CLAIMS

1. A high gamma prime nickel-based superalloy, comprising by wt. %:
   - Chromium from 9.0 to 10.5 %,
   - Cobalt from about 16 to 22 %,
   - Molybdenum from 1.0 to 1.4 %,
   - Tungsten from 5.0 to 5.8 %,
   - Tantalum from 2.0 to 6.0 %,
   - Niobium from 1.0 to 4.0 %,
   - Tantalum plus Niobium from 3.0 to 7.0 %,
   - Aluminum from 3.0 to 6.5 %,
   - Hafnium from 0.2 to 1.5 %,
   - Germanium from 0 to 1.0 %,
   - Yttrium from 0 to 0.2 %,
   - Silicon from 0 to 1.0 %,
   - Boron from 0 to 0.015 %,
   - Carbon from 0.01 to 0.2%,
   - Rhenium from 1.5 to 3.5 %, and
   - Nickel with impurities to balance.

2. The high gamma prime nickel-based superalloy as per claim 1 wherein the total content of germanium and silicon is within 0.9 – 1.1 wt. %.

3. The use of the high gamma prime nickel-based superalloy as per claim 1 or 2 as the material for a welding wire, welding powder, or turbine engine components.

4. A method of manufacturing a turbine engine component, wherein it comprises a step of using the high gamma prime nickel-based superalloy as per one of claims 1-2.

5. The method of manufacturing a turbine engine component as per claim 4, wherein the method comprises one or more steps selected from among:

a) Casting,
b) Annealing at 2190 – 2290°F for 1 – 2 hours,
c) Hot forming by a plastic deformation at 1500 – 1800°F,
d) Primary aging at 1975 – 2050°F for 2 – 4 hours, and
e) Secondary aging at 1300 – 1500°F for 16 – 24 hours.

6. The method of manufacturing a turbine engine component as per claim 5, wherein the method comprises a heat treatment selected from among an annealing within a temperature range from 2190°F to 2290°F for 1 – 2 hours, a primary aging within a temperature range from 1975°F to 2050°F for 2 – 4 hours, and a secondary aging within a temperature range from 1300°F to 1500°F for 16 – 24 hours.

7. The method of manufacturing a turbine engine component as per claim 5, wherein prior to the step of hot forming at the temperature of 1500 – 1800°F, the method comprises an additional step of a hot isostatic pressure treatment at a temperature of 2200 – 2290°F, pressure of 15 – 20 KSI for 2 – 6 hours.

8. The method of manufacturing a turbine engine component as per claim 5, wherein the method comprises the hot forming by the plastic deformation by 5 - 80%.

9. The method of manufacturing a turbine engine component as per claim 5, wherein the temperature of the primary aging is selected above the service temperature of the turbine engine component.

10. ~~The~~A method of manufacturing a turbine engine component ~~as per claim 4~~, wherein the method comprises steps of:

    a) a fusion welding by a melting in a welding pool and deposition of a powder mix comprising at least two dissimilar nickel and cobalt based powders in quantities of (70 – 80) wt. % and (20 – 30) wt. % respectively, wherein:

~~T~~the nickel-based powder comprises by wt. %:

- Chromium from 6 to 8 %,
- Cobalt from 6 to 12 %,
- Molybdenum 1.3 to 1.6 %,
- Tungsten from 4.5 to 5 %,
- Tantalum from 2.0 to 6.0 %,
- Niobium from 1 to 4.0%,
- Tantalum plus Niobium from 3.0 to 7.0 %,
- Aluminum from 3.0 to 6.5 %,
- Hafnium from 0.2 to 1.5 %,
- Rhenium from 2.5 to 3 %,
- Germanium from 0 to 1.0 %,
- Silicon from 0 to 1 %,
- Yttrium for 0 to 0.2 %,
- Boron from 0 to 0.015 %,
- Carbon from 0.01 to 0.1%, and.
- Ni with impurities to balance, and

The cobalt based powder comprises by wt. %:

- Nickel from 10 to 18 %,
- Chromium from 19 to 21 %,
- Tungsten from 8 to 10 %,
- Aluminum from 3 to 6.5 %,
- Germanium from 0 to 1.0 %,
- Silicon from 0 to 1 %,
- Yttrium from 0 to 0.45 %,
- Hafnium from 0 to 1.5 %,
- Niobium from 0 to 4%,
- Carbon from 0.01 to 0.2% and

- Co with impurities to balance;

b) Progressively moving and solidifying the welding pool as per a preprogrammed welding path, forming welding beads with the same chemical composition as the high gamma prime nickel-based superalloy of claim 1.

11. The method of manufacturing a turbine engine component as per claim 10, wherein the fusion welding is selected from among a laser beam, plasma arc, micro plasma, electron beam, and gas tungsten arc welding.

12. The method of manufacturing a turbine engine component as per claim 10, wherein the method further comprises a post weld heat treatment selected from among the high isostatic pressure, annealing, aging or combination of the annealing and aging.

13. The method of manufacturing a turbine engine component as per claim 12, wherein after post weld heat treatment, the method further comprises a step of machining to a required geometry.

14. The method of manufacturing a turbine engine component as per claim 13, wherein the method further comprises a step of non-destructive testing.

15. The method of manufacturing a turbine engine component as per claim 10, wherein the powder mix is in the form of a pre-alloyed powder blend comprising the nickel and cobalt based powders or in the form of the dissimilar nickel and cobalt based powders that are mixed in the welding pool directly during welding.

16. The method of manufacturing a turbine engine component as per one of claims 4-15, wherein the turbine engine component is manufactured by a 3D additive manufacturing method.

17. A turbine engine component as obtained by the method according to one of claims 4-16.