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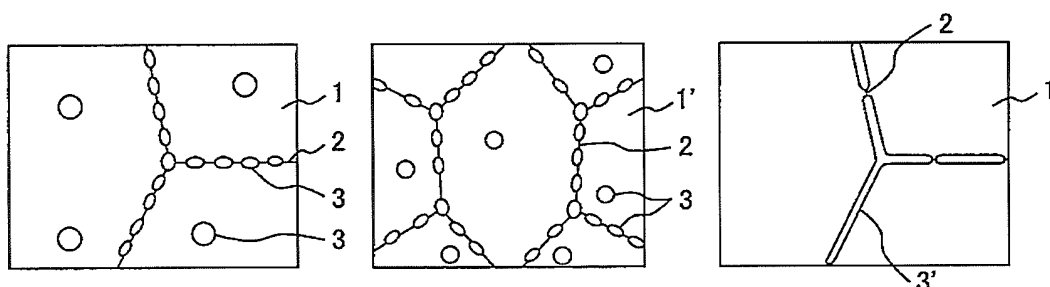
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(54) **High-strength Ni-based wrought superalloy and manufacturing method of same**

(57) An Ni-based wrought superalloy in accordance with the present invention includes: (a) from 0.005 to 0.2 mass% of C; (b) from 0 to 1 mass% of Si; (c) from 0 to 1 mass% of Mn; (d) from 10 to 24 mass% of Cr; (e) at least one of Mo and W, the total content expressed by "[Mo content] + 0.5×[W content]" being from 5 to 17 mass%; (f) from 1 to 2 mass% of Al; (g) from 0.5 to 3.5 mass% of Ti; (h) from 0 to 10 mass% of Fe; (i) at least one of from 0.002 to 0.02 mass% of B and from 0.01 to 0.2 mass% of Zr; and (j) the balance being Ni and inevitable

impurities, the Ni content being from 48 to 80 mass%. Furthermore, the Ni-based wrought superalloy has a polycrystalline body including a plurality of grains, and an average size of the grains after a heat treatment is from 72 to 289  $\mu\text{m}$ . Moreover, a plurality of granular precipitations precipitate along the grain boundaries of the Ni-based wrought superalloy after the heat treatment, and an average length of the granular precipitations along the grain boundary is from 0.5 to 2.5  $\mu\text{m}$  in an arbitrary cross-sectional view of the polycrystalline body.

**FIG. 1**



**INVENTIVE**  
**NI-BASED WROUGHT**  
**SUPERALLOY**

**COMPARATIVE**  
**NI-BASED WROUGHT**  
**SUPERALLOY A**

**COMPARATIVE**  
**NI-BASED WROUGHT**  
**SUPERALLOY B**



## EUROPEAN SEARCH REPORT

Application Number  
EP 10 17 6855

DOCUMENTS CONSIDERED TO BE RELEVANT			
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 22 August 2011	Examiner Vlassi, Eleni
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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Application Number  
EP 10 17 6855

DOCUMENTS CONSIDERED TO BE RELEVANT			
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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
2	Place of search The Hague	Date of completion of the search 22 August 2011	Examiner Vlassi, Eleni
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons &amp; : member of the same patent family, corresponding document</p>			

EPO FORM 1503 03.82 (P04C01)



Application Number

EP 10 17 6855

**CLAIMS INCURRING FEES**

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

**LACK OF UNITY OF INVENTION**

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☒ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

**LACK OF UNITY OF INVENTION  
SHEET B**

Application Number

EP 10 17 6855

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 12, 14(completely); 1-11(partially)

A method for producing a Ni-based wrought superalloy of the composition of claim 1, wherein the method comprises the step of carrying out a two step solution heat treatment composed of a first solution heat treatment at a temperature from 1100-1160 C and a second solution heat treatment at a temperature from 980-1080 C subsequently to the first solution heat treatment, and optionally a two step artificial aging heat treatment.

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2. claims: 13, 15(completely); 1-11(partially)

A method for producing a Ni-based wrought superalloy of the composition of claim 1, wherein the method comprises the step of carrying out a single-step prolonged solution heat treatment at a temperature from 980-1080 C for 24 hours or more, and optionally a two step artificial aging heat treatment.

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**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 10 17 6855

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
The members are as contained in the European Patent Office EDP file on  
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22-08-2011

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EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82