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(54) **Method of forming multicolor aluminium alloy**

Verfahren zum Bilden einer mehrfarbigen Aluminiumlegierung

Procédé de formation d'alliage en aluminium multi-couleur

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DescriptionBACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a method of forming a multicolor aluminum alloy, and more particularly to a method of forming a multicolor aluminum alloy by anodizing for preferred color quality.

2. Description of the Prior Arts

[0002] A conventional anodizing surface treatment comprises forming a base oxide layer on a metal substrate by chemical or electrochemical treatment to provide a protective effect to the metal substrate. The metal may be aluminum alloy. The conventional anodizing surface treatment may further comprise steps of forming a base ink layer on the base oxide layer, forming a subsequent oxide layer and forming a subsequent ink layer on the subsequent oxide layer, wherein the steps after reforming the surface of the base layers may be repeated and the subsequent layer is included as the base in such repeated treatments to provide a multicolor effect.

[0003] However, the step of reforming the surface of the base layer requires a cutting or a milling process to expose the substrate such as cutting or milling, which uses coolant and oil that must be fully removed, or the coolant and oil prevent the surface oxide layer being formed on the substrate.

[0004] In addition, cutting or milling may damage the original ink layer. The step of forming the surface oxide layer may cause the original oxide layer to flake, thereby allowing the metal substrate to be oxidized.

[0005] Furthermore, the surface ink layer may bleed into the base ink layer. The base ink layer must also be fully removed before a surface oxide layer can be formed on the substrate so increasing a manufacturing time of the multicolor substrate.

[0006] To overcome the shortcomings, the present invention provides a method of forming multicolor on aluminum alloy to mitigate or obviate the aforementioned problems.

[0007] UP 60 075599 A discloses multicolor anodizing of Al pieces

SUMMARY OF THE INVENTION

[0008] The main objective of the present invention is to provide a method of forming multicolor aluminum alloy, and more particularly to a method of forming multicolor aluminum alloy using anodizing surface treatment for preferred color quality.

[0009] A method for forming multicolor aluminum alloy comprising steps of preparing, surface treating, forming, processing and reprocessing. Preparing comprises providing an aluminum alloy substrate and cleaning with wa-

ter. Surface treating comprises disposing the substrate in a base electrolytic solution to form a base oxide layer by anodizing. Forming comprises forming a membrane of transparent, acid-proof, insulated plastic material on the substrate. Processing comprises removing local area membrane and corresponding oxide layer from the substrate and cleaning. Reprocessing comprises disposing the clean substrate in a subsequent electrolytic solution to form a subsequent oxide layer on areas of the substrate exposed by the membrane by anodizing.

[0010] Other objectives, advantages and novel features of the invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] Fig. 1 is a block diagram of a method of forming multicolor aluminum alloy in accordance with the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0012] With reference to Fig. 1, a method of forming multicolor aluminum alloy in accordance with the present invention comprises steps of preparing, surface treating, forming, processing and reprocessing.

[0013] The step of preparing comprises acts of providing an aluminum alloy substrate having an external surface, machining the substrate to form a shaped substrate by a Computer Numerical Control (CNC) machine with coolant and oil, removing the coolant and oil from the external surface with sodium hydroxide and cleaning the shaped substrate with water, thereby removing impurities from the external surface of the substrate to provide a clean external surface.

[0014] The step of surface treatment comprises disposing the substrate with clean external surface in a base electrolytic solution to form a colored oxide layer on the substrate by an anodizing surface treatment, removing the substrate from the base electrolytic solution after forming the base oxide layer on the external surface of the substrate and drying to form a colored substrate.

[0015] The step of forming comprises forming a membrane on the colored oxide layer made from a transparent acid-proof insulated plastic material, such as plastic, rubber or ceramic layer.

[0016] The step of processing comprises processing the substrate to remove at least one local area of membrane and corresponding local area of colored oxide layer from the external surface of the colored substrate with coolant and oil using the CNC machine, removing the coolant and oil from the colored substrate using sodium hydroxide and cleaning the external surface of the substrate with water, thereby removing impurities from and providing a clean colored substrate.

[0017] The step of reprocessing comprises disposing

the substrate in a subsequent electrolytic solution to form a subsequent oxide layer on the external surface of the substrate exposed by the membrane, and removing the substrate from the subsequent electrolytic solution after forming the subsequent oxide layer on the external surface of the substrate and drying to add a color to the colored oxide layer.

[0018] By forming a transparent, acid-proof, insulation plastic to cover and protect the colored oxide, the coolant and oil in subsequent steps do not adhere to the colored oxide layer so is cleaned easily. When the local membrane on the local colored oxide is removed, the local colored oxide is fully replaced by the oxide layer so bleeding does not occur and damage to the oxide layer is replaced with the colored layer. Therefore, a preferred color quality is achieved.

[0019] Even though numerous characteristics and advantages of the present invention have been set forth in the foregoing description, together with details of the structure and features of the invention, the disclosure is illustrative only. Changes may be made in the details, especially in matters of shape, size, and arrangement of parts within the principles of the invention to the full extent indicated by the broad general meaning of the terms in which the appended claims are expressed.

Claims

1. A method for forming multicolor aluminum alloy comprising steps of:

preparing, comprising
 providing an aluminum alloy substrate having an external surface;
 machining the substrate with coolant and oil to form a shaped substrate;
 removing the coolant and oil from the external surface of the substrate; and
 cleaning the shaped substrate with water;
 surface treating, comprising disposing the shaped substrate with clean external surface in a base electrolytic solution to form a base oxide layer on the external surface of the substrate by anodizing surface treatment to provide a colored substrate;
 forming, comprising forming a membrane on the colored substrate made from a transparent, acid-proof, insulating plastic material;
 processing, comprising
 processing the colored substrate to remove at least one local area of membrane and corresponding local area of colored oxide layer from the external surface of the colored substrate;
 removing the coolant and oil from the colored substrate; and cleaning the external surface of the colored substrate with water to form a clean colored substrate; and

reprocessing, comprising disposing the clean colored substrate in a subsequent electrolytic solution to form a subsequent oxide layer on the external surface of the substrate exposed by the membrane.

2. The method as claimed in claim 1, wherein the step of surface treating further comprises removing the substrate from the base electrolytic solution after forming the base oxide layer on the external surface of substrate and drying.
3. The method as claimed in claim 2, wherein the reprocessing step further comprises removing the substrate from the subsequent electrolytic solution after forming the subsequent oxide layer on the external surface of the substrate and drying.
4. The method as claimed in claim 3, wherein the step of machining the substrate is performed by a Computer Numerical Control (CNC) machine.
5. The method as claimed in claim 4, wherein the step of processing the substrate to remove at least one local area membrane and corresponding local area of colored oxide layer from the external surface of the colored substrate is performed by the CNC machine.
6. The method as claimed in claim 5, wherein in the steps of removing the coolant and oil uses sodium hydroxide.
7. The method as claimed in claim 1, wherein the steps of surface treating and surface reprocessing further comprise removing the substrate from the electrolytic solution after forming the oxide layer and drying.
8. The method as claimed in claim 1, wherein in the step of machining the substrate to form the shaped substrate is performed by a CNC machine.
9. The method as claimed in claim 1, wherein the step of processing the substrate to remove at least one local area membrane and corresponding local area of colored oxide layer from the external surface of the colored substrate is performed by a CNC machine.
10. The method as claimed in claim 1, wherein the steps of removing the coolant and oil from the external surface of the substrate used sodium hydroxide.

Patentansprüche

1. Verfahren zum Herstellen einer mehrfarbigen Aluminiumlegierung mit den Schritten:

- Vorbereiten, umfassend
Bereitstellen eines Aluminiumlegierungssubstrats mit einer Außenoberfläche; Maschinelle Bearbeitung des Substrats unter Verwendung von Kühlmittel und Öl, um ein geformtes Substrat auszubilden; 5
Entfernen des Kühlmittels und des Öls von der Außenoberfläche des Substrats; und Reinigen des geformten Substrats mit Wasser;
Oberflächenbehandlung mit Anordnen des geformten Substrats mit einer sauberen Außenoberfläche in einer elektrolytischen Basislösung, um eine Basisoxidschicht auf der Außenoberfläche des Substrats durch anodisierende Oberflächenbehandlung auszubilden, um ein farbiges Substrat bereitzustellen; 10
Formen mit Ausbildung einer Membran auf dem farbigen Substrat, die aus einem transparenten, säurebeständigem und isolierendem Kunststoff hergestellt ist; 15
Bearbeitung mit
Bearbeiten des gefärbten Substrats, um zumindest einen lokalen Bereich der Membran und den entsprechenden lokalen Bereich der gefärbten Oxidschicht von der Außenoberfläche des gefärbten Substrats zu entfernen; 20
Entfernen der Kühlflüssigkeit und des Öls vom gefärbten Substrat; und
Reinigen der Außenoberfläche des gefärbten Substrats mit Wasser, um ein sauberes gefärbtes Substrat auszubilden; und 25
Wiederaufarbeitung mit Anordnen des sauberen gefärbten Substrats in einer nachfolgenden elektrolytischen Lösung, um eine nachfolgende Oxidschicht auf der Außenoberfläche des Substrats, die durch die Membran freigelegt wurde, auszubilden. 30
2. Verfahren nach Anspruch 1, wobei der Schritt der Oberflächenbehandlung ferner das Entfernen des Substrats aus der elektrolytischen Basislösung nach dem Ausbilden der Oxidschicht auf der Außenoberfläche des Substrats und dem Trocknen umfasst. 35
3. Verfahren nach Anspruch 2, wobei der Wiederaufarbeitungsschritt ferner das Entfernen des Substrats aus der nachfolgenden elektrolytischen Lösung nach dem Ausbilden der nachfolgenden Oxidschicht auf der Außenoberfläche des Substrats und dem Trocknen umfasst. 40
4. Verfahren nach Anspruch 3, wobei der Schritt der maschinellen Bearbeitung des Substrats mit einer computergestützten numerisch gesteuerten (CNC) Maschine durchgeführt wird. 45
5. Verfahren nach Anspruch 4, wobei der Schritt des Bearbeitens des Substrats, um zumindest einen lokalen Bereich der Membran und den entsprechenden lokalen Bereich der gefärbten Oxidschicht der Außenoberfläche des gefärbten Substrats zu entfernen, mit einer CNC Maschine durchgeführt wird. 50
6. Verfahren nach Anspruch 5, wobei bei den Schritten des Entfernens der Kühlflüssigkeit und des Öls Natronlauge verwendet wird.
7. Verfahren nach Anspruch 1, wobei die Schritte der Oberflächenbehandlung und der Wiederaufarbeitung ferner das Entfernen des Substrats aus der elektrolytischen Lösung nach dem Ausbilden der Oxidschicht und dem Trocknen umfassen.
8. Verfahren nach Anspruch 1, wobei der Schritt der maschinellen Bearbeitung des Substrats, um das geformte Substrat auszubilden, mit einer CNC Maschine durchgeführt wird.
9. Verfahren nach Anspruch 1, wobei der Schritt des Bearbeitens des Substrats, um zumindest einen lokalen Bereich der Membran und den entsprechenden lokalen Bereich der gefärbten Oxidschicht der Außenoberfläche des gefärbten Substrats zu entfernen, mit einer CNC Maschine durchgeführt wird.
10. Verfahren nach Anspruch 1, wobei bei den Schritten des Entfernens der Kühlflüssigkeit und des Öls von der Außenoberfläche des Substrats Natronlauge verwendet wird.

Revendications

1. Procédé pour former un alliage d'aluminium multicolore comprenant les étapes suivantes :

la préparation, incluant :

la mise à disposition d'un substrat en alliage d'aluminium présentant une surface extérieure ;
l'usinage du substrat avec un fluide de refroidissement et de l'huile pour obtenir un substrat façonné ;
le retrait du fluide de refroidissement et de l'huile de la surface extérieure du substrat ;
et
le nettoyage à l'eau du substrat façonné

le traitement de surface, incluant l'introduction du substrat façonné avec la surface extérieure propre dans une solution électrolytique de base pour former une couche d'oxyde de base sur la surface extérieure du substrat en anodisant le traitement de surface pour obtenir un substrat coloré ;

- la formation, incluant la formation, sur le substrat coloré, d'une membrane composée d'un matériau en plastique transparent, résistant à l'acide et isolant ;
 le traitement, incluant
 le traitement du substrat coloré pour enlever au moins une zone locale de membrane et la zone locale correspondante de couche d'oxyde colorée de la surface extérieure du substrat coloré ;
 le retrait du fluide de refroidissement et de l'huile du substrat coloré ; et
 le nettoyage à l'eau de la surface extérieure du substrat coloré pour obtenir un substrat coloré propre ; et
 le retraitement, incluant l'introduction du substrat coloré propre dans une solution électrolytique subséquente pour obtenir une couche d'oxyde subséquente sur la surface extérieure du substrat exposé par la membrane.
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2. Procédé selon la revendication 1, dans lequel l'étape de traitement de surface comprend en outre le retrait du substrat de la solution électrolytique de base après la formation de la couche d'oxyde de base sur la surface extérieure du substrat, et le séchage. 25
3. Procédé selon la revendication 2, dans lequel l'étape de retraitement comprend en outre le retrait du substrat de la solution électrolytique subséquente après la formation de la couche d'oxyde subséquente sur la surface extérieure du substrat, et le séchage. 30
4. Procédé selon la revendication 3, dans lequel l'étape d'usinage du substrat est réalisée par une machine à commande numérique par ordinateur (CNC). 35
5. Procédé selon la revendication 4, dans lequel l'étape de traitement du substrat destinée à enlever au moins une zone locale de la membrane et la zone locale correspondante de la couche d'oxyde colorée de la surface extérieure du substrat coloré est réalisée par la machine à commande numérique par ordinateur (CNC). 40
6. Procédé selon la revendication 5, dans lequel de l'hydroxyde de sodium est utilisé lors des étapes de retrait du fluide de refroidissement et de l'huile. 45
7. Procédé selon la revendication 1, dans lequel les étapes de traitement de surface et de retraitement de la surface comprennent en outre le retrait du substrat de la solution électrolytique après la formation de la couche d'oxyde, et le séchage. 50
8. Procédé selon la revendication 1, dans lequel l'étape d'usinage du substrat pour obtenir le substrat façonné est réalisée par une machine à commande numérique par ordinateur (CNC). 55
9. Procédé selon la revendication 1, dans lequel l'étape de traitement du substrat destinée à enlever au moins une zone locale de membrane et la zone locale correspondante de la couche d'oxyde colorée de la surface extérieure du substrat coloré est réalisée par une machine à commande numérique par ordinateur (CNC). 5
10. Procédé selon la revendication 1, dans lequel les étapes de retrait du fluide de refroidissement et de l'huile de la surface extérieure du substrat font appel à de l'hydroxyde de sodium. 10

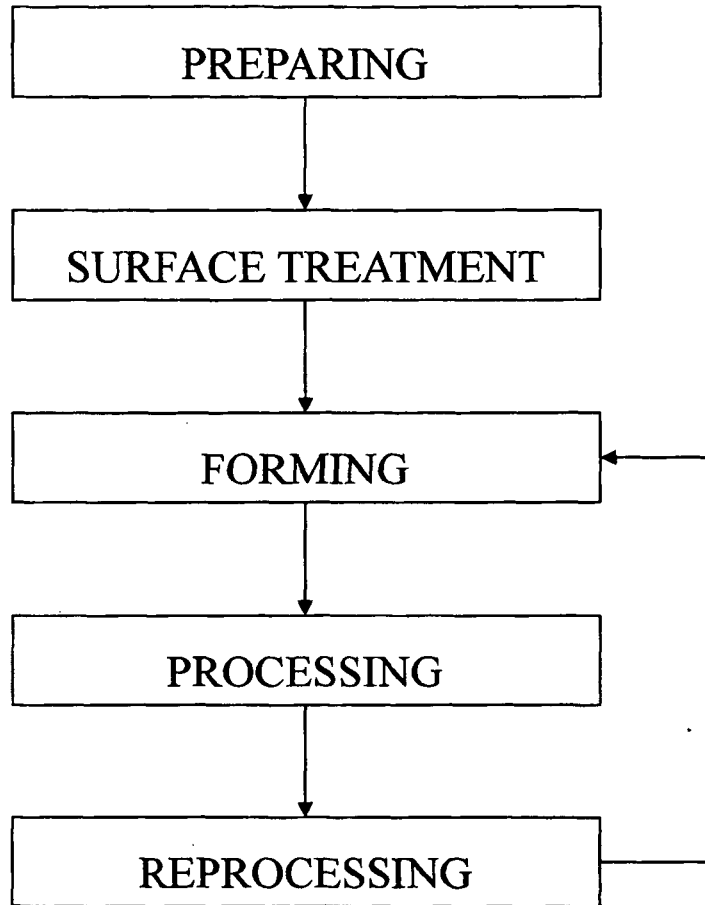


FIG.1