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(54) CONTACTLESS ELECTRONIC COMMUNICATION DEVICE WITH OPTIONAL AUXILIARY POWER SOURCE

(76) Inventors: **Thierry Desfontaines**, Le Petit Rouviere (FR); **Philippe Rincel**, Puy Ricard (FR); **Nathalie Caye**, Lille (FR)

Correspondence Address:
ROLAND PLOTTEL
ROCKFELLER CENTER STN.
P.O. BOX 293
NEW YORK, NY 10185-0293 (US)

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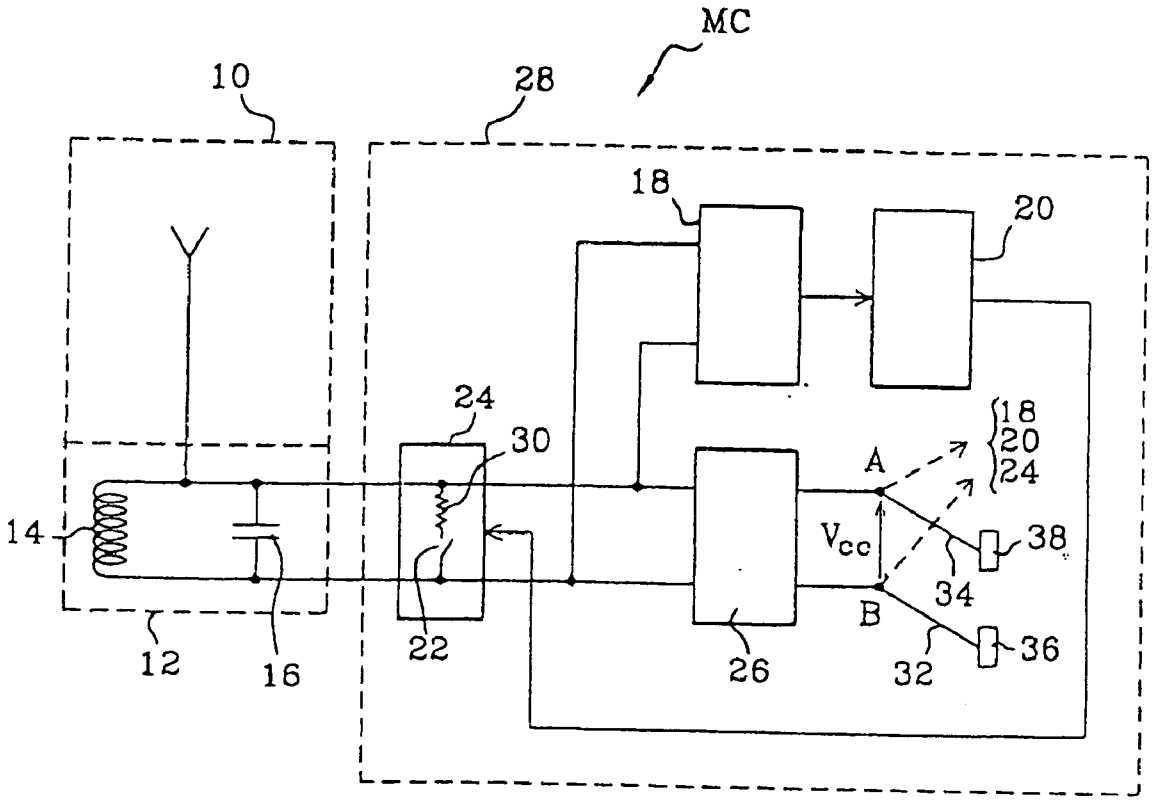
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(57) **ABSTRACT**

A device having a card (**40**) and a support (PC). The card has (a) no internal battery, (b) a single antenna (**10**) that receives electromagnetically data and power, (c) a data processor, (d) rectifying and filtering circuitry receiving the electromagnetic input and supplying at output terminals (A, B) a voltage to the processor. and (e) two terminals (**36, 38**) on an external surface of the card which are connected to the output terminals (A, B). The support is mechanically and electrically connectable to the card. It has (a) a power source that may be a battery, (b) surface terminals that mate with the card's external terminals, (c) a switch for connecting the power source to the surface terminals, and (d) a mechanism for holding together the card and support with the card's and the support terminal's electrically engaged to one another.



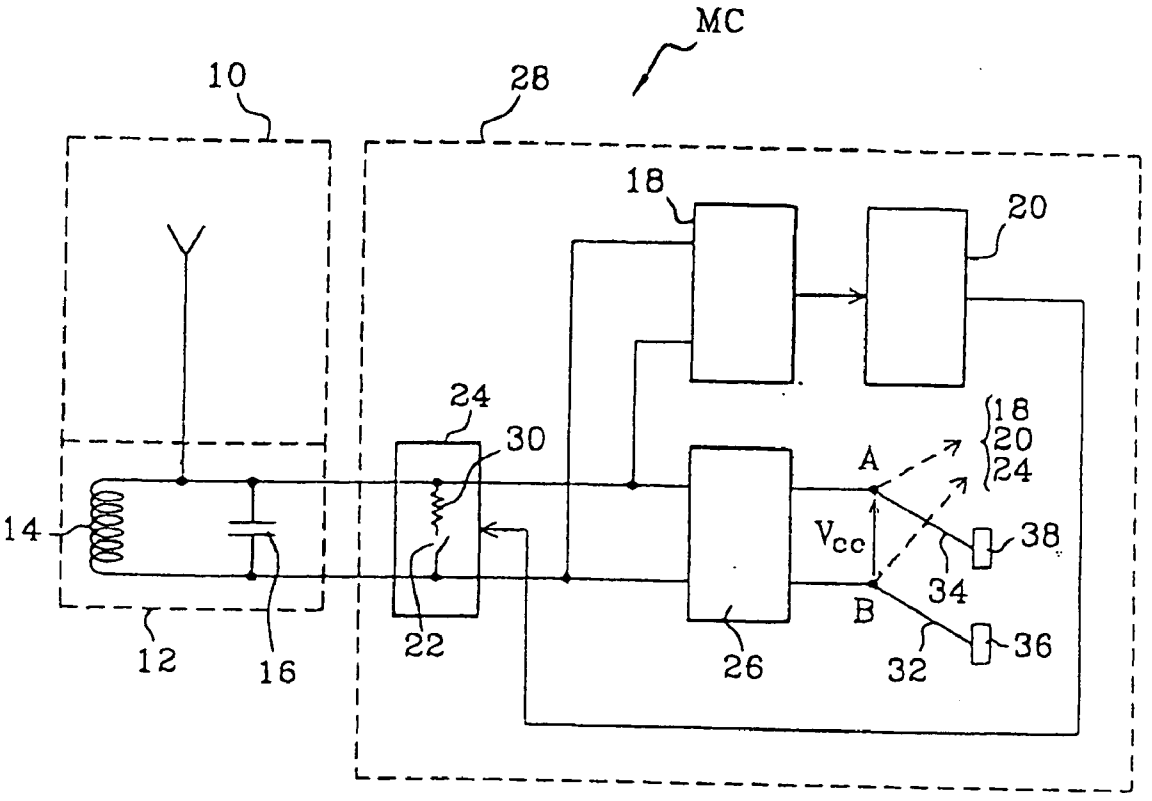


FIG.1

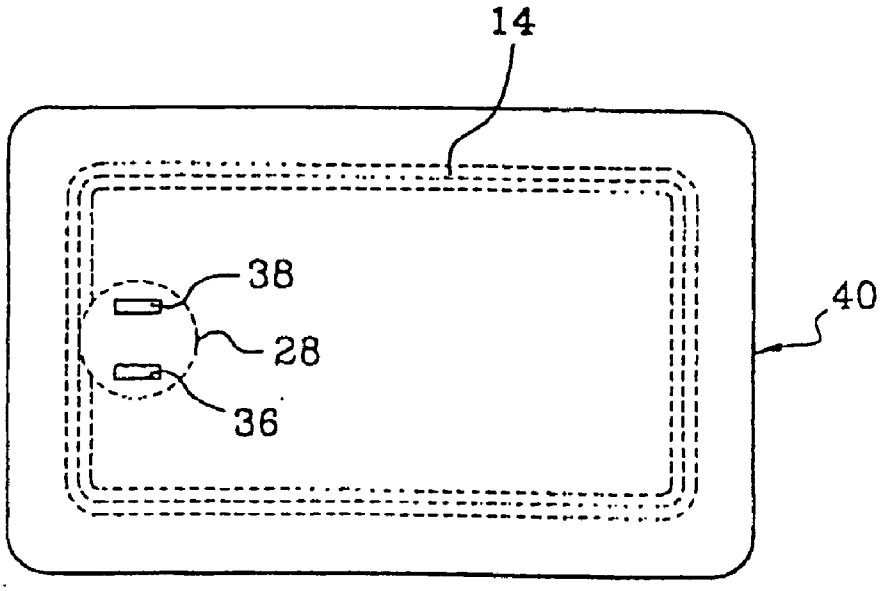


FIG.2A

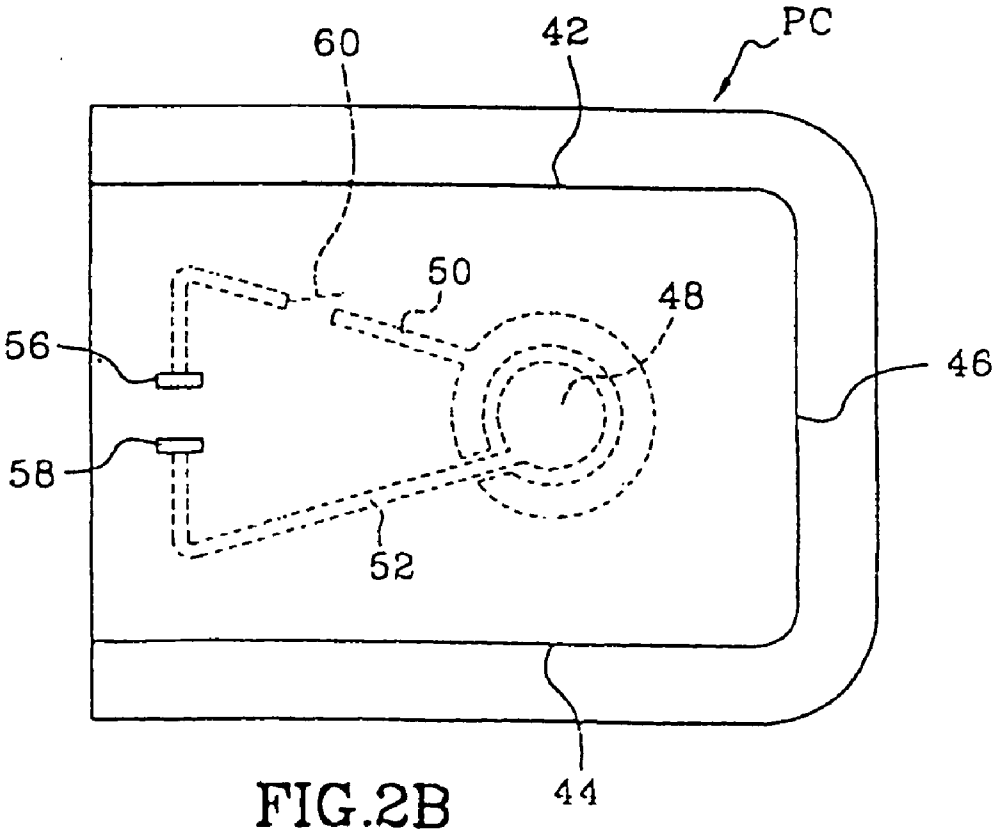


FIG.2B

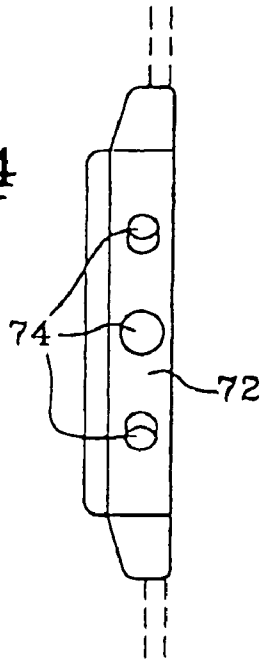


FIG.4

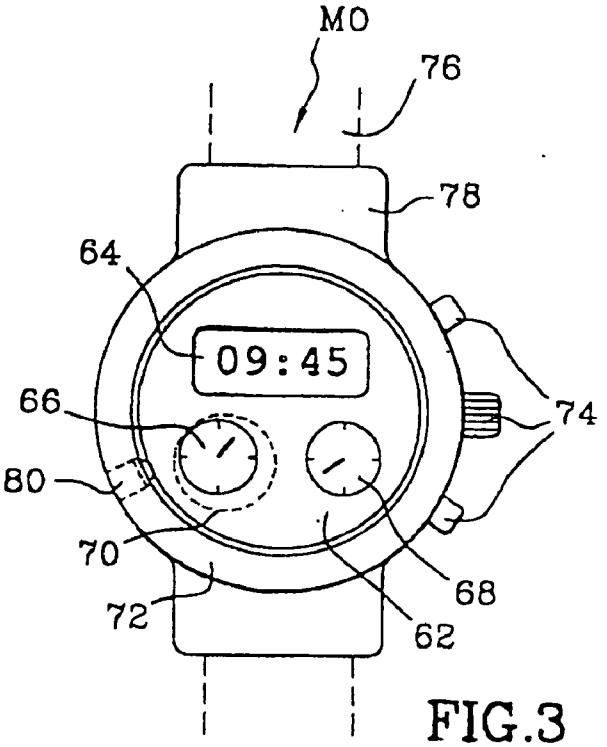


FIG.3

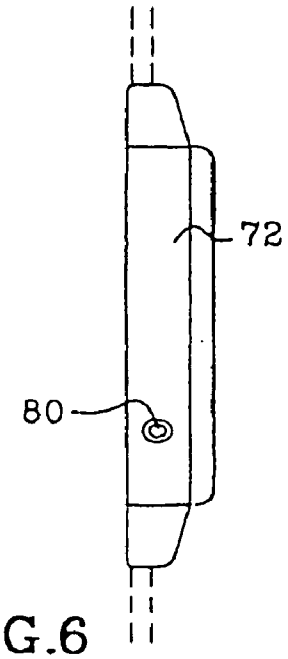


FIG.6

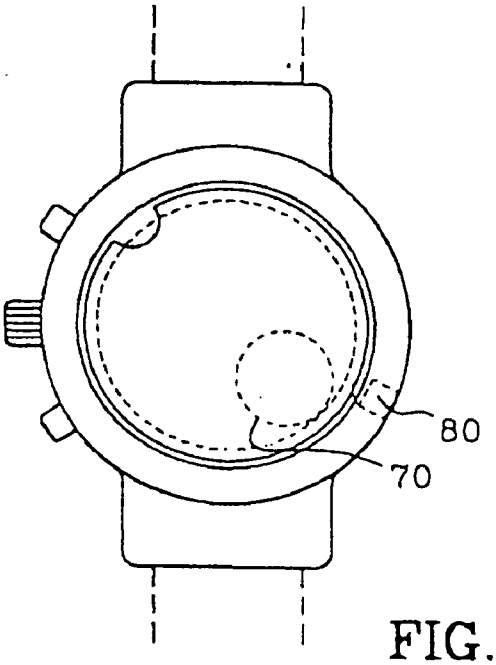


FIG.5

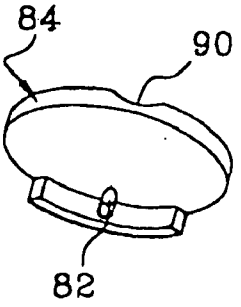


FIG.7

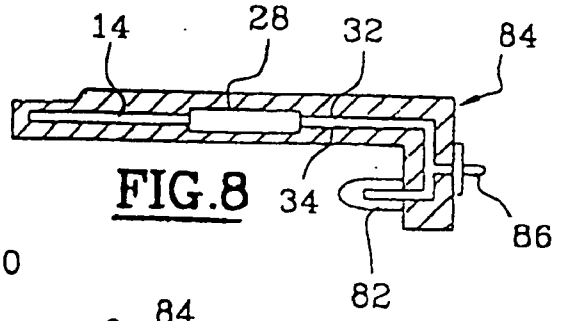


FIG.8

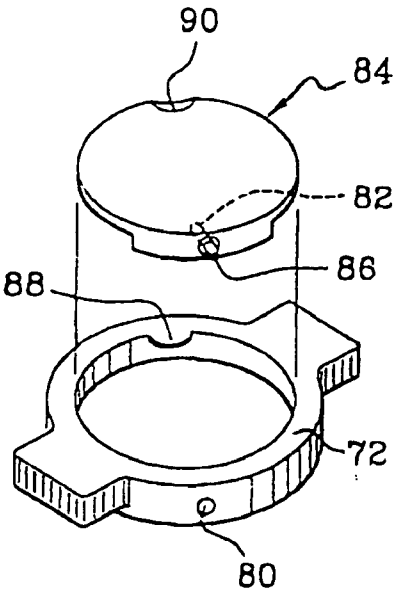


FIG.9

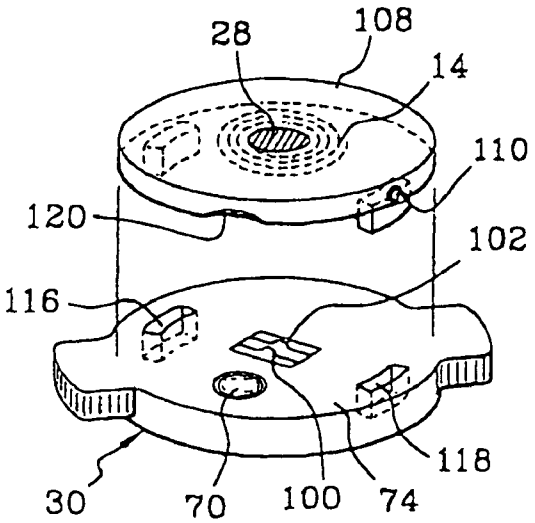


FIG.10

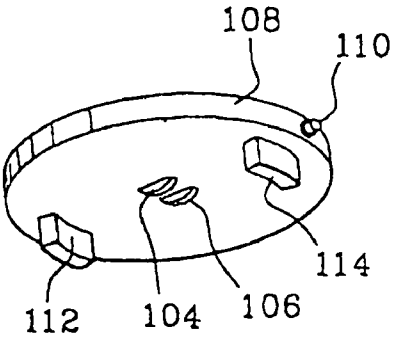


FIG.11

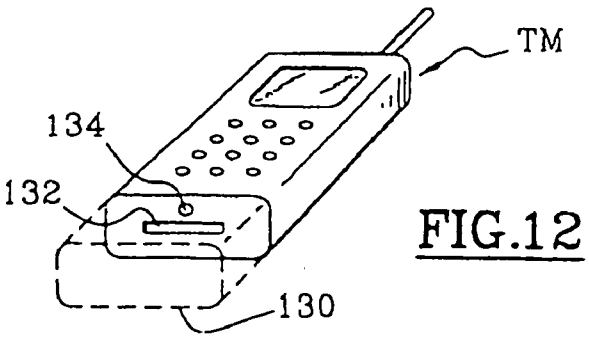


FIG.12

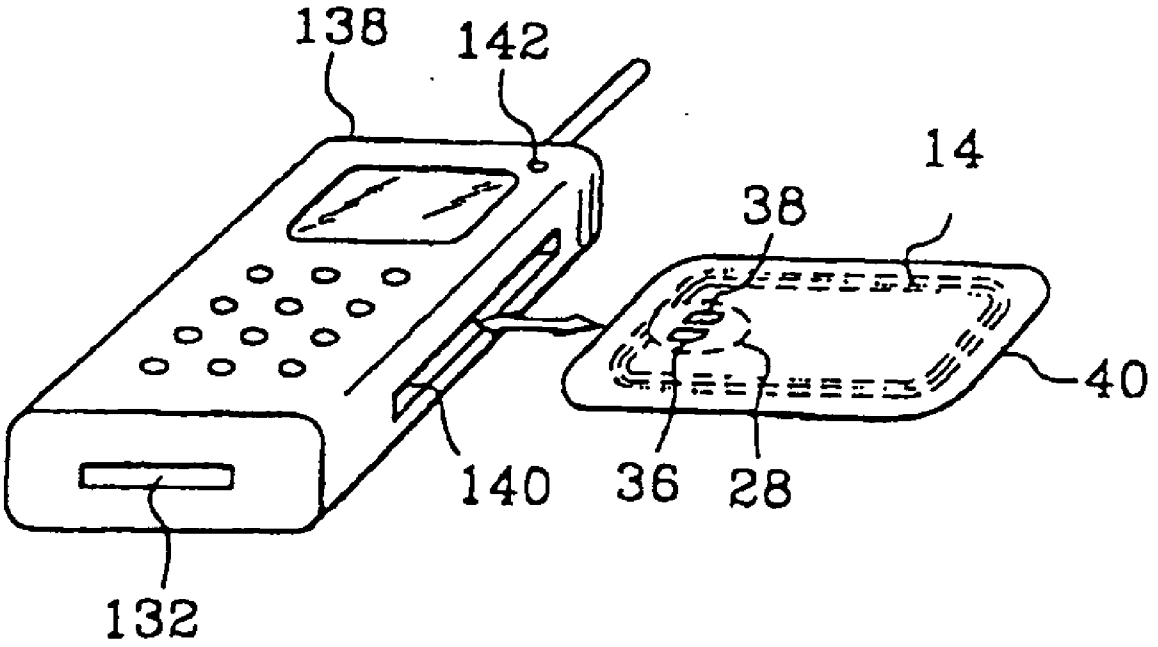


FIG.13

CONTACTLESS ELECTRONIC COMMUNICATION DEVICE WITH OPTIONAL AUXILIARY POWER SOURCE

[0001] The invention relates to contactless electronic communication systems in which at least one electronic communication device without an internal electric power source carried by a user communicates, by means of electromagnetic signals, with an electronic interrogation/reading/writing device.

[0002] Such contactless electronic communication systems are used, for example, for controlling access to ski runs, premises, garages, public transportation, etc, since the absence of any contact increases the speed of passage of the users whilst allowing exchange of information between the electronic device carried and the interrogation/reading/writing device so as to manage access according to certain criteria.

[0003] The electronic interrogation/reading/writing device emits electromagnetic signals, for example at radio frequency, which are detected by the electronic communication device carried by the user and serve on the one hand as a transmission medium for the information to be exchanged and on the other hand as an energy source for the electrical power supply to the electronic communication device. To this end, the latter comprises, for example, as shown in the simplified diagram in **FIG. 1**, an antenna **10** consisting of a resonant circuit **12** comprising a coil **14** and a capacitor **16**. The radio frequency signals received by the antenna **10** coming from the interrogation/reading/writing device are applied to a demodulator **18** which detects the low-frequency modulation signals containing the binary information transmitted by the interrogation/reading/writing device.

[0004] These binary information signals are processed by a digital processing circuit **20** in order to interpret them and if necessary produce a response in the form of binary signals which are transmitted to the interrogation/reading/writing device via a modulator **24** represented by a switch **22** and a load impedance **(30)** connected to the terminals of the resonant circuit **12**.

[0005] The radio frequency signals detected by the antenna **10** are also applied to a rectifying and filtering circuit **26** which supplies, at the terminals A and B, a supply voltage V_{cc} to the circuits **18**, **20** and **24**.

[0006] The contactless electronic communication device according to the diagram in **FIG. 1** is produced in the form of a microcircuit **28** disposed in a plastic card, of the bank card type, the coil **14** of the antenna being disposed along the periphery of the card, the whole constituting a communication module MC.

[0007] It should be noted that the capacitor **16** is produced partly in the microcircuit **28** and partly outside it with a view to the tuning adjustment of the resonant circuit **12**.

[0008] Such a microcircuit can also be disposed in the case of a watch, the material of the case being designed to allow passage of the electromagnetic signals to the antenna inside the case.

[0009] Such contactless electronic communication systems have the major drawback that their operating distance is limited, for example a few tens of centimetres at the frequency of 13.56 MHz in read/write mode, because of the inadequacy of the electrical supply power which is actually available for the microcircuit, beyond a certain distance between the interrogation/reading/writing device and the antenna.

[0010] In addition, this inadequacy of the electrical supply power limits the speed and therefore the calculation power of the microcircuit, which does not make it possible to implement complex transactions requiring major data processing and/or cryptographic calculations for the purpose of security in a short interval of time.

[0011] Moreover, it is not possible to increase the radiation energy of the interrogation/reading/writing devices since their power is limited so as not to interfere with adjacent installations and the environment in general, in accordance with current regulations.

[0012] The purpose of the invention is therefore to produce a contactless electronic communication device which has a maximum operating distance and a calculation power which are greater than those of the devices of the prior art.

[0013] This aim is achieved by modifying the contactless electronic communication device so that it can be connected to an electrical power source of a normal object, such as an electric battery, disposed on a support such as a card holder or a watch.

[0014] The invention therefore relates to a contactless electronic electromagnetic communication device of the type comprising in a module:

[0015] means of receiving electromagnetic signals,

[0016] means of processing the electromagnetic signals received, and

[0017] means of rectifying and filtering the electromagnetic signals received in order to supply, at two output terminals, a supply voltage to the processing means,

[0018] characterised in that it also comprises

[0019] means of supporting an electrical power source, and

[0020] means of connecting the said electrical power source to the said output terminals of the rectifying and filtering circuit.

[0021] The connection means also comprise a switch for establishing or cutting off the connection between the power source and the terminals of the rectifying and filtering circuit.

[0022] The connection means comprise:

[0023] in the module, conductors for connecting the output terminals of the rectifying and filtering circuit to first contact terminals,

[0024] in the support means, conductors for connecting the electrical power source to second contact terminals, and

[0025] means for connecting together the said first and second contact terminals.

[0026] When the module is carried by a card of the bank type

[0027] the means of supporting the electrical power source comprise a card holder, and

[0028] the means of connecting the said first and second contact terminals comprise means of guiding and holding the card in the card holder so as to make the said first and second contact terminals coincide.

[0029] When the module is disposed in a case

[0030] the means of supporting the electrical power source comprise an object such as a watch with an electric battery,

[0031] the first contact terminals comprise a connector disposed on the case of the module,

[0032] the second contact terminals comprise a connector disposed on the watch case, and

[0033] the said connectors cooperate with each other in order to establish electrical connections and being held in this position by holding means carried by the case of the module and the object supporting the electrical power source.

[0034] The connectors can be studs which are situated opposite each other or connectors of the male/female type.

[0035] Where the supporting object is a portable mobile telephone, the battery charging terminals are used for establishing the connection between the battery and the module.

[0036] Other characteristics and advantages of the invention will emerge with the description of some of its embodiments, this being given with reference to the accompanying drawings, in which:

[0037] **FIG. 1** is a functional electronic diagram of an electronic communication device having characteristics of the invention,

[0038] **FIGS. 2A and 2B** show a microcircuit card implementing a contactless electronic communication device and a card holder according to the invention, the latter being able to receive the card of **FIG. 2A**,

[0039] **FIG. 3** is a plan view of a watch containing an electric battery,

[0040] **FIG. 4** is a right-hand view of the watch of **FIG. 3**,

[0041] **FIG. 5** is a view from below of the watch of **FIG. 3**,

[0042] **FIG. 6** is a left-hand view of the watch of **FIG. 3**,

[0043] **FIG. 7** is a perspective view of a case containing a contactless communication module and designed to adapt to a watch containing an electric battery,

[0044] **FIG. 8** is a view in section of the case of **FIG. 7**,

[0045] **FIG. 9** is a view in exploded perspective of the case of **FIG. 7** and of the case of the watch containing the electric battery,

[0046] **FIG. 10** is a view in exploded perspective of a variant combination between a case containing a communication module and a watch containing an electric battery,

[0047] **FIG. 11** is a view in perspective from below of the case of **FIG. 10**,

[0048] **FIG. 12** is a view in perspective of a case containing a contactless communication module associated with a mobile telephone handset according to the invention, and

[0049] **FIG. 13** is a view in perspective of a portable mobile telephone handset associated with a microcircuit card according to **FIG. 2A**.

[0050] The diagram in **FIG. 1** of a contactless electronic device will not be described again for the elements known from the prior art.

[0051] To implement the invention, it must be modified in order to connect, via conductors **32**, **34**, the output terminals A and B of the rectifying and filtering circuit **26** with two contact terminals **36** and **38** disposed outside the module MC containing the microcircuit **28** and the resonant circuit antenna **10**.

[0052] The so-called contactless communication module MC is normally housed in the thickness of a plastic card **40**, the coil **14** of the antenna **10** being housed at the periphery of the card in one or more turns. According to the invention, the contact terminals **36** and **38** are disposed on the surface of the card **40**.

[0053] The card **40** cooperates with a card holder PC so as to be inserted, by sliding for example, in raised grooves **42** and **44** with a stop **46**. The card holder serves as a support for an electric battery **48** housed in the thickness of the card holder. The electrical terminals of the battery **48** are connected by conductors **50** and **52** housed in the thickness of the card holder, to contact terminals **56** and **58** disposed at the surface of the card holder so as to cooperate respectively with the contact terminals **36** and **38** of the card **40**, it being understood that the card **40** in **FIG. 2A** must be turned over in order to be inserted in the grooves **42** and **44**.

[0054] The electrical connection between the electric battery **48** and the contact terminals **56** and **58** may be permanent or intermittent as required by the user provided that a switch **60** is connected in series, on the conductor **50** for example, which is handled by the user.

[0055] By means of this combination of the card **40** with the card holder PC, the microcircuit **28** is supplied with the voltage of the electrical battery **48**, which can replace or possibly be added to the voltage supplied by the rectifying and filtering circuit **26**. The result is a supply voltage V_{cc} which is constant since it is independent of the distance between the card **40** and the interrogation/reading/writing device, giving rise to a greater maximum detection distance, a longer period available for processing and a higher calculation speed.

[0056] There exist microcircuit cards known as "combicards" which are designed on the one hand to communicate with an interrogation/reading/writing device at a distance but also on the other hand to communicate with an interrogation/reading/writing device with contacts. For this purpose, these combicards have a microcircuit **28** connected to contact terminals of the conventional type, for example according to ISO 7816-2.

[0057] These combicards can be used in the context of the invention with the card holder PC provided that the contact terminals **56** and **58** have an arrangement in accordance with the aforementioned standard.

[0058] In general terms, the contact terminals **36** and **38** of the contactless card **40** and those **56**, **58** of the card holder PC will comply with the standard, which ipso facto will allow the use of combicards by the card holder PC.

[0059] The switch **60** can be of the push button microswitch type housed in the thickness of the card holder, the push button being for example disposed on the face of the card holder opposite to the one receiving the card **40**.

[0060] The electrical battery **48** is of the extra-flat type and is housed in a cavity in the card holder PC with a view to its possible replacement.

[0061] Naturally, the microswitch and its push button can be housed in the cavity of the extra-flat battery.

[0062] In the example embodiment of the invention according to **FIGS. 2A and 2B**, the contactless electronic module MC is carried by a plastic card **40** of the bank card type whilst the electrical battery **48** is carried by a card holder PC on which the card **40** is inserted so as to establish electrical contacts between the terminals **36**, **38**, **56** and **58**.

[0063] The invention also applies to any contactless electronic module as modified in order to have contact terminals **36** and **38** so as to be connected to contact terminals of a battery carried by an object such as an electronic watch or a mobile telephone handset.

[0064] The object carrying the battery must be modified in order to have contact terminals equivalent to the terminals **56** and **58** of the card holder PC and the same applies to the contact terminals **36** and **38** of the modules in order to adapt to the terminals **56** and **58** of the object carrying the electrical battery. FIGS. **4** to **11** show two examples of combination between a contactless electronic module and a watch with electrical battery whilst **FIGS. 12 and 13** show two examples of combinations between a contactless electronic module and a mobile telephone.

[0065] A watch MO (FIGS. **3** to **11**) of the electronic type comprises an electronic circuit (not shown), a display device (**62**) with one or more dials **64**, **66**, **68** and an electrical supply battery **70**, these three components being disposed in a case **72** provided on its periphery with various control buttons **74**. The case **72** is held on the wrist by a bracelet **76** via connection articulations **78**.

[0066] According to the invention, the electrical battery **70** is connected not only to the electronic circuit and to the dials but also to a connector **80** (FIGS. **3** to **9**), of the female type for example, which is carried by the lateral part of the watch case **72**. This connector **80** cooperates with a male connector **82** carried by a case **84** containing the microcircuit **28**, the antenna coil **14** and the electrical conductors **32** and **34**. A microswitch **86** is connected in series to the conductor **32** so as to supply or not the microcircuit **28** at the request of the user.

[0067] The case **84** is fixed to the back of the watch by snapping on the male **82** and female **80** connectors and by means of a lug **88** under which a thinned part **90** of the case **84** fits.

[0068] Instead of being disposed on the lateral face of the watch, the output connector of the electrical battery **70** can be disposed on the back of the watch case in the form of two contacts **100** and **102** (**FIGS. 10 and 11**) which cooperate respectively with two studs **104** and **106** on a case **108** containing the electronic microcircuit **28**, the antenna coil **14** and the electrical conductors **32** and **34**.

[0069] The studs **104** and **106** are connected to the points A and B of the electronic microcircuit **28** by the electrical conductors **32** and **34**, one of which is provided with a microswitch **110** actuated by the user.

[0070] The case **108** is fixed to the back of the watch by two brackets **112**, **114** which cooperate respectively with two housings **116** and **118** disposed in the back of the watch. The case **108** has a thinned peripheral part **120** for release.

[0071] When the electrical battery is on a mobile telephone™ (**FIG. 12**), the electronic microcircuit **28** and its antenna are, for example, disposed in a parallelepipedal case **130** having on one face two male contacts, not shown. These two contacts are inserted in female contacts **132** on the mobile telephone, those used for recharging the telephone battery. A microswitch **134** is disposed on an electrical conductor **32** or **34** and is actuated by the user by means of a push button carried by the case **130**.

[0072] Some mobile telephones **138** (**FIG. 13**) are equipped with a connector **140** (**FIG. 13**) in which a card of the bank type can be inserted with a view to adding additional functions to the mobile telephone. In this case, the contactless card **40** of **FIG. 2A** can be inserted in the connector **140** so as to connect its contacts **36** and **38** to the electrical supply contacts of the connector **140**. The switch **142** is disposed on the mobile telephone **138**.

[0073] It should be noted that the switch **60** or **142** is carried by the card holder PC or the mobile telephone **138**, which contains the electrical power source, whilst the switch **86** or **134** is carried by the case **84** or **130**, which contains the microcircuit **28**.

[0074] It should be noted that the electrical power source can be a rechargeable battery, an electrical battery, removable or not, or so-called solar cells, for example of the photovoltaic type.

1. A electronic electromagnetic communication device of the type comprising a battery-less card (**40**) having:

means (**10**) for receiving electromagnetic signals,

means (**18**, **20**, **24**) for processing the electromagnetic signals received, and

means (**26**) for rectifying and filtering the electromagnetic signals received in order to supply at two output terminals (A, B), a supply voltage (V_{cc}) to the processing means (**18**, **20**, **24**),

two contacts (**36**, **38**) on a surface of the card.

and means (**32**, **34**) for connecting said two output terminals (A, B) to the two contacts (**36**, **38**),

characterized in that said device also comprises a card holder (PC) having

means for supporting an electrical power source (**48**, **70**), and

means (**56**, **58**, **80**, **82**, **100**, **102**, **104**, **106**, **132**, **140**) for connecting said electrical power source (**48**, **70**) via said two surface contacts to said output terminals (A and B) of the rectifying and filtering means (**26**).

2. A device according to claim 1, characterized in that the connection means comprise a switch (**60**, **86**, **110**, **134**, **142**) for establishing and cutting off the connection between the power source (**48**, **70**) and the terminals (A, B) of the rectifying and filtering means (**26**).

3-9. (canceled)

10. The device according to claim 2, wherein the card holder connection means comprises conductors **(50, 52)** for connecting the electrical power source **(48, 70)** to surface contact **(56, 58, 80, 100, 102, 132, 140)** on a surface of the holder, and means for connecting and holding together the said surface contacts of the card with the surface contacts of the holder.

11. The device according to claim 10 wherein said holder comprise a mobile telephone apparatus (TM) and said holder surface contacts comprise studs **(132)** connected to a rechargeable electrical battery, and wherein said studs **(132)** are also usable for recharging the battery of the mobile telephone apparatus.

12. A device comprising:

a card **(40)** having

an electronic contactless internal power-sourceless electromagnetic communication module (MC),

a single antenna **(10)** for receiving both power and data electromagnetic signals,

means **(18, 20, 24)** for processing the data in the electromagnetic signals received, and

means **(26)** for rectifying and filtering the electromagnetic signals received in order to supply, at two output terminals (A, B), a supply voltage (Vcc) to the processing means **(18. 20. 24)**; and said output terminals (A, B) including two external terminals **(36, 38)** on an external surface of the card,

a support (PC, MC, TM, **138**) removably connectable to the card having

an electrical power source **(48, 70)**,

connections including surface terminals **(56, 58, 80, 82, 100, 102, 104, 106, 132, 140)** mating with the external terminals **(36, 38)** for connecting the power source to the output terminals (A, B) of the rectifying and filtering means **(26)**,

a switch **(60, 86, 110, 134, 142)** for making or cutting-off the connection between the power source **(48, 70)** and the output terminals (A, B) of the rectifying and filtering circuit **(26)**, and

mechanical means **(42, 44, 46)** for receiving said card and connecting and holding together said external terminals **(36, 38)** of the card with the surface terminals **(56, 58)** of said connections of the support.

13. A battery-less card comprising:

a card **(40)** having,

a) a single antenna **(10)** for receiving electromagnetic signals,

b) an electronic module (MC) including, means **(18, 20, 24)** for processing data in the electromagnetic signals received, and means **(26)** for rectifying and filtering the electromagnetic signals received in order to supply, at two output terminals (A, B), a supply voltage (Vcc) to the processing means **(18. 20. 24)**, and

c) two external terminals **(36, 38)** on an external surface of the card connected to said output terminals (A, B);

whereby when said card is connected into a card holder (PC) with an electrical power source **(48, 70)** and with external power source surface terminals **(56, 58, 80, 82, 100, 102, 104, 106, 132, 140)**, and means **(42, 44, 46)** for guiding and stopping the card **(40)** in the card holder (PC) so as to make said card and holder contact terminals coincide, the power source may be connected to the output terminals (A, B) of the rectifying and filtering means **(26)**.

14. A device according to claim 1 wherein the card has the physical dimensions of and the surface contacts have the physical dimension of and locations of ISO 7816.

15. A device according to claim 12 wherein the card has the physical dimensions of and the external terminals have the physical dimension of and locations of ISO 7816.

16. A device according to claim 13 wherein the external terminals have physical dimensions and locations as defined in ISO 7816.

* * * * *