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(54) Card connector with a slider having a non-flat pressing part
Kartenverbinder mit Schieber mit nicht flachem Druckteil
Connecteur de carte ayant un poussoir avec un élément de pression non plan

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Description

Background of the Invention:

[0001]  This invention relates to a card connector with a slider for inserting and ejecting a card into and from the connector by sliding movement.

[0002]  A connector of the type is disclosed, for example, in Japanese Patent Application Publication (JP-A) 2000-260524 and comprises an insulating housing and a plurality of contacts held by the housing. The housing is made of synthetic resin and is formed into a rectangular frame. A card is inserted into the housing through an opening formed on a front side thereof. When the card is inserted into the housing, each contact is brought into contact with a signal contact of the card. Thus, the card is connected to the connector.

[0003]  In the state where the card is inserted in the housing, the card is press by elastic force of the contacts towards one surface of the housing and may possibly be deformed. Deformation of the card results in a reduced contacting pressure between the card and the contacts and may possibly cause contact failure.

[0004]  In order to prevent the deformation of the card, a reinforcing part called a slider is used. Specifically, the card is placed on the slider and, in this state, inserted into the housing. Since the slider and the card are kept in a stacked state within the housing, the deformation of the card is suppressed to some extent owing to the rigidity of the slider. Therefore, it is possible to prevent the contact failure between the card and the contacts.

[0005]  However, since the slider is substantially entirely flat plate-like member, the card may unexpectedly be released from the housing due to mechanical shock, vibration, or the like.

Summary of the Invention:

[0006]  It is therefore an object of this invention to provide a card connector with a slider having a function of preventing the card from unexpectedly being released, in addition to reinforcement of a card.

[0007]  Other objects of the present invention will become clear as the description proceeds.

[0008]  According to an aspect of the present invention, there is provided a connector for use in connecting a card. The connector comprises a housing made of an insulator, a contact having conductivity and coupled to the housing, and a slider coupled to the housing and movable in a predetermined direction for carrying the card to a particular position faced to the contact. The slider has a pressing part which is non-flat and elastically deformed to cause restring force while the slider carries the card towards the particular position. The pressing part presses the card towards the contact by the restoring force when the card is placed at the particular position.

Brief Description the Drawing:

[0009]  Fig. 1 is a perspective view of a card connector according to a first embodiment of this invention as seen from an upper side (in a state where a slider is pulled out from a housing);

Fig. 2A is a perspective view of the slider of the card connector illustrated in Fig. 1 as seen from the upper side;

Fig. 2B is a perspective view of the slider of the card connector illustrated in Fig. 1 as seen from a lower side;

Fig. 3A is a perspective view of the housing of the card connector in Fig. 1 as seen from the upper side;

Fig. 3B is a perspective view of the housing in Fig. 3A as seen from the lower side;

Fig. 4 is a perspective view of the card connector in Fig. 1 in the middle of insertion of the card;

Fig. 5 is a perspective view of the card connector in Fig. 1 in the state where the slider, together with the card, is completely inserted into the housing;

Fig. 6 is a sectional view of the card connector in Fig. 1 in the state where the card is placed on the slider;

Fig. 7 is a sectional view taken along a line VII-VII in Fig. 5;

Fig. 8A is a perspective view of a modification of the slider as seen from the upper side;

Fig. 8B is a perspective view of the slider illustrated in Fig. 8A as seen from the lower side; and

Fig. 9 is a perspective view of a card connector according to a second embodiment of this invention in the state where a slider is pulled out from a housing.

Description of the Preferred Embodiments:

[0010]  Referring to Figs. 1 through 7, description will be made of a connector according to a first embodiment of this invention.

[0011]  The connector 1 illustrated in the figure is adapted to be used to connect a card 11, such as an IC (Integrated Circuit) card, a SIM (Subscriber Identity Module) card, a MMC (Multimedia Card), a SD (Secure Digital) card, and a memory stick. The card 11 has an upper or first surface 11a, a lower or second surface 11b opposite to the first surface 11a, and front and rear ends 11c and 11d adjacent to the first and the second surfaces and opposite to each other. Plural signal contacts 12 are formed on the first surface 11a of the card 11.

[0012]  The connector 1 comprises a housing 2 made of an insulator, a plurality of contacts (see Figs 6 and 7) 3 having elasticity and conductivity and coupled to the housing 2, and a slider 4 coupled to or engaged with the housing 2 and slideable along the housing 2 in a predetermined or first direction A1 for carrying the card 11 to
a particular position faced to the contacts 3.

[0013] The slider 4 is produced from a metal plate elastically deformable and has an integral structure including a pressing part 4a of a plate-like but non-flat shape, a locking part 4b connected to a first end of the pressing part 4a in the first direction A1 and upwardly bent therefrom in a second direction A2 perpendicular to the first direction A1, a butting part 4c connected to a second end opposite to the first end of the pressing part 4a and downwardly bent therefrom in the second direction A2. It is noted that the engaging part 4d is located at a center portion of the second end of the pressing part 4a and that the engaging parts 4d are located at both sides of the butting part 4c in a third direction perpendicular to the first and the second directions A1 and A2.

[0014] The pressing part 4a serves to bring the card 11 into contact with the contacts 3 held by the housing 2. The pressing part 4a is bent at its intermediate portion in the first direction A1 and formed into a mountain-like or angled shape having a ridge at a bent position 4a1. Thus, the pressing part 4a has a ridge portion or a protruding part 4e protruding at the intermediate portion in the first direction A1 towards the card 11.

[0015] The locking part 4b serves to prevent the card 11 from being undesiredly released from the connector 1. More particularly, the locking part 4b is engaged with the rear end 11d of the card 11 to prevent the card 11 from being undesiredly released and escaped from the housing 2 of the connector 1. The locking part 4b is displaceable over a retreating distance D (see Figs. 4 and 6). The locking part 4b is provided with a pull-out part 4b1 formed at its center to be engaged by a finger of a user or an operator in order to remove the card 11 from the connector 1.

[0016] The butting part 4c is pressed by the front end 11c of the card 11 in an early stage of insertion of the card 11 into the connector 1 and presses the forward end of the card 11 in a stage of ejecting the card 11 from the connector 1.

[0017] As illustrated in Fig. 6, the engaging parts 4d serves to prevent the slider 4 from being released from the housing 2 immediately before the card 11 is inserted and immediately after the card 11 is ejected.

[0018] Particularly referring to Fig. 3, the housing 2 will be described.

[0019] The housing 2 is produced from synthetic resin into a rectangular frame. The housing 2 has a top plate 2a provided with six rectangular holes 2a1 formed in its center area to be press-fitted with the six contacts 3 (see Fig. 6) and two die-molding holes 2a2 formed on each of the left and the right sides thereof. Further, the housing 2 has left and right opposite side plates 2b and 2c provided with three receiving or seating parts 2b1 and three receiving or seating parts 2c1, respectively. The receiving parts 2b1 and 2c1 are parallel to the top plate 2a and adapted to receive the slider 4. The slider 4 is inserted through an opening 2d formed on a front side of the housing 2 and butted to a rear plate 2e to be stopped (see Fig. 7). The contacts 3 may be coupled to the top plate 2a by insert molding.

[0020] Next, description will be made of insertion of the card 11 into the connector 1 and ejection of the card 11 from the connector 1.

[0021] The slider 4 is pulled out from the housing 2 as illustrated in Fig. 1 and the card 11 is placed on the pressing part 4a of the slider 4. Then, the state illustrated in Fig. 6 is obtained. When the rear end 11d of the card 11 is slightly pressed in the first direction A1, the front end 11c of the card 11 presses the butting part 4c of the slider 4. Then, the state in Fig. 4 is reached.

[0022] When the rear end 11d of the card 11 is further pressed towards the connector 1, a rear surface of the pressing part 4a of the slider 4 is brought into press contact with the receiving parts 2b1 and 2c1, six in total, of the housing 2. Consequently, the pressing part 4a is elastically deformed to displace the locking part 4b upward over the retreating distance D. As a result, the locking part 4b is moved to a position depicted by a dotted line in Fig. 6. In addition, the pressing part 4a causes restring force therein while the slider 4 carries the card 11 towards the above-mentioned particular position.

[0023] Thereafter, the locking part 4b is pushed and advanced towards the connector 1. Then, the rear end 11d of the card 11 is pressed by the locking part 4b. When the butting part 4c and the engaging parts 4d of the slider 4 are butted to the rear plate 2e of the housing 2, the slider 4 and the card 11 are stopped in the state illustrated in Fig. 7.

[0024] At this time, the card 11 is placed at the particular position and is pushed upward by the restoring force of the pressing part 4a of the slider 4. Therefore, the signal contacts 12 (see Fig. 4) of the card 11 are brought into press contact with the contacts 3 held by the housing 2, respectively. In other words, the pressing part 4a presses the second surface 11b of the card 11 towards the contacts 3 by the restoring force. Then, the contacts 3 are pressed and elastically deformed. Thus, the card 11 is electrically connected to the connector 1.

[0025] In order to eject the card 11 from the connector 1, the pull-out part 4b1 of the slider 4 is engaged by the finger and the slider 4 is pulled out from the housing 2. Then, the butting part 4c presses the front end 11c of the card 11 so that the card 11, together with the slider 4, is ejected from the connector 1.

[0026] Referring to Figs. 8A and 8B, a modification of the slider 4 will be described.

[0027] The slider 4 illustrated in Figs. 8A and 8B is modified in design of the pressing part 4a. The pressing part 4a has a continuously curved surface. In other words, the protruding part 4e is formed by curving the pressing part 4a.

[0028] Next referring to Fig. 9, description will be made of a card connector according to a second em-
bodiment of this invention. Similar parts are designated by like reference numerals and description thereof will be omitted.

[0029] A card 31 is provided with a plurality of signal contacts 32, seven in number, formed on its surface in the vicinity of its forward end. On the other hand, the card connector 21 is provided with rectangular holes 2a1, seven in number, formed on the top plate 2a of the housing 2 on the rear side. Although not shown in the figure, conductive contacts are disposed in the rectangular holes 2a1, respectively, like in the card connector 1 illustrated in Figs. 1 through 7.

[0030] The pressing part 4a of the slider 4 has the protruding part 4e formed by a bent plane or a continuously curved plane. When the card 31 is brought into press contact with the contacts held by the housing 2, the pressing part 4a prevents the deformation of the card 31.

[0031] While the present invention has thus far been described in connection with a few embodiments thereof, it will readily be possible for those skilled in the art to put this invention into practice in various other manners. For example, the top surface of the pressing part 4a may be modified in design into any other appropriate shape, for example, a composite or complex surface comprising a combination of a flat plane and a curved plane. Further, the contacts may be held by an additional member or an additional device separate from the housing and brought into contact with the signal contacts of the card through openings formed in the housing.

Claims

1. A connector (1) for use in connecting a card (11), the connector comprising:

   a housing (2) made of an insulator;
   a contact (3) having conductivity and coupled to the housing; and
   a slider (4) coupled to the housing and movable in a predetermined direction (A1) for carrying the card to a particular position faced to the contact, characterised in that the slider has a pressing part which is non-flat and elastically deformed to cause restring force while the slider carries the card towards the particular position, the pressing part pressing the card towards the contact by the restoring force when the card is placed at the particular position.

2. The connector according to claim 1, wherein the card has a first surface (11a) to be faced to the contact and a second surface (11b) opposite to the first surface, the pressing part receiving the card to face the second surface.

3. The connector according to claim 1 or 2, wherein the card has a front end (11c) and a rear end ad (11d) acent to the first and the second surfaces, the front and the rear ends being opposite to each other in the predetermined direction, the slider having:

   a butting part (4c) connected to the pressing part and adapted to be brought into contact with the front end of the card; and
   a locking part (4b) connected to the pressing part and adapted to be engaged with the rear end of the card.

4. The connector according to claim 3, wherein the locking part has a pull-out part (4b1) having a shape adapted to be engaged by a finger.

5. The connector according to claim 3 or 4, wherein the slider further has two engaging parts (4a) connected to the pressing part and spaced from each other, the engaging parts being engaged with the housing to prevent the slider from being released from the housing.

6. The connector according to any one of claims 1 to 5, wherein the slider has an engaging part (4d) connected to the pressing part and adapted to inhibit the slider from being released from the housing.

7. The connector according to claim 6, wherein the pressing part has a plate-like shape and has a protruding portion (4e) formed at an intermediate portion in the predetermined direction and protruding towards the card.

8. The connector according to claim 7, wherein the protruding part is formed by bending the pressing part.

9. The connector according to claim 7, wherein the protruding part is formed by curving the pressing part.

10. The connector according to any one of the preceding claims, wherein the housing has a top plate (2a) provided with a hole (2a1), the contact being held by the housing via the hole.

Patentansprüche

1. Verbinder (1) zum Benutzen beim Verbinden einer Karte (11), wobei der Verbinder aufweist:

   ein Gehäuse (2), das aus einem Isolator hergestellt ist;
   einen Kontakt (3) mit Leitfähigkeit, der mit dem
Gehäuse gekoppelt ist;
einen Schieber (4), der mit dem Gehäuse gekoppelt ist und in einer vorbestimmten Richtung (A1) bewegbar ist zum Bringen der Karte zu einer bestimmten Position, die dem Kontakt zugewandt ist;
dadurch gekennzeichnet, dass der Schieber ein Pressteil aufweist, das nicht flach ist und elastisch verformt ist zum Verursachen einer rückstellenden Kraft, während der Schieber die Karte zu der bestimmten Position bringt, wobei der Pressteil die Karte durch die rückstellende Kraft presst, wenn die Karte an der bestimmten Position angeordnet ist.

2. Verbinder nach Anspruch 1, bei dem die Karte eine erste Oberfläche (11a), die dem Kontakt zuzuwendend ist, und eine zweite Oberfläche (11b), die der ersten Oberfläche entgegengesetzt ist, aufweist, wobei der Pressteil die Karte zum Zuwendung der zweiten Oberfläche aufnimmt.

3. Verbinder nach Anspruch 1 oder 2, bei dem die Karte ein vorderes Ende (11c) und ein hinteres Ende (11d) benachbart zu der ersten und der zweiten Oberfläche aufweist, das vordere Ende und das hintere Ende einander in der vorbestimmten Richtung gegenüber sind, wobei der Schieber aufweist:
einen Anschlagsteil (4c), der mit dem Pressteil verbunden ist und zum in Kontakt bringen mit dem vorderen Ende der Karte ausgelegt ist; und
 einen Verriegelungsteil (4b), der mit dem Pressteil verbunden ist und ausgelegt ist, in Eingriff mit dem hinteren Ende der Karte gebracht zu werden.

4. Verbinder nach Anspruch 3, bei dem der Verriegelungssteil einen Herausziehteil (4b1) mit einer Form aufweist, die zum Angreifen mit einem Finger ausgelegt ist.

5. Verbinder nach Anspruch 3 oder 4, bei dem der Schieber weiter zwei Eingriffsteile (4d) aufweist, die mit dem Pressteil verbunden sind und voneinander beabstandet sind, wobei die Eingriffsteile mit dem Gehäuse in Eingriff stehen zum Verhindern, dass der Schieber von dem Gehäuse freigelassen wird, der Anschlagsteil zwischen den Eingriffsteilen vorgesehen ist.

6. Verbinder nach einem der Ansprüche 1 bis 5, bei der Schieber einen Eingriffsteil (4d) aufweist, der mit dem Pressteil verbunden ist und zum Eingriff mit dem Gehäuse ausgelegt ist zum Verhindern, dass der Schieber von dem Gehäuse freigegeben wird.

7. Verbinder nach einem der Ansprüche 1 bis 6, bei dem der Pressteil eine plattenartige Form und einen vorstehenden Abschnitt (4e) aufweist, der an einem mittleren Abschnitt in der vorbestimmten Richtung gebildet ist und zu der Karte vorsteht.

8. Verbinder nach Anspruch 7, bei dem der vorstehende Teil durch Biegen des Pressteiles gebildet ist.


10. Verbinder nach einem der vorhergehenden Ansprüche, bei dem das Gehäuse eine obere Platte (2a) aufweist, die mit einem Loch (2a1) zu sehen ist, wobei der Kontakt durch das Gehäuse über das Loch gehalten ist.

**Revendications**

1. Connecteur (1) à utiliser pour connecter une carte (11), le connecteur comprenant :
un boîtier (2) constitué d'un isolant ;
un contact (3) présentant une certaine conductivité et couplé au boîtier ; et
un poussoir (4) couplé au boîtier et mobile dans une direction prédéterminée (A1) pour déplacer la carte dans une position particulière en face du contact,
caractérisé en ce que
le poussoir comprend un élément de pression non plat et déformé élastiquement pour créer une force de rappel pendant que le poussoir déplace la carte en direction de la position particulière, l'élément de pression pressant la carte vers le contact en employant la force de rappel lorsque la carte est placée dans la position particulière.

2. Connecteur selon la revendication 1, caractérisé en ce que
la carte présente une première surface (11a) à placer en face du contact et une seconde surface (11b) opposée à la première surface, l'élément de pression recevant la carte de manière à faire face à la seconde surface.

3. Connecteur selon la revendication 1 ou 2, caractérisé en ce que
la carte présente une extrémité avant (11c) et une extrémité arrière (11d) à proximité des première et seconde surfaces, les extrémités avant et arrière étant opposées l'une à l'autre dans la direction prédéterminée, le poussoir comprenant :
un élément de butée (4c) connecté à l'élément
de pression et adapté pour être amené en contact avec l'extrémité avant de la carte ; et un élément de fermeture (4b) connecté à l'élément de pression et adapté pour être engagé avec l'extrémité arrière de la carte.

4. Connecteur selon la revendication 3, caractérisé en ce que l'élément de fermeture comporte un élément de retrait (4b1) dont la forme est adaptée pour qu'il puisse être engagé par un doigt.

5. Connecteur selon la revendication 3 ou 4, caractérisé en ce que le poussoir comprend en outre deux éléments d'engagement (4d) connectés à l'élément de pression et espacés l'un de l'autre, les éléments d'engagement étant engagés avec le boîtier en vue d'empêcher le poussoir d'être détaché du boîtier, l'élément de butée étant disposé entre les parties d'engagement.

6. Connecteur selon l'une quelconque des revendications 1 à 5, caractérisé en ce que le poussoir comprend un élément d'engagement (4d) connecté à l'élément de pression et adapté pour être engagé avec le boîtier en vue d'empêcher le poussoir d'être détaché du boîtier.

7. Connecteur selon l'une quelconque des revendications 1 à 6, caractérisé en ce que l'élément de pression se présente sous la forme d'une plaque et comporte une partie saillante (4e) formée à une partie intermédiaire dans la direction prédéterminée et saillant en direction de la carte.

8. Connecteur selon la revendication 7, caractérisé en ce que la partie saillante est formée en pliant l'élément de pression.

9. Connecteur selon la revendication 7, caractérisé en ce que la partie saillante est formée en courbant l'élément de pression.

10. Connecteur selon l'une quelconque des revendications précédentes, caractérisé en ce que le boîtier comprend une plaque supérieure (2a) comportant un trou (2a1), le contact étant maintenu par le boîtier par l'intermédiaire du trou.