

UNITED STATES PATENT OFFICE

2,300,286

ELECTRICAL CONTACT

Childress B. Gwyn, Jr., Bannockburn, Ill., assign-
or to Fansteel Metallurgical Corporation, North
Chicago, Ill., a corporation of New York

No Drawing. Application May 8, 1941,
Serial No. 392,487

6 Claims. (Cl. 200—166)

This invention relates to electric contacts.

An object of the invention is to improve the compositions and combinations of compositions for electric make-and-break contacts for applications such as voltage regulators, relays and the like.

Other objects of the invention will be apparent from the following description taken in connection with the appended claims.

The present invention comprises the combination of elements, methods of manufacture, and the product thereof brought out and exemplified in the disclosure hereinafter set forth, the scope of the invention being indicated in the appended claims.

While a preferred embodiment of the invention is described herein, it is contemplated that considerable variation may be made in the method of procedure and the combination of elements without departing from the spirit of the invention.

In voltage regulators or relays the contacts should be non-fusing, have a low contact resistance with a relative small contact pressure and be capable of maintaining low resistance in service after a large number of operations.

It is of importance in contact applications to consider the type of current load placed upon the contacts. This load will normally be through a resistive circuit in voltage regulators. For relay applications, on the other hand, the load may vary from purely resistive to purely inductive. It may be a combination of resistance and inductance. It may also include capacitative loads as well.

It has been found that contacts in such services as mentioned above frequently fail on account of excessive material transfer. This transfer is a function of the electrical conditions at the time of make or break and it is also dependent upon the materials which are used for the contacts. It is well known that different metals and different alloys have widely different characteristics in their ability to withstand transfer.

It is known that the tendency of the contact materials to transfer and of the contacts to fail is also dependent upon the contact polarity. That is, if one material is used for the positive contact and another material for the negative contact in a D. C. circuit the tendency to contact failure will be different from a combination in which the materials of the positive and negative contacts are reversed. This is apparently dependent upon the characteristics of the different materials in the composition, including such factors as the arcing voltages, ionization potentials, sticking or non-fusing characteristics and the like.

According to the present invention, there is proposed the use of contact combinations for D. C. purposes wherein the contact on the posi-

tive side is characterized by the presence of an appreciable quantity of a platinum group element and the contact on the negative side is made up of a refractory metal such as tungsten in combination with silver and in some cases modifying element.

I have found the most suitable materials for the positive side to be alloys of a precious metal, e. g. of the platinum group or gold with or without silver, which may also include small amounts of hardening metals such as the metals of the iron group or copper.

For most applications the contacts for the positive side may be formed of alloys in the following range of compositions:

	Per cent
Platinum and/or palladium and/or gold	0-98
Other metals of the platinum group	0-15
Silver	0-50
Iron group or copper	0-5

The preferred contact materials for the negative side are hard alloys of high conductivity characterized by a wear-resisting ingredient such as tungsten, molybdenum or their carbides or borides, plus a conductive ingredient such as silver, copper or alloys made up principally of these elements modified by lesser amounts of other elements such as one of the iron group metals, cadmium, zinc, arsenic or the alkali or alkali-earth metals.

For most uses the negative contacts may be formed of alloys having their ingredients present in the following range of proportions:

Tungsten, molybdenum or the carbides thereof	20-80
Silver or copper	75-15
Modifying element	0-5

Examples of preferred compositions for use according to the invention are:

Positive side:		Per cent
a. Palladium		71
Platinum		25
Nickel		4
b. Palladium		84
Platinum		14
Nickel		2
c. Platinum		92
Iridium		8
d. Palladium		90
Ruthenium		10
e. Palladium		60
Silver		40
f. Gold		71
Silver		25
Nickel		4

Negative side:

a. Molybdenum	35
Tungsten carbide	25
Silver	20
Copper	20
b. Molybdenum	64
Silver	35
Nickel	1
c. Tungsten	75
Copper	24
Cobalt	1
d. Tungsten carbide	75
Silver	24.6
Copper	0.4
e. Tungsten	50
Silver	45
Cadmium	5

In comparison tests of various of the preferred combinations of the present invention with other contact combinations, it has been found that combinations selected according to the invention operate for periods of the order of 300 to 5,000 hours which is far in excess of known previous combinations.

While the present invention as to its objects and advantages has been described here as carried out in specific embodiments thereof, it is not desired to be limited thereby but it is intended to cover the invention as broadly as the spirit and scope of the appended claims permit.

What is claimed is:

1. In combination a co-operating pair of electric make-and-break contacts, one contact being formed of an alloy rich in at least one noble metal and the other contact being made up of a wear-resistant constituent selected from the sixth group of the periodic system and a conductive constituent of the class consisting of silver, copper and alloys predominating in these metals.

2. An electric contact combination for D. C. operation the contact on one side of said combination having the composition

	Per cent	
At least one metal of the group platinum, palladium, gold	0-98	45
At least one metal of the group ruthenium, rhodium, osmium, iridium	0-15	
Silver	0-50	
At least one metal of the group iron cobalt, nickel, copper	0-5	50

and the contact on the other side being made up of a wear-resistant constituent selected from the sixth group of the periodic system and a conductive constituent of the class consisting of silver, copper and alloys predominating in these metals.

3. An electric contact combination for D. C. operation, the contact on one side of said combination being formed of an alloy rich in at least one noble metal and the contact on the other side of said combination having the composition

	Per cent	
Tungsten, molybdenum or the carbides thereof	20-80	
Silver or copper	15-75	
Modifying agent selected from the class consisting of iron, cobalt, nickel, cadmium, zinc, arsenic, the alkali metals and the alkaline earth metals	0-5	

4. An electric contact combination wherein one contact is made up of platinum group metals containing a small amount of iron group metal as a modifying agent and the other contact is made up of a tungsten group metal in combination with silver.

5. An electric contact combination wherein one contact is made up of a platinum group alloy and the other contact is made up of a tungsten group metal, silver, and a small amount of another metal which serves as a modifying agent for the silver.

6. An electric contact combination wherein one contact is made of a platinum group alloy and the other contact is made up of a tungsten group metal, a small amount of a modifying agent for said metal selected from the class consisting of carbon and boron and silver.

CHILDRESS B. GWYN, JR.