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Chipcard-Contacting Unit ✓

The invention relates to a chipcard-contacting unit in which the contact field of the chipcard is connected electrically and mechanically through contacts with the printed circuit board of the contacting unit, wherein, for asserting the position of making contact by the chipcard relative to the contacts, there is provided a switch arrangement with a stop member limiting the axial insertion movement of the chipcard.

Such a chipcard contacting-unit has been disclosed in the International Patent Application WO 95/33243. It is used, for example, for banking transactions, pay television, and as access facilitator to data networks, personal computers and the like in the form of reading instruments. In the case of mobile chipcard-reading instruments and also in mobile phones in conjunction with SIM cards, the miniaturised design requires a highly accurate contact making function because the relative tolerances (housing, printed circuit board, and making contact) considerably affect the contact-making function and the reliability. In order to ensure the position of contact and the joint functioning of the chipcard and the contacting unit, there is provided the switch arrangement which in practice establishes the presence of a chipcard in the chipcard-contacting unit by actuating, with the transverse front edge of the chipcard, means for switch actuation, such as a contact spring or a switch lever, so that signal transfer from the printed circuit board to the chipcard and vice versa can occur only after this interaction. The chipcard-contacting unit is informed through the switch arrangement that the chipcard has been inserted and is situated in the proper position of making contact, whereupon data transfer is possible.

It is the shortcoming of the known chipcard-contacting unit that the positioning of the inserted chipcard is not sufficiently accurately guided by the stop member alone which limits the axial movement and that the inserted chipcard is not always necessarily in the required position of making contact. Thus, there is the risk that the chipcard is beyond the switch hysteresis in the inserted position and that data transfer is made impossible. In particular, in the case of unfavourable positioning tolerances, for example, of the printed circuit board relative to the housing, the chipcard can be pushed beyond the stop member so that the contact field of the chipcard is lifted from the contact springs which are connected with the printed circuit board and that malfunction in making contact occurs. Also vibrations and shock may cause inadvertent release of the chipcard from the position of making contact.

With this state of the art, the problem underlying the invention is to improve the functional reliability of chipcard-reading instruments yet avoiding the cited shortcomings and



to increase the reliability of making contact when the chipcard inserted into the contacting unit is positioned.

According to the invention, this problem is solved in a chipcard-contacting unit of the above-specified kind in that, in addition to the axial stop member for the chipcard, there is provided a guide means which, in the form of an abutment, guides the insertion movement of the chipcard into the position of making contact on the chipcard's side opposite the contact field. In this way, any lifting of the chipcard from the switch arrangement is avoided in the position of making contact and the chipcard is prevented from deviating upwards in the vertical direction; this is of particular importance when the contacts of the printed circuit board are configured as contact springs which, due to their spring action, exert vertical forces onto the contact field of the inserted chipcard.

The guide means is preferably a depressing member which acts upon the surface opposite the contact field of the chipcard and which is conveniently formed as a flat piece overlapping the transverse front side of the chip card at the axial stop member. The plastic body supporting the switch arrangement and the contacts, the axial stop member provided thereon, and the guide means in the form of the flat piece can be formed as an integral element of plastic material and can be produced in a simple way and at low cost.

According to a preferred embodiment of the invention, the guide means is provided with an insertion ramp guiding the front edge of the inserted chipcard, and the clamping function provided by the guide means can be enhanced by configuring the guide means in the form of a resilient spring made from plastics or metal. The guide means assumes an active clamping function for the chipcard and in this way the previously possible involuntary release of the chipcard from the position of making contact, for example, by vibration or shock, is definitely prevented.

In order to ensure a simple accommodation of the additional guide means within the very small housing dimensions without increasing the vertical dimensions, particularly in the case of mobile chipcard-reading instruments, it is proposed in an expedient modification of the invention to provide a recess or a window in the adjacent housing plate, for example, in the housing bottom or in the frequently provided reinforcing plate, with the guide means completely or partially engaging the recess or the window.

The chipcard-contacting unit according to the invention will be used preferably in PCMCIA chipcard-reading instruments because there extreme tolerance requirements exist by virtue of the standardisation of the dimensions, which, for example, makes it impossible to use

lateral guide means for the chipcard to be inserted; because of the mobile use, additional stringent requirements in regard to a position of positively making contact are applicable.

As an overall feature, the additional contact guiding provided according to the invention accomplishes that in the area of the end-of-run switch, the reliability of making contact is substantially improved so that external tolerances of the system and of the instruments no longer affect the reliable functioning of the card-contacting unit (intrinsically safe functioning) and that the chipcard is adequately protected against vibrations and shock, wherein, as a consequence of the abutment or the depressing feature, also the soldered connections of the switch arrangement are mechanically strain-relieved and the opened module can be electrically and mechanically tested prior to closing the housing; this results in considerable savings in the mounting and reduces the number of rejects.

Other details, features, and advantages of the object of the invention will become obvious from the ensuing description of the associated drawing in which a preferred embodiment of a PCMCIA chipcard-contacting unit is schematically represented. In the drawing, there show:

Figure 1, a PCMCIA chipcard-contacting unit in a side view, with housing parts being omitted in order to show the internal structure clearly;
 Figure 2, a side view of the switch arrangement; and
 Figure 3, a perspective overall view of the switch arrangement.

The PCMCIA chipcard-contacting unit 1 shown in Figure 1 of the drawing is a PCMCIA reading unit to be connected to a personal computer, a notebook or a similar data-processing system (not illustrated) with PCMCIA connection; only the front region is shown and housing parts are omitted to allow a view into the interior of the contacting unit and to show clearly the schematic structure. A chipcard 2 conforming to ISO 7816 is inserted into the contacting unit 1 and is in the make-contact position. It can be recognised that within the card-shaped outer housing 3 on the front side thereof there is arranged a conventional PCMCIA socket 4 with 68 standard connections. The same are connected via soldering lugs 5 with a printed circuit board 6 supporting electronics components and an integrated circuit, not illustrated. On the printed circuit board 6 or on an appropriately shaped window in the circuit board 6 there is arranged a plastic body 7 supporting a switch arrangement 8 the contact spring 9 of which can be recognised particularly in Figure 3 of the drawing. The switch arrangement is electrically and mechanically connected with the printed circuit board 6 via soldering lugs 10

retained in the plastic body 7; there are provided upright contact springs 11 to make contact with the contact field 12 of the inserted chipcard 2.

Between the chipcard 2 and the outer housing 3, on the upper side of the housing as shown in the drawing, there is a reinforcing plate 13 extending at least over the area in which the chipcard 2 makes contact with the printed circuit board 6.

In the chipcard-contacting unit 1, the contact field 12 of the chipcard 2 is electrically and mechanically connected with the printed circuit board 6 by the contact springs 11 and the soldering lugs 10 and, for defining the chipcard's 2 position of making contact with its contact field 12 relative to the contact springs 11, there is provided the switch arrangement 8 with the contact spring 9 in the plastic body 7 which has a stop member 14 limiting the axial insertion movement (arrow) of the chipcard 2.

Parallel with, and spaced from, the plastic body 7, above the axial stop member 14 there is an additional guide means 15 which is integral with the plastic body and has the form of a bridge-like flat piece 17 overlapping the transverse front side 16 of the inserted chipcard 2; the rear part of the flat piece 17 is provided with an insertion ramp 18 engaging the transverse front edge of the chipcard 2 in its insertion movement.

When the chipcard 2 is pushed into the contacting unit, the front edge of the chipcard 2 is engaged by the insertion ramp 18 of the flat piece 17 and introduced into the gap between the flat piece 17 and the adjacent surface of the plastic body 7 of the switch arrangement 8. During the further forward movement of the inserted chipcard 2, the contact spring 9 is pressed down and the switch arrangement 8 is actuated in this way; the forward movement of the chipcard 2 is terminated at the axial stop member 14 by the chipcard's front edge hitting the same. In this end position of the chipcard 2, which is defined by the limitation of the axial movement and the fixing of the vertical position, the contact field 12 and the contact springs 11 are in the precise relative position of making contact. Acting as an abutment, the flat piece 17 counteracts the effect of the contact springs 11 and of the contact spring 9 and, by depressing the chipcard, performs a clamping function.

In order to keep the dimensions of the outer housing 3 unchanged, in the reinforcing plate 13 there is provided a recess which corresponds to the size of the flat piece 17, cannot be recognised in the drawing, and is partially engaged by the flat piece 17, as can be inferred by comparing the views of Figure 1 and Figure 2.

List of reference numbers

- 1 **contacting unit**
- 2 **chipcard**
- 3 **outer housing**
- 4 **PCMCIA socket**
- 5 **soldering lugs**
- 6 **printed circuit board**
- 7 **plastic body**
- 8 **switch arrangement**
- 9 **contact spring**
- 10 **soldering lugs**
- 11 **contact springs**
- 12 **contact field**
- 13 **reinforcing plate**
- 14 **axial stop member**
- 15 **guide means**
- 16 **transverse front side**
- 17 **flat piece**
- 18 **insertion ramp**



Claims

1. A chipcard-contacting unit (1) in which the contact field (12) of the chipcard (2) is connected electrically and mechanically through contacts (11) with the printed circuit board (6) of the contacting unit, wherein, for asserting the position of making contact by the chipcard (2) relative to the contacts (11), there is provided a switch arrangement (8) with a stop member (14) limiting the axial insertion movement of the chipcard (2), characterised in that, in addition to the axial stop member (14), for the chipcard (2) there is provided a guide means (15) which, in the form of an abutment, guides the insertion movement of the chipcard (2) into the position of making contact on the chipcard's (2) side opposite the contact field (12).
2. The chipcard-contacting unit according to Claim 1, characterised in that the guide means (15) is a depressing member acting upon the chipcard's (2) side opposite the contact field (12) of the chipcard.
3. The chipcard-contacting unit according to Claim 1 or 2, characterised in that the guide means (15) is configured at the axial stop member (14) in the form of a flat piece (17) overlapping the transverse front edge (16) of the chipcard (2).
4. The chipcard-contacting unit according to any one of Claims 1 to 3, characterised in that a plastic body (7) supports the switch arrangement (8) and the contacts (11) and that the axial stop member (14) and the guide means (15), preferably in the form of the flat piece (17) are made integral with the plastic body (7).
5. The chipcard-contacting unit according to any one of Claims 1 to 4, characterised in that the guide means (15) are provided with an insertion ramp (18) guiding the front edge of the inserted chipcard (2).
6. The chipcard-contacting unit according to any one of Claims 1 to 5, characterised in that the guide means (15) have the form of a resilient spring made from plastics or metal.
7. The chipcard-contacting unit according to any one of Claims 1 to 6, characterised in that in the housing plate adjacent the additional guide means (15), particularly in a reinforcing plate (13) provided therein, there is provided a recess or a window which is fully or partially engaged by the guide means (15).
8. The chipcard-contacting unit according to any one of the preceding claims, characterised by its utilisation in a PCMCIA chipcarding-reading instrument.

