

DISC REPRODUCING APPARATUSBACKGROUND OF THE INVENTIONField of the Invention

The invention relates to a disc reproducing apparatus which can reproduce a CD-I disc on which image data and the like in addition to audio data are recorded.

Description of the Prior Art

There has been proposed a CD-I (CD Interactive) system in which image data (natural image, animation, computer graphics, etc.), text data, program data, and the like in addition to audio data are recorded onto a CD (Compact Disc) and which can execute the operation in an interactive manner. Since such a CD-I system has a reproducing function of characters, images, audio data, computer data, etc., it can be used in AV industrial apparatuses mainly for the purpose of audio and video fields, an electronic publishing which mainly handles characters, data base services mainly comprising information files, education and amusement which are mainly executed by interactive responses, and the like. Thus, the CD-I system is expected as a medium of a new format.

In the CD-I system, various specifications are predetermined so that it can widely be spread as a home-use system while keeping a compatibility. That is, in the CD-I system, a CPU of the 68000 type (microprocessor of 16 bits developed by Motorola Inc.) is used and an operating

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REPLACED SHEETS	SG
☒ Description : paged 1 to paged 25	
☒ Claim(s) : paged 26 to paged 30	
☒ Drawing(s) : paged 47 to paged 77	
☐ Abstract : paged 3 to paged 5	
DATE OF RECEIPT	

system which is fundamentally based on widespread OS9 is used as a real-time operating system which handles various kinds of files. Two trigger buttons and an X-Y device are used as an input device. Two audio and video systems are prepared as an output system. The CD-I player is constructed so that it can reproduce ordinary compact disc for a music.

As mentioned above, the CD-I player can reproduce not only a CD-I disc but also an ordinary compact disc for musics (CD-DA disc). However, in the CD-I player, it is determined that two trigger buttons and an X-Y device are used as an input device. All of the operations must be performed by using at least those two trigger buttons and the X-Y device. Therefore, in the conventional CD-I player, even when a CD-DA disc is reproduced, the operations must be performed by the two trigger buttons and the X-Y device.

Therefore, there is considered a method whereby the operation keys of PLAY, STOP, AMS (Auto Music Scan), and the like which are used when reproducing a compact disc for musics are displayed on an initial screen of an LCD display, and when a CD-DA disc has been loaded, the operations of the operation keys which are displayed on the screen are executed by using two trigger buttons and an X-Y device. In the case of the CD-I disc, however, since those operation keys which are displayed are unnecessary, if the operation keys are always displayed on



1 the initial screen, the vain operation keys are displayed
so long as the CD-I disc has been loaded, so that the user
is confused.

5 In the case of reproducing a CD-DA disc, since
there is no need to display on the screen, there is
considered a method whereby the LCD display is turned off
and an electric power consumption is reduced. However, in
the case where the operations to reproduce the CD-DA disc
are executed by using two trigger buttons and an X-Y
10 device while observing the screen, if the LCD display is
turned off, an inputting operation cannot be performed.

OBJECTS AND SUMMARY OF THE INVENTION

It is, therefore, an object of the invention to
provide a disc reproducing apparatus in which when a disc
15 having different format has been loaded, the operability
can be improved without making the user confused.

Another object of the invention is to provide a
disc reproducing apparatus which can also execute various
kinds of operations even if an LCD display has been turned
20 off.

According to an aspect of the invention, there
is provided a disc reproducing apparatus for reproducing a
disc on which audio data has been recorded or a disc on
which at least image data in addition to audio data have
25 been recorded, comprising:

means for reading and reproducing the audio data



1 from the disc;

means for forming a video signal on the basis of
the image data;

display means for displaying the video signal;

5 discriminating means for discriminating whether
the disc to be reproduced is the disc on which only the
audio data has been recorded or the disc on which the
image data together with the audio data have been
recorded;

10 operating means for operating the reproduction
of the audio data and a display of the video signal; and

means for switching the operation of the
operating means on the basis of the result of the
discrimination by the discriminating means.

15 According to another aspect of the invention,
there is provided a disc reproducing apparatus in which a
disc is loaded into a main body and which has means for
reproducing a plurality of audio data recorded on the
disc, means for reading out and displaying a plurality of
20 image data recorded on the disc, and an operation key for
selecting and displaying the plurality of image data,
comprising:

means for detecting whether the disc has been
loaded or not;

25 means for detecting whether the image data has
been recorded on the disc or not after the loading of the
disc had been detected; and



1 means for setting the operation key to a special
key to control the reproduction of the plurality of audio
data in the case where no image data is recorded on the
disc.

5 The display means comprises an LCD display, for
example. The LCD display is arranged on a cover portion
which is arranged on the play main body so as to the
freely opened or closed. In a state that the cover
portion is opened, the LCD display is exposed, thereby
10 enabling the video signal to be seen and enabling the
display of the video signal to be operated. In a state
that the cover portion is closed, the audio data can be
reproduced and the reproduction of the audio data can
be operated. Further, when the driving of the LCD display
15 is stopped, the operating means functions as a special key
for operating the audio reproduction.

When a disc is loaded, the kind of disc is
discriminated from TOC (Table of Contents) data recorded
on the disc. When a CD-DA disc has been loaded, operation
20 keys of PLAY, STOP, AMS, etc. are displayed. When a CD-I
disc has been loaded, those operation keys are erased.
Therefore, when a CD-DA disc has been loaded, an audio
reproduction can be easily performed. A situation such
that when a CD-I disc has been loaded, a vain display is
25 displayed and the user is confused can be prevented.

Further, in the case where a CD-DA disc or a CD-I/CD-DA



1 disc (disc in which a CD-I format and a CD-DA format
mixedly exist) has been loaded and only an audio
reproduction is executed, two trigger buttons and an X-Y
device which are used to reproduce the CD-I disc are made
5 function as a special key for an audio reproduction.
Thus, even when the driving of an LCD display has been
stopped, various kinds of audio reproducing operations can
be freely executed.

The above, and other, objects, features and
10 advantage of the present invention will become readily
apparent from the following detailed description thereof
which is to be read in connection with the accompanying
drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

15

Fig. 1 (Figs. 1A and 1B) is a perspective view showing a whole
construction of an embodiment of the invention;

Figs. 2A, 2B and 3 are schematic diagrams which are
used in the explanation of the specifications of a CD-I;

20

Fig. 4 is a block diagram showing an internal
construction of the embodiment of the invention;

Fig. 5 is a flowchart which is used in the
explanation of the operation of the embodiment of the
invention; and

25

Fig. 6 (Figs. 6A to 6D) is a schematic diagram which is used in
the explanation of the indication of a display in the
embodiment of the invention.



1 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

 An embodiment of the invention will be described
in accordance with the following order.

 a. Construction of an embodiment

5 b. With respect to a CD-I format

 b1. Data structure

 b2. Writing of audio data

 b3. Writing of video data

 b4. Disc

10 b5. Hardware

 c. Internal construction of an embodiment

 d. Operation of an embodiment

 e. Operation when display is unnecessary

15 a. Construction of an embodiment

 Figs. 1A and 1B are diagrams showing a whole
construction of a CD-I player to which the invention has
been applied.

 In Figs. 1A and 1B, reference numeral 1 denotes
20 a whole CD-I player to which the invention has been
applied. In order to enable the CD-I player 1 to be
easily carried to the outside an LCD display 13 is
integrated and the size and weight of the CD-I player 1
are reduced by realizing an IC, using chip parts, and the
like. Dimensions of the entire CD-I player 1 are set to,
25 for instance, a width of 140 mm, a length of 170 mm, and a
height of 60 mm.



1 A disc driving section to rotate the disc 15
which has been set, a head driving section to move the
optical head in the radial direction of the disc, and a
printed circuit board to process a reproduction signal
5 from the optical head are enclosed in the casing of the
player main body portion 2 of the CD-I player 1. Further,
a computer comprising a CPU of the 68000 type is enclosed
in the casing.

A head phones jack 3, a sound volume adjusting
10 dial 4, and a power on/off switch 5 are arranged on a
front side surface 2A of the player main body portion 2.
An open button 6 is arranged on a front side upper edge of
the player main body portion 2.

A middle cover 7 is rotatably arranged on the
15 player main body portion 2 of the CD-I player 1. By
depressing the open button 6, the middle cover 7 is opened
as shown in Fig. 1B. When the middle cover 7 is opened,
the disc can be loaded/unloaded. A window portion 8 is
formed in the middle cover 7. A transparent member is
20 used as a window portion 8. The rotating state of the
loaded disc 15 can be checked through the window portion
8.

An X-Y device 11 and trigger buttons 10A and 10B
are arranged on a front edge surface of the middle cover
25 7. The X-Y device 11 can designate positions in the X and
Y directions by depressing portions which are deviated
from the center in the vertical and horizontal direction,



1 respectively.

A pointing device such as track ball, mouse, joy-stick, or the like can be used as such an X-Y device 11.

5 An outer cover 12 is rotatably arranged over the middle cover 7. The outer cover 12 can be manually opened.

The outer cover 12 can be opened to an opening/closing angle of 90° or more, and fixed to predetermined opening/closing angle of θ. The LCD display 13 of a size of, e.g., 4 inches is arranged on a back surface 12A of the outer cover 12. By opening the outer cover 12, the LCD display 13 is exposed as shown in the figure, thereby enabling a picture plane of the LCD display 13 to be seen. An LCD driving switch 14A is also arranged on the back surface 12A of the outer cover 12. By operating the LCD driving switch 14A, the LCD display 13 can be on/off controlled. Reference numeral 14B denotes a switch to detect opening/closing of the outer cover 12 which is arranged on a rear side front edge surface of the play main body 2. By operating the switch 14B, the LCD display 13 may be on/off controlled depending on the opening/closing state of the outer cover 12. That is, when the outer cover 12 is opened, the driving of the LCD display 13 is turned on. When the outer cover 12 is closed, the driving of the LCD display 13 is turned off.



1 b. With respect to a CD-I format

 The CD-I player to which the invention has been
applied can reproduce a CD-I disc, a CD-I/CD-DA disc (disc
in which a CD-I format and a CD-DA format mixedly exist),
5 and a CD-DA disc (ordinary compact disc for reproducing a
music) as discs. A data format of the CD-I will now be
described.

 b1. Data structure The CD-I records data
in a format which is fundamentally based on the CD-ROM. A
10 recording unit of the data is set to a block in a manner
similar to the CD-ROM. One block is set to 2352 bytes.
In the case of the disc having a diameter of 12 cm, a
recording capacity of the whole CD-I disc is equal to
about 640 Mbytes.

15 There are two kinds of data structures of the
CD-I of a form 1 and a form 2. They correspond to a mode
1 and a mode 2 of the CD-ROM, respectively.

 In the mode 1 in the CD-ROM, an error detection
20 code and an error correction code are added to the data of
one block, thereby enabling a strong error correction to
be executed. In the mode 2 in the CD-ROM, none of the
error detection code and the error correction code is
added, thereby enabling a large amount of user's data to
25 be assured.

 In the CD-I, the form 1 and the form 2 can be
designated every block and both of the forms 1 and 2 can



1 be allowed to mixedly exist in one disc.

The CD-I format differs from the CD-ROM format with respect to a point that a sub-header of eight bytes is provided at the head of the user's data. Each block in
5 which audio data, image, and data have been recorded is time-sharingly multiplexed to the sub-header on a block unit basis, and they are written twice and stored to process in a real-time manner. The sub-header comprises four items of a file number, a channel number, a sub-mode,
10 and a data type.

That is, Fig. 2A shows a structure of the form 1. In the form 1, a sync (12 bytes) is provided at the head. A header (4 bytes) is subsequently provided. Further, a sub-header (8 bytes) is provided. After that,
15 user's data (2048 bytes) is provided. An error detection code EDC (4 bytes) and a P parity (172 bytes) and a Q parity (104 bytes) for error correction are added to the user's data. In the form 1, the error correcting capability is enhanced. The form 1 is suitable in the
20 case of handling data such as character data, program data, or the like whose errors cannot be interpolated.

Fig. 2B shows a structure of the form 2. In the form 2, a sync (12 bytes) is provided at the head. A header (4 bytes) is subsequently provided. Further, a
25 sub-header (8 bytes) is provided. After that, user's data (2324 bytes) is provided and a reserve area (4 bytes) is



1 provided. The form 2 is suitable in the case of handling
data such as audio data, video data, or the like which can
be interpolated.

5 As shown in Fig. 3, the sub-header which is
added to the head of the user's data comprises a file
number (2 bytes), a channel number (2 bytes), a sub-mode
(2 bytes), and a data type (2 bytes).

b2. Writing of audio data

10 Four modes are determined when audio data in CD-
I is written.

One of the modes is based on the same recording
system as that of the existing CD-DA in which the sampling
frequency is set to 44.1 kHz and the number of
15 quantization bits is set to 16 bits. This mode intends to
perform a super Hi-Fi reproduction.

In another mode, an ADPCM (Adaptive Differential
PCM) is used as a recording method. The sampling
frequency is set to 37.8 kHz and the number of
20 quantization bits is set to 8 bits. In this mode, a sound
quality which is close to that of an LP record can be
reproduced. The reproducing time is set to two hours in
the stereophonic mode and is set to four hours in the
monaural mode. This mode intends to perform a Hi-Fi
25 reproduction.

In still another mode, the ADPCM is used as a
recording method. The sampling frequency is set to 37.8



1 kHz and the number of quantization bits is set to 4 bits.
In this mode, a sound quality which is close to that of an
FM broadcasting can be reproduced. The reproducing time
is set to four hours in the stereophonic mode and is set
5 to eight hours in the monaural mode. This mode intends to
perform a Hi-Fi reproduction of a long time.

In further another mode, the ADPCM is used as a
recording method. The sampling frequency is set to 18.9
kHz and the number of quantization bits is set to 4 bits.
10 The reproducing time is set to eight hours in the
stereophonic mode and set to sixteen hours in the monaural
mode. This mode intends to perform a speech reproduction.

b3. Writing of video data

15 Image data is processed as follows in accordance
with the type of image data.

In the case of a natural image, the sampling
frequency of a luminance signal Y is set to 7.6 MHz and
the sampling frequencies of color difference signals U and
V are set to 3.8 MHz. The image data is sampled at ratios
20 of 4 : 2 : 2. Bits are compressed to four bits and
recorded. They are returned to eight bits upon
reproduction.

In the case of graphics, a CLUT (Color Lookup
Table) is used. The CLUT graphics include three modes of
25 256 colors (8 bits), 128 colors (7 bits), and 16 colors (4
bits). Necessary colors can be selected from sixteen



1 million colors and used.

In the case of an animation, a run length code is used. In this case, image data is compressed by using color information and a length between pixels. An
5 animation on a full screen can be realized by using such a code.

b4. Disc

In the CD-I disc, mechanical dimensions such as
10 outer diameter dimension, center hole dimension,
thickness, and the like, optical parameters such as
refractive index, reflectance, and the like, recording
parameters such as disc rotating direction, recording
linear velocity, track shape, track pitch, and the like,
15 use environment situations, and the like are all similarly
set those of an ordinary compact disc (CD-DA) for a music.

The disc is constructed in a manner such that it
is possible to discriminate whether the disc is a CD-I
disc or not on the basis of the contents in a TOC (Table
of Contents) of a lead-in area of the disc. That is, in
20 the CD-I disc or CD-I/CD-DA disc, a PSEC is set to 10 when
(POINT = A0). On the other hand, in the other discs, the
PSEC when (POINT = A0) is set to a value other than 10.
For example, in the CD-DA disc, the PSEC when (POINT = A0)
is set to 00. Therefore, from the PSEC when (POINT = A0),
25 it is possible to judge whether the disc is a CD-I disc or
a CD-I/CD-DA disc or another disc. Control fields of



1 (POINT = A0, A1, A2) of the CD-I disc are set to (01 x 0).
A control field of (POINT = A0) of the CD-I/CD-DA disc is
always set to (01 x 0) and the other control fields are
set to (00 x 0). Consequently, from the control field, it
5 is possible to judge whether the disc is a CD-I disc or a
CD-I/CD-DA disc.

b5. Hardware

In the CD-I, since audio data is included and a
high-speed process in a real-time manner is needed, a
10 process by a machine language is executed. As a CPU for
such a purpose, a CPU of 16 bits of the 68000 type which
has been developed by Motorola Inc. is designated. A CD-
RTOS (Real-Time Operating System) which handles various
15 kinds of files fundamentally uses the OS9 and the program
is assembled as an ROM into the system. At least an X-Y
device and two trigger buttons are prepared as an input
device. Two systems of audio and video are prepared as an
output. The CD-I player can reproduce a CD-DA for musics.

20 c. Internal construction of an embodiment

Fig. 4 shows an internal construction of the CD-
I player 1 to which the invention has been applied.

In Fig. 4, a disc 15 is rotated by a spindle
motor 21 at a CLV (constant linear velocity). The
25 rotation of the spindle motor 21 is controlled by a
spindle servo circuit 22 on the basis of clocks which are



1 reproduced by a CD reproducing circuit 28. An output of a
system controller 20 is supplied to the spindle servo
circuit 22.

5 A recording signal on the disc 15 is reproduced
by an optical head 23. The optical head 23 is supported
by a biaxial device. An output of a focusing/tracking
servo circuit 25 is supplied to the biaxial device. The
output of the system controller 20 is supplied to the
focusing/tracking servo circuit 25. The focusing/tracking
10 servo circuit 25 applies servo controls to two axes for
the optical head 23 in the focusing direction and the
tracking direction on the basis of an output of a photo
detector.

The optical head 23 is made movable in the
15 radial direction of the disc 15 by a slide feeding
mechanism 24 using, for instance, a linear motor. The
slide feeding mechanism 24 is controlled by a threading
servo circuit 26. The output of the system controller 20
is supplied to the threading servo circuit 26. The
20 optical head 23 can be accessed to a desired track
position by the slide feeding mechanism 24.

An output of the optical head 23 is supplied to
a CD reproducing circuit 28 through an RF amplifier 27.
The CD reproducing circuit 28 comprises a reproducing
25 circuit of bit clocks, an EFM demodulating circuit, a CIRC
error correction circuit, and the like. The CD
reproducing circuit 28 EFM demodulates the output of the



1 optical head 23 and executes an error correcting process.
The CD reproducing circuit 28 is controlled by the system
controller 20.

5 An output of the CD reproducing circuit 28 is
supplied to a CD-ROM reproducing circuit 29. The CD-ROM
reproducing circuit 29 comprises a sync detecting circuit,
a descrambling circuit, an error correction circuit, and
the like. A sync signal is detected by the CD-ROM
reproducing circuit 29 and the scramble is released. A
10 header address is checked and a target block is accessed.
In the case of the form 1, the error correcting process is
further executed. The CD-ROM reproducing circuit 29 is
controlled by the system controller 20.

15 An input from an input device 30 is given to the
system controller 20. The input device 30 comprises the
X-Y device 11 and two trigger buttons 10A and 10B.

Reference numeral 31 denotes a CPU to control
the CD-I system. A CPU of the 68000 type is used as a CPU
31. A master controller 32 is connected to the CPU 31.
20 The CPU 31 and the system controller 20 are
bidirectionally connected. A bus 33 is led out of the CPU
31. One chip in which the CPU 31 and the master
controller 32 are assembled can be also used.

25 The data reproduced by the CD-ROM reproducing
circuit 29 is sent to the bus 33. RAMs 35A and 35B are
connected to the bus 33 through video controllers 34A and



1 34B, respectively. A system ROM 36 and a non-volatile RAM
37 which is backed up by batteries are bidirectionally
connected to the bus 33. An audio decoder 38 is connected
to the bus 33.

5 The image data in the data reproduced by the CD-
ROM reproducing circuit 29 is supplied to video
controllers 34A and 34B under control of the CPU 31.
Video signals based on the image data are formed by the
video controllers 34A and 34B. The video signals are
10 supplied to a video synthesizer 39. The video synthesizer
39 synthesizes the video signal from the video controller
34A and the video signal from the video controller 34B.
An output of the video synthesizer 39 is supplied to the
LCD display 13 via an LCD driving circuit 40. The driving
15 of the LCD display 13 can be turned on/off by the LCD
driving switch 14A. The switch 14B is turned on/off
depending on an opening or closed state of the outer cover
12 (Fig. 1), and a signal indicating the on/off state of
the switch 14B is supplied to the system controller 20.

20 The audio data in the data reproduced by the CD-
ROM reproducing circuit 29 is supplied to the audio
decoder 38 under control of the CPU 31. The audio decoder
38 ADPCM decodes the audio data based on the ADPCM and the
like. The decoded audio data is supplied to the D/A
25 converter 41 and is converted into the analog signal. The
analog signal is generated from the head phones output
terminal 3 through a low pass filter 42 and an amplifier



1 43. An audio signal level which is generated from the
head phones output terminal 3 can be set by the sound
volume adjusting dial 4.

5 d. Operation of an embodiment

The operation of an embodiment of the invention
will now be described. Fig. 5 shows the operation when
the LCD display 13 is turned on. In this state, audio
reproduction and image reproduction can be performed.

10 In Fig. 5, when the power source is turned on by
the power on/off switch 5 (Fig. 1), a check is made to see
if a calendar and an internal clock have been set or not
(step 51).

15 In the case of setting the calendar and the
internal clock, the calendar and the internal clock are
set by using the X-Y device 11 and the trigger buttons 10A
and 10B (step 52). After the calendar and the internal
clock were set, a check is made to see if the disc has
been loaded or not (step 53).

20 If the calendar and the internal clock are not
set in step 51, step 53 follows and a check is made to see
if the disc has been loaded or not.

25 If the disc is not loaded, an indication of the
unloaded state of the disc is displayed by the LCD display
13 (step 54). That is, if the disc is not loaded, as
shown in Fig. 6A, an indication of the unloaded state of
the disc is displayed in a display area 45 of the LCD



1 display 13 and the calendar and the time are displayed in
a display area 46.

The discrimination regarding the loading of the
disc is continued (step 55).

5 If it is detected in step 53 or step 55 that the
disc has been loaded, the TOC of the innermost rim of the
disc is accessed (step 56).

From the data of the TOC, a check is first made
to see if the loaded disc is a CD-I/CD-DA disc or a CD-I
10 disc or a CD-DA disc (step 57). That is, in the case of
the CD-I disc or CD-I/CD-DA disc, PSEC when (POINT = A0)
is set to 10. In the case of another disc, since PSEC
when (POINT = A0) has been set to a value other than 10,
e.g., 00 in the CD-DA disc, a check is made from the PSEC
15 when (POINT = A0) to see if the disc is a CD-I disc or a
CD-DA disc.

If it is decided that the disc is the CD-DA
disc, an indication when the CD-DA disc has been loaded is
displayed in the LCD display 13 (step 58). That is when
20 the CD-DA disc has been loaded, as shown in Fig. 6B, a
content indicating that the disc has been loaded is
displayed in the display area 45 of the LCD display 13.
An indication of an operation key such as PLAY, AMS, STOP,
etc. to operate the CD-DA is displayed in the display area
25 46.

When the operation key displayed in the display



1 area 46 is operated by using the X-Y device 11 and the
trigger buttons 10A and 10B, the CD-DA disc is reproduced
in accordance with the above operation (step 59).

5 If it is determined in step 57 that the disc is
not the CD-DA disc, a check is made to see if the disc is
a CD-I disc or a CD-I/CD-DA disc (step 60). Namely,
control fields of (POINT = A0, A1, A2) of the CD-I disc
are set to (01 x 0) and a control field of (POINT = A0) of
the CD-I/CD-DA disc is always set to (01 x 0). The other
10 control fields are set to (00 x 0). Therefore, from the
control field, it is judged whether the disc is the CD-I
disc or the CD-I/CD-DA disc.

If it is determined that the loaded disc is the
CD-I disc, an indication when the CD-I disc has been
15 loaded is displayed on the LCD display 13 (step 61). That
is, if the CD-I disc has been loaded, as shown in Fig. 6C,
an indication showing that the disc has been loaded is
displayed in the display area 45 of the LCD display 13. A
title and the like of an application software are
20 displayed in the display area 47.

When operating by using the X-Y device 11 and
the trigger buttons 10A and 10B in accordance with an
instruction of the application software, the CD-I disc is
reproduced in accordance with the operation (step 62).

25 If it is decided that the loaded disc is the CD-
I/CD-DA disc, an indication when the CD-I/CD-DA disc has
been loaded is displayed on the LCD display 13 (step 64).



1 That is, when the CD-I/CD-DA disc has been loaded, as
shown in Fig. 6D, an indication showing that the disc has
been loaded is displayed in the display area 45 of the LCD
display 13. An indication of the operation key such as
5 PLAY, AMS, STOP, or the like to operate the CD-DA is
displayed in the display area 46. The title and the like
of the application software are displayed in a display
area 47.

10 In the case of the CD-I/CD-DA disc, a check is
made to see if only the CD-DA is reproduced or not (step
65). When the operation key displayed in the display area
46 is operated by using the X-Y device 11 and the trigger
buttons 10A and 10B, only the portion of the CD-DA area is
reproduced in accordance with the operation (step 66).
15 When operating by using the X-Y device 11 and the trigger
buttons 10A and 10B in accordance with the instruction of
the application software, the CD-I/CD-DA is reproduced in
accordance with the operation (step 67).

As mentioned above, according to an embodiment
20 of the invention, in the case of the CD-I/CD-DA disc, only
the CD-DA area can be reproduced. Thus, only the sounds
of the application software can be enjoyed.

e. Operation when display is unnecessary

25 In the case of reproducing the CD-DA disc, only
the audio data is reproduced, so that there is no need to
display on the LCD display 13. In the case of reproducing



1 only the audio data from the CD-I/CD-DA disc as well,
there is no need to display on the LCD display 13. As
mentioned above, if the LCD display 13 is driven when the
screen display is unnecessary, an electric power is vainly
5 consumed. In the embodiment of the invention, therefore,
when there is no need to display a screen, by enabling the
LCD display 13 to be turned off by the LCD driving switch
14, the electric power consumption can be reduced.

 If the LCD display 13 is turned off, however, it
10 is impossible to execute the operation while looking at
the indication on the LCD display 13. It is also possible
to provide special keys for audio reproduction in addition
to the X-Y device 11 and the trigger buttons 10A and 10B.
However, if such keys are provided, the number of keys
15 increases and the apparatus enlarges in size. In the
embodiment of the invention, accordingly, the X-Y device
11 and the trigger buttons 10A and 10B are allowed to
function as special keys for audio reproduction when the
loaded disc is the CD-DA disc and the driving of the LCD
20 display 13 has been turned off or when the loaded disc is
the CD-DA disc and only the audio reproduction is executed
and the driving of the LCD display 13 has been turned off.
That is, for instance, the left direction and the right
direction of the X-Y device 11 function as an "AMS key",
25 the trigger button 10A functions as a "PLAY/PAUSE key",
and the trigger button 10B functions as a "STOP key".



1 Consequently, even when the driving of the LCD display 13
has been stopped, various audio reproducing operations can
be freely executed.

In the case of turning on/off the driving of the
5 LCD display 13 by the switch 14B to detect an opening or
closed state of the outer cover 12, the driving of the LCD
display 13 is turned on by the switch 14B when the outer
cover 12 is open, so that an audio reproduction and an
image reproduction are executed. When the outer cover 12
10 is closed, the driving of the LCD display 13 is turned off
and only an audio reproduction is performed. In this
case, the functions of the trigger buttons 10A and 10B and
the X-Y device 11 are switched as mentioned above in
accordance with the opening or closed state of the outer
15 cover 12. When the outer cover 12 is closed, the CD-I
disc cannot be reproduced. In the case of the CD-I/CD-DA
disc, only the CD/DA area can be reproduced.

Further, since a video reproduction is not
performed for a CD-DA disc, when a CD-DA disc has been
20 loaded, the trigger buttons 10A and 10B and the X-Y device
11 can be allowed to function as a special key for an
audio reproduction irrespective of the on/off state of the
LCD display 13. It is also possible to construct in a
manner such that the trigger buttons 10A and 10B and the
25 X-Y device 11 are made function as a special key for an
audio reproduction if the LCD display 13 has been turned
off independently of the kind of disc.



1 According to the invention, when a disc is
loaded, the kind of disc is discriminated from the TOC
data. When a CD-DA disc is loaded, the operation keys
such as PLAY, STOP, AMS, and the like are displayed. When
5 a CD-I disc is loaded, those operation keys are erased.
Therefor, when a CD-DA disc is loaded, the audio
reproduction can be easily executed. A situation such
that in the case where a CD-I disc has been loaded, a vain
display is displayed and the user becomes confused can be
10 prevented. On the other hand, when a CD-I/CD-DA disc is
loaded, the operation keys such as PLAY, STOP, AMS, and
the like are displayed and only the audio reproduction can
be executed by operating those keys.

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5 C L A I M S

1. A disc reproducing apparatus (1) for reproducing a disc (15) on which audio data has been recorded or a disc on which at least image data in addition to audio data have been recorded, comprising:
- 10 means for reading and reproducing the audio data from the disc;
- means for forming a video signal on the basis of the image data;
- 15 display means (13) for displaying the video signal;
- discriminating means for discriminating whether the disc to be reproduced is the disc on which only the audio data has been recorded or the disc on which the image data together with the audio data have been recorded;
- 20 operating means (10A, 10B, 11) for operating the reproduction of the audio data and a display of the video signal; and
- means for switching the operation of the operating means on the basis of the result of the discrimination
- 25 by the discriminating means.
2. An apparatus according to claim 1, wherein the reproduction of the audio data and the display of the video signal are operated by operations of an X-Y pointing device (11)
- 30 and a plurality of trigger switches (10A, 10B).
3. An apparatus according to claim 1, wherein the

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1 video signal is displayed on a screen of an LCD display
and the apparatus further has driving means for driving
said LCD display.

5 4. An apparatus according to claim 1, further
having means for displaying content information of the
audio data in the case where the disc to be reproduced is
the disc on which the audio data has been recorded and for
displaying content information of at least the image data
10 in the case where the disc to be reproduced is the disc on
which the audio data regarding the image data has been
recorded together with the image data.

5. An apparatus according to claim 1 or 3,
comprising:
15 a player main body section having the means for
forming the video signal on the basis of the image data
recorded on the disc and the means for reproducing the
audio data recorded on the disc;

20 a cover section which has the display means for
displaying the video signal and which is provided for the
player main body section so as to be freely opened or
closed; and

25 means which is constructed in a manner such that
the display means is exposed in an open state of the cover
section, the video signal is displayed, the display of the
video signal can be made operative, the audio data can be
reproduced in a closed state of the cover section, and the





1 reproduction of the audio data can be made operative.

6. An apparatus according to claim 3, wherein the
LCD display is provided on a back surface side of the
cover section which is provided for the player main body
5 section so as to freely opened or closed, and the driving
of the LCD display turned on or off in accordance with an
opening/closing operation of the cover section.

7. An apparatus according to claim 3, further
having change-over switch for turning on/off the driving
10 of the LCD display,

and wherein when the change-over switch has been
turned off and the driving of the LCD display has been
stopped, the operating means is used as a special key to
make the reproduction of the audio data operative.

8. An apparatus according to claim 7, wherein when
only the audio data has been reproduced from the disc on
which the image data had been recorded together with the
audio data and the driving of the LCD display has been
15 stopped, the operating means is used as a special key to
make the reproduction of the audio data operative:

9. A disc reproducing apparatus in which a disc is
loaded into a main body and which has means for
reproducing a plurality of audio data recorded on the
disc, means for reading out and displaying a plurality of
25 image data recorded on the disc, and an operation key for
selecting and displaying said plurality of image data,





1 comprising:

means for detecting whether the disc has been loaded or not;

means for detecting whether the image data has
5 been recorded on the disc or not after the loading of the disc had been detected; and

means for setting the operation key to a special key to control the reproduction of said plurality of audio data in the case where no image data is recorded on the
10 disc.

10. An apparatus according to claim 9, further comprising means for selecting and reproducing only the audio data from the disc on which the plurality of image data have been recorded together with the plurality of
15 audio data,

and wherein upon reproduction of the audio data, the operation key of the image data is allowed to function as a reproducing operation key of the audio data.

20 11. An apparatus according to claim 9, further comprising an X-Y pointing device and a plurality of trigger switches for selecting and displaying said plurality of image data,

and wherein among various kinds of controls of the reproduction of the audio data, functions of PLAY,
25 STOP, PAUSE, and SEARCH are made correspond to said X-Y pointing device and said plurality of trigger switches,





1 respectively.

12. An apparatus according to claim 10, wherein a
right direction key and a left direction key of the x-y
pointing device are made correspond to a forward SEARCH
5 and a backward SEARCH, respectively.

13. An apparatus according to claim 5, further
having a plurality of key switches which input various
kind of control information to control the display of the
video signal and on which control contents of said control
10 information are displayed,

and wherein said control contents displayed on
the key switches are respectively displayed on a screen
together with the key switches.

15 14. An apparatus according to claim 9, further
comprising means for displaying present date and time,
and wherein in the case where an unloading of
the disc has been detected, the date and time are
displayed.

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