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TITLE OF THE INVENTION

DISC PLAYER HAVING DISC CHANGING FUNCTION

FIELD OF THE INVENTION

The present invention relates to a disc
5 player wherein disclike recording media (hereinafter
referred to as "discs") having various items of data
recorded therein are accommodated in a plurality of
disc storage portions and which is adapted to
selectively play desired discs.

10 BACKGROUND OF THE INVENTION

Compact discs (CDs) having audio signals
digitally recorded thereon and CD players are already
in wide use. In recent years, CD players have been
developed which have a disc changing function and
15 which are adapted to selectively play a plurality
of discs accommodated in the player.

For example, Examined Japanese Patent
Publication HEI 4-19626 proposes a CD player which is
adapted to select desired CDs from among a plurality
20 of CDs accommodated in the body of the player, select
desired pieces of music recorded on the selected
CDs and automatically play the selected pieces.
For this purpose, the desired CD numbers and the
music piece numbers in the desired CDs are registered

in a memory by manipulating input keys in advance for the player to automatically give a CD music performance based on the data stored in the memory

Examined Japanese Patent Publication HEI 4-
5 245085 proposes another CD player for use with a plurality of magazines each accommodating a plurality of CDs, one of the magazines being replaceably set in the body of the player. The magazines prepared for the CD player in advance are each given a name, which
10 is registered in a memory. The CDs accommodated in each magazine are also each given a name, which is also registered in the memory. Accordingly, the data as to a particular disc which becomes lost or damaged after the registration can be erased from the memory without
15 the necessity of setting the disc in the player body.

With the conventional CD players having a disc changing function, the plurality of CDs must each be given a name for identifying the CD as distinguished from the other CDs, and the names of a desired number
20 of CDs need to be specified before automatic playing. Thus, the CD players have the problem of being very cumbersome to operate.

Especially with CD players which handle a multiplicity of CDs, the music recorded therein falls
25 under different categories such as classical music,

jazz and rock. However, the user is desirous to select a particular category from among the different categories, e.g., rock only, for automatic playing. In this case, it is necessary with the conventional
5 CD player to input and register the names of all CDs included in the desired category, hence a cumbersome procedure.

SUMMARY OF THE INVENTION

An object of the present invention is to
10 provide a disc player which in automatically playing a plurality of discs included in a particular category optionally selected by the user from among the discs to be played by the player, the plurality of discs can be played automatically merely by specifying the
15 desired category without the necessity of specifying the names of the discs.

The present invention provides a disc player which has a disc changing function and which comprises memory means for storing a category name for each of
20 disc storage portions, category specifying means to be manipulated for specifying the category name of the discs to be played, and automatic reproduction means for retrieving from the memory means the category name specified by manipulating the category specifying
25 means and successively automatically playing a

plurality of discs in the disc storage portions given the category name.

More specifically, the disc player has a display, and category display means for displaying
5 the category name of each of the disc storage portions on the display.

The disc player further comprises category input means to be manipulated when a new category name is to be registered in the memory means, and category
10 registration means for registering the category name in the memory means in accordance with the manipulation of the category input means.

When a particular category name is specified by manipulating the category specifying means to
15 execute automatic reproduction, the category display means successively shows on the display all category names stored in the memory means and given to the disc storage portions containing the discs which can be played.

20 With the disc player embodying the present invention, the category input means is manipulated when discs are accommodated in the plurality of disc storage portions to input a category name for each of the disc storage portions. In accordance with this
25 operation, the category registration means registers

the category name of each storage portion in the memory means. Category names are not limited to those of music such as classical music, jazz and rock but can be desired names insofar as these names represent
5 the categories of what is recorded in the discs.

When discs are to be automatically played thereafter, the category specifying means is manipulated to specify the category name of the discs to be played. In accordance with this, the automatic reproduction
10 means retrieves the specified category name from the memory means and recognizes the disc storage portions which are given the specified category name. The reproduction means then prepares a control signal for automatically playing the discs in these storage
15 portions in a predetermined order and feeds the signal to a control circuit of the disc player.

Consequently, the discs included in the specified category are played in succession for reproduction. The order in which the disc are played
20 can be the order of discs as arranged in the disc storage portions, a random order or various other orders that can be predetermined.

The disc player having a disc changing function and embodying the present invention automati-
25 cally plays the discs in a particular category as

selected from among a plurality of discs accommodated
in the player, merely when the category is specified
as desired. The player is therefore easier to use
than the conventional disc player in the case of which
5 disc names need to be specified individually.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram showing the construction
of a disc player embodying the invention;

FIG. 2 is a diagram showing the structure of
10 data in a memory;

FIG. 3 is a flow chart showing a procedure
for registering category names only;

FIG. 4 is a flow chart showing the first
half of a procedure for registering category names
15 and subcategory names;

FIG. 5 is a flow chart showing the second
half of the same procedure;

FIG. 6 is a flow chart showing a category
selection procedure for automatic playing based on
20 the category name only;

FIG. 7 is a flow chart showing a category
selection procedure for automatic playing based on
the category name and subcategory name;

FIG. 8 is a flow chart showing an automatic
25 playing procedure;

FIG. 9 is a flow chart showing an example of automatic performance;

FIG. 10 is a front view showing an arrangement on a front panel;

5 FIG. 11 is a diagram showing an example of category name displayed for category registration;

FIG. 12 is a diagram showing another example of category name displayed;

10 FIG. 13 is a diagram showing examples of category name and subcategory name displayed;

FIG. 14 is a diagram showing other examples of category name and subcategory name displayed;

15 FIG. 15 is a diagram showing a display example indicating a particular category of automatic performance; and

FIG. 16 is a diagram showing another display example for another category.

DETAILED DESCRIPTION OF EMBODIMENT

20 With reference to the drawings, a detailed description will be given of an embodiment of the invention, i.e., a disc player having a disc changing function for 24 discs.

FIG. 1 shows the construction of the disc player. A disc holder 7 has accommodated therein 24
25 CDs 8, from among which one CD 8 is selected and

withdrawn by a disc selection-retrieval mechanism 6.
The disc is transported to a playing mechanism
comprising a pickup 52 for reproducing signals, a disc
motor 53 for drivingly rotating the CD 8, etc.

5 The interior of the disc holder 7 is
partitioned into 24 disc storage portions, to which
the consecutive numbers "1" to "24" are assigned,
respectively. The disc is identified with reference
to the number.

10 The pickup 52 has connected thereto a
reproduction control circuit 5 for controlling the
tracking movement and focusing movement of the pickup
52. A digital signal available from the pickup 52
via the circuit 5 is fed to a digital signal
15 processing circuit 51, thereby processed for demodula-
tion, error correction, D/A conversion, etc. and fed
to a subsequent circuit (not shown) comprising, for
example, an amplifier. Part of the signal available
from the processing circuit 51 is fed to the disc
20 motor 53 to control the rotation of the CD.

 A system control circuit 4 comprising a
microcomputer is connected to the reproduction control
circuit 5 and the digital signal processing circuit 51.
Connected to the control circuit 4 are an operation
25 panel 1 having arranged thereon a group of operation

keys 24 and a liquid crystal display 2, and a memory 3 for storing data as to categories.

The system control circuit 4 executes an overall system control operation for the CD player including setting operation modes, and a control operation concerning categories relating to the invention. For the latter control operation, the circuit 4 has category registration means 41, category display means 42 and automatic performance means 43 which are provided by the computer program to be described later.

The category registration means 41 executes a procedure for registering category names in the memory 3 in accordance with the manipulation of the operation key group 24. The automatic performance means 43 retrieves a particular category name specified by manipulating the key group 24 from the memory 3 and executes a procedure for automatically playing in a predetermined order the discs in the storage portions which are given the category name. The category display means 42 executes a procedure for showing the category name of each disc storage portion on the display 2. These procedures will be described in detail later.

FIG. 10 shows the construction of the operation panel 1. The display 2 comprises a first

display portion 10 and a second display portion 22. The operation key group 24 includes MEMORY key 11, SELECT keys 12, CATEGORY key 13, SUBCATEGORY key 14, EJECT/LOAD key 15, BACK key 16, SELECT SUBCATEGORY
5 key 17, SELECT CATEGORY key 18, FWD key 19 and PLAY key 20.

FIG. 2 shows a data structure in the memory 3. An 8-byte category registration portion and an 8-byte subcategory registration portion are provided
10 for each of the 24 disc storage portions. The addresses "1" to "24" are given to the storage portions, respectively. A root category name (hereinafter referred to merely as the "category name") for a particular category such as rock, classical music or
15 jazz is registered in the category registration portion. A subcategory name such as the name of a singer or various symbols or the like which can be optionally determined by the user is registered in the subcategory registration portion. Such category names
20 and subcategory names given form a hierarchial category structure.

Although a name or the like is optionally registered in the subcategory registration portion, one of the seven standard category names predetermined
25 by the manufacturer can be selectively registered in

the category registration portion. When required,
an optional category name determined by the user as
desired can also be registered in this portion.
The seven standard category names are shown on the
5 display in a predetermined order when the category
names are registered as will be described later.

Thus, category names and subcategory names
can be registered in the memory 3 for all the 24
disc storage portions. However, for the disc storage
10 portion having no discs accommodated therein,
specific data "X" indicating that no category or
subcategory is given is written to the address
corresponding to the storage portion. The category
name only can be given with no subcategory name
15 provided. In this case the data "X" is written to
the subcategory registration portion.

FIGS. 3 to 9 each show the control procedure
to be executed by the system control circuit 4 in
connection with categories for the circuit to perform
20 a particular function. FIG. 3 shows the procedure
for registering the category name only, FIG. 4 and
FIG. 5 the procedure for registering both the category
name and the subcategory name, FIG. 6 a category
selection procedure for automatic playing based on
25 the category name only, FIG. 7 a category selection

procedure for automatic playing based on both the category name and the subcategory name, FIG. 8 an automatic playing procedure, and FIG. 9 an example of automatic performance.

5 For the registration of the category, EJECT/LOAD key 15 shown in FIG. 10 is first depressed, whereupon the second display portion 22 shows "LOAD DISC," urging the user to load a CD. In response to this, the user loads the CD into a specified disk storage portion through a CD inlet 23. 10 The second display 22 then shows "(disc storage portion No.) PROGRAM CATEGORY," demanding registration of the category, whereupon CATEGORY key 13 is pushed.

 With reference to FIG. 3, CATEGORY key is 15 checked as to whether it has been pushed in step S1. If it has been pushed, step S2 inquires whether the category has been registered for the storage portion concerned. When the answer is affirmative, the category name already registered is displayed in step 20 S3. If otherwise, the first standard category name "ROCK" is displayed in step S4.

 Next in step S5, an inquiry is made as to whether a new category name is to be registered, cancelling the displayed category name. If the answer 25 is affirmative, the new category name (desired category

name) is input by SELECT key, FWD key and BACK key in step S9. MEMORY key is thereafter pushed in step S10, whereby the new category name is registered.

Subsequently, a scroll shows that the category name
5 has been registered in step S11.

On the other hand, if step S5 finds that no new category name is to be registered, step S6 asks the user whether the category name displayed is the desired one. When the answer is affirmative, the
10 sequence proceeds to step S10, in which the name is registered in the memory. If otherwise, step S7 confirms that CATEGORY key has been depressed, followed by step S8, in which the next standard category is displayed. The sequence then returns to step S5.
15 Steps S5 to S8 are repeated until the desired standard categories are displayed. After the last standard category has been displayed, the sequence returns to the first standard category "ROCK." When the desired category is shown in this process, step S10 follows
20 to register the category in the memory.

In registering the category name and sub-category name as shown in FIG. 4, the category registration steps S12 to S18 which are the same as steps S1 to S8 of FIG. 3 are executed. When the
25 category name shown on the display in step S16 is the

desired one in this process, the procedure for registering the subcategory follows.

In this procedure, step S19 first inquires whether SUBCATEGORY key has been depressed. After the
5 key has been depressed, an inquiry is made in step S20 as to whether a subcategory has been registered in the subcategory registration portion concerned. If the answer is affirmative, the registered subcategory name is shown in step S21, whereas if otherwise, step
10 S22 shows that no registration has been made.

Next in step S23 of FIG. 5, an inquiry is made as to whether a new subcategory name is to be registered, cancelling the displayed subcategory name. When the answer is affirmative, the new name
15 is input by SELECT key, FWD key and BACK key in step S27, and step S28 confirms that MEMORY key has been pushed. This results in the registration of the new subcategory name in the memory. Subsequently in step S29, the scroll shows that the category name and
20 subcategory name have been registered.

On the other hand, if the answer to the inquiry of step S23 is negative, step S24 asks the user whether the subcategory name displayed is the desired one. When the answer is affirmative, the sequence proceeds
25 to step S28 to register the subcategory name in the

memory. When the answer is negative, depression of
SUBCATEGORY key is confirmed in step S25, step S26 then
displays the next subcategory name already registered,
and the sequence returns to step S23. Steps S23 to
5 S26 are then repeated until the desired subcategory names
are displayed. After the last subcategory name
registered has been displayed, the display urges the
user to input a new subcategory. When the desired
subcategory is displayed in this process, step S28
10 follows to register the subcategory in the memory.

The above category registration procedure
is executed for all the 24 disc storage portions,
whereupon the sequence returns to the main routine
of the system control circuit 4, which waits for a
15 command to set, for example, PLAY mode.

The procedure for inputting with keys the
new category or subcategory name is executed using
SELECT keys 12 of "1" to "9"; FWD key 19 and BACK key
16 shown in FIG. 10 as already stated. At this time,
20 characters are picked up using these keys from the
alphabet shown in the first display portion 10 to
form the desired name. The name thus formed is
shown on the second display portion 22 of the display
2. FIG. 10 partly shows the first display portion 10
25 on an enlarged scale.

To pick up the character from the alphabet, the position of character is determined by FWD key 19 and BACK key 16 first, and SELECT key 12 ("1" to "9") is depressed to specify a group of three characters arranged in a vertical row. For example, when "Q" is to be selected, SELECT key 12, "6" is pushed once, whereby "P" is selected. The key "6" is pushed once again to select "Q". By pushing BACK key 16 or FWD key 19, the character in the position is fixed.

10 The row of characters selected is determined as a category by pushing CATEGORY key 13, SUBCATEGORY key 14 or PLAY key 20.

FIGS. 11 to 14 show examples shown on the second display portion 22 for registration. FIGS. 11 and 12 show examples of category names only. "DISK 1" indicated at 87 shows a disc storage portion number. "POP" and "JAZZ" indicated at 88 show categories. "1" to "24", indicated at 89, are the numbers of the storage portions. FIGS. 13 and 14 show examples displayed for the registration of subcategories. The subcategory names "1ST" and "2ND" are added to category indications 88.

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With reference to FIG. 6 showing a category selection procedure for automatic playing or performance, step S31 first inquires whether SELECT

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CATEGORY key has been depressed. If the answer is affirmative, the memory is searched for a registered category in step S32. When the category has been registered, the name of category registered is
5 displayed along with the storage portion number in step S34. Next, an inquiry is made as to whether the displayed category name is the one desired by the user. If the answer is negative, depression of SELECT CATEGORY key is confirmed in step S36, and the
10 sequence thereafter returns to step S32. Steps S32 to S36 are repeated for all the categories registered to display all categories. Step S32 confirms that no registered category remains, whereupon the category selection state is cancelled in step S33. The
15 sequence then proceeds to step S31 to wait for the subsequent depression of SELECT CATEGORY key. When the desired category is displayed in step S35 in this process, the procedure is completed.

Through the execution of the above
20 procedure, the display shows all the category names registered and the numbers of storage portions which are given the category names. At this time, the subcategory is disregarded.

FIGS. 15 and 16 show examples of categories
25 shown on the display. The example of FIG. 15 indicates

that the category name "POP" is given to the disc storage portions No. "11" and No. "12". The example of FIG. 16 shows that the category name "JAZZ" is given to the storage portions Nos. "5" to "8", "23" and
5 "24".

In the category and subcategory selection for automatic playing shown in FIG. 7, a category selection procedure S37 to S42 is executed first like steps S31 to S36 of FIG. 6. When the desired category
10 is shown in step S41 in this process, a subcategory selection procedure follows. More specifically, step S43 inquires whether SELECT SUBCATEGORY key has been depressed. If the answer is affirmative, step S44 inquires whether there is any registered sub-
15 category by searching the memory. When the answer is affirmative, the registered subcategory name is displayed along with the category name and disc storage portion number in step S46. Next step S47 asks the user whether the displayed subcategory name
20 is the desired one. If the answer is negative, step S48 confirms that SELECT SUBCATEGORY key has been pushed, and the sequence returns to step S44. The foregoing steps S44 to S48 are repeated for all subcategories, all subcategories are displayed, and step S44 confirms
25 that any registered subcategory no longer remains,

whereupon the subcategory selecting state is cancelled in step S45. The sequence returns to step S41 to execute category selection again. When the desired subcategory is displayed in step S47 during this process, the procedure is terminated.

FIG. 8 shows an automatic performance procedure, in which the foregoing category/subcategory selection procedure is executed first to show the desired category name/subcategory name on the display. An inquiry is then made as to whether PLAY key 20 has been depressed in step S51. When the answer is affirmative, the player first plays the discs in the storage portion of the smallest of the numbers of the storages having the category name/subcategory name shown (step S52). Termination of performance is thereafter detected in step S53, followed by step S54 which inquires whether the discs in all the storage portions with the category name/subcategory name concerned have been completely played. If the answer is negative, the discs in the storage portion with the next larger number are played, followed by step S53. When step S54 confirms completion of the discs in all storage portions during this process, the performance is discontinued in step S56 to complete the procedure.

When the category name is specified, all

discs falling under the category of that name are played regardless of whether the subcategories are the same or different. Further when both the category name and subcategory name are specified, only the CDs
5 falling under the category and subcategory concerned are played.

FIG. 9 shows an example of automatic performance when the category name "ROCK" is given to the storage portions Nos. "2", "6" and "10". First
10 in step S57, the category name "ROCK" is selected by the foregoing category selection procedure, followed by step S58, which inquires whether PLAY key has been pushed. When the key has been depressed, step S59 follows, in which the discs accommodated in the
15 storage portions Nos. "2", "6" and "10" are played in succession. The performance is thereafter terminated in step S60.

With the disc player embodying the present invention described, discs are automatically played
20 merely by specifying the category concerned and, when required, the subcategory concerned. Accordingly, the names of the individual discs need not be specified, and the player is extremely easy to use.

Further when category names are registered,
25 standard category names are first displayed in

succession, so that a particular category name, when to be selected from among these names, can be input by an easy procedure.

Further, in specifying the category name for
5 automatic playing, the category names registered in the memory are successively shown on the display. The category name is therefore easy to specify.

The above embodiment has been described to illustrate the present invention and should not be
10 interpreted as limiting the present invention as defined in the appended claims or reducing the scope thereof. The device of the invention is not limited to the foregoing embodiment in construction but can be modified variously by one skilled in the art without
15 departing from the spirit of the invention as set forth in the claims.

For example, the invention is not limited to CD players but can of course embodied as disc
players of any type for use with disc-like recording
20 media.

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10 C l a i m s :

15 1. A disc player adapted to selectively play a plurality of discs (8) accommodated in a plurality of disc storage portions, the disc player comprising:

memory means (3) for storing a category name for each of the disc storage portions,

20 category specifying means (24) to be manipulated for specifying the category name of the discs to be played, and

 automatic reproduction means (4) for retrieving from the memory means (3) the category name specified by manipulating the category specifying means (24) and
25 successively automatically playing a plurality of discs (8) in the disc storage portions given the category name.

2. A disc player as defined in claim 1 which further comprises a display (2; 22), and category
30 display means (42) for displaying the category name of each disc storage portion on the display (2; 22).

3. A disc player as defined in claim 2 which further comprises category input means (12, 16, 19)
35 to be manipulated when a new category name is to be registered in the memory means (3), and category registration means (41) for registering the category name



in the memory means (3) in accordance with the manipulation of the category input means (12, 16, 19).

4. A disc player as defined in claim 2 or 3
5 wherein when one of the category name is specified by manipulating the category specifying means (24) to execute automatic reproduction, the category display means (42) successively shows on the display (2; 22) all category names stored in the memory means (3) and given to the disc
10 storage portions containing the discs (8) which can be played.

5. A disc player as defined in claim 3
15 wherein the category names include a plurality of standard category names prepared in advance and an optional category name optionally determinable by the user, and when the category names are input, the category registration means (41) first registers the standard category name selected by the manipulation of the category input means (12, 16, 19)
20 in the memory means (3) while successively showing the plurality of standard category names on the display (21) and thereafter registers the optional category name input by manipulating the category input means (12, 16, 19) in the memory means (3).

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6. A disc player as defined in claim 1 wherein the category names have a hierarchical structure wherein root category names provide the first stratum, and subcategory names provide the second stratum.

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