

【SPECIFICATION】**【TITLE OF THE INVENTION】**

SPOOL WINDED WITH A GOLD ALLOY WIRE USED FOR A BONDING PROCESS

【DETAILED DESCRIPTION OF THE INVENTION】**【FIELD OF THE INVENTION】**

The present invention is related to a spool where a gold alloy wire for a bonding process is winded. Particularly, the present invention is related to a spool where a gold alloy wire bonded on a pad of a printed circuit board is winded.

【DESCRIPTION OF THE REALTED ART】

To form a conventional spool where a wire is winded, a preliminary spool including aluminum is formed. An anodizing process is performed on a surface of the preliminary spool so that the conventional spool may be obtained. The anodized surface of the conventional spool may not have conductivity. Thus, the wire is required to be physically connected to a bonding device in order that an electric signal may be communicated between the wire and the bonding device.

FIG. 1 is a picture showing the conventional spool combined with the bonding device.

Referring to FIG. 1, the wire winded on the conventional spool is physically connected to the bonding device such that the electric signal may be communicated between the wire and the bonding device.

However, in case that the conventional spool is employed, an end portion of the wire winded on the conventional spool is required to be physically connected to the

bonding device. Thus, a time required for performing a bonding process may increase. In addition, an efficiency of the bonding process may decrease.

The conventional spool may be easily damaged by an external impact because the conventional spool is formed by the anodizing process. For example, a scratch may be formed on the conventional spool by the wire.

In addition, a cost required for forming the conventional spool is relatively large because the preliminary spool is formed using aluminum. Thus, a recycling process incurring an additional cost is required to be performed.

【INVENTION】**【OBJECT】**

Embodiments of the present invention provide a cheap and durable spool capable of connecting a bonding device to a wire without a physical connection between the bonding device and the wire.

【CONSTITUTION】

In accordance with embodiments of the present invention, a spool includes a body and a chromium layer. The body integrally includes a first portion having a tubular shape and a second portion having an annular shape. The body is formed using plastic. The second portion is provided on both sides of the first portion. The chromium layer is plated on the body. A gold alloy wire is wound on the chromium layer. The chromium layer is combined with a bonding device such that the bonding device is electrically connected to the chromium layer. The gold alloy wire wound on the chromium layer is electrically connected to the bonding device by the chromium layer without a physical connection between the gold alloy wire and the bonding device.

The chromium layer may have a thickness of 0.1 μ m to 100 μ m. The plastic may be acrylonitrile butadiene styrene copolymer or polystyrene copolymer. The chromium layer may be formed using trivalent chromium. The chromium layer may have a glossy surface. The spool may further include a first adhesion layer formed on the body and a second adhesion layer formed on the first adhesion layer. The chromium layer may be formed on the second adhesion layer. The first adhesion layer may include copper or nickel. The second adhesion layer may include nickel.

【EFFECT】

According to embodiments of the present invention, the combining portion of the bonding device may be electrically connected to the gold alloy wire wound on the spool even though the combining portion of the bonding device is not physically connected to the gold alloy wire. As a result, a time required for performing the bonding process may be reduced. In addition, an efficiency of the bonding process may increase.

Chromium has a relatively large intensity, a relatively large corrosion resistance and a relatively large durability. Thus, the shape of the spool may not be easily changed by an external impact. In addition, when the gold alloy wire is wound on the spool, a scratch may not be formed on the spool.

Furthermore, a cost required for forming the spool is relatively small. Thus, the spools may be used like expendable supplies. As a result, a recycling process may not be required.

【EMBODIMENTS】

The present invention will now be described more fully hereinafter with reference to the accompanying drawings, in which exemplary embodiments of the invention are illustrated. The invention may, however, be embodied in different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. It will also be understood that, although the terms "first," "second," etc., may be used herein to describe various elements, components, regions, layers and/or sections, these elements, components, regions, layers and/or sections should not be limited by these terms. Rather, these

terms are used merely as a convenience to distinguish one element, component, region, layer and/or section from another element, component, region, layer and/or section. For example, a first element, component, region, layer and/or section could be termed a second element, component, region, layer and/or section without departing from the teachings of the present invention.

FIG. 2 is a perspective view illustrating a spool in accordance with embodiments of the present invention. FIG. 3 is a front view illustrating the spool in FIG. 3. FIG. 4 is a cross-sectional view taken along a I-I' line in FIG. 2.

Referring to FIGS. 2 to 4, a spool where a gold alloy wire for a bonding process is to be wound may include a body 10 and a chromium layer 20. The body 10 may include a first portion 1 having a substantially tubular shape and a second portion 2 having a substantially annular shape. The second portion 2 may be provided on both sides of the first portion 1. The first and second portions 1 and 2 may be formed as one body.

The body 10 may be formed using a material capable of being plated with a metal. For example, the body 10 may be formed using a plastic. Particularly, the plastic used to form the body 10 may be acrylonitrile butadiene styrene (ABS) copolymer or polystyrene (PS) copolymer. In case that the body 10 is formed using ABS copolymer or PS copolymer, a transformation of the body 10 may be prevented in a metal plating process.

As described above, the first portion 1 and the second portion 2 may have the tubular shape and the annular shape, respectively. However, many apparent variations of the shapes of the first and second portions 1 and 2 are possible in accordance with a bonding device where the spool is to be combined.

The chromium layer 20 may be plated on the body 10. The chromium layer 20

may have a substantially uniform thickness. Thus, the spool may be conformed to the body 10. Particularly, the spool may have a hole 30 where the bonding device is to be combined.

In case that a thickness of the chromium layer 20 is less than about $0.1\text{ }\mu\text{m}$, the body 10 may be outwardly exposed. In addition, the shape of the spool may be changed by a relatively small force. On the other hand, in case that the thickness of the chromium layer 20 is more than about $100\mu\text{m}$, a surface defect such as a crack and a pin hole may be formed. Thus, the thickness of the chromium layer 20 may be about $0.1\mu\text{m}$ to about $100\mu\text{m}$.

In case that the chromium layer 20 have a glossy surface, a surface uniformity of the chromium layer 20 may be relatively greater than that of the chromium layer 20 having a lusterless surface. When the surface uniformity increases, a contact area between the chromium layer 20 and the gold alloy wire for the bonding process may increase. Thus, a contact resistance between the chromium layer 20 and the gold alloy wire may decrease. As a result, the chromium layer 20 may advantageously have the glossy surface.

Hexavalent chromium may cause an environmental pollution. In addition, hexavalent chromium is classified as a toxic material to human health. Thus, trivalent chromium may be advantageously used instead of hexavalent chromium. However, in case that hexavalent chromium may be safely obtained, hexavalent chromium may be allowed to be used.

In addition, a first adhesion layer and a second adhesion layer may be formed on the body 10 before the chromium layer 20 is formed on the body 10. Particularly, the

first adhesion layer including copper or nickel is plated on the body 10. The second adhesion layer including nickel is then plated on the first adhesion layer. Thereafter, the chromium layer 20 is plated on the second adhesion layer. Here, the first and second adhesion layers may increase an adhesive property of the chromium layer 20 with respect to the plastic body 10.

FIG. 5 is a picture showing the spool in FIGS. 2 to 4 combined with the bonding device.

Referring to FIG. 5, a combining portion of the bonding device is inserted into the hole of the spool such that the combining portion of the bonding device may make electric contact with an inner face of the hole. Thus, the combining portion of the bonding device is electrically connected to the spool so that the combining portion of the bonding device may be electrically connected to the gold alloy wire wound on the spool.

That is, in case that the spool of the present invention different from the conventional spool in FIG. 1 is employed, the spool having an electric conductivity may serve to electrically connect the bonding device to the gold alloy wire wound on the spool. Thus, the combining portion of the bonding device may be electrically connected to the gold alloy wire wound on the spool even though the combining portion of the bonding device is not physically connected to the gold alloy wire. As a result, a time required for performing the bonding process may be reduced. In addition, an efficiency of the bonding process may increase.

Chromium has a relatively large intensity, a relatively large corrosion resistance and a relatively large durability. Thus, the shape of the spool may not be easily changed by an external impact. In addition, when the gold alloy wire is wound on the spool, a scratch may not be formed on the spool.

As described above, the spool is formed by plating the chromium layer 20 on the body 10 including plastic that is relatively cheap. Thus, a cost required for forming the spool is relatively small. As a result, the spools may be used like expendable supplies without performing a recycling process.

The foregoing is illustrative of the present invention and is not to be construed as limiting thereof. Although a few embodiments of this invention have been described, those skilled in the art will readily appreciate that many modifications are possible in the embodiments without materially departing from the novel teachings and advantages of this invention. Accordingly, all such modifications are intended to be included within the scope of this invention as defined in the claims. Therefore, it is to be understood that the foregoing is illustrative of the present invention and is not to be construed as limited to the specific embodiments disclosed, and that modifications to the disclosed embodiments, as well as other embodiments, are intended to be included within the scope of the appended claims. The invention is defined by the following claims, with equivalents of the claims to be included therein.

【BRIEF DESCRIPTION OF THE DRAWINGS】

FIG. 1 is a picture showing a conventional spool combined with a bonding device.

FIG. 2 is a perspective view illustrating a spool in accordance with an embodiment of the present invention.

FIG. 3 is a front view illustrating the spool in FIG. 3.

FIG. 4 is a cross-sectional view taken along a I-I' line in FIG. 2.

FIG. 5 is a picture showing the spool in FIGS. 2 to 4 combined with a bonding device.

reference numerals denoting primary elements in the drawings

10 : body

20 : chromium layer

30 : hole

【CLAIMS】**【CLAIM 1】**

A spool comprising:

a body integrally including a first portion having a tubular shape and a second portion having a annular shape, the body being formed using plastic, the second portion being provided on both sides of the first portion; and

a chromium layer plated on the body, a gold alloy wire being winded on the chromium layer, the chromium layer being combined with a bonding device such that the bonding device is electrically connected to the chromium layer; and

wherein the gold alloy wire winded on the chromium layer is electrically connected to the bonding device by the chromium layer without a physical connection between the gold alloy wire and the bonding device.

【CLAIM 2】

The spool of claim 1, wherein the chromium layer has a thickness of 0.1 μ m to 100 μ m.

【CLAIM 3】

The spool of claim 1, wherein the plastic is acrylonitrile butadiene styrene copolymer or polystyrene copolymer.

【CLAIM 4】

The spool of claim 1, wherein the chromium layer is formed using trivalent chromium.

【CLAIM 5】

The spool of claim 1, wherein the chromium layer has a glossy surface.

【CLAIM 6】

The spool of claim 1, further comprising:

a first adhesion layer formed on the body; and

a second adhesion layer formed on the first adhesion layer; and

wherein the chromium layer is formed on the second adhesion layer.

【CLAIM 7】

The spool of claim 6, wherein the first adhesion layer includes copper or nickel.

【CLAIM 8】

The spool of claim 6, wherein the second adhesion layer includes nickel.