

SIM CARD CONNECTOR AND SIM CARD CONNECTOR
ASSEMBLY INCLUDING THE SAME

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a SIM card connector.

2. Description of the Related Art

As the electronic and information technologies develop, SIM card connectors are popularly applied. Due to the requirement of compact-size electronic devices using SIM card connectors, there is a need to develop thinner SIM card connectors.

A conventional thin SIM card connector usually includes a thin insulating body with a thickness of, for example, approximately 0.2 mm. Obviously, such a thin insulating body is very weak and flimsy so that the insulating body may be warped by high reflow temperature. As a result, the SIM card connector may not be properly soldered, and will suffer a low production yield.

Taiwan Patent No. M328092 discloses a SIM card connector 7 having an improved thin insulating body 70. As shown in FIG. 1, the SIM card connector 7 comprises an insulating body 70, a plurality of terminals 71 received in the insulating body 70, and a shield 72 placed over the insulating body 70. The insulating body 70 includes a bottom wall 700 and a pair of side walls 701 extending upward from the two sides of the bottom wall 700. Each side wall 701 includes a locating platform 702 and a locking platform 703. The shield 72 is a square thin metal slice, comprising two sides extending downward and including a plurality of covering slices 720, wherein one covering slice 720 provides a locking hole 721 corresponding to the locking platform 703 on the side wall 701 of the insulating body 70. The shield 72 can be assembled according to the

following procedure: the shield 72 is positioned upon the insulating body 70; the locking platform 703 is retained in the locking hole 721 of the shield 72; and the back end of the shield 72 depends on the locating platform 702. As such, the relative relationship between the shield 72 and the insulating body 70 is secured.

The insulating body 70 has a pair of side walls 701 so that the strength of the insulating body 70 can be improved, and the warpage of the insulating body 70 may be reduced. However, compared to a plate-like insulating body, the insulating body 70 needs an irregular and complex mold for manufacturing.

Based on the above, for SIM card connectors, further development is required to overcome the current drawbacks.

SUMMARY OF THE INVENTION

An objective of the present invention is to provide a SIM card connector including an insulating body, which has a simple configuration and can be properly held to prevent warpage.

In order to achieve the above objective, a SIM card connector comprising an insulating body, a plurality of terminals, a frame above the insulating body, and two engaging elements is provided. The plurality of terminals are insert-molded with the insulating body. The frame comprises a main portion and two side plates. The main portion extends above the insulating body. The two side plates are disposed oppositely relative to the main portion and bent to be adjacent to two opposite edges of the insulating body. Each side plate includes at least one soldering slice. The at least one soldering slice extends toward the insulating body and beyond the respective edge of the insulating body. The two engaging elements are insert-molded with the insulating body and disposed with respect to the two at least one soldering slices. Each engaging element comprises a base and a soldering portion. The soldering portion extends

from the base and is located adjacent to the respective at least one soldering slice.

Another embodiment of the present invention provides a SIM card connector assembly, which includes the above-mentioned SIM card connector and a printed circuit board, wherein the above-mentioned SIM card connector is mounted on the printed circuit board.

Other objects, advantages and novel features of the invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be described according to the appended drawings in which:

FIG. 1 is a perspective view showing a prior SIM card connector;

FIG. 2 is a top perspective view of a SIM card connector showing an insulating body being assembled into a metal frame according to one embodiment of the present invention;

FIG. 3 is a perspective view showing a SIM card connector viewed from below according to one embodiment of the present invention;

FIGS. 4 and 5 are schematic views showing an arrangement of a metal frame, a molded insulating body, a plurality of terminals, and a plurality of engaging elements according to one embodiment of the present invention;

FIG. 6 is a perspective view showing a SIM card connector according to one embodiment of the present invention and a PCB to which it will be mounted; and

FIG. 7 is a perspective view showing a SIM card connector assembly according to one embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Hereinafter, embodiments of the present invention are described in detail with reference to the attached drawings.

FIG. 2 shows a SIM card connector 1 according to one embodiment of the present invention. Referring to FIGS. 2, 3, and 6, the SIM card connector 1 may comprise an insulating body 2, a plurality of terminals 3, a frame 4, and two engaging elements 5. The plurality of terminals 3 can be insert-molded with the insulating body 2. The frame 4 may include a main portion 40 and two side plates 41. The main portion 40 may extend above the insulating body 2, and the two side plates 41 may be disposed oppositely relative to the main portion 40 and bent to be adjacent to two opposite edges 27. Each side plate 41 may include at least one soldering slice 410. The at least one soldering slice 410 may extend toward the insulating body 2 and beyond the respective edge 27 of the insulating body 2. The two engaging elements 5 can be integrated with the insulating body 2, and disposed with respect to the two at least one soldering slices 410. Each engaging element 5 may include a base 50 and a soldering portion 51. The soldering portion 51 extends from the base 50, and is located adjacent to the respective at least one soldering slice 410.

Specifically, as shown in FIG. 2, the SIM card connector 1 comprises an insulating body 2, a plurality of terminals 3 insert-molded with the insulating body 2, a metal frame 4, and a plurality of engaging elements 5 insert-molded with the insulating body. Each engaging element 5 can be disposed adjacent to a corresponding corner of the insulating body 2. As shown in FIG. 6, an inserting-card space 10 is formed between the insulating body 2 and the metal frame 4 so that a corresponding SIM card (not shown) can be inserted along an inserting direction A and can contact the terminals 3.

FIG. 3 shows a perspective view of a SIM card connector 1 according to one embodiment of the present invention, and FIGS. 4 and 5 are schematic views showing an arrangement of a metal frame 4, a molded

insulating body 2, a plurality of terminals 3, and a plurality of engaging elements 5 according to one embodiment of the present invention.

As shown in FIGS. 3 to 5, the insulating body 2 can substantially be in a shape of rectangle, and comprises a top surface 20, a bottom surface 21 opposite to the top surface 20, and a plurality of passageways 22 extending through the insulating body 2 from the top surface 20 to the bottom surface 21. In this embodiment, the plurality of passageways 22 are arranged in two rows along the inserting direction A of a SIM card, and an open slot 23 is formed between the two rows of passageways 22 and extends through the insulating body 2 from the top surface 20 to the bottom surface 21. As shown in FIG 2, each edge 27 of the insulating body 2 may include at least one notch 24, and the at least one notch 24 may be formed with respect to the engaging element 5, and expose the respective soldering portion 51. In the present invention, at least one notch 24 is disposed adjacent to a corner of the insulating body 2. In addition, the insulating body 2 may include one recess 26 formed on the bottom surface of the insulating body 2.

Each terminal 3 comprises a spring arm 30, a contact portion 31, a fixing portion 32, and a soldering tail 33. The spring arm 30 inclines upward into the corresponding one of the plurality of passageways 22. The contact portion 31 is formed in one end of the spring arm 30, and protrudes into the inserting-card space 10. The fixing portion 32 extends from the other end of the spring arm 30, and is insert-molded in the insulating body 2. Particularly, the fixing portion 32 comprises a first fixing portion 320 disposed close to the bottom surface 21 of the insulating body 2, and a second fixing portion 321 disposed close to the top surface 20 of the insulating body 2 and connecting with the first fixing portion 320. The first fixing portion 320 is flat and has an opening 322 in the middle thereof; and the second fixing portion 321 is bent and configured to be bridged over the opening 322. Alternatively, the top surface of the second fixing portion 321 can be flat or curved. The insulating material 25, such as plastic, will flow into the opening 322 during insert-molding of the insulating body 2 with the plurality of terminals 3. Thus, each terminal 3

has larger area contacting the insulating body 2 in a limited vertical space than in the prior art, consequently strengthening the securing force of the insulating body 2 to the terminal 3. The soldering tail 33 extends from another end of the first fixing portion 320 at an obtuse angle with respect to the spring arm 30. The end of the soldering tail 33 extends out of the insulating body 2, wherein the ends of soldering tails 33 in the front row along the inserting direction A are disposed outside the insulating body 2, and the ends of soldering tails 33 in the back row are disposed in the open slot 23 of the insulating body 2. In the present embodiment, to securely solder the terminals 3 on a printed circuit board PCB 6 (see FIGS. 6 and 7) the free end of the soldering tail 33 is shaped into an enlarged portion 330 to increase the soldering area contacting the PCB 6.

In order to make a SIM card connector 1 as thin as possible, the bottom of the first fixing portion 320 is exposed and not hidden by the bottom surface 21 of the insulating body 2, i.e., the bottom of the first fixing portion 320, the bottom of the soldering tail 33, and the bottom of the insulating body 2 are in the same plane; and the top of the second fixing portion 321 is exposed and not hidden by the top surface 20 of the insulating body 2.

The metal frame 4 comprises a main portion 40 extending above the top surface 20 and two side plates 41 disposed on opposite sides of the main portion 40. The two side plates 41 are vertically bent downward to be adjacent to two opposite edges 27 of the insulating body 2 so as to extend along the opposite side walls of the insulating body 2 in a direction parallel to the inserting direction A. Each side plate 41 includes at least one soldering slice 410 for soldering the frame 4 to the PCB 6 and for supporting the insulating body 2. In the present embodiment, each side plate 41 includes a pair of soldering slices 410. The pair of soldering slices 410 extend toward the insulating body 2 and parallel to the main portion 20, are disposed side by side, and define a gap 411 therebetween.

The plurality of engaging elements 5 is provided corresponding to the

soldering slices 410. In the present invention, an engaging element 5 is provided adjacent to each corner of the insulating body 2. Each engaging element 5 includes a base 50 and a soldering portion 51. The base 50 is insert-molded within the insulating body 2, comprising an opening 500 in its middle, and a securing portion 501 connecting to the opposite sides of the opening 500 and bridged over the opening 500. The insulating material 25 flows into the opening 500 during insert-molding of the engaging element 5 into the insulating body 2, such that the engaging element 5 will be securely fixed in the insulating body 2 even though the insulating body 2 is very thin, approximately 0.2 mm.

The base 50 of the engaging element 5 can be disposed adjacent to the respective edge 27 of the insulating body 2 with the soldering portion 51 extending toward the edge 27. The soldering portion 51 can be covered by the insulating body 2, or be exposed by forming a notch 24 on the edge 27 so that the solder joint between the soldering portion 51 and the respective soldering pads 61 can be inspected. The bottom surface of the soldering portion 51 and the bottom surfaces of the corresponding soldering slices 410 can be in the same plane. In this embodiment, a recess 26 is provided and configured to receive the corresponding soldering portion 51 and the corresponding soldering slices 410. Under such a circumstance, the bottom portion of the soldering portion 51 may protrude in comparison to the recess surface of the respective recess 26. Further, the bottom of the base 50 can be exposed and not hidden by the bottom of the insulating body 5. In one embodiment, the bottom surface of the soldering slices 410, the bottom surface of the soldering portion 51, the bottom surface of the base 50, and the surface bottom of the insulating body 2 can be in the same plane. Consequently, a SIM card connector 1 is obtained.

As shown in FIG. 7, one embodiment of the present invention proposes a SIM card connector assembly 100, which includes the above-mentioned SIM card connector 1 and a printed circuit board (PCB) 6. Referring to FIGS. 6 and 7, the PCB 6 defines a plurality of first soldering pads 60 corresponding to the soldering tails 33 of the terminals 3, and a

plurality of second soldering pads 61 corresponding to the soldering slices 410 of the side plates 41. After the insulating body 2 and the metal frame 4 are assembled together, each pair of soldering slices 410 at the side plate 41 is received in one corresponding recess 26 of the insulating body 2, and the soldering portion 51 corresponding to the pair of soldering slices 410 is disposed in the gap 411 to be soldered on the same second soldering pads 61. Before reflow soldering the SIM card connector 1 to the PCB 6, a dummy card (not shown) is inserted into the inserting-card space 10 to hold the insulating body 2 down during reflow soldering. Then, the solder tails 33 of the terminals 3 are soldered on the corresponding first soldering pads 60, and the soldering slices 410 of the metal frame 4 and the soldering portion 51 of the engaging element 5 are soldered on the corresponding second soldering pads 61. The metal frame 4 and the insulating body 2 can be simultaneously soldered to the printed circuit board. Thus, the warpage of the insulating body 2 can be prevented. After reflow soldering, the dummy card is removed. The notches 24 allow direct observation of the soldering quality.

The SIM card connector 1 of the present invention has various embodiments under the invention spirit thereof. The above embodiments are illustrated to help understand the present invention, and shall not be deemed as the limitations to the present invention. Persons skilled in the art can obtain numerous embodiments besides the above without creative work under the teaching and suggestion of the present invention. For example, in another embodiment, the insulating body 2 does not provide recesses to receive the soldering slice 410 of the frame 4, if the height of the SIM card connector 1 is not critical. The PCB 6 may provide specific soldering pads for the soldering portion 51 of the engaging element 5, if the available area of the PCB 6 does not need to be seriously considered.

Compared with prior SIM card connectors, the present invention provides a SIM card connector comprising an engaging element in each end of the insulating body thereof, wherein each engaging element has a soldering portion to be soldered on the same solder pad provided for the

corresponding soldering slice of the frame. Therefore, the present invention can minimize the warpage of the insulating body, consequently decreasing the risk of non-soldering. The stability of the SIM card connector is improved. Meanwhile, the present invention minimizes the number of solder pads of the PCB to obtain an electrical product in small size.

The above-described embodiments of the present invention are intended to be illustrative only. Numerous alternative embodiments may be devised by persons skilled in the art without departing from the scope of the following claims.

What is claimed is:

1. A SIM card connector, comprising:

an insulating body;

a plurality of terminals insert-molded with the insulating body;

a frame, comprising:

a main portion extending above the insulating body; and

two side plates disposed oppositely relative to the main portion and bent to be adjacent to two opposite edges of the insulating body; each side plate including at least one soldering slice extending toward the insulating body and beyond the respective edge of the insulating body; and

two engaging elements insert-molded with the insulating body and disposed with respect to the two at least one soldering slices, each engaging element comprising:

a base; and

a soldering portion extending from the base and located adjacent to the respective at least one soldering slice.

2. The SIM card connector of Claim 1, wherein the at least one soldering slice is located adjacent to one end of the respective side plate.

3. The SIM card connector of Claim 2, wherein the insulating body includes a plurality of recesses formed on a bottom surface of the insulating body and disposed with respect to the two at least one soldering slices, wherein the at least one soldering slice is received in the corresponding recess.

4. The SIM card connector of Claim 1, wherein the insulating

body includes a plurality of recesses formed on a bottom of the insulating body and with respect to the two at least one soldering slices, wherein the at least one soldering slice is received in the corresponding recess.

5. The SIM card connector of any one of Claims 1 to 4, wherein the at least one side plate includes a pair of soldering slices arranged side by side, the pair of soldering slices defines a gap therebetween, and the respective soldering portion is disposed in the gap.

6. The SIM card connector of Claim 5, wherein the bottom surface of the at least one soldering slice, the bottom surface of the soldering portion corresponding to the at least one soldering slice, and the bottom surface of the insulating body are in the same plane.

7. The SIM card connector of Claim 6, wherein each of the edges of the insulating body includes a notch formed with respect to and exposing the respective soldering portion of the engaging element.

8. The SIM card connector of Claim 7, wherein the base of each engaging element is insert-molded within the insulating body, comprising an opening in the middle thereof, and a securing portion connects to opposite sides of the opening and is bridged over the opening.

9. The SIM card connector of Claim 8, wherein the bottom surface of the base is exposed and flush with the bottom surface of the insulating body.

10. The SIM card connector of Claim 9, wherein a top surface of the securing portion is exposed and flush with the top surface of the insulating body.

11. A SIM card connector assembly comprising a SIM card connector of Claim 1 in combination with a printed circuit board.

12. The SIM card connector assembly of Claim 11, wherein the at

least one soldering slice is located adjacent to one end of the respective side plate.

13. The SIM card connector assembly of Claim 12, wherein the insulating body includes a plurality of recesses formed on a bottom surface of the insulating body and disposed with respect to the two at least one soldering slices, wherein the at least one soldering slice is received in the corresponding recess.

14. The SIM card connector assembly of Claim 11, wherein the insulating body includes a plurality of recesses formed on a bottom surface of the insulating body and disposed with respect to the two at least one soldering slices, wherein the at least one soldering slice is received in the corresponding recess.

15. The SIM card connector assembly of any one of Claims 11 to 14, wherein the at least one soldering slice and the soldering portion corresponding to the at least one soldering slice are soldered on a same soldering pad of the printed circuit board.

16. The SIM card connector assembly of Claim 15, wherein the at least one side plate includes a pair of soldering slices arranged side by side, the pair of soldering slices defines a gap therebetween, and the respective soldering portion is disposed in the gap.

17. The SIM card connector assembly of Claim 16, wherein the bottom surface of the at least one soldering slice, the bottom surface of the soldering portion corresponding to the at least one soldering slice, and the bottom surface of the insulating body are in the same plane.

18. The SIM card connector assembly of Claim 17, wherein each of the edges of the insulating body includes a notch formed with respect to and exposing the respective soldering portion of the engaging element.

19. The SIM card connector assembly of Claim 18, wherein the

base of each engaging element is insert-molded within the insulating body, comprising an opening in the middle thereof, and a securing portion connects to opposite sides of the opening and is bridged over the opening.

20. The SIM card connector assembly of Claim 19, wherein the bottom surface of the base is exposed and flush with the bottom surface of the insulating body.

21. The SIM card connector assembly of Claim 20, wherein a top surface of the securing portion is exposed and flush with the top surface of the insulating body.