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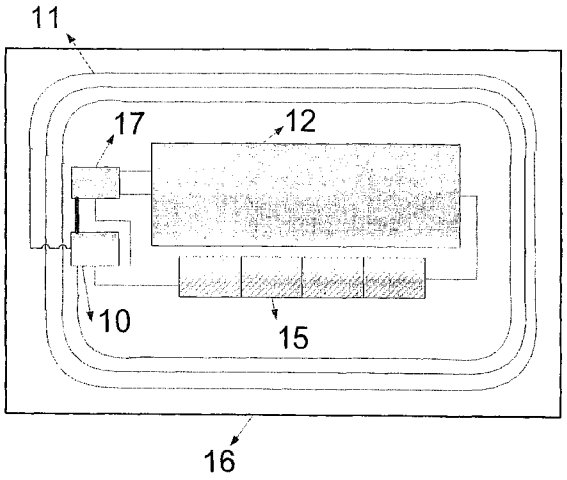
(54) **Title:** A SELF-DISPLAY RFID TAG DEVICE WITH A DISPLAY UNIT OR BLUETOOTH TECHNOLOGY




(57) **Abstract:** A Radio Frequency Identification (RFID) tag device, comprises a RFID storage chip (10) and its antenna (11) mounted on a support (16), and a photoelectric cell (15) or another power source mounted on the support (16) and connected to the storage chip (10) to energize the storage chip. Data from the storage chip (10) is arranged to be displayed, via a processor (17) that converts the output signal from the storage chip into an input signal for the display, on a display that is an internal display (12) incorporated on said support (16) of the RFID tag device or is an external display incorporated in a mobile or fixed external unit excluding dedicated RFID readers and dedicated RFID reader/writers. The external unit - for example a mobile phone (21) - is configured for radiofrequency transmission according to Bluetooth protocol. The power source (15) powers via the processor (17) the transmission of data from the storage chip (10) to be displayed on a flexible or hard internal display (12) or activates via the processor (17) a radiofrequency transmission according to Bluetooth protocol to transmit data to be displayed on the external display.

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# A Self-Display RFID Tag Device With A Display Unit Or Bluetooth Technology

## Background

The invention relates to a self-display contactless Radio Frequency Identification (RFID) storage chip whatever its kind, used in particular in document protection or in the field of storage chip usage.

The current invention and the prior invention of WO 2007/015169A2 arose due to the fact that RFID storage chips nowadays require a dedicated RFID reader/writer device in order to read the data from the storage chip. Due to the increased demand for RFID storage chips, there is a need for a huge number of special reader devices worldwide, requiring a huge investment. In addition, it is in particular difficult to access all places with PCs to load the required software. In this context, our invention offers a solution to read data from a RFID storage chip without any need to use a dedicated RFID reader device and PC to read the data on the storage chip.

It is known from WO/2005/069208 to provide a RFID tag that communicates with a standard dedicated RFID tag reader using RF energy, wherein the tag comprises means sensitive to light for inhibiting communication between the RFID tag and the RFID tag reader, for security purposes. In one example the means sensitive to light is a photoelectric cell that switches off the RFID reader in the absence of light. This teaching is not concerned with eliminating the need for dedicated RFID readers, but pursues a different aim related to the security of using RFID tags.

## Summary of the Invention

According to the invention, a Radio Frequency Identification (RFID) tag device comprises a RFID storage chip and its antenna mounted on a support, and a power source (in particular a photoelectric cell) mounted on the support and connected to the storage chip to energize the storage chip in response to activation of the power source such as by light impinging on the photoelectric cell. Data from the storage chip is arranged to be displayed on a display that is an internal display incorporated on the support of the RFID tag device or is an external display incorporated in a mobile or fixed external unit excluding dedicated RFID readers and dedicated RFID

reader/writers, which mobile or fixed external unit is configured for radiofrequency transmission according to Bluetooth protocol. The photoelectric cell or other power source powers, via a processor, the transmission of data from the storage chip to be displayed on an internal display or activates a radiofrequency transmission according to Bluetooth protocol to transmit data to be displayed on the external display.

In both cases, with an internal or an external display, the invention provides for displaying the data from the RFID storage chip without the need for the usual dedicated RFID reader/writer; instead the display takes place on the integrated screen or on the external screen of an available type of mobile or fixed external unit such as a mobile phone, a personal digital assistant or a PC, all operating according to the Bluetooth protocol. This obviates the need to provide large numbers of dedicated RFID readers/writers.

The RFID tag device of the invention can comprise an internal display that is a rigid or flexible screen located on the support and/or is arranged to cooperate with an external display incorporated in a mobile telephone, a personal digital assistant (PDA) or a personal computer, in which case the device comprises means for activating a radiofrequency transmission according to Bluetooth protocol to transmit data to be displayed on the external display incorporated in the mobile telephone or personal digital assistant (PDA) or personal computer.

The RFID tag device of the invention can if required be arranged to simultaneously display data on an internal display and on an external display, wherein the photoelectric cell powers the transmission of data from the storage chip to be displayed on the internal display and simultaneously activates a radiofrequency transmission according to Bluetooth protocol to transmit data to be displayed on the external display.

The RFID tag device of the invention can be associated with a document by being attached on the document, merged into the document or formed integrally within the document. The same applies to other supports for the RFID tag device of the invention.

For example, the RFID tag device of the invention is in the form of a flexible adhesive patch, or alternatively is in the form of a rigid or semi-rigid layer, in particular in the format of a standard credit card.

The invention also provides, in combination, a RFID tag device as set out above with a mobile telephone, a personal digital assistant (PDA) or a personal computer, each of which has a display and is configured for radiofrequency transmission according to Bluetooth protocol such that the display displays data transmitted from the RFID tag device by radiofrequency transmission according to Bluetooth protocol.

Another aspect of the invention is the use of a mobile telephone, a personal digital assistant (PDA) or a personal computer, each of which has a display and is configured for radiofrequency transmission according to Bluetooth protocol, for displaying data transmitted from the RFID tag device by radiofrequency transmission according to Bluetooth protocol.

A further aspect of the invention is the use of a RFID tag device as set out above for displaying data from the storage chip on an internal display or on an external display incorporated in a mobile or fixed external unit excluding dedicated RFID readers and dedicated RFID reader/writers, in accordance with the requirements for any intended purpose.

The invention also provides a method of displaying data stored in the RFID storage chip of a RFID tag device as set out above, comprising energizing the storage chip by activating the power source for example in response to light impinging on the photoelectric cell, this energizing of the storage chip from the photoelectric cell or other power source powering the transmission of data from the storage chip to be displayed on an internal display, or activating a radiofrequency transmission according to Bluetooth protocol to transmit data to be displayed on said external display.

In this method, the RFID storage chip can be programmable by an external server, and energy from the photoelectric cell activates a radiofrequency transmission according to Bluetooth protocol to transmit data to be displayed on the external display in an external unit. This external unit – for example a mobile phone – is connectable to the external server e.g. by sending an SMS for verifying the data to be displayed.

The invention thus offers a new design of the storage chip, having in one embodiment an integrated display unit (flexible or hard screen), and a solar (light) cell or other acutance energy source to provide the storage chip with the required energy to display

its data on the attached screen in response to an output signal from the storage chip that is transmitted via a processor which converts the output signal from the storage chip into an input signal for the integrated screen. Or in another embodiment, the storage chip sends its data via a processor which converts the signal for Bluetooth technology when the power source is actuated such as by facing a light source, the light cells or other power source generating enough electric energy to activate the storage chip and in this way can react to the source of light energy through the Protocol. The Bluetooth Protocol processor then sends the stored data by Bluetooth for example using a special RFID antenna and the oscillations of the sender antenna are picked up by any other mobile / portable device operating also according to the Bluetooth protocol.

To begin with, data is stored in the storage chip using RFID according to the common standard of RFID systems, then, the storage chip is attached to a document or other support for the RFID storage chips. Alternatively, the data is stored in the RFID chip after attachment to the document/support. When there is a need to read the storage chip the attached photoelectric cells (e.g. solar chips) are exposed to suitable light (e.g. lamp light) and convert the light energy into enough electric energy to activate the storage chip, or another power source is actuated that activates the display via a processor. When required, a special Bluetooth processor is activated to receive data from the storage chip, convert it into the standard Bluetooth oscillations, transfer it through the antenna and send it to a mobile or fixed device near the storage chip, which could be a portable device such as a PDA, a portable telephone, PC or other.

In case of using a mobile phone or Personal Digital Assistant (PDA) or any other similar device to receive data, the person can send the mentioned data to the document's central server connected with GSM network, which stores the entire characteristic data of the standard exported documents carrying the RFID storage chip. In this case, the server receives the mentioned data to confirm its correctness and reply to the mobile phone, the Personal Digital Assistant (PDA) or other device as regards the correctness of the received data or its size.

**Detailed Description of the Invention**

As mentioned, the invention relates to a contactless RFID self-display storage chip of any kind for use in particular in the protection of documents or in the field of usage of storage chips.

The current invention, and the prior invention of WO2007/015169A2, arose due to the fact that storage chips at present require many dedicated RFID reader/writer devices to read the data from the storage chip. As a result of the increased usage of hard or flexible RFID storage tags in different shapes and sizes and for different purposes and applications, as non-limiting example in the shape of credit cards or flexible adhesive pads like labels, a huge number of dedicated reader devices is needed globally, which means huge investments. In addition, particularly, it is difficult to access all places with PCs for loading the software, and to solve these problems our invention offers a solution to read the characterized data on the RFID storage chip with no need to use a dedicated RFID reader device with a PC to read the data of the storage chip.

**The first case (integrated screen)**

The invention offers a new design of RFID storage chips with added electronic components to provide the storage chips with energy, working for example through solar/light cells and a display unit (flexible or hard screen, e.g. LCD or any other kind of screen). When exposed to a suitable light source, that could for example be a lamp, the stored data displayed is transferred from the special storage unit RFID via a processor into the display unit, in a first example. Alternatively, the energy source could be a battery activated by a push-button.

**The second case (Bluetooth)**

In the second case, the storage chip uses the special RFID antenna associated with the storage chip's processor to transmit the data stored via Bluetooth and send the data by Bluetooth Protocol to a nearby device that is set up to deal with this kind of connection. This could be a portable device, a GSM phone, a PC, a Personal Digital Assistant (PDA) or other.

**To clarify the first case**

The RFID storage chip with its contents programmed through RFID technology is a common standard for these systems.

To read the RFID storage chip without using a dedicated RFID reader, the light cells are exposed to ordinary light, for example light from a lamp, or another energy source like a battery is activated e.g. by a push button.

The light chips or other energy source generate enough electric energy to activate the RFID storage chip, whereby the storage chip is activated for example by the energy produced by the light impinging on the light cell or by activating a push button. The energy generated also activates a processor that converts the storage chip's processor that supplies its output signal to the display screen, and sends its stored data to be displayed on the display screen, whereupon the user can read visibly the stored data from the display unit attached to the storage chip.

**In the other case (Bluetooth)**

The RFID storage chip with its contents programmed through RFID technology is a common standard of these systems.

To read the storage chip without using a dedicated RFID reader, the light cell(s) are also exposed to ordinary light, for example or light from a lamp, or a battery is activated by a push-button. The light cell(s) or other energy source thereby generate(s) enough electric energy to activate the RFID storage chip, whereby the storage chip is activated for example by the energy produced by the light impinging on the light cell, or energy delivered from a battery. In response to the mentioned energy, the storage chip sends its stored data through a Bluetooth processor using a special RFID antenna or special design which is used by the mentioned protocol to send, via an antenna, the special oscillations of the Bluetooth protocol to any nearby or portable device supporting Bluetooth technology, so the user can read electronically the data on a receiver which can be a Portable phone, a Personal Digital Assistant (PDA) or another.

Later, the user of the portable device can send the data to a central server through a contactless mobile network via a short SMS message or by any other similar method. When the central server receives the message, it immediately starts to compare its

contents with the stored characterized data of the storage chip and sends the result of the comparison (whether acceptance or refusal) to the users of the mobile phone or any similar device. In this way, the correctness of the characterized data on the storage chip will be confirmed, for various uses and purposes.

**Brief Description of Drawings**

Figures 1 to 3 show a RFID tag device disclosed in WO 2007/015169A2.

Figure 1 is a diagram of a RFID tag device with its storage chip, antenna, integrated display and photoelectric cells;

Figure 2 is a diagram of another RFID tag device with its storage chip and antenna supported by Bluetooth technology, and photoelectric cells;

Figure 3 is a diagram illustrating the connection of a RFID tag device according to the invention to a mobile phone and a server; and

Figure 4 is a diagram of a RFID tag device according to the invention including a processor.

**Figure (1): Legend**

(10) Storage chip.

(11) RFID antenna

(12) Display unit, flexible or hard.

(15) Light cells to generate energy (photoelectric).

(16) Support of the storage chip (thin or thick).

**Figure (2): Legend**

(10) Storage chip supported with Bluetooth technology

(11) Antenna.

(15) Light cells to generate energy (photoelectric).

(16) Support of the storage chip (thin or thick).

**Figure (3): Legend**

(20) Self display RFID tag device according to the invention.

(21) Mobile phone or any other device that supports the implementation of Bluetooth with a GSM card.

(22) Server in the GSM network.

**Figure (4): Legend**

(11) RFID antenna

(10) Storage chip

(12) Display unit flexible or hard.

(15) Light cells to generate energy (photoelectric).

(16) Storage chip

(17) Digital data processor

**Detailed description of Figure 1:**

Figure 1 shows a Radio Frequency Identification (RFID) tag device according to WO 2007/015169A2, comprising a RFID storage chip 10 and its antenna 11 mounted on a support 16, and a photoelectric (light) cell 15 mounted on the support 16 and connected to the storage chip 10 to energize the storage chip in response to light impinging on the photoelectric cell 15. Data from the storage chip 10 is arranged to be displayed an internal display 12 incorporated on the support 16 of the RFID tag device. This internal display 12 can be a rigid or flexible screen located on the support 16.

The storage chip 10 and its contents are programmed by RFID according to the common standards/methods in such systems.

To read the storage chip 10 without using a dedicated RFID reader, light for example from an ordinary lamp is focussed on the light cell 15.

The light cell(s) 15 generate enough electric energy to activate the storage chip 10, the storage chip 10 is then activated through the Protocol by the light energy source, then sends the stored data to be displayed on the display screen 12. The user can read the data visibly from the display screen 12 attached to the storage chip 10.

Thus, the user can read the data from the RFID tag device without the need to use a dedicated RFID reader.

**Detailed description of Figure 2:**

Figure 2 shows another Radio Frequency Identification (RFID) tag device according to WO 2007/015169A2, comprising a RFID storage chip 10, that supports Bluetooth technology, and its antenna 11 mounted on a support 16, and a photoelectric (light) cell 15 mounted on the support 16 and connected to the storage chip 10 to energize the storage chip in response to light impinging on the cell 15. Data from the storage chip 10 is arranged to be displayed on a display that is an external display incorporated in a mobile or fixed external unit of any available and suitable type that can be used for displaying data and that supports Bluetooth technology, but excluding dedicated RFID readers and dedicated RFID reader/writers. This mobile or fixed external unit is configured for radiofrequency transmission according to Bluetooth protocol, and the photoelectric cell 15 powers the activation of a radiofrequency transmission according to Bluetooth protocol to transmit data to be displayed on said external display.

The RFID tag device of Figure 2 can for example be arranged to cooperate with an external display incorporated in a mobile telephone 21, a personal digital assistant (PDA) or a personal computer, the device comprising means for activating a radiofrequency transmission according to Bluetooth protocol to transmit data to be displayed on the external display incorporated in the mobile telephone 21 or personal digital assistant (PDA) or personal computer.

The storage chip 10 and its contents are programmed by RFID according to the common standards/methods in such systems.

To read the storage chip 10 without using a dedicated RFID reader, light for example from an ordinary lamp is focused on the light cell(s) 15.

The light cell(s) 15 generate enough electric energy to activate the storage chip 10, the storage chip 10 is then activated through the Protocol by the light energy source, then sends the stored data via Bluetooth using the special RFID antenna 11, the data being converted to send special oscillations according to Bluetooth Protocol via the antenna 11 to any nearby device or mobile phone supporting Bluetooth technology. In such case

the user can read the data electronically on the mobile/receiver device, again without the need for a dedicated RFID reader.

**Detailed description of Figure (3):**

As described above, the invention also relates to displaying data stored in the RFID storage chip 10 of a RFID tag device according to the invention by energizing the storage chip 10 in response to light impinging on the photoelectric cell 15. This energizing of the storage chip from the photoelectric cell 15 powers the transmission of data from the storage chip 10 to be displayed on an internal display 12 according to Figure 1, or activates a radiofrequency transmission according to Bluetooth protocol to transmit data to be displayed on said external display, according to Figure 2.

In this method of Figure 2, the RFID storage chip 10 can be programmable by an external server 22 shown in Figure 3. Energy from the photoelectric cell 15 activates a radiofrequency transmission according to Bluetooth protocol to transmit data to be displayed on the external display of an external unit like the mobile phone 21, and the external unit is connectable to the external server 22 for verifying the data to be displayed.

Thus, to ensure the correctness of the sending data to the mobile phone 21 or to any other device supporting Bluetooth technology, the user could send the data to the central server 22 via a wireless mobile network through a short SMS message or any other similar method. When the central server device 22 receives the message, it compares the message's content with the stored characterized data on the storage chip 10 and sends the result of the comparison (whether acceptance or refusal) to the mobile phone user. In this way, the correctness of the characterized data of the storage chip 10 could be confirmed, which serves various purposes and usages.

**Detailed Description of Figure (4) :**

Fig. 4 shows that the RFID Storage chip 10 that receives the power from cell 15 and the storage chip protocol processes, the data through a control line to a processor 17 for digital processing to display the data on display screen 12 or alternatively also with Bluetooth to display on a mobile/PDA or the like.

As shown, the cell 15 or other power source separately powers the storage chip 10 and the processor 17. The processor 17 is a microprocessor that converts the output signal from the RFID storage chip 10 into an input signal for the integrated display screen 12, or in the case of Bluetooth transmission to an external display it converts the output signal from the RFID storage ship 10 into a standard Bluetooth signal.

When the power source 15 is activated it powers on the one hand the storage chip 10 and on the other hand the processor 17. Thus, when the storage chip 10 supplies its output signal this output signal is converted by the processor 17 into an input signal for the integrated display 12 (or the Bluetooth device with antenna). The integrated screen 12 is also powered by the power source 15 and displays the output of the RFID storage chip 10. Alternatively, the Bluetooth transmission activates the display of a remote device.

**Other Aspects of the Invention**

The invention also covers the following aspects:

1- New design of the RFID storage chip and adding electronic components consisting of an energy-providing photoelectric cell, plus a display unit or Bluetooth technology working when the photoelectric cells attached to the storage chip face a suitable light source, and using a processor for delivering the signal from the storage chip to the display device.

2- New design of the storage chip having flexible or solid display unit (screen), a photoelectric cell in order to provide the storage chips with the necessary energy to display its data on an attached screen, whereby the invention has a self-display RFID storage chip whatever its kind, contactless or other, to be used in document protection or in the field of storage chips usage.

3- New design of storage chip distinguished in that the storage chip could send its data through the Bluetooth technology when a photoelectric cell is exposed to a light source. The photoelectric cells then produce enough electric energy to activate the storage chips which in this case is able to define the light source by Bluetooth protocol, which sends the storage data via Bluetooth by using a special RFID antenna that sends the oscillations according to the Bluetooth protocol to any portable device or other.

4- A new method to assure the correctness of data and documents by saving data into a storage chip using RFID according to common standard ways of RFID systems, then the storage chip is attached to a document or any other different support of the RFID storage chips. When there is a need to read the storage chip, the attached photoelectric cells are exposed to a suitable light (e.g. from a lamp). The light energy converts into enough electric energy to activate the storage chips, then the Bluetooth processor is activated and receives the data from the storage chip, which converts to standard Bluetooth oscillations and transmits via the antenna, and sends it to nearby equipment which could be a portable device, PC or other. When the data is received by a mobile phone, personal digital assistant (PDA), or any other device, in this case the person can send these data to a central document server connected with a GSM network, which stores the whole characterized data of the exported standard data of the RFID storage chips. The server receives the mentioned data, checks its correctness, then replies to the mobile phone, personal digital assistant (PDA) or any other device to confirm the correctness of the received data or its size.

5- A new method to read the data visibly, achieved by programming the storage chip with its contents through the common standard RFID technology. When the storage chip is read without a RFID reader, ordinary light is directed into the photoelectric cells. The light source generates enough electric energy to activate the storage chips, which "feels" the lighting source through Protocol, and sends its stored data to be displayed on the display screen. In this case, the user can read visibly from the display unit attached to the storage chip.

6- A new method to read the data on a receiver/portable device, the storage chip with its contents programmed by RFID technology in common standard ways. To read the storage chip without using a dedicated RFID reader, normal light is focussed on the photoelectric cells so the mentioned photoelectric cells generate enough electric energy to activate the storage chip which "feels" the lighting energy source via protocol, then the chip sends its stored data through Bluetooth by using the special RFID antenna and converts it to an antenna to send the special oscillations of Bluetooth Protocol to any nearby device or mobile supporting operation with Bluetooth technology, in such case

the user can read the data in electronic way either on the receiver device or on a mobile phone.

7- A new method to confirm the correctness of the storage chip data. To ensure the correctness of the exported data to the mobile phone or to any other device supporting Bluetooth technology, the user sends the data to a central server via a mobile wireless network by sending a short SMS or any other similar method. When the central server device receives the message it compares its contents with the recorded characterized data on the storage chip and then sends the result of the comparison (whether acceptance or refusal) to the user mobile phone. In this way the user could be sure of the correctness of the stored data.

In a variation of Figures 1, 2 and 4, instead of being powered by a photoelectric cell 15, the RFID tag device is powered by an integrated battery which preferably has an on-off button so the battery can be activated to power the device only when specifically needed.

## CLAIMS

1. A Radio Frequency Identification (RFID) tag device, comprising a RFID storage chip (10) and its antenna (11) mounted on a support (16), and a power source (15) mounted on the support (16) and connected to the storage chip (10) to energize the storage chip in response activation of the power source, wherein data from the storage chip is arranged to be displayed on a display that is an internal display incorporated on said support (16) of the RFID tag device or is an external display incorporated in a mobile or fixed external unit excluding dedicated RFID readers and dedicated RFID reader/writers, which mobile or fixed external unit is configured for radiofrequency transmission according to Bluetooth protocol, and the power service (15), via a processor (17), powers the transmission of data from the storage chip (10) to be displayed on an internal display (12) or activates a radiofrequency transmission according to Bluetooth protocol to transmit data to be displayed on said external display.

2. The RFID tag device of claim 1, comprising an internal display (12) that is a rigid or flexible screen located on said support (16).

3. The RFID tag device of claim 1 that is arranged to cooperate with an external display incorporated in a mobile telephone (21), a personal digital assistant (PDA) or a personal computer, the device comprising means for activating a radiofrequency transmission according to Bluetooth protocol to transmit data to be displayed on the external display incorporated in the mobile telephone (21) or personal digital assistant (PDA) or personal computer.

4. The RFID tag device of claim 1, 2 or 3, which is arranged to simultaneously display data on an internal display and on an external display, wherein the power source (15) powers the transmission of data from the storage chip (10), via the processor (17), to be displayed on the internal display (12) and simultaneously activates a radiofrequency transmission according to Bluetooth protocol to transmit data to be displayed on the external display.

5. The RFID tag device of any preceding claim, which is associated with a document by being attached on the document, merged into the document or formed integrally within the document.

6. The RFID tag device of any preceding claim, which is in the form of a flexible adhesive patch.

7. The RFID tag device of any one of claims 1 to 5, which is in the form of a rigid or semi-rigid layer, in particular in the format of a standard credit card.

8. The RFID tag device of any preceding claim, wherein the power source (15) is a photoelectric cell that energizes the storage ship in response to light impinging on the photoelectric cell (15).

9. The RFID tag device of any one of claim 1 to 7, wherein the power source is a battery that is activatable by an on-off button.

10. The RFID device of any preceding claim, wherein the power source (15) powers the storage chip (10) and the processor (17).

11. In combination, a RFID tag device of any preceding claim with a mobile telephone (21), a personal digital assistant (PDA) or a personal computer, each of which has a display and is configured for radiofrequency transmission according to Bluetooth protocol such that the display displays data transmitted from the RFID tag device by radiofrequency transmission according to Bluetooth protocol.

12. Use of a RFID tag device of any one of claims 1 to 10 for displaying data from the storage chip (10) on an internal display or on an external display incorporated in a mobile or fixed external unit excluding dedicated RFID readers and dedicated RFID reader/writers, in accordance with the requirements for any intended purpose.

13. A method of displaying data stored in the RFID storage chip of a RFID tag device according to any one of claims 1 to 10, comprising energizing the storage chip by activating the energy source (15), said energizing of the storage chip powering the transmission of data from the storage chip (10) via the processor (17) to be displayed on an internal display (12), or activating via the processor (17) a radiofrequency transmission according to Bluetooth protocol to transmit data to be displayed on said external display.

14. The method of claim 13, wherein the RFID storage chip is programmable by an external server (22), energy from the power source (15) activates via the processor 17 a radiofrequency transmission according to Bluetooth protocol to transmit data to be displayed on said external display in an external unit, and said external unit is connectable to the external server (22) for verifying the data to be displayed.

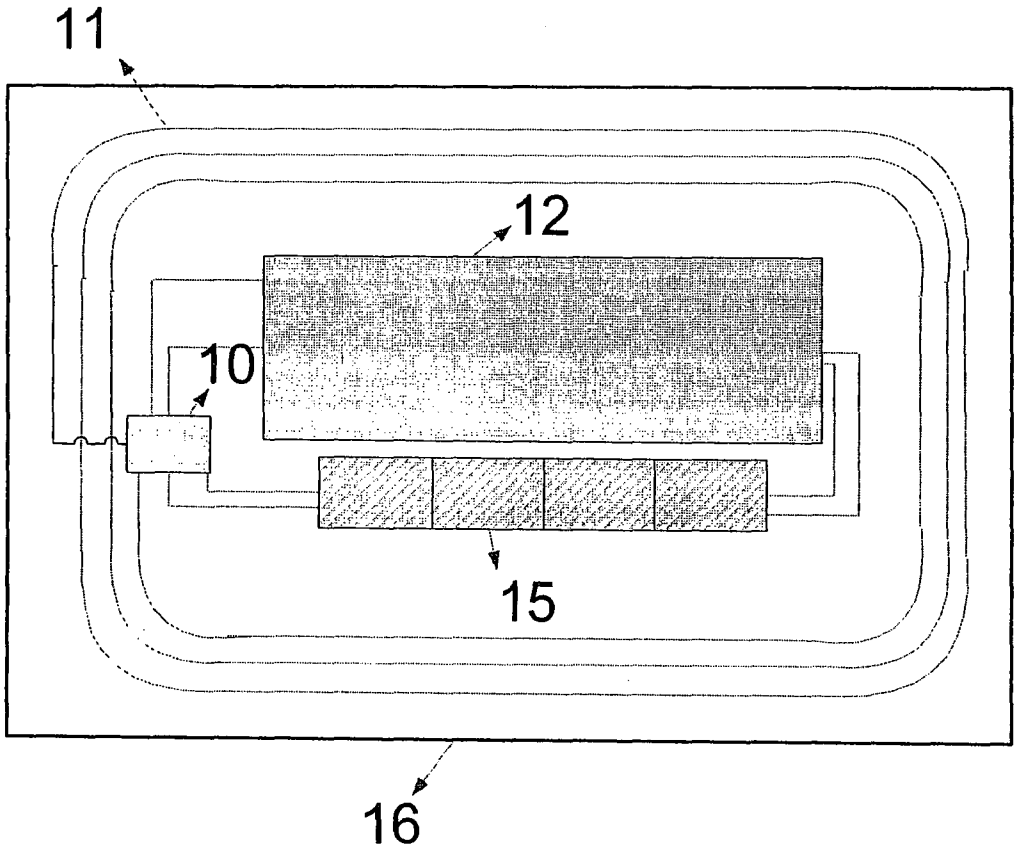


Figure ( 1 )

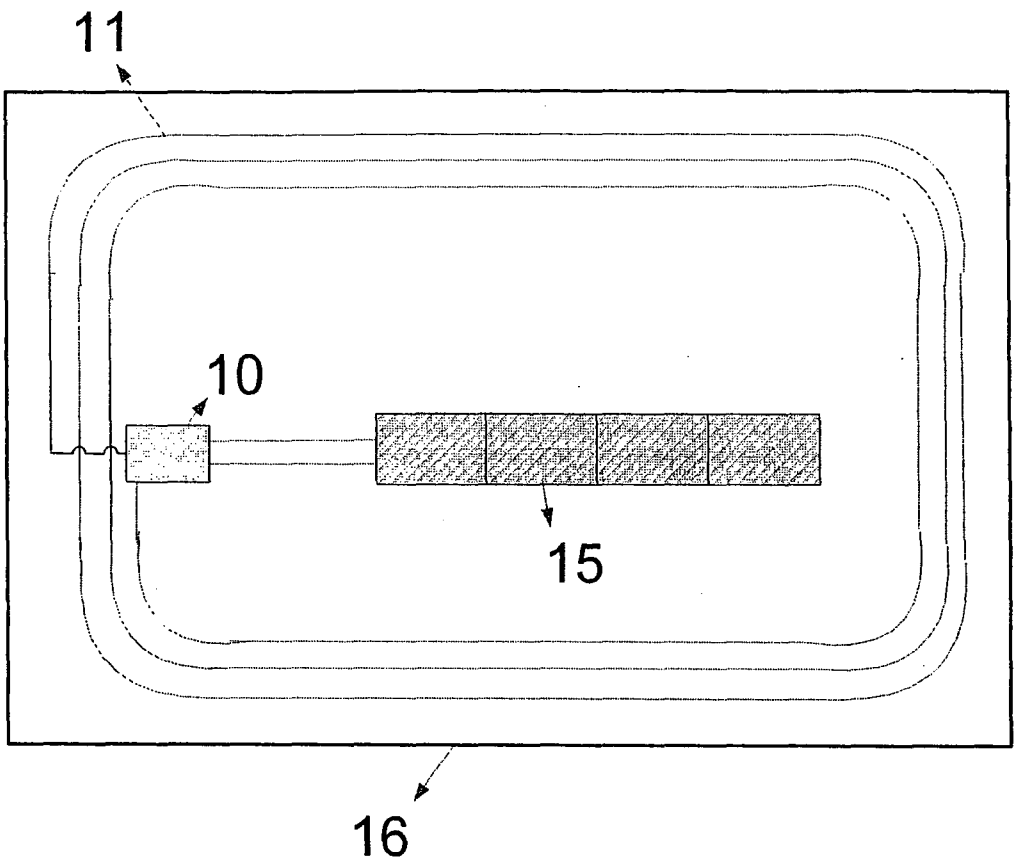


Figure ( 2 )

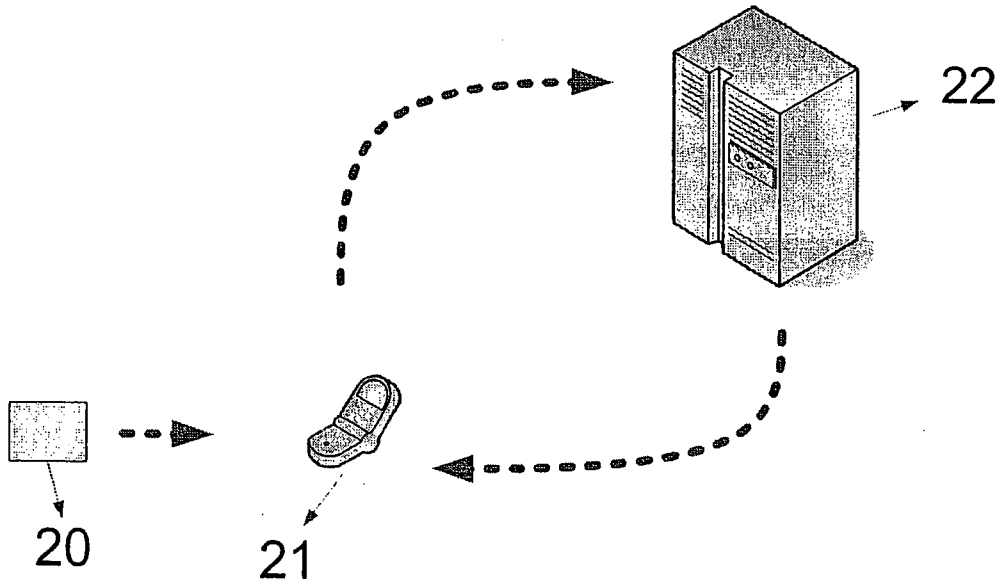


Figure ( 3 )

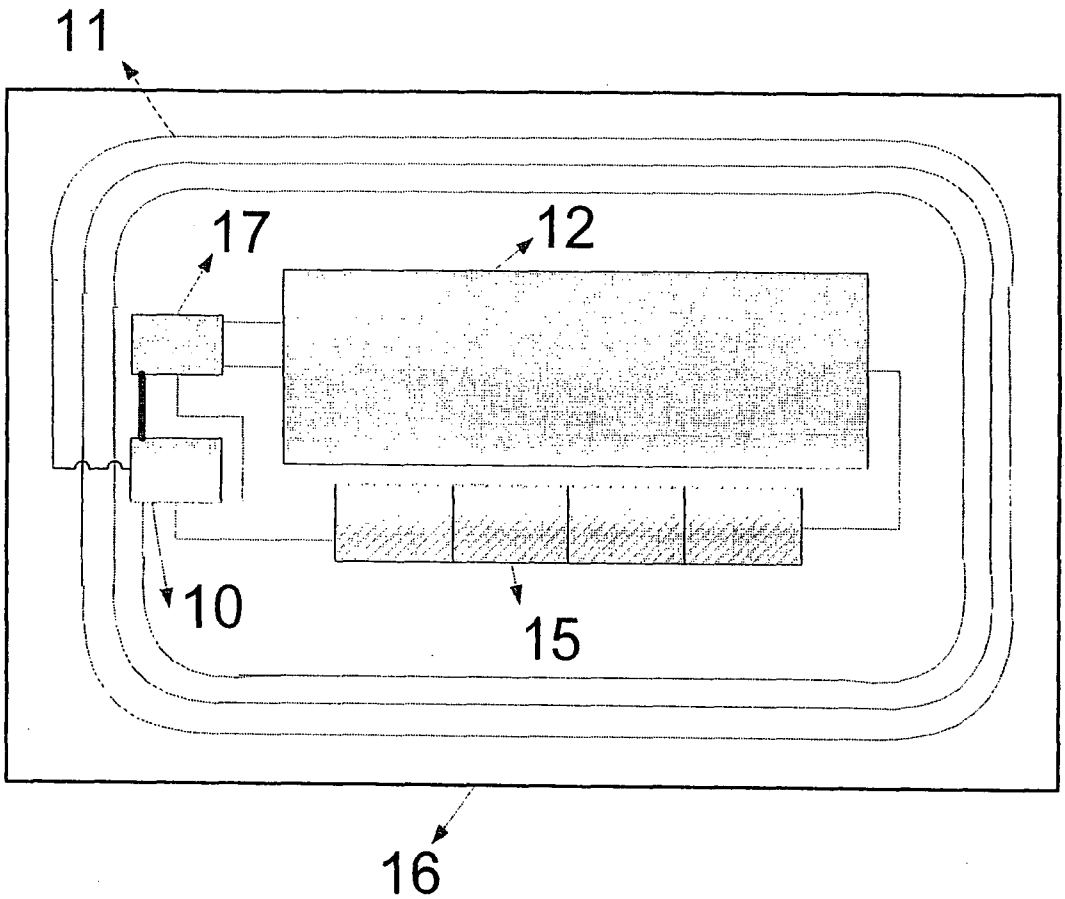


Figure (4)