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JP02101133	Intermetallic TiAl-Ti3Al composite materials. DAIDO STEEL
JP05115995	Ti Al, oxidation resistance heavy material and Ti Al for Ti3Al intermetallic make component, Ti3Al intermetallic make valve DAIDO STEEL FUJI VALVE
EP-837221	Ti-Al turbine rotor and method of manufacturing said rotor DAIDO STEEL
JP2015168835	TURBINE WHEEL MADE OF TiAl DAIDO STEEL
EP2924134	Ti-Al-based heat-resistant member DAIDO STEEL
JP2009114513	TiAl-BASED ALLOY DAIDO STEEL
JP2008184665	TiAl ALLOY SUPERIOR IN HIGH-TEMPERATURE CREEP CHARACTERISTICS AND MANUFACTURING METHOD THEREFOR DAIDO STEEL
JP2008142717	METHOD AND APPARATUS FOR MAKING INGOT OF Ti AND Ti ALLOY OR TiAl DAIDO STEEL

Intermetallic TiAl-Ti3Al composite materials.
JP02101133

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- **International Patent Classification**
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- **CPC Code**
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  1988JP-0251169 1988-10-05

- **Fampat family**

JPH02101133	A	1990-04-12	[JP02101133]
EP0365174	A1	1990-04-25	[EP-365174]
EP0365174	B1	1995-03-01	[EP-365174]
DE68921410	D1	1995-04-06	[DE68921410]
DE68921410	T2	1995-08-10	[DE68921410]
JP2960068	B2	1999-10-06	[JP2960068]

- **Abstract:**
  (EP-365174)
  A TiAl-Ti3 Al composite material having improved mechanical strength and ductility in which Al is contained in the range of 33 to 35% by weight percentage, the balance is substantially Ti, and TiAl-intermetallic compound contains Ti3 Al-intermetallic compound in the range of 10 to 35% by volume percentage.

Claims

(EP-365174)

1. A TiAl -Ti3 Al composite material containing 33 to 35% of Al by weight percentage and the balance being substantially Ti, wherein TiAl -intermetallic compound contains 10 to 35% of Ti3 Al -intermetallic compound by volume percentage.
2. A TiAl -Ti3 Al composite material containing not less than 33% and less than 34% of Al by weight percentage and the blance being substantially Ti, wherein TiAl -intermetallic compound contains 10 to 35% of Ti3 Al -intermetallic compound by volume percentaqge.
3. A TiAl -Ti3 Al composite material containing 33 to 35% of A by weight percentage and the balance being substantially Ti, wherein TiAl -intermetallic compound contains 15 to 35% of TiAl -intermetallic compound by volume percentage.
4. A TiAl -Ti3 Al composite material containing not less than 33% and less than 34% of Al by weight percentage and the balance being substantially Ti, wherein TiAl -intermetallic compound contains 15 to 35% of Ti3 Al -intermetallic compound by volume percentage.
5. A TiAl -Ti3 Al composite material containing 33.5% of Al by weight percengtage and the balance being substantially Ti, wherein TiAl -intermetallic compound contains 15 to 35% of Ti3 Al -intermetallic compound by volume percentage.

Ti Al, oxidation resistance heavy material and Ti Al for Ti3Al intermetallic make component, Ti3Al intermetallic make valve

JP05115995

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- **International Patent Classification**
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- **Priority Details**
  1991JP-0211624 1991-07-26

- **Fampat family**

JPH05115995	A	1993-05-14	[JP05115995]
JP3283546	B2	2002-05-20	[JP3283546]

- **Abstract:**
  (JP05115995)
  PURPOSE:To provide the member made of the TiAl, Ti3Al intermetallic compd. which is light in weight and simultaneously satisfies heat resistance, mechanical strength and wear resistance. CONSTITUTION:The TiAl, Ti3Al intermetallic compd. contg. Si and/or Nb is built up at the prescribed point of the member made of the TiAl, Ti3Al intermetallic compd. The Si and/or the Nb improves the high-temp. oxidation resistance of the lightweight TiAl, Ti3Al intermetallic compd. Then, the member made of the TiAl, Ti3Al intermetallic compd. having the built-up part which has the high heat resistance and does not generate crack, etc., is obtd.

Claims

(JP05115995)

1. Al: 30-42 weight % with, Nb: 0.5-2
0 weight %, Si: 0.5-5 weight %, W: The 0.1-20 it is heavy
Quantity %, P: The 0.001-0.02 weight % the empty 1 where it is chosen
To contain the element above kind or 2 kinds, the remainder substantial Ti
Chemical combination between TiAl and the Ti [3] Al metal which designate that it consists of as feature
Heavy material [0002] for thing
make component| Al: 30-42 weight % with, Nb: 0.5-2
0 weight %, Si: 0.5-5 weight %, W: The 0.1-20 it is heavy
Quantity %, P: The 0.001-0.02 weight % the empty 1 where it is chosen
Element above kind or 2 kinds and, furthermore Cr: 0.1-5 weight
% V: 0.1-5 weight %, Mn: 0.1-5 weight %, F
e: 0.1-5 weight %, Mo: 0.1-5 weight %, Ta: 0.

1-5 weight %, Zr: 0.1-5 weight %, Hf: 0.1-5
Weight % B: The 0.005-0.02 weight % the empty it was chosen
Element above 1 or 2 kinds at total 0.1-10 weight %
It contained, the remainder designated that substantially it consists of Ti as feature
TiAl and heavy material [0003] for Ti [3] Al intermetallic
make component| Al: 30-42 weight % with, Nb: 0.5-2
0 weight %, Si: 0.5-5 weight %, W: The 0.1-20 it is heavy
Quantity %, P: The 0.001-0.02 weight % the empty 1 where it is chosen
Element above kind or 2 kinds and, furthermore carbide and nitride, one
Containing the chemical compound above the 1 or 2 kinds which are chosen from the chemical material
Ti which designates that it does, as for the remainder substantially it consists of Ti as feature
Al and heavy material [0004] for Ti [3] Al intermetallic
make component| Al: 30-42 weight % with, Nb: 0.5-2
0 weight %, Si: 0.5-5 weight %, W: The 0.1-20 it is heavy
Quantity %, P: The 0.001-0.02 weight % the empty 1 where it is chosen
Element above kind or 2 kinds and, furthermore Cr: 0.1-5 weight
% V: 0.1-5 weight %, Mn: 0.1-5 weight %, F
e: 0.1-5 weight %, Mo: 0.1-5 weight %, Ta: 0.

1-5 weight %, Zr: 0.1-5 weight %, Hf: 0.1-5
Weight % B: The 0.005-0.02 weight % the empty it was chosen
Element above 1 or 2 kinds at total 0.1-10 weight %
With, furthermore 1 kind [ma] which are chosen from the carbide, the nitride and the one chemical material
It is to contain the chemical compound of 2 kinds or more, the remainder substantial Ti?
And others TiAl which designates that it becomes as feature, the Ti [3] Al intermetallic
Make heavy material [0005
] for component| From claim 1 using heavy material up to of claim 4
The [te] meatiness doing the valve face at least feature
TiAl which it does, the Ti [3] Al intermetallic make valve

Ti-Al turbine rotor and method of manufacturing said rotor
EP-837221

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- **International Patent Classification**
  B23K-001/00 B23K-001/002 B23K-001/18 B23K-001/19 B23K-031/02 B23K-033/00 B23K-035/24 B23K-035/30 B23K-103/18 B23K-103/24 C21D-001/76 C21D-009/28 C21D-009/50 C22C-014/00 C22F-001/00 C22F-001/18 F01D-005/02 F01D-005/04 F01D-005/28 F01D-025/00 F02B-039/00 H05B-006/10
- **US Patent Classification**
  PCLO=416213000R PCLX=416241000R PCLX=416244000A
- **CPC Code**
  B23K-001/00/18; B23K-2201/04; F01D-005/02/5; F01D-005/04/3; F01D-005/28; F05D-2230/23; F05D-2300/133; F05D-2300/173 Y02P-010/253

- **Publication Information**
  EP0837221 A2 1998-04-22 [EP-837221]
- **Priority Details**
  1996JP-0311143 1996-10-18
  1996JP-0359854 1996-12-27
  1997JP-0027630 1997-02-12

- **Fampat family**

EP0837221	A2	1998-04-22	[EP-837221]
JPH10118764	A	1998-05-12	[JP10118764]
JPH10193087	A	1998-07-28	[JP10193087]
JPH10220236	A	1998-08-18	[JP10220236]
EP0837221	A3	1999-11-03	[EP-837221]
US6007301	A	1999-12-28	[US6007301]
EP0837221	B1	2003-09-10	[EP-837221]
AT249571	T	2003-09-15	[ATE249571]
DE69724730	D1	2003-10-16	[DE69724730]
DE69724730	T2	2004-04-01	[DE69724730]
JP3829388	B2	2006-10-04	[JP3829388]

- **Abstract:**
  (EP-837221)
  A turbine rotor consisting of a wheel made of a TiAl alloy of good heat resistance and a rotor shaft made of a steel with good bonding strength is disclosed. As the shaft material a structural steel or a martensitic heat resistant steel is used. A TiAl turbine wheel made by precision casting is butted to the shaft with insertion of a brazing filler in the butted interfaces and stress of 0.01kgf/mm**2 or higher but lower than yield stress of the shaft is applied on the butted interfaces under heating by high frequency induction heating in atmosphere of an inert gas or a reducing gas to a temperature higher than the liquidus temperature of the brazing metal but not exceeding 100 DEG.C above the liquidus temperature. Turbine rotors with good accordance of the axes of the wheel and the shaft will be obtained by fitting a projection (or recess) and a recess (or projection) formed at the base of the wheel and the end of the sh aft concentrically to the outer shape thereof, and by brazing the ring-shaped area outside the fitted parts.

Claims

(EP-837221)

1. A TiAl turbine rotor consisting of a TiAl turbine wheel made by precision casting and a rotor shaft bonded thereto, characterized in that a structural steel or a martensitic heat resistant steel is used as the meterial for the shaft, and that the base of the wheel and the end of the shaft are bonded by brazing.
2. A TiAl turbine rotor consisting of a TiAl turbine wheel made by precision casting and a rotor shaft bonded thereto, characterized in that a structural steel or a martensitic heat resistant steel is used as the meterial for the shaft, that a recess (or a projection) and a projection (or a recess) are provided concentrically at the base of the wheel and the end of the shaft, and that the recess and projection are fitted and the ring-shaped part outside the recess and the projection are bonded by brazing.
3. A TiAl turbine rotor of claim 1 or claim 2, characterized in that the TiAl used for the TiAl turbine wheel has the alloy composition comprising, by weight %, Al:31-35% and the balance substantially of Ti.
4. A TiAl turbine rotor of claim 2, characterized in that the TiAl used for the TiAl turbine wheel has the alloy composition further comprising, by weight %, in addition to the composition of claim 3, at least one of Cr, Mn and V in an amount of (in case of two or more, in total) 0.2-4.0%.
5. A TiAl turbine rotor of claim 3 or claim 4, characterized in that the TiAl used for the TiAl turbine wheel has the alloy composition furthr comprising, by weight %, in addition to the composition of claims 3 or 4, at least one of Nb, Ta and W in an amount of (in case of two or more, in total) 0.2-8.0%.
6. A TiAl turbine rotor of one of claims 3 to 5, characterized in that the TiAl used for the TiAl turbine wheel has the alloy composition further comprising, in addition to the composition of one of claims 3 to 5, by weight %, Si: 0.01-1.00%
7. A TiAl turbine rotor of one of claims 3 to 6, characterized in that the TiAl used for the TiAl turbine wheel has the alloy compositions defined in one of claims 3 to 6 in which impurities are, by weight %, Zr: less than 1.0%, Fe: less than 1.0%, C: less than 0.2%, O: less than 0.2% and N: less than 0.2%.
8. A TiAl turbine rotor of claim 1 or claim 2, characterized in that the shaft of the rotor is hardened and tempered, and subjected to surface hardening treatment.
9. A method of producing a turbine rotor consisting of a TiAl turbine wheel and a steel shaft, characterized in that base of a TiAl turbine wheel made by precision casting and an end of a rotor shaft of a structural steel or a martensitic heat resistant steel are butted with insertion of a brazing filler between the butted interfaces;
that stress of 0.01kgf/mm**2 or higher but lower than yield stress of the shaft and the rotor wheel at the bonding temperature is posed on the butted interfaces;
that heat is given to the wheel and the shaft to be bonded by high frequency induction heating in atmosphere of an inert gas or a reducing gas to a temperature higher than the liquidus temperature of the brazing metal but not exceeding 100 DEG.C above the liquidus temperature;
and that the parts are maintained at the temperature to carry out bonding by brazing.
10. A method of producing a turbine rotor consisting of a TiAl turbine wheel and a steel shaft, characterized in that the base of TiAl turbine wheel made by precision casting and the end of a rotor shaft of a structural steel or a martensitic heat resistant steel are processed to form a projection or a recess and a recess or a projection concentrical to the profiles of these parts;
that the projection and the recess are fitted and a brazing filler is inserted at the ring-shaped area around the fitted projection and the recess;
that stress of 0.01kgf/mm**2 or higher but lower than yield stress of the shaft and the rotor wheel at the bonding temperature is posed to the interfaces between the brazing filler and the parts to be bonded;
that the wheel and the shaft to be bonded are heated by high frequency induction heating in atmosphere of an inert gas or a reducing gas to a temperature higher than the liquidus temperature of the brazing metal but not exceeding 100 DEG.C above the liquidus temperature, and that the parts are maintained at the temperature to carry out bonding by brazing.
11. A method of producing TiAl turbine rotor according to one of claims 9 and 10, characterized in that both the turbine wheel and the shaft are brazed by high frequency induction heating in atmosphere of non-oxidizing gas to a temperature above the austenitizing temperature of the shaft material;
and that a cooling gas is blasted or a cooling liquid is jetted to the shaft to quenche and harden it.
12. A method of producing TiAl turbine rotor according to one of claims 9 and 10, characterized in that a brazing metal containing Ag, Ni, Cu or Ti as the main component thereof and having a melting point of 800 DEG.C or higher is used as the brazing filler for bonding.
13. A method of producing TiAl turbine rotor according to claim 9 or claim 10, characterized in that the brazing metal and the shaft material are in such a combination that the liquidus temperature of the brazing metal is higher than the austenitizing temperature of the shaft material.
14. A method of producing TiAl turbine rotor according to claim 10, characterized in that there is a gap up to 1mm between the inner surface of the recess and the outer surface of projection;
and that the diameters of the projection and the recess are so chosen that the brazed ring-shaped area shares 20% or more of the cross section of the bonded part.
15. A method of producing TiAl turbine rotor according to claim 10, characterized in that depth of the recess is larger than height of the projection and thus a cavity of length of 15mm or more is formed in the part of bonding.

TURBINE WHEEL MADE OF TiAl
JP2015168835

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- **International Patent Classification**
  C22C-014/00 F01D-005/02 F01D-025/00

- **Publication Information**
  JP2015168835 A 2015-09-28 [JP2015168835]
- **Priority Details**
  2014JP-0042920 2014-03-05

- **Fampat family**

JP2015168835	A	2015-09-28	[JP2015168835]

- **Abstract:**
  (JP2015168835)
  PROBLEM TO BE SOLVED: To provide a turbine wheel made of TiAl excellent in high temperature properties that is composed of a TiAl alloy of which the high temperature properties can be improved by HIP treatment.SOLUTION: A turbine wheel made of TiAl is composed of a TiAl alloy containing 30.0 mass%Al33.0 mass%, 0.06 mass%C0.12 mass%, O<0.1 mass%, N<0.05 mass%, and the balance of Ti and inevitable impurities. The turbine wheel made of TiAl has a texture of the central part of an equiaxial crystal and an average crystal grain size of 0.3 mm or more and 3.0 mm or less. The turbine wheel made of TiAl has an area ratio of microshrinkage less than 0.005 area% in the central part of the wheel after HIP treatment.

Claims

(JP2015168835)

Claims machine translated from Japanese
1. The TiAl make turbine wheel which has the constitution below.

(1) as for the aforementioned TiAl make turbine wheel,
30.0mass%<=Al<=33.0mass%,
0.06mass%<=C<=0.12mass%,
O<=0.1mass%, and,
N<=0.05mass%
It includes, it consists of the TiAl based alloy where the remainder consists of Ti and the inevitable impurity.

(2) as for the aforementioned TiAl make turbine wheel, organization of the wheel central part and the like consists of the axial crystal, at the same time, average crystal grain size is below 3.0mm above 0.3mm.

(3) as for the aforementioned TiAl make turbine wheel, area ratio of the micro shrinkage of the wheel central part after HIP is under 0.005area%.
2. As for the aforementioned TiAl based alloy,
7.0mass%<=Nb+Ta<=8.0mass%
Furthermore in the claim 1 which is included the TiAl make turbine wheel of statement.
3. As for the aforementioned TiAl based alloy,
0.2mass%<=Si<=1.0mass%,
Furthermore in the claim 1 which is included or 2 the TiAl make turbine wheel of statement.
4. As for the aforementioned TiAl based alloy,
0.5mass%<=Cr<=1.5mass%
Furthermore from the claim 1 which is included either up to 3 in 1 sections the TiAl make turbine wheel of statement.
5. As for the aforementioned TiAl based alloy,
0.2mass%<=Mn+V<=4.0mass%
Furthermore from the claim 1 which is included either up to 4 in 1 sections the TiAl make turbine hole of statement.
6. As for the aforementioned TiAl based alloy,
0.2mass%<=W+Re<=10.0mass%
Furthermore from the claim 1 which is included either up to 5 in 1 sections the TiAl make turbine hole of statement.
7. As for the aforementioned TiAl based alloy,
Zr<1.0mass%, and/or,
Fe<1.0mass%
Furthermore from the claim 1 which is included either up to 6 in 1 sections the TiAl turbine hole of statement.

Ti-Al-based heat-resistant member
EP2924134

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- **US Patent Classification**
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- **CPC Code**
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  2015JP-0028942 2015-02-17

- **Fampat family**

EP2924134	A1	2015-09-30	[EP2924134]
US2015275673	A1	2015-10-01	[US20150275673]
JP2015193910	A	2015-11-05	[JP2015193910]

- **Abstract:**

(EP2924134)
The present invention relates to a Ti-Al-based heat-resistant member including a Ti-Al-based alloy which includes: 28.0 mass% to 35.0 mass% of Al; 1.0 mass% to 15.0 mass% of at least one selected from the group consisting ofNb, Mo, W and Ta; 0.1 mass% to 5.0 mass% of at least one selected from the group consisting of Cr, Mn and V; and 0.1 mass% to 1.0 mass% of Si, with the balance being Ti and unavoidable impurities, in which a whole or a part of a surface of the Ti-Al-based heat-resistant member includes a hardened layer as a surface layer, the hardened layer having a higher hardness than an inside of the Ti-Al-based heat-resistant member, and the Ti-Al-based heat-resistant member has a hardness ratio (a hardness of the surface layer / a hardness of the inside) of 1.4 to 2.5.

Claims

(EP2924134)

1. A Ti-Al-based heat-resistant member comprising a Ti-Al-based alloy which comprises: 28.0 mass% to 35.0 mass% of Al; 1.0 mass% to 15.0 mass% of at least one selected from the group consisting of Nb, Mo, W and Ta; 0.1 mass% to 5.0 mass% of at least one selected from the group consisting of Cr, Mn and V; and 0.1 mass% to 1.0 mass% of Si,
with the balance being Ti and unavoidable impurities,
wherein a whole or a part of a surface of the Ti-Al-based heat-resistant member includes a hardened layer as a surface layer, said hardened layer having a higher hardness than an inside of the Ti-Al-based heat-resistant member, and
the Ti-Al-based heat-resistant member has a hardness ratio represented by the following expression (a) of 1.4 to 2.5: (Equation image 4 not included in text)
in which HV S is a hardness of the surface layer and is a Vickers hardness measured at a site located at a distance of 0.02 mm +- 0.005 mm from the surface of the Ti-Al-based heat-resistant member (load: 0.98 N), and
HV I is a hardness of the inside of the Ti-Al-based heat-resistant member and is a Vickers hardness measured at a site located at a distance of 0.50 mm +- 0.10 mm from the surface of the Ti-Al-based heat-resistant member (load: 0.98 N).

2. The Ti-Al-based heat-resistant member according to claim 1, wherein the Ti-Al-based alloy further comprises from 0.01 mass% to 0.2 mass% of C.

3. The Ti-Al-based heat-resistant member according to claim 1 or 2, wherein the Ti-Al-based alloy further comprises from 0.005 mass% to 0.200 mass% of B.

4. The Ti-Al-based heat-resistant member according to any one of claims 1 to 3, wherein the hardened layer has a hardened layer depth, which is a distance from the surface of the Ti-Al-based heat-resistant member to a site where the hardness is (HV S+HV I)/2, of 0.03 to 0.25 mm.

5. The Ti-Al-based heat-resistant member according to any one of claims 1 to 4, wherein the hardened layer has an alpha 2 volume ratio, which is a volume ratio of an alpha 2 phase measured at a site located at a distance of 0.02 mm +- 0.005 mm from the surface of the Ti-Al-based heat-resistant member, of 30 to 60% by volume.

6. The Ti-Al-based heat-resistant member according to any one of claims 1 to 5, wherein the inside of the Ti-Al-based heat-resistant member has a gamma (TiAl)/alpha 2(Ti 3Al) lamellar structure.

7. The Ti-Al-based heat-resistant member according to any one of claims 1 to 6, which is a turbine wheel.

8. The Ti-Al-based heat-resistant member according to claim 7, wherein a surface layer of a wing part of the turbine wheel has an average crystal grain diameter of 10 to 50 micron m and has an equi-axed grain structure having random crystal orientation.

9. The Ti-Al-based heat-resistant member according to claim 8, wherein an inside of the wing part of the turbine wheel has an average crystal grain diameter of 100 to 500 micron m and has an equi-axed grain structure having random crystal orientation.

TiAl-BASED ALLOY
JP2009114513

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- **International Patent Classification**
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- **Publication Information**
  JP2009114513 A 2009-05-28 [JP2009114513]
- **Priority Details**
  2007JP-0290405 2007-11-08

- **Fampat family**

JP2009114513	A	2009-05-28	[JP2009114513]

- **Abstract:**

(JP2009114513)
PROBLEM TO BE SOLVED: To provide a TiAl-based alloy which is superior in hot workability and specific strength, and is inexpensive. SOLUTION: The TiAl-based alloy includes 30 to 45 mol% Al, 0.1 to 10 mol% Fe and the balance Ti with unavoidable impurities. The TiAl-based alloy further preferably contains at least one element among V, Cr and Mn in a total amount of 0.5 mol% to 5.0 mol%. In addition, the TiAl-based alloy further preferably contains at least one element among Nb, Mo, Ta and W in a total amount of 0.5 mol% to 5.0 mol%. COPYRIGHT: (C)2009,JPO&INPIT

Claims

(JP2009114513)

Claims machine translated from Japanese
1. 30<=Al<45mol%,
0.1<=Fe<=10mol%
It includes, the TiAl basic alloy where the remainder consists of Ti and the inevitable impurity.
2. 0.5<= (V, Cr and Mn) <=5.0mol%
Furthermore in the claim 1 which is included the TiAl basic alloy of statement.
3. 0.5<= (Nb, Mo, Ta and W) <=5.0mol%
Furthermore in the claim 1 which is included or 2 the TiAl basic alloy of statement.
4. 0.01<= (C, B and Si) <=1.0mol%
Furthermore from the claim 1 which is included in either up to 3 the TiAl basic alloy of statement.

TiAl ALLOY SUPERIOR IN HIGH-TEMPERATURE CREEP CHARACTERISTICS AND MANUFACTURING METHOD THEREFOR

JP2008184665

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- **International Patent Classification**
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- **Priority Details**
  2007JP-0020164 2007-01-30

- **Fampat family**

JP2008184665	A	2008-08-14	[JP2008184665]

- **Abstract:**
  (JP2008184665)
  PROBLEM TO BE SOLVED: To provide a TiAl alloy which has superior high-temperature creep characteristics to a conventional one without impairing its toughness and lightweight properties. SOLUTION: The TiAl alloy has a composition comprising, by mass%, 31 to 34% Al, 0.1 to 0.7% Si, one or more elements of 0.1 to 15.0% Nb, 0.1 to 15.0% Mo, 0.1 to 15.0% W and 0.1 to 15.0% Ta so that the total amount can satisfy Nb+Mo+W+Ta<+15.0%, one or more elements of 0.1 to 3.0% Cr, 0.1 to 3.0% Mn and 0.1 to 3.0% V so that the total amount can satisfy Cr+Mn+V<+3.0%; 0.01 to 0.12% C and the balance Ti with unavoidable impurities, while satisfying the following expressions (1), (2) and (3): expression (1): value A (=0.15(Nb+Mo+W+Ta)+0.05(Cr+Mn+V)+0.95Si-5C)=0.8 to 3.0; expression (2): Al=(33.5-value A)+-0.5; and expression (3): value B (=0.5Si+5C)=0.1 to 0.8. COPYRIGHT: (C)2008,JPO&INPIT

Claims

(JP2008184665)

1. Mass % with

Al: 31-34%

Si: 0.1-0.7%

Nb: 0.1-15.0% and Mo: 0.1-15.0% and W: 0.1-15.0% and Ta: Either of 0.1-15.0% 1 kinds or 2 kinds or more at total Nb+Mo+W+Ta<=15.0%

Cr: 0.1-3.0% and Mn: 0.1-3.0%, V: Either of 0.1-3.0% 1 kinds or 2 kinds or more at total Cr+Mn+V<=3.0%

C: 0.01-0.12%

The TiAl alloy which is superior in the hot creeping quality which features the thing which at the same time possesses the constitution of remainder Ti and the inevitable impurity and the below-mentioned formula (1), formula (2), formula it fills up (3).

Formula (1)

[A value =0.15 (Nb+Mo+W+Ta) +0.05 (Cr+Mn+V) +0.95Si-5C]: 0.8-3.0

Formula (2)

Al= (33.5-A value) 0.5

Formula (3)

[B value =0.5Si+5C]: 0.1-0.8

However formula (1), formula (3) as for each element sign in the content which is in the midst of alloying (mass %) you display.
2. In claim 1,

Al: 31-34%

Si: 0.1-0.7%

Nb: 0.1-15.0%

Cr: 0.1-3.0%

C: 0.01-0.12%

So the TiAl alloy which is superior in the hot creeping quality which features that it is.
3. In either of claim 1,2, mass % with

B: 0.005-0.200%

Furthermore the TiAl alloy which is superior in the hot creeping quality which features that it contains.
4. In either of the claim 1-3, casting way the TiAl alloy which is superior in the hot creeping quality which features that area ratio of Ti-Si crystallization ones is the 0.1-6.0% with organization.
5. Being production method of each TiAl alloying the claim 1-4

The material which consists of the aforementioned constitution the truth in aerial or inert gas atmosphere, the processing temperature 900-1350.deg.C, production method of the TiAl alloy which is superior in the hot creeping quality which features that heat treatment under conditions of processing time 1-24 time.
6. Being production method of each TiAl alloying the claim 1-4

Production method of the TiAl alloy which is superior in the hot creeping quality which features that it does centrifugal casting which loads centrifugal force when solidifying of casting the material which consists of aforementioned constitution/and the processing temperature 1000-1350.deg.C, processing time 1-24 time, HIP (high-temperature gravitational pressure pressurization) processes the said material under conditions of pressure 1000-3000 atmospheric pressure and does casting defective removal.

METHOD AND APPARATUS FOR MAKING INGOT OF Ti AND Ti ALLOY OR TiAl

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- **Abstract:**
  (JP2008142717)
  PROBLEM TO BE SOLVED: To provide a method for making an ingot of Ti and Ti alloy or TiAl, which method can surely make the ingot composed of Ti, etc. so as to have an excellent casting surface, and further to provide an ingot making apparatus to be used for the same method. SOLUTION: The apparatus 1 for making the ingot of Ti and Ti alloy or TiAl comprises an induction melting furnace 2 which melts Ti and Ti alloy or TiAl and discharges the molten metal M1 thereof from the tapping nozzle 6 located on the bottom 4 of the furnace, a casting mold 10 which is arranged below the induction melting furnace 2 and can descend relative to the induction melting furnace 2, and a metallic pipe 8 made of Ti, etc., the metallic pipe 8 being hung inside the casting mold 10 from the vicinity of the bottom 4 of the melting furnace 2, wherein the casting mold 10 is supported on the table 12 arranged on the upper end of a hydraulic cylinder 16. COPYRIGHT: (C)2008,JPO&INPIT

Claims

(JP2008142717)

1. The hot spring doing the ? hot water of Ti, Ti alloy or TiAl which are melted with the induction fusion furnace from the bottom of the aforementioned fusion furnace the note lowering,

As the above-mentioned ? hot water which under note is done the note hot water is done in the mold which falls relatively vis-a-vis the above-mentioned fusion furnace,

Around the above-mentioned ? hot water which under note is done, it encloses with the pipe of the metal make which from near the bottom of the above-mentioned fusion furnace hangs inside the above-mentioned mold,

The ingot-making method of Ti, Ti alloy or TiAl which feature thing.
2. As for drop of the aforementioned mold, adjusting to the rise of the hot water surface of the aforementioned ? hot water which the note hot water is done inside that, as it is done, the bottom of the pipe of the aforementioned metal make, it is soaked in the above-mentioned ? hot water,

In the claim 1 which features thing Ti of statement, ingot-making method of Ti alloy or TiAl.
3. The induction fusion furnace which melts Ti, Ti alloy or TiAl and at the same time from the bottom the hot spring it can point these ? hot waters and,

The mold which is arranged in the lower part of the above-mentioned induction fusion furnace, makes drop possible relatively vis-a-vis the above-mentioned fusion furnace and,

The pipe of the metal make which from near the bottom of the above-mentioned fusion furnace hangs inside the above-mentioned mold and, it includes,

The ingot-making device of Ti, Ti alloy or TiAl which feature thing.
4. The aforementioned mold is supported on the ascent and descent possible table,

In the claim 3 which features thing Ti of statement, the ingot-making device of Ti alloy or TiAl.