Title: ANTI-DIVERSION, ANTI-COUNTERFEITING AND ANTI-TAMPERING PACKING TAPE

Abstract: A self-adhesive tape with an optical signature authenticatable by a hand-held optical reader. (Figure 1) shows the top and side views of the tape. The tape is a plastic or polyester substrate. At least one optical signature is affixed to the tape that is not visible to the unaided human eye and is difficult to detect without advance knowledge of the specific parameters.
TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:  
— with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.
Anti-Diversion, Anti-Counterfeiting
and Anti-Tampering Packing Tape

FIELD OF THE INVENTION

This invention relates generally to anti-diversion, anti-counterfeiting and anti-tampering devices and methods and more particularly to a security packing tape having machine-detectable structures.

BACKGROUND OF THE INVENTION

Diversion, counterfeiting and tampering are problems in the sale of goods. Among the results of these activities are lost profits and substandard goods in the market.

Diversion is often characterized by the term "gray-market goods", or simply "gray goods." These are products sold in one market area, e.g., the United States, that were lawfully produced but which the manufacturer or authorized reseller did not intend for sale in that market. The merchandise is authentic product from the manufacturer, but that product has been diverted from its intended destination. Diversion is also sometimes referred to as "parallel importation."

Three distinct scenarios are the most common sources of gray goods. First, a producer may manufacture goods for
export sale only and find that the merchandise has been diverted back to the origin market either before or after exportation. Second, goods made abroad by a foreign licensee may be imported without the authorization of the licensor. Finally, goods made abroad either by the manufacturer or a licensee may be imported into the local market to compete with goods offered by the authorized local licensee.

Parallel importations often occur because of price differences in the global marketplace. A United States publisher of computer software may, for example, have only a small market share in Mexico. As a business strategy, that publisher may legitimately decide to introduce a new product into the Mexican market at a substantial discount compared to the sales price for the same product in the United States. If the discount is large enough, it becomes possible for U.S. parties to purchase the software in Mexico and import it to the United States for resale at a discount over the same product in authorized channels. Or a United States drug manufacturer may desire for a variety of reasons to sell drugs to combat AIDS in Africa at a steeply discounted price relative to sales in Europe or the United States. In that case, European and U.S. parties might purchase the drugs in Africa and import them
to Europe and the U.S. where they can sell them for full price.

In other parallel importation cases, a manufacturer may limit its retail distribution to upscale markets. An example of this practice is the cosmetics trade where some products are only sold through salons or selected stores. Mass retailers who would like to sell the same product may find it abroad on sale at deeply discounted prices. The discounter may then have an opportunity to enter the market from which the producer has tried to exclude it.

The harm of the gray market is that the practice causes erosion in distribution channels, interferes with the contracts of exclusive licensees, causes complicating warranty issues, deprives the manufacturer of its full sales price, deprives certain geographically located consumers of the products and erodes the upscale product image. Thus, authorized licensees do not get the full benefit of their license fees, the manufacturers do not achieve their intended results, certain consumers do not benefit from the products and no authorized retailer gets the full benefit of its advertising and marketing expenses. In addition, authorized resellers or licensees are usually subject to contractual control by the licensor or manufacturer. The licensor may, for example, require authorized outlets to have trained sales personnel or
service departments or to maintain warranty services and an inventory of service parts. Parallel importers lack privity with the licensor or manufacturer and are under no obligation to provide warranty support or the specified level of customer service. Consumers, unaware that they are purchasing from an unauthorized seller, may develop a negative opinion of the product. Thus, gray-market products may undercut the goodwill of the manufacturers and authorized resellers. This often occurs when consumers seek warranty service on a gray-market product. If the factory refuses to service the product, the consumer may well feel alienated. The factory, however, has no obligation to service the good and would incur an unplanned expense if it provided the service. Thus, the unwary consumer of gray-market goods usually gets a product without a factory warranty and has not received the full benefit of his or her bargain.

Beyond the gray market, goods are outright stolen and sold on the black market.

Counterfeiting occurs in three forms. In the first form, only the labeling on the goods is counterfeited in order to disguise gray market or black market items. In the second form, the goods themselves are copied and these usually inferior goods are sold as authentic goods, possibly also with counterfeit labeling. In the third and
final form, authorized manufacturers are producing additional unauthorized product.

10 Counterfeiting often occurs when there is high demand for an inexpensive look-a-like of a particular product (as in high-end watches sold on street-corners), unmet supply for high margin products, high licensing and royalty fees owed to trademark and design owners, relatively low production costs, improvements to inexpensive manufacturing tools, simplified distribution processes and overwhelmed enforcement mechanisms.

11 The harm of counterfeiting is that it involves lost revenues to the manufacturers, confusion in product pricing, erosion in consumer confidence and loss in brand value. In addition, counterfeiting may in some cases result in life and safety threats to individuals who are unwitting consumers of substandard pharmaceuticals, foods, automotive parts and many other products with increased risk rates from defects.

12 In tampering, the package containing goods is opened or manipulated in some way in order to pilfer or alter the goods. For example, containers may be opened in order to substitute authentic goods with counterfeit goods, or to deliberately substitute or add products to create life and safety risks for the consumer.
In sum, it remains desirable to have a way to prevent diversion of goods, counterfeiting and tampering. Preferably, the solution is a cost effective and efficient way of maintaining integrity of goods shipped from producers, ensuring the authenticity of products at any point in the supply chain and determining that the merchandise has been delivered to its intended destination.

It is an object of the present invention to provide a method and apparatus for a secure closure device for containers of merchandise to prevent and detect tampering.

It is another object of the present invention to provide a method and apparatus to prevent and detect counterfeiting of goods.

It is another object of the present invention to provide a method and apparatus to prevent and detect diversion of goods.

SUMMARY OF THE INVENTION

The problems of preventing diversion, counterfeiting and tampering with goods are solved by the present invention of a self-adhesive tape having an optical signature authenticatable by an optical reader.

The present invention is a facestock substrate which may be plastic, polyester, paper or other medium, on which
material having at least one specific optical signature is affixed. Each such optical signature may have a number of different characteristics, but the signature is generally not visible to the unaided human eye and is difficult to detect without advance knowledge of the specific parameters. In this way, the security features may provide a covert level of product protection. The material, for example, may provide light or other electromagnetic radiation in one or more very well-defined wavelength and intensity ranges (passively reflected or actively or reactively emitted), or combinations of these ranges, so that scanning of the material must be made over astronomically high numbers of combinations of narrow wavelength and intensity parameters to detect the signature.

In addition, such materials may be made more difficult to detect (and more difficult to counterfeit) by unauthorized recipients through the use of "decoys" or "noise" of visible or more easily detected optical characteristics. These extra characteristics may perform additional functions of coding source and authorized destination information and providing anti-diversion and anti-tampering artifacts. To further avoid counterfeiting, such materials may be selected from those for which synthesis, manufacture or affixation are
difficult to reverse engineer even with knowledge of the specific parameters of the optical signatures. The application of the tape across the opening of a container provides means to ensure that counterfeit items are not substituted in the authenticatable container as well as to allow application of authenticatable destination codes at the time of shipment for secure product tracking.

In one example, the behavior of the marking substance when subjected to radiation is detectable using a hand-held, finely-tuned reader. The radiation, in a first embodiment of the invention, is in the visible light portions of the spectrum. In a second embodiment, the markings absorb part of the spectrum of radiation and the absence of this portion of the spectrum is detectable with the machine reader. In a third embodiment, a color-shifting optically variable coating is applied to the tape alongside the marking material, to add a security feature detectable by the unaided human eye. The color-shifting coating consists of an ink containing thin-film optical interference pigmented flakes that produce an iridescent reflection that changes color as the viewing angle is changed. Adhesive is applied to the tape over the printed markings so that the tape may be used to seal packaging and to present immediate tamper evidence. The verifiable markings on the tape prevent counterfeiting, diversion and
tampering of merchandise as the markings are not easily reproduced.

21 The present invention together with the above and other advantages may best be understood from the following detailed description of the embodiments of the invention illustrated in the drawings, wherein:

BRIEF DESCRIPTION OF THE DRAWINGS

22 Figure 1 is a top and side view schematic drawing of the packing tape according to principles of the invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

23 Figure 1 shows a top view and a side view of a packing tape of the present invention. Generally, the packing tape 10 has some kind of marking 15 detectable from the top of the tape.

24 More specifically, the packing tape 10 has a flexible, transparent or translucent substrate layer 20 capable of being printed with a marking substance. In the present embodiment of the invention, the tape substrate is made of a plastic or polyester. In a preferred embodiment of the invention, the tape product may be formed into a roll and would not require separation between layers or a tape backing layer. In alternative embodiments of the invention, the tape substrate could be paper or some other
medium capable of being printed with material having an optical signature.

The marking substance is printed on the underside 25 of the substrate layer 20. The marking substance may be printed to form words as shown in Figure 1 or may be printed in some other configuration such as a bar code or as a simple layer of marking material. In alternative embodiments of the invention, the marking substance may not be visible to the unaided human eye. It is, however, preferable to have the marking material visible to the unaided human eye in order to act as a decoy to aspects of the marking material which are not visible to the unaided human eye. In alternative embodiments of the invention, where the tape substrate substantially blocks passage of light such as a paper tape, the marking substance may be printed on the top of the tape substrate rather than the underside.

In any case, the marking material has at least one characteristic that is not visible to the unaided human eye, but is detectable mechanically by an individual familiar with the mark’s location and characteristics. The characteristic of the marking material is an optical signature authenticatable with an optical reader. The material, for example, may provide electromagnetic radiation in one or more very well-defined wavelength and
intensity ranges (passively reflected or actively or reactively emitted), temporal or spatial ranges or combinations of these ranges, so that scanning of the material must be made over astronomically high numbers of combinations of narrow parameters to detect the signature. For example, inks with optical activity detectable within narrow parameters could be used. Such materials may be less likely to be detected (and subsequently counterfeited) by unauthorized recipients through "decoys" or "noise" of visible or more easily detected optical characteristics that may also perform additional functions of coding source and authorized destination information and to provide anti-tampering artifacts. To further avoid counterfeiting, such materials may be selected from those for which synthesis, manufacture or affixation are difficult to reverse engineer even with knowledge of the specific parameters of the optical signatures.

In the present embodiment of the invention, the marking substance is an ink with machine-readable optical characteristics manufactured by Pitkit Technologies. The ink is indistinguishable to the unaided eye from inks normally used in the printing industry. A reader, also available from Pitkit Technologies, is programmed to measure the relevant optical parameters of the particular ink used for marking. In this way, a counterfeited tape
that appears to the unaided eye to be a duplicate of an
authentic tape can be easily detected using a machine
reader. The destination-related information printed on
the tape deters diversion. The ink described above is
provided merely as an example. Any ink having machine
readable optical characteristics, preferably where the ink
reacts in a narrow well-defined wavelength and intensity,
may be contemplated within the scope of the present
invention.

The reader may be a hand-held reader, or an embedded
reader in a table-top or similar configuration for reading
goods passing on a conveyor. Alternatively, the reader
may be mounted on a moving platform for taking readings in
a stocked warehouse. Readers are known in the art. In
addition to the Pikit reader, examples are the scanners
5,381,020 and 6,043,503, PSC Inc. disclosed in U.S. Patent
No. 5,602,376 and Symbol Technologies, Inc. disclosed in
Patent No. 6,216,951.

Returning to Figure 1, a layer of adhesive 30 is
applied on the underside 25 of the tape. The adhesive
binds selectively to the substrate layer such that the
tape can be used to seal a package, effectively keeping
the package closed, but also such that the adhesive is
capable of forming a tamper-evident bond with the package.
In this way once it is affixed to the package, an attempt
to remove the tape will result in damage to the marking
substance. The damage to the marking substance will
present evidence of tampering.

30 In a first alternative embodiment of the invention,
destination-related information printed on the tape deters
diversion.

31 In a second alternative embodiment of the invention,
the markings absorb part of the spectrum of radiation and
the absence of this portion of the spectrum is detectable
with the machine reader.

32 In a third embodiment of the invention, a color-
shifting optically variable ink is applied on the
underside of the tape alongside the marking material, to
add a security feature detectable by the unaided human
eye. The color-shifting ink contains thin-film optical
interference pigmented flakes that produce an iridescent
reflection that changes color as the viewing angle is
changed.

33 It is to be understood that the above-described
embodiments are simply illustrative of the principles of
the invention. Various and other modifications and
changes may be made by those skilled in the art which will
embody the principles of the invention and fall within the
spirit and scope thereof.
What is claimed is:

1. A self-adhesive sealing tape, comprising:
   a flexible substrate layer;
   a marking substance printed on a first side of said substrate layer, said marking substance having an optical characteristic requiring a machine reader for detection; and
   adhesive disposed on a second side of said flexible substrate layer to form an adhesive packing tape capable of sealing packages.

2. The tape of claim 1 wherein said first side and said second side are the underside of said substrate layer, said adhesive disposed over the marking substance printed on the substrate.

3. The tape of claim 1 wherein said marking substance is an ink that emits electromagnetic radiation in a specified emission wavelength range, said emitted radiation detectable by a electromagnetic radiation reader tuned to said specified emission wavelength range.

4. The tape of claim 1 wherein said marking substance is an ink that emits electromagnetic radiation in a specified emission wavelength range in response to radiation directed
at or otherwise effecting the marking substance, said emitted radiation detectable by a electromagnetic radiation reader tuned to said specified emission wavelength range.

5. The tape of claim 3 and claim 4 wherein the specified emission wavelength range is a span of 1 to 100 nanometers.

6. The tape of claim 1 wherein the marking substance is an ink that absorbs electromagnetic radiation in a specified absorption wavelength range, said absorption detectable by an absorption reader tuned to said specified absorption wavelength range.

7. The tape of claim 1 wherein the marking substance is an ink that absorbs electromagnetic radiation in a specified absorption wavelength range in response to radiation directed at or otherwise effecting the marking substance, said absorption detectable by an absorption reader tuned to said specified absorption wavelength range.

8. The tape of claim 6 and claim 7 wherein the specified absorption wavelength range is a span of 1 to 100 nanometers.
9. The tape of claim 1 wherein said substrate layer is a plastic.

10. The tape of claim 7 wherein said plastic is polyester.

11. The tape of claim 1 wherein said substrate layer is paper.

12. The tape of claim 1 wherein said marking substance has a plurality of optical characteristics requiring a machine reader for detection.

13. The tape of claim 12 wherein said plurality of optical characteristics comprises response in two different wavelength ranges.

14. The tape of claim 12 wherein said plurality of optical characteristics comprises response in a wavelength range and an intensity range.

15. The tape of claim 1 wherein the marking material is printed in a specified area within a larger mark.

16. The tape of claim 1 wherein said marking material has at least one easily detected characteristic.
17. The tape of claim 16 wherein said at least one easily detected characteristic is visibility without a machine reader.

18. The tape of claim 1 wherein the marking substance is printed as characters providing information.

19. The tape of claim 18 wherein said information is package destination information.

20. The tape of claim 1 wherein the adhesive is capable of forming a tamper-evident bond with a package to which it is affixed whereby removal of the tape from the package results in damage to the marking material.
FIG. 1

Source: U.S.  
Destination: NW Territories
# INTERNATIONAL SEARCH REPORT

**INTERNATIONAL APPLICATION NO.**

PCT/US02/36399

## A. CLASSIFICATION OF SUBJECT MATTER

**IPC(?)** : B32B 15/04, 7/12; G01N 21/86; G01V, 8/00  
**US CL.** : 428/343, 354; 250/559.44  
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)  
U.S. : 428/343, 354; 250/559.44

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 practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category *</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
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<tbody>
<tr>
<td>X</td>
<td>EP 0 342 982 A2 (DRG (UK LIMITED)) 23 November 1989 (23.11.89), column 1, lines 3-5, 23-28, 33-44, 48-61 and Figs 1 and 2.</td>
<td>1-4, 6-9, 12-18, 20</td>
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<td>X,P</td>
<td>US 6361079 B1 (Kirkman) 26 March, 2002 (26.3.2002), column 1, lines 11-18; column 2, lines 40-52 and Fig. 1a.</td>
<td>1-4, 6-7, 9, 12-18, 20</td>
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* Further documents are listed in the continuation of Box C.  
See patent family annex.

* Document defining the general state of the art which is not considered to be of particular relevance

*E* earlier application or patent published on or after the international filing date  
*F* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)  
*G* document referring to an oral disclosure, use, exhibitions or other means  
*P* document published prior to the international filing date but later than the priority date claimed

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