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5 The present invention relates to IC card readers. The term "IC card" is used to designate any card including at least one electronic component with which electrical connections are to be established in a reader fitted to an apparatus which is operated by this type of card (e.g. a bank terminal or a pay phone).

10 In general, IC card readers comprise guide means for guiding or positioning the card, optional means for verifying that a card is present in the reader in an appropriate position, and also contact elements for providing electrical connection with conducting pads on the IC card via which circuits are established to the apparatus including the
15 IC card reader.

One such IC card reader is described in French patent number 2 534 713. The guide means therein are surfaces associated with the structure of the reader. The presence of a card is verified by means of an end-of-stroke microswitch and
20 the contact elements are resilient metal blades mounted in a frame of insulating material.

There are thus three independent parts, and assembly thereof is not described in detail. Unfortunately, such a structure requires the various parts to be assembled
25 accurately, and not only is this expensive, but given the accumulated assembly tolerances of the various parts, this may also lead to it being impossible, in practice, to satisfy the requirements of the user. In addition, the actual assembly is left to the manufacturer of the apparatus, whereas such a
30 manufacturer would find it appreciably easier to use a unit component which did not require any special precautions.

More precisely, the force exerted by each of the contact elements for connection to the IC card when pressing against a conducting pad of a card can be expressed by an equation of the
35 type $f = kx$, where k represents the resilient characteristics

of the contact element, and x represents the deflection to which said contact element is subjected in the presence of a card. This force f must be obtained relatively accurately, i.e. with relatively narrow tolerances, since if it is too small then there are problems of contact resistance, and if it is too large, then there are problems of wear both with the contact elements and with the cards. Further, the force exerted by all of the contact elements together on a card give rise to a force retaining the card in the apparatus, and this overall force is also subject to narrow tolerances. Unfortunately, the value of k may vary in the course of industrial manufacture by as much as $\pm 25\%$, for example. Although this amount of tolerated variation could be reduced to a smaller value, that would require expensive measures to be undertaken. If it is desired that the force f remain within limits which are not much wider than those allowed to the factor k , then x must be defined as narrowly as possible. In other words accurately positioning the card relative to the contact elements is of capital importance.

The same considerations apply to the IC card reader as described in the document EP-A-0 231 409, which comprises two parts, one being a printed circuit of which the stationary ends of the contact element constitute integral parts, and another part, referred to as median part, which guides these contact elements through a series of slots in which the free ends of the contact elements are engaged. This latter part further bears means for defining the position of guiding slideways. The guiding of the contact elements is restricted to the lateral direction with respect to the axis of card insertion and parallelly to the plane of the latter. As a result, the respective positioning of the contact elements and of the card still depends on the size and assembling tolerances of several parts, which fact is to be criticized as has been exposed above.

By patent document DE 34 42 397 A1 and by the product

called IC-Kartenleser 2000 by the company SIEMENS, an IC card reader is further known, which comprises a plate around contact elements, and extensions defining the position of slideways for the card.

5 In this reader, the plate and all the pieces belonging thereto, including the contact elements and a printed circuit card to which it is welded, constitute a mobile unit driven in translation by the inserted card, against the force of return springs. This mobile unit comprises a slideway which governs
10 the position of the contact elements.

 The positioning of the contact elements is not determined accurately by a contact frame, but by the action of the slideway. It is thus inaccurate, given the number of interposed pieces and the fact that these pieces are mobile,
15 which makes a certain gap necessary, which gap increases with use.

 The positioning of the card is not determined either with accuracy, since the slideways only supply a transversal guidance.

20 In fact, these dispositions do not supply, and actually do not seek to supply an accurate respective positioning of the card with respect to the contact elements, since a mechanism is provided to shift the contacts towards the card, which is a performing but expensive solution.

25 The invention thus differs from these known solutions and concerns an IC card reader according to the preamble of the independant claim, solving the problem of assembly tolerances and making it possible to satisfy the severest card positioning requirements at reduced cost, said reader being
30 very simple to use.

 The IC card reader according to the present invention is defined by the independant claim.

 It is characterized in that it comprises two extensions which prolong the substance of an inner frame
35 molded over the contact elements for electrical connection

with the IC card, and which extend sideways in the direction of the lateral edges of the card and which project beyond these edges, these two extensions each carrying means for defining the position of the two card-guiding slideways.

5 These extensions are preferably perforated. At least a portion of the slideway is formed in the substance of each extension. At least a portion thereof may be added to each extension. An add-on piece constituting a lid may extend from one slideway to the other. A brake pressing the card against
10 the add-on piece may be incorporated either in the contact frame or else in its lid. Finally, the frame may include an end-of-stroke contact whose components are inserted in the frame.

15 The various objects and characteristics of the present invention are now described in greater detail in the following description which is made by way of non-limiting example and with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of a contact frame in accordance with the present invention;

20 Figure 2 is a plan view of the Figure 1 frame;

Figure 3 is an end view of the Figure 1 frame, with a lid constituting the card-guiding slideways;

Figure 4 is a fragmentary end view showing slideways formed in part on the frame and in part on the lid; and

25 Figure 5 is a side view of the Figure 3 frame.

Figure 1 is a perspective view of a contact frame 1 designed in accordance with the present invention and showing an IC card 2 in position to be inserted. For the purposes of this description, these two parts are shown upsidedown relative
30 to the normal position thereof in which the card is presented with its contact zone on top and in which the contact frame 1 should therefore be disposed above the card and facing the card. The frame essentially comprises a part 3 made of molded insulating material and acting simultaneously: as a support for
35 contact elements 4 used for making connections with the inte-

grated circuit (IC) on the card 2; as a support for an end-of-stroke contact 5 for indicating that a card is present in the reader and properly positioned for the purposes of being read; and as a support at least for slideways 6 for guiding the card and intended to lead it to the above-mentioned position in which it can be read.

To this end, the contact frame 1 comprises an inner frame 7 constituted by portions of the frame 1 delimiting connection windows 8, 9, 10, and 11. The contact elements 4 extend into these windows from bars 12 and 13 in which they are overmolded. It can thus be understood that the position of the contact elements 4 is determined by the position of a portion of the mold used for casting the frame 1. The contact elements 4 are shaped and they project above the plane 14 of the surface of the frame 1. They are intended to come into contact with contact pads in the connection zone 15 of the card 2 when the card is properly inserted in the IC card reader. With reference to Figure 2 which is a plan view of the Figure 1 contact frame, it can be seen that the windows 8 and 11 include indentations 16 which protect the ends of the contact elements 4.

The inner frame 7, as shown in Figures 1 and 2, is extended by two extensions 17 and 18 which terminate at their ends furthest from the inner frame 7 in slideway supports 6. In a first embodiment, these supports 6 are mere flat surfaces, each provided with at least one centering peg 19 or 20. Other slideway positioning means could be provided instead of or in addition to those mentioned above. Further, the centering pegs such as those shown in Figures 1 and 2 may also serve as fixing means (e.g. by rivets) for the slideways. Reference is made to Figure 3 which is an end view of the frame 1 as shown in Figures 1 and 2, shown the usual way up, this time. It can be seen that slideways 21 and 22 are both formed in a piece of molded insulating material 23 constituting a lid and mounted on the support 6 of the frame 1. The lid part 23 is accurately positioned relative to the frame 1 by the centering pegs 19 and

20. It guides the card 2 by engaging its edges. If the same portion of the mold as that which defines the positions of the contact elements 4 also serves for defining the surfaces 6 and the centering pegs 19 and 20, then the positioning of the card 2 relative to the contact elements 4 is obtained with a degree of accuracy which is now related solely to the care with which the mold for forming the frame 1 is made and to the assembly tolerances between the frame 1 and the lid part 23, which assembly is performed in the factory, i.e. with narrow tolerances.

As can be seen in Figures 1 and 2, the extensions 18 and 19 preferably are perforated with relatively large holes 24 in order to save plastic.

The contact frame 1 also carries an end-of-stroke contact 5 and an end-of-stroke abutment 25. The end-of-stroke contact 5 is a normally closed contact which is opened by the card shortly before it comes into abutment against the end-of-stroke abutment 25 by pressing against the end 27 of a moving blade 26, thereby separating the blade from a fixed contact 28. The two blades are force-fitted in slots 29 and 30 provided in the frame 1, thereby ensuring that they are accurately positioned. Further, the abutment 25 ensures that the card is properly positioned in the IC card reader.

Finally, Figures 1 and 2 show a pusher 31 which is integrally molded with the frame 1 and which is a resilient blade intended to press the IC card 2 against the lid 23, thereby pressing it against the face of the slideway opposite to the contact elements and thus accurately defining the distance of the card from the contact elements 4.

As can be seen in Figures 3, 4, and 5, the pusher may alternatively be integrally formed with the lid part 23, extending from the end thereof which is not reached by the card, and being cantilevered back from that and towards the center of the frame 1. Its end 34 is shaped so as to be cammed away by the leading edge of the card 2, after which it exerts

pressure on the card by means of a rounded surface so as to avoid damaging the card.

It may also be observed that the opening via which the IC card is inserted between the parts 1 and 23 is chamfered at 32 in conventional manner.

There remains the possibility, which can be seen in Figures 3 and 4, that at least a portion of the slideway on either side of the frame is integrally formed with the frame 1, as shown in Figure 4. This provides an IC card reader having all of its dimensional tolerances determined by a single molded part, thereby providing a solution which is both effective and cheap. However, the slideways may be at least partially formed in parts which are added on, or preferably in a single lid-forming add-on part, as shown in Figure 3, for example. Insofar as this part may itself be mounted on the frame 1 during manufacture of the frame, narrow tolerances can still be ensured under economic conditions.

Naturally, the above description is given purely by way of non-limiting example and numerous variants may be envisaged without thereby going beyond the scope of the invention.



CLAIMS

1. An IC card reader comprising:
 - a contact frame constituting an inner frame (7) provided with windows (8, 9, 10) made of an insulating substance which is molded onto contact elements (4) for electrical connection with the IC card, so as to position them in said windows, and
 - guiding slideways (21, 22) surrounding the edges of the card and positioning it with respect to the contact elements in the direction of the deflection to which the contact elements are submitted during insertion of the card, as well as in the transversal direction, characterized in that the contact frame (1) further comprises two extensions (17, 18) prolonging the substance of said inner frame (7) which extend laterally in the direction of the lateral edges of the card and beyond these edges, these two extensions carrying each means (6, 19, 20) for defining the position of the two guiding slideways (21, 22).
2. An IC card reader according to claim 1, characterized in that the extensions (17, 18) are perforated, at least in part.
3. An IC card reader according to claim 1 or 2, characterized in that the slideways (21, 22) are integral with the substance of said contact frame (1).
4. An IC card reader according to claim 1 or 2, characterized in that the slideways (21, 22) are constituted by a piece added to each extension (17 or 18).
5. An IC card reader according to claim 1 or 2, characterized in that the slideways (21, 22) are in part integral with the substance of said contact frame (1) and in part made of a piece added to each extension.



6. An IC card reader according to claim 4 or 5, characterized in that said add-on pieces are integral with a part (23) covering said frame and constituting a lid which is assembled thereon.
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7. An IC card reader according to claims 4 and 6, characterized in that the slideways (21, 22) are totally formed in the add-on part constituting the lid (23).
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8. An IC card reader according to any one of claims 1 to 7, characterized in that said contact frame (1) carries an elongated resilient part (31) provided with a hooked end (34) suitable for being cammed away by the front edge of a card inserted in the reader, and for then pressing against the card
- 15
- and pushing it against said lid (23).
9. An IC card reader according to claim 8, characterized in that said elongated resilient part (31) is disposed between the contact elements (4) and the edge of the card which is
- 20
- closest thereto.
10. An IC card reader according to any one of claims 1 to 7, characterized in that said lid (23) carries an elongate resilient part (31) extending backwards from the front edge
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- which is not reached by the card and provided with a profiled end (34) being cammed away before the front edge of a card inserted into the reader, then pressing against the card and pushing it against said lid (23).
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11. An IC card reader according to claim 10, characterized in that said elongate resilient part is fixed to the lid such as to be placed between the contact elements (4) and the edge of the card closest thereto.
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12. An IC card reader according to any one of the preceding



claims, characterized in that said contact frame (1) carries a moving contact blade (26) and a fixed contact blade (28) of an end-of-stroke contact (5) disposed on the front edge of said frame which is not reached by said card, except for a portion
5 of the moving blade against which the card comes into abutment when it reaches the end of its stroke.