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ANTIFRICTION COMPOSITION

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This invention relates to metallic bodies, comprising compositions or mixtures which are frequently termed alloys, and are adapted for use as bearing materials, brushes and the like.

It is an object of the invention to provide an improved material, having excellent antifric-tion characteristics.

It is a further object of the invention to provide an improved material which is non-scoring.

Another object is that of providing an im-proved material as aforementioned, which will have good mechanical strength, high fatigue re-sistance and high corrosion resistance.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

The present invention comprises a combina-tion of elements, methods of manufacture and the product thereof, brought out and exempli-fied in the disclosure hereinafter set forth, the scope of the invention being indicated in the appended claim.

While a preferred embodiment of the inven-tion 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.

According to the present invention, a metallic composition is provided, containing the essential ingredients in the following approximate pro- portions:

	Per cent
Metal taken from the 6th group of the periodic system, such as molybdenum and tungsten	40 to 70
Metal of the iron group, such as iron, cobalt and nickel	.1 to 10
Soft low melting metal composed pre-dominantly of metal selected from the group consisting of lead and tin	Balance

Within these composition ranges there are a number of specific compositions or mixtures, which have been found to be of particular im- portance. Several of such compositions are listed below.

(1)	Per cent
Tungsten	69
Iron	25
Lead	Substantially the balance
(2)	Per cent
Tungsten	65
Nickel	10
Lead	Substantially the balance
(3)	Per cent
Tungsten	50
Molybdenum	15
Nickel	5
Lead	Substantially the balance

The preferred method of making compositions of the type described is to press the powders of metals from the sixth group of the periodic sys- tem and the powders of metals taken from the iron group, together to a suitable density and pre-sintering such pressed bars. This sintering operation may be carried out in a reducing at- mosphere, such as a hydrogen atmosphere. The temperatures may vary according to the com- position and will range anywhere from 700-1300 degrees C.

After such sintering operations have been completed then the lead or lead alloy is placed on the top of the pre-sintered piece and the impregnation process is carried out again in a reducing atmosphere, such as hydrogen, cracked ammonia, or other suitable gases. The temper- ature of impregnation may vary considerably, according to the pressed density of the pre- sintered slug. The impregnation temperatures again may vary from 600 to 1100 or 1200 degrees C. In order to facilitate impregnation, small percentages of additional ingredients may be added, such as, for instance, silicon, phosphorus, copper or silver.

The resulting structure shows a very fine dis- tribution of lead or lead alloy particles, surround- ing the harder particles of the metals taken from the 6th group of the periodic system, and the metals from the iron group. Such a structure is ideally suitable for bearings, resulting in good antifric-tion and antiscoring properties.

Instead of impregnating it is also possible to mix the ingredients together very intimately and press them into the desired shapes. After that, they may be sintered at a temperature at which lead is in the molten condition, causing the entire structure to be promptly bonded to- gether. It is also possible to replace part of the lead by graphite, which still further improves the bearing qualities. It is also possible to add part of the ingredients in the form of compounds which decompose at sintering temperatures, so that the resulting structure does not possess the highest density, but that such structure still contains voids which may be impregnated with a lubricating medium.

Materials having a fine mechanical mixture of soft metal and harder crystals, are ideally suited for bearing purposes, due to the resulting combination of properties.

Scoring is directly connected with molecular cohesion when two solids are brought together and a more or less incipient welding of two metal surfaces in contact seems to take place. Therefore, a very thin film of oil is necessary in all bearings of this type to prevent this metal to metal contact.

In bearings of the nature described, the danger of scoring is considerably decreased, because un-

der increased heat, the lead or lead alloy might become molten, and act as a liquid lubricant.

It is believed that with the present invention a framework is formed of the refractory metal particles held together with the iron group metal and hence the material will maintain its strength and freedom from cracking or disintegrating due to softening or melting of the lead. Hence the lead is maintained at the bearing surfaces regardless of its physical condition.

A number of tests were run on bearings prepared according to the present invention, and it was found that the so-called running-in properties of this combination were superior to the bearing materials of the prior art.

I have found that instead of impregnating the refractory base with pure lead, lead alloys may be used, containing substantial quantities of tin, antimony and copper. In other words, instead of pure lead, lead alloys containing 84% lead, 5% tin, .5% copper, 10% antimony may be used, or the tin content may be even increased to the following proportions:

	Per cent
Tin	59.5
Lead	26
Copper	3
Antimony	10.5

These alloys of lead are known under the name of Babbitts and are all characterized by a low melting point.

Other so-called soft metals may also be present, but in all cases, the melting point of these lead alloys will be below 450 degrees C.

In testing bearings of the type described for hardness, it was found that the hardness will vary as a function of the temperature, and the

following values were obtained on a composition containing about 70% tungsten, .25% iron, balance lead.

Degrees C.	Brinell hardness
26.8	108
121	91
149	75
177	59
204	45
260	43

Materials of this type have been found particularly useful in bearings for clocks, washing machines, vacuum sweepers, and the like. Materials of the type described have also been found to be useful as brushes on electric motors.

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 claim.

What is claimed is:

25 An electrical apparatus brush material formed of a heterogeneous metal composition formed of 40 to 70% of particles of metal selected from the group consisting of molybdenum and tungsten, interspersed with .1 to 10% of metal selected from the group consisting of iron, cobalt and nickel and the balance substantially all a soft low melting metal composed predominantly of metal selected from the group consisting of lead and tin, said low melting metal not exceeding 50% of said composition, said low melting metal binding said composition together.

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