Title: IDENTIFICATION AND TRACKING DEVICE THAT IS FLEXIBLE AND RESISTANT TO CHEMICAL AGENTS AND HIGH TEMPERATURES AND PRESSURES

FIG 1

Abstract: The present invention relates to an identification device, in particular an RFID (Radio Frequency IDentification) device used to track merchandise during the production, transport, logistics, storage and sale phases. Such device comprises a circuit and an antenna, possibly positioned upon a support layer and coated with a coating layer of plastic material having a flexibility less than or equal to 25 Shore A. The plastic material preferably used is latex, possibly in a mixture with other chemical additives. Said device can be applied on merchandise, e.g. items of clothing or shoes, which are subjected during their life cycle to temperatures ranging from -50°C to 180°C and/or pH levels ranging between 3 and 12 and/or pressures of 2 to 50 bars.
"Identificatxpn and tracking device that is flexible and resistant to chemical agents and high temperatures and pressures"

DESCRIPTION

The present invention relates to an identification device, in particular an RFID (Radio Frequency IDentification) device used to track merchandise during the production, transport, logistics, storage and sale stages.

The present invention further relates to a procedure for manufacturing said device.

As is well known, tags containing a specification of the product brand, code, model, price and any other relevant descriptive data are habitually used on merchandise intended for sale, in particular on products of clothing, shoes and white goods.

Such tags also have the function of enabling the products they are associated with to be tracked throughout their life cycle, from the production stage, to transport, storage and sale. In particular, during the sale phase, the tags prevent such products from being stolen or removed in an unlawful or uncontrolled manner from the area they should remain positioned in.

The tags can also be used to check for counterfeits. In fact, the originality of a product can be checked by
determining whether the tag applied contains codes and data recognised by the monitoring system.

The identification and tracking function are obtained thanks to a circuit housed inside the tag; this circuit generally comprises: a memory containing the product brand, model, price, identification code and any other relevant descriptive data; a transmission module for generating a signal incorporating at least such identification code; and an antenna for transmitting such signal.

During the sale phase, the tag applied on the product has an anti-shoplifting function, i.e. it prevents the merchandise from being unlawfully removed from the store. So long as the product and the relative tag remain in a pre-established area, suitably monitored, the circuit will dialogue at a pre-established frequency with the monitoring system, so that the latter may have continual confirmation of the product's presence in the pre-established area.

When the system no longer detects the presence of the tag (and therefore, presumably, of the product associated with it), it generates a suitable signal to keep track of such absence.
If the absence of the product has a corresponding recording of a sales transaction, the system will have ended its monitoring activity.

If, on the contrary, the absence of the tag has no sales transaction corresponding to it, the system will generate an alarm signal to indicate the anomalous situation.

The identification and tracking tags most widely used at present are RFID (Radio Frequency IDentification) tags that dialogue with the monitoring system using radio frequencies.

The tags currently used are undoubtedly valid, but they present a drawback in that they cannot be applied to merchandise such as items of clothing, footwear etc. in which resistance to high temperatures (e.g., manufacturing or washing temperatures), chemical agents (e.g. dyes, bleaches, additives for treating leather) and pressure (e.g. the pressure of a foot on a shoe sole, the pressure of the body on some parts of clothing, etc.) is of fundamental importance.

Another drawback tied to the tags currently on the market is their poor adaptability to merchandise such as items of clothing and footwear, in which it is of primary importance that the presence of any identification and tracking tag is not noticed by the purchaser.
The problem at the basis of the invention is to provide an identification and tracking device that can resist chemical agents and high temperatures and pressures and also has the capacity of being scarcely visible to the purchaser of the merchandise it is applied to. Such problem is resolved by an identification and tracking device as described in the appended claims. The present invention relates to an identification and tracking device comprising a circuit which in turn comprises a memory containing at least one item of product-related information, e.g. brand, model, price, identification code and any other relevant descriptive data, and a transmission module for generating a signal at least incorporating one item of product-related information, e.g. the identification code. The device also comprises an antenna for transmitting such signal. In a preferred embodiment, the circuit and the antenna are positioned, for example by gluing, on a support layer. The identification and tracking device is characterised in that it comprises at least a protective coating layer of plastic material having a flexibility less than or equal to 25 Shore A. The plastic material preferably used is latex, possibly in a mixture with other chemical additives.
The identification and tracking device of the invention is preferably an RFID (Radio Frequency IDentification) device that dialogues with the monitoring system using radio frequencies.

Further characteristics and advantages will become more apparent from the detailed description of a preferred, but not exclusive, embodiment of a device according to the invention.

Such description is given with reference to the appended figures, which likewise have solely exemplifying and hence non-limiting purposes, in which:

- Figure 1 schematically shows a device according to the invention;
- Figure 2 shows a block diagram of a circuit belonging to the device of Figure 1.

With reference to Figure 1, 1 is used to indicate the identification and tracking device of the invention as a whole.

With reference to Figures 1 and 2, the device 1 comprises a circuit 2 in turn comprising a memory 9, wherein at least one item of product-related information is recorded, preferably at least an identification code (ID) of the product; the memory 9 is connected to a transmission module 8 for generating a response signal
110 containing at least one item of information identifying the product the device 1 is associated with.

The monitoring system (not shown as it belongs to prior art) emits a request signal 100, preferably a radio frequency request signal, which propagates in a given monitoring area.

The electromagnetic field generated by the request signal 100 serves to power the circuit 2, which is activated and consequently generates the response signal 110.

The circuit 2 can be constructed, for example, as an ISO TAG operating at 13.56 MHz, or else a UHF TAG; the latter, in particular, may prove particularly useful in the case of readings over great distances.

Preferably, the circuit 2 is provided with a transmission module 8 for generating the response signal 110.

Preferably the circuit 2 further comprises a memory 9 for containing an identification code ID univocally associated with a product.

In other words, a product has associated therewith an identification code ID, which allows it to be recognised even among a plurality of wholly identical products; such identification code ID is memorised in the memory 9 of the circuit 2.

In the preferred embodiment, the memory 9 is operatively associated with the transmission module 8 so as to
incorporate the identification code ID in the response signal 110.

As a result, the monitoring system (not shown), by recognising the various identification codes of the devices present in an area, can always know of the presence of such devices and therefore detect the absence of one or more of the same, which presumably also implies the absence of the products associated therewith. Alternatively, or in addition, the monitoring system keeps track of and records the movements of a product associated with an identification and tracking device.

The device further comprises an antenna 3 for receiving a request signal 100 and for transmitting a response signal 110.

Through the request signal 100 picked up by the antenna 3, the circuit 2 receives the energy necessary to power the transmission module 8 for generating the response signal 110.

Preferably, the antenna 3 is also used to transmit the response signal 110.

The length of the antenna 3 will be defined so that the antenna is able to interact with the request signal 100 at the frequency of the latter and, preferably, to transmit the response signal 110 at the desired frequency.
The device further comprises a support layer whereupon the circuit and the antenna are housed, for example by gluing.

The support layer can be a mesh or a continuous layer.

In a preferred embodiment, the support layer is made of a plastic material that takes on adhesive properties at temperatures above 60°C. It is possible to position and anchor the circuit and the antenna to the support layer by applying a temperature above 60°C, at which the plastic material will partially melt and become adhesive.

The circuit and the antenna are applied on top of the support layer by gently pressing and allowing to cool. At the end of cooling, the circuit and the antenna will be glued to the support layer. Alternatively, the support layer can consist of an adhesive material. In this case, the circuit and the antenna are anchored to the support layer by adhesion at room temperature.

Alternatively, the circuit and the antenna can be anchored to the support layer by gluing. Adhesive materials that can be advantageously used for gluing are, for example, an acrylic-based glue or natural rubber. These adhesive materials are particularly useful in cases where the item of clothing to which the device of the invention is applied is leather. In fact, these adhesive materials can be applied to glue the device of the
invention onto leather from the very beginning of the product's life cycle, i.e. from the slaughterhouse.

The support layer preferably consists of a polymeric material chosen from the group consisting of polyester, polycarbonate, polypropylene, in particular mono-oriented polypropylene, and vinyl polychloride.

The support layer has the function of lending tensile strength to the device without altering the other characteristics thereof, in particular that of a flexibility less than or equal to 25 Shore A.

The device further comprises at least one protective coating layer 5, preferably three coating layers, consisting of plastic material having a flexibility less than or equal to 25 Shore A.

Preferably, each coating layer 5 comprises latex, possibly in a mixture with chemical additives as specified below.

The latex preferably employed to prepare the protective layers according to the invention is natural latex.

The latex is submitted to a vulcanisation process, i.e. it is treated with sulphur at room temperature, or, to accelerate the reaction, at temperatures between 30°C and 60°C in a ventilated oven. The vulcanisation times vary from 15 to 30 hours, if the reaction takes place at room temperature, and from 1 to 7 hours if heating in an oven.
occurs.
Once the vulcanisation of the latex has been achieved, ammonia, which is a stabilising additive, and water, in a quantity ranging between 30% and 60%, preferably between 40% and 50%, are added. In a preferred embodiment, chemical additives having specific functions are added to the mixture.
For example, if one wants the identification and tracking device to take on a given colour that makes it more easily concealable when applied to a product, water-based dyes or inks of the desired colour can be added to the latex. If, alternatively or in addition, one wishes to modify the electric or magnetic field of the device, conductive additives can be used, e.g. carbon black, brass, metal powder, etc.
Other additives that may be added are additives based on ferrite or another magnetic material serving to create a magnet effect.
The chemical additives are used in a quantity ranging from 3% to 8%, preferably from 4% to 6% by weight, in relation to the total weight of the mixture.
Once the mixture of latex, water, ammonia and any chemical additives has been obtained, the mixture is poured over the components of the device, i.e. over the
circuit and antenna, possibly housed upon a support layer, so that the mixture completely surrounds the components on both faces and the sides (see figure 1). The excess water is allowed to evaporate in a controlled atmosphere under exposure to a flow of air.

If necessary, a second layer is poured on top of the first layer and the excess water is allowed to evaporate. A series of protective layers may be added according to the requirements of use of the device. For example, to increase the mechanical strength of the device, several protective layers can be added so as to obtain a thickness of up to 2 mm.

With a thickness of approximately 2 mm, resistance to a pressure of about 40 bars is obtained, whereas smaller thicknesses, e.g. approximately 0.6 mm, provide resistance to pressures of 2-3 bars. Therefore, the device of the invention will have a thickness ranging between 0.5 mm and 2 mm, according to application requirements.

The flexibility of the device is less than or equal to 25 Shore A. The device is therefore endowed with a good degree of flexibility, which makes it applicable to items of clothing and footwear requiring good flexibility and adaptability to the various materials used, e.g. leather.

Thanks to the protective coating layer, the device of the
The device of the invention resists temperatures ranging between -50 °C and 180 °C and pH values ranging between 3 and 12.

Thanks to the support layer of the device, consisting of adhesive plastic material, the device of the invention resists tractions of up to 100 Kg, while the flexibility of the device will be maintained unchanged at values less than or equal to 25 Shore A.

Therefore, the device presents very good versatility of application, having the ability to resist the aggression of aggressive chemical agents, such as detergents, dyes, additives employed in leather treatment processes, etc., the different temperatures of the various fabric treatment stages, e.g. the stage of dyeing, washing, treatment with special additives, etc., and the tractions exerted, up to 50 bars, by water extraction units in industrial laundry facilities.

The device of the invention may therefore be employed not only to monitor any unauthorised removal of merchandise, but also to track a product during the various phases preceding sale, i.e. from production, to storage, to transport, etc.

Being resistant to chemical aggression and high temperatures, the device can be applied to a product from the very first stages in the manufacture thereof. One may consider, for example, leather or jeans fabric submitted
to manufacturing steps in which aggressive chemical additives are used and to processing steps at high temperatures.

Finally, thanks to its flexibility and resistance to high pressure, the device can be used to mark footwear and items of clothing where these characteristics are of fundamental importance. Furthermore, the device is very thin and can be produced in different colours. Accordingly, it can be very easily concealed from the eyes of the end purchaser.

The most advantageous uses of the device of the invention are in the soles of footwear, in the hem of a dress, in the hem of a sheet or a tablecloth, in the pockets of or as a label on a pair of jeans and in leather garments, both for the purpose of controlling the product during the sale stage and keeping track of the production, storage and transport thereof.

The device of the invention can be printed on and replace the label containing the indications required by law, e.g. washing temperatures, type of ironing, etc., today placed on every fabric or non-fabric garment.

Another characteristic of the device of the invention is that it is completely non-toxic and can therefore stay in contact with the skin of the product user without creating allergic reactions.
The device of the invention is typically engaged with the respective product by gluing, sewing or magnetism.
Claims

1. An identification and tracking device (1), comprising at least a circuit (2) which comprises at least a memory (9) containing at least one item of product-related information, said memory being connected to at least a transmission module (8) for generating a signal (110) containing said at least one item of information, said circuit further comprising at least an antenna (3), connected to said transmission module (8), for transmitting said signal (110), characterised in that said device comprises at least one coating layer of plastic material having a flexibility less than or equal to 25 Shore A.

2. The device according to claim 1, further comprising a support layer of plastic material whereupon said circuit and said antenna are positioned and anchored.

3. The device according to claim 2, wherein said plastic material is an adhesive plastic material.

4. The device according to claim 2, wherein said plastic material is chosen from the group consisting of polyester, polycarbonate, polypropylene, in particular mono-oriented polypropylene, and vinyl polychloride.

5. The device according to any of the claims 1 to 4, wherein said coating layer of plastic material is a layer of latex.
6. The device according to claim 5, wherein said latex is vulcanised natural latex.

7. The device according to any of the claims 1 to 6, wherein said coating layer further comprises chemical additives chosen from among dyes, inks, carbon black, brass, metal powders, magnetic materials, preferably ferrite, and ammonia.

8. The device according to claim 7, wherein said chemical additives are comprised within the coating layer in a quantity ranging from 3% to 8%, preferably from 4% to 6% by weight.

9. The device according to any of the claims 1 to 8, comprising two or more coating layers.

10. The device according to any of the claims 1 to 9, having a thickness ranging between 0.5 mm and 2 mm.

11. The device according to any of the claims 1 to 10, wherein said device has a flexibility less than or equal to 25 Shore A.

12. The device according to any of the claims 1 to 11, wherein said device is a radiofrequency device, preferably it is an RFID device.

13. Use of the device according to any of the claims 1 to 12, for application on merchandise, preferably items of clothing and shoes, for the identification and tracking of said merchandise.
14. The use according to claim 12, for application on merchandise subjected to temperatures of between -50°C and 180°C, and/or pH levels ranging between 3 and 12 and/or pressures from 2 to 50 bars.

15. A process for preparing a device according to any of the claims 1 to 12, comprising the following steps:
   a) providing a device comprising at least a circuit (2) comprising at least a memory (9) connected to at least a transmission module, and at least an antenna (3) connected to said transmission module (8);
   b) submitting a latex mixture to vulcanisation through the addition of sulphur;
   c) adding "ammonia and water to the vulcanised latex;"
   d) pouring the mixture obtained in point c) over the device of point a) so as to cover every part thereof and allowing the water to evaporate;
   e) if necessary, repeating pouring at least one more time so as to obtain, after drying, at least two protective layers.

16. The process according to claim 15, wherein said device as per point a) is positioned and anchored to a support layer (4), preferably of adhesive plastic
material.

17. The process according to claim 15 or 16, wherein said point b) is conducted at room temperature or at a temperature ranging between 30°C and 60°C for periods of time ranging from 15 to 30 hours and from 1 to 7 hours, respectively.

18. The process according to any of the claims 1 to 17, wherein in point c) said ammonia and water are added in a quantity ranging between 30% and 60%, preferably between 40% and 50% by weight.

19. The process according to any of the claims 1 to 18, wherein point c) is followed by the addition of further chemical additives chosen from among: dyes, inks, carbon black, brass, metal powders, magnetic materials, preferably ferrite, and ammonia.

20. The process according to claim 19, wherein said chemical additives are added in a quantity ranging from 3% to 8%, preferably from 4% to 6% by weight.
A. CLASSIFICATION OF SUBJECT MATTER

INV. G06K19/077
ADD.

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)
G06K

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents:

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Date of the actual completion of the international search 19 May 2010

Date of mailing of the international search report 09/06/2010

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