

METHOD AND APPARATUS FOR MARKING MANUFACTURED ITEMS USING PHYSICAL CHARACTERISTIC

The present invention relates to methods and apparatus for marking manufactured items.
5 In particular, the present invention relates to marking packaged goods.

Counterfeit and contraband goods are a global problem for customers, manufacturers, and government authorities. Counterfeit goods, which are unauthorized productions of goods usually of inferior quality, are illegally sold all over the world. These goods are detrimental to the customer because they could be of inferior quality which may be hazardous (this is particularly
10 important for products such as pharmaceuticals or other consumed goods). Counterfeit goods are detrimental to manufacturers because they may suffer a loss of reputation, an increase in competition from illegal manufacturers producing their products, and infringement of other legal rights. Contraband goods, which are goods manufactured for the purposes of evading taxes or government regulations, are also a considerable problem for manufacturers and government
15 authorities. These goods are illegally diverted, traded, or imported which results in significant losses of revenue to government authorities due to improper collection of duties or taxes.

It is advantageous to be able to authenticate manufactured items using unique markings on the items without needing to store every unique marking at the location where the items are to be authenticated. It is also desirable to be able to detect counterfeit items, or items for which the
20 unique marking of an authentic product has been copied, without needing to store an authentication record of each unique marking.

In one aspect of the disclosure, there is provided a method of marking a manufactured item, comprising:

25 creating a unique product identifier for a manufactured item, the unique identifier being a numeric or alphanumeric sequence or value;
creating one or more encryption keys;
generating a secret key ~~from~~ using the unique product identifier and the one or more encryption keys;
generating a physical key from a measured physical property of the manufactured item;
30 generating a secure identifier derived from or incorporating the secret key and the physical key; and
placing a mark on the manufactured item, the mark comprising the secure identifier or an identifier derived from the secure identifier.

The secure identifier may incorporate the unique product identifier.

35 Preferably, the method further includes the step of generating a system noise value using the secret key and the unique product identifier, wherein the secure identifier is derived from or incorporates the system noise value. Preferably the step of generating the system noise value comprises performing a hash function on the secret key and the unique product identifier.

generating a new physical key from a measured physical property of the manufactured item;
generating a new copy of the physical noise value by performing a hash function on the new
physical key and the derived unique product identifier; comparing the new copy of the physical
noise value with the derived physical noise value; and providing an indication of whether both the
5 new copy of the system noise value is identical to the derived system noise value and the new
copy of the physical noise value is identical to or correlates to the derived physical noise value.

In either embodiment, the step of generating the first secure identifier may comprise
encrypting the unique product identifier and the system noise value using a code generator key,
wherein the step of generating the second secure identifier comprises combining the first secure
10 identifier and the physical noise value together with a code generator ID, and wherein the code
generator key can be derived or obtained from a look-up table at a verification centre using the
code generator ID.

In either embodiment, the method may further comprise the step of storing the one or
more encryption keys at a verification centre. The one or more encryption keys may comprise a
15 static key and a dynamic key, and wherein a new dynamic key is created for each batch of
manufactured items whereas the same static key is used for plural batches of manufactured
items

The unique product identifier may include information identifying a batch of items to which
the item belongs.

20 The invention provides the ability to authenticate both on basis of information from the
manufacturer i.e. the various encryption keys, and on the basis of a physical property of the item.
This provides two layers of authentication, and allows for the detection of cloning of identifiers on
genuine items, but does not require large scale storage of authentication codes.

In another aspect of the invention, there is provided an apparatus for marking a
25 manufactured item, comprising:

- a key generator configured to generate encryption keys;
- a code generator configured to generate a unique product identifier for each
30 manufactured item, each unique identifier being a numeric or alphanumeric sequence or value;
- a physical key generator configured to generate physical keys from a measured physical
property of each manufactured item;
- processing means configured to:
 - generate a secret key for each manufactured item using the unique product identifier and
one or more encryption keys;
 - generate a secure identifier derived from or incorporating the secret key and the physical
35 key; and
 - a marker for marking each manufactured item with the secure identifier or an identifier
derived from the secure identifier.

CLAIMS

1. A method of marking a manufactured item, comprising:
 - 5 creating a unique product identifier for a manufactured item, the unique identifier being a numeric or alphanumeric sequence or value;
 - creating one or more encryption keys;
 - generating a secret key ~~using~~ from the unique product identifier and the one or more encryption keys;
 - 10 generating a physical key from a measured physical property of the manufactured item;
 - generating a secure identifier derived from or incorporating the secret key and the physical key; and
 - placing a mark on the manufactured item, the mark comprising the secure identifier or an identifier derived from the secure identifier.
- 15 2. A method according to claim 1, further comprising generating a system noise value using the secret key and the unique product identifier, wherein the secure identifier is derived from or incorporates the system noise value.
- 20 3. A method according to claim 1 or 2, further comprising generating a physical noise value using the physical key and the unique product identifier, wherein the secure identifier is derived from or incorporates the system noise value.
4. A method according to any preceding claim, wherein the secure identifier incorporates the
- 25 unique product identifier.
5. A method according to claim 4 when dependent on claims 2 and 3, wherein the step of generating the secure identifier comprises generating a first identifier by encrypting the unique product identifier together with the system noise value and generating the secure identifier by
- 30 encrypting the first identifier together with the physical noise value.
6. A method according to claim 5, further comprising authenticating the manufactured item at a verification centre, the step of authenticating comprising:
 - identifying the mark on the item;
 - 35 decrypting the mark to derive the first identifier and the physical noise value;
 - decrypting the first identifier to derive the unique product identifier and the system noise value;

- generating a new physical key from a measured physical property of the manufactured item;
- generating a new copy of the physical noise value by performing a hash function on the new physical key and the derived unique product identifier;
- 5 comparing the new copy of the physical noise value with the derived physical noise value;
- and
- providing an indication of whether the derived physical noise value is identical to or correlates to the new copy of the physical noise value.
- 10 7. A method according to claim 6, the step of authenticating further comprising:
- generating a new copy of the secret key from the unique product identifier and the one or more encryption keys;
- generating a new copy of the system noise value by performing a hash function on the new copy of the secret key and the unique product identifier;
- 15 comparing the new copy of the system noise value with the derived system noise value;
- and
- providing an indication of whether the new copy of the system noise value and the derived system noise value are identical.
- 20 8. A method according to claim 4 when dependent on claim 2 and 3, wherein the step of generating the secure identifier comprises generating a first secure identifier by encrypting the unique product identifier together with the system noise value;
- generating a second secure identifier by encrypting the unique product identifier together with the physical noise value; and
- 25 placing a mark on the manufactured item, the mark comprising the first and second secure identifiers or an identifier or identifiers derived from the first and second secure identifiers.
9. A method according to claim 8, further comprising authenticating the manufactured item at a verification centre, the step of authenticating comprising:
- 30 identifying the mark on the item;
- decrypting the mark to derive the unique product identifier, the system noise and the physical noise;
- generating a new copy of the secret key from the unique product identifier and the one or more encryption keys;
- 35 generating a new copy of the system noise value by performing a hash function on the new copy of the secret key and the unique product identifier;
- comparing the new copy of the system noise value with the derived system noise value;

- generating a new physical key from a measured physical property of the manufactured item;
- generating a new copy of the physical noise value by performing a hash function on the new physical key and the derived unique product identifier;
- 5 comparing the new copy of the physical noise value with the derived physical noise value;
- and
- providing an indication of whether both the new copy of the system noise value is identical to the derived system noise value and the new copy of the physical noise value is identical to or correlates to the derived physical noise value.
- 10
10. A method according to any preceding claim, wherein the one or more encryption keys comprise a static key and a dynamic key, and wherein a new dynamic key is created for each batch of manufactured items.
- 15 11. A method according to any preceding claim wherein the unique product identifier includes information identifying a batch of items to which the item belongs.
12. An apparatus for marking a manufactured item, comprising:
- 20 a key generator configured to generate encryption keys;
- a code generator configured to generate a unique product identifier for each manufactured item, each unique identifier being a numeric or alphanumeric sequence or value;
- a physical key generator configured to generate physical keys from a measured physical property of each manufactured item;
- processing means configured to:
- 25 generate a secret key for each manufactured item using the unique product identifier and one or more encryption keys;
- generate a secure identifier derived from or incorporating the secret key and the physical key; and
- a marker for marking each manufactured item with the secure identifier or an identifier
- 30 derived from the secure identifier.
13. An apparatus according to claim 12, wherein the processor is configured to generate a system noise value for each manufactured item by performing a hash function on the secret key and a unique product identifier, wherein the secure identifier is derived from or incorporates the
- 35 system noise value.
14. An apparatus according to claim 12 or 13, wherein the processor is configured to generate a physical noise value for each manufactured item by performing a hash function on the

physical key and the unique product identifier, wherein the secure identifier is derived from or incorporates the physical noise value.

15. An apparatus according to any one of claims 12 to 14, wherein the manufactured item is
5 a container containing a tobacco product.