Technical Disclosure Commons

Defensive Publications Series

May 2022

ENERGY HARVESTING BATTERY-LESS SMART CARD WITH VICINITY COMMUNICATION CAPABILITY

YUEXI CHEN
visa

MUSTAFA TOP
visa

Follow this and additional works at: https://www.tdcommons.org/dpubs_series

Recommended Citation
CHEN, YUEXI and TOP, MUSTAFA, "ENERGY HARVESTING BATTERY-LESS SMART CARD WITH VICINITY COMMUNICATION CAPABILITY", Technical Disclosure Commons, (May 19, 2022)
https://www.tdcommons.org/dpubs_series/5146

This work is licensed under a Creative Commons Attribution 4.0 License.
This Article is brought to you for free and open access by Technical Disclosure Commons. It has been accepted for inclusion in Defensive Publications Series by an authorized administrator of Technical Disclosure Commons.

TITLE: “ENERGY HARVESTING BATTERY-LESS SMART CARD WITH VICINITY COMMUNICATION CAPABILITY”

VISA

YUEXI CHEN

MUSTAFA TOP

TECHNICAL FIELD

[0001] This disclosure relates generally to the field of payment processing. More particularly., the disclosure simplifies the user's ability to make payments, accumulate rewards, and authentication.

BACKGROUND

[0002] Generally, various technologies focus to simplifying the user's ability to make payments, accumulate rewards, or authentication by including information relating to multiple cards, and allowing the user to conveniently select a card among the multiple cards by operation of a user input unit, and to use various payment methods.

[0003] One of the existing technologies discloses that to provide customers of a retailer with improved customer service, the principles of this existing technology provide a point-of-sale (POS) device to interact with a mobile device, such as a mobile telephone, of a customer to provide the customer with data or information when checking out and purchasing products. The information may be associated with products that the customer is purchasing. The mobile device of the customer may have an application or applet loaded onto his or her mobile device to enable POS interaction with the mobile device. A wireless access point, such as a barcode scanner, may be in communication with the point-of-sale system and configured to operate as an access point for a mobile device of the customer to communicate with the point-of-sale system.

[0004] Thus, payment industry is exploring vicinity wireless protocol like Bluetooth, Zigbee, WiFi for payment use cases. The vicinity wireless protocol requires power, thus the payment use cases are all limited to powered devices like smartphone and wearables. To overcome the challenges such as on card battery cost, operating requirements, durability and reliability of payment industry requirements and business cases, payment industry is seeking a battery-less card design with vicinity wireless communication capability.

SUMMARY

[0005] According to some non-limiting embodiments, the present disclosure payment processing that simplifies the user's ability to make payments, accumulate rewards, and

authentication. The objective of the present disclosure is to develop a battery-less card design with vicinity communication capability configured to:

- Perform predictive analysis/ early detection of discounts, promotion, loyalty based on one or more cards associated with the user or customer.
- Sorting a Card Program Promotion Advertisement (CPPA) that may match the card of the user when there are CPPAs match with the card program identifier (CPI) of the user. The sorted advertisement may be displayed on a point-of-sale device's display to make the right choice to the users.
- Displays various offers related to a product that may be applied with the card of the user in order to attract the users.
- Identify the user area of interest based on the time that he/she may spend in front of each and every shelf of the showroom.
- Provides auto gateless checkout experience to the user by which the user can experience cardless transactions as there may be particular tabs which works for each and every user. As soon as the user leaves the showroom, the tab which may be maintained is closed.
- Provides shopping guidance to the user by understanding the list or registry that may be prepared by user which is available at the showroom application. Based on the list or registry, the user may be guided through the different shelfs and the user may be indicated with reference signs such as number, nickname, color or emoji using a display as soon as he/she approaches a particular shelf.

[0006] In some non-limiting embodiments, the present disclosure focuses to provide battery-less card design with vicinity communication capability. To overcome the problem such as battery cost, operating requirements, durability, and reliability issues that was faced in the existing technology, the present disclosure describes a battery less card design. The present disclosure discloses that a user's card may be configured with the antenna that may be capable of collecting the energy from radio frequencies to work effectively. As an example, a showroom may have a dedicated power source in the desired frequencies like 2.4 GHz - 5 GHz that may be located at the entrance of the store or showroom to power up the card of the user to communicate as soon as the cardholder enters the store.

[0007] Initially, when the user enters the store, the dedicated power source configured in the store may transmit the radio frequency that may be collected by the antenna which is configured

in the card of the user. In some embodiments, the method includes collecting the generated energy to power on the chip of the card in low power mode and start to broadcast or communicate over vicinity wireless protocol with the nearby Point Of Sale (POS) device of the store. In some embodiments, the POS device may include, but not limited to, card reader, computer having a WIFI antenna (built-in or externally attached e.g., by USB interface) to emit power for activating the card nearby to establish vicinity connection. Upon detecting the type of the card, the POS prompts the card holder about the loyalty, discounts etc that are available. For instance, if the user has card A in his wallet, discount prices associated with the card A might be indicated to the user. Similarly, if the user has card B in his wallet, he may get points added to his card which he may use during his future transaction. (Module 1). Further, in some embodiments, the method includes sorting a Card Program Promotion Advertisement (CPPA) that may match the card of the user when there are multiple cards associated with the user. Initially, CPI of the card is matched with CPI(s) of card program promotion advertisement to predict the best discounts or offers that may be applied. There may be many CPPA that can be applied to the card of the user. In some embodiments, the CPPA that may match the card of the user may be sorted when there are multiple CPPAs that match with the Card Program Identifier (CPI) of the user. The sorted advertisement may be displayed on a but not limited to point-of-sale device's display or may be via a connected electronic display around the relevant locations of the store or before or during the checkout cashier at POS locations to enable the user to make the right choice of card for the transaction. For instance, a particular bank may promote particular offer. If that offer matches the type of the card that the user possesses, then that offer may be displayed to the user (Module 2). Furthermore, in some embodiments, the method includes displaying various offers related to a product that may be applied with the card of the user in order to attract the users. For instance, when the connection is established between the POS and the card of the user, the POS may suggest the offer for particular items by the information of the card of the user. (Module 3) (for example, card A may be used to avail 5% discount on item X). Thereafter, in some embodiments, the method includes identifying the user area of interest based on the time that he/she may spend in front of each and every shelf of the showroom. A base station may be configured at different location inside the store to power the card of the user. For instance, when the user approaches a shelf, the base station powers up the card and card may send out randomized identifier to base stations. By the card trajectories inside the shop, the user behavior may be tracked by determining the time spent in different departments in store. Also, user behavior may be tracked by shopping information in different sections of the store. (Module 4). Further, in some embodiments, the method includes

providing auto gateless checkout experience to the user by which the user can experience cardless transactions as there may be particular tabs which works for each and every user. As soon as the user leaves the showroom, the tab which may be maintained is closed (Module 5). Finally, in some embodiments, the method includes providing shopping guidance to the user by understanding the list or registry that may be prepared by user which is available at the showroom application. Based on the list or registry, the user may be guided through the different shelfs and the user may be indicated with reference signs such as number, nickname, color or emoji using a display as soon as he/she approaches a particular shelf.

[0008] The present research work provides an advantage in which the user can make transaction with the help of the wifi signals that may be collected by the chip of the card. The present disclosure saves battery cost and increases durability, and reliability of card as it works with the help of energy that is collected in the chip of the card. The present disclosure also provides user the shopping guidance experience in order to save time and purchase the required products without wasting the time by searching for the products in the store. Further, the present disclosure denotes that the card of the user automatically connects with the Point-Of-Sale (POS) device of the store, which in turn helps in providing the suitable options of using the card based on the loyalty and the coupons that the user may get by using a particular card.

[0009] These and other features and characteristics of the present invention, as well as the methods of operation and functions of the related elements of structures and the combination of parts and economies of manufacture, will become more apparent upon consideration of the following description and the appended claims with reference to the accompanying drawings, all of which form a part of this specification, wherein like reference numerals designate corresponding parts in the various figures. It is to be expressly understood, however, that the drawings are for the purpose of illustration and description only and are not intended as a definition of the limits of the invention. As used in the specification and the claims, the singular form of “a,” “an,” and “the” include plural referents unless the context clearly dictates otherwise.

BRIEF DESCRIPTION OF THE DRAWINGS AND APPENDICES

[0010] Additional advantages and details of non-limiting embodiments are explained in greater detail below with reference to the exemplary embodiments that are illustrated in the accompanying schematic figures, in which:

[0011] FIG. 1 discloses an exemplary card of a user in which an antenna is configured according to some principles of the present disclosure;

[0012] FIG.2A discloses an exemplary architecture of a system that may perform early detection of discounts, promotion, loyalty, and the like, according to some principles of the present disclosure;

[0013] FIG.2B shows a a flowchart illustrating a method of performing early detection of discounts, promotions, loyalty, and the like, in accordance with some embodiments of the present disclosure;

[0014] FIG. 3A discloses an architecture for a system that may sort a Card Program Promotion Advertisement (CPPA) that may match with the card of the user when there are multiple cards associated with the user according to some principles of the present disclosure;

[0015] FIG.3B shows a flowchart illustrating a method of sorting a card program promotion advertisement (CPPA) that may match with the card of the user when there are multiple cards associated with the user, in accordance with some embodiments of the present disclosure;

[0016] FIG. 4A discloses an exemplary architecture of a system that may display various offers related to a product that may be applied with the card of the user in order to attract the users according to some principles of the present disclosure;

[0017] FIG.4B shows a flowchart illustrating a method displaying various offers related to a product that may be applied with the card of the user in order to attract the user's, in accordance with some embodiments of the present disclosure;

[0018] FIG. 5A shows an exemplary architecture for identifying the user area of interest based on the time spent in front of each and every shelf of the showroom according to some principles of the present disclosure;

[0019] FIG.5B shows a flowchart that illustrating a method identifying the user area of interest based on the time spent in front of each shelf of the showroom, in accordance with some embodiments of the present disclosure;

[0020] FIG. 6 discloses an exemplary architecture for providing auto gateless checkout experience to the user according to some principles of the present disclosure;

[0021] FIG. 7 discloses an exemplary architecture for providing shopping guidance to the user by understanding the list or registry of the user, according to some principles of the present disclosure;

[0022] FIG. 8 is a block diagram of an exemplary computer system for implementing embodiments consistent with the present disclosure.

DESCRIPTION OF THE DISCLOSURE

[0023] In the present document, the word "exemplary" is used herein to mean "serving as an example, instance, or illustration." Any embodiment or implementation of the present subject matter described herein as "exemplary" is not necessarily to be construed as preferred or advantageous over other embodiments.

[0024] While the disclosure is susceptible to various modifications and alternative forms, specific embodiment thereof has been shown by way of example in the drawings and will be described in detail below. It should be understood, however that it is not intended to limit the disclosure to the particular forms disclosed, but on the contrary, the disclosure is to cover all modifications, equivalents, and alternative falling within the spirit and the scope of the disclosure.

[0025] The terms “comprises”, “comprising”, or any other variations thereof, are intended to cover a non-exclusive inclusion, such that a setup, device or method that comprises a list of components or steps does not include only those components or steps but may include other components or steps not expressly listed or inherent to such setup or device or method. In other words, one or more elements in a device or system or apparatus proceeded by “comprises… a” does not, without more constraints, preclude the existence of other elements or additional elements in the device or system or apparatus.

[0026] The terms "an embodiment", "embodiment", "embodiments", "the embodiment", "the embodiments", "one or more embodiments", "some embodiments", and "one embodiment" mean "one or more (but not all) embodiments of the invention(s)" unless expressly specified otherwise.

[0027] The terms "including", "comprising", “having” and variations thereof mean "including but not limited to", unless expressly specified otherwise.

[0028] As used herein, the terms "communication" and "communicate" may refer to the reception, receipt, transmission, transfer, provision, and/or the like of information (e.g., data, signals, messages, instructions, commands, and/or the like). For one unit (e.g., a device, a system, a component of a device or system, combinations thereof, and/or the like) to be in communication with another unit means that the one unit is able to directly or indirectly receive information from and/or transmit information to the other unit. This may refer to a direct or indirect connection (e.g., a direct communication connection, an indirect communication connection, and/or the like) that is wired and/or wireless in nature. Additionally, two units may be in communication with each other even though the information transmitted may be modified, processed, relayed, and/or routed between the first and second unit. For example, a first unit may be in communication with a second unit even though the first unit passively receives information and does not actively transmit information to the second unit. As another example, a first unit may be in communication with a second unit if at least one intermediary unit (e.g., a third unit located between the first unit and the second unit) processes information received from the first unit and communicates the processed information to the second unit. In some non-limiting embodiments, a message may refer to a network packet (e.g., a data packet and/or the like) that includes data. It will be appreciated that numerous other arrangements are possible.

[0029] As used herein, the term "merchant" may refer to an individual or entity that provides goods and/or services, or access to goods and/or services, to customers based on a transaction, such as a payment transaction. The term "merchant" or "merchant system" may also refer to one or more computer systems operated by or on behalf of a merchant, such as a server computer executing one or more software applications. A "point-of-sale (POS) system," as used herein, may refer to one or more computers and/or peripheral devices used by a merchant to engage in payment transactions with customers, including one or more card readers, near-field communication (NFC) receivers, RFID receivers, and/or other contactless transceivers or receivers, contact-based receivers, payment terminals, computers, servers, input devices, and/or other like devices that can be used to initiate a payment transaction.

[0030] As used herein, the term payment card may be (e.g., a credit or debit card), a gift card, a smartcard, smart media, a payroll card, a healthcare card, a wrist band, a machine-readable medium containing account information, a keychain device or fob, an RFID transponder, a retailer discount or loyalty card, a mobile device executing an electronic wallet

application, a personal digital assistant, a security card, an access card, a wireless terminal, and/or a transponder, as examples.

[0031] As used herein, the term "computing device" may refer to one or more electronic devices that are configured to directly or indirectly communicate with or over one or more networks. A computing device may be a mobile or portable computing device, a desktop computer, a server, and/or the like. Furthermore, the term "computer" may refer to any computing device that includes the necessary components to receive, process, and output data, and normally includes a display, a processor, a memory, an input device, and a network interface. A "computing system" may include one or more computing devices or computers. An "application" or "Application Program Interface" (API) refers to computer code or other data sorted on a computer-readable medium that may be executed by a processor to facilitate the interaction between software components, such as a client-side front-end and/or server-side back-end for receiving data from the client. An "interface" refers to a generated display, such as one or more graphical user interfaces (GUIs) with which a user may interact, either directly or indirectly (e.g., through a keyboard, mouse, touchscreen, etc.). Further, multiple computers, e.g., servers, or other computerized devices, such as an autonomous vehicle including a vehicle computing system, directly or indirectly communicating in the network environment may constitute a "system" or a "computing system".

[0032] It will be apparent that systems and/or methods, described herein, can be implemented in different forms of hardware, software, or a combination of hardware and software. The actual specialized control hardware or software code used to implement these systems and/or methods is not limiting of the implementations. Thus, the operation and behavior of the systems and/or methods are described herein without reference to specific software code, it being understood that software and hardware can be designed to implement the systems and/or methods based on the description herein.

[0033] FIG. 1 discloses an exemplary card of a user in which an antenna is configured according to some principles of the present disclosure.

[0034] FIG. 1 shows an exemplary architecture of card of a user that may comprise an antenna **101**, Bluetooth Low Energy (BLE) antenna, Europay, MasterCard, and Visa (EVM) chip. For instance, the card of the user may be a credit card, debit card, a gift card, a smartcard, smart media, a payroll card, and the like. The antenna **101** may be attached to EVM chip of the

card through, but not limited to, a BLE antenna. For ease of understanding, the present disclosure is explained in terms of BLE antenna. However, this should not be construed as a limitation of the present disclosure. The BLE (or equivalent low energy communication chip) is in a combined module with EMV chip as shown in FIG. 1. The BLE may be a separate module but connected via a data link and optional backup power link. The BLE antenna may use 2.4 GHz radio frequencies as classic Bluetooth, which allows dual-mode devices to share a single radio antenna **101** but may use a simpler modulation system. Further, the antenna **101** affixed to the EVM chip may be flexible and easy to integrate in the existing dual interface card design. The antenna **101** configured in the card may be used to collect the energy from the radio frequencies that may be further used for wireless communication with Point Of Sale (POS) device (s). Further, the antenna **101** on the card may start to collect and generate energy to power on the chip in low power mode. Later, the antenna **101** may start to broadcast or communicate over vicinity wireless protocol with the nearby POS device(s) **201**. The vicinity Wireless protocols could be Low Energy Bluetooth (BLE), ZigBee or other available RF interfaces requiring low energy consumption.

[0035] FIG.2A discloses an exemplary architecture 200a of a system that may perform early detection of discounts, promotion, loyalty and the like, according to some principles of the present disclosure.

[0036] In FIG.2A, the architecture includes a card of a user and a point-of-sale (POS) device **201.** Generally, the POS terminal is a hardware system for processing card payments at retail locations. A software to read magnetic strips of credit and debit cards is embedded in the hardware. There are many different types of POS devices **201**, including but not limited to smartphones, tablets, mobile POS, card and chip readers, touch screens, computers, self-service kiosks, and terminals. Other POS-related devices include barcode scanners, cash drawers, keyboards, and receipt printers. Initially, when a cardholder enters the store, POS having a WIFI antenna (built-in or externally attached e.g., by USB interface) may emit power for activating the card nearby to establish vicinity connection. The antenna **101** affixed in the user's card collects the energy and generates energy to power on the chip in low power mode. Upon the activation of the chip, the card starts to broadcast and/or communicate over vicinity wireless protocol with the nearby POS device **201**. Further, the POS device **201** detects aspects such as card type, issuer, card program and the like, of the nearby cards in the store. Thereafter, the POS device prompts the cardholder i.e., the user suitably. For instance, once the connection

is established between the cardholder and the POS device **201**, the POS device **201**prompts the user that if the user uses card A belonging to a particular issuer for the transaction in the store, then he may get 200 bonus points on his next transaction. Another example, the POS device **201** prompts the user that if the user uses card C of a particular issuer for the transaction in the store, then he may get 50% off on particular transaction.

[0037] FIG.2B shows a flowchart illustrating a method of performing early detection of discounts, promotions, loyalty and the like, in accordance with some embodiments of the present disclosure.

[0038] As illustrated in **FIG. 2B**, method **200b** includes one or more blocks illustrating a method for performing early detection of discounts, promotions, loyalty. The method **200b** may be described in the general context of computer-executable instructions. Generally, computer-executable instructions can include routines, programs, objects, components, data structures, procedures, modules, and functions, which perform functions or implement abstract data types.

[0039] The order in which the method **200b** is described is not intended to be construed as a limitation, and any number of the described method blocks can be combined in any order to implement the method **200b**. Additionally, individual blocks may be deleted from the methods without departing from the scope of the subject matter described herein. Furthermore, the method **200b** can be implemented in any suitable hardware, software, firmware, or combination thereof.

[0040] At **block 201**, the method **200b** may include generating, by a POS device **201**, the energy that may be required to power on the chip of the card. For instance, when the user enters the store, the store may have dedicated power supply, or the POS may have WIFI signals that may emit signal for activating the card nearby to establish vicinity connection.

[0041] At **block 203**, the method **200b** may include identifying, by the POS device **201**, the type of card, issuer or the card program of one or more cards in the showroom. For instance, identifying the type of card, issuer or card program identifier that may help the user to avail the discounts.

[0042] At **block 205**, the method **200b** may include prompting, by the POS device, the user by providing suggestions to the user. For instance, once the connection is established between

the cardholder and the POS device **201**, the POS device **201** prompts the user that if the user uses card A belonging to a particular issuer for the transaction in the store , then he may get 200 bonus points on his next transaction. Another example, the POS device **201** prompts the user that if the user uses card C of a particular issuer for the transaction in the store, then he may get 50% off on particular transaction.

[0043] FIG. 3A shows an architecture of a system that may sort a Card Program Promotion Advertisement (CPPA) that may match with the card of the user when there are multiple cards associated with the user according to some principles of the present disclosure.

[0044] In FIG.3A, the architecture includes a card of a user and a point-of-sale (POS) device **201** and Card Program Identifier (CPI) device **301.** Initially, when a cardholder enters the store, POS having a WIFI antenna (built-in or externally attached e.g., by USB interface) emits power for activating the card nearby to establish vicinity connection. The antenna **101**affixed in the user's card collects the energy from the POS that may have a WIFI antenna (built-in or externally attached e.g. by USB interface) to power on the chip in low power mode. Upon the activation of the chip, the card starts to broadcast and/or communicate over vicinity wireless protocol with the nearby POS device **201**. When card holder approaches near the POS device **201**, the POS receives the CPI of the card. The CPI may contain the header and advertiser address. . The POS device **201**validates the received CPI with the CPI that may be stored in the CPI device **301** of Card Program Promotion Advertisement (CPPA). For instance, if multiple CPPA matches with the card of the user, then CPPA may be sorted or may be rated according to the advertisement value. Based on the number of CPIs match, POS device **201** may display the CPPA matched in the sorted order to attract the cardholder using an advertised card program.

[0045] For instance, when the cardholder enters the store, the card gets powered up with the help of the POS that has a WIFI antenna (built-in or externally attached e.g., by USB interface) that may emit power for activating the card nearby to establish vicinity connection. When the cardholder approaches near the POS device **201**, the POS device **201** receives the CPI of the card (as shown in FIG.3A). The POS device **201** validates the CPI and tends to match the CPI with the CPI that may be stored in the CPI device **301** of CPPA such as discount, loyalty and the like. As an example, if the user wants to buy a phone, then multiple CPPA may be matched with the CPI of cardholder. Then the POS sorts the matched CPPA by the advertisement value and displays the sorted list of CPPA value on the POS display (not shown in FIG.3A). The

process of displaying the CPPA may be done in order to attract the user. For instance, based on the type of the card that the user has (for example credit card, debit card, and the like), the user may get certain discounts on a particular product or a cashback by using particular card of the user. This may help the user to decide which card can be used in order to get a cashback or discounts.

[0046] FIG.3B shows a flowchart illustrating a method of sorting a card program promotion advertisement (CPPA) that may match with the card of the user when there are multiple cards associated with the user, in accordance with some embodiments of the present disclosure.

[0047] As illustrated in **FIG. 3B**, method **300b** includes one or more blocks illustrating a method of sorting a card program promotion advertisement (CPPA) that may match with the card of the user. The method **300b** may be described in the general context of computer-executable instructions. Generally, computer-executable instructions can include routines, programs, objects, components, data structures, procedures, modules, and functions, which perform functions or implement abstract data types.

[0048] The order in which the method **300b** is described is not intended to be construed as a limitation, and any number of the described method blocks can be combined in any order to implement the method **300b**. Additionally, individual blocks may be deleted from the methods without departing from the scope of the subject matter described herein. Furthermore, the method **200b** can be implemented in any suitable hardware, software, firmware, or combination thereof.

[0049] At **block 301**, the method **300b** may include generating, by a POS device **201**, the energy that may be required to power on the chip of the card. For instance, when the user enters the store, the store may have dedicated power supply, or the POS may have WIFI signals that signal coverage to emits power for activating the card nearby to establish vicinity connection.

[0050] At **block 303**, the method **300b** may include receiving, by the POS device **201**, the Card Program Identifier (CPI) information of the card.

[0051] At **block 305**, the method **300b** may include comparing, by the POS, the received CPI with the CPI that may be stored in the CPI device **301** of card program promotion

advertisement (CPPA) to predict discount, loyalty and the like. As an example, if the user wants to buy a phone, then multiple CPPA may be matched with the CPI of cardholder.

[0052] At **block 307** and **block 309**, the method **300b** may include sorting the matched CPPA by the advertisement value and displays the sorted list of CPPA value on the POS display. For instance, the POS sorts the matched CPPA by the advertisement value and displays the sorted list of CPPA value on the POS display.

[0053] FIG. 4A discloses an exemplary architecture of a system that may display various offers related to a product that may be applied with the card of the user in order to attract the users according to some principles of the present disclosure.

[0054] In FIG.4A, the architecture 400a includes a card that may be configured with the antenna **101**, a Point-of- Sale (POS) device, Card Program Identifier (CPI) device and a Connected Electronic Display (CED) **401.** The CED **401** may be placed, but not limited to, in-front of the shelf that can also display the name of the items placed in the shelf. The CED **401** has the Bluetooth Low Energy (BLE) antenna that may be capable of establishing a connection with the powered or activated card of the user. The BLE connection may be adjustable by tuning the BLE antenna and BLE protocol handling software. For instance, when the cardholder visits the store, the store may have a dedicated power source in the desired frequencies (e.g., 2.4GHz and 5 GHz) that may be located at the entrance of the store to power up the card to communicate with the cardholder as soon as he/ she enters the store. The antenna **101** configured in the chip of the card collects the energy from the radio frequencies to power up the chip of the card. Upon establishing the connection between the POS device **201** and the card, the card starts to broadcast its CPI. Further, the CED **401** may receive the shared CPI of the card and CED **401** may transmit received CPIs to a computing system (not shown in FIG.4A) with its identifier and location information such as merchandise shelf number. The computing system matches the received CPIs with target card program promotion advertisement (CPPA) of CPI device **301**. When the CPIs are matched with the CPPAs, the computing system may display the relevant discounts, coupons or offers of the card. Further, the computing system may rate and sort the matched CPPAs by the advertisement value, number of CPIs matched and then link CPPA category (such as groceries, clothing) with the merchandise category of the shelf to which the CED **401** may be affixed. The computing system send the topmost CPPA to the CED **401** in which the CCPA may be displayed to attract the

cardholder so that he/she may purchase the products by looking into the offers that may be obtained using his/her card.

[0055] As an example, when the user visits the store, the card may be powered up by collecting the energy as described above. Upon establishing the connection, when the user approaches near a shelf which may have, as an example, grocery section, the CED **401** present near grocery section may connect with the card of the user. The CPI of the user may be received by the CED **401** which then transmits the received CPI to the computing system. The computing system match the CPI with CPPA which may display the discounts or loyalty. The computing system sorts the CPPA and displays the topmost applicable coupon on the CED **401** that may be applied for the grocery.

[0056] FIG.4B shows a flowchart illustrating a method of displaying various offers related to a product that may be applied with the card of the user in order to attract the users, in accordance with some embodiments of the present disclosure.

[0057] As illustrated in **FIG. 4B**, method **400b** includes one or more blocks illustrating a method for displaying various offers related to a product that may be applied with the card of the user The method **400b** may be described in the general context of computer-executable instructions. Generally, computer-executable instructions can include routines, programs, objects, components, data structures, procedures, modules, and functions, which perform functions or implement abstract data types.

[0058] The order in which the method **400b** is described is not intended to be construed as a limitation, and any number of the described method blocks can be combined in any order to implement the method **400b**. Additionally, individual blocks may be deleted from the methods without departing from the scope of the subject matter described herein. Furthermore, the method **400b** can be implemented in any suitable hardware, software, firmware, or combination thereof.

[0059] At **block 401**, the method **400b** may include generating, by a POS device **201**, the energy based on the collected radio frequencies to power on the chip of the card. For instance, when the user enters the store, the store may have dedicated power supply, or the POS may have WIFI signals to emit power for activating the card nearby to establish vicinity connection.

[0060] At **block 403**, the method **400b** may include receiving, by a CED **401**, the Card Program Identifier (CPI) information such as header, advertisement address details of the card.

[0061] At **block 405**, the method **400b** may include transmitting, by the CED **401**, the received CPI to a computing system to compare the received CPI with the Card Program Promotion Advertisement (CPPA) of a CPI device **301**.

[0062] At **block 407**, the method **400b** may include sorting based on the advertisement value and the number of CPI matched and co-relate the matched CPI with the products. For instance, the computing system match the CPI with CPPA which may display the discounts or loyalty. The computing system sorts the CPPA and displays the topmost applicable coupons/discounts on the CED **401** that may be applied for the product e.g., grocery.

[0063] At **block 409**, the method **400b** may include displaying the sorted advertisements to the user on the CED **401** in order to collect the coupon using the card.

[0064] In alternative embodiment, the card of the user may be powered by the CED **401** whenever the user approaches near the CED **401**. Further, the CED **401** may include BLE antenna to establish the vicinity connection with the cardholder. In other alternative embodiment, the card of the user may be activated with the Wi-Fi signals from the POS device **201** when the user enters the store.

[0065] FIG. 5A shows an exemplary architecture 500a for identifying the user area of interest based on the time spent in front of each and every shelf of the showroom according to some principles of the present disclosure.

[0066] In FIG.5A, the architecture includes card of a user that may be configured with an antenna **101** to power up the chip of the card when the energy is collected and one or more base station 501-501n as shown in FIG 5A. The one or more base station may be configured at different location inside a store. The base station may be capable of emitting the energy that may be required by the card to get activated. For instance, when the user enters the store, the card of the user may be connected to the nearby base station as the card may be powered by collecting the energy emitted by the base station. As an example, when the user is near the grocery section the base station that may be located near to grocery section establishes the connection with the card of the user. Based on the established connection between the card and the base station, the base station may receive the randomized identifier. In the present disclosure, a merchant of the store can determine the user behavior by collecting the cards trajectories inside the store to optimize the time taken by the user in different section of the

store and order of shopping in different section of the store. For instance, when the connection is established between the card of the user and the base station that may be present near the electronics section of the store, the base station receives the randomized identifier of the card. Based on the received randomized identifier information of the card, the merchant of the store may understand that the user may be interested in buying the electronic products as he has spent more time in front of electronics section of the store.

[0067] FIG.5B shows a flowchart that illustrates a method of identifying the user area of interest based on the time spent in front of each shelf of the showroom, in accordance with some embodiments of the present disclosure.

[0068] As illustrated in **FIG. 5B**, method **500b** includes one or more blocks illustrating a method for managing traffic at a junction. The method **500b** may be described in the general context of computer-executable instructions. Generally, computer-executable instructions can include routines, programs, objects, components, data structures, procedures, modules, and functions, which perform functions or implement abstract data types.

[0069] The order in which the method **500b** is described is not intended to be construed as a limitation, and any number of the described method blocks can be combined in any order to implement the method **500b**. Additionally, individual blocks may be deleted from the methods without departing from the scope of the subject matter described herein. Furthermore, the method **500b** can be implemented in any suitable hardware, software, firmware, or combination thereof.

[0070] At **block 501**, the method **500b** may include generating, by a base station, the energy based on the collected radio frequencies to power on the chip of the card. For instance, when the user enters the store, the store may have dedicated power supply, or the base station that may have WIFI signals to emit power for activating the card nearby to establish vicinity connection.

[0071] At **block 503**, the method **500** may include receiving, by the base station, the card randomized identifier information of the user's card.

[0072] At **block 505**, the method **500** may include identifying, by the base station, the time spent and the user trajectories in different sections of the store.

[0073] FIG. 6 discloses an exemplary architecture for providing auto gateless checkout experience to the user according to some principles of the present disclosure.

[0074] In FIG. 6, the architecture discloses connection between the POS and the card of the user. FIG.6 explains a scenario when the user enters the store in order to purchase the item required by him/her. As the user enters the store, the user taps the card at the POS that may be required for pre-authorization at a bar. Further, the bar may tend to open a particular tab for each and every user without asking for the card from the user. Upon performing the pre-authorization, the POS device **201** may transmit the required energy that may be required for the card to power up in order to establish the connection. Once the card of the user is active, the user can buy any products and make the payment. When the user has left the store, then the POS device **201** may lose the connection that may be established between the POS device **201** and the card of the user. Therefore, the tab that may be opened for that particular user may be closed since the connection is lost. When the tab of that particular user may be automatically closed, the POS device **201** may send the final amount for authorization and settlement.

[0075] FIG.7A discloses an exemplary architecture for providing shopping guidance to the user by understanding the list or registry of the user, according to some principles of the present disclosure.

[0076] In FIG.7A the architecture includes a card that may be configured with the antenna, **101** a Point-of- Sale (POS) device, Card Program Identifier (CPI) device **301** and a Connected Electronic Display (CED) **401.** The CED **401** may be placed but not limited to in-front of the shelf that can also display the name or reference signs associated with the user. The CED **401** has the Bluetooth Low Energy (BLE) antenna that may be capable of establishing a connection with the powered or activated card of the user. The BLE connection may be adjustable by tuning the BLE antenna and BLE protocol handling software. In some embodiments, the user can sign into a merchant application to prepare the shopping list that he/she may wish to purchase in the store before he/she starts the shopping. The user prepares the list or registry in the merchant application where the registry or list may be associated with the reference signs or codes such as but not limited to nickname, reference number, color, avatar, emoji. The user may be aware of the reference signs associated with the list or registry. Therefore, when the user visits the store, the card of the user that may be configured with the antenna **101** may establish the connection with the POS device **201** of the store. Once the user starts to move across different sections of the store, whenever he may approach to the section that was

mentioned in the list or registry prepared by him, the CED **401** may display the reference signs associated with the user. For instance, the user may be interested in purchasing an electronic item for example smartphone which he/she might have listed in the registry of the merchant application before start of shopping. As soon as the registry is updated in the merchant application, the reference sign may be displayed for the user. Based on which the user can identify that the indication such as reference sign displayed on the CED is for the user. In other words, based on the reference signs indicated on the CED **401**, the user may understand that the items listed in the registry is in particular shelf of the store which makes the user job easy without searching for he item throughout the store. When the user enters the merchant store and move towards the electronic section, the CED **401** that may be placed in front of the electronic section may display the reference sign associated with the user. Upon identifying the reference sign by the user that may be associated with him, the user may purchase the product. This may help the user to purchase the desired product that may be in his/her registry quickly.

[0077] FIG. 8 is a block diagram of an exemplary computer system for implementing embodiments consistent with the present disclosure.

[0078] In some embodiments, FIG. 8 illustrates a block diagram of an exemplary computer system 800 for implementing embodiments consistent with the present disclosure. In some embodiments, the computer system 800 may be a Card Program Identifier (CPI) device and may include a central processing unit ("CPU" or "processor") 802 that is associated with antenna **101** of card of the user and the POS device to perform a method of battery-less card design with vicinity wireless communication capability. In an alternative embodiment, the computing system may be the POS device **201** that communicates with the CPI device **301** to perform the method of battery-less card design with vicinity wireless communication capability. The processor 802 may include at least one data processor for executing program components for executing user or system-generated business processes. A user may include a person, a person using a device such as those included in this disclosure, or such a device itself. The processor 802 may include specialized processing units such as integrated system (bus) controllers, memory management control units, floating point units, graphics processing units, digital signal processing units, etc.

[0079] The processor 802 may be disposed in communication with input devices 811 and output devices 812 via I/O interface 801. The I/O interface 801 may employ communication protocols/methods such as, without limitation, audio, analog, digital, stereo, IEEE-1393, serial

bus, Universal Serial Bus (USB), infrared, PS/2, BNC, coaxial, component, composite, Digital Visual Interface (DVI), high-definition multimedia interface (HDMI), Radio Frequency (RF) antennas, S-Video, Video Graphics Array (VGA), IEEE 802.n /b/g/n/x, Bluetooth, cellular (e.g., Code-Division Multiple Access (CDMA), High-Speed Packet Access (HSPA+), Global System For Mobile Communications (GSM), Long-Term Evolution (LTE), WiMax, or the like), etc.

[0080] Using the I/O interface 801, the computer system 800 may communicate with the input devices 1311 and the output devices 812.

[0081] In some embodiments, the processor 802 may be disposed in communication with a communication network 809 via a network interface 803. The network interface 803 may communicate with the communication network 809. The network interface 803 may employ connection protocols including, without limitation, direct connect, Ethernet (e.g., twisted pair 10/100/1000 Base T), Transmission Control Protocol/Internet Protocol (TCP/IP), token ring, IEEE 802.11a/b/g/n/x, etc. Using the network interface 803 and the communication network 1309, the computer system 800 may communicate with user of the card, POS device **201** and CPI device **301**. As an example, the one or more data sources 813 may include an issuer bank and any other external source comprising client data. The communication network 909 can be implemented as one of the different types of networks, such as intranet or Local Area Network (LAN), Closed Area Network (CAN) and such. The communication network 809 may either be a dedicated network or a shared network, which represents an association of the different types of networks that use a variety of protocols, for example, Hypertext Transfer Protocol (HTTP), CAN Protocol, Transmission Control Protocol/Internet Protocol (TCP/IP), Wireless Application Protocol (WAP), etc., to communicate with each other. Further, the communication network 809 may include a variety of network devices, including routers, bridges, servers, computing devices, storage devices, etc. In some embodiments, the processor 802 may be disposed in communication with a memory 805 (e.g., RAM, ROM, etc. not shown in FIG.3) via a storage interface 803. The storage interface 803 may connect to memory 805 including, without limitation, memory drives, removable disc drives, etc., employing connection protocols such as Serial Advanced Technology Attachment (SATA), Integrated Drive Electronics (IDE), IEEE-1393, Universal Serial Bus (USB), fibre channel, Small Computer Systems Interface (SCSI), etc. The memory drives may further include a drum,

magnetic disc drive, magneto-optical drive, optical drive, Redundant Array of Independent Discs (RAID), solid-state memory devices, solid-state drives, etc.

[0082] The memory 805 may store a collection of program or database components, including, without limitation, a user interface 806, an operating system 807, a web browser 808 etc. In some embodiments, the computer system 800 may store user/application data, such as the data, variables, records, etc. as described in this disclosure. Such databases may be implemented as fault-tolerant, relational, scalable, secure databases such as Oracle or Sybase.

[0083] The operating system 807 may facilitate resource management and operation of the computer system 800. Examples of operating systems include, without limitation, APPLE® MACINTOSH® OS X®, UNIX®, UNIX-like system distributions (E.G., BERKELEY SOFTWARE DISTRIBUTION® (BSD), FREEBSD®, NETBSD®, OPENBSD, etc.), LINUX® DISTRIBUTIONS (E.G., RED HAT®, UBUNTU®, KUBUNTU®, etc.), IBM®OS/2®, MICROSOFT® WINDOWS® (XP®, VISTA®/7/8, 10 etc.), APPLE® IOS®, GOOGLE™ ANDROID™, BLACKBERRY® OS, or the like. The User interface 1306 may facilitate display, execution, interaction, manipulation, or operation of program components through textual or graphical facilities. For example, user interfaces may provide computer interaction interface elements on a display system operatively connected to the computer system 1300, such as cursors, icons, checkboxes, menus, scrollers, windows, widgets, etc. Graphical User Interfaces (GUIs) may be employed, including, without limitation, Apple® Macintosh® operating systems' Aqua®, IBM® OS/2®, Microsoft® Windows® (e.g., Aero, Metro, etc.), web interface libraries (e.g., ActiveX®, Java®, Javascript®, AJAX, HTML, Adobe® Flash®, etc.), or the like.

[0084] In some embodiments, the computer system 800 may implement the web browser 1308 stored program components. The web browser 808 may be a hypertext viewing application, such as MICROSOFT® INTERNET EXPLORER®, GOOGLE™ CHROME™, MOZILLA® FIREFOX®, APPLE® SAFARI®, etc. Secure web browsing may be provided using Secure Hypertext Transport Protocol (HTTPS), Secure Sockets Layer (SSL), Transport Layer Security (TLS), etc. Web browsers 808 may utilize facilities such as AJAX, DHTML, ADOBE® FLASH®, JAVASCRIPT®, JAVA®, Application Programming Interfaces (APIs), etc. In some embodiments, the computer system 800 may implement a mail server stored program component. The mail server may be an Internet mail server such as Microsoft Exchange, or the like. The mail server may utilize facilities such as Active Server Pages (ASP), ACTIVEX®,

ANSI® C++/C#, MICROSOFT®, .NET, CGI SCRIPTS, JAVA®, JAVASCRIPT®, PERL®, PHP, PYTHON®, WEBOBJECTS®, etc. The mail server may utilize communication protocols such as Internet Message Access Protocol (IMAP), Messaging Application Programming Interface (MAPI), MICROSOFT® exchange, Post Office Protocol (POP), Simple Mail Transfer Protocol (SMTP), or the like. In some embodiments, the computer system 800 may implement a mail client stored program component. The mail client may be a mail viewing application, such as APPLE® MAIL, MICROSOFT® ENTOURAGE®, MICROSOFT® OUTLOOK®, MOZILLA® THUNDERBIRD®, etc.

[0085] Furthermore, one or more computer-readable storage media may be utilized in implementing embodiments consistent with the present disclosure. A computer-readable storage medium refers to any type of physical memory on which information or data readable by a processor may be stored. Thus, a computer-readable storage medium may store instructions for execution by one or more processors, including instructions for causing the processor(s) to perform steps or stages consistent with the embodiments described herein. The term "computer-readable medium" should be understood to include tangible items and exclude carrier waves and transient signals, i.e., non-transitory. Examples include Random Access Memory (RAM), Read-Only Memory (ROM), volatile memory, non-volatile memory, hard drives, Compact Disc (CD) ROMs, Digital Video Disc (DVDs), flash drives, disks, and any other known physical storage media.

[0086] Finally, the language used in the specification has been principally selected for readability and instructional purposes, and it may not have been selected to delineate or circumscribe the inventive subject matter. Accordingly, the disclosure of the embodiments of the disclosure is intended to be illustrative, but not limiting, of the scope of the disclosure.

[0087] With respect to the use of substantially any plural and/or singular terms herein, those having skill in the art can translate from the plural to the singular and/or from the singular to the plural as is appropriate to the context and/or application. The various singular/plural permutations may be expressly set forth herein for sake of clarity.

[0088] Any of the software components or functions described in this application, may be implemented as software code to be executed by a processor using any suitable computer language such as, for example, Java, C++ or Perl using, for example, conventional or object-oriented techniques. The software code may be stored as a series of instructions, or commands

on a computer readable medium, such as a random access memory (RAM), a read only memory (ROM), a magnetic medium such as a hard-drive or a floppy disk, or an optical medium such as a CD-ROM. Any such computer readable medium may reside on or within a single computational apparatus, and may be present on or within different computational apparatuses within a system or network.

[0089] The above description is illustrative and is not restrictive. Many variations of the invention may become apparent to those skilled in the art upon review of the disclosure.

[0090] One or more features from any embodiment may be combined with one or more features of any other embodiment without departing from the scope of the invention.

[0091] A recitation of "a", "an" or "the" is intended to mean "one or more" unless specifically indicated to the contrary.

[0092] All patents, patent applications, publications, and descriptions mentioned above are herein incorporated by reference in their entirety for all purposes. None is admitted to be prior art.

[0093] Although the invention has been described in detail for the purpose of illustration based on what is currently considered to be the most practical and preferred embodiments, it is to be understood that such detail is solely for that purpose and that the invention is not limited to the disclosed embodiments, but, on the contrary, is intended to cover modifications and equivalent arrangements that are within the spirit and scope of the invention. For example, it is to be understood that the present invention contemplates that, to the extent possible, one or more features of any embodiment can be combined with one or more features of any other embodiment.

ABSTRACT

ENERGY HARVESTING BATTERY-LESS SMART CARD WITH VICINITY COMMUNICATION CAPABILITY

The present disclosure focusses to simplifying the user's ability to make payments, accumulate rewards, or authentication by including information relating to multiple cards, and allowing the user to conveniently select a card among the multiple cards by operation of a user input unit, and to use various payment methods. The method includes performing predictive analysis/ early detection of discounts, promotion. Further, sorts and displays the Card Program Promotion Advertisement (CPPA) that may match the card of the user to obtain the offers. Also, identifies the user area of interest based on the time that he/she may spend in front of each and every shelf of the showroom. Further, providing auto gateless checkout experience to the user by which the user can experience cardless transactions. Finally, providing shopping guidance to the user by understanding the list or registry that may be prepared by user which is available at the showroom application.

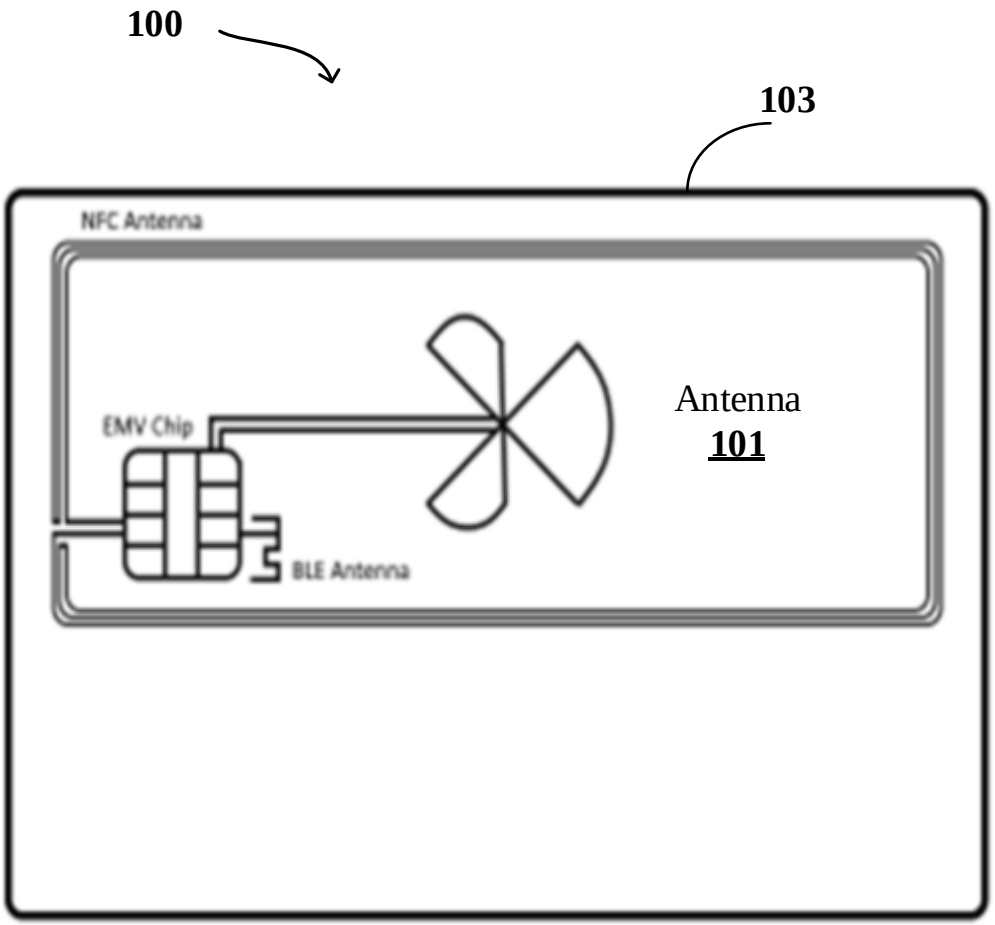

FIG.1

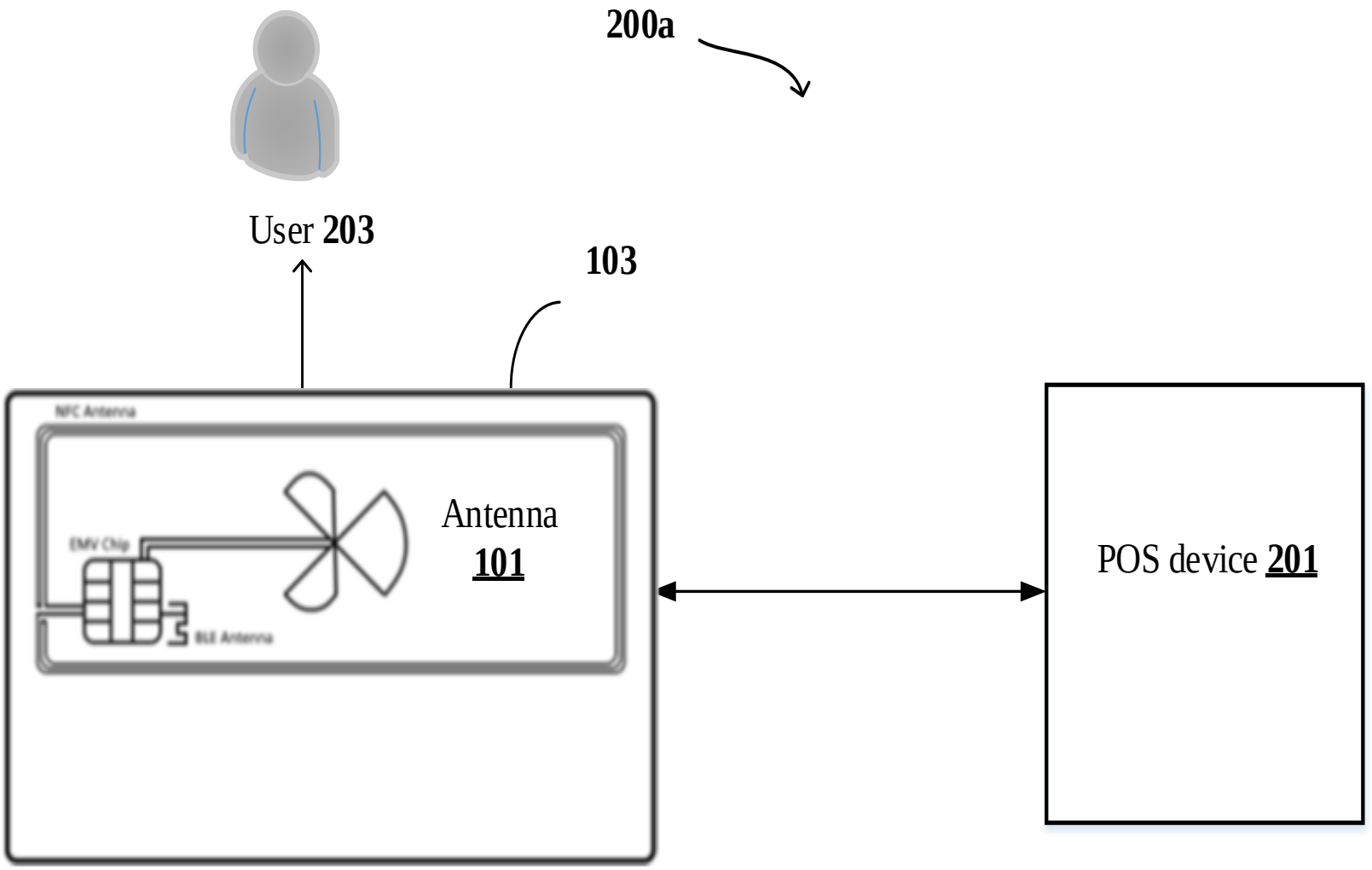
200a
User **203**
103
NFC Antenna
EMV Chip
BLE Antenna
Antenna
101
POS device **201**

FIG.2A

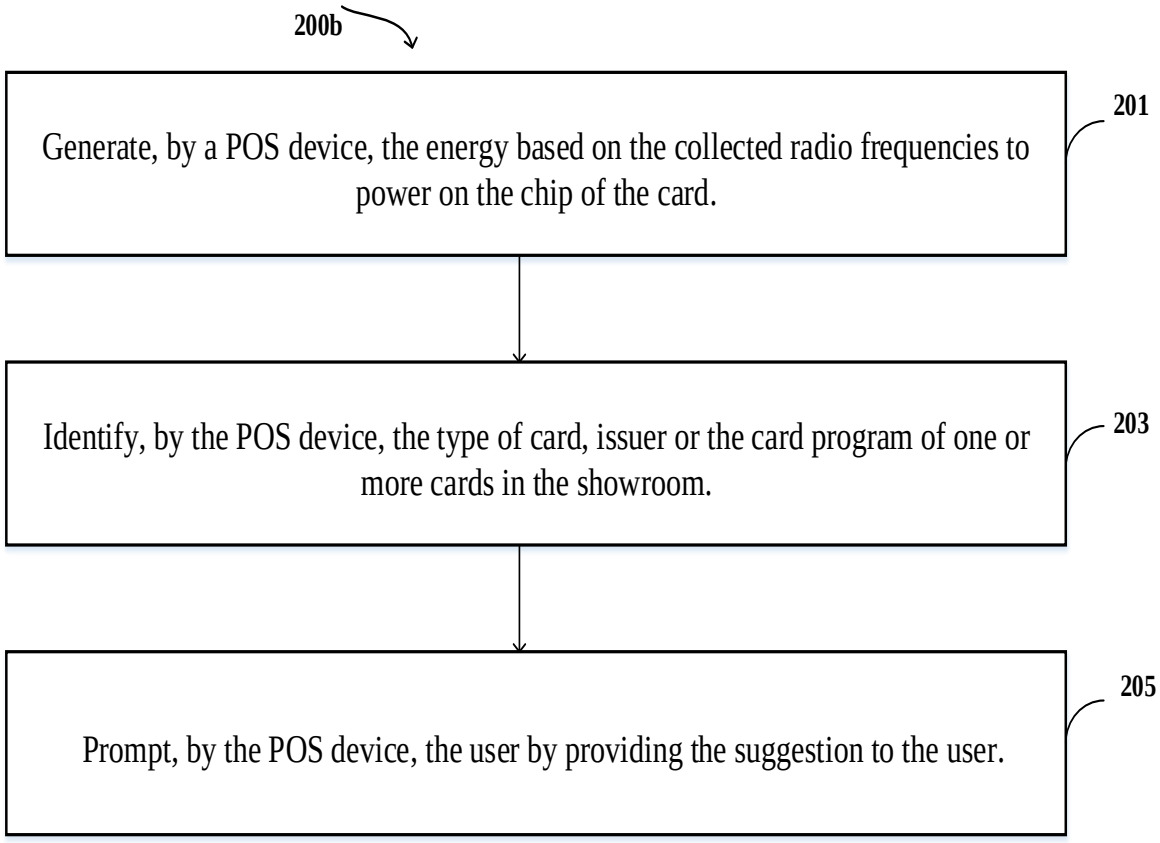
200b
Generate, by a POS device, the energy based on the collected radio frequencies to power on the chip of the card.
201
Identify, by the POS device, the type of card, issuer or the card program of one or more cards in the showroom.
203
Prompt, by the POS device, the user by providing the suggestion to the user.
205

FIG.2B

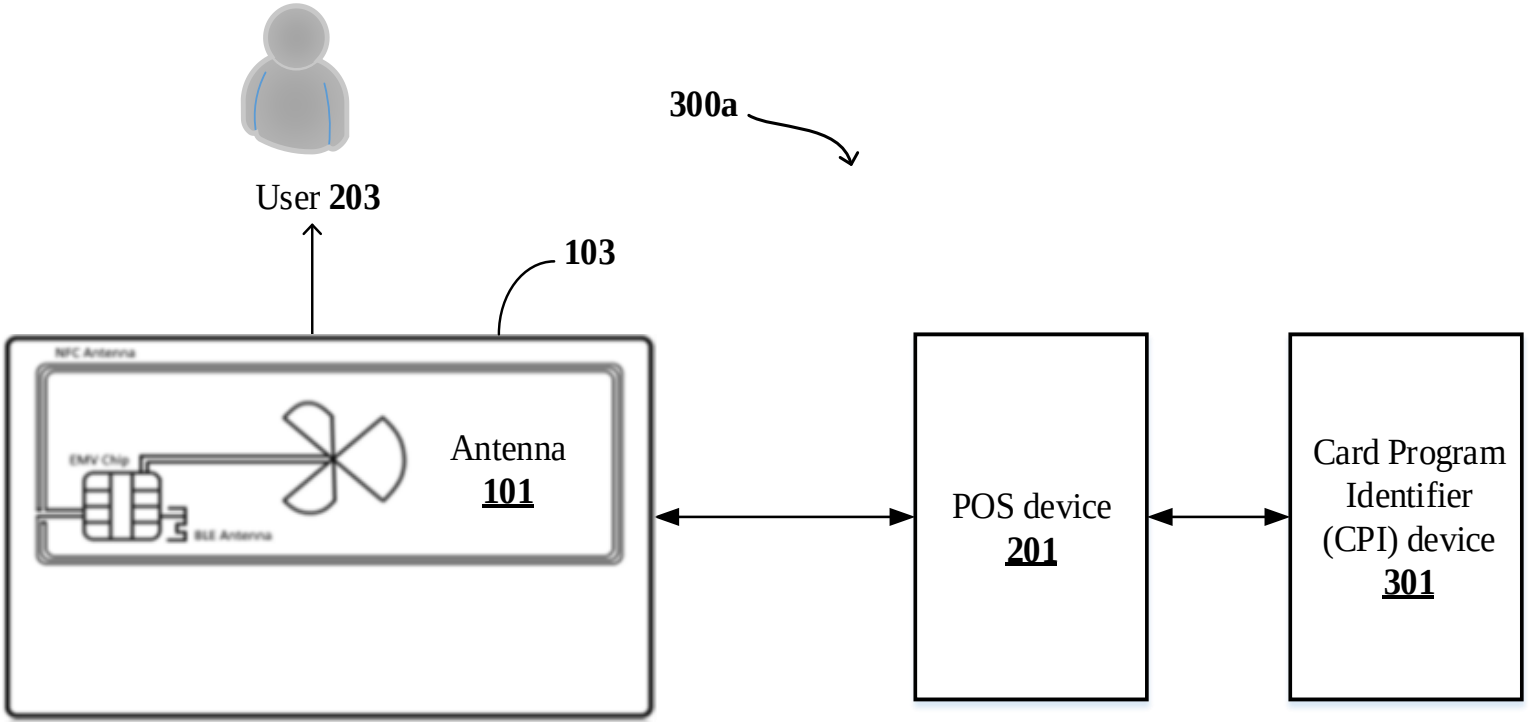
300a
User **203**
103
NFC Antenna
EMV Chip
BLE Antenna
Antenna
101
POS device
201
Card Program Identifier (CPI) device
301

FIG.3A

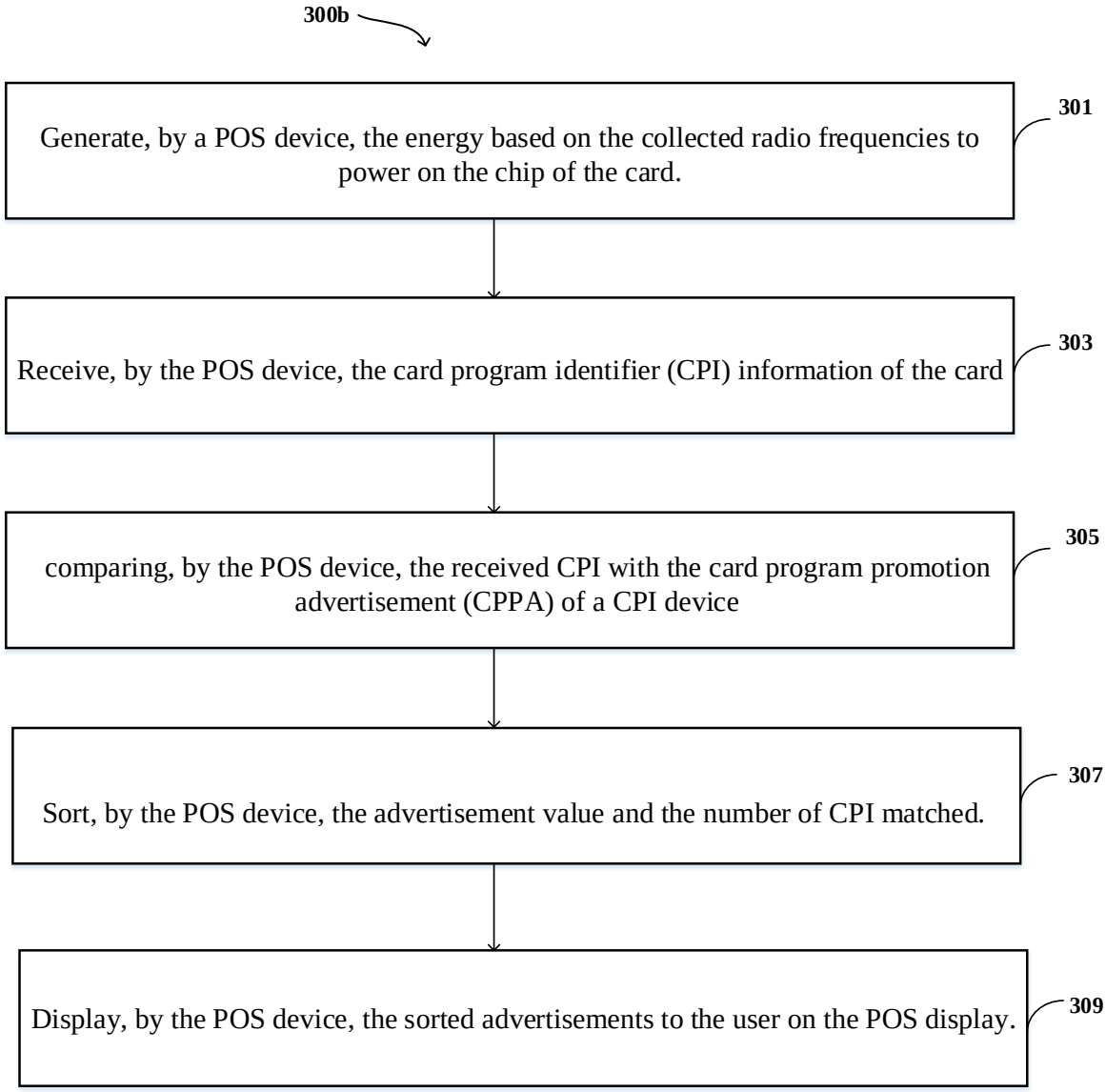
300b
Generate, by a POS device, the energy based on the collected radio frequencies to power on the chip of the card.
301
Receive, by the POS device, the card program identifier (CPI) information of the card
303
comparing, by the POS device, the received CPI with the card program promotion advertisement (CPPA) of a CPI device
305
Sort, by the POS device, the advertisement value and the number of CPI matched.
307
Display, by the POS device, the sorted advertisements to the user on the POS display.
309

FIG.3B

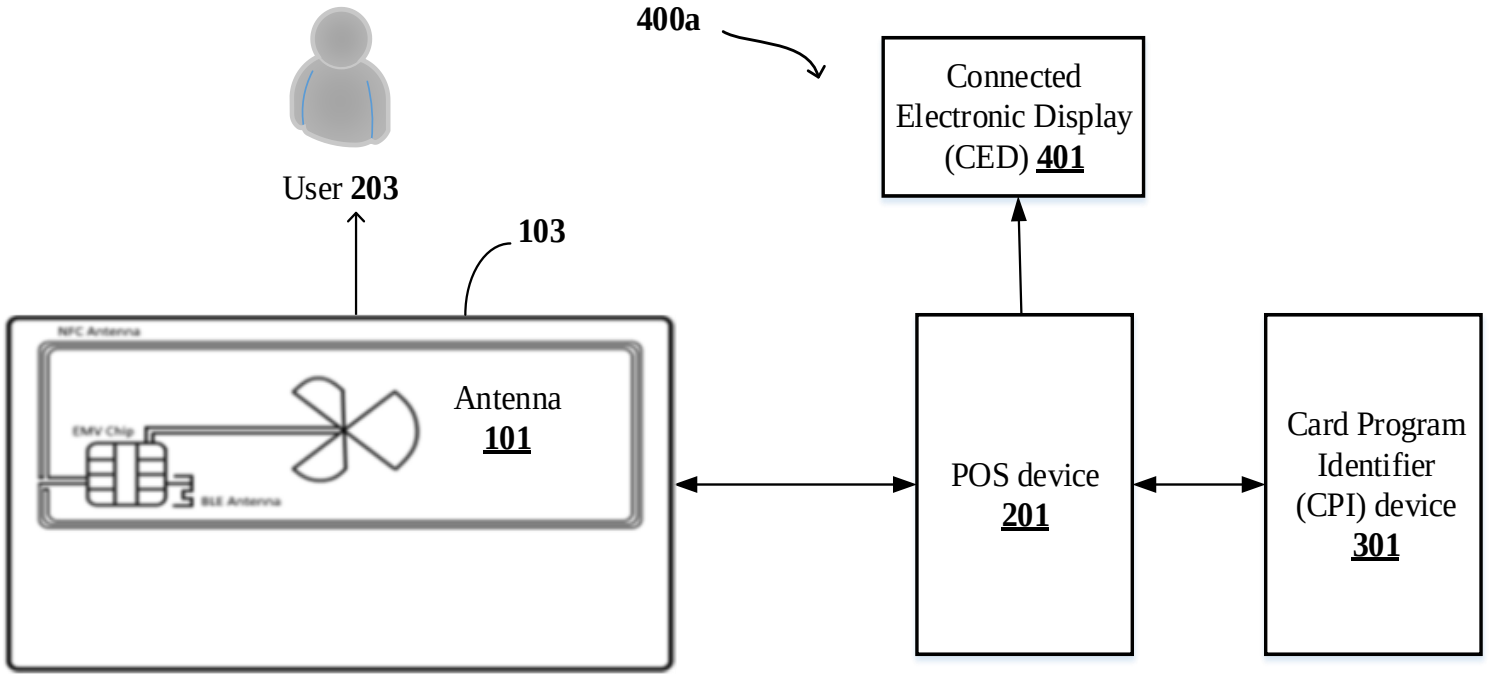
400a
Connected Electronic Display (CED) 401
User 203
103
NFC Antenna
EMV Chip
BLE Antenna
Antenna 101
POS device 201
Card Program Identifier (CPI) device 301

FIG.4A

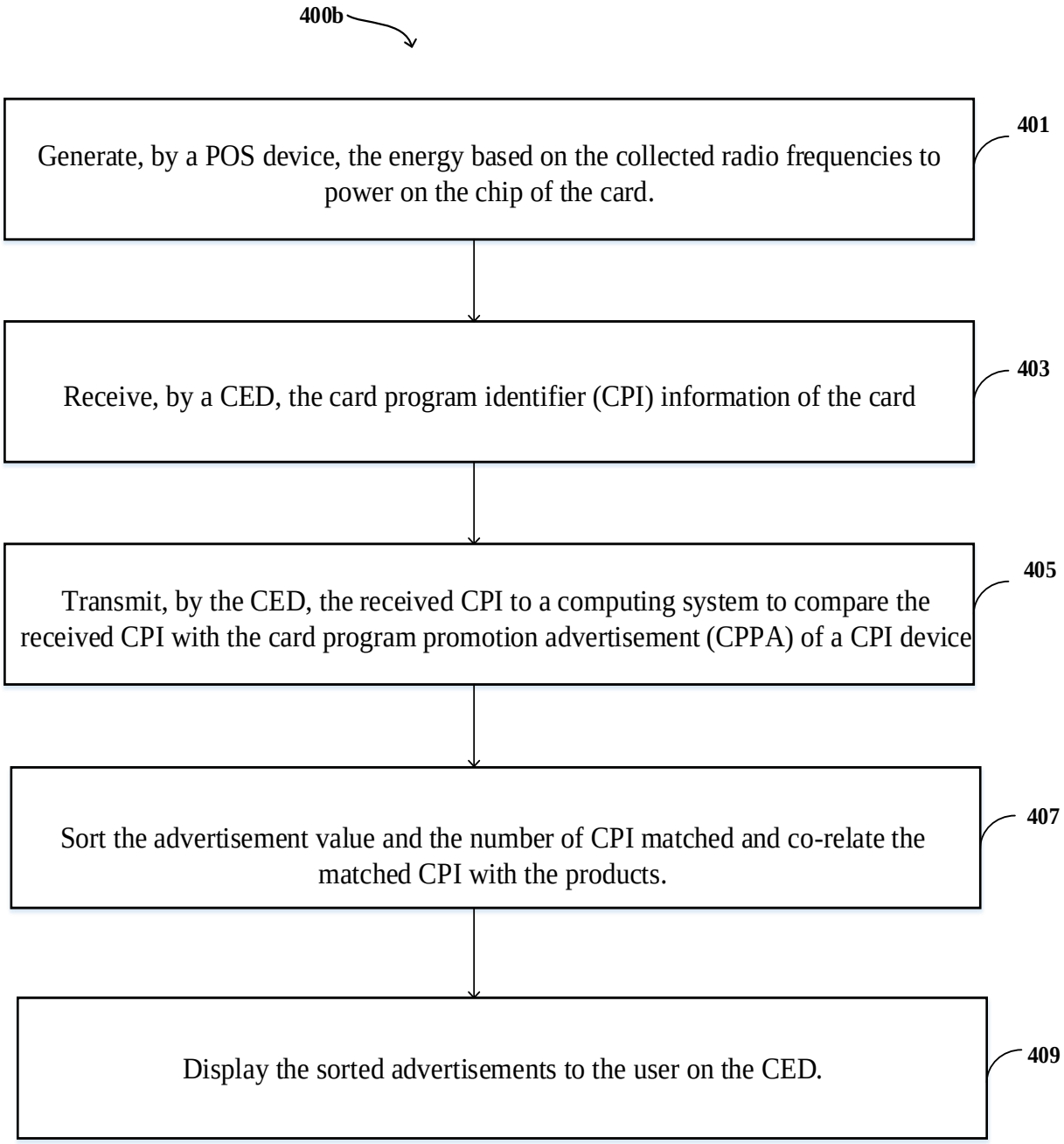
400b
Generate, by a POS device, the energy based on the collected radio frequencies to power on the chip of the card.
401
Receive, by a CED, the card program identifier (CPI) information of the card
403
Transmit, by the CED, the received CPI to a computing system to compare the received CPI with the card program promotion advertisement (CPPA) of a CPI device
405
Sort the advertisement value and the number of CPI matched and co-relate the matched CPI with the products.
407
Display the sorted advertisements to the user on the CED.
409

FIG.4B

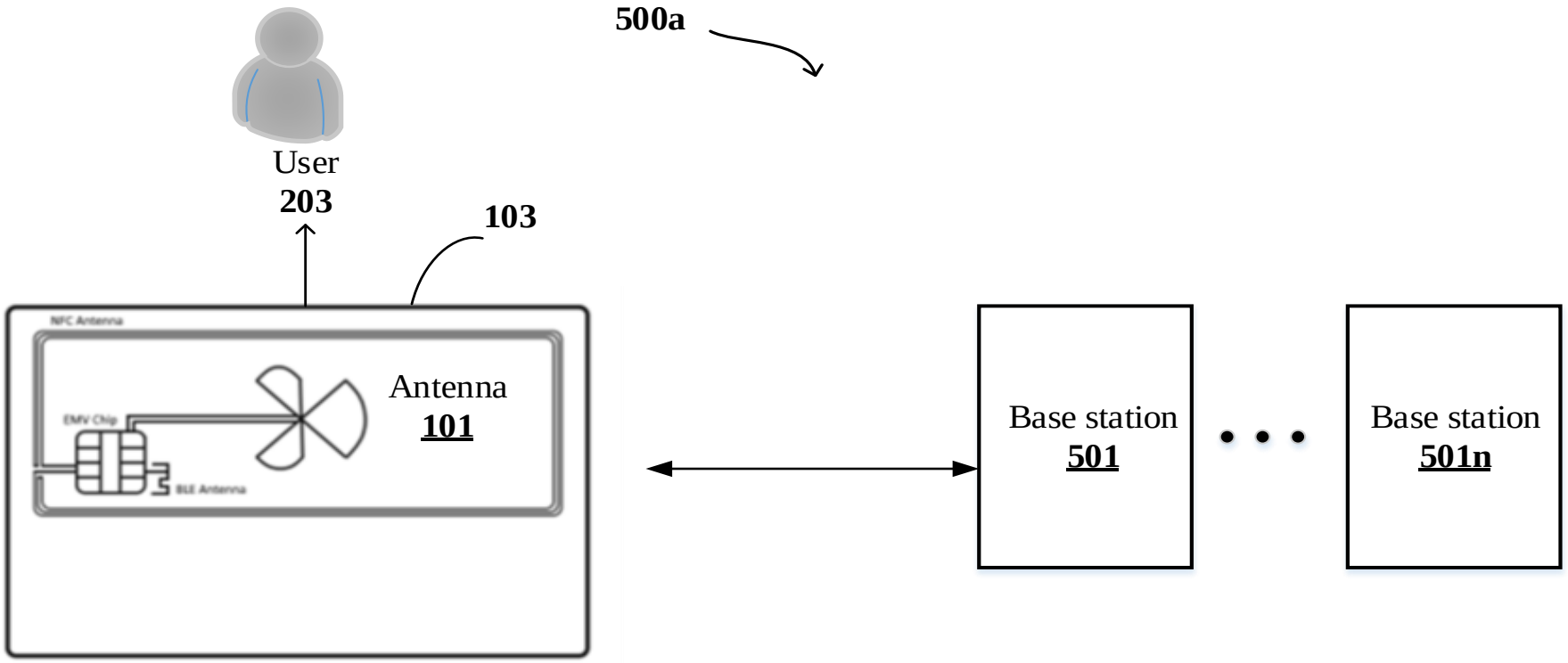
500a
User
203
103
NFC Antenna
EMV Chip
BLE Antenna
Antenna
101
Base station
501
Base station
501n

FIG.5A

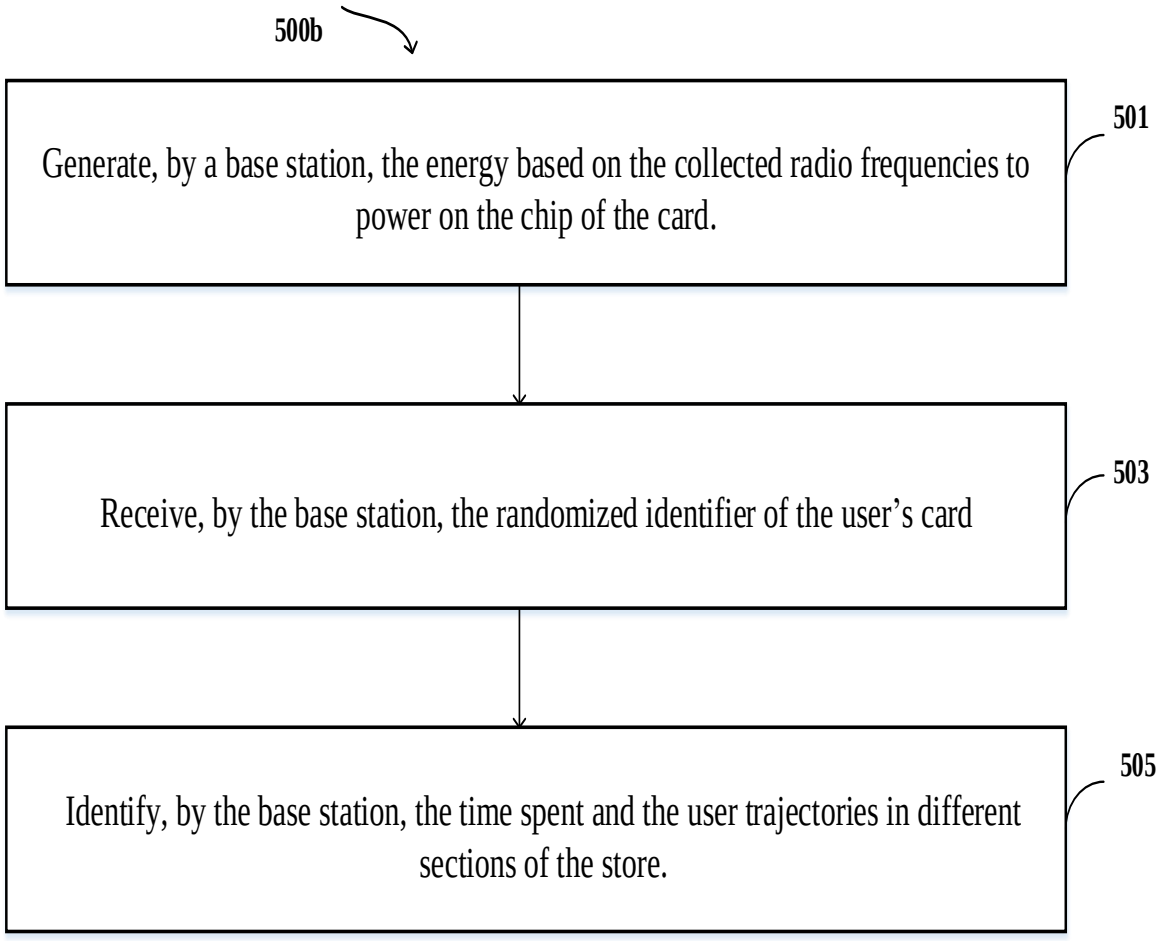
500b
Generate, by a base station, the energy based on the collected radio frequencies to power on the chip of the card.
501
Receive, by the base station, the randomized identifier of the user's card
503
Identify, by the base station, the time spent and the user trajectories in different sections of the store.
505

FIG.5B

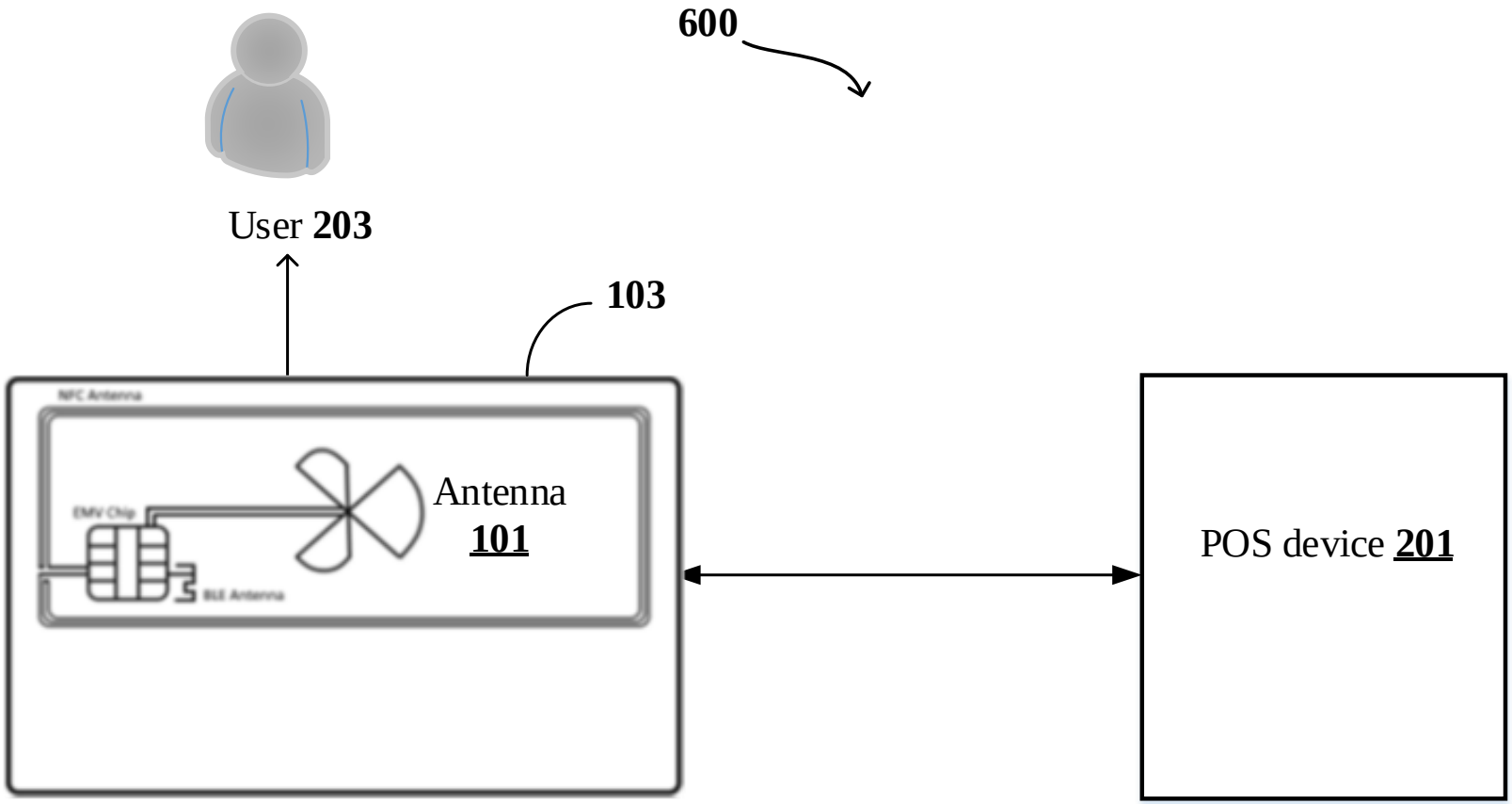
600
User **203**
103
NFC Antenna
EMV Chip
BLE Antenna
Antenna
101
POS device **201**

FIG.6

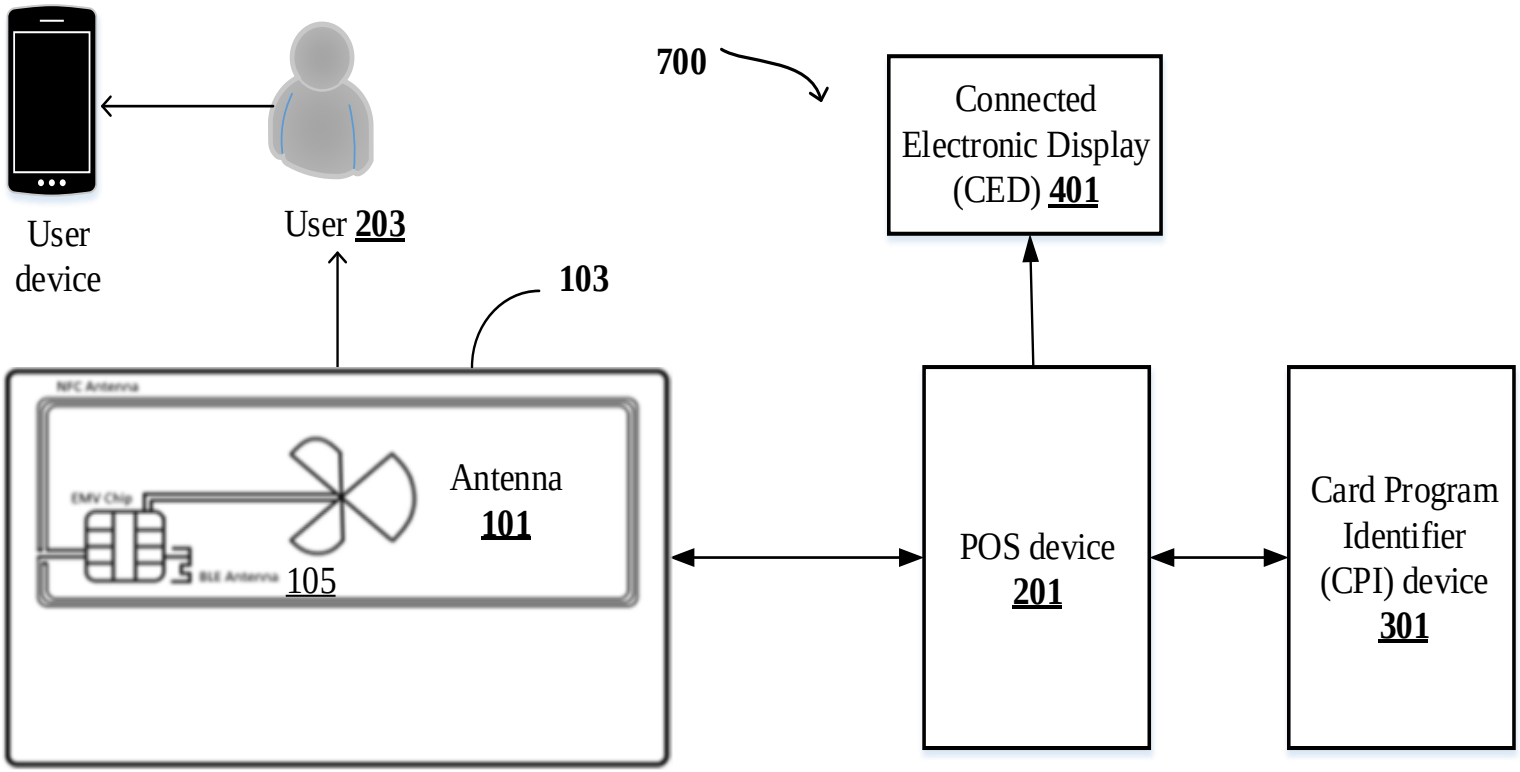
700
Connected Electronic Display (CED) 401
User device
User 203
103
NFC Antenna
EMV Chip
BLE Antenna
Antenna 101
105
POS device 201
Card Program Identifier (CPI) device 301

FIG.7

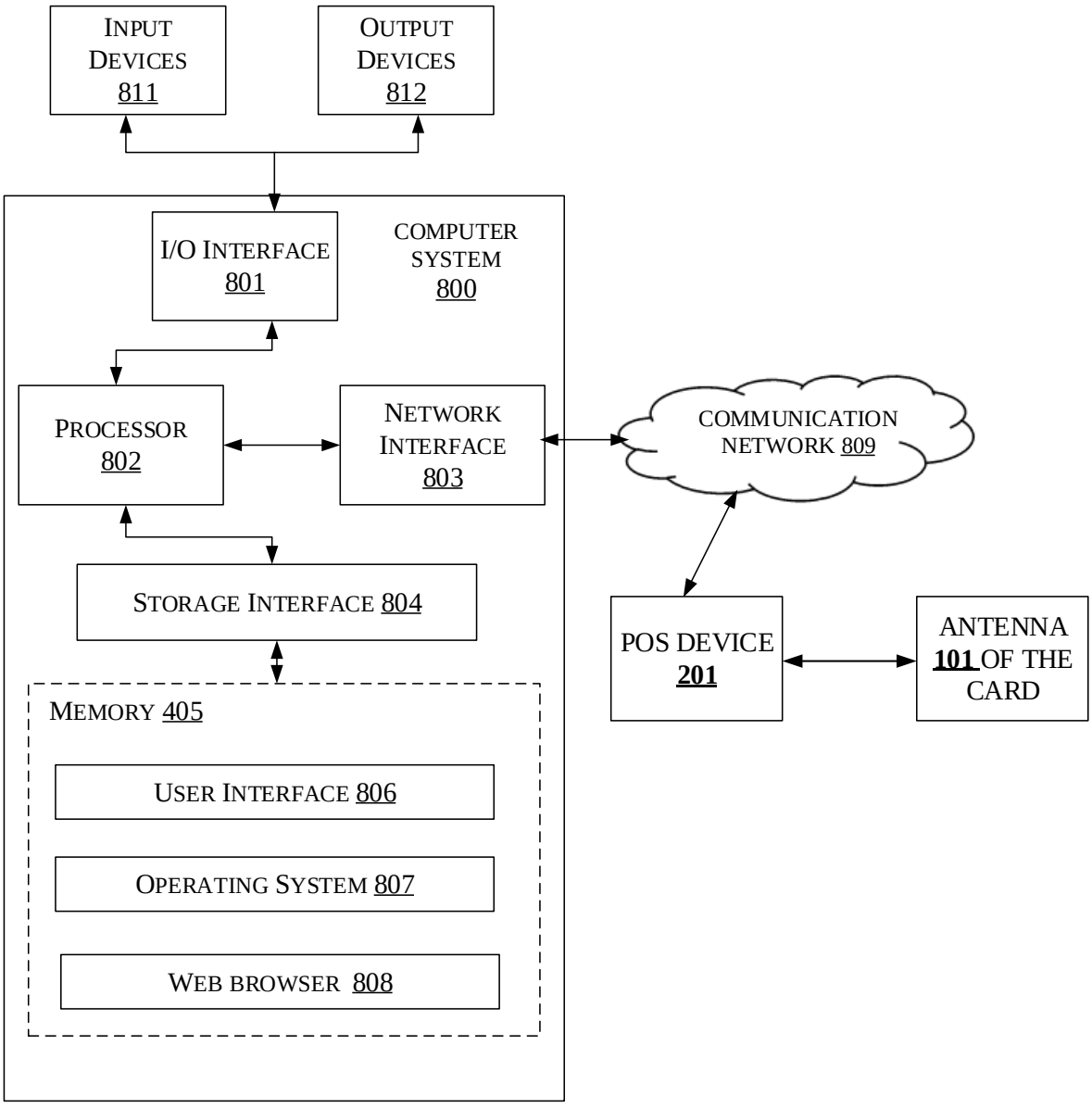
INPUT DEVICES 811
OUTPUT DEVICES 812
I/O INTERFACE 801
COMPUTER SYSTEM 800
PROCESSOR 802
NETWORK INTERFACE 803
COMMUNICATION NETWORK 809
STORAGE INTERFACE 804
POS DEVICE 201
ANTENNA 101 OF THE CARD
MEMORY 405
USER INTERFACE 806
OPERATING SYSTEM 807
WEB BROWSER 808

FIG.8