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IC CARD READER WITH CARD HOLDER FASTENING MECHANISM AND CARD HOLDER



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BACKGROUND OF THE INVENTION

1 Technical Field of the Invention

5 The present invention relates generally to an IC card reader designed to read data from an IC card, and more particularly to such an IC card reader with a fastening mechanism which attaches a card holder detachably to a data reading table and a card holder configured to establish detachable installation on an IC card reader.

10 2 Background Art

 Contaceless IC cards are now being employed in various applications for establishing radio communication with an IC card reader. For instance, the IC card may be used to check whether a card user is an authorized person or not when entering a security
15 room. The user passes the IC card nearby the IC card reader to input an ID code. The IC card may also be used in checking whether the card user is a person authorized to use a personal computer or not. In this case, the user passes, like the above, the IC card nearby the IC card reader to input an ID code into the
20 computer when starting it..

 Further, the IC card may be used for access to security files stored in a personal computer many times or inputting a user ID code into a merchant computer system for making an electronic payment for a purchase during the on-line internet shopping at
25 various web sites. In such a case, the user must pass the IC card

over the IC card reader each time the ID code is required to be inputted to the computer. This is quite inconvenient for the user. In order to alleviate such an inconvenience, a card holder may be employed to hold the IC card on a data reading table of the IC card reader. A drawback is, however, encountered in that different types of card holders and IC card readers need to be prepared for meeting various application requirements.

SUMMARY OF THE INVENTION

It is therefore a principal object of the invention to avoid the disadvantages of the prior art.

It is another object of the invention to provide an IC card reader and a card holder capable of meeting various application requirements.

According to one aspect of the invention, there is provided an IC card reader which is used in reading data stored in an IC card and inputting it into, for example, a personal computer through radio communication. The IC card reader generally comprises: (a) a casing; (b) an antenna disposed within the casing which works to establish radio communication with an IC card which is placed over a data reading table provided on the casing; (c) a card holder designed to hold the IC card at the data reading table; and (d) a fastening mechanism which attaches the card holder to the data reading table detachably. This structure provides for ease of usage of the IC card reader to a user in two selectable modes. In the first mode, the user may input data into a host device such as a

computer only by passing the IC card over the data reading table of the IC card reader instantaneously. In the second mode, the user may insert the IC card into the card holder fitted on the data reading table of the IC card reader to transmit data to the host device
5 through the antenna.

In the preferred mode of the invention, the fastening mechanism is so designed as to allow the card holder to be installed on the data reading table selectively at different orientations.

The fastening mechanism may include a polygonal table used
10 as the data reading table. The polygonal table is configured to have corners or sides establishing firm engagement with the card holder.

The polygonal table may be designed to establish the firm engagement at at least two of the corners or the sides with the card holder. The polygonal table is, for example, of square shape.

15 The fastening mechanism may be so configured that the card holder is fitted on the data reading table from a preselected direction. The card holder may include a card holding portion into or from which the IC card is to be inserted or drawn. The direction in which the IC card is drawn from the card holding portion is set different
20 from the direction in which the card holder is fitted on the data reading table.

The direction in which the IC card is drawn from the card holding portion is preferably perpendicular to the direction in which the card holder is fitted on the data reading table.

25 The card holder may be so configured that the IC card is inserted and held. The card holder may have provided thereon an

indication of a direction in which the IC card is to be inserted into the card holder.

The fastening mechanism may include a portion of the card holder which is configured to establish firm engagement of the card holder with the data reading table.

The casing has a plurality of surfaces oriented in different directions. One of the surfaces has installed thereon a communication port to which a communication cable is connected to establish communication with a host device and a power supply port to which a power supply cable is connected.

The communication port and the power supply port may be made of a single unit.

A support member may further be provided which is designed to support a body of the IC card reader in a given position on a plane.

The card holder defines an insertion path along which the IC card is inserted into the card holder. The support member holds the body of the IC card reader so as to orient the insertion path of the card holder to a given direction at a predetermined angle to the plane.

The support member may be formed integrally with the card holder.

The support member may be configured to have at least two mount tables on which the body of the IC card reader is to be mounted selectively. The mount tables are inclined at different angles to the plane, respectively. For example, a first one of the

mount tables is inclined at a first angle less than 45° to the plane, while a second one of the mount tables is inclined at a second angle more than 45° .

The support member may be made of a one-piece resinous
5 member.

The support member has a fastening mechanism working to establish firm installation of the body of the IC card reader thereon.

According to the second aspect of the invention, there is provided an IC card reader unit which comprises: (a) a casing; (b) an
10 antenna disposed within the casing, the antenna working to establish radio communication with an IC card through radio communication which is placed over a data reading table provided on the casing; and (c) a fastening mechanism configured to attach to the data reading table detachably a card holder in which the IC card
15 is to be held over the data reading table.

In the preferred mode of the invention, the fastening mechanism is so designed as to allow the card holder to be installed on the data reading table selectively at different orientations.

The fastening mechanism may include a polygonal table used
20 as the data reading table. The polygonal table is configured to have corners or sides establishing firm engagement with the card holder.

According to the third aspect of the invention, there is provided a card holder for an IC card reader which comprises: (a) a card holding portion within which an IC card is to be held to
25 establish radio communication with a data reading table of the IC card reader; and (b) a fastening mechanism working to establish

installation of the card holing portion on the data reading table detachably.

In the preferred mode of the invention, the fastening mechanism is configured to establish firm engagement of the card
5 holding portion on the data reading table at a given orientation.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be understood more fully from the detailed description given hereinbelow and from the accompanying drawings of the preferred embodiments of the invention, which,
10 however, should not be taken to limit the invention to the specific embodiments but are for the purpose of explanation and understanding only.

In the drawings:

Fig. 1(a) is a plan view which shows an IC card reader/writer
15 according to the first embodiment of the invention;

Fig. 1(b) is a front view of Fig. 1(a);

Fig. 1(c) is a side view of Fig. 1(a);

Fig. 2(a) is a plan view which shows an IC card reader/writer according to the first embodiment of the invention from which a card
20 holder is removed;

Fig. 2(b) is a front view of Fig. 2(a);

Fig. 2(c) is a side view of Fig. 2(a);

Fig. 2(d) is a partially enlarged view which shows a holder engagement structure provided on a data reading table;

25 Fig. 3(a) is a plan view which shows a card holder;

Fig. 3(b) is a front view of Fig. 3(a);

Fig. 3(c) is a side view of Fig. 3(a);

Fig. 3(d) is a partially enlarged view which shows a holder engagement structure mating with the one shown in Fig. 2(d);

5 Fig. 4(a) is a plan view which shows a card holder being installed on a body of an IC card reader/writer;

Fig. 4(b) is a front view of Fig. 4(a);

Fig. 5(a) is a plan view which shows an IC card reader/writer into which an IC card is inserted;

10 Fig. 5(b) is a side view of Fig. 5(a);

Fig. 6(a) is an illustration which shows an example wherein a user passes an IC card nearby an IC card reader/writer to input data into the reader/writer;

Fig. 6(b) is an illustration which shows an example wherein a
15 user inserts an IC card into a card holder installed on an IC card reader/writer;

Fig. 7(a) is a plan view which shows an IC card reader/writer according to the second embodiment of the invention;

Fig. 7(b) is a front view of Fig. 7(a);

20 Fig. 7(c) is a side view of Fig. 7(a);

Fig. 8 is a plan view which shows the IC card reader/writer of Fig. 7(a) on which a card holder is installed;

Fig. 9(a) is a plan view which shows a card holder according
25 to the third embodiment of the invention;

Fig. 9(b) is a front view of Fig. 9(a);

Fig. 9(c) is a side view of Fig. 9(a);

Fig. 10(a) is a plan view which shows a card holder according to the fourth embodiment of the invention;

Fig. 10(b) is a front view of Fig. 10(a);

5 Fig. 10(c) is a side view of Fig. 10(a);

Fig. 10(d) is a partially enlarged view which shows a holder engagement structure for installing a card holder firmly on a body of an IC card reader/writer;

10 Fig. 11(a) is a plan view which shows a holder installation structure of an IC card reader/writer according to the fifth embodiment of the invention;

Fig. 11(b) is a front view of Fig. 11(a);

Fig. 11(c) is a side view of Fig. 11(a);

15 Fig. 12(a) is a plan view which shows a card holder which is to be installed on the IC card reader/writer in Figs. 11(a) to 11(c);

Fig. 12(b) is a front view of Fig. 12(a);

Fig. 12(c) is a side view of Fig. 12(a);

20 Fig. 12(d) is a partially enlarged view which shows a holder engagement structure for establishing firm engagement of a card holder with a body of the IC card reader/writer in Figs. 11(a) to 11(c);

Fig. 13(a) is a plan view which shows an IC card reader/writer according to the sixth embodiment of the invention which includes a stay for supporting a body of the IC card reader/writer at a desired position on a plane;

25 Fig. 13(b) is a front view of Fig. 13(a);

Fig. 13(c) is a side view of Fig. 13(a);

Fig. 14 is a plan view which shows the IC card reader/writer in Figs. 13(a) to 13(c) on which the card holder is installed at orientation reversed to that in Figs. 13(a) to 13(c);

Fig. 15(a) is an illustration which shows a first example
5 wherein the IC card reader/writer in Figs. 13(a) to 13(c) is placed on a left side of a personal computer;

Fig. 15(b) is an illustration which shows a second example wherein the IC card reader/writer in Figs. 13(a) to 13(c) is placed on a right side of a personal computer;

10 Fig. 16(a) is a side view which shows an IC card reader/writer according to the seventh embodiment of the invention which includes a stay for supporting a body of the IC card reader/writer at a desired position on a plane;

Fig. 16(b) is a side view which shows the stay of Fig. 16(a)
15 installed on an opposite side of the body of the IC card reader/writer;

Fig. 17 is an illustration which shows the IC card reader/writer of Fig. 16(a) or 16(b) placed on a side of a personal computer;

Fig. 18 is a side view which shows an IC card reader/writer
20 according to the eighth embodiment of the invention which includes a stay configured to support a body of the IC card reader/writer in two different positions;

Fig. 19(a) is an illustration which shows the body of the IC card reader/writer of Fig. 18 which is placed on one of two mount
25 tables at a first orientation;

Fig. 19(b) is an illustration which shows the body of the IC

card reader/writer of Fig. 18 which is placed on the other mount table at a second orientation different from that in Fig. 19(a);

Fig. 20(a) is an illustration which shows an arrangement of Fig. 19(b), as viewed from a user;

5 Fig. 20(b) is an illustration which shows the IC card reader/writer of Fig. 19(b) as viewed from a back side of the drawing;

Fig. 21 is a side view which shows an IC card reader/writer which includes a stay configured to support a body of the IC card reader/writer in two different positions according to the ninth
10 embodiment of the invention;

Fig. 22 is a perspective view which shows an IC card reader/writer which includes a stay configured to support a body of the IC card reader/writer in two different positions according to the tenth embodiment of the invention;

15 Fig. 23 is a perspective view which shows an IC card reader/writer which includes a stay configured to support a body of the IC card reader/writer in two different positions according to the eleventh embodiment of the invention;

Fig. 24 is a side view which shows an IC card reader/writer
20 which includes a stay configured to support a body of the IC card reader/writer in three different positions according to the twelfth embodiment of the invention;

Fig. 25(a) is a side view which shows an IC card reader/writer which includes a stay configured to support a body of the IC card
25 reader/writer in two different positions according to the thirteenth embodiment of the invention;

Fig. 25(b) is a side view which shows a body of the IC card reader/writer of Fig. 25(a) placed on a mount table of the stay different from the one of Fig. 25(a);

Fig. 26(a) is a side view which shows an IC card reader/writer
5 which includes a stay configured to support a body of the IC card reader/writer in two different positions according to the fourteenth embodiment of the invention;

Fig. 26(b) is a side view which shows the stay of Fig. 26(a) standing in a position different from the one of Fig. 26(a);

10 Fig. 26(c) is a plan view which shows a mount table of the stay of Figs 26(a) and 26(b);

Fig. 27(a) is a side view which shows an IC card reader/writer which includes a stay configured to support a body of the IC card reader/writer in three different positions according to the fifteenth
15 embodiment of the invention;

Fig. 27(b) is a side view which shows the IC card reader/writer of Fig. 27(a) mounted on the stay at a second orientation different from the one of Fig. 27(a); and

Fig. 27(c) is a side view which shows the IC card reader/writer
20 of Fig. 27(a) mounted on the stay at a third orientation different from the ones of Figs. 27(a) and 27(b).

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings, wherein like reference numbers refer to like parts in several views, particularly to Figs. 1(a) to 6(b),
25 there is shown an IC card reader/writer 1 according to the invention.

The IC card reader/writer 12 consists essentially of a reader/writer unit 1 and a card holder 7.

The reader/writer unit 1 includes a rectangular casing 2 which has a major surface on which a data reading table 3, as
5 clearly shown in Figs. 2(a) and 2(b), is provided. The data reading table 3 has a square external form and projects as a whole from the casing 2. The data reading table 3 has a joint 3b to the major surface of the casing 2 and peripheral edges 3a extending outside the joint 3b to form guide rails for insertion of the card holder 7, as
10 discussed below in detail. The data reading table 3 has disposed therein an antenna coil 4, as indicated by a broken line in Fig. 2(a), which works to establish radio communication with an IC card placed on or above the data reading table 3.

The reader/writer unit 1 also has, as clearly shown in Fig.
15 2(c), disposed in a side wall of the casing 2, a communication connector 5 such as an RS-232C interface with Dsub-9 pins and a DC-IN jack 6 into which a plug of an AC adapter (not shown) is to be inserted for supplying DC power used to operate the reader/writer unit 1. Into the connector 5, a cable is to be inserted for serial
20 communication with a host device such as a personal computer.

The card holder 7, as shown in Figs. 1(a) to 1(c) and 3(a) to 3(c), is made of substantially square frame 7a and has a U-shaped card holding frame 8 formed over a lower half of the frame 7a which forms parallel guide grooves 79 (i.e., a card insertion guide path) into
25 which sides of the IC card are inserted. The card holding frame 8, as can be seen from Fig. 3(c), is inclined to a user side at a given

angle α to a plane of the frame 7a for providing ease of insertion of the IC card to the user.

An arrow and a character "Card" are printed on or cut in a lower side of the card holding frame 8. The arrow indicates a
 5 direction in which the IC card is to be inserted into the card holder 7. The upper and lower sides 7u and 7d of the frame 7a are, as clearly shown in Fig. 3(c), curled to the rear side of the card holder 7 to form guide grooves 10u and 10d, respectively.

The card holder 7 is, as clearly shown in Figs. 4(a) and 4(b),
 10 fitted on the data reading table 3 of the reader/writer unit 1 from a left side, as viewed in the drawings. Specifically, the installation of the card holder 7 on the data reading table 3 is accomplished by aligning the guide grooves 10u and 10d of the frame 7a with the guide rails formed by the peripheral edges 3a of the data reading
 15 table 3 and sliding the frame 7a to the right side, as viewed in the drawings.

The upper and lower sides 7u and 7d of the frame 7 of the card holder 7, as clearly shown in Figs. 3(c) and 3(d), have formed on central portions of ends thereof protrusions 11u and 11d for
 20 establishing firm engagement with two of four recesses 3c, as shown in Figs. 2(a) and 2(b), formed in central portions of side walls of the joint 3b of the data reading table 3. In the case, as illustrated in Figs. 4(a) and 4(b), where the card holder 7 is fitted on the data reading table 3 from the left side, the protrusions 11u and 11d
 25 engage the upper and lower recesses 3c of the data reading table 3.

In the case where the card holder 7 is installed on the

reader/writer unit 1 in a position as illustrated in Figs. 1(a) to 1(c), the user is allowed to insert the IC card 13, as shown in Figs. 5(a) and 5(b), into the card holding frame 8 from above it. The direction in which the card holder 7 is fitted on the reader/writer unit 1 is

5 perpendicular to that in which the IC card 13 is inserted into or drawn from the card holder 7. After completion of insertion of the IC card 13 into the card holder 7, the IC card 13 is held vertically, as viewed in Figs. 5(a) and 5(b).

The card holder 7 may alternatively be fitted on the

10 reader/writer unit 1 from an angular direction oriented at 90° , 180° , or 270° to the direction, as illustrated in Figs. 4(a) and 4(b).

Figs. 6(a) and 6(b) show examples of cases of use of the IC card reader/writer 12.

Fig. 6(a) illustrates for the case where a user inputs an ID

15 password to a personal computer 14 which is required to start the personal computer 14. The card holder 7 is not installed on the reader/writer unit 1. The input of the password may be achieved by holding the IC card 13 in user's hand and passing it over the data reading table 3.

20 Fig. 6(b) illustrates for the case where the user purchases some products at a plurality of web sites through the internet. The card holder 7 is installed on the reader/writer unit 1. The user inserts the IC card 13 into the card holder 7. Each time it is required by a merchant computer system to identify a user ID code

25 for making an electronic payment for the purchase during the on-line internet shopping, the IC card reader/writer 12 establishes

communication with the merchant computer system through the computer 14 to transmit data stored in the IC card 13.

As apparent from the above discussion, the IC card reader/writer 12 is so designed as to provide for ease of installation and removal of the card holder 7 on and from the data reading table 3 of the reader/writer unit 1. Therefore, in a case where it is required only to establish a one-time instant communication between the IC card reader/writer 12 and the computer 14, the user is allowed to input the data in the IC card 13 into the IC card reader/writer 12 without having to install the card holder 7 on the reader/writer unit 1. Alternatively, in a case where it is required to establish several communications between the IC card reader/writer 12 and the computer 14 for a relatively long period of time, the user may install the card holder 8 on the data reading table 3 of the reader/writer 1 and insert the IC card 13 into the card holder 7. Specifically, the structure of the IC card reader/writer 12 of this embodiment meets different cases of use, as described above, thus eliminating the need for manufacturers to produce different types of IC card reader/writers meeting the various cases of use.

The data reading table 3 is of square shape in external form and designed to allow the user to insert the IC card 13 into the card holder 7 from different directions. Thus, the user may select a desired one of the directions in which the IC card 13 is to be inserted into or drawn from the card holder 7 without having to move the reader/writer unit 1. The protrusions 11u and 11d on the card holder 7 and the recesses 3c in the data reading table 3 serve to

achieve a firm joint of the card holder 7 and the reader/writer unit 1.

The direction in which the card holder 7 is fitted on the reader/writer unit 1 is, as described above, perpendicular to that in which the IC card 13 is inserted into or drawn from the card holder 7, thereby avoiding accidental dislodgement of the card holder 7 from the reader/writer unit 1 caused by the insertion or drawing of the IC card 13.

The connector 5 and the DC-IN jack 6 are provided on the same side of the casing 2 of the IC card reader/writer 12, thus providing for ease of arrangement of cables, especially when the reader/writer 1 and the personal computer 14 are both disposed in a limited area.

Figs. 7(a) to 8 show an IC card reader/writer according to the second embodiment of the invention which is different from the first embodiment in structures of the data reading table and the card holder. Other arrangements are identical, and explanation thereof in detail will be omitted here.

The IC card reader/writer includes a reader/writer unit 16 and a card holder 17. The reader/writer unit 16 has a data reading table 15 which is of regular octagonal shape in external form. The card holder 17 has a frame 17a and a holding frame 18 whose adjacent corners are cut at an angle of 45° to the side of the frame 17a. The recess 3c is formed in each side of the data reading table 15.

In a case, as illustrated in Fig. 8, the installation of the card holder 17 on the data reading table 15 is accomplished by sliding the

card holder 17 downward, as viewed in the drawing, from a direction oriented at 45° upward and to the left. The user may select a desired one of eight directions in which the card holder 17 (i.e., an IC card) is to be inserted into or drawn from the reader/writer 16 in
5 units of 45° .

Figs. 9(a) to 9(c) show a card holder 19 according to the third embodiment of the invention.

The card holder 19 has a width slightly greater than that of the card holder 7 in the first embodiment. Similarly, a card holding
10 frame 20 has a width slightly greater than that of the card holding frame 8 in the first embodiment. The card holder 19 has the same joint mechanism as that of the card holder 7 in the first embodiment and can be installed directly on the reader/writer unit 1. The structure of this embodiment is useful for a case where the IC card
15 13 is packed in, for example, a polyvinyl casing 21. Specifically, it is possible to insert the IC card 13 packed in the casing 21 into the card holder 19 as it is.

Other arrangements are identical with those in the first embodiment, and explanation thereof in detail will be omitted here.

20 Figs. 10(a) to 10(d) show a card holder 23 in the fourth embodiment of the invention.

The card holder 23 has sharp protrusions 22u and 22d formed on ends of upper and lower sides 23u and 23d of the frame 7a, as viewed in the drawings, instead of the protrusions 11u and
25 11d formed on the central portions of the upper and lower sides 7u and 7d of the frame 7a in the first embodiment.

The protrusions 22u and 22d are elastically deformable. When the card holder 23 slides on the data reading table 3, and each corner thereof reaches a corresponding one of the corners of the data reading table 3, the protrusions 22u and 22d are elastically fitted on
5 the corners of the data reading table 3, thereby achieving a firm joint of the card holder 23 to the data reading table 3.

Other arrangements are identical with those in the first embodiment, and explanation thereof in detail will be omitted here.

Figs. 11(a) to 12(d) show an IC card reader/writer according
10 to the fifth embodiment of the invention.

The IC card reader/writer consists of a reader/writer unit 24 and a card holder 27. The card holder 27 has, as clearly shown in Figs. 12(a) and 12(c), the frame 7a whose upper and lower sides 7u and 7d have, as clearly shown in Fig. 12(d), tapered ends 28,
15 respectively. The tapered ends 28 are oriented at approximately 45° to the sides 7u and 7d.

The reader/writer unit 24 includes, as shown in Figs. 11(a) and 11(b), a data reading table 25 which has a recess formed in each corner thereof. Each recess has two tapered surfaces 26 which are
20 oriented perpendicular to each other.

The installation of the card holder 27 on the data reading table 25 is accomplished by placing the card holder 27 over the plane of the data reading table 25, coinciding the corners of the card holder 27 with those of the data reading table 25, and pushing the
25 card holder 27 against the plane of the data reading table 25 to cause the tapered ends 28 to be deformed elastically, passed over

the tapered surfaces 26, and fitted on the joint 25b.

Other arrangements are identical with those in the first embodiment, and explanation thereof in detail will be omitted here.

Figs. 13(a) to 15(b) show an IC card reader/writer 32
5 according to the fifth embodiment of the invention.

The IC card reader/writer 32 includes a card holder 29 which is made up of a card holding portion 30 and a stay 31. The card holding portion 30 has substantially the same structure as that of the card holder 7 in the first embodiment. The stay 31 works as a
10 support for holding the reader/writer unit 1 in a vertical position on a desk, for example. The card holding portion 30 may be formed integrally with the stay 31.

The stay 31 is made up of a rectangular base plate 31a, as shown in Fig. 13(b), and a support plate 31b, as shown in Fig. 13(c),
15 extending perpendicular to a plane of the base plate 31a. The card holding portion 30 stands on the base plate 31a vertically at a given interval away from the support plate 31b which is equivalent to the thickness of the reader/writer unit 1. Fitting the card holder 29 on the reader/writer unit 1 in the same manner as described in the first
20 embodiment, the reader/writer unit 1 is held vertically by the card holding portion 30 and the support plate 31b of the stay 31.

Other arrangements are identical with those in the first embodiment, and explanation thereof in detail will be omitted here.

Fig. 14 illustrates for a case where the card holder 29 is fitted
25 on the reader/writer unit 1 from a direction diametrically opposed to that in Figs. 13(a) to 13(c). Specifically, in the case of Figs. 13(a) to

13(c), the connector 5 and the DC-IN jack 6 are located on the right side of the casing 2, as viewed in Figs. 13(a) and 13(b), while in the case of Fig. 14, they are located on the left side.

Fig. 15(a) illustrates for the case where the IC card reader/writer 32 on which the card holder 29 is fitted in the manner shown in Figs. 13(a) to 13(c) is placed on the left side of the personal computer 14. Fig. 15(b) illustrates for the case where the IC card reader/writer 32 on which the card holder 29 is fitted in the manner shown in Fig. 14 is placed on the right side of the personal computer 14. In either case, the IC card 13 is inserted into the card holding portion 30 of the card holder 29 vertically from above the IC card reader/writer 32.

Figs. 16(a) to 17 show an IC card reader/writer 35 according to the seventh embodiment of the invention which is different from the sixth embodiment of Figs. 13(a) to 15(b) only in structure of a card holder 33. Other arrangements are identical, and explanation thereof in detail will be omitted here.

The card holder 33 has a card holding portion 30 standing on a base plate 34a of a stay 34 at an orientation opposed to that in the sixth embodiment. The base plate 34a has a width smaller than that of the base plate 31a in the sixth embodiment, so that it does not, as can be seen from Figs. 16(a) and 16(b), project from the card holding portion 30 in order to eliminate interference with manual insertion of the IC card by the user.

In use, the IC card reader/writer 35 is, as shown in Figs. 16(a) and 16(b), laid on a desk in contact of a rear end 34c of the

base plate 34a of the stay 34 and a corner of the casing 2 of the reader/writer unit 1 with the surface of the desk. This causes the IC card reader/writer 35 (i.e., the card holding portion 30) to be oriented to a user at an angle which provides for ease of insertion of the IC card, especially when the user is sitting on a chair.

5 Additionally, the inclination of the card holding portion 30 to the plane of the desk also ensures close contact between the IC card and the data reading table 3, thus resulting in improved stability of communication between the IC card and the IC card reader/writer 35.

The IC card reader/writer 35 of Fig. 16(a) is reversed in orientation of the card holder 33 to the reader/writer unit 1.

Fig. 17 illustrates the case where the IC card reader/writer 35 on which the card holder 33 is fitted in the position, as shown in Fig. 16(b), is placed on the right side of the personal computer 14. The user is permitted to insert the IC card into the card holder 33 while facing the front of the personal computer 14.

Figs. 18 to 20(b) show an IC card reader/writer 12 according to the eighth embodiment.

20 The IC card reader/writer 12 consists essentially of a reader/writer unit 1, a card holder 7, and a stay 36. The reader/writer unit 1 and the card holder 7 may have the same structures as those in the first to fifth embodiments of Fig. 1 to 12(d). The stay 36 is made of up a rectangular base 36a and two mount
25 tables 36b and 36c configured to provide different angles of the card insertion guide path to the user. The mount tables 36b and 36c

extend vertically from opposed ends of the base 36a and are bent inwardly at angles $\theta 1$ and $\theta 2$. The angle $\theta 1$ is less than 45° , while the angle $\theta 2$ is more than 45° . Ends of the mount tables 36b and 36c face each other through a small gap. The stay 36 is
 5 formed by a one-piece strip made of, for example, synthetic resin.

The reader/writer unit 1 may be mounted on either of the mount tables 36b and 36c. Fig. 18 exemplifies, for convenience of illustration, the stay 36 on which the two reader/writer units 1 are installed on the mount tables 36b and 36c, respectively.

10 The reader/writer unit 1 has legs 38 formed on the bottom of the casing 2. The legs 38 are fitted in mating holes or recesses 39 formed in the surface of each of the mount tables 36b and 36c, thereby holding the reader/writer unit 1 firmly on one of the mount tables 36b and 36c. The reader/writer unit 1 may alternatively be
 15 attached to either of the mount tables 36b and 36c using a pressure sensitive adhesive double coated tape. A stopper may be formed on a lower edge of each of the mount tables 36b and 36c for avoiding a downward slippage of the reader/writer unit 1.

Fig. 19(a) illustrates a first example where the stay 36 is
 20 placed on a desk 40, and the reader/writer unit 1 on which the card holder 7 is fitted is mounted on the mount table 36b of the stay 36. The user 41 is allowed to insert the IC card 13 into the card holder 7 from an upper and right direction, as viewed the drawing. The connector 5 and the DC-IN jack 6 (not shown in Fig. 19(a)) are
 25 located on the rear side of the reader/writer 1, as viewed from the user 41 (i.e., the left side of the drawing). This arrangement is

useful for a case where it is possible to secure a space for a communication cable 42 on the rear side of the desk 40.

Fig. 19(a) illustrates a second example where the stay 36 is placed on the desk 40, and the reader/writer unit 1 on which the
5 card holder 7 is fitted is mounted on the mount table 3b of the stay 36. The user 41 is allowed to insert the IC card 13 into the card holder 7 from an upper and left direction, as viewed in the drawing. The connector 5 and the DC-IN jack 6 (not shown in Fig. 19(b)) are located on the right side of the reader/writer 1, as viewed from the
10 user 41 (i.e., the back side of the drawing). This arrangement is useful for a case where it is possible to secure a space for a communication cable 42 on the right side of the desk 40, as viewed from the user 41.

Fig. 20(a) illustrates the arrangement of Fig. 19(b), as viewed
15 from the user 41. A computer monitor 14a is disposed on the left side of the IC card reader/writer 12. A computer body 14b is placed on the right side of the IC card reader/writer 12. Fig. 20(b) illustrates the IC card reader/writer 12 as viewed from the back side of the drawing of Fig. 19(b).

20 The structure of this embodiment has the two mount tables 36b and 36c inclined to the base 36a at different angles, thus permitting the user to select a desired one of the mount tables 36b and 36c on which the reader/writer unit 1 is to be mounted as needed. The stay 36 is made of a one-piece member and thus easy
25 to manufacture.

Fig. 21 shows the IC card reader/writer 12 according to the

ninth embodiment of the invention which is different from the eighth embodiment in that the reader/writer unit 1 is mounted on a stay 36A which is different in geometrical shape from the stay 36.

The stay 36A has the mount table 36b whose end is bent
5 downward at right angles toward the right end, as viewed in the drawing, of the base 36a to form a support 36d.

When the user would like to hold the reader/writer unit 1 at a smaller inclination, the user may mount the reader/writer unit 1 on the mount table 36b in the same manner as in the eight
10 embodiment. Alternatively, when the user would like to hold the reader/writer unit 1 at a greater inclination, the user may mount the reader/writer unit 1 on the right side of the stay 36A, as viewed in the drawing, by standing it at a corner thereof on the base 36a with the bottom against the support 36d. Like the eighth embodiment,
15 the angle $\theta 1$ is less than 45° , while the angle $\theta 2$ is more than 45° .

Fig. 22 shows the IC card reader/writer 12 according to the tenth embodiment of the invention.

The reader/writer unit 1 is held on a stay 36B. The stay
20 36B is made of a one-piece member and consists of the base 36 and mount tables 36c and 36e. The mount table 36c, like the eighth embodiment of Fig. 18, extends from an end of the base 36a. The mount table 36e continues from the mount table 36c and is oriented downward, like the eighth embodiment, but it has an end which
25 extends perpendicular to the base 36a and is spaced at a given interval away from an end of the base 36a. The angles which the

mount tables 36c and 36e make with the base 36a are equivalent to those in the eighth embodiment.

Fig. 22 illustrates, as an example, the reader/writer unit 1 held on the mount table 36c of the stay 36B.

5 Other arrangements are identical with those in the eighth embodiment, and explanation thereof in detail will be omitted here.

Fig. 23 shows the IC card reader/writer 12 according to the eleventh embodiment of the invention which is a modification of the tenth embodiment of Fig. 22.

10 The IC card reader/writer 12 has a stay 36C. The stay 36C has mount tables 36b and 36f. The mount table 36b extends, like the mount table 36c of Fig. 22, directly from the base 36a, while the mount table 36f continues from the mount table 36b downward, like the mount table 36e of Fig. 22 and is bent perpendicular to the base
15 36a with an end spaced at a given interval away from the base 36a. The angles which the mount tables 36b and 36f make with the base 36a may be set equal to the angles $\theta 1$ and $\theta 2$ in Fig. 18. Fig. 23 illustrates, as an example, the reader/writer unit 1 held on the mount table 36b of the stay 36C.

20 Fig. 24 shows the twelfth embodiment of the invention.

The IC card reader/writer 12 has a stay 43. The stay 43 is formed by a one-piece member made of synthetic resin, for example, and consists of a rectangular base 43a and three mount tables 43b, 43c, and 43d. The mount table 43b, like the mount table 36b of Fig.
25 21, extends vertically from the base 43a and is bent at the angle $\theta 1$. The mount table 43c continues from the mount table 43b and

extends substantially parallel to the base 43a. The mount table 43d is bent from an end of the mount table 43c downward and extends to the base 43a at the angle $\theta 2$. The mount table 43d has an end spaced at a given interval away from the base 43a.

5 The user may select one of the three mount tables 43b, 43c, and 43d which meets a desired angle of insertion of the IC card.

Figs. 25(a) and 25(b) show the thirteenth embodiment of the invention.

 The IC card reader/writer 12 has a stay 44. The stay 44 is
10 formed by a one-piece strip which is bent at the angle $\theta 2$ to define two mount tables 44a and 44b. The mount table 44a is longer than the mount table 44b. When the user would like to hold the reader/writer unit 1 at a smaller inclination, the user may place the stay 44 on a desk in a position, as illustrated in Fig. 25(a), where the
15 mount table 44a makes the angle $\theta 1$ with the plane of the desk. Alternatively, when the user would like to hold the reader/writer unit 1 at a greater inclination, the user may place the stay 44 in a position, as illustrated in Fig. 25(b), where the mount table 44a is laid directly on the plane of the desk to incline the mount table 44b
20 at the angle $\theta 2$ to the desk.

Figs. 26(a) to 26(c) show the fourteenth embodiment of the invention.

 The IC card reader/writer 12 has a stay 45. The stay 45 is made of a one-piece strip which is curled in the illustrated manner
25 to define a single mount table 45a and two bases 45b and 44c. The mount table 45a, as clearly shown in Fig. 26(a), extends from the

base 45c at the angle $\theta 1$ and from the base 45b, as shown in Fig. 26(b), at the angle $\theta 2$. The mount table 45a is longer than the bases 45b and 45c.

When the user would like to hold the reader/writer unit 1 at
5 a smaller inclination, the user may place the stay 45 on a desk in a position, as illustrated in Fig. 26(a), where the mount table 45a makes the angle $\theta 1$ with the plane of the desk. Alternatively, when the user would like to hold the reader/writer unit 1 at a greater inclination, the user may place the stay 45 in a position, as
10 illustrated in Fig. 26(b), where the base 45b is laid directly on the plane of the desk to incline the mount table 45a at the angle $\theta 2$ to the desk.

The mount table 45a, as clearly shown in Fig. 26(c), has four arc-shaped recesses 46 formed on sides thereof in which legs 38
15 formed on the bottom of the reader/writer unit 1 are fitted. Two pieces of pressure sensitive adhesive double coated tape 47 are, as shown in Fig. 26(c), attached to the surface of the mount table 45a for holding the reader/writer unit 1 on the mount table 45a firmly at the two inclinations, as shown in Figs. 26(a) and 26(b).

20 The structure of this embodiment is, as described above, designed to hold the reader/writer unit 1 at a desired one of the two inclinations and results in a decrease in area on the desk occupied by the IC card reader/writer 12.

Figs. 27(a) to 27(c) show the fifteenth embodiment of the
25 invention.

The IC card reader/writer 12 has a stay 48. The stay 48 is

made of a one-piece strip which is curled to a C-shape to define three mount tables 48a, 48b, and 48c and a base 48d. The mount table 48c, as will be described later, also works as a base. The structure of this embodiment is designed to allow the user to select a desired
 5 one of three inclinations at which the reader/writer unit 1 is to be held.

Fig. 27(a) illustrates the stay 48 which is placed with the mount table 48c laid directly on the plane of a desk. The base 48d extends from an end of the mount table 48c at an angle $\theta 3 (= 90^\circ)$
 10 to incline the mount table 48a at the angle $\theta 1$ to the desk. The mount table 48b extends from an end of the mount table 48a downward at an obtuse angle and has an end bent upward at right angles to define a support 48e. The mount table 48b is inclined at the angle $\theta 2$ to the plane of the desk. The reader/writer unit 1 is
 15 held on the mount table 48a firmly using the pressure sensitive adhesive double coated tape 47.

Fig. 27(b) illustrates an example where the reader/writer unit 1 is held on the mount table 48b of the stay 48 placed on the desk in the same position as shown in Fig. 27(a). The reader/writer unit 1
 20 also has a side edge put on the support 48e.

Fig. 27(c) illustrates an example where the reader/writer unit 1 is held by the stay 48 at right angles to the desk. The stay 48 is placed on the desk with the base 48d laid directly on the plane of the desk. The reader/writer unit 1 is attached to the mount table 48c
 25 through the pressure sensitive adhesive double coated tape 47. An area of the base 48c is smaller than areas on the desk occupied by

the stay 48, as shown in Figs. 27(a) and 27(b).

While the present invention has been disclosed in terms of the preferred embodiments in order to facilitate better understanding thereof, it should be appreciated that the invention
5 can be embodied in various ways without departing from the principle of the invention. Therefore, the invention should be understood to include all possible embodiments and modifications to the shown embodiments which can be embodied without departing from the principle of the invention as set forth in the
10 appended claims. For example, the data reading table 3 is not limited in external form to square or octagonal shape, but may be of polygonal shape such as pentagon or hexagon. The data reading table 3 may also be formed to have a rectangular shape to limit the insertion of the IC card to the card holder to one direction.

15 The installation of the card holder 7, for example, in the first embodiment may be achieved by fitting only the guide groove 10u on the edge 3a of the data reading table 3. Additionally, if it is possible to ensure frictional adhesion sufficient for holding the card holder on the data reading table firmly, the direction of installation of the
20 card holder on the data reading table may be the same as that of insertion of the IC card into the card holder.

The connector 5 and the DC-IN jack 6 may be provided in a single unit. For instance, one of pins of the connector 5 may be used for power supply.

25 The stay in each of the above embodiments may be made of several discrete parts joined or welded to each other or a one-piece

member closed in a polygonal shape.

What is claimed is:

1. An IC card reader comprising:
 - a casing;
 - 5 an antenna disposed within said casing, said antenna working to establish radio communication with an IC card which is placed over a data reading table provided on said casing;
 - a card holder designed to hold the IC card at the data reading table; and
 - 10 a fastening mechanism which attaches said card holder to the data reading table detachably.
2. An IC card reader as set forth in claim 1, wherein said fastening mechanism is so designed as to allow said card holder to
15 be installed on the data reading table selectively at different orientations.
3. An IC card reader as set forth in claim 2, wherein said fastening mechanism includes a polygonal table used as the data
20 reading table, said polygonal table being configured to have corners or sides establishing firm engagement with said card holder.
4. An IC card reader as set forth in claim 3, wherein said polygonal table is designed to establish the firm engagement at at
25 least two of the corners or the sides with said card holder.

5. An IC card reader as set forth in claim 4, wherein said polygonal table is of square shape.

6. An IC card reader as set forth in claim 1, wherein said
5 fastening mechanism is so configured that said card holder is fitted on the data reading table from a preselected direction, wherein said card holder includes a card holding portion into or from which the IC card is to be inserted or drawn, and wherein a direction in which the IC card is drawn from the card holding portion is different from the
10 direction in which said card holder is fitted on the data reading table.

7. An IC card reader as set forth in claim 6, wherein the direction in which the IC card is drawn from the card holding portion
15 is perpendicular to the direction in which said card holder is fitted on the data reading table.

8. An IC card reader as set forth in claim 1, wherein said card holder is so configured that the IC card is inserted and held and has
20 provided thereon an indication of a direction in which the IC card is to be inserted into said card holder.

9. An IC card reader as set forth in claim 1, wherein said fastening mechanism includes a portion of said card holder which is
25 configured to establish firm engagement of said card holder with the data reading table.

10. An IC card reader as set forth in claim 1, wherein said casing has a plurality of surfaces oriented in different directions, one of the surfaces having installed thereon a communication port to which a communication cable is connected to establish communication with a host device and a power supply port to which a power supply cable is connected.

11. An IC card reader as set forth in claim 10, wherein the communication port and the power supply port are made of a single unit.

12. An IC card reader as set forth in claim 1, further comprising a support member designed to support a body of the IC card reader in a given position on a plane.

13. An IC card reader as set forth in claim 12, wherein said card holder defines an insertion path along which the IC card is inserted into the card holder, and wherein said support member holds the body of the IC card reader so as to orient the insertion path of said card holder to a given direction at a predetermined angle to the plane.

14. An IC card reader as set forth in claim 13, wherein said support member is formed integrally with said card holder.

15. An IC card reader as set forth in claim 13, wherein said support member is configured to have at least two mount tables on which the body of the IC card reader is to be mounted selectively, the mount tables being inclined at different angles to the plane,
5 respectively.

16. An IC card reader as set forth in claim 15, wherein a first one of the mount tables is inclined at a first angle less than 45° to the plane, while a second one of the mount tables is inclined at a second
10 angle more than 45° .

17. An IC card reader as set forth in claim 16, wherein said support member is made of a one-piece member.

15 18. An IC card reader as set forth in claim 15, wherein said support member has a fastening mechanism working to establish firm installation of the body of the IC card reader thereon.

19. An IC card reader unit comprising:
20 a casing;
an antenna disposed within said casing, said antenna working to establish radio communication with an IC card which is placed over a data reading table provided on said casing; and
a fastening mechanism configured to attach to the data
25 reading table detachably a card holder in which the IC card is to be held over the data reading table.

20. An IC card reader unit as set forth in claim 19, wherein said fastening mechanism is so designed as to allow the card holder to be installed on the data reading table selectively at different
5 orientations.

21. An IC card reader unit as set forth in claim 20, wherein said fastening mechanism includes a polygonal table used as the data reading table, said polygonal table being configured to have corners
10 or sides establishing firm engagement with the card holder.

22. A card holder for an IC card reader comprising:
a card holding portion within which an IC card is to be held to establish radio communication with a data reading table of the IC
15 card reader; and

a fastening mechanism working to establish installation of said card holding portion on the data reading table detachably.

23. A card holder as set forth in claim 22, wherein said fastening
20 mechanism is configured to establish firm engagement of said card holding portion on the data reading table at a given orientation.