



Biopolymer based optical micro-structures

Diffractive microstructure and a method of producing the same

Current situation

There is a growing interest in providing means for identification of fibrous materials and for verifying the origin thereof. An object is to prevent or at least make the production and distribution of counterfeit goods packed in such materials difficult. Medicines and tobacco products packed in cardboard packages can be mentioned as specific examples of important goods.

Examples of safety features (in the following also “safety markings”) incorporated into fibrous materials include various tags and labels allowing for optical or electrical identification of the materials. In particular, there are a number of RFID and barcode tag solutions known in the art. One problem related to present day tags and labels is that they have to be attached to the surface of, e.g., the cardboard, in a separate process step. Depending on how they are fixed to the cardboard surface, for example by use of adhesives, there is always a risk that they might fall off during handling or conversion.

There is also a considerable risk that separate safety markings are copied and used for counterfeiting of the product. It is an aim of the present invention to eliminate at least a part of the problems related to the known art and to provide a technical solution for incorporating safety markings integrally into fibrous product during production so as to allow for identification of the origin of the product and for preventing manipulation of a product by attachment of a separate tag or label.

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Invention

The present invention is based on the finding that it is possible to form optically identifiable microstructures on the surface of a fibrous product by hot-pressing of a specific kind of layer present on the surface of the product or which forms a part of the product, viz. a layer formed by thermoplastic carbohydrate polymer or derivatives thereof.

In particular, the present invention comprises using, as a substrate for the embossing operation, a layer of a thermoplastic carbohydrate polymer or a polymer derived from a carbohydrate material, said polymer having a glass transition point of less than 210 °C.

The diffractive microstructure can be produced by a method comprising the steps of

- forming a layer of a thermoplastic carbohydrate polymer having a glass transition point of less than 210 °C; and
- embossing into the layer a diffractive microstructure comprising micro- protrusions or microgrooves or a combination thereof.

Solution

Considerable advantages are obtained by the invention. Thus, the invention provides an inexpensive and reliable way of incorporating into the products safety markings, which allow for visual inspection or detection e.g. based on polychromatic light or based on the use of laser beams and other monochromatic light. Typically, the present microstructure is capable of diffracting light in the visual range, in the ultraviolet range, in the infrared range or in a broad wavelength range comprising visual, ultraviolet and/or infrared light.

The microstructures can be impressed into the surface of the materials during the production process.

Application areas

The polymers used in the invention are biocompatible and, in some cases, even biodegradable materials. The biocompatibility allows for the use of the polymer layers in foodstuff packagings and wrappings of other products which must meet stringent requirements, e.g. as cigarette papers. The cost for the application of the marking is small compared to the cost of the product and its package. Further, no additional processing of the embossed surfaces is required for achieving visually complete and mechanically durable decorations.

Additional information

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