Title (en)

Process for manufacturing an article from a heat-resisting alloy.

Title (de)

Verfahren zur Herstellung eines Werkstückes aus einer warmfesten Legierung.

Title (fr)

Procédé pour la fabrication de pièces en un alliage résistant aux températures élevées.

Publication

EP 0045984 A1 19820217 (DE)

Application

EP 81200670 A 19810616

Priority

CH 602780 A 19800808

Abstract (en)

1. Process for manufacturing a workpiece from a creep-resistant, precipitation-hardenable austenitic alloy having a high nickel content and containing a metal oxide as the hardening idspersoid, this process being in accordance with the methods employed in powder metallurgy and in which a metal powder is mixed with a metal oxide powder, is mechanically alloyed, is encased in a metal container, and is densified, by hot-compaction, to 100% of the theoretical density, in a manner such that an easily deformable intermediate material is produced, which has a very fine grain size and is suitable for further processing, terminating in an annealing treatment for developing a coarse grain size, characterised in that the abovementioned intermediate material is converted to the finished workpiece by means of a purpose-designed working operation which embodies the final shaping step, the deformation rate and the degree of deformation being determined in accordance with the intermediate material, which can exhibit deformation which is insufficient, optimum, or excessive, in a manner such that the logarithm of the temperature-compensated deformation rate, expressed as log (.~epsilon DNi--1 m**2), where ._epsilon = d[¦In (Ao /Af)¦]/dt, and Ao and Af respectively denote the cross-sectional areas of the workpiece before and after the working operation, while DNi denotes the diffusion coefficient of nickel, which is a function of temperature, lies between the values 16.5 and 20 in case a) - insufficient deformation of the intermediate material, lies between the values 10 and 22 in case b) - optimum deformation of the intermediate material in the range of low degrees of deformation for the final-shaping step, described by 0 =< epsilon < 0.3, where epsilon denotes ¦In (Ao /Af)¦ and lies, in the range of comparatively high degrees of deformation for the final-shaping step, described by epsilon > 1.0, between the values 15.5 and 20, lies between the values 14 and 18 in case c) - excessive deformation of the intermediate material in the range of low degrees of deformation for the final-shaping step, described by 0.1 < ¦epsilon¦ < 0.2, and lies, in the range of comparatively high degrees of deformation for the final-shaping step, described by ¦epsilon¦ > 0.8, between 16 and 20, and in that the degree of deformation for the final-shaping step, described by epsilon, reaches a value of not less than 0.5 in case a) - insufficient deformation of the intermediate material, is as small as desired, and can thus also be nil, in case b) - optimum deformation of the intermediate material, increases linearly with the deformation rate, but reaches a value of not less than 0.1, in case c) - excessive deformation of the intermediate material in the range of low degrees of deformation for the final-shaping step, described by 0.1 < ¦epsilon¦ < 0.6, the above being subject to the restriction that in case a), the values must lie within the shaded region in Figure 5, in case b), the values must lie within the shaded region in Figure 6, and in case c), the values must lie within the shaded region in Figure 7.

Abstract (de)

Ein aus einer pulvermetallurgisch hergestellten oxyddispersionsgehärteten warmfesten, ausscheidungshärtbaren Nickelsuperlegierung bestehender Rohling wird durch gezielte Umformung und nachfolgende Glühung in ein fertiges Werkstück mit grobkörnigem Gefüge übergeführt, indem bei jedem Umformschritt, mindestens aber beim letzten Teilschritt des aus Schmieden, Walzen oder Warmziehen bestehenden Prozesses ein Wertepaar Verformungsgeschwindigkeit/Verformungsgrad in verhältnismässig engen Grenzen eingehalten wird. Grobkorn lässt sich in allen Fällen unabhängig vom Zustand des Vormaterials des Rohlings erzielen, sofern eine optimale Verformungsgeschwindigkeit und ein minimaler Verformungsgrad eingehalten werden.

IPC 1-7

C22F 1/10; B22F 3/24; C22C 19/05

IPC 8 full level

B22F 3/14 (2006.01); **B22F 3/24** (2006.01); **C22C 1/05** (2006.01); **C22C 19/05** (2006.01); **C22C 32/00** (2006.01); **C22F 1/10** (2006.01)

CPC (source: EP)

B22F 3/24 (2013.01); **C22C 32/0026** (2013.01); **C22F 1/10** (2013.01)

Citation (search report)

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EP0398121A1; EP0087183A1; EP0274631A1; EP0074679A1

Designated contracting state (EPC)

AT BE CH DE FR GB SE

DOCDB simple family (publication)

EP 0045984 A1 19820217; **EP 0045984 B1 19840314**; AT E6674 T1 19840315; DE 3162643 D1 19840419; JP S5754237 A 19820331

DOCDB simple family (application)

EP 81200670 A 19810616; AT 81200670 T 19810616; DE 3162643 T 19810616; JP 12253381 A 19810806