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(54) Title: OPTICAL SUPPORT FOR THE NON-VOLATILE MEMORISATION OF DATA AND PROCESSES FOR ITS MANUFACTURING		
(57) Abstract The invention concerns an optical support for the non-volatile memorisation of data comprising a suitably shaped base upon which at least an interference configuration obtained by holographic technique is realised.		

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OPTICAL SUPPORT FOR THE NON VOLATILE
MEMORISATION OF DATA AND PROCESSES FOR ITS
MANUFACTURING

5 The present invention relates to an optical support for the non-volatile memorisation of data, as well as to processes for its manufacturing.

More specifically, the invention relates a support of the above kind, which is writable or not, having any shape, realised by holographic technique.

10 As it is well known, in the recent years, memory supports have greatly diffused, generically included in the CD and DVD family, and compatible supports.

15 Recently, shaped memory supports, writable and not writable, have been introduced, which are always realised employing traditional techniques, or by employing suitable realisation processes using the injection moulding.

Generally speaking, well known basic technology for the manufacturing of an industrial non writable compact disc, comprises the following operative phases:

- 20
1. production of the printing matrix on the disc moulding head;
 2. assembling of the printing matrix in the disc moulding head;
 3. charging the polycarbonate grain within the reservoir, said polycarbonate being the basic material for the realisation of the product;

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 4. heating of the polycarbonate;
 5. injection of polycarbonate within the expansion head;
 6. extraction of the disc;
 7. elimination of the exceeding polycarbonate;
 8. passage to the aluminising phase;

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 9. deposition of the aluminium lamina;
 10. carrying out of a protective lacquering;
 11. eventual quality control;
 12. eventual printing or personalisation of the back of the obtained support.

35 Otherwise, the basic technology for the production of CD-R (writable) and CD-WR compact discs, also known as "gold" and "green", comprises the following operation:

1. production of the printing matrix on the disc moulding head;

2. assembling of the printing matrix in the disc moulding head;
3. charging the polycarbonate grain within the reservoir;
4. heating of the polycarbonate;
5. injection of polycarbonate within the expansion head;
- 5 6. extraction of the disc;
7. elimination of the exceeding polycarbonate;
8. passage to the dye application phase;
9. charging of the dye reservoir;
10. placing the dye layer on the disc;
- 10 11. drying of the covering dye;
12. automatic washing and trimming of the disc edge creating a reference edge preventing the correspondence of the polycarbonate disc circumference with the covering disc circumference created by the positioning of the dye;
- 15 13. deposition of the protective lacquering of the disc treated surface;
14. drying of the protective lacquering;
15. eventual surface homogeneity control;
16. passage to the gold-plating phase;
- 20 17. gold-plating (application of the gold layer)
18. eventual random quality control;
19. eventual printing or personalisation of the back.

In this situation, the Applicant has realised a new kind of optical support that is realised employing the holographic techniques, obtaining many remarkable advantages.

In fact, the optical support according to the present invention can be realised by employing as basic material any kind of material, such as paperboard, and like, easily obtainable on the market and very cheap to be bought.

Furthermore, by the solution suggested according to the present invention, employing the holographic technique for the realisation of the optical support, it is possible to produce CD by a much more economical and simpler to be realised technique.

Moreover, in case of production of optical supports compatible with the present industrially manufactured compact discs, it is not necessary to carry out all the propaedeutical operations of shaping and

incision of the "master" matrix by which compact discs are presently moulded before passing to the following alluminatura phase.

5 In fact, by the use of a holographic technique, an "impression" operation of a holographic "interference pattern" obtained from the standard disc employed for the pre-masterisation on a disc of any material suitable to the specific aim will make it superfluous the heat moulding of the disc image within the mould chamber presently used.

10 Furthermore, in case of production of optical supports compatible during writing/reading with CD-R ("gold" – "green"), C-WR, DVD, the holographic "interference pattern" will contain the information relevant to the track necessary to the right positioning of the reading/writing optical group of the masterizzatore that will be used by the final user for the writing of the disc thus obtained.

15 The impression of this interference pattern will precede or follow the deposition of the "dyeing" layer on the disc surface, so that in this case the heat moulding operation of the track is unnecessary during the moulding, always carried out by heat, of a polycarbonate disc.

20 Therefore, main object of the present invention is that of being able to produce optical supports (CD family and DVD family, and compatible) without being it necessary to use the present manufacturing systems and materials presently employed, but maintaining all the data storage capability and the optical features allowing their readability within standard readers/writers.

25 Further object of the present invention is that of manufacturing optical supports compatible during reading/writing with the standard peripheral units available to use CD ROM, CD-R, CD-WR, DVD discs, employing holographic impression techniques.

30 Another object of the present invention is that of realising holographic optical support derivatives (fragments the shape and dimensions of which can be or cannot be included in the ISO range for the validation of credit cards and optical cards, or can have any shape, said fragments maintaining all the original writability- re-writability and average readability features), employing the same manufacturing techniques for holographic optical supports modifying the geometry of the production.

35 It is therefore specific object of the present invention an optical support for the non volatile memorisation of data comprising a suitably

shaped base upon which at least an interference configuration obtained by holographic technique is realised.

5 In a preferred embodiment of the support according to the invention, different interference images are provided on a surface distinguishable varying the incidence angle or the ray frequency.

Preferably, according to the invention, said support can provide an only readable interference configuration or a writable interference configuration.

10 Furthermore, according to the invention, said base can be comprised of a rigid material, or of a flexible material, such as paper, paperboard, plastic material, ecc.

Always according to the invention, a protection layer can be provided on said holographic interference configuration.

15 In case of readable optical support, an aluminium lamina is deposited on said configuration, and then a protective lacquering is deposited.

Instead, in case a writable optical support, a dye layer is deposited on said interference configuration, then a protective lacquer layer and a gold-plating layer are deposited.

20 In a particularly preferred embodiment of the support according to the invention between the layer destined to receive the holographic interference image and the final layer destined to realise the finishing surface a material layer, also known as "dye", is interposed.

25 Still according to the invention, said interference configuration can be read and/or masterised by standard readers and/or masterisers.

Furthermore, the invention concerns a process for the realisation of an optical support for the non volatile memorisation of data, comprising the steps of:

- 30 - realising a master of the interference configuration;
- providing a support base comprised of the chosen material;
- overlapping the master on the support base;
- projecting on master and base a coherent light beam coming from a laser apparatus;
- 35 - eventually shaping said support base with the impressed holographic interference.

Preferably, according to the invention, the holographic interference configuration can be impressed by punching on a material,

either simple or composite, mechanically suitable to maintain said impression, and the material receiving the interference image will be then assembled on a support increasing its stability, stiffness and resistance to the environment wearing, eventually providing a protective lacquering layer or a protective lamination of the finished object surface.

5 Furthermore, according to the invention, said interference configuration master realisation provides the distribution of a potassium dichromate and gum arabic solution dissolved in a hydro-alcoholic solution on a very thin transparent plate, letting then the solution drying on the
10 plate within a dark room, and then the overlapping of the plate on a CD sample, making the treated plate surface coinciding with the CD surface opposed with respect to the metalised one.

Still according to the invention, said interference configuration master realisation provides the realisation of a glass "master", preferably
15 obtained by the standard laser incision technique usually employed during the manufacturing phase of a mould in an optical disc factory, and treating the master thus obtained in such a way to make it electro-conductive, preferably by silvering, and thus depositing by electroplating a sufficiently thick (about 1 mm) metal layer on the silvered master, said first nickel
20 mould being used either directly to obtain copies of the original hologram by a pressure printing (punching) on a thin aluminised plastic layer previously assembled on a sufficiently rigid support, or it can be used to obtain matrixes on the base, an entire series of copies of the same mould can be produced, each one of which will be possibly used to produce
25 copies of the original hologram.

Now, punched holograms are obtained by punching employing a printing matrix comprised of a material suitably realised to this end and comprised of at least two layers, one of which acts as real support and it is destined to receive the punched image, and the other one is comprised of
30 a high resistance plastic material or polymer, usually a transparent material provided with the necessary dimensional stability, resistance, chemical inertia and time optical stability features.

In the following, two examples to exploit the process for the realisation of optical supports according to the are described for
35 illustrative, but not limitative purposes.

EXAMPLE I

Starting from a standard CD containing data tracks an holographic optical support is obtained, working by employing a 3 Watt red light helium/neon laser apparatus, a very thin transparent layer, an gum arabic and potassium dichromate solution dissolved within a hydro-alcoholic solution, a hydro-alcoholic solution development bath, and a standard CD-ROM containing data tracks.

An gum arabic and potassium dichromate solution dissolved within a hydro-alcoholic solution has been distributed on a very thin transparent plate, letting then the solution drying on the plate in a dark room. Afterwards, the plate has been superimposed on the standard CD, making the treated surface of the plate coinciding with the CD surface opposed with respect to the metalised one.

Afterwards, a coherent light beam coming form the laser apparatus has been projected on the treated plate and on the underlying CD. After the exposition, the plate has been exposed to the standard development, fixing and exsiccation operations.

In this way a holographic interference imagine of the sample CD has been obtained.

Afterwards, a precise cut of the plate has been realised, thus obtaining from the same a surface analogous to the sample CD, circumscribing the zone containing the interference image. This plate has been introduced within a standard compact disc reader, proceeding thus to the reading of the holographic image of the sample CD.

EXAMPLE II

Starting from a "glass" master, obtained by the standard laser incision techniques usually employed during the production phase of the mould in an optical disc factory, a glass matrix containing the interference image (hologram) of the same master has been obtained.

Master was then treated in such a way to make it electro-conductive by silvering.

On the silvered master a sufficiently thick (about 1 mm) nickel layer was deposited by electroplating. Afterwards, the nickel disc has been detached from the silvered glass matrix.

First nickel mould obtained was used to realise copies of the original hologram by a pressure printing (punching) on a thin aluminised plastic film previously assembled on a sufficiently rigid support.

It is well evident that a holographic optical support thus obtained is able to generate a virtual image of the object panned when lightened by an outer light source, also in case said light is not coherent on a particular frequency.

- 5 The present invention has been described for illustrative but not limitative purposes, according to its preferred embodiments, but it is to be understood that modifications and/or changes can be introduced by those skilled in the art without departing from the relevant scope as defined in the enclosed claims.

CLAIMS

- 5 1. Optical support for the non volatile memorisation of data characterised in that it comprises a suitably shaped base upon which at least an interference configuration obtained by holographic technique is realised.
2. Optical support according to claim 1, characterised in that different interference images are provided on a surface distinguishable varying the incidence angle or the ray frequency.
- 10 3. Optical support according to claim 1 or 2, characterised in that said support provides an only readable interference configuration or a writable interference configuration.
4. Optical support according to claim 1, 2 or 3, characterised in that said base is comprised of a rigid material, or of a flexible material, such as paper, paperboard, plastic material, ecc.
- 15 5. Optical support according to one of the preceding claims, characterised in that a protection layer is provided on said holographic interference configuration.
6. Optical support according to one of the preceding claims, characterised in that in case of readable optical support, an aluminium lamina is deposited on said configuration, and then a protective lacquering is deposited.
- 20 7. Optical support according to one of the preceding claims 1 - 5, characterised in that in case a writable optical support, a dye layer is deposited on said interference configuration, then a protective lacquer layer and a gold-plating layer are deposited.
- 25 8. Optical support according to one of the preceding claims, characterised in that between the layer destined to receive the holographic interference image and the final layer destined to realise the finishing surface a material layer, also known as "dye", is interposed.
- 30 9. Optical support according to one of the preceding claims, characterised in that said interference configuration is read and/or masterised by standard readers and/or masterisers.
10. Process for the realisation of an optical support for the non volatile memorisation of data, comprising the steps of:
- 35 - realising a master of the interference configuration;
- providing a support base comprised of the chosen material;
- overlapping the master on the support base;

- projecting on master and base a coherent light beam coming from a laser apparatus;
- eventually shaping said support base with the impressed holographic interference.

5 11. Process according to claim 10, characterised in that the holographic interference configuration is impressed by punching on a material, either simple or composite, mechanically suitable to maintain said impression.

10 12. Process according to claim 11, characterised in that, the material receiving the interference image is assembled on a support increasing its stability, stiffness and resistance to the environment wearing.

15 13. Process according to claim 11 or 12, characterised in that a protective lacquering layer or a protective laminated of the finished object surface is provided.

20 14. Process according to claim 10, characterised in that said interference configuration master realisation provides the distribution of a potassium dichromate and gum arabic solution dissolved in a hydro-alcoholic solution on a very thin transparent plate, letting then the solution drying on the plate within a dark room, and then the overlapping of the plate on a CD sample, making the treated plate surface coinciding with the CD surface opposed with respect to the metallised one.

25 15. Process according to claim 10, characterised in that said interference configuration master realisation provides the realisation of a glass "master", preferably obtained by the standard laser incision technique usually employed during the manufacturing phase of a mould in an optical disc factory, and treating the master thus obtained in such a way to make it electro-conductive, preferably by silvering, and thus depositing by electroplating a sufficiently thick (about 1 mm) metal layer on
30 the silvered master, said first nickel mould being used either directly to obtain copies of the original hologram by a pressure printing (punching) on a thin aluminised plastic layer previously assembled on a sufficiently rigid support, or it can be used to obtain matrixes on the base, an entire series of copies of the same mould can be produced, each one of which will be
35 possibly used to produce copies of the original hologram.

16. Process according to claim 15, characterised in that said glass master is obtained by the standard laser incision techniques

normally employed during the production phase of a mould in an optical disc factory.

5 17. Optical support for the non volatile memorisation of data according to each one of the claims 1 – 9, substantially as illustrated and described.

18. Process for the realisation of an optical support for the non volatile memorisation of data according to each one of the claims 8 – 17, substantially as illustrated and described.

INTERNATIONAL SEARCH REPORT

International Application No

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A. CLASSIFICATION OF SUBJECT MATTER IPC 6 G11B7/00		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
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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)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
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Information on patent family members

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