Title: ELECTRICAL ADAPTER FOR COUPLING TO A PORTABLE CARD AND A PORTABLE CARD INTEGRAL WITH SUCH AN ADAPTER

Abstract: An adapter (30, 40, 41, 44, 45, 50, 63, 85) for coupling to a portable device (10) having a substantially card shaped body, includes a casing (31) adapted for mechanical attachment to the portable device, and supporting an electronic circuit (86). A set of FCCS compatible contacts (88) coupled to the electronic circuit (86) is accessible from at least one outer surface of the casing for connecting the electronic circuit to an external device.
Electrical adapter for coupling to a portable card and a portable card integral with such an adapter

FIELD OF THE INVENTION

This invention relates generally to the field of card devices and more specifically to an improved card like apparatus enabling connection to a host device.

BACKGROUND OF THE INVENTION

Plastic data cards are well known and include ATM card, credit cards, employee card and so on. Advances in technology have increased the data and processing capacity of such devices and rendered them more compact.

USB devices are also common and are used for peripheral devices such as a mouse, a keypad, a printer and similar devices. USB tokens are widely used as means to store, retrieve and transfer information from one computer to another. Other tokens are used to authenticate a user, or to create digital signature. Various versions of self-powered card are emerging.

Various types of cards are known ranging from non-electronic credit cards having magnetic stripes to wholly integrated smart cards having on-board memory and CPU chips that communicate with external host devices via a contact or non-contact interface. However, no provision is currently made to enhance the features of such cards after production. Specifically, no suggestion has been made to upgrade non-electronic credit cards so as to add electronic features and to permit communication with external host devices.

PC cards of various kinds are well known for insertion into a slot of a computer. It is also known for such PC cards to be provided with an adapter that allows connection of peripheral equipment to the PC card, while it is connected to the PC. Also known are adapters that may be coupled to a smart card for allowing the smart card to be coupled to external devices. Examples of both types of device can be found in the following publications whose contents are incorporated herein by reference.

US2001019907 (Roth et al.) discloses an adapter having RJ series sockets for coupling a communications device via an RJ series plug to a communications card. The communications card is in the form of a hollow shell into which the adapter is inserted.
US Pat. No. 5,679,007 (Potdevin et al.) discloses a portable interface in the form of a housing having at least one slot for accommodating an electronic smart card such that contacts in the smart card engage corresponding contacts inside the interface. One end of the interface is pluggable into a card reader so as to allow connection of the smart card to the card reader.

US Pat. No. 6,027,028 (Pieterse et al.) discloses a connector in the shape of a standard printed circuit chip card having contact areas joined by conductors and to be used to apply battery recharging energy to an electronic device such as a mobile telephone through a chip card receiving slot in the device. A sleeve to which the wires are fixed may be placed over a standard chip card. This sleeve may be formed with an opening to expose the chip card contacts so that normal operation may be carried out while batteries are being recharged.

The above documents are representative of various kinds of adapter that either serve as a receptacle for accommodating an electronic card therein or which require that the electronic card is itself at least partially hollow for accommodating the adapter. The latter are thus unsuitable for use with standard smart cards of the kind that fit into one’s wallet and comply with ISO 7810 for example, while the former may be suitable for use with conventional smart cards but in order to accommodate the smart card must be of larger dimension. This means that the footprint of the smart card when coupled to the adapter is necessarily larger than that of the smart card on its own and this may militate against storage and carrying the adapter-card combination in a wallet having pockets dimensioned for standard credit cards.

None of the above arrangements is capable of providing additional functionality to non-electronic cards, such as conventional credit cards having magnetic stripes.

It would therefore be desirable for an adapter to provide additional functionality for a card-like device without substantially increasing its footprint so as to allow the combined unit to be carried in a wallet in conventional manner.

**SUMMARY OF THE INVENTION**

In accordance with one embodiment of the invention, there is disclosed an adapter for coupling to a portable device having a substantially card-shaped body, the adapter comprising:

- a casing adapted for mechanical attachment to the portable device,
- an electronic circuit supported on or in the casing, and
a set of FCCS compatible contacts coupled to the electronic circuit and being accessible from at least one outer surface of the casing for connecting the electronic circuit to an external device.

In accordance with another embodiment of the invention, there is disclosed a method for adding electronic functionality to a portable device having a substantially card-shaped body, the method comprising:

(a) providing an adapter having a electronic circuit coupled to FCCS compatible contacts for connection to an external device; and

(b) mechanically coupling the adapter to the portable device.

The adapter can be either mechanically or both mechanically and electrically coupled to the card. Thus, the terms "mounted" or "assembled" as used herein imply both mechanical or mechanically and electrical connection. As described, the adapter may be fixedly or removably coupled to the card. Removable connection may be achieved using clips or friction, screws, pins etc. Fixed connection may be achieved using glue, ultrasonic or other bonding that renders disassembly impossible without damaging the card or the adapter.

The term "card" as used herein is intended to imply that its shape is similar to a credit card or smart card, typically having dimensions and shape that may conform to standards such as ID1 or ISO 7810.

In accordance with yet another aspect of the invention, there is provided a portable device comprising:

a substantially card-shaped body supporting an electronic circuit and a male connector protruding from an end of the card and having contacts;

wherein the connector has a bulbous split cross-section so that upper and lower portions of the connector are resiliently splayed apart.

The card and adapter according to the invention may be formed using a lamination process by uniting several layers using hot or cold lamination such as UV curing.

**BRIEF DESCRIPTION OF THE DRAWINGS**

In order to understand the invention and to see how it may be carried out in practice, some embodiments will now be described, by way of non-limiting example only, with reference to the accompanying drawings, in which:

**Fig. 1** is an exploded view of a smart card device according to an embodiment of the invention;

**Fig. 2a** is a perspective view of the card-shaped device shown in **Fig. 1**;
Figs. 2b and 2c show opposites surfaces of the card-shaped device shown in Fig. 2a;

Figs. 3a to 3f show different views of a two-sided USB mini-retractable adapter used to add functionality to the card-shaped device shown in Fig. 2a;

Figs. 4a to 4c show various views of a mini-retractable adapter used to add functionality to the card-shaped device shown in Fig. 2a;

Figs. 5a, 5b, 6a, 6b, 7, 8a and 8b show an adapter according to various embodiments used to add functionality to the card-shaped device shown in Fig. 2a;

Figs. 9 to 11 show an adapter according to another embodiment;

Figs. 12 and 13 show details of a lock mechanism that can be used to snap-fit a movable adapter according to various embodiments of the invention;

Figs. 14a and 14b show an example of a card-shaped device according to another embodiment of the invention;

Figs. 15a to 15c show various views of an adapter for attaching to an edge of a card-shaped device according to another embodiment of the invention;

Figs. 16a and 16b show opposite sides of an adapter having a double-sided connector on both extremities;

Fig. 17 shows an adapter for attaching to an edge of a card-shaped device according to another embodiment of the invention;

Figs. 18a, 18b and 18c show various views of an electronic card with an adapter at a corner thereof;

Figs. 19a, 19b and 19c show contours of card-shaped devices according to different embodiments for accommodating an adapter at a corner thereof;

Figs. 20a and 20b show details of a card-shaped device and adapter according to another embodiment of the invention; and

Figs. 21a and 21b show details of a card-shaped device and adapter according to another embodiment of the invention;

The drawings constitute a part of this specification and include exemplary embodiments to the invention, which may be embodied in various forms. It is to be understood that in some instances various aspects of the invention may be shown exaggerated or enlarged to facilitate an understanding of the invention. It is also to be understood that although various embodiments have been described, many features may be combined and the invention embraces all such combinations.
DETAILED DESCRIPTION OF EMBODIMENTS

Detailed descriptions of the preferred embodiment are provided herein. It is to be understood, however, that the present invention may be embodied in various forms. Therefore, specific details disclosed herein are not to be interpreted as limiting, but rather as a basis for the claims and as a representative basis for teaching one skilled in the art to employ the present invention in virtually any appropriately detailed system, structure or manner.

Fig. 1 is an exploded view of a smart card device 10 shown in perspective in Fig. 2a. The smart card device 10 has a body 11 having an electronic circuit 12 embedded between an upper and lower laminations 13 and 14, respectively, and, which can be located at any position on the card body 11. The card body 11 may comply with the ID-1 standard and ISO 7813 card dimensions but is not limited thereto.

Figs. 2b and 2c show opposites surfaces of the card body 11 having a first surface 15 (Side A) and an opposite surface 16 (Side B), the electronic circuit 11 having at least one electronic component embedded within the card substrate and accessible from both surfaces thereof. The electronic circuit 12 has a first surface 17 (Side A) that includes a first set of contacts 18, a second surface 19 (Side B) opposite the first surface 17 and including an optional second set of contacts 12, each set of contacts complying in number of contacts and configuration with a target device allowing connection to other electronic devices having a FCCS connector (e.g. but not limited to, PC, cellular, PDA’s, Radio Car, GPS systems, etc.)

In some cases an adapter is needed between the systems on the card body and the target device to comply with existing connection systems. Figs. 3a, 3b, 3c and 3d show different views of an USB adapter 30 used to connect between the device and any USB Host devices. Such an adapter can be used to adapt the card to other standards (e.g. but not limited to, MiniUSB, MicroUSB, SmartCard, etc.) so as to adapt to the mechanical arrangement of the targeted device or system. The adapter may have a single set of contacts on only one side or may have two sets, one on each opposite surface, for the user convenience as shown in Figs. 3a and 3b.

Figs. 3a and 3b show opposing surfaces of a two-sided USB adapter 30 as an example, allowing connection of the device by inserting the USB adapter into a USB host connector regardless of the orientation of the USB adapter 30. The USB adapter 30 has a casing 31 on a first surface (Side A) 32 of which are embedded two sets of contacts, each contact of which is electrically connected to the corresponding contact of the other set. A first contact set 33 located toward a periphery of the adapter 30.
connects to corresponding contacts of external devices or systems and a second contact set 34 connects to corresponding contacts on the card body. By such means, the electrical circuit 12 may be connected via the adapter 30 to an external device. On a second surface 35 of the casing 31 opposite the first surface 32, and shown in the figure as Side B, are embedded two further sets of contacts 36 and 37 whose respective contacts are shorted one to the other. The first contact set 36 is located toward a periphery of the adapter 30 and connects to corresponding contacts of external devices or systems and the second contact set 37 connects to corresponding contacts on the card body 11.

An aperture 38 is formed through the adapter 30 for attaching the adapter 30 to the device 10 via a pin 39 (shown in Fig. 4a). The aperture 38 and the pin 39 thus serve as a mechanical attachment for removably attaching the adapter to the smart card device. As will emerge from the following description, the mechanical attachment may have many different forms, some of which will be described by way of non-limiting example only. However, what is important to note is that the mechanical attachment in whatever form it takes allows the adapter to be attached to the smart card device in such a manner that contacts on an outer surface of the smart card device are electrically connected to corresponding contacts of the adapter. Furthermore, preferably the adapter is attached to the smart card in such a manner as to preserve the original footprint of the smart card. In some embodiments this is achieved by using a card device at least one of whose major dimensions is smaller than that of a conventional credit card and ensuring that an overall length and width of the device and the adapter combined substantially conforms to those of a conventional credit card, i.e. to within ±2mm. In other embodiments the card is of standard credit card dimensions, and the adapter is collapsible so to lie within the boundary of the card.

It is to be understood that the connectivity between the electrical circuit 12 on the card body 11 and the USB adapter 30 can be done differently. For example, the electrical circuit 12 on card body 11 could have only one set of contacts on one surface of the card, and then the adapter 30 may have one set of connections to connect to the systems on the card body 11. But if the adapter has two sets of contacts as in the example to connect to external devices or systems, then the respective contacts of the two sets of contacts will be shorted together so as to allow proper connection regardless of the orientation of the adapter.

Fig. 3c shows a side view of the adapter 30 having two sets of internal contacts 34 and 37. It is to be understood, however, that the present example is merely only one
way to implement the adapter, which in practice can take various forms and may have a set of connections on one side only or have two sets of connections on opposite sides, as required depending on whether the electronic circuit 12 has contact sets on only one or both surfaces thereof. **Fig. 3d** show a schematic perspective view of the adapter 30.

**Figs. 3e** and **3f** show respectively lower and upper cross sectional views through the line A-A in **Fig. 3c**, making apparent the sets of external and internal contacts used in the example of USB adapter 30. The contact set 36 comprises four contacts c13, c14, c15 and c16, respectively connected to GND, D+, D-, Vbus.

Respective contacts of the contact set 36 are directly connected to respective contacts of the contact set 14 which comprises four contacts d, c2, c3 and c4. Contact set 33 comprises four contacts c9, c10, c11 and c12, respectively connected to GND, D+, D-, Vbus. Respective contacts of the contact set 11 are directly connected to respective contacts of the contact set 34 which comprises four contacts c5, c6, c7 and c8.

According to one embodiment, contact set 33 is physically designed to comply with a USB type-A female connector and set 34 is physically designed to connect with the contact set 18 of an electronic system 12 shown in **Fig. 4a**. Contact set 36 is likewise physically designed to comply with a USB type-A female connector and contact set 37 is physically designed to connect with the contact set 12 of an electronic system 12.

**Fig. 4a** shows an exploded view of a card 11 having a mini-retractable adapter 30 shown in extended position in **Fig. 4b** whereby the contacts for external connection protrude outside of the card body allowing connection to other devices or systems. The card can include other systems such as a smart card, magnetic strip or RFID, albeit not limited thereto. Also shown is an identity picture that is printed on the card using known techniques such as printing, laser engraving, embossing etc. as is known in ID cards, credit cards, etc. An aperture 38 serves to secure the adapter in the card by insertion of a pin 39 that prevents sliding movement of the adapter. As noted above, the aperture 38 and the pin 39 constitute a mechanical attachment for securing the adapter to the card. Any other suitable device can be used to mechanically connect the adapter to the card. Likewise, the way the adapter is moved so as to protrude outside of the card surface is not limited to translation movement and other any suitable mechanism may be used. For example, the adapter may be rotated about a hinge axis or it may be moved by combined translation and motion.
Fig. 4c shows a magnified view of the connection area between the mini-retractable adapter 30 and the card, the adapter being shown transparent so as to render visible the contacts 20 on the card in contact with a contact set 37 of the adapter 30 and a contact set 36 of the adapter 30 that is USB compliant in the example. By such means, the adapter 30 may add functionality to the electronic circuit 12. Alternatively, the adapter 30 may be used to add electronic functionality to a conventional non-electronic credit card having a magnetic strip but no electronic circuit 12. To this end there may be embedded within the adapter an electronic circuit (such as that shown as 86 in Fig. 20b.)

Fig. 5a shows a generally L-shaped adapter 40 according to another embodiment of the invention that is fixedly connected to the card along a longitudinal edge thereof and is dimensioned so that an end of the adapter protrudes beyond the transverse edge of the card. Fig. 5b shows the adapter 40 when fitted to the card 11.

Fig. 6a shows a generally L-shaped adapter 41 according to another embodiment of the invention having a fixed portion 42 that is fixedly connected to the card along a longitudinal edge thereof and has a moveable portion is dimensioned so that, when extracted, an end of the adapter protrudes beyond the transverse edge of the card. Fig. 6b shows the adapter 41 in its retracted position.

Fig. 7 shows a generally L-shaped adapter 44 according to an embodiment of the invention that is fixedly coupled to the card 11 along its short edge.

Figs. 8a and 8b show a generally L-shaped adapter 45 according to another embodiment having a moveable portion 46 shown in extended and retracted positions, respectively. The moveable portion 46 is coupled to a fixed portion 47 that is attached to a short edge of the card 11 and has contacts for coupling to an external device. The movable portion 46 will be used in other adapters having different shapes according to different embodiments as described below.

Figs. 9 to 11 show an adapter 50 according to another embodiment adapted to cover the entire card surface and that may have integrated either a necklace hole 51 located, for example, at an edge 52 of the adapter 50, or a crocodile clip 53 so as to allow the adapter to be worn when not in use. The adapter 50 is provided with a protruding contact set 54 for connection to other devices or systems (e.g. but not limited to PC, cellular, PDA's, Radio Car, GPS systems, etc.) The contact set 54 may be fixed as shown in Fig. 9 or may be retractable having an extended state as shown in Fig. 10 and a retracted state as shown in Fig. 11.
The crocodile clip 53 and the necklace hole 51 can be implemented in the adapters according to all embodiments of the invention. The shapes of the adapters described in the above examples are by way of example only and it is to be understood that the adapter is not limited to these shapes.

Figs. 12 and 13 show details of a lock mechanism that can be used to snap-fit the movable adapter according to various embodiments of the invention in extended or in retracted position. The card 11 is provided with an aperture 37, which instead of being round as shown in Fig. 3a is in the form of an elongate slot having respective keyholes 37a and 37b at opposite ends thereof. The adapter 30 is attached to the card 11 by a resilient pin 38 that fits into the elongate slot and so as to slide therein under pressure and expand within the keyholes 37a and 37b, thereby snap-fitting the adapter 30 in the retracted or extended position, respectively.

Figs. 14a and 14b show an example of a device 55 according to another embodiment of the invention having a card 11 that may comply with card thickness as described in standards such as ID1 or ISO 7810. The card 11 supports an electronic circuit 12, a male connector 56 that may be a double-sided USB connector protruding from the card 11 and having contacts 57. As seen in the direction of arrow A-A, the connector 56 has a slightly bulbous split cross-section so that upper and lower portions, shown respectively as 56a and 56b are splayed apart either under the bias of a spring shown schematically as 56c or a gel or by virtue of the natural resilience of the material from which the connector 56 is formed. The electronic circuit 12 may integrate a smart card module having a contact pad 58. The connector 56 connects the device 55 to the USB outlet of an external host computer having a conventional USB outlet, whose internal height is significantly larger than that of the card 11. The connector 56 must therefore be designed that it is sufficiently deep to engage the internal contacts of the USB outlet while not preventing insertion of the card 11 into a ATM machine. The depth of the connector 56 when the upper and lower portions 56a and 56b are splayed apart is such that the contacts 57 properly engage the internal contacts of the USB outlet. However, as shown in Fig. 14b, when the connector 56 is inserted between upper and lower rollers 59a and 59b of an ATM, the split portions 56a and 56b are pressed toward each other thus allowing insertion of the card 11. By such means, the device 55 is suitable for insertion into an ATM in the usual manner, while allowing connection to the USB port of an external host device. The device 55 may be realized by a card 11 having an integral connector as described. Alternatively, an adapter having such a connector may be coupled to a conventional card.
Fig. 15a is an exploded view of a device 60 according to another embodiment of the invention having a card 11 having a flange 61 extending from one side thereof for inserting into a recess 62 in a corresponding side of an adapter 63 supporting an electronic circuit (not shown) and having a male connector 64 at a first end thereof. The card 11 and the adapter 63 are fastened by means of pins 65a and 65b that engage respective apertures 66a and 66b in the electronic circuit 63 and respective apertures 67a and 67b in the adapter 63. As shown, the apertures 67a and 67b may be elongated so as to allow sliding movement of the adapter 63 relative to the card 11, from a retracted position shown in Fig. 15b to an extracted position shown in Fig. 15c. The elongated apertures 67a and 67b may be shaped in a manner similar to those described above with reference to Figs. 12 and 13 so as to snap-fit the adapter 63 in either position.

The adapter 63 may or may not be built from the same material as the card 11 (e.g. but not limited to lamination process, molding, state of the art plastic, etc.) The card 11 has no electronics but may have a surface allowing pre- or post-manufacturing printing. When the two components are aligned and inter-connected with the contact set in its retracted state, the combined device forms a rectangular device that has substantially the same length and width as the ID-1 and ISO 7813 standard format, allowing it to be fitted into a wallet with other credit cards for easy transportation.

Figs. 16a and 16b show opposite sides of adapter 63 from which it is seen that the connector 64 is a double-sided connector having a first set of contacts 68a on a first side thereof and a second set of contacts 68b on a second, opposite side thereof. Also shown at a second end of the adapter 63 opposite the first end, is a second double-sided connector 69, having first and second sets of contacts 70a and 70b on opposite surface. The contacts 68a, 68b and 70a, 70b allow the electronic circuit within the adapter 63 to be connected to external devices, such as a PC or card reader. When used to couple the adapter 63 to a PC, the respective contacts of either or both connectors 64 and 69 may conform to the USB standard. Alternatively, they may conform to ISO 14443 or ISO 7816 standard interface for coupling to contacts of conventional smart card readers. Likewise, other contact arrangements may equally well be employed, such as, but not limited to, MiniUSB, MicroUSB, SmartCard, IEEE, etc. Although separate connectors 64 and 69 are shown in Figs. 16a and 16b, it will be appreciated that in some embodiments only a single connector may be necessary; and although double-sided connectors are shown, one or both of the connectors may be single-sided.
The embodiment shown in Figs. 15 and 16 is particularly adapted to add electronic functionality to a non-electronic data carrier such as conventional credit card having a magnetic stripe. As noted above, the adapter 63 supports an electronic circuit, which at its most basic can be simply a memory component. Any of the techniques described above may be employed to mechanically attach the adapter 63 to the card 11 so as to allow movement of the adapter as shown or fixed attachment.

Fig. 17 shows a device 75 similar to that shown in Fig. 15a, the only difference being that the flange 61 is provided on the adapter 63, while the recess 62 is part of the card 11. All other components and their manner of engagement are as described above with reference to Fig. 15a and identical reference numerals are used.

Figs. 18a, 18b and 18c show a device 80 in the form of an electronic card 81 that may comply with ID-1 and ISO 7813 standard dimensions but is not limited thereto, having an embedded RFID 82, a smart card contact pad 83 and a magnetic stripe 84. The card 81 is configured for mechanical coupling to an adapter 85 having an embedded electronic circuit 86 (shown in dotted outline), thus producing a multifunction card that can be stored in a wallet.

Fig. 18a shows the device 80 with the adapter 85 in a retracted state for ease of transportation and/or carrying. An end of the adapter 85 supports a connector 87 having contacts 88 on at least one surface thereof. Thus, although in the figure only one set of contacts 88 is shown, another set can be implemented on the opposite surface of the adapter 85. Fig. 18b shows the same device as in Fig. 18a but this time with the adapter 82 in extended position for connecting the connector 84 to external devices or systems.

Fig. 18c is an exploded view of the adapter 85 prior to assembly to the electronic card 81. Thus, pins 65a and 65b engage apertures 66a and 66b on the adapter 85, as well as the elongated apertures 67a and 67b in the electronic card 81, which allow movement between the adapter 85 and card 81.

Figs. 19a, 19b and 19c show non-limiting embodiments of a card having corners that are contoured differently to allow the adapter 85, when coupled thereto in its retracted state, to form a rectangle with the card 81 that may optionally conform to ID-1 and ISO 7813 standard length and width.

Figs. 20a and 20b show a device 90 similar in many respects to the device 80 described above with reference to Fig. 18a and identical reference numerals are used to reference those components that are common to both embodiments. An electronic card 81 that may comply with ID-1 and ISO 7813 standard dimensions but is not limited
thereto supports an electronic circuit 91 having an embedded RFID 82, and a smart card contact pad 83. The card 81 is configured for mechanical and electrical coupling to an adapter 85 having an embedded electronic circuit 86 (shown in dotted outline), thus producing a multi-function card that can be stored in a wallet. The electronic circuit 91 is provided with a first connector 92 whose contacts are adapted to engage corresponding contacts of a second connector 93 (shown in dotted outline) on the adapter 85 when the adapter 85 is in its extended state. Thus, by extending the adapter 85, electrical communication is established between the electronic circuit 91 on the card 81 and the electronic circuit 86 on the adapter 85 so that they can exchange data or receive power one from the other, for example.

Fig. 21a shows another example of a device 95 comprising a card 96, typically having a substrate whose thickness is more than 1mm in which a first electronic circuit 97 is embedded. An adapter 98 is shown connected to the card 96 in its retracted state. The adapter 98 embeds a second electronic circuit 99, shown in dotted outline.

Fig. 21b is an exploded view the device 95 showing details of the adapter 98, which may be formed wholly or partially from lamination process material and electrically connected to the first electronic circuit 97 by means of a flexible cable 100. By way of example, the second electronic circuit 99 is shown as an MP3 player having controls 101 and a display 102. The MP3 player also has an audio output connector 103 to which an earphone 104 may be connected via connectors 105 and 106. The first electronic circuit 97 may contain a battery or may itself be a battery for supplying power to the second electronic circuit 99. A set of contacts 107 in the adapter 98 allows connection to external devices or systems (e.g. PC, cellular, PDA’s, Radio Car, GPS systems, etc.). The battery, while not a feature of the invention, may be a flexible thin layer electrochemical cell such as described in US 2002/192542 in the name of Power Paper Ltd. of Petach Tikva, Israel.

If desired, the contacts 107 may be formed on both surfaces of the adapter 98 so as to allow connection to an external device or system in either orientation of the adapter 98. The adapter 98 may be mechanically coupled to the card 96 in a manner similar to that described above with reference to Fig. 15a. In this case, it will be noted that elongated apertures 66a and 66b are provided on a flange 61 of the adapter, which is inserted into a recess 62 of the card to allow engagement with corresponding circular apertures 67a and 67b via pins (not shown). The adapter 98 may then be moved longitudinally relative to the card 96 so as to extract the adapter when in use, and to withdraw it for carrying whereupon its major dimensions may conform to those
of a Standard credit card. It should also be noted that according to one embodiment of such a device, the first electronic circuit 97 embedded in the card 96 may simply be a battery for supplying power to the second electronic circuit.

While the invention has been described in connection with a number of embodiments, it is not intended to limit the scope of the invention to the particular form set forth, but on the contrary, it is intended to cover such alternatives, modifications, and equivalents as may be included within the spirit and scope of the invention as defined by the appended claims.

For example, it will be appreciated that although device 60 shown in Fig. 15a has only a single flange 61 in the card 11 for engaging a single recess 62 in the adapter, the card may be provided with more than one flange and the adapter may be provided with more than one recess. A similar consideration applies to the device 75 shown in Fig. 17 where the card 11 may have more than one recess and the adapter 63 more than one flange.

USB is an acronym for Universal Serial Bus, which has become the universal standard for connecting peripherals to computer motherboards. Although some embodiments of the invention have been described with particular reference to the USB standard, it is to be understood that the principles of the invention are equally applicable to other standards and particularly to connectors having different contact arrangements than the USB standard. It is therefore to be understood that the invention both as described and as claimed is not intended to be limited to any specific standard and the more generic term "flexibly connectable computer systems" abbreviated as FCCS will be used to denote any interface standard for allowing devices to be connected to a computer. Specifically, wherever the term FCCS or USB is used in the claims, this is intended to embrace a connector that conforms to any of the following standards:

USB; Mini USB; Micro USB; IEEE-1394; SD; Mini SD and Micro SD.
CLAIMS:
1. An adapter (30, 40, 41, 44, 45, 50, 63, 85) for coupling to a portable device (10) having a substantially card-shaped body, the adapter comprising:
   a casing (31) adapted for mechanical attachment to the portable device,
   an electronic circuit (86) supported on or in the casing, and
   a set of FCCS compatible contacts (88) coupled to the electronic circuit (86) and being accessible from at least one outer surface of the casing for connecting the electronic circuit to an external device.

2. The adapter according to claim 1, wherein in at least one position of the adapter when fixed to the portable device, an overall length and width of the portable device and the adapter combined substantially conforms to those of a conventional credit card.

3. The adapter according to claim 2, wherein the casing when fixed to the portable device is moveable relative to the portable device from a first position where the contacts are contained within a boundary of the portable device to a second position where the contacts protrude outside the boundary of the portable device.

4. The adapter according to any one of claims 1 to 3, wherein the electronic circuit includes a memory chip.

5. The adapter (98) according to any one of claims 1 to 4, wherein the electronic circuit (99) is adapted to receive power from a battery (97) within the portable device (96).

6. The adapter according to any one of claims 1 to 5, wherein the electronic circuit (91) includes a first connector (92) whose contacts are adapted to engage corresponding contacts of a second connector (93) on the adapter (85).

7. The adapter (63) according to any one of claims 1 to 6, wherein the casing is provided with at least one flange (61) in a side thereof for inserting into a respective recess (62) in a side of the card (11).

8. The adapter (63) according to any one of claims 1 to 6, wherein the casing is provided with at least one recess (62) in a side thereof for accommodating a respective flange (61) protruding from a side of the card (11).
9. The adapter (30, 63) according to any one of claims 1 to 6, having at least one aperture (37, 66a, 66b) for coupling to a corresponding aperture (67a, 67b) of the portable device (10) via a respective pin (38, 65a, 65b).

10. The adapter according to claim 9, wherein respective apertures (67a, 67b) in the adapter or the portable device are elongated so as to allow limited sliding movement of the adapter relative to the portable device.

11. The adapter according to any one of claims 1 to 5, wherein:
   respective apertures (67a, 67b) in the adapter or the portable device are elongated so as to allow limited sliding movement of the adapter relative to the portable device from a retracted state to an extended state; and
   the electronic circuit (91) includes a first connector (92) whose contacts are adapted to engage corresponding contacts of a second connector (93) on the adapter (85) when the adapter is in its extended state.

12. The adapter (30) according to any one of claims 9 to 11, wherein:
   each of the apertures is an elongate slot (37) having respective keyholes (37a, 37b) at opposite ends thereof, and
   the pin (38) is adapted to fit into the elongate slot and expand within the keyholes (37a, 37b) thereby snap-fitting the adapter in a retracted or extended position.

13. The adapter according to any one of claims 1 to 12, wherein the FCCS compatible contacts (57) are mounted on a connector (56) having a bulbous split cross-section so that upper and lower portions (56a, 56b) are resiliently splayed apart.

14. The adapter according to claim 13, wherein respective thicknesses of said upper and lower portions (56a, 56b) are dimensioned such that when pressed together they have a combined thickness that is sufficiently thin to pass through an automatic teller machine (ATM).

15. The adapter according to any one of claims 1 to 14, wherein the FCCS compatible contacts (88) are provided on opposing outer surfaces of the casing.

16. The adapter according to any one of claims 1 to 15, wherein the FCCS compatible contacts (88) are USB compatible.
17. A portable device having a substantially card-shaped body fixedly coupled to the adapter of any one of claims 1 to 16.

18. The portable device according to claim 17, wherein the card (11) includes an upper (13) laminated layer and a lower laminated layer (14).

19. The portable device according to claim 17 or 18, wherein the card (11) has at least one embedded electronic circuit (12).

20. The portable device according to claim 19, wherein the electronic circuit includes a memory component.

21. The portable device according to claim 19, wherein the electronic circuit is a memory component.

22. The portable device (90) according to claim 19, wherein the electronic circuit (97) is a battery.

23. The portable device according to claim 19, wherein the electronic circuit (91) is adapted to establish electrical communication with an electronic circuit (86) on the adapter (85).

24. The portable device according to claim 19, wherein the electronic circuit (91) includes an RFID.

25. The portable device according to claim 19, wherein the electronic circuit (91) includes a smart card.

26. A portable device (55) comprising:
   - a substantially card-shaped body (11) supporting an electronic circuit (12) and a male connector (56) protruding from an end of the card (11) and having contacts (57);
   - wherein the connector (56) has a bulbous split cross-section so that upper and lower portions (56a, 56b) of the connector are resiliently splayed apart.

27. The portable device according to claim 26, wherein the contacts are FCCS-compatible.

28. The portable device according to claim 26 or 27, wherein the connector (56) is a double-sided USB connector.
29. The portable device according to any one of claims 26 to 28, wherein respective thicknesses of said upper and lower portions (56a, 56b) are dimensioned such that when pressed together they have a combined thickness that is sufficiently thin to pass through an automatic teller machine (ATM).

30. A method for adding electronic functionality to a portable device (10) having a substantially card-shaped body, the method comprising:
   (a) providing an adapter (30) having a electronic circuit coupled to FCCS compatible contacts for connection to an external device; and
   (b) mechanically coupling the adapter to the portable device.

31. The method according to claim 30, configuring the adapter so that in at least one state thereof the electronic circuit is coupled to an electronic circuit within the portable device.

32. The method according to claim 30 or 31, wherein mechanically coupling the adapter to the data carrier includes fixedly mounting the adapter on the data carrier.

33. The method according to claim 30 or 31, wherein mechanically coupling the adapter to the data carrier includes moveably mounting the adapter on the data carrier.
AMENDED CLAIMS
[received by the International Bureau on 19 October 2007 (19.10.2007)]

CLAIMS:

1. An adapter (30, 40, 41, 44, 45, 50, 63, 85) for coupling to a portable device (10) having a substantially card-shaped body, the adapter comprising:
   a casing (31) adapted for mechanical attachment to the portable device,
   an electronic circuit (86) supported on or in the casing, and
   a set of FCCS compatible contacts (57, 88) coupled to the electronic circuit (86) and being accessible from at least one outer surface of the casing for connecting the electronic circuit to an external device;
   characterized in that:
   the body of said device (10) is of substantially credit card dimensions; and
   the FCCS compatible contacts (57) are mounted on a connector (56) having a bulbous split cross-section so that upper and lower portions (56a, 56b) are resiliently splayed apart.

2. The adapter according to claim 1, wherein in at least one position of the adapter when fixed to the portable device, an overall length and width of the portable device and the adapter combined substantially conforms to those of a conventional credit card.

3. The adapter according to claim 2, wherein the casing when fixed to the portable device is moveable relative to the portable device from a first position where the contacts are contained within a boundary of the portable device to a second position where the contacts protrude outside the boundary of the portable device.

4. The adapter according to any one of claims 1 to 3, wherein the electronic circuit includes a memory chip.

5. The adapter (98) according to any one of claims 1 to 4, wherein the electronic circuit (99) is adapted to receive power from a battery (97) within the portable device (96).

6. The adapter according to any one of claims 1 to 5, wherein the electronic circuit (91) includes a first connector (92) whose contacts are adapted to engage corresponding contacts of a second connector (93) on the adapter (85).
7. The adapter (63) according to any one of claims 1 to 6, wherein the casing is provided with at least one flange (61) in a side thereof for inserting into a respective recess (62) in a side of the card (11).

8. The adapter (63) according to any one of claims 1 to 6, wherein the casing is provided with at least one recess (62) in a side thereof for accommodating a respective flange (61) protruding from a side of the card (11).

9. The adapter (30, 63) according to any one of claims 1 to 6, having at least one aperture (37, 66a, 66b) for coupling to a corresponding aperture (67a, 67b) of the portable device (10) via a respective pin (38, 65a, 65b).

10. The adapter according to claim 9, wherein respective apertures (67a, 67b) in the adapter or the portable device are elongated so as to allow limited sliding movement of the adapter relative to the portable device.

11. The adapter according to any one of claims 1 to 5, wherein:

   respective apertures (67a, 67b) in the adapter or the portable device are elongated so as to allow limited sliding movement of the adapter relative to the portable device from a retracted state to an extended state; and

   the electronic circuit (91) includes a first connector (92) whose contacts are adapted to engage corresponding contacts of a second connector (93) on the adapter (85) when the adapter is in its extended state.

12. The adapter (30) according to any one of claims 9 to 11, wherein:

   each of the apertures is an elongate slot (37) having respective keyholes (37a, 37b) at opposite ends thereof, and

   the pin (38) is adapted to fit into the elongate slot and expand within the keyholes (37a, 37b) thereby snap-fitting the adapter in a retracted or extended position.

13. The adapter according to claim 1 to 12, wherein respective thicknesses of said upper and lower portions (56a, 56b) are dimensioned such that when pressed together they have a combined thickness that is sufficiently thin to pass through an automatic teller machine (ATM).

14. The adapter according to any one of claims 1 to 13, wherein the FCCS compatible contacts (88) are provided on opposing outer surfaces of the casing.

AMENDED SHEET (ARTICLE 19)
15. The adapter according to any one of claims 1 to 14, wherein the FCCS compatible contacts (88) are USB compatible.

16. A portable device having a substantially card-shaped body fixedly coupled to
the adapter of any one of claims 1 to 15.

17. The portable device according to claim 16, wherein the card (11) includes an
upper (13) laminated layer and a lower laminated layer (14).

18. The portable device according to claim 16 or 17, wherein the card (11) has at
least one embedded electronic circuit (12).

19. The portable device according to claim 18, wherein the electronic circuit
includes a memory component.

20. The portable device according to claim 18, wherein the electronic circuit is a
memory component.

21. The portable device (90) according to claim 18, wherein the electronic circuit
(97) is a battery.

22. The portable device according to claim 18, wherein the electronic circuit (91) is
adapted to establish electrical communication with an electronic circuit (86) on the
adapter (85).

23. The portable device according to claim 18, wherein the electronic circuit (91)
includes an RFID.

24. The portable device according to claim 18, wherein the electronic circuit (91)
includes a smart card.

25. A portable device (55) comprising:
   a substantially card-shaped body (11) supporting an electronic circuit (12) and a
male connector (56) protruding from an end of the card (11) and having contacts (57);
   wherein the connector (56) has a bulbous split cross-section so that upper and
lower portions (56a, 56b) of the connector are resiliently splayed apart.

26. The portable device according to claim 25, wherein the contacts are FCCS-
compatible.

AMENDED SHEET (ARTICLE 19)
27. The portable device according to claim 25 or 26, wherein the connector (56) is a double-sided USB connector.

28. The portable device according to any one of claims 25 to 27, wherein respective thicknesses of said upper and lower portions (56a, 56b) are dimensioned such that when pressed together they have a combined thickness that is sufficiently thin to pass through an automatic teller machine (ATM),

29. A method for adding electronic functionality to a portable device (10) having a substantially card-shaped body, the method comprising:
   (a) providing an adapter (30) having a electronic circuit and a connector supporting FCCS compatible contacts for connection to an external device; and
   (b) mechanically coupling the adapter to the portable device; characterized by:
      (c) forming said device (10) so that the body is of substantially credit card dimensions; and
      (d) providing the connector (56) with a bulbous split cross-section so that upper and lower portions (56a, 56b) are resiliency splayed apart.

30. The method according to claim 29, configuring the adapter so that in at least one state thereof the electronic circuit is coupled to an electronic circuit within the portable device.

31. The method according to claim 29 or 30, wherein mechanically coupling the adapter to the data carrier includes fixedly mounting the adapter on the data carrier.

32. The method according to claim 29 or 30, wherein mechanically coupling the adapter to the data carrier includes moveably mounting the adapter on the data carrier.
A. CLASSIFICATION OF SUBJECT MATTER
INV. G06K19/077 H01R31/06

According to International Patent Classification (IPC) or to both national classification and IPC.

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
HOIR G06K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and where practical, search terms used)

EPO-Internal, wpi Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Further documents are listed in the continuation of Box C

See patent family annex

* Special categories of cited documents

IA* document defining the general state of the art which is not considered to be of particular relevance
E* earlier document but published on or after the international filing date
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Date of the actual completion of the international search: 13 August 2007
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Name and mailing address of the ISA:
European Patent Office, P B 5818 Patentlaan 2
NL-2280 HV RiJSWijk
Tel (+31-70) 340-2040, Tx 31 651 epo nl,
Fax (+31-70) 340-3016

Authorized officer: Segerberg, Tomas
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