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by their attorneys

Howson and Howson
Our invention relates to that class of electrical connections which is especially useful in uniting flexible metallic conductors, commonly made of copper strands and known as "pig-tails", to carbon graphite or metal graphite brushes or blocks adapted for use as brushes on commutators of electric motors and generators and the like. However, our invention may be employed in other connections, such for example as for battery electrodes.

The object of our invention is to provide an inexpensive construction which will give a more perfect electrical connection and one which, at the same time is stronger mechanically than those heretofore used.

Two forms of the invention are shown by way of illustration in the accompanying drawings, in which

Figure 1 is a side elevation partly in section showing one form, and

Fig. 2 is a similar view showing another form.

Such a construction is described, illustrated, and claimed in Patent No. 1,485,942 granted to Charles W. Adams on March 4th, 1924. In this patent there is described a construction in which a block of carbon or the like has formed therein a hole of suitable size to receive the end of a "pig-tail" connector. The connector is held in place in this hole by means of a securing material packed or tamped within the hole, or into an auxiliary hole against a part of the connector. The securing material disclosed in Patent No. 1,485,942 is copper which has been cleaned. Specifically the copper is described as hammered copper powder. It is also stated in this patent that some zinc, lead, tin or other metal might be alloyed or otherwise combined with the copper.

We have discovered that a more durable connection of greater mechanical strength and lower electrical resistance can be produced by combining tin or the like with the copper to produce on the copper particles a fused protective and uniting coating of the added metal. We have also discovered that equal results can be attained by the use of chemically disintegrated copper or properly reduced copper oxide, instead of hammered copper.

The mechanical forms of the connections may be such as shown in the Adams patent, comprising in general a block of carbon in which is formed a suitable hole to receive the end of the pig-tail copper conductor, the securing material of powdered copper being tamped in the hole about the end of the inserted pig-tail.

We follow in general the method described in said Adams patent, but instead of using hammered copper powder, we find it possible to use chemically disintegrated copper or a properly reduced copper oxide can be satisfactorily used.

We cleanse this copper powder with sal ammoniac and by heat treatment and we may repulverize and screen it to get a uniform size, preferably 100 mesh as described in the Adams patent.

We now combine with the copper powder so prepared a powder of tin or tin alloy or equivalent low-melting metal, such as lead, but we prefer to use tin. We prefer to mix by means of a ball mill or otherwise, 20 parts of powdered tin with 80 parts by weight of the copper powder. The resulting mixture is packed or tamped into the hole prepared for it in the carbon block to make electrical and mechanical connection of the "pig-tail" with the carbon block.

After the tamping operation the brush is heated to a temperature considerably higher than the melting point of tin, preferably about 570° C., so that while the copper is not fused, the tin is fused in situ. There is thus produced a fused protective and uniting coating of the tin for the particles of copper, and it has been found that the presence of tin with the copper securing material prevents electro-chemical changes and oxidation of the copper powder, which is likely to occur particularly at high operating temperatures. Furthermore, the addition of tin, and the act of baking the brush after the "pig-tail" and securing material are in place produces a connection of greater mechanical strength and lower electrical resistance than those heretofore obtained.
Instead of hammered copper powder, chemically disintegrated copper or properly reduced copper oxide powder may be used with good results, and instead of pure tin powder, alloys of tin and lead, ordinary Babbit metal, or lead or other metals having a low melting point may be used.

In the following claims the term "carbon block" is used in a sufficiently general sense to embrace blocks or brushes of carbon graphite or metal graphite.

We claim:

1. A carbon block having a hole therein, and a metallic electrical conductor in the hole, in combination with a securing and connecting means therefor closely surrounding the conductor in the block, said securing and connecting means consisting of copper powder and a metal of lower melting point fused thereto.

2. A carbon block having a hole therein, and a metallic electrical conductor in the hole, in combination with a securing and connecting means therefor closely surrounding the conductor in the block, said securing and connecting means consisting of copper powder and tin fused thereto.

3. A carbon block having a hole therein, and a metallic electrical conductor in the hole, in combination with a securing and connecting means therefor consisting of 80 per cent of copper powder and 20 per cent of tin fused to the copper closely surrounding the conductor in the block.

4. The herein described method of uniting pig-tails to carbon blocks, consisting in subjecting copper powder to the action of a cleansing agent, mixing tin powder with said copper powder, packing the pig-tail into a hole in the carbon block by means of the mixed powder, and fusing the tin alone in situ.

In testimony whereof we have signed our names to this specification.

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