The Objective of the Security Marking Technology: using technical means to ultimately prevent the possibility of faking documents or products

There are three vital issues whenever people want to communicate / cooperate about a product: Identification, Authentication and Traceability.

The most commonly used identification agent is the "product label" - it represents many things at once and more than just a "piece of paper with information". "Product Labels" are used to inform and protect producers, transporters, users and disposers. They are extensions of the corporate image, accompanying products through the manufacturing processes and supply chains. Their appearance contributes to selling and recording the locations and critical data of any product. "Product Labels" are also legal documents - their contents and accuracy inform about the products being in compliance with regulations and requirements and contractual obligations. Their content and information contribute to correct and safe product storage, distribution, transportation and usage, as well as final disposal.

Although, strictly speaking, it is not part of the "label“ per se, the printed message on it is the very reason a "label" is used for. Basically the manufacturer has two options: either to print or engrave an identification number on the product and to register the specifications on accompanying forms or sets of documents, or to record the information required directly on the "label". Although less expensive in material costs, "direct labeling" of information lacks long term stability and may not be resistant to high temperatures or moisture, it has limited durability and suffers from occasional background discoloration. In many cases direct information labeling cannot withstand manufacturing processes, leaving portability and low cost as its only true advantages.
For that reason, storing information on accompanying paperwork is strongly enhancing the comprehensiveness of product specifications, while at the same time it is creating the problem of safely attaching information to the product concerned all along the manufacturing, transportation, use and disposal processes though which the product has to pass. In that case the main requirement is authentication, i.e. making certain that the identification process has been reliable, in order to certify that the label or the accompanying paper on which the product specifications are printed do effectively belong to the product concerned!

If a reasonable level of confidence is needed in the assertion that accompanying specification data are associated with the right identifier, then this assertion needs to be authenticated - Authentication is the process of establishing confidence in an assertion of identity -. It is performed by cross-checking between one or several "authenticators". There may exist various "Authenticators" for identity assertions. They include hidden information (such as a watermark or a "Kinegram®") and visible elements of a product (such as an

undeletable tag). What a product is (i.e. its chemical composition, surface structure or physical dimensions) represents an entity assertion!

The final issue of any product identification and authentication is Traceability, which is defined as the ability to trace the evolution of dependent attributes within the life-cycle of a product. The identity of a product, as it exists in the real world, is changing with time. Therefore identifiers need some closer attention, as, in many circumstances, they are dependent from changes of the underlying material, with the purpose to tell the customer and user all about a product's history.

Inquiries about a product's origin will be swiftly addressed, the ability to trace supplies are expected to add value to the product by giving it a unique “personality" with its own history. Looking upstream through the supply chain, each batch of ingredients of a product will finally arrive to each supplier's own production process. The suppliers should then be able to provide (on request) the origins and dates of manufacture of those ingredients provided and used during the manufacturing of the product. Traceability of a product can be ensured, for example, to delivery notes which are a useful means of linking an order, the supply of the required goods, the batch number and the date of payment, i.e. traceability helps to ensure that only correctly delivered goods are paid for!
"Identification", "Authentication" and "'Traceability" are three strongly interlinked features of the supply chain: the first specifying the product, the second asserting the first and the third documenting the evolution of the two previous ones over time. The task of monitoring the attributes of a product by means of the three aforementioned agents leads to a clear and unequivocal certification of its origin. The main difficulty is to interrelate all three agents in such a way, that no interference between them allows for tampering, defrauding or faking of any product - ranging from coins, banknotes documents, paintings, scientific studies, photographs, video tapes, vehicles, spare parts, to diaries, fragments of the Holy Cross, Rolex watches or olive oil! Faking can be anything between a crime, a scandal, an annoyance, a joke or a work of art! Certifying the origin of a product therefore means to ultimately prevent any possibility of faking!

Our Objectives

Our actions with regard to the solution of the aforementioned problems are aimed to find ways to achieve the following objectives:
Elimination of possibility of document counterfeiting in security systems
Prevention of financial losses due to product fakes
Ensuring and securing accurate and tamper proof direct part marking

Enhancement of product safety by means of an undeletable tagging of products and specifications
Provision of accurate real-time identity verification
Identification of re-usable parts in product disposal (prevention of scraping)
Authentication of parts and insuring that only original items are used for service and maintenance
Immediate access to "back to birth" information on all marked parts

Equally important to Governments as these security and safety enhancing features will be to support the objectives of rendering the public administration processes more efficient in allowing instant authentication of any document in order to radically prevent the two main ways in realizing fraud with identity and security items.

COUNTERFEITING - the reproduction of a document, article or product with the purpose of deceiving even the most meticulous check up by a qualified examiner, and

FORGERY - the replication or alteration of a document's or a product's data such as identity signatures, money and other value notes, technical specifications, credit and ID cards and documents, etc., with the intention of defrauding.

Our Approach and Solution

The approach in developing a technical solution was to interlink the three features - “Identification“, "Authentication" and "Traceability" in such a way that they become an inseparable unit by the following means:

Replacing a "fixed" label with a permanent engraving of all necessary information directly on the product (irrespective of the material);
Developing an "engraved" label containing comprehensive manufacturing and product-sensitive data;
Creating of a label application solution giving the users the flexibility to adapt their equipment to the needs of their production environment, allowing for fast turnaround as production needs to change;
Optimizing the media design with regard to data applicability and readability by specifying media and machinery at the same time;
Establishing a comprehensive move towards virtually paperless "supply chain management" by use of "fixed labels" not to be treated as elements separated from the
"products".
Our solution allows to improve the process efficiency throughout the entire distribution channel and over the entire life-cycle of a product allowing for faster, more accurate and more timely product related communications within the company and the product supply and distribution chain and including the final

user, by ensuring immediate access to all relevant document and product data and by eliminating any possibility of counterfeiting that actually exists, namely

„ORIGINATING“ - reproduction of an item using the same materials and production methods as used for the creation of the original document or product
„COPYING“ - exact replication of a document or product using similar materials, production methods or both
„IMITATION“ - the replication of a document or product by using entirely different materials and methods
„ALTERATION“ - the change of data in the original document
Our solution provides for protecting an item by allowing for verification of its authenticity and validity by invisible and unalterable marks on the product or document itself. This is achieved by embedding complementary hidden (secret) information in the visible image (watermark, PIN etc.) on different surface levels.

Original and Personalized Product Specifications

Our technology provides for embedding document or product related information into the security marking on several levels, the information being specific to each different level as well as to each separate object to be protected. The information can be generated from different sources (manufacturer, control authorities, monitoring bodies, etc.). The embedded secret (hidden) information for a certain level is protected from objectionable or unauthorized alteration by recording on a non alterable carrier / memory (CD-ROM or DVD-ROM).

In order to preserve the independence between the different protection levels only those institutions which provide the hidden information for any specific level will have access to the personalization procedure. Thus, the overall protection is composed of a number of independent protection elements: If, by chance counterfeiters obtain access to the security information embedded in one specific (for example, security leakage within the organization), the information stored in all other levels will still remain undercover. If the counterfeiter would like to replicate the security marking, he will need to access and modify separately the information stored in each level, thus the possibility of copying, defrauding, counterfeiting and forgery is close to zero.

When the personalized / protected document / product is being verified as to its authenticity, the specialized software will undertake a verification of the various security coeds (hidden / secret information) provided by each independent institution and only if all the security codes of the document / product to be verified match the records in the database, the verified document / product will be signaled as authentic or genuine.

Consequently, the technology provides for the introduction of independent protection features in the overall protection: If by any chance the hidden

information or codes stored on one specific level is given away to unauthorized parties (security leakage within the organization), the information stored in all other levels will still remain untouched. Due to the necessity of changing the information stored in each level separately, the possibility of fraud and forgery is virtually impossible; the exception being a case where the criminal elements have availed themselves of the original secret / hidden information from each of the selected institutions. Such cases will be completely eliminated if all the institutions use our specialized software algorithm for stochastic generation of the hidden / security codes.