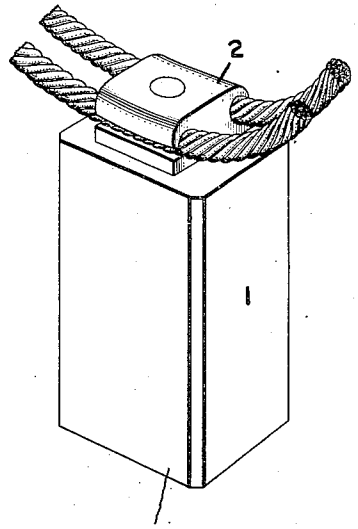
E. G. GILSON.

PROCESS OF MAKING BEARING COMPOSITIONS.

APPLICATION FILED JULY 7, 1910.

1,071,044. Patented Aug. 26, 1913.



Witnesses:
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UNITED STATES PATENT OFFICE.

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PROCESS OF MAKING BEARING COMPOSITIONS.

1,071,044. Specification of Letters Patent. Patented Aug. 26, 1913.

Application filed July 7, 1910. Serial No. 570,787.

To all whom it may concern:

Be it known that I, EMERY G. GILSON, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Processes of Making Bearing Compositions, of which the following is a specification.

My invention relates to the manufacture of metallic articles containing a lubricating material, such as graphite, and which are suitable for uses requiring a minimum of friction between rubbing or sliding parts, such as brushes for dynamo-electric machines, dash-pots, bearings for shafts and the like.

In accordance with my invention, an intimate mixture of graphite and a reducible metallic compound or compounds, for example, metallic oxids, is heated to a temperature sufficient to reduce all but a small percentage of the oxids by interaction with some of the graphite. The reduction mass, still containing a certain percentage of unreduced material, is then compressed into desired form and the reduction is continued after compression until it is substantially complete and consolidation of the metals has taken place. The presence of unreduced material in the mixture before compression appears to prevent both segregation and agglomeration of the metal powder and results in a homogeneous, strong product in which the graphite is distributed with great uniformity. Although appearing perfectly solid and dense, articles made by this process are still porous enough to absorb considerable oil.

The accompanying drawing illustrates a dynamo-electric machine brush made in accordance with my invention.

I will explain my invention as applied to the manufacture of metallic articles consisting chiefly of copper associated with some metal or metals, which will alloy with copper, such as tin, lead or zinc, and in addition to these metals containing graphite as a lubricating material. The alloying metal is added to aid the consolidation of the copper particles by soldering them together during the final stage of the process to form a coherent homogeneous mass, and it also acts as a lubricant.

A typical mixture, for example, consists of 100 parts of black copper oxid, CuO, 10 parts of tin oxid, SnO_2, and 125 parts of graphite. These materials, of course, should be in a finely divided condition and thoroughly mixed. For this purpose they can conveniently be pulverized in a ball mill. This mixture is placed in a suitable retort, consisting for example of copper, and is heated for about 8 hours to a temperature of 650 to 700° C. At the end of this time a large part of the metals will have been reduced by the graphite to a metallic state but the mixture should contain small amounts of unreduced oxids. The amount of unreduced material will vary somewhat with the character of the mixture. Some mixes need contain at this stage of the proceedings no more than .5 to 2.5% of oxid but, of course, only relative figures can be given. The length of time that the mixture is heated and the temperature to which it is subjected should be varied in accordance with the character and proportion of the mixture and other conditions so as to leave at least the above amount of unreduced oxid. For example, if lead is used in addition to tin, the reduction temperature should not be much more than 600° C. and the time should be shortened.

Upon cooling, the mixture is put through a 100 mesh sieve and is compressed into predetermined form—for example, the block 1 as shown in the drawing. The compressed articles are then packed in charcoal, so as to exclude air, and are again heated to a temperature of 650 to 700° C. until the reduction of the metals is substantially complete and alloyage between the copper and tin, lead, or other metal has taken place. To obtain these results, it is advisable to regulate the heat and the duration of heating so as to reach the above temperature at the end of about 18 hours, the heating being then continued for about 60 hours. If the finished article is to be used as a brush it may then be provided with suitable current connections 2.

As an alternative method of obtaining the

thorough incorporation of the materials, a reducible salt, for example, copper acetate is dissolved in water and the tin oxid and graphite are added to the solution. The solution is evaporated to dryness, the tin oxid and graphite being maintained uniformly distributed by constant stirring. The mass is then placed in a ball mill and finely powdered.

The subsequent reduction is preferably carried out in a crucible which is provided with a dasher for the purpose of constantly agitating the material during the reduction. The agitation in this case appears to be necessary to avoid agglomeration of the metal. The reduction takes place at a temperature in the neighborhood of 600° C., the range of temperature being somewhat lower than is the case when employing copper oxid. The reduction is continued for 2½ to 3½ hours, at the end of which time all but about 5% of the tin oxid and copper oxid formed at this stage should have been reduced to the metallic state by the graphite. The copper, of course, will not be present as acetate since the acetate is decomposable by heat and breaks down to form the oxid. In this case, as well as in the alternative method of preparation described above, the mixture will be spoiled by carrying the reduction too far. In the latter method, however, the minimum amount of unreduced oxid permissible is in the neighborhood of 2½%, and as a rule 5% is preferable. After reduction the powder is put through a 100 mesh sieve and compressed into the required form. The pressed blocks are finally heated for a long time in order to complete the reduction and agglomerate the particles in the manner described above.

These examples will serve to indicate the steps of the process, but it will, of course, be understood that the proportions will be varied in accordance with the properties desired in the finished article, the length of time required for reduction and the temperature of the reduction being in turn varied somewhat in accordance with the materials used and their proportion, but in each case the conditions should be so regulated as to leave a small amount of unreduced metallic oxid in the reduction mixture before compressing the same into final form.

Articles made by the above process are more or less porous and are capable of absorbing as high as 5% by weight of oil. Whether any oil can be introduced advantageously into the finished article, of course, depends upon the use to which they are finally put.

It is to be understood that my invention applies to the manufacture of bearing material containing metals other than those above specified. Any metal which has the requisite physical properties and which can be readily reduced, as, for example silver, can be used in place of copper. In the same manner other alloying metals can be used, or they may be left out entirely.

What I claim as new and desire to secure by Letters Patent of the United States, is,—

1. The process which consists in subjecting a mixture of reducible metallic compounds with a reducing material to a temperature sufficient to reduce by the action of said reducing material all but a small percentage of said compounds to the metallic state, then compressing the mixture in a predetermined shape and finally heating at the reduction temperature until the reduction is substantially complete.

2. The process which consists in subjecting a mixture of copper oxid, an oxid of metal alloyable with copper and graphite to a temperature at which reduction of said oxids by the graphite takes place and continuing the reduction until all but a small percentage of the metallic constituents have been reduced, then compressing the mixture and continuing the reduction until said metals have been substantially completely reduced and alloyage has taken place.

3. The process of making current collectors for dynamo-electric machines which consists in subjecting to a temperature of about 600° to 700° C. a mixture of graphite, copper oxid, and an oxid of a reducible metal capable of alloying with copper and continuing the reduction until all but a small percentage of the metals have been reduced, then compressing the mixture and subsequently continuing the reduction.

4. The process which consists in subjecting a mixture of copper oxid, tin oxid and graphite to a temperature of about 600 to 700° C., until all but about .5–5% of said oxids have been reduced to the metallic state, then compressing the mixture and subsequently continuing the reduction until it is substantially complete.

5. The process which consists in subjecting a mixture of reducible metallic compound and a reducing agent to the temperature necessary to effect chemical reaction, agitating the material while reduction takes place, molding the reduction mixture before the reduction is complete and then continuing the reduction until consolidation of the materials has taken place.

6. The process of making a metal-graphite composition which consists in molding a mixture comprising copper, a soft metal alloyable with copper and reducible by carbon from its oxid, a small percentage of an oxid of at least one of said metals, and graphite in excess of the amount necessary to reduce said oxid, and heating in an inert

environment until substantial reduction of the oxid and consolidation of the materials has taken place.

7. The process of making brushes for dynamo electric machines which consists in compressing a mixture comprising copper, tin, about .5 to 5% of oxid of said metals, and graphite in excess of the amount necessary to reduce said oxid, and firing the molded mass with the exclusion of air until substantial reduction of the oxid and agglomeration and alloyage has taken place.

In witness whereof, I have hereunto set my hand this 6th day of July, 1910.

EMERY G. GILSON.

Witnesses:

HELEN ORFORD,

BENJAMIN B. HULL.