Method and System for self-checkout at a point of sale

Technical field

The present disclosure relates to a self-checkout point of sale (POS) and a method of self-checking out at a self-checkout POS.

Background

Payment for goods, products and articles (hereinafter referred to as articles for simplicity) in shops, stores, supermarkets, and the like is typically done at a cashier checkout point or at a self-checkout point. The latter self-checkout POS is gaining popularity, especially in convenience stores and supermarkets, but also in other retail stores.

A self-checkout POS is an automated system that allows customers to scan, bag, and pay for their purchases without the assistance of a cashier. Scanning typically involves the customer scanning a barcode on an article or entering a product code to identify the purchased article. The customer can then bag the article, possibly by placing it in a designated bagging area with weight sensors for double checking the scanned item with the expected weight of the article on the weight sensor. Payment is performed, typically cashless using a bankcard or mobile payments. The POS system may then print or email a receipt, completing the transaction.

A self-checkout POS system typically includes a user interface, often including a touch screen interface, with a user-friendly design for easy navigation. The barcode scanner for scanning product barcodes may be a fixed scanner or a handheld scanner located at the self-checkout POS. Sometimes a mobile handheld scanner is used to scan the articles while shopping, allowing the customer only having to pay at the self-checkout POS. Various security features may be implemented as the self-checkout POS, such as the mentioned weight sensors, and/or cameras or employee oversight to prevent theft.

Traditionally it is thought that self-checkout POS reduces costs by having fewer cashier personnel. Also, it is often thought that by having multiple self-checkout POS in the area previously covered by a single cashier POS, cost savings can be achieved

due to a more efficient use of floor area. However, the expected personnel cost savings are not always realized and sometimes the overall costs even increase when using self-checkout POS.

A main factor in the lack of cost savings is the amount of nonpaid articles leaving the store at the self-checkout POS. Customers can make mistakes and forget to scan articles, but most importantly there is a large amount of articles that are intentionally not scanned and paid for, i.e., stolen. Extra personnel to overlook the self-checkout POS then also adds to the costs of the self-checkout POS.

Another problem that increasingly occurs at self-checkout POS is aggressive behavior of customers towards personnel. Random checking by personnel of bagged articles against scanned articles can be perceived as annoyance to the customer, as carefully bagged articles have to be removed again from the bag. Also, as one can image, in case of theft the customer can react aggressively when being confronted by personnel with non-scanned articles. A side effect of this aggressive behavior can also be that personnel is reluctant to check or less accurately checks bags when required to do so.

Customers intentionally wanting to leave without paying may abuse the self-checkout POS system by coming up with excuses when being confronted by personnel, such as stating to simply haven forgotten to scan an article. Also, as checks are typically being performed at random, the customer may take a chance of not being picked by personnel for such random check. Then there is also the risk of a customer not placing all articles in the bag, but trying to sneak out articles otherwise, e.g., in jack pockets. A random check will typically only check the articles in the bag.

Replacing cashier checkout points with self-checkout points can have great benefits to retailers in terms of cost savings and can improve customer experience in the checkout process, but there is a need for overcoming the above-identified drawbacks in existing self-checkout POS.

Summary

A summary of aspects of certain examples disclosed herein is set forth below. It should be understood that these aspects are presented merely to provide the reader with a brief summary of these certain embodiments and that these aspects are not

intended to limit the scope of this disclosure. Indeed, this disclosure may encompass a variety of aspects and/or a combination of aspects that may not be set forth.

The present disclosure presents various aspects of an improved self-checkout POS. The solution of the present disclosure may include applying a twofold article authentication check at the POS.

According to an aspect, a self-checkout POS is presented. The self-checkout POS may include a walking area. The self-checkout POS may further include an article processing part. The self-checkout POS may further include a security gate. The self-checkout POS may further include a Radio Frequency Identification (RFID) detector. The self-checkout POS may further include a barcode scanner. The self-checkout POS may further include a payment system The RFID detector may be arranged to detect a presence of one or more articles in a section of the walking area before the security gate. Hereto, each of the one or more articles may include an RFID tag that is detectable by the RFID detector. The barcode scanner may be arranged to scan the one or more articles. Hereto, each of the one or more articles may include a barcode that is scannable by the barcode scanner. The payment system may be arranged to settle payment of the scanned one or more articles only if the RFID detector does not detect the presence of an article in the section of the walking area before the security gate.

In an embodiment, the self-checkout POS may further include a privacy gate that is arranged to be closed when a customer is detected in the section of the walking area before the security gate.

In an embodiment, the barcode may be a 1D barcode and the barcode scanner may be a 1D barcode scanner. The 1D barcode scanner may include a hand scanner or a fixed scanner for scanning the 1D barcode.

In an embodiment, the barcode may be a 2D barcode, such as a QR code, that is printed on the article or on a package of the article. The 2D barcode scanner may include a hand scanner or a fixed scanner for scanning the 2D barcode.

In an embodiment, a further RFID tag may include data comprising the barcode. The further RFID tag may be attached to the article or to a package of the article. The barcode scanner may include an RFID scanner for reading the data comprising the barcode from the further RFID tag.

In an embodiment, the RFID tag and the further RFID tag may be integrated into a single RFID tag.

In an embodiment, the RFID tag and the further RFID tag may be one and the same RFID tag.

In an embodiment, the self-checkout POS may further include a retour part arranged to receive one or more non-scanned articles.

In an embodiment the self-checkout POS may be arranged to open the security gate when no articles are scanned by the barcode scanner and no articles are detected by the RFID detector.

In an embodiment, the self-checkout POS may further include a de-tagger arranged to deactivate the RFID tag.

In an embodiment, the self-checkout POS may further include a product stop gate that is arranged to be closed when another customer is detected in a section of the walking area after the security gate.

In an embodiment, the self-checkout POS may further include a first camera arranged to detect the presence of one or more articles in the section of the walking area before the security gate.

In an embodiment, the self-checkout POS may further include a second camera arranged to detect the presence of the other consumer in the section of the walking area after the security gate.

In an embodiment, the first camera and the second camera are integrated into a single camera.

In an embodiment, the first camera and the second camera are one and the same camera.

In an embodiment, the self-checkout POS may be arranged to open the security gate only after a successful settlement of payment for the scanned articles.

In an embodiment, the RFID tag may be an Ultra High Frequency (UHF) RFID tag.

In an embodiment, the RFID tag may be a Surface Acoustic Wave (SAW) RFID tag.

In an embodiment, the self-checkout POS may further include a returnable items collecting system arranged to collect returnable items prior to settling payment of the scanned one or more articles.

According to an aspect of the present disclosure, a method of self-checking out at a self-checkout POS is presented. The method may include closing a security gate. The method may further include starting a self-checkout procedure. The method may further include detecting, by an RFID, detector, a presence of one or more articles in a section of a walking area of the self-checkout POS before the security gate. Each of the one or more articles may include an RFID tag that is detectable by the RFID detector. The method may further include opening the security gate only if no articles are detected by the RFID detector and one of the following conditions is true. First condition may be: one or more articles are scanned using a barcode scanner and the scanned one or more articles are settled using a payment system of the self-checkout POS. Second condition may be: all articles are retoured to a retour part of the self-checkout POS. Third condition may be: no articles are scanned or retoured. Herein, the barcode scanner may scan a barcode that is printed on the article or on a package of the article. Examples of a barcode are a 1D barcode and a 2D barcode (e.g., QR code).

In an embodiment, the self-checkout procedure may be triggered by an initiation of the self-checkout procedure through a display of the self-checkout POS.

In an embodiment, the self-checkout procedure may be triggered by a scanning, using a barcode scanner of a barcode of a first of the one or more articles.

In an embodiment, the self-checkout procedure may be triggered by a scanning of a loyalty card.

In an embodiment, the method may include closing a privacy gate upon detecting that a customer is present in the section of the walking area before the security gate.

In an embodiment, the method may include opening the security gate when no articles are scanned by the barcode scanner and no articles are detected by the RFID detector.

In an embodiment, the method may include deactivating, by a de-tagger, of the RFID tag.

In an embodiment, the method may further include closing a product stop gate when another customer is detected in a section of the walking area after the security gate.

In an embodiment, the method may further include detecting by a first camera the presence of one or more articles in the section of the walking area before the security gate.

In an embodiment, the method may include opening the security gate only after a successfully settling of a payment for the scanned articles.

According to an aspect of the present disclosure, a computer program product is presented. The computer program product may include instructions which, when executed by at least one processor, cause the at least one processor to perform one or more of the steps of the above-described method.

Advantageously, the solution of the present disclosure enables a more robust self-checkout POS, where human errors (e.g., forgetting to scan an article) or shoplifting can be minimized or even completely remedied. Moreover, less personnel or other security measures, such as tracking customers with cameras while shopping, will be required to facilitate self-checkout POS locations.

Brief description of the Drawings

Embodiments of the present disclosure will now be described, by way of example only, with reference to the accompanying schematic drawings in which corresponding reference symbol indicate corresponding parts, in which:

Figures 1A-1H show top views of an example embodiment of a self-checkout POS, with each of the figures 1A-1H showing a snapshot of the self-checkout POS at different stages in a self-checkout procedure;

Fig. 2 is an abstract representation of a self-checkout POS system;

Figures 3-9 show example embodiments of method steps in a checking out process at a self-checkout POS; and

Fig. 10 shows an example embodiment of a computing system for implementing certain aspects of the present technology.

The figures are intended for illustrative purposes only, and do not serve as restriction of the scope of the protection as laid down by the claims.

Detailed description

It will be readily understood that the components of the embodiments as generally described herein and illustrated in the appended figures could be arranged and designed in a wide variety of different configurations. Thus, the following more detailed description of various embodiments, as represented in the figures, is not intended to limit the scope of the present disclosure but is merely representative of various embodiments. While the various aspects of the embodiments are presented in drawings, the drawings are not necessarily drawn to scale unless specifically indicated.

The described embodiments are to be considered in all respects only as illustrative and not restrictive. The scope of the present disclosure is, therefore, indicated by the appended claims rather than by this detailed description. All changes which come within the meaning and range of equivalency of the claims are to be embraced within their scope.

Reference throughout this specification to features, advantages, or similar language does not imply that all of the features and advantages that may be realized with the present disclosure should be or are in any single example of the present disclosure. Rather, language referring to the features and advantages is understood to mean that a specific feature, advantage, or characteristic described in connection with an embodiment is included in at least one embodiment of the present disclosure. Thus, discussions of the features and advantages, and similar language, throughout this specification may, but do not necessarily, refer to the same example.

Furthermore, the described features, advantages, and characteristics of the present disclosure may be combined in any suitable manner in one or more embodiments. One skilled in the relevant art will recognize, in light of the description herein, that the present disclosure may be practiced without one or more of the specific features or advantages of a particular embodiment. In other instances, additional features and advantages may be recognized in certain embodiments that may not be present in all embodiments of the present disclosure. Reference throughout this specification to "one embodiment," "an embodiment," or similar language means that a particular feature, structure, or characteristic described in connection with the indicated embodiment is included in at least one embodiment of the present disclosure. Thus, the phrases "in one embodiment," "in an embodiment," and similar

language throughout this specification may, but do not necessarily, all refer to the same embodiment.

The solution of the present disclosure includes an improved self-checkout POS method and system that may be used as a POS in any type of retailer, such as, but not limited to, shops, stores and supermarkets. In the following non-limiting examples, the retailer is a supermarket and articles are goods and products sold by the supermarket, but it is to be understood that other kind of retailers selling other type of goods, products or articles may similarly apply the solution of the present disclosure.

The solution of the present disclosure assumes that an article or the packaging of the article includes a scannable barcode. The barcode may be scanned by the customer at the self-checkout POS (or during shopping using a handheld scanner while shopping) for addition to the bill, which is to be paid at the self-checkout POS.

The barcode may be a 1D barcode, also known as a linear barcode, printed on the article or packaging. Non-limiting examples of such 1D barcode are a Universal Product Code (UPC), a European Article Number (EAN) and a GS1 DataBar, hereinafter referred to as “1D barcode”. Alternatively, the barcode may be a 2D barcode printed on the article or packaging. Non-limiting examples of such 2D barcode are a Quick Response (QR) code and a Datamatrix code, hereinafter referred to as QR code. When using barcodes, QR codes are preferred for its versatility and amount of data that can be stored in the QR code. Barcodes enable detection at shorter distances.

According to an aspect of the present disclosure, the article or packaging is further provided with an RFID tag, preferably a passive RFID tag but possibly an active RFID tag, which is primary used for detecting the presence of the article at the self-checkout POS, as will be further detailed below. In a preferred embodiment, this RFID tag is a UHF RFID tag. Another non-limiting example of an RFID tag is a passive Surface Acoustic Wave (SAW) tag. RFID tags enable detection at larger distances, e.g., 3m to 12m for UHF passive RFID tags or 2m to 20m for SAW passive RFID tags.

Contrary to the printed barcode (1D barcode or QR code), the RFID tag attached to the article or packaging may have a double function of (i) article identification when scanning for addition to the bill and (ii) for presence detection at the self-checkout POS.

Figures 1A-1H show top views of a preferred embodiment of a self-checkout POS 1, with each of the figures 1A-1H showing a snapshot of the self-checkout POS 1 at different stages in the self-checkout procedure. The layout of the self-checkout POS 1 is not limited to this example and may be modified, e.g., to suit the kind of retailer and articles or products sold by the retailer. But the main functionality will be similar for all self-checkout POS 1 according to the present disclosure, i.e., presence of articles or products can be detected by an RFID detector 30 of the self-checkout POS 1 and articles 52 can be scanned by the customer at the self-checkout POS 1.

As shown in figures 1A-1H, the self-checkout POS 1 of the preferred embodiment includes a self-checkout POS area that may be functionally split in an article processing area 10 and a walking area 16. The article processing part 10 may optionally include a retour part 12 for retouring articles. The article processing part 10 may optionally include a de-tagger 14 for deactivating RFID tags. The de-tagger 14 may be implemented at various locations in the article processing part 10. A conveyor belt may be part of the article processing part 10 to forward the articles to the end of the article processing part 10 after scanning the articles. The walking area 16 is the area where the customer is present and moves during the self-checkout procedure, e.g., with a shopping cart, shopping basket or other means for carrying articles. In this example, the customer will be using a shopping cart 50 with an article 52 initially present in the shopping cart 50.

Various gates may be part of the self-checkout POS 1, including a security gate 20, optionally a privacy gate 22 and optionally a product stop gate 24. These gates 20, 22, 24 may be closed and opened during the self-checkout POS procedure.

The self-checkout POS 1 includes an RFID detector 30 for detecting the presence of an RFID tag on articles before the articles are scanned by the customer. In this example, the RIFD detector 30 will detect the presence of an RFID tag on article 52 in the shopping cart 50 when the customer entered the walking area 16 of the self-checkout POS 1, i.e., the section of the walking area 16 before the closed security gate 20. For the solution of the present disclosure, it is not required to determine an amount of articles present in the shopping cart 50 by the RFID detector 30. It can be sufficient to determine whether or not an article is still present at the customer, e.g., in the shopping cart but also possibly hidden away from the shopping cart 50, when the customer wants to proceed with payment of the articles.

For the detection of the RFID tag, the RFID tag may be a simple RFID tag without including data identifying the article 52. I.e., for the detection of the presence of the article 52 it is not required to identify the article 52.

The self-checkout POS 1 may include one or more camera's 32, 34. A first camera 32 may optionally be used to detect a presence of articles in the shopping cart 50 and relate this information with the detection of articles by the RFID detector 30. In case of a discrepancy between the determination by the camera 32 and the RFID detector 30 (e.g., the camera 32 detects an empty shopping cart 50 but the RFID detector 30 detects that an article is still present in the walking area 16), the system may conclude that something is wrong (possibly a theft attempt) and initiate appropriate action.

A second camera 34 may be used to detect if another customer is present in the walking area 16, as will be further explained below. The first camera 32 and the second camera 34 may be one and the same camera.

The article processing part 10 includes a barcode scanner system 40, 42 for scanning articles and processing the thus identified articles for inclusion on the bill. For example, a 1D barcode scanner system 40 may be used by the customer to manually scan the article 52. In another example, a QR barcode scanner system 42 may be used by the customer to manually scan the article 52. Hereto, the customer may use a hand scanner that may be part of the barcode scanner system 40, 42 to scan the barcode on the article 52 or alternatively hold the barcode of the article 52 in front of a fixed barcode scanner that may be part of the barcode scanner system 40, 42. Alternatively, the article 52 may include an further RFID tag including a barcode stored therein in the form of some data, which may be read by an RFID barcode scanner system 42. This further RFID tag may be the same RFID tag as used for presence detection by the RFID detector 30 or it may be a separate RFID tag.

A payment system 44 allows the customer to pay for the scanned articles before leaving the self-checkout POS 1. The payment system 44 may include a payment terminal that accepts physical bankcards or bankcards stored in a mobile device, the latter typically being Near Field Communication (NFC) based. Alternatively, the payment system 44 may be arranged to accept payments via the mobile device, e.g., using an app on a smartphone.

Fig. 1A shows a snapshot of the self-checkout POS 1, where a customer entered the walking area 16 with a shopping cart 50 including an article 52. The security gate 20 is closed allowing the customer to enter the walking area 16 up to the point where the articles are to be scanned and paid. Optional privacy gate 22 was open to allow the customer to enter the walking area 16. Also shown is that optional product stop gate 24 is closed.

With reference to Fig. 1B, when the customer has entered the self-checkout POS 1, the privacy gate 22 may be closed to avoid that another customer enters the self-checkout POS 1. The closing of the privacy gate 22 may be triggered in various manners, e.g., by detecting the presence of the customer/shopping cart with the article 52 by the RFID detector 30 and/or the first camera 32, or by the customer activating the self-checkout procedure, e.g., by pressing a start-button on a touch screen of the self-checkout POS 1 or by scanning a loyalty card.

Fig. 1C shows a scenario where the customer decides not to buy an article 52 but retours the article 52. Hereto, the optional retour part 12 may be used, where the customer can place the article 52 for picking up by personnel. Articles placed at the retour part 12 will not be detected by the RFID detector 30 anymore and will thus not be processed as being non-paid when the customer pays for other articles. Possibly, the customer retours all articles, resulting in the customer wanting to leave the self-checkout POS 1 without payment. It may then be determined that no articles are present in the walking area 16 by the RFID detector 30 and no articles are scanned by the barcode scanner system 40, 42, resulting in the security gate 20 being opened allowing the customer to exit the self-checkout POS 1.

Fig. 1D shows the article 52 having passed the RFID scanner 40, 42, preferably after the RFID tag being de-tagged. The article 52 may have been forwarded by a conveyor belt (not shown) or simply put on the article processing part 10 after scanning by the customer.

Before payment, returnable items (also known as deposit items), such as empty bottles, empty cans or empty crates, may be returned to the store for recycling and/or redemption of deposit amounts on the returnable items. Hereto, the customer may select an option, e.g., on a touch screen of the self-checkout POS system, for returning such items. The self-checkout POS system may then switch to a mode for returning the returnable items, wherein, optionally, the RFID scanner 40, 42 may be disabled

from scanning articles to avoid the returnable items to be scanned as articles 52 to be paid for. Moreover, a reverse vending machine or any other suitable returnable items collecting system (not shown) may be activated allowing the customer to return the returnable items to the store. A deposit amount may be calculated for the returned returnable items, which deposit amount may be redeemed by deduction from the final invoice.

When all articles are scanned and optionally returnable items have been processed, the customer may proceed with payment for the articles, typically initiated by pressing a payment button on the touch screen of the self-checkout POS system. The payment may be performed on the payment system 44 of the self-checkout POS 1, which is typically integrated with the touch screen interface of the self-checkout POS system and which typically interfaces with a bank account of the customers.

When the payment is successful, it may be determined if another customer 60 is still present in the walking area 16 at the other side of the security gate 20, e.g., based on a determination by the second camera 34. This other customer 60 may still be busy collecting articles 62 from the article processing part 10 after payment of these articles 62. The product stop gate 24 may be used to ensure that articles 62 of the other customer do not get mixed up with the article 52 of the current customer.

When the payment is successful and there is no other customer in the walking area 16 anymore, the security gate 20 and the optional product stop gate 24 may be opened. The customer may then proceed through the security gate to the end of the walking area 16, as depicted in Fig. 1E.

With reference to Fig. 1F, the security gate 20 may then close again, the optional privacy gate 22 may be opened and the optional product stop gate 24 may be closed. This allows another customer to enter the self-checkout POS 1 as shown in Fig. 1A.

Preferably, after the article 52 has been scanned, the RFID tag for detecting the presence of the article, i.e., as detected by the RFID detector 30, may be deactivated by the optional de-tagger 14. The de-tagger 14 may be implemented at various locations in the article processing part 10. For example, after the product has been scanned by the 1D barcode scanner 40 or QR code scanner 42, the article 52 may be placed on a conveyor belt that guides the article 52 along the de-tagger 14. In another example, the de-tagger 14 may be integrated with the barcode scanner 40, 42,

allowing the RFID tag to be deactivated together with or directly after the scanning of the article 52. This is depicted by Fig. 1G.

To finish the self-checkout procedure, the customer may obtain the article 52 from the article processing part 10 and leave the self-checkout POS 1, as illustrated in Fig. 1H.

Parts of the self-checkout POS 1, such as shown in figures 1A-1H, may be integrated in a self-checkout POS system 2, an abstract representation of which is shown in Fig. 2. I.e., the self-checkout POS system 2 may include: hardware for the optional retour part 12, e.g., for alerting personnel that articles have been placed at the retour part 12; hardware for the optional de-tagger 14; one or more controllers for the security gate 20, optional privacy gate 22 and optional product stop gate 24; the RFID detector 30; the optional first camera 32 and/or the optional second camera 34, the first and second camera possibly being one and the same; the barcode scanner 40 and/or the QR barcode scanner 42; and the payment system 44, which is typically communicatively connected to one or more remote payment of banking systems.

The parts of the self-checkout POS system 2 may be controlled by a central computer system 70. The central computer system 70 may be implemented as a plurality of computer system that each control a sub-system of the self-checkout POS system 2.

The self-checkout POS system 2 may include a data storage 72, where inventory of the supermarket, or retailer in general, may be stored. When scanning articles using the barcode scanner 40, 42, the data storage 72 may be used, typically via the computer system 70, to obtain pricing information to be put on the bill. After payment for the articles, the inventory may be updated.

It is to be understood that the self-checkout POS system 2 may be implemented in various manners, not being limited to the example of Fig. 2. For example, one or more of the parts shown in Fig. 2 may be implemented in sub-systems, or further (not shown) elements may be part of the self-checkout POS system 2 to enable the operation of the self-checkout POS system 2. Also, one or more of the parts of the self-checkout POS system 2 may be implemented remotely, e.g., in a communicatively connected remote computing system, in a cloud system, or in a remote controller system. The computer system 70 may be implemented as a single computer system or as multiple communicatively connected computer systems, each responsible for one

or more parts of the self-checkout POS system 2. The date storage 72 may be implemented as a single data storage or as multiple data storages, possible partly or completely located remotely, e.g., in a cloud storage or in another computer system.

According to an aspect of the present disclosure, a method of checking out at a self-checkout POS is presented, example embodiments and aspects of which are shown in figures 3-9. Figures 3-9 show flow charts, wherein solid boxes represent steps of the method, dashed boxes represent optional steps, diamond shapes represent decision points, parallelograms represent data, circles represent a continuation from a step in another figure, and arrow boxes represent a continuation to a step in another figure.

Fig. 3 shows an example embodiment of the overall process of checking out at a self-checkout POS, such as the self-checkout POS of figures 1A-1H and which may be implemented by the self-checkout POS system 2 of Fig. 2. Step 100 represents a first phase, where the customer checks in to the self-checkout POS. Step 100 may correspond to figures 1A-1B and a more detailed example of step 100 will be presented in Fig. 4. Step 200 represents a second phase, where articles are processed. Step 200 may correspond to figures 1C-1D and more details examples of step 200 will be presented in Fig. 5 and Fig. 6. Step 300 represents a third phase, where the customer checks out from the self-checkout POS. Step 300 may correspond to figures 1E-1H and a more detailed example of step 300 will be presented in Fig. 9.

With reference to Fig. 4, in the first phase 100, the security gate 20 is closed 102 and, if a privacy gate 22 is present, the privacy gate 22 is opened 104. This allows the customer to enter 106 the self-checkout POS in the walking area 16. The self-checkout procedure may then be started 108, e.g., initiated by the customer pressing a button on a touch screen of the self-checkout POS 1, initiated by the customer scanning the first article 52, or initiated by the RFID detector 30 detecting the presence of an article 52 in the walking area 16 before the security gate 20. If present, the privacy gate 22 may then be closed to prevent other customers from entering the same self-checkout POS. Optionally, a product stop gate 24 may be present, which may be closed 112 at this stage, to keep apart the articles 52 of the current customer from the articles 62 of a previous customer at the same self-checkout POS 1.

With reference to Fig. 5, in the second phase 200, the articles 52 may be scanned and processed. In step 202 the RFID detector 30 detects 202 a presence of an article

52 in the walking area 16 before the security gate 30. This triggers the self-checkout POS 1 that there is at least one article 52 that is to be scanned or retoured.

Step 204 in the flowchart indicates the choice of the customer to either scan the article 52, retour the article 52, or indicate that the customer is ready to proceed with payment of the articles and/or exit the store.

In step 210, the article 52 may be scanned by the customer. This may be done using a barcode scanner 40, 42, e.g., a hand scanner or a fixed scanner to scan a 1D barcode or QR-code, or, if the barcode is in the form of an RFID code, using an RFID scanner 42 to scan the barcode data from the further RFID tag. The process may then return to step 202.

Preferably, the RFID tag on the article 52 or on the package of the article 52 is deactivated 212 at a de-tagger 14 after scanning 210. Optionally, a next article can only be scanned after the RFID tag has been de-tagged 212 by the de-tagger 14.

In step 220, the article 52 may be retoured to the store instead of scanned. Hereto, the customer may, e.g., place the article 52 on a retour part 12 of the article processing part 10. This ensures that the article 52 is not detected by the RFID detector 30 anymore and allows a store employee to return the article to the store. Optionally, an alert may be triggered 222 when placing the article at the retour part 12, possibly triggered by the customer pressing a button, e.g., a button on a touch screen of the self-checkout POS 1.

If all articles are retoured, i.e., no articles are scanned, the customer may exit the store without paying. This is determined in step 224, e.g., supported by the RFID detector 30 not detecting any articles in the walking area 16 anymore and no articles being scanned. Alternatively, the customer may press a button, e.g., on a touch screen of the self-checkout 1, indicating that all articles have been retoured. The process may then continue with step 240. Otherwise, the process may return to step 202.

If in step 202 the RFID detector 30 detects that there are no articles present in the walking area 16, then the process may continue at step 300.

Fig. 6 shows an alternative embodiment of phase 2 process 200A, which is an extension to the process 200 of Fig. 5. The alternative process 200A includes a similar step 202, where the presence of one or more articles 52 is detected in the walking area 16 using the RFID detector 30.

In step 203, an optional camera 32 may detect the presence of articles 52 in the walking area, e.g., by scanning the contents of a shopping cart, a shopping basket or articles carried by the customer.

In step 230, the detection result from the RFID detector, as detected in step 202, may be compared with the detection result from the camera 32, as detected in step 203.

If one or more articles were detected by the RFID detector 30 and the camera 32 detected one or more articles (depicted “yes,yes” in Fig. 6), then the process may continue at step 250 of Fig. 5. In this alternative embodiment, where the flowchart of Fig. 5 returns to step 202, it is to be understood that the process returns to step 202 of Fig. 6.

If one or more articles were detected by the RFID detector 30 but the camera 32 did not detect any article (depicted “yes,no” in Fig. 6), the customer may be checked in verification step 232. Possibly, the camera 32 simply missed the presence of the article and the customer may continue with step 250 (verification is “ok” in Fig. 6). Possibly, the customer tried to steal an article by obscuring the article from the camera 32, but the RFID detector 30 picked up an RFID signal indicative of the presence of one or more articles in the walking area 16. The self-checkout process may then stop 290, typically followed by shop personnel being involved in the further processing. Note that, because the security gate 20 is still closed and possibly the privacy gate 22 is also closed, the customer will not be able to leave the store without paying for the obscured article or facing consequences for trying to steal an article.

If no articles are detected by the RFID detector 30 but the camera 32 detects one or more articles (depicted “no,yes” in Fig. 6), there may be a flaw in the system. The process may then stop in step 290 and possibly an alert may be triggered 234 to alert shop personnel. These articles might be bought elsewhere.

If no articles are detected by the RFID detector 30 and no articles are detected by the camera 32 when the customer entered the walking area 16 (depicted “no,no” in Fig. 6), then it may be determined that the customer entered the self-checkout POS without any articles and the process may process at step 240.

Fig. 7 shows an example embodiment of the RFID detection step 202, which may be implemented in the process 200 of Fig. 5 or the process 200A of Fig. 6. In step 2022, the RFID detector 30 detects the presence of one or more RFID tags in the

walking area 16, indicative of the presence of one or more articles 52 that have not been scanned yet. This detection need not be precise, i.e., it is not required (but may be possible) to scan the specifics of the article 52; a detection of a presence of an article suffices.

Optionally, an article 52 may be identified by the RFID detector in step 2024. Hereto, data stored on an RFID tag may be read. In step 2026, the article may be registered based on the data read from the RFID tag and stored in a data storage 2028. The data storage 2028 may be any form of non-volatile or volatile data storage.

Fig. 8 shows an example embodiment of the article scanning step 210, which may be implemented in the process 200 of Fig. 5 or the process 200A of Fig. 6. In step 2102, the barcode of the article is scanned, e.g., using 1D barcode scanner 40 or QR code scanner 42.

Optionally, in step 2104, the scanned article may be matched with an article registered in step 2026. Hereto, data 2028 of the registered article may be read from the data storage 2028 and compared to the barcode scanned in step 2102. This step enables a more robust system, where a double check is performed to ensure that the detected article matched the scanned article.

In step 2106, the scanned article is registered 2106 in the self-checkout POS 1, typically by storing data indicative of the scanned article in a data storage 2108. The data storage 2028 may be any form of non-volatile or volatile data storage. With this step, the scanned articles may be placed on the bill, to be paid when all articles are scanned.

With reference to Fig. 9, in the third phase 300, the customer may proceed with payment for the scanned articles. This may be triggered by the customer indicating that all articles have been scanned, e.g., by pressing a button, e.g., a button on a touch screen of the self-checkout POS 1. Alternatively, the RFID detector 30 may detect that there are no more articles present in the walking area 16.

In step 302, it may be verified that all articles have been scanned. This step is typically performed when the customer indicated that all articles have been scanned. The RFID detector may then verify if there are no more articles present in the walking area 16. If an article is detected (“nok”), the process may return to step 250. If no article is detected (“ok”), the process may process to step 304.

In step 304, the customer may perform the payment for all scanned articles, e.g., using payment system 44. If the payment is not successful ("nok") the self-checkout procedure may stop at step 390, possibly triggering an alert 234 to alert shop personnel. Note that, because the security gate 20 is still closed and possibly the privacy gate 22 is also closed, the customer will not be able to leave the store without paying.

In step 306, it may be checked if the exit, i.e., the walking area 16 beyond the security gate 20, is free. I.e., it may be checked, e.g., using camera 34, if a previous customer is still present, e.g., offloading articles from the article processing part 10. If the exit is not free ("no"), then this check 306 may be repeated until the exit is free.

If the exit is free ("yes"), then the security gate may be opened 308. Note that step 240 in figures 5 and 6 may also continue with this step 308. With the security gate opened 308, the customer may walk beyond the security gate 20 to pick up the bought articles and leave the self-checkout POS area.

Optionally, it may be detected 310 that the customer leaves the walking area 16, i.e., exited the self-checkout POS, triggering the optional product stop gate 24 to be opened 320.

Optionally, the RFID tag on the article 52 or on the package of the article 52 may be deactivated 322 at a de-tagger 14 before leaving the self-checkout POS 1.

Another customer may now enter the self-checkout POS 1, returning the process to step 100.

After any of the stop events 290, 390, shop personnel may open the security gate and/or reset the self-checkout POS 1 to the state at the beginning of step 100.

In a preferred embodiment, when the customer has multiple articles to scan, a next article can only be scanned when the current article has been scanned 210 and de-tagged 212.

De methods shown in figures 3-9 are to be understood as non-limiting. I.e., process steps may be performed in a different order, process steps may be omitted, and/or process steps may be added, insofar resulting in a same or similar outcome.

FIG. 10 shows an example embodiment of a computing system 1000 for implementing certain aspects of the present technology. In various examples, the computing system 1000 may be any computing device making up the self-checkout

POS system 2 of Fig. 2 or elements thereof, or any other computing system described herein.

In some implementations, a computing system 1000 may implement the methods described herein, such as the methods describes in figures 3-9, including processes 100, 200, 200A and/or 300 of the present disclosure.

The computing system 1000 may include any component of a computing system described herein, which components may be in communication with each other using connection 1005. The connection 1005 may be a physical connection via a bus, or a direct connection into processor 1010, such as in a chipset architecture. The connection 1005 may also be a virtual connection, networked connection, or logical connection.

In some implementations, the computing system 1000 may be a distributed system in which the functions described in this disclosure may be distributed within a datacenter, multiple datacenters, a peer network, etc. In some embodiments, one or more of the described system components represents many such components each performing some or all of the functions for which the component is described. In some embodiments, the components may be physical or virtual devices.

The example system 1000 includes at least one processing unit (CPU or processor) 1010 and a connection 1005 that couples various system components including system memory 1015, such as read-only memory (ROM) 1020 and random-access memory (RAM) 1025 to processor 1010. The computing system 1000 may include a cache of high-speed memory 1012 connected directly with, in close proximity to, or integrated as part of the processor 1010.

The processor 1010 may include any general-purpose processor and a hardware service or software service, such as services 1032, 1034, and 1036 stored in storage device 1030, configured to control the processor 1010 as well as a special-purpose processor where software instructions are incorporated into the actual processor design. The processor 1010 may essentially be a completely self-contained computing system, containing multiple cores or processors, a bus, memory controller, cache, etc. A multi-core processor may be symmetric or asymmetric.

To enable user interaction, the computing system 1000 may include an input device 1045, which may represent any number of input mechanisms, such as a microphone for speech, a touch-sensitive screen for gesture or graphical input,

keyboard, mouse, motion input, speech, etc. The computing system 1000 may also include an output device 1035, which may be one or more of a number of output mechanisms known to those of skill in the art. In some instances, multimodal systems may enable a user to provide multiple types of input/output to communicate with the computing system 1000. The computing system 1000 may include a communications interface 1040, which may generally govern and manage the user input and system output. There is no restriction on operating on any particular hardware arrangement, and therefore the basic features here may easily be substituted for improved hardware or firmware arrangements as they are developed.

A storage device 1030 may be a volatile or a non-volatile memory device and may be a hard disk or other types of computer readable media which may store data that are accessible by a computer, such as magnetic cassettes, flash memory cards, solid state memory devices, digital versatile disks, cartridges, random access memories (RAMs), read-only memory (ROM), and/or some combination of these devices.

The storage device 1030 may include software services, servers, services, etc., that, when the code that defines such software is executed by the processor 1010, causes the system to perform a function. In some embodiments, a hardware service that performs a particular function may include a software component stored in a computer-readable medium in connection with the necessary hardware components, such as processor 1010, connection 1005, output device 1035, etc., to carry out the function.

Other variations to the disclosed embodiments can be understood and effected by those skilled in the art in practicing the claimed invention, from a study of the drawings, the disclosure and the appended claims. In the claims, the word “comprising” does not exclude other elements or steps, and the indefinite article “a” or “an” does not exclude a plurality. The mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these measures cannot be used to advantage. Any reference signs in the claims should not be construed as limiting the scope thereof.

CLAIMS

1. A self-checkout point of sale, POS (1), comprising:

a walking area (16);

an article processing part (10);

a security gate (20);

a Radio Frequency Identification, RFID, detector (30);

a barcode scanner (40, 42); and

a payment system (44),

wherein the RFID detector (30) is arranged to detect a presence of one or more articles (52) in a section of the walking area (16) before the security gate (20), each of the one or more articles (52) comprising an RFID tag that is detectable by the RFID detector (30),

wherein the barcode scanner (40, 42) is arranged to scan the one or more articles (52), each of the one or more articles (52) comprising a barcode that is scannable by the barcode scanner (40, 42),

wherein the payment system (44) is arranged to settle payment of the scanned one or more articles (52) only if the RFID detector does not detect the presence of an article (52) in the section of the walking area (16) before the security gate (20).

2. The self-checkout POS (1) according to claim 1, further comprising a privacy gate (22) that is arranged to be closed when a customer is detected in the section of the walking area (16) before the security gate (20).

3. The self-checkout POS (1) according to claim 1 or claim 2,

wherein the barcode is one of a 1D barcode and a QR code that is printed on the article (52) or on a package of the article (52),

and wherein the barcode scanner (40) is a 1D barcode scanner comprises a hand scanner or a fixed scanner for scanning the 1D barcode,

or wherein the barcode scanner (42) is a QR barcode scanner comprises a hand scanner or a fixed scanner for scanning the QR code.

4. The self-checkout POS (1) according to claim 1 or claim 2,

wherein a further RFID tag comprises data comprising the barcode,

wherein the further RFID tag is attached to the article (52) or to a package of the article (52),

and wherein the barcode scanner (42) comprises an RFID scanner for reading the data comprising the barcode from the further RFID tag.

5. The self-checkout POS (1) according to claim 4, wherein the RFID tag and the further RFID tag are integrated into a single RFID tag or are one and the same RFID tag.

6. The self-checkout POS (1) according to any one of the preceding claims, further comprising a retour part (12) arranged to receive one or more non-scanned articles.

7. The self-checkout-POS (1) according to claim 6, wherein the self-checkout POS (1) is arranged to open the security gate (20) when no articles are scanned by the barcode scanner (40, 42) and no articles are detected by the RFID detector (30).

8. The self-checkout POS (1) according to any one of the preceding claims, further comprising a de-tagger (14) arranged to deactivate the RFID tag.

9. The self-checkout POS (1) according to any one of the preceding claims, further comprising a product stop gate (24) that is arranged to be closed when another customer is detected in a section of the walking area (16) after the security gate (20).

10. The self-checkout POS (1) according to any one of the preceding claims, further comprising a first camera (32) arranged to detect the presence of one or more articles (52) in the section of the walking area before the security gate (20).

11. The self-checkout POS (1) according to claim 9, further comprising a second camera (34) arranged to detect the presence of the other consumer in the section of the walking area (16) after the security gate (20).

12. The self-checkout POS (1) according to claim 11, wherein the first camera (32) and the second camera (34) are integrated into a single camera or are one and the same camera.

13. The self-checkout POS (1) according to any one of the preceding claims, wherein the self-checkout POS (1) is arranged to open the security gate (20) only after a successful settlement of payment for the scanned articles.

14. The self-checkout POS (1) according to any one of the preceding claims, wherein the RFID tag is an Ultra High Frequency, UHF, RFID tag or a Surface Acoustic Wave, SAW, RFID tag.

15. The self-checkout POS (1) according to any one of the preceding claims, further comprising a returnable items collecting system arranged to collect returnable items prior to settling payment of the scanned one or more articles (52).

16. A method of self-checking out at a self-checkout point of sale, POS (1), the method comprising:

closing (102) a security gate (20);

starting (108) a self-checkout procedure;

detecting (202), by a Radio Frequency Identification, RFID, detector (30), a presence of one or more articles (52) in a section of a walking area (16) of the self-checkout POS (1) before the security gate (20), wherein each of the one or more articles (52) comprises an RFID tag that is detectable by the RFID detector (30);

opening (240, 308) the security gate (308) only if no articles (52) are detected (202) by the RFID detector (30) and one of the following conditions is true:

one or more articles (52) are scanned (210) using a barcode scanner and the scanned one or more articles (52) are settled (304) using a payment system (44) of the self-checkout POS (1);

all articles (52) are retoured (220, 224) to a retour part (12) of the self-checkout POS (1); or

no articles (52) are scanned or retoured.

17. The method according to claim 16, wherein starting (108) the self-checkout procedure is triggered by one of:

an initiation of the self-checkout procedure through a display of the self-checkout POS (1);

a scanning (202), using a barcode scanner (40, 42) of a barcode of a first of the one or more articles;

a scanning of a loyalty card.

18. The method according to claim 16 or claim 17, further comprising:

closing (110) a privacy gate (22) upon detecting that a customer is present in the section of the walking area (16) before the security gate (20).

19. The method according to any one of the claims 16-18, comprising opening (240) the security gate (20) when no articles are scanned by the barcode scanner (40, 42) and no articles are detected by the RFID detector (30).

20. The method according to any one of the claims 16-19, comprising deactivating (212, 322), by a de-tagger (14), of the RFID tag.

21. The method according to any one of the claims 16-20, further comprising closing (112) a product stop gate (24) when another customer is detected in a section of the walking area (16) after the security gate (20).

22. The method according to any one of the claims 16-21, further comprising detecting (203) by a first camera (32) the presence of one or more articles (52) in the section of the walking area before the security gate (20).

23. The method according to any one of the claims 16-22, comprising opening (240, 308) the security gate (20) only after a successfully settling of a payment for the scanned articles.

24. A computer program product comprising instructions which, when executed by at least one processor, cause the at least one processor to perform the method according to any one of claims 16 to 23.

5

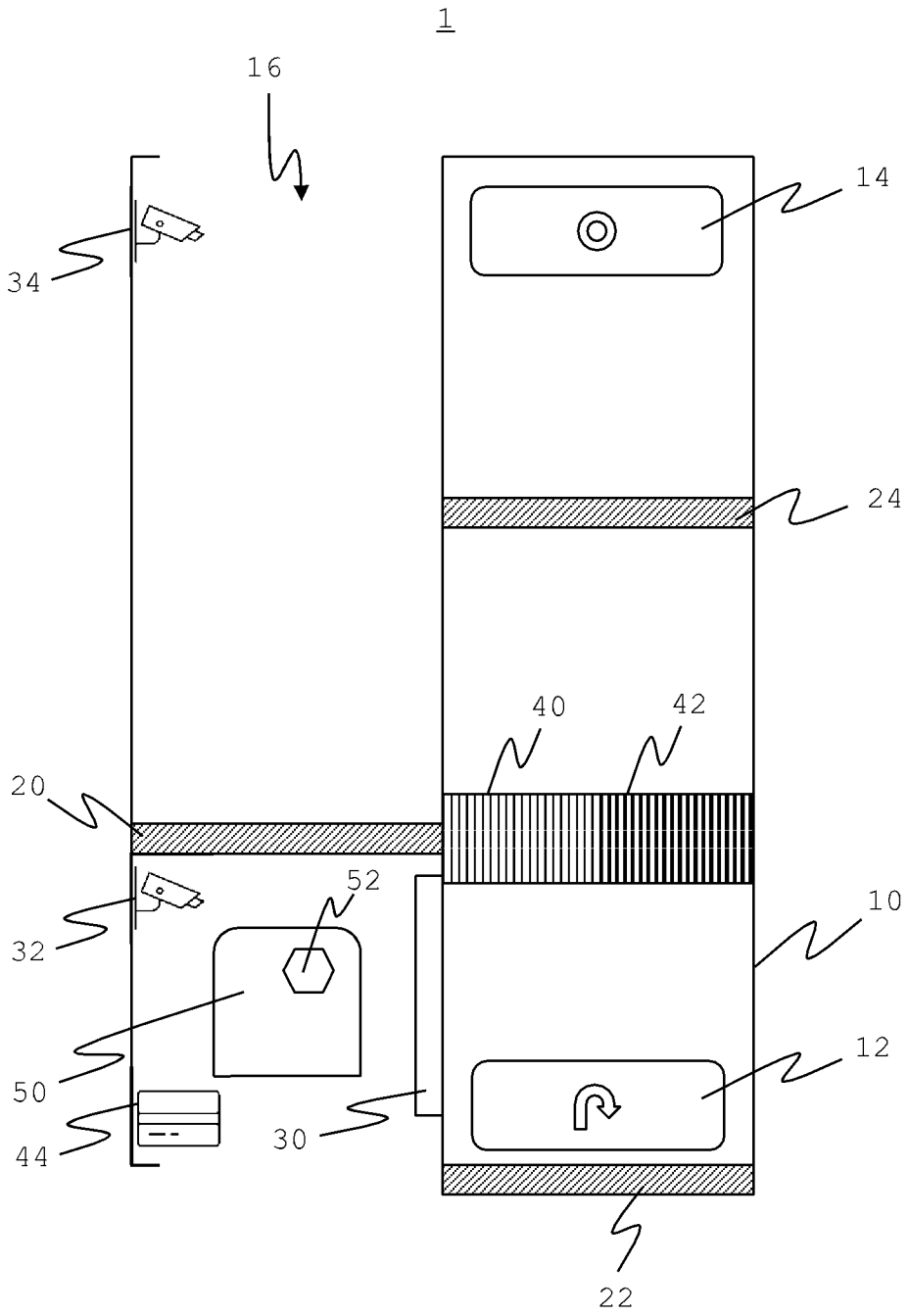

FIG.1A

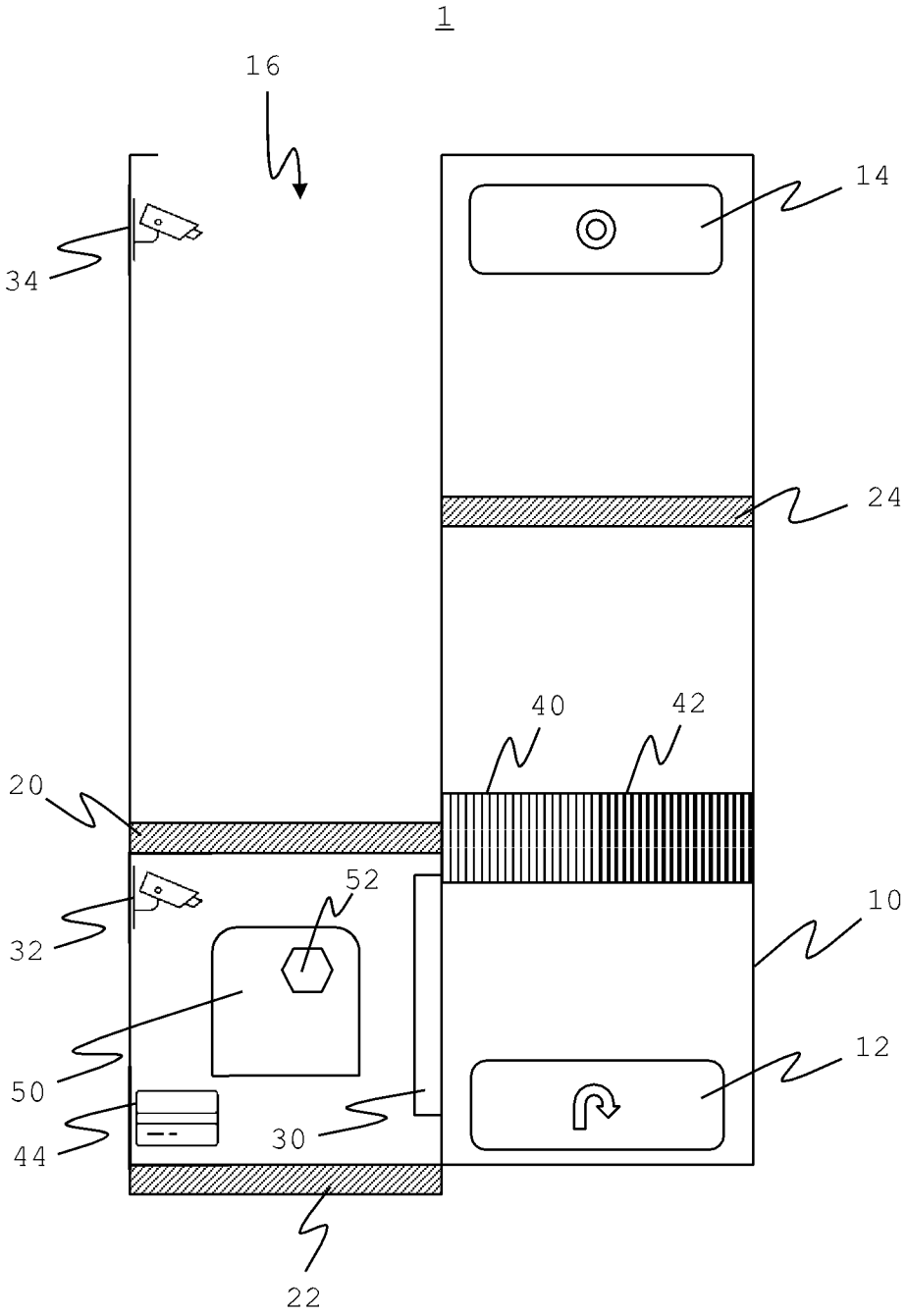

FIG.1B

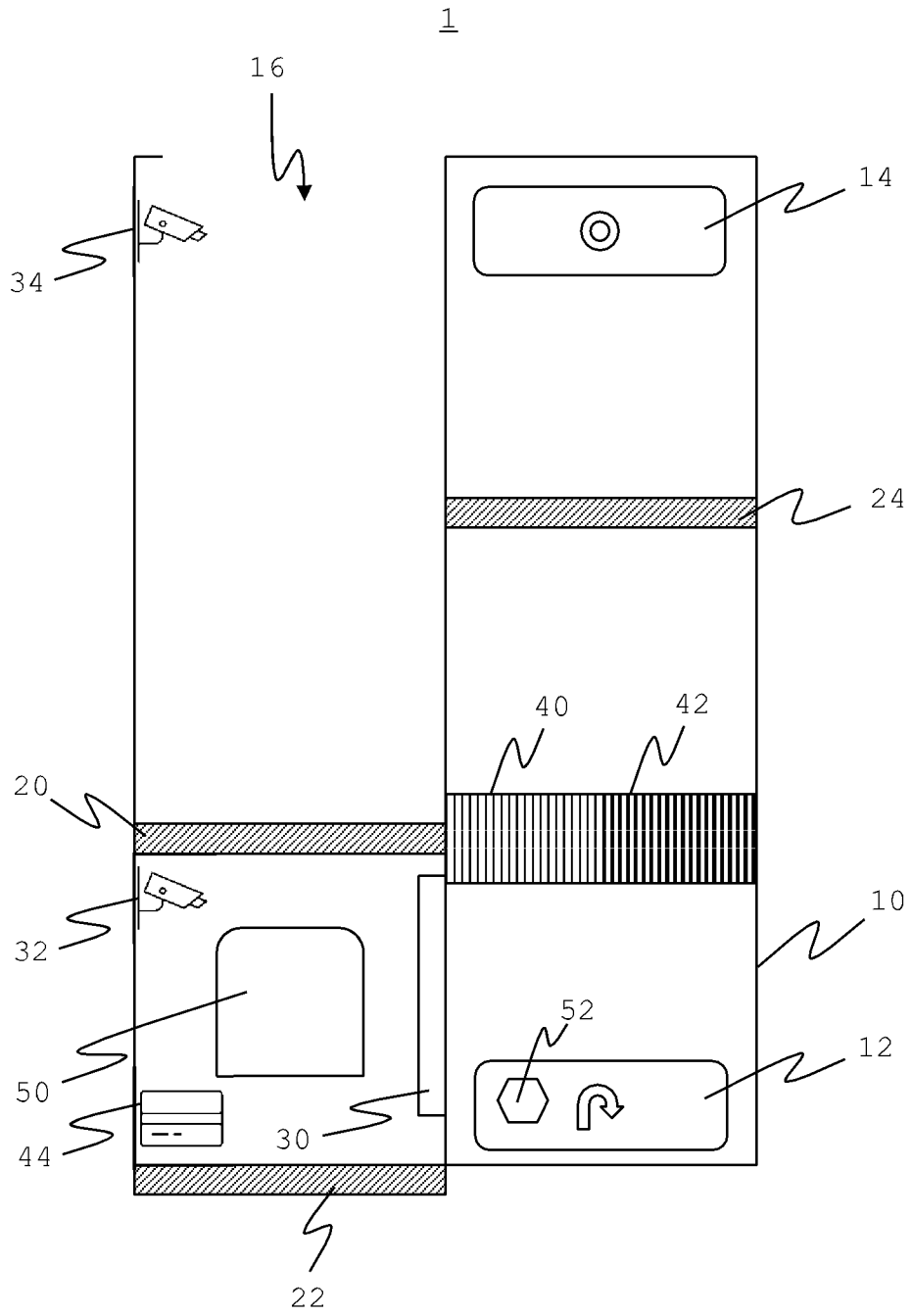

FIG.1C

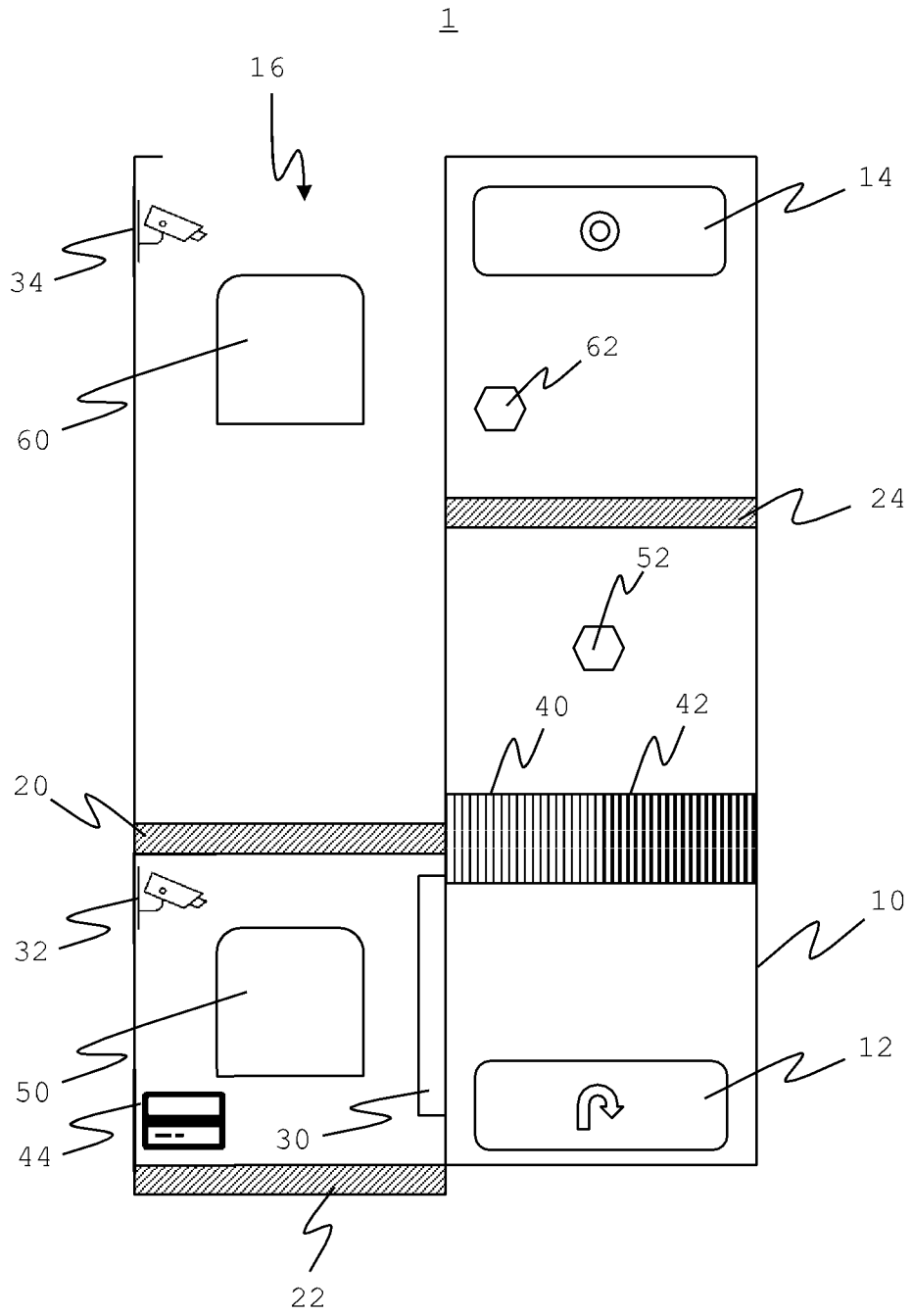

FIG.1D

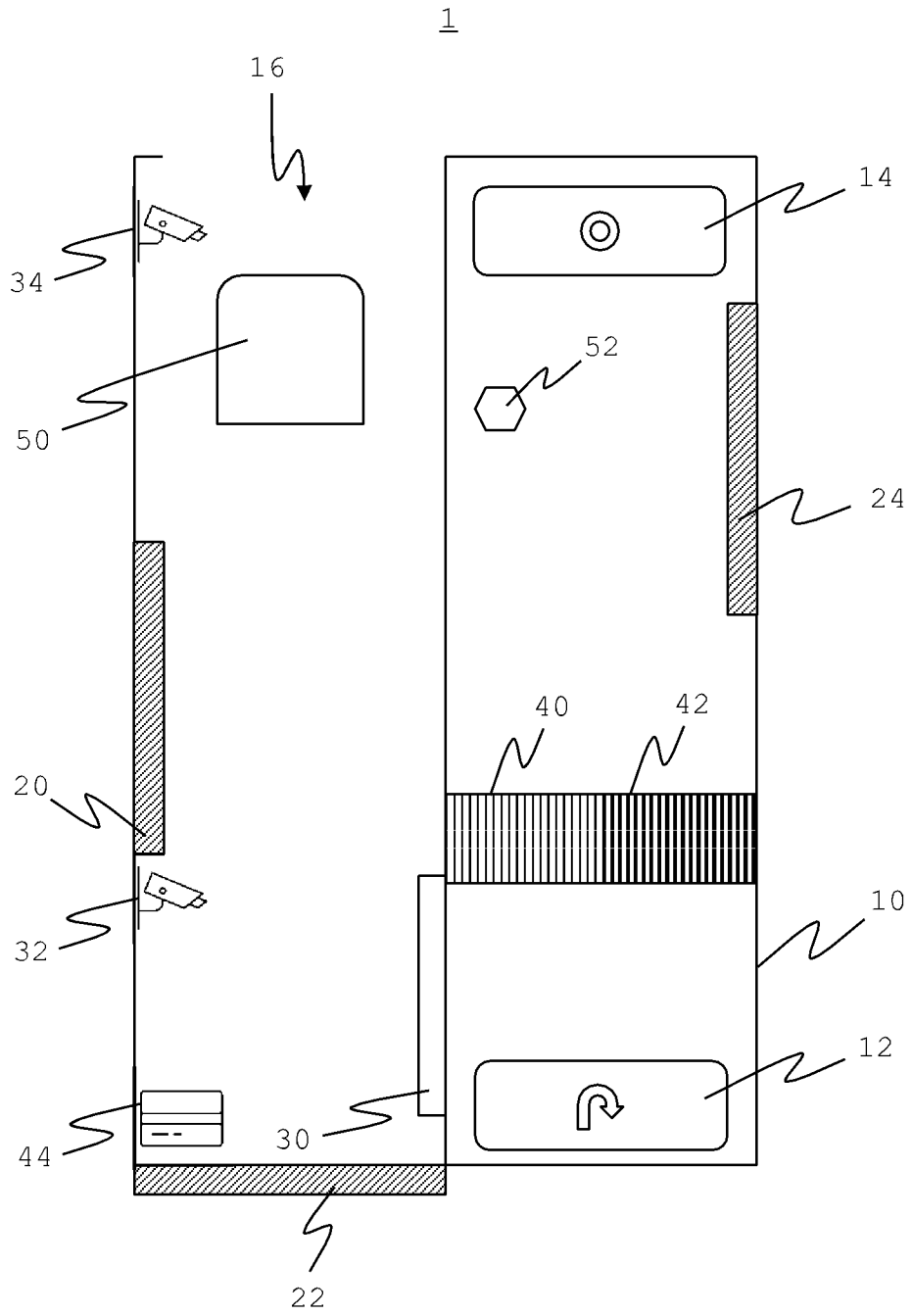

FIG.1E

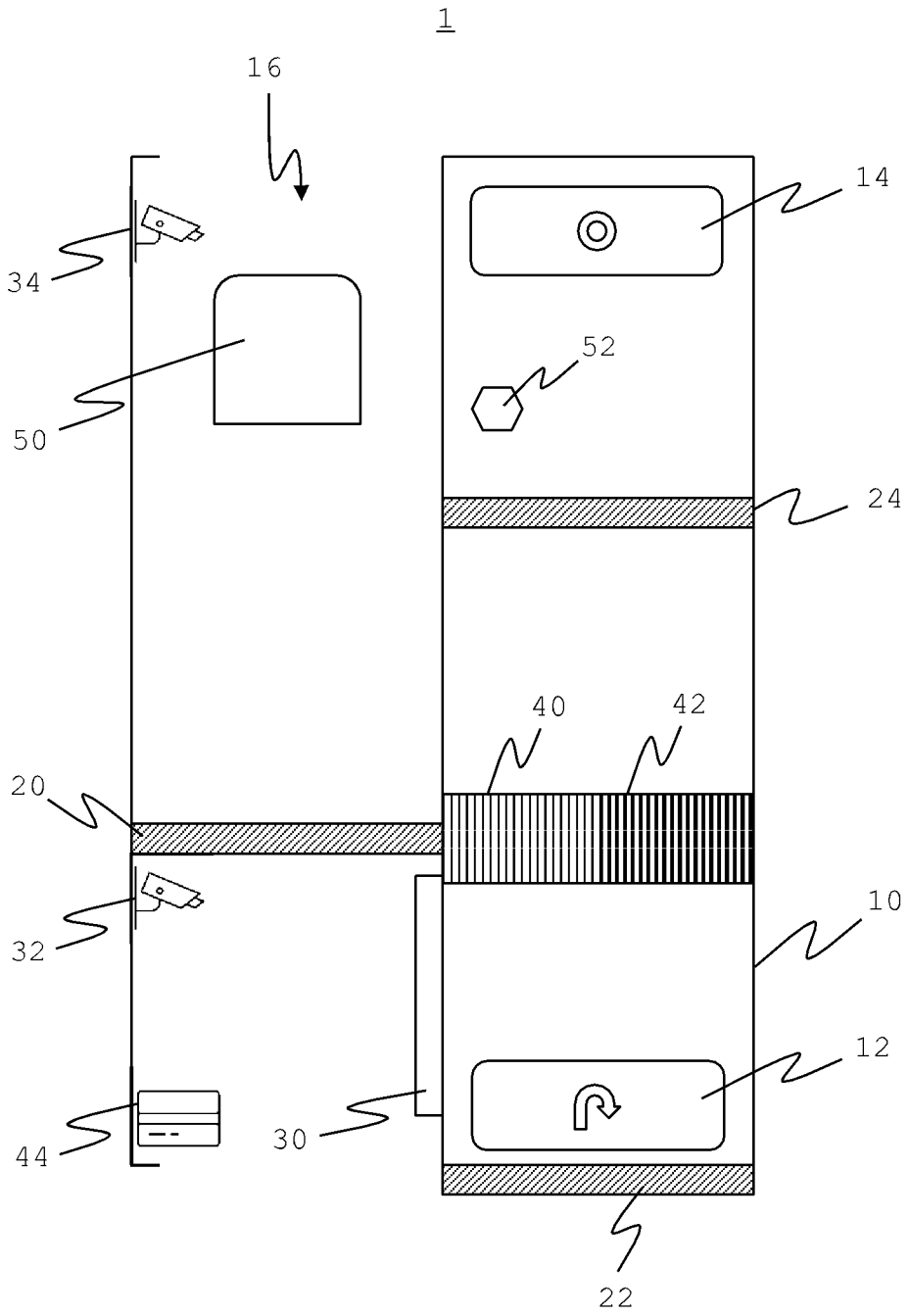

FIG.1F

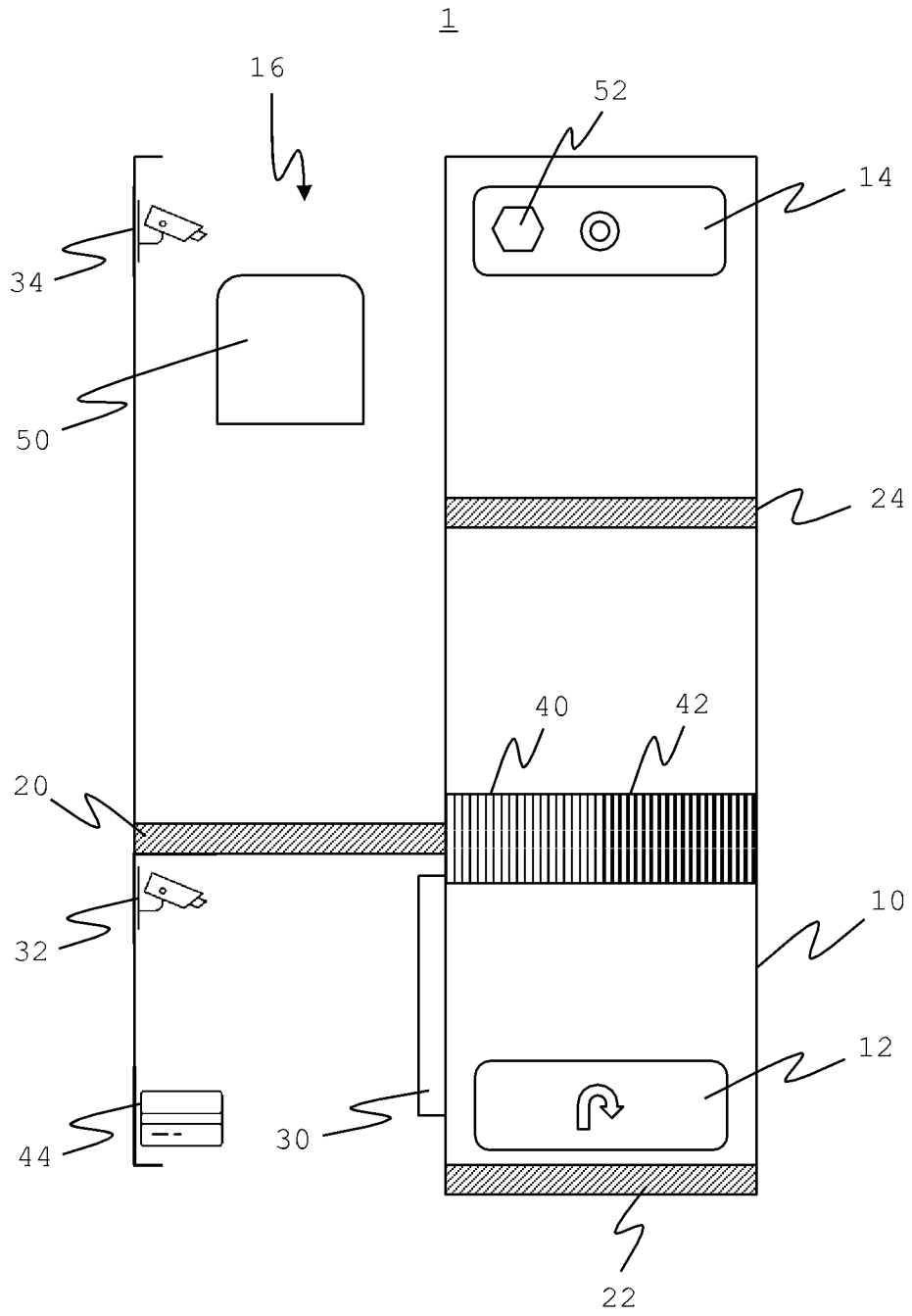

FIG.1G

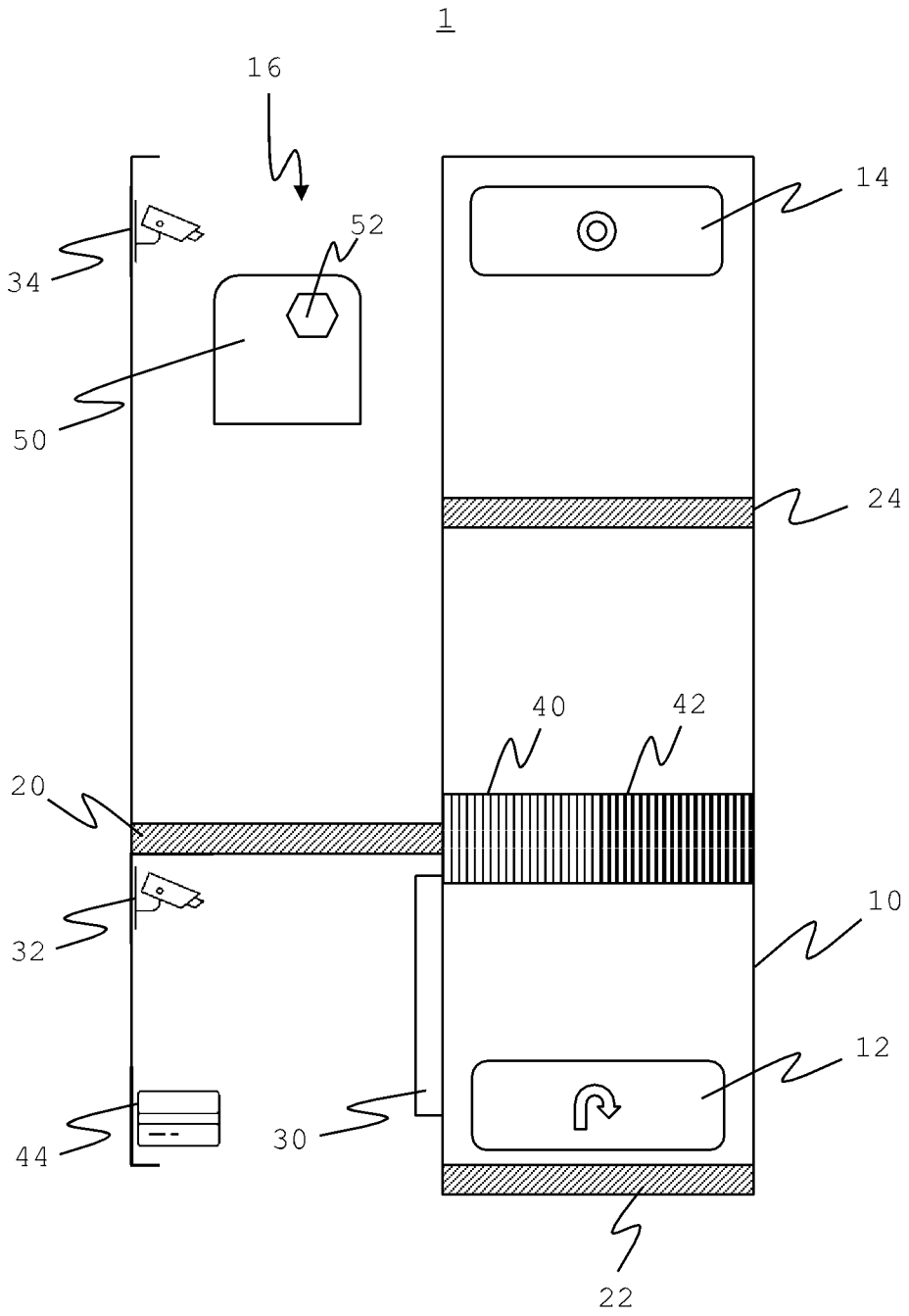

FIG.1H

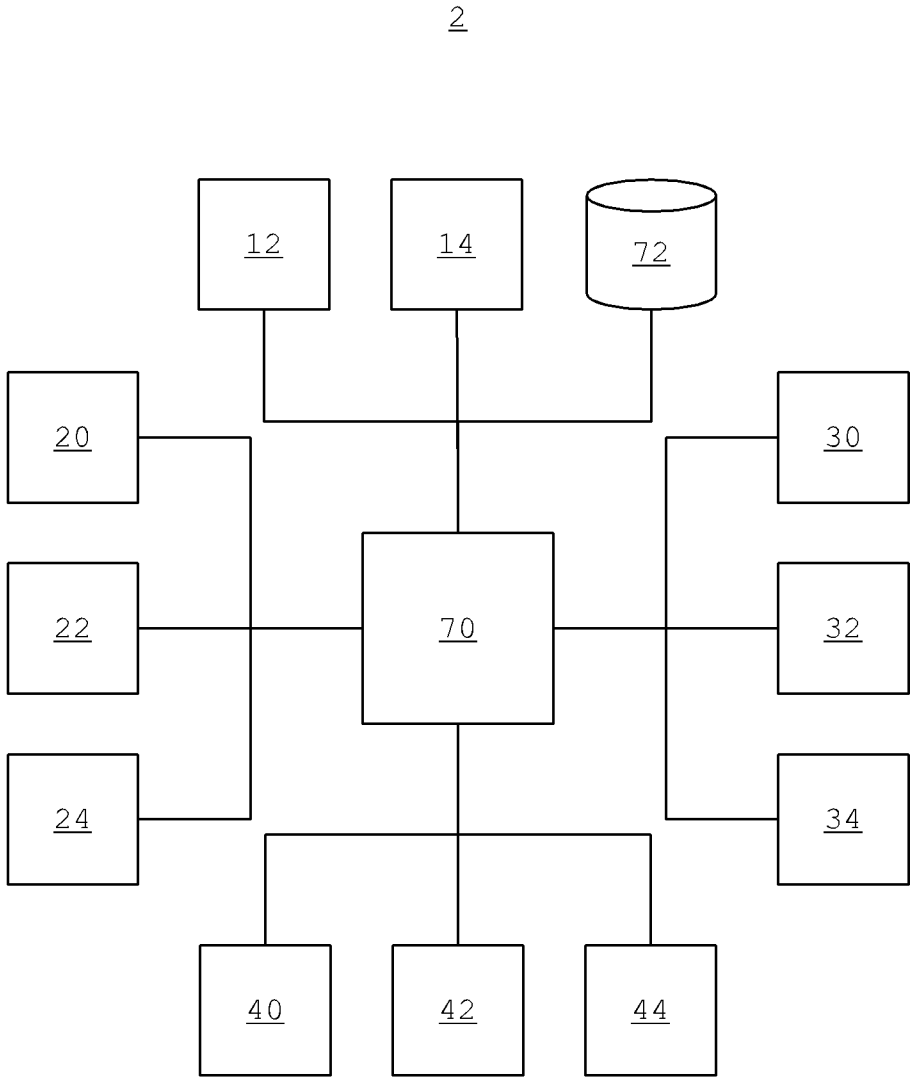

FIG.2

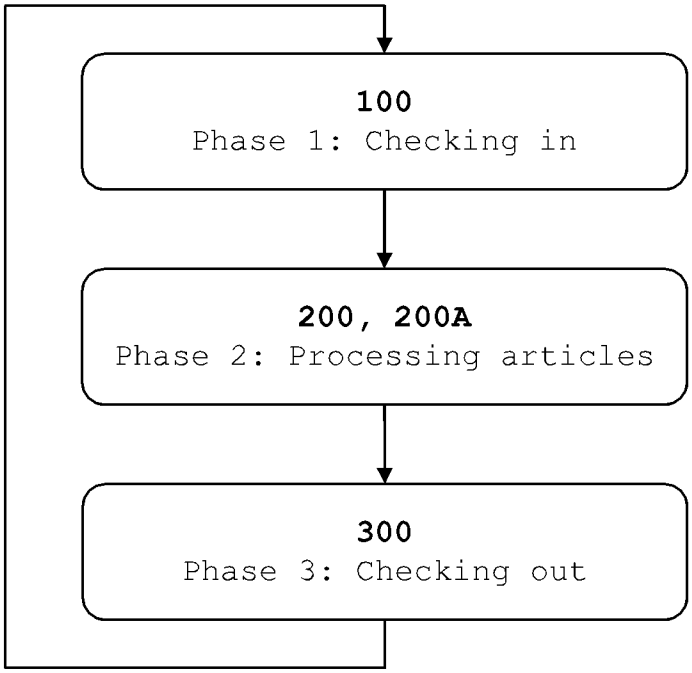
100
Phase 1: Checking in
200, 200A
Phase 2: Processing articles
300
Phase 3: Checking out

FIG.3

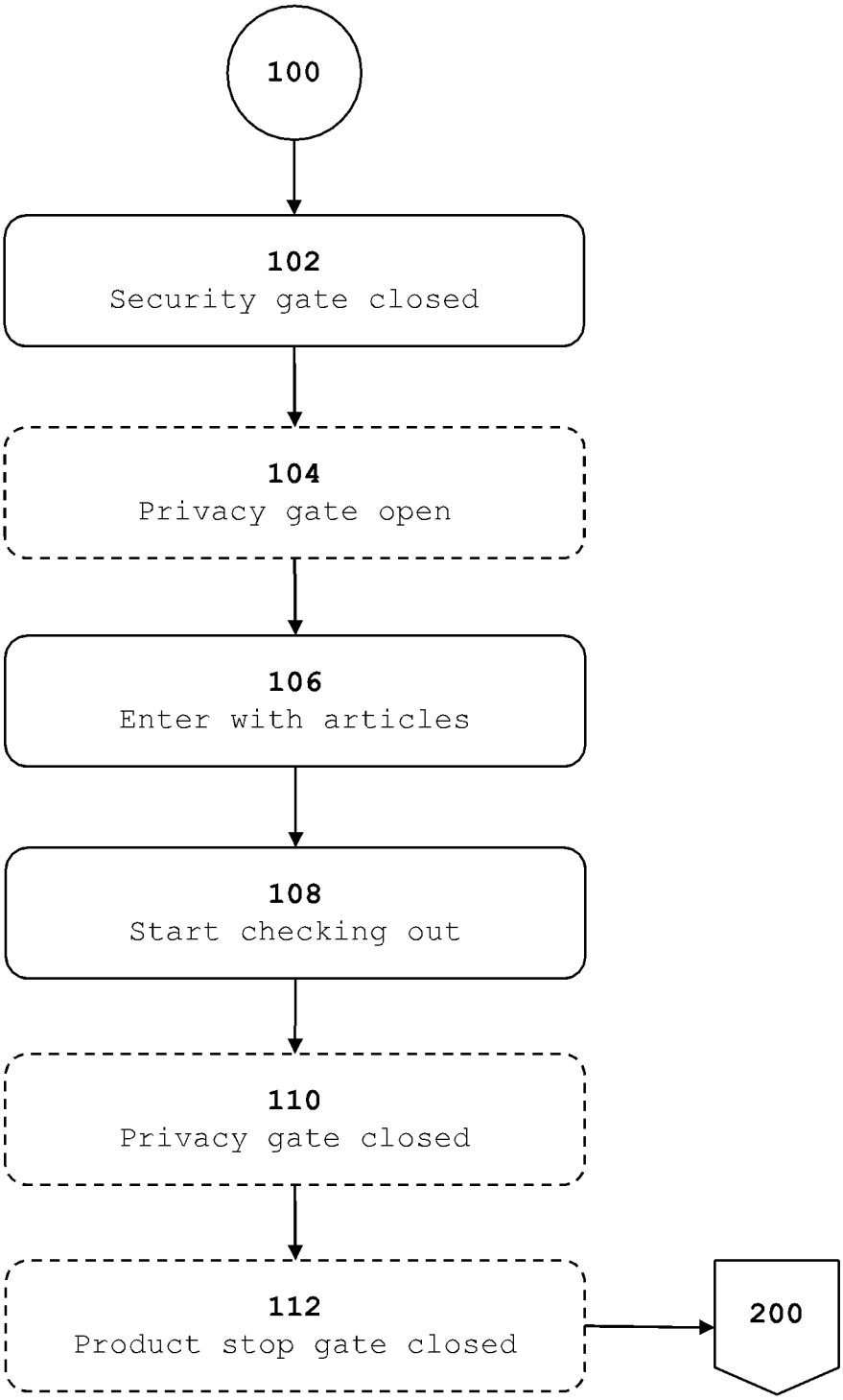
100
102
Security gate closed
104
Privacy gate open
106
Enter with articles
108
Start checking out
110
Privacy gate closed
112
Product stop gate closed
200

FIG. 4

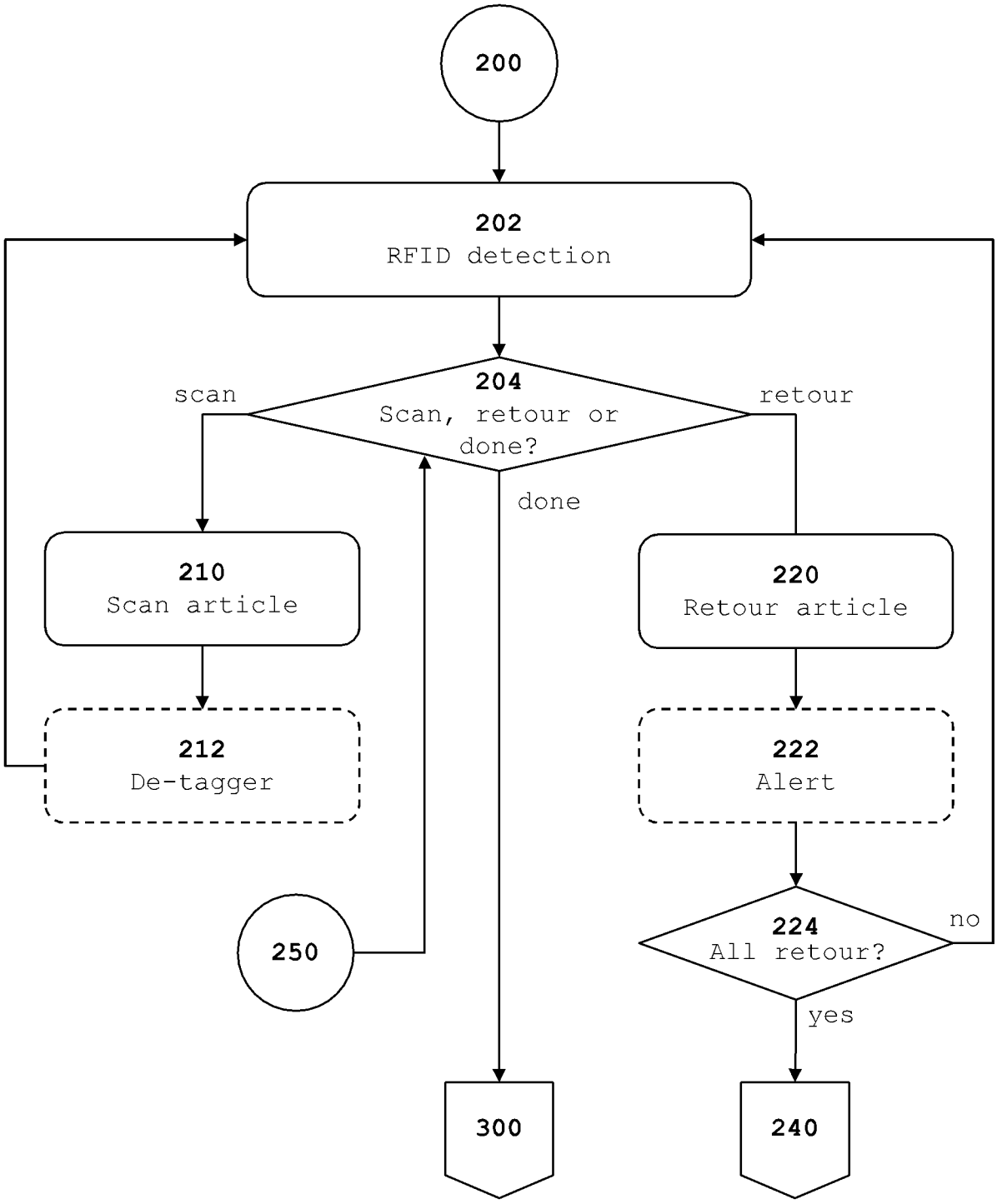
200
202
RFID detection
204
Scan, retour or done?
scan
retour
done
210
Scan article
212
De-tagger
220
Retour article
222
Alert
224
All retour?
no
yes
250
300
240

FIG.5

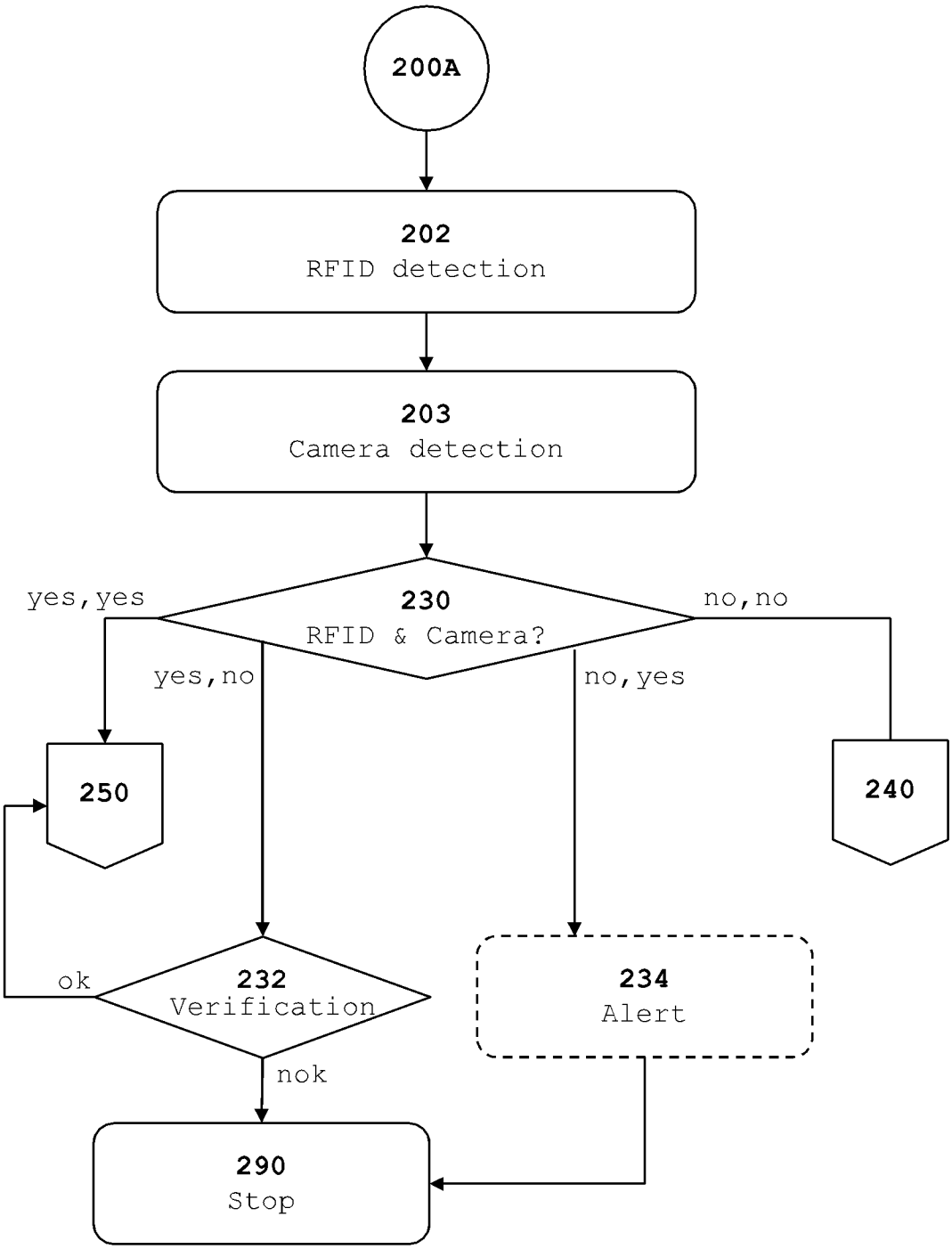
200A
202
RFID detection
203
Camera detection
230
RFID & Camera?
yes,yes
yes,no
no,yes
no,no
250
240
232
Verification
ok
nok
234
Alert
290
Stop

FIG. 6

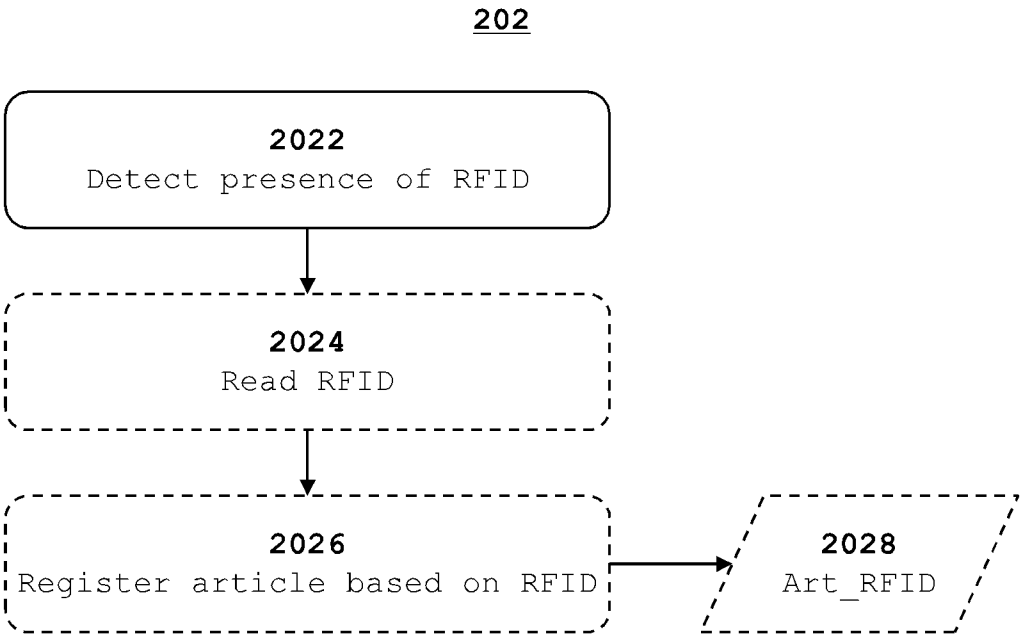
202
2022
Detect presence of RFID
2024
Read RFID
2026
Register article based on RFID
2028
Art_RFID

FIG.7

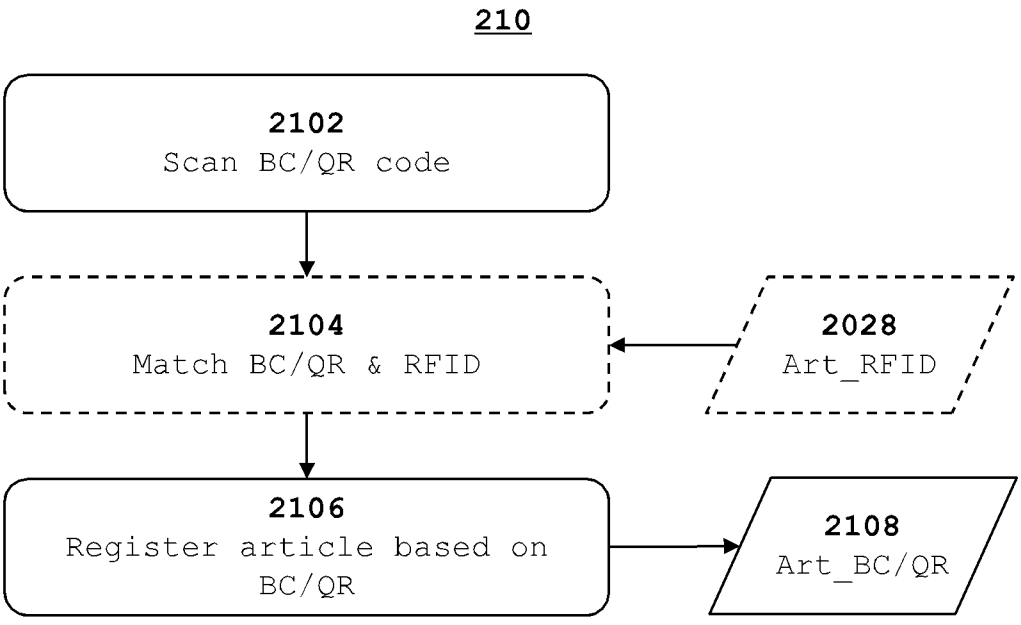
210
2102
Scan BC/QR code
2104
Match BC/QR & RFID
2028
Art_RFID
2106
Register article based on BC/QR
2108
Art_BC/QR

FIG.8

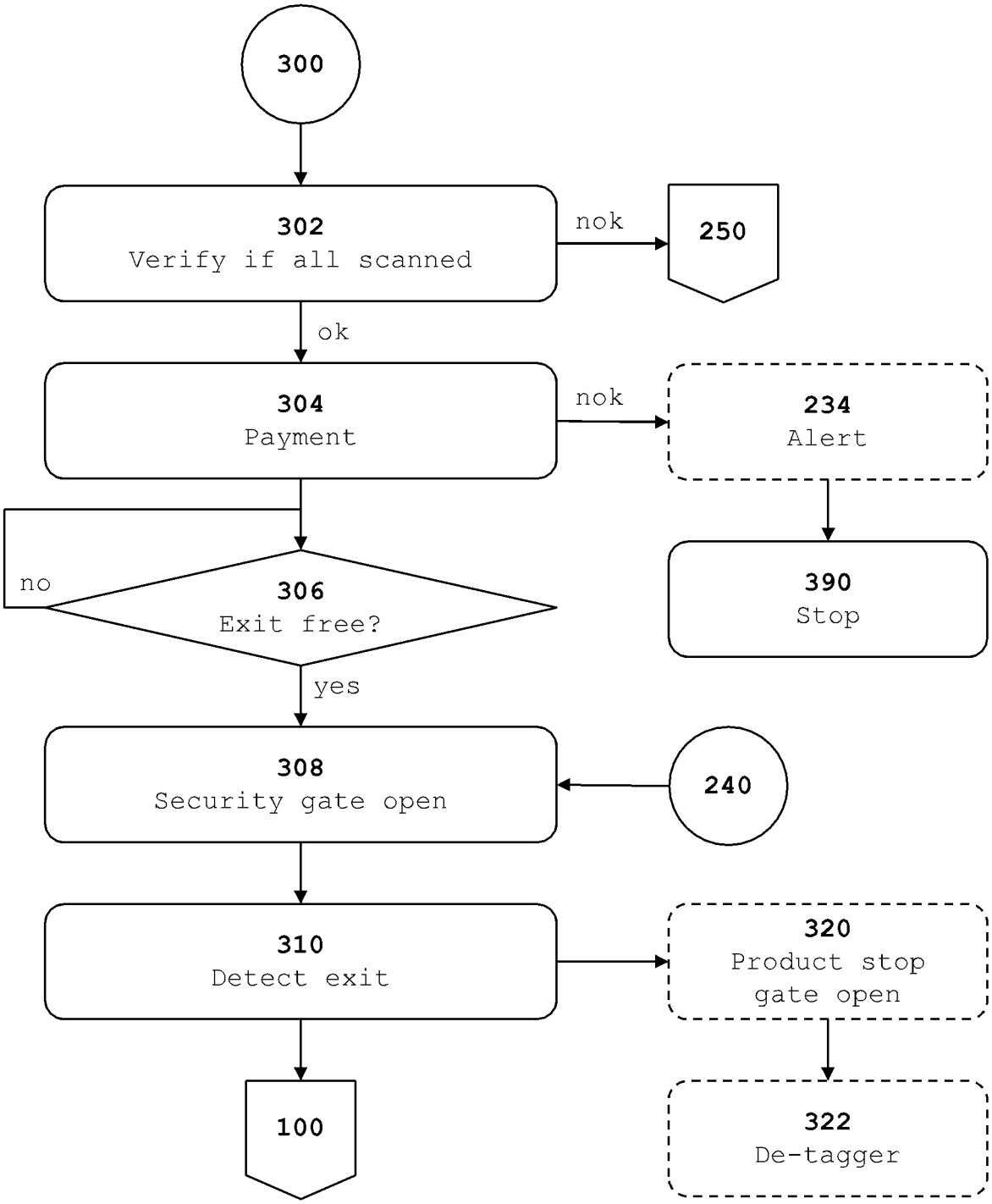
300
302
Verify if all scanned
nok
250
ok
304
Payment
nok
234
Alert
390
Stop
no
306
Exit free?
yes
308
Security gate open
240
310
Detect exit
320
Product stop gate open
322
De-tagger
100

FIG. 9

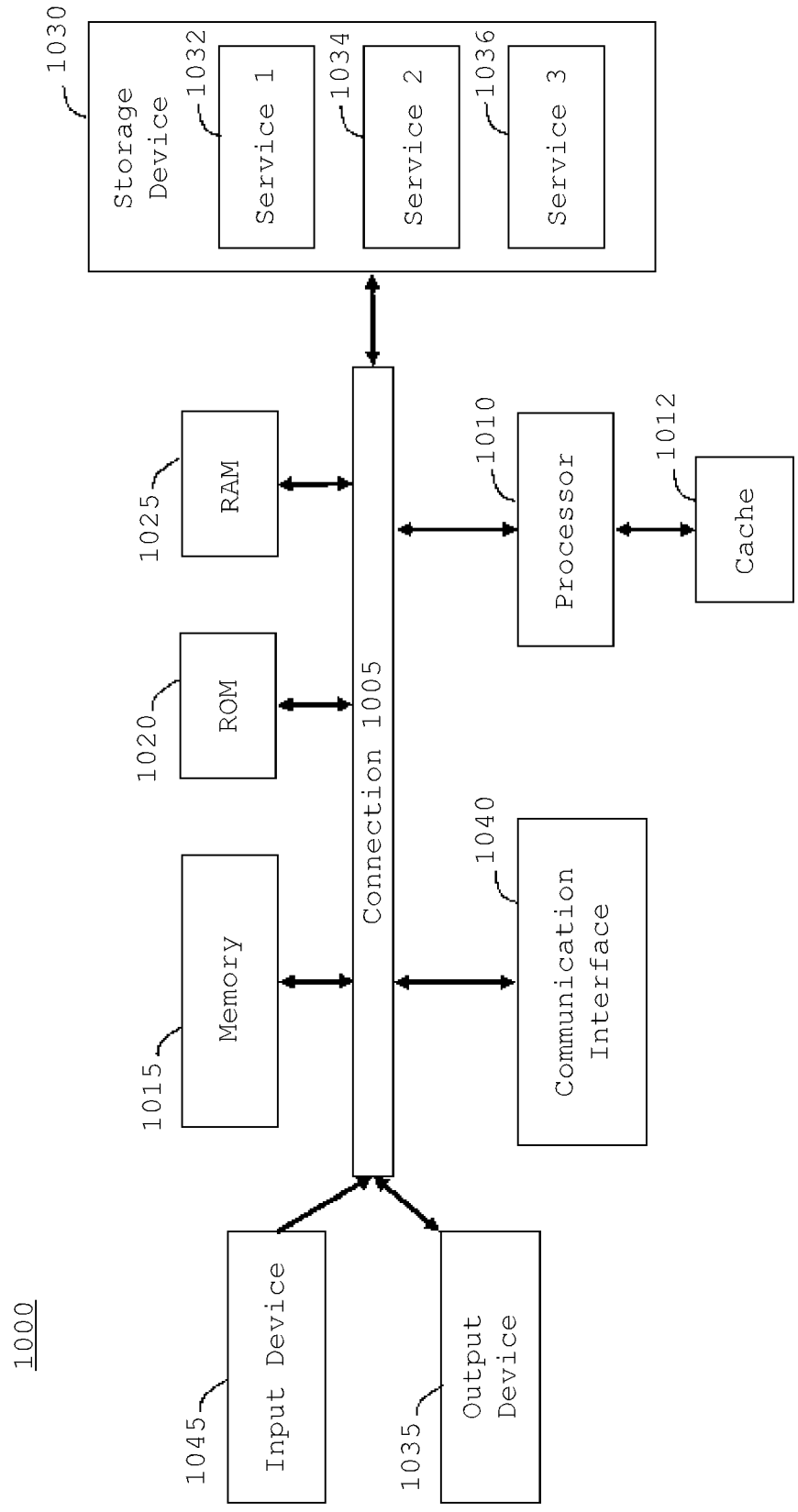
1000
1030
Storage Device
1032
Service 1
1034
Service 2
1036
Service 3
1025
RAM
1020
ROM
1015
Memory
Connection 1005
1010
Processor
1012
Cache
1040
Communication Interface
1045
Input Device
1035
Output Device

FIG.10