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Balevski et al.

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[54] **ZINC ALLOY CONTAINING NITROGEN**

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[58] **Field of Search**..... 75/178 CL, 178 D, 178 C, 75/178 R

[56] **References Cited**

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[57] **ABSTRACT**

A zinc base alloy which can be used for mechanically loaded structural components, contains iron, lead, copper, cadmium, and particularly nitrogen.

1 Claim, 2 Drawing Figures

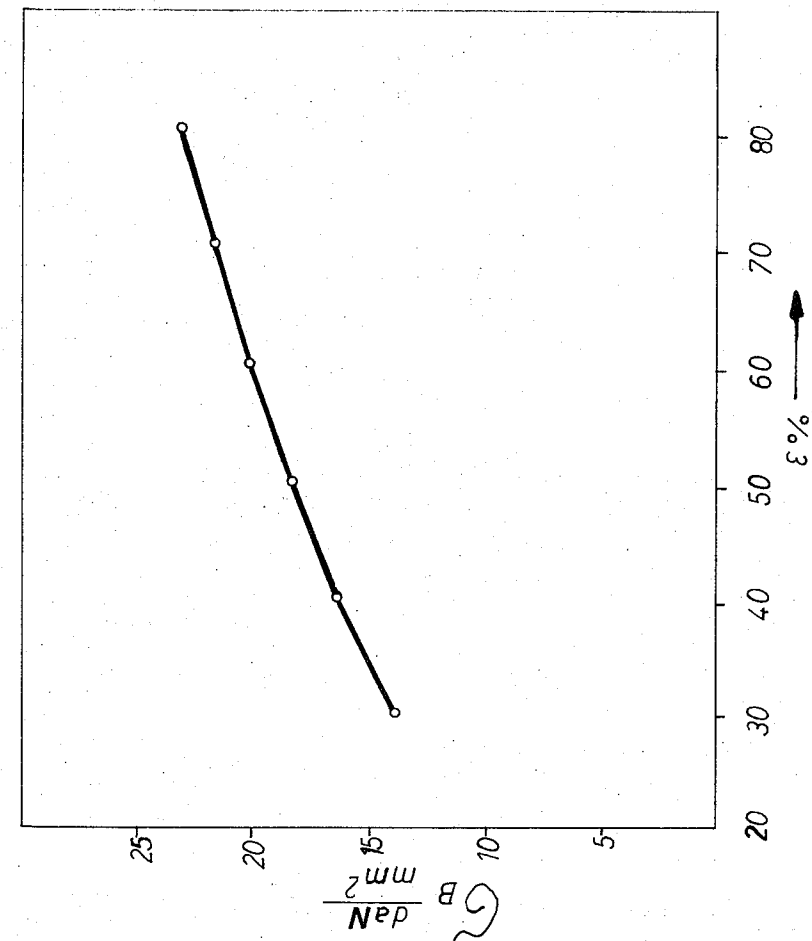
$\sigma_B \frac{daN}{mm^2}$
25
20
15
10
5
20
30
40
50
60
70
80
ε %

FIG. 2

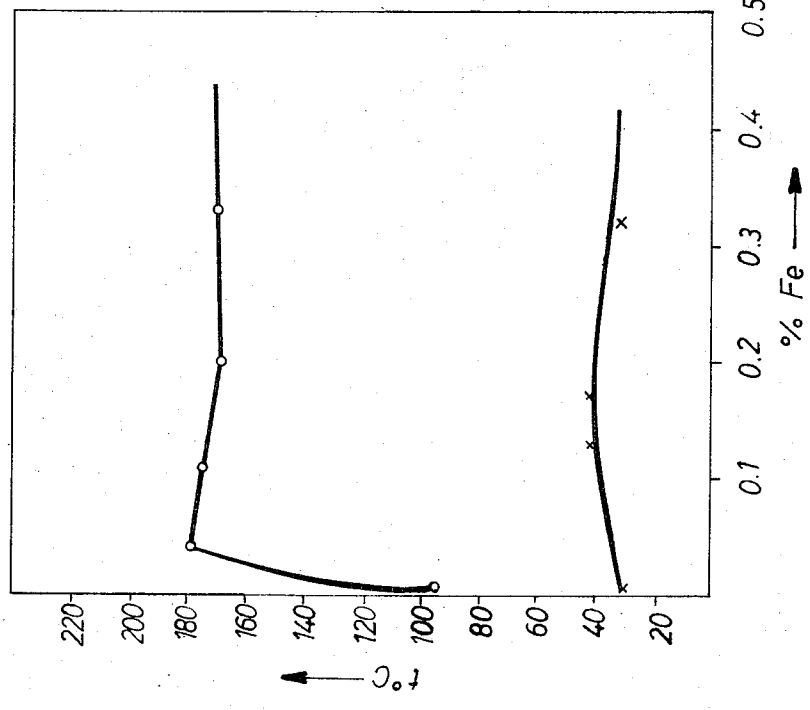
t°C
220
200
180
160
140
120
100
80
60
40
20
0.1
0.2
0.3
0.4
0.5
% Fe

FIG. 1

ZINC ALLOY CONTAINING NITROGEN

This invention relates to a zinc alloy, particularly an alloy of high and stable mechanical properties, which can be used after plastic forming as a material for loaded structural components.

Commercially pure zinc and its alloys are used on a very limited scale for galvanizing, in the production of galvanic elements, in typography and in other cases where no corrosion resistance and strength properties are required. However, these alloys cannot be used for mechanically loaded components because of their low mechanical strength, as well as their low recrystallization temperature. For example, a zinc alloy containing 0.3 percent iron has a temperature of beginning of recrystallization of 30°C and a tensile strength of $\sigma_B =$ 14.5 kgf/mm² after press-working at 100°C and a degree of deformation of $\epsilon = 80$ percent. This temperature is in the range of normal room or atmosphere temperature, which means that at this temperature the material begins to creep, the crystals begin to transform themselves and with the time a deformation of the continuously (permanently) loaded components takes place.

It is therefore a general object of the present invention to provide for an increase and a stabilization of the strength properties of zinc, i.e., to obtain an alloy of higher strength, featuring a sufficiently high temperature of beginning of recrystallization.

The zinc alloy containing iron, lead, copper and cadmium, contains according to the present invention also nitrogen. This zinc alloy has the following composition (all percentages are by weight):

iron	0.05 – 0.5%
nitrogen	0.0005 – 0.5%
lead	less than 0.015%
copper	less than 0.007%
cadmium	less than 0.015%
zinc	the remainder.

The advantages of the zinc alloy according to the invention are that this alloy features a tensile strength, which is higher that that of all hitherto known zinc alloys, as well as an increased temperature of beginning of recrystallization. This advantages of the alloy make it usable, after plastic forming, as a material for mechanically loaded structural components.

This alloy is obtained by saturation of the melt with nitrogen and carrying out the solidification at a considerably higher partial pressure of the nitrogen in the gas atmosphere than the pressure at which it has been saturated.

EXAMPLE

A zinc alloy according to the invention containing 0.3 percent iron, 0.015 percent cadmium, 0.007 percent copper, 0.015 percent lead and 0.0006 percent nitrogen, which after plastic forming at a degree of deformation $\epsilon = 80$ percent features a tensile strength of $\sigma_b = 23.4$ kgf/mm².

This alloy has a considerably higher strength and recrystallization temperature than all hitherto known zinc alloys. If no nitrogen is contained in this same alloy, its strength is only 14.5 kgf/mm².

The diagram in FIG. 1 shows the dependence of the temperature of beginning of recrystallization of the zinc alloy on the iron content. Curve 1 shows the temperature of beginning of recrystallization of the zinc alloy without nitrogen, while curve 2 is valid for a nitrogen content according to the example. The degree of deformetion is $\epsilon = 50$ percent and the duration of annealing is 2 hours. At an iron content of 0.3 percent the temperature of beginning of recrystallization is $t =$ 170°C. This is a sufficiently high temperature, and it can be assumed that this alloy can be used in all normal cases for general engineering components. After natural ageing the high strength of the zinc alloy containing nitrogen is preserved.

The diagram in FIG. 2 shows the dependence of the tensile strength on the degree of deformation in plastic forming (press-working at 100°C) of the alloy according to the example.

The corrosion resistance of the disclosed zinc alloy remains the same as in the case of pure zinc.

What we claim is:

1. A zinc base alloy, consisting essentially of (all percentages are by weight):

iron	0.05 – 0.5%
nitrogen	0.0005 – 0.5%
lead	an effective amount up to 0.015%
copper	an effective amount up to 0.007%
cadmium	an effective amount up to 0.015%
zinc	the remainder

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