Nov. 10, 1931. C. R. SHORT 1,831,325

LINED BEARING MEMBER AND METHOD OF FORMING SAME

Filed March 1, 1926

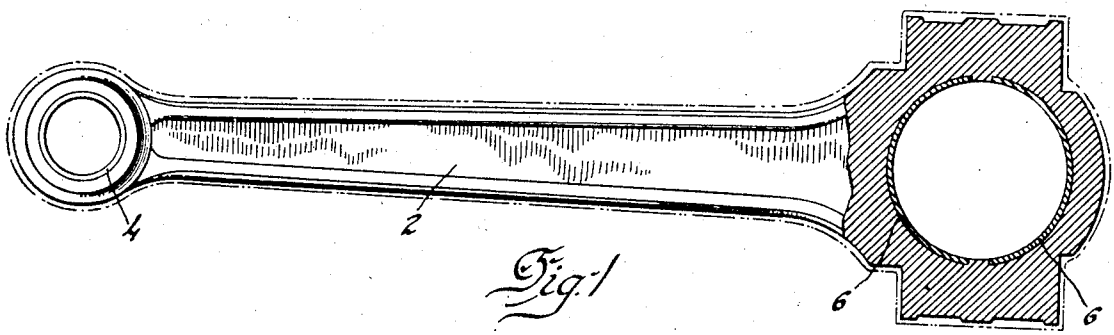


Fig. 1

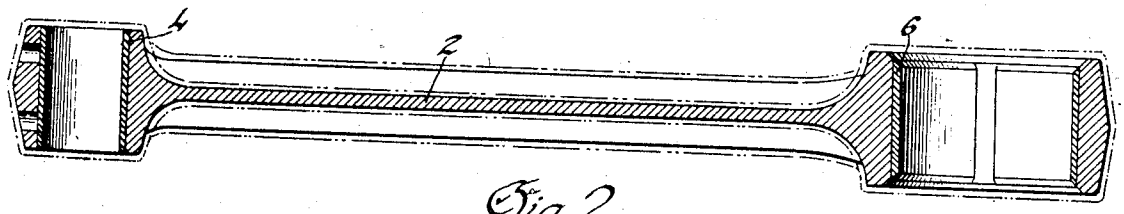


Fig. 2

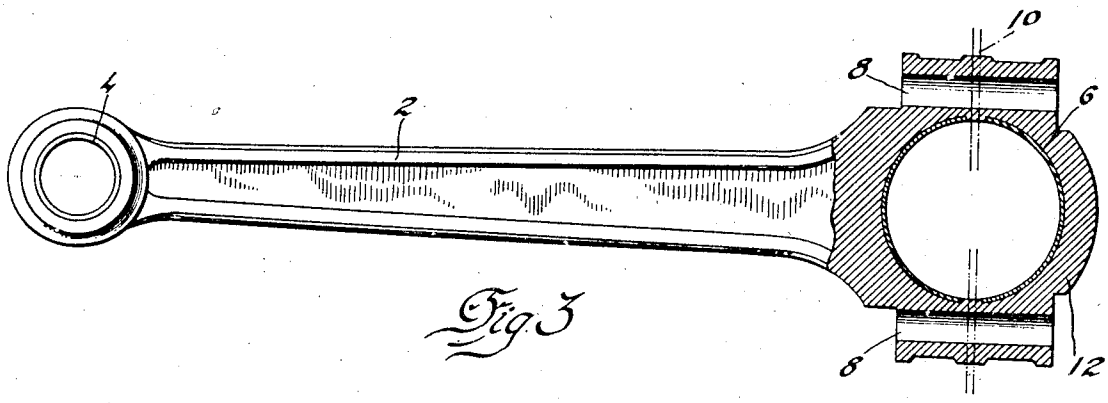


Fig. 3

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Patented Nov. 10, 1931

1,831,325

UNITED STATES PATENT OFFICE

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LINED BEARING MEMBER AND METHOD OF FORMING SAME

Application filed March 1, 1926. Serial No. 91,505.

In my Patent No. 1,711,000, issued April 30, 1929, I have described a method of making parts of metals which are only slightly malleable, such as aluminum or aluminum alloys, which possess many points of advantage over prior methods of working metals of this class. As set forth in that specification by first casting the article to the approximate shape desired and then subjecting it to heavy pressure as by forging or rolling I secure a strong dense molecular structure which is not weakened by flaws such as are produced when metals possessing the above characteristics are shaped by forging only. By this process I secure also a smooth finished surface in contrast to the rather rough, pitted surface which is characteristic of casting, and there is at the same time sufficient flow of metal to fill up any small interior cavities which may be produced in the casting operation.

The present application has to do with articles made according to the process just described but is also of a broader application. The invention consists, in its broadest aspect, in making a lined bearing member by casting the member about the liner. This of course necessitates that the liner be of a material which is not melted at the pouring temperature of the metal forming the back. Thus I may make use of a plain or porous bronze liner and a backing of aluminum alloy. While the resulting bearing member may be used in this form, first being subjected to some finish machining operations, I have found it desirable to improve the bearing by compacting the metal of the back after the manner described in my prior application. In addition to producing a densification of the molecular structure of the back this operation results in an improved heat conducting bond between the liner and the back and, from another point of view, my invention includes within its scope the generic idea of forming a good bond between a bearing liner and a bearing member by the application of heavy pressure to the latter. In carrying out my process in its preferred form, the casting, which has been lined in the manner just described, is subjected to heavy pressure as by a forging operation. To prevent distortion of the liner the latter is fitted over studs which hold it against collapse. The effect of the forging operation is that described in my prior application; in other words, a desirable densification of the molecular structure of the metal, while at the same time the liner is more firmly gripped and seated in the bearing member improving the contact between the liner and back so that heat is more readily conducted away from the bearing. If desired, I may employ liners of porous bronze composition known commercially as "Durex bearings"; these liners serving to retain a considerable quantity of oil and being thus self lubricating.

As a further adaptation of this invention I may employ the method described in the making of lined bearing segments. In this case I place a plurality of segmental liners in a mold and cast the back about them as before. After the material of the back has been compacted as described I may sever the back and segments and thus produce a split bearing member.

Referring to the drawings:

Figure 1 is a plan view of a connecting rod embodying my invention.

Figure 2 is a side elevation.

Figure 3 is a plan view of the finished article.

I have selected for illustration a connecting rod 2 provided with a bushing or liner 4 at one end and segmental liners 6 at the other. These liners are, as previously described, placed in the mold and the connecting rod is cast about them. While the connecting rod which constitutes the bearing back may be of any suitable material my process is particularly applicable to the treatment of connecting rods made of aluminum or aluminum alloy, such as aluminum silicon. I have indicated in dot-and-dash lines in Figures 1 and 2 the approximate shape of the connecting rod before the forging operation, the shape of the rod after the forging operation being indicated by full lines. In the forging operation the bearing apertures encircle studs provided in the forging die so as to prevent distortion of the lining.

As shown, the forging effects an over-all reduction in the size of the connecting rod and produces a strong, compact molecular structure.

Figure 3 indicates the connecting rod after it has been subjected to machining operations such as drilling of the holes 8, and trimming of the rough edges which result from forging. I have indicated at 10 the cut which will next be made in the "big end" bearing in order to produce a separable bearing cap 12 to permit the application of the connecting rod to the crank shaft in the usual manner.

While I have chosen a connecting rod for purposes of illustration, it is apparent that my improved process may be employed in the manufacture of various bearing members. While the process is described in connection with a bearing member of aluminum or aluminum alloys it is, of course, susceptible of application in the manufacture of bearing members of any of the metals or alloys suitable for this purpose.

I claim:

1. The method of securing a good heat conducting bond between a liner and a bearing member which consists in placing the lined bearing in a die shaped to fit the liner and compacting the bearing member about the liner by the application of heavy pressure to the said member so as to cause the member to approach finished shape as well as assume a dense molecular structure.

2. The method of forming a lined split bearing member which consists in casting the bearing member about the entire lining at one operation and then severing the bearing member and lining to produce bearing segments.

3. In the method as defined by claim 2, the additional step of compacting the said member about the liner by the application of pressure prior to the severing operation.

4. The method of forming a lined split bearing which consists in preparing a plurality of lining segments, mounting the segments in a suitable mold, casting the member about the segments and then severing the bearing member and segments.

5. A bearing assembly consisting of a liner and a bearing member cast about the liner, and compacted thereabout by the application of pressure.

6. A bearing assembly consisting of a liner and a backing of a material which is not readily formed by forging, the backing material being cast about the liner and compacted thereabout by the application of pressure.

7. A bearing assembly consisting of a liner and a bearing member compacted about the liner into the desired size and shape by the application of heavy pressure.

8. The method of making a lined bearing member, which consists in preparing a liner of substantially finished dimensions, mounting the liner in a suitable mold, casting the member about the liner, and working the member under pressure so as to cause it to approach finished shape and to give to it a dense molecular structure insuring a good heat conducting bond between the liner and back.

9. A lined bearing member consisting of a porous bronze liner and a backing cast about the liner and compacted thereabout by the application of heavy pressure thereto.

In testimony whereof I affix my signature.

CHARLES R. SHORT.