

United States Patent

Walter et al.

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[54] **VACUUM SWITCH CONTACTS**

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[51] Int. Cl. **C22c 19/00**

[58] Field of Search **75/170, 171, 176; 148/32, 32.5; 200/166**

[56] **References Cited**

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[57] **ABSTRACT**

Improved vacuum switch contact members have been fabricated from an electrically conductive hard metallic matrix containing a dispersoid of an electrically conductive metallic material which is insoluble in the matrix and which has a relatively high vapor pressure when heated by an arc developed between two such contact members. A specific example of a 96 weight per cent nickel, two per cent beryllium and 2 per cent bismuth composition is disclosed.

2 Claims, No Drawings

VACUUM SWITCH CONTACTS

This invention relates to electrical contacts for use in vacuum switches.

As implied by the name, a vacuum switch is a device for selectively interrupting an electrical current by physically separating a pair of electrical contact members in a vacuum environment and, of course, alternatively by physically moving one or both of a pair of such members into physical, electrically conducting, contact with each other. Depending upon the characteristics of the contact members, certain adverse effects may be produced in the circuitry associated with the operation of the switch, particularly upon the interruption of current flow, such as the resulting undesirable current surge produced by "chopping" or a too sudden interruption of the current flow. A high breakdown and recovery strength is also desirable in such switches. It would be desirable to provide vacuum switch contact members which have improved properties or characteristics over the alloy members presently used and such is a principal object of this invention.

Briefly stated, and in accordance with one aspect of the invention, it was conceived that electrical contact members for such switches should be reasonably good electrical conductors, be physically hard, i.e. resist plastic deformation, have a high arc stability upon braking contact and a high recovery strength. It was conceived that these advantages could be accomplished by providing contact members composed of a hard metallic matrix containing an insoluble dispersoid of a different metallic material having a higher vapor pressure than the matrix material when an arc was formed between the contacts and which would have the requisite breakdown or recovery strength.

In accordance with the foregoing, and as a specific working example, vacuum switch contact members were fabricated from an alloy composed of about 96 per cent nickel, 2 per cent beryllium and 2 per cent bismuth. Upon examination, these members were found to be composed of a hard matrix of the Ni-Be alloy containing a fine, evenly distributed bismuth dispersoid. The diamond pyramid hardness of these bodies was found to be about 178 Kg./mm.² compared to 88.1 D.P.H. for a 2 per cent beryllium copper alloy.

When these contacts were tested and compared to silver contacts under the same test conditions, it was found that they exhibited a recovery strength about 50 per cent greater than the silver contacts in the range of 200 to 1,600 amperes and had a vacuum breakdown strength after spark conditioning of

from about 27 to 60 per cent greater than the silver contacts (and about 25 per cent greater than copper). These contact members were also found to have a greater arc stability than similar contacts made from a 20 per cent bismuth copper alloy, particularly at currents less than 2.5 amperes.

It will be apparent to those skilled in the art that suitable matrices other than the particular nickel beryllium alloy previously disclosed may be employed, and dispersoids other than bismuth may be selected, depending upon the particular matrix and the operating conditions under which the contact members are to be used. For example, a matrix of pure nickel containing a bismuth dispersoid may be used if a softer matrix may be tolerated. It will be apparent that a matrix composed of molybdenum or tungsten may also be used with the dispersoid. Other dispersoids having the requisite high vapor pressure under are conditions may also be employed. For example, an antimony dispersoid in an appropriate hard matrix may be useful. It will also be apparent that these kinds of contacts may have utility in electrical apparatus having a current breaking function where the switching operation is not the primary function of the apparatus.

What we claim is:

1. An article of manufacture comprising an electrically conductive contact member having a contact surface consisting essentially of an electrically conductive hard metallic matrix and a dispersoid in said matrix of an electrically conductive metallic material which has a high vapor pressure when exposed to the heat of an electric arc at a surface of said member, said dispersoid material being substantially insoluble in said matrix material and substantially evenly distributed therethrough, said matrix being primarily composed of nickel and said dispersoid therein being bismuth, said nickel matrix material containing about 2.0 wt. per cent of beryllium as a hardening agent.

2. An article of manufacture comprising an electrically conductive contact member having a contact surface consisting essentially of an electrically conductive hard metallic matrix and a dispersoid of an electrically conductive metallic material which has a high vapor pressure when exposed to the heat of an electric arc at a surface of said member, said dispersoid material being substantially insoluble in said matrix material and substantially evenly distributed therethrough, said matrix being composed primarily of nickel and said dispersoid being bismuth, said contact member surface being composed essentially of about 96 per cent by wt. nickel, 2 per cent beryllium and 2 per cent bismuth.

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