

TITLE OF THE INVENTION

Electronic components to be mounted on a circuit board and method of manufacturing the same

TECHNICAL FIELD OF THE INVENTION

The present invention relates to electronic components to be mounted on a circuit board by soldering for use in various electronic appliances, and a method of manufacturing the same.

BACKGROUND OF THE INVENTION

Hitherto, when an electronic component, which is composed by forming an external connection terminal of an insulated case and an internal fixed contact or the like by a single metal plate and fitting to the insulated case by insert forming or similar method, is connected to a printed board, a metal hoop material having the surface treated preliminarily by plating is used as the metal plate, and such metal hoop material is a surface treated material low in contact resistance in order to stabilize contact with the internal fixed contact or the like.

This conventional electronic component technology is explained herein in an example of push switch. Fig. 9 is a sectional view showing an example of a conventional push switch. Fig. 10 is a perspective view of a metal hoop material used in the conventional push switch. Fig. 11 is a perspective view of metal terminal and insulated case used in the conventional push switch.

In Fig. 9, in the bottom of an insulated case 1 made of insulating resin, integral outside fixed contacts 3A, 3B are fixed to a first connection terminal 2, and an integral middle fixed contact 5 to a second connection terminal 4, by insert forming. A dome-shaped movable contact 6 of inverting action type made of elastic metal plate is put on the outside fixed contacts 3A, 3B. Thus, the switch contact is composed. On this switch contact, a pushbutton 7 made of rigid material is mounted so as to be movable vertically. In this constitution, by pressing the pushbutton 7, the movable contact 6 is inverted, and a short circuit is formed between the outside fixed contacts 3A, 3B and middle fixed contact 5, that is, between the first connection terminal 2 and the second one 4. In this manner, the push switch is constituted.

In this push switch, the insulated case 1 having the integral first connection terminal 2 connected to the outside fixed contacts 3A, 3B and the integral second connection terminal 4 connected to the middle fixed contact 5 is fabricated in the following manner. That is, as shown in Fig. 10, a metal hoop material of which surface is treated by plating is processed by trimming, and is consecutively processed into the shape of the fixed contacts 3A, 3B, 5, first connection terminal 2, and second connection terminal 4, and a contact hoop 8 is fabricated. Then, the contact hoop 8 is insert formed, and the insulated case 1 is made. Later, as shown in Fig. 11, the insert formed body is separated at the connection part of the first connection terminal 2 and second connection terminal 4,

into every insulated case 1, and is bent and processed so as to be easily soldered to a printed board.

Generally, as the surface plating treatment of the metal hoop material, in order to stabilize the contact of the fixed contacts 3A, 3B and middle fixed contact 5 with the movable contact 6, silver plating is applied to both face and back surfaces of the metal hoop material preliminarily in the state of metal hoop material before trimming process into the shape of fixed contacts and connection terminals.

However, in the push switch having such silver plated connection terminals, when this push switch is stored for a long period at high temperature, if the ambient condition is likely to promote sulfurization phenomenon until soldering connection after mounting the push switch on the printed board, the silver plated on both surfaces of the connection terminals is transformed into silver sulfide, and solder wettability to the connection terminals is impaired, and, as a result, when soldering the printed board and connection terminals, a sufficient solder bridge may not be formed between the soldering land of the printed board and the connection terminals.

The invention is intended to solve such problem of the prior art, and it is an object thereof to present electronic components to be mounted on a printed board maintaining the conventional reliability of contact and having an excellent solderability.

SUMMARY OF THE INVENTION

To achieve the object, the invention provides an electronic component to be mounted on a circuit board, comprising an electric insulated case, a functional part contained in the electric insulated case, and an external connection terminal electrically conducting with the functional part and projecting from the electric insulated case. The functional part includes a first electric contact part. The first electric contact part and the external part are composed of a mutually integrally formed metal plate. The metal plate has a first surface and a second surface positioned at the back side of the first surface. The first surface of the first electric contact part includes a first conductive layer having a low contact resistance capable of conducting electrically by contact. The second surface of the external connection terminal has a second conductive layer capable of being soldered. The second surface of the external connection terminal including the second conductive layer can be soldered to the circuit board.

Preferably, the first electric contact part and the external connection terminal are formed of the metal plate having the first conductive layer on the first surface and having the second conductive layer on the second surface, the first electric contact part includes the first surface having the first conductive layer and the second surface having the second conductive layer, and the external connection terminal includes the first surface having the first conductive layer and the second surface having the second

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conductive layer.

Preferably, the external connection terminal projects in a downward direction of the electric insulated case, and the external connection terminal can be inserted into a hole formed in the circuit board.

Preferably, the function part has a second electric contact part capable of contacting with the first electric contact part, the first conductive layer of the first surface of the first electric contact part is exposed in the electric insulated case, and the first contact part electrically conducts with the second contact part when the first surface of the electric contacting part contacts with the second electric contact part.

In this constitution, the reliability of electric contact of the first electric contact part is excellent, and at the same time it also brings about an effect of connection of external connection terminal to the circuit board securely by soldering.

In the constitution, preferably, the first conductive layer is a layer containing at least one of a silver and a silver-alloy, and the second conductive layer is a layer containing at least one of solder and tin.

In the constitution, when the electronic component having contact parts and connection terminals is put in high temperature environments or in the atmosphere likely to promote sulfurization phenomenon, the contact parts maintain an excellent contact resistance value, and at the same time it brings about an effect

of preventing deterioration of solder wettability when soldering the connection terminals.

In the constitution, preferably, the second conductive layer of the external connection terminal is soldered to a soldering land when the external connection terminal is installed in the soldering land formed on the circuit board.

Preferably, the external connection terminal has the second surface including the second conductive layer and first surface including the first conductive layer, and when the external terminal is installed in a terminal fitting hole having a soldering land formed on the circuit board, the external terminal has a folded shape so as to be installed, with the first surface having the first conductive layer in a state capable of contacting with the edge of the terminal fitting hole, and with the second surface having the second conductive layer in a state having a clearance from the edge.

Preferably, the soldering land is formed at the back side of the surrounding of the terminal fitting hole of the circuit board, the first surface of the external connection terminal contacts with the soldering land, and the soldering land and the second surface can be soldered by covering the clearance.

The constitution brings about an effect of bridging the gap between the external connection terminal and terminal fitting hole securely with solder.

In the constitution, preferably, the external connection terminal has the second surface including the second conductive

layer and first surface including the first conductive layer, the external connection terminal forms a leg for mounting on the circuit board, and the leg has a section of at least one of circle and polygon, being processed in a state of mutually linking the conductive layer of the second surface and the first conductive layer of the first surface.

Preferably, the leg is formed by rolling the metal plate including the second conductive layer of the second surface and the first conductive layer of the first surface, from both the first surface and the second surface.

The constitution brings about an effect of bridging the gap between the external connection terminal and terminal fitting hole securely with solder.

The circuit board mounting the electronic component of the invention is composed of the electronic component of the invention, and the circuit board having a soldering land, and the second conductive layer of the second surface of the external terminal is joined to the soldering land.

In this constitution, the reliability of electric contact of the first electric contact part is excellent, and at the same time it also brings about an effect of connection of external connection terminal to the circuit board securely by soldering. It also brings about an effect of bridging the gap between the external connection terminal and terminal fitting hole securely with solder.

The invention further provides a method of manufacturing an

electronic component to be mounted on a circuit board composed of an electric insulated case, a functional part contained in the electric insulated case, and an external connection terminal electrically conducting with the functional part and projecting from the electric insulated case. The method is comprising (1) a step of installing a first conductive layer having a low contact resistance so as to conduct electrically by contact, on a first surface of a metal plate, (2) a step of installing a solderable second conductive layer, on a second surface positioned at the back side of the first surface of the metal plate, and (3) a step of forming a first electric contact part and external connection terminal consecutive to the first electric contact part, by processing the metal plate.

In the constitution, preferably, the first electric contact part includes the first surface having the first conductive layer and the second surface having the second conductive layer, the external connection terminal includes the first surface having the first conductive layer and the second surface having the second conductive layer, the external connection terminal can be soldered to a soldering land formed on the circuit board, the functional part has a second electric contact part capable of contacting with the first electric contact part, the first conductive layer of the first surface of the first electric contact part is exposed in the electric insulated case, and the first electric contact part conducts electrically to the second electric contact part when the first surface of the first electric contact part contacts with the

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second electric contact part.

Preferably, the first conductive layer is a layer containing at least one of a silver and a silver-alloy, and the second conductive layer is a layer containing at least one of solder and tin.

Preferably, the method further comprises (4) a step of folding the external connection terminal into a specified shape, wherein the specified folded shape of the external connection terminal is such that, when the external terminal is installed in a terminal fitting hole having a soldering land formed on the circuit board, it is installed therein, with the first surface having the first conductive layer in a state capable of contacting with the edge of the terminal fitting hole, and with the second surface having the second conductive layer in a state having a clearance from the edge.

Preferably, the method further comprises (4) a step of forming a leg in a shape having at least one section of circle and polygon, in the vicinity of the leading end of the external connection terminal, wherein the leg is processed in a state so that the first conductive layer of the first surface and the conductive layer of the second surface of the external connection terminal may be coupled to each other.

More preferably, the leg is formed by rolling the metal plate including the second conductive layer of the second surface and the first conductive layer of the first surface, from both the first surface and the second surface.

In this manufacturing method, in the case of connection by soldering after folding by fitting on a taping member, feeding into an assembly line, and inserting the leg of an external connection terminal into a terminal fitting hole in the circuit board by using an automatic mounting machine, the gap between the external connection terminal and terminal fitting hole can be securely bridged by solder. In addition, the conventional die and assembling equipment can be used, which brings about an industrial merit of manufacturing at low cost.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a sectional view of a push switch showing an example of an electronic component to be mounted on a printed board according to a first embodiment of the invention.

Fig. 2 is a front view including a partial section for explaining the mounted state of the push switch shown in Fig. 1 on a printed board.

Fig. 3 is a front view including a partial section for explaining the soldered state of the push switch mounted on the printed board shown in Fig. 2.

Fig. 4 is a perspective view of an electronic component to be mounted on a printed board according to other embodiment of the invention.

Fig. 5 is a perspective view of a push switch showing an example of an electronic component to be mounted on a printed board

according to a second embodiment of the invention.

Fig. 6 is a sectional view for explaining the processing method and processing state of roll forming of the terminal leg portion in a plate form of an essential part of the push switch shown in Fig. 5.

Fig. 7 is a front view for explaining the insertion state of the push switch shown in Fig. 5 into the fitting hole in the printed board.

Fig. 8 (a) is a partial sectional front view showing the mounted state of the push switch shown in Fig. 5 on the printed board, and (b) is its bottom view.

Fig. 9 is a sectional view of a conventional push switch.

Fig. 10 is a perspective view of a metal hoop material processed by plating and trimming used in the conventional push switch shown in Fig. 9.

Fig. 11 is a perspective view of an insulated case processed by folding the connection terminal composed in the conventional push switch in Fig. 9.

Reference Numerals

9, 31 Insulated cases

10, 27, 32 First connection terminals

12, 28, 33 Second connection terminals

10A, 11C, 11D, 12A, 13A, 32B, 33B Silver plated surfaces

10B, 11E, 11F, 12B, 13B, 32C, 33C Solder or tin plated surfaces

10C, 12C Contacting outside surfaces
10D, 12D Inside surfaces with a clearance
11A, 11B Outside fixed contacts
13 Middle fixed contact
14 Movable contact
15, 34 Pushbuttons
16, 29 First protrusions
17, 30 Second protrusions
18, 35 Printed boards
19, 36 First terminal fitting holes
20, 37 Second terminal fitting holes
21, 42 First soldering lands
22, 43 Second soldering lands
23 Edge of first terminal fitting hole
24 Edge of second terminal fitting hole
25, 44 First solder bridges
26, 45 Second solder bridges
32A First terminal leg
33A Second terminal leg
38, 40 Forming dies
39 Hexagonal section
41 Circular section

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The electronic component to be mounted on a circuit board

according to the preferred embodiments of the invention are described below, relating to an example of push switch, by reference to Fig. 1 through Fig. 8.

Embodiment 1

Fig. 1 is a sectional view showing the constitution of a push switch according to a first embodiment of the invention. In Fig. 1, in the bottom of an insulated case 9 of insulating resin box, integrally formed outside fixed contacts 11A, 11B are fixed to a first connection terminal 10, and an integrally formed middle fixed contact 13 to a second connection terminal 12, by insert forming. A dome-shaped movable contact 14 of inverting action type made of elastic metal plate is put on the outside fixed contacts 11A, 11B. Thus, the switch contact is composed. On this switch contact, a pushbutton 15 made of rigid material is mounted so as to be movable vertically. By pressing the pushbutton 15, the movable contact 14 is inverted, and a short circuit is formed between the outside fixed contacts 11A, 11B and middle fixed contact 13, that is, between the first connection terminal 10 and the second connection terminal 12. The shape of the parts for composing this push switch is same as in the prior art, and therefore the same dies and assembling facilities as in the prior art may be employed for composing the constituent parts.

Only the difference in constitution of the embodiment from the prior art is described below. In the push switch of the embodiment, silver or silver-alloy plating of low contact

resistance is applied on the surfaces of contact surface sides 11C, 11D of outside fixed contacts 11A, 11B, contact surface side 13A of middle fixed contact 13, and first connection terminal side 10A and second connection terminal side 12A on the same side as the contact surface side. Solder or tin plating of high solderability is applied on the surfaces of the opposite side of these silver or silver-alloy plated surfaces of outside fixed contact sides 11E, 11F, middle fixed contact side 13B, first connection terminal side 10B, and second connection terminal side 12B. The portions slightly above the leading end of the leg of the first connection terminal 10 and second connection terminal 12 inserted into the terminal fitting hole of the printed board are folded so as to dispose first protrusion 16 and second protrusion 17 at the outside respectively.

The state of mounting such push switch on the printed board is shown in Fig. 2. When the first connection terminal 10 and second connection terminal 12 are inserted into first terminal fitting hole 19 and second terminal fitting hole 20 in the printed board 18 as the circuit board, the first protrusion 16 and second protrusion 17 elastically contact with the outside edges of the pair of terminal fitting holes 19, 20 by making use of elastic property of the terminals, thereby acting to prevent the terminals from slipping out. As the first protrusion 16 and second protrusion 17 contact elastically with each other, the first outer side 10C and second outer side 12C tightly contacting with first hole edge 23 and second hole edge 24 having a first soldering land 21 and second

soldering land 22 are the surface plated sides of low contact resistance, and first inner side 10d and second inner side 12D with a slight clearance are surface plated sides of high solderability.

Accordingly, if the silver or silver-alloy plating of surface plating of low contact resistance is transformed into silver sulfide due to sulfurization phenomenon, a solder bridge is likely to be formed due to tight contact with the first soldering land 21 and second soldering land 22. On the other hand, the solder or tin plating of surface plating material of high solderability is not sulfurized, and is excellent in solder wettability, and therefore if there is a slight clearance between the connection terminals 10, 12 and soldering lands 21, 22 as shown in Fig. 3, a first solder bridge 25 and a second solder bridge 26 are formed securely between the connection terminals 10, 12 and soldering lands 21, 22.

In the outside fixed contacts 11A, 11B, middle fixed contact 13, first connection terminal 10, and second connection terminal 12, to apply different types of plating on the face and back surfaces, different platings are applied on the face and back surfaces in the state of metal hoops before the trimming process of the outside fixed contacts 11A, 11B, middle fixed contact 13, first connection terminal 10, and second connection terminal 12. Such plating process can be done easily in the existing plating facility and process, and the cost is so much different from the conventional cost.

In the embodiment, the side contacting tightly with the first soldering land 21 and second soldering land 22 of the printed board 18 is outside of the pair of fitting holes 19, 20, but not limited to this, a different constitution as shown in Fig. 4 may be also possible. That is, in Fig. 4, the plating side of low contact resistance is the inside, and the plating side of high solderability is the outside, and a first protrusion 29 and a second protrusion 30 are provided inside of the pair of first connection terminal 27 and second connection terminal 28, and the inside contacts tightly with the edge of the soldering hole and a slight clearance is made outside. In such constitution, too, same effects as above are obtained. The silver-alloy is an alloy of silver and another metal.

Embodiment 2

The appearance of a push switch according to a second embodiment is shown in Fig. 5. In Fig. 5, in the bottom of an insulated case 31 of insulating resin box, an integral first connection terminal 32 is fixed to an outside fixed contact (not shown), and an integral second connection terminal 33 to a middle fixed contact (not shown), by insert forming. The first connection terminal 32 and second connection terminal 33 are projecting vertically beneath the bottom, respectively. Other constituent parts such as movable contact (not shown) and pushbutton 34 and the operating method of push switch are same as in the first embodiment, and detailed description is omitted herein.

In Fig. 5, silver or silver-alloy plating of low contact

resistance is applied on the contact side surface of the outside fixed contact, contact side surface (not shown) of the middle fixed contact, and shaded areas 32B, 33B of the first connection terminal 32 and second connection terminal 33 on the same side as thereof. On the opposite sides 32C, 33C of these silver or silver-alloy plated sides 32B, 33B, solder or tin plating of high solderability is applied. The legs 32A, 33A of the first connection terminal 32 and second connection terminal 33 are processed in a circular section by rolling process by forming from both face and back sides. Fig. 7 shows the connection state of connection terminals 32, 33 into first terminal fitting hole 36 and second terminal fitting hole 37 of a printed board 35. In this circular section, the legs 32A, 33A are respectively inserted into the holes 36, 37.

The processing method of rolling by this forming process is described in Fig. 6 (a) to (c). First, as shown in Fig. 6 (a), terminal legs 32A, 33A of plate form are inserted between upper and lower forming dies 38 of triangular shape, and rolled and formed nearly into a hexagonal section 39. Then, as shown in Fig. 6 (b), the terminal legs 32A, 33A rolled and formed nearly into the hexagonal section 39 are pressed between upper and lower hemispherical forming dies 40, and rolled and formed nearly into a circular section 41. By this processing, plated portions 32B, 33B of the face surface of the terminal legs 32A, 33A of plate form and plated portions 32C, 33C of the back surface thereof are extended by roll forming as shown in Fig. 6 (c), and as a result, in the state

of circular section 41, the plated portions 32B, 33B and plated portions 32C, 33C on the back surface contact with each other, thereby covering nearly the entire circumference.

The push switch in this second embodiment is fitted on a taping member and is supplied into the assembly line of the set. Next, using the automatic mounting machine, the first leg 32A and second leg 33A of the first connection terminal 32 and second connection terminal 33 are inserted into terminal fitting holes 36, 37 of the printed board 35 as shown in Fig. 7. Afterwards, as shown in Fig. 8 (a) and (b), the first leg 32A and second leg 33A are folded in mutually opposite directions, and soldered and connected to first soldering land 42 and second soldering land 43 in the lower circumference of the mounting holes 36, 37. At this time, the soldering lands 42, 43 of the printed board 35 respectively contact tightly with either the plated portions 32B, 33B of low contact resistance or plated portions 32C, 33C of high solderability of the terminal legs 32A, 33A. The mutually contacting portions are determined by the folding direction of the terminal legs 32A, 33A, but anyway as the surface plated portions contact tightly with the soldering lands 42, 43, a first solder bridge 44 and a second solder bridge 45 are likely to be formed. If the plated portions 32B, 33B of low contact resistance contact tightly with the soldering lands 42, 43, since the plated portions 32B, 33B of low contact resistance is consecutive to the plated portions 32C, 33C of high solderability, formation of solder bridges 44, 45 is easier than in the case of the

first embodiment.

Incidentally, in the process of rolling and forming the legs 32A, 33A in plate form of the first connection terminal 32 and second connection terminal 33 into the circular section 41 from the face and back sides, after rolling and forming in the state of terminals only, it is possible to add a step of assembling the rolled terminals into the electronic component, or after assembling the terminals into the electronic component, it is possible to add a step of rolling and forming the legs of terminals.

Alternatively, the shape of rolling and forming the legs 32A, 33A of the first connection terminal 32 and second connection terminal 33 may be also hexagonal, octagonal or other polygonal shape, and same effects are obtained. However, the circular section is most preferred.

Thus, according to the constitution of the invention, if the electronic component to be mounted on a circuit board is stored at high temperature for a long period, or if the ambient condition until the time of connection by soldering after the electronic component is mounted on a circuit board is likely to promote sulfurization phenomenon, it is effective to prevent the solderability of the connection terminals from deteriorating and to offer an excellent solderability. Moreover, the conventional dies and assembling facilities can be employed, which brings about a practical benefit of manufacturing at low cost.

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Claims

1. An electronic component to be mounted on a circuit board, comprising:

an electric insulated case,

a functional part contained in said electric insulated case,

and

an external connection terminal electrically conducting with said functional part and projecting from said electric insulated case, wherein

said functional part includes a first electric contact part,

said first electric contact part and said external part are composed of a mutually integrally formed metal plate,

said metal plate has a first surface and a second surface positioned at the back side of said first surface,

a first surface of said first electric contact part includes a first conductive layer having a low contact resistance capable of conducting electrically by contact,

a second surface of said external connection terminal includes a second conductive layer capable of being soldered, and

said second surface of said external connection terminal including said second conductive layer can be soldered to said circuit board.

2. An electronic component to be mounted on a circuit

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board of claim 1, wherein

said first electric contact part and said external connection terminal are formed of said metal plate having said first conductive layer on said first surface and having said second conductive layer on said second surface,

said first electric contact part includes said first surface having said first conductive layer and said second surface having said second conductive layer, and
said external connection terminal includes said first surface having said first conductive layer and said second surface having said second conductive layer.

3. An electronic component to be mounted on a circuit board of claim 1, wherein

said external connection terminal projects in a downward direction of said electric insulated case, and

said external connection terminal can be inserted into a hole formed in said circuit board.

4. An electronic component to be mounted on a circuit board of claim 1, wherein

said function part has a second electric contact part capable of contacting with said first electric contact part,

said first conductive layer of said first surface of said first electric contact part is exposed in said electric insulated



case, and

said first contact part electrically conducts with said second contact part when said first surface of said electric contacting part contacts with said second electric contact part.

5. An electronic component to be mounted on a circuit board of claim 1, wherein said first conductive layer is a layer containing at least one of silver and silver-alloy.

6. An electronic component to be mounted on a circuit board of claim 1, wherein said second conductive layer is a layer containing at least one of solder and tin.

7. An electronic component to be mounted on a circuit board of claim 1, wherein

said first conductive layer is a layer containing at least one of silver and silver-alloy, and

said second conductive layer is a layer containing at least one of solder and tin.

8. An electronic component to be mounted on a circuit board of claim 1, wherein said second conductive layer of said external connection terminal is soldered to a soldering land when said external connection terminal is installed in said soldering land formed on said circuit board.



9. An electronic component to be mounted on a circuit board of claim 1, wherein

said external connection terminal has said second surface including said second conductive layer and a first surface including said first conductive layer, and

when said external terminal is installed in a terminal fitting hole having a soldering land formed on said circuit board, said external terminal has a folded shape so as to be installed, with said first surface having said first conductive layer in a state capable of contacting with an edge of said terminal fitting hole, and with said second surface having said second conductive layer in a state having a clearance from said edge.

10. An electronic component to be mounted on a circuit board of claim 9, wherein

said soldering land is formed at a back side of a surrounding of said terminal fitting hole of said circuit board, said first surface of said external connection terminal contacts with said soldering land, and

said soldering land and said second surface can be soldered by covering said clearance.

11. An electronic component to be mounted on a circuit board of claim 9, wherein



said first conductive layer is at least one of silver layer and silver-alloy layer, and

said second conductive layer is a layer containing at least one of solder and tin.

12. An electronic component to be mounted on a circuit board of claim 1, wherein

said external connection terminal has said second surface including said second conductive layer and first surface including said first conductive layer,

said external connection terminal forms a leg for mounting on said circuit board, and

said leg has a section of at least one of circle and polygon, being processed in a state of mutually linking said conductive layer of said second surface and said first conductive layer of said first surface.

13. An electronic component to be mounted on a circuit board of claim 12, wherein said leg is formed by rolling said metal plate including said second conductive layer of said second surface and said first conductive layer of said first surface, from both said first surface and said second surface.

14. A method of manufacturing an electronic component to be mounted on a circuit board, said electronic component being





composed of an electric insulated case, a functional part contained in said electric insulated case, and an external connection terminal electrically conducting with said functional part and projecting from said electric insulated case,

said method comprising the steps of:

(1) installing a first conductive layer having a low contact resistance so as to conduct electrically by contact, on a first surface of a metal plate,

(2) installing a solderable second conductive layer, on a second surface positioned at a back side of said first surface of said metal plate, and

(3) forming a first electric contact part and external connection terminal consecutive to said first electric contact part, by processing said metal plate.

15. A method of manufacturing an electronic component to be mounted on a circuit board of claim 14, wherein

said first electric contact part includes said first surface having said first conductive layer and said second surface having said second conductive layer,

said external connection terminal includes said first surface having said first conductive layer and said second surface having said second conductive layer,

said external connection terminal can be soldered to a soldering land formed on said circuit board,



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said functional part has a second electric contact part capable of contacting with said first electric contact part,

said first conductive layer of said first surface of said first electric contact part is exposed in said electric insulated case, and

said first electric contact part conducts electrically to said second electric contact part when said first surface of said first electric contact part contacts with said second electric contact part.

16. A method of manufacturing an electronic component to be mounted on a circuit board of claim 14, wherein said first conductive layer is at least one of a silver layer and silver-alloy layer.

17. A method of manufacturing an electronic component to be mounted on a circuit board of claim 14, wherein said second conductive layer is a layer containing at least one of solder and tin.

18. A method of manufacturing an electronic component to be mounted on a circuit board of claim 14, further comprising:

(4) a step of folding said external connection terminal into a specified shape,

wherein the specified folded shape of said external connec-



tion terminal is such that, when said external terminal is installed in a terminal fitting hole having a soldering land formed on said circuit board, it is installed therein, with said first surface having said first conductive layer in a state capable of contacting with the edge of said terminal fitting hole, and with said second surface having said second conductive layer in a state having a clearance from said edge.

19. A method of manufacturing an electronic component to be mounted on a circuit board of claim 14, further comprising:

(4) a step of forming a leg in a shape having at least one section of circle and polygon, in the vicinity of the leading end of said external connection terminal,

wherein said leg is processed in a state so that said first conductive layer of said first surface and said conductive layer of said second surface of said external connection terminal may be coupled to each other.

20. A method of manufacturing an electronic component to be mounted on a circuit board of claim 19, wherein said leg is formed by rolling said metal plate including said second conductive layer of said second surface and said first conductive layer of said first surface, from both said first surface and said second surface.



ABSTRACT OF THE DISCLOSURE**TITLE OF INVENTION: ELECTRONIC COMPONENTS TO BE MOUNTED
ON A CIRCUIT BOARD AND METHOD OF
MANUFACTURING THE SAME**

In an electronic component to be soldered on a printed board, it is an object of the invention to present an electronic component to be mounted on a printed board excellent in solderability, having same contact reliability as in prior art. For example, in a push switch, contact terminals 10, 12 connected to a printed board are plated with silver (or silver-alloy) low in contact resistance on the side of the surface contacting with fixed contacts 11A; 11B, 13, and the surface of the opposite side of the silver (or silver-alloy) plated surface is treated with solder of excellent solderability or tin plating. In this constitution, while maintaining the contact reliability of the switch contact parts, deterioration of solder wettability of the terminal is prevented, so that the connection terminals of electronic component can be connected securely by soldering to the printed board.

Selected drawing: Fig. 1

Fig. 2

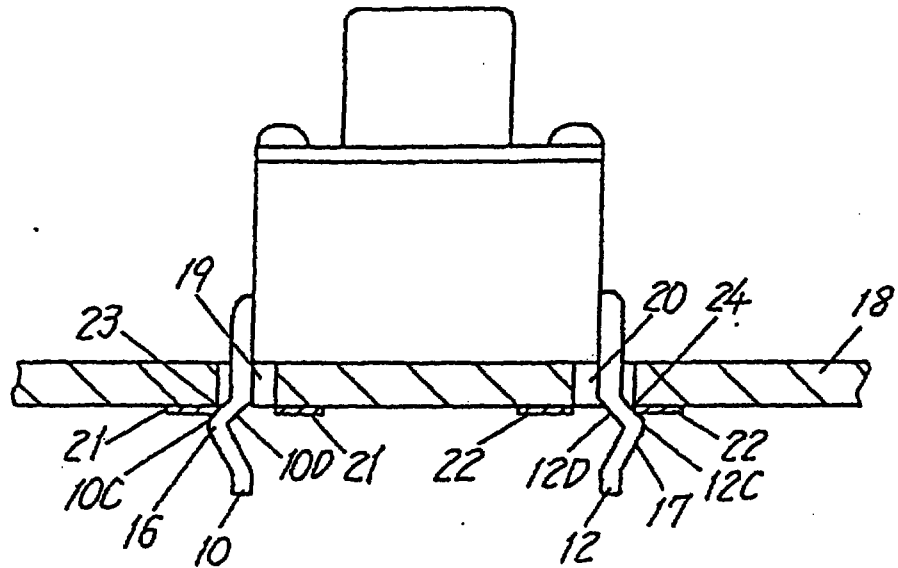


Fig. 3

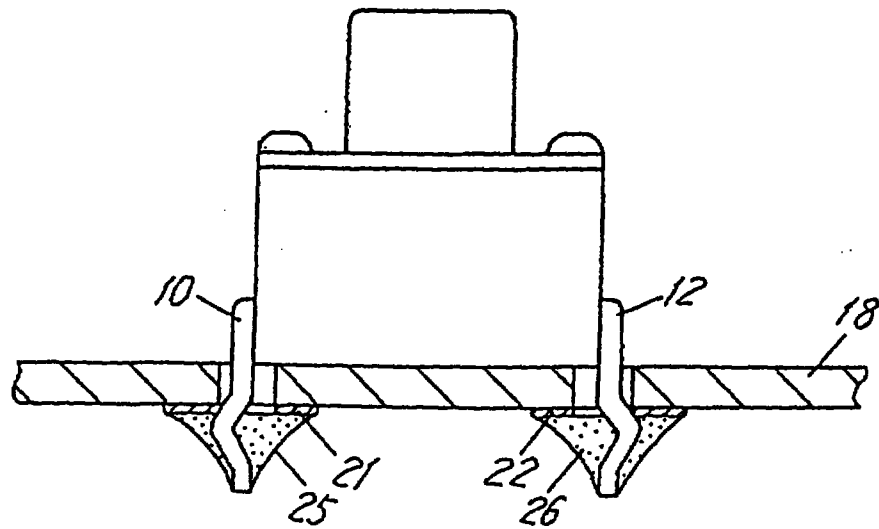


Fig. 4

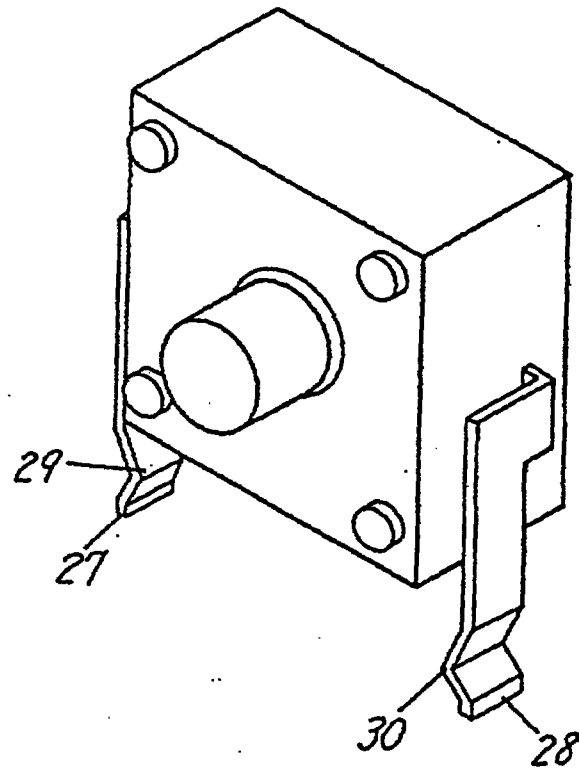


Fig. 5

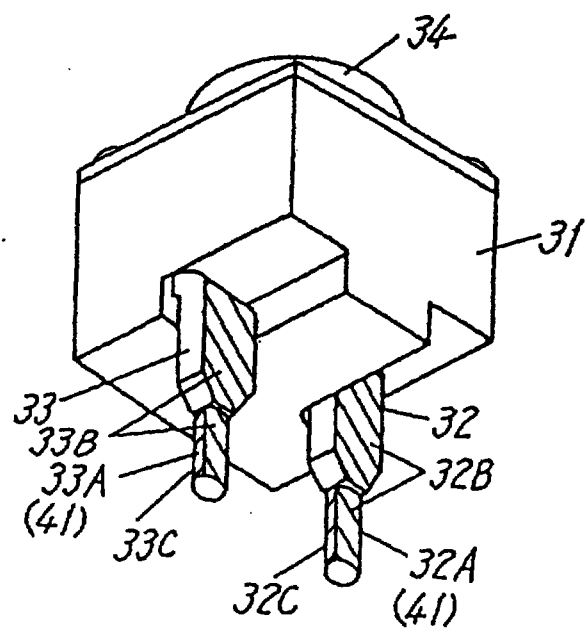


Fig. 6

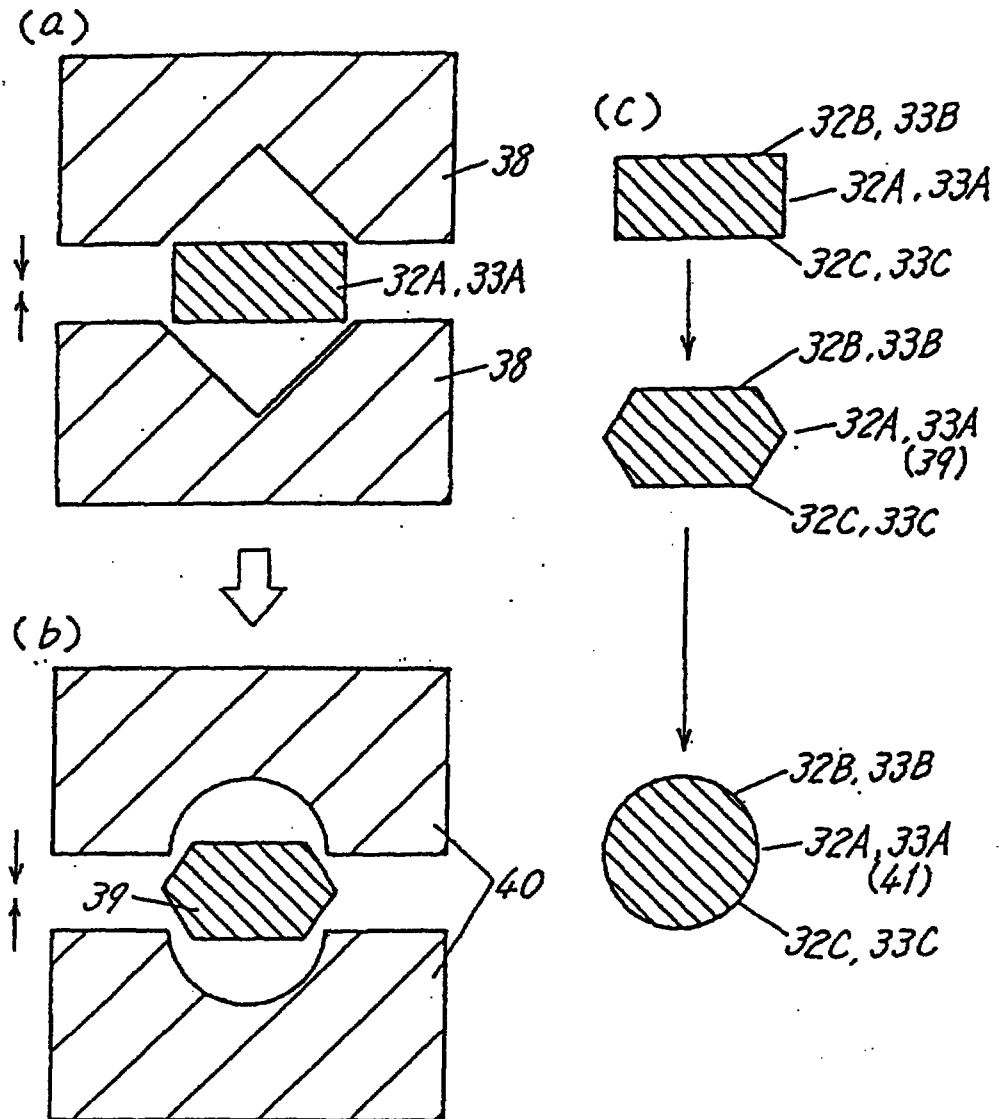


Fig. 7

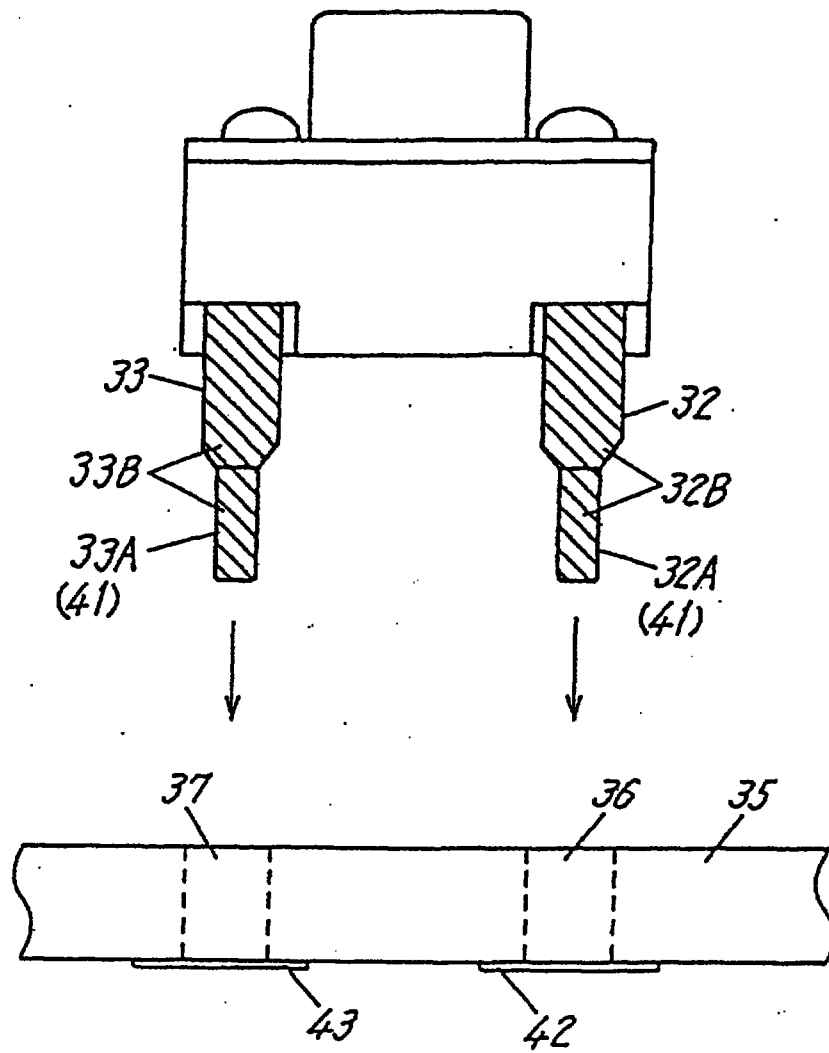


Fig. 8

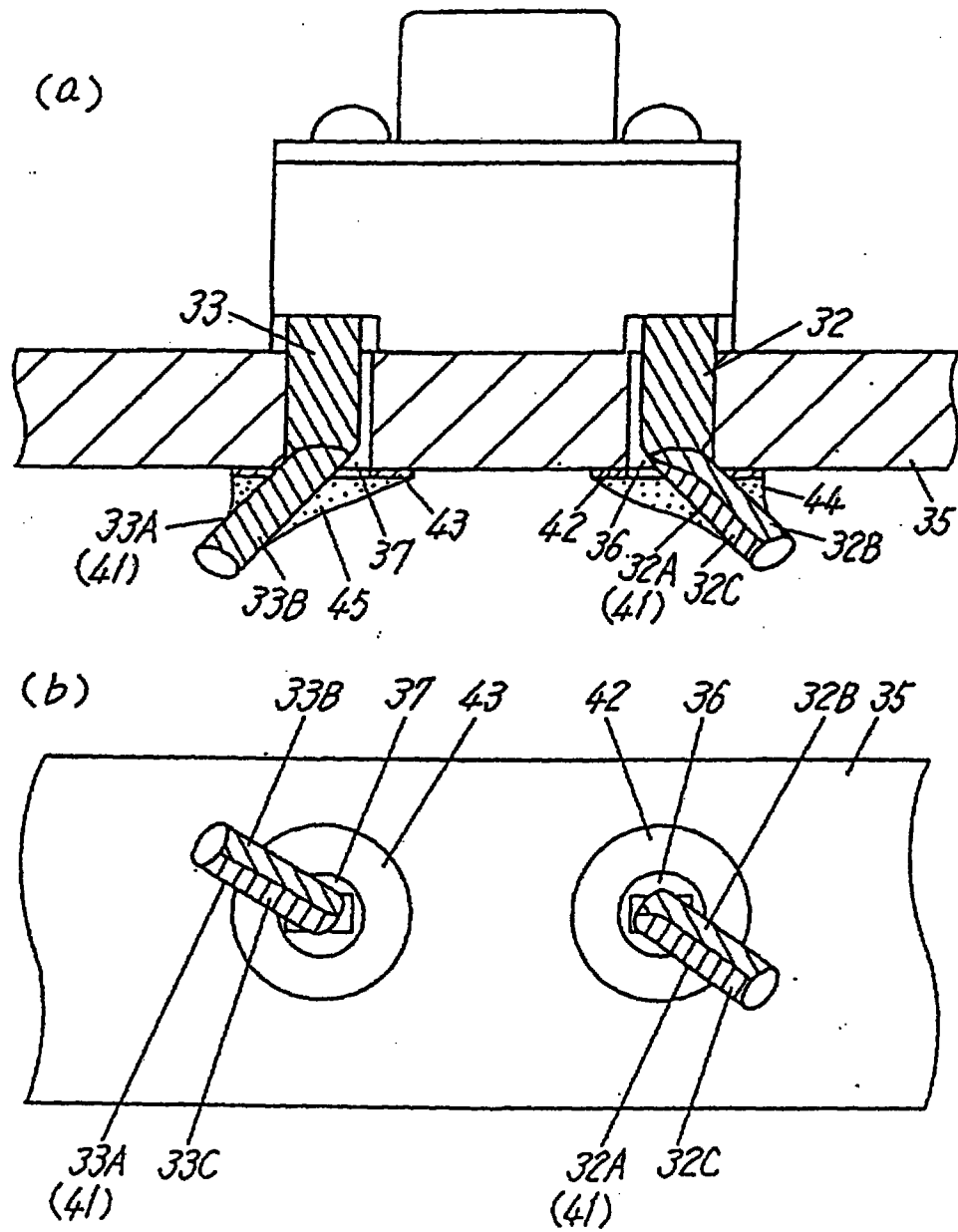


Fig. 9

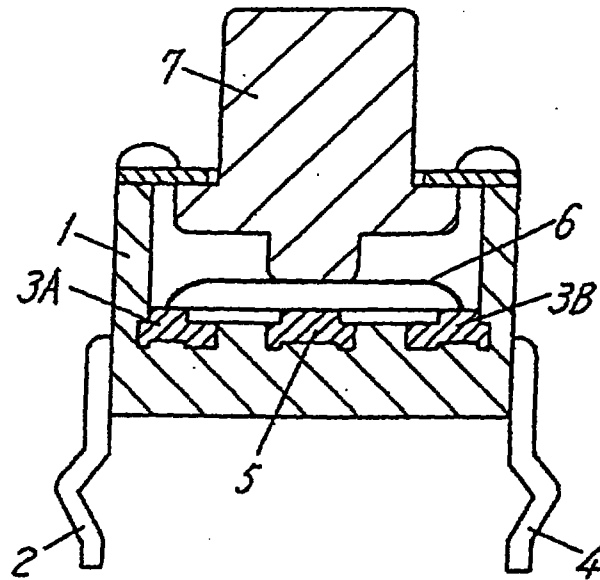


Fig. 10

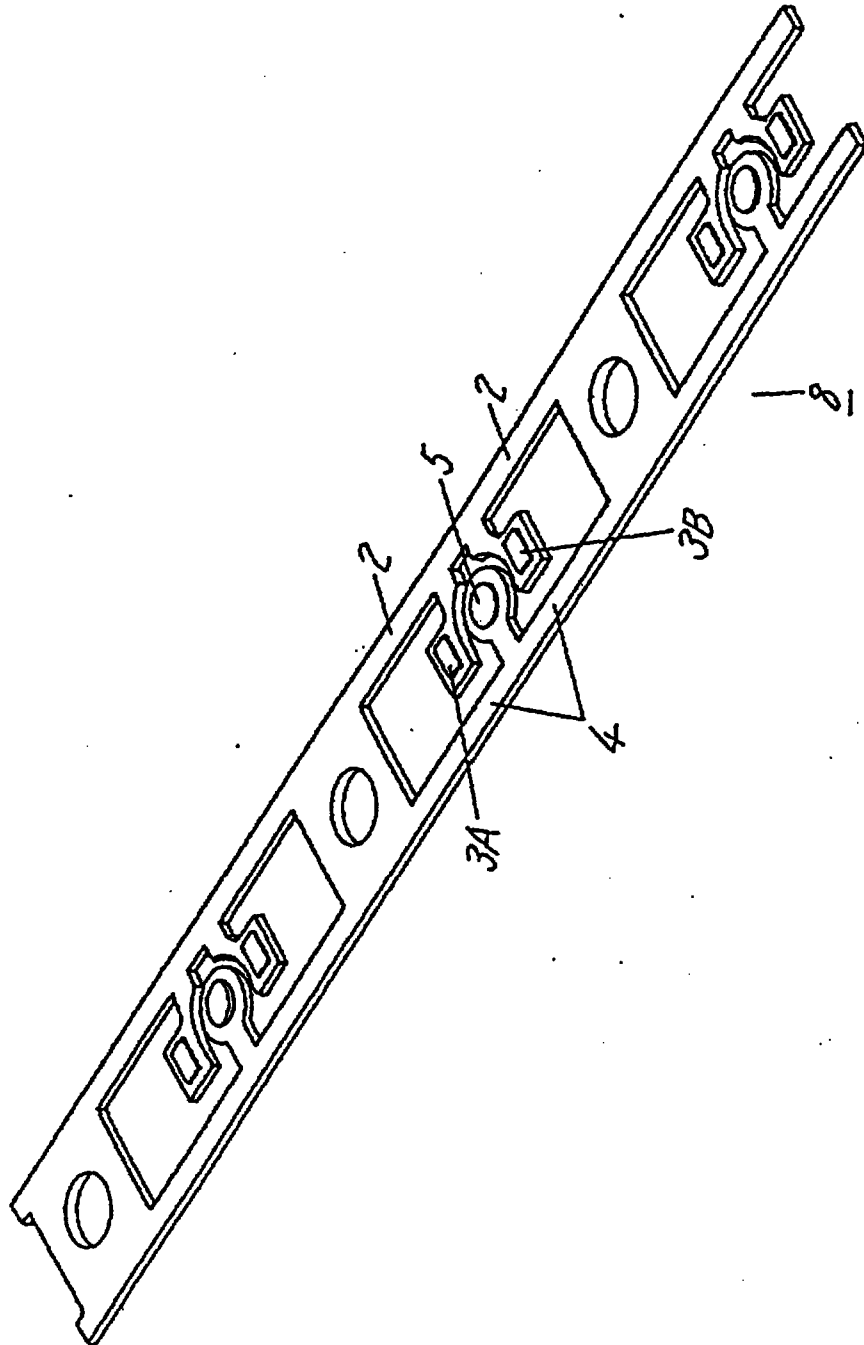
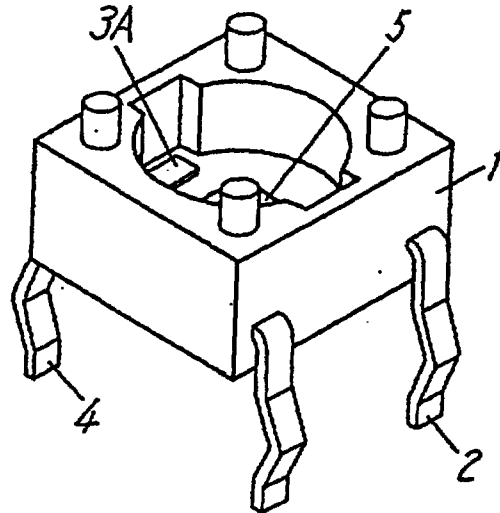


Fig. 11



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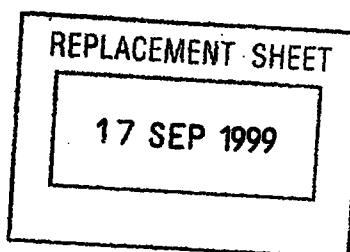
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SUMMARY OF THE INVENTION

In accordance with the invention, there is provided an electronic component to be mounted on a circuit board, comprising:

- 5 an electric insulated case,
 a functional part contained in said electric insulated case, and
 an external connection terminal electrically conducting with said functional part and projecting from said electric insulated case, wherein
 said functional part includes a first electric contact part, which is exposed in said
10 electric insulated case,
 said first electric contact part and said external part are composed of a mutually integrally formed metal plate,
 said metal plate has a first surface and a second surface positioned at the back said of said first surface,
15 a first surface of said first electric contact part includes a first conductive layer having a low contact resistance capable of conducting electrically by contact,
 a second surface of said external connection terminal includes a second conductive layer which has better solderability than said first conductive layer and is formed from a different material from said first conductive layer, and
20 said second surface of said external connection terminal including said second conductive layer is more strongly soldered than said first surface, to said circuit board.

Preferably, the first electric contact part and the external connection terminal are formed of the metal plate having the first conductive layer on the first surface and having the
25 second conductive layer on the second surface, the first electric contact part includes the first surface having the first conductive layer and the second surface having the second conductive layer, and the external connection terminal includes the first surface having the first conductive layer and the second surface having the second

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electronic component to be mounted on a circuit board, said electronic component being composed of an electric insulated case, a functional part contained in said electric insulated case, and an external connection terminal electrically conducting with said functional part and projecting from said electric insulated case,

5 said method comprising the steps of:

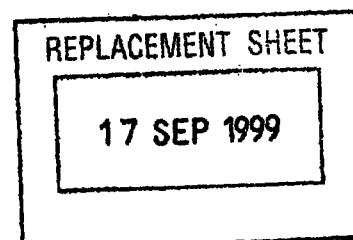
(1) installing a first conductive layer having a low contact resistance so as to conduct electrically by contact, on a first surface of a metal plate,

(2) installing a solderable second conductive layer, which has better solderability than said first conductive layer and is formed from a different material than said first
10 conductive layer on a second surface positioned at a back side of said first surface of said metal plate,

(3) forming a first electric contact part and external connection terminal consecutive to said first electric contact part, by processing said metal plate, and

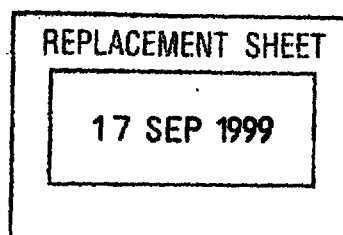
(4) fixing said first electric contact part in an exposed state in said electric insulated
15 case.

In the constitution, preferably, the first electric contact part includes the first surface having the first conductive layer and the second surface having the second conductive layer, the external connection terminal includes the first surface having the first conductive layer and
20 the second surface having the second conductive layer, the external connection terminal can be soldered to a soldering land formed on the circuit board, the functional part has a second electric contact part capable of contacting with the first electric contact part, the first conductive layer of the first surface of the first electric contact part is exposed in the electric insulated case, and the first electric contact part conducts electrically to the second electric
25 contact part when the first surface of the first electric contact part contacts with the



Claims

1. An electronic component to be mounted on a circuit board, comprising:
an electric insulated case,
5 a functional part contained in said electric insulated case, and
an external connection terminal electrically conducting with said functional part and
projecting from said electric insulated case, wherein
said functional part includes a first electric contact part, which is exposed in said
electric insulated case,
10 said first electric contact part and said external part are composed of a mutually
integrally formed metal plate,
said metal plate has a first surface and a second surface positioned at the back said of
said first surface,
a first surface of said first electric contact part includes a first conductive layer having
15 a low contact resistance capable of conducting electrically by contact,
a second surface of said external connection terminal includes a second conductive
layer which has better solderability than said first conductive layer and is formed from a
different material from said first conductive layer, and
said second surface of said external connection terminal including said second
20 conductive layer is more strongly soldered than said first surface, to said circuit board.
2. An electronic component to be mounted on a circuit



composed of an electric insulated case, a functional part contained in said electric insulated case, and an external connection terminal electrically conducting with said functional part and projecting from said electric insulated case,

said method comprising the steps of:

5 (1) installing a first conductive layer having a low contact resistance so as to conduct electrically by contact, on a first surface of a metal plate,

(2) installing a solderable second conductive layer, which has better solderability than said first conductive layer and is formed from a different material than said first conductive layer on a second surface positioned at a back side of said first surface of said
10 metal plate,

(3) forming a first electric contact part and external connection terminal consecutive to said first electric contact part, by processing said metal plate, and

(4) fixing said first electric contact part in an exposed state in said electric insulated case.

15

15. A method of manufacturing an electronic component to be mounted on a circuit board of claim 14, wherein

said first electric contact part includes said first surface having said first conductive layer and said second surface having said second conductive layer,

20 said external connection terminal includes said first surface having said first conductive layer and said second surface having said second conductive layer,

said external connection terminal can be soldered to a soldering land formed on said circuit board,

