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METALLIC COMPOSITION

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This invention relates to a metallic composition and the manufacture thereof.

It is an object of the invention to provide a material which will have useful properties for many applications and which will be particularly suitable for electrical contacting members, because it will provide low contact resistance and long life under arcing conditions such as are encountered in electrical contacts used for making and breaking electrical circuits.

It is a further object of the invention to provide a material which will be useful for bearing purposes.

It is a further object of the invention to produce a new metallic composition and combinations of metallic elements the production of which heretofore has not been practicable.

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 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.

The invention contemplates the provision of a metallic body consisting of elements which it has been impossible to alloy by the standard methods of the prior art. The new metallic composition comprises the combination of such elements as cobalt and nickel with metals which have a low melting point and also a low boiling point, such as cadmium and zinc, and silver.

The complete composition may contain the combined ingredients in the following ranges of proportions:

	Percent
Metal of the nickel-cobalt group	25 to 90
Metal of the cadmium-zinc group	1 to 30
Silver in the least useful amount	to 70

The selection of the exact composition to be used for any purpose will, of course, depend on the specific properties desired for the applica-

tion contemplated. The following alloy compositions are therefore given as specific examples of preferable proportions for certain specific purposes:

	Percent	
a. Metal of the nicker-cobalt group	70	5
Metal from the group cadmium and zinc	28	
Silver	2	
b. Metal of the nickel-cobalt group	50	
Metal comprising the group of cadmium and zinc	10	10
Silver	40	
c. Metal of the nickel-cobalt group	30	
Metal comprising the group of cadmium and zinc	10	15
Silver	60	
d. Metal of the nickel-cobalt group	50	
Metal comprising the group of cadmium and zinc	25	
Silver	25	20
e. Metal of the nickel-cobalt group	30	
Metal comprising the group of cadmium and zinc	25	
Silver	45	
f. Nickel	60	25
Cadmium	10	
Silver	30	
g. Nickel	25	
Cadmium	5	
Silver	70	30

While the alloy described in "a" has been found very useful as a high grade bearing material, the balance of the alloys have been particularly developed to produce an electrical contacting material. By varying the proportions of the nickel or cobalt, the cadmium zinc group and the silver, the material can be adjusted for serving different contact purposes.

In certain cases, for instance, it is necessary to have non-sticking properties and a higher percentage of cadmium is found advisable. This cadmium content also will tend to lower the contact resistance. In other applications, it might be desirable to have a high, specific conductivity and therefore a high silver content is desirable; in other applications the cheapness of the material is the outstanding factor and the contact applications are not extremely severe. For such purposes, material high in a

metal taken from the nickel-cobalt group is used because this will cheapen the contact.

Furthermore, the selection of the specific composition depends on the type of manufacturing procedure that is used. If, for instance, the material must be worked into strips or sheets, a certain ratio of the nickel-cobalt metal, the zinc cadmium metal and the silver must be observed.

In producing the metal compositions of the nature disclosed, the standard alloying methods of the prior art can not be used. It is impossible, for instance, to melt down the nickel or cobalt and to add the cadmium to such a melt, because cadmium volatilizes at very low temperatures and would be almost completely lost during the standard alloying processes.

I have found it possible to make the metal compositions by another method. For instance, nickel powder is mixed with a small percentage of silver powder compressed and sintered in a reducing atmosphere or in vacuum, then a certain weight of cadmium is placed on top of this mixture and soaked into the mixture by capillary action. The product obtained is very homogeneous.

In producing materials which contain substantial quantities of silver in addition to nickel or cobalt metal and a metal of the nature of cadmium, I have found it advisable to mix all powders together and compress them either at room or elevated temperatures. If I compress at elevated temperatures a denser product is produced because at such elevated temperatures the yield point of the powders is lowered and more plastic flow is obtained, which reduces greatly the porosity of the pressed body. In subsequently sintering the metal composition I may vary the temperature of sintering and the time of sintering in order to produce the desired results. If, for instance, I have silver and cadmium present, I may sinter the material in such a way that all cadmium will alloy with the silver and form a silver-cadmium alloy which is mixed with the nickel. It is also possible, however, to carry on the sintering process only so far that part of the cadmium is left in the free condition, while another part combines with the silver. Accordingly, the contact behavior will be different. Cadmium which is left present as free cadmium will have a stronger tendency to evaporate than cadmium which has been alloyed with the silver.

In experimenting with the above mixtures, I have made a complete microscopical study and

from such a study, it can be found out definitely what times and temperatures of sintering must be employed for different size pieces, to obtain the desired properties.

In order to process the metallic composition of the present invention, it is possible to vary the mechanical and heat treatments. For instance, after the material has been pressed and sintered, it may be re-pressed and re-sintered, or it may be forged, rolled and swaged and then from such swaged strips or wires, contact plates or contact rivets might be procured which are fastened to some sort of a support by either a brazing or a welding method and used in electrical equipment as contacting elements.

While the present invention as to its objects and advantages 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:

1. A metal composition of nickel, cadmium and silver, said nickel comprising 25 to 90% of said composition, said cadmium comprising 1 to 30% of said composition, balance substantially all silver.

2. An electrical contacting member formed of a metal composition composed of a sintered mixture of powders of metal selected from the group consisting of nickel and cobalt, metal selected from the group consisting of cadmium and zinc, and silver, said nickel-cobalt group metal being present in proportions of 25 to 90%, said cadmium-zinc group metal being present in proportions of 1 to 30% and said silver being present in proportions ranging from the least useful amount to 70%.

3. An electrical contacting member formed of a metal composition of nickel, zinc and silver, said nickel comprising 25 to 90% of said composition, said zinc comprising 1 to 30% of said composition, balance substantially all silver.

4. An electrical contacting member formed of a metal composition of cobalt, cadmium and silver, said cobalt comprising 25 to 90% of said composition, said cadmium comprising 1 to 30% of said composition, balance substantially all silver.

5. An electrical contacting member formed of a metal composition of cobalt, zinc and silver, said cobalt comprising 25 to 90% of said composition, said zinc comprising 1 to 30% of said composition, balance substantially all silver.

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