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(54) Title: ELECTRONIC PRICE LABEL AND ELECTRONIC PRICE LABEL SYSTEM

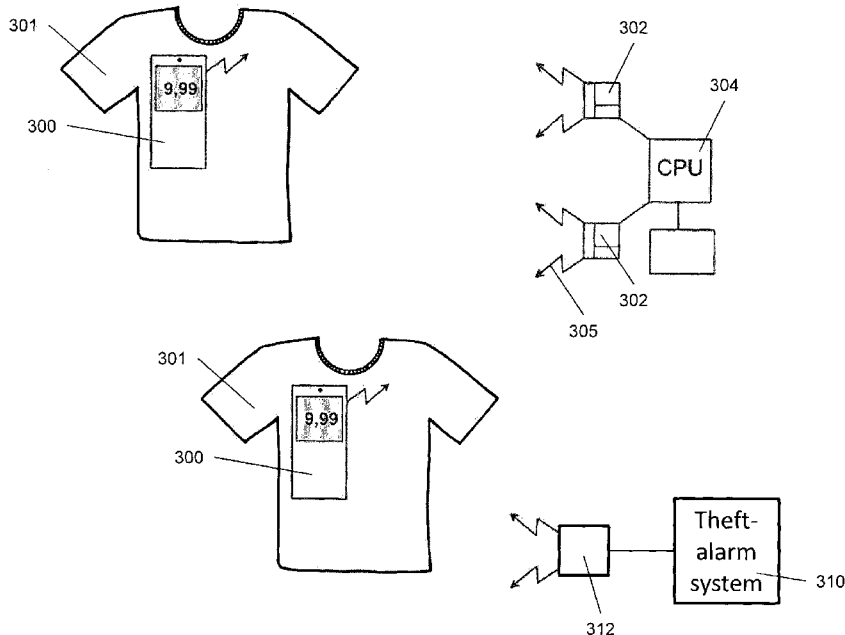


Fig. 3

(57) Abstract: An electronic price label (100, 200, 300, 400) and electronic price label system wherein electronic price label (100, 200, 300, 400) comprises a communication module for receiving product related information and a display for displaying product related information. The electronic price label (100, 200, 300, 400) further comprises an electronic article surveillance part which can be detected by an electronic article surveillance system (310).

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ELECTRONIC PRICE LABEL AND ELECTRONIC PRICE LABEL SYSTEM

5 Field of the invention

The invention relates to electronic price labels and electronic price label systems.

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Background of the invention

Conventionally, the product related information, such as price, is attached to products like clothes with hanging tags made of e.g. paper or similar material. This information can be attached to the product at the place of manufacturing or it can be later added to the product. At least when local information, local price or updated price is to be attached to the product this has to be done manually in the store. The new prices are printed out on paper or a corresponding material, and these pieces with their new price markings are attached manually to existing tags on the products. Thus, an employee must first find the correct product where the tag has to be updated and the new tag is attached in its position. A disadvantage in this arrangement is, among other things, the fact that the arrangement is very laborious and there is a high risk of mistakes. In case of a mistake, a situation may occur, in which the price information on the price tags on the product conflicts with the price information in the cash register system.

Also electronic shelf label systems, ESL systems, are known which offer automatic updating of prices to an electronic label that will facilitate and accelerate the updating of the price information to a significant extent. ESL systems are systems used by retailers for displaying product pricing on shelves. Typically, electronic shelf labels are implemented as electronic display modules that are attached to the front edge of retail shelving. These modules use different technologies to show the current product price and also other information to the customer. A communication network allows the price display to be automatically updated when-

ever a product price is changed. This automated system reduces pricing management labor costs and improves pricing accuracy.

5 ESL systems are particularly suitable for use in large shops or super-markets that offer thousands or tens of thousands product items for sale, whose prices must be updated frequently and correctly.

The electronic price display modules can be updated from a centralized control system via wired or wireless communication. All-wired systems
10 have obvious problems in terms of the layout limitations caused by complicated cabling due to the high number of individual ESL displays. Wireless systems have their major technological bottleneck in the need for individual power supplies for each ESL display unit and requirement for long power supply lifetime, i.e. operational lifetime for the batteries.
15 In addition, the wireless systems need to be able to provide reliable communication channel in an environment that has high number of individual receiver-transmitter units that in order to prolong the battery life, need to operate with minimum transmitting power levels.

20 A display technology that is suitable for ESL applications is a so called Electronic Paper Display (EPD) that possesses a paper-like high contrast appearance, ultra-low power consumption, and a thin, light form. EPD's aim is to give the viewer the experience of reading from paper, while providing the capability to electronically update the displayed information.
25 EPD's are technology enabled, as one possibility, by electronic ink. Such ink carries an electrical charge enabling it to be updated through electronics. Electronic ink is well suited for EPD's as it is a reflective technology which requires no front or backlight, is viewable under a wide range of lighting conditions, including direct sunlight, and
30 requires no power to maintain an image. Electrical power is only consumed when the displayed data is changed. In order become widely applied in different type of applications, wireless ESL's or corresponding electronically controlled wireless displays are faced with a number of requirements that are partly dictated by the manufacturing process and
35 partly by the end use, for example, the use, environment and manageability in a store by the store personnel.

WO0067110 discloses a display unit for electronic shelf price label system that utilizes electronic ink and EPD technology. The electronic display unit in WO0067110 features a printable electronic display comprising an encapsulated electrophoretic display medium. The resulting electronic display is flexible and has in large measure the applications of a printed display. Further, since the encapsulated electrophoretic display medium used in the present invention can be printed, the display itself can be made inexpensively. The encapsulated electrophoretic display medium is an optoelectronically active material which comprises at least two phases: an electrophoretic contrast media phase and a coating/binding phase. The electrophoretic display medium can form, for example, a full color, multi-color, or two color (e. g. black and white) display. The electrophoretic phase comprises at least one species of encapsulated electrophoretic particles, having distinct physical and electrical characteristics, dispersed in a clear or dyed suspending fluid. The coating/binding phase includes a polymer matrix that surrounds the electrophoretic phase. In this embodiment, the polymer in the polymeric binder is capable of being dried, cross linked, or otherwise cured as in traditional inks, and therefore a printing process can be used to deposit the encapsulated electrophoretic display medium onto a substrate.

Also electronic article surveillance systems are known which are used to prevent shoplifting from retail stores, pilferage of books from libraries or removal of properties from office buildings. Special tags are fixed to merchandise or books and these tags are removed or deactivated by the clerks when the item is properly bought or checked out. At the exits of the store, a detection system sounds an alarm or otherwise alerts the staff when it senses active tags.

The problem with the electronic price label systems of the prior art is that the electronic price labels of the prior art systems don't offer electronic article surveillance system features. If both electronic labels and electronic article survey system is wanted to be used in retail environment, it currently requires two independent systems. With two independent systems two separate labels or tags (electronic price labels and electronic article surveillance tags) have to be attached to the products.

Summary of the invention

It is an aim of the present invention to solve the above-mentioned problems and simultaneously provide an arrangement for an electronic price label and electronic price label system. The electronic prize label according to the invention is characterized in what will be presented in the characterizing part of claim 1 and electronic prize label system according to the invention is characterized in what will be presented in the characterizing part of claim 15. Other embodiments of the invention are characterized in what will be presented in the other claims.

The present invention solves problems of prior art by providing an electronic price label which comprises a communication module for receiving product related information, a display for displaying product related information and an electronic article surveillance part which can be detected by an electronic article surveillance system. This way the electronic price label of the invention can be used as a price label with electronic price label system and as an electronic article surveillance tag with electronic article surveillance system.

In one embodiment of the invention the electronic price label comprises one antenna which is configured to be used by both the communication module for receiving product related information and the electronic article surveillance part so that the electronic price label can be detected by electronic article surveillance system.

In one embodiment of the invention the electronic price label comprises one integrated circuit, e.g. ASIC or a microprocessor, which is configured to control both the communication module for receiving product related information and the electronic article surveillance part.

In one embodiment of the invention the electronic price label comprises two integrated circuits, e.g. ASICs or microprocessors, which first integrated circuit is configured to control the communication module for receiving product related information and the second integrated circuit is configured to control the electronic article surveillance part.

In one embodiment of the invention the electronic price label comprises a first and a second antenna and the first antenna is configured to be used as an antenna for radio communication with base stations of the electronic price label system and the second antenna is configured to be
5 used as an antenna for communication with electronic article surveillance system. In one embodiment of the invention the second antenna of the electronic price label is configured to function as a matching circuit for the first antenna.

10 In one embodiment of the invention the electronic article surveillance part is an external part attached to the electronic price label and protected against removing with a cover part.

As said above, with the solution of the present invention it's possible to
15 provide an electronic price label which can be used with electronic article surveillance system to implement theft-alarm features. Benefit of the structure of the electronic price label according to the invention when compared to prior art solutions is that with the solution of this invention the theft alarm functionality and electronic price label function-
20 ality is integrated into one single label.

Description of the Drawings

25 In the following, the invention will be described in more detail by means of an embodiment example with reference to the appended drawings, in which

30 Fig. 1 presents an example implementation of an electronic price label, which comprises one antenna,

Fig. 2 presents another example implementation of an electronic price label, which comprises two anten-
nas,

35 Fig. 3 presents a schematic and simplified view of an example arrangement of the electronic price label

system in a supermarket or in corresponding sales premises,

5 Fig. 4A – D present an example implementation of an electronic price label which comprises an opening for attaching the electronic price label to a product, and

10 Fig. 5A – D present an example implementation of an electronic price label which comprises an opening for attaching the electronic price label to a product.

Detailed description of the invention

15 The electronic price label according to the present invention comprises a communication module for receiving product related information, a display for displaying product related information, and electronic article surveillance part which can be detected by an electronic article surveillance system.

Figure 1 presents an example embodiment of an electronic price label 100 which comprises electronic article surveillance part. The electronic price label 100 has a layered structure. It consists essentially of a flexible e-paper display 101 comprising e-paper display material, a backplane layer 103 as a flexible circuit board having an electrode structure for controlling the display, a battery 107, which can be substantially rigid or flexible, and wherein the thickness of said battery is greater than the thickness of said flexible display layer 101 and the thickness of said flexible backplane layer 103, and a resilient layer 108 having a cut-out space for said battery 107, wherein said resilient layer 108 is arranged to provide a substantially even total thickness of said label.

Also energy harvesting methods may be used to provide energy to the electronic price label, such as solar or photovoltaic cells. Also capacitors, such as electric double-layer capacitors, i.e. supercapacitors, can be used instead or with the battery. In one embodiment of the invention the energy source, such as battery, of the electronic price label can be

changed. In one embodiment of the invention the electronic price label has an opening e.g. in the back side of the electronic price label, via which the energy source can be removed from the electronic price label and inserted to the electronic price label.

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The display is arranged to display the information related to the product. Also other product information can be added to electronic price label such as name of the product, logo and/or some other information relating to the product. The information which is in the display can be
10 e.g. price, sale price and/or discount.

One layer of the display is, for example, an active ink layer. The ink layer contains a number of microcapsules filled with liquid and containing, for example, substantially black particles with a positive surface
15 charge and substantially white particles with a negative surface charge, whose location in the microcapsules is controlled by an electric field so that at the desired display segments, the black particles are on top, wherein said display segments look black when viewed from above, and at the other display segments, the white particles are on top, wherein
20 these display segments look white when viewed from above. The background of the display consists of the same microcapsules, wherein, for example, the price information can be displayed as dark numbers against a light background, or vice versa, if desired. Such a display used can be, for example, the electrophoretic microcapsule display laminate disclosed in Finnish patent application No. FI 20050192. Instead of
25 segment display type, the display type can also be pixel type display.

The electronic price label further comprises wireless communication capabilities with one antenna 102 consisting of any shape e.g. two triangular antenna patterns on the same flexible circuit board as the display
30 control, as the ESL-module is implemented as semi-active RF tags that is powered from incident RF communicating via modulated backscatter, and a separate flexible circuit board. The electronic price label is configured to communicate with the antenna 102 with electronic price label
35 system and electronic article surveillance system.

The battery 107 has been encapsulated in a cut-out space by laminating said display 101, backplane 103, control circuit board and resilient lay-

ers 108 together. Further, the display layer 101, the backplane layer 103, the resilient layer 108 and the battery 107 are located between two outside protective layers (not shown) forming a body of the electronic price label for an electronic price label suitable to be attached to a product. Also a protective layer 106 can be arranged at the bottom of the backplane layer 103 to prevent moisture from getting to display layer 101 which is sensitive to moisture variations. The rigid component has been attached to the separate flexible printed circuit board 109 operating as a submodule under the backplane and the antenna. Backplane layer 103 as a flexible circuit board having an electrode structure for controlling the display and separate flexible printed circuit board 109 can be considered to form control electronics of the electronic price label. Circuit board 109 can comprise electronics configured to control both the communication module for receiving product related information and the electronic article surveillance part.

The backplane and the antenna circuit board 103 and the electronic price label control circuit board are patterned plastic films (PET or PC or PVC or polyimide) with patterned conductive copper layers. The forming and patterning of the conductors can be made using any method known as such for a person skilled in the art, for example by direct printing of conductive ink or by etching of a thin metal layer. The lower surface of the backplane 103 has display segment lead lines patterned in a similar way. Each display segment is electrically connected to a corresponding display segment lead line for example through a preferably laser processed via. Also other ways of providing feed-through vias are possible as is evident for a person skilled in the art. In order to establish an electrical contact from the back-plane segments to the display front electrode, which is in this example on the front surface of the flexible electronic display web, an electrically conducting tape 105 is laminated on the backplane area acting as a front electrode feed line. Alternatively and instead of an electrically conducting tape 105, electrically conducting paste or similar material with adhesive nature may be dispensed on the backplane web to make contact with the front plane electrodes.

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It's also possible to add further layers 104 to change the visual appearance of the electronic price label or to protect the electronic price label.

The electronic price label can have multiple memory locations for the information, for example for price information. The electronic price labels can also comprise multiple different views stored in the memory locations i.e. different pages that include different information to be displayed. Staff can have its own pages which can be displayed only with a special staff equipment. Also loyalty customers or other group of users can have own pages which can be activated using e.g. loyalty card. E.g. Loyalty Card holders can have special price displayed for them when loyalty card is brought close to the electronic price label.

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In one embodiment of the invention the electronic price label comprises one integrated circuit, e.g. ASIC or a microprocessor, which is configured to control both the communication module for receiving product related information and the electronic article surveillance part.

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The electronic price labels according to the invention can have identification codes which are able to identify the electronic price label. The electronic price label can have separate identification codes for operating with the electronic price label system and electronic article surveillance system.

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In embodiment with one antenna the identification code of the electronic surveillance part and electronic price label part can be same identifier or they can be unique identifiers.

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In another embodiment the electronic price label comprises two integrated circuits, e.g. ASICs or microprocessors, which first integrated circuit is configured to control the communication module for receiving product related information and the second integrated circuit is configured to control the electronic article surveillance part. Also in this embodiment the identification code of the electronic surveillance part and electronic price label part can be same identifier or they can be unique identifiers.

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Figure 2 presents another example implementation of an electronic price label 200, which comprises two antennas. The electronic price label 200 is similar to the price label 100 presented in Figure 1 but it has an additional antenna compared to the embodiment of figure 1. The

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first antenna 202 of the electronic price label is configured to be used as an antenna for radio communication with base stations of the electronic price label system and the second antenna 210 of the electronic price label is configured to be used as an antenna for communication with electronic article surveillance system. In one embodiment of the invention the second antenna 210 is arranged on the outer surface of the resilient layer 108 as shown in the Figure 2. The price label can also have protecting layers 203 in the outside surfaces of electronic price label as shown in Figure 2. It's also possible to add further layers 204 on top of electronic price label to e.g. change the visual appearance of the electronic price label.

The electronic price label of figure 2 can comprises two integrated circuits, e.g. ASICs or microprocessors, which first integrated circuit is configured to control the communication module for receiving product related information and the second integrated circuit is configured to control the electronic article surveillance part. Also in this embodiment the identification code of the electronic surveillance part and electronic price label part can be same identifier or they can be unique identifiers.

In one embodiment of the invention the second antenna is arranged to a layer between the resilient layer and the circuit board so that the second antenna is next to circuit board and the first antenna. This embodiment is not presented in Figures but when compared to the embodiment presented in Figure 2, this embodiment would be otherwise similar but in this embodiment the resilient layer 108 would be in place of second antenna 210 (or layer of the second antenna 210) and the second antenna 210 (or layer of the second antenna 210) would be in place of the resilient layer 108. This embodiment of the electronic price label can comprise one integrated circuit, e.g. ASIC or a microprocessor, which is configured to control both the communication module for receiving product related information and the electronic article surveillance part.

In one embodiment of the invention the second antenna 210 is configured to function as a matching circuit for the first antenna 202.

In one embodiment of the invention the first antenna 202 is configured to function as a matching circuit for the second antenna 210.

5 In the embodiments where antenna is used as matching circuit for the other antenna, it's advantageous that the second antenna is arranged close to circuit board and/or the first antenna e.g. next to circuit board and/or the first antenna.

10 In one embodiment of the invention the electronic article surveillance part of the electronic price label is an external part attached to the electronic price label and protected against removing with a cover part (not shown in figures).

15 Electronic price label can have attachment means (not shown figures) by which the electronic price label can be attached to products. Also external attachment means can be used to attach the electronic price label to products.

20 In one embodiment of the invention the electronic article surveillance part is radio frequency tag such as an RFID-tag, an acousto-magnetic tag or any other type of electronic article surveillance tag.

25 In one embodiment of the invention the communication module communicates with a base station of an electronic price label system by reflecting back a signal it receives.

In one embodiment of the invention the display is an electronic ink display, such as a bistable E-Ink-segment display.

30 In one embodiment of the invention product related information is price of the product, sale price of the product and/or amount of discount.

35 In one embodiment of the invention the communication module is configured to communicate with on 868 MHz frequency band, 2,4 GHz frequency band or any other frequency band allowed to be used for an electronic price label system.

Figure 3 shows schematically, as an example, a typical arrangement of the electronic price label system in a supermarket or similar sale environment.

- 5 Products 301 are equipped with electronic price labels that are typically attached to the products 301. Electronic price labels 300 are attached to the products 301 such that they are easily perceivable for the customers.
- 10 Furthermore, the electronic price label system comprises at least a central processing unit 304 connected to a base station 302 or other communication means, via which it is possible to transmit, for example, updated price information and other control information to the electronic price label 300.

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- In one embodiment of the invention the electronic price label comprises an opening such as a hole, which opening is arranged through the structure of the electronic price label. The electronic price label can be attached e.g. to a product by using the opening, e.g. when an attachment means, such as a pin or a loop, are attached through the opening.
- 20

- Figures 4A – D present an electronic price label according to one embodiment of the invention. The embodiment presented in Figures 4A – D is otherwise similar to the electronic label presented in Figure 1 or 2 but
- 25 it has an opening for attaching the electronic price label to a product.

- In an embodiment presented in Figure 4A – D an example embodiment of an electronic price label 400 is shown which comprises electronic article surveillance part and an opening 412 for attaching the electronic price label to a product. The electronic price label 400 has a layered structure. It can comprise a front side part 404 having a flexible e-paper display 401 comprising e-paper display material and a backplane layer (not shown) as a flexible circuit board having an electrode structure for controlling the display. The electronic price label 400 can further
- 30
- 35 comprise a battery which can be substantially rigid or flexible, and wherein the thickness of said battery is greater than the thickness of said flexible display layer 401 and the thickness of said flexible backplane layer, and a resilient layer 408 having a cut-out space for said

battery, wherein said resilient layer 408 is arranged to provide a substantially even total thickness of said label. The first antenna of the electronic price label is configured to be used as an antenna for radio communication with base stations of the electronic price label system and the second antenna 410 of the electronic price label is configured to be used as an antenna for communication with electronic article surveillance system. In one embodiment of the invention the second antenna 410 is arranged on the outer surface of the resilient layer 408 such that the opening 412 is essentially surrounded by the antenna structure or in close proximity of the antenna structure. In one embodiment of the invention electronic price label having an opening comprises only one antenna and price label functionality and electronic article functionality can be used with same antenna. The price label can also have protecting layers 403 in the outside surfaces of electronic price label. It's also possible to add further layers on top of electronic price label to e.g. change the visual appearance of the electronic price label.

In this embodiment of Figures 4A – D the opening for attaching the label is arranged such that the alarm part and antenna for the alarm part of the electronic price label surrounds the opening. This embodiment has the advantage that the electronic price label can't be easily removed from the product without damaging the electronic price label, its electronic article surveillance part and/or electronic article surveillance antenna. If the electronic price label is removed by just simply cutting near the position of the opening or by other violent means of removal, an alarm can be created because the antenna and or electronic article surveillance part is damaged. Also because the electronic article surveillance functionality and parts are integrated and hidden to the structure of the electronic price label, it's difficult for the shoplifters to know which part of the electronic label can be damaged without causing an alarm. The integration of the electronic article surveillance part and antenna inside the electronic price label is also advantageous because customers can't see or know that the electronic price label comprises an electronic surveillance part and therefore the customers don't try to remove the electronic article surveillance part from the product.

Figures 5A – D present an embodiment of the invention wherein a pin 502 is attached to and/or inserted through the electronic label via the

opening. The electronic label presented in Figures 5A – D is similar to the embodiment presented in Figures 4A – D.

The electronic price labels communicate in a wireless manner with the
5 base station. Wireless communication method may be based on any known wireless communication technology, but in order to save battery life of the electronic price labels, passive backscatter radio communication is preferred. In this approach the base stations actively send radio signals and instead of answering with active radio transmission, the
10 electronic price label do not use a radio transmitter; instead, they answer by modulating the reflected power of the base station signal. The modulation is achieved, typically, by changing the load state of the antenna in the electronic price label, for example, by connecting and disconnecting the antenna between the ground and non-ground potential.
15 This modulation of the backscattered signal allows for the electronic price label to answer to the base stations and further to the store level server. The system can be configured to use certain frequency band, e.g. 868 MHz frequency band, for communication between electronic price labels and base station(s). In one embodiment of the invention
20 the system can use multiple frequency bands for communication between electronic price label and base station(s) and/or different kind of diversity techniques. Electronic price label can use its antenna or one of its antennas for communicating with the base station with backscatter radio communication.

25 Each electronic price label can be identified by its own identification code for electronic price label system that the electronic price label in question knows to listen for in the transmission from the base station. After receiving new information, instructions or commands from the
30 store server via base station, the electronic price label can acknowledge the reception of these instructions by using the reflected backscattering modulated properly and timely for the store level server to identify that the response is coming from the electronic price label in question. To facilitate that the store server may have a certain listening period after
35 a transmission directed to a certain electronic price label for giving the module possibility to answer during that time.

In one embodiment of the invention communication module can comprise an active radio transmitter instead of backscatter radio communication means. In this embodiment the radio transmitter is preferably low power RF-transmitter or transceiver.

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Information stored to electronic price labels and communication between the electronic price labels and base stations can be encrypted.

10 The electronic price label and electronic price label system according to the invention offers also alarm features. Therefore the electronic price label system comprises electronic article surveillance system 310. The electronic article surveillance system 310 comprises at least one detection means 312 configured to detect electronic price labels comprising electronic article surveillance part. Detection means 312 can be e.g.
15 gate alarms or other kind of detectors which are able to detect electronic price labels comprising electronic article surveillance part.

The electronic price label system is configured to give an alarm signal if an activated electronic price label having an active electronic article
20 surveillance part is detected by the detection means from the area where the detection means are able to detect the presence of an active electronic article surveillance part.

In one embodiment the electronic article surveillance system comprises
25 security ports and alarm signal is given based on the response from security ports when electronic price label is exported through the security port. The alarm can be made in this case if the price label is exported through the port.

30 The electronic price label can be removed from the product at the cashier and attached to a new product without deactivating the electronic price label and its electronic article surveillance part.

In one embodiment of the invention the alarm can also be done if the
35 radio connection to electronic price label is lost. This can be due to disturbing the radio by e.g. wrapping the electronic price label to metal shield or because electronic price label is being damaged. An alarm can

also be made if the electronic price label is exported away from the base station area.

Although exemplary embodiments of the present invention have been
5 described with reference to the attached drawings, the present invention is not limited to these embodiments, and it should be appreciated to those skilled in the art that a variety of modifications and changes can be made without departing from the spirit and scope of the present invention. Embodiments described in the description in combination
10 with other embodiments can be also used as separate embodiments.

Claims

1. An electronic price label (100, 200, 300, 400) for an electronic price label system, the electronic price label (100, 200, 300, 400) comprising:

a communication module for receiving product related information,

a display for displaying product related information,

characterized in that the electronic price label (100, 200, 300, 400) further comprises:

electronic article surveillance part which can be detected by an electronic article surveillance system.

2. An electronic price label (100, 300) according to claim 1, **characterized** in that the electronic price label (100, 300) comprises one antenna (102) which is configured to be used by the communication module for receiving product related information and electronic article surveillance part.

3. An electronic price label (100, 300) according to claim 1 or 2 **characterized** in that the electronic price label (100, 300) comprises one integrated circuit, e.g. ASIC or a microprocessor, which is configured to control the communication module for receiving product related information and the electronic article surveillance part.

4. An electronic price label (100, 300) according to claim 1 or 2 **characterized** in that the electronic price label (100, 300) comprises two integrated circuits, e.g. ASICs or microprocessors, which first integrated circuit is configured to control the communication module for receiving product related information and the second integrated circuit is configured to control the electronic article surveillance part.

5. An electronic price label (200, 300, 400) according to any of claims 1 or 3 – 4 **characterized** in that electronic price label comprises a first and a second antenna and the first antenna (202) is configured to be used as an antenna for radio communication with base stations of the electronic price label system and the second antenna (210, 410) is

configured to be used as an antenna for communication with electronic article surveillance system (310).

6. An electronic price label (200, 300, 400) according to claim 5,
5 **characterized** in that the second antenna (210, 410) is configured to function as a matching circuit for the first antenna (202).

7. An electronic price label according to claim 4 and 5, **characterized**
10 in that electronic article surveillance part is an external part attached to the electronic price label and protected against removing with a cover part.

8. An electronic price label (100, 200, 300, 400) according to any of preceding claims **characterized** in that the electronic article
15 surveillance part is radio frequency tag such as an RFID-tag, an acousto-magnetic tag or any other type of electronic article surveillance tag.

9. An electronic price label (100, 200, 300, 400) according to any of preceding claims **characterized** in that communication module
20 communicates with a base station of an electronic price label system by reflecting back a signal it receives.

10. An electronic price label (100, 200, 300, 400) according to any of preceding claims **characterized** in that the display is an electronic
25 ink display, such as a bistable E-Ink-segment display.

11. An electronic price label (100, 200, 300, 400) according to any of preceding claims **characterized** in that product related information is price of the product, sale price of the product and/or amount
30 of discount.

12. An electronic price label (100, 200, 300, 400) according to any of preceding claims **characterized** in that communication module comprises an antenna and is configured to communicate with on 868
35 MHz frequency band, 2,4 GHz frequency band or any other frequency band allowed to be used for an electronic price label system.

13. An electronic price label (400) according to any of preceding claims **characterized** in that it comprises an opening (412) for attaching the electronic price label to a product, which opening (412) is formed through the structure of the electronic price label.

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14. An electronic price label (400) according to claim 13 **characterized** in that the electronic article surveillance part and/or electronic article surveillance antenna (410) is arranged such that they essentially surround the opening (412).

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15. An electronic price label system **characterized** in that the system comprises:

plurality of electronic price labels (100, 200, 300, 400) according any previous claims and

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at least one base station (302) configured to send and receive information with any of the electronic price labels, and

electronic article surveillance system (310) comprising at least one detection means (312) configured to detect electronic price labels (100, 200, 300, 400) comprising electronic article surveillance part.

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16. An electronic price label system according to claim 15 **characterized** in that the electronic price label system and/or electronic article surveillance system is configured to give an alarm signal.

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17. An electronic price label system (300) according to claim 15 or 16 **characterized** in that the detection means (312) of the electronic article surveillance system (310) comprise security ports and alarm signal is given based on the response from the security ports when electronic price label (100, 200, 300, 400) is exported through the security port.

30

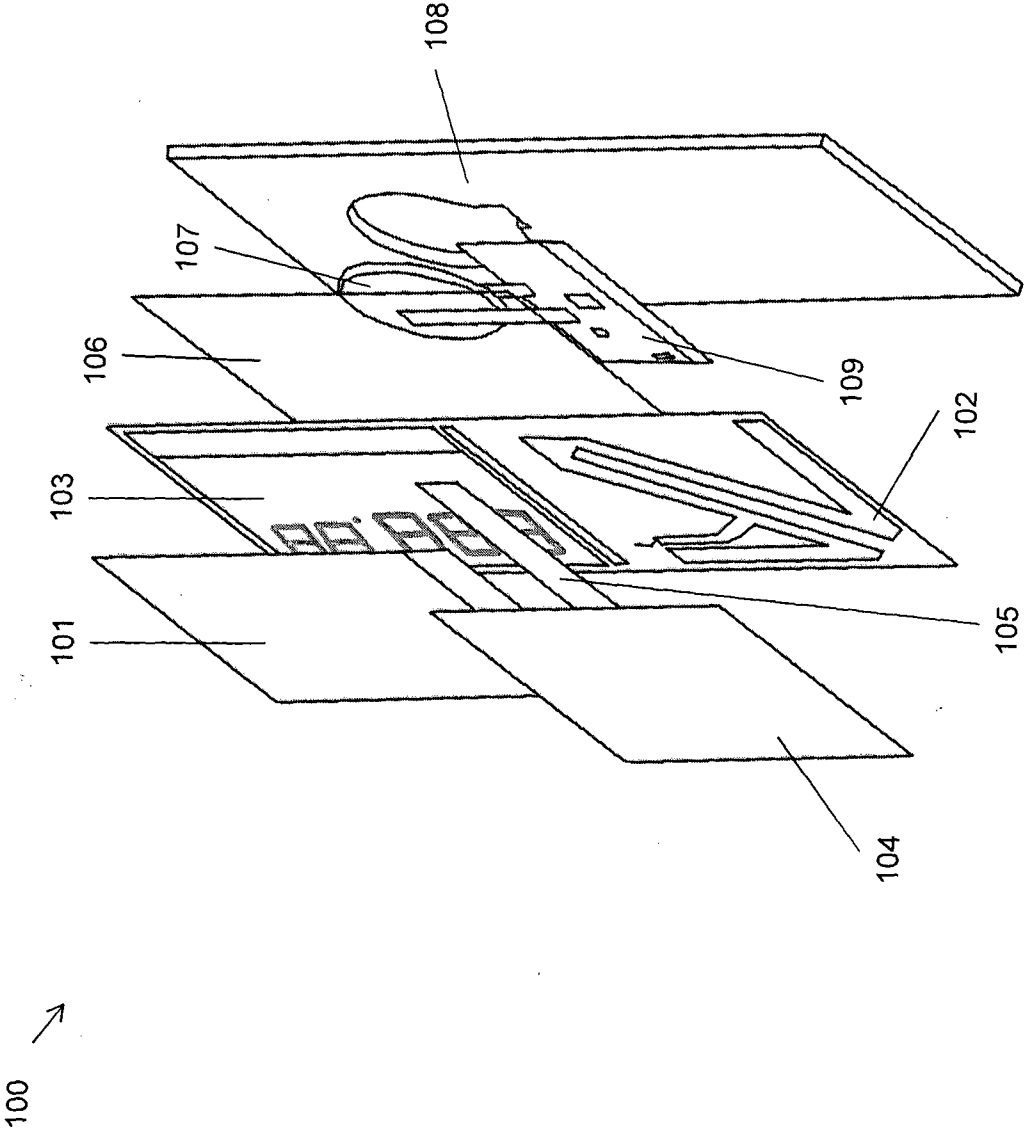
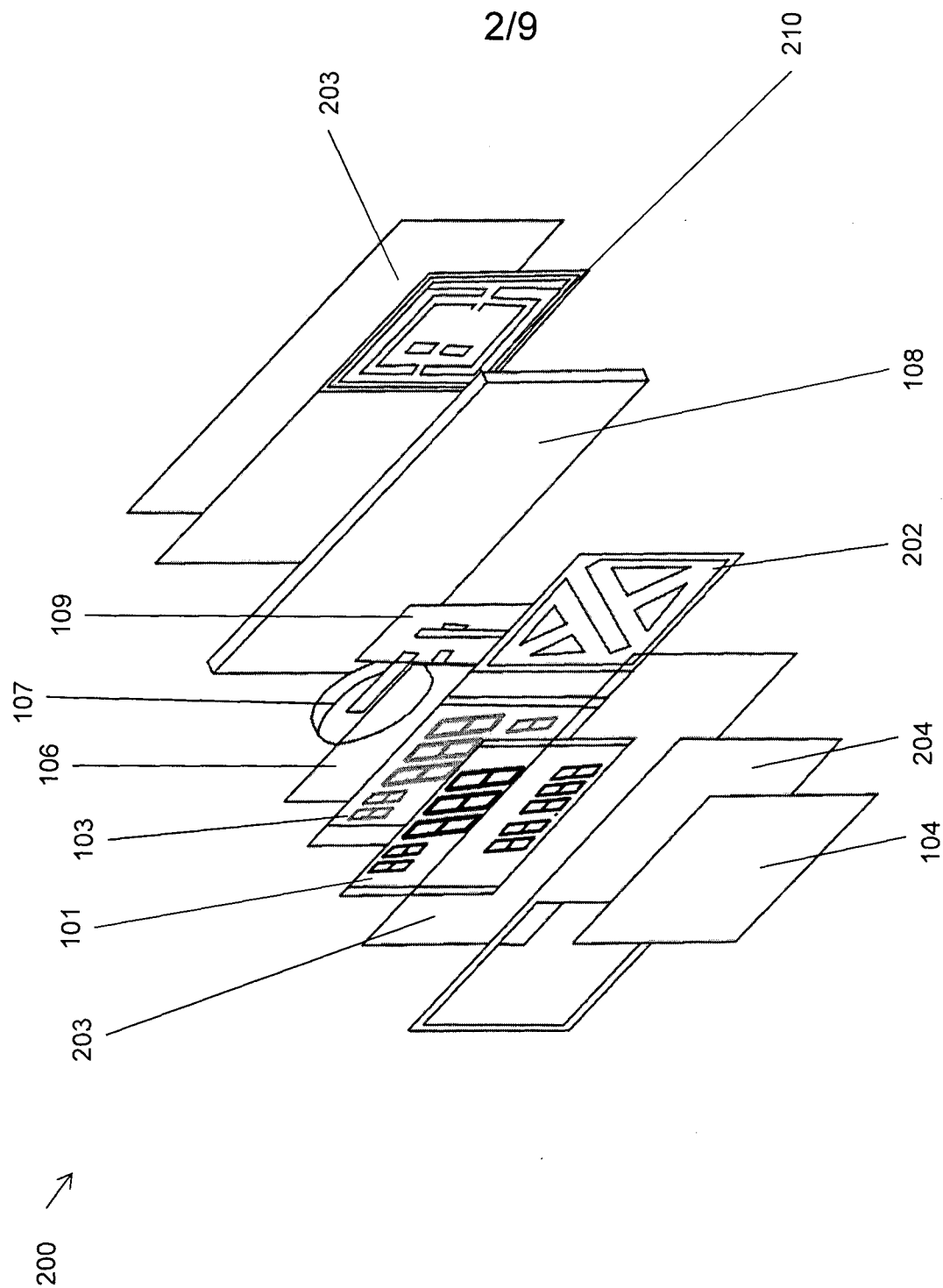


Fig. 1



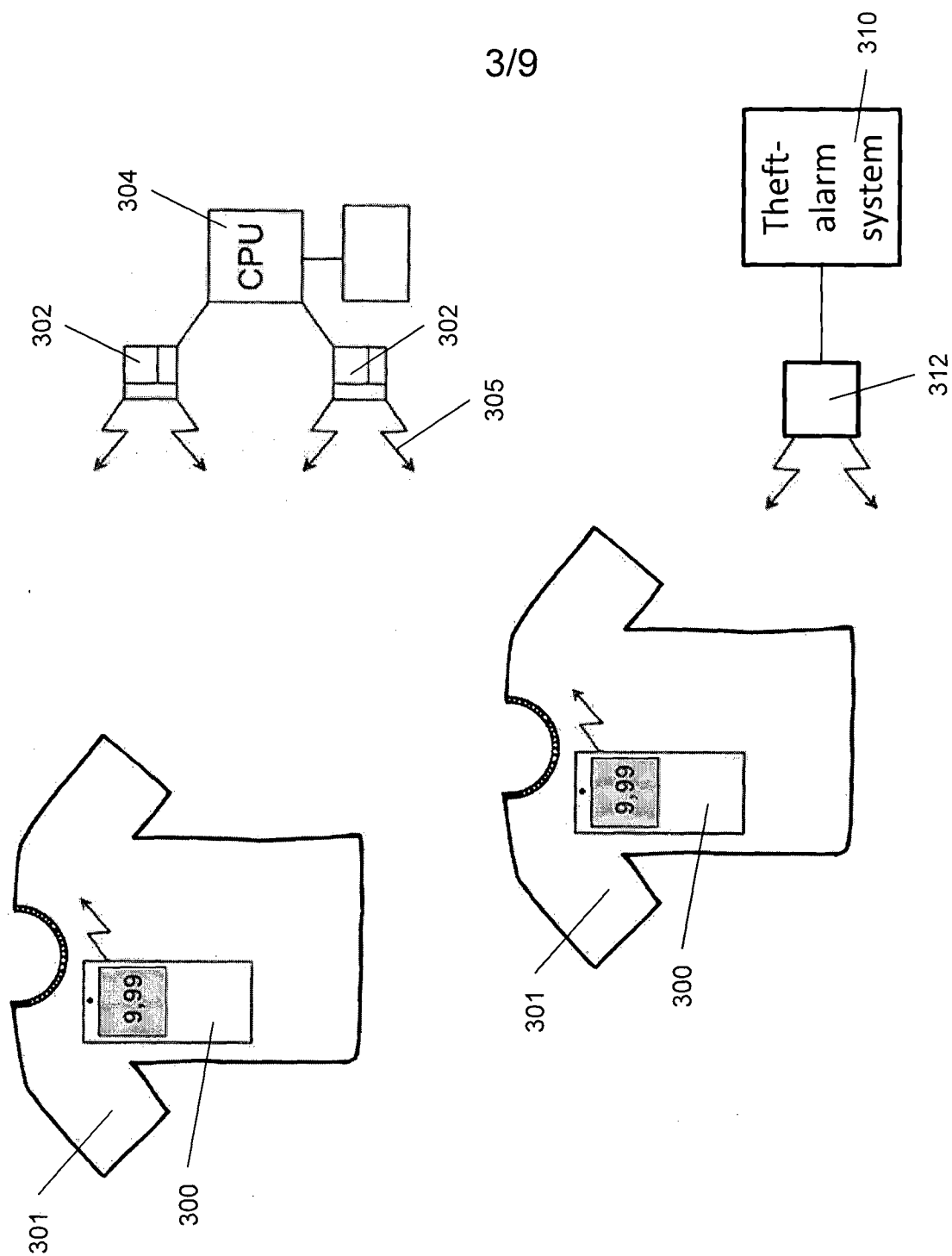


Fig. 3

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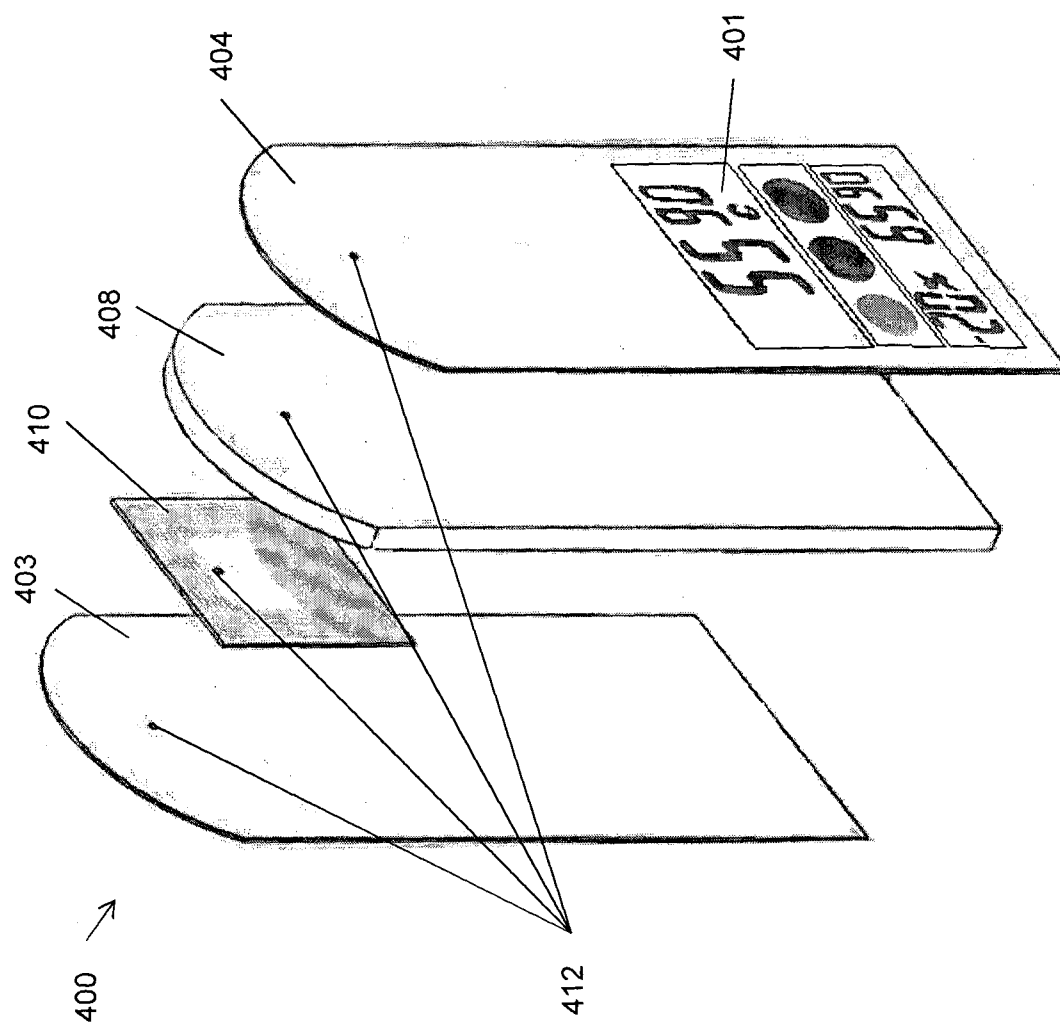


Fig. 4A

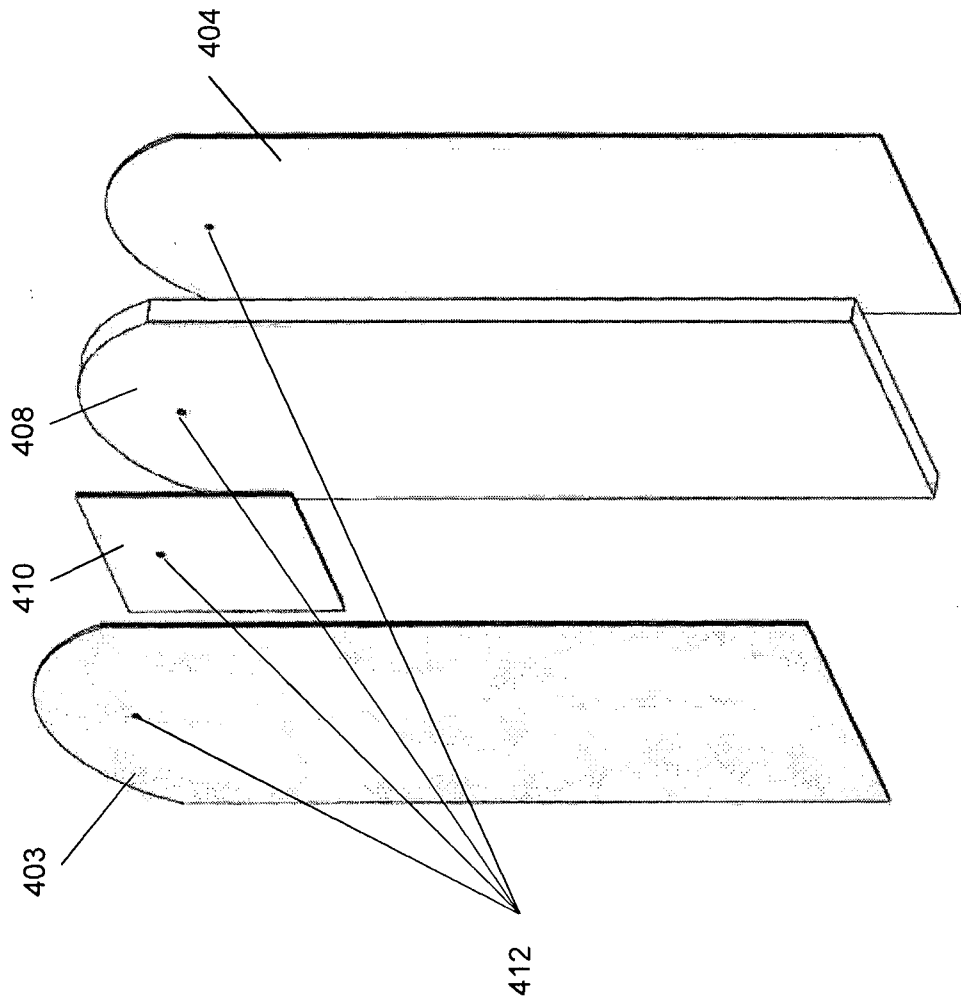


Fig. 4B

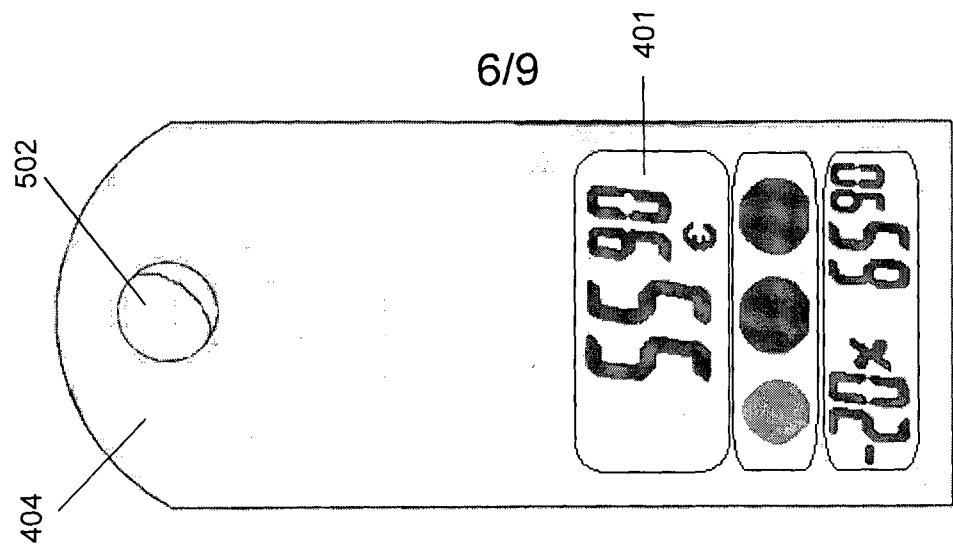


Fig. 5A

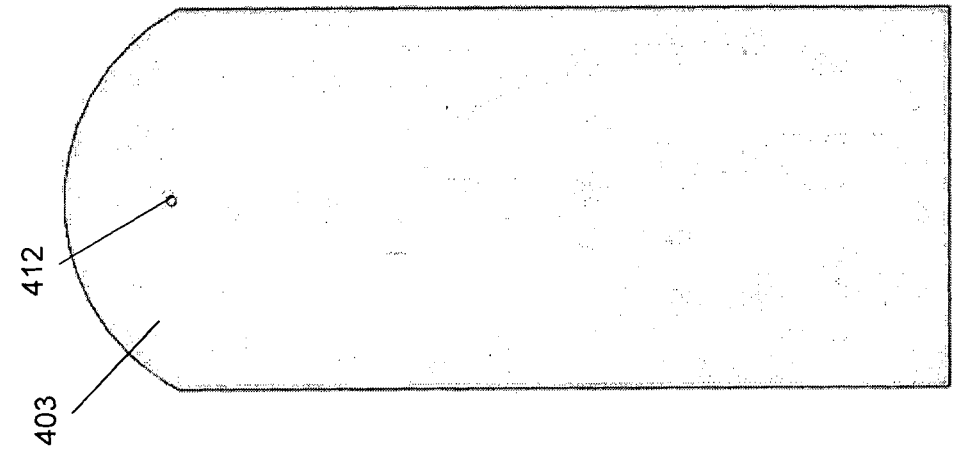


Fig. 4D

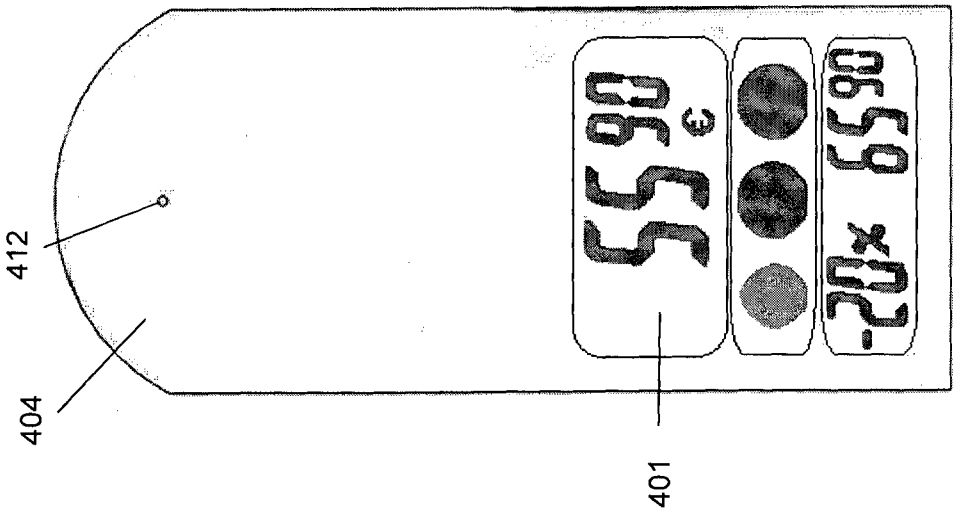


Fig. 4C

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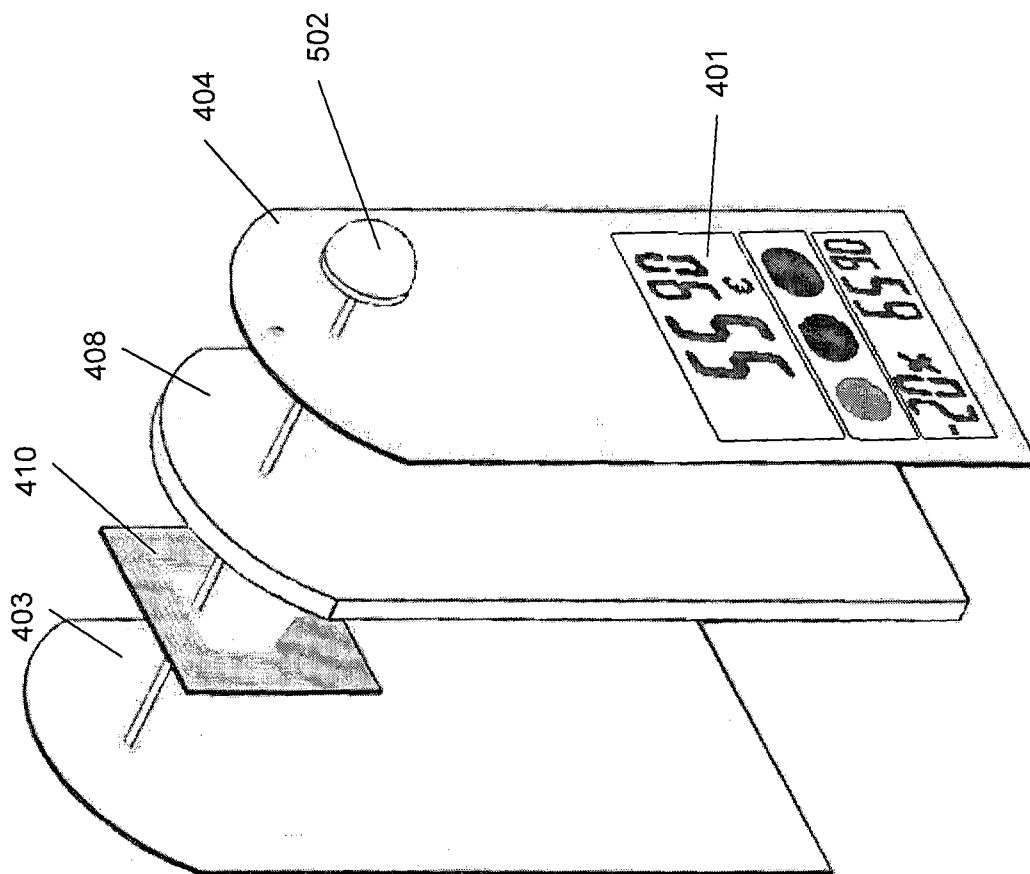


Fig. 5B

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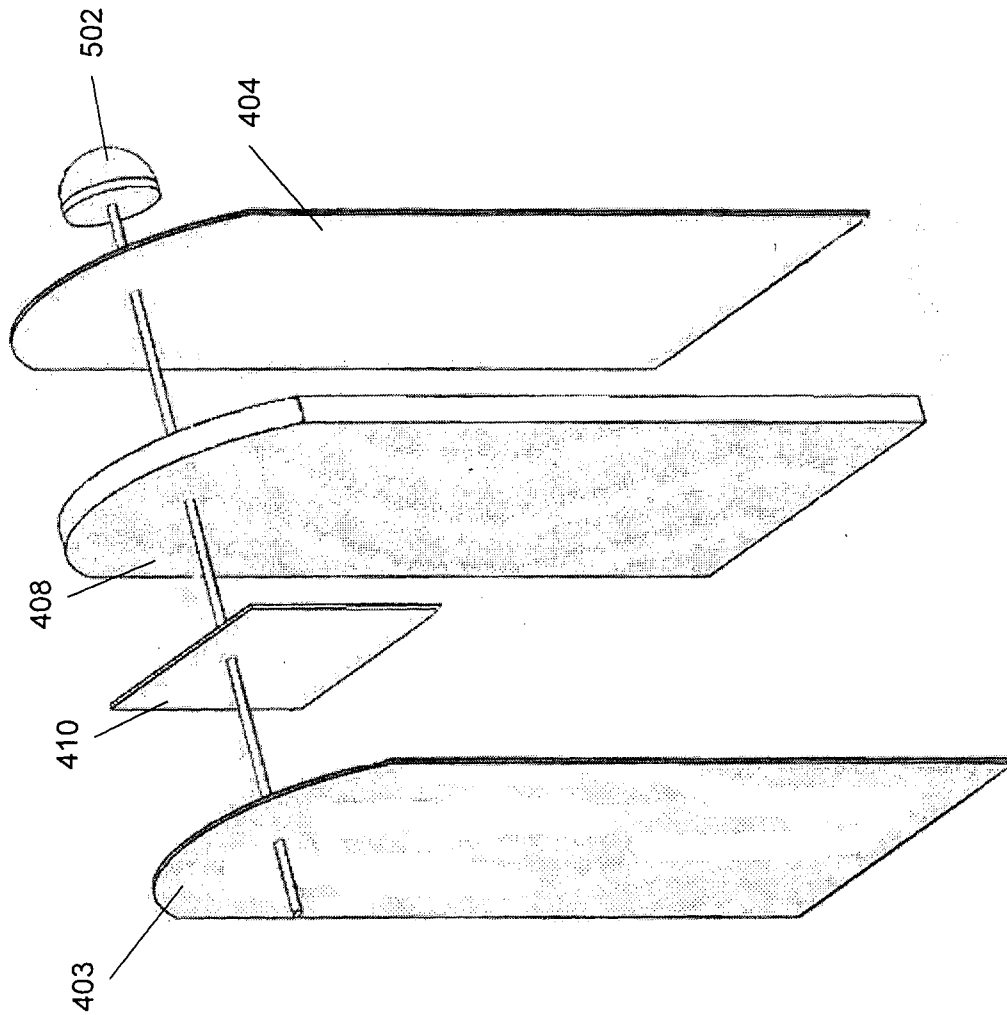


Fig. 5C

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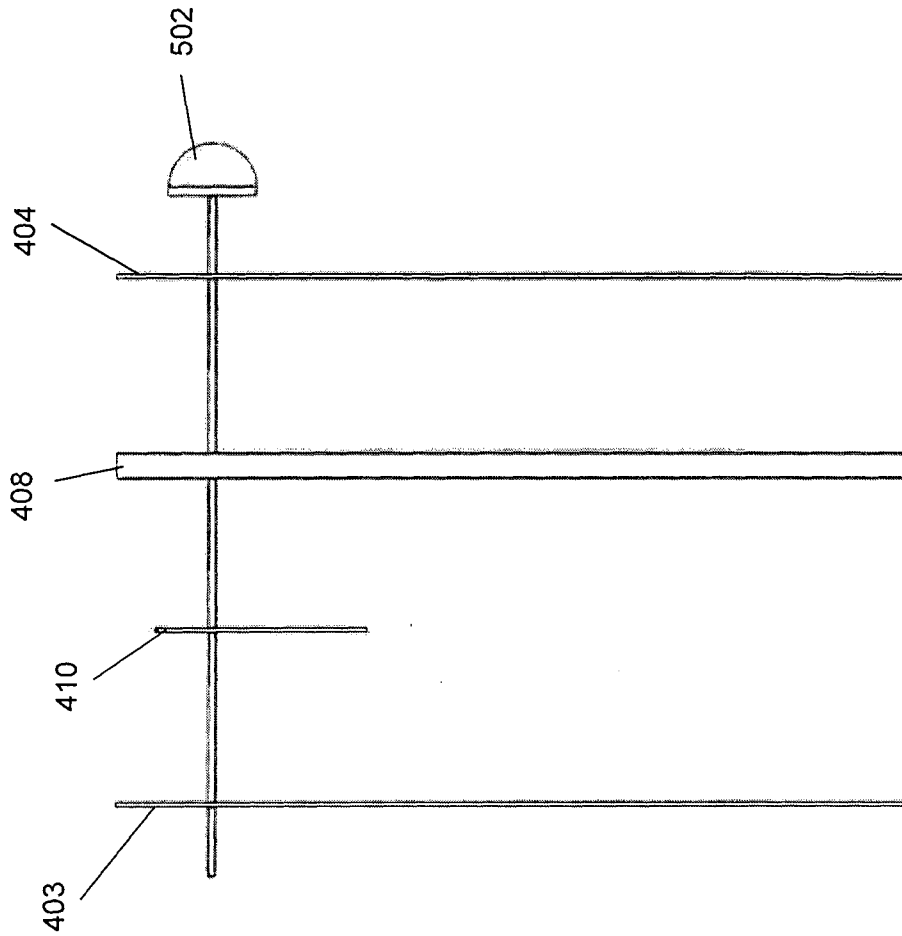


Fig. 5D

INTERNATIONAL SEARCH REPORT

International application No.

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A. CLASSIFICATION OF SUBJECT MATTER

See extra sheet

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)

IPC: G06K, G08B, E05B, G09F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
FI, SE, NO, DK

Electronic data base consulted during the international search (name of data base, and, where practicable, search terms used)

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

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"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search
22 January 2015 (22.01.2015)Date of mailing of the international search report
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INTERNATIONAL SEARCH REPORT

International application No.

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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IPC

G06K 19/077 (2006.01)

G08B 13/24 (2006.01)

E05B 73/00 (2006.01)

G09F 3/20 (2006.01)

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