(54) Title: SHIELD CASE FIXING DEVICE FOR PRINTED CIRCUIT BOARD

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(57) Abstract: The present invention discloses a shield case-fixing device for a printed circuit board, which can securely fix a shield case to a printed circuit board in a simple and easy manner, thereby improving convenience in the work and increasing the shield rate. The shield case-fixing device for a printed circuit board includes: a fixing frame body of a ring shape bondingly mounted on the surface of a printed circuit board; a shield case detachably engaged with the fixing frame body; and a fixing means including a fitting groove formed to a predetermined depth along the entire periphery of the top surface of the fixing frame body so as to allow the sidewalls of the shield case to be snap-lifted thereto.
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Description

Title of Invention: SHIELD CASE FIXING DEVICE FOR PRINTED CIRCUIT BOARD

Technical Field

[1] The present invention relates to a shield case-fixing device for a printed circuit board built in a variety of electronic equipment such as, for example, cellular phones, telephones, Karaoke machines, radios, IBM navigators, MP3s players and the like, and more particularly, to such a shield case-fixing device for a printed circuit board, in which a shield case can be fixed to the printed circuit board in a convenient and firm manner.

Background Art

[2] In general, electromagnetic waves can have an adverse effect on a variety of electronic equipment such as, for example, cellular phones, telephones, Karaoke machines, radios, IBM navigators, MP3s players and the like. This phenomenon is called Electromagnetic Interference (EMI). The IMI induces generation of noises from the electronic equipment and acts to the human body as a harmful factor.

[3] For this reason, currently, electronic components generating the electromagnetic waves, i.e., memory chips built in a printed circuit board (PCB) are covered with a shield case to previously shield EMI generated from the electronic components so that the EMI is prevented from having an effect on the operation the electronic equipment itself or other electronic equipment.

[4] The shield case is formed in a box shape which is opened only at the bottom thereof and is installed on a printed circuit board so as to protectively cover the electronic components mounted on the printed circuit board. Various examples for fixing the shield case to the printed circuit board are shown in FIGs. 16 to 19. FIG. 16 is a cross-sectional view illustrating an example for fixing a shield case to a printed circuit board according to the prior art.

[5] As shown in FIG. 1, an electronic component 14 such as a memory chip is mounted on a printed circuit board 12, and a shield case 10 formed in a box shape which is opened only at the bottom thereof to protectively cover the electronic component is fixed to the printed circuit board 12. In this case, in order to fix the shield case 10 to the printed circuit board 12, it is required that a hole 12a should be formed in the printed circuit board, a support leg 10a should be formed protruding downwardly from the bottom of the shield case 10 to correspond to the hole 12a, and the support leg 10a should be fixedly inserted into the hole 12a. That is, the support leg 10a is inserted into the hole 12a and then is soldered to the printed circuit board 12 so as to fix the
shield case 10 to the printed circuit board 12.

Such a construction additionally requires a process for forming the hole 12a in the printed circuit board 12. Further, a process of soldering the support leg 10a after inserting the support leg 10a of the shield case 10 into the hole 10a requires a skilled technique, which is a cause of reduction of workability. Moreover, the soldering work in fact makes it difficult to separate the shield case 10 from the printed circuit board 12 and makes it impossible to repair the electronic components 14.

FIG. 17 is a perspective view illustrating another example for fixing a shield case to a printed circuit board according to the prior art, FIG. 18 is a cross-sectional view illustrating the assembled state of FIG. 17, and FIG. 19 is an enlarged view illustrating a portion A of FIG. 18.

As shown in FIGs. 17 to 19, after a plurality of fixing clips 16 is previously mounted on a printed circuit board 12, the shield case 10 is securely fixed to the printed circuit board 12 by means of the fixing clips 16. That is, after the plurality of fixing clips 16 is previously mounted on the printed circuit board 12, in such a fashion as to be arranged along the periphery of the shield case 10, the sidewalls of the shield case 10 are detachably inserted into the fixing clips so that the sidewalls of the shield case 10 are grippingly fixed to the fixing clips 16 by means of an elastic force of the fixing clips 16.

However, the fixing clips 16 are constructed to grip the sidewalls of the shield case 10 using the elastic force of the fixing clips 16. Thus, if an elastic (gripping) force of the fixing clip 16 becomes weak, there is a risk that a fixing force for fixing the shield case 10 will also be weak, which may result in easy escape of the shield case 10 from the fixing clip 16. Further, in the fixation of the shield case 10 by the fixing clips 16, a gap corresponding to the thickness of the fixing clip 16 is defined between the printed circuit board 12 and the shield case 10. As a result, complete shielding of the electromagnetic interference generated from the electronic component 14 cannot be achieved.

As described above, the example of FIG. 16 is good in terms of the shield rate owing to direct fixation of the shield case 10 to the printed circuit board 12, but has a disadvantage in that it the process for fixing the shield case 10 to the printed circuit board is difficult and maintenance and repair of the shield case also is difficult. In the meanwhile, the example of FIGs. 17 to 19 is good in terms of fixation and maintenance and repair of the shield case 10 since the shield case 10 is fixed to the printed circuit board 12 using the fixing clips 16, but has a shortcoming in that the shield rate is degraded due to the gap defined between the shield case 10 and the printed circuit board 12 by the fixing clip 16.

**Disclosure of Invention**
Technical Problem

[11] Accordingly, the present invention has been made in an effort to solve the above problem occurring in the prior art, and it is an object of the present invention to provide a shield case-fixing device for a printed circuit board, which can securely fix a shield case to a printed circuit board in a simple and easy manner, thereby improving convenience in the work and increasing the shield rate.

[12] Another object of the present invention is to provide a shield case-fixing device for a printed circuit board, which can be molded with an organic polymer and a resin so as to be implemented in various shapes so that the shield case fixing device (particularly, a fixing frame body) is surface-treated with a metal material by using plating, deposition, coloring or the like.

Solution to Problem

[13] To accomplish the above object, according to the present invention, there is provided a shield case-fixing device for a printed circuit board, including: a fixing frame body bondingly mounted on the surface of a printed circuit board, the fixing frame body being formed in a polygonal ring shape so as to surround the periphery of an electronic component installed on the printed circuit board; a shield case detachably engaged with the fixing frame body so as to shield electromagnetic interference (EMI) generated from the electronic component, the shield case being formed in a polygonal shape which is closed at the top thereof and is opened at the bottom thereof to correspond to the fixing frame body to protectively cover the top of the fixing frame body; and a fixing means including a fitting groove formed to a predetermined depth along the entire periphery of the top surface of the fixing frame body so as to allow the sidewalls of the shield case to be snap-fitted thereto, and a plurality of locking lugs extending laterally outwardly from the sidewalls of the shield case in such a fashion as to be arranged at predetermined intervals on the sidewalls of the shield case snap-fitted into the fitting groove of the fixing frame body, and a plurality of retaining steps steppedly formed on the inner surface of the fitting groove of the fixing frame body to correspond the positions of the locking lugs so as to allow the locking lugs to be fixedly retained by the retaining steps.

[14] The fixing frame body is molded with a metal material or an organic polymer and a resin so as to form a metal layer on the entire surface thereof.

[15] The fixing frame body further includes indented recesses 114 formed on both opposed sidewalls thereof where the retaining steps are formed so that the shield case is detached from or attached to the fixing frame body by means of the opposed indented recesses.

[16] The shield case further comprises a plurality of heat-radiating holes formed on the
top surface thereof.

[17] **Advantageous Effects of Invention**

[18] The present invention has advantageous effects in that the shield case is engaged with the fixing frame body which is closed at the sidewalls thereof and then the engaged fixing frame body is bondingly mounted on the surface of the printed circuit board, so that the shield case can be fixedly engaged in a convenient and simple manner. In addition, a complete electromagnetic interference-shielding effect is ensured to improve the reliability of the product. Moreover, easy separation of the shield case from the fixing frame body enables the repair of the electronic component.

[19] **Brief Description of Drawings**

[20] FIG. 1 is a disassembled top perspective view illustrating a state in which a fixing frame body and a shield case are separated from a printed circuit board according to an embodiment of present invention;

[21] FIG. 2 is a cross-sectional view taken along the line I-I of FIG. 1;

[22] FIG. 3 is an enlarged top plan view illustrating a fixing frame body 110 shown in FIG. 1;

[23] FIG. 4 is a partially enlarged cross-sectional view taken along the line II-II of FIG. 3;

[24] FIG. 5 is a partially enlarged cross-sectional view illustrating a modified example of FIG. 4;

[25] FIG. 6 is a cross-section view illustrating a state in which a shield case is engaged with a fixing frame body of FIG. 5;

[26] FIG. 7 is a partially enlarged cross-sectional view taken along the line III-III of FIG. 3;

[27] FIG. 8 is a cross-section view illustrating a state in which a shield case is engaged with a fixing frame body of FIG. 7;

[28] FIG. 9 is a disassembled perspective view illustrating a state in which a fixing frame body and a shield case are separated from a printed circuit board according to other modified embodiment of FIG. 1;

[29] FIGS. 10 to 12 are top perspective views illustrating other modified examples of the shield case of FIG. 9;

[30] FIGs. 13 to 15 are top plan views illustrating the shield case and the fixing frame body according to other modified embodiment of present invention;

[31] FIG. 16 is a cross-sectional view illustrating an example for fixing a shield case to a printed circuit board according to the prior art;

[32] FIG. 17 is a perspective view illustrating another example for fixing a shield case to a
printed circuit board according to the prior art;

FIG. 18 is a cross-sectional view illustrating the assembled state of FIG. 17; and
FIG. 19 is an enlarged view illustrating a portion A of FIG. 18.

Best Mode for Carrying out the Invention

A preferred embodiment of the present invention will be described hereinafter in more detail with reference to the accompanying drawings.

FIG. 1 is a disassembled top perspective view illustrating a state in which a fixing frame body and a shield case are separated from a printed circuit board according to an embodiment of present invention, FIG. 2 is a cross-sectional view taken along the line I-I of FIG. 1, FIG. 3 is an enlarged top plan view illustrating a fixing frame body 110 shown in FIG. 1, FIG. 4 is a partially enlarged cross-sectional view taken along the line II-II of FIG. 3, FIG. 5 is a partially enlarged cross-sectional view illustrating a modified example of FIG. 4, FIG. 6 is a cross-section view illustrating a state in which a shield case is engaged with a fixing frame body of FIG. 5, FIG. 7 is a partially enlarged cross-sectional view taken along the line III-III of FIG. 3, and FIG. 8 is a cross-section view illustrating a state in which a shield case is engaged with a fixing frame body of FIG. 7.

As shown in the drawings, a shield case-fixing device for a printed circuit board according to the present invention includes a fixing frame body 110, a shield case 120 and a fixing means 140.

The fixing frame body 110 is bondingly mounted on the surface of a printed circuit board 102. The shield case 120 is detachably engaged with the fixing frame body 110 so as to shield electromagnetic interference (EMI) generated from an electronic component 104 installed on the printed circuit board 102. In addition, the fixing means 140 serves to allow the shield case 120 to be fixedly inserted into the fixing frame body 110. To this end, the fixing frame body 110 has a fitting groove 130 formed along the entire periphery of the top surface thereof so as to allow the shield case 120 to be fittingly inserted thereto. The shield case 120 fitted into the fitting groove 130 of the fixing frame body 110 has a plurality of locking lugs 142 extending laterally outwardly from the sidewalls thereof, and the fixing frame body 110 has a plurality of retaining steps 144 formed on the inner surface of the fitting groove of the fixing frame body 110.

As shown in the drawings, the fixing frame body 110 is formed in a polygonal shape which is opened at the top and bottom thereof and is closed at the sidewalls thereof, so that the fixing frame body 110 is bondingly mounted on the surface of a printed circuit board 102 in a state in which the electronic component 104 installed on the printed
circuit board 102 is internally surrounded by the fixing frame body 110. The fixing frame body 110 is most preferably formed in a square ring shape, but may be formed in shapes other than the square ring shape, for example, in a pentagonal shape, a hexagonal shape or the like.

[41] In addition, the fixing frame body 110 is made of a metal material or an organic polymer and a resin. In case where the fixing frame body 110 is made of an organic polymer and a resin, as shown in FIG. 5, a metal layer 112 must be formed on the entire surface of the fixing frame body 10 in order to bondingly mount the fixing frame body on the printed circuit board 102. The formation of the metal layer 112 on the fixing frame body is performed by surface-treating the fixing frame body by using a frame (for example, a shield fence frame) molded with the organic polymer and the resin by various methods such as plating, coloring, deposition or the like. That is, the fixing frame body 110 is formed by a frame molded using the organic polymer and the resin, and then is surface-treated with a metal material to form the metal layer 112 thereon.

[42] Also, the metal layer 112 can be surface-treated with copper, gold, silver, tin, nickel or the like so as to improve durability. Such a metal layer 112 has an electromagnetic interference-shielding function which can shield the electromagnetic interference generated from the electronic component. Particularly, if the fixing frame body 110 is molded with the organic polymer and the resin, advantageously it can be implemented in various polygonal shapes which are difficult to realize using an iron plate made of an alloy material including iron.

[43] As shown in the drawings, the shield case 120 is formed in the same shape as that of the fixing frame body 110 in such a fashion as to be closed at the ceiling wall and sidewalls thereof and opened at the bottom thereof, so that the shield case is detachably engaged with the fixing frame body 110 so as to protectively cover the electronic component 104 to completely thereby shield the electromagnetic interference generated from the electronic component 104. The shield case 120 can be made by performing the plastic working on a ferrous, non-ferrous and alloy sheet.

[44] As shown in the drawings, the fitting groove 130 is intended to allow the sidewalls of the shield case 120 to be snap-fitted into the fixing frame body 110. To this end, the fitting groove 130 is formed to a predetermined depth along the entire periphery of the top surface of the fixing frame body 110.

[45] The sidewalls of the shield case 120 are fitfully inserted into the fitting groove 130 so that the shield case 120 can be fixedly engaged with the fixing frame body 110.

[46] As shown in drawings, the fixing means 140 includes a plurality of locking lugs 142 extending laterally outwardly from the sidewalls of the shield case in such a fashion as to be arranged at predetermined intervals on the sidewalls of the shield case 120 snap-
fitted into the fitting groove 130 of the fixing frame body 110, and a plurality of
retaining steps 144 steppedly formed on the inner surface of the fitting groove 130 of
the fixing frame body 110 to correspond the positions of the locking lugs 142 so as to
allow the locking lugs to be fixedly retained by the retaining steps, so that the locking
lugs 142 are lockingly engaged with the retaining steps 144. As a result, the shield case
120 can be prevented from separated from the fixing frame body 110 after being fixed
to the fixing frame body 110 (see FIG. 8).

[47] The retaining step 144 can be simply and easily formed such that its width is larger
than that of the fitting groove 130 at a lower portion of the fixing frame body 110. That
is, the fitting groove 110 is formed to a predetermined depth on the top surface of the
fixing frame body 110, and a groove for forming the retaining step 144 is drilled to a
predetermined depth on the bottom surface of the fixing frame body 110, so that the
retaining step 144 can be formed simply and easily.

[48] In addition, in order to allow the shield case 120 to be separated from the fixing
frame body 110 in a state in which the sidewalls of the shield case 120 is fixedly fitted
into the fitting groove 130 formed on the top surface of the fixing frame body 110 by
means of the fixing means 140, indented recesses 114 are preferably formed on both
opposed sidewalls of the fixing frame body 110 where the retaining steps 144 are
formed. Thus, the shield case 120 is detached from or attached to the fixing frame
body 110 by means of the opposed indented recesses. That is, a user forcibly pushes
the both opposed sidewalls of the shield case 120 fittingly engaged with the fixing
frame body 110 by using the indented recesses 114 to cause the sidewalls of the shield
case 120 to have a given tension, so that the locking lugs 142 lockingly engaged with
the retaining steps 144 are easily separated from the retaining steps 144.

[49] In this manner, when the fixing frame body 110 is mounted on the surface of the
printed circuit board 102 and then the shield case 120 is detachably engaged with the
fixing frame body 110, any gap is not defined between the printed circuit board 102
and the fixing frame body 110, and the fixing frame body 110 and the shield case 120,
thereby ensuring a complete electromagnetic interference-shielding effect.

[50] Moreover, the present invention can accomplish automation of the process when the
fixing frame body 110 is bondingly mounted on the surface of the printed circuit board
102 in a state in which the shield case 120 is fixedly engaged with the fixing frame
body 110 in advance. That is, when the shield case 120 is fixedly engaged with the
fixing frame body 110, a box-shaped assembly is obtained which is opened at the
bottom thereof, so that since the top thereof can be picked up, construction of an
automated line is possible, resulting in convenience of the work and reduction in the
process number.

[51] FIG. 9 is a disassembled perspective view illustrating a state in which a fixing frame
body and a shield case are separated from a printed circuit board according to an
modified embodiment the present invention.

As shown in FIG. 9, this modified embodiment of the present invention is the same
as the above embodiment except that the shield case 120 further has a plurality of heat
radiating holes 122 formed on the top surface thereof. That is, the constructions for
detachably fixedly engaging the shield case 120 with the fixing frame body 110 are the
same as those in the above embodiment. Like this, if the heat-radiating holes 122 are
further formed on the shield case 120, the heat generated from the electronic
component 104 installed on the printed circuit board 102 is effectively discharged to
the outside, thereby improving the performance of the equipment. The heat-radiating
holes 122 can be formed in a circular shape on the shield case.

FIGS. 10 to 12 are top perspective views illustrating other modified examples of the
shield case of FIG. 9.

The other modified examples of the shield case 120 shown in FIGs. 10 to 12 are
implemented by the shapes of the heat-radiating holes 122 formed on the shield case 120.
That is, the heat-radiating holes 122 may be formed in a square shape as shown in FIG.
10, may be formed in a diamond shape as shown in FIG. 11, and may be formed in a
hexagonal shape as shown in FIG. 12. Besides, it is, of course, to be understood that
the heat-radiating holes 122 may be formed in a pentagonal shape other than a circular
shape, a square shape and a hexagonal shape.

FIGS. 13 to 15 are top plan views illustrating the shield case and the fixing frame
body according to other modified embodiment of present invention.

The fixing frame body 110 and the shield case 120 are preferably formed in a square
ring shape as shown in FIG. 13, but may be formed in a polygonal shape having an
inclined portion at one side thereof as shown in FIG. 14, and may be formed in a
hexagonal shape as shown in FIG. 15.

**Industrial Applicability**

As described above, when the fixing frame body 110 and the shield case 120 are
formed in various polygonal shapes, the circuit construction of the printed circuit board
can advantageously be freely realized.

Although the present invention has been described in connection with the exemplary
embodiments illustrated in the drawings, it is only illustrative. It will be understood by
those skilled in the art that various modifications and equivalents can be made to the
present invention. Therefore, the true technical scope of the present invention should
be defined by the appended claims.
Claims

[Claim 1]  A shield case-fixing device for a printed circuit board, comprising: a fixing frame body bondingly mounted on the surface of a printed circuit board, the fixing frame body being formed in a polygonal ring shape so as to surround the periphery of an electronic component installed on the printed circuit board; a shield case detachably engaged with the fixing frame body so as to shield electromagnetic interference (EMI) generated from the electronic component, the shield case being formed in a polygonal shape which is closed at the top thereof and is opened at the bottom thereof to correspond to the fixing frame body to protectively cover the top of the fixing frame body; and a fixing means including a fitting groove formed to a predetermined depth along the entire periphery of the top surface of the fixing frame body so as to allow the sidewalls of the shield case to be snap-fitted thereto, and a plurality of locking lugs extending laterally outwardly from the sidewalls of the shield case in such a fashion as to be arranged at predetermined intervals on the sidewalls of the shield case snap-fitted into the fitting groove of the fixing frame body, and a plurality of retaining steps steppedly formed on the inner surface of the fitting groove of the fixing frame body to correspond the positions of the locking lugs so as to allow the locking lugs to be fixedly retained by the retaining steps.

[Claim 2]  The shield case-fixing device according to claim 1, wherein the fixing frame body is molded with a metal material or an organic polymer and a resin so as to form a metal layer on the entire surface thereof.

[Claim 3]  The shield case-fixing device according to claim 1, wherein the fixing frame body further comprises indented recesses 114 formed on both opposed sidewalls thereof where the retaining steps are formed so that the shield case is detached from or attached to the fixing frame body by means of the opposed indented recesses.

[Claim 4]  The piping coupling device according to claim 1 or 2, wherein the shield case further comprises a plurality of heat-radiating holes formed on the top surface thereof.
A. CLASSIFICATION OF SUBJECT MATTER

H05K 9/00(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H05K 9/00; H01J 17/16; H05K 5/02

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models
Japanese utility models and applications for utility models
(Chinese Patents and application for patent)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS(KIPO internal)& Keywords: "SHIELDING," "CASE," "ENCLOSURE," "ELECTROMAGNETIC," "HOOK," "GROOVE," "FIXING," "CIRCUIT," "BOARD," "DEVICE," "EMI" AND "COVER"

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Date of the actual completion of the international search  13 APRIL 2010 (13.04.2010)

Date of mailing of the international search report  15 APRIL 2010 (15.04.2010)

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