

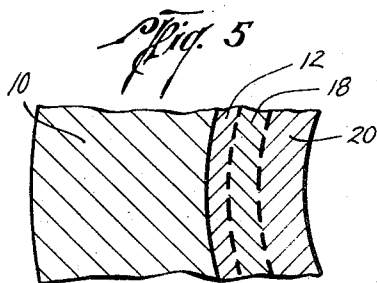
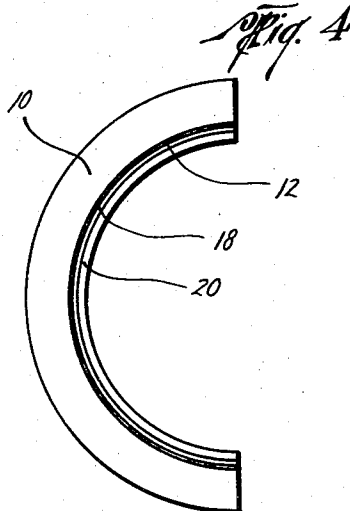
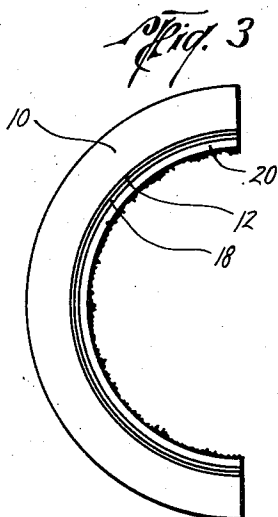
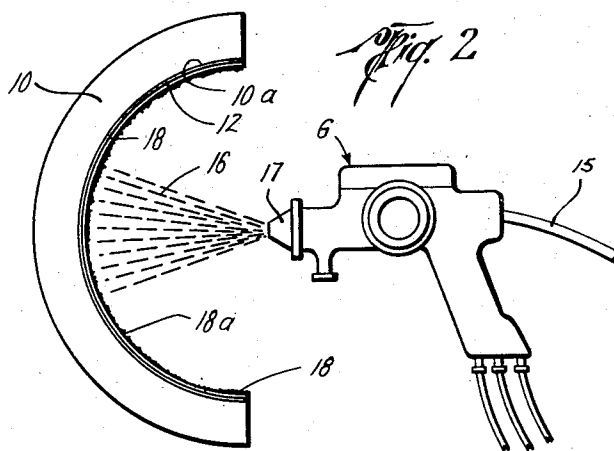
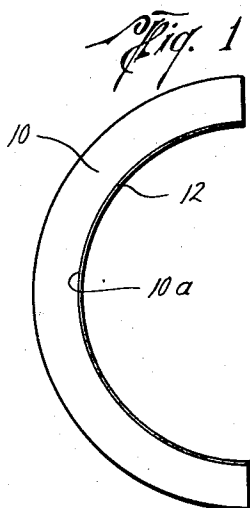
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2,833,667

METHOD OF LINING A BEARING SHELL

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1

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METHOD OF LINING A BEARING SHELL

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4 Claims. (Cl. 117—50)

This invention relates to new and useful improvements in bearings and methods of making same.

In the manufacture of bearings, such as the bearings for engine shafts, a bearing shell is generally lined with a bearing material such as babbitt. The babbitt is ordinarily poured on a tin coated bearing shell to form a predetermined thickness of the babbitt lining. As the babbitt cools from its liquid to the solid state after being poured into the metal sleeve or shell, there is a relatively high shrinkage of the babbitt as compared to the metal shell and as such shrinkage of the babbitt occurs, the tin coating is pulled loose from the bearing shell so that the bond between the babbitt and the metal bearing shell is weakened or separated to such an extent that the babbitt flakes out or otherwise fails after relatively short periods of use. Attempts have been made to apply the babbitt material by spraying. Material applied by spraying is not subject to the shrinkage which occurs in poured material but no practical way has been heretofore devised to produce an efficient and satisfactory bond between the babbitt material and the bearing shell.

One object of this invention is to provide an improved method of applying babbitt material to a bearing shell wherein the babbitt material is sprayed onto the bearing shell and an efficient bond between the babbitt material and the shell is produced.

An object of this invention is to provide a new and improved babbitt lined bearing in which the shrinkage of the babbitt metal in the bearing body member or shell is substantially completely eliminated whereby a failure of the bearing due to an improper bond between the bearing body member or shell and the babbitt is prevented.

An important object of this invention is to provide a new and improved lined bearing and a method of making same wherein an initial layer of babbitt is applied in a relatively thin layer to a bearing body member or shell having a layer of tinning material thereon to fuse the babbitt to the tinning material without weakening or damaging the bond between the tinning material and the bearing body member.

Another object of this invention is to provide a new and improved bearing and the method of making same, wherein the bearing is formed by spraying a relatively thin layer of babbitt material onto a previously tinned surface on a bearing shell when the bearing shell is at a temperature slightly above the melting point of the tinning material so that as the babbitt and the tin cool and thus harden, the babbitt and tin are fused into a layer which is firmly bonded to the bearing shell; the initially applied babbitt material providing a surface which facilitate the application of additional babbitt material by spraying, whereby the babbitt material may be built up to the desired thickness.

The construction designed to carry out the invention will be hereinafter described together with other features thereof.

The invention will be more readily understood from a

2

reading of the following specification and by reference to the accompanying drawings forming a part thereof, wherein an example of the invention is shown, and wherein:

5 Figure 1 is an elevation illustrating a bearing shell which has had its inner bearing surface coated with a tinning material which is bonded thereto.

Figure 2 is a view similar to Figure 1, but illustrating the application of the initial sprayed layer of babbitt to 10 the tinned surface of the bearing shell.

Figure 3 is a view similar to Figure 1, but illustrating the bearing after additional babbitt has been applied to the tinned surface of the bearing shell.

Figure 4 is a view similar to Figure 3, but illustrating the bearing of Figure 3 after the babbitt has been machined to a desired thickness. 15

Figure 5 is an enlarged fragmentary view illustrating a portion of the bearing shown in Figure 4.

In the drawings, the numeral 10 designates a conventional bearing shell which is substantially semi-cylindrical and which is adapted to be used as a bearing for engine shafts and the like when the inner curved surface of 10a of the shell 10 is lined with a bearing material. The bearing shell 10 is made of steel, cast iron, brass or 25 any other material that can be successfully coated on its inner surface 10a with a conventional tinning material.

In the present invention, a relatively thin layer of tinning material is initially applied to the surface 10a of the bearing shell 10 by any of the known methods wherein the tinning material is effectively bonded to the bearing shell. For example, the bearing shell 10 can be dipped into a molten bath of tinning material after the surface 10a to be tinned is properly cleaned with acid or other 30 suitable material. The tinning material is either tin or an alloy thereof, and usually is an alloy containing 70% tin and 30% lead. The tinning material is applied in a relatively thin layer and for best results, the thickness of the tinning layer 12 (Fig. 1) should not exceed .002 inch. After the tinning material layer 12 is formed on the surface 10a, all of the flux and other impurities which might 35 be present as a result of the tinning step are removed in the usual manner, for example, by washing with water.

The bearing shell 10 with the tinning material layer 12 thereon is then heated to a temperature slightly above the melting point of the tinning material so that the tinning material becomes softened to a semi-solid condition. The heating of the bearing shell to soften the tinning layer 12 can be accomplished with numerous heating devices or methods that are well known, such as an electric 40 oven or the like.

Preferably, the shell 10 is heated until the tinning material 12 becomes liquefied and then the shell 10 is cooled, or is permitted to cool, until the tinning material is just changing to a solid state. At this point a thin layer of babbitt metal is sprayed onto the tinning material layer 12 (Fig. 2). The spraying of the babbitt material is accomplished with a metallizing gun G of conventional construction into which is fed a babbitt rod 15 and which 45 sprays babbitt material 16 from a nozzle 17 of the gun G. Since the tinning material 12 is in a softened or semi-liquid state, the sprayed particles of babbitt metal 16 actually penetrate to some extent and fuse with the tinning material so that there results what is believed to be an alloying or fusing of the tinning 12 and the babbitt material so that what is referred to as the babbitt layer 18 has its inner portion fused with the tinning material while its outer portion comprises babbitt material layer 18 as the layers 12 and 18 cool. The babbitt layer 18 is relatively 50 thin and is of such thickness that the force of shrinkage developed by the applied babbitt as it cools is insufficient to damage, weaken or otherwise harm the bond between the

3

tinuing material layer 12 and the bearing shell 10. For best results, the layer consisting of the fused tinning and babbitt material should be between .004 and .006 inches in thickness.

The spraying of the babbitt 16 to form the initial babbitt layer which is fused to the tinning material 13 produces a somewhat roughened or irregular external surface 18a due to babbitt particles extending therefrom which surface is particularly suitable for the mechanical bonding of subsequent babbitt material thereto. Thus, after the layer 18 has cooled below the point at which it solidifies, then additional babbitt material is sprayed onto the initial babbitt layer 18 to build up the babbitt liner to a predetermined desired thickness. In Fig. 3, the bearing shell 10 is shown after the additional babbitt material has been added to form the thickness of babbitt 20 on top of the initial babbitt layer 18.

Due to the relatively irregular surface 18a of the initial babbitt layer 18, the additional babbitt is bonded to said layer by what is believed to be an interlocking or intermingling of the sprayed babbitt particles and such bond could be termed a mechanical bond as distinguished from the fusion bond between the tinning layer 12 and the initial babbitt layer 18. Additional babbitt material is then applied by spraying and since shrinkage is no appreciable factor where the material is sprayed an excellent bond between such additional material and the initial layer is produced. Thus, the required thickness of babbitt lining is firmly bonded to the bearing shell 10 and the flaking out and other defects in prior known bearings is avoided, whereby increased service is obtained from the bearings of this invention.

After the bearing has been completed with a sufficient application of babbitt material (Fig. 3), the external surface of the babbitt is then machined to the required smoothness and thickness in the usual manner and such bearing in its final machined condition is illustrated in Fig. 4. In Figure 5, a portion of the completed bearing is illustrated in the fragmentary sectional view wherein the parts are enlarged to show the relationship more clearly between the bearing shell 10, the tinning layer 12, the initial babbitt layer 18 which has a portion thereof fused with the tinning material and the additional babbitt material 20.

The bearing produced by the above method has numerous advantages over the prior known babbitt lined bearing since the bearing of this invention eliminates the flaking out of the babbitt from the bearing shell after the bearing has been in service a short time. Also, the excellent bearing properties of sprayed babbitt are utilized while maintaining an adequate bond with the bearing shell. The sprayed babbitt has a certain amount of porosity which permits it to absorb oil which results in better lubrication and further reduces wear and increases the life of the bearing.

It should be noted that although the above description of the bearing and the method of making same has been directed to a bearing of the type ordinarily used for engine shafts and therefore of a semi-cylindrical construction, the invention is applicable to other types of bearing body members having different shapes and uses than that illustrated and described above.

As heretofore described, the bearing shell with the tinning material layer thereon is initially heated to a temperature slightly above the melting point of the tinning material by any suitable means. It would be possible to carry out this initial heating step by immersing the bearing shell in a vat of molten babbitt material which is at a temperature of about 75° F. to 100° F. above the melting temperature of the babbitt material. Such immersion would function to heat the bearing shell as well as the tinning material and would bring about some fusion of babbitting material with the tinning material. Upon removal of the shell from the vat of molten babbitt material, the surplus babbitt material is wiped from the sur-

4

face, leaving a very thin layer of fused babbitt and tinning material on the shell.

As has been described, the layer of fused babbitt and tinning material would be permitted to cool, and, when this material was just changing from a liquid to a solid state, the initial babbitt layer 18 would be sprayed thereon. This initial babbitt layer would then fuse with the material already on the shell, which, as above pointed out, would be a combination of tinning material with some babbitting material which had fused therewith by reason of immersion into the vat of molten babbitt.

The foregoing disclosure and description of the invention is illustrative and explanatory thereof and various changes in the size, shape and materials, as well as in the details of the illustrated construction, may be made, within the scope of the appended claims, without departing from the spirit of the invention.

What is claimed is:

1. In a method for the production of lined bearings, the steps of, heating a bearing shell having a layer of tinning material bonded thereto to a temperature sufficient to soften the tinning material to a semi-solid condition, and then spraying a relatively thin layer of babbitt onto the layer of tinning material while the tinning material is in such semi-solid condition to effect a fusion of the babbitt with the tinning material whereby the applied babbitt and the tinning material are firmly bonded to the bearing shell the layer consisting of the fused tinning and babbitt material being between .004 and .006 inches in thickness, and the inner portion of said babbitt layer is fused with said tinning material and the outer portion of said babbitt layer comprises babbitt material only as the tinning and babbitt layers cool, the thickness of the applied babbitt layer being such that the force of shrinkage developed by the applied babbitt layer as said babbitt layer cools is insufficient to affect the bond between the tinning material and the bearing shell.

2. In a method for the production of lined bearings, the steps of, heating a bearing shell having a layer of tinning material bonded thereto to a temperature sufficient to soften the tinning material to a semi-solid condition, and then spraying a relatively thin layer of babbitt onto the layer of tinning material while the tinning material is in such semi-solid condition to effect a fusion of the babbitt with the tinning material whereby the applied babbitt and the tinning material are firmly bonded to the bearing shell the layer consisting of the fused tinning and babbitt material being between .004 and .006 inches in thickness, and the inner portion of said babbitt layer is fused with said tinning material and the outer portion of said babbitt layer comprises babbitt material only as the tinning and babbitt layers cool, the thickness of the applied babbitt layer being such that the force of shrinkage developed by the applied babbitt layer as said babbitt layer cools is insufficient to affect the bond between the tinning material and the bearing shell, and thereafter spraying additional babbitt material to the initial babbitt layer to build up a bearing surface of desired thickness.

3. In a method of lining a bearing shell having a layer of tinning material bonded thereto, the steps of, heating the bearing shell to a temperature slightly above the melting point of the tinning material to liquefy the tinning material, then permitting the tinning material to cool, and then spraying a relatively thin layer of babbitt onto the layer of tinning material at the time said tinning material is just changing from a liquid to a solid state whereby the applied babbitt and the tinning material are firmly bonded to the bearing shell the layer consisting of the fused tinning and babbitt material being between .004 and .006 inches in thickness, and the inner portion of said babbitt layer is fused with said tinning material and the outer portion of said babbitt layer comprises babbitt material only as the tinning and babbitt layers cool, the thickness

5

of the applied babbitt layer being such that the force of shrinkage developed by the applied babbitt layer as said babbitt layer cools is insufficient to affect the bond between the tinning material and the bearing shell.

4. In a method of lining a bearing shell having a layer of tinning material bonded thereto, the steps of, heating the bearing shell to a temperature slightly above the melting point of the tinning material to liquefy the tinning material, then permitting the tinning material to cool, and then spraying a relatively thin layer of babbitt onto the layer of tinning material at the time said tinning material is just changing from a liquid to a solid state whereby the applied babbitt and the tinning material are firmly bonded to the bearing shell the layer consisting of the fused tinning and babbitt material being between .004 and .006 inches in thickness, and the inner portion of said babbitt layer is fused with said tinning material and the outer portion of said babbitt layer comprises babbitt material only as the tinning and babbitt layers cool, the thickness

6

of the applied babbitt layer being such that the force of shrinkage developed by the applied babbitt layer as said babbitt layer cools is insufficient to affect the bond between the tinning material and the bearing shell, and thereafter spraying additional babbitt material upon the initial babbitt layer to build up a bearing surface of desired thickness.

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