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(54) **Georeferenced printing device and method**

(57) The present invention relates to methods and apparatus for a printing device georeferenced place on the production line , connected securely with a central server , to receive, process and store information that is printed , so the certificate and secure , on a label georeferenced and encrypted affixed to the product.

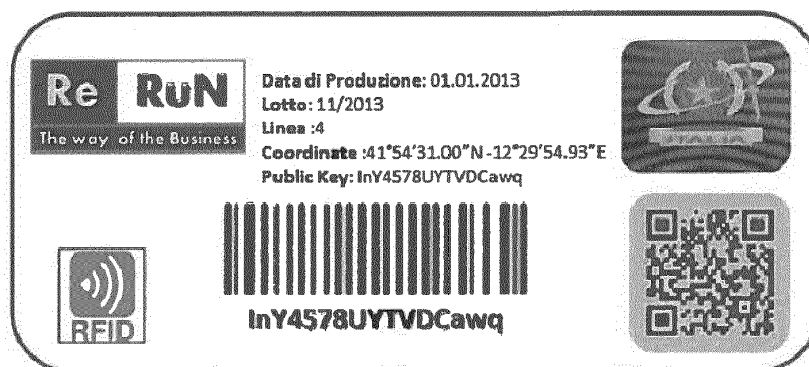
The purpose of this invention is to provide a device that is able to certify in an objective manner and tamper-proof, the source of the good product.

The printing device comes with the GPS positioning function, with a form of secure network access the internet via wifi systems, with a cryptographic module that can guarantee a very high physical and logical protection

of the information exchanged, with a module for smart cards user identification, with a diagnosis module for remote control of the apparatus to verify in real time the functionality and tamper-proof, the apparatus, with a form of printing labels and with a form of reading / writing a RFID TAG. The various modules are connected to the central device of printing via the cables.

Labels printed by the print module are identified in real time with GPS and the encryption key obtained from the various calculations and interactions with the central server. The degree of automation is high and the device works as an integrated system.

FIG.2 .



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Description

[0001] The state of the art printing georeferenced is passive and stand-alone applications, the process of georeferencing, of artwork to be printed, is not done by the printing device but from an upstream process, totally separated from the printer. Normally these processes are carried out by GIS, allocated on the central servers, which shall bring them to their geographical coordinates so that the normalization of the print file.

[0002] These printing processes see the printer as a simple device to entrust the file to print and regarding georeferenciation and encryption of what you are going to print, the printer becomes totally passive and not intervene in any way.

[0003] In particular as regards the printed labels, which are affixed on the goods produced, the print file is produced upstream of the printer and the printing device is a passive element that plays on paper as produced by a computer. The file label printing could be done from any computer and printed from any printer anywhere in the world.

[0004] This method of printing, which is well suited generic labeling, is totally ineffective for certification not tamper-proof production label, made with a specific printer, in a specific place and a specific production line, also the impossibility certify in solidarity and objective data reported within the label printer that produces it, does not allow subsequent processes verification certified the point of production of the label.

[0005] Currently there are no printers "active", as that reported in this document, which are independently capable of detecting the geographical coordinates, process the data coming from a server and produce the print file and obviously print labels.

[0006] In summary, this invention provides for label printing georeferenced and certified by a device that is interfaced with a network module to allow you to securely connect to the central server and exchange private keys of the product, with the cryptographic module that serves to both sign and encrypt the communication channels that the labels and the related TAG-RFID, with the GPS module that serves to detect in real time the geographical coordinates of the printer, with in management module smart card which serves to securely identify the 'user who starts the printer and manages the maintenance, with the form of reading-writing of TAG RFID, included with the self-adhesive label, which allows you to store private keys of product required to verify the validity of the label, with the diagnostic module that is used to check that the printer is not tampered including through the use of photosensors.

[0007] More particularly, the invention incorporates the concept of providing in an objective manner the origin of the goods by the use of self-adhesive labels, with attached RFID-TAG, which combined together allow the identification non-repudiable and not tamper-proof of production of the label (which will be labeled on the prod-

uct).

[0008] In FIG. 1 is shown a block diagram of the printing device, used in connection with the central system, while in FIG. 2 is an example of the labels that are to be produced by the printer.

[0009] To better understand how the printing device, are described below in detail the following modules that are housed within the container, and the method that the device contains, namely:

1. **Identification- Module:** This module allows the printer that is on standby, to "feel" the proximity of a Smart-Card contact-less, to identify the user and start the phase of "warm-up" of the device which in turn starts all the modules to operate;

2. **Network - Module:** This module allows you to start the interconnection with the grid and generate channels protected connection between the printer and the central server. In this phase the central module will need to exchange with the session keys;

3. **GPS - Module:** This module, after the phase coupling to various geostationary satellites, can detect real-time geographic coordinates of the printer or provide whenever the processing system produces the label;

4. **Compatible read / write RFID-TAG:** This module, once produced the cryptographic key product, allows the writing of TAG label affixed Self-adhesive and it rechecks the accuracy of the data written. The keys to store combined with 2D encrypted written on the label, enable formal verification of the validity of the label;

5. **Print Module:** This module allows printing the label, according to the layout of FIG: 2. The process of printing labels is integral and integrated to joining the pack, made on the packaging line;

6. **Form diagnosis:** the diagnosis module, through the use of photosensors, shall be controlled at a distance, that the printer is not tampered with. In case of tampering send the alarm to the central system and blocks label printing. This module includes a diagnostic method that allows you to control the printer so that it is not tampered with and can be monitored remotely. The method also does through the use of photosensors

7. **Cryptographic Module:** the cryptographic module shall generate the key device and by user keys, product, data line and the data of georeferencing shall generate a key label that will later be written on the tag by the challenge response mode with algorithm AES encryption, and the 2D barcode encryption that will be subsequently written on adhesive

label;

8. **Method of Printing label georeferenced:** A method of starting work activities printer comprising: startup of all modules of checking in warm-up, the secure communication with the central system to receive permission to print, the 'label issue with on board signed code, the communication with the Tag for the synchronous write of the key, the communication with the central system to the hold-on of the apparatus and for the control of activities.

[0010] The following describes the printing process of the device, namely:

- **Phase recognition:** Provides the user recognition, through a Smart Card Contact-less, it checks the credentials, if the check result is positive, the identification form authorizes the goodwill of the entire device.
- **Phase warm-up:** initiated by the identification module downstream of the positive recognition, will initiate all the modules of the device, to open the connection to the central server, exchanging session keys, requires the cryptographic key user, communicates with the central system to verify the hold-on the apparatus and to verify that the device has not been tampered with and against the positive outcome shall put the device in the state of ready.
- **level of development:** initiated by the identification module after the device was put in the state of ready, shall require, to the central system, the cryptographic key product, simply digitize the geographical coordinates from the GPS module, generates the private key of 'label by the cryptographic module, takes the data line via the network module, and prepares the print file.
- **Phase Printing:** initiated after the phase of elaboration, provides, to ensure that through the RFID module to write data to the tag, verify the consistency of the data written and through the print module emits the label cryptographic product.
- **Stage of data collection:** start after the printing phase, provides, through the cryptographic module to sign and encrypt data products in the pipeline, and through the network module forwarding authority to Central system.

[0011] This apparatus has been designed with the intent to cancel the weaknesses of the control of the supply chain logistics and consequently generate benefit for all those involved, both from the manufacturer, which aims to improve the certification process objective of the goods that side institutions that can objectively identify every single product / batch.

[0012] That means that the apparatus is to implement a system allowing companies to directly issue, directly on the production line, allowing identification in a non-repudiable and tamper-proof the goods and at the same time combat counterfeiting, such as the production of "Made in Italy".

[0013] The devices that will be used are designed to not be tamper-proof and not tamper; as the writing of information will be done using metadata signed directly on the label, and on the TAG, this in order to avoid that the labels printed in Italy are then used on goods not produced in Italy. Currently the value of counterfeiting is around € 120billion.

[0014] The device is designed also to allow optimal management of all information created, namely, the same once downloaded to a central database, with methods of data mining will populate the various databases both institutional (verification and control) and consumer, all via a Secure Internet access.

Claims

1. Georeferenced a printing device comprising:

- A GPS module (3) to detect the geographical coordinates;
- A module wifi network (2) to connect;
- An identification form (1) to identify the Contactless Smart Card ;
- A read / write module (4) to read and write RFID - TAG ;
- A module for printing labels (5);
- A diagnostic module (6) to verify the integrity of the device;
- A cryptographic module (7) to generate cryptographic keys, sign and encrypt data ;
- A container where all the modules are housed , provided with a tamper-proof system;

2. The printing method georeferenced using the device of claim 1 comprising the steps :

- Control, tamper-proof and unlock the device ;
- Request of cryptographic keys;
- Extraction of geographic coordinates from the GPS module ;
- Preparation for the signature and encrypts the data produced ;
- Writing / reading RFID - TAG ;
- Request for forwarding data from the device to the central server;
- Monitoring asynchronous and quantification of printing events.

FIG.1.

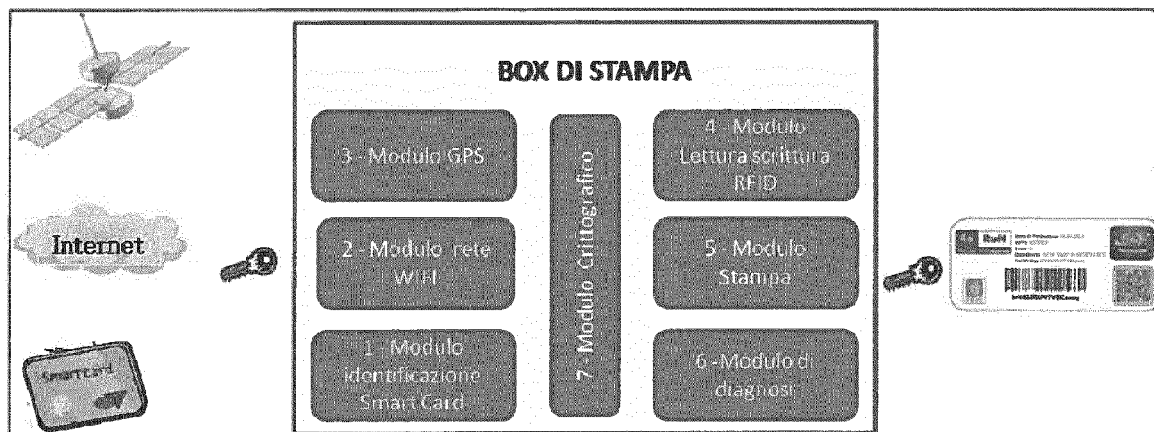


FIG.2 .

