, it is important that continuity of contact be preserved as long as possible between the armature tongue contact 3, such as shown in Figs. 1 and 2, and the side contacts 2 and 2'.

Electrical contacts that have usually obtained in high speed relays or transmitters consisted of iridio-platinum, silver, tungsten or the like. Such contacts are all subject to an oxidizing and fusing effect of a more or less extent at the contacting surfaces of such contacts and often result in undue sparking and even welding may occur soon after moderate periods of operation. Cemented tungsten carbide, however, which as already stated consists of finely divided particles of tungsten carbide and a binder such as cobalt, when subjected to the sintering process incident to the manufacture of said composition, results in a deoxidization of said particles thus eliminating undesirable effects inherent in electric contacts made up of prior art materials other than tungsten carbide.

And, secondly, due to the character of the materials that make up tungsten carbide contacts, the latter are subject to a slight decomposition at the point of contact. The decomposition effect referred to, is due to the momentary high temperature that results from the contacting of such contacts when operating within the range of current values commonly used in telegraphic transmission. The momentary high temperature referred to results in the softening of the binder, such as cobalt. The softening of the binder as stated, releases a small amount of the tungsten carbide particles. The aforesaid particles having a much higher melting point than that of the binder are not affected or changed in any manner, but are merely released. The release of the particles as stated occurs at the time the tongue contact 3 of the telegraph relay or transmitter breaks away from its side contact and such released particles remain in suspension during the period (perhaps .002 sec.) while the tongue contact 3 is in midair or is in a state of "bounce" prior to settling upon the opposite contact or "back stop" which may be the side contact 2' in Figs. 1 and 2. In the event of polar telegraph transmission, the tongue contact 3 will travel toward the contact 2 resulting in a similar process of decomposition of a minute quantity of particles, said quantity being sufficient to form an arc forming and conducting, but nonfusing medium between said tongue contact 2 while said tongue contact is in midair, or has not entirely settled upon the side contact in the direction to which said tongue is travelling.

I claim:

1. A circuit interrupter comprising two contacts consisting of a composition of finely divided tungsten carbide and a binder having a lower melting point than the carbide, one of said contacts being movable relative to the other contact.

2. A circuit interrupter comprising two contacts, one contact being movable relatively to the other contact, said contacts consisting of a composition of finely divided tungsten carbide and a binder of cobalt, whereby the surface temperature of the binder produced by the current at the instant of separation of the contacts permits the release of tungsten carbide particles which increase the conductivity of the gap between the contacts.

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