A component, in particular a rotor blade of a gas turbine, having a blade tip plating, the plating including a cover layer that is formed of abrasive particles embedded in a metallic matrix material, and the cover layer being applied onto a surface of the component with the intermediate situation of a metallic bonding layer, wherein the metallic bonding layer is fashioned as a bonding layer applied to the component by high-speed flame spraying, and that the metallic matrix material of the cover layer is galvanically deposited.
COMPONENT WITH A REINFORCING PLATING

[0001] The present invention relates to a component, in particular a gas turbine component such as a turbine rotor blade, having a plating, in particular a blade tip plating, as recited in the preamble of Claim 1.

[0002] Turbomachines, such as gas turbines, generally have a plurality of rotating rotor blades and a plurality of stationary guide blades, the rotor blades rotating together with a rotor and the rotor blades and guide blades being enclosed in a stationary housing. In order to improve performance, it is important to optimize all components and sub-systems, including what are known as sealing systems.

[0003] In turbomachines, a particular problem is the maintenance of a minimum gap between the rotating rotor blades and the stationary housing of a high-pressure compressor. This is because high-pressure compressors exhibit the highest absolute temperatures and temperature gradients, which makes it difficult to maintain the gap between the rotating rotor blades and the stationary housing. Inter alia, another reason for this is that compressor rotor blades do not have shrouds as are used in turbine rotor blades.

[0004] As just mentioned, rotor blades in a compressor do not have shrouds. Therefore, ends or tips of the rotor blades are exposed to direct frictional contact with the stationary housing, in what is called blade rubbing. Such rubbing of the tips of the rotor blades in the housing is caused by manufacturing tolerances during the setting of a minimum radial gap. Because the frictional contact of the tips of the rotor blades wears material away from them, an undesired enlargement of the gap can result around the entire periphery of the housing and rotor. In order to avoid this, it is known from the prior art to plate the ends or tips of the rotor blades with a hard coating or with abrasive particles. Two different types of blade tip platings are known from the prior art, namely, on the one hand, platings of a ceramic material or, on the other hand, platings of abrasive particles. The present invention relates to a plating, in particular a blade tip plating, of a component, in particular a gas turbine rotor blade, with abrasive particles.

[0005] U.S. Pat. No. 6,194,086 B1 discloses a rotor blade of a gas turbine having a blade tip plating in which the blade tip plating comprises a cover layer that is made of abrasive particles embedded in a metallic matrix material. The cover layer made up of the abrasive particles embedded in the metallic matrix material is applied onto the tip of a rotor blade that is to be plated with the interposition of a metallic bonding layer. The metallic bonding layer is fashioned as a LPPS layer, and is accordingly applied to the component using low-pressure plasma spraying. The disadvantage of such LPPS bonding layers is that in particular at high operating temperatures of up to 1200° C. they have low mechanical adhesion to the blade tip, so that during operation the blade tip plating can flake off.

[0006] Against this background, the present invention is based on the problem of creating a new type of component having a plating. This problem is solved by a component as recited in Claim 1. According to the present invention, the metallic bonding layer is fashioned as a bonding layer that is applied to the component using high-speed flame spraying, the metallic matrix material of the cover layer being galvanically deposited.

[0007] According to the present invention, the bonding layer is applied to the component using high-speed flame spraying. In this way, the plating adheres to the component better than is the case given the use of LPPS bonding layers. The blade tip plating of the component accordingly has better mechanical bonding, in particular at high operating temperatures.

[0008] Preferred further developments of the present invention result from the subclaims and from the following description. Exemplary embodiments of the present invention are explained in more detail on the basis of the drawing, without being limited thereto.

[0009] FIG. 1 shows a schematized cross-section of a plating applied to a component.

[0010] The present invention relates to a plated component, in particular a rotor blade of a gas turbine provided with a blade tip plating. The rotor blade of the gas turbine is preferably realized as a high-pressure compressor rotor blade.

[0011] FIG. 1 shows a highly schematized cross-section of a blade tip 10 of a rotor blade, blade tip 10 of the rotor blade having a blade tip plating 11.

[0012] Blade tip plating 11 has at least two layers, namely an outer cover layer 12 and an inner bonding layer 13. In the exemplary embodiment shown in FIG. 1, cover layer 12 is applied onto blade tip 10 via bonding layer 13. Additional layers may be present between cover layer 12 and bonding layer 13.

[0013] According to FIG. 1, cover layer 12 is formed by abrasive particles 14 that are embedded in a metallic matrix material 15. Bonding layer 13 is realized as a metallic bonding layer. Metallic bonding layer 13 and metallic matrix material 15 of cover layer 12 are each made of a MCrAlY material.

[0014] According to the present invention, metallic bonding layer 13 is fashioned as a bonding layer applied to the component using high-speed flame spraying (HVOF). Due to the application of bonding layer 13 using high-speed flame spraying, said bonding layer is very strong and has low porosity, so that it adheres well to blade tip 10. Metallic matrix material 15 of cover layer 12 is deposited galvanically. Abrasive particles 14 are embedded therein that are preferably formed as hard material particles made of cubic boron nitride.

[0015] As already mentioned, metallic matrix material 15 of cover layer 12, and metallic bonding layer 13, are each made of a MCrAlY material, preferably having the following composition:

- 14-22% by weight chromium (Cr),
- 6-14% by weight cobalt (Co),
- 4-9% by weight aluminum (Al),
- 5-8% by weight tantalum (Ta),
- 1-3% by weight rhenium (Re),
- 0.5-1% by weight hafnium (Hf),
- 0.5-1.5% by weight silicon (Si),
- 0.3-1% by weight yttrium (Y),
- remainder nickel.

[0016] The following composition of the MCrAlY material is particularly preferred:

- 18% by weight chromium,
- 10% by weight cobalt (Co),
- 6.5% by weight aluminum (Al),
- 6% by weight tantalum (Ta),
- 2% by weight rhenium (Re),
- 0.5% by weight hafnium (Hf),
- 1% by weight silicon (Si),
- 0.3% by weight yttrium (Y),
- remainder nickel.
According to the present invention, in this way a rotor blade is provided having a blade tip plating, the plating having a high-speed flame-sprayed bonding layer that creates the bond of blade tip 11 to blade tip 10, and high-speed flame-sprayed bonding layer 13 having high mechanical load capacity, in particular at high operating temperatures. Bonding layer 13 bears cover layer 12, which is formed of abrasive particles 14 embedded in metallic matrix material 15, metallic matrix material 15 of cover layer 12 being galvanically deposited.

1. A component, in particular a rotor blade of a gas turbine, comprising: a blade tip plating, said plating including a cover layer that is formed of abrasive particles embedded in a metallic matrix material, and the cover layer being applied onto a surface of the component with the intermediate situation of a metallic bonding layer,

   wherein
   the metallic bonding layer is fashioned as a bonding layer applied to the component by high-speed flame spraying,
   and that the metallic matrix material of the cover layer is galvanically deposited.

2. The component as recited in claim 1,

   wherein
   the metallic matrix material of the cover layer is made of a McrAlY material, or includes a McrAlY material.

3. The component as recited in claim 2,

   wherein
   the metallic matrix material of the cover layer is made of a McrAlY material and has the following composition:
   14-22% by weight chromium (Cr),
   6-14% by weight cobalt (Co),
   4-9% by weight aluminum (Al),
   5-8% by weight tantalum (Ta),
   1-3% by weight rhenium (Re),
   0.5-1% by weight hafnium (Hf),
   0.5-1.5% by weight silicon (Si),
   0.3-1% by weight yttrium (Y),
   the remainder being nickel.

4. The component as recited in claim 3,

   wherein
   the McrAlY material has the following composition:
   18% by weight chromium (Cr),
   10% by weight cobalt (Co),
   6.5% by weight aluminum (Al),
   6% by weight tantalum (Ta),
   2% by weight rhenium (Re),
   0.5% by weight hafnium (Hf),
   1% by weight silicon (Si),
   0.3% by weight yttrium (Y),
   the remainder being nickel.

5. The component as recited in claim 1,

   wherein
   the metallic bonding layer is made of a McrAlY material and has the following composition:
   14-22% by weight chromium (Cr),
   6-14% by weight cobalt (Co),
   4-9% by weight aluminum (Al),
   5-8% by weight tantalum (Ta),
   1-3% by weight rhenium (Re),
   0.5-1% by weight hafnium (Hf),
   0.5-1.5% by weight silicon (Si),
   0.3-1% by weight yttrium (Y),
   the remainder being nickel.

6. The component as recited in claim 5,

   wherein
   the McrAlY material has the following composition:
   18% by weight chromium,
   10% by weight cobalt (Co),
   6.5% by weight aluminum (Al),
   6% by weight tantalum (Ta),
   2% by weight rhenium (Re),
   0.5% by weight hafnium (Hf),
   1% by weight silicon (Si),
   0.3% by weight yttrium (Y),
   the remainder being nickel.

7. The component as recited in claim 1,

   wherein
   the abrasive particles of the cover are made of cubic boron nitride.