July 24, 1962 J. MILLET 3,046,425

CARBON BRUSHES

Filed April 21, 1959

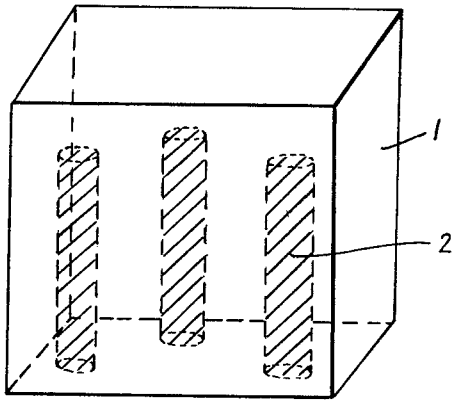

Fig.1.

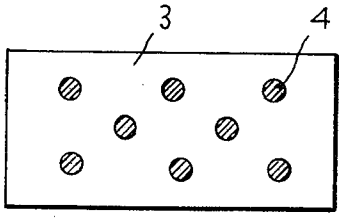

Fig.2.

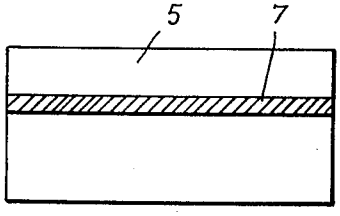

Fig.3

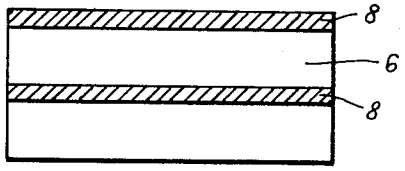

Fig.4

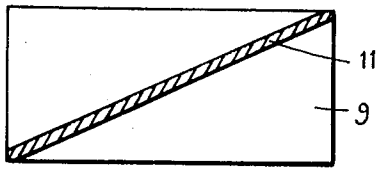

Fig.5

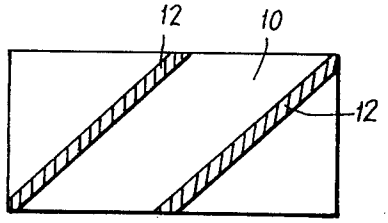

Fig.6.

Inventor
Jacques Millet.
By
Stone & Mack
Attorneys.

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CARBON BRUSHES

Jacques Millet, Paris, France, assignor to Societe le Carbone-Lorraine, Paris, France, a company of France

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The present invention relates to carbon brushes and has for an object improvement therein.

A great number of compounds have already been proposed for brushes intended for use in electrotechnology, functioning in a rarefied and dry atmosphere. In order to improve the life and the behavior of the brushes at a high altitude, mineral or organic substances are generally introduced, these substances being dispersed in their mass or inserted under various forms in the graphite block or which are joined to the latter by various means.

It has already been proposed to incorporate sulphides, having a crystalline form which is very similar to that of graphite, in recesses, channels, grooves, etc. provided in the brushes. The sulphides used are preferably finely powdered molybdenum sulphides which crystallise according to the cubic or hexagonal system.

Brushes containing tin sulphide have proved more satisfactory than those containing molybdenum sulphide because under vacuum they have a more regular contact voltage.

However it has been found that brushes containing tin sulphide distributed as referred to tend to leave on the collector traces of sulphide which becomes deposited along the tracks of the channels.

It is a more specific object of this invention to remedy this drawback, to improve the operation of the brushes under vacuum or in a rarefied atmosphere, and to avoid making scratches on the patina of the collector and to stabilise the contact voltage.

Accordingly, the invention provides a carbon brush for use at high altitudes or in a rarefied atmosphere, characterised by the introduction of a mixture of tin sulphide and a binding agent in channels or other receptacles arranged in said brush.

In the prior proposal referred to above, the sulphide is incorporated whilst maintaining the crystalline form of the sulphide, which will not be modified either by baking or sintering.

According to a first specific embodiment of the present invention, the binding agent may be a highly conductive metal having a low melting point, such as a silver powder for example.

Silver powder has moreover the property that it starts to sinter in the cold. By compressing a powder mixture comprising approximately from 5 to 15% of a silver powder, and of tin sulphide, a relatively solid metallic mass is obtained.

According to a first embodiment, a number of channels, pockets or other receptacles are formed in a block of graphite forming a brush. These receptacles are then filled with a mixture comprising 90% tin sulphide having a given granulation and 10% silver powder which is the binding agent. The mixture is vigorously compressed without sintering the tin sulphide and a brush is obtained, which operates satisfactorily. Brushes made in such a manner have a coefficient of friction of 0.20 and their wear is very much reduced. The wear, measured under vacuum, with a speed of rotation of the brush against a contacting surface of 10 metres per second, is lower than 0.17 mm. per hour. These same brushes show a constant voltage drop on contact, said voltage drop being approximately 0.75 volt. Comparative tests made with brushes which only comprise tin sulphide which is not strengthened by silver powder show under the same conditions a wear of 2.3 mm. per hour.

According to a second embodiment the binding agent consists of a styrene polyester resin.

This resin has in particular the remarkable property of assisting in the formation and maintenance of a patina on the collectors. It lowers the coefficient of friction and considerably improves the switching properties and the resistance to wear of the brushes in a rarefied atmosphere.

According to this second embodiment, a mixture of 90% tin sulphide and 10% resin is introduced in the recesses, grooves, channels or other receptacles provided in the mass of the brushes. The polymerization of the resin may be effected in the presence of a hardening agent such a benzoyl peroxide for example. In this case heat is applied, during polymerisation. It may also be effected in the cold by adding an accelerator such as cobalt naphthenate or methylethyl ketone peroxide. The tin sulphide is mixed with the resin before the latter hardens and then the thus constituted paste is introduced in the receptacle. In situ polymerisation is effected under the above described conditions in the cold or with application of heat.

The voltage drop on contact measured on brushes made according to this second embodiment, as well as the lessening of wear, are of the same order of magnitude as in the case of the brushes manufactured according to the first embodiment.

The various specific embodiments of the invention may be illustrated by way of non-limiting indication by means of the accompanying drawings. All these modifications cause the tin disulphide to sweep the greatest possible width of the track in order to render the patina more homogeneous.

FIGURE 1 shows a graphite brush **1**, in which three deep pits or pockets **2** have been bored. These pits or pockets may be filled either with a mixture of tin sulphide and silver, or with a mixture of tin sulphide and styrene polyester resin. The number of receptacles **2** is not limited. Moreover they may be in alignment or staggered.

FIGURE 2 shows a cross-section of a brush **3** in which three series of receptacles have been made in staggered disposition, filled, as desired, with one or the other mixture.

FIGURES 3 and 4 show cross-sections of brushes **5** and **6** respectively in which the tin sulphide mixture is located in deep slots **7** and **8** respectively, which are parallel to the largest side of the cross-section.

FIGURES 5 and 6 show cross-sections of brushes **9** and **10** respectively in which the tin sulphide mixture is located in slots **11** and **12** respectively made along the diagonal of the cross-section or along oblique and parallel slots.

The introduction of the sulphide-binder mixture may be effected with various qualities of carbons and graphites. The form, the number, the arrangement and the direction of the recesses, grooves, channels or pits and so on filled with the mixtures described in the present invention may vary in accordance with the particular application envisaged.

I claim:

1. A carbon brush for use at high altitudes and under rarefied atmospheres containing at least one receptacle, and a mixture of tin sulphide and a binding agent in said at least one receptacle, said binder not being capable of modifying the structure of the tin sulphide.

2. A carbon brush for use at high altitudes and under rarefied atmospheres containing at least one receptacle, and a mixture of tin sulphide and a styrene polyester resin in said at least one receptacle.

3. A carbon brush for use at high altitudes and under rarefied atmospheres containing at least one receptacle, and a mixture of 90% of tin sulphide and 10% of a binding agent in said at least one receptacle, said binder not being capable of modifying the structure of the tin sulphide.

4. A carbon brush for use at high altitudes and under rarefied atmospheres containing at least one receptacle, and a mixture of 90% of tin sulphide and 10% of a styrene polyester resin in said at least one receptacle.

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