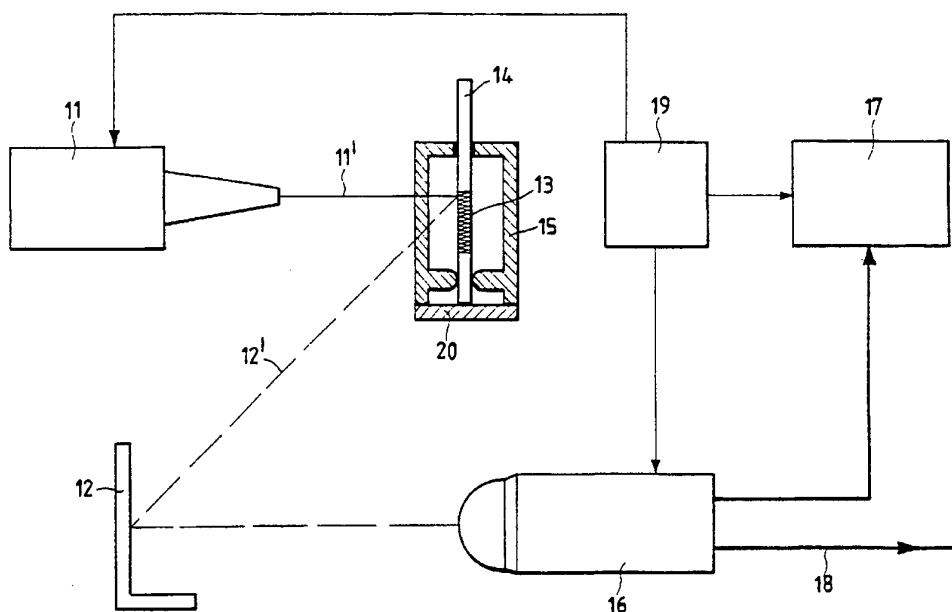




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(54) Title: OPTOELECTRONIC APPARATUS AND RELEVANT METHOD FOR THE AUTOMATIC CHECK OF AUTHENTICITY OF DOCUMENTS AND OBJECTS BY MEANS OF HOLOGRAMS



(57) Abstract

An optoelectronic apparatus and method for the automatic check of authenticity of documents and objects by means of holograms, constituted by an illuminator to illuminate a hologram not visible under normal light, a mechanical interface which determines and fixes in space the position of said object and of the hologram applied onto it, a reflective surface so arranged as to reproduce an image relevant to the illuminated hologram and a reading device to detect the image, with said reading device being connected with a display in order to display detected data relevant to the image, with, as an outlet from the reading device, an external data line being provided.

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"OPTOELECTRONIC APPARATUS AND RELEVANT METHOD FOR THE
AUTOMATIC CHECK OF AUTHENTICITY OF DOCUMENTS AND
OBJECTS BY MEANS OF HOLOGRAMS"

The present invention relates to an
5 optoelectronic apparatus and relevant method for the
automatic check of documents and object for
authenticity, by means of holograms.

In the field of the authenticity check of
documents and other documents, the holographic
10 technology already found application some time ago.

In fact, the effect of ridimensionality and the
dynamicity of colours which can be seen by a human eye
which observes a hologram, make the latter different
from any other products from normal printing
15 processes.

During the past years, several techniques of
holograms application have been developed, such as,
e.g., techniques based on high-temperature
application, or on the use of a self-destroying
20 pressure adhesive means. These techniques transfer to
the object the inherent security elements which are
typical of holograms, securing ease of identification
and difficulty of reproduction.

The security level secured by the recognition of
25 a hologram applied to an object and visible by human
eye, considerably increases when to the visible image
by the human eye contained in the same hologram one or
more images are added, or fully substituted for it,
which cannot be seen with normal light.

30 The present invention aims at providing an

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optoelectronic apparatus and relevant method which makes it possible the authenticity to be verified or checked in an automatic way, of documents or objects to which at least one hologram not visible under normal light, is applied.

Through the automatic authenticity certification, the apparatus protects documents and objects from counterfeiting attempts, using objective recognition criteria based on code reading and comparing, without any actions by human operators.

Furthermore, the purpose of the invention is also of creating a simple and easy-to-use apparatus which operates according to a method for hologram check, which secures highly reliable results.

In order to achieve these purposes, an optoelectronic apparatus and relevant method has been provided for the automatic check of authenticity of documents and objects by means of holograms, which is constituted by an illuminator to illuminate a hologram not visible under normal light, a mechanical interface which determines and fixes in space the position of said object and of the hologram applied to it, a reflecting surface so arranged as to reproduce an image relevant to the illuminated hologram and a static reading device to detect the image, with said static reading device being connected with a display in order to display detected data relevant to the image, with, as an outlet from the reading device, an external data line being provided.

The structural and functional characteristics and

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the advantages of an apparatus and relevant method according to the present invention will be better understood from the following exemplifying, non-limitative disclosure in detail thereof made by referring to the accompanying drawing in which an optoelectronic apparatus for the automatic authenticity check of documents and objects by means of holograms, is shown in schematic view.

An apparatus according to the present invention is essentially constituted by an illuminator 11, such as a laser light source, which generates a real image relevant to a hologram 13 not visible under normal light, on a reflecting surface 12.

The hologram 13 can contain a whatever image, as well as an image with an encoded information, such as, e.g., a standard bar code. In this case, the safety level increases, because the optical information not visible under normal light additionally is an encoded information.

The code detection is secured by means of the precise relative positioning in space of a document or object 14 onto which the hologram 13 is applied, entered in a mechanical interface 15 which can be made adaptable in order to match different shapes and dimensions of the documents and objects to be submitted to authenticity check, the illuminator 11 and a suitable device 16 for code reading, e.g., a device for static reading standard bar codes. The latter device 16 collects the image by means of its own optics and converts it into digital electrical

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signals. The digital signals are decoded and displayed on a suitable display 17, as alphanumerical characters. Said decoded signals are simultaneously sent to a data line 18, also as alphanumerical characters, in order to be submitted to a further external processing.

Additionally to the above, the optoelectronic apparatus can perform a comparison between an alphanumerical data extracted from the standard bar code, i.e., from the hologram 13, and a stored reference data. As a consequence, a suitable signal of occurred check is generated. This signal may optionally be an electric, optical, light signal or a combination thereof.

The optoelectronic apparatus can be fed with power according to two different modes. In fact, it may be fed from an external power feed, or can be provided with an internal power source 19, as shown in the accompanying figure.

The operation of the apparatus is based on the property of the hologram which, stimulated by a laser light having a suitable wavelength, generates in space an image which derives from the image stored in said hologram.

Such an image must be collected on a plane the orientation of which in space is constrained both to the inclination of the optical axis of laser light beam relatively to the surface on which the hologram is, and to the rotation of the hologram on the same surface.

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This precise geometric relation is determined by the configuration of the facility by means of which the hologram was generated.

The method for checking the document or other
5 object, to which a hologram non visible under normal light and encoded was applied, is as follows.

The document 14 bearing the hologram 13 of the above disclosed type, is manually entered into the mechanical interface 15. The purpose of the latter is
10 of facilitating the insertion and rendering it smooth and precise, until a limit element 20 is reached. Therefore, the limit element 20 defines the exact position of the document 14, relatively to the laser light source 11, i.e., it makes it possible, the
15 position of the hologram 13 which is reached by a laser light beam 11 emitted by the source 11, to be defined.

Once that the hologram 13 is illuminated, an image of the hidden code is reproduced. Such a
20 reproduction is carried out according to an optical path, indicated with 12', and the image is projected onto the reflecting surface 12.

The same reflecting surface 12 must have such characteristics, i.e., size, colour, position in
25 space, as to present to the device for static code reading 16 a full, sharp and brilliant image free from distortions.

Under such conditions, the static reading device 16 displays the image of the bar code, converting an
30 encoded sequence of black and white lines, into a

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sequence of electrical impulses.

This detection and consequent transformation are made possible by an electro-optical sensor integrated in a digital control and processing circuit contained
5 in said static device 16, which electronically performs multiple sequential scanning cycles along the middle line of the bar code, integrating the data from the single reading steps.

The data is then digitally processed and decoded
10 so as to supply at the outlet, through a connector, on the data line 18, and alphanumerical code which is the code stored in the standard bar code contained in the image. The same information, as alpha numerical data, is also available for a subsequent use by an external
15 computer.

The alphanumerical code information is additionally sent by the standard bar code reading device 16 to the display 17 which enables said code to be displayed as a sequence alphanumerical characters.
20 The code is finally compared to a stored data in order to signal, by means of a suitable signal, the occurred check of authenticity of the object.

The main advantage of the present invention is that it enables the operator to verify the
25 authenticity of documents by means of a hologram which contains a two-fold secret information, because it cannot be seen by a human eye under normal light, and is additionally is encoded as a standard bar code. As a consequence, an optical check is provided, which
30 fully performs the desired security function.

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One of the advantages of the apparatus according to the present invention is also given by the easy use which makes it possible the results to be obtained immediately. The results can furthermore be displayed
5 in different ways, e.g., they can be displayed on a suitable display or, inasmuch as the apparatus is provided with a data line leading to an external outlet, the detected data can be sent to an external computer which, when so desired, can perform further
10 checks and calculations.

A further advantage is that thanks to an adaptable mechanical interface, the apparatus can be used as well when various types of objects, and not only documents, must be checked for authenticity. In
15 fact, the apparatus can be used for authenticity checks of credit cards, paper currency, cheques, access cards, tickets and other objects the provenance or authenticity of which must be rigorously checked.

A not least advantage of the apparatus derives
20 from the embodiment thereof. In fact, such an apparatus can be applied not only when a bar code is used which is hidden and hence not visible under normal light, but also when the hidden code contained as a hologram, is of another type. When the nature or
25 the form of the hidden code is changed, also the static reading device or the sensor thereof which makes it possible such a code to be detected without need for a scanning by the light source, must be changed. This change or replacement of the whole
30 reading device, and of the sensor, can be carried out

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in such a way as not to compromise, or anyway
interfere with, the operation of the apparatus.

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C L a i m s

1. An optoelectronic apparatus and relevant method for the automatic check of authenticity of documents and objects by means of holograms constituted by an illuminator to illuminate a hologram not visible under normal light, a mechanical interface suitable for determining in space a fixed position of said object and of the hologram applied to it, a reflecting surface so arranged as to reproduce a real image relevant to the illuminated hologram and a static reading device to detect the real image, with said static reading device being connected with a display in order to display detected data relevant to the real image, with, as an outlet from the reading device, an external data line being provided.

2. Apparatus according to claim 1, characterized in that said external data line is a line which makes it possible said data relevant to the real image detected, to be transmitted to an external computer.

3. Apparatus according to claim 1, characterized in that said illuminator is a laser light source.

4. Apparatus according to claim 1, characterized in that the information contained in said hologram not visible under normal light is in the form of a standard bar code.

5. Apparatus according to claim 4, characterized in that said static reading device is a standard bar code reading device.

6. Apparatus according to claim 1, characterized in that said mechanical interface is provided with a

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limit element suitable for determining a fixed position of said hologram relatively to said illuminator and adaptable to different shapes and sizes of the documents and other objects submitted to authenticity check.

7. Apparatus according to claim 1, characterized in that said mechanical interface can be adaptable to different shapes and sizes of the documents and objects submitted to authenticity check.

10 8. Apparatus according to claim 1, characterized in that said static reading device comprises an electro-optical sensor, integrated in a digital control and processing system.

15 9. Apparatus according to claim 7, characterized in that said reading device transmits an alphanumeric code to said data line and said display.

20 10. Apparatus according to claim 1, characterized in that said apparatus is provided with an internal power supply.

11. Apparatus according to claim 1, characterized in that said apparatus is fed from an external power supply.

25 12. Method for authenticity check by means of the apparatus according to claim 1, characterized in that it comprises the following steps:

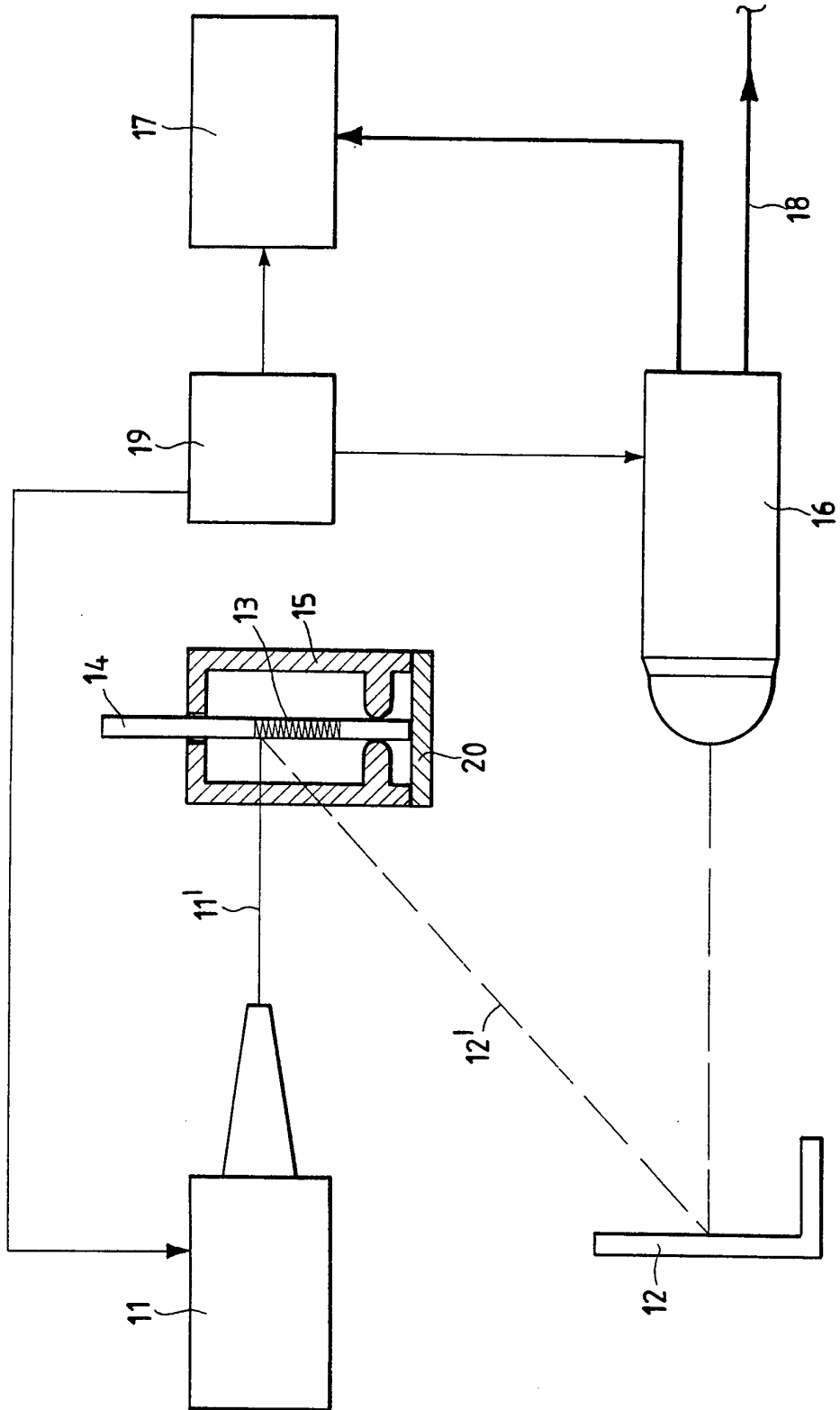
- * inserting an object bearing at least one hologram which is not visible under normal light, into a mechanical interface,
- 30 * determining a fixed position of said inserted

11.

object and said hologram, by means of a limit element said mechanical interface is provided with,

- * illuminating said hologram borne by said object,
- 5 * riproducing a real image relevant to said hologram on a reflecting surface,
- * reading of said image and detecting the information contained in it,
- * digital processing of the detected data,
- 10 * transmitting the processed data to a display and to an external data line;
- * displaying the data;
- * comparing said detected data with stored data;
- * signalling the occurred authenticity check.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP 94/02125A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 G06K19/16

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)
IPC 6 G06K

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 practical, search terms used)

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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