TRANSLATION

D E S C R I P T I O N

"OPTICAL DISK STRUCTURE, METHOD OF MUNUFACTURING THE SAME, AND APPARATUS FOR MANUFACTURING THE SAME"

Technical Field

The present invention relates generally to a recording medium for use in recording/reproducing audio information, video information or ordinary data, and more particularly to an optical disk structure capable of recording/reproducing signals by means of light, a method of manufacturing the optical disk structure and an apparatus for manufacturing the optical disk structure.

Background Art

There is known an optical disk constructed so that recorded signals are reproduced by means of a laser beam. In an example of this type of optical disk, signal recording areas are provided on both sides of the disk.

Recently, a small-sized video disk (with a diameter of about 12 cm) for high-density recording has been developed. In the small-sized, high-density video disk, most of a flat portion of the disk extending from a central hole to a recording start region is used as a clamp zone (to be clamped and held by a disk holding mechanism). Thus, the flat portion functions as a reference surface of the disk in relation to the optical system when the disk is mounted on a turntable and

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clamped by a clamper.

If a conventional label is attached to this disk as indication means, the following problems (a) and (b) will occur:

a) Because of a tilt (inclination) tolerance angle of the disk is required very small, even if the disk is slightly inclined, the quality of a reproduced signal is greatly degraded. If the above-mentioned indication means is used, the disk tends to be easily inclined due to a sheet attached to the clamp zone or unevenness of printed ink, etc.

b) A sheet is attached, or ink, etc. is printed, on a limited area of the clamp zone of the disk. When the disk is mounted on the turntable and held by the clamper, the clamper may cause damage to the indication surface due to a slip which occurs, in particular, at the time of start of the operation. As a result, the indication may become unclear, the reference surface of the clamp zone may be inclined, or the indication means may be removed.

An object of the invention is to provide an optical disk structure wherein indication means provided on flat surfaces surrounding a central hole in a disk can maintain a clear, stable indication state, a method of manufacturing the optical disk structure, and an apparatus for manufacturing the same.

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an optical disk structure wherein the clear, stable indication state can be maintained and, even if the indication means is provided, reference surfaces to be clamped are not adversely affected, a method of manufacturing the optical disk structure, and an apparatus for manufacturing the same.

Disclosure of the Invention

In order to achieve the objects, there is provided an optical disk structure in which first and second optical disks having annular light transmissive disk substrates with a common central hole, one of surfaces of at least one of which light transmissive disk substrates is provided with a reflection film, are attached to each other as one body with an adhesive layer interposed, such that the reflection film is opposed to the adhesive layer, thereby forming a compound optical disk, the optical disk structure comprising:

an inner surface of a portion of at least one of the light transmissive disk substrates, the portion facing a clamper and being located around the central hole;

indication means provided on the inner surface by means of one of printing and attachment; and

the adhesive layer with light shielding properties, provided between the indication means and the other of the light transmissive disk substrates.

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According to this means, the printed or attached indication means is located inside the disk. Thus, the indication means is not removed or damaged by friction, etc. between the disk and a clamper or a turntable, and clear indication is maintained. In particular, since the adhesive layer provided in the region of the indication means has light shield properties, the indicated matter does not become less visible due to light from the back side.

According to this invention, there is also provided an optical disk structure in which first and second optical disks having annular light transmissive disk substrates with a common central hole, one of surfaces of at least one of which light transmissive disk substrates is provided with a reflection film, are attached to each other as one body with an adhesive layer interposed, such that the reflection film is opposed to the adhesive layer, thereby forming a compound optical disk, the optical disk structure comprising:

a recess portion recessed in a thickness direction in a portion of at least one of the light transmissive disk substrates around the central hole; and

indication means provided on a bottom surface of the recess portion by means of one of printing and attachment.

According to this means, the printed or attached indication means is provided from the reflection film

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side between the attached disks. Thus, even if the flat portions surrounding the central hole are used as clamp zones functioning as reference surfaces, the influence of the indication means does not occur. The indication means is not removed or damaged by friction, etc. between the disk and a clamper or a turntable, and clear indication is maintained. In particular, the indication means is printed or attached to the bottom of the recess portion. Thus, even if there is a variance in thickness in printed matter or sheet, the variance does not deform the clamp zones.

Brief Description of the Drawings

FIG. 1A is a plan view of a compound optical disk according to an embodiment of the present invention;

FIG. 1B is a cross-sectional view of the compound optical disk shown in FIG. 1A;

FIG. 1C is a partially enlarged view of the compound optical disk shown in FIG. 1B;

FIG. 1D shows a relationship between the compound optical disk and a clamper;

FIG. 2 is a cross-sectional view showing a main part of a compound optical disk according to another embodiment of the invention;

FIG. 3 is a cross-sectional view showing a main part of a compound optical disk according to still another embodiment of the invention;

FIG. 4 is a cross-sectional view showing a main

part of a compound optical disk according to still another embodiment of the invention;

FIG. 5 is a cross-sectional view showing a main part of a compound optical disk according to still another embodiment of the invention;

FIG. 6 is a cross-sectional view showing a main part of a compound optical disk according to still another embodiment of the invention;

FIG. 7 is a cross-sectional view showing a main part of a compound optical disk according to still another embodiment of the invention;

FIG. 8A is a plan view of a compound optical disk according to another embodiment of the invention;

FIG. 8B is a cross-sectional view of the compound optical disk shown in FIG. 8A;

FIG. 8C is a partially enlarged view of the compound optical disk shown in FIG. 8B;

FIG. 9 is a cross-sectional view showing a main part of a compound optical disk according to another embodiment of the invention;

FIG. 10 is a cross-sectional view showing a main part of a compound optical disk according to still another embodiment of the invention;

FIG. 11A is a plan view of a compound optical disk according to another embodiment of the invention;

FIG. 11B is a cross-sectional view of the compound optical disk shown in FIG. 11A;

FIG. 12A is a plan view of a compound optical disk according to another embodiment of the invention;

FIG. 12B is a cross-sectional view of the compound optical disk shown in FIG. 12A;

FIG. 13A illustrates steps of a method of manufacturing a compound optical disk, according to an embodiment of the invention;

FIG. 13B illustrates steps of a method of manufacturing a compound optical disk, according to another embodiment of the invention;

FIG. 14A shows an apparatus for manufacturing a compound optical disk according to an embodiment of the invention;

FIG. 14B shows an apparatus for manufacturing a compound optical disk according to another embodiment of the invention;

FIG. 15 illustrates advantages of the compound optical disks of the present invention;

FIG. 16 is a graph showing measured tilt values for explaining the advantages of the invention; and

FIG. 17 is a graph showing measured tilt values for explaining the advantages of the invention.

Best Mode of Carrying Out the Invention

Embodiments of the present invention will now be described with reference to the accompanying drawings.

FIGS. 1A to 1D show an embodiment of the present invention. FIG. 1A is a plan view, FIG. 1B is

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a cross-sectional view and FIG. 1C is a partially enlarged view. First and second optical disks 11 and 12 have a common central hole 10 of the same diameter. The first and second optical disks 11 and 12 include annular light transmissive disk substrates 11a and 12a, respectively. One surface of the disk substrate 11a and one surface of the disk substrate 12a have reflection films 11b and 12b. Protection films 11c and 12c are provided on upper surfaces of the reflection films 11b and 12b. The first and second optical disks 11 and 12 are attached to each other as one body with an adhesive layer 13 interposed, such that their reflection films 11b and 12b are opposed to each other. Thus, the first and second optical disks 11 and 12 constitute a compound optical disk 100.

FIG. 1A shows the external appearance of the compound optical disk 100. The disk 100 includes, from the outer peripheral side to the inner peripheral side, a non-signal region 101, a signal recording region 102, a clamp region 103, an edge portion 104, and the central hole 10. In the case of this compound optical disk 100, the clamp region 103 functions also as indication section. The indication section is constituted such that indication members 11d and 12d are provided on the inside of the regions of the light transmissive disk substrates 11a and 12a which correspond to the clamp region 103. The indication members 11d and 12d show

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characters, figures, signs, etc. which can be recognized from the outside surfaces of the compound optical disk 100.

The materials and dimensions of the respective elements of the compound optical disk 100 will now be described.

The light transmissive disk substrates 11a and 12a are formed of, e.g. polycarbonate, acrylic resin, or glass material. The adhesive layer 13 is formed of hot melt (e.g. PPET2009 manufactured by TOA GOSEI KAGAKU KOGYO) with a thickness of about 10 to 30 μm. The optical reflection films 11b and 12b are formed of aluminum, etc. with a thickness of about 0.1 μm. The protection films 11c and 12c are formed of, e.g. ultraviolet-curing coating material (e.g. SK500 manufactured by SONY CHEMICAL) with a thickness of about 5 to 15 μm. Preferably, the adhesive layer 13 should have moisture-proof properties.

The indication members 11d and 12d are formed by attaching labels printed on sheets or by effecting direct printing on the disk substrates. Alternatively, the indication members 11d and 12d can be formed by means of coating or cutting.

The adhesive provided between the indication members 11d and 12d has light shield properties. If the adhesive passes light, the characters or figures on the indication members become less visible.

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According to the above-described disk, indication means formed by printing or attaching sheets are located inside the disk. Thus, the indication means is not removed or damaged by friction, etc. between the disk and a clamper or a turntable, and clear indication is maintained. In particular, since the adhesive layer provided in the region of the indication means has light shield properties, the indicated matter does not become less visible due to light from the back side. Therefore, characters or figures indicated by the indication members are clearly viewed.

FIG. 1D shows the state in which the compound optical disk 100 is mounted on a turntable 121 and the clamp region of the disk is held by a clamper 120.

The following consideration should be given in providing the indication members 11d and 12d. When the indication members 11d and 12d are printed, if offset printing is adopted, the thickness of each indication member can be limited to about 15 μm even in the case of multi-color printing. However, if generally used silk printing is adopted and the number of colors is increased, the thickness becomes 40 to 50 μm or more.

To solve the above problem, recess portions 11e and 12e may be formed in the light transmissive disk substrates 11a and 12a from the back side as indication member forming portions, and the indication members 11d and 12d may be embedded in the recess portions 11e

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and 12e, as shown in FIGS. 2 and 3. Thereby, printing with greater thickness can easily be performed and a high indication effect can be exhibited.

In many cases, a boundary portion between a stamper (for forming signal pits during manufacture) and a stamper holder is provided at a position between a clamp zone and a beginning portion of a signal recording region. At the same time, annular projections 11f and 12f are provided at the boundary portion. The annular projections 11f and 12f are formed to protect signal surfaces when manufactured disks are stacked.

When the disk with the annular projections 11f and 12f is formed, the disk substrates 11a and 12a are formed by using a mold having a projection on the side corresponding to the inner surface of each substrate. Thus, the recess portions 11e and 12e can be easily formed simultaneously with the formation of the annular projections 11f and 12f, without providing special manufacturing steps.

In the above embodiments, the first and second disks 11 and 12 have protection films 11c and 12c. In the case of the compound optical disk 100 of this invention, the first and second disks 11 and 12 are formed as one body with the adhesive layer 13 interposed, such that their reflection films 11b and 12b are opposed to each other. Thus, as shown in FIGS. 4 and 5, the

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protection films 11c and 12c may be omitted. Thereby, the steps of manufacturing the protection films 11c and 12c may be omitted. In the embodiments of FIGS. 4 and 5, the protection films in the embodiments of FIGS. 2 and 3 are omitted. In each embodiment, common parts are indicated by like reference numerals and a description thereof is omitted.

According to the optical disk of this invention, the label means is provided by printing or attachment of sheets on the reflection film side between the mutually attached disks. Accordingly, even if the outer surfaces of the optical disk are used as clamp zones serving as reference surfaces, there is no influence due to the label means. The label means is not removed or damaged by friction, etc. between the disk and the clamper or turntable. Clear indication can be maintained.

Indicated matter of the indication section includes an identification mark of "side A" and "side B", the title of recorded information (e.g. characters of the title, figures), the name of a manufacturer, the manufacturing number, etc.

In FIGS. 2 to 5, the edges of the recess portions 11e and 12e are sharply defined. However, as shown in FIGS. 6 and 7, the edges of the recess portions 11e and 12e may be curved.

The present invention is not limited to the above

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embodiments.

FIG. 8A is a plan view, FIG. 8B is a cross-sectional view and FIG. 8C is a partially enlarged view. First and second optical disks 11 and 12 have a common central hole 10 of the same diameter. The first and second optical disks 11 and 12 include annular light transmissive disk substrates 11a and 12a, respectively. One surface of the disk substrate 11a and one surface of the disk substrate 12a have reflection films 11b and 12b. Protection films 11c and 12c are provided on upper surfaces of the reflection films 11b and 12b. The first and second optical disks 11 and 12 are attached to each other as one body with an adhesive layer 13 interposed, such that their reflection films 11b and 12b are opposed to each other. Thus, the first and second optical disks 11 and 12 constitute a compound optical disk 100.

FIG. 8A shows the external appearance of the compound optical disk 100. The disk 100 includes, from the outer peripheral side to the inner peripheral side, a non-signal region 101, a signal recording region 102, a clamp region 103, an edge portion 104, and the central hole 10. In the case of this compound optical disk 100, the clamp region 103 functions also as indication section. The indication section is constituted such that indication members 11d and 12d are provided on the inside of the regions of the light transmissive disk

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substrates 11a and 12a which correspond to the clamp region 103. The indication members 11d and 12d show characters, figures, signs, etc. which can be recognized from the outside surfaces of the compound optical disk 100.

In this disk, annularly projecting lens portions 11x and 12x are formed on portions of the outer surfaces of the clamp region 103 so that indicated matter on the indication members 11d and 12d can be viewed enlargedly.

The materials and dimensions of the respective elements of the compound optical disk 100 are the same as those in the preceding embodiments.

The following consideration should be given in providing the indication members 11d and 12d. When the indication members 11d and 12d are printed, if offset printing is adopted, the thickness of each indication member can be limited to about 15 μm even in the case of multi-color printing. However, if generally used silk printing is adopted and the number of colors is increased, the thickness becomes 40 to 50 μm or more.

To solve the above problem, recess portions 11e and 12e may be formed in the light transmissive disk substrates 11a and 12a from the back side as indication member forming portions, and the indication members 11d and 12d may be embedded in the recess portions 11e and 12e, as shown in FIGS. 9 and 10. Thereby, printing with greater thickness can easily be performed and

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a high indication effect can be exhibited.

In many cases, a boundary portion between a stamper (for forming signal pits during manufacture) and a stamper holder is provided at a position between a clamp zone and a beginning portion of a signal recording region. At the same time, annular projections are provided at the boundary portion. The annular projections are formed to protect signal surfaces when manufactured disks are stacked. When the disk with the annular projections is formed, the disk substrates 11a and 12a are formed by using a mold having a projection on the side corresponding to the inner surface of each substrate. Thus, the recess portions 11e and 12e can be easily formed simultaneously with the formation of the annular projections, without providing special manufacturing steps. In addition, if the annular projections are formed to serve also as lens portions 11x and 12x, there is no need to add steps for forming the lens portions 11x and 12x.

The present invention is not limited to the above embodiments and various modifications can be made. In the above embodiments (FIGS. 8C and 9), the first and second disks 11 and 12 have protection films 11c and 12c. In the case of the compound optical disk 100 of this invention, the first and second disks 11 and 12 are formed as one body with the adhesive layer 13 interposed, such that their reflection films 11b and 12b are opposed

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to each other. Thus, as shown in FIG. 10, the protection films 11c and 12c may be omitted. Thereby, the steps of manufacturing the protection films 11c and 12c may be omitted.

In the above embodiments, the outer surface portions of the indication means are used as clamp region, the lens portions 11x and 12x are formed on the outer peripheral side of the indication means. However, needless to say, the lens portions 11x and 12x may be formed on the inner peripheral side, for example, as indicated by dotted lines. The positions and number of lens portions may be freely chosen in accordance with the indication means. It is possible, therefore, that a plurality of lens portions are formed on the outer surface side of the indication means and on the inner and outer peripheral sides of the indication means and the regions between the lens portions are used as clamp regions for holding the disk. If such clamp regions are used, the clamper is automatically situated between the lens portions, and the disk can be advantageously positioned in a reproducing apparatus. In each embodiment, common parts are indicated by like reference numerals and a description thereof is omitted.

According to the optical disk of this invention, the label means is provided by printing or attachment of sheets on the reflection film side between the mutually attached disks. Accordingly, even if the

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outer surfaces of the optical disk are used as clamp zones serving as reference surfaces, there is no influence due to the label means. The label means is not removed or damaged by friction, etc. between the disk and the clamper or turntable. Clear indication can be maintained. In particular, according to the disk of this invention, the indicated matter can be easily viewed from the outside by virtue of the lens portions 11x and 12x.

FIGS. 11A and 11B show still another embodiment of the optical disk of the invention.

FIG. 11A is a plan view and FIG. 11B is a cross-sectional view. In this embodiment, additional label means is provided on the outer peripheral side. In the preceding embodiments, the indication members 11d and 12d are provided on the inner peripheral side. However, indications members 11g and 12g may be provided on the outer peripheral side, too.

FIGS. 12A and 12B show still another embodiment of the optical disk of the invention.

FIG. 12A is a plan view and FIG. 12B is a cross-sectional view. In the case of the disk of this embodiment, information can be read out from one side only. Recording signals are recorded on the second disk 12 alone, and the first disk 11 comprises a transparent substrate alone. In this case, a large indication member 11h may be provided on the inner

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surface of the first disk 11.

A method of manufacturing the above-described optical disks will now be described.

FIG. 13A illustrates manufacturing steps of a method according to an embodiment of the invention, and FIG. 13B illustrates manufacturing steps of a method according to another embodiment of the invention.

A compound optical disk according to this invention comprises first and second optical disks. Each optical disk has an annular light transmissive disk substrate with a central hole. A reflection film is provided on one side of the disk substrate. The first and second optical disks are attached to each other as one body with an adhesive layer interposed, such that their reflection films are opposed to each other. Indication means is printed or attached from the reflection film side in the region surrounding the central hole. The attachment step is performed after an indication means providing step, e.g. a label printing step.

Specifically, in FIG. 13A, a mold (generally called "stamper") provided in advance with pits representing recording information is attached to a resin molding machine such as an injection molding machine. Then, a disk of a transparent plastic material such as polycarbonate or acrylic resin, on which pits of the stamper are exactly transferred, is obtained (step S11). A metal such as aluminum is deposited by sputtering or

vacuum deposition on that surface of the disk, which is provided with the pits, thereby forming a reflection film (step S12). Subsequently, an ultraviolet-curing resin, etc. is coated by a spinner, etc. on the surface of the reflection surface, thereby forming a protection film for protecting the reflection surface against damage or oxidation (step S13). In this manner, the first and second disks are formed and labels are printed on predetermined areas (inside of the clamp regions) (step S14). After the printing, the disks are attached to each other (step S15). In the attachment step, a thermoplastic adhesive called "hot melt" is coated by a roll coater, etc. on the attachment surfaces of the disks. The attachment surfaces with the adhesives are abutted upon each other and pressed on each other under pressure, thus forming a single compound optical disk. In the embodiment shown in FIG. 13B, the step of forming the protection film is omitted.

In a method and apparatus for manufacturing the optical disk of the present invention, the following techniques are applicable, in particular, to the step of attaching two disks.

As shown in FIG. 14A, an attaching (pressing) apparatus comprises upper and lower disk-like pressing plates 210 and 220 having diameters substantially equal to or greater than those of the disks. Disk-like elastic members 211 and 221 for pressing the outer

surfaces of the first and second disks are provided on the inner surfaces of the pressing plates 210 and 220. The first and second disks 11 and 12 sandwiching the adhesive layer 13 are transferred to the space between the elastic members 211 and 221. The lower pressing plate 220 is fixed on a support table (not shown), and the upper pressing plate 210 is attached to a vertical movement mechanism. The vertical movement mechanism gradually lowers to clamp the disk structure.

Portions 21a and 22a of the elastic members 211 and 221, which correspond to the indication members 11d and 12d of the disks, are formed of a material different from the material of the other portions 21b and 22b. Specifically, the portions corresponding to the indication members are formed of a relatively soft material such as silicone rubber (e.g. hardness: JISA40), and the other portions, excluding the indication members, are formed of a relatively hard material such as EP rubber (e.g. hardness: JISA65).

In this embodiment, the proper pressure in the attachment step was 2-3 kg/cm^2 and the proper pressing time was about 3 seconds, in the case of a 120 mm disk.

The pressing apparatus is not limited to the above, and the same advantages are obtainable with an apparatus shown in FIG. 14B.

In this embodiment, annular recess portions 21d and 22d (about 0.1 mm deep) are formed in those

disk-side portions of the pressing plates 210 and 220, which correspond to the indication members. Elastic sheets (e.g. CIEGAL 7355-OFF 1.35 mm: manufactured by DAIICHI REISU) are interposed between the disks, on the one hand, and the pressing plates 210 and 220, on the other. In this state, the disk structure is pressed, as in the preceding embodiments. The same advantages as in the preceding embodiments are obtainable with this method and apparatus.

The pressing force on the indication members is made less than that on the other portions for the following reason. Printing is effected on the indication members by means of a screen printing method, or a stamping method. After the ink is dried up. For example, if an ultraviolet-curing ink is used, the ink is cured by ultraviolet after printing. An adhesive such as hot melt is coated by means of a roll coater, etc. on the two disks. Those surfaces of the disks, which are coated with the adhesives, are abutted upon each other and pressed on each other. The thickness of the indication member increases by a degree corresponding to the thickness of the ink layer, resulting in unevenness due to characters, etc. printed in ink. If the disks are pressed by elastic members with uniformly high hardness, the unevenness appears on the outer surfaces of the indication members of the disks. As described above, in the case of small disks, the regions

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of the indication members serve as clamp regions. The clamp regions are used as reference surfaces and need to have high flatness. In the present invention, the structure of the elastic members or the structure of the pressing plates are devised so that the unevenness does not appear on the outer surfaces of the indication members.

FIG. 15 is a table showing comparison results of tilts between the case (inner surface printing) where a label (thickness: 50 μm; area: 3 mm^2) is printed on about half the entire circumference of the clamp area, as in the present invention, and the conventional case (outer surface printing). FIGS. 16 and 17 are graphs in which variations in tilt are plotted from 22 mm in radius to 58 mm in radius of a spiral (a measuring device is radially moved while the disk is being rotated). FIG. 16 shows the case of a disk of inner surface printing, and FIG. 17 shows the case of an outer surface printing. In FIG. 15, "r" indicates the radial position on the disk, and "range" is a variation range of tilt in one rotation of the disk, as measured at 30 mm in radius and at 50 mm in radius.

As can be seen from the table and graphs, the variation range is much smaller in the case of the inner surface printing, which is adopted in the present invention. The tilt of the disk hardly occurs, and the excellent signal reproduction can be performed in the

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case of using a high recording density disk.

As has been described above, according to the present invention, the indication means buried inside the disk at the portion surrounding the central hole can maintain a clear, stable indication state. In addition, the indication means does not adversely affect the reference surfaces for clamping.

Industrial Applicability

This invention is effectively used in the field of utilizing and manufacturing a recording/reproducing apparatus for an optical disk, and manufacturing and saling an optical disk.

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1. An optical disk structure in which first and second optical disks having annular light transmissive disk substrates (11, 12) with a common central hole (10), one of surfaces of at least one of which light transmissive disk substrates is provided with a reflection film (11b, 12b), are attached to each other as one body with an adhesive layer (13) interposed, such that said reflection film is opposed to said adhesive layer, thereby forming a compound optical disk (100), said optical disk structure comprising:

an inner surface of a portion (103) of at least one of said light transmissive disk substrates (11a, 12a), said portion facing a clamper and being located around the central hole (110);

indication means (11b) provided on said inner surface by means of one of printing and attachment; and

said adhesive layer (13) with light shielding properties, provided between said indication means (11b) and the other of the light transmissive disk substrates.

2. An optical disk structure in which first and second optical disks having annular light transmissive disk substrates (11, 12) with a common central hole (10), one of surfaces of at least one of which light transmissive disk substrates is provided with a reflection film (11b, 12b), are attached to each

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other as one body with an adhesive layer (13) interposed, such that said reflection film is opposed to said adhesive layer, thereby forming a compound optical disk (100), said optical disk structure comprising:

a recess portion (11e, 12e) recessed in a thickness direction in a portion of at least one of the light transmissive disk substrates (11a, 12a) around said central hole; (10) and

indication means (11d, 12d) provided on a bottom surface of said recess portion (11e, 12e) by means of one of printing and attachment.

3. The optical disk structure according to claim 2, wherein protection films (11c, 12c) are formed on upper surfaces of said reflection films (11b, 12b) of the first and second optical disks (11, 12), and said adhesive layer (13) is interposed between the protection films.

4. The optical disk structure according to claim 2, wherein said adhesive layer (13) is directly situated on the reflection films of the first and second optical disks (11, 12).

5. The optical disk structure according to claim 2, wherein annular projections (11f, 12f) are formed on outer peripheries of the indication means and on outer surfaces of the light transmissive disk substrates, and recess portions are formed in inner surfaces of the

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light transmissive disk substrates so as to correspond to said projections.

6. The optical disk structure according to claim 2, wherein an outer surface of the portion in which the indication means (11e, 12e) is provided is a clamp region (103) for holding the disk.

7. The optical disk structure according to claim 2, wherein said indication means (11e, 12e) is formed such that one of at least one character and at least one sign representing at least a title of recorded information is visible from the outside of the disk structure.

8. An optical disk structure in which first and second optical disks (11, 12) having annular light transmissive disk substrates (11a, 12a) with a common central hole (10), one of surfaces of at least one of which light transmissive disk substrates is provided with a reflection film (11b, 12b), are attached to each other as one body with an adhesive layer (13) interposed, such that said reflection film is opposed to said adhesive layer, thereby forming a compound optical disk,

wherein indication means (11d, 12d) is provided by one of printing and attachment from the reflection film (11b, 12b) side of at least one of the first and second optical disks within the disk at a portion surrounding the central hole (10), and a projecting lens portion (11x, 12x) is formed on a portion of an outer surface of the portion surrounding the central hole (10) and

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corresponding to the indication means (11d, 12d), and

a substantially flat clamp region (103) is provided adjacent to the lens portion (11x,12x).

9. The optical disk structure according to claim 8, wherein said lens portion (11x, 12x) is formed in an annular shape on said outer surface and is situated on an inner peripheral side of said indication means (11d, 12d).

10. The optical disk structure according to claim 8, wherein said lens portion (11x, 12x) is formed in an annular shape on said outer surface and is situated on an outer peripheral side of said indication means (11d, 12b).

11. The optical disk structure according to claim 8, wherein a region adjacent to said lens portion (11x, 12x) is a clamp region for holding the disk.

12. The optical disk structure according to claim 8, wherein a plurality of said lens portions (11x, 12x) are provided on said outer surface and on the inner and outer peripheral sides of the indication means, and a region between the lens portions on the inner and outer peripheral sides is a clamp region.

13. A method of manufacturing an optical disk comprising:

a step (S11) of forming light transmissive disk substrates (11a, 12a) having a common central hole (10) and recording regions in radially intermediate regions,

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pits representing recording information being transferred onto said recording regions by means of a stamper;

a step (S12) of providing reflection films (11b, 12b) on those surfaces of the light transmissive disk substrates (11a, 12a) which are provided with said pits;

a step (S14) of providing an indication member (11e, 12e) by one of printing and attachment on at least one of those sides of the light transmissive disk substrates (11a, 12a), which are provided with said reflection films (11b, 12b), and on a portion facing a clamp region around said central hole (10); and

a step (S15) of attaching the first and second optical disks (11, 12) with the indication member (11e, 12e) to each other as one body by means of an adhesive (13) such that the reflection films (11b, 12b) are opposed to each other.

14. A method of manufacturing an optical disk comprising:

a step (S11) of forming light transmissive disk substrates (11a, 12a) having a common central hole and recording regions in radially intermediate regions, pits representing recording information being transferred onto said recording regions by means of a stamper;

a step (S12) of providing reflection films (11b, 12b) on those surfaces of the light transmissive disk substrates (11a, 12a) which are provided with said pits;

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a step (S13) of providing protection films (11c, 12c) on upper surfaces of the reflection films (11b, 12b);

a step (S14) of providing an indication member (11e, 12e) by one of printing and attachment on at least one of those sides of the light transmissive disk substrates (11a, 12a), which are provided with said protection films (11c, 12c), and on a portion facing a clamp region around said central hole (10); and

a step (S15) of attaching first and second optical disks with the indication member (11e, 12e) to each other as one body by means of an adhesive (13) such that the reflection films (11b, 12b) are opposed to each other.

15. A method of manufacturing an optical disk comprising:

a step (S11) of forming light transmissive disk substrates (11a, 12a) having a common central hole (10) and recording regions in radially intermediate regions, pits representing recording information being transferred onto said recording regions by means of a stamper, and forming a recess portion (11d, 12d) recessed in a thickness direction in a portion of at least one of the light transmissive disk substrates (11a, 12b) around said central hole (10);

a step (S12) of providing reflection films (11b, 12b) on those surfaces of the light transmissive disk

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substrates (11a, 12a) which are provided with said pits;

a step (S14) of providing an indication member (11e, 12e) by one of printing and attachment on a bottom surface of said recess portion (11d, 12d) in at least one of the light transmissive disk substrates (11a, 12a), which are provided with said reflection films (11b, 12b); and

a step of attaching first and second optical disks (11, 12) having the indication member (11e, 12e) to each other as one body by means of an adhesive such that the reflection films are opposed to each other.

16. A method of manufacturing an optical disk comprising:

a step (S11) of forming light transmissive disk substrates (11a, 12a) having a common central hole (10) and recording regions in radially intermediate regions, pits representing recording information being transferred onto said recording regions by means of a stamper, and forming a recess portion (11d, 12d) recessed in a thickness direction in a portion of at least one of the light transmissive disk substrates (11a, 12a) around said central hole (10);

a step (S12) of providing reflection films (11b, 12b) on those surfaces of the light transmissive disk substrates which are provided with said pits;

a step (S13) of providing protection films

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(11c, 12c) on upper surfaces of the reflection films (11d, 12d);

a step (S14) of providing an indication member (11e, 12e) by one of printing and attachment on a bottom surface of said recess portion (11d, 12d) in at least one of the light transmissive disk substrates (11a, 12a), which are provided with said protection films (11a, 12a); and

a step (S15) of attaching first and second optical disks having the indication member (11e, 12e) to each other as one body by means of an adhesive (13) such that the reflection films (11b, 12b) are opposed to each other.

17. The method according to claim 15 or 16, wherein said step (S11) of forming said light transmissive disk substrates includes a step of forming an annular projection (11f, 12f) serving as a spacer on a portion of an outer surface corresponding to said indication member (11e, 12e).

18. The method according to claim 15 or 16, wherein said step (S11) of forming said light transmissive disk substrates includes a step of forming an annular projection serving both as a spacer and a lens portion on a portion of an outer surface corresponding to said indication member (11e, 12e).

19. An apparatus for manufacturing an optical disk, wherein there are provided first and second

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optical disks having annular light transmissive disk substrates having a common central hole and recording regions in radially intermediate regions, pits representing recording information are transferred onto said recording regions by means of a stamper, reflection films are provided on those surfaces of the light transmissive disk substrates which are provided with said pits, an indication member is provided by one of printing and attachment on at least one of those sides of the light transmissive disk substrates, which are provided with said reflection films, and on a portion around said central hole, and there is provided an attaching apparatus for attaching the first and second optical disks having the indication means to each other as one body by means of an adhesive such that the reflection films are opposed to each other,

characterized in that said attaching apparatus includes disk-like elastic members (211, 221) provided on mutually facing sides of first and second pressing plates (210, 220) for pressing outer surfaces of said first and second optical disks, those portions of the elastic members which face the indication members (11e, 12e) are formed of a material softer than a material of the other portions of the elastic members.

20. An apparatus for manufacturing an optical disk, wherein there are provided first and second optical disks having annular light transmissive disk

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substrates having a common central hole and recording regions in radially intermediate regions, pits representing recording information are transferred onto said recording regions by means of a stamper, reflection films are provided on those surfaces of the light transmissive disk substrates which are provided with said pits, an indication member is provided by one of printing and attachment on at least one of those sides of the light transmissive disk substrates, which are provided with said reflection films, and on a portion around said central hole, and there is provided an attaching apparatus for attaching the first and second optical disks having the indication means to each other as one body by means of an adhesive such that the reflection films are opposed to each other,

characterized in that said attaching apparatus includes first and second annular recess portions (21d, 22d) formed in parts of mutually opposed surfaces of first and second pressing plates (210, 220) for pressing outer surfaces of the first and second optical disks, which parts of the mutually opposed surfaces correspond to said indication members (11e, 12e), and first and second elastic sheets (212, 222) situated along said mutually opposed surfaces of the first and second pressing plates (210, 220) so as to cover said first and second annular recess portions, said first and second optical disks being clamped between said

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first and second elastic sheets and attached to each other.

