Patent Document 1 discloses the method to prevent forming of a straight conductive material in via structure (corresponding to the "through hole" referred to in the present invention) by providing one or more intended voids made of plating resists in via structure. As a result, the forming of a conductive material in via structure is limited only on a region required for the transmission of electric signals. Application of such a method is advantageous because a desired multilayered printed wiring board can be manufactured by "lamination all at once". In the conventional manufacturing method of a multilayered printed wiring board, as printed-wiring boards (~~PCB~~PWB) are sequentially laminated a plurality of sub-assemble ~~PCB~~PWBs are individually prepared, followed by laminating sub-assemble ~~PCB~~PWB to finish a multilayered wiring board. In the manufacturing method, a plurality of laminating steps are necessary until intended multilayered structure is achieved, and after each lamination, additional process for plating through holes and/or via structure may be also required. So, increased manufacturing cost and cycle time have been disadvantage.

[0004]

Figure 10 of Patent Document 1 is "a drawing showing stacked ~~PCB~~PWB in specific embodiment, and a split plated via structure are formed by selectively providing plating resist in gap formed in a conductive layer and an adjacent dielectric layer of a sub-composite structures".

The plated via structure 1030 in Figure 10 is split into a plurality of electrically isolated portions (1030a and 1030b) by selectively providing plating resist in a sub-composite structure used in manufacturing of the stacked ~~PCB~~PWB.

[Document Cited]

[Patent Document]

[0005]

[Patent Document 1] Japanese Patent No. 5179883

[Summary of Invention]

[Problems to be Solved by Invention]

[0006]

However, in the manufacturing process of the multilayered printed wiring board disclosed in Patent Document 1, a step of forming a sub-composite (printed wiring board) is necessary to split via structure into electrically isolated portions. The sub-composite has through holes in the area for forming via structure, and a process of filling the hole with a plating resist is required.

[0007]

In the manufacturing process of the sub-composite disclosed in Patent Document 1, filling method of through holes for providing of a conduction isolation portion with a plating resist may employ stencil printing and

[0010]

The copper clad laminate provided with a protective layer according to the present invention is a copper clad laminate used for a printed wiring board having a conduction isolation portion electrically isolating a through hole characterized in that the copper clad laminate is provided with a protective layer on the surface that can be mechanically released after forming of the through holes for providing of a conduction isolation portion and filling of the through holes for providing of a conduction isolation portion by a plating resist. The thickness of the protective layer is 2 μm or more and 50 μm or less.

[Advantages of Invention]

[0011]

The copper clad laminate provided with a protective layer according to the present invention is excellent in the biting performance of a drill edge at the drilling start and prevents damage on a surface of a copper layer of the copper clad laminate in the drill working because the copper clad laminate is provided with a protective layer. Further, as the protective layer has enough strength, excellent releasing of the protective layer after finishing filling through holes for providing of a conduction isolation portion with a plating resist may be achieved because the protective layer has enough strength. Further, a level difference generated by a plating resist projection can be reduced because thickness of the

Figures 3 and 4, and a printed wiring board s~~PCB~~PWB 2 and a printed wiring board s~~PCB~~PWB 3 shown in Figure 3 have a conduction isolation portion 2 for partially isolating electrical connection between layers. The manufacturing process of the multilayered printed wiring board 10 will be specifically described.

[0015]

The multilayered printed wiring board 10 is manufactured by "lamination all at once" using a plurality of double-sided printed wiring boards and insulating layer constituting materials as shown in Figure 3. That is, the multilayered laminate shown in Figure 4(A) is manufactured by using double-sided printed wiring boards s~~PCB~~PWB 1, s~~PCB~~PWB 2, s~~PCB~~PWB 3 and s~~PCB~~PWB 4 which should constitute a multilayered printed wiring board as shown in Figure 3, wherein the insulating layer constituting materials 4 such as pre-preg prepared by impregnating the resin into a skeletal material such as glass cloth or glass paper, or a resin film are inserted between the layers of these printed wiring boards, and lamination all at once is conducted by a method such as press lamination or roll lamination.

[0016]

Then, the through holes 7 penetrating both the central portion of a conduction isolation portion 2 and the multilayered laminate is formed by drilling at a place where the conduction isolation portion 2 is

provided, as shown in Figure 4(B). As the opening diameter of the through holes 7 is smaller than the diameter of the conduction isolation portion 2, the constituent material of the conduction isolation portion 2 exposes in the inner wall of the through holes 7 after drilling.

[0017]

The multilayered printed wiring board 10 shown in Figure 2 is manufactured by conducting de-smear treatment and through hole plating on the multilayered laminate having a through holes 7 in Figure 4(B) followed by wiring forming on outer copper layer 3 (the outer copper layer 3 includes a plated copper layer). Note that the through holes 7 in Figure 4(B) correspond to the through holes TH1 and TH2 shown in Figure 2. In the through holes TH1 and TH2, vertical electrical connection between layers is isolated by the conduction isolation portions 2, and the layers constituting the multilayered printed wiring board 10 are divided into a plurality of electrical segments.

[0018]

The copper clad laminate provided with a protective layer 1 according to the present invention is used in manufacturing of the printed wiring board s~~PCB~~PWB 2 and the printed wiring board s~~PCB~~PWB 3 each having the conduction isolation portion 2 shown in Figure 3, that are used in

the manufacturing of the multilayered printed wiring board 10 described above.

[0019]

The method of using the copper clad laminate provided with a protective layer 1 according to the present invention will be described referring to Figure 1. Figure 1 shows a process of manufacturing the printed wiring board s~~PCB~~PWB 3 shown in Figure 3 with a schematic cross sectional image.

[0020]

Figure 1(A) shows the copper clad laminate provided with a protective layer 1 according to the present invention. As is obvious in the figure, the copper clad laminate provided with a protective layer 1 according to the present invention is a double-sided copper clad laminate having the copper layers 3 on both side of the insulating layer constituting material 4, and protective layers 5 is provided on the both side of the double-sided copper clad laminate. Regarding the insulating layer constituting material 4 and the copper layer 3, there is no particular limitation in thickness and type.

[0021]

As the surface of the double-sided copper clad laminate is provided with the protective layer 5, biting performance of a drill edge is improved in forming of through holes. As a result, the damage such as scratches and abrasions on the surface of the copper layers 3

The methods of manufacturing the copper clad laminate provided with the second protective layer 1 include the following two types. The first method previously prepares "copper foil provided with a resin film layer and an adhesive layer" and laminate them to both side of the insulating layer constituting material 4 such as pre-preg. The procedure makes the surface of copper foil free from scratches and adhesion of foreign matter and contaminants in lamination to the insulating layer constituting material 4.

[0044]

The other method applies adhesive layers on both side of the double-sided copper clad laminate composed of the insulating layer constituting material 4 and copper foil followed by laminating of a resin film. The method improves manufacturing efficiency of the entire laminate because double-sided copper clad laminates, precursors of s~~PCB~~PWB 1 to s~~PCB~~PWB 4 in Figure 3 are manufactured in the same process.

[0045]

<Copper clad laminate provided with the third protective layer>

The protective layer of the copper clad laminate provided with the third protective layer 1 has reinforcing metal layer on the surface, and has a layer structure of "reinforcing metal layer/resin film layer" as a protective layer of two-layer structure or a layer

[0055]

Figure 1(C) shows the through holes for providing of a conduction isolation portion 6 formed by drilling after forming the conduction isolation portion 2 for partially isolating electrical connection between layers. Paste or viscous liquid that can be used as a plating resist is preferable to be used for forming the conduction isolation portion 2 as disclosed in Patent Document 1 described above. Note that the plating resist is used for forming a portion not plated, and the plating resist applicable for forming the conduction isolation portion 2 includes a silicon resin, a polyethylene resin, a fluorocarbon resin, a polyurethane resin and an acrylic resin. Then, filling of the plating resist into the inner portion of the through holes for providing of a conduction isolation portion 6 is conducted by filling methods including printing, stencil printing, and needle dispensing. If such a filling method is employed, the plating resist may remain on the surface of the protective layer 5 including the surroundings of the opening of the through holes for providing of a conduction isolation portion 6 just after the formation of the conduction isolation portion 2 shown in Figure 1(C).

[0056]

After finishing formation of the conduction isolation portion 2, the printed wiring board s~~PCB~~PWB 3

shown in Figure 1(D) is prepared by releasing the protective layer 5 from the surface of the copper layer 3 followed by forming of a wiring. Note that any technique may be used for forming the wiring. For example, the method including steps starting from the state shown in Figure 1(C), removing only the protective layer 5 on the surface on which a wiring should be formed, laminating an etching resist on the surface; exposing, developing, and etching for a wiring pattern formation; releasing the etching resist to form a wiring only on one side; followed by releasing of the protective layer 5 remaining on the other side in a subsequent arbitrary stage. Note that such method etch only the copper layer 3 on one side is preferable to be applied in the case where the printed wiring board s~~PCB~~PWB 1 and the printed wiring board s~~PCB~~PWB 4 each having the conduction isolation portion 2 shown in Figure 3 are provided in the outer layer of a multilayered printed wiring board. Examples and Comparative Examples will be described.

[Example 1]

[0057]

Preparation of a copper clad laminate provided with a protective layer: In Example 1, the copper clad laminate provided with a protective layer composed of a single layer of polybenzimidazole resin film was prepared. 10% by mass solution of polybenzimidazole in

conduction isolation portion after filling the plating resist can be completely removed. Therefore, in the method of manufacturing a multilayered printed wiring board disclosed in Patent Document 1, the copper clad laminate provided with a protective layer according to the present invention is suitable material for used in manufacturing a printed wiring board with lamination all at once.

[Symbol List]

[0082]

1 Copper clad laminate provided with a protective layer

2 Conduction isolation portion

3 Copper layer

4 Insulating layer constituting material

5 Protective layer

6 through holes for providing of a conduction isolation portion

7 Through holes for forming through hole

10 Multilayered printed wiring board

TH1, TH2 Through hole

s~~PCB~~PWB 1, s~~PCB~~PWB 2, s~~PCB~~PWB 3, s~~PCB~~PWB 4 Printed wiring board

Claims

[Claim 1]

A copper clad laminate used for manufacturing of a printed wiring board having a conduction isolation portion electrically isolating a through hole,

the copper clad laminate is the copper clad laminate provided with a protective layer characterized in that the copper clad laminate is provided with a protective layer on the surface that can be mechanically released after forming of the through holes for providing of a conduction isolation portion and filling of the through holes for providing of a conduction isolation portion by a plating resist, characterized in that

the thickness of the protective layer is 2 μm or more and 50 μm or less.

[Claim 2]

The copper clad laminate provided with a protective layer according to claim 1, wherein the protective layer has a resin layer that can be released from the surface of the copper clad laminate after heating at 160°C to 240°C for 60 min to 120 min.

[Claim 3]

The copper clad laminate provided with a protective layer according to claim 2, wherein the resin layer has a resin film layer containing one or two or more selected

from polyimide, polyamide, polyamide-imide, polybenzimidazole, polyethersulfone, a liquid crystal polymer, syndiotactic polystyrene, polyether ether ketone, polysulfone, polyphenylene sulfide, polyether imide, cycloolefin, polyethylene terephthalate, polybutylene terephthalate, polymethylpentene, ultra-high molecular weight polyethylene, polyvinylidene fluoride, polyethylene naphthalate, polyolefin, a fluorine-contained resin, an ethylene-tetrafluoroethylene copolymer, polyacetal, polycarbonate, polyphenylene ether, polyarylate, phenoxy, and a styrene-butadiene copolymer.

[Claim 4]

The copper clad laminate provided with a protective layer according to claim 3, wherein the resin layer is composed of the resin film layer and an adhesive layer formed on the surface of the resin film, and the adhesive layer should be released from the surface of the copper clad laminate.

[Claim 5]

The copper clad laminate provided with a protective layer according to claim 4, wherein the adhesive layer contains one or two or more components selected from a rubber-based material, a silicone resin, and an acrylic resin.

[Claim 6]

The copper clad laminate provided with a protective layer according to any one of claims 2 to 5, wherein the

protective layer has the resin layer and a reinforcing metal layer on the outside surface of the resin layer.

[Claim 7]

The copper clad laminate provided with a protective layer according to claim 6, wherein the protective layer is composed of the resin layer, the reinforcing metal layer provided on the outside surface of the resin layer, and a releasing layer provided on the outside surface of the reinforcing metal layer.

[Claim 8]

The copper clad laminate provided with a protective layer according to claim 6 or 7, wherein the reinforcing metal layer is composed of any one selected from copper, a copper alloy, aluminum, an aluminum alloy, nickel, and a nickel alloy.

[Claim 9]

The copper clad laminate provided with a protective layer according to claim 7, wherein the releasing layer is composed of one or mixture of two or more organic agent(s) selected from a nitrogen-containing organic compound, a sulfur-containing organic compound and a carboxylic acid.

[Claim 10]

A multilayered printed wiring board manufactured by using the copper clad laminate provided with a protective layer according to any one of claims 1 to 9.

[Document Name] Claims

[Claim 1]

A copper clad laminate used for manufacturing of a printed wiring board having a conduction isolation portion electrically isolating a through hole,

the copper clad laminate is the copper clad laminate provided with a protective layer characterized in that the copper clad laminate is provided with a protective layer on the surface that can be released after forming of the through holes for providing of a conduction isolation portion and filling of the through holes for providing of a conduction isolation portion by a plating resist.

[Claim 2]

The copper clad laminate provided with a protective layer according to claim 1, wherein the protective layer has a resin layer that can be released from the surface of the copper clad laminate after heating at 160°C to 240°C for 60 min to 120 min.

[Claim 3]

The copper clad laminate provided with a protective layer according to claim 1 or 2, wherein the resin layer has a resin film layer containing one or two or more selected from polyimide, polyamide, polyamide-imide, polybenzimidazole, polyethersulfone, a liquid crystal polymer, syndiotactic polystyrene, polyether ether ketone,

polysulfone, polyphenylene sulfide, polyether imide, cycloolefin, polyethylene terephthalate, polybutylene terephthalate, polymethylpentene, ultra-high molecular weight polyethylene, polyvinylidene fluoride, polyethylene naphthalate, polyolefin, a fluorine-contained resin, an ethylene-tetrafluoroethylene copolymer, polyacetal, polycarbonate, polyphenylene ether, polyarylate, phenoxy, and a styrene-butadiene copolymer.

[Claim 4]

The copper clad laminate provided with a protective layer according to claim 2 or 3, wherein the resin layer is composed of the resin film layer and an adhesive layer formed on the surface of the resin film, and the adhesive layer should be released from the surface of the copper clad laminate.

[Claim 5]

The copper clad laminate provided with a protective layer according to claim 4, wherein the adhesive layer contains one or two or more components selected from a rubber-based material, a silicone resin, and an acrylic resin.

[Claim 6]

The copper clad laminate provided with a protective layer according to any one of claims 1 to 5, wherein the protective layer has the resin layer and a reinforcing metal layer on the outside surface of the resin layer.

[Claim 7]

The copper clad laminate provided with a protective layer according to claim 6, wherein the protective layer is composed of the resin layer, the reinforcing metal layer provided on the outside surface of the resin layer, and a releasing layer provided on the outside surface of the reinforcing metal layer.

[Claim 8]

The copper clad laminate provided with a protective layer according to claim 6 or 7, wherein the reinforcing metal layer is composed of any one selected from copper, a copper alloy, aluminum, an aluminum alloy, nickel, and a nickel alloy.

[Claim 9]

The copper clad laminate provided with a protective layer according to claim 7, wherein the releasing layer is composed of one or mixture of two or more organic agent(s) selected from a nitrogen-containing organic compound, a sulfur-containing organic compound and a carboxylic acid.

[Claim 10]

A multilayered printed wiring board manufactured by using the copper clad laminate provided with a protective layer according to any one of claims 1 to 9.