(12) **APPLICATION**

(11) **20200435** (13) **A1**

(19) NO

NORWAY (51) Int Cl.

G06Q 10/00 (2012.01)
G06Q 20/32 (2012.01)
G07F 7/06 (2006.01)
G06K 19/06 (2006.01)

Norwegian Industrial Property Office

(21)	Application nr	20200435	(86)	Int. application day and application nr
(22)	Application day	2020.04.08	(85)	Entry into national phase
(24)	Date from which the industrial right has effect	2020.04.08	(30)	Priority
(41)	Available to the public	2021.09.20		

(71) Applicant RVM SYSTEMS AS, Kobbervikdalen 75, 3036 DRAMMEN, Norge

(72) Inventor Frode Tollefsen Bryhn, Erik Hansens vei 1 C, 3430 SPIKKESTAD, Norge
Lars Møgster, Søren Paulsens vei 18, 3027 DRAMMEN, Norge
Lionel Tokarz, Solbergs Gate 12 A, 3040 DRAMMEN, Norge
Lars Helge Stølen, Gryteveien 80, 3074 SANDE I VESTFOLD, Norge

(74) Agent or Attorney ONSAGERS AS, Postboks 1813, Vika, 0123 OSLO, Norge

(54) Title **Reverse vending machine and system for reverse vending of objects**

(57) Abstract

A reverse vending machine comprises a processing device connected to a computing and storage service for transferring session identification identifying an ongoing session of returning objects from the reverse vending machine to the computing and storage service. The machine further comprises a user interface adapted to communicate with a mobile computing device for transferring session identification signals from the reverse vending machine to the mobile computing device. In a system for reverse vending of objects, the mobile computing device comprises a program configured to communicate with the computing and storage service.

FIELD OF THE INVENTION

The present invention relates in general to a reverse vending machine, and more specifically to identifying an ongoing session of returning objects and transferring the information from the reverse vending machine to a computing and storage service.

BACKGROUND

The reverse vending machine (RVM) is a device to receive and process objects for recycling, typically used beverage containers like bottles and cans (objects). The RVM will measure and extract several properties from the objects. These properties are compared to the properties of objects in an object database. The objects are then either accepted or rejected, based on certain criteria. The accepted objects are processed by the RVM. The processing can consist of transporting, counting, sorting, compacting, crushing, rendering unusable and storing in a bin or other suitable device. The rejected objects are in standard RVM configuration returned to the user of the RVM (end-user).

In a traditional RVM the end-user can return objects one at a time. The objects usually need to be inserted into an opening of the RVM in an orderly manner. The end-user needs to take every single object by hand. Some type of RVMs might need the object inserted in a certain orientation. Other RVMs will accept the objects with either the top or bottom first. In general, the object needs to be inserted in an orderly and controlled way so the RVM can properly identify, transport and process it.

An RVM with a Bulk feed module enables the end-user to put several objects into the machine at once, without paying attention to the orientation of the objects or how the objects are fed into the RVM. The Bulk feed module will typically align and separate each object so the RVM can identify, transport and process the objects. The Bulk feed module may be an integrated part of the RVM, or a separate unit attached or connected to a standard RVM.

In some configurations, the RVM may process rejected objects and unknown objects even if they do not fulfil the RVM's acceptance criteria. The processing of rejected or unknown objects can consist of, but not limited to transporting, counting, sorting, compacting, crushing and or storing in a bin or containers. The processing of rejected objects can be done automatically or based on user input either prior to start of recycling or during recycling process.

The accepted objects may constitute a certain value that can be redeemed, awarded or credited to the end-user. This is typically done to encourage users to return objects such as bottles and cans. In markets where the recycling of bottles and cans are well regulated the customer or end user will first pay a deposit in addition to the normal price of the product in the normal purchase process. When the end-user returns the empty object for recycling this deposit can be paid back or returned to the customer. An RVM is often used to ensure that the deposit is only paid back for objects which is part of the deposit recycling system (DRS). In non-regulated markets or for local recycling systems an RVM can still be used to receive, count and process objects for recycling based on certain criteria.

The value of the objects can be redeemed by the customer as a deduction from a normal payment in a store, donated, used to buy lottery tickets, cash payment, electronic payment, credited to an account or a loyalty program. In some systems the value can be added to an account for public transport or written directly to a card to add to the balance of certain types of electronic cash or public transport cards. The value does not have to be "real money" but could be points, rewards or discounts in various schemes. For the rest of this document we use the term "value", independent if it is real money, cash, electronic funds, points, awards, discounts or other forms of values.

The terms "objects" returned to an RVM is typically referring to used beverage containers like bottles or cans. In some markets RVM's will also accept crates with or without bottles inside. The RVM could also be used for other objects like but not limited to food containers, general liquid containers, cups, batteries, lightbulbs or other items that can be collected, identified and processed.

The use of mobile applications (APP) has become the standard in many daily tasks. An APP is software application designed to run on a mobile device, phone, tablet or watch. Handling money transactions especially small amounts is now commonly performed with mobile APPs. In the return and recycling of food and beverage containers small amounts of money are typically paid from the RVM owner, store or from the deposit system (DRS) itself to the end customer.

Smartphones have become devices that most people will always bring with them. The small and powerful devices with a good touch screen, user interface, network connectivity and camera are versatile hardware platforms for mobile applications. The majority of devices are running on one of just two or three operating systems or platforms. This makes it easy to develop applications with a potentially large user base with less software development resources. The microprocessor and camera inside most smart phones are fully capable of reading and decoding both one-dimensional (1D) and two-dimensional (2D) barcodes. More and more wireless standards are supported not only for internet or network access but also short-range,

low power wireless standards like Bluetooth, BLE, RFID, NFC or other. This make the smartphone the ideal hardware platform for small amount payments. The smartphone with a mobile APP can act as an electronic user identification. This makes payment systems based on mobile devices more secure in the way that user can be linked to a phone number during the registration process.

The pay-out process from an RVM needs to be streamlined to ensure that the end-user is credited the correct value of the recycled objects in a secure and reliable way. The traditional way to redeem the value of returned objects in an RVM is with a printed receipt. The RVM will print a receipt or voucher on thermal paper when the return session is finished. The end-user will then bring this physical receipt to the location where the value can be redeemed. The pay-out can be provided by a cashier, POS (point of sale), tiller, cash dispenser machine, an information desk in a store or other locations.

As an alternative it is possible to encode or store the complete information of the return transaction in a 1D or 2D barcode or other kind of code or symbol after the return session is completed. This code could in one embodiment be printed on paper or voucher and brought to the location where the value can be redeemed. It is also possible to show this on the screen of the RVM and scan it or otherwise read it with a mobile application (APP). The digital copy of this barcode could then either be interpreted by the APP, forwarded to a computing and storage service or be brought to the cashier or POS and presented by the APP to be redeemed. This is a less secure solution may not be so suitable for a well-integrated system.

The total value of the recycled objects could also be electronically transferred directly to the users account, with a bank transfer, PayPal, Google Pay, Apple Pay or other service for transfer of money. Yet another option is to transfer the value into a bonus or loyalty program. Some chain of stores has their own program where returning customers are rewarded for their loyalty with bonuses and special offers. A loyalty program is usually linked to membership card, mobile application, telephone number, credit or debit card. These cards can be used to identify the customer or at least the account to which the value should be transferred.

To enable the electronic transaction of the value to take place the end-user needs to provide the account, membership number or other unique way of identification. The RVM need to know where to transfer the value. In some cases, the identification information can be entered on the touchscreen of the RVM. This identification information could be an email address, telephone, account, membership number or other unique way of identification.

The process of entering information on a touchscreen can be difficult or intimidating for some people. It is also prone to errors, where the identification

process might fail, or the value of the returned objects can be lost or payed to the wrong account.

A more convenient solution is to use a membership card or other document with a barcode that can be read by a barcode scanner in the RVM, POS or mobile application. The barcodes can be a conventional one-dimensional (1D) format with bars or lines with various thickness and spacing. The most common 1D formats are UPC8, UPC12, EAN8, EAN13, EAN128, Code 128 or other standardized formats. Alternately two-dimensional (2D) codes or symbologies where the information is encoded in a series of light and dark squares placed in a rectangular area. The most common 2D formats are QR code, Data Matrix, Aztec, PDF417, Maxi Code or other standardized formats. The advantage with 2D codes is that it can contain more data and encode any alphanumeric characters whereas 1D codes is mostly limited to numeric data with just a few, typically less than 25 digits.

In some loyalty programs the customer or end-user is issued a membership card, this could be a printed card with a membership number in a suitable barcode format or just in plain text. It can also be some other form of electronically readable card. Traditional contact-based cards are for example, but not limited to, magnetic stripe, chip or smart cards. Also, technologies with contactless card or devices, for example, but not limited to NFC, RFID, MiFare, FeliCa, Bluetooth, BLE, WIFI, ZigBee, Zwave or other can be used. A mobile application on a smartphone could also serve as a membership card and be used as identification. It is also possible to use biometric information to make a positive identification of the user. This could for example be, but not limited to, face recognition, fingerprint, retina or DNA scanning.

A major disadvantage with cards, wireless devices or biometrics it that they require dedicated hardware to read and identify the user. The same goes for reading barcodes on loyalty cards and mobile phone screens. This will add to the cost and complexity of the RVM. In an established system it is important to consider the already installed base of RVM's in the field. These may need to undergo a costly upgrade in order to be able to read and identify the user or account.

The applicant has found a way to use an existing component in the RVM, for example the screen, to show or present a token which could be in form of a 1D or 2D barcode containing information to identify the ongoing return session. This could enable a mobile application to scan the token and forward it together with the user information stored in APP to a computing and storage service. When the return session is completed all relevant information can be sent by the RVM to the same computing and storage service. At the computing and storage service all the information will typically be stored in a database. It is then possible to link the

information about the completed return session to a specific user with the purpose of transferring the value of the returned objects to an account or loyalty program.

For new DRS's or markets where mobile applications are used exclusively to transfer or redeem the value of returned objects the current invention can reduce the cost and complexity of the RVM. Also, it will enable older RVM's to work with such a system with just a software upgrade and no additional hardware to read loyalty cards or barcodes from a mobile APP.

SUMMARY OF THE INVENTION

The object of the invention is to provide a reverse vending machine and a system for reverse vending of objects that solves the above mentioned problems and provides a link between a return session in a RVM and an user, to enable data and the value of the returned objects to be entered into a database. The database can be located at a local or remote computing and storage service. This information can in turn be used to transfer the correct value to an account or loyalty program or otherwise transfer the value to the user.

The invention relates to a process and workflow for identifying a return session in a reverse vending machine with a dedicated mobile application.

The object of the invention is solved by the machine, system and program that has been set forth in the appended, independent claims. Advantageous embodiments, features or aspects have been defined in the dependent claims.

BRIEF DESCRIPTION OF THE DRAWINGS

It should also be understood that the following figures are merely illustrative and may not be drawn to scale.

Figure 1 illustrates a typical layout of the front part of an RVM.
Figure 2 illustrates the layout of a screen on a front part of an RVM with a session token after the first object has been accepted by the RVM.
Figure 3 show the end-user scanning a token barcode at the screen of the RVM with a mobile APP.
Figure 4 shows the data flow and steps involved in the RVM, the user's mobile application and a computing and storage service.

DETAILED DESCRIPTION OF THE INVENTION

Figure 1 illustrates a typical layout of the front part of a reverse vending machine (RVM) 1. The reverse vending machine 1 comprises a user interface 2, for example

in form of a screen and an opening 4 for receiving objects to be returned by the RVM.

The RVM also comprises an arrangement 5, 6 for providing payment to the user after a returning session is completed. The arrangement for providing payment may be a button 5 for using the money for a lottery ticket, or for providing a receipt that can be used for cash return or as part of payment for goods in a store.

The RVM comprises a processing device connected to a computing and storage service for transferring session identification information such as information identifying an ongoing session of returning objects and the complete information regarding the session after it has been completed. Such information is for example the value of the returned objects, ie. the amount of money the user will receive based on the number and type of objects that have been returned to the RVM.

The user interface 2 is adapted to communicate with a mobile computing device, such as a mobile/cell phone, tablet computer, smart watch, etc. for transferring session identification signals and/or other information from the reverse vending machine to the mobile computing device. This process is illustrated in figure 3. The communication is in the figure done by displaying a token 3 on the screen 2. The provision of a user interface and communication with a mobile computing device such as a phone, causes a reversal of the identification process. Instead of the RVM identifying the end customer by reading a customer account or other identification number from a card or device, the customer can use his or her mobile device 7 with a dedicated mobile application 8 to identify the ongoing session of returning objects. This can be achieved by scanning a unique barcode or token 3 on the screen 2 of the RVM 1.

Figure 2 illustrates more details of an example of the layout of a screen 2 on a front part of an RVM. The screen 2 comprises the token 3 as well as information regarding the ongoing session. In the figure, one bottle has been returned, having the value of 2 kr (NOK). The screen may be a touch screen enabling the user to give simple input as alternative or additionally to the communication with the mobile device.

Figure 4 shows the data flow and steps involved in the RVM, the user's mobile application 8 and computing and storage service 9. In the following description, a screen is used as example of user interface, but other kinds of user interfaces are also possible, as will be mentioned below.

A return session starts when a user starts inserting objects into the RVM though for example the opening 4 shown in figure 1. When the return session has started or any

time during the return session, a token 3, for example in form of a 1D or 2D barcode is shown on the screen 2 of the RVM 1. This token 3 represents the session identification for the ongoing return session. The session identification or token 3 is transferred from the RVM to a computing and storage service 9. The end-user can scan the barcode with a dedicated mobile APP 8 installed in his/her phone or other mobile device. The scanned information from the barcode together with the user's identification which is stored on the mobile device 7/APP 8 are then automatically sent by the APP 8 to the computing and storage service 9. The computing and storage service 9 comprises programming in form for example of a software application for processing the information received from the RVM and the user's phone. It is then possible for the software application running on the computing and storage service 9 to link the ongoing return session to the end-user. The computing and storage service 9 can typically be a cloud-based service with dedicated software to handle data from the RVM 1 and mobile APP 8 concerning return sessions for returned, recycled food and beverage containers.

As an alternative the computing and storage service 9 could also be comprised in the RVM as a process running on the processing device of RVM itself. In that case the linking of the session identification and the user identification can take place in the RVM. This alternative embodiment would require a service, device or similar, accessible on the public internet or other communication protocol to forward the session identification and user identification from the mobile APP back to the RVM.

As an optional step it is possible to give feedback to the end-user that the linking of the return session and user identification has been successful. This feedback can be shown on the screen 2 of the RVM and in the APP 8.

The RVM may in one embodiment comprise means for detecting end of a session and the processing device can be adapted to transfer data from the session of returning objects to the computing and storage service.

When the return session has been completed, and the end user has entered all the objects into the RVM, the details about the return session is sent from the RVM to the computing and storage service 9. The software process on the computing and storage service 9 can then match the session identification sent by the mobile APP 8 and the session data sent by the RVM. This enables the value of the returned objects to be transferred to the correct receiver, location or account. The account can be a bank account, member account or other type of account comprising a value accessible for the user. The total value of the recycled objects could be electronically transferred directly to the users account, with a bank transfer, PayPal, Google Pay, Apple Pay or other service for transfer of money. Another option is to transfer the value into a bonus or loyalty program. This could be achieved with an

electronic information transfer, API call or other. The mobile APP 8 could also hold the receipt for each return session. This enables the end-user to redeem the value of the receipt later by presenting the receipt in the APP to a POS (point of sale), tiller, cashier information desk or other location for redeeming the value from receipts.

In the registration process or at first time use of the APP, the user needs to enter some personal information. This could be one or more of the following but not limited to name, address, email, phone number, account number, credit card number, membership number, passport number, personal identification number, social security number or other information necessary.

The RVM will typically be connected to a LAN (local area network) via ethernet or WIFI or directly to the internet via GPRS, 3G, UMTS, 4G, LTE, CDMA or other wired or wireless standards. This enables communication between the RVM and the computing and storage service 9 or cloud service.

The end-user's mobile device will typically be connected to the internet via WIFI or mobile data network like GPRS, 3G, UMTS, 4G, LTE, CDMA, 5G or other cellular data standard. This enables the APP 8 on the end-user's mobile device to send and receive data about the return session, receipts, value of the returned objects and balance of either bank or loyalty accounts.

The barcode shown on the RVM screen could contain a key or a token 3 to uniquely identify the specific return session. The data about the actual return session could then be sent to and stored in a common database on the RVM, in the store, at a centralized location, in a data centre or in a cloud storage service. The session token 3 can later be used during the pay-out process to retrieve the information about the return session.

The barcode presented on the screen needs to contain enough information to ensure secure and reliable identification of the return session. To achieve this a barcode format able to encode the necessary information should be used. Both one-dimensional (1D) or preferably a two-dimensional (2D) symbology or barcode type could be used. This includes format like but not limited to UPC8, UPC12, EAN13, EAN128, Code 128, QR code, Data Matrix, Aztec, PDF417 or Maxi Code.

The user will typically need to register his personal data in the mobile application prior to the first use. This includes providing one or more of the following items: name, address, email, phone number, bank account number, credit card number, membership number or other information on how and where to pay or transfer the value for the returned objects. From a security point of view, it is advantageous to use a mobile device within a cellular network. There are some inherent security features in cellular networks such as a unique identification number of the mobile device itself typically called IMEI. Also it is convenient to verify that a user which

tries to register an account in an APP is actually in possession of a certain mobile device or able to receive SMS, text messages, email or otherwise prove that the identification is in fact correct and authentic.

The invention utilizes an already existing component or device (in this case the screen 2) in the RVM and the camera on the user's mobile device to make the link between the customer and the return session. Other means for a mobile application to identify the return session could be to use a short-range wireless communication interface like but not limited to NFC, RFID, IRDA, Bluetooth, BLE or WIFI. But this would again need additional hardware in the RVM. In future RVM's some of these technologies may be required for other purposes, become standard in the components inside the RVM or can be added at a very low cost. The main point is for the mobile device of the end user to get the unique identification of the current return session without the risk that other customers in the vicinity can intercept the information or otherwise prevent the rightful owner of the current return session to receive the value for the returned objects.

Information about each return session can be stored in a database. Typically, stored information can be the date and time of the transaction, number of objects, total value and a unique identifier for the store, site, transaction and RVM. The information stored about the return session can be even more detailed including but not limited to data about each object or type of objects returned, properties of the returned objects and the return session itself.

The computing and storage service could also be adapted to process the data related to the returned objects in the session. Such processing can for example be to calculate the value of the returned objects in the session based on the type and properties of the objects and/or other information received from the RVM.

The database can be located near or inside the RVM, in the store or at a remote location. The remote location could be in a server, a data centre, in a cloud service or distributed throughout the internet. The cloud service in this context refers to a remote storage and computing facility located at one or more locations where the data can be distributed over one or more physical servers or storage volumes. This is typically done to get a high level of data security, speed and availability. This kind of distributed computing and storage solution is easy scalable and able to handle large amount of data and connected clients and is a common solution for mobile application infrastructures.

CLAIMS

1. A reverse vending machine comprising
- a processing device connected to a computing and storage service for transferring session identification identifying an ongoing session of returning objects from the reverse vending machine to the computing and storage service and
- a user interface, where the user interface is adapted to communicate with a mobile computing device for transferring session identification signals from the reverse vending machine to the mobile computing device.

2. A reverse vending machine according to claim 1, where the user interface is a screen displaying a token adapted to be read by the mobile computing device.

3. A reverse vending machine according to claim 2, where the token is in form of a one or two-dimensional code displayed on the screen.

4. A reverse vending machine according to claim 1, where the user interface comprises a token wirelessly transmitted by means of NFC, RFID or Bluetooth.

5. A reverse vending machine according to one of the previous claims, where the computing and storage service is configured to receive session identification from the RVM and user identification from the mobile computing device and link them together.

6. A reverse vending machine according to one of the previous claims, where the computing and storage service is located remotely and connected to the processing device.

7. A reverse vending machine according to any of claims 1-5, where the computing and storage service is located in or near the reverse vending machine.

8. A reverse vending machine according to one of the previous claims, comprising means for detecting end of a session of returning objects and where the processing device further is adapted to transfer data from the session of returning objects to the computing and storage service.

9. A reverse vending machine according to one of claims 5 to 8, where the user interface is adapted to give feedback to an end-user that the linking of the return session and user identification has been successful.

10. A reverse vending machine according to one of the previous claims, where the computing and storage service is adapted to process the data related to the returned objects in the session.

11. A reverse vending machine according to one of the previous claims, where the computing and storage service is adapted to enable transfer of the value of the returned objects to a receiver, location or account.

12. A system for reverse vending of objects, comprising
- a reverse vending machine, a mobile computing device and a computing and storage service,

where the reverse vending machine comprises a processing device connected to the computing and storage service for transferring session identification from the reverse vending machine to the computing and storage service and a user interface, where the user interface is adapted to communicate with the mobile computing device for transferring session identification signals from the reverse vending machine to the mobile computing device, and

where the mobile computing device comprises a program configured to communicate with the computing and storage service.

13. A system for reverse vending of objects according to claim 12, where the computing and storage service is configured to receive session identification from the RVM and the mobile computing device and link them together.

14. A system for reverse vending of objects according to claim 13, where the computing and storage service is configured to receive user identification from the mobile computing device and linking this to the session identification.

15. A system for reverse vending of objects according to one of claims 12-14, where the computing and storage service is configured to receive information related to the session of returning objects.

16. system for reverse vending of objects according to one of claims 12-15, where the computing and storage service is adapted to process data related to the returned objects in the session.

17. A system for reverse vending of objects according to one of the claims 12-16, where the computing and storage service is adapted to enable transfer of the value of the returned objects to a receiver, location or account.

18. A program for a mobile computing device configured to communicate with a reverse vending machine by receiving session identification signals from the reverse vending machine by means of a user interface.

19. A program for a mobile computing device according to claim 18, further configured to transfer session identification signals and user identification to a computing and storage service.

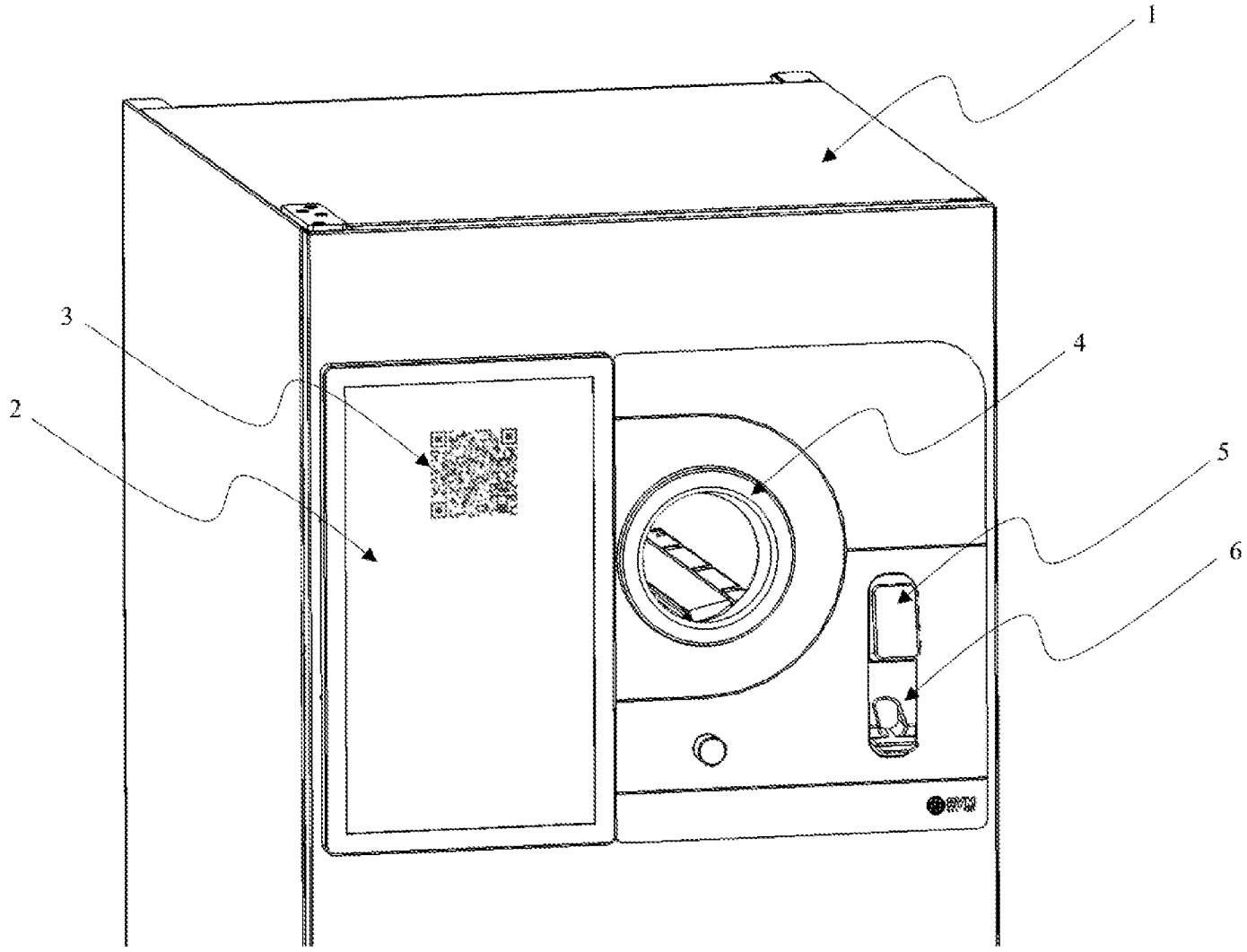


Fig. 1

Fig. 2

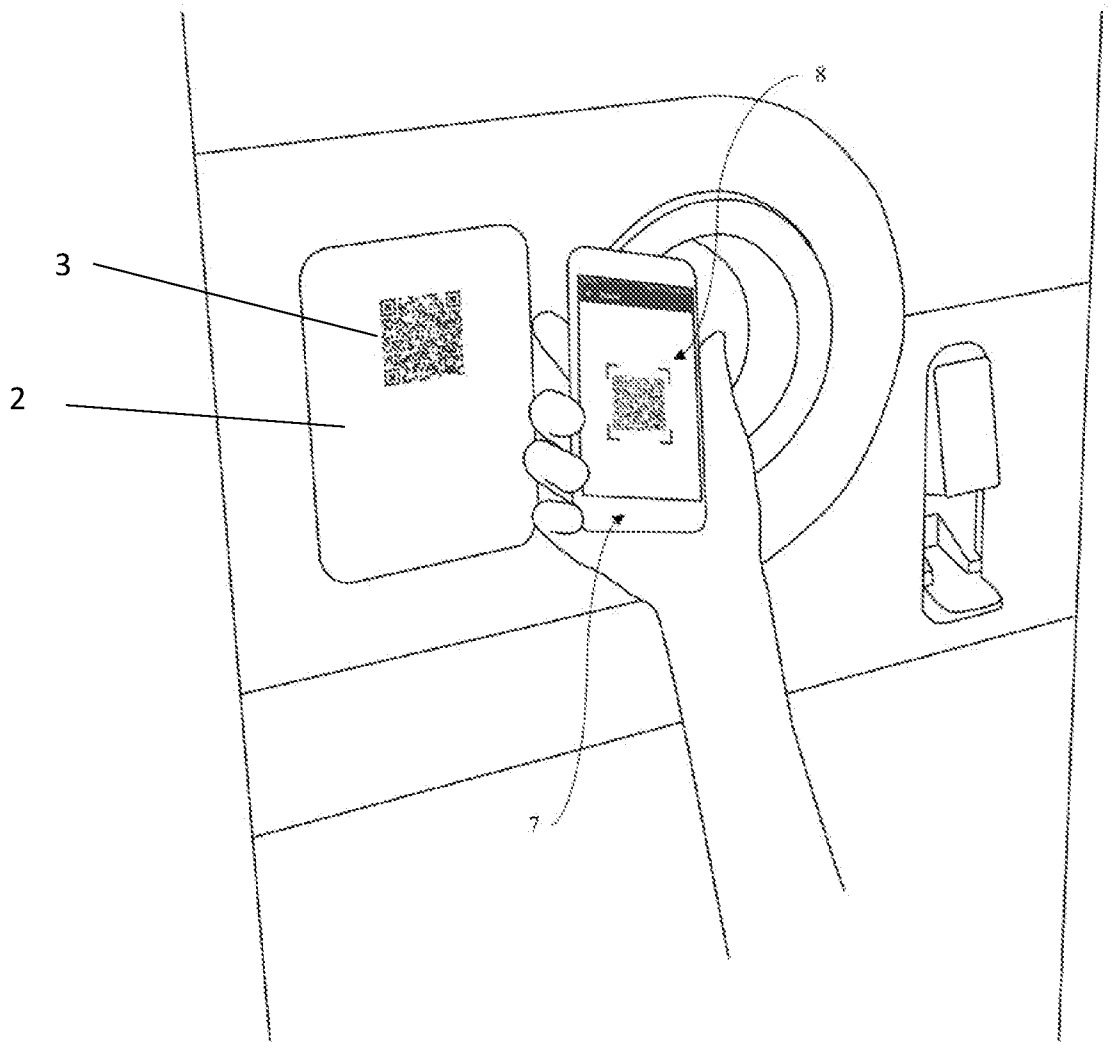
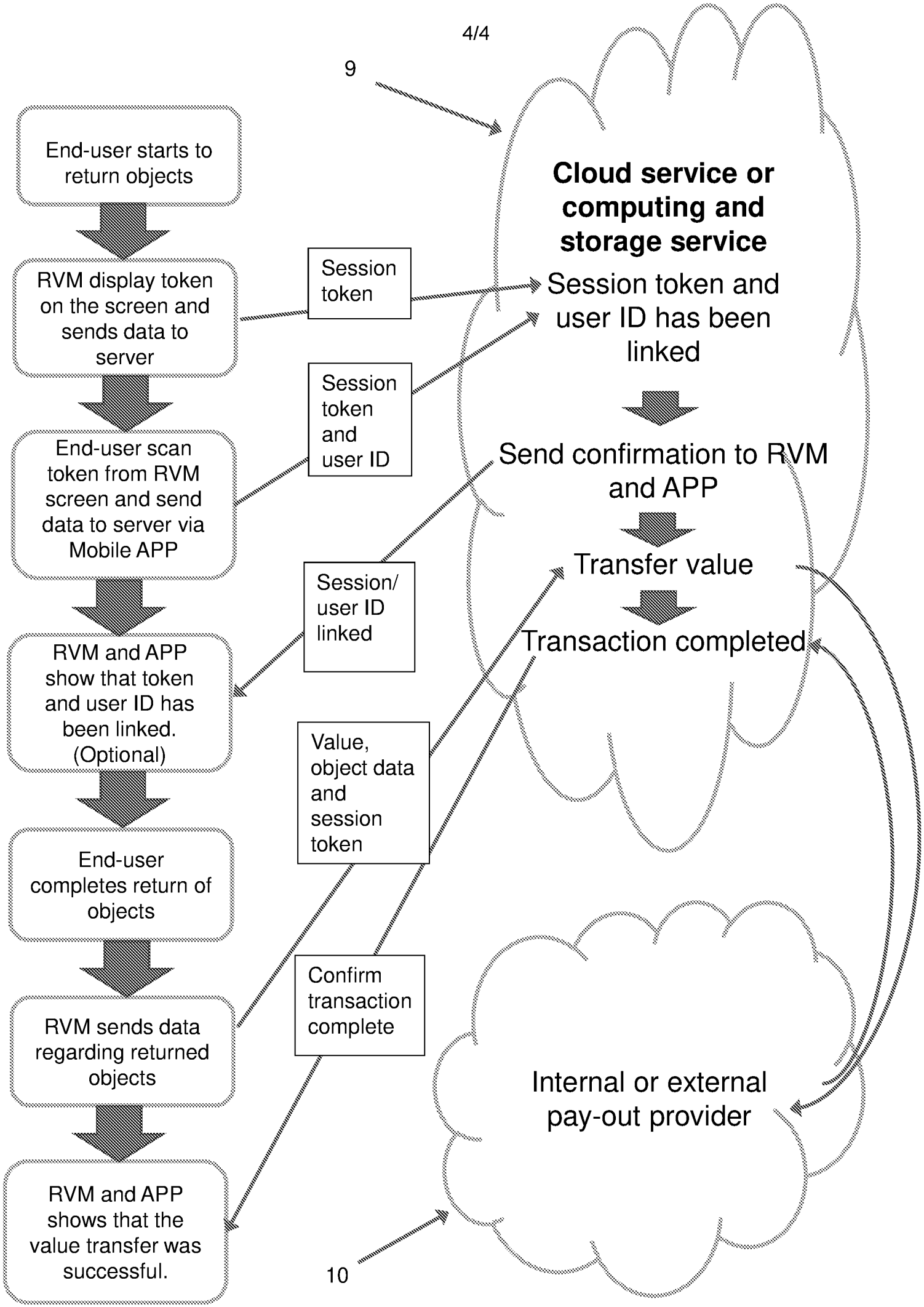


Fig. 3


9
End-user starts to return objects
RVM display token on the screen and sends data to server
End-user scan token from RVM screen and send data to server via Mobile APP
RVM and APP show that token and user ID has been linked. (Optional)
End-user completes return of objects
RVM sends data regarding returned objects
RVM and APP shows that the value transfer was successful.
Session token
Session token and user ID
Session/ user ID linked
Value, object data and session token
Confirm transaction complete
Cloud service or computing and storage service
Session token and user ID has been linked
Send confirmation to RVM and APP
Transfer value
Transaction completed
Internal or external pay-out provider
10