

HIGH-DENSITY COMPACT DISC

1. Field of the Invention

The present invention relates to a high-density compact disc (CD), and more particularly to an optical disc, which has better storage capacity and is compatible to the present CD and VCD player.

2. Description of Related Art

A Compact Disc (CD) is a commonly used memory storage device. In 1981, PHILIP™ and SONY™ defined the specification for CD Audio (Compact Disc Digital Audio) and published the Red Book. With small size, large capacity and high fidelity, CDs in a short time replaced the conventional recording devices, such as plastic or bakelite disc and tape.

PHILIP™ and SONY™ later on issued the Yellow Book, Orange Book and White Book to include different specifications for CDs. The CD field has been extended to include CD-ROM for storing computer data and VCD for storing video information. Because the storage capacity of a single CD is only 650 MB, it can only store a film of 74 minutes in length. A movie of 100 minutes or longer requires two or more discs, which results in an interruption in the movie while the user changes the discs.

The storage structure on a conventional CD is shown in Fig.4. The disc forms a plurality of circular tracks consisting of pits (60) in the surface thereof. Limited by the production technology, the pits (60) have burrs (61) residually formed at the periphery thereof. That is to say, the slope of the pits (60) is gentle, which causes interfere when reading the information from the CD and thus "cross-talk" by these burrs (61) is generated. so the pitch (distance between two adjacent tracks in the radial direction) must be wide enough to avoid cross-talk. According to the Red Book, the pitch, the scan velocity and the length of a time unit (T) of the CD, should be $1.6\mu\text{m}$, 1.4m/s , and $0.327\mu\text{m}$, respectively.

Referring to Fig. 5, the width of a CD reading head (70) is $1.7\mu\text{m}$. When the reading head (70) is reading on a track, it clears the adjacent track by $0.3\mu\text{m}$. Figure 6 shows the decoding technique of the pits (60). The top row is binary

9901340-1

codes, the middle row is modulated signals and the bottom row is the shape of the pits (60). Each code in the top row corresponds to a time unit. The number "1" indicates the identification signal for the reading head (70) laser, such that the laser of the reading head (70) is controlled by the code to change from one state to another state, such as from active to inactive. The number "0" indicates the identification signal for the laser of the reading head (70), such that the reading head (70) laser is controlled by the code to maintain one state, such as in the active or inactive state. The change must be completed within the time unit. The slopes of the pits (60) correspond to the number "1" and fix on the length of a time unit. Because the slope is gentle, the length of unit time is defined at $0.327\mu\text{m}$ as described hereinbefore.

The wider pitch and the longer time unit limit the storage capacity of the conventional CD. To shorten the pitch and the unit time greatly increases the storage capacity.

A high-density compact disc in accordance with the present invention tends to mitigate and/or obviate the aforementioned problem.

The main object of the present invention is to provide a high-density compact disc, which can store more data than the conventional CD.

Another object of the present invention is to provide a high-density compact disc, which is compatible with the present CD and VCD players without the need to redesign the hardware.

Other objects, advantages and novel features of the invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings.

IN THE DRAWINGS:

Fig. 1 is a plan view showing pits of the high-density compact disc of the present invention;

Fig. 2 is a cross-sectional view showing a reading head and two adjacent tracks of the present invention;

Fig. 3 is diagram showing the coding technique of the high-density compact disc in accordance with the present invention;

Fig. 4 is a plan view showing pits of a conventional compact disc;

Fig. 5 is a cross-sectional view showing a reading head and two adjacent tracks of the conventional compact disc;

Fig. 6 is a diagram showing the conventional compact disc coding technique.

Referring to Fig. 1, a high-density compact disc in accordance with the present invention has a configuration similar to the conventional CD and can be adapted for use with the present CD or VCD player. The table shown below discloses the comparison of the main parameters of the conventional CD and the high-density CD of the present invention. After review of the table, it is to be noted that the parameters of the high-density CD are still within the scope of the Red Book.

Item	Specification	Conventional CD	High-density CD
Scanning Velocity	Linear velocity of the reading head	1.2m/s-1.4m/s	0.8m/s-1.19m/s
Track Pitch	Distance between two adjacent tracks	1.5-1.7 μ m	1.0-1.49 μ m
Maximum Information Diameter	Maximum Diameter capable of storing data in the disc	MID $\leq$ 116mm	120mm > MID > 116mm
Push Pull	Signals for reading	$0.04 \leq pp \leq 0.07$	$pp \leq 0.04$
Cross Talk	Disturbed signals in reading	XT $\leq$ 50%	XT > 50%

By improving production technology, the slope of the pits' periphery is steeper than that of the conventional CD, so chances of interference while reading information from the CD is greatly reduced.. Therefore, the pitch (20) can be reduced from 1.6 μ m to 1.2 μ m, as shown in Figs. 1 and 2. In this case, a reading

head (30) whose width is $1.7\mu\text{m}$ still clears the adjacent track by about $0.1\mu\text{m}$ when reading a track of the CD. The clearance is adequate to assure that cross-talk can not occur.

Furthermore, the slope of the wall of the pits (10) is also improved more steeply. The length of a time unit (T) is reduced from $0.327\mu\text{m}$ to $0.231\mu\text{m}$ (in fact, it could be anywhere within the range of $0.23\text{-}0.24\mu\text{m}$), as shown in Fig.3. The space between the pits is then reduced correspondingly. This means the same length can store more data.

By shortening the pitch and the length of a time unit at the same time, the storage capacity increases to 1.2GB (125 minutes of stored video), which is much more than 650MB (74 minutes) of the conventional CD. Most movies can be stored on one disc thereby obviating the necessity of changing the disc during a movie. The high-density CD is compatible with present CD and VCD players, so there is no need to redesign the player hardware.

The advantages of the present invention are:

1. The storage capacity of the high-density compact disc is 1.2GB, so a movie of 125 minutes can be completely stored in one disc. This saves the cost of cutting an additional original plate and a lot of material.

2. Since consumable material is saved, it is advantageous to the environment.

3. The high-density CD is convenience to use since it is compatible with the present CD and VCD players.

Even though numerous characteristics and advantages of the present invention have been set forth in the foregoing description, together with details of the structure and function of the invention, the disclosure is illustrative only, and changes may be made in detail, especially in matters of shape, size, and arrangement of parts within the principles of the invention to the full extent indicated by the broad general meaning of the terms in which the appended claims are expressed.

This Sheet Has Been Replaced





CLAIMS

1. A high-density compact disc having a plurality of tracks consisting of a plurality of pits, wherein the improvements comprise:

the distance between two adjacent pits is smaller than $0.3\mu\text{m}$ and the distance between two adjacent tracks is less than $1.6\mu\text{m}$.

2. The high-density compact disc as claimed in claim 1, wherein the distance within a time unit is less than $0.972\mu\text{m}$.

3. The high-density compact disc as claimed in claim 2, wherein the distance between adjacent pits is $0.1\mu\text{m}$.

4. The high-density compact disc as claimed in claim 1, wherein the distance between adjacent tracks is between $1.0\text{--}1.4\mu\text{m}$.

5. The high-density compact disc as claimed in claim 5, wherein the distance between two adjacent tracks is $1.2\mu\text{m}$.

This Sheet Has Been Replaced

