Patented Oct. 31, 1933 1,932,678

UNITED STATES PATENT OFFICE

1,932,678

ELECTRICAL CONTACT ELEMENT

Samuel Ruben, New York, N. Y.

No Drawing. Application November 13, 1929
Serial No. 406,993

9 Claims. (Cl. 219—4)

This invention relates to a metal mixture; it relates to a mixture of metals integrally cemented to produce a hard material of low resistance.

The object of the invention is to produce a mixture capable of withstanding mechanical stress with minimum wear; especially such a mixture adapted for use as an electrical contact for welding and other operations.

Broadly, the invention comprises the use of a refractory metal of the sixth periodic group such as tungsten, chromium or molybdenum and a good conductor such as silver or copper with a hardening material such as beryllium. For contact use, the beryllium is reacted only on the surface.

The choice of the refractory material used is dependent upon the use to which the finished product is to be put.

In preparing the mixture generally, where a heterogeneous structure is desired, I prefer to use the metals in the following proportions: Approximately nine parts of the refractory metal, such as tungsten, to one part of the conducting metal, such as silver, by weight. To this is added beryllium in an amount equal to two per cent (2%) by weight of the silver or other conducting metal used. The percentage of beryllium however, is variable, dependent upon the hardness desired. The metals are preferably in powdered form. The mixture is compressed under very high pressure and is then heated in a hydrogen or other non-oxidizing atmosphere to or about the melting point of the conductive metal used, at which temperature the mixture forms.

For a spot welding electrode, the following combination is deemed preferable: A mixture of tungsten powder and silver powder in the proportions by weight, of nine parts of tungsten to one part of silver is mixed together and pressed into a slug at high pressure in a hydraulic press. A pressure of about twenty tons is applied. The slug is then coated with a layer of beryllium powder, the powder being applied with a volatile binder such as nitro cellulose in amylacetate, after which it is placed in a carbon mold and heated in hydrogen to or about the melting point of the silver. The melted silver flows into the tungsten by capillary effect and thoroughly cements the tungsten grains to give an integral structure and the beryllium on the surface alloys with the silver and infuses into the slug which increases the hardness and due to its chemical stability, allows the product when ground into shape to withstand high current density and intense mechanical stress with minimum physical or chemical effect. The beryllium can also be applied, instead of by the method indicated, by pressing powdered beryllium into the surface of the slug without the use of a binder.

When stresses will not be so intense, other refractory metals such as chromium or molybdenum can be used in place of the tungsten. Also, other high electrically conductive elements may be substituted for the silver.

The proportions of the various materials indicated are meant to be approximate only and to serve a general use of the mixture product; other proportions may be used to obtain more pronounced characteristics of the various allied metals, as their respective proportions are increased or vice versa.

What is claimed is:

1. An electrical contact element having its base composed of the combination of a refractory metal of the sixth periodic group and a highly conductive metal of the copper-silver class, said base having an electrical contact-making surface containing beryllium.

2. An electrical contact element having its base composed of an alloy containing a refractory metal of the sixth periodic group and a highly conductive metal of the copper-silver class as essential elements thereof, said base having a top layer containing beryllium applied thereto to form an electrical contact-making surface.

3. An electrical contact element having its base composed of a copper alloy as an essential component thereof, said base having a top layer containing beryllium applied thereto to form an electrical contact-making surface.

4. An electrical contact element having its base composed of a silver alloy as an essential component thereof, said base having a top layer containing beryllium applied thereto to form an electrical contact-making surface.

5. An electrical contact element having its base composed of an alloy of tungsten and copper as the essential elements thereof, said base having a top layer containing beryllium applied thereto to form an electrical contact-making surface.

6. An electrical contact element having its base composed of an alloy of tungsten and silver as the essential elements thereof, said base having a top layer containing beryllium applied thereto to form an electrical contact-making surface.

7. The method of producing a contact element which comprises mixing together a refractory metal of the sixth periodic group and a highly conductive metal of the copper-silver class, com-

pressing said mixture into a slug, applying a layer of beryllium to the surface of said slug and heating to the melting point of the highly conductive metal.

8. The method of producing a contact element which comprises mixing together a refractory metal of the sixth periodic group and a highly conductive metal of the copper-silver class, compressing said mixture into a slug, applying a coating of beryllium and an organic binding material to the surface of said slug, and heating to the melting point of the highly conductive metal so as to vaporize off the organic binder and allow the beryllium to infuse into the surface of the slug.

9. An electrical contact element having as an essential constituent of its base, a high heat conducting metal or metal alloy of the copper-silver class, said base containing substantially no beryllium and having an electrical contact-making surface layer containing beryllium, integrally held thereon.

SAMUEL RUBEN.