

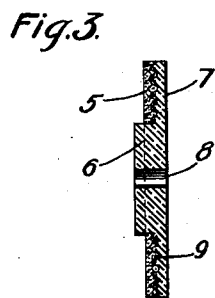
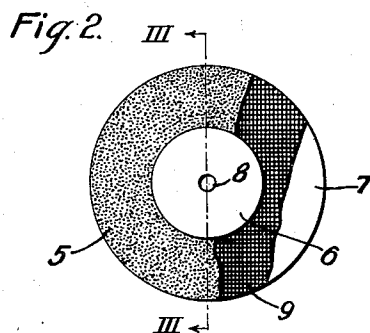
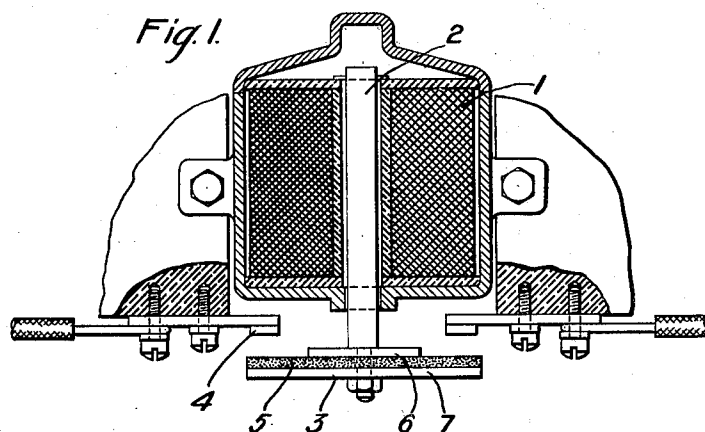
July 15, 1924.

1,501,330

B. J. GUDGE ET AL

ELECTRICAL ELEMENT

Filed May 12, 1919



WITNESSES:

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Patented July 15, 1924.

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UNITED STATES PATENT OFFICE.

BENJAMIN J. GUDGE AND PAUL G. GUEST, OF WILKINSBURG, PENNSYLVANIA, ASSIGNORS TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

ELECTRICAL CONTACT ELEMENT.

Application filed May 12, 1919. Serial No. 296,428.

To all whom it may concern:

Be it known that we, BENJAMIN J. GUDGE, a citizen of the United States, and a resident of Wilkesburg, in the county of Allegheny and State of Pennsylvania, and PAUL G. GUEST, a citizen of the United States, and a resident of Wilkesburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Electrical Contact Elements, of which the following is a specification.

Our invention relates to electrical conductors or contact elements and more particularly to contact elements or bridging members for employment in switches, relays and the like, and it has, for its primary object, the provision of a carboniferous composition particularly adapted, because of its strength, for employment for such purposes.

Heretofore, carbon conductors or contact members have been molded from finely divided carbon, or equivalent material, together with some binder, usually of an organic nature, such as a pitch. The molded body has then been baked in powdered coke to drive off the volatile portion of the pitch and to transform the remainder into a binding carbon. For instance, when the desired contacts are in the form of disks for relays, it has been common to mold a cylindrical body of carbon with an organic binder, as above described. This body would then be sawed, or otherwise cut, transversely to provide a plurality of disk-shaped sections of desired thickness which might then be formed with central openings to receive insulating sleeves or bushings so that they might be secured to the ends of relay plungers.

It has been found, however, that considerable difficulty was met with in properly insulating the disks from the plunger and that the disks were so brittle and lacking in mechanical strength that a large percentage of them were destroyed in assembling the relays and many of them were broken during shipment of the relays and in their subsequent use.

We have now found that a carbon contact member of far greater mechanical strength may be provided by employing a suitable binder which remains a permanent portion of the molded carboniferous body and that a binder comprising a phenolic condensation

product is particularly adapted for the purpose.

We have further ascertained that, by molding the carbon material, together with a suitable backing material, comprising an insulating composition of relatively great mechanical strength, the contact or bridging members may be still further reinforced and strengthened. Furthermore, when these members are in the form of disks for attachment to the plungers of relays, we have found that it is advisable to form them with central openings and to mold therein hubs of the insulating material at the same time that the backing of such material is provided.

In view of these facts, one object of our invention resides in providing a contact member for relays essentially comprising an annular body of carboniferous conducting material, and a binder, such as a phenolic condensation product, provided with a hub portion and a backing of an insulating composition which shall serve not only to reinforce the contact member proper but also as a means for insulating it from a relay plunger, or equivalent element, to which it may be connected in use.

Although phenolic condensation products possess relatively high insulating qualities, we have discovered that, for many purposes in which the contact members are to be employed in circuits carrying currents of relatively low amperage, the amount of the phenolic condensation product utilized as the binder will not materially increase the resistance of the contact member.

Nevertheless, with currents of high amperage, this increase in resistance of the contact member may be serious, and, for this reason, another object of our invention consists in providing means for greatly reducing the resistance which contact members of this character would otherwise offer to the passage of current.

With these and other objects in view, our invention will be more fully described, illustrated in the drawings, in the several views of which corresponding numerals indicate like parts, and then particularly pointed out in the claims.

Fig. 1 is a view, partially in elevation and partially in section, of a relay equipped with a contact or bridging member con-

structed in accordance with our invention; Fig. 2 is a plan view of the conducting face of the member and Fig. 3 is a diametral, sectional view taken on the line III—III of Fig. 2 showing the details of construction.

We have found that while electrical conductors or contact members, for switches and relays, as previously formed, molded from finely divided carbon and a binder which is subsequently carbonized, are unsatisfactory because of their low mechanical strength, much stronger elements of this character may be provided by the employment of a binder which remains a permanent part of the composition, such as a phenolic condensation product. For example, such bodies or articles may be readily provided by thoroughly mixing or mingling finely divided carbon with a phenolic condensation product, in suitable proportions. Preferably, as little of the phenolic condensation product should be employed as will give the resultant body the requisite mechanical strength. The proportions of the carbon to the phenolic condensation product may, however, be considerably varied, such proportions being dependent upon the mechanical strength required and upon whether or not it is essential that the body shall offer as little resistance to the passage of electrical current as possible. We have ascertained that bodies comprising 90% carbon and 10% of the binder are very satisfactory. The mixed binder and carbon may be brought to any desired shape by subjecting the composition to heat and pressure in a suitable mold to shape the body and convert the binder to its final, hard and substantially insoluble and infusible condition.

If unusual strength is desired in contact or bridging members of this character, they may be reinforced by a body of moldable composition which shall preferably be one having insulating properties. Such body may be molded and cured at the same time as the conducting element to provide, with it, a single, unitary article in which the conducting material and reinforcing material are relatively localized in any desired manner. For instance, the insulating material may form a backing for one face of the conducting element or it may, in addition, provide means for securing the article, as a whole, to any desired relay or switch member in such manner as to insulate the conducting element therefrom.

Where it is requisite that the conducting element, or contact, shall offer a minimum resistance to the passage of an electric current, suitable means may be provided for reducing the resistance which the body of molded carbon and a phenolic condensation product, as a binder, would offer. For instance, metallic conductor elements may be imbedded within the carbon composition, in

any suitable manner, as by the employment of metal gauze or, in case the conducting portion of the member is provided with a reinforcing backing of non-conducting material, copper gauze or equivalent conducting means may be molded into the body between the conducting and the backing materials.

While our invention is in no way restricted to electrical conductors for any particular purposes or to the employment of the same in relays or switches, we have, for the sake of convenience, illustrated it as embodied in the contact or bridging member of a relay of otherwise convenient type.

Referring more particularly to Fig. 1 of the drawings, we have disclosed a relay of conventional type including an actuating coil 1 and a co-operating core or plunger 2 carrying a bridging member 3 adapted, when the coil is energized, to be brought into operative engagement with spaced contacts 4.

The construction of the contact or bridging member 3, which is illustrative of only one of numerous possible embodiments of our invention, may best be understood by reference to Figs. 2 and 3 of the drawing. As here shown, the conductor member comprises an annular, conducting portion 5, which may be of any width and thickness, provided with a hub 6 and backing 7 of non-conducting material, the hub being formed with an opening 8 for convenient attachment to the plunger of the relay. Suitable conducting and reinforcing elements may be molded into the conducting portion 5 of the member or between such portion and the backing portion 7 thereof to decrease its resistance and, as best shown in Figs. 2 and 3, the conducting elements may comprise an annular sheet of metallic gauze 9.

When practising our invention, to manufacture an article of the kind shown in the drawings, we may suitably dispose a mixture of finely divided carbon and a phenolic condensation product, the latter possibly comprising 10% of the mixture, in a mold and compress it to provide a body of the desired shape. We may then remove the pressure-applying portion of the mold and place within the mold a suitable quantity of a moldable composition having insulating properties to provide the hub portion and backing of the contact member. A composition suitable for this purpose may comprise a mixture of wood flour or asbestos and a phenolic condensation product in suitable proportions, as, for example, substantially 60% of wood flour and 40% of a phenolic condensation product.

The materials thus assembled in the mold may then be subjected to the pressure to properly form the hub and backing portions thereof and to heat to harden the

binder of both the conducting material and the insulating material.

Where a backing is provided, weaker binders may be employed for the carbon portion, such as sugar. As such a carbon composition must be baked at a relatively high temperature, asbestos should be substituted for wood flour as the filler for the backing.

It will, of course, be understood that, if metallic gauze or its equivalent is to be incorporated in the body, to reduce the resistance of the conducting material, it will either be molded in the conducting portion of the body or between such portion and the backing portion thereof. The gauze or its equivalent, however, is only required under certain circumstances, such as where circuits of high amperage will be encountered.

By practising our foregoing invention, we have found that it is possible to provide electrical conductors or contact members, of carbon and a binder, which are much stronger mechanically than those previously known to us. We have further found that we may reinforce such members in a simple and inexpensive manner by providing them with backing and attaching portions of moldable insulating material of such character that both the conducting portions and insulating portions of the body may be molded and joined together at the same time and by the same molding or curing treatment.

Furthermore, if desirable, the resistance of the conducting portion of the member may be materially decreased by molding into it, or between it and the reinforcing portion of the member, a metallic element or elements in the form of gauze or the like.

While we have illustrated our invention as embodied in a relay, it will be appreciated that it is adaptable to a wide range of purposes and to numerous articles and, for that reason, no limitations are to be imposed upon our invention, other than those indicated in the claims in which it is our intention to cover it as broadly as may be permitted by the state of the art.

We claim as our invention:

1. An electrical conducting element comprising a molded body formed partly of

carbon and a binder and partly of insulating material, the materials being localized in definite portions of the body.

2. An electrical conducting element comprising a conducting portion of carbon and a phenolic condensation product as a binder and a reinforcing backing portion molded thereto and comprising an insulating composition.

3. An electrical conducting element comprising a conducting portion and an insulating portion, each having a heat-hardened binder, said portions being intimately joined.

4. An electrical conducting element comprising a conducting portion of carbon and a phenolic condensation product and a reinforcing, backing portion of a comminuted filler and a phenolic condensation product as a binder, the binder of both portions being hardened by the application of heat and pressure.

5. A contact member for relays comprising a disk of finely divided carbon associated with a heat-hardened phenolic condensation product and a backing and hub portion of insulating material.

6. A contact member for relays comprising a disk of finely divided carbon associated with a heat-hardened phenolic condensation product and a backing and hub portion of a comminuted filler and a hardened phenolic condensation product.

7. A contact for relays comprising a disk-shaped body, one face of which is formed of finely divided carbon and a hardened phenolic condensation product as a binder and the other face of which is formed of a comminuted filler and a similar hardened binder.

8. A contact for relays comprising a disk-shaped body, one face of which is formed of finely divided carbon and a hardened phenolic condensation product as a binder and the other face and hub portion of which are formed of a comminuted filler and a similar hardened binder, and metallic gauze molded between the materials.

In testimony whereof, we have hereunto subscribed our names this 30th day of April, 1919.

BENJ. J. GUDGE.
PAUL G. GUEST.