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(54) HEAT-RESISTANT BEARING MATERIAL

(76) Inventors: **Roland Ruch**, Schopfheim (DE); **Lutz Steinert**, Schopfheim (DE); **Klaus Wintrich**, Schopfheim (DE)

Correspondence Address:
RADER, FISHMAN & GRAUER PLLC
39533 WOODWARD AVENUE, SUITE 140
BLOOMFIELD HILLS, MI 48304-0610 (US)

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(57) **ABSTRACT**

A heat-resistant bearing material consisting of an austenitic iron matrix alloy should, under high temperatures, have good solid lubricant properties with a high heat resistance and a high creep resistance. To this end, an iron matrix alloy is used, containing a sufficient sulphur part for obtaining a solid lubricant action on the bearing surfaces thereof, and between 1 and 6 wt. % of at least one of the following alloy elements: tungsten (W), cobalt (Co), niobium (Nb), rhenium (Re), molybdenum (Mo), tantalium (Ta), vanadium (V), hafnium (Hf), yttrium (Y), zirconium (Zr), and/or comparably high-melting alloy elements.

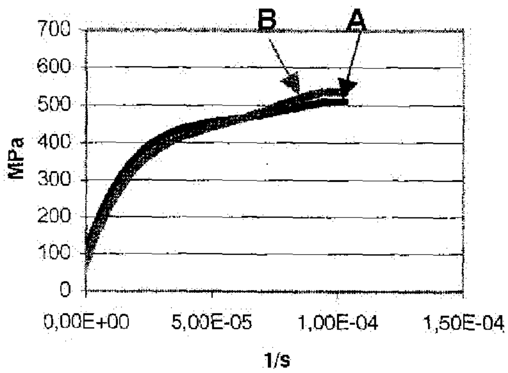

Fig. 1a

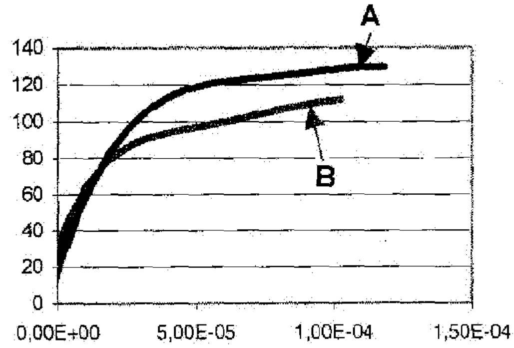

Fig. 1b

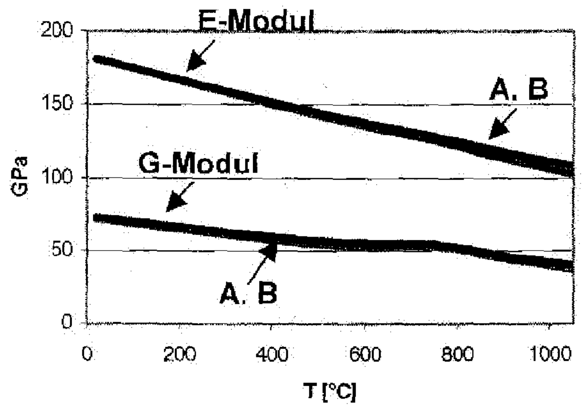

Fig. 2

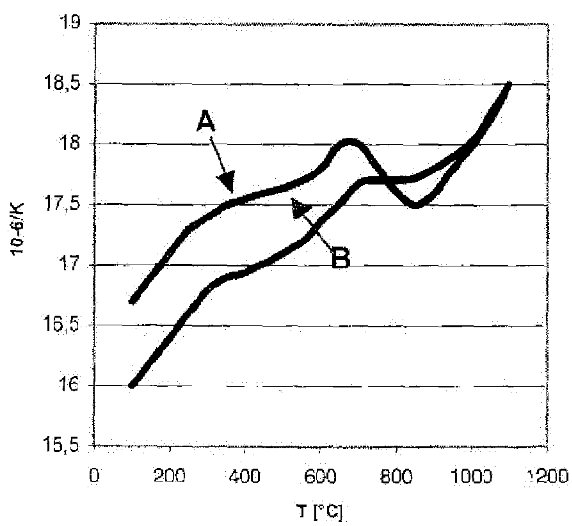

Fig. 3

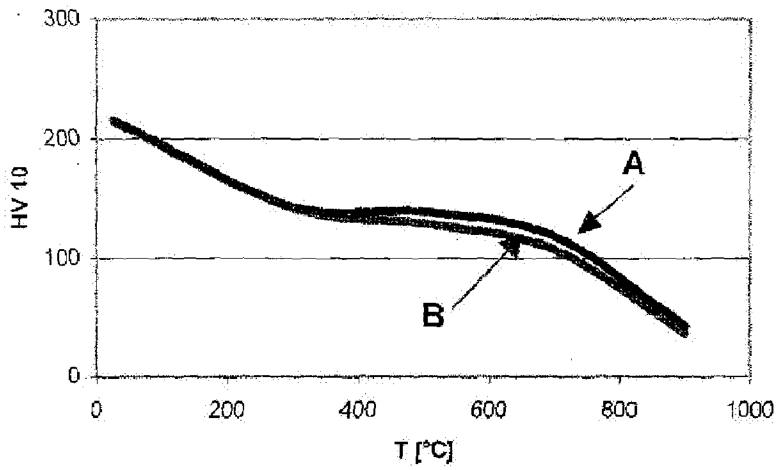

Fig. 4

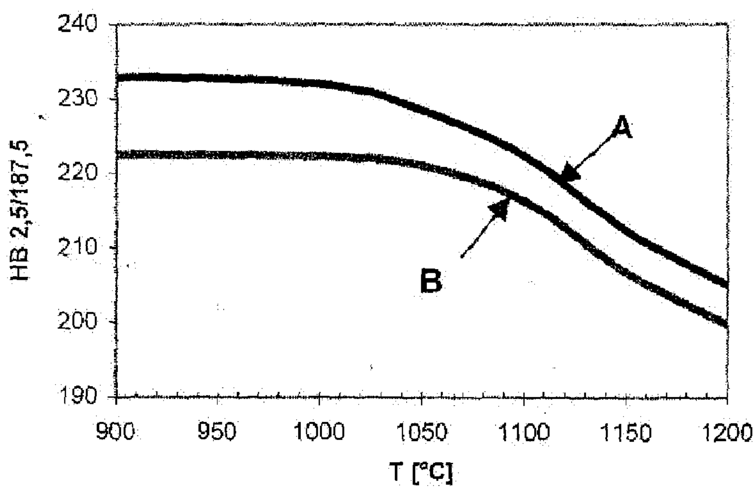

Fig. 5

	E	$R_{p0,2}$	R_m	[illegible]	λ
	[GPa]	[MPa]	[MPa]	[g/cm3]	[W/mK]
A	183	377	506	7,7	10,4
B	183	330	463	7,74	10,5

Fig. 6

HEAT-RESISTANT BEARING MATERIAL

[0001] The invention relates to a heat-resistant bearing material consisting of an austenitic iron matrix alloy, and here addresses the problem of making such a bearing material functionally reliable for use at high temperatures, especially at temperatures exceeding 600° C., in particular exceeding 850° C. The bearing material here is to exhibit solid lubricant properties, which are to be retained at the specified high temperatures to as high a degree as possible.

[0002] This object is achieved by means of a bearing material according to the characterizing features of claim **1**

[0003] Advantageous alloys of such a bearing material are the subject matter of the subclaims.

[0004] The invention is based on the general idea of providing sulfur in a percentage amount that allows sulfides required for a lubricating effect to form within the alloy. Such a formation of sulfide within an austenitic matrix alloy intended to exhibit a high creep resistance and high strength at high temperatures is a contradiction in and of itself. This contradiction stems from the fact that, based on general expert knowledge, sulfides contained in such a material are disadvantageous for a high creep resistance and high strength at high temperatures because they constitute a structural disturbance, and must therefore be avoided. Therefore, the invention proposes something that runs absolutely counter to general expert knowledge with respect to the objective of obtaining a material that is highly creep resistant and strong in terms of temperature, and still exhibits lubricating properties even at high temperatures, and hence represents a surprising result not to be expected by an expert.

[0005] The drawing shows a few diagrams depicting characteristics for bearing materials according to the invention. The curves denoted in individual diagrams relate to a material according to claim **7** if marked A, and a material according to claim **8** if marked B.

EXPLANATION TO INDIVIDUAL DIAGRAMS

[0006] FIG. **1***a*, **1***b*

[0007] These diagrams show the creep behavior of alloys A and B during the gradual exposure of a sample in increments of 2 MPa, a retention period of 35 sec and when measuring the creep rate in the last 5 sec of the retention period, specifically in part a for a creep behavior at 700° C., and in part b for a creep behavior at 900° C.

[0008] FIG. **2**

[0009] This diagram records the modulus of elasticity E and sheer modulus G for alloys A and B as a function of temperature.

[0010] FIG. **3**

[0011] This diagram depicts the thermal expansion coefficient for alloys A and B as a function of temperature.

[0012] FIG. **4**

[0013] This diagram records the hot hardness (in HV10) on the ordinate as a function of the temperature for alloys A and B.

[0014] FIG. **5**

[0015] The ordinate shows the hardness (in HB 2.5/187.5) for alloys A and B after stored for a respective 2 hours and air-cooled as a function of temperature.

[0016] FIG. **6**

[0017] This figure contains a table that indicates values for p =density, λ=heat conductivity, R_{p02}=expansion limit, R_m=tensile strength, E=modulus of elasticity for alloys A and B at respective room temperature.

[0018] All features described in the specification and the following claims can be significant to the invention both individually and taken together in whatever form.

1. A heat-resistant bearing material that is an austenitic iron matrix alloy, consisting of:

a sufficient sulfur percentage to achieve a solid lubricant action on bearing surfaces of the bearing material, and

between 1% w/w and 6% w/w of at least one or more of the melting alloy elements:

tungsten (W), cobalt (Co), niobium (Nb), rhenium (Re), molybdenum (Mo), tantalum (Ta), vanadium (V), hafnium (Hf), yttrium (Y), zirconium (Zr) and an alloy with a comparable melting point to the melting alloy elements; and

wherein the following alloy composition is included, where the individual alloy elements are each indicated in % w/w:

C=0.4-0.6
Cr=18-27
Nb=1.4-1.8
Ni=12-22
S=0.2-0.5
Si=2.9-3.2
Residue=Iron
Contaminants or unspecified alloy elements up to 3.

2. The bearing material according to claim **1**, wherein the following alloy composition is included, where the individual alloy elements are each indicated in % w/w:

C=0.4-0.6
Cr =18.5-20.5
Nb =1.4-1.8
Ni =12.5-14
S =0.25-0.45
Si=2.9-3.15
Residue=Iron
Contaminants or unspecified alloy elements up to 3.

3. The bearing material according to claim **1**, wherein the following alloy composition is included, where the individual alloy elements are each indicated in % w/w:

C=0.4-0.6
Cr=24.5-26.5
Nb=1.4-1.8
Ni=19.5-21.5
S=0.25-0.45
Si=2.9-3.15
Residue=Iron
Contaminants or unspecified alloy elements up to 3.

4. The bearing material of claim **1**, wherein a paddle bearing ring is constructed of the bearing material.

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