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METHOD OF MAKING BEARINGS

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Fig. 1.

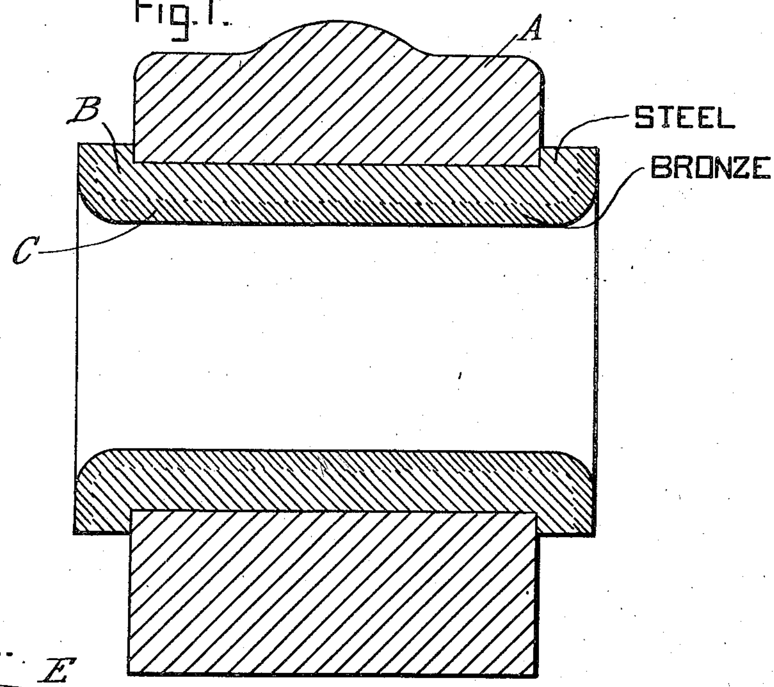
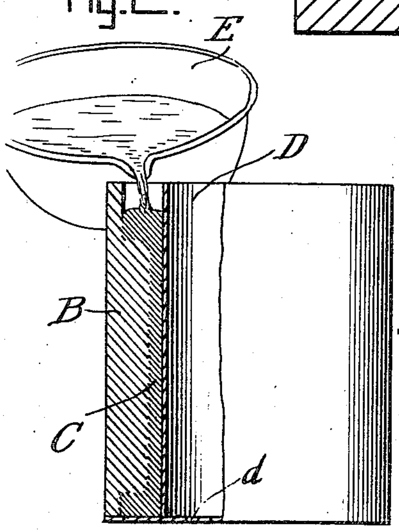


Fig. 2.



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METHOD OF MAKING BEARINGS

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6 Claims. (Cl. 22—58)

In the development of motors designed for high speed and heavy loads it is important that they be of the lightest weight possible in order that the least amount of power may be required to propel their own weight and, therefore, that metal of the lightest weight possible be employed. This has resulted in the improvement of metals used for such purposes so that the weight has been decreased without impairing the strength and endurance qualities but more flexibility has resulted, such improved metals being capable of withstanding more or less flexing. Such flexing of the metals as well as the speed of or the load carried by the motor causes a strain upon the bearings used which breaks down lining of such material as Babbitt metal, which has heretofore been generally employed for such purposes, and also results in the loosening of the bond between the Babbitt lining and the metal of which the shell is composed, thereby materially decreasing the life of the bearing and impairing its efficiency in use. Inasmuch as the value of the motor in service can equal only the life of the bearing it becomes more and more important in the development of this art that bearings be provided which will stand up under the flexing and the great speed and the great load imposed without danger of destruction in the performance of such duty and particularly without separation of the metals of which the shell and the lining are composed.

The object of my said invention is to provide a bearing and a method of making the same composed of metals which will provide a bearing of the necessary strength and rigidity and a bearing surface which will be of comparatively soft wearing quality but at the same time capable of resisting much higher temperature and withstanding much greater strain or "pounding" in service than metals such as Babbitt metal; and also one in which the metals are united by a bond that makes them practically integral and incapable of separation under flexing or any other strain. I have found by experience that a steel shell affords the best foundation for a bearing such as required for the purpose indicated for the reason that it may be of lighter weight for the same degree of strength than any other metal which I have found suitable for the purpose. I have also found that so-called "plastic bronze" makes a most desirable metal for the lining or wearing surface for the bearing. By "plastic bronze" I mean a composition composed of copper and lead the proportions of which may be varied to suit different conditions and different requirements, a suitable composition being thirty (30) parts of lead and seventy (70) parts of copper. "Plastic bronze" is generally understood to also include, if desired, copper alloys of from 4% to 7% tin with 20% to 30% lead and with or without small quantities of nickel. It will be understood that in using the term "plastic bronze" herein it is intended to include all such suitable compositions and variations thereof. As is well known the melting point of steel is considerably higher than the melting point of the bronze but the melting point of bronze is very much higher than the melting point of babbitt and the bronze of a composition such as above indicated while affording a most excellent surface for the bearings of high speed motors, nevertheless is of a density and tenacity capable of resisting the wear and heavy duty required.

In the manufacture of bearings of my said invention I employ a method by which the steel shell and the bronze lining or bearing surface are united by fusing the two metals to unite them by a bond that makes them practically integral and permanent so that separation under any strain, load or flexing imposed by the duty of the motor is impossible.

In the accompanying drawing, Figure 1 illustrates a bearing such as contemplated by my invention, the bearing housing usually of aluminum or any other appropriate metal being indicated by the reference letter A, the steel shell by the reference letter B, and the bronze lining by the reference letter C.

In Figure 2 I illustrate a method of forming the bearing which consists in mounting a cylinder D with a bottom *d* within the shell B and pouring the molten bronze from a ladle E into the space between the cylinder and the inner surface of the shell. It will be understood of course that the ends of the bearing are machined off appropriately after the bearing is finished. The bottom *d* of the cylinder D is large enough to cover the end of the shell B as clearly indicated.

While I have illustrated this as a method by which the molten bronze may be applied to the shell it will be understood, of course, that any other appropriate method may be employed, whether it be the method of pouring, the method of die casting, or the method of applying by centrifugal force or any other method now known or found appropriate. And I also want it understood that while I have specified "steel" and "plastic bronze" as the two metals preferable in use that these terms are used as meaning any metals that may be found capable of the use intended. Further, while the method described has been found particularly adapted for the purpose set forth it will be understood of course that it may be modified within the scope of the appended claims. For example, the steel shell and lining metal may be heated together to a temperature where the lining metal will be a substantial degree above its melting point and the steel shell a substantial degree below its melting point or the parts may be heated separately to different temperatures so long as the steel shell is a substantial degree below its melting point and the lining metal a substantial degree above its melting point. The two metals may be united or applied to each other in any manner found practicable, the particular method illustrated and described being one that I have found suitable for the purpose. As will be understood the steel back and the lining metal may be united in flat sheet form if desired and then rolled or otherwise shaped to form a bearing of the shape desired.

In the practice of the method by which these bearings are produced the steel shell of appropriate thickness is heated to a temperature which is approximately the temperature required for melting the bronze metal which is to be used to provide the bearing surface. The bronze metal is heated not only to the melting point but to approximately two hundred (200) degrees above its melting point and then is applied to the surface of the shell by the method heretofore described and illustrated in Figure 2 of the drawing or by any other method found appropriate. The bronze metal being in a fluid condition and the steel of a temperature substantially the same as that of such bronze metal the two metals fuse and unite firmly together forming a bond that makes the two metals practically integral and incapable of separation regardless of strain, flexing or other duty imposed in use.

After the bronze metal is poured or otherwise applied to the steel shell it is allowed to cool for a short period sufficient to allow the two metals to fuse together but before the lead in the composition of the bronze can settle and separate from the copper by reason of its greater gravity the bearing is immersed in a cold bath and cooled quickly so that the copper and lead content of the bronze composition are held in the metal properly mixed and of the same relative proportions throughout.

The bearing resulting from the practice of the method herein set forth is made the subject matter of another application No. 575,117, filed November 14, 1931, as a division of this application.

While I have illustrated a bearing with the shell lined on its inner surface with the bronze it will be understood of course that its outside may be in a like manner covered with a bronze bearing surface or the bearing surface may be applied to both sides of the steel shell, depending upon the character of use for which the bearing is intended.

By this method a bearing is provided which has been found capable of withstanding the severe requirements of motors designed for the highest speed in airplane and other service and by actual test and comparison such bearings have been able to far exceed in their efficiency in these respects any bearings made by any other processes heretofore known.

Having thus fully described my said invention, what I claim as new and desire to secure by Letters Patent, is:

1. The method of forming bearings which consists in heating a steel shell to approximately the melting point of the bronze lining metal, heating the bronze lining metal to a temperature higher than its melting point, depositing said lining metal while so heated upon the surface of the heated shell, permitting the two metals to fuse and then rapidly cooling the same.

2. The method of forming bearings which consists in providing a steel shell of relatively light flexible character, heating said shell to approximately the melting point of a plastic bronze lining metal, heating said plastic bronze lining metal to a temperature higher than its melting point, depositing said lining metal while in its molten state upon the surface of the heated steel shell, pausing for a short space of time to permit the two metals to fuse and then rapidly cooling the same.

3. The method of forming bearings which consists of heating a steel body to a temperature higher than the melting point of a composition metal for the bearing surface, mounting a cylindrical core concentrically within said heated steel body, then applying the composition lining metal heated to a temperature higher than its melting point in the space between said core and steel body, allowing time for the two metals to fuse and then immersing the bearing and core in a cold bath to set the composition.

4. The method of forming bearings which consists in combining a steel shell of relatively flexible character with a lining of "plastic bronze" by heating the two metals to a temperature that will not melt the steel but will melt the lining metal, permitting the two metals to fuse and then rapidly cooling the same.

5. The method of forming bearings which consists in combining a steel shell with a lining of "plastic bronze" by heating the two metals to a temperature that will not melt the steel, but will melt the lining metal, permitting the two metals to fuse and then rapidly cooling the same.

6. The process of producing a bearing having an outer iron or steel layer, and an inner layer consisting primarily of copper and lead, said two layers being autogenously welded together at their meeting surfaces, which process comprises contacting a molten mass of said copper and lead to form said inner layer, with said outer iron or steel layer heated to a temperature sufficiently high to produce an autogenous weld between the layers; permitting said bearing to stand for a time sufficient for an autogenous weld to form between the layers; and finally drastically chilling said bearing.

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