

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
21 December 2007 (21.12.2007)

PCT

(10) International Publication Number
WO 2007/146169 A2

(51) International Patent Classification:
G06K 7/00 (2006.01)

(21) International Application Number:
PCT/US2007/013581

(22) International Filing Date: 8 June 2007 (08.06.2007)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
2006-160825 9 June 2006 (09.06.2006) JP

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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— without international search report and to be republished upon receipt of that report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.



WO 2007/146169 A2

(54) Title: CARD CONNECTOR

(57) Abstract: A card connector having a housing with a hollow portion partially formed by a pair of generally parallel extending side walls for exclusively accommodating either a first type of card or a second type of card which each have a plurality of terminal members arranged on one surface along one edge and where the first type of card has a relatively wide width along the edge and the second type of card has a relatively narrow width along the edge. The hollow portion includes a narrow width hollow portion which is located at the inner side of the hollow portion. The narrow width hollow portion carries second connection terminals for connection to the second type of card while the other hollow portion carries first connection terminals for connection to the first type of card. The side walls contain multiple convex portions which interact with convex portions provided on the cards to help assure proper card orientation within the connector. A cover is slidably and rotatably mounted to the housing to cover the upper side of the housing and the accommodated card. The cover includes engaging and lock pieces that interact with engaging and lock parts provided on the sidewalls of the housing to secure the cover in the closed position.

CARD CONNECTOR

BACKGROUND OF THE INVENTION

The present invention relates to a card connector. Conventionally, an electronic
5 apparatus, such as a personal computer, a cellular phone, a PDA (Personal Digital
Assistant), a digital camera, a video camera, a music player, a game machine, a car
navigation system, or the like, is provided with a card connector in order to use a variety
of memory cards such as an SIM (Subscriber Identity Module) card, an MMC (R) (Multi
Media Card), an SD (R) (Secure Digital) card, a mini SD (R) card, a memory stick (R), a
10 smart media (R), and the like.

In recent years, along with diversification of electronic apparatuses, memory cards
also tend to be diversified. Therefore, a card connector capable of fitting not only one
type of memory card but also two types of memory cards is proposed (refer to Japanese
Patent Application Laid-Open (Kokai) No. 2003-132977, for instance).

15 Fig. 7 is a drawing illustrating a conventional card connector.

In the figure, a reference numeral 301 identifies a housing for a card connector,
and a plurality of first connector terminals 302 disposed on an innermost wall of the
housing, which come into contact with and are electrically connected with contact pads of
a first card, not illustrated herein. A plurality of hole parts 304 for accommodating each
20 of the first connector terminals 302 are formed near the innermost wall of an inner bottom
surface 303 of the housing 301. In addition, an accommodating concave portion 305 for
accommodating a second card 306 is formed in the inner bottom surface 303 in a position
nearer the outer or opposite side of the innermost wall.

The second card 306 is provided with a plurality of contact pads 307, and is
25 accommodated in the accommodating concave portion 305 in such an orientation that the
contact pads 307 may face downward. On a surface of the accommodating concave
portion 305, a plurality of second connector terminals are disposed, not illustrated herein,
which come into contact with and are electrically connected with the contact pads 307.

However, in the conventional card connector, the first card and the second card

306 differing in sizes and shapes are fitted so as to be stacked in layers. Therefore, a guide (accommodating concave portion 305) for fitting and positioning a card for each layer thereof is formed in the housing.

5 Particularly, in the case of the conventional card connector, since the card to be fitted on a lower layer is smaller than a card to be fitted on a higher layer, it is possible to easily form the guide in the housing.

However, in such a card connector, since the cards are fitted so as to be stacked in two layers, the thickness of the card connector becomes thick, and it is difficult to fit the same in a compact electronic apparatus.

10 In using the card, there are few requests for fitting two cards having different shapes at the same time, however, there is a strong request for downsizing the card connector while selectively using cards differing in size and shape while assuring proper insertion of the card.

15 SUMMARY OF THE INVENTION

It is an object of the present invention, in order to solve the above-mentioned problem encountered by the conventional card connector, and to be able to exclusively and selectively fit cards differing in size and shape in a housing without forming two layers, to provide a card connector being reduced in thickness dimension and small-sized
20 as well as capable of easily and surely fitting two types of cards.

To this end, in a card connector according to the present invention, the card connector comprising: a housing having a hollow portion containing a plurality of terminal members arranged along one edge on one surface of a card, and exclusively accommodating a first type of card being formed with the one edge relatively wide in
25 width, and a second type of card being formed with the one edge relatively narrow in width and referred to as a narrow width portion; first connection terminals and second connection terminals which are mounted on the housing and come into contact with the terminal members of the first type of card and the second type of card; and a cover member one end of which is rotatably mounted on the housing, the cover member for

overspreading and covering an upper side of at least one part of the housing, and the first and second types of cards being accommodated in the housing, wherein, the housing has a narrow width hollow portion which is formed in an innermost side of the hollow portion, and which is wider in width than the narrow width portion of the second type of card, and is narrower in width than the first type of card, and the first type of card is accommodated in the hollow portion so as not to be positioned in the narrow width hollow portion, and the second type of card is accommodated in the hollow portion so that at least one part of the narrow width portion may be positioned in the narrow width hollow portion.

In the card connector according to another embodiment of the present invention, the second connection terminal is disposed in the narrow width hollow portion, and the first connection terminal is disposed in a position outward from the narrow width hollow portion.

In the card connector according to still another embodiment of the present invention, the housing further has a first engaging convex portion and a second engaging convex portion being formed on one sidewall part, and a third engaging convex portion being formed on the other sidewall part; the first type of card has a first concave portion and a second concave portion being formed on one sidewall, and a third concave portion being formed on the other sidewall, and is accommodated in the hollow portion of the housing, so that the first concave portion, the second concave portion, and the third concave portion may engage with the first engaging convex portion, the second engaging convex portion, and the third engaging convex portion, respectively; and the second type of card has a first concave portion being formed on one sidewall, and is accommodated in the hollow portion of the housing so that the first concave portion may engage with the first engaging convex portion.

In the card connector according to still another embodiment of the present invention, the housing has, at a boundary of the narrow width hollow portion, a first convex portion formed on one sidewall part to prevent the first card from entering, and a second convex portion being formed on the other sidewall part to prevent the first card from entering; the first type of card is accommodated in the hollow portion of the housing

so that a front edge thereof may face the first convex portion for the first card entering prevention and the second convex portion for the first card entering prevention; and the second type of card has a front cut-away portion having a shape created by cutting off a corner portion formed by a front edge and one sidewall, and is accommodated in the hollow portion of the housing so that the first convex portion for the first card entering prevention may be positioned in the front cut-away portion.

In the card connector according to still another embodiment of the present invention, the card connector comprising: a housing having a hollow portion for exclusively accommodating a first type of card being formed in an outer circumference shape including a concave portion in a predetermined position, and a second type of card being formed in an outer circumference shape differing from the shape of said first type of card; a first terminal and a second terminal which are mounted on the housing, and come into contact with terminal members of the first type of card and the second type of card; and a cover member one end of which is rotatably mounted on the housing, the cover member for overspreading and covering an upper side of at least one part of the housing and the first and second types of cards being fitted in the housing, wherein the hollow portion has two sidewalls facing, in nearly parallel, the outer circumference shape of each card, the hollow portion having a depth dimension smaller than the total of thickness of the first type of card and the second type of card; one sidewall forming the hollow portion guides a part of the outer circumference shape of each card; an engaging convex portion is formed on the other sidewall, the engaging convex portion engaging with the concave portion of the first type of card, and guiding the outer circumference shape of the second type of card; and the engaging convex portion is formed across the depth dimension of the hollow portion.

According to such a configuration, if the engaging convex portion provided in the hollow portion of the housing across the depth of the hollow portion engages with the concave portion of the first card, and guides the outer circumference shape with reference to the second card, thereby it is possible to exclusively and selectively accommodate cards differing in sizes and shapes thereof in the housing.

According to the present invention, the card connector is formed so that positions of fitting two types of cards may differ in an anteroposterior direction according to the width dimension of the tip portion of each card. This provides a card connector capable of exclusively fitting two types of cards having a plurality of connection terminals
5 arranged along the front edge on one surface, and being minimal in thickness dimension and small-sized. Further, the card connector can easily and surely fit two types of cards.

In addition, by using differences in the outer circumference shape of the two types of cards, it is also possible to exclusively and selectively fit the card in the connector. In this case, it is possible to obtain a card connector that is minimal in thickness dimension
10 and small-sized with a simple configuration for only forming a convex portion on a sidewall of the housing forming a hollow portion for accommodating the card.

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

15

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view showing the card connector according to the embodiment of the present invention;

20 Fig. 2 is a three-sided drawing showing the first card according to the embodiment of the present invention;

Fig. 3 is a three-sided drawing showing the second card according to the embodiment of the present invention;

Fig. 4 is a drawing showing the state of having fitted the first card in the housing for the card connector according to the embodiment of the present invention;

25 Fig. 5 is a drawing showing the state of having closed the cover member of the card connector according to the embodiment of the present invention;

Fig. 6 is a drawing showing the state of having fitted the second card in the housing for the card connector according to the embodiment of the present invention; and

Fig. 7 is a drawing showing the conventional card connector.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Preferred embodiments of the present invention will be described below in detail with reference to the accompanying drawings.

5 Fig. 1 is a perspective view showing a card connector according to an embodiment of the present invention.

In the figure, a reference numeral 10 indicates a card connector according to the embodiment of the present invention, which is fitted in an electronic apparatus not to be illustrated herein. And, any of two types of cards to be explained later, that is a first card
10 31 as a first type of card and a second card 41 as a second type of card is exclusively fitted inside the card connector 10, and the first card 31 or the second card 41 is fitted in an electronic apparatus through the card connector 10. In addition, the electronic apparatus is, for example, a personal computer, a cellular phone, a PDA, a digital camera, a video camera, a music player, a game machine, a car navigation system, or the like, and
15 may be any kind of apparatus.

In addition, the first card 31 and the second card 41, for example, are an SIM card, an MMC (R), an SD (R) card, a mini SD (R) card, a memory stick (R), a smart media (R), a T-Flash (Trans Flash) memory card, and the like, and may be any kinds of cards. However, in the embodiment of the present invention, the first card 31 and the second
20 card 41 will be described as a memory stick micro (R) and a micro SD (R) card, respectively. In this embodiment, representations of directions such as up, down, left, right, front, rear, and the like, being used for explaining the structure and movement of each part of the card connector 10 are not absolute, but relative. These representations may be appropriate when the card connector 10 or each part thereof is situated in the
25 position shown in the figures, however, if the position of the card connector 10 or each part thereof changes, such representations should be interpreted to be changed according to the change of the position thereof.

The card connector 10 has a housing 11, accommodating only one of either the first card 31 or the second card 41, which is integrally molded from insulating material

such as synthetic resin or the like, and a cover member 21 which is molded by applying a machining process such as punching, bending or the like to a plate material made of a conductive material such as metal or the like, and is rotatably fitted to the housing 11. The cover member 21 is a member for overlying and covering an upper side of the housing 11, and Fig. 1 shows the state where the cover member 21 is situated in the position with the cover opened. In addition, as explained later, in the state where the cover member 21 is situated in the position with the cover closed, the card connector 10 has a generally flat rectangular shape.

As illustrated in the figure, the housing 11 has a bottom wall part 11a having a shape created by cutting off an anterior edge side, that is, this side (right side in Fig. 1) thereof in a nearly U-shape or a right square bracket pattern, and an innermost wall part 11b extending along an edge of an innermost side (left side in Fig. 1) of an inner part of the bottom wall part 11a and standing upright from the bottom wall part 11a. In this case, on the bottom wall part 11a, a first terminal accommodating opening 11f and a second terminal accommodating opening 11e having generally square or rectangular shapes are formed. Also, a plurality of first terminals 12 are disposed side by side in the first terminal accommodating opening 11f and a plurality of second terminals 13 are disposed side by side in the second terminal accommodating opening 11e. In addition, the second terminal accommodating opening 11e is formed, lying adjacent to the innermost wall part 11b, to the right side thereof, and the first terminal accommodating opening 11f is formed to the right from the second terminal accommodating opening 11e.

The first terminal 12 is a connecting terminal for the first card 31, is formed of a conductive plate material equipped with resilience such as a metal plate, and is formed in a shape of a cantilever, wherein a root portion of the first terminal 12 is fitted in the bottom wall part 11a, and a tip portion thereof extends, in the first terminal accommodating opening 11f, obliquely upward toward the innermost wall part 11b and projects upward from an upper surface of the bottom wall part 11a. A tip portion 12b of the first terminal 12 functions as a contacting part and abuts, in a resilient manner, on each of contact pads 32 which are disposed on a lower surface of the first card 31 to

thereby be electrically connected thereto. Further, a solder tail part 12a extending from the root portion of the first terminals 12 projects from an edge of the right side of the bottom wall part 11a toward the right side, and is electrically connected, by soldering and so forth, to a signal line, a contact pad, a terminal, or the like, that is, a counterpart terminal member, which is formed on a wiring board or the like in the electronic apparatus.

On the other hand, the second terminal 13 is a connecting terminal for the second card 41, and is composed of a conductive plate material equipped with resilience such as a metal plate, being formed in a shape of a cantilever, wherein a root portion of the second terminal 13 is fitted in the innermost wall part 11b and a tip portion thereof extends, in the second terminal accommodating opening 11e, obliquely upward toward the right side from the innermost wall part 11b, and projects upward from the upper surface of the bottom wall part 11a. A tip portion 13b of the second terminal 13 functions as a contacting part and abuts, in a resilient manner, on each of contact pads 42 which are disposed on a lower surface of the second card 41 to be electrically connected thereto. Further, a solder tail part 13a (refer to Fig. 4 to 6) extending from the root portion of the second terminals 13 projects from an edge of an inner side of the innermost wall part 11b toward a further inner side or to the left as shown in Figs. 1 and 4, and is electrically connected, by soldering and so forth, to a signal line, a contact pad, a terminal or the like, that is, a counterpart terminal member, which is formed on the wiring board or the like.

The housing 11 includes a first sidewall part 11d as a sidewall part extending in an anteroposterior direction along one side edge of the bottom wall part 11a, and a second sidewall part 11c as a sidewall part extending in the anteroposterior direction along the other side edge of the bottom wall part 11a. A fixing auxiliary metallic bracket 18 is fitted in a side edge in the right side of the second sidewall part 11c. In order to fix the card connector 10 to a wiring board in an electronic apparatus or the like, the fixing auxiliary metallic bracket 18 is fixed to a connecting part formed in the wiring board or the like. In addition, the second terminals 13 are fitted within the innermost wall part 11b, and a detect switch 14 for detecting that the contact pads 42 thereof are electrically

connected to the second terminals 13 is disposed in a portion of the first sidewall part 11d, while a solder tail part 14a of the detect switch 14 projects from a side edge on the right side of the first sidewall part 11d. The solder tail part 14a is also equipped with a function as a fixing auxiliary metallic bracket and is electrically connected, by soldering and so forth, to a signal line, a contact pad, a terminal or the like, that is, a counterpart terminal member, which is formed on the wiring board or the like.

In addition, formed on an inner side surface of the first sidewall part 11d, are a first engaging convex portion 11g and a second engaging convex portion 11h which engage with a first concave portion 33a and a second concave portion 33b, to be explained later, respectively, that are formed on one sidewall of the first card 31. On the other hand, on an inner side surface of the second sidewall part 11c, a third engaging convex portion 11i is formed which engages with a third concave portion 33c, to be explained later, that is formed on the other sidewall of the first card 31. If the first card 31 is accommodated in a concave hollow portion defined by the bottom wall part 11a, the second sidewall part 11c, and the first sidewall part 11d in such an orientation as rendering the first concave portion 33a, the second concave portion 33b, and the third concave portion 33c to engage with the first engaging convex portion 11g, the second engaging convex portion 11h, and the third engaging convex portion 11i, respectively, thereby it is possible to fit the first card 31 in the housing 11, in a predetermined orientation and in a predetermined position. When the second card 41 is accommodated in the hollow portion of the housing 11, the third engaging convex portion 11i guides an outer circumference of the second card 41 and stabilizes the position thereof. The third engaging convex portion 11i is formed in a thickness direction of the card across the full depth of the hollow portion.

Further, a second convex portion for the first card entering prevention 11j projecting inward is formed on an inner side surface of the second sidewall part 11c corresponding to an edge or boundary of the outer side of the second terminal accommodating opening 11e, and similarly, a first convex portion for the first card entering prevention 11k projecting inward is formed on an inner side surface of the first

sidewall part 11d. Since a dimension between the edges of the inner sides of the second convex portion for the first card entering prevention 11j and the first convex portion for the first card entering prevention 11k being disposed on right and left is smaller than a width dimension of a front surface of the first card 31, the position of the front surface of the first card 31 is regulated by the second convex portion for the first card entering prevention 11j and the first convex portion for the first card entering prevention 11k, and consequently, the first card 31 is prevented from being fitted in an inner side beyond the predetermined position.

In addition, a portion of an inner side beyond the second convex portion for the first card entering prevention 11j in the second sidewall part 11c is formed in wall thickness and includes a first side surface for the second card 11l which is positioned inward beyond inner side surfaces of other portions. Similarly, a portion of an inner side beyond the first convex portion for the first card entering prevention 11k in the first sidewall part 11d is formed in wall thickness and includes a second side surface for the second card 11m which is positioned inward beyond inner side surfaces of other portions. Further, a narrow width hollow portion narrower in width than the hollow portion is defined between the first side surface for the second card 11l and the second side surface for the second card 11m. Furthermore, the dimension between the first side surface for the second card 11l and the second side surface for the second card 11m being disposed on right and left is smaller than the width dimension in the front surface of the first card 31 and a width dimension in a portion nearer the rear end of the second card 41, however, the concerned dimension is larger than a width dimension of a narrow width portion 44 being disposed on a portion in the vicinity of a front end of the second card 41.

Then the second card 41 is fitted so as to make the narrow width portion 44 be positioned between the first side surface for the second card 11l and the second side surface for the second card 11m. In this case, if the second card 41 is accommodated in such a position as rendering a first concave portion 43a, to be explained later, to engage with the first engaging convex portion 11g and rendering the narrow width portion 44 to be positioned between the first side surface for the second card 11l and the second side

surface for the second card 11m, thereby it is possible to fit the second card 41 in the housing 11, in a predetermined position and in a predetermined orientation.

Further, a first convex portion for the second card entering prevention 11n projecting inward is formed on an end of inner side of the first side surface for the second card 11l, and similarly, a second convex portion for the second card entering prevention 11o projecting inward is formed on an end of inner side of the second side surface for the second card 11m. Since a dimension between the edges of the inner sides of the first convex portion for the second card entering prevention 11n and the second convex portion for the second card entering prevention 11o being disposed on right and left is smaller than a width dimension of the front end of the second card 41, the position of the front end of the second card 41 is regulated by the first convex portion for the second card entering prevention 11n and the second convex portion for the second card entering prevention 11o, and consequently, the second card 41 is prevented from being fitted in an inner side beyond the predetermined position.

In addition, a cover engaging part 15 for maintaining the cover member 21 with a cover thereof closed is formed on an outside surface of the second sidewall part 11c and the first sidewall part 11d. The cover engaging part 15 is formed in a nearly L-shaped channel and includes an entering channel part 15a into which a cover engaging piece 24 of the cover member 21 enters and an engaging channel part 15b with which the cover engaging piece 24 engages. It is to be noted that in the illustrated example, two sets of cover engaging parts 15 are formed from side to side, however, the number of the cover engaging parts 15 can be arbitrarily set, and for example, one each of the cover engaging parts 15 can be formed on right and left sides, respectively. In addition, the number of the cover engaging pieces 24 can be arbitrarily set as in the case of the cover engaging part 15.

Further, a spindle engaging groove 16 extending in an inward-outward direction on the connector is formed in the vicinity of an end of the innermost side in the outside surface of the second sidewall part 11c and the first sidewall part 11d. The rotation spindle 26 of the cover member 21 is rotatably and slidably inserted in the spindle

engaging groove 16. In addition, on the outside surface of the second sidewall part 11c and the first sidewall part 11d, the lock convex projection or portion 17 which engages with a lock piece 25 of the cover member 21 and makes the cover member 21 to be non-slidable to lock the same is formed.

5 On the other hand, the cover member 21 includes a top board part 22 having a nearly rectangular shape and a side surface part 23 extending in an anteroposterior direction along both side edges of the top board part 22. In addition, the side surface part 23 is a member being integrally formed with the top board part 22 and is formed by being bent so as to nearly make a right angle with respect to the top board part 22. Further, a
10 pivot part 23a having a rotation spindle 26 is formed on an edge part of an inner side of each side surface part 23 (downside of Fig. 1). Here, the rotation spindle 26 projects inward from an inner side of the pivot part 23a and is rotatably and slidably inserted in the spindle engaging groove 16 of the housing 11. This enables the cover member 21 to be rotatable relative to the housing 11 and slidable in an anteroposterior direction.

15 In addition, each side surface part 23 includes the cover engaging piece 24 on a downside (front side in Fig. 1) edge, that is, on an edge opposite to the top board part 22. The cover engaging piece 24 is a tongue-shaped member being integrally formed so as to project from the side surface part 23, is formed by being bent so as to nearly make a right angle with respect to the side surface part 23, and projects inward nearly in parallel with
20 the top board part 22. In addition, when the cover member 21 is rotated to a closed position to overspread and cover an upper side of the housing 11, the cover engaging piece 24 enters, from above, into the entering part 15a being formed on the second sidewall part 11c and the first sidewall part 11d of the housing 11, and further, when the cover member 21 is slid toward the right side to a locked position, the cover engaging
25 piece 24 engages with the engaging part 15b, preventing the cover member 21 from opening.

Further, each side surface part 23 includes a lock piece 25 in the form of a cantilever. The lock piece 25 is formed by bending a part of the cover member 21 composed of a plate material such as metal, and functions as a spring through elastic

deformation. Furthermore, the resilient lock piece 25 is integrally connected with the side surface part 23 in a root portion and extends from an inner side toward the right side or outward side of the connector along the side surface part 23. In addition, a free end of the lock piece 25, that is, a tip of the lock piece 25 is positioned inward beyond the side surface part 23. In addition, when the cover member 21 is rotated to overspread and cover the upper side of the housing 11 and the cover member 21 is slid toward this side of the housing 11, the tip of the lock piece 25 engages with the lock convex portion 17 being formed on an outside surface of the second sidewall part 11c and the first sidewall part 11d. This prevents the cover member 21 from sliding toward inner side of the housing 11, and thereby the cover member 21 is locked. It is to be noted that the tip of the lock piece 25 engages with the lock convex portion 17 in a state that the cover engaging piece 24 engages with the engaging part 15b. Therefore, lock of the cover member 21 securely prevents the cover member 21 from opening.

Next, the first card 31 and the second card 41 will be explained.

Fig. 2 is a three-sided drawing showing the first card according to the embodiment of the present invention, and Fig. 3 is a three-sided drawing showing the second card according to the embodiment of the present invention. In Fig. 2 and Fig. 3, (a), (b), and (c) show an elevation view, a bottom view, and a side view, respectively.

As described above, in the embodiment of the present invention, the first card 31 is a memory stick micro (R) and has a nearly rectangular plate-like shape as illustrated in Fig. 2, and each dimension is 15.0[mm] in length (length between top and bottom in Fig. 2(b)), 12.5[mm] in width (width between right and left in Fig. 2(b)), and 1.2[mm] in thickness (thickness between right and left in Fig. 2(c)). In a position nearer a front end of a lower surface of the first card 31, a plurality of contact pads 32 are disposed side by side along a front edge of the first card 31. In addition, the first concave portion 33a and the second concave portion 33b are formed on one sidewall (wall on the left side in Fig. 2(b)) of the first card 31, and the third concave portion 33c is formed on the other sidewall (wall on the right side in Fig. 2(b)) of the first card 31.

On the other hand, the second card 41 is a micro SD (R) card and has a nearly

rectangular plate shape as illustrated in Fig. 3, and each dimension is 15.0[mm] in length (length between top and bottom in Fig. 3(b)), 11.0[mm] in width (width between right and left in Fig. 3(b)), and 0.7[mm] in thickness (thickness between right and left in Fig. 3(c)). In a position nearer a front end of a lower surface of the second card 41, a plurality
5 of contact pads 42 are disposed side by side along a front edge of the second card 41.

The numbers of the contact pads 42, the pitch and so forth, of the second card 41 are different from the numbers of the contact pads 32, the pitch and so forth, of the first card 31. Therefore, the numbers of the second terminals 13, the pitch and so forth, of the second card 41 corresponding to the contact pads 42 are different from the numbers of the
10 first terminals 12, the pitch and so forth, of the first card 31 corresponding to the contact pads 32.

In addition, the first concave portion 43a and a front cut-away portion 43b as the second concave portion are formed on one sidewall (left sidewall in Fig. 3(b)) of the second card 41. The front cut-away portion 43b is formed by cutting off a corner portion
15 formed by the front edge and the one sidewall of the second card 41 over a predetermined range, and has a nearly trapezium shape. This enables the narrow width portion 44 narrower in width than a portion nearer the rear end of the second card 41 to be formed on a portion nearer the front end of the second card 41, and the width dimension thereof is 9.7[mm]. It is to be noted that in the narrow width portion 44, the sidewalls disposed
20 right and left are in parallel relationship.

Next, an operation of fitting a card in the card connector 10 provided with the above-described configuration will be described. First, a case of fitting the first card 31 will be described.

Fig. 4 is a drawing showing the state of having fitted the first card in the housing
25 for the card connector according to the embodiment of the present invention. Fig. 5 is a drawing showing the state of having closed the cover member of the card connector according to the embodiment of the present invention.

In this case, as illustrated in Fig. 4, the cover member 21 is put into the state with the cover thereof opened. In this case, it is preferable that the cover member 21 is widely

opened so that an angle to be made between the cover member 21 and the housing 11 may become equal to or greater than 90 degrees, in order to easily fit the first card 31 in the housing 11.

Next, a user or the like of the electronic apparatus mounts the first card 31 with
5 fingers and so forth, on the bottom wall part 11a of the housing 11 to fit the first card 31 in the housing 11. In this case, the orientation of the first card 31 is put into such a position that a surface on which the contact pads 32 are formed, that is, a lower surface of the first card 31 faces downward, facing the bottom wall part 11a, and the front edge of the first card 31 faces the second convex portion for the first card entering prevention 11j
10 and the first convex portion for the first card entering prevention 11k. Then, by rendering the first concave portion 33a and the second concave portion 33b to engage with the first engaging convex portion 11g and the second engaging convex portion 11h of the housing 11, respectively, and by rendering the third concave portion 33c to engage with the third engaging convex portion 11i, the first card 31 is accommodated in the concave hollow
15 portion of the housing 11.

In this case, it is preferable that, while holding the first card 31 in a rising orientation where the front end thereof may be positioned downward, first, the front end or edge of the first card 31 is rendered to abut on a portion in the vicinity of the second convex portion for the first card entering prevention 11j and the first convex portion for
20 the first card entering prevention 11k of the housing 11, and subsequently, while rendering the first card 31 to rotate around the front end as a center, a rear end of the first card 31 is moved downward, and the first card 31 is mounted on the bottom wall part 11a in a nearly flat state in order to be accommodated in the concave hollow portion of the housing 11. When the first card 31 is accommodated in the concave hollow portion of the
25 housing 11 through such a procedure, the first card 31 in a rising orientation, while being held with fingers and so forth, just has to be transferred into the card connector 10, and then the holding of the first card 31 just has to be released. Therefore, even if there is not enough space around the card connector 10 as in the case where other electronic parts are densely mounted around the card connector 10, a user and so forth can easily handle the

first card 31 with fingers and so forth, and thereby can accommodate the first card 31 in the concave hollow portion of the housing 11.

This enables, as illustrated in Fig. 4, to fit the first card 31 in the housing 11 in the predetermined orientation and in the predetermined position. In this case, the first card 31 is mounted on the bottom wall part 11a in a nearly flat state to be accommodated in the concave hollow portion of the housing 11. In addition, each of the contact pads 32 faces each of the first terminals 12 disposed in this side of the second terminals 13.

Subsequently, the user rotates the cover member 21 around the rotation spindle 26 to put the cover into a closed position. This renders the upper side of the housing 11 and the first card 31 being accommodated in the housing 11 to be overlaid by the cover member 21. Then the cover engaging piece 24 enters, from above, into the entering part 15a formed on the second sidewall part 11c and the first sidewall part 11d of the housing 11. Subsequently, when the user slides the cover member 21 toward the right or outer side with fingers and so forth, the cover engaging piece 24 engages with the engaging part 15b. In addition, the lock piece 25 of the cover member 21 engages with the lock convex portion 17 of the second sidewall part 11c and the first sidewall part 11d, and puts the cover member 21 into the non-slidable state to lock the same. This creates a state as illustrated in Fig. 5, under which the cover member 21 is surely prevented from opening, and thus, the operation of fitting the first card 31 in the card connector 10 is completed.

In a state that the first card 31 is fitted in the card connector 10, the first card 31 is pressed downward by the cover member 21 and is pressed against the upper surface of the bottom wall part 11a of the housing 11, while the tip portion 12b of the first terminals 12 of the card connector 10 abuts on the contact pads 32 of the first card 31 in a resilient manner, and thereby the first terminals 12 are electrically connected to the contact pads 32. In addition, since the first concave portion 33a and the second concave portion 33b engage with the first engaging convex portion 11g and the second engaging convex portion 11h of the housing 11, respectively, and the third concave portion 33c engages with the third engaging convex portion 11i, the first card 31 may not move in an anteroposterior direction with respect to the card connector 10. For this reason, electrical

connection of the first terminals 12 and the contact pads 32 is properly maintained, and the first card 31 is prevented from being detached from the card connector 10.

In addition, the first card 31 is prevented from being accommodated in an improper position in the hollow portion of the housing 11.

5 The first card 31 is prevented from being accommodated in the inner side beyond the predetermined position as illustrated in Fig. 4, that is, in a narrow width hollow portion nearer the innermost wall part 11b by the second convex portion for the first card entering prevention 11j and the first convex portion for the first card entering prevention 11k. Since a dimension between the inner side edges of the second convex portion for the
10 first card entering prevention 11j and the first convex portion for the first card entering prevention 11k, being disposed right and left and a dimension between the first side surface for the second card 11l and the second side surface for the second card 11m are smaller than the width dimension of the first card 31, respectively, it is impossible to accommodate the first card 31 in the narrow width hollow portion in the inner side
15 beyond the second convex portion for the first card entering prevention 11j and the first convex portion for the first card entering prevention 11k. For this reason, the second terminals 13 disposed in the narrow width hollow portion are prevented from unnecessarily coming into contact with the first card 31 and from being damaged.

In addition, the first card 31 is prevented from being accommodated in the inner
20 side, that is, in a position adjacent to the innermost wall part 11b, by the first engaging convex portion 11g, the second engaging convex portion 11h, and the third engaging convex portion 11i. Since the first concave portion 33a, the second concave portion 33b, and the third concave portion 33c of the first card 31 can not engage with the first
25 engaging convex portion 11g, the second engaging convex portion 11h, and the third engaging convex portion 11i, respectively, if a position of the first card 31 is situated in this inner side, it is impossible to accommodate the first card 31.

Further, the first card 31 is prevented from being accommodated in the concave hollow portion of the housing 11 in an improper orientation by the first engaging convex portion 11g, the second engaging convex portion 11h, and the third engaging convex

portion 11i. As illustrated in Fig. 2(b), the first concave portion 33a, the second concave portion 33b, and the third concave portion 33c of the first card 31 are asymmetrically disposed with respect to a longitudinal center shaft of the first card 31. The first engaging convex portion 11g, the second engaging convex portion 11h, and the third engaging convex portion 11i are also disposed likewise. For this reason, since the first concave portion 33a, the second concave portion 33b, and the third concave portion 33c of the first card 31 can not engage with the first engaging convex portion 11g, the second engaging convex portion 11h, and the third engaging convex portion 11i, respectively, if the first card 31 assumes an orientation of the wrong side up or an orientation of back to front, the first card 31 cannot be accommodated.

Next, a case of fitting the second card 41 will be described.

Fig. 6 is a drawing showing the state of having fitted the second card in the housing for the card connector according to the embodiment of the present invention.

As in the case of the first card 31, as illustrated in Fig. 6, the cover member 21 is put into the state with the cover opened. In this case, it is preferable that the cover member 21 is open widely so that an angle to be made between the cover member 21 and the housing 11 may become equal to or greater than 90 degrees, in order to easily fit the second card 41 in the housing 11.

Next, a user or the like of the electronic apparatus mounts the second card 41, with fingers and so forth, on the bottom wall part 11a of the housing 11 to fit the second card 41 in the housing 11. In this case, the orientation of the second card 41 is put into such a position that a surface on which the contact pads 42 are formed, that is, a lower surface of the second card 41 faces downward, facing the bottom wall part 11a, and the front end of the second card 41 faces the first convex portion for the second card entering prevention 11n and the second convex portion for the second card entering prevention 11o. Then, by rendering the first concave portion 43a to engage with the first engaging convex portion 11g of the housing 11, the first convex portion for the first card entering prevention 11k of the housing 11 to be situated in the front cut-away portion 43b, and a portion nearer the front end of the narrow width portion 44 to be situated in the narrow

width hollow portion being formed between the first side surface for the second card 11l and the second side surface for the second card 11m, the second card 41 is accommodated in the concave hollow portion of the housing 11.

In this case, it is preferable that, while holding the second card 41 in a rising orientation that the front end of the second card 41 may be positioned downward, first, the front end of the second card 41 is rendered to abut on a portion in the vicinity of the first convex portion for the second card entering prevention 11n and the second convex portion for the second card entering prevention 11o of the housing 11, and subsequently, while rendering the second card 41 to rotate around the front end as a center, a rear end of the second card 41 is moved downward, and the second card 41 is mounted on the bottom wall part 11a in a nearly flat state in order to be accommodated in the concave hollow portion of the housing 11. When the second card 41 is accommodated in the concave hollow portion of the housing 11 through such a procedure, the second card 41 in a rising orientation, while being held with fingers and so forth, just has to be transferred into the card connector 10, and then the holding of the second card 41 just has to be released. Therefore, even if there is not enough space around the card connector 10 as in the case that other electronic parts are densely mounted around the card connector 10, a user can easily handle the second card 41 with fingers and so forth, and thereby can accommodate the second card 41 in the concave hollow portion of the housing 11.

Accordingly, as illustrated in Fig. 6, the second card 41 can be fitted in the housing 11 in the predetermined orientation and in the predetermined position. In this case, the second card 41 is mounted on the bottom wall part 11a in a nearly flat state and is accommodated in the hollow portion of the housing 11. In addition, a portion nearer the front end of the narrow width portion 44 is positioned in the narrow width hollow portion, and each of the contact pads 42 faces each of the second terminals 13.

Subsequently, as in the case of the first card 31, the user rotates the cover member 21 around the rotation spindle 26 as a center to close the same, and put the cover member 21 into a state with a cover closed. This renders the upper side of the housing 11 and the second card 41 being accommodated in the housing 11 to be overspread by the cover

member 21. Then, the cover engaging piece 24 enters, from above, into the entering part 15a formed on the second sidewall part 11c and the first sidewall part 11d of the housing 11. Subsequently, when the user slides the cover member 21 toward the right or outer side with fingers and so forth, the cover engaging piece 24 engages with the engaging part 15b. In addition, the lock piece 25 of the cover member 21 engages with the lock convex portion 17 of the second sidewall part 11c and the first sidewall part 11d, and puts the cover member 21 into the non-slidable state to lock the same. Accordingly, this prevents the cover member 21 from opening, and thus, the operation of fitting the second card 41 in the card connector 10 is completed.

In a state that the second card 41 is fitted in the card connector 10, the second card 41 is pressed downward by the cover member 21 and is pressed against the upper surface of the bottom wall part 11a of the housing 11, while the tip portion 13b of the second terminals 13 of the card connector 10 abuts on the contact pads 42 of the second card 41 in a resilient manner, and thereby the second terminals 13 are securely electrically connected to the contact pads 42. In addition, since the first concave portion 43a engages with the first engaging convex portion 11g of the housing 11, the second card 41 may not move in an anteroposterior direction with respect to the card connector 10. For this reason, electrical connection of the second terminals 13 and the contact pads 42 is maintained, and the second card 41 is prevented from being detached from the card connector 10.

In addition, the second card 41 is prevented from being accommodated in an improper position in the hollow portion of the housing 11.

The second card 41 is prevented from being accommodated in the inner side beyond the predetermined position as illustrated in Fig. 6, that is, in a position nearer the innermost wall part 11b, by the first convex portion for the second card entering prevention 11n and the second convex portion for the second card entering prevention 11o. Since a dimension between the inner side edges of the first convex portion for the second card entering prevention 11n and the second convex portion for the second card entering prevention 11o being disposed right and left is smaller than the width size of the

narrow width portion 44 of the second card 41, the second card 41 cannot be accommodated in the inner side beyond the first convex portion for the second card entering prevention 11n and the second convex portion for the second card entering prevention 11o.

5 In addition, the second card 41 is prevented from being accommodated in the inner side beyond the predetermined position as illustrated in Fig. 6, by the first engaging convex portion 11g. Since the first concave portion 43a of the second card 41 cannot engage with the first engaging convex portion 11g, if a position of the second card 41 is situated at this improper position, the second card 41 cannot be accommodated. In
10 addition, since the first concave portion 43a is small in size, the first concave portion 43a cannot engage with the second engaging convex portion 11h and the third engaging convex portion 11i.

 Further, the second card 41 is prevented from being accommodated in the concave hollow portion of the housing 11 in an improper orientation by the first engaging convex
15 portion 11g, the second engaging convex portion 11h and the third engaging convex portion 11i, as well as the first side surface for the second card 11l and the second side surface for the second card 11m. As illustrated in Fig. 3(b), the first concave portion 43a and the front cut-away portion 43b of the second card 41 are asymmetrically disposed with respect to a longitudinal center shaft of the second card 41. In addition, the first
20 engaging convex portion 11g is also disposed likewise. For this reason, since the first concave portion 43a of the second card 41 cannot engage with the first engaging convex portion 11g, and further, the narrow width portion 44 of the second card 41 cannot be positioned in the narrow width hollow portion being formed between the first side surface for the second card 11l and the second side surface for the second card 11m, if the second
25 card 41 has an orientation of the wrong side up or an orientation of back to front, the second card 41 cannot be accommodated.

 As described above, in the embodiment of the present invention, the hollow portion of the housing 11 is formed for accommodating the first card 31 and the second card 41, and in the inner side of the hollow portion, has a narrow width hollow portion

wider in width than the narrow width portion 44 of the second card 41 and narrower in width than the first card 31, wherein the first card 31 is accommodated in the hollow portion so as not to be positioned in the narrow width hollow portion, and the second card 41 is accommodated in the hollow portion so that at least a part of the narrow width portion 44 may be positioned in the narrow width hollow portion. For this reason, the card connector 10 is formed so that fitting positions of two types of cards, that is, the first card 31 and the second card 41 which differ in an anteroposterior direction according to a width dimension of tip portions thereof. This enables the exclusive fit of either the first card 31 or the second card 41, and thus obtains the card connector 10 that is minimal in thickness dimension and small-sized. Further, this enables the user to easily and surely fit the first card 31 and the second card 41 within the connector.

In addition, the second terminals 13 are disposed in the narrow width hollow portion, and the first terminals 12 are disposed in a position outward or to the right from the narrow width hollow portion. For this reason, the second terminals 13 are prevented from unnecessarily coming into contact with the first card 31 and being damaged.

Further, the housing 11 includes the first engaging convex portion 11g and the second engaging convex portion 11h being formed on the first sidewall part 11d, and the third engaging convex portion 11i being formed on the second sidewall part 11c, wherein the first card 31 includes the first concave portion 33a and the second concave portion 33b being formed on one sidewall, and the third concave portion 33c being formed on the other sidewall, and is accommodated in the hollow portion of the housing 11 so that the first concave portion 33a, the second concave portion 33b, and the third concave portion 33c may engage with the first engaging convex portion 11g, the second engaging convex portion 11h, and the third engaging convex portion 11i, respectively, and the second card 41 includes the first concave portion 43a being formed on one sidewall and is accommodated in the hollow portion of the housing 11 so that the first concave portion 43a may engage with the first engaging convex portion 11g.

This renders the first card 31 and the second card 41 to be accommodated in the hollow portion of the housing 11 in the predetermined position and in the predetermined

orientation. In addition, since the first card 31 and the second card 41 may not move in an anteroposterior direction with respect to the card connector 10, electrical connection of the first terminals 12 with the contact pads 32, and electrical connection of the second terminals 13 with contact pads 42 are surely maintained. Further, the first card 31 and the second card 41 are prevented from being detached from the card connector 10.

Further, the housing 11 includes, at a boundary of the narrow width hollow portion, the first convex portion for the first card entering prevention 11k being formed on the first sidewall part 11d and the second convex portion for the first card entering prevention 11j being formed on the second sidewall part 11c, wherein the first card 31 is accommodated in the hollow portion of the housing 11 so that the front end of the first card 31 may face the first convex portion for the first card entering prevention 11k and the second convex portion for the first card entering prevention 11j, and the second card 41 includes the front cut-away portion 43b and is accommodated in the hollow portion of the housing 11 so that the first convex portion for the first card entering prevention 11k is positioned in the front cut-away portion 43b.

This renders the first card 31 and the second card 41 to be accommodated in the hollow portion of the housing 11 in the predetermined position and in the predetermined orientation.

While the present invention has been described with reference to certain embodiments, it will be understood by those skilled in the art that various changes and substitutions may be made and equivalents may be used without departing from the spirit and scope of the invention. It is therefore intended that the invention not be limited to the particular embodiment disclosed, but that the invention will include all embodiments falling within the scope of the appended claims.

WHAT IS CLAIMED IS:

1. A card connector comprising:

a housing having a hollow portion for exclusively accommodating a first type of card or a second type of card, said first type of card and said second type of card each containing a plurality of terminal members arranged along one edge on one surface of said card, said first type of card being formed with said one edge relatively wide in width and the second type of card being formed with a narrow width portion having said one edge relatively narrow in width;

first connection terminals and second connection terminals which are mounted on said housing to respectively come into contact with the terminal members of the first type of card or the second type of card; and

a cover member one end rotatably mounted on the housing, the cover member for overlying and covering an upper side of the housing and the first or second types of cards being accommodated in said housing, wherein:

the housing has a narrow width hollow portion which is formed in an inner side of the hollow portion, and which is wider in width than the narrow width portion, and is narrower in width than the first type of card; and

the first type of card is accommodated in the hollow portion so as not to be positioned in the narrow width hollow portion, and the second type of card is accommodated in the hollow portion so that at least part of the narrow width portion may be positioned in the narrow width hollow portion.

2. The card connector according to claim 1, wherein:

the second connection terminals are disposed in the narrow width hollow portion;

and

the first connection terminals are disposed in a position outward from the narrow width hollow portion.

3. The card connector according to claim 1, wherein:
the housing includes a first sidewall and a second sidewall;
said first sidewall includes a first engaging convex portion and a second engaging
convex portion and said second sidewall includes a third engaging convex portion;
5 each type of card having one sidewall and an other sidewall;
the first type of card has a first concave portion and a second concave portion
formed on said one sidewall and a third concave portion formed on said other sidewall
and is accommodated in the hollow portion of the housing with said first concave portion,
said second concave portion and said third concave portion in engagement respectively
10 with said first engaging convex portion, said second engaging convex portion and said
third engaging convex portion; and
the second type of card has a first concave portion formed on said one sidewall
and is accommodated in the hollow portion of the housing with said first concave portion
engagement with said first engaging convex portion.

15

4. The card connector according to claim 1, wherein:
the housing includes a first convex portion for the first card entering prevention
being formed on said first sidewall at a boundary of said narrow width hollow portion,
and a second convex portion for the first card entering prevention being formed on said
20 second sidewall at said boundary of said narrow width hollow portion;
said first type of card being accommodated in said hollow portion of the housing
with said one edge in facing relationship with said first convex portion for the first card
entering prevention and with said second convex portion for the first card entering
prevention; and
25 said second type of card having a front cut-away portion at said one edge and
being accommodated in the hollow portion of the housing with said first convex portion
for the first card entering prevention positioned within the first cut-away portion.

5. A card connector comprising:

a housing having a hollow portion for exclusively accommodating a first type of card having an outer circumference shape including a concave portion in a predetermined position, and a second type of card having an outer circumference shape differing from the shape of said first type of card, said first type of card and said second type of card each having terminal members;

first connection terminals and second connection terminals carried by said housing for respective contact with said terminal members of the first type of card and the second type of card; and

a cover member having one end rotatably mounted on the housing, the cover member for overlying and covering an upper side of the housing and the first or second types of cards being accommodated in said housing, wherein:

said hollow portion having a first sidewall and a second sidewall facing, in nearly parallel relationship, the outer circumference shape of each card, said hollow portion having a depth dimension smaller than the total thickness of the first type of card and the second type of card;

said first sidewall forming part of said hollow portion guides a part of the outer circumference shape of each card;

said second sidewall having an engaging convex portion for engagement with the concave portion of the first type of card and for guiding the outer circumference shape of the second type of card; and

said engaging convex portion having a depth equal to the depth of said hollow portion.

6. The card connector according to claim 3, wherein:

an outside surface of at least one of said sidewalls includes a cover engaging part in the form of a generally L-shaped channel having an entering channel portion and an engaging channel portion;

said cover including a top board and a pair of side surfaces extending at a

generally right angle with respect to said top board, each side surface associated with one of said sidewalls, said side surface associated with said one of said sidewalls having an engaging piece projecting inward at a generally right angle with said side surface and parallel with said top board;

5 said cover being slidably and rotatably mounted to said housing for movement between open, closed and locked positions, said engaging piece received in said entering channel portion in response to rotation of said cover from said open to said closed position and said engaging piece slidingly received within said engaging channel portion in response to movement of said cover to said locked position.

10

7. The card connector according to claim 6, wherein:

an outside surface of at least one of said sidewalls includes a convex projection;
and

15 said side surface associated with said one of said sidewalls having an integrally formed resilient lock piece, said lock piece moving to latching engagement with said convex projection in response to movement of said cover to said locked position.

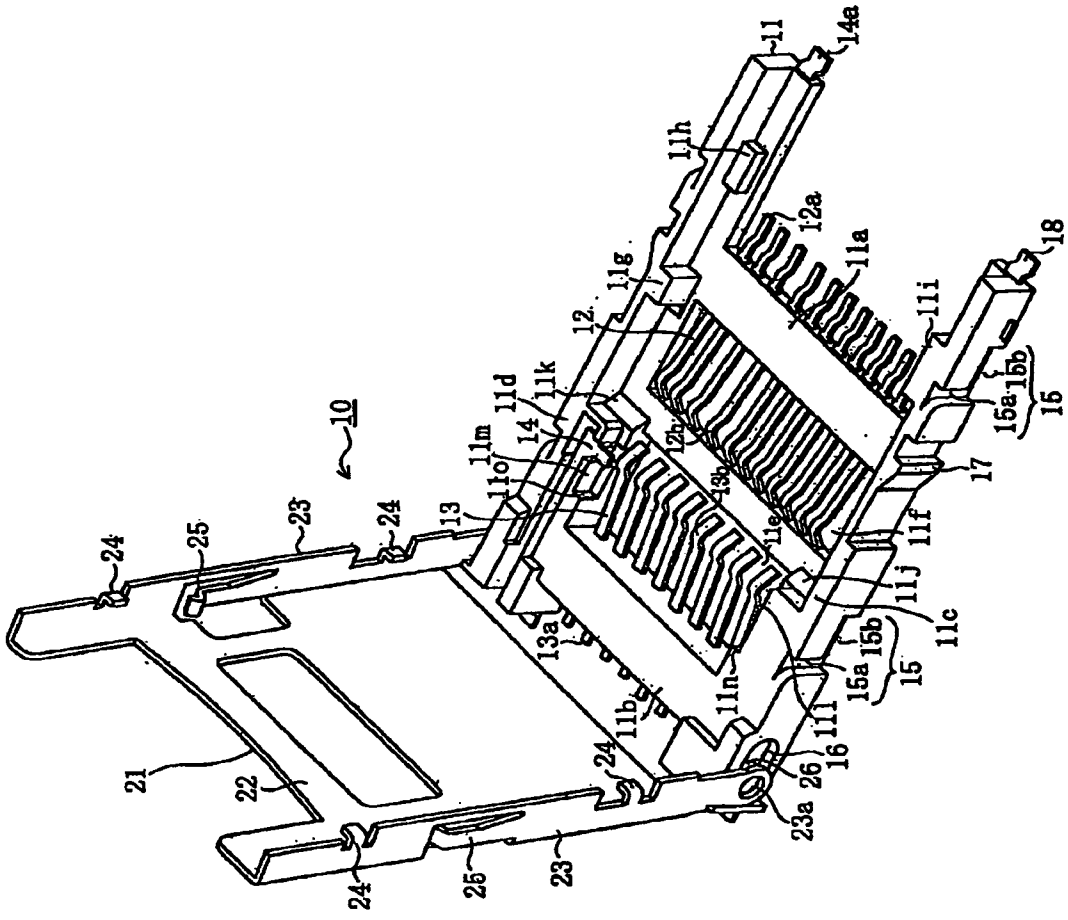


FIG. 1

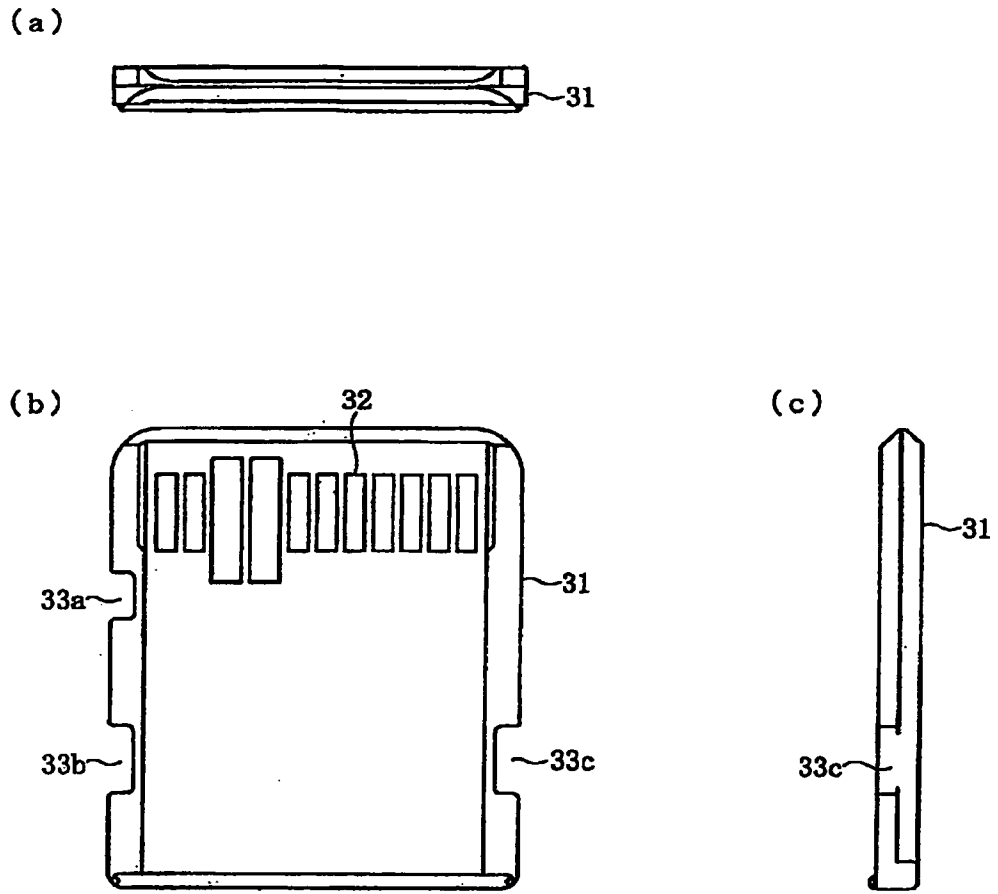


FIG. 2

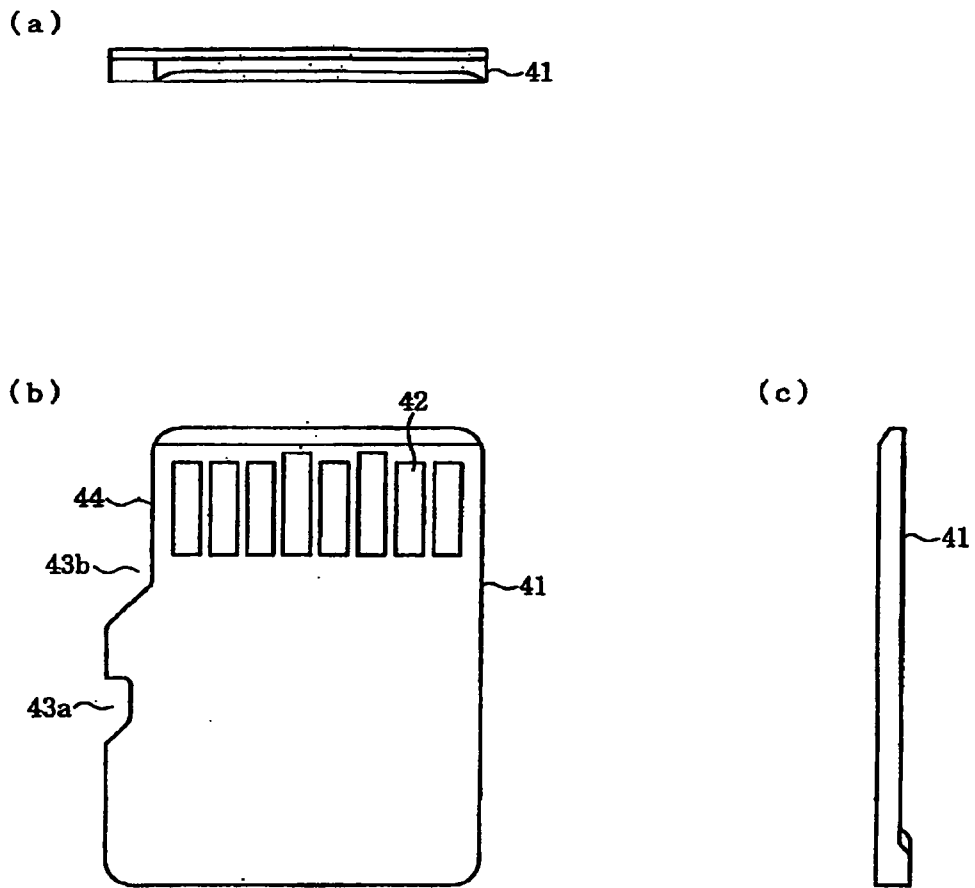


FIG. 3

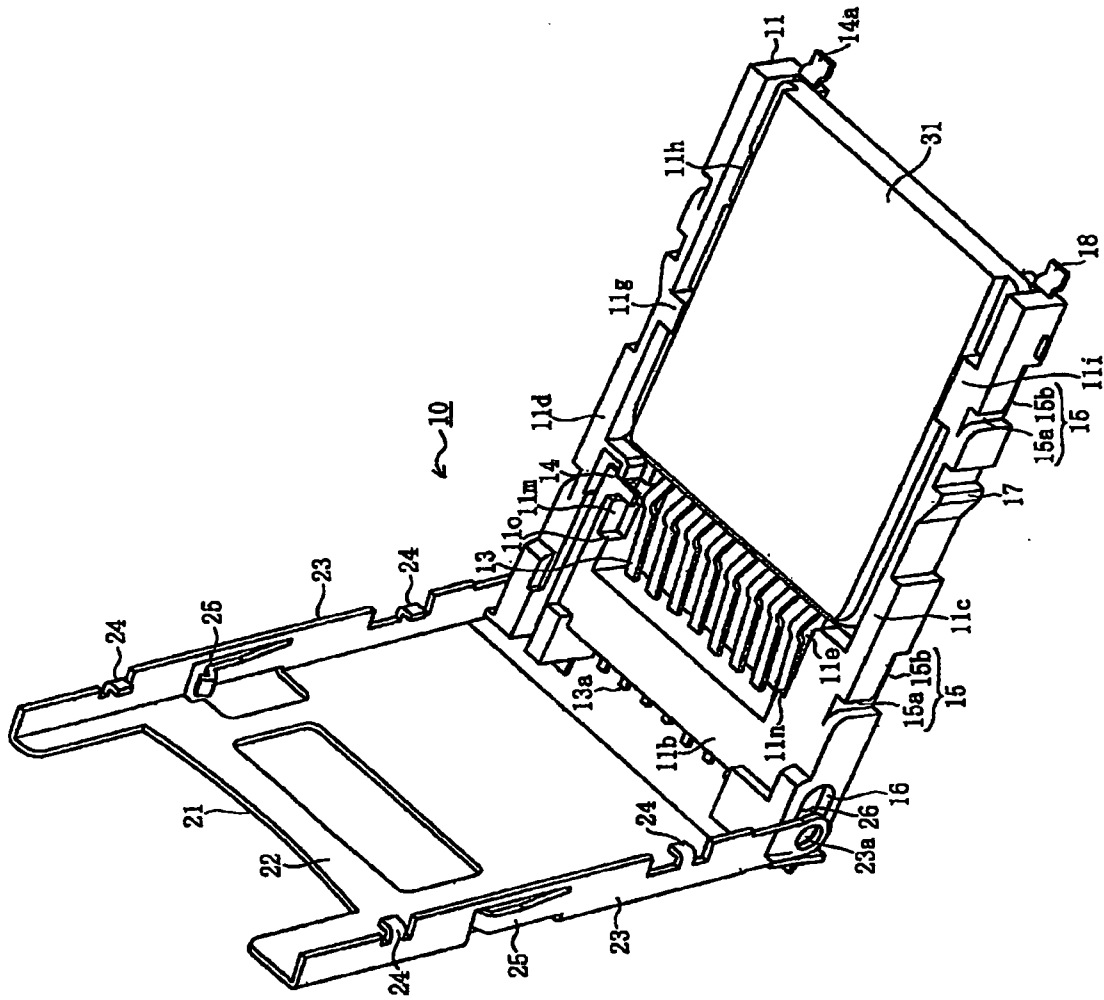


FIG. 4

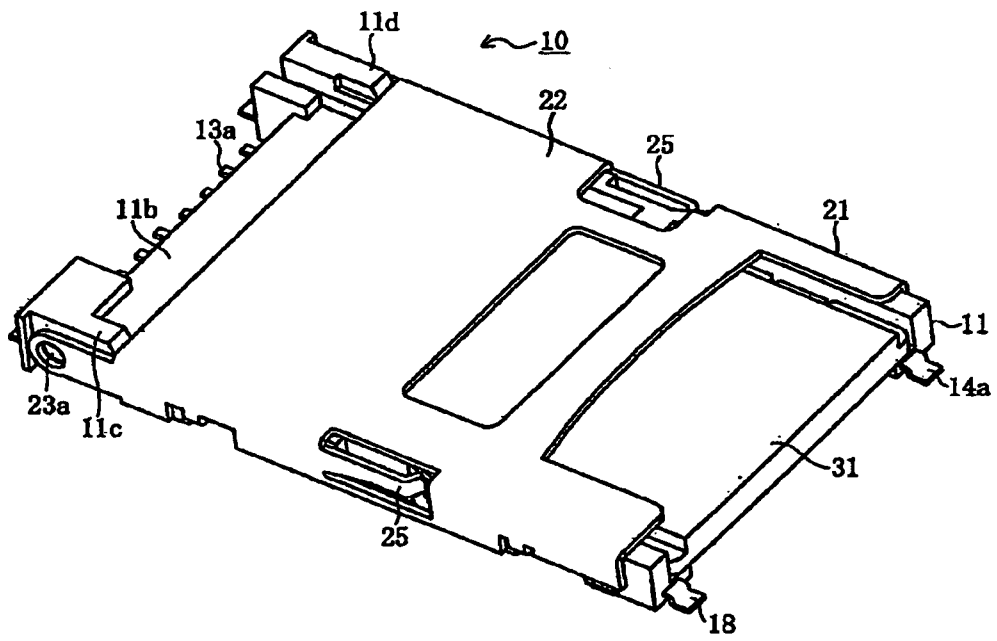


FIG. 5

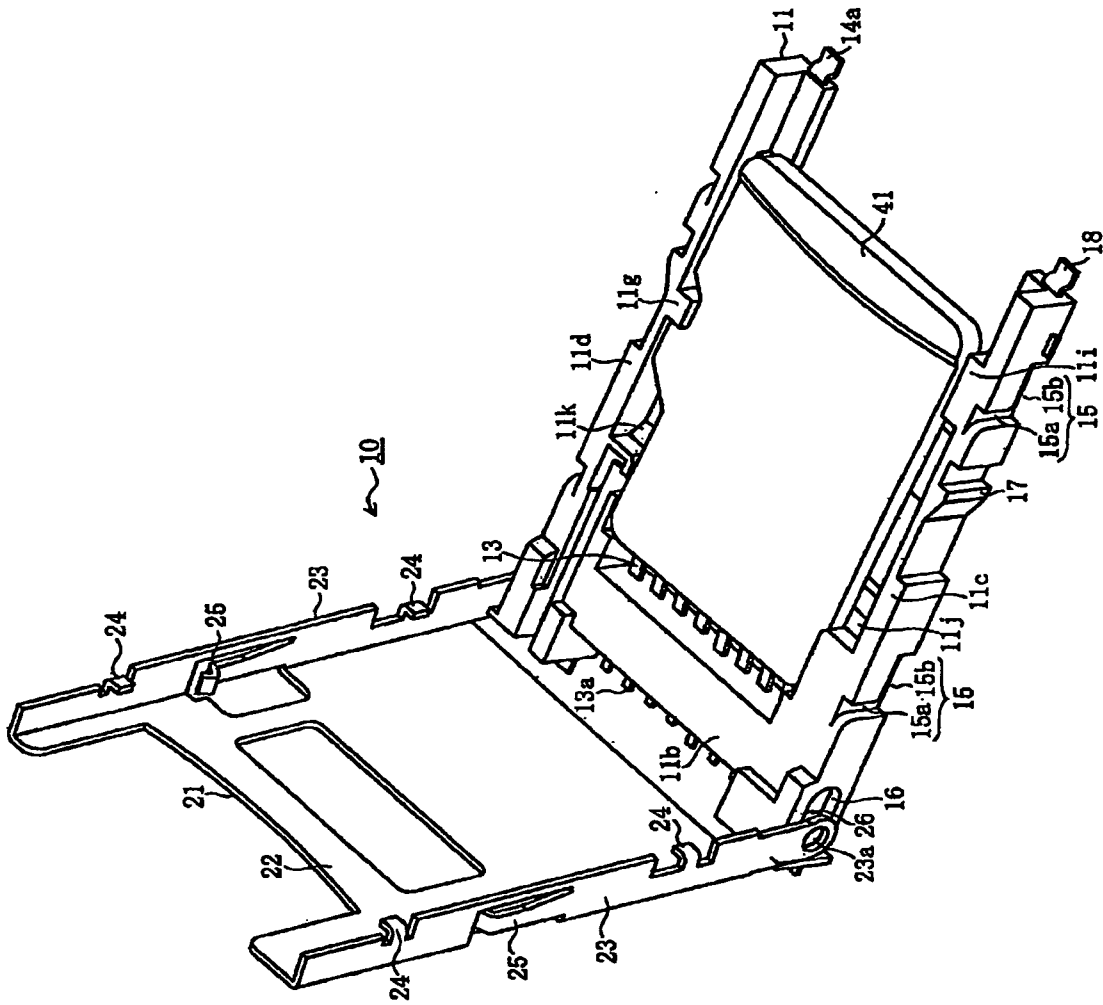
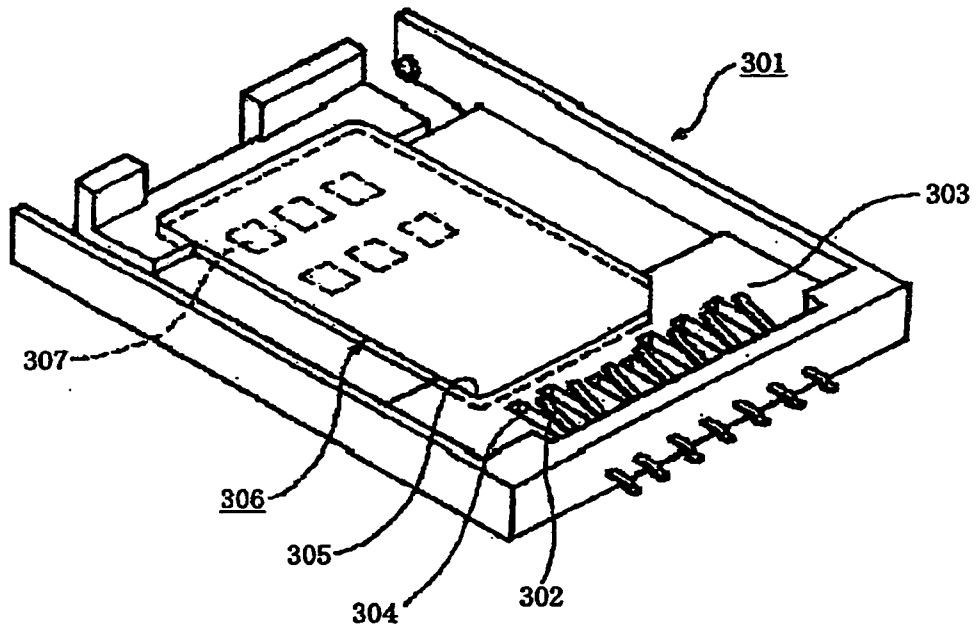


FIG. 6



(Prior art)

FIG. 7