RFID METHOD AND SYSTEM FOR REMOTE MONITORING AND RESTOCKING OF DISPLAY UNITS

A method and a system for remote monitoring, automatic restocking products and maintenance of display units in sales areas, at remote locations. Each display unit is provided with a GPS device for detecting its geographical location; a control unit and an RFID scanner are provided for retrieving data stored in a smart TAG associated with each product, at the time of removal from the display unit. The information stored in the control unit comprising data relating to the geographical location and an inventory list, is transmitted in real time by a main communications network, to a central monitoring unit which, in turn, selectively communicates with each local warehouses competent for each sales area or group of sales areas; a mobile delivery system, activated by a local warehouses, provides an automatic restocking and maintenance of each individual display unit.
RFID METHOD AND SYSTEM FOR REMOTE MONITORING AND RESTOCKING OF DISPLAY UNITS

BACKGROUND OF THE INVENTION

This invention refers to a method and a system for the remote control and automatic restocking products in display units in variously located sales areas, by centralised logistics and monitoring, suitable for allowing a selective geographic localisation and positioning of each display unit, making an inventory of the contents and state of the same display units, to provide restocking and maintenance.

STATE OF THE ART

Conventional vending and distribution systems, in large shopping centres or equipped sales areas, contemplate the display of pre-established quantities of individual products on shelves, showcases and more in general in special display units which must be periodically checked and replenished by specific operators.

Each product is normally provided with a label, having a bar code, designed to provide data indicative of the type and selling price of the product.

The label is automatically or manually read by a special scanner, in correspondence with one or more payment points connected to a central control system which takes care of managing the entire supply system.

Systems of this kind are extremely complex and intricate, and call for the use of a large number of operators specially trained for visually checking and supplying the individual products.

In order to prevent theft of products and/or to provide an automatic inventory system it has also been suggested to make use of radiofrequency identification systems, also referred to as RFID systems according to coded technological standards, capable of automatically providing identifying data for each individual product, for example as described in WO 99/05660 for inventory of publications in a library.

The published Japanese patent application JP 2002024321, of Fuji Xerox Co Ltd., in turn proposes a vending system according to which individual samples of products to be sold, each provided with an identification code memorised in an RFID label or tag, are displayed in an appropriate store; a
purchaser, provided with his/her own identification code, places the sample in correspondence with a special scanner which transmits the product data, and the request, to a centralised distribution system which takes care to send the required product directly to the purchaser's home.

A previously published Japanese patent application JP 3123126, on behalf of CSK Corp., also suggested a system for controlling and restocking individual automatic vending machines, according to which each machine is provided with an internal data source and a device capable of measuring the number of sales of the individual products.

The data relating to each automatic vending machine, are transmitted directly to a base station which in turn informs special restocking and/or maintenance vehicles, thereby enabling a remote control, at all times, of the products existing in each vending machine, and its state of repair, without an operator having to go to the site.

Both these systems possess several positive advantages in that they tend to centralise the management and control operations, thereby reducing the use of personnel; however, they have several drawbacks due, in one case, to the complexity and higher costs of the home delivery, and the impossibility of modifying the system and, in the second case, in particular to the impossibility of managing differentiated and variously located sales areas with a single control centre, or of removing or modifying the disposition of the vending machines, without informing the control centre beforehand of the new or different location of the machines themselves. These systems consequently are extremely rigid that is very little appropriate both as regards control, and as regards the limited number of vending machines that can be managed in a same or different sales areas.

The patent application WO 00/49542 again suggests a system for remote management of automatic vending machines, according to which use is made of a considerable number of sensors to supply specific management information to a local microcomputer, which communicates with a central computer by a dedicate telephone line or digital mobile telephony. The system is also preset to indicate the exact localisation of each machine by a GPS localising device.
Although this solution relieves the central control unit of the need to know beforehand the exact location of each machine, it nevertheless once again proposes a complex system which requires machines specially dedicated to displaying and dispensing specific products, special programming and specific means for selecting and dispensing the individual products.

There is consequently a need to have a new monitoring system for sale, control and restocking of freely displayed products, which is extremely simplified and which at the same time offers the utmost organisational flexibility in locating and controlling several display units in any sales area, and in automatically and constantly updating their state.

**OBJECTS OF THE INVENTION**

Therefore, the general object of this invention is to provide a method and an integrated monitoring system for the display, sale, control and restocking of products in individual display units, wherever located and or locatable in a same sales area or in different sales areas, by means of a solution which is extremely simple and flexible to manage.

A further object of this invention is to provide a method and a monitoring system, as mentioned previously, which enable a remote control of management data of individual display units, wherever and however located, and which make use of an integrated monitoring system for localising the display units and for detection of the products displayed.

In this way, each individual display unit can be freely removed, shifted, replaced and/or controlled without having to modify the central monitoring system.

In the same way it is possible to replace individual products with other ones, or change the quantity and type of products displayed in each individual display unit.

**BRIEF DESCRIPTION OF THE INVENTION**

In particular, according to the invention a method has been provided for sales, control and restocking of products, in display units, located in a same and/or in different sales areas, according to which information relating to a state of each display unit is detected and transmitted to a mobile supply and/or
maintenance system, characterised by the steps of:

- providing each product with its own RFID radiofrequency identification code;
- providing each individual display unit with a GPS geographical locating device, a scanner or automatic code reading device for selective reading the identification codes of the products, and respectively, a local microprocessor control unit;
- storing in the local control unit information relating to a state of the display unit;
- updating the information stored in the local control unit, by the automatically reading of the RFID identification code of each individual product at the removal from the display unit;
- selectively detecting, by a central monitoring unit, the geographical location and information relating to the state of each individual display unit;
- transferring the information relating to the state of each display unit to a competent local supply warehouse; and
- restocking each display unit, by the mobile supply system, on the basis of the information detected by the central monitoring unit and provided to the mobile supply system by the local warehouse.

According to a further feature of the invention, a monitoring system has been provided for sale, monitoring, control of the state and automatic restocking of products in display units located in a same and/or in different geographical sales areas, in accordance with the method previously mentioned, the monitoring system comprising:

- a plurality of display units in said sales areas, each display unit being provided with a GPS geographical locating device, and respectively with a scanner device for reading an RFID identification code associated with each product in a displayer;
- a microprocessor control unit in each display unit, for storing information relating to the state of the same display unit; and
- a central monitoring unit selectively connectable, by a communications network, to the control unit of each display unit and to the respective local supply
system;
the RFID reading device being arranged in each display unit for an automatic reading of the identification code of the products, and for an automatic updating of the information stored in the local control unit, at the removal of each individual product.

**BRIEF DESCRIPTION OF THE DRAWINGS**

These and further features of the method and the system according to this invention will be more clearly evident from the following description, with reference to the accompanying drawings, in which:

Fig. 1 is a diagram of the monitoring system for controlling and restocking display units, according to the invention;

Fig. 2 is a block diagram of the control unit of each display unit;

Fig. 3 is a flow chart showing the relevant steps of the method according to the invention.

**DETAILED DESCRIPTION OF THE INVENTION**

As shown in the diagram of fig. 1, the monitoring system comprises a plurality of display units 10.1-10.n hereinafter also referred to as “displayers” arranged to contain a number of products or items freely displayed for sale to the public.

The display units 10.1-10.n can be of any suitable type, for example consisting of shelves, showcases, cabinets or other display systems to allow the individual products to be displayed and freely withdrawn by any purchaser.

The displayers 10.1-10.n can be positioned in a single sales area or in several sales areas spaced apart from one another, or otherwise geographically located.

The monitoring system for sale, control and supply of products according to the invention also comprises a GPS position system 12 for providing information on the geographical location of each displayer 10.1-10.n in each sales area, and a main monitoring unit 13 connected by radio, telephone or mobile telephony network, for example GSM, GPRS or UMTS, to the GPS system 12 for detecting the locations of the displayers 10.1-10.n, as well as control unit 11 inside each individual displayer.
Lastly, the monitoring system comprises one or more wherehouses or storage units 14.1-14.14.m for storing the products, each dedicated to supplying the displayers of a given sales area or group of sales areas, and to perform maintenance operations.

The various storage units 14.1-14.14.m are in turn connected, by radio, telephone or other type of communications network 15, to the central monitoring unit 13; the individual storage units 14.1-14.14.m are also connected, via radio, or by mobile telephony, to a mobile supply system for restocking the products, consisting for example of special motorvehicles 16 driven by an operator charged for restocking the displayers in the sales areas within his competence, and/or personnel for the maintenance.

Fig. 2 shows a block diagram of the control unit 11 of each display 10.1-10.10.n.

The control unit 11 comprises a microprocessor 17, provided with a memory 18 stored with a working program, as well as for storing all the information relating to the state of the displayers, and for its management.

For the purposes of this description, the expression "state of the display" is understood to mean all the information necessary for identifying at all times the individual products contained in the same display, in terms of quantity and type, by means of their identification code, providing an inventory list, as well as data relating to the geographical location and information on the maintenance state of the display itself, and/or to any management errors.

Still with reference to fig. 2, reference P has been used to indicate a generic product or item stored in the displayers 10.1-10.10.n, which is provided with a microcircuit or RFID tag, in which information useful for identifying each product, are stored and detected by automatic reading of an identification code, at the removal of the same item from the displayers.

The control unit 11 also comprises a GPS card 19 connected to a first data inlet l1 of the microprocessor 17, and an RFID identification code reading/writing device 20 of each individual product P, substantially consisting of a scanner connected to a second data inlet l2 of the microprocessor 17.

The scanner device 20 must be positioned in the display in such a way
as to interact with the RFID TAG of each individual product, to automatically receive all the identification data of the product P upon its removal from the displayer.

In this way, at each withdrawal of a product, in the microprocessor 17 an inventory list containing the type and number of products still existing in the displayer is continuously and automatically updated.

The control unit 11 of each displayer 10.1-10.n also comprises a communication interface 21 such as a GSM, GPRS, UMTS modem or wireless connection for linking to a communications network and to the central monitoring unit 13; lastly, reference 22 in fig. 2 has been used to indicate a power supply circuit connectable to an external source of electric power 23, and/or provided with an internal power source, consisting for example of a rechargeable, or other type of electric battery.

Each displayer 10.1-10.n can be provided with an alarm system connected to the microprocessor 17, to detect any internal errors and report them to the central monitoring unit 13 by means of the communications network, for request of maintenance to a unit 14.1-14.m involved in the management of the restocking and maintenance of the displayers.

Lastly, each displayer 10.1-10.n can be provided with a monitor 24, whereby each displayer can receive, store in the memory of the microprocessor and provide audio and/or video information concerning the products in the displayer, transmitted and/or broadcasted by the central monitoring unit 13 by means of the same communications network.

With reference to the flow diagram of fig. 3, a more detailed description will now be given of the method according to this invention, referring to a generic displayer 10.n.

As previously mentioned, the central unit 13 in a programmed way or at a request of an operator, by its internal monitoring system MS interrogates the displayer 10.n to acquire knowledge of its state.

In particular, by the GPS system with which the displayer is equipped, the monitoring unit 13 locates the sales area and the precise geographical position of the displayer (GPS position).
Once the geographical position of the displayers has been identified, the central monitoring unit 13 receives from the displayers 10.n all the information concerning its state, carrying out an inventory check step IC, and respectively a maintenance check step MC.

At this point, the central monitoring unit 13, on the basis of the information received by the displayers 10.m takes care to send the competent local supply unit 14.m, the data relating to a restocking request RR and/or a maintenance request MR. The local supply unit 14.m alerts the mobile service 16 for the necessary restocking operations of the displayers and/or for any maintenance operations that may be required.

The same control, monitoring, restocking and maintenance procedure, by means of the communication system and by the methods described, takes place for all the displayers 10.1-10.m of all the sales areas, and for all the controlled local supply units, thereby achieving an unrestricted and extremely versatile global solution which greatly simplifies the monitoring and restocking procedures of the individual displayers, and which relieves the system itself of the need to be informed beforehand about the exact geographical position or about any changes that have been made to the same displayers.

The combination of the GPS technology for locating the geographical position of the individual displayers, with the RFID technology for a constant and automatic updating of the inventory list IL, upon removal of each individual product, in addition to characterising and simplifying the system according to this invention, makes also it possible to considerably lower the costs for management and restocking the displayers, which in this way can be freely located and removed in any geographical area subject to the competence of a specific local supply and maintenance unit.

According to the invention, the communication system between the monitoring unit 13 and the various displayers 10.1-10.n, can advantageously be used for sending an error report ER information and/or audio-video A/O messages to the individual displayers, in relation to the products displayed.

The messages and information are consequently memorised by the microprocessor 17, with which each display 10.1-10.n is provided, which in this
way continuously or periodically transmits them on its own monitor 24.

From what has been described and shown, it will be evident that a system and an automatic method are provided for monitoring and supplying products in displayers in one or more geographical areas, which make use of particular technologies for locating the displayers, identifying the products and updating the state of each display, thereby making the system economical and extremely versatile to manage, regardless of the geographical area or areas in which the various displayers are located.

It is understood therefore that what has been described and shown with reference to the accompanying drawings, has been given purely in order to illustrate the general features of the method and of the monitoring system of the invention; therefore, other modifications or variations of the method and/or of the system may be made, without thereby departing from the claims.
CLAIMS

1. A method for sales control and restocking of products (P) in display units (10) located in a same and/or in different sales areas, according to which information relating to a state of each displayer is detected and transmitted to a mobile supply and/or maintenance system (16), characterised by the steps of:

   providing each product (P) with its own RFID radiofrequency identification code (TAG);

   providing each individual display unit (10) with a GPS geographical locating device (12), an automatic reading device (20) for selective reading the identification code (TAG) of the products (P), and respectively, a local microprocessor control unit (17);

   storing in the aforesaid local control unit (17) information relating to a state of the display unit (10);

   updating the information stored in the local control unit (11), by automatically reading the RFID identification code (TAG) of each individual product (P), at the removal from the display (10);

   selectively detecting, by a central monitoring unit (13), the geographical location and the information relating to the state of each individual display unit (10);

   transferring the information relating to the state of each display (unit 10) to a competent local supply wherehouse (14); and

   restocking each displayer unit (10), by the mobile supply system (26), on the basis of the information detected by the central monitoring unit (13) and provided to the mobile supply system (26), by the local wherehouse (14).

2. The method according to claim 1, characterised in that the information relating to the state of each display unit (10) comprises an inventory list (IL) of the displayed products (P), which is automatically updated at the reading of the identification code (TAG) of each product (P), at the removal from the display (unit 10).

3. The method according to in claim 1, characterised by detecting state errors of the display unit (10), and transmitting to the central monitoring unit (13)
an information concerning a maintenance request (MR).

4. The method according to claim 1, characterised by periodically and automatically transmitting to the central monitoring unit (13) an information relating to the state of each display unit (10).

5. The method according to claim 1, characterised by transmitting audio-video information concerning the products (P) in each display unit (10) and/or group of displayers (10), by the central monitoring unit (13) and said information transmission network (12).

6. The method according to claim 5, characterised in that said audio-video information is stored in the local control unit (11), and transmitted onto a monitor (24) provided in each display unit (10).

7. The method according to claim 1, characterised local control unit (11) by connecting the display unit (10) to the central monitoring unit (13), and the latter to the local supply system (16), by a wireless communications network.

8. A monitoring system for selling, monitoring, controlling a state and automatic restocking products (P) in display units (10) located in a same and/or in different sales areas, according to the method of claims 1, characterized by comprising:

   a plurality of display units (10) in said sales areas;

   an RFID identification code (TAG) associated with each product (P), each display unit (10) being provided with a GPS geographical locating device (19), and RFID reading means (20), for reading the RFID identification code associated with each product (P), in the display units (10);

   a local control unit (11) in each display unit 10, for storing information relating to its state; and

   a central monitoring unit (13) selectively connectable, by a communications network (12), to the local control units (11) of the individual display units (10) and selectively connectable to a local supply system (16);

   the RFID reading means (20) being arranged in each display unit (10) for automatic scanning the RFID identification code (TAG) of the products (P), and for automatic updating the information in the local control unit (11), at the removal of each individual product (P) from the display unit (10).
9. The monitoring system according to claim 8, characterised in that the local control unit (11) of each display unit (10) is programmed for automatically updating an inventory list (IL) of the products (P), by reading the RFID identification code of each product (P) at the removal from the display unit (10).

10. The monitoring system according to claim 8, characterised in that the local control unit (11) of each display unit (10) is programmed for detecting state and errors of the display unit (10), and for reporting said state and errors to the central monitoring unit (13) of the monitory system.

11. The monitoring system according to claim 8, characterised in that said central monitoring unit (13) is programmed for periodically, and/or at a request of an operator, detecting information concerning the state of each individual display unit (10).

12. The monitoring system according to claim 8, characterised in that each display unit (10) is provided with a monitor (24) for displaying, audio-video information concerning the products (P), received from the central monitoring unit (13).

13. The monitoring system according to claim 8, characterised in that the local control units (11) for the individual display unit (10) are connected to the central monitoring unit (13) by radio and/or telephone and/or wireless communications network (12).
A. CLASSIFICATION OF SUBJECT MATTER

INV. G06Q10/00 : G07F9/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G06Q G07F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Further documents are listed in the continuation of Box C. See patent family annex.

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Authorized officer: Pinheiro, T.
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