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METHOD FOR HEAT TREATING BEARINGS
AND PRODUCT THEREOF

Lucien Peras, Billancourt, France, assignor to Regie Nationale des Usines Renault, Billancourt, France, French works

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Rings for bearing balls and rollers are at present almost generally made of steel having the following composition: carbon 1%—Cr about 1.30%—Mn about 0.40%—silicon content less than 0.40%.

Before being ground to the final dimensions, the balls and rollers are subjected to a hardening treatment, followed by tempering at a low temperature around 150° C. and their hardness, measured on the Rockwell machine by the penetration of a diamond cone under a load of 150 kg. lies between 62 and 67.

Bearings made in this way are very satisfactory to ensure the good running of mechanisms which only have to withstand a moderate temperature. But as soon as the temperature of a bearing in operation exceeds 180° C., the bearing surfaces wear very rapidly and the bearings themselves become unfit for use in a very short time; very often, in fact, the mechanism in which they are used deteriorates through the friction and the shocks which, themselves, result from the eccentricity created by increases in play caused by wear.

According to the invention, rings and rollers are so constituted that, without abnormal wear, they can withstand continuous service at temperatures decidedly higher than those which formerly it was not permissible to exceed; to this end the steel, according to the invention, has a silicon content considerably higher than is usual.

The steel used for the manufacturing of the new bearings contains the elements carbon, silicon, manganese, and occasionally chromium and molybdenum in amounts comprised within the limits shown in the table below:

C, percent	Si, percent	Mn, percent	Cr, percent	Mo, percent
0.80-1.30	0.80-2.0	0.20-0.80	0-3	0-2.5

and may have, as a non-limiting example, the following composition:

	Percent
C	1
Si	1.4
Mn	0.4
Cr	1.5

which is very suitable.

The elaboration, rolling, drawing, tempering, and machining of steels of this kind can be carried out without any difficulty by present techniques.

After being machined approximately to the final dimensions, the pieces are subjected to heat treatment by

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being brought to a temperature between 820° and 900° C., followed by quenching, and possibly tempering at between 180 and 250° C. The desired very fine distribution of carbides, not dissolved during the quenching treatment is obtained if the rings, balls, or rollers, have been previously normalised by heating to a sufficiently high temperature, at least 900° C., in order to dissolve the carbides, and then cooling in air.

In a general manner, the temperature chosen for heating before quenching is 50 to 80° higher than that of the completion of eutectoid transformation on heating.

Quenching is generally carried out in oil, but in the case of balls it is more advantageous if water is used for this purpose. The quenching of the rings can be done by steps, a salt bath at a temperature of 180° C. being the first cooling medium, the ambient air the second.

A very great hardness is obtained when quenching, by whatever means it was carried out, is followed by cooling to a temperature below -20° C.

After treatment, the machining is completed on the grinding wheel and with the usual polishing methods until the desired final dimensions are precisely obtained.

Bearings manufactured according to the invention, from steels with a high carbon content and a silicon content which is comprised between 0.80 and 2.0%, withstand, without any abnormal wear, temperatures which may rise to 250° C., while the usual bearings of carbon chromium steel cannot withstand, without damage, temperatures above 180° C. With the case-hardened steels which are sometimes used for bearings, the working temperature can scarcely rise above 150° C.

The table below shows hardnesses, after the quality heat treatment and after one hundred hours' heating at 250° C. carried out as a test after the heat treatment, of steels, some of which contain the small quantities of silicon which are usual, and some of which have a silicon content in conformity with the invention.

Composition					RC hardness after treatment	Hardness after heating for 100 hours at 250° after heat treatment
C	Si	Mn	Cr	Mo		
0.96	0.34	0.44	1.15	0.05	66	57.8
1.00	0.28	0.35	traces	1.70	65.5	59.7
1.06	1.42	0.48	traces	traces	65.5	62
1.00	1.36	0.41	traces	1.71	66	62.4
0.96	0.87	0.30	traces	1.05	66	62

It is worthy of note that a composition, such as that shown in the third line, can be used, since this composition does not include any noble alloying constituent element, it is of particular interest on account of its low cost.

The advantage of the steels of the invention appears clearly when it is known that the 62 Rockwell hardness is that which extensive experience has shown to be necessary for good practical behaviour of bearings.

The bearings according to the invention can be used with great advantage particularly in the construction of gas turbines.

I claim:

1. A process of treating bearings consisting essentially of 0.8 to 1.3 percent carbon, 0.8 to 2.0 percent silicon, 0.2 to 0.8 percent manganese, 0 to 3 percent chromium,

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0 to 2.5 percent molybdenum and the remainder substantially iron which comprises heating said bearings to a temperature of from 50 to 80° C. above the eutectoid transformation temperature, quenching said bearings at a temperature from 180 to 250° C. and cooling said bearings at a temperature below -20° C.

2. A process of treating bearings consisting essentially of 0.8 to 1.3 percent carbon, 0.8 to 2.0 percent silicon, 0.2 to 0.8 percent manganese, 0 to 3 percent chromium, 0 to 2.5 percent molybdenum and the remainder substantially iron which comprises heating said bearings to a temperature of from 820 to 900° C., quenching said bearings at a temperature of from 180° to 250° C. and

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cooling said bearings to a temperature below -20° C.

3. A heat treated bearing element produced by the process of claim 1.

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