Appeal Decision

Appeal No. 2017-2411

Tokyo, Japan
Appellant MITSUI MINING & SMELTING CO. LTD.

Saitama, Japan
Patent Attorney YOSHIMURA, Katsuhiro

The case of appeal against the examiner's decision of refusal of Japanese Patent Application No. 2012-194738, entitled "Manufacturing Method of Printed Wiring Board" (the application published on March 20, 2014, Japanese Unexamined Patent Application Publication No. 2014-53342) has resulted in the following appeal decision:

Conclusion

The appeal of the case was groundless.

Reason

No. 1 History of the procedures

The application was filed on September 5, 2012, reasons for refusal were notified on June 8, 2016, and a written amendment was submitted on July 19, 2016. However, the examiner's decision of refusal was issued on November 15, 2016 (dispatch date: November 24). Against this, an appeal against the examiner's decision of refusal was requested on February 20, 2017 and after that, reasons for refusal were notified on September 28, 2017 and a written amendment was submitted on December 11, 2017.

No. 2 The Invention

The inventions according to claims 1 to 4 of the present application are recognized to be as specified by the matters described in claims 1 to 4 in the scope of claims which were amended by the amendment dated December 11, 2017, and the invention according to claim 1 (hereinafter, referred to as "the Invention") is as follows:

"[claim 1]

A manufacturing method of a printed wiring board, comprising:

a black oxidation process step of performing a black oxidation process on the surface of a carrier foil on at least one surface side on a double-sided metal-clad laminate which comprises a metal foil layer, a junction interface layer, and the carrier foil having a thickness of 15 μm or less on each of both sides of an insulation layer having a thickness of 200 μm or less in order from the side of the insulation layer;

a via hole forming step of irradiating the surface of the carrier foil on one side with a laser after the black oxidation process, to form a bottomed via hole with a metal foil layer on the other side as a bottom;

a plating step of performing, after forming the bottomed via hole, a plating process for inter-layer connection for achieving conduction between the metal foil layer on one surface and the metal foil layer on the other surface, in the bottomed via hole;

and

a carrier foil peeling step of peeling, after the plating process, each of the carrier foils from the surface of each of the metal foil layers."

No. 3 Cited Documents

1 Cited Document 1

International Publication No. WO2009/054456 (hereinafter, referred to as "Cited Document 1"), which was cited in the reasons for refusal by the body dated September 28, 2017 (hereinafter, referred to as "the reasons for refusal by the body") and was distributed before the filing of the present application, includes the following description with drawings (especially refer to FIG. 2A). Underlines are added by the body. The same shall apply hereinafter.

(1) [0001] The present invention relates to a manufacturing method of a printed wiring board having a via.

[0002] A copper foil laminated polyimide film has the feature of being thin and lightweight and therefore, it is used for high-performance electronic apparatuses, especially for a highly densely wired flexible printed circuits (FPC), tape automated bonding (TAB), and so on in which reduction in size and weight is preferable. A wiring board for an electronic apparatus that accommodates higher density mounting is required because of advancing higher integration and finer design of electronic devices, and a double-sided wiring board and multilayer wiring board are proposed as a wiring board accommodating higher density mounting. In order to manufacture double-sided and multilayer wiring boards, highly-productive via formation is required."

(2) "[0055] <Embodiment 2> In this embodiment, one example of a method of forming a circuit by a subtractive method using a polyimide film with copper foil with carrier laminated on both sides thereof is shown in FIG. 2A and FIG. 2B.

[0056] A polyimide film 101 formed by laminating copper foil with carrier on both sides thereof is prepared as shown in FIG. 2A (a). This copper foil laminated polyimide film with carrier on both sides thereof 101 is formed by laminating a copper foil with a carrier 3, a polyimide film 2, and a copper foil with carrier 3' in this order, and each of the copper foils with carrier (3, 3') is a laminate of a copper foil (4, 4') and a carrier foil (5, 5') as a protection layer. In this case, the thickness of the copper foil is in the range of 1 to 8 μm (preferably, the range of 1 to 6 μm).

[0057] In the next step, as shown in FIG. 2A (b), a via 6 is formed by using laser or the like at a predetermined position of both the copper foil with carrier 3 and the polyimide film 2 on one side of the copper foil laminated polyimide film with carrier on both sides thereof 101. The via can be provided in a plurality. The via 6 can be formed in various forms: for example, it may be formed by removing a portion up to the polyimide film to be a hole with the copper foil 4' on a rear surface left unremoved, as shown in FIG. 2B (b); it may be formed by removing the copper foil 4' on the rear surface to be a hole reaching the carrier foil 5' (which becomes a through hole after the peeling of the carrier foil 5'); or it may be formed to be a through hole penetrating the copper foil with carrier 3' including the carrier foil 5' on the rear surface.

[0058] After formation of the via, especially after formation of the via by laser processing, resin smear and resin burr, and metal smear and metal burr 7 are generated

(FIG. 2A (b)) and therefore, as with embodiment 1, the inside of the via 6 and the periphery of the via on the surface of 3 are cleaned by wet blast processing, obtaining a via-formed copper foil laminated polyimide film with carrier on both sides 112 (FIG. 2A (c)).
[0059] In the next step, as shown in FIG. 2A (d), the carrier foil 5 and carrier foil 5' which are protection layers are peeled from the copper foil laminated polyimide film with carrier on both sides 112, obtaining a double-sided copper foil laminated polyimide film in which the copper foil 4, the polyimide film 2, and the copper foil 4' are directly laminated. Normally, it is preferable to remove a peeling layer that remains on the surface of the copper foil by half etching.
[0060] In the next step, as shown in FIG. 2A (e), a conductive film (8) is formed on the surface of polyimide of the via 6 of the double-sided copper foil laminated polyimide film, making the copper foil 4 and copper foil 4' conductive. Then, as shown in FIG. 2A (f), copper-plated layers (21, 21') are provided on the upper parts of the conductive film (8) and copper foils (4, 4') of the double-sided copper foil laminated polyimide film. The copper-plating process is the same as described in embodiment 1. In the next step, as shown in FIG. 2B (g), photoresist layers (9, 9') are provided on the upper parts of the copper-plated layers of the double-sided copper foil laminated polyimide film, and then, as shown in FIG. 2B (h), the photoresist layers are exposed by using a mask for a wiring pattern, to develop and remove a portion that is not to be the wiring pattern. From an opening portion from which a resist has been developed and removed, a plurality of copper portions (22, 22') that are not to be the wiring pattern appear. For the resist opening portion (resist removal portion), patterns for an opening line width, pitch, and the like are set to allow formation of a copper wiring portion so as to correspond to the wiring pattern. A photoresist available here is the same as described in embodiment 1."

(3) "[0090] As for the copper foil with carrier, the thickness of carrier is not especially limited but it may be one that can reinforce a thin copper foil, and the thickness of carrier is preferably 10 to 40 μm, more preferably is 10 to 35 μm, and further preferably is 10 to 18 μm. The thickness of the copper foil 4 is preferably 1 to 8 μm, more preferably 1 to 6 μm, further preferably 2 to 5 μm, and even further preferably 2 to 4 μm. The surface roughness Rz of the copper foil on the side of lamination with a polyimide film is preferably 1.0 μm or less, more preferably 0.8 μm or less, and further preferably 0.7 μm or less."

(4) "[0103] The thickness of the polyimide film is not especially limited but it may be one that allows lamination with a copper foil with carrier foil without any problems, allows manufacture and handling, and allows sufficient support of a copper foil; and is preferably 1 to 500 μm, more preferably 2 to 300 μm, further preferably 5 to 200μm, even further preferably 7 to 175 μm, and especially preferably 8 to 100 μm."

In summary, according to the description of the Invention in light of all the above-described matters and illustrated contents of the drawings, the following invention (hereinafter, referred to as "the Cited Invention") is described in Cited Document 1.

"A manufacturing method of a printed wiring board, comprising:

a first step of irradiating the surface of a carrier foil 5 on one side with a laser on a copper foil laminated polyimide film with carrier on both sides thereof 101 which comprises a copper foil 4, 4', a peeling layer, and a carrier foil 5, 5' having a thickness of 10 to 18 μm in order from the side of the polyimide film 2, on each of both sides of a polyimide film 2 having a thickness of 5 to 200 μm, to form a via 6 having a copper foil 4' on the other side as a bottom,

a second step of peeling, after forming the via 6, each of the carrier foils 5, 5' from the surface of each of the copper foils 4, 4'; and

a third step of performing, after peeling the carrier foils 5, 5', a process of forming a conductive film 8 and a copper plated layer 21 for inter-layer connection for achieving conduction between the copper foil 4 on one surface and the copper foil 4' on the other surface, in the via 6."

2 Cited Document 2

Japanese Unexamined Patent Application Publication No. 2004-87697 (hereinafter, referred to as "Cited Document 2") that was cited in the reasons for refusal by the body and distributed before filing of the present application includes the following description with drawings (refer especially to FIG. 1 (b), (c), and (d)).

(1) "[0001]
[Field of the Invention]
The present invention relates to a manufacturing method of a wiring board and more specifically relates to a manufacturing method of a wiring board using a copper foil with copper carrier."

(2) "[0012]
FIG. 1 (b) shows the state where a through hole 16 is formed by performing drilling processing by a drill, laser machining, or the like on a substrate comprising a core material 12 to both sides of which a copper foil 30 with copper carrier is applied. After the drilling processing, a desmear treatment is performed to remove smears on the inner surface of the through hole 16.
FIG. 1 (c) shows the next state where a copper layer 18 is formed as a plating film on the inner surface of the through hole 16 and the outer surface of the copper carrier 30b of the copper foil 30 with copper carrier by performing electrolytic copper plating (panel plating), after performing electroless copper plating for forming a plating power supply layer on the inner surface of the through hole 16.
[0013]
FIG. 1 (d) shows the state where the copper carrier 30b has been peeled to be removed from the copper foil with copper carrier 30 and the copper foil 30a is left on the surface of the core material 12, which is a characteristic step in the manufacturing process of this embodiment. As mentioned above, the copper carrier 30b can be easily removed in such a manner that it is peeled from the copper foil 30a. This step is performed so as to leave only the copper foil 30a on the surface of the core material 12 by removing the copper carrier 30b from the copper foil with copper carrier 30 and thereby also removing the copper layer 18 adhered to the outer surface of the copper carrier 30b at the same time. In this operation, the copper layer 18 adhered to the inner surface of

the through hole 16 is broken at an end portion connected to the copper carrier 30b and is left adhered to the inner surface of the through hole 16 as is; and the electrical conduction between the copper layer 18 on the inner surface of the through hole 16 and the copper foil 30a adhered to the surface of the core material 12 is ensured."

(3) "[0016]

According to a manufacturing method of a wiring board of this embodiment, the copper carrier 30b of the copper foil with copper carrier 30 is peeled from the copper foil 20a to be removed, so that only the copper foil 30a can be left on the surface of the core material 12 with the inner surface of the through hole 16 covered with the copper layer 18; and thereby a wiring pattern 20 can be easily formed by etching the copper foil 30a left on the surface of the core material 12. The copper foil 30a of the copper foil with copper carrier 30 is extremely thin and is formed in a uniform thickness and therefore, an extremely highly-precise fine wiring pattern can be formed. Such formation of the conductive layer in a uniform thickness is extremely effective in forming a fine wiring pattern with high precision. If the thickness of the conductive layer is controlled by a polishing process, the thickness of the conductive layer may partially vary, causing deterioration in the formation precision of a wiring pattern."

(4) Considering the description in paragraph [0012] in light of FIG. 1 (c), it can be said that it is obvious that the "plating power supply layer" is one for inter-layer connection that connects the copper foils 30a on both sides with each other.

In summary, according to the description of the Invention in light of all the above-described matters and illustrated contents of the drawings, the following matter (hereinafter, referred to as "the technical matter described in Cited Document 2") is described in Cited Document 2.

"A manufacturing method of a wiring board comprising the steps of: performing, after forming a through hole 16, electroless copper plating and electrolytic copper plating for inter-layer connection for achieving conduction between a copper foil 30a on one surface and a copper foil 30a on the other surface, inside the through hole 16; and peeling and removing, after the electroless copper plating and electrolytic copper plating, the copper carrier 30b from each of the copper foils 30a."

No. 4 Comparison/Judgment

1 Comparison

In comparison of the Invention and the Cited Invention, in light of the configurations, functions, or technical significances thereof, the "polyimide film 2 having a thickness of 5 to 200 μm" of the latter has a thickness of 200 μm or less, and therefore, corresponds to the "insulation layer having a thickness of 200 μm or less" of the former; and similarly, the "copper foil 4, 4'" correspond to the "metal foil layer," the "peeling layer" corresponds to the "junction interface layer," the "copper foil laminated polyimide film with carrier on both sides thereof 101" corresponds to the "double-sided metal-clad laminate," and the "via 6 having a copper foil 4' on the other side as a bottom" corresponds to the "bottomed via hole with a metal foil layer on the other side as a bottom."

In addition, the "carrier foil 5, 5' having a thickness of 10 to 18 μm" in the Cited Invention is in common with the "carrier foil having a thickness of 15 μm or less" in the Invention only in terms of being a "carrier foil."

In the first step of the Cited Invention, the via 6 corresponding to the bottomed via hole is formed and therefore, "a first step of irradiating the surface of a carrier foil 5 on one side with a laser ... to form a via 6 having a copper foil 4' on the other side as a bottom" in the Cited Invention is in common with "a via hole forming step of irradiating the surface of the carrier foil on one side with a laser after the black oxidation process, to form a bottomed via hole with a metal foil layer on the other side as a bottom" in the Invention only in terms of being "a via hole forming step of irradiating the surface of the carrier foil on one side with a laser, to form a bottomed via hole with a metal foil layer on the other side as a bottom."

In the second step of the Cited Invention, the carrier foils 5, 5' are peeled and therefore, "a second step of peeling, after forming the via 6, each of the carrier foils 5, 5' from the surface of each of the copper foils 4, 4'" in the Cited Invention is in common with "a carrier foil peeling step of peeling, after the plating process, each of the carrier foil from the surface of each of the metal foil layers" in the Invention only in terms of being "a carrier foil peeling step of peeling each of the carrier foils from the surface of each of the metal foil layers."

Therefore, the two inventions correspond to each other in terms of being:
"A manufacturing method of a printed wiring board, comprising:

a via hole forming step of irradiating the surface of a carrier foil on one side with a laser on a double-sided metal-clad laminate which comprises a metal foil layer, a junction interface layer, and the carrier foil on both sides of an insulation layer having a thickness of 200 μm or less in order from the side of the insulation layer, to form a bottomed via hole with a metal foil layer on the other side as a bottom; and

a carrier foil peeling step of peeling each of the carrier foils from the surface of each of the metal foil layers."

On the other hand, they are different in the following points:

[Different feature 1]

In the Invention, the carrier foil "having a thickness of 15 μm or less" is provided; whereas, in the Cited Invention, the carrier foil 5, 5' having a thickness of 10 to 18 μm is provided.

[Different feature 2]

In the Invention, the "black oxidation process step of performing a black oxidation process on the surface of a carrier foil on at least one surface side" is provided before the via hole forming process; whereas, in the Cited Invention, such a process is not provided.

[Different feature 3]

In the Invention, "a plating step of performing, after forming the bottomed via hole, a plating process for inter-layer connection for achieving conduction between the metal foil layer on the one surface and the metal foil layer on the other surface, in the

bottomed via hole" is provided before the carrier foil peeling step; whereas, in the Cited Invention, a third step of performing, after peeling the carrier foils 5, 5', there is provided a process of forming a conductive film 8 and copper plated layer 21 for inter-layer connection for achieving conduction between the copper foil 4 on one surface and the copper foil 4' on the other surface, in the via 6.

2 Judgment on the different features

Each of the different features is examined below.

(1) Regarding Different feature 1

It is a design matter that can be appropriately implemented by a person skilled in the art to conceive the configuration of the Invention related to Different feature 1 by employing the carrier foil 5, 5' having a thickness of 15 μm or less instead of the carrier foil 5, 5' having a thickness of 10 to 18 μm in the Cited Invention from the viewpoint of easier laser machining and resource saving; and it can be said that such a configuration can be easily conceived.

(2) Regarding Different feature 2

As illustrated in the descriptions of "the surface layer of copper is subjected to oxidation processing or the like to be blackened in advance for avoiding the reflection of a laser, thereby allowing easy absorption of the energy of the laser" on page 1, lower right column, line 20 to page 2, upper left column, line 3 and "a blackish brown oxide film is formed on the copper surface" on page 2, upper left column, line 17 in Japanese Unexamined Patent Application Publication No. S61-99596 which had been distributed before the filing of the present application and the description of "Copper oxide that has a surface reflection factor of 30-80% in the range of a wavelength of 9.3-10.6 μm and is 1.0-2.0 μm thick is formed on the surface of the copper foil positioned on the outer layer before laser machining" in paragraph [0011] in Japanese Unexamined Patent Application Publication No. 2006-339259 which had been distributed before the filing of the present application, it is a well-known matter to perform a black oxidation process on a copper foil surface for drilling by a low-energy laser (although it is not explicitly described that a copper oxide film is black in Japanese Unexamined Patent Application Publication No. 2006-339259, it is a matter of technical common sense that oxide copper shows a color including black).

It can be said that a person skilled in the art can easily conceive of the configuration of the Invention related to Different feature 2 by applying the well-known matter for performing a drilling process by a low-energy laser in the Cited Invention.

(3) Regarding Different feature 3

In comparison of the Invention and the technical matter described in Cited Document 2, the "copper foil 30a" in the latter corresponds to the "metal foil layer" in the former; and similarly, the "electroless copper plating and electrolytic copper plating" corresponds to the "plating process," the "copper carrier 30b" corresponds to "each of the carrier foils," and the step of "peeling and removing ... the copper carrier 30b from each of the copper foils 30a" corresponds to the "carrier foil peeling step of peeling ... each of the carrier foils from the surface of each of the metal foil layers."

The "through hole 16" in the technical matter described in Cited Document 2 is in common with the "bottomed via hole" in the Invention only in terms of being a "via hole"; and the step of "performing, after forming a through hole 16, electroless copper plating and electrolytic copper plating for inter-layer connection for achieving conduction between a copper foil 30a on one surface and a copper foil 30a on the other surface, inside the through hole 16" in the former is in common with the step of "plating step of performing, after forming the bottomed via hole, a plating process for inter-layer connection for achieving conduction between the metal foil layer on the one surface and the metal foil layer on the other surface, in the bottomed via hole " in the latter only in terms of being a "plating step of performing, after forming a via hole, a plating process for inter-layer connection for achieving conduction between the metal foil layer on one surface and the metal foil layer on the other surface, in the via hole."

Then, it can be said according to the terminology of the Invention that the technical matter described in Cited Document 2 suggests the "plating step of performing, after forming a via hole, a plating process for inter-layer connection for achieving conduction between the metal foil layer on one surface and the metal foil layer on the other surface, in the via hole and a carrier foil peeling step of peeling, after the plating process, each of carrier foils from the surface of each of the metal foil layers."

Paragraph [0016] in Cited Document 2 describes that a "highly-precise fine wiring pattern can be formed" as the effect of the technical matter described in Cited Document 2. In addition, paragraph [0002] in Cited Document 1 describes, as the background of the Cited Invention, that a copper foil laminated polyimide film is used for a highly densely wired flexible printed circuits (FPC) and the like; and therefore, it can be said that the problem to be solved of forming a highly-precise fine wiring pattern is also inherent in the Cited Invention.

The Cited Invention and the technical matter described in Cited Document 2 are in common with each other in terms of removing carrier foils after forming a via. In addition, it is obvious that the technical matter described in Cited Document 2 is applicable to not only a through hole but also to a bottomed via hole.

Accordingly, it can be said that a person skilled in the art can easily conceive of the configuration of the Invention related to Different feature 3 by applying the technical matter described in Cited Document 2 in order to solve the problem inherent in the Cited Invention which is described above.

In addition, even considering the working effect of the Invention, the effect can be predicted from the Cited Invention, the technical matter described in Cited Document 2, and the well-known matter and is not remarkable.

Thus, the Invention could have been easily made by a person skilled in the art based on the Cited Invention, the matter described in Cited Document 2, and the well-known matter.

No. 5 Closing

As described above, the invention according to claim 1 of the present application (the Invention) could have been easily made by a person skilled in the art based on the

Cited Invention, the technical matter described in Cited Document 2, and the well-known matter; thus, the appellant should not be granted a patent for the Invention in accordance with the provisions of Article 29(2) of the Patent Act.

Accordingly, the present application should be rejected without examining inventions relating to the other claims of the present application.

Therefore, the appeal decision shall be made as described in the conclusion.

February 19, 2018

Chief administrative judge: HIRATA, Nobukatsu
Administrative judge: TAKIYA, Ryoichi
Administrative judge: NAKAGAWA, Ryuji