Oct. 13, 1959 L. J. SCHMID 2,908,056

MANUFACTURE OF BEARINGS

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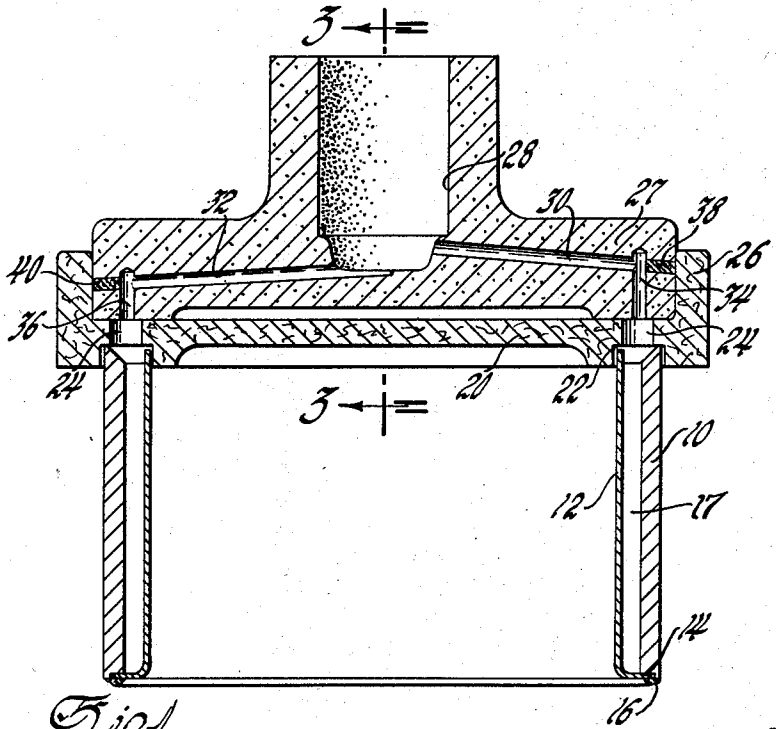


Fig. 1

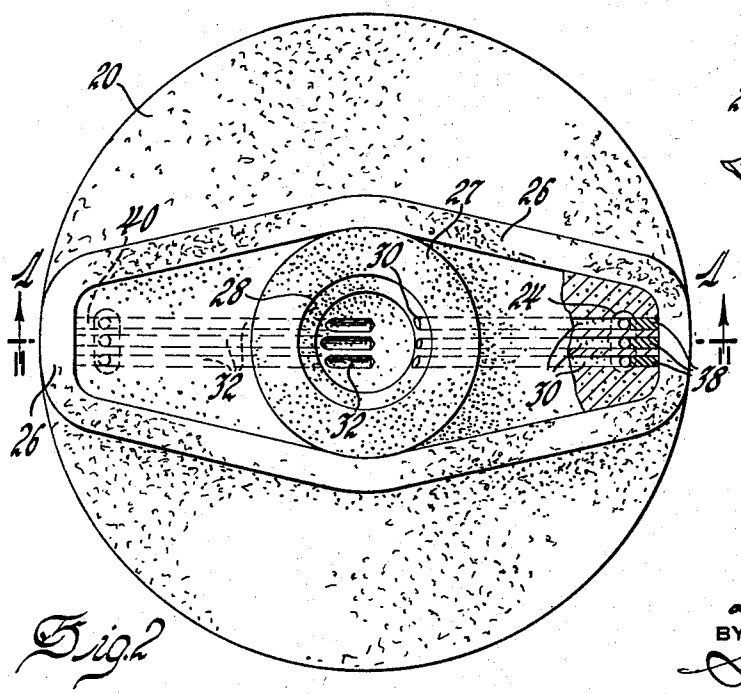


Fig. 2

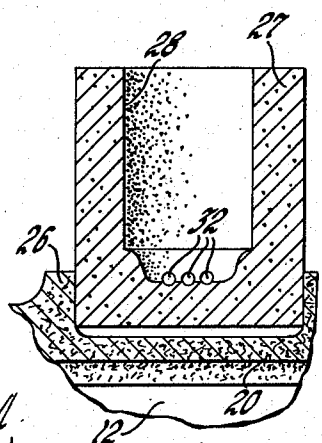


Fig. 3

INVENTOR
Leonard J. Schmid
BY
L. E. Ross
ATTORNEY

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MANUFACTURE OF BEARINGS

Leonard J. Schmid, Brownsburg, Ind., assignor to General Motors Corporation, Detroit, Mich., a corporation of Delaware

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This invention relates to the manufacture of bearings and is more particularly concerned with an apparatus and method of forming composite bearings comprising a reinforcing back of strong metal to which is strongly bonded a softer bearing material.

One method which has been used prior to this invention for making composite bearings is to weld to the reinforcing back a metallic member to form a space between the member and reinforcing back or shell within which bearing metal can be cast. The composite mold structure comprising the reinforcing back and member welded thereto then has a protective cover placed thereon having a pouring basin and passages leading to the mold cavity. The entire assembly is heated, preferably in a nonoxidizing or reducing atmosphere to insure that the mold surfaces of the back and member welded thereto will be free of oxides during the step of casting the bearing metal. After the composite mold structure and protective cover have been heated to a suitable temperature, they are removed from the furnace and molten bearing metal is cast into the mold cavity. One form of protective cover that has been used is one of molded graphite or molded clay-graphite. The cover has a pouring basin which provides a molten head of metal in the upper portion of the casting to feed bearing metal to take care of shrinkage which occurs during solidification. Where a protective atmosphere is used in the preheat furnace the cover also serves to maintain the controlled atmosphere of the furnace within the cavities after removal from the furnace. Protective covers formed of graphite or mixtures of clay and graphite deteriorate rapidly due to abrasion resulting from the handling of the covers necessitated by their reuse. Particles abraded from the undersurfaces of the cover fall into the mold cavity and become entrapped in the solidified bearing metal thereby resulting in a defective bearing. The primary object of the present invention is to eliminate disadvantages resulting from protective covers heretofore employed in making composite bearings and like articles.

Other objects and advantages of the invention will become more apparent as the description proceeds.

Reference is herewith made to the accompanying drawings in which:

Figure 1 is a sectional view on line 1—1 of Figure 2 illustrating a composite protective cover in accordance with one embodiment of the present invention in position for casting molten bearing metal into contact with a reinforcing back.

Figure 2 is a top plan view with parts broken away of the protective cover of Figure 1.

Figure 3 is a fragmentary sectional view on line 3—3 of Figure 1.

In Figure 1 of the drawing there is shown an annular reinforcing back or shell 10 having within it a sleeve 12 having an outwardly extending flange 14 welded at 16 to the reinforcing back at the lower end thereof to form an annular space 17 for reception of cast bearing metal. The weld 16 is continuous and forms an air-tight joint

between the flange and reinforcing back. The welded assembly consisting of shell 10 and flanged sleeve 12 may be regarded as a composite mold assembly. Above the composite mold assembly is a composite protective cover. The protective cover comprises a portion 20 formed of molded silicon carbide. The silicon carbide portion is of generally circular configuration. The lower face of the silicon carbide portion of the protective cover has an annular groove 22 for reception of the upper end of the composite mold. The silicon carbide member also has passages 24 leading from the annular groove 22 to the upper face thereof. On the upper face of the silicon carbide member 20 there is an upwardly extending flange 26 forming an elongated pocket or nest for reception of a member 27 of molded graphite or molded clay-graphite. Member 27 has a hollow portion 28 forming a pouring basin and, as seen in Figure 1, a plurality of generally similar passages 30 leading outwardly to the right and a plurality of generally similar passages 32 leading to the left. The passages 30 and 32 are connected with transversely extending passages 34 and 36, respectively, which lead to the openings 24 in the silicon carbide member. In making the upper portion 27 of the cover, the graphite or clay-graphite mixture is molded generally to the shape desired and thereafter the passages are formed by drilling. The graphite or clay-graphite member is relatively soft and this makes it possible to readily drill the passages. The outwardly extending passages 30 and 32 are formed by drilling from the outer surface of the graphite or clay-graphite to the pouring basin and the portions of these passages outwardly from the transverse passages 34 and 36 are stopped off by plugs 38 and 40, respectively, which may be formed of graphite, clay-graphite or other suitable refractory material. A suitable refractory cement such as "Silmanite" may be used to cement the plugs in place.

The composite cover has an extremely hard, refractory portion of molded silicon carbide which resists abrasion from contact with the upper end of the bearing shell or mold, and at the same time a softer refractory portion of graphite or clay-graphite which can be readily drilled to form the necessary passages to conduct molten bearing metal from the pouring basin to the mold. The graphite or clay-graphite portion also provides carbon which can react with any traces of oxygen which may be present to form CO and/or CO_2, thereby insuring that there will be no significant traces of oxygen to react with the shell backing and bearing metal being cast. The composite cover is one having extremely long life. The rejection rate of bearings produced by use of the composite cover is greatly lowered.

The method and apparatus of the present invention are particularly advantageous in the formation of composite bearings comprising a steel backing member and a cast bronze or cast leaded-bronze metallurgically bonded thereto. It will be understood, of course, that the principles of the invention are applicable to other backing materials and bearing metals.

It will be understood that the entire assembly including the protective cover is heated in a furnace having a nonoxidizing or reducing atmosphere therein prior to casting the molten bearing metal. A typical example of a highly satisfactory nonoxidizing atmosphere is one composed as follows:

Constituents:	Percent by volume
Hydrogen	15.5
Carbon Monoxide	11.5
Carbon Dioxide	3.5
Nitrogen	Bal.
Dew point—45° F.	

The heating is such that the molten bearing metal being cast is not chilled below its melting point when it comes into contact with the reinforcing back or shell. Generally therefore the mold and cover are heated in the furnace to a temperature somewhat above the melting point of the bearing metal. In the case of a bronze or leaded-bronze bearing material a temperature on the order of 2,000° F. has proven especially satisfactory in practice. It will be understood, of course, that the temperature will vary with the melting point of the particular bearing metal being employed. The nonoxidizing or reducing gas insures clean surfaces on the bearing back so that the bearing metal will become strongly bonded thereto. Under some conditions it is contemplated that a flux may be used that is solid under atmospheric conditions but which is fluid or molten at the temperature to which the mold and bearing back are heated. After removal from the furnace the molten bearing metal is poured into the pouring basin where it flows into the mold.

After the cast bearing metal has solidified the protective cover may be removed. Thereafter the sleeve 12 is removed by machining and the backing and cast bearing metal are machined to final dimensions. The result is a composite bearing comprising a reinforcing backing to which is strongly bonded a cast bearing metal.

It will be understood that the composite protective cover may also be employed in making composite bearings having one or more flanges. Likewise the protective cover may be used in forming composite bearings in which the cast bearing metal is on the outside of the reinforcing shell or backing.

Changes and modifications of the embodiments of my invention described herein may be made without departing from the principles and spirit of the invention.

I claim:

1. In combination a metallic bearing backing member and a metallic sleeve member spaced from one another to form an annular cavity therebetween, a first cover member formed of molded silicon carbide on said metallic members forming an upper wall for said cavity, a second cover member formed of the material taken from the group consisting of graphite and clay-graphite supported by said first cover member, a centrally located pouring basin in said second cover member, a plurality of vertically disposed apertures in said first cover member laterally disposed from said pouring basin, a plurality of passages in said second cover member extending substantially horizontally from said basin to each of said apertures, said passages and said apertures presenting to said cavity a continuous enclosed conduit operative to inhibit passage of gases between said cavity and the atmosphere.

2. In combination a metallic bearing reinforcing member and a metallic sleeve member spaced from one another to form an annular cavity therebetween, a first cover member formed of molded silicon carbide and having an annular groove in the lower face thereof for the reception of the upper ends of the said metallic members forming an upper wall for said cavity, a second cover member formed of the material taken from the group consisting of graphite and clay-graphite supported by said first cover member, a centrally located pouring basin in said second cover member, at least one vertically disposed aperture in the groove of said first cover member laterally disposed from said pouring basin, a plurality of passages in said second cover member extending substantially horizontally from the outer periphery of said basin to said aperture, said passages and said aperture presenting to said cavity the continuous enclosed conduit operative to inhibit passage of gases between said cavity and the atmosphere.

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