CLAIMS

1. An Al-free brazing repair material which is used in a repairing operation in which the brazing repair material is charged into a repairing portion of a base material ~~composed of high strength and temperature resistant Co-based alloy or Ni-based alloy containing 15 to 30% of Cr, the base material~~ having a defective including a~~such as~~ crack and corrosion, and a diffusion heat treatment is carried out whereby the brazing repair material is integrally bonded to the repairing portion so as to repair the defective repairing portion, wherein

said brazing repair material is composed of a mixture comprising:

non-molten alloy powder having a composition similar to that of the base material~~containing 10 to 25 mass % of Ni, 15 to 45 mass % of Cr, 6 to 8 mass % of Ta, 0.1 mass % or less (including zero) of W, 0.05 mass % or less of C and balance of Co~~; and

molten alloy powder which is melted at a temperature of the diffusion heat treatment, ~~and~~

wherein the molten alloy powder is a brazing repairing alloy and consists of~~containing~~ 0.001 to 0.05 mass % of C, 2.5 to 4.5 mass % of Si, 12 to 20 mass % of Cr, 17 to 23 mass % of Co, 2 to 4 mass % of B, the~~and~~ balance being~~of~~ Ni~~,~~ and inavoidable impurities~~excluding Al~~, and a constitution ratio [Si+1.5×(C+B)] of the components is 6 or more and 9 or less, and wherein the non-molten alloy powder consists of 10 to 25 mass % of Ni, 15 to 45 mass % of Cr, 6 to 8 mass % of Ta, 0.1 mass % or less of W, 0.05 mass % or less of C, the balance being

Co and inavoidable impurities.

2. The brazing repair material according to claim 1, wherein the non-molten alloy powder contains 0.001 to 0.01 mass % of C and 18 to 25 mass % of Cr.

~~3. A brazing repair material which is used in a repairing operation in which the brazing repair material is charged into a repairing portion of a base material composed of high strength and temperature resistant Co-based alloy or Ni-based alloy containing 15 to 30% of Cr, the base material having a defective such as crack and corrosion, and a diffusion heat treatment is carried out whereby the brazing repair material is integrally bonded to the repairing portion so as to repair the defective repairing portion, wherein~~

~~said brazing repair material composed of a mixture comprising:~~

~~non-molten alloy powder containing 10 to 25 mass % of Ni, 15 to 45 mass % of Cr, 6 to 8 mass % of Ta, 0.1 mass % or less (including zero) of W, 0.05 mass % or less of C and balance of Co; and~~

~~molten alloy powder which is melted at a temperature of the diffusion heat treatment, and~~

~~wherein the molten alloy powder is a brazing repairing alloy containing 10 to 25 mass % of Ni, 15 to 45 mass % of Cr, 6 to 8 mass % of Ta, 0.1 mass % or less (including zero) of W, 0.05 mass % or less of C, 2 to 5 mass % of Si, 1 to 5 mass % of B and balance of Co, and excluding Al.~~

~~4. The brazing repair material according to claim 3, wherein the non-molten alloy powder contains 0.001 to 0.01 mass % of C and 18 to 25 mass % of Cr.~~

35. A brazing repairing method comprising:

a step of carrying out inspection of a base material of a gas turbine part in which a defective including a crack and corrosion is generated after operating the gas turbine, followed by disassembling and cleaning a surface portion of the base material, followed by performing solution heat treatment to the base material, followed by chipping the surface portion and a bottom of a penetrating crack, followed by removing an oxide layer from the surface portion of the base material, and followed by conducting a preliminary process of TIG drip-preventing processing for the penetrating crack;

a step of forming a flow-preventing surrounding for a brazing repair material around a repairing portion;

a step of charging the brazing repair material according to ~~any one of~~ claims 1 ~~or to~~ 24 into the flow-preventing surrounding, the brazing repair material comprising a mixture of non-molten alloy powder having a composition similar to that of the base material and molten alloy powder which is melted at a temperature of diffusion heat treatment;

a brazing repairing step of repeating, a plurality of times, the diffusion heat treatment at a temperature equal to or lower than a melting point of the base material of the gas turbine part and equal to or higher than a melting point of the molten alloy powder, thereby integrally bonding the brazing repair

material to the repairing portion, and for compacting and densifying the brazing repair material by conducting a heat treatment under pressurized atmosphere;

a step of carrying out finishing processing including inspection of a brazing repaired portion, additional repairing operation of partial defective portion and repairing processing of a cooling hole;

a step of carrying out solution treatment and aging heat treatment for the repaired portion subjected to the finishing processing; and

a step of re-assembling the repaired gas turbine parts.

46. The brazing repairing method according to claim 35, wherein a weight ratio of the non-molten alloy powder of the brazing repair material is set to 0.8 times or more of the molten alloy powder, and a particle diameter of the non-molten alloy powder is set to 2 times or more of the molten alloy powder, thereby enhancing a charging degree of the brazing repair material to the repairing portion, and enhancing flowability of the molten alloy powder in the non-molten powder and tip end portion of the crack.

57. The brazing repairing method according to claim 46, wherein the weight ratio of the non-molten alloy powder of the brazing repair material with respect to the brazing repair material is set to 1 to 1.5 times of the molten alloy powder.

68. The brazing repairing method according to claim 37, wherein the brazing repairing step is carried out by utilizing a hot isostatic pressing (HIP)

method in which a heating temperature is set to 1000°C or higher and 1300°C or lower, a pressurizing force is set to 1000 atm pressure or higher and 2000 atm pressure or lower, and the solution treatment and aging treatment are carried out after the brazing repairing step.

7~~9~~. The brazing repairing method according to claim 6~~8~~, wherein the heating temperature in the hot isostatic pressing (HIP) method is set to 1100°C or higher and 1260°C or lower.

8~~10~~. The brazing repairing method according to claim 3~~5~~, wherein a crack is formed in the repairing portion, and composition of the brazing repair material charged into the crack becomes closer to a composition of the molten alloy powder toward a tip end of the crack from a surface side thereof.

9~~11~~. The brazing repairing method according to claim 3~~5~~, wherein as a charging method of the brazing repair material to the repairing portion, the brazing repair material is carried using high velocity carrier gas flow at 800°C or lower at which the alloy powder is not melted or oxidized, particle velocity of the brazing repair material is set to 300m/sec or higher, and the brazing repair material is adhered to the repairing portion or charged into the crack.