** MACHINE TRANSLATED DOCUMENT **

** TRADUZIONE AUTOMATICA **

Description

USE OF white GOLD ALLOYS IN POWDER FOR PRODUCTION OF precious objects with Rapid Prototyping by addition of material

DESCRIPTION

Field of application

[0001] The present invention is applicable in the field of jewelry and particularly relates to the use of white gold alloys in powder for production of precious objects with rapid prototyping by addition of material.

Definitions

[0002] In the present text, by the term "rapid prototyping or derived by the addition of material" is meant a shaping process of various materials for making layer by layer objects to be drawings computerized 3D. Merely by way of example, rapid prototyping methods by the addition of material in accordance with the present text are rapid prototyping and/or the direct production by selective melting laser (SLM) , electron beam melting (EBM) or selective laser sintering (SLS) .

[0003] In the present text, by the term "title" or derivatives of an alloy or of an object in precious gold is meant, unless otherwise indicated, the lowest concentration of gold in the alloy or object precious. Typically the by way of gold and expressed in thousandths of mass on mass or carat gold.

[0004] For Europe, the reference standard for the titers of alloys of precious metal and the DIN EN 29202.

[0005] In the present text, by the term "carato" or derived referred to by way of an alloy or of an object is meant precious, unless there are indications to the contrary the twenty part of the total mass of an alloy or of an object precious of gold. Thus, for instance, an alloy or an object precious contains 18 carat gold by way minimum 75% of gold.

[0006] In the present text, by the term "consists essentially" or derived associated with a composition or product of interest consisting of two or more components is meant, unless there are indications to the contrary that that product or composition consists of components listed (that is that the total of the components listed are 100% of the composition or product), minus the impurities.

[0007] In the present text, by the term "object precious" or derived means, unless otherwise indicated, a finished product of any shape and size, deriving from the treatment of an alloy.

[0008] In the present text, by the term "percentage by weight" or "% by weight" or derived means, unless otherwise indicated, the percentage by weight of a component of interest with respect to the total weight of the composition in which the component of interest is included.

State of the art

[0009] some rapid prototyping processes by the addition of material the selective melting of metal powder by laser to construct layer by layer the desired object.

[0010] Each section of the object is constructed by the consecutive scanning of the laser beam, which determines the linear melting of the metal powder, with the consequent progressive formation of a compact layer of alloy.

[0011] One of the main problems of this method of machining and the reflection of the electromagnetic radiation which causes poor absorption of energy and a reduced capacity of melting of the metal particles.

[0012] This drawback is particularly felt in the field of jewelry, due to the high reflectivity of precious alloys, particularly those with matrix of gold, material that has an electrical resistivity significantly greater than the silver.

[0013] In order to obviate this drawback, additional surface treatments are carried out (oxidation, painting, etc.) , which lead to the formation of thin layers having a highest adsorption of the substrate which is then heated in an indirect manner.

[0014] Moreover, the high reflectivity of precious alloys involves the formation of high surface roughness, consisting of the projection of particles of metal powder above the bed of construction which are also responsible for the formation of harmful blistering in the surface and porosity.

[0015] By W02013128413 silver alloys are known for rapid prototyping processes for addition of material.

Presentation of the invention

[0016] object of the present invention is to obviate the above mentioned drawbacks by providing white gold alloys in powder form for the production

of precious objects with rapid prototyping by addition of material.

[0017] Another aim of the present invention is to provide white gold alloys in powder form for the production of precious objects with low surface roughness.

[0018] This and other objects are achieved by the use of a white gold alloy powder by way 18, 14, 10 or 9 carat gold comprising:

(A) from 37.5 to 38.5 % or from 41.7 to 42.5 or from 58.5 % to 59.5 % by weight or from 75% to 76% by weight of gold

(D) from 0.05 % to 5% by weight, preferably from 0.05 % to 3 % by weight of at least a metalloid selected from the group consisting of germanium, silicon, boron, Tellurium, phosphorous and selenium;

wherein the alloy further comprises Alternatively:

B) palladium and silver in a weight ratio of between 00:1 and 1:0 ;

or

(C) nickel and copper in a weight ratio of between 1:2 and 1:3;

in which the alloy is essentially comprises the components (A), (B) and (D) or (A) , (C) and (D) ,

wherein the silver and copper alloy does not include simultaneously

for the manufacture of precious objects with rapid prototyping by addition of material, in such a way that the same precious objects have low surface roughness.

[0019] Conveniently, the precious objects may be made by selective laser (SLM) , electron beam melting (EBM) or selective laser sintering (SLS) .

[0020] The classical gold alloys in fact, while allowing to obtain precious objects with good mechanical characteristics do not allow to have a good surface roughness.

[0021] Therefore, to the classic gold alloys are added chemical elements metalloids, such as germanium, silicon, boron, tellurium, phosphorus and/or selenium, in percentages reported above.

[0022] The addition of these elements in the powder plays a fundamental role in the improvement of selective laser fusion and their effect can be appreciated both in terms of reduced surface roughness and porosity and in terms of reduced projection of metal particles during the laser action.

[0023] For the purpose, since the gallium creates potential problems linked to the formation of blisters, the alloys in powder form of the present invention may be free of gallium.

[0024] Moreover, since the platinum has reduced thermal conductivity, the alloys in powder form of the present invention may be free of these elements.

[0025] Preferably the at least a metalloid is selected from the group comprising germanium, silicon and boron.

[0026] Advantageously, a white gold alloy powder by way 18 carat gold may consist essentially of

(A) from 75% to 76% by weight of gold

(B) from 10% to 15% by weight of palladium; from 10% to 15% by weight of silver;

(D) from 0.05 % to 3% by weight of at least a metalloid, or will consist essentially of

(A) from 75% to 76% by weight of gold

(C) from 5% to 10% by weight of nickel; from 15 % to 20 % by weight of copper;

(D) from 0.05 % to 3% by weight of at least a metalloid. Suitably a white gold alloy by way 14 carat gold may consist essentially of

(A) from 58.5 % to 59.5 % by weight of gold

(B) from 15% to 25% by weight of palladium;

from 15% to 25% by weight of silver;

(D) from 0.05 % to 3% by weight of at least a metalloid,

or will consist essentially of

(A) from 58.5 % to 59.5 % by weight of gold

(C) from 8 % to 20 % by weight of nickel;

from 23% to 35% by weight of copper;

(D) from 0.05 % to 3% by weight of at least one metalloide.In

a preferred but not exclusive embodiment, a white gold alloy by way 10 carat gold may consist essentially of

(A) from 41.7 % to 42.5 % by weight of gold

(B) from 25% to 45% by weight of palladium;

from 25 to 45 % by weight of silver;

(D) from 0.05 % to 3% by weight of at least a metalloid,

or will consist essentially of

(A) from 41.7 % to 42.5 % by weight of gold

(C) from 12.5 % to 35% by weight of nickel;

from 35% to 50% by weight of copper;

(D) from 0.05 % to 3% by weight of at least one metalloide.Vantaggiosamente

the alloy may have a particle size of between 1 μm and 60 ym.

[0027] The invention will be better understood thanks to the following examples which are provided for purely illustrative purposes and are not limitative of the invention.

Examples

Example 1 - Preparation of alloys

[0028] were prepared two examples of white gold alloys in powder, both for 18 carat gold.

Sample 1

gold 75,20 % by weight;

palladium 12.4 % by weight;

silver 12.2 % by weight;

germanium 0.2 % by weight.

Sample 2

gold 75,20 % by weight;

nickel 7.5 % by weight;

copper 17.1 % by weight;

germanium 0.2 % by weight.

[0029] The alloys of the samples 1-2 were prepared by a gas atomizer which operates in environment completely protected with argon and atmospheric pressure. The atomization ensures the formation of powders consisting of particles having a prevalently spherical shape.

Example 2 - embodiment of precious objects

[0030] have been made by SLM lamellar blocks (parallelepiped having a length of 10.0 mm and a width of 5.0 mm and a thickness of 5.0 mm and a nominal distance uniform between the individual laminae of 500 pm)in white gold

by the powders of samples 1 and 2.

[0031] An apparatus was used SLM 50 (Realizer)provided with a fiber laser (W max = 100 Watt) having a spot from 10 μm and a table of circular construction (70 mm), inserted in a protected atmosphere chamber with inert gas (Ar).

[0032] Both blocks have good mechanical characteristics and low surface roughness.