May 28, 1929. W. KOEHLER 1,714,564

ANTIFRICTION AND ANTIABRASIVE METAL

Filed Aug. 1, 1927

Fig. 1.

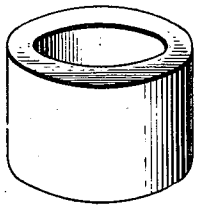
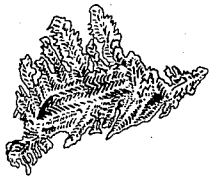


Fig. 2.



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Patented May 28, 1929. 1,714,564

UNITED STATES PATENT OFFICE.

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ANTIFRICTION AND ANTIABRASIVE METAL.

Application filed August 1, 1927. Serial No. 210,005.

This invention relates to metallic articles of manufacture, of the kind which have as a characteristic marked anti-friction and anti-abrasive properties, and is particularly adapted for bearings, contact members and moving parts for engines, generators, motors, pumps, mills, machinery, railway and motor vehicles, etc.

The invention comprises as a base, a finely divided flocculent metal powder, or a mixture of flocculent powders of two or more metals. The flocculent metal powders may be mixed with other metal powders, or with materials having lubricating properties in flake or powder form, such as graphite, mica, molybdenum sulphide, talc, etc., either singly or mixed, in any desired proportion. The mixture of flocculent metal powder or powders, with or without the addition of other anti-friction material as described, is suitably molded into any desired shape, and while still in the mold is subjected to a sufficiently high pressure applied at a suitable rate and for a desired length of time, until the mixed mass has become thoroughly intermatted and compressed to the desired degree, and the resulting product has acquired new mechanical properties, as compared with metal composition bearings and parts, as heretofore produced.

Referring to the drawings,

Fig. 1 is a perspective view of a bearing bushing embodying my invention, and

Fig. 2 is a highly magnified view of a crystal of flocculent copper suitable for practising the invention.

The flocculent metal powder used as the base for this new product is a cohesive material having new properties not possessed by powdered metals as heretofore known or used in this art. This flocculent metal powder may be produced electro-chemically as hereinafter described and is characterized by a greater degree of homogeneity and capacity for combining with other substances than powdered metal as heretofore known. Its characteristics persist in any desired state of subdivision, the particles of powder being soft to the touch, and collectively possessing to a very high degree the quality of "felting" or "self-matting" upon compression. The individual particles are characterized, when seen under the microscope, by a "feathery" crystalline appearance, and a dendritic filiform or arborescent or radiating formation, variously shaped; and upon intermingling, collectively constitute a somewhat cohesive flour-like mass, the particles of which after suitable compression, intertwine and mat with each other so as to produce a tenacious and rigid product.

A suitable process for the production of flocculent metals for my improved product consists in subjecting to electrolysis commingled solutions of any metal desired to be deposited and a metal of higher positive nature, according to the electro-chemical series, subjecting the solution to an electric current of a potential greater than that required to deposit the metal having a higher positive nature, whereupon the less positive metal will be deposited and remain on the cathode, notwithstanding the high electromotive force of the current. The desired metal will be deposited in a finely divided, powdery state, and analysis shows the metal to be substantially pure.

In carrying out my process above outlined, I preferably provide an electrolytic bath having a conductive, inert cathode, an anode composed of a conductive inert material and a material capable of ionization, and an electrolyte carrying salts of the two metals in solution. For example, if it be desired to produce copper powder, salts of copper and sodium may be utilized.

It is evident that various metals suitable for bearing purposes may be treated to put them into the flocculent form and utilized alone or in combination with other metals, likewise in flocculent form, with graphite and other anti-friction materials, for the purpose of making a wide variety of articles useful in industry wherein the coefficient of friction between them and adjacent moving parts is a matter of any importance.

The following metals I have found may be produced in flocculent form, particularly adapted for bearings and parts of this kind, viz: copper, iron, nickel, tin, zinc, antimony and lead; and the invention contemplates that these and other suitable metals may be used either singly or combined in any desired proportions.

The suitably molded and compressed product, either as a bearing block, sleeve, drum or other desired shape, may, if desired, be subjected to a greater or less degree of heat treatment, preferably in a reducing atmosphere, at a temperature which will vary with the composition of the product, but should not exceed the sweating point of the composition.

The resulting product may for some purposes, and depending upon its porosity, be saturated with a lubricating material, such as paraffin, beeswax, or other oily or grease-like material.

The product obtained is strong, ductile, and fibrous; it may be rolled, drawn, machined, and further shaped by pressure. Under test for tensile strength, a product suitable for use for a bearing has withstood a tensile strain of twenty thousand pounds per square inch; and its resistance to scoring or seizing under a moving load is much superior to rolled or cast copper or bearing metal alloys.

I claim:

1. As a new article of manufacture, an anti-friction and anti-abrasive metal composition molded to a desired shape containing metal particles characterized by great cohesiveness due to their dendritic structural formation and self-matting properties.

2. As a new article of manufacture, an anti-friction and anti-abrasive metal composition molded to a desired shape and density containing metal particles characterized by great cohesiveness due to their dendritic structural formation and self-matting properties.

3. As a new article of manufacture, an anti-friction and anti-abrasive metal composition molded to a desired shape containing particles of suitable metals characterized by great cohesiveness due to their dendritic structural formation and self-matting properties, compressed and heat treated to constitute a tough, ductile homogeneous product.

4. As a new article of manufacture, an anti-friction and anti-abrasive metal composition molded to a desired shape containing metal particles mixed with lubricating material in powder or flake form, said metal particles being characterized by great cohesiveness due to their dendritic structural formation and self-matting properties.

5. A bearing composed of comminuted metal the particles of which have a highly orientated crystalline formation, and afford an enormous expanse of filiform surface capable of ready association and admixture with similar particles of the same metal or particles of other metals having similar structure, and possessing great compressibility and affinity for each other.

6. A bearing composed of comminuted metal the particles of which have a highly orientated crystalline formation, and afford an enormous expanse of filiform surface capable of ready association and admixture with similar particles of the same metal or particles of other metals having similar structure, and possessing great cohesiveness.

7. A bearing composed of compressed comminuted arborescent crystalline self-matting metal particles and a lubricating material in intimate admixture, the particles of metal presenting extensive structural configuration and possessing great affinity for each other whereby the product containing said particles is strong, ductile, non-disintegrating and self lubricating.

8. An anti-friction and anti-abrasive article composed of flocculent copper and another metal harder than copper, the particles thereof having cohesive properties, consolidated under pressure to form a machinable, pressure resisting composite material capable of operation under high pressure at high temperature without deterioration.

9. An anti-friction and anti-abrasive article composed of flocculent copper and another metal, the particles thereof having cohesive properties, consolidated under pressure to form a machinable, pressure resisting composite material capable of operation under pressure and at high temperature without deterioration.

In testimony whereof I affix my signature.

WILLIAM KOEHLER.