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【54】 name Title: A repair device for metal components

【21】 Application Number: 115203030 **【22】** Application Date: Republic of China
115 (2026) Year 04 month 08 Day

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[57] Scope of patent application

1. A repair device for metal components, comprising:
A cold gas dynamic spraying device, comprising a powder feeder for providing powder repair materials, a gas supply device, a gas heater for heating the gas, a gas flow controller, and a nozzle assembly for accelerating powder repair material particles;
The cold gas dynamic spraying equipment is connected to the gas flow controller via the gas supply device to input carrier gas into the gas flow controller. The gas flow controller controls the pressure of the pressurized carrier gas and diverts the pressurized carrier gas to the powder feeder and gas heater. The powder feeder and gas heater are connected to the nozzle assembly, allowing powder repair material particles to be accelerated by the pressurized carrier gas through the nozzle assembly. The accelerated carrier gas and powder repair material are ejected from the nozzle assembly onto a repair surface area of the repair assembly.
2. The repair device for metal components according to claim 1, wherein the cold gas dynamic spraying device supplies the carrier gas to the gas supply device; and sets a preset pressure on the gas flow controller to apply it to the carrier gas; and sets a preset temperature on the gas heater to apply the pressurized carrier gas and powder repair material; and adjusts the spray distance from the nozzle assembly to the repair surface area to a predetermined distance; and cold-sprays the powder repair material onto the repair surface area through the nozzle assembly, forming a coating with predetermined thickness and size to cover the repair surface area
3. The repair device for metal components according to claim 2, wherein the powder repair material is the same as the material of the repair assembly
4. The repair device for metal components according to claim 2, wherein the carrier gas includes one of the following: nitrogen and helium

5. The repair device for metal components according to claim 2, wherein the predetermined pressure is between 140 psi and 200 psi
6. The repair device for metal components according to claim 2, wherein the predetermined temperature is between 350°C and 500°C
7. The repair device for metal components according to claim 2, wherein the spraying distance is between 10-30mm
8. The repair device for metal components according to claim 2, wherein the coating complies with a technical data requirement of the component design specification
9. The repair device for metal components according to claim 8, wherein the technical data requirements include one or more of the following: tensile strength, load-bearing capacity, yield strength, peel strength, compressive strength, and flexural strength
10. A repair device containing aluminum metal components, comprising:

(2)

A cold gas dynamic spraying device, comprising a powder feeder for providing powder repair materials, a gas supply device, a gas heater for heating the gas, a gas flow controller, and a nozzle assembly for accelerating powder repair material particles;

The cold gas dynamic spraying equipment is connected to the gas flow controller via the gas supply device to input carrier gas into the gas flow controller. The gas flow controller controls the pressure of the pressurized carrier gas and diverts the pressurized carrier gas to the powder feeder and the gas heater. The powder feeder and gas heater are connected to the nozzle assembly, allowing powder repair material particles to be accelerated by the pressurized carrier gas through the nozzle assembly. The accelerated carrier gas and powder repair material are ejected from the nozzle assembly onto a repair surface area of the repair assembly;

The cold gas dynamic spraying device supplies the carrier gas composed of nitrogen to the gas supply device; A preset pressure between 150-200psi is set on the gas flow controller to apply to the carrier gas from the gas supply device; A predetermined temperature between 350°C and 400°C is set on the gas heater to apply to the pressurized carrier gas and powder repair material; The spray distance from the nozzle assembly to the repair surface area is adjusted to a predetermined distance of 10-30mm; The powder repair material is cold-sprayed onto the repair surface area through the nozzle assembly, forming a coating with predetermined thickness and size to cover the repair surface area

11. A repair device for metal components, comprising:

A cold gas dynamic spraying device, comprising a powder feeder for providing powder repair materials, a gas supply device, a gas heater for heating the gas, a gas flow controller, and a nozzle assembly for accelerating powder repair material particles;

The cold gas dynamic spraying equipment is connected to the gas flow controller via the gas supply device to input carrier gas into the gas flow controller. The gas flow controller controls the pressure of the pressurized carrier gas and diverts the pressurized carrier gas to the powder feeder and gas heater. The powder feeder and gas heater are connected to the nozzle assembly, allowing powder repair material particles to be accelerated by the pressurized carrier gas through the nozzle assembly. The accelerated carrier gas and powder repair material are ejected from the nozzle assembly onto a repair surface area of the repair assembly; The repair components are AL-7075 and AL-2024;

The cold gas dynamic spraying device supplies the carrier gas composed of helium to the gas supply device; A preset pressure of 140psi is set on the gas flow controller to apply to the carrier gas from the gas supply device; A preset temperature of 400°C is set on the gas heater to apply to the pressurized carrier gas and powder repair material; The spray distance from the nozzle assembly to the repair surface area is adjusted to a predetermined distance of 10-30mm; The powder repair material is cold-sprayed onto the repair surface area through the nozzle assembly, forming a coating of predetermined thickness and size to

(2)

cover the repair surface area

12. A repair device for metal components, comprising:

A cold gas dynamic spraying device, comprising a powder feeder for providing powder repair materials, a gas supply device, a gas heater for heating the gas, a gas flow controller, and a nozzle assembly for accelerating powder repair material particles;

The cold gas dynamic spraying device is connected to the gas flow controller via the gas supply device to input carrier gas into the gas flow controller. The gas flow controller controls the pressure of the pressurized carrier gas and diverts the pressurized carrier gas to the powder feeder and gas heater. The powder feeder and gas heater are connected to the nozzle assembly, allowing powder repair material particles to be accelerated by the pressurized carrier gas through the nozzle assembly. The accelerated carrier gas and powder repair material are ejected from the nozzle assembly onto a repair surface area of the repair assembly; The repair assembly is made of cast iron, steel, and nickel;

The cold gas dynamic spraying device supplies the carrier gas composed of nitrogen to the gas supply device; and sets **a preset pressure between 175-200 psi on the gas flow controller** to apply the carrier gas from the gas supply device for transport to the powder feeder and the gas heater; and sets **a preset temperature of 400-500°C on the gas heater** to apply to the pressurized carrier gas and powder repair material; and the nozzle assembly is applied to the repair surface area

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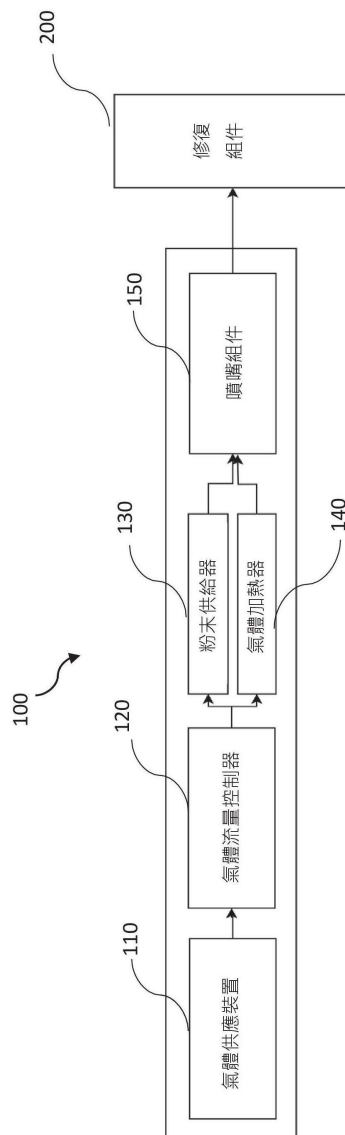
1. Adjust the spraying distance to a predetermined distance of 10-30mm; Then, the powder repair material is cold-sprayed onto the repair surface area through the nozzle assembly, forming a coating with predetermined thickness and size to cover the repair surface area

A brief explanation of the diagram

In schematics, the same reference characters usually refer to the same part in different views. These schemas are not necessarily drawn to scale but usually emphasize illustrating the principles of the invention. The dimensions of various features or elements may be arbitrarily enlarged or reduced for clarity. In the following description, when considering non-limiting examples and drawings, the various embodiments of the invention will be better understood:

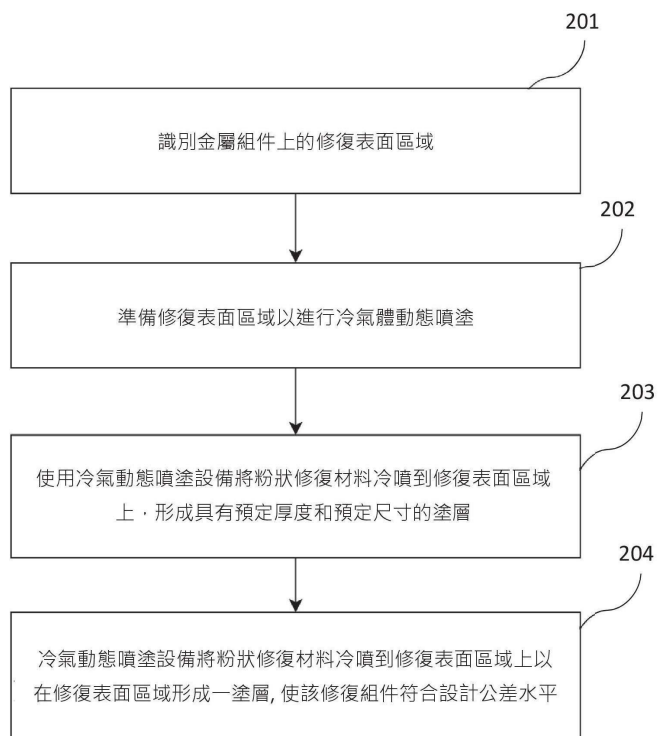
[Figure 1] shows a structural block diagram of the cold gas dynamic spraying device according to various embodiments;

[Figure 2] shows a flowchart of the method for repairing metal components according to various embodiments



【圖1】

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【圖2】

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新型

全 4 頁

【54】名稱：一種金屬組件之修復設備

【21】申請案號：115203030 【22】申請日：中華民國 115 (2026) 年 04 月 08 日

【72】新型創作人：高百慶 (SG) KOH, PAK KENG

【71】申請人：新加坡商依神給私人有限公司 ECK PTE LTD
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【57】申請專利範圍

1. 一種金屬組件之修復設備，其包含：
一冷氣體動態噴塗設備，其包括用於提供粉末修復材料的一粉末供給器、一氣體供應裝置、用於加熱氣體的一氣體加熱器、一氣體流量控制器和用於加速粉末修復材料顆粒的一噴嘴組件；
該冷氣體動態噴塗設備係透過該氣體供應裝置係連結於該氣體流量控制器，以將一載氣輸入至該氣體流量控制器，氣體流量控制器係控制加壓載氣的壓力，並將加壓後之載氣分流輸送至該粉末供給器和該氣體加熱器，該粉末供給器和氣體加熱器係連結於該噴嘴組件，使粉末修復材料的顆粒通過噴嘴組件被加壓載氣加速，加速的載氣和粉末修復材料從該噴嘴組件，係用以向一修復組件的一修復表面區域噴出。
2. 如請求項 1 所述之金屬組件之修復設備，其中，該冷氣體動態噴塗設備係向該氣體供應裝置提供該載氣；並在該氣體流量控制器上設置預定壓力，以應用於該載氣；且在該氣體加熱器上設置預定溫度，以應用於經加壓之該載氣和該粉末修復材料；並將該噴嘴組件到該修復表面區域的一噴塗距離調整到預定距離；並將該粉末修復材料透過噴嘴組件冷噴塗到該修復表面區域上，形成具有預定厚度和預定尺寸的塗層以覆蓋該修復表面區域。
3. 如請求項 2 所述之金屬組件之修復設備，其中，該粉末修復材料與修復組件之材料相同。
4. 如請求項 2 所述之金屬組件之修復設備，其中，該載氣包括以下之一：氮氣和氬氣。
5. 如請求項 2 所述之金屬組件之修復設備，其中，該預定壓力在 140 psi 至 200 psi 之間。
6. 如請求項 2 所述之金屬組件之修復設備，其中，該預定溫度在 350°C 至 500°C 之間。
7. 如請求項 2 所述之金屬組件之修復設備，其中，該噴塗距離在 10-30mm 之間。
8. 如請求項 2 所述之金屬組件之修復設備，其中，該塗層符合組件設計規範的一技術數據要求。
9. 如請求項 8 所述之金屬組件之修復設備，其中，該技術數據要求包括以下一項或多項：拉伸強度、承載能力、屈服強度、剝離強度、承壓強度和彎曲強度。
10. 一種含鋁金屬組件之修復設備，其包含：

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一冷氣體動態噴塗設備，其包括用於提供粉末修復材料的一粉末供給器、一氣體供應裝置、用於加熱氣體的一氣體加熱器、一氣體流量控制器和用於加速粉末修復材料顆粒的一噴嘴組件；

該冷氣體動態噴塗設備係透過該氣體供應裝置係連結於該氣體流量控制器，以將一載氣輸入至該氣體流量控制器，氣體流量控制器係控制加壓載氣的壓力，並將加壓後之載氣分流輸送至該粉末供給器和該氣體加熱器，該粉末供給器和氣體加熱器係連結於該噴嘴組件，使粉末修復材料的顆粒通過噴嘴組件被加壓載氣加速，加速的載氣和粉末修復材料從該噴嘴組件，係用以向一修復組件的一修復表面區域噴出；

該冷氣體動態噴塗設備係向該氣體供應裝置提供由氮氣組成的該載氣；並在該氣體流量控制器上設置 150-200psi 之間的預定壓力，以應用於來自該氣體供應裝置的該載氣；且在該氣體加熱器上設置 350°C - 400°C 之間的預定溫度，以應用於經加壓之該載氣和該粉末修復材料；並將該噴嘴組件到該修復表面區域的一噴塗距離調整到 10-30mm 的預定距離；並將該粉末修復材料透過噴嘴組件冷噴塗到該修復表面區域上，形成具有預定厚度和預定尺寸的塗層以覆蓋該修復表面區域。

11. 一種金屬組件之修復設備，其包含：

一冷氣體動態噴塗設備，其包括用於提供粉末修復材料的一粉末供給器、一氣體供應裝置、用於加熱氣體的一氣體加熱器、一氣體流量控制器和用於加速粉末修復材料顆粒的一噴嘴組件；

該冷氣體動態噴塗設備係透過該氣體供應裝置係連結於該氣體流量控制器，以將一載氣輸入至該氣體流量控制器，氣體流量控制器係控制加壓載氣的壓力，並將加壓後之載氣分流輸送至該粉末供給器和該氣體加熱器，該粉末供給器和氣體加熱器係連結於該噴嘴組件，使粉末修復材料的顆粒通過噴嘴組件被加壓載氣加速，加速的載氣和粉末修復材料從該噴嘴組件，係用以向一修復組件的一修復表面區域噴出；該修復組件為 Al-7075 和 Al-2024；

該冷氣體動態噴塗設備係向該氣體供應裝置提供由氮氣組成的該載氣；並在該氣體流量控制器上設置 140psi 的預定壓力，以應用於來自該氣體供應裝置的該載氣；且在該氣體加熱器上設置 400°C 的預定溫度，以應用於經加壓之該載氣和該粉末修復材料；並將該噴嘴組件到該修復表面區域的一噴塗距離調整到 10-30mm 的預定距離；並將該粉末修復材料透過噴嘴組件冷噴塗到該修復表面區域上，形成具有預定厚度和預定尺寸的塗層以覆蓋該修復表面區域。

12. 一種金屬組件之修復設備，其包含：

一冷氣體動態噴塗設備，其包括用於提供粉末修復材料的一粉末供給器、一氣體供應裝置、用於加熱氣體的一氣體加熱器、一氣體流量控制器和用於加速粉末修復材料顆粒的一噴嘴組件；

該冷氣體動態噴塗設備係透過該氣體供應裝置係連結於該氣體流量控制器，以將一載氣輸入至該氣體流量控制器，氣體流量控制器係控制加壓載氣的壓力，並將加壓後之載氣分流輸送至該粉末供給器和該氣體加熱器，該粉末供給器和氣體加熱器係連結於該噴嘴組件，使粉末修復材料的顆粒通過噴嘴組件被加壓載氣加速，加速的載氣和粉末修復材料從該噴嘴組件，係用以向一修復組件的一修復表面區域噴出；該修復組件為鑄鐵、鋼和鋁；

該冷氣體動態噴塗設備係向該氣體供應裝置提供由氮氣組成的該載氣；並在該氣體流量控制器上設置 175-200 psi 之間的預定壓力，以應用於來自該氣體供應裝置的該載氣，用於運輸到該粉末供給器和該氣體加熱器；且在該氣體加熱器上設置 400-500°C 之預定溫度，以應用於經加壓之該載氣和該粉末修復材料；並將該噴嘴組件到該修復表面區域的

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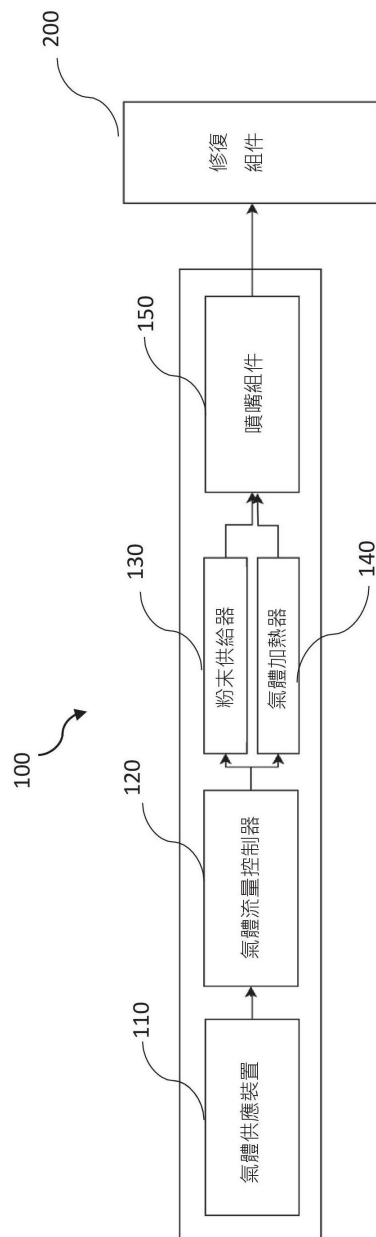
一噴塗距離調整到 10-30mm 的預定距離；並將該粉末修復材料透過噴嘴組件冷噴塗到該修復表面區域上，形成具有預定厚度和預定尺寸的塗層以覆蓋該修復表面區域。

圖式簡單說明

在圖式中，相同的參考字符通常指代不同視圖中的相同部分。這些圖式不一定按比例繪製，而是通常強調說明本創作的原理。各種特徵或元素的尺寸可能為了清晰起見而被任意擴大或縮小。在以下描述中，結合非限制性示例和附圖考慮時，本創作的各種實施例將被更好地理解：

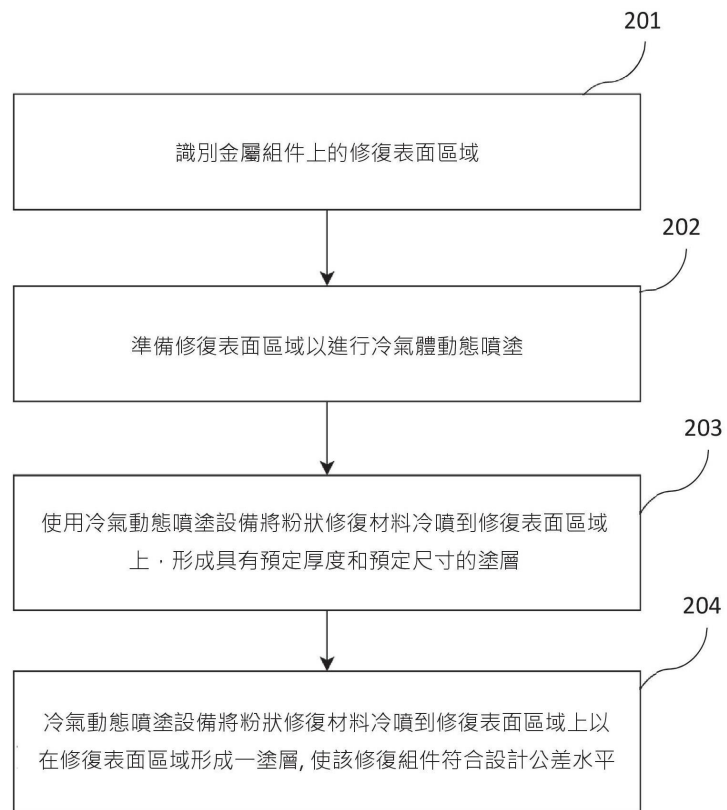
[圖 1]展示了根據各種實施例的冷氣體動態噴塗設備的結構方塊圖；

[圖 2]展示了根據各種實施例修復金屬組件的方法流程圖。



【圖1】

(4)



【圖2】