(12) UK Patent Application (19) GB (11) 2 343 784 (13) A

(43) Date of A Publication 17.05.2000

(21) Application No 9927092.8

(22) Date of Filing 16.11.1999

(30) Priority Data
(31) 09266364 (32) 11.03.1999 (33) US
(31) 98112034 (32) 16.11.1998 (33) HK

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(51) INT CL[7]
G11B 7/24

(52) UK CL (Edition R)
G5R RB23 RPB1

(56) Documents Cited
GB 2155684 A EP 0883091 A WO 97/18942 A
US 5852598 A US 5774446 A US 4462036 A

(58) Field of Search
UK CL (Edition R) G5R RB21 RB23 RFN RPA RPB1
INT CL[7] G11B 7/24 23/00 25/04
Online: JAPIO, EPODOC, WPI

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(54) Abstract Title
Optical disc

(57) An optical disc is provided with a projecting portion 4 which projects parallel to the axis of rotation and enables the disc to locate in the inner tray 7 of an optical disc reading device, such inner tray normally be used to receive 80 mm mini-CDs (or 80 mm mini-DVDs). The projecting portion may be in the form of a knob 4, or an inner layer 30 which is thicker than an outer layer 40. The overall shape of the optical disc, viewed in plan, can be irregular and need not engage at all with the outer tray of the reading device.

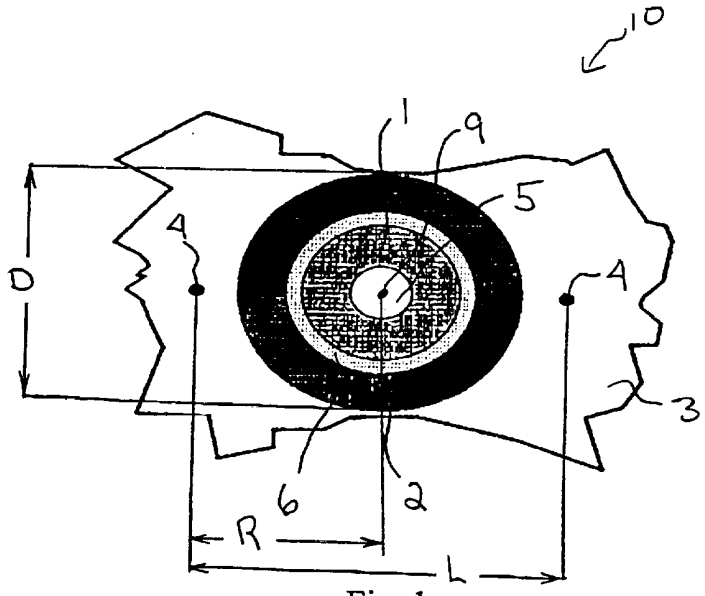

Fig. 1

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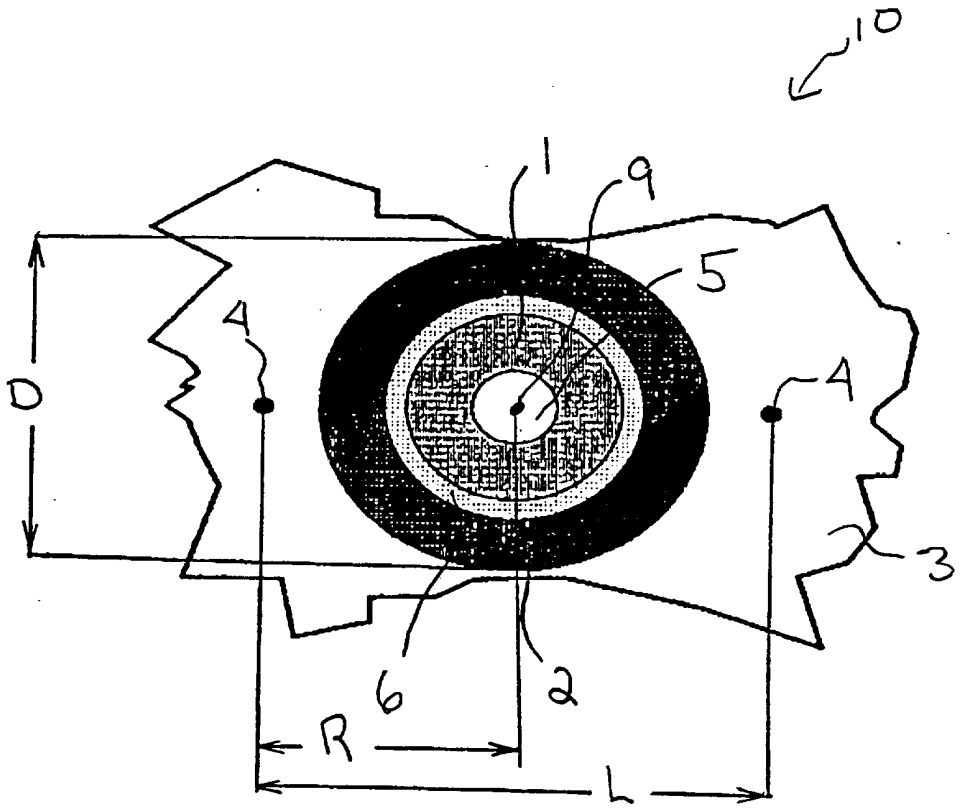

Fig. 1

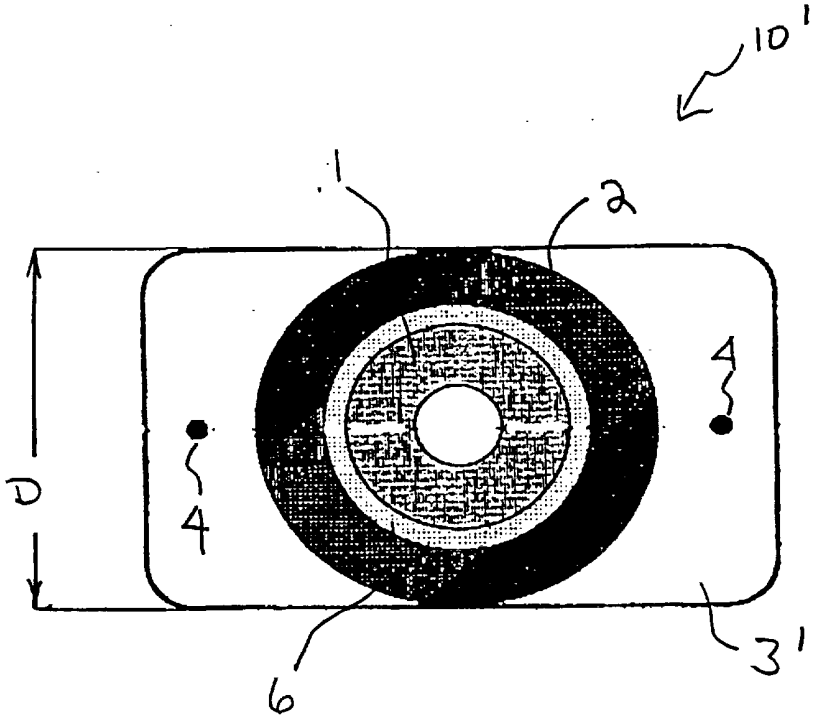

Fig. 2

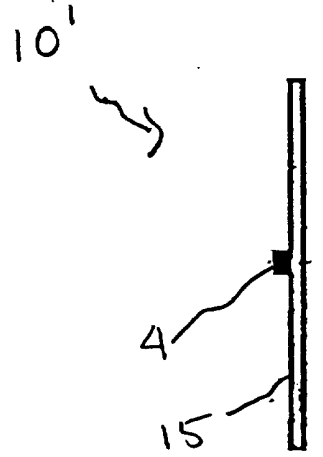

Fig. 3

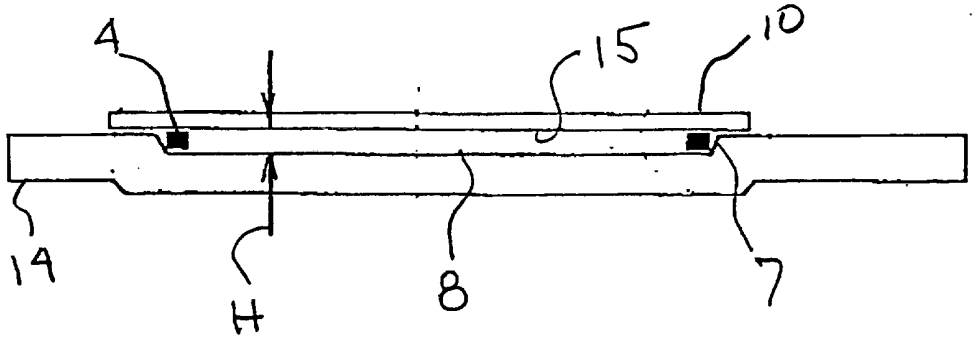

Fig. 4

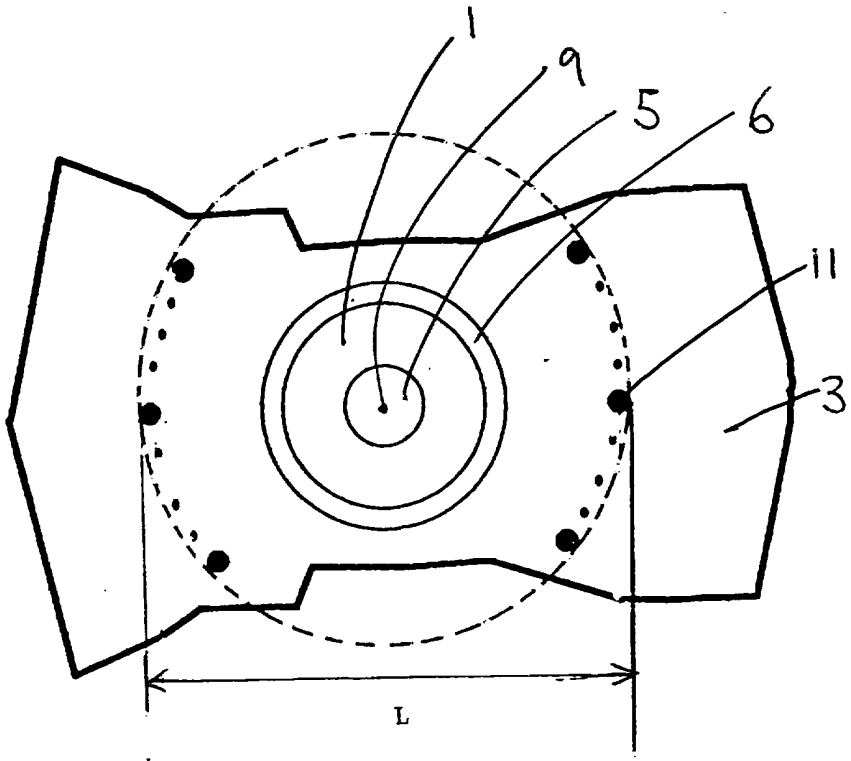

Fig. 5

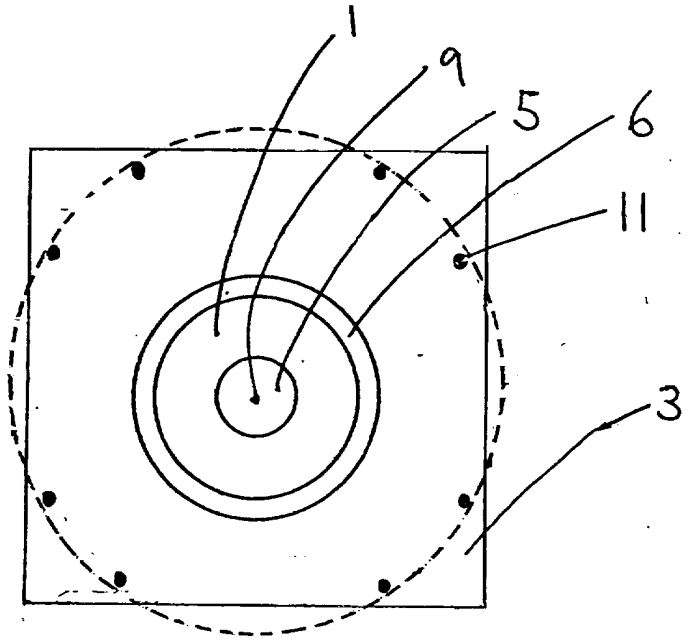

Fig. 13

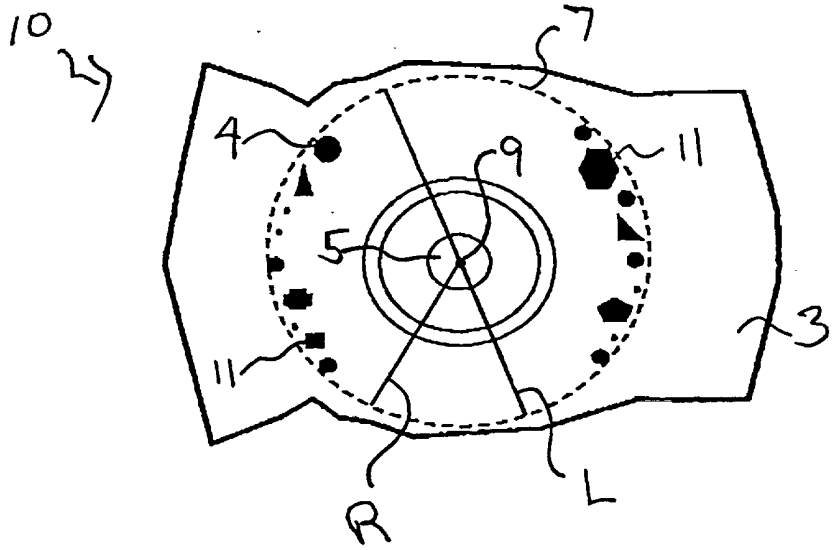

Fig. 6

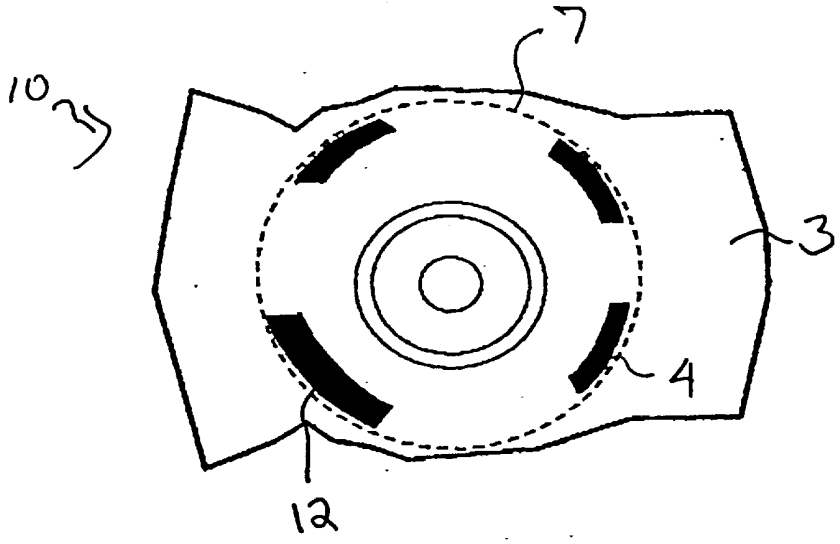

Fig. 7

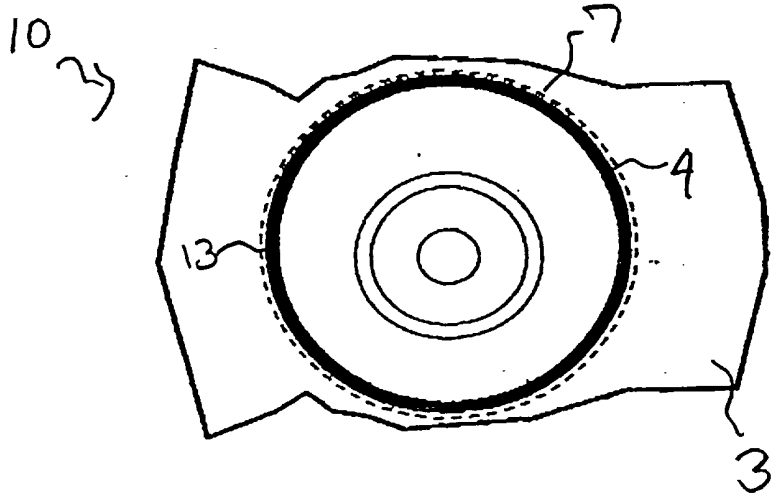

Fig. 8

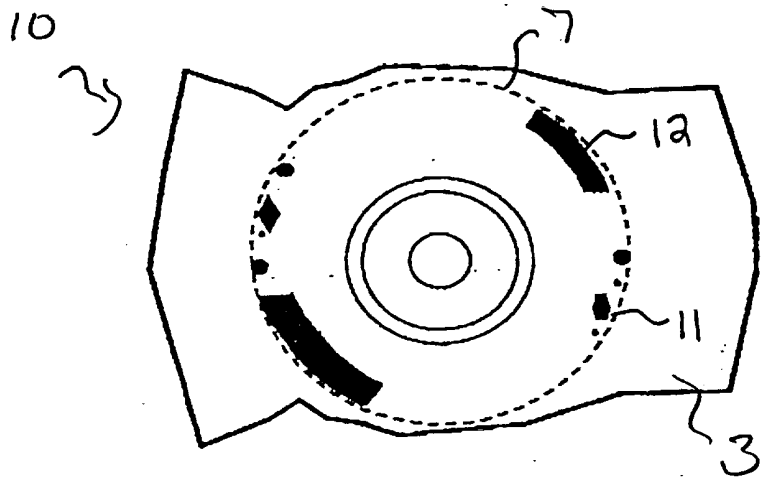

Fig. 9

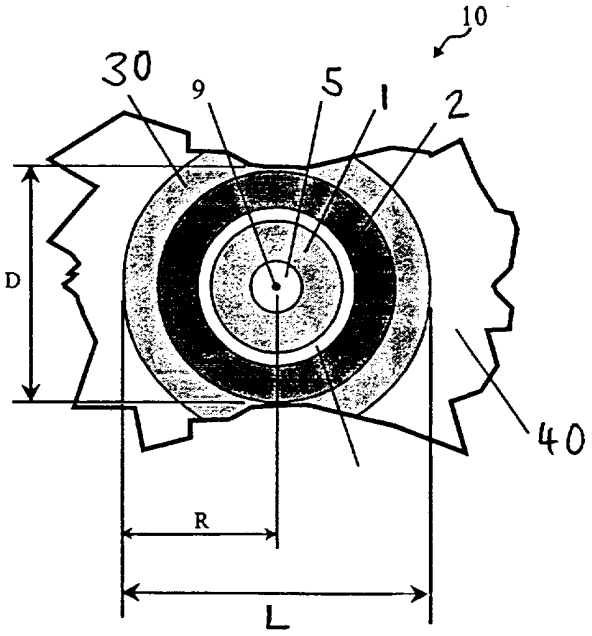

Fig. 10

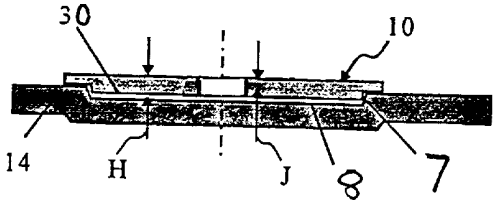

Fig. 11

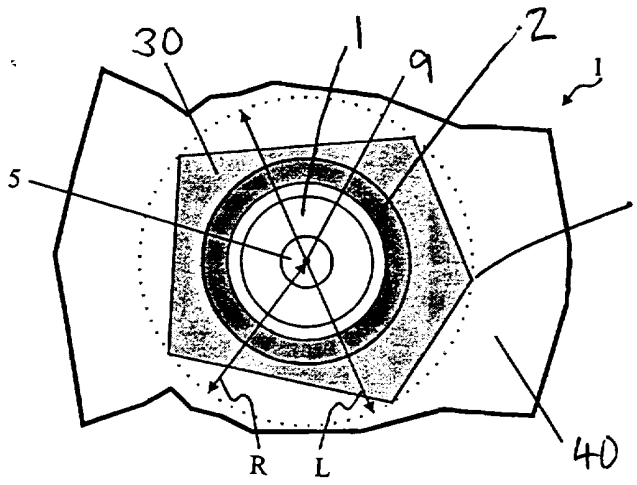

Fig. 12

OPTICAL DISC

This invention relates generally to storage discs which are utilized for storing digital data. More particularly, the present invention relates to optical discs that carry audio, video or data information.

Conventional storage discs have a standard circular shape with an outside diameter of 120 mm or 80 mm. For example, a 120 mm compact disc (CD) can accommodate a maximum of about 650 Mbytes of data. The storage capacity is substantially the same for the other data formats, for example CD-DA, CD-1, CD-ROM XA, CD-Extra, CD-ROM Mode 1 & Mode 2 and VCD. The storage capacity of a DVD disc is approximately 20 times this storage capacity. The official global productivity of optical discs for the year 1997 was around 10,000,000,000 (10 billion) pieces and the actual figure may be double, or even triple this value.

Every optical disc is read from the inner circle to the outer circle. The inner portions of the disc will remain unaffected even if the outer portion is partially removed, altered, or damaged. For such case, the outer layer of the disc only provides support for disc positioning during rotation. As an industrial standard, all optical disc reading devices are designed to read standard discs (120 mm) and mini discs, where the outside diameter of the disc is only 80 mm. Commonly, disc reading devices have an inner tray of 80 mm diameter for properly positioning the mini disc.

Viewed from one aspect the invention provides an optical disc which can store data and be read by optical disc reading devices having an inner tray, comprising a substantially annular data ring capable of storing data, an outer profile outwardly of the data ring, and at

least one projecting portion disposed in the outer profile, the projecting portion projecting in a direction parallel to the axis of rotation of the optical disc, for receipt in the inner tray so as to locate the optical disc centrally in the optical disc reading device.

Viewed from another aspect the invention provides an optical disc which can store data and be read by optical disc reading devices having an inner tray, comprising:

a substantially circular central ring which contains no data;

a substantially annular data ring outwardly of the central ring, the data ring being capable of storing data;

an outer profile outwardly of the data ring; and

at least one projecting portion disposed in the outer profile, the projecting portion projecting in a direction parallel to the axis of rotation of the optical disc, for receipt in the inner tray so as to locate the optical disc centrally in the optical disc reading device.

With such an arrangement the optical disc can be centred in the reading device by at least one projecting portion locating in the inner tray of the reading device. This frees the disc from having to have portions which engage the outer tray in order to center the disc. Thus the shape and size of the disc can be freely designed without the constraint of having to engage the outer tray. The outer profile can extend beyond the width of the inner tray, but need not extend as much as the width of the outer tray. It may also have portions which do not extend as far as the inner tray.

The embedded data in the data ring are unaffected for data access. This invention thus reduces the size and shape limitations of optical discs which hitherto

have had to engage either an outer tray of 120 mm diameter or an inner tray of 80 mm diameter.

This invention generates numerous new applications for the usage of optical discs in different market sectors, for example, multi-media ticketing to exhibitions, conferences, and theme parks, multi-media business card, interactive membership card, interactive product catalog, multi-media corporate premium, and music entertainment and distribution etc. The invention provides a wholly new marketing and advertising media which gives the popular technological product a "new look". The optical disc may be in the form of a calendar, promotional item or gift.

The outer profile may in fact be circular but with a diameter which can be less than that of the outer tray. Preferably the outer profile has a non-circular shape, for example rectangular, square or irregular.

In preferred embodiments, the distance between the projecting portion(s) and the center of the disc is approximately 40 mm. Preferably it is no greater than 41 mm.

Preferably, the optical disc has a surface and the at least one projecting portion has a height relative to the surface, the height being not larger than 3 mm.

In certain embodiments, the optical disc comprises a plurality of projecting portions. At least one of these may make a point contact with the inner tray in use. Such a projecting portion may be in the form of a knob or node. In a preferred form of the invention, the optical disc comprises a plurality of pairs of projecting portions, the projecting portions in a pair being disposed at a circumferential spacing closer to each other than the circumferential spacing between circumferentially adjacent pairs. In one embodiment, there are four such pairs.

At least one of the aforementioned plural projecting portions may have an arcuate outer edge for

correspondence with the profile of the inner tray. Such a projecting portion may be in the form of a curved strip or the like.

In a preferred embodiment, there is provided a projecting portion which forms a complete ring.

In a preferred embodiment, the data ring is of substantially the same thickness as the at least one projecting portion. Outwardly of the projecting portion, the outer profile will have a thinner portion. It will therefore be understood that the projecting portion projects in the axial direction relative to the thinner portion, but the greater thickness of the optical disc may be maintained in the area inwardly of the thinner portion, so as to include the data ring and preferably also the central ring. Such a thickened area may be arranged to make point contact with the inner tray at a plurality of locations.

The shape of the projecting portion(s) may be that of a cylinder, pyramid or sphere. The projecting portion(s) may be hollow, e.g. when formed by stamping, or solid, e.g. when formed by adhering an additional member to the disc.

Certain preferred embodiments of the invention will now be described by way of example and with reference to the accompanying drawings in which:

Figure 1 is a schematic plan view of a first embodiment of an optical disc in accordance with the invention, said disc having an irregular shape;

Figure 2 is a schematic plan view of second embodiment of an optical disc, said disc having the shape of a membership card;

Figure 3 is a schematic side view of the optical disc of Figure 2;

Figure 4 is a front elevation view of the optical disc of Figure 1 positioned in the tray of a reader device;

Figure 5 is a plan view of a third embodiment of an

optical disc;

Figure 6 is a plan view of a fourth embodiment of an optical disc;

Figure 7 is a plan view of a fifth embodiment of an optical disc;

Figure 8 is a plan view of a sixth embodiment of an optical disc;

Figure 9 is a plan view of a seventh embodiment of an optical disc;

Figure 10 is a plan view of an eighth embodiment of an optical disc;

Figure 11 is a front elevation view of the optical disc of Figure 10 positioned in the tray of a reader device;

Figure 12 is a plan view of a ninth embodiment of an optical disc; and

Figure 13 is a plan view of a tenth embodiment of an optical disc.

With reference to the drawings wherein like numerals represent like parts throughout the several figures, an optical disc in accordance with the preferred embodiments of the present invention is generally designated by the numeral 10.

As shown in Figure 1, the optical disc is a disc having a random (or irregular), nonstandard shape and includes a central ring 1, a data ring 2, an outer profile 3, and one or more knobs 4. Central ring 1 has an opening 5 in the center having a diameter of 15 mm, which is the same for all conventional, circular optical discs. The rotating axle of the reading device makes use of this opening 5 to engage and drive the disc. The area 6 between the central ring 1 and the inner edge of 30 data ring 2 is useless and therefore no data is present. All the data is stored in data ring 2 and its maximum data storage capacity is governed by the diameter D of the data ring 2 and the format, for example, CD-DA, CD-ROM Mode 1 & Mode 2, CD-Extra, CD-R0M XA or DVD, in

which the data is stored. For a DVD formatted disc, the capacity may be 20 times greater than the other standards. The rest of the area outside the data ring 2 is the outer profile.

The size and shape of the outer profile 3 can be changed as required according to each specific use of the disc 10. The outer profile 3 completely surrounds data ring 2 and thus ensures the integrity of data storage. The knobs 4 are positioned within outer profile 3. There must be at least one knob 4 to center the disc prior to engagement of the rotating axle of the reading device in the central opening 5. However, other than this requirement, there is no limit on the shape, size and number of knobs 4. The knobs 4 utilize the rim 7 of the inner tray 8 (Figure 4) intended for 80 mm mini discs as a supporting edge in order to center the disc 10. The distance R between the center 9 of opening 5 and the center of the knobs 4 should be less than 41 mm such that the distance L between the centers of oppositely disposed knobs 4 is less than 82 mm in diameter.

The optical disc 10 can be used for many applications and can assume numerous configurations. For example, in Figure 2, the disc 10 is utilized as an identification (ID) card. As shown in Figure 2, the outer profile 3' of the ID card 10' may have a rectangular shape. Alternatively, the outer profile 3 may have a shape which is associated with the person's name or organization. The ID card 10' illustrated in Figure 2 has the same diameter D for the data ring 2 as the disc 10 illustrated in Figure 1. Therefore, the data storage capacities are equal (assuming that the same data formats are used). Figure 3 illustrates the thickness of the knobs 4.

Figures 5, 6, 7, 8, 9 and 13 show that all of the knobs 4 should most preferably fall within the locus of a 40 mm distance R from the center 9 of opening 5, or on

a circle having a diameter L of 80 mm, which is the diameter of the tray 8 for an optical mini disc. As shown in Figures 5 and 6, each knob 4 may have the form of a node 11, where each node 11 has a random shape and size. Each node may make substantially point contact with the inner tray. There must be at least one node 11.

In the embodiment of Figure 13, the knobs 11 are arranged in four pairs, the knobs in each pair being disposed at a circumferential spacing closer to each other than the circumferential spacing between circumferentially adjacent pairs. The optical disc is square and each pair of knobs is located near the corner of the square.

As shown in Figure 7, the knobs 4 may have the form of a stripe or block 12. Again, the size of the stripe or block 12 is not constrained. The number of stripes or blocks 12 should be equal to or more than 2. Each stripe or block may have an accurate outer edge for correspondence with the profile of the inner tray.

With reference to Figure 8, the knob 4 may have the shape of a ring 13. The knobs 4 may be a mixture of nodes 11 and stripes or blocks 12 as shown in Figure 9. In addition, the knobs 4 can be either hollow or solid because it will not affect disc rotation. The knobs 4 may be produced by a mechanical punch. If glue is used to mount the knobs 4, the presence of the knobs 4 would be undetectable from the printing (upper) side of the disc.

As shown in Figure 4, the optical disc 10 is placed on top of the driver tray 14 such that the knobs 4 fit into the 80 mm mini disc portion 8 of the tray 14. The knobs 4 do not hinder disc rotation but give support for alignment. The maximum height H of knobs 4 beneath the surface 15 of the disc 10 should be less than 3 mm. There is no special requirement for the shape of knobs 4. They could be cylindrical, pyramid, spherical, etc.

The embodiment shown in Figures 10 and 11 is an optical disc having a random (or irregular), non-standard shape and includes a central ring 1, a data ring 2, a thicker inner layer 30, and a thinner outer layer 40. The area outside the data ring 2 is the outer profile, consisting of the inner layer 30 and the outer layer 40. The data ring 2 has the same thickness as the inner layer 30. The inner layer has an outer perimeter along the locus of 80 mm diameter. The rest of the area outside the inner layer 30 is the outer thinner layer 40 with a reduced thickness.

The size and shape of the inner layer 30 and outer layer 40 can be changed as required according to each specific use of the disc 10. The inner layer 30 completely surrounds the data ring 2 and thus ensures the integrity of data storage. In one particular possible configuration the data ring 2 can exactly overlap with the layer 3. The thicker inner layer 3 must have at least one point touching the 80 mm diameter locus to center the disc. However, other than this requirement, there is no limit on the shape, size and number of section(s) of this layer 30. There is no limit on the shape and size of the thinner outer layer 40. The thicker inner layer 30 utilizes the rim 7 of the inner tray 8 (Figure 11) intended for 80 mm mini discs as a supporting edge in order to position the disc 10 centrally. Figure 11 illustrates the thickness of the inner layer 30 and the thickness J of the outer layer 40. The inner layer 30 projects from the outer layer 40 in the direction parallel to the axis of rotation. The maximum thickness J of outer layer 40 should preferably be less than 2 mm.

In the embodiment of Figures 10 and 11, the outer edges of the inner layer are part circular. In the embodiment of Figure 12 the inner layer 30 has a polygonal shape, with the corners of the polygon making substantially point contact with the inner tray. In

both cases, the outer perimeter of the thicker inner layer 30 should fall within the locus of a 40 mm distance from the center 9 of opening 5, or on a circle having a diameter L of 80 mm, which is the diameter of the inner tray 8 for an optical mini disc. As shown in Figure 12, the inner layer 30 can have a random shape and size. There must be at least one corner 31, preferably at least two. There is no limitation to the size and shape of the thinner outer layer 40, except that it should fit within the outer tray of the disc reader. Sections of the outer layer 40 can be connected or disconnected to each other but will always be connected to the inner layer 30.

The optical disc 10 merges traditionally printed material with computer storage media. It breaks the size and shape limitations of normal optical discs and creates opportunities for the development of new applications of optical discs in various business sectors.

While preferred embodiments have been shown and described, various modifications and substitutions may be made thereto without departing from the scope of the invention. Accordingly, it is to be understood that the present invention has been described by way of illustration and not limitation.

Claims

1. An optical disc which can store data and be read by optical disc reading devices having an inner tray, comprising:

a substantially circular central ring which contains no data;

a substantially annular data ring outwardly of the central ring, the data ring being capable of storing data;

an outer profile outwardly of the data ring; and

at least one projecting portion disposed in the outer profile, the projecting portion projecting in a direction parallel to the axis of rotation of the optical disc, for receipt in the inner tray so as to locate the optical disc centrally in the optical disc reading device.

2. An optical disc as claimed in claim 1, not being in the form of a visiting card.

3. An optical disc as claimed in claim 1, in the form of calendar, promotional item or gift.

4. An optical disc as claimed in claim 1, 2 or 3, wherein the outer profile has a non-circular shape.

5. An optical disc as claimed in claim 4, wherein the outer profile is square.

6. An optical disc as claimed in any preceding claim, wherein the distance between the axis of rotation of the disc and the outermost radial point of the at least one projecting portion is no greater than 41 mm.

7. An optical disc as claimed in any preceding claim,

wherein the optical disc has a surface and the at least one projecting portion has a height relative to the surface, the height being not larger than 3 mm.

8. An optical disc as claimed in any preceding claim, comprising a plurality of projecting portions.

9. An optical disc as claimed in claim 8, wherein at least one of the projecting portions is arranged to make point contact with the inner tray.

10. An optical disc as claimed in claim 9, comprising a plurality of pairs of projecting portions, the projecting portions in a pair being disposed at a circumferential spacing closer to each other than the circumferential spacing between circumferentially adjacent pairs.

11. An optical disc as claimed in claim 8 or 9, wherein at least one of the projecting portions has an arcuate outer edge for correspondence with the profile of the inner tray.

12. An optical disc as claimed in any of claims 1 to 7, comprising a projecting portion which forms a complete ring.

13. An optical disc as claimed in any preceding claim, wherein the data ring is of substantially the same thickness as the at least one projecting portion.

14. An optical disc as claimed in any of claims 1 to 12, wherein the projection has a shape selected from the group consisting of cylindrical, pyramid and spherical.

15. An optical disc as claimed in any of claims 1 to 14, wherein the projection is hollow.

16. An optical disc as claimed in any of claims 1 to 14, wherein the projection is solid.

17. An optical disc which can store data and be read by optical disc reading devices having an inner tray, comprising a substantially annular data ring capable of storing data, an outer profile outwardly of the data ring, and at least one projecting portion disposed in the outer profile, the projecting portion projecting in a direction parallel to the axis of rotation of the optical disc, for receipt in the inner tray so as to locate the optical disc centrally in the optical disc reading device.

18. An optical disc substantially as hereinbefore described with reference Figures 1 and 4 or Figures 2 and 3 or Figure 5 or Figure 6 or Figure 7 or Figure 8 or Figure 9 or Figures 10 and 11 or Figure 12 of the accompanying drawings.

Application No: GB 9927092.8 **Examiner:** Guy Tucker
Claims searched: 1 - 18 **Date of search:** 10 February 2000

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.R): G5R RPA, G5R RPB1, G5R RB21, G5R RB23, G5R RFN

Int Cl (Ed.7): G11B 7/24, G11B 23/00, G11B 25/04

Other: Online: JAPIO, EPODOC, WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
A	GB2155684A	NV PHILIPS	
A	EP0883091A	CUBA GMBH	
A	WO97/18942	DISCART LLC	
A	US5852598	WIEST, PETER	
A	US5774446	BORSADIA, SURESH	
A	US4462036	EASTMAN KODAK CO.	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.