

April 19, 1955

G. L. WILLIAMSON

2,706,759

REFRACTORY CONTACTS

Filed July 14, 1951

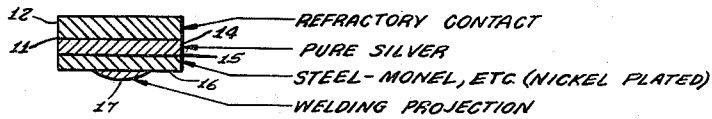
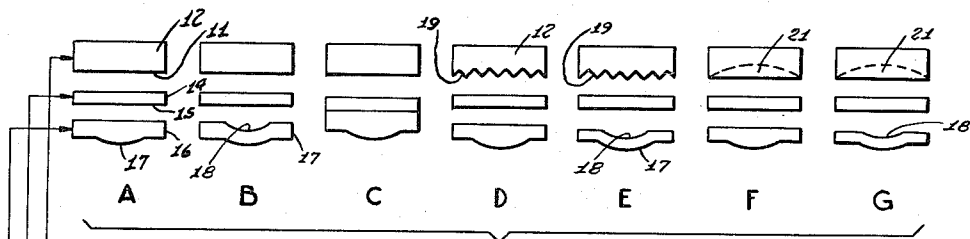


FIG. 1.



REFRACTORY CONTACT
PURE SILVER
STEEL-MONEL, ETC.

FIG. 2.

IMPREGNATING SILVER BONDED TO STEEL AS AN OVERLAY

SERRATED (CIRCULAR OR CROSS-HATCHED) CONTACT

CONCAVE BACKED CONTACT

INVENTOR.
GEORGE L. WILLIAMSON

BY *Ostrolenk & Faber*

ATTORNEYS

1

2,706,759

REFRACTORY CONTACTS

George L. Williamson, Pittsburgh, Pa., assignor to Gibson Electric Company, Pittsburgh, Pa., a corporation of Pennsylvania

Application July 14, 1951, Serial No. 236,721

8 Claims. (Cl. 200—166)

My invention relates to a novel method of producing refractory type electrical contacts, and more particularly relates to a novel method of producing refractory type electrical contacts which are adapted to be attached to supports by spot-welding technique.

It has heretofore been a well known practice to spot-weld electrical contacts for circuit interrupting devices to supports. In such constructions the contact which is usually of good electrical conducting material, such as silver, is usually provided with a comparatively high resistance backing material which is weldable and which will hereinafter be referred to as weldable backing material, such as nickel plated steel or Monel. Such weldable backing material is used since it is much more easily welded than the low resistance electrical conducting material, such as silver. The weldable backing material in such cases were provided with welding projections which were then spot-welded to the contact carrying arm of a circuit breaker, switch, or the like.

In many cases electrical contact material consists of the refractory type of metal, such as tungsten, molybdenum, or their carbides, which have been impregnated with a low resistance, low melting point material, such as silver or copper.

It has been proposed to attach such refractory contacts to supports by spot-welding techniques but except under very favorable circumstances this has been found quite difficult.

In other cases it has also been proposed that the refractory contacts be furnished with a ferrous metal backing such as described in connection with the silver or copper contacts above.

In the latter procedure, a powder of the refractory material, such as tungsten, molybdenum and their carbides, is first pressed into the form of a contact now well known in the art. This compressed material is then sintered at temperatures and for periods well known in the art. A slug of silver is placed on this porous composition and heated until the silver has melted and fills up the pores of the contact. The sintered contact is then silver soldered to a ferrous metal backing.

This procedure is costly and time consuming if carried out by any of the common joining techniques.

In accordance with the present invention the steps of impregnation of the silver and of brazing of the steel backing are achieved in a single operation in such a manner that the impregnating silver simultaneously impregnates the contact and also provides the necessary bond to the steel back.

Accordingly an object of my invention is to provide a novel and less expensive method of producing refractory type contacts which have projection welding type ferrous metal backings.

A further object of my invention is to provide a novel refractory contact having a steel back.

Still a further object of my invention is to provide a novel refractory type contact.

These and other objects of my invention will be more fully explained in connection with the attached drawings in which:

Figure 1 is a cross-sectional view of the contact in one step of the procedure.

Figures 2A-G show various forms of a stage of my novel process.

In accordance with the present invention, a refractory material which may be either tungsten or molybdenum, or other refractory material and their carbides, is ad-

2

mitted in powdered form into a cavity having the desired shape of the contact. This powdered refractory material is then pressed at a pressure which will provide the required porosity to accommodate the required amount of silver in a manner now well known in the art.

The resultant briquette is then sintered in a reducing atmosphere at a temperature of the order of 2000° F. for approximately one hour.

In contact with the face 11 (Figure 1) of the refractory contact 12 thus formed is placed a piece of pure silver 14 having the appropriate weight. In contact with the face 15 of the silver 14 is placed a weldable backing material 16 which may be steel, Monel, or equivalent ferrous material and which, if desired, may have been previously nickel plated.

The weldable backing material may also be provided, if desired, with a welding projection 17.

This assembly as shown in Figure 1 is then placed in a furnace having a reducing atmosphere and held at approximately 2300° F. for a period of 3 to 7 minutes depending upon the size of the contact. During this final sintering operation, the pure silver will melt and will impregnate the contact. At the same time the silver will act as a bonding material to bond the impregnated refractory contact to the ferrous weldable backing material.

The end product obtained by this procedure will be one which has a hard metallic face providing an excellent electrical contact material and will at the same time have a ferrous metal backing which is suitable for spot-welding to any desired base metal support.

In practice it has been found that it is exceedingly difficult to accurately control the manufacturing steps with such precision that a predetermined amount of silver will impregnate in exactly the same manner in each successive impregnation of contacts. As a result, some contacts after impregnation show a slight excess of silver on their surface by virtue of the fact that the pressed and sintered contact was not capable of absorbing all of the silver.

This would be a distinct disadvantage if it occurred while producing projection type welding contacts in accordance with the present invention since undoubtedly a non-parallelism would result of the weldable backing with respect to the contact.

Examples of the construction for correcting this difficulty are shown in Figure 2.

In Figure 2B I have shown a cavity at 18 in the weldable backing 17 into which any excess silver which may be present may be absorbed.

In Figure 2D the impregnated refractory contact 12 is formed with a serration as at 19 into which the excess silver may be deposited.

In Figure 2E both the serrations 19 and cavity 18 in the weldable backing 17 are provided.

In Figure 2F a cavity at 21 in the refractory contact may be employed for containing the excess silver.

In Figure 2G a cavity 21 in the contact and a cavity 18 in the weldable backing are provided for the excess silver.

It will be understood, however, that these examples are only by way of illustration and that other means than these for providing containing spaces for excess silver will solve the problem thus encountered.

Accordingly I do not wish to be limited by the specific illustrations herein given but only by the appended claims.

I claim:

1. The method of producing contacts for electrical devices which comprises the step of pressing powdered refractory material into the form of a briquette, sintering the compressed material, placing silver in contact with one face of the briquette and placing a weldable metallic ferrous backing in contact with one face of the impregnating conducting material, placing the assembly in a furnace and simultaneously impregnating the refractory material with the conducting material and bonding the backing to the impregnated contact.

2. The method of making contacts for electrical devices which comprises the steps of pressing a powdered refractory material from the group consisting of tungsten,

3

tungsten carbide, molybdenum, and molybdenum carbide into the form of a briquette, sintering the compressed material, and melting between said briquette and a weldable backing material a quantity of silver sufficient to simultaneously impregnate said briquette and bond it to said backing material.

3. The method of making contacts for electrical devices which comprises steps of pressing at least one powdered refractory material from the group consisting of tungsten, tungsten carbide, molybdenum and molybdenum carbide into the form of a briquette, sintering the compressed material and melting between said briquette and a weldable backing material a quantity of silver sufficient to simultaneously impregnate said briquette and bond it to said backing material, the melting step also being carried out in a reducing atmosphere.

4. An electrical contact comprising at least one refractory material from the group consisting of tungsten, tungsten carbide, molybdenum and molybdenum carbide, said refractory material having a serrated surface and being impregnated with silver and a weldable metallic backing in contact with the serrated edge of said contact and bonded to said contact through the said impregnating material.

5. An electrical contact comprising at least one refractory material from the group consisting of tungsten, tungsten carbide, molybdenum and molybdenum carbide, said refractory material having a serrated surface and being impregnated with silver, and a weldable me-

4

tallic backing from the group consisting of ferrous metals and Monel in contact with the serrated edge of said contact and bonded to said contact through the said impregnating silver.

6. An electrical contact comprising molybdenum and silver, said contact having a serrated surface, the said serrated surface being bonded to a weldable metallic backing material by means of the silver with which the contact is impregnated.

7. An electrical contact comprising tungsten and silver, said contact having a serrated surface, the said serrated surface being bonded to a weldable metallic backing material by means of the silver with which the contact is impregnated.

8. An electrical contact comprising tungsten carbide and silver, said contact having a serrated surface, the said serrated surface being bonded to a weldable metallic backing material by means of the silver with which the contact is impregnated.

References Cited in the file of this patent

UNITED STATES PATENTS

2,298,999	Allen	Oct. 13, 1942
2,401,483	Hensel et al.	June 4, 1946
2,414,463	Gunn et al.	Jan. 21, 1947
2,464,591	Larsen et al.	Mar. 15, 1949
2,504,906	Tremblay	Apr. 18, 1950
2,641,670	Graves	June 9, 1953