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BEARING-METAL ALLOY.

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This invention relates to improvements in bearing metal alloys having approximately the following basic composition:

70 to 75 percent of lead,
15 to 25 percent of antimony,
3 to 6 percent of tin.

Such bearing metal alloys, as it is known, are composed of mixed crystals containing antimony and tin imbedded in or surrounded by a softer ground mass or continuous phase consisting of lead, with some dissolved antimony and tin in eutectic concentration. It stands to reason that a bearing metal which only contains in maximo 6 percent of tin will show heavy disadvantages in comparison to the high-grade tin alloys formerly used for bearing metals, because only a small amount of hard mixed crystals can be formed, imbedded in the highly compressible and soft ground mass.

Now, we have found that for the purpose of improving such bearing metal alloys with a very high content of lead and a relatively small content of tin as indicated above, it is of great advantage to harden in the first place the softer ground mass consisting mainly of lead whereby the compressibility of the alloy is obviated or reduced. Such a hardening effect is only to be produced by adding small quantities of metals which will be taken up by the lead in solid solution and join the eutectic such as, for instance, cadmium, bismuth, thallium, mercury. It may be stated, by way of example, that the hardness of lead is increased from 150 to 200 percent by an addition of only 2 percent of cadmium.

By detailed researches we have found that the best hardening results are obtained by limiting the additions of the metals mentioned above to 0.5 to 5 percent of the whole, these metals being used separately or in combination.

(*a*) 71.5 percent of lead,
22.0 percent of antimony,
4.0 percent of tin,
1.0 percent of cadmium,
0.7 percent of copper,
0.3 percent of phosphorus,
0.5 percent of arsenic,

By way of example, the following basic composition of a bearing metal alloy with a high lead content and a relatively small content of tin as well as of antimony may be mentioned:

75 percent of lead,
16 percent of antimony,
5 percent of tin,
4 percent of cadmium.

By adding to such a basic composition of bearing metal alloys certain constituents which increase the hardness of the eutectic, bearing metal alloys are obtained which, though containing only a very small (up to about 6 percent) amount of tin, are to all intents and purposes fully equivalent substitutes to the prior bearing metal alloys with a high tin content.

For the purpose of improving the basic bearing metal composition described above, the following additions may be made use of:

Copper as it is shown by the following example:

74 percent of lead,
18 percent of antimony,
4 percent of tin,
3 percent of cadmium,
1 percent of copper;

Nickel or the equivalent cobalt, for example:

73.5 percent of lead,
20 percent of antimony,
4 percent of tin,
0.5 percent of cadmium,
0.5 percent of copper,
1.5 percent of nickel;

Phosphorus (or its metallic alloys) or the equivalent arsenic, for instance, in the following compositions:

(*b*) 70.5 percent of lead,
22.0 percent of antimony,
4.0 percent of tin,
0.5 percent of cadmium,
0.7 percent of copper,
0.3 percent of phosphorus,
0.5 percent of arsenic,
1.5 percent of nickel;

Metals of a high melting point such as iron, manganese, chromium (the total amount of these metals present not exceeding about 2 percent of the alloy):

72.0 percent of lead,
20.0 percent of antimony,
3.0 percent of tin,
1.0 percent of nickel,
0.5 percent of arsenic,
1.2 percent of copper phosphide,
0.8 percent of iron,
0.5 percent of manganese,
0.5 percent of chromium,
0.5 percent of bismuth.

Of course, the various hardening constituents may be added in combination to the basic composition described above as is illustrated by the following example:

74.0 percent of lead,
15.0 percent of antimony,
4.0 percent of tin,
2.0 percent of cobalt,
0.5 percent of arsenic,
1.5 percent of copper phosphide,
1.0 percent of iron,
0.5 percent of phosphorus,
1.0 percent of bismuth,
0.5 percent of thallium.

What we claim is:

1. A bearing metal alloy comprising approximately from 70 to 75 percent of lead, 15 to 25 percent of antimony, 3 to 6 percent of tin, and appreciable quantities of cadmium not exceeding 5 per cent.

2. A bearing metal alloy consisting of about 70.5 percent of lead, 22 percent of antimony, 4 percent of tin, 0.5 percent of cadmium, 0.7 percent of copper, 0.3 percent of phosphorus, 0.5 percent of arsenic and 1.5 percent of nickel.

3. A bearing metal alloy containing crystallized components in a eutectic ground mass rich in lead, said alloy containing 70 to 75 per cent lead, 15 to 25 per cent antimony, 3 to 6 per cent tin, 1 to 3 per cent nickel, and 0.6 to 2 per cent copper, and said eutectic containing another metal in solution in substantial amount not exceeding 5 per cent of the whole composition.

4. A bearing metal alloy containing crystallized components in a eutectic ground mass rich in lead, said alloy containing 70 to 75 per cent lead, 15 to 25 per cent antimony, 3 to 6 per cent tin, 1 to 3 per cent nickel, 0.6 to 2 per cent copper, and a substantial amount, not exceeding 1 per cent, of an element of the phosphorus group, and said eutectic containing another metal in solution in substantial amount not exceeding 5 per cent of the whole composition.

5. A bearing metal alloy containing crystallized components in a eutectic ground mass rich in lead, said alloy containing 70 to 75 per cent lead, 15 to 25 per cent antimony, 3 to 6 per cent tin, 1 to 3 per cent nickel, 0.6 to 2 per cent copper, a substantial amount, not exceeding 1 per cent of an element of the phosphorous group and a substantial amount, not exceeding 1 per cent of a metal of the iron group, and said eutectic containing another metal in solution in substantial amount not exceeding 5 per cent of the whole composition.

In testimony whereof we affix our signatures.

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