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SINTERED ALUMINUM BEARING

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This invention relates to sintered powder metallurgical products, and more particularly to the production of sintered porous aluminum base bearings, in which a plurality of constituents are present.

It is an object of the present invention to provide improved sintered aluminum base bearings, the metallic constituents of which have different melting points, and do not alloy readily with each other.

It is a further object of the invention to provide sintered aluminum base bearings having reduced coefficients of friction, and correspondingly improved bearing qualities.

Other objects and the advantages 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 some preferred embodiments of the invention are 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 the prior art bearings have been described that were made of a mixture of powdered aluminum and a suitable bonding metal, such as phosphor tin or a mixture of 98 parts of lead and 2 parts of phosphor tin.

It has now been found that sintered porous aluminum bearings having improved properties can be obtained from aluminum powders and/or aluminum alloy powders in combination with thallium and/or a thallium base alloy, which cannot be allowed directly in substantial quantities with aluminum, the thallium percentages ranging from .5 to 45%. The addition of thallium or the thallium base alloy may be made by various procedures, such as impregnating the compacted and sintered aluminum base with thallium or a thallium base alloy, or adding the thallium powder or thallium alloy powder as such to the aluminum powder, mixing, pressing and sintering same, or by providing an aluminum coating over the thallium particles or thallium base alloy particles. The aluminum coated particles are then pressed into suitable forms and sintered. Besides thallium or thallium alloy also some of the so-called Babbitt type materials may be added, the latter consisting primarily of tin, antimony, copper, lead and arsenic.

As examples of thallium base alloys adapted to be used in carrying out the present invention, alloys consisting of 25 to 75% by weight of thallium, 10–50% by weight of lead and 15–25% by

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weight of tin may be mentioned. The term "thallium base material" used in the present specification and claims is intended to include thallium as well as all thallium alloys having a lower melting point than aluminum, which can be used for bearing purposes and cover alloys of thallium with such metals as lead, tin, antimony, cadmium, indium.

The term "aluminum" or "aluminum base" used in this specification and the appended claims includes both pure aluminum and suitable aluminum alloys preferably of the duraluminum type, the alloying consisting of such elements as copper, magnesium, manganese, silicon zinc, chromium and nickel.

In cases where the bearing is subjected to heavy loads, it may be necessary to back it up by a solid metal, such as a ferrous alloy or a cuprous alloy. The bonding of the aluminum base powder to the backing materials can be accomplished by various means, such as coating the ferrous or cuprous alloy with metals or alloys forming an alloy, both with the aluminum and the base, such metals or alloys being zinc or zinc alloys or tin or tin alloys.

Compositions embodying the present invention contain at least 50 volume percent and up to about 98 volume per cent of the aluminum base. Due to the rather wide differences between the low specific gravity of aluminum and the specific gravities of additional metals used in carrying out this invention, it is desirable to compound the mixtures on the basis of volume percentages rather than weight percentages.

A composition desirable for bearing purposes may contain, for instance, 70 volume percent of a sintered aluminum base alloy consisting, for example, of 96% by weight of aluminum and 4% by weight of copper, or of an aluminum base alloy consisting of 92.5% by weight of aluminum, 1.5% by weight of magnesium, .6% by weight of manganese and 4.4% by weight of copper. The balance of 30 volume percent in either case may be a thallium base material, e. g. thallium or a thallium alloy consisting of 25–75% by weight of thallium and the balance being lead or lead and tin.

Another composition suitable for bearings according to our invention may contain 90% of aluminum and 10% thallium.

Good results also have been obtained with the examples given in the following table:

	Volume, per cent		
	I	II	III
Aluminum	70	85	95
Thallium		15	5
Thallium alloy consisting of 50% Pb and 50% Tl	30		

The sintered aluminum base bearings can be produced with a predetermined amount of porosity, permitting the impregnation of the bearings with lubricating media, such as oils, greases, waxes and the like. The aluminum base powders may also be mixed with graphite or molybdenum sulfide which increases the lubrication properties of the bearings.

The aluminum base alloys may be improved in ultimate strength, yield point and elongation, by the application of a heat treatment commonly known as "age hardening." This treatment consists of rapidly cooling the alloy from an elevated temperature and age hardening same at room temperature or at a slightly elevated temperature. If the sintered porous materials are impregnated with lubricants, the impregnation and heat treatment may be combined into one operation by heating the material in a medium which is used as an impregnating lubricant.

As a specific example of procedure in forming sintered bearings in accordance with this invention, a mixture of 70 volume percent of an aluminum base alloy powder consisting of 93% Al, 7% Sn, and 30 volume percent of a thallium alloy consisting of 50% Pb, 50% Tl was pressed into a suitable form under a pressure of 30 ton/m.^{2} sintered at 400° C. and then re-pressed at 50 tons/m.^{2}.

It has been found that the products embodying the present invention have many advantages. They have good thermal conductivity, low coefficient of friction and low specific gravity. Another advantage is their resistance to corrosion.

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 is intended to cover the invention broadly within the spirit and scope of the invention as defined in the appended claims.

We claim:

1. A bearing formed of an alloy composed of 0.5 to 45% thallium by volume and the balance substantially all aluminum, said bearing being characterized by low coefficient of friction and good resistance to corrosion.

2. A bearing formed of a sintered compacted porous mass of powdered aluminum impregnated with a thallium base material composed of 25 to 75% by weight thallium and of at least one of the metals selected from the group consisting of lead and tin, the aluminum constituting at least 50 volume percent of the bearing, said bearing being characterized by low coefficient of friction and good resistance to corrosion.

3. A bearing formed of a pressed and sintered porous mass composed of at least 50% aluminum by volume, the balance being substantially all thallium, and a lubricant impregnating the pores of said mass.

4. A bearing formed of a pressed and sintered shell composed of at least 50% aluminum by volume, the balance being substantially all a thallium alloy composed of 25 to 75% by weight thallium and of at least one of the metal selected from the group consisting of lead and tin, and a solid metal backing member bonded to said shell.

5. A bearing formed of a sintered compacted mass composed of at least 50 volume percent of an age hardened aluminum alloy of the duralumi-

num type, the balance being substantially all a thallium alloy composed of 25 to 75% by weight thallium and of at least one of the metals selected from the group consisting of lead and tin, said bearing being characterized by good fatigue properties, low coefficient of friction and high corrosion resistance.

6. A bearing formed of a sintered compacted mass composed of at least 50% aluminum by volume, the balance being substantially all a thallium alloy consisting of 25 to 75% by weight of thallium, 10 to 50% by weight of lead and 15 to 25% by weight of tin.

7. A bearing formed of a sintered compacted mass composed of at least 50 volume percent aluminum, the balance being substantially all a thallium alloy having a lower melting point than aluminum and composed of 25 to 75% by weight thallium and of at least one metal selected from the group consisting of lead, tin, antimony, cadmium and indium, said bearing being characterized by low coefficient of friction, good fatigue properties and high corrosion resistance.

8. A bearing formed of an alloy composed of at least 50 and not more than about 98 volume percent aluminum base material, the balance being substantially all a thallium alloy composed of 25 to 75% by weight thallium and of at least one of the metals selected from the group consisting of lead and tin, said bearing being characterized by low coefficient of friction, good fatigue properties and high corrosion resistance.

9. A bearing formed of an alloy composed of about 70 volume percent of aluminum and about 30 volume percent of a thallium alloy consisting of about 50% by weight of thallium and about 50% by weight of lead, said bearing being characterized by low coefficient of friction and high corrosion resistance.

10. A bearing formed of an alloy composed of about 85% aluminum by volume and about 15% thallium by volume, said bearing being characterized by low coefficient of friction and high corrosion resistance.

11. A bearing formed of an alloy composed of about 95% aluminum by volume and about 5% thallium by volume.

12. A bearing formed of a sintered compacted mass composed of at least 50 volume per cent aluminum, the balance being substantially all a thallium alloy having a lower melting point than aluminum, said thallium alloy consisting of 25 to 75% by weight of thallium, the balance substantially all lead.

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