

UNITED STATES PATENT OFFICE

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ELECTRICAL CONTACT

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This invention relates to electrical make-and-break contacts.

An object of the invention is to provide an electrical make-and-break contact which is suitable for use in connection with magnetos, relays and similar devices.

Another object is to provide an electrical make-and-break contact which may be substituted for contacts of the platinum-iridium, and similar types.

A further object is the provision of an electrical make-and-break contact of high hardness, superior electrical characteristics, and which, compared to contacts commonly used in the various fields mentioned, is relatively free from carburizing.

Further objects will be apparent from the following disclosure.

For many purposes, such as for magneto contacts, relay contacts, etc. it has heretofore been customary to use electrical make-and-break contacts composed of platinum-ruthenium or iridium-platinum alloys. While such contacts are fairly satisfactory, due to their hardness, non-corrosiveness in normal and most industrial atmospheres and low transfer (carry-over) under the electrical arcing inherent to magneto and most relay operations, they also possess the disadvantages of high initial cost and difficulty of fabrication and have usually required a fairly high percentage of iridium or ruthenium to reach the desired degree of hardness. Moreover, the alloys of platinum and iridium have shown a marked affinity for hydrocarbon vapours under electrical arcing conditions and this characteristic seems to increase with the increased percentages of iridium necessary to produce sufficient mechanical strength and hardness for magneto and similar uses.

My invention includes the use of an alloy of palladium, nickel and silver, and particularly an alloy of such metals suitable as a substitute for platinum-ruthenium and platinum-iridium alloys, in the fabrication of electrical make-and-break contacts.

In some instances, I may substitute copper for the silver, and cobalt or iron for the nickel and in special cases where low cost is not of essential importance, platinum for the palladium. Where iron is substituted for the nickel, I find it desirable to keep the percentage at not more than 2% by weight.

The alloy from which the contacts in my invention are preferably formed contains a preponderance of palladium, a smaller amount of

silver, which may be pure or commercial silver, and a much smaller amount of nickel. For general purposes, I prefer to keep the limits as follows:

|           | Percent |   |
|-----------|---------|---|
| Palladium | 60 -75  | 5 |
| Silver    | 10 -35  |   |
| Nickel    | 0.5- 5  |   |

Where the contacts are to be used for magnetos and relays, however, I prefer to keep the limits down as follows:

|           | Percent |    |
|-----------|---------|----|
| Palladium | 70-80   |    |
| Silver    | 20-30   |    |
| Nickel    | 1- 3    | 15 |

A contact element formed from an alloy of 72% palladium, 26% silver and 2% nickel has a Rockwell B hardness comparable with that of a 25% iridium platinum alloy contact, and has a density of approximately 11.66 grams per c. c. as compared to a minimum of 21.4 grams per c. c. for the iridium-platinum. In addition to this volumetric advantage of

|      |    |
|------|----|
| 21.4 |    |
| 11.6 | 25 |

or 184%, my alloy has, of course, considerable advantage in lower cost.

The contact of this invention compares favorably in electrical characteristics with iridium-platinum contacts, particularly on relay and magneto service and is superior to such contacts from a carburizing standpoint when exposed to hydrocarbon vapours.

As compared with platinum-ruthenium contacts generally formed from about 92% platinum and 8% ruthenium, there is, in addition to other advantages, a substantial saving in cost.

I have also found that the initial contact installation cost may be materially reduced by using one contact of my alloy against a mating contact of tungsten, molybdenum or carbides of these metals. Such substitution can be made with no reduction in contact or service life and, in some cases, a longer life is obtainable than with "mating" contacts formed of the same composition. The polarity is not of importance on alternating current service but on direct current I prefer, although not necessarily limiting myself, to use my alloy on the negative (battery) side of the contact circuit with the refractory contact on the positive (battery) side. This prevents or ameliorates transfer.

I have also found that the alloys which I have described herein may, to advantage, be used as

a substitute for gold and gold alloys generally used for jewelry, dental and other purposes, the alloy of this invention being both cheaper and harder than the standard gold or white gold metals.

Since I may desire to vary the elements of my alloy somewhat to overcome peculiar arcing characteristics or to secure various desirable degrees of hardness, I do not limit myself to the percentages set forth in my alloy but use them as illustrative of the proportions only and not as limiting proportions.

What is claimed is:

1. An electrical contact element composed of one of the metals palladium and platinum—60% to 85%; one of the metals silver and copper—10% to 35%; and one of the metals nickel, cobalt and iron—0.5% to 5%.
2. An electrical contact element composed of one of the metals palladium and platinum—70% to 80%; one of the metals silver and copper—

20% to 30%; and one of the metals nickel and cobalt—1% to 3%.

3. An electrical contact composed of about 72% palladium; about 26% silver and about 2% nickel.

4. An electrical contact element composed of 60 to 85% palladium, 10 to 35% silver and 0.5 to 5% nickel or cobalt.

5. An electrical contact element composed of an alloy containing about 0.5 to 5% nickel, about 10 to 35% silver and the remainder substantially all palladium characterized by such hardness and other electrical and mechanical characteristics as to admit of substitution for electrical contact elements of platinum-ruthenium or platinum-iridium.

6. An electrical contact element composed of an alloy containing about 2% nickel, about 26% silver and the remainder substantially all palladium, characterized by a hardness comparable with that of a 25% iridium-platinum alloy contact.

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