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ELECTRIC CONTACT

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5 Claims. (Cl. 200—166)

This invention relates to electrical contacts. The present application is a continuation in part of prior-filed co-pending application Serial No. 258,183, filed February 24, 1939.

5 A general object of this invention is the provision of electrical make-and-break contact having improved operating characteristics.

10 A more specific object of the invention is the provision of electrical make-and-break contacts which have, due to the composition thereof, a reduced contact resistance, less tendency for arcing, pitting and transferring during the operation and which overcome particularly the danger of sticking or fusing together.

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

20 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.

25 The present invention contemplates the use of boron in proportions ranging from 0.01% to 10%, balance substantially all silver. It is also contemplated that the addition of boron can be utilized to effect improvements in silver base contact materials which may contain, in addition to silver, auxiliary metals from the iron group such as iron, nickel and cobalt and ingredients which wholly or partially alloy with silver such as copper, gold, platinum, palladium, silicon, cadmium, zinc, magnesium, tin, manganese or other contact metals.

35 The preferred ranges of percentages of the ingredients are as follows:

	Percent
40 A. Boron -----	0.1 to 10
Silver -----	Balance
B. Boron -----	0.01 to 5
Iron group metal -----	5 to 50
Silver -----	Balance
45 C. Boron -----	0.01 to 5
Alloying ingredients selected from the group consisting of copper, gold, platinum, palladium, cadmium, zinc, manganese, magnesium, tin -----	0.5 to 30
50 Silver -----	Balance
D. Boron -----	0.01 to 5
Silicon -----	0.1 to 5
Silver -----	Balance

55 Silver has advantageous characteristics for

contacts when used alone or in its alloys. The addition of boron adds further desirable characteristics to the contacts and, in several respects, supplements the advantages of silver. Our preferred method of making contacts of silver and boron consists of mixing the powders of silver and boron, pressing, and then sintering them at a temperature below the melting point of silver, preferably in a neutral or reducing atmosphere. Another method we have found suitable is to 10 press these materials cold and then apply a repressing operation at an elevated temperature such as 300° to 500° C. and then sinter the materials after such an operation. After sintering, the materials can again be repressed or be converted by hammering, rolling or swaging or other operations into any suitable form or shape from which contacts can be fabricated either by punching, heading, cutting or similar operations.

Where the auxiliary ingredients are used with the silver they may first be combined with the silver to form a silver base alloy or composition, which is then reduced to powder and mixed with the boron powder or they may be added as a powder to the mixture of silver and boron.

25 Boron of fine particle size is preferred. The boron prevents the sticking together of co-operating contacts when they are subjected to currents tending to cause fusion at the contact surface. It is thought that the boron particles form a conductive layer between the silver of the two contacts and thus prevent direct fusion together of the metal of the two contacts. Boron is excellently suited for this purpose due to its high melting point, which is in the neighborhood of 35 2500° C. Moreover, boron forms oxides which have great dissolving power for other metallic oxides and therefore keep the contacting surfaces clean.

Another advantage of the new combination is 40 that it will lend itself more readily to silver brazing of the contacts to backings than will materials of the prior art such as silver-graphite and silver-molybdenum. Materials of the prior art such as silver-graphite are very difficult to 45 braze because the silver solder does not wet the graphite and therefore the adhesion and the strength of such silver solder joints are very poor. In the case of silver boron the conditions are quite different because the boron forms some boric acid 50 or its anhydride, which acts as a flux for the silver solder, cleaning the surfaces to be brazed together.

In some cases it is proposed to back up the boron-silver contact layer by a solid metal layer 55

and produce a bi-metallic structure consisting on one side of boron silver and the other side of a metal or alloy such as silver not containing any boron, iron, copper, nickel or other metal.

- 5 Such bi-metallic strips can be cut into suitable sizes and attached to the backing by any suitable means.

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

What is claimed is:

- 15 1. An electric contact formed of a metal composition of boron from 0.01 to 10% and the balance predominantly silver, said boron being in the form of finely divided particles interspersed with and bonded by said silver.

- 20 2. An electric contact formed of a metal composition of 0.1 to 10% boron, balance silver, said boron being finely divided and interspersed with and bonded by said silver.

3. An electric contact formed of a metal com-

position of finely divided boron from 0.01 to 5%, and silver as the bonding agent therefor, metal selected from the group consisting of iron, cobalt and nickel comprising 5 to 50% of said composition contained in said silver, said silver forming substantially all of the balance of said composition. 5

4. An electric contact formed of a metal composition of 0.01 to 5% boron, 5 to 50% of metal selected from the group consisting of iron cobalt and nickel and the balance silver. 10

5. An electric contact formed of a bonded metal composition of boron from 0.01 to 5% and the balance a silver base alloy containing 0.5 to 30% of alloying ingredients selected from the group consisting of copper, gold, platinum, palladium, cadmium, zinc, manganese, magnesium and tin, said boron being finely divided and interspersed and bonded with said silver base alloy. 15

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