

Introduction

The technique of making base boards on high-speed rail equipment cabinet by composite material

Technology Field

This invention relates to a kind of technique of making base boards on high-speed rail equipment cabinet by composite material with high strength and light weight.

Background Technology

Base board on high-speed rail equipment cabinet is an important part of the equipment cabinet from standard high speed train. In practical application, lamination design, material usage and technique design are considered since there are certain requirements on bearing ability, flame retardant ability and anti-impact ability of base board; along with the constant update of science and technology, light weight and smooth going design is used to effectively reducing the resistance of the train during operation, thereby reducing the continuous energy consumption. Under the condition of ensuring comprehensive performance, using of composite materials instead of aluminum alloy materials can reduce the weight of the overall train and enhance the level of light weight performance.

Invention Content

In view of the above questions, the main purpose of the present

invention is to provide a kind of technique to make base boards on high-speed rail equipment cabinet with high strength and light weight.

This invention is to solve the above technical problems by the following technical solution: one kind of technique to make base boards on high-speed rail equipment cabinet with composite material which includes:

Aramid fiber honeycomb, PET foam, 3K carbon fiber flame retardant prepreg, unidirectional carbon fiber flame retardant prepreg, glass fiber flame retardant prepreg, aramid flame retardant prepreg, 300g/m² of single medium temperature curing blue epoxy adhesive.

And the technique of making base board on high-speed rail equipment cabinet by composite material includes the following steps:

- (1)、making base main board;
- (2)、making handles of base board;
- (3)、making slider block of base board; slide block includes two parts;
- (4)、The four parts of base main board, handle and slide blocks are formed together as base board assembly;

In installation, handle of base board is stuck in one side of main board, and another two slide blocks of base board are stuck into the two side which face with each other among the rest three sides.

In a specific example of the present invention, the base main board is designed in lamination sequence from outside to inside as following:

1 layer of 198~200g/m² 3K twill carbon fiber flame retardant prepreg;

5~8 layers of 300~315g/m² glass fiber flame retardant prepreg;
2 layers of 235~240g/m² aramid flame retardant prepreg;
2 layers of 100~150g/m² unidirectional carbon fiber flame retardant prepreg;

1 layer 300g/m² of single medium temperature curing blue epoxy adhesive;

2 layers of 100~150g/m² unidirectional carbon fiber flame retardant prepreg;

1 piece of aramid honeycomb with thickness of 16.5mm;

1 layer 300g/m² of single medium temperature curing blue epoxy adhesive;

2 layers of 100~150g/m² unidirectional carbon fiber flame retardant prepreg;

5~8 layers of 300~315g/m² glass fiber flame retardant prepreg;

1 layer of 198~200g/m² 3K twill carbon fiber flame retardant prepreg;

According to the lamination design, all layers are pasted in the mold cavity closely. Product is taken shape on hot press machine with temperature setting of 130-150 ° C, molding time of 3600-3800s and pressure setting of 4mpa-6mpa.

In a specific example of the present invention, the base board handle lamination process includes the following: lamination of handle is designed in 20~25 layers of 150gsm unidirectional carbon fiber flame retardant prepreg, and all layers of prepreg are pasted in the mold cavity,

using vacuum bagging molding technique with temperature setting of 130-150°C and molding time of 4500~4800s.

In a specific example of the present invention, the lamination technique for slide block of base board includes the following: 20~25 layers of 150gsm unidirectional carbon fiber flame retardant prepreg to be wrapped around PET foam, and then to take shape on hot press machine with temperature setting of 130-150 ° C, molding time of 3600-3800s, pressure setting of 2mpa-3mpa.

In a specific example of the present invention, the density of aramid fiber honeycomb is required to be 48~50kg/m³.

In a specific example of the present invention, the density of PET foam is required to be 59~61 kg/m³.

The positive progresses of this invention lie in:

This technique of producing base boards on high-speed rail equipment cabinet with composite material has the following advantages:

1、By lamination design, the invention makes the base board obtain very high strength at all angles, with aramid design gaining high impact resistance;

2、Mould pressing technique is used on the main board and slide blocks of base board, and vacuum bagging technique is used on the handle; Two different techniques are used on different product parts.

3、Hot pressing technique requires low contents of resin which dramatically reduces the weight of the base board.

4、The invention brings not only elegant and nice appearance also

strong performance. Compared with aluminum alloy material, the weight of product in composite material is 35% ~ 40% lower which leads to a good prospect of application.

Description of figures

Figure 1 is the assembly resolution diagram of the base board in this invention.

Figure 2 is the assembly diagram of base board in this invention.

Figure 3-1 is the structural diagram of handle' s connection with the base board in this invention

Figure 3-2 is sectional view of the handle in this invention

Figure 4-1 is the structural diagram of Slide block' s connection with the base board in this invention.

Figure 4-2 is the sectional view of the slider block in this invention.

Specific implementation

A preferred example is given together with following figures to describe technical solution of this invention in detail.

This invention is a technique of making base board on high-speed rail equipment cabinet with composite material which includes:

Aramid honeycomb, PET foam, 3K carbon fiber flame retardant prepreg, unidirectional carbon fiber flame retardant prepreg, glass fiber flame retardant prepreg, aramid flame retardant prepreg, 300gsm of single

medium temperature curing blue epoxy adhesive;

And the technique of making base board on high-speed rail equipment cabinet by composite material includes the following steps:

- (1)、making main board 1 of base board;
- (2)、making handles 2 of base board;
- (3)、making slider block 3 of base board; slide block 3 includes two parts;
- (4)、The four parts of base main board 1, handle 2 and slide blocks 3 are formed together as base board assembly;

Figure 1 is the assembly resolution diagram of the base board in this invention, and Figure 2 is the assembly diagram of base board in this invention.

As shown in Figure 1-2, during installation, handle of base board is stuck in one side of main board, and two slide blocks of base board are stuck into the two sides which face with each other among the rest three sides.

Figure 3-1 is the structural diagram of handle' s connection with the base board in this invention, Figure 3-2 is sectional view of the handle in this invention, Figure 4-1 is the structural diagram of Slide block' s connection with the base board in this invention, Figure 4-2 is the sectional view of the slider block in this invention.

In this invention, the lamination design of the base main board is in sequence from outside to inside as following:

1 layer of 198~200gsm 3K twill carbon fiber flame retardant prepreg;

5~8 layers of 300~315gsm glass fiber flame retardant prepreg;
2 layers of 235~240gsm aramid flame retardant prepreg;
2 layers of 100~150gsm unidirectional carbon fiber flame retardant prepreg;

1 layer of 300gsm single medium temperature curing blue epoxy adhesive;

2 layers of 100~150gsm unidirectional carbon fiber flame retardant prepreg;

1 piece of aramid honeycomb with thickness of 16.5mm

1 layer of 300gsm single medium temperature curing blue epoxy adhesive

2 layers of 100~150gsm unidirectional carbon fiber flame retardant prepreg;

5~8 layers of 300 ~315gsm glass fiber flame retardant prepreg;

1 layer of 198~200g/m² 3K twill carbon fiber flame retardant prepreg;

According to the lamination design, all layers are pasted in the mold cavity closely. Product is taken shape on hot press machine with temperature setting of 130-150 ° C, molding time of 3600-3800s and pressure setting of 4mpa-6mpa.

In this invention, the lamination technique for making handle of base board includes the following: lamination of handle is designed in 20~25 layers of 150gsm unidirectional carbon fiber flame retardant prepreg, and all layers of prepreg are pasted in the mold cavity, using vacuum

bagging molding technique with temperature of 130–150°C and molding time of 4500~4800s.

In this invention, the lamination technique for slide block of base board includes the following: 20~25 layers of 150gsm unidirectional carbon fiber flame retardant prepreg to be wrapped around PET foam , and then to take shape on hot press machine with temperature setting of 130–150° C, molding time of 3600–3800s, pressure setting of 2mpa–3mpa.

The density of aramid fiber honeycomb is required to be
48~50kg/m³

The density of above PET foam is required to be 59~61 kg/m³.

The following examples are provided for further explanation of the invention:

Example one

Step one: The production of base boards with mould pressing technique:

According to lamination design, one layer of 200gsm 3K twill carbon fiber flame retardant prepreg/ six layers of 300gsm glass fiber flame retardant prepreg/ three layers of 235gsm aramid retardant prepreg/ two layers of 150gsm unidirectional carbon fiber flame retardant prepreg/ one layer of 300gsm single medium temperature curing blue epoxy adhesive/two layers of 100~150gsm unidirectional carbon fiber flame retardant prepreg/four layers of 300gsm glass fiber flame retardant prepreg/one layer of 200gsm 3k twill carbon fiber flame retardant prepreg;

all layers are pasted in the mould cavity closely, with temperature setting of 130° C, molding time of 3600s and the pressure setting of 4mpa. (Letter K in the name of 3K carbon fiber means the type of carbon fiber yarn, 1K is used to refer to 1000 single yarn as one tow, 2K is 2000, 3K is 3000)

Step two: The handle of base board is produced in all carbon fiber structure with molding technique of vacuum bagging, temperature setting of 130°C, and molding time of 4600s.

Step three: The slide block of base board is produced with 20 layers of 150gsm unidirectional carbon fiber flameretardant prepreg which are wrapped around PET foam , and then to take shape on hot press machine with temperature setting of 130° C, molding time of 3600s, pressure setting of 2mpa.

Step four: parts to be CNC processed, and all 3 parts be glued together.

Step five: Comparing with the weight of base board with aluminum alloy material on real high speed rail, the weight of base board in composite material is 39% less than it. Loading capacity has been over 2500pa per unit area.

Example two

Step one: The production of base boards with mould pressing technique:

According to lamination design, 1 layer of 200g/m² 3K twill carbon

fiber flame retardant prepreg/7 layers of 300g/m² glass fiber flame retardant prepreg/2 layers of 235g/m² aramid retardant prepreg/2 layers of 150g/m² unidirectional carbon fiber flame retardant prepreg /1 layer of 300g/m² single medium temperature curing blue epoxy adhesive/2 layers of 150g/m² unidirectional carbon fiber flame retardant prepreg /1 piece of aramid honeycomb with thickness of 16.5mm/1 layer of 300g/m² single medium temperature curing blue epoxy adhesive /2 layers of 100~150g/m² unidirectional carbon fiber flame retardant prepreg/4 layers of 300g/m² glass fiber flame retardant prepreg/1 layer of 200g/m² 3K twill carbon fiber flame retardant prepreg, all layers are pasted in the mould cavity closely, with temperature setting temperature of 140° C, molding time of 3600s and the pressure setting of 4mpa.

Step two: The handle of base board is produced in all carbon fiber structure with molding technique of vacuum bagging, temperature setting of 140°C, molding time of 4600s.

Step three: The slide block of base board is produced with 20 layers of 150gsm unidirectional carbon fiber flame retardant prepreg which are wrapped around PET foam , and then to take shape on hot press machine with temperature setting of 140° C, molding time of 3600s, pressure setting of 2mpa.

Step four: parts to be CNC processed, and all 3 parts be glued together.

Step five: Comparing with the weight of base board with aluminum alloy material on real high speed rail, the weight of base board in composite

material is 37% less than it. Loading capacity has been over 2500pa per unit area.

Example three

Step one: The production of base boards with mould pressing technique:

According to lamination design, 1 layer of 200g/m² 3K twill carbon fiber flame retardant prepreg/6 layers of 300 g/m² glass fiber flame retardant prepreg/ 3 layers of 235g/m² aramid retardant prepreg/2 layers of 150g/m² unidirectional carbon fiber flame retardant prepreg/1 layer of 300g/m² of single medium temperature curing blue epoxy adhesive /2 layers of 150g/m² unidirectional carbon fiber flame retardant prepreg /1 piece of aramid honeycomb with thickness of 16.5mm /1 layer of 300g/m² single medium temperature curing blue epoxy adhesive/2 layers of 100~150g/m² unidirectional carbon fiber flame retardant prepreg/4 layers of 300g/m² glass fiber flame retardant prepreg/1 layer of 200g/m² 3K twill carbon fiber flame retardant prepreg, all layers are pasted in the mould cavity closely, with temperature setting of 150° C, molding time of 3600s and the pressure setting of 4mpa.

Step two: The handle of base board is produced in all carbon fiber structure with molding technique of vacuum bagging, temperature setting of 150°C, molding time of 4600s.

Step three: The slide block of base board is produced with 20 layers of 150gsm unidirectional carbon fiber flame retardant prepreg which are

wrapped around PET foam , and then to take shape on hot press machine with temperature setting of 150 ° C, molding time of 3600s, pressure setting of 2mpa.

Step four: parts to be CNC processed, and all 3 parts be glued together.

Step five: Comparing with the weight of base board with aluminum alloy material on real high speed rail, the weight of base board in composite material is 39% less than it. Loading capacity has been over 2500pa per unit area.

All the above information is used to show and describe the basic principles, main features and advantages of this invention. The technician of this field should understand that the invention is not restricted to the examples above. Above examples and the specification are just used to describe the principle of the invention. Based on the principle and scope of this invention, various changes and improvement can be done, and these changes and improvements are included in the scope of the present invention. The scope of this invention which requires to be protected is defined in the Claim of Rights attached and its equivalent definition.

Claim of Rights

1. A technique of making base board on high-speed rail equipment cabinet with composite material, its characteristics lies in:

The material includes:

Aramid honeycomb, PET foam, 3K carbon fiber flame retardant prepreg, unidirectional carbon fiber flame retardant prepreg, glass fiber flame retardant prepreg, aramid flame retardant prepreg, 300gsm of single medium temperature curing blue epoxy adhesive;

And the technique of making base board on high-speed rail equipment cabinet by composite material includes the following steps:

- (1)、making main board of base board;
- (2)、making handles of base board;
- (3)、making slider block of base board; slide block includes two parts;
- (4)、The four parts of base main board, handle and slide blocks are formed together as base board assembly;

In installation, handle of base board is stuck in one side of main board, and another two slide blocks of base board are stuck into the two sides which face with each other among the rest three sides.

2. According to Claim 1, the characteristic of this technique for making base board on high-speed rail equipment cabinet with composite material lies in:

The base main board is designed in lamination sequence from outside to inside:

1 layer of 198~200gsm 3K twill carbon fiber flame retardant prepreg
5~8 layers of 300 ~315gsm glass fiber flame retardant prepreg
2 layers of 235~240gsm aramid flame retardant prepreg
2 layers of 100~150gsm unidirectional carbon fiber flame retardant prepreg

1 layer of 300gsm single medium temperature curing blue epoxy adhesive

2 layers of 100~150gsm unidirectional carbon fiber flame retardant prepreg

1 piece of aramid honeycomb with thickness of 16.5mm

1 layer 300gsm of single medium temperature curing blue epoxy adhesive

2 layers of 100~150gsm unidirectional carbon fiber flame retardant prepreg

5~8 layers of 300 ~315gsm glass fiber flame retardant prepreg

1 layer of 198~200gsm 3K twill carbon fiber flame retardant prepreg

According to the lamination design, all layers are pasted in the mold cavity closely. Product is taken shape on hot press machine with temperature setting in 130-150° C, molding time of 3600-3800s, pressure setting of 4mpa-6mpa.

3. According to Claim 1, the characteristic of this technique for making base board on high-speed rail equipment cabinet with composite material lies in:

The base board handle lamination process includes the following:

lamination of handle is designed in 20 ~ 25 layers of 150gsm unidirectional carbon fiber flame retardant prepreg, and all layers of prepreg are pasted in the mold cavity, using vacuum bagging molding technique with temperature of 130–150°C and molding time of 4500~4800s.

4. According to Claim 1, the characteristic of this technique for making base board on high-speed rail equipment cabinet with composite material lies in:

The lamination technique for slide block of base board includes the following: 20~25 layers of 150gsm unidirectional carbon fiber flame retardant prepreg to be wrapped around PET foam , and then to take shape on hot press machine with temperature setting in 130–150° C, molding time of 3600–3800s, pressure setting of 2mpa–3mpa.

5. According to Claim 1, the characteristic of this technique for making base board on high-speed rail equipment cabinet with composite material lies in:

The density of aramid fiber honeycomb is required to be 48~50kg/m³.

6. According to Claim 1, the characteristic of this technique for making base board on high-speed rail equipment cabinet with composite material lies in:

The density of PET foam is required to be 59~61 kg/m³.