

5

Plate-shaped Optical Data Carrier

10 The present invention relates to a plate-shaped optical data carrier comprising a layer transparent for radiation and an information recording layer on the surface of which memory areas for digital information are arranged, wherein said data carrier comprises a through opening for a receiving means of a reading and/or writing device.

15 Such data carriers are generally known by the names of CD (Compact Disc), CD ROM (Compact Disc Read Only Memory), and DVD (Digital Versatile Disc). Apart from solely readable types there are also types such as CD-R which allow the user to individually record information by using specific writing devices, possibly even as a rewriteable type (CD-RW).

20 The known data carriers are received at their central opening by an appropriate reading and/or writing device and rotated so as to realize a data flow from and to the data carrier by means of a radially movable reading and/or writing head emitting a laser beam.

25 The generally known prior art also includes so-called CD ROM cards having the thickness of a conventional CD ROM or DVD but mostly not having the standardized banker's card format. On such data carriers, the memory area is limited to a circular ring of the maximum possible diameter fitting into the roughly rectangular surface of the data carrier. Compared with conventional banker's cards comprising a magnetic
30 strip or electronic chip elements, these CD ROM cards are remarkably thicker which is regarded as a disadvantage. This thickness significantly reduces their elasticity,

- 2 -

which, if the CD ROM card is carried in a purse, adversely affects the carrying comfort of the latter. Also the free space in conventional wallets or purses often does not allow to receive a plurality of CD ROM cards. Also, the polycarbonate used to manufacture these CD ROM cards is disadvantageous for handling the card in typical
5 rough everyday conditions as the brittleness of the material, in combination with its low elasticity, may easily cause the material to break or crack.

DE 29616 619 U1 describes a so-called multimedia visiting card whose width and length are similar to the size of standard paper visiting cards. However, this known
10 visiting card is made of CD ROM material with the thickness of the visiting card being equal to that of a normal CD ROM.

Such a so-called non-standard format of a CD or CD ROM cannot be used in all conventional players. DE 297 04 140 U1 thus discloses a CD player adapter, especially
15 for the multimedia visiting card described in DE 296 16 619 U1. The outer dimensions of the body of the CD player adapter equal exactly the dimensions of a standard CD or CD ROM while said body comprises an inner through recess of a rectangular cross-section corresponding to the shape of the peripheral geometry of the multimedia visiting card. The visiting card can be fixed on the player adapter because its front sides
20 have a convex shape while the front edges of the inner recess of the player adapter are of a matching concave shape. Due to the elasticity of the plastic material used to form the visiting card as well as the player adapter, the visiting card can be inserted into the recess using a certain force, thus ensuring a secure and defined connection of the two components due to the matching shapes in the inserted state. In order to
25 facilitate the action of inserting or extracting the visiting card into or from the player adapter, widened rounded areas are provided in the corner areas of the inner recess.

Further, it is desirable to increase the variability of such data carriers with regard to various storage principles and the corresponding reading and writing methods.
30

From EP 0 723 266 A2 an optically readable digital thin-film data carrier is known which

- 3 -

is manufactured of a foil-like material and is glued onto a carrier sheet for storage and transport purposes. For reading the data carrier, it is placed onto a support which is transparent for the scanning laser beam of a reading device. The beam path of the laser extends through the support where already complete or at least partial focusing of the beam takes place.

Particularly disadvantageous in regard to this thin-film data carrier is that the laser beam must penetrate two boundaries between the support transparent for the radiation and the actual data carrier. When dirt particles or air inclusions are present in this area of the beam path, which is arranged in immediate vicinity or comparatively minimal vicinity of the focal point of the laser, this inevitably results in impairments of the reading process.

GB 2 059 666 A describes an audio-video card which has a circular ring-shaped memory member provided with a coil shaped groove. The groove is sensed by the rotating pin of the reading device wherein, in a purely mechanical way, a transformation into electrical signals is realized. An optical reading principle is not realized in connection with this data carrier.

DE 297 09 648 U1 discloses the visiting card which is comprised of a section of a CD and, for example, has the dimensions of a check card. Arranging a chip on one side of the visiting card is also suggested. As a result of the dimensions of the card as well as the positioning of the memory chip, a compatibility of the known visiting card with standard card formats, such as, for example, magnetic strip cards, smart cards, and chip cards, is not possible.

It is an object of the present invention to provide a data carrier whose handling and keeping meet high comfort requirements and which is characterized by variability as regards the storage principles applied in data storage.

Based on a data carrier of the aforementioned kind, this object is solved in that the

thickness of the data carrier is smaller than the thickness of a standard data carrier of the DVD type, which is approximately 1.2 mm, and greater than the sum of the thicknesses of the information recording layer and a layer transparent for radiation of a standard data carrier of the DVD type, which is approximately 0.5 mm, wherein focusing
5 of a light beam of the reading and/or writing device is realized exclusively within the data carrier and here in the layer transparent for radiation, which - as viewed from the surface of the data carrier impinged on by the light beam - is arranged in front of the information recording layer.

10 Due to its reduced thickness, such a data carrier offers good flexibility and therefore very comfortable handling. To carry even a plurality of such data carriers does not cause the space problems occurring with regard to conventional CD ROM cards. The thickness of the backing layer needs to be dimensioned only so small that the data carrier can be handled and transported without the risk of being damaged.

15 As far as the data carrier comprises a layer transparent for radiation above the information recording layer, said transparent layer can completely take on the function of the backing layer ensuring the shape stability of the data carrier, so that the thickness of the layer transparent for radiation essentially defines the minimum thickness of the
20 data carrier as the thickness of the information recording layer is extremely small. It is a fact that the reduction in thickness suggested according to the present invention causes the disadvantage that without further measures the data carrier cannot be read by the CD or DVD players which are presently in use. However, the present invention offers the tremendous advantage of providing an optical data carrier which
25 due to all its dimensions, especially its thickness, is compatible with data carriers using other storage principles (magnetic strip card, chip card, ...) and thus can be used in a "multimedia" manner.

30 Preferably, its thickness, length and width are equal to those of conventional chip cards or magnetic strip cards. According to the present standards, its thickness should be approximately 0.8 mm. Thus, the present invention provides for the first

- 5 -

time an optical data carrier which, with respect to its dimensions and usability, is completely compatible with existing formats such as credit card, banker's card, chip card, and "smart card".

- 5 As a particularly advantageous feature of the present invention, the opening is arranged eccentrically and the data carrier is provided with an electronic chip element which is readable and/or writable via contact surfaces.

- 10 In addition to its function as an optical data carrier, the data carrier according to the present invention further has the very advantageous feature of performing the function of a chip card. The space needed for the chip element, whose arrangement is standardized for known chip cards, is provided by eccentrically arranging the opening for the receiving means. When, for example, the centre of the opening is arranged on the longer central axis of a rectangle defining the shape of the data carrier, the available
15 storage area is not reduced as the size of the circular ring fitting onto the card remains unchanged compared with a central arrangement of said opening. The eccentric arrangement of the opening increases the safety of application as it is obvious to anybody not to use said card without an adapter. Otherwise, the card (even when having a central opening) cannot be used in slot drives and in the common
20 drawer trays of PCs. However, this weak point also exists with respect to conventional CD cards.

Preferably, the layer transparent for radiation is made of polycarbonate.

- 25 In a further development of the present invention, it is provided to arrange the chip element on the side of the data carrier positioned opposite to the layer transparent for radiation.

- 30 In order to further enhance the functionality and compatibility of the data carrier with respect to different storage principles, it is suggested to provide the data carrier with a magnetic strip. It makes sense to arrange the magnetic strip as well as the chip

- 6 -

element on the side of the data carrier positioned opposite to the layer transparent for radiation. In such case, it will really be a multimedia data carrier.

5 In order to meet higher aesthetic requirements of the data carrier and/or to provide the data carrier with specific security features, a further development of the present invention suggests to provide the side of the data carrier positioned opposite to the layer transparent for radiation with a coating, for example, in the form of a "watermark" or a hologram.

10 In a further development, the data carrier according to the present invention comprises a circular-ring memory member comprising the opening, a supporting member having the thickness, length, and width of a standard data carrier of the chip card type, and a chip element being readable and/or writeable via contact surfaces, wherein the memory member and the chip element are insertable into the support
15 member in a manner providing essentially plane surfaces of the data carrier.

On the one hand, an annular memory member is easier to manufacture than a memory member of a different shape, and, on the other hand, different materials can be used for both members in order to meet the different requirements. Thus, the memory
20 member is preferably made of polycarbonate having a high surface hardness while it makes sense to manufacture the supporting member of a flexible material less susceptible to breakage, cracking, or fatigue, for example, a plastic material or cardboard.

25 Furthermore, it is suggested that the memory member has a thickness between 0.5 mm and 0.6 mm and an outer diameter matching essentially the width of a standard data carrier of the chip card type in order to achieve the largest memory capacity possible of the data carrier.

30 In a preferred embodiment of the data carrier, the supporting member is at least in part made of hard cardboard. This offers the advantage that the user may individually

print on the supporting member by laser printing, for example, for use as a visiting card. After printing, the memory member and, if applicable, the chip element may be inserted into the properly shaped respective recesses of the supporting member and be affixed, for instance, by gluing. Compared with conventional visiting cards, such

5 visiting cards offer the advantage that, on the one hand, considerably more information can be stored while maintaining the flexibility of common chip cards, and, on the other hand, this information can be directly read into the data processing system of the recipient of the visiting card, thus making separate and time-consuming manual input of these data redundant.

10

Further, the present invention suggests an adapter to receive a data carrier, said adapter being provided with a receiving space whose inner dimensions are slightly larger than the outer dimensions of the data carrier to be received, and with a central opening arranged coaxially to the opening in the data carrier in its received position,

15 wherein the sum of the thickness of the data carrier and the thickness of the adapter in the receiving space area is equal to the thickness of a standard data carrier of the DVD type and wherein the unit formed of the adapter and the data carrier is rotatable without balance error around the central axis of the opening.

20 This ensures in a simple manner the playability of the data carrier according to the present invention even at high revolution rates and independently from the model of the reading and/or writing device. Usually the user does not carry the adapter with him/her; the adapter is kept with the reading and/or writing device. One single adapter is sufficient for a plurality of similar data carriers. The adapter can, for example, be

25 integrally formed by injection moulding or assembled from two disks.

Now the present invention will be further described with respect to two embodiments of data carriers being schematically shown in the figures, in which:

30 Fig. 1 shows a data carrier having an eccentrically arranged opening and a chip element as well as a magnet strip;

- 8 -

- Fig. 2 shows an adapter for receiving the data carrier shown in Fig. 1;
- Fig. 3 shows a data carrier with a centrally arranged opening;
- 5 Fig. 4 shows an adapter for receiving the data carrier shown in Fig. 3;
- Fig. 5 shows a supporting member;
- Fig. 6 shows a memory member; and
- 10 Fig. 7 shows a chip element.

A data carrier 1 shown in Fig. 1 has approximately the rectangular format of a standard chip card, i.e., a length 2 of approx. 85 mm, a width 3 of approx. 54 mm, and a
15 thickness 4 of approx. 0.8 mm. The data carrier 1 is provided in an area standardized for this purpose with an electronic chip element 5 for reading and writing digital information.

The data carrier 1 further comprises on its side not visible in Fig. 1 a layer transparent
20 for radiation having a thickness of approx. 0.5 mm and an information recording layer, arranged below the layer in a view from the bottom surface of the data carrier, with memory areas for digital information being arranged on the surface of the information recording layer. The information recording layer extends over a circular ring area defined by the dashed line 6.

25 Further, the data carrier 1 comprises an opening 7 being eccentrically arranged with respect to the rectangle, i.e. away from its centre of gravity, the opening cooperating with a receiving means (not shown) of a reading and/or writing device and thus being standardized in its dimensions and shape. Due to the eccentric opening the risk of
30 playing the data carrier 1 without the corresponding adapter is reduced.

Fig. 2 shows an adapter 8 having the basic shape of a conventional data carrier of

- 9 -

the DVD type and a thickness of 1.2 mm. The adapter 8 is assembled from two cylindrically shaped circular disks 9 and 10, the upper one having a thickness of approx. 0.8 mm and the lower one having a thickness of approx. 0.4 mm. The two circular disks 9 and 10 are glued to each other with their mutual contact surfaces.

5

The lower circular disk 10 of Fig. 2 comprises a central through opening 11 having the same diameter as the opening 7 in the data carrier 1. The upper circular disk 9 is provided with a rectangular recess which defines a receiving space 12 together with the end face 13 of the lower circular disk 10 forming a terminating plane. The data carrier 1 according to Fig. 1 can be inserted in the receiving space 12 in such a way that, on the one hand, the opening 7 in the data carrier 1 is in alignment with the opening 11 in the adapter 8, and, on the other hand, the surface formed by the transparent layer of the data carrier 1 is flush with the end face 14 of the upper circular disk 9. Thus, a unit comprising the data carrier 1 and the adapter 8 is provided which is rotatable at a high speed without balance error around the central axis 15 of the openings 7 and 11 of the assembled data carrier 1 and the adapter 8. Therefore, the data carrier 1 can be used in commercially available reading and/or writing devices.

Fig. 3 shows an alternative data carrier 1' having, similar to the data carrier 1 shown in Fig. 1, length, width, and thickness dimensions equal to those of a conventional chip card or magnetic strip card. In order to ensure the playability of the data carrier 1' irrespective of the constructional design of the receiving means of the reading and/or writing devices, an adapter 8' shown in Fig. 4 is used which like the adapter 8 according to Fig. 2 comprises two circular disks 9' and 10 being glued to one another. While the lower circular disk 10 is identical to that of the adapter 8 and comprises a central opening 11', the upper circular disk 9' comprises a centrally arranged rectangular recess. Thus, a receiving space 12' is defined which allows the insertion of the data carrier 1' in such a way that its opening 7' is in alignment with the opening 11 and that it can be inserted into conventional reading and/or writing devices.

30

The design of the data carrier 1 shown in Fig. 1 is clearly illustrated by Figs. 5 through

- 10 -

7. The data carrier comprises a supporting member 16 made of hard cardboard which corresponds in its length, width, and thickness to the respective dimensions of the data carrier 1. The support member 16 comprises a cylindrical recess 17 whose central axis 15 is located on the plane of symmetry extending in lengthwise direction of the support member 16 while being arranged offset relative to the plane of symmetry extending transversely thereto, i.e., perpendicularly thereto. The recess 17 has a depth 18 of approx. 0.58 mm, which results in a remaining thickness 19 of the support member 16 in the area of the recess 17 amounting to approx. 0.22 mm. The through opening 7 is arranged coaxially with the recess 17.

Furthermore, the support member 16 is provided with a generally rectangular through recess 20 into which the chip element 5 according to Fig. 7 can be inserted.

The memory member 21 shown in Fig. 6 has the same outer diameter and the same thickness 18 of 0.58 mm as the recess 17 in the support member 16. The memory member 21 comprises a layer transparent for radiation and an adjacent information recording layer and is made essentially of polycarbonate. The memory member according to Fig. 6 is inserted into the recess of the support member 16 according to Fig. 5 to obtain a data carrier 1 as shown in Fig. 1. Thus, the openings 7" of the memory member 21 and 7 of the support member 16 are congruently arranged one above the other. The surface of the memory member 21 in its glued-in state is flush with the surface of the support member 16.

CLAIMS

1. A plate-shaped optical data carrier (1, 1') having a substantially rectangular shape, comprising a memory member (21) having a layer transparent for radiation and an information recording layer adjoining it, on whose surface memory areas for digital information are arranged, wherein said data carrier comprises a through opening (7, 7', 7'') for a receiving means of a reading and/or writing device, **characterised in that** the thickness (4) of said data carrier is equal to the thickness of approximately 0.8 mm of a chip card or magnetic strip card and in that the memory member (21) has a thickness (18) of between 0.5 mm and 0.75 mm.
2. A data carrier according to Claim 1, **characterised in that** it has the length (2) and the width (3) of a standard data carrier of the chip card type.
3. A data carrier according to Claim 1 or 2, **characterised in that** it comprises a support member (16) having a circular ring-shaped recess (17) into which the memory member (21) is insertable such that substantially planar surfaces of the data carrier (1, 1') result.
4. A data carrier according to one of the Claims 1 through 3, **characterised in that** the depth of the recess (17) of the support member (16) corresponds to the thickness (18) of the memory member (21).
5. A data carrier according to one of the Claims 1 through 4, **characterised in that** the memory member (21) has an outer diameter which corresponds substantially to a width (3) of a standard data carrier of the chip card type.
6. A data carrier according to one of the Claims 1 through 5, **characterised in that** it

has a chip element (5) which can be read via contact surfaces and which is insertable into the support member (16) such that a substantially planar surface of the data carrier (1, 1') results.

7. A data carrier according to one of the Claims 1 through 6, **characterised in that** the opening (7) is arranged eccentrically in the data carrier (1).
8. A data carrier according to one of the claims 1 through 7, **characterised by** an adapter (8, 8') for a reading and/or writing device for digital data, comprising an essentially rectangular recess (12, 12') having inner dimensions that are slightly greater than the outer dimensions of a plate-shaped data carrier (1, 1') to be received therein, comprising a central opening (11) which is coaxial to an opening (7, 7') of the data carrier (1, 1') to be received therein, wherein a unit to be formed of the adapter (30) and the data carrier (1, 1') can be rotated about a central axis (15) of the openings (7, 7', 11) without balance error, wherein the sum of the thickness of the data carrier (1, 1') and the thickness of the adapter (8, 8') in its recess (12, 12') corresponds to the thickness of a standard data carrier of the DVD type.
9. A data carrier according to Claim 8, **characterised in that** the plate-shaped data carrier (1, 1') to be inserted into the recess (12, 12') of the adapter (8, 8') is a standard chip card or magnetic strip card.
10. A data carrier according to Claim 8 or 9, **characterised in that** the adapter (8, 8') has the basic shape of a conventional data carrier of the DVD type.
11. A data carrier according to one of the Claims 8 through 10, **characterised in that** the adapter (8, 8') is comprised of two circular disks (9, 10) of which one (9) has a thickness of practically 0.8 mm and the other a thickness of practically 0.4 mm.

12. A data carrier according to Claim 11, **characterised in that** one of the circular disks (9) has a rectangular recess which, in connection with an end face of the other circular disk (10) forming a boundary, provides the recess (12, 12') of the adapter (8, 8').
13. A data carrier according to one of the Claims 8 through 12, **characterised in that** a surface formed by a transparent layer of the data carrier (1, 1') is flush with an outer surface (14) of the one circular disk (9) of the adapter (8, 8').
14. A data carrier according to one of the Claims 8 through 10, **characterised in that** the adapter (8, 8') is manufactured as a monolithic part by an injection molding process.
15. A data carrier according to one of the Claims 8 through 14, **characterised in that** the recess (12) of the adapter (8, 8') receiving a data carrier (1) is arranged eccentrically relative to a central opening (11).
16. A data carrier according to Claim 15, **characterised in that** the central opening (11) of the adapter (8, 8') and an eccentrically arranged opening (7) of a data carrier (1) have the common central axis (15) about which the unit formed of the adapter (8) and the data carrier (1) can rotate without balance error.
17. A data carrier according to Claim 15 or 16, **characterised in that** the eccentric recess (12) of the adapter (8, 8') is arranged within its outer periphery.