GAMING MACHINE CAPABLE OF CHANGING THE VOLUME LEVEL IN THE PREDETERMINED AUDIO RANGE AND TONE CONTROL METHOD

CROSS REFERENCE TO RELATED APPLICATION

This application claims the benefit of U.S. Provisional Application No. 60/924,979, filed on June 7, 2007 and U.S. Non-Provisional Application No. 11/932,503, filed on October 31, 2007.

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001]

The invention relates to a gaming machine and a method of adjusting a sound quality thereof.

[0002]

In a conventional gaming machine, when a player inserts a game medium such as coin or bill into an insertion slot of the gaming machine and presses a start button, symbols are variably displayed in a display mounted on a front of a cabinet and the symbols are then stopped automatically.

[0003]

The gaming machine, as disclosed in U.S. Patent No. 7,128,650, for example, comprises a sound circuit that outputs a sound signal, in which a variety of effect sounds such as BGM, game effect sound, function music and the like are overlapped,

and a speaker that converts the sound signal into a sound wave and turns it up. Then, the machine carries out a game effect through the effect sound outputted from the speaker. When adjusting a volume of the effect sound, a volume adjustor is operated in the sound circuit, so that an output voltage of the sound signal is increased or decreased. As a result, the volumes of all the effect sounds such as BGM or game effect sound included in the sound signal are adjusted into a same level by the volume adjustor.

[0004]

The invention provides a gaming machine having an adjustment function of an effect sound, which is not provided to the conventional gaming machine, and a method of adjusting a volume thereof.

SUMMARY OF THE INVENTION

[0005]

The invention provides a gaming machine having structures as described below. The gaming machine comprises a game that is operated by a betting of a player, background music information of a sound signal having a frequency characteristic that becomes a background music of the game, function music information of a sound signal having a frequency characteristic that becomes a function music representing an operating state of the game

relating to an action of the player, a volume level changer that can change a volume level of the sound signal and switch a range in which the volume level is changed, a selection switch that is adapted to be operated from an outside and selects a range of the sound signal, a speaker that converts the sound signal into a sound wave and turns it up, and a game controller that is programmed to change, in the volume level changer, a volume level of a range of the sound signal selected in the selection switch and to output the sound signal having the volume level changed from the speaker.

[0006]

According to the above structure, a range of a sound signal, which includes a sound signal having a frequency characteristic that becomes a background music of a game and a sound signal having a frequency characteristic that becomes a function music representing an operating state of the game relating to an action of a player, is enabled to be selected by an operation from an outside. After the volume level of the range of the selected sound signal is changed, the sound signal is converted into a sound wave that is then turned up.

[0007]

As a result, it is possible to enable a player to hear the voice sound in which a volume level of the selected range is changed. Accordingly, when increasing the volume level, it is

possible to enable the player to easily hear for the selected range. To the contrary, when decreasing the volume level, it is possible to enable the player to have a difficulty in hearing for the selected range. Thereby, since it is possible to change the volume of a predetermined range in accordance with a provision environment of the gaming machine and the player's preference, it is possible to flexibly carry out an effect of the gaming machine by the voice sound including the background music and the function music.

[0008]

The invention provides a gaming machine having structures as described below. The gaming machine comprises a game that is operated by a betting of a player, background music information of a sound signal having a frequency characteristic that becomes a background music of the game, function music information of a sound signal having a frequency characteristic that becomes a function music representing an operating state of the game relating to an action of the player, sample music information of a sound signal having a frequency characteristic that becomes a sample music having the background music and the function music, a volume level changer that can change a volume level of the sound signal and switch a range in which the volume level is changed, a selection switch that is adapted to be operated from an outside and selects a range of the sound signal, a speaker

that converts the sound signal into a sound wave and turns it up, and a game controller that is programmed to use a sound signal of the sample music information when the selection switch is operated, to change, in the volume level changer, a volume level of a range of the sound signal selected in the selection switch and to output the sound signal having the volume level changed from the speaker.

[0009]

According to the above structure, a range of a sound signal of a sample music, which includes a sound signal having a frequency characteristic that becomes a background music of a game and a sound signal having a frequency characteristic that becomes a function music representing an operating state of the game relating to an action of a player, is enabled to be selected by an operation from an outside. After the volume level of the range of the selected sound signal is changed, the sound signal is converted into a sound wave that is then turned up.

[0010]

As a result, it is possible to enable a player to hear the voice sound of the sample music in which a volume level of the selected range is changed. Accordingly, when increasing the volume level, it is possible to enable the player to easily hear for the selected range. To the contrary, when decreasing the volume level, it is possible to enable the player to have a

difficulty in hearing for the selected range. Thereby, since it is possible to change the volume of a predetermined range in accordance with a provision environment of the gaming machine and the player's preference, it is possible to flexibly carry out an effect of the gaming machine by the voice sound including the background music and the function music. In addition, since the sample music includes the background music and the function music, it is possible to easily adjust the volume level.

[0011]

The invention provides a gaming machine having structures as described below. The gaming machine comprises a game that is operated by a betting of a player, background music information of a sound signal having a frequency characteristic that becomes a background music of the game, function music information of a sound signal having a frequency characteristic that becomes a function music representing an operating state of the game relating to an action of the player, a volume level changer that can change a volume level of the sound signal and switch a range in which the volume level is changed, a selection switch that is adapted to be operated from an outside and selects a range of the sound signal, a speaker that converts the sound signal into a sound wave and turns it up, and a game controller that is programmed to use a sound signal in which the background music information and the function music information are mixed, to

change, in the volume level changer, a volume level of a range of the sound signal selected in the selection switch and to output the sound signal having the volume level changed from the speaker.

[0012]

According to the above structure, a range of a sound signal of a sample music, which includes a sound signal having a frequency characteristic that becomes a background music of a game and a sound signal having a frequency characteristic that becomes a function music representing an operating state of the game relating to an action of a player, is enabled to be selected by an operation from an outside. After the volume level of the range of the selected sound signal is changed, the sound signal is converted into a sound wave that is then turned up.

[0013]

As a result, it is possible to enable a player to hear the voice sound in which a volume level of the selected range is changed. Accordingly, when increasing the volume level, it is possible to enable the player to easily hear for the selected range. To the contrary, when decreasing the volume level, it is possible to enable the player to have a difficulty in hearing for the selected range. Thereby, since it is possible to change the volume of a predetermined range in accordance with a provision environment of the gaming machine and the player's

preference, it is possible to flexibly carry out an effect of the gaming machine by the voice sound including the background music and the function music. In addition, since it is used a sound signal in which the background music information and the function music information are mixed, it is possible to perform a volume adjustment in a predetermined range for both the background music and the function music.

[0014]

The invention provides a gaming machine having structures as described below. The gaming machine comprises a game that is operated by a betting of a player, background music information of a sound signal having a frequency characteristic that becomes a background music of the game, function music information of a sound signal having a frequency characteristic that becomes a function music representing an operating state of the game relating to an action of the player, a volume level changer that can change a volume level of the sound signal and switch a range in which the volume level is changed, a selection switch that is adapted to be operated from an outside and selects a range of the sound signal, a speaker that converts the sound signal into a sound wave and turns it up, and a game controller that is programmed to change, in the volume level changer, a volume level of a range of a sound signal of the background music information selected in the selection switch, to form a sound

signal in which the sound signal of the background music information and the sound signal of the function music information are mixed and to output the formed sound signal from the speaker.

[0015]

According to the above structure, a range of a sound signal of a sample music, which includes a sound signal having a frequency characteristic that becomes a background music of a game and a sound signal having a frequency characteristic that becomes a function music representing an operating state of the game relating to an action of a player, is enabled to be selected by an operation from an outside. After the volume level of the range of the selected sound signal is changed, the sound signal is converted into a sound wave that is then turned up.

[0016]

As a result, it is possible to enable a player to hear the voice sound in which a volume level of the selected range is changed. Accordingly, when increasing the volume level, it is possible to enable the player to easily hear for the selected range. To the contrary, when decreasing the volume level, it is possible to enable the player to have a difficulty in hearing for the selected range. Thereby, since it is possible to change the volume of a predetermined range in accordance with a provision environment of the gaming machine and the player's

preference, it is possible to flexibly carry out an effect of the gaming machine by the voice sound including the background music and the function music. In addition, after the volume level of the range of the sound signal of the background music information is changed, it is outputted a sound signal in which the sound signal of the background music information and the sound signal of the function music information are mixed. Accordingly, it is possible to perform a volume adjustment in a predetermined range only for the background music.

[0017]

The invention provides a gaming machine having structures as described below. The gaming machine comprises a game that is operated by a betting of a player, background music information of a sound signal having a frequency characteristic that becomes a background music of the game, function music information of a sound signal having a frequency characteristic that becomes a function music representing an operating state of the game relating to an action of the player, a volume level changer that can change a volume level of the sound signal and switch a range in which the volume level is changed, a selection switch that is adapted to be operated from an outside and selects a range of the sound signal, a speaker that converts the sound signal into a sound wave and turns it up, and a game controller that is programmed to change, in the volume level changer, a volume

level of a sound signal of the background music information, to change, in the volume level changer, a volume level of the range of a sound signal of the function music information selected in the selection switch, and to output, from the speaker, a sound signal in which the sound signal of the background music information and the sound signal of the function music information are mixed.

[0018]

According to the above structure, a range of a sound signal of a sample music, which includes a sound signal having a frequency characteristic that becomes a background music of a game and a sound signal having a frequency characteristic that becomes a function music representing an operating state of the game relating to an action of a player, is enabled to be selected by an operation from an outside. After the volume level of the range of the selected sound signal is changed, the sound signal is converted into a sound wave that is then turned up.

[0019]

As a result, it is possible to enable a player to hear the voice sound in which a volume level of the selected range is changed. Accordingly, when increasing the volume level, it is possible to enable the player to easily hear for the selected range. To the contrary, when decreasing the volume level, it is possible to enable the player to have a difficulty in hearing

for the selected range. Thereby, since it is possible to change the volume of a predetermined range in accordance with a provision environment of the gaming machine and the player's preference, it is possible to flexibly carry out an effect of the gaming machine by the voice sound including the background music and the function music. In addition, for the background music, it is possible to perform a volume adjustment in an entire range, and for the function music, it is possible to perform a volume adjustment in a predetermined range.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020]

FIG. 1 illustrates a volume adjustment state of a gaming machine;

FIG. 2 is a block diagram of a gaming machine;

FIG. 3 illustrates a display screen;

FIG. 4 is a block diagram of a gaming machine;

FIG. 5 is a block diagram showing a control circuit of a gaming machine;

FIG. 6 shows symbols and code numbers thereof;

FIG. 7 is a flow chart of a game executing process;

FIG. 8 is a flow chart of a volume adjusting process; and

FIG. 9 is a block diagram of a gaming machine.

FIG. 10 is a block diagram of a gaming machine.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0021]

(embodiment 1)

Hereinafter, it will be described a first embodiment of a gaming machine and a method of adjusting a volume thereof according to the invention. Meanwhile, in the following embodiment, a slot machine is described as an example of the gaming machine. However, it should be noted that the invention is not limited thereto.

[0022]

(method of adjusting a sound quality)

As shown in Fig. 1, a slot machine 10 executes a method for adjusting a sound quality comprising a first step of enabling a range of a sound signal, which includes a sound signal having a frequency characteristic that becomes a background music (BGM) of a game and a sound signal having a frequency characteristic that becomes a function music representing an operating state of the game relating to an action of a player, to be selected by an operation from an outside, a second step of changing a volume level of the range of the selected sound signal and a third step of converting a sound signal having the volume level changed into a sound wave and turning it up. Herein, the function music is a voice sound

representing an operating state of a game relating to an action of a player. For example, the function music includes a voice sound that is generated in inserting a coin, a voice sound that is generated in betting, a voice sound that is generated in paying out a coin and the like.

[0023]

Thereby, it is possible to enable a player to hear the voice sound in which a volume level of the selected range is changed. Accordingly, when increasing the volume level, it is possible to enable the player to easily hear for the selected range. To the contrary, when decreasing the volume level, it is possible to enable the player to have a difficulty in hearing for the selected range. As a result, since it is possible to change the volume of a predetermined range in accordance with a provision environment of the gaming machine and the player's preference, it is possible to flexibly carry out an effect of the gaming machine by the voice sound including the background music and the function music.

[0024]

For example, in a case where the slot machine 10 outputs a background music and a function music, even when the whole volume is increased, it is possible to implement a usage aspect in which a volume is decreased for the upper range in which a player feels unpleasant.

[0025]

Furthermore, in the first step, any sound signal can be selectively inputted, based on a volume control signal received from an outside such as hall computer. Thereby, each slot machine 10 can collectively adjust the volumes, based on the volume control signal.

[0026]

(structure of the sound quality adjustment)

The method of adjusting a sound quality is carried out by the slot machine 10. The slot machine 10 comprises a game that is operated by a betting of a player, background music information of a sound signal having a frequency characteristic that becomes a background music of the game, function music information of a sound signal having a frequency characteristic that becomes a function music representing an operating state of the game relating to an action of the player, a volume level changer that can change a volume level of the sound signal and switch a range in which the volume level is changed, a selection switch that is adapted to be operated from an outside and selects a range of the sound signal, a speaker that converts the sound signal into a sound wave and turns it up, and a game controller that is programmed to change, in the volume level changer, a volume level of a range of the sound signal selected in the selection switch and to output the sound signal having

the volume level changed from the speaker.

[0027]

In this embodiment, the game controller is described which is programmed to use a sound signal in which the background music information and the function music information are mixed, to change, in the volume level changer, a volume level of a range of the sound signal selected in the selection switch and to output the sound signal having the volume level changed from the speaker. In the mean time, in this case, it is used a sound signal in which the background music information and the function music information are mixed, so that it is possible to perform a volume adjustment in a predetermined range for both the background music and the function music.

[0028]

Specifically, as shown in Fig. 2, the slot machine 10 comprises a main CPU 41 that is the game controller, a sound signal output device 201 that is connected to the main CPU 41 and outputs several sound signals in parallel, a volume level changer 211 that can change a volume level of a sound signal and switch a range in which a volume level is changed, first to third selection switches 221, 222, 223 that are adapted to be operated from an outside and select a range of a sound signal, and a sound output device 212 that overlaps the sound signals having a predetermined range in which a volume level is changed

and converts the signals into a sound wave.

[0029]

The sound signal output device 201 has a main body PCB (Printed Circuit Board) 60 that outputs sound signals of a digital format in parallel and a D/A converter 210 that converts the sound signals outputted from the main body PCB 60 into an analog format. The D/A converter 210 has output terminals 210a, 210b, 210c. The output terminals 210a, 210b, 210c output the sound signals, which are converted into the analog format in the D/A converter 210, in parallel. Specifically, the output terminal 210a outputs a BGM signal of an analog format, the output terminal 210b outputs a function music signal of an analog format and the output terminal 201c outputs an effect sound signal of an analog format.

[0030]

The sound signal output device 201 is such connected that it inputs the signals into the volume level changer 211. The volume level changer 211 has a first adder 205, a signal switching unit 203, low pass filters 204a, 204b, 204c and a second adder 207.

[0031]

The first adder 205 has two input terminals and a single output terminal. Each input terminal is connected to the output terminals 210a, 210b of the D/A converter 210. In the mean time,

an output terminal of the first adder 205 is connected to the signal switching unit 203. The first adder 205 adds (overlaps) the BGM signal and the function music signal which are inputted from the D/A converter 210 and then outputs the overlapped signal to the signal switching unit 203.

[0032]

The signal switching unit 203 has a switch unit 203a, a single input terminal 203b and output terminals 203c, as a switch device. The input terminal 203b is connected to the output terminal of the first adder 205. Meanwhile, each of the output terminals 203c is connected to the low pass filters 204a, 204b, 204c, respectively. Thereby, a sound signal outputted from the first adder 205 passes to the signal switching unit 203 and is inputted to each of the low pass filters 204a, 204b, 204c.

[0033]

Moreover, the signal switching unit 203 has a switch changeover terminal 203d. The switch changeover terminal 203d is connected to the main body PCB 60. The main body PCB 60 outputs a switching signal for adjusting a volume of a predetermined range. The switching signal is outputted in an operation timing of first to third selection switches 221, 222, 223 and represents a connection state corresponding to the first to third selection switches 221, 222, 223.

[0034]

The switch changeover terminal 203d is connected to a switching controller (not shown) in the signal switching unit 203. The switching controller has a function of controlling a switching of a connection state between the input terminal 203b and the output terminal 203c, based on a switching signal. Thereby, the signal switching unit 203 switches a connection state between the input terminal 203b and the output terminal 203c, thereby setting one of the low pass filters 204a, 204b, 204c as an output destination of a sound signal.

[0035]

The low pass filters 204a, 204b, 204c consist of a resistor and a condenser so as to decrease a volume level in a predetermined range of a sound signal. Meanwhile, the low pass filters 204a, 204b, 204c may consist of an OP AMP. Each of the low pass filters 204a, 204b, 204c is such structured that it decreases a volume level in different ranges, respectively. Thereby, when the low pass filters 204a, 204b, 204c, which become an input destination of a sound signal, are selected by the signal switching unit 203 resulting from the operation of the first to third selection switches 221, 222, 223, it is possible to reduce a volume (voltage of a sound signal) for a range of the selected low pass filters 204a, 204b, 204c.

[0036]

The low pass filters 204a, 204b, 204c are connected to the

one input terminal of the second adder 207. The other input terminal of the second adder 207 is connected to the output terminal 210c of the D/A converter 210. Thereby, the sound signals, which are inputted to the second adder 207, become a sound signals of the function music signal and the BGM signal having a volume decreased in a predetermined range in the low pass filters 204a, 204b, 204c, and an effect sound signal outputted from the output terminal 210c of the D/A converter 210. The second adder 207 outputs, from the output terminal, a new sound signal in which the sound signals of the BGM signal and the function music signal and the effect sound signal are added.

[0037]

The volume level changer 211 structured as described above is connected to the sound output device 212. The sound output device 212 has a volume amplifier 206 and a speaker 29. The volume amplifier 206 is connected to an output terminal of the second adder 207. The volume amplifier 206 amplifies the sound signal inputted from the first adder 205 by a predetermined amplifying ratio. The volume amplifier 206 is connected to the speaker 29. The speaker 29 converts the sound signal into a sound wave and turns it up.

[0038]

Meanwhile, in the embodiment, the volume adjustment is performed in the single slot machine 10 by forming a switching

signal with the first to third selection switches 221, 222, 223 provided to the slot machine 10. However, the invention is not limited thereto. In other words, the volume adjusting method may be carried out in a system having several slot machines 10, a hall computer (not shown) and a communication network such as LAN or Internet that connects the slot machines 10 and the hall computer in a data communication manner. In this case, the hall computer can collectively change the volumes of predetermined ranges of all the slot machines 10.

[0039]

In addition, the slot machine 10 may have a game controller that has sample music information of a sound signal having a frequency characteristic that becomes a sample music having the background music and the function music and that is programmed to use a sound signal of the sample music information when the first to third selection switches 221, 222, 223 are operated, to change a volume level of a range of the sound signal selected in the first to third selection switches 221, 222, 223 and to output the sound signal from the speaker. In this case, since the sample music includes the background music and the function music, it is possible to easily adjust a volume level.

[0040]

(slot machine 10)

In the followings, the slot machine 10 having the volume level changer 211 will be specifically described.

[0041]

As shown in Figs. 1 and 3, the slot machine 10 executes a playing method comprising steps of randomly selecting a scatter object symbol 181 from many symbols 180, rearranging the symbols 180 in a display, awarding a payout determined by a combination of the symbols 180 rearranged on a payline L, and when a predetermined number or more of the scatter object symbols 181 is rearranged, setting the scatter object symbol 181 as a scatter symbol 182, notifying a content of a payout determined on the basis of the scatter symbol 182 and awarding the payout.

[0042]

In addition, the slot machine 10 executes a playing method comprising steps of providing a display area (scatter object symbol display unit 163) to a part different from an arrangement area (display windows 151~155) for arranging the symbols 180 and displaying the scatter object symbol 181 in the display area, and when a predetermined number or more of the scatter object symbols 181 is rearranged, notifying that the scatter object symbol 181 is set as a scatter symbol 182.

[0043]

Herein, the "arrangement" means a state in which the symbols 180 including the scatter symbol 182 are allowed to be

visible with naked eyes of an exterior player. In other words, the symbols 180 are under state of being displayed in the display windows 151~155. In the mean time, the "rearrangement" is meant by arranging the symbols 180 again after dismissing the arrangement of the symbols 180. In addition, the "payline" L is provided to determine a combination of the symbols 180. In other words, when the symbols 180 are rearranged on and out of the payline L, a combination is determined for only the symbols 180 rearranged on the pay line. As a result of the determination for a combination, when it is made a winning combination, it is carried out, for example, a process of paying out a coin in accordance with the winning combination.

[0044]

In addition, the "scatter symbol" 182 is a symbol making it a condition that a winning is made through only the arrangement thereof, irrespective of the payline L. In other words, when the scatter symbol 182 is rearranged, a winning is made and it is carried out, for example, a process of paying out a coin on the basis of the number of all the scatter symbols 182 rearranged on and out of the payline L. The "scatter object symbol 181" is a symbol functioning as a scatter symbol on condition that a predetermined number or more of the symbols is rearranged. For example, in a case where a scatter object symbol is "BELL" and the number of rearrangement (set threshold) is set

to be "3," when three or more "BELLs" are rearranged, it functions as a scatter symbol and when two or less "BELLs" are rearranged, it functions as a typical symbol. In addition, the "symbol 180" means all symbols used in the slot machine 10 and includes the scatter symbol 182 and the scatter object symbol 181. The payline L, the symbol 180, the scatter symbol 182 and a winning combination will be more specifically described later.

[0045]

(display unit 101)

As shown in Fig. 4, the slot machine executing the above playing method is provided with a display unit 101 (display) and a game controller 100. The display unit 101 is structured to have the payline L and to arrange the symbols 180 including the scatter symbol 182. In addition, the display unit 101 is structured to provide the scatter object symbol display unit 163 (display area 101b) to a part different from the display windows 151~155 (arrangement area 101a) for arranging the symbols 180.

[0046]

The display unit 101 may be a mechanical structure with a reel device for arranging the symbols 180 by rotation of a reel or electrical structure with a video reel on which an image is displayed for arranging the symbols 180. Further, the display unit 101 may be a structure of combining a mechanical structure (reel) and an electrical structure (video reel). The electrical

structure may include a liquid crystal device, a CRT (cathode-ray tube), a plasma display and the like. A detailed structure of the display unit 101 will be described later.

[0047]

(game controller 100)

The game controller 100 is structured to execute a first process of randomly selecting a scatter object symbol 181 from many symbols 180, a second process of rearranging the symbols 180 in a display, a third process of awarding a payout determined by a combination of the symbols 180 rearranged on a payline L, and a fourth process of when a predetermined number or more of the scatter object symbols 181 is rearranged, setting the scatter object symbol 181 as a scatter symbol 182, notifying a content of a payout determined on the basis of the scatter symbol 182 and awarding the payout. In other words, the game controller 100 has a first processing unit, a second processing unit, a third process unit and a fourth processing unit.

[0048]

In addition, the game controller 100 is structured to execute a fifth process of providing a display area 101b (scatter object symbol display unit 163) to a part different from an arrangement area 101a (display windows 151~155) for arranging the symbols 180 and displaying the scatter object symbol 181 in the display area 101b, and a sixth process of when

a predetermined number or more of the scatter object symbols 181 is rearranged, notifying that the scatter object symbol 181 is set as a scatter symbol 182. In other words, the game controller 100 has a fifth processing unit and a sixth processing unit in addition to the first to fourth processing units.

[0049]

The game controller 100 comprises a scatter object symbol memory 105 for storing the scatter object symbols 181, a scatter symbol memory 106 for storing a scatter symbol 182, a symbol memory 108 for storing all symbols including the scatter symbols 182 and a display symbol memory 107 for storing the symbols in the respective memories 105, 106, 108 as a display symbol. The display symbol memory 107 can be accessed by a display control unit 102. The display control unit 102 sets the arrangement area 101a for arranging the symbols and the display area 101b for displaying the scatter object symbols 181 in the different parts of the display unit 101. In addition, the display control unit 102 reads out the symbols 180 in the display symbol memory 107 under control of a game executing unit 110 and displays the symbols in the arrangements area 101a and the scatter object symbols 181 in the display area 101b. A detailed display state will be described later.

[0050]

Further, the game controller 100 is connected to a game

start unit 109. The game start unit 109 has a function of outputting a game start signal in accordance with control of the player. The game controller 100 comprises a game executing unit 110 for rearranging the symbols with an input of a game start signal, as trigger, from the game start unit 109, a combination payout determining unit 111 for determining a payout determined by a combination of the symbols rearranged on the payline in a unit game, a scatter symbol payout determining unit 112 for determining a payout determined on the basis of the scatter symbols rearranged on and out of the payline and a payout award unit 113 for awarding the respective payouts determined in the combination payout determining unit 111 and the scatter symbol payout determining unit 112.

[0051]

In addition, the game controller 100 has a symbol determining unit 104 that is operated when a game start signal is inputted from the game start unit 109. The symbol determining unit 104 randomly selects the scatter object symbol 181 from the symbols 180. The symbol determining unit 104 outputs the scatter object symbol 181 to a rearrangement-number determining unit 114 and the scatter object symbol memory 105. The rearrangement-number determining unit 114 sets the scatter object symbol 181 as a scatter symbol 182 when a predetermined number of the scatter object symbols 181 is rearranged. In other words, the

rearrangement-number determining unit 114 enables the scatter object symbol memory 105 to transmit the scatter object symbol 181 stored therein to the scatter symbol memory 106, thereby setting it as the scatter symbol 182.

[0052]

Furthermore, the game controller 100 comprises an information output unit 116 and a game information memory 117 and a range setting unit 230 connected to the information output unit 116. The game information memory 117 stores the background music data of a sound signal having a frequency characteristic that becomes a background music of a game, the function music data of a sound signal having a frequency characteristic that becomes a function music representing an operating state of a game relating to an action of a player and the sample music data of a sound signal having a frequency characteristic that becomes a sample music having the background music and the function music. In addition, the game information memory 117 stores character data corresponding to the scatter symbol 182, payout-number data and description data and the like, in addition to the above information.

[0053]

The range setting unit 230 is adapted to be operated from an outside and to select a range of the sound signal. Specifically, it consists of the first to third selection

switches 221, 222, 223 in Fig. 2 and the other switches. In the mean time, the range setting unit 230 may be a touch panel provided to the display unit 101 of a liquid crystal display device. In addition, the range setting unit 230 may be installed to an outside of the gaming machine and alternatively, may be installed in the gaming machine.

[0054]

The information output unit 116 is adapted to read out the data stored in the game information memory 117 and to output it as a sound signal to the volume level changer 211. In addition, the information output unit 116 is adapted to output a switching signal of the range setting unit 230 to the volume level changer 211. The volume level changer 211 is adapted to switch a range by the switching signal, in which a volume level of the overlapped sound signal of the BGM signal and the function music signal is changed. Thereby, the information output unit 116 reads out a variety of data from the game information memory 117 and outputs it to the volume level changer 211, thereby outputting a voice sound having the decreased volume level of a predetermined range selected on the basis of the switching signal, through the volume amplifier 206 and the speaker 29.

[0055]

In the mean time, each block of the game controller 100 may be structured with a hardware or software, as required.

[0056]

(operation of the game controller 100)

With the above structure, an operation of the game controller 100 will be described.

When a game start signal is outputted from the game start unit 109 through an operation of a player, the symbol determining unit 104 starts a process and the game executing unit 110 starts a unit game, so that the symbols 180 are rearranged (second process). The symbol determining unit 104 randomly selects a scatter object symbol 181 from the symbols 180 stored in the symbol memory 108 (first process). The determined scatter object symbol 181 is stored in the scatter object symbol memory 105 and is also used for a determination process in the rearrangement-number determining unit 114.

[0057]

The scatter object symbol 181 stored in the scatter object symbol memory 105 is outputted to the display symbol memory 107 and then used for an image process in the display control unit 102, so that it is displayed in the display area 101b of the display unit 101. In other words, the game controller 100 executes the fifth process of providing the display area 101b to a part different from the arrangement area 101a for arranging the symbols 180 and displaying the scatter object symbol 181 in the display area 101b. Thereby, the player can easily recognize

the scatter object symbol 181 since the scatter object symbol 181 is displayed in the display area 101b separated from the arrangement area 101a.

[0058]

In addition, when the symbols 180 are rearranged as a unit game is executed, the rearrangement-number determining unit 114 specifies the scatter object symbol 181 among the rearranged symbols 180 and calculates a rearrangement-number of the scatter object symbol 181. Then, when the predetermined number or more of the scatter object symbols 181 is rearranged, it sets the scatter object symbol 181 as a scatter symbol 182. In other words, it transmits the scatter object symbol 181 stored in the scatter object symbol memory 105 to the scatter symbol memory 106. Thereby, the scatter object symbol 181 serves as a scatter symbol 182.

[0059]

In addition, when the scatter symbol 182 is set, the information output unit 116 reads out the character data corresponding to the scatter symbol 182, the payout-number data and the description data from the game information memory 117 and outputs the data to the display control unit 102. Then, it is notified the contents of a payout determined on the basis of the scatter symbols 182 rearranged on and out of the payline L and the payout is awarded (fourth process). Further, the data is

outputted to the volume level changer 211 and then outputted as voice sound from the speaker 29.

[0060]

In addition, when the game is executed as described above, a function music representing a game start is outputted in starting a game and a function music representing a payout is outputted in awarding a payout. In addition to the function music, a background music is outputted. At this time, the volume level changer 211 decreases a volume for the high range selected in the range setting unit 230. Thereby, since the player has a difficulty in hearing a voice sound of the high range, it is possible to decrease the displeasure of the player. In addition, when the range setting unit 230 is operated, the sample music including the background music and the function music is outputted. Accordingly, it is possible to easily adjust the volume level.

[0061]

(display state)

It is specifically described an example of a display state of the display unit 101, for the operation processes of the slot machine 10. In the mean time, as shown in Fig. 3, the display state is described with reference to a structure in which the display unit 101 arranges the symbols with a video reel manner.

[0062]

The display unit 101 has display windows 151~155 as the arrangement area for arranging the plural symbols. The display windows 151~155 are arranged in a central part of the display unit 101. In the display windows 151~155, symbol columns consisting of the plural symbols 180 are scroll-displayed. In addition, each of the display windows 151~155 is divided into upper, center and lower stages 151a, 151b, 151c. Each of the symbols is stopped (arranged) in the respective stages 151a, 151b, 151c. For example, in Fig. 3, "ORANGE" is stopped in the upper stage 151a of the display window 151, "STRAWBERRY" is stopped in the center stage 151b of the display window 151 and "BLUE 7" is stopped in the lower stage 151c of the display window 151. As a result, the display windows 151~155 display a symbol matrix consisting of 5 columns and 3 rows. In the mean time, the symbol matrix is not limited to 5 columns/3rows.

[0063]

In addition, the display unit 101 has the scatter object symbol display unit 163 as the display area for displaying the scatter object symbols 181. The scatter object symbol display unit 163 is arranged in a right-handed upper part of the display unit 101 so as not to overlap with the display windows 151~155. In the mean time, the scatter object symbol display unit 163 may be provided in an arbitrary position on condition that it can avoid overlapping with the display windows 151~155.

[0064]

A selection object window 165 is provided below the scatter object symbol display unit 163. The selection object window 165 displays a symbol which will be a candidate for the scatter object symbol 181. Accordingly, the player can intuitively recognize that a scatter object symbol 181 is randomly selected among the candidate symbols displayed in the selection object window 165 and then displayed in the scatter object symbol display unit 163.

[0065]

In addition, the display unit 101 has a scatter symbol display unit 171. The scatter symbol display unit 171 is basket-shaped, and displays the scatter symbol 182 as a received thing. The scatter symbol display unit 171 is provided to a left-handed upper corner part of the display unit 101. In the mean time, the scatter symbol display unit 171 may be provided to an arbitrary position on condition that it can avoid overlapping with the display windows 151~155 and the scatter object symbol display unit 163.

[0066]

A display state of Fig. 3 shows a state that the scatter symbol 182 has been set. Specifically, "ORNAGE" is displayed as a received thing in the scatter symbol display unit 171, through a series of operations that "ORANGE" displayed in the scatter

object symbol display unit 163 is moved to the scatter symbol 182 and then received. As a result, the player can intuitively recognize that "ORANGE" has been set as the scatter symbol 182 by observing the displayed state of the scatter symbol 182 with naked eyes.

[0067]

(symbol, combination, etc.)

As shown in Fig. 6, the symbols 180 to be displayed in the display windows 151~155 of the display unit 101 constitute columns of symbols by 22 symbols. The symbols constituting the respective columns of symbols are given with one code number of 0~21. Each of the columns of symbols is constituted with a combination of symbols of "JACKPOT 7," "BLUE 7," "BELL," "CHERRY," "STRAWBERRY," "PLUM," "ORANGE" and "APPLE."

[0068]

The three successive symbols in the columns of symbols are displayed (arranged) in the upper, center and lower stages 151a, 151b, 151c of the display windows 151~155, respectively, so that they constitute a symbol matrix of 5 colums/3 rows. When a 1-BET button 26 or MAX-BET button 27 is pushed and then a spin button 23 is pushed, the symbols constituting the symbol matrix starts the scroll. When the scroll starts, the scrolls of the respective symbols are stopped (rearranged) after a predetermined time period has lapsed.

[0069]

In addition, various winning combinations are predetermined with regard to the respective symbols. The winning combination is a combination that a combination of symbols stopped on the payline L becomes an advantageous state to the player. The advantageous state is a state in which a coin is paid out in accordance with the winning combination, the payout-number of coins is added to a credit, a bonus game is started, and the like.

[0070]

Specifically, when a combination of "APPLE" symbol is stopped on the payline L, a bonus is triggered and a gaming state is shifted to a bonus game from a basic game. In addition, when a symbol of "CHERRY" is stopped on the payline L, 20 coins (game medium) are paid out per one bet. When a symbol of "PLUM" is stopped on the payline L, 5 coins are paid out per one bet.

[0071]

In the mean time, a bonus game is a gaming state that is more advantageous than a basic game. In one embodiment, the bonus game is a free game. The free game is a gaming state allowing a player to play a game for a predetermined number of times, without betting a coin. The bonus game is not particularly limited as long as it is a gaming state advantageous to the player, i.e., it is more advantageous than

the basic game. For example, the bonus game may include a state in which it is possible to obtain more game medium than the basic game, a state in which it is possible to obtain a game medium in a higher probability than in the basic game, a state in which a game medium is less consumed than in the basic game, and the like. Specifically, a free game, a second game and the like are examples of the bonus game.

[0072]

(mechanical structure)

In the followings, it will be described an example of the slot machine structured in a mechanical and electrical manner.

[0073]

As shown in Fig. 1, the slot machine 10 is provided in a game arcade. The slot machine 10 executes a unit game by using a game medium. The game medium is a coin, bill or electronic negotiable information corresponding to them. Meanwhile, in the invention, the game medium is not particularly limited. For example, a medal, token, electronic money, ticket and the like can be used. The ticket is not particularly limited and may be a ticket with a barcode that will be described later.

[0074]

The slot machine 10 comprises a cabinet 11, a top box 12 provided to an upper part of the cabinet 11 and a main door 13 provided to a front of the cabinet 11. The main door 13 is

provided with a lower image display panel 16. The lower image display panel 16 has a transparent liquid crystal panel for displaying a variety of information. The lower image display panel 16 displays a video reel and a variety of information and effect images relating to a game. Specifically, the lower image display panel 16 displays the display windows 151~155 of 5 colums/3 rows, the scatter object symbol display unit 163 and the scatter symbol display unit 171, and other effect images, as required.

[0075]

In the mean time, in this embodiment, it is exemplified a case where the symbols of 5 colums/3 rows are displayed with the lower image display panel 16. However, the invention is not limited thereto. For example, a mechanical reel having symbols provided to a periphery thereof may be rotated and stopped to display symbols that are beyond a display window 15.

[0076]

One activated payline L is displayed in the lower image display panel 16. The payline L is set to horizontally traverse the center stages 151b of the display windows 151~155. Meanwhile, in this embodiment, although the payline L traverses the center stages 151b of the display windows 151~155, it may traverse the other stages of the display windows 151~155. For example, the payline L may traverse the upper stages 151a or lower stages

151c of the display windows 151~155. Alternatively, the payline L may traverse the lower stage 151c of the display window 151, the center stage 151b of the display window 152 and the upper stage 151a of the display window 153. Further, the payline L may be 2 or more. When two or more paylines L are provided, all paylines L may be activated and the number of paylines L relating to a predetermined condition such as bet-number of coins may be activated.

[0077]

In the mean time, a credit-number display unit and a payout-number display unit may be displayed in the lower image display panel 16. The credit-number display unit displays a total number that the slot machine 10 can pay out to a player (which will be referred to as total credit-number). The payout-number display unit displays number of coins to be paid out when a combination of symbols stopped on the payline is a winning combination.

[0078]

A control panel 20, a coin receiving slot 21 and a bill validator 22 are provided below the lower image display panel 16. The control panel 20 is provided with plural buttons 23~27. The buttons 23~27 allows instructions, which are related to a game progress by a player, to be inputted. The coin receiving slot 21 enables a coin to be received in the cabinet 11.

[0079]

The control panel 20 is provided with a spin button 23, a change button 24, a cash out button 25, a 1-BET button 26, a MAX-BET button 27 and the first to third selection switches 221, 222, 223. The spin button 23 is a button for inputting an instruction to start the scroll of symbols. The change button 24 is a button to be used when a player asks a staff in the game arcade for exchange of money. The cash out button 25 is a button for inputting an instruction to pay out the coins of total credit-number into a coin tray 18.

[0080]

The 1-BET button 26 is a button for inputting an instruction to bet one coin, among coins of the total credit-number, per one game. The MAX-BET button 27 is a button for inputting an instruction to bet maximum coins (for example, 50 coins), among coins of the total credit-number, per one game.

[0081]

The bill validator 22 validates whether bill is normal or not and receives the normal bill into the cabinet 11. In the mean time, the bill validator 22 can read a ticket 39 having a barcode which will be described later. When the bill validator 22 reads the ticket 39 having a barcode, it outputs a reading signal relating to the read content to a main CPU 41.

[0082]

A belly glass 34 is provided to a lower frontal surface of the main door 13, i.e., below the control panel 20. A character of the slot machine 10 and the like are drawn on the belly glass 34. An upper image display panel 33 is mounted to a front of the top box 12. The upper image display panel 33 has a liquid crystal panel and displays, for example, an effect image and an image indicating an introduction of a game content and an explanation of a game rule.

[0083]

To the top box 12 is mounted a speaker 29 for outputting voice. A ticket printer 35, a card reader 36, a data displayer 37 and a keypad 38 are provided below the upper image display panel 33. The ticket printer 35 prints a barcode having data encoded thereto, such as credit-number, date and time, identification number of the slot machine 10 and the like, onto a ticket, thereby outputting the ticket 39 having the barcode. The player can play a game in another gaming machine with the ticket 39 having a barcode and exchange the ticket 39 having a barcode with bill in a change booth of the game arcade.

[0084]

The card reader 36 reads and writes the data from and into a smart card. The smart card is a card carried by a player, into which data for identifying the player and data relating to a game history of the player are memorized.

[0085]

The data displayer 37 consists of a fluorescent display and the like, and displays the data read by the card reader 36 and the data inputted by the player through the keypad 38. The keypad 38 inputs instructions or data relating to a ticket issue.

[0086]

(electrical structure)

A control unit having the game controller 100 or the volume level changer 211 shown in Fig. 4 is mounted in the cabinet 11. As shown in Fig. 5, the control unit comprises a motherboard 40, a main body PCB (Printed Circuit Board) 60, a gaming board 50, a sub CPU, a door PCB 80, and various switches and sensors.

[0087]

The gaming board 50 is provided with a CPU (Central Processing Unit) 51, a ROM 55 and a boot ROM 52 which are connected to each other by an internal bus, a card slot 53S corresponding to a memory card 53 and an IC socket 54S corresponding to a GAL (Generic Array Logic) 54.

[0088]

The memory card 53 stores a game program and a game system program therein. The game program includes a stop symbol determining program. The stop symbol determining program is a program for determining a symbol (code number corresponding to

the symbol) to be stopped on the payline L. The stop symbol determining program includes symbol weight data corresponding to each of plural payout rate (for example, 80%, 84%, 88%). The symbol weight data is data representing a correspondence relation between the code number of each symbol and 1 or plural random numbers belonging to a predetermined numerical range (0~256) for each of the display windows 151~155.

[0089]

The payout rate is determined on the basis of data for setting a payout rate, which data is outputted from the GAL 54, and a stop symbol is determined on the basis of the symbol weight data corresponding to the payout rate.

[0090]

Further, the memory card 53 stores various data used for the game program and the game system program. Specifically, the data representing a relationship between the symbols 180 displayed in the display windows 151~155 and the random number ranges and the data representing a relationship between the set thresholds and the random number ranges and the like are stored in a data table form shown in Fig. 1. Further, the selection object symbols 181 displayed in the selection windows 161, 162, 163 are stored. In the mean time, these data are transmitted to a RAM 43 of the motherboard 40 when executing the game program.

[0091]

In addition, the card slot 53S is structured to insert and remove the memory card 53 and connected to the motherboard 40 through an IDE bus. Accordingly, it is possible to change a type or content of a game to be executed in the slot machine, by removing the memory card 53 from the card slot 53S, writing another game program and game system program in the memory card 53 and inserting the memory card 53 into the card slot 53S.

[0092]

The game program includes a program relating to a game progress and a program for shifting a gaming state into a bonus game.

[0093]

The GAL 54 is provided with plural input and output ports. When the data is inputted into the input ports, the GAL 54 outputs data corresponding to the inputted data from the output ports. The data outputted from the output ports is the data for setting a payout rate that has been described above.

[0094]

The IC socket 54S is structured to attach and detach the GAL 54. The IC socket 54S is connected to the motherboard 40 through a PCI bus. Accordingly, it is possible to change the data for setting a payout rate which is outputted from the GAL 54, by detaching the GAL 54 from the IC socket 54S, rewriting the program stored in the GAL 54 and then attaching the GAL 54

to the IC socket 54S.

[0095]

The CPU 51, the ROM 55 and the boot ROM 52, which are connected to each other by the internal bus, are connected to the motherboard 40 through the PCI bus. The PCI bus carries out a signal transfer between the motherboard 40 and the gaming board 50 and supplies power to the gaming board 50 from the motherboard 40. The ROM 55 stores nation identification information and an authentication program. The boot ROM 52 stores a preliminary authentication program and a program (boot code) enabling the CPU 51 to execute the preliminary authentication program.

[0096]

The authentication program is a program (falsification check program) for authenticating the game program and the game system program. The authentication program is a program for confirming and verifying that the game program and the game system program are not falsified. In other words, the authentication program is described in accordance with a procedure for authenticating the game program and the game system program. The preliminary authentication program is a program for authenticating the authentication program. The preliminary authentication program is described in accordance with a procedure for verifying that the authentication to be

authenticated is not falsified, i.e., for authenticating the authentication program.

[0097]

The motherboard 40 is provided with a main CPU 41 (game controller), a ROM (Read Only Memory) 42, a RAM (Random Access Memory) 43 and a communication interface 44.

[0098]

The main CPU 41 has functions of a game controller for controlling the whole slot machine 10. In particular, the main CPU 41 carries out a control for outputting a command signal to scroll the symbols of the lower image display panel 16 when the spin button 23 is pushed after the credit is bet, a control for determining symbols to be stopped after the symbols are scrolled and a control for stopping the determined symbols in the display windows 151~155.

[0099]

In other words, the main CPU 41 has functions of an arrangement game controller 100 for selecting and determining arrangement symbols with regard to a symbol matrix from the plural types of symbols so as to rearrange them, as a new symbol matrix after scrolling the plural symbols to be displayed in the lower image display panel 16, and executing an arrangement control which will be stopped at the determined symbols from the scroll state.

[0100]

In addition, the main CPU 41 has functions of the game controller 182 for executing a first process of randomly selecting a scatter object symbol 181 from the symbols 180, a second process of rearranging the symbols 180 in the display, a third process of awarding a payout determined on the basis of the symbols 180 on the payline L and a fourth process of when a predetermined number or more of the scatter object symbols 181 is rearranged, setting the scatter object symbol 181 as a scatter symbol 182, notifying a content of a payout determined on the basis of the scatter symbol 182 through voice sound and display and awarding the payout. Further, the main CPU 41 has a function of the game controller 100 for executing a fifth process of providing a display area (scatter object symbol display unit 163) to a part different from the arrangement area (display windows 151~155) for arranging the symbols 180 and displaying the scatter object symbol 181 in the display area and a sixth process of when a predetermined number or more of the scatter object symbols 181 is rearranged, notifying that the scatter object symbols 181 is set as a scatter symbol 182.

[0101]

The ROM 42 stores a program such as BIOS (Basis Input/Output System) executed by the main CPU 41, and data that is permanently used. When the BIOS is executed by the main CPU

41, each of peripheral devices is initialized and the game program and the game system program stored in the memory card 53 are read out through the gaming board 50.

[0102]

The RAM 43 stores the data or program which is used when the main CPU 41 carries out a process. For example, in the RAM 43, the scatter object symbol memory 105, the scatter symbol memory 106, the symbol memory 108, the display symbol memory 107 and the game information memory 117 shown in Fig. 4 are respectively provided in a data area form. The data area of the selection object symbol memory 105 stores the selection object symbols 181. The data area of the scatter symbol memory 106 stores the scatter object symbol 181. The data area of the symbol memory 108 stores the symbols 180. The data area of the display symbol memory 107 stores the symbols 180, the scatter object symbols 181 and the scatter symbol 182.

[0103]

The communication interface 44 is provided to communicate with a host computer and the like through a communication line, which are mounted in the game arcade. In addition, the motherboard 40 is connected to the main body PCB (Printed Circuit Board) 60 and the door PCB 80 through a USB (Universal Serial Bus). Further, the motherboard 40 is connected to a power unit 45. When power is supplied to the motherboard 40 from the

power unit 45, the main CPU 41 of the motherboard 40 is operated and the power is supplied to the gaming board 50 through the PCI bus, so that the CPU 51 is also operated.

[0104]

The main body PCB 60 and the door PCB 80 are connected to a device or apparatus for producing an input signal which will be inputted to the main CPU 41, and a device or apparatus which is controlled by the control signal outputted from the main CPU 41. The main CPU 41 executes the game program and the game system program stored in the RAM 43, based on the input signal inputted to the main CPU 41 to carry out an arithmetic process, thereby storing a result thereof in the RAM 43 or transmitting a control signal to each device or apparatus to control it.

[0105]

The main body PCB 60 is connected with a lamp 30, the sub CPU, a hopper 66, a coin sensor 67, a graphic board 68, the D/A converter 210, the volume level changer 211, the bill validator 22, the ticket printer 35, the card reader 36, a key switch 38S and the data displayer 37. The D/A converter 210 is connected to the speaker 29 through the volume level changer 211 and the volume amplifier 206.

[0106]

The lamp 30 is turned on/off on the basis of the control signal outputted from the main CPU 41. The sub CPU controls the

scroll of symbols of the display windows 151~155 and is connected to a VDP (Video Display Processor). The VDP reads out image data of the symbol stored in an image data ROM, produces a scroll image to be displayed in the display windows 151~155 and outputs the scroll image in the lower image display panel 16.

[0107]

The hopper 66 is mounted in the cabinet 11 and pays out predetermined number of coins to the coin tray 18 from the coin payout slot 19, based on the control signal outputted from the main CPU 41. The coin sensor 67 is mounted in the coin payout slot 19 and outputs an input signal to the main CPU 41 when it detects that the predetermined number of coins are paid out from the coin payout slot 19.

[0108]

The graphic board 68 controls an image display in the upper image display panel 33 and the lower image display panel 16, based on the control signal outputted from the main CPU 41. In addition, the graphic board 68 is provided with a VDP for producing image data on the basis of the control signal outputted from the main CPU 41, a video RAM for temporarily storing the image data produced by the VDP, and the like.

[0109]

The bill validator 22 reads an image of the bill and accommodates the normal bill in the cabinet 11. In addition, in

accommodating the normal bill, the bill validator 22 outputs an input signal to the main CPU 41, based on an amount of the bill. The main CPU 41 stores a credit-number, which corresponds to the amount of the bill transmitted by the input signal, in the RAM 43.

[0110]

The ticket printer 35 prints a barcode having data encoded thereto, such as credit-number stored in the RAM 43, date and time, identification number of the slot machine 10 and the like, on a ticket, based on the control signal outputted from the main CPU 41, thereby outputting the ticket 39 having the barcode.

[0111]

The card reader 36 reads the data from the smart card to transmit it to the main CPU 41, and writes the data into the smart card, based on the control signal outputted from the main CPU 41. The key switch 38S is mounted to the keypad 38, and outputs an input signal to the main CPU 41 when the player manipulates the keypad 38. The data displayer 37 displays the data which is read by the card reader 36 or the data which the player inputs through the keypad 38, based on the control signal outputted from the main CPU 41.

[0112]

The door PCB 80 is connected with the control panel 20, a reverter 21S, a coin counter 21C and a cold cathode tube 81. The

control panel 20 is provided with a spin switch 23S corresponding to the spin button 23, a change switch 24S corresponding to the change button 24, a cash out switch 25S corresponding to the cash out button 25, a 1-BET switch 26S corresponding to the 1-BET button 26 and a MAX-BET switch 27S corresponding to the MAX-BET button 27. Each of the switches 23S~27S outputs an input signal to the main CPU 41 when each of the corresponding buttons 23~27 is pushed by a player.

[0113]

The coin counter 21C is mounted in the coin receiving slot 21 and validates whether a coin, which is inserted in the coin receiving slot 21 by the player, is normal or not. A coin except the normal coin is discharged from the coin payout slot 19. In addition, the coin counter 21C outputs an input signal to the main CPU 41 when it detects a normal coin.

[0114]

The coin counter 21C is operated on the basis of the control signal outputted from the main CPU 41 and distributes a coin, which is recognized as a normal coin by the coin counter 21C, to a cash box (not shown) or hopper 66 mounted in the slot machine 10. In other words, when the hopper 66 is fully filled with the coins, the normal coin is distributed into the cash box by the reverter 21S. In the mean time, when the hopper 66 is not fully filled with the coins, the normal coin is distributed into

the hopper 66. The cold cathode tube 81 functions as a backlight mounted to rear sides of the lower image display panel 16 and the upper image display panel 33 and is turned on, based on the control signal outputted from the main CPU 41.

[0115]

(sound quality adjustment)

Hereinafter, it is described a volume adjustment that is performed in the slot machine 10. As the main CPU 41 executes a volume adjustment processing routine of Fig. 8, it is determined whether the first to third selection switches 221, 222, 223 are operated by the player (S101). When the first to third selection switches 221, 222, 223 are not operated (S101, NO), this routine is ended and a standby state is made until the operation is carried out.

[0116]

When the first to third selection switches 221, 222, 223 are operated (S101, YES), a switching signal corresponding to the first to third selection switches 221, 222, 223 is outputted to the volume level changer 211 (S102). Then, the sample music data is outputted to the volume level changer 211 (S103). After a predetermined time period of standby elapses (S104), this routine is ended.

[0117]

Thereby, as shown in Fig. 2, the sample music data is

outputted to the D/A converter 210 via the main body PCB 60 and then is converted into an analog signal format. A BGM signal is outputted from the first output terminal 210a of the D/A converter 210 and a function music signal is outputted from the second output terminal 210b. The BGM signal and the function music signal are synthesized in the first adder 205 and then pass to a connection passage corresponding to the switching signal of the signal switching unit 204 and is then outputted to the low pass filters 204a, 204b, 204c specified by the switching signal.

[0118]

After the volume of a predetermined range is decreased in the low pass filters 204a, 204b, 204c, the signal passes to the second adder 207 and is outputted to the volume amplifier 206. The sample music having a volume decreased in the predetermined range is outputted from the speaker 29 and the player having operated the first to third selection switches 221, 222, 223 hears it. The player determines whether a sound quality of the sample music is proper or not. When the player is dissatisfied with the sound quality, the player may tentatively hear a next sample music by operating the first to third selection switches 221, 222, 223 and adjust the sound quality so that it becomes a desired sound quality.

[0119]

(processing operation)

In the followings, it will be described a process which is carried out in the slot machine 10 wherein the volume is adjusted as described above. When the main CPU 41 reads out and executes the game program, a game is started. As shown in Fig. 7, in the game executing process, it is determined whether a coin is bet (S10). In this process, it is determined whether it is received an input signal from the 1-BET switch 26S as the 1-BET button 26 is pushed and whether it is received an input signal from the MAX-BET switch 27S as the MAX-BET button 27 is pushed. When the coin is not bet (S10, NO), the step of S10 is re-executed and it is under standby state until a coin is bet.

[0120]

In the mean time, when the coin is bet (S10, YES), the credit-number stored in the RAM 43 is subtracted, correspondingly to the number of coins bet (S11). Meanwhile, if the number of coins bet is larger than the credit-number stored in the RAM 43, it is not carried out the process of subtracting the credit-number and the step of S11 is re-executed. In addition, if the number of coins bet is above the upper limit (50 pieces in this embodiment) which can be bet per one game, it is not carried out the process of subtracting the credit-number and a step of S12 is carried out.

[0121]

Next, it is determined whether the spin button 23 is ON or not (S12). When the spin button 23 is not ON (S12, NO), the procedure is returned to the step of S10. Meanwhile, when the spin button 23 has not been ON (for example, the spin button 23 is not ON and an instruction to end the game is inputted), it is canceled the subtraction result in the step of S11.

[0122]

In the mean time, when the spin button 23 is ON (S12, YES), a symbol determining process is executed (S13). In other words, a stop symbol determining program stored in the RAM 43 is executed, so that it is determined the symbols 180 which will be stopped in the fifteen respective stages of the display windows 151~155. Thereby, it is determined a combination of symbols to be stopped on the payline L.

[0123]

Then, the symbols 180 of the display windows 151~155 are scroll-displayed (S14). In the mean time, the scroll process is such that the symbols 180 are scrolled in an arrow direction and then the symbols 180 determined in the step of S13 are stopped (rearranged) in the display windows 151~155.

[0124]

After that, a scatter object symbol determining process is executed (S15). In other words, a scatter object symbol 181 is randomly determined from the symbols 180 of "BELL," "CHERRY,"

"STRAWBERRY," "PLUM," "ORANGE" and "APPLE." Then, the determined scatter object symbol 181 is displayed in the scatter object symbol display unit 163.

[0125]

When the scroll of the symbols 180 is stopped, it is acquired a rearrangement-number of the scatter object symbol 181 (S16). Then, it is determined whether the rearrangement-number is a set threshold or more (S17). When it is a set threshold or more (S17, YES), the scatter object symbol 181 is set as a scatter symbol 182. Specifically, the scatter object symbol 181 is displayed as a received thing in the scatter symbol display unit 171, through a series of operations that the scatter object symbol 181 is moved from the scatter object symbol display unit 163 to the scatter symbol display unit 171 and then received in the scatter symbol display unit 171 (S18).

[0126]

After that, a character 251 is displayed between the scatter symbol display unit 171 and the scatter object symbol display unit 163 and a speech bubble representing a speech content of the character 251 is displayed. In addition, the speech content of the character 251 is outputted with a voice sound. Specifically, an original description image 252 of "ORANGE has become a scatter symbol" is displayed in the speech bubble and is voice-outputted (S19).

[0127]

After that, a payout process is carried out. In other words, it is summed a payout-number of coins based on a winning combination and a payout-number of coins based on the display number of the scatter symbols 182. Then, when the coins to be paid out are stored, a predetermined number of credits is added to a credit-number that is stored in the RAM 43. In the mean time, when paying out the coins, a control signal is transmitted to the hopper 66, so that a predetermined number of coins is paid out (S20).

[0128]

In the mean time, when the rearrangement number is not a set threshold or more (S17, NO), it is determined whether a combination of the symbols 180 stopped on the payline L is a winning combination (S23). When it is not a winning combination (S23, NO), the combination is neither the scatter symbol 182 nor a winning combination. This means a blank, so that this routine is ended.

[0129]

In the mean time, when the combination is a winning combination (S23, YES), the step of S20 is executed. After that, it is determined whether a bonus trigger is made as the winning combination. In other words, it is determined whether a combination of "APPLE" is arranged on the payline L (S21). When

it is determined that a bonus trigger is made (S21, YES), a bonus game process is executed (S22). Meanwhile, when a bonus trigger is not made (S21, NO), this means a blank, so that this routine is ended.

[0130]

(embodiment 2)

In the followings, a second embodiment of the gaming machine and the volume adjusting method thereof according to the invention will be described. In the mean time, the same member as the first embodiment is provided with a same reference numeral and the description thereof is omitted.

[0131]

A slot machine 10 according to this embodiment comprises a gaming machine cabinet, a game that is operated by a betting of a player, background music information of a sound signal having a frequency characteristic that becomes a background music of the game, function music information of a sound signal having a frequency characteristic that becomes a function music representing an operating state of the game relating to an action of the player, a volume level changer that can change a volume level of the sound signal and switch a range in which a volume level thereof is changed, a selection switch that is adapted to be operated from an outside and selects a range of the sound signal, a speaker that converts the sound signal into

a sound wave and turns it up, and a game controller programmed to change, in the volume level changer, a volume level of a sound signal of the background music information selected in the selection switch, to form a sound signal in which the sound signal of the background music information and the sound signal of the function music information are mixed, and to output the formed sound signal from the speaker.

[0132]

According to the above structure, a range of a sound signal, which includes a sound signal having a frequency characteristic that becomes a background music of a game and a sound signal having a frequency characteristic that becomes a function music representing an operating state of the game relating to an action of a player, is enabled to be selected by an operation from an outside. After the volume level of the range of the selected sound signal is changed, the sound signal is converted into a sound wave that is then turned up.

[0133]

As a result, it is possible to enable a player to hear the voice sound in which a volume level of the selected range is changed. Accordingly, when increasing the volume level, it is possible to enable the player to easily hear for the selected range. To the contrary, when decreasing the volume level, it is possible to enable the player to have a difficulty in hearing

for the selected range. Thereby, since it is possible to change the volume of a predetermined range in accordance with a provision environment of the gaming machine and the player's preference, it is possible to flexibly carry out an effect of the gaming machine by the voice sound including the background music and the function music. In addition, since it is used a sound signal in which the background music information and the function music information are mixed, it is possible to perform a volume adjustment in a predetermined range for both the background music and the function music.

[0134]

Specifically, as shown in Fig. 9, the slot machine 10 comprises a main CPU 41 that is the game controller, a sound signal output device 201 that is connected to the main CPU 41 and outputs several sound signals in parallel, a volume level changer 211 that can change a volume level of a sound signal and switch a range in which a volume level is changed, first to third selection switches 221, 222, 223 that are adapted to be operated from an outside and select a range of a sound signal, and a sound output device 212 that overlaps the sound signals having a predetermined range in which a volume level is changed and converts the signals into a sound wave.

[0135]

The sound signal output device 201 is such connected that

it inputs the signals into the volume level changer 211. The volume level changer 211 has a signal switching unit 203, low pass filters 204a, 204b, 204c and a second adder 207.

[0136]

The signal switching unit 203 has a switch unit 203a, a single input terminal 203b and output terminals 203c, as a switch device. The input terminal 203b is connected to the output terminal 210a of the D/A converter 210. Meanwhile, each of the output terminals 203c is connected to the low pass filters 204a, 204b, 204c, respectively. Thereby, a BGM signal outputted from the D/A converter 210 passes to the signal switching unit 203 and is inputted to each of the low pass filters 204a, 204b, 204c.

[0137]

Moreover, the signal switching unit 203 has a switch changeover terminal 203d. The switch changeover terminal 203d is connected to the main body PCB 60. The main body PCB 60 outputs a switching signal for adjusting a volume of a predetermined range. The switching signal is outputted in an operation timing of first to third selection switches 221, 222, 223 and represents a connection state corresponding to the first to third selection switches 221, 222, 223.

[0138]

The low pass filters 204a, 204b, 204c are connected to the

input terminal of the second adder 207. The other input terminal of the second adder 207 is connected to the output terminals 210a,210b, 210c of the D/A converter 210, respectively. Thereby, the sound signals, which are inputted to the second adder 207, become a BGM signal having a decreased volume of a predetermined range in the low pass filters 204a, 204b, 204c, a function music signal outputted from the output terminal 210c of the D/A converter 210 and an effect sound signal. The second adder 207 outputs a new sound signal from the output terminal, in which the sound signal of the BGM signal, the function music signal and the effect sound signal are added. The other structures are same as the first embodiment.

[0139]

(embodiment 3)

In the followings, a third embodiment of the gaming machine and the volume adjusting method thereof according to the invention will be described. In the mean time, the same member as the first embodiment is provided with a same reference numeral and the description thereof is omitted.

[0140]

A slot machine 10 according to this embodiment comprises a gaming machine cabinet, a game that is operated by a betting of a player, background music information of a sound signal having a frequency characteristic that becomes a background music of the

game, function music information of a sound signal having a frequency characteristic that becomes a function music representing an operating state of the game relating to an action of the player, a volume level changer that can change a volume level of the sound signal and switch a range in which a volume level thereof is changed, a selection switch that is adapted to be operated from an outside and selects a range of the sound signal, a speaker that converts the sound signal into a sound wave and turns it up, and a game controller programmed to change, in the volume level changer, a volume level of a sound signal of the background music information, to change, in the volume level changer, a volume level of a range of a sound signal of the function music information selected in the selection switch, and to output a sound signal from the speaker, in which the sound signal of the background music information and the sound signal of the function music information are mixed.

[0141]

According to the above structure, a range of a sound signal, which includes a sound signal having a frequency characteristic that becomes a background music of a game and a sound signal having a frequency characteristic that becomes a function music representing an operating state of the game relating to an action of a player, is enabled to be selected by an operation from an outside. After the volume level of the

range of the selected sound signal is changed, the sound signal is converted into a sound wave that is then turned up.

[0142]

As a result, it is possible to enable a player to hear the voice sound in which a volume level of the selected range is changed. Accordingly, when increasing the volume level, it is possible to enable the player to easily hear for the selected range. To the contrary, when decreasing the volume level, it is possible to enable the player to have a difficulty in hearing for the selected range. Thereby, since it is possible to change the volume of a predetermined range in accordance with a provision environment of the gaming machine and the player's preference, it is possible to flexibly carry out an effect of the gaming machine by the voice sound including the background music and the function music. In addition, for the background music, it is possible to perform a volume adjustment in an entire range, and for the function music, it is possible to perform a volume adjustment in a predetermined range.

[0143]

Specifically, as shown in Fig. 9, the slot machine 10 comprises a main CPU 41 that is the game controller, a sound signal output device 201 that is connected to the main CPU 41 and outputs several sound signals in parallel, a volume level changer 211 that can change a volume level of a sound signal and

switch a range in which a volume level is changed, first to third selection switches 221, 222, 223 that are adapted to be operated from an outside and select a range of a sound signal, and a sound output device 212 that overlaps the sound signals having a predetermined range in which a volume level is changed and converts the signals into a sound wave.

[0144]

The sound signal output device 201 is such connected that it inputs the signals into the volume level changer 211. The volume level changer 211 has a first signal switching unit 203, low pass filters 204a, 204b, 204c, a second adder 207, a second signal switching unit 213 and a volume adjusting unit 214.

[0145]

The first signal switching unit 203 has a switch unit 203a, a single input terminal 203b and output terminals 203c, as a switch device. The input terminal 203b is connected to the output terminal 210b of the D/A converter 210. Meanwhile, each of the output terminals 203c is connected to the low pass filters 204a, 204b, 204c, respectively. Thereby, a function music signal outputted from the D/A converter 210 passes to the signal switching unit 203 and is inputted to each of the low pass filters 204a, 204b, 204c.

[0146]

In addition, the second signal switching unit 213 has the

same structure as the first signal switching unit 203. An input terminal of the second signal switching unit 213 is connected to the output terminal 210a of the D/A converter 210. An output terminal of the second signal switching unit 213 is connected to the volume adjusting unit 214 having resistors. The second signal switching unit 213 outputs a BGM signal to the resistors of the volume adjusting unit 214 corresponding to the switching signal.

[0147]

The volume adjusting unit 214 and the low pass filters 204a, 204b, 204c are connected to the input terminals of the second adder 207, respectively. In addition, the other input terminal of the second adder 207 is connected to the output terminals 210c of the D/A converter 210. Thereby, the sound signals, which are inputted to the second adder 207, become a BGM signal having a volume adjusted in all ranges in the volume adjusting unit 214, a function music signal having a volume decreased in a predetermined range in the low pass filters 204a, 204b, 204c and an effect sound signal outputted from the output terminal 210c of the D/A converter 210. The second adder 207 outputs a new sound signal from the output terminal, in which the sound signal of the BGM signal, the function music signal and the effect sound signal are added. The other structures are same as the first embodiment.

[0148]

In the mean time, although the above descriptions of the first, second and third embodiments have been provided with regard to the characteristic parts so as to understand the invention more easily, the invention is not limited to the first and second embodiments as described above and can be applied to the other embodiments and the applicable scope should be construed as broadly as possible. Furthermore, the terms and phraseology used in the specification have been used to correctly illustrate the invention, not to limit it. In addition, it will be understood by those skilled in the art that the other structures, systems, methods and the like included in the spirit of the invention can be easily derived from the spirit of the invention described in the specification. Accordingly, it should be considered that the invention covers equivalent structures thereof without departing from the spirit and scope of the invention as defined in the following claims. Further, the abstract is provided so that an intellectual property office and a general public institution or one skilled in the art who is not familiar with patent and legal or professional terminology can quickly analyze the technical features and essences of the invention through a simple investigation. Accordingly, the abstract is not intended to limit the scope of the invention that should be evaluated by the claims. In addition, it is

required to sufficiently refer to the documents that have been already disclosed, so as to fully understand the objects and effects of the invention.

[0149]

The above descriptions include a process that is executed on a computer or computer network. The above descriptions and expressions have been provided so that the one skilled in the art can understand the invention most effectively. In the specification, the respective steps used to induce one result or blocks having a predetermined processing function should be understood as a process having no self-contradiction. In addition, the electrical or magnetic signal is transmitted/received and written in the respective steps or blocks. Although the processes in the respective steps or blocks embody the signal as a bit, value, symbol character, term, number and the like, it should be noted that these have been used for the convenience of descriptions. Further, although the processes in the respective steps or blocks have been often described as an expression common to a human action, the process described in the specification is executed by a variety of devices in principle. In addition, the other structures necessary for the respective steps or blocks are apparent from the above descriptions.

WHAT IS CLAIMED IS:

1. A gaming machine comprising:

a game that is operated by a betting of a player,

background music information of a sound signal having a frequency characteristic that becomes a background music of the game,

function music information of a sound signal having a frequency characteristic that becomes a function music representing an operating state of the game relating to an action of the player,

a volume level changer that can change a volume level of the sound signal and switch a range in which the volume level is changed,

a selection switch that is adapted to be operated from an outside and selects a range of the sound signal,

a speaker that converts the sound signal into a sound wave and turns it up, and

a game controller that is programmed to change, in the volume level changer, a volume level of a range of the sound signal selected in the selection switch and to output the sound signal having the volume level changed from the speaker.

2. A gaming machine comprising:

a game that is operated by a betting of a player,

background music information of a sound signal having a frequency characteristic that becomes a background music of the game,

function music information of a sound signal having a frequency characteristic that becomes a function music representing an operating state of the game relating to an action of the player,

sample music information of a sound signal having a frequency characteristic that becomes a sample music having the background music and the function music,

a volume level changer that can change a volume level of the sound signal and switch a range in which the volume level is changed,

a selection switch that is adapted to be operated from an outside and selects a range of the sound signal,

a speaker that converts the sound signal into a sound wave and turns it up, and

a game controller that is programmed to use a sound signal of the sample music information when the selection switch is operated, to change, in the volume level changer, a volume level of a range of the sound signal selected in the selection switch and to output the sound signal having the volume level changed from the speaker.

3. A gaming machine comprising:

a game that is operated by a betting of a player,

background music information of a sound signal having a frequency characteristic that becomes a background music of the game,

function music information of a sound signal having a frequency characteristic that becomes a function music representing an operating state of the game relating to an action of the player,

a volume level changer that can change a volume level of the sound signal and switch a range in which the volume level is changed,

a selection switch that is adapted to be operated from an outside and selects a range of the sound signal,

a speaker that converts the sound signal into a sound wave and turns it up, and

a game controller that is programmed to use a sound signal in which the background music information and the function music information are mixed, to change, in the volume level changer, a volume level of a range of the sound signal selected in the selection switch and to output the sound signal having the volume level changed from the speaker.

4. A gaming machine comprising:

a game that is operated by a betting of a player,

background music information of a sound signal having a frequency characteristic that becomes a background music of the game,

function music information of a sound signal having a frequency characteristic that becomes a function music representing an operating state of the game relating to an action of the player,

a volume level changer that can change a volume level of the sound signal and switch a range in which the volume level is changed,

a selection switch that is adapted to be operated from an outside and selects a range of the sound signal,

a speaker that converts the sound signal into a sound wave and turns it up, and

a game controller that is programmed to change, in the volume level changer, a volume level of a range of a sound signal of the background music information selected in the selection switch, to form a sound signal in which the sound signal of the background music information and the sound signal of the function music information are mixed and to output the formed sound signal from the speaker.

5. A gaming machine comprising:

a game that is operated by a betting of a player,

background music information of a sound signal having a frequency characteristic that becomes a background music of the game,

function music information of a sound signal having a frequency characteristic that becomes a function music representing an operating state of the game relating to an action of the player,

a volume level changer that can change a volume level of the sound signal and switch a range in which the volume level is changed,

a selection switch that is adapted to be operated from an outside and selects a range of the sound signal,

a speaker that converts the sound signal into a sound wave and turns it up, and

a game controller that is programmed to change, in the volume level changer, a volume level of a sound signal of the background music information, to change, in the volume level changer, a volume level of the range of a sound signal of the function music information selected in the selection switch, and to output, from the speaker, a sound signal in which the sound signal of the background music information and the sound signal of the function music information are mixed.

6. A method of adjusting a sound quality of a gaming machine comprising:

enabling a range of a sound signal to be selected by an operation from an outside, the sound signal including a sound signal having a frequency characteristic that becomes a background music of a game and a sound signal having a frequency characteristic that becomes a function music representing an operating state of the game relating to an action of a player,

changing a volume level of a range of the sound signal selected, and

converting the sound signal having the volume level changed and turning it up.