Aug. 18, 1953 C. L. HARVEY 2,649,525

CONTACT

Filed May 16, 1951

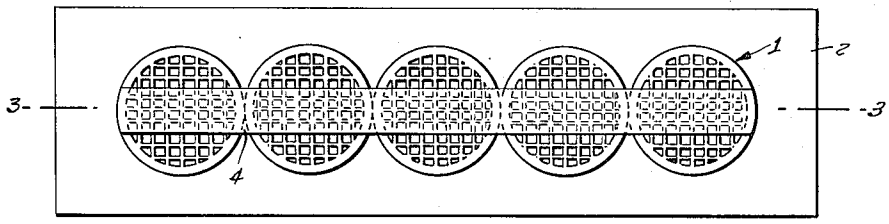


FIG. 1

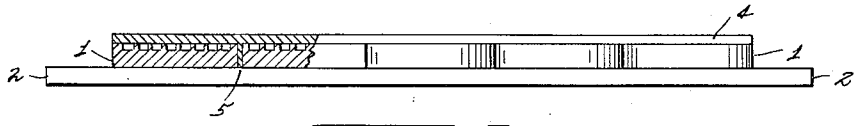


FIG. 2

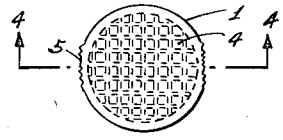


FIG. 3

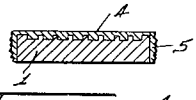


FIG. 4

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ATTORNEYS

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Application May 16, 1951, Serial No. 226,693

5 Claims. (Cl. 200—166)

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My invention relates to electrical contacts of the general type disclosed in application Serial No. 181,329 filed August 24, 1950, and more specifically to a connected series of electrical contacts and a method of bonding a series of electrical contacts together, the said electrical contacts being formed of briquettes which are initially porous and capable of impregnation.

Electrical contacts of the type to which this invention relates are composed of a sintered combination of a highly conductive metal such as copper or silver and a semirefractory or a refractory metal, such as tungsten, tungsten carbide, molybdenum, and molybdenum carbide. The final treatment of the initially porous sintered combination comprises the operation of impregnating the same with a high conductivity metal, such as silver. The electrical contacts referred to herein contain, in most cases, about forty or more percent of the refractory material.

Electrical contacts which contain refractory material in an amount of the order of that referred to above are hard and brittle, and hence cannot be subjected to the usual forming operations such as rolling, slitting, cutting, punching, coining and staking. Therefore, they are furnished as individually molded and treated pieces which have not heretofore been available in other than individual form. This is a highly objectionable feature of these contacts when attempting to utilize them in a high production rate set-up. This is particularly true when the individual contacts are very small.

It is presently the practice to either braze or weld the contact to the contact arm. In applying these contacts to the contact carrying arm the operator feeds the contact in position in a jig in the welding machine and then applies the arm to which the contact is to be welded to the contact.

In many instances the contact is of the order of $\frac{3}{16}$'' in diameter and $\frac{1}{32}$'' in thickness and is accordingly not easily manipulated into its position.

Moreover, there is considerable risk to the operator whose hands must for an instant while placing the contact in place be underneath the electrode which is shortly thereafter to be machine operated with considerable force against the arm and contact while applying current for welding.

In order to overcome these difficulties it has been proposed to bond the individual contacts to a paper strip with an adhesive. However, after removal of the contact from the paper strip it is found that the adhesive adheres to the contact

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and adversely affects its characteristic or presents special problems in removal of the adhesive or other foreign matter prior to the securement of the contact on the contact arm.

In accordance with my present invention, I have discovered that I can achieve a binding between adjacent contacts so as to form a long strip comprising a plurality of such contacts. Such a long strip of contacts now makes it relatively easy to handle the operations of feeding individual contacts into the welding jig. The operator, in such a construction, merely holds the contact strip at one end and uses the contact strip to position an end contact into the welding jig.

Accordingly, an object of my invention is to provide a novel means for connecting a plurality of electrical contacts toegther in series and a novel method for obtaining this result.

A further object of my invention is to provide a bonding material which will have no deleterious effect upon the conductivity or other properties of the electrical contacts.

A further object of my invention is to combine the bonding operation with a previously established operation in the production of electrical contacts.

To carry this out, a further object of my invention is to utilize the contact briquette impregnating metal as the bonding material so that the operation of impregnating the contacts will also result in connecting them.

A further object of my invention is to provide a bonding material between the contacts which may easily be ruptured to allow separation between two adjacent contacts, but which material is sufficiently strong mechanically to maintain the connection until it is affirmatively broken.

My novel bonding process which satisfies the above objects, the connected series of contacts being produced thereby, may more easily be understood by referring to the following description and drawings in which

Figure 1 is a side view of a series of contacts prior to bonding.

Figure 2 is a side view of a series of contacts bonded together.

Figures 3 and 4 show plan and side views of the severed contact.

There are several methods by which it is possible to produce the kind of contacts or parts contemplated in this disclosure; these parts being made from metal powders by what is commonly referred to as the impregnation process. Al-

though the details of actually producing an impregnated part are not a part of this invention, a general explanation is given herewith.

Essentially, the type of contact in connection with the process of, and result of, the present invention is used as is described in application Serial No. 181,329, filed August 24, 1950. A powder consisting of one or more refractive metals, such as tungsten or molybdenum, is preferably although not necessarily combined with a powder consisting of a conductive metal, this metal being preferably identical to that which will subsequently be used to impregnate the contact, as for example, silver. This combination is thoroughly mixed, as for example by using a tumbling process. The powders thus mixed are then inserted into a die cavity of an appropriate size and shape, and compacted therein by applying pressure to the die plungers which compact the powder. Thereafter the compacted material is sintered. The compacting pressure is so selected that the briquette which is obtained will have a predetermined percent porosity after it is sintered subsequent to the compacting operation.

The process is then completed by placing an appropriate quantity of the impregnating material, as for instance, silver, upon the porous sintered compact, and placing the whole within a furnace and bringing said whole to a temperature in excess of the melting point of the impregnating material. The impregnating material when thus melted will flow into the sintered compact and fill the voids, creating a dense product.

In connection with this general description of the method used to produce the electrical contacts of the type to which this invention is directed, I will here describe may novel bonding operation.

As shown in Figure 1, after the contacts 1 are pressed and sintered, they are placed upon a support 2, and so positioned that they are adjacent to and touching each other, and so arranged that their centers lie along a predetermined path, in this case said path being a straight line indicated by axis line 3—3. An appropriate size slug 4 of the impregnating material is then placed upon each of the compacts 1. It is to be noted that the individual slugs 4 of said impregnating material may be replaced by a bar or rod of any desirable shape, said bar being of sufficient length to rest upon the tops of all the combined contacts.

The above mentioned assembly is then placed into a furnace which is held at a temperature sufficient to melt the impregnating material and cause it to flow and impregnate the contacts.

In addition to impregnating the contacts 1, as heretofore mentioned, the impregnating metal will form a fillet 5 between any two adjacent contacts 1 as shown in Figure 2; one contact being bonded by this fillet 5 between the two contacts 1 adjacent to it.

Thus, the bonding operation has been combined with the normally required impregnating process, this process heretofore being outlined.

The bonding fillet 1 is thus produced with a relatively soft material, namely the impregnating metal, such as silver or copper. The fillet, being soft, may easily be ruptured by an operator or by mechanical means associated with a

positioning fixture. However, the fillet is sufficiently strong so that a strip of a predetermined length, supported horizontally or vertically by one end, will be capable of supporting its own weight. Since the fillet is composed of the impregnating material, it must necessarily be a good conductor, and hence cannot adversely affect the properties of the contact.

It will now be apparent from the above description that when a strip containing a plurality of such contacts 1 bonded to each other at their tangential engaging point 5 is applied to a receptable or jig in a welding machine, a simple rocking movement of the strip while the contact is held in place in the jig will release the strip from this contact at the tangential point where the contact is secured to the next adjacent end contact.

An appropriate fixture and jig for the positioning of the contacts can be constructed or modified so as to utilize the heretofore described combined form of electrical contacts rather than the individual items. It is obvious that there is greater ease in both mechanical and manual handling of the combined form than there is with the individual contacts.

A jig and fixture combination is conceivable which may better utilize a combined form of electrical contacts in and annular ring rather than the aforementioned strip form. Hence I wish my invention to cover any shape into which a plurality of contacts may be formed by my novel method.

While I have described my invention in connection with a particular composition of an electrical contact, it will now be obvious that my invention is applicable to any contact which can be joined together at an appropriate point to form a strip of a plurality of contacts. Accordingly, I prefer to be bound not by the specific disclosures herein contained, but only by the appended claims.

I claim:

1. A strip of silver impregnated electrical contacts; adjacent contacts being connected by silver fillets.

2. A strip of electrical contacts impregnated with a conducting metal; adjacent contacts being connected by fillets of said impregnating metal.

3. A strip of initially porous electrical contacts impregnated with a conducting metal; adjacent contacts being connected by fillets of the impregnating metal.

4. A strip of initially porous electrical contacts impregnated with a conducting metal; adjacent contacts being connected by fillets of the impregnating metal, each fillet extending integrally from within one contact into an adjacent contact.

5. A strip of conducting powder impregnated electrical contacts; adjacent contacts being connected by said conducting powder fillets.

CECIL L. HARVEY.

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