March 4, 1947. J. F. HEUBERGER 2,416,830

IRON-GRAPHITE CONTACT

Filed Nov. 28, 1942

Fig. 1

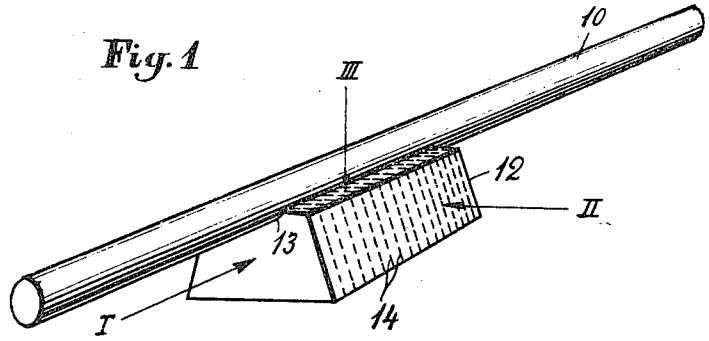


Fig. 2

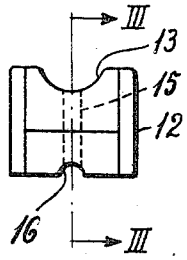


Fig. 3

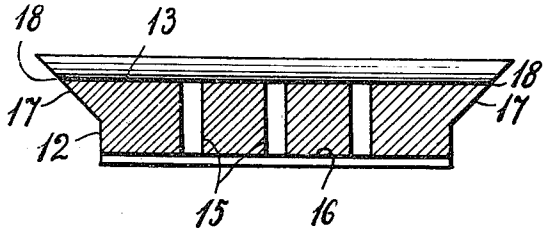
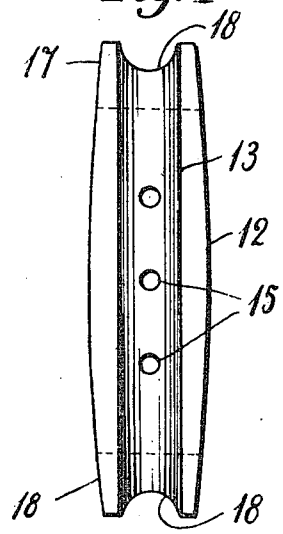


Fig. 4



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IRON-GRAPHITE CONTACT

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1 Claim. (Cl. 191—59.1)

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Hitherto, carbon contacts are commonly used as contact members in sliding contacts, particularly where comparatively large electric currents have to pass through the contact at a high voltage and where in addition the same is subjected to great mechanical stresses, as being the case, for instance, in current collectors for electric vehicles. Such current collectors hitherto have the drawback, among others, that they are apt to wear out rather rapidly.

It is the object of the present invention to improve sliding contacts and similar current-transmitting members and according to the main feature thereof the said members are of a material, which is produced in a metal-ceramic way, said material consisting substantially of mixture of iron powder and graphite powder pressed and sintered in known manner. According to the use of the contact, the proportions of the two principal constituents thereof may vary, so that the graphite is present in from 5 to 50%.

Further objects and advantages of the invention will be apparent from the following description considered in connection with the accompanying drawing, which forms a part of this specification, and of which:

Fig. 1 shows a perspective view of one embodiment of the invention.

Fig. 2 is an end view of a somewhat modified embodiment of the invention.

Fig. 3 is a sectional view on the line III—III of Fig. 2.

Fig. 4 is a plan view of said embodiment.

I have determined that the wearing ability of a sliding contact is dependent on the position of the sliding surface relatively to the direction of the pressure applied in the pressing of the iron and graphite powder mixture. Since the graphite grains are scale-shaped and possess good sliding properties, they will orient themselves during the pressing operation in such manner that the planes of the scales are at right angles to the direction of the pressure. The greatest wearing strength in the sliding contact will be obtained if the planes of the scales are at right angles to the sliding surface of the contact. This is shown in Fig. 1, in which 10 designates a live conducting wire and 12 a current collector or sliding contact in accordance with the invention. The contact 12 is provided with a groove 13 for guiding the conducting wire, and the contact moves parallel to said wire. The contact 12 is in known manner held with a certain pressure against the wire 10, which pressure is particularly concentrated to the inner (lower) portions of the wall of the

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groove. The sliding contact will attain its best wearing strength if, in the pressing operation of the powder mixture, it is pressed in the direction of the arrow I, that is to say parallel or substantially parallel to the longitudinal direction of the wire 10. The graphite scales are then caused to orient themselves in planes perpendicular to the sliding surface 13, as is indicated by the dash lines 14 in the drawing. Even if the sliding contact has been manufactured by pressing in the direction of the arrow II, the graphite scales are tilted up relatively to the sliding surface or relatively to that portion of the sliding surface, which is subjected to the most severe wear.

On the other hand, it is less advantageous to manufacture the sliding contact by pressing the powder mixture in the direction of the arrow III, inasmuch as the graphite scales will then lie substantially parallel to the sliding surface. According to an important feature of the invention, the pressing direction in the manufacture of the sliding contact has thus been selected in a manner such that the scale-shaped constituents thereof are set up on their edges relatively to the sliding surface.

By reason of the iron component the sliding contacts according to the invention possess great wearing strength, and on account of the graphite component they possess good sliding properties. Another advantage of these sliding contacts is the high specific weight as compared with the above-mentioned carbon contacts. By reason of its greater inertia the sliding contact according to the invention will behave more quietly in operation, especially at joints in the conducting wire or at other irregularities in the surface, on which the contact is sliding.

Carbon contacts, particularly those for current collectors of electric locomotives, are frequently moulded into a special frame on the contact loop. In effecting this moulding it easily happens that the carbon contact is cracked on account of the thermic stresses and/or by reason of the mechanical stresses in cooling. The contacts according to the invention do not involve any difficulties in this respect, and they may even be secured in their frames by welding or other thermic or mechanical attaching methods. This largely depends on the fact that an iron-graphite contact leads off the heat far better than does a carbon contact.

In the manufacture of sintered bodies from iron powder the sintering operation, which as a rule takes place at temperatures of about 1,000–1,200 degrees centigrade, must be carried out in a re-

ducing atmosphere, in order to remove such oxides apt to prevent the sintering process, which are always found on the surface of iron powder, and in order to prevent oxidation during the sintering procedure. No special measures in this respect need be taken in connection with sintered bodies according to the present invention, inasmuch as the graphite in the powder mixture has itself a reducing effect at the sintering temperature.

A further advantage of the invention resides in the fact that the hardness and thus the elasticity of the material may be varied to a greater extent than in a carbon contact, which is due not only to the composition of the material but also to the pressing pressure employed in the manufacture of the powder body, which pressure may amount to a value between 2 tons per square centimetre (preferably at a high percentage of graphite) and 8 tons per square centimetre (at a low percentage of graphite).

Even at the higher of said pressures, a more or less porous body will be obtained. The porous sliding contact thus manufactured may therefore be easily impregnated with means, which are useful for the proper functioning of the contact. A sliding contact, which is to be used in the open air and is thus subjected to atmospheric influences may be impregnated, for instance, with a water-repellent oil. The iron of the sliding contact is thus protected against rusting, and the contact surface is kept bright, the voltage drop in the contact surface being thus kept low. To this end, the oil may be admixed with reducing agents or other substances having a negative catalytic effect (protective effect) in the roasting process (such as hydroquinone). An impregnating oil may also be selected for the purpose of reducing the friction of the sliding contact.

To attain certain special properties, the powder mixture may contain, in addition to iron and graphite, small quantities of other metallic or non-metallic constituents, such as copper powder, nickel powder, colloidal carbon, and so forth; the first-mentioned substances may then form alloys with the iron, while the colloidal carbon mentioned as an example increases the reducing effect of the graphite. The metallic admixtures must not constitute more than about 10% of the percentage of iron, and as a rule the non-metallic substances must not constitute more than 10% of the percentage of graphite.

In the embodiment according to Figs. 2–4 the sliding contact 12 has bores 15 extending from the bottom of the groove 13 right through the body of the contact at right angles or at an inclination to said groove. The bores 15 open in a longitudinal groove 16 at the lower side of the contact body. The bores 15 serve to drain the groove 13 in case there is rain water on the wire 10, which is being collected on the lower side of the same. This avoids decrease in transmission of current or formation of electric arcs resulting in steam being produced between the contact body and the wire.

The contact body 12 is intended to be inserted in a holder, which may be of any well-known construction (not shown). The longitudinal groove 16 ensures that water flowing down through the channels 15 can find its way between such holder and the contact body.

The sliding contact 12 may instead of the bores 15 or in addition thereto be provided at one or both ends with portions 17 forming a kind of snow plough having sharp edges 18 against the groove 13 in order to remove from the wire 10 any ice or frost deposited thereon. Such ice or frost is in this way prevented from entering between the wire and the contact, which may cause great wear of the contact body or even cause interruptions of the function of the whole device.

While two more or less specific embodiments of the invention have been shown, it is to be understood that these are for purpose of illustration only, and that the invention is not to be limited thereby, but its scope is to be determined by the appended claim.

What I claim is:

A sliding contact comprising substantially a pressed mixture of powdered metal and graphite, the graphite being in the form of scales so oriented that the scales lie in planes substantially perpendicular to the wearing surface of said contact.

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