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(54) Title: CARTE A PUCHE AVEC ALIMENTATION EN Energie INTEGREE

(57) Abstract: A portable object (1) comprises a circuit (22) for receiving information conveyed by an energy field and an internal energy source (18). The portable object (1) further comprises: a switch (24), that connects the circuit (22) to the internal energy source (18) when the switch (24) receives a control energy that is above a threshold level; and a switch controller (23) that substantially derives the control energy from the energy field.
GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent
(BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR,
NE, SN, TD, TG).

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Integrated circuit card with
built-in power supply

FIELD OF THE INVENTION

This invention concerns an integrated circuit card, such as a mixed connection integrated circuit card which can be connected to a reader either by a contact connection via the card's external connection pads, or by a contactless connection via electromagnetic coupling, or such as a contactless integrated circuit card operating for example by electromagnetic coupling. The integrated circuit cards of this type are used for example as identification cards, access cards, remote toll cards, etc.

BACKGROUND OF THE INVENTION

A card of this type includes a card body with an antenna and an integrated circuit connected to the antenna.

A contactless reading device which can be used with this type of card includes the means to transmit a signal in the form of an electromagnetic field which is converted by the antenna into an electrical signal supplying firstly the energy required to supply the integrated circuit and secondly information used by the integrated circuit, and means to receive signals transmitted in return by the integrated circuit via the card's antenna. Such contactless systems are interesting since they allow an exchange of information between the card and the reading device when the holder moves the card in front of this reading device without the need, as with the contact systems, for the cardholder to stop and insert the card in a reading device.

However, a disadvantage of this system lies in the fact that the amplitude of the signal supplied by the antenna from the electromagnetic field emitted by the reading device drops rapidly as the distance between the reading device and
the card increases. Below a certain voltage, the integrated circuit is unable to operate.

Because of this constraint integrated circuits requiring very low electrical energy to operate are required, whereas the current trend in the contact systems is to use integrated circuits including cryptographic functions, which require a relatively large amount of energy. With the known contactless reading systems, if such integrated circuits are used the card would either have to be held a few centimetres from the reading device to obtain the energy required to supply the integrated circuit during its operation, or the internal clock frequency of the integrated circuit would have to be slowed down in order to reduce its consumption, which would then increase the duration of the transaction to the extent that contactless use as the cardholder passes would no longer be possible.

It is noted that the European patent application published under number EP 0 582 961 concerns a read/write device for transmitting data to an autonomous data-storing device without using any cable. The autonomous data-storing device comprises a detector and a first battery for supplying the detector. The autonomous data-storing device further comprises a data processing unit. A second battery and a switch are associated to the data processing unit so that the second battery is connected to the data processing unit only during data transmission.

**SUMMARY OF THE INVENTION**

It is an object of the invention to reduce costs.

According to one aspect of the invention, a portable object comprises a circuit for receiving information conveyed by an energy field and an internal energy source. The portable object further comprises a switch, that connects the circuit to the internal energy source when the switch
receives a control energy that is above a threshold level. The portable object further comprises a switch controller that substantially derives the control energy from the energy field.

The portable object according to the invention thus does not require an additional internal energy source for controlling the switch. This allows a cost reduction.

Advantageous embodiments are defined in the dependant claims. It is noted that an implementation of the characteristics of claim 2 or claim 3 does not necessitate the application of the characteristics of claim 1.

Other features and advantages of the invention will appear on reading the description which follows of a special, non-limiting mode of realisation of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

It will refer to the drawings attached, amongst which:

- figure 1 is a diagram of the battery and the card integrated circuit according to the invention;
- figure 2 is a plan view of the centre sheet of the card according to the invention; and
- figure 3 is a cross-section through the thickness of the card according to the invention, with exploded view.

DETAILED DESCRIPTION

In reference to the figures, the card described here is a mixed connection card which includes in a known manner a card body generally designated in 1 in which an integrated circuit module generally designated in 2 and an antenna 3 are mounted. This type of card is designed for use with a contactless reading device capable of emitting in a known
manner an electromagnetic field which is picked up by the antenna 3 to supply to the integrated circuit module 2 information to be processed, and to receive signals emitted in response by the integrated circuit module 2 via the antenna 3.

The card body 1 includes a centre sheet 4 with a side 5 on which is attached a covering sheet 6 and an opposite side 7 on which is attached a covering sheet 8. The thickness of the centre sheet 4 is approximately 500 µm and the thickness of the covering sheets 6 and 8 is approximately 150 µm each.

The integrated circuit module 2 includes a support sheet 9 with a side 10 on which is fixed an integrated circuit 11 encapsulated in a resin block 12 and on which there are internal connection pads 13.1, 13.2 connected to the integrated circuit 11 and an opposite side 14 on which there are external connection pads 15 also connected to the integrated circuit by conductors not visible crossing the support sheet 9.

The integrated circuit module 2 is fitted in a tiered housing of the card body 1 including a cavity 16 made in the centre sheet 4 and the covering sheet 6 to receive the resin block 12 and a spot facing 17 cut in the covering sheet 6 to receive the support sheet 9.

The antenna 3 extends over side 5 of the centre sheet 4 and includes ends 3.1, 3.2 which come out in the bottom of the spot facing 17 to form terminals for connection to the internal connection pads 13.1 of the integrated circuit module 2.

The card according to the invention also includes a battery 18 fitted in a cavity 19 of the centre sheet 4. The thickness of the battery 18 is approximately the same as the thickness of the centre sheet 4 and is therefore held in position in the card body 1 by the sides of the cavity 19 and the covering sheets 6, 8. The battery 18 is connected by conductors 20 to connection pads 21 which come out in the bottom of the spot facing 17 to form terminals for connection
to the internal connection pads 13.2 of the integrated circuit module 2.

The integrated circuit 11 will now be described in more detail.

The integrated circuit 11 includes a processing part 22 connected firstly to an operating part 23 and secondly to the internal connection pads 13.2 via a switching element 24.

The switching element 24 is of type static electronic switch, such as a transistor, formed in the integrated circuit 11 and has an activated state in which the processing part 22 is connected to the battery 18 via the pads 13.2 and 21 and a deactivated state in which the processing part 22 is disconnected from the battery 18. The switching element 24 is connected to the operating part 23 to be controlled by it.

The operating part 23 is connected to the internal connection pads 13.1 of the integrated circuit module 2 to extract (especially by demodulation), from the signal supplied by the antenna 3 from the electromagnetic field emitted by the reading device, firstly a power signal to either power the processing part 22 or control the switching element 24 and secondly an information signal to transmit it to the processing part 22 so that the signal can be processed. The operating part comprises 23 a rectifier for rectifying the signal supplied by the antenna 3 from the electromagnetic field emitted by the reading device. The power signal thus substantially derives from the electromagnetic field emitted by the reading device.

The card operation will now be described.

When the card is subject to an electromagnetic field, the antenna 3 converts this field into an electrical signal. The operating part 23 analyses the electrical signal so as to check whether the electrical signal is intended to be used by the processing part 22 or not.

If the signal is not intended to be used by the processing part 22, this signal is ignored.

We will now assume that the signal picked up is intended to be used by the processing part 22.
If the amplitude of the signal supplied by the antenna from the electromagnetic field is greater than a lower amplitude threshold and less than an upper amplitude threshold, the power signal obtained is sufficient to set the switching element 22 into its activated state but insufficient to power the processing part 22 directly. The operating part 23 then sets the switching element 24 into its activated state. The processing part 22 is thereby powered by the battery 18 and can process the information signal transmitted by the operating part 23.

If the amplitude is greater than the upper amplitude threshold, the power signal obtained is sufficient to power the processing part 22 directly. The operating part 23 then sets the switching element 24 into its deactivated state and powers the processing part 22 from the power signal.

If the amplitude drops below the upper amplitude threshold, the operating part 23 sets the switching element 24 into its activated state and the processing part 22 is thereby powered by the battery 18.

If the amplitude drops below the lower amplitude threshold, the switching element 24 is deactivated and the power supply of the processing part 22 is switched off.

The card manufacture will now be described.

Manufacture of the card starts by putting the battery 18 in the cavity 19 of the centre sheet 4 and creating the antenna 3, the conductors 20 and the pads 21 (for example as copper lines, conducting ink, brazing paste, silver glue, etc.).

The sheets 4, 6, 8 are then assembled and laminated.

The sport facing 17 and the cavity 16 are milled before fixing the integrated circuit module 2 in the housing so created. The internal connection pads 13.1, 13.2 connect the integrated circuit 11 respectively to the ends 3.1, 3.2 of the antenna 3 and to the pads 20.

The embodiment described hereinbefore with reference to the drawings illustrates the following characteristics. A
portable object (1) comprises a circuit (22) for receiving information conveyed by an energy field and an internal energy source (18). The portable object (1) further comprises:

- a switch (24), that connects the circuit (22) to the internal energy source (18) when the switch (24) receives a control energy (power signal) that is above a critical level; and
- a switch controller (23) that substantially derives the control energy from the energy field.

The invention is of course not limited to the method described and variants can be made without leaving the scope of the invention as defined by the claims.

In particular, the invention is also applicable to contactless cards and especially to those in which the integrated circuit is mounted using the flip-chip technique.

The architecture of the integrated circuit may also be different from that described.

As mentioned in the above description, the operating part 23 effects three different functions. The operating part 23 transmits information to the processing part 22. The device 23 also controls the switching element 24 and supplies the processing part 22. It also possible to have three different circuits each of the circuits carrying out one of these functions.

As a variant, the reading device may be designed to emit a specific control signal for the switching element 24.

It is also possible not to plan for direct powering of the integrated circuit with the energy drawn from the signal supplied by the antenna by controlling the switching element 24 uniquely according to a lower threshold so that as soon as the signal amplitude is greater than this threshold, the integrated circuit is powered by the battery.

In addition, the battery may be a rechargeable accumulator, the card then including for example means of connecting the battery to an external power supply source.
Also, the ends 3.1, 3.2 of the antenna 3 and the connection pads 21 may come out in the spot facing 17 indirectly via conductors.

The card may also be manufactured by methods different from that described and especially by moulding.
CLAIMS

1. A portable object (1) comprising:
   - a circuit (22) for receiving information conveyed by an energy field; and
   - an internal energy source (18);
characterized in that the portable object (1) comprises:
   - a switch (24), that connects the circuit (22) to the internal energy source (18) when the switch (24) receives a control energy that is above a threshold level;
   - a switch controller (23) that substantially derives the control energy from the energy field.

2. The portable object (1) according to claim 1, characterized in that, the portable object (1) comprises:
   - an energy extractor for extracting an electrical energy from the energy field; and
   - a power supply path for applying the electrical energy extracted from the energy field to the circuit (22).

3. The portable object (1) according to claim 2, characterized in that, the power supply path comprises the switch, the switch controller (23) being arranged to apply the electrical energy to the circuit (22) and to disconnect the internal energy source from the circuit (22), when the energy field is sufficiently strong so as to power the circuit (22).
**INTERNATIONAL SEARCH REPORT**

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC 7 G06K19/07 G06K7/00

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)

IPC 7 G06K G01S

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

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

EPO-Internal, PAJ, WPI Data

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

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Further documents are listed in the continuation of box C.

**X** Patent family members are listed in annex.

* Special categories of cited documents:

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