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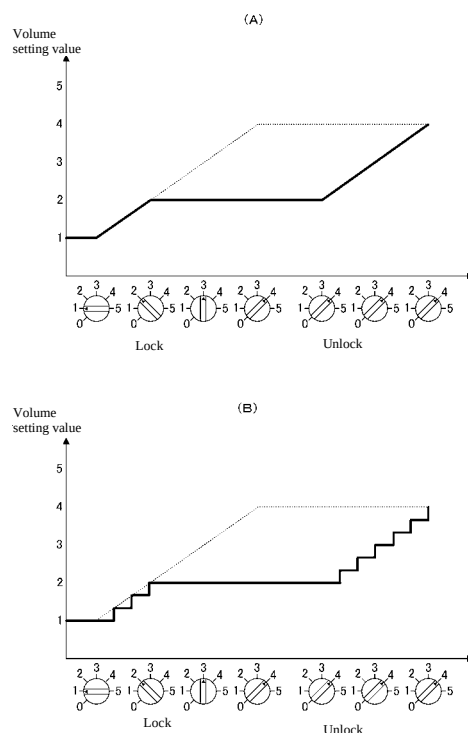
(54) [Title of Invention] AUDIO OUTPUT DEVICE

(57) [Abstract]

[Problem] To provide an audio output device that illustrates how to deal with a case wherein a volume setting value indicated by a hardware volume differs from a volume setting value by software control.

[Resolution Means] When a control unit 11 receives an unlocking operation, the same control unit compares a volume setting value indicated by a VR 12 at that time and a volume setting value stored in a setting storage unit 15, and when these volume setting values are not identical, changes a volume setting value set in an amplifier 18 to the volume setting value indicated by the VR 12 at a predetermined rate of change. For example, in the example of FIG. 2 (A), the time required for the volume setting value to match the volume setting value of the VR 12 is fixed, and the volume setting value is changed linearly.

[Selected Drawing] FIG. 2



[Scope of Patent Claims]

[Claim 1]

An audio output device, comprising:

a volume reception unit for receiving a volume setting operation,

a volume control unit for controlling a volume of an output audio in response to the volume setting operation received by the volume reception unit,

and a volume fixation operation reception unit for receiving a volume fixation operation and a volume fixation release operation;

wherein when the volume fixation operation is received, the volume control unit maintains the volume of the output audio at a volume setting value at the time of the volume fixation operation, regardless of the volume setting operation received by the volume reception unit;

and when the volume fixation release operation is received, the volume control unit performs volume control processing to change the volume of the output audio by a predetermined rate of change from the volume setting value at the time of the volume fixation operation to the volume setting value received by the volume receiving unit.

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[Claim 2]

The audio output device according to claim 1, wherein the volume control unit performs the volume control processing when the volume fixation release operation is received and the volume setting unit receives a new operation.

[Claim 3]

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The audio output device according to claim 1 or claim 2, wherein the volume control processing is processing for continuously changing a volume.

[Claim 4]

The audio output device according to claim 1 or claim 2, wherein the volume control processing is processing for intermittently changing a volume.

[Claim 5]

The audio output device according to any one of claims 1 to 4, wherein the rate of change is changed according to a volume of an output audio at that time and the volume setting value received by the volume reception unit.

[Claim 6]

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The audio output device according to any one of claims 1 to 5, wherein, in the volume control processing, the volume control unit changes the volume of the output audio to a target volume setting value corresponding to the volume setting value received by the volume reception unit.

[Claim 7]

An audio output device, comprising:

a volume reception unit for receiving a volume setting operation by a user,

a volume control unit for controlling a volume of an output audio in response to the volume setting operation received by the volume reception unit,

and a volume fixation operation reception unit for receiving a volume fixation operation and a volume fixation release operation;

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wherein when the volume fixation operation is received, the volume control unit maintains the volume of the output audio at a volume setting value at the time of the volume fixation operation, regardless of the volume setting operation received by the volume reception unit,

and when the volume fixation release operation is received, the volume control unit maintains the volume setting of the output audio at the volume setting value at the time of the volume fixation operation as-is; and after the volume setting value received by the volume reception unit matches the volume setting value at the time of the volume fixation operation, the volume control unit performs volume control processing to control the volume of the output audio in response to the volume setting operation received by the volume reception unit.

[Detailed Description of Invention]

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[Technical Field]

[0001]

The present invention relates to an audio output device that outputs audio, and more particularly to controlling a volume of the output audio.

[Background Art]

[0002]

Conventionally, an audio device having a child lock function that prevents the volume from being

changed even when volume adjustment keys (up and down keys) on a remote control are operated by a child for mischievous purposes or the like, has been proposed (see, for example, Patent Document 1).

[Prior Art Document]

[Patent Document]

[0003]

[Patent Document 1] JP 2008-53985 A

[Summary of Invention]

[Problem to Be Solved by Invention]

[0004]

However, the device of Patent Document 1 performs internal control (software control) so that the volume is not changed even when the volume adjustment keys are operated. If the device was made such that the volume did not change even when a hardware volume (volume knob) on the device body or the like was changed, the volume setting value indicated by the hardware volume would differ from the volume setting value by software control, leaving the user with a sense of discomfort. Patent Document 1 does not illustrate how to deal with this situation.

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[0005]

Therefore, an object of the present invention is to provide an audio output device that illustrates how to deal with a case wherein a volume setting value indicated by a hardware volume differs from a volume setting value by software control.

[Means for Solving Problem]

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[0006]

The audio output device of the present invention is provided with a volume reception unit for receiving a volume setting operation, a volume control unit for controlling a volume of an output audio in response to the volume setting operation received by the volume reception unit, and a volume fixation operation reception unit for receiving a volume fixation operation and a volume fixation release operation.

[0007]

When the volume fixation operation is received, the volume control unit maintains the volume of the output audio at a volume setting value at the time of the volume fixation operation, regardless of the volume setting operation received by the volume reception unit, and when the volume fixation release operation is received, the volume control unit performs volume control processing to change the volume of the output audio by a predetermined rate of change from the volume setting value at the time of the volume fixation operation to the volume setting value received by the volume reception unit.

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[0008]

In other words, when the volume fixation operation is received, the audio output device of the present invention maintains the volume indicated by the volume reception unit (hardware volume), but when the volume fix is released, the volume of the output audio is gradually made to match the volume indicated by the hardware volume. In this way, even when the volume setting value indicated by the hardware volume and the volume setting value by software control differ, the volume changes gradually after the volume fix is released to match the volume setting value of the hardware volume, thereby reducing the sense of discomfort felt by the user.

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[0009]

Furthermore, an aspect in which the volume control unit performs the volume control processing when the volume fixation release operation is received and the volume setting unit receives a new operation, is possible. In other words, the volume is not changed immediately after the volume fix is released, but is changed when the hardware volume is actually operated. Therefore, it is possible to realize an appropriate volume change that reflects the user's intention in changing the volume.

[0010]

Note that the volume may change continuously or intermittently. The rate of change is changed in response to the volume of the output audio at that time and the volume setting value received by the volume reception unit. For example, the time required to match the hardware volume is fixed, and the volume is changed at a constant rate of change, but when the hardware volume is operated while the volume is changing and the target volume setting value is changed, the rate of change is increased or decreased.

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[0011]

Furthermore, the target volume setting value (target volume setting value) does not need to perfectly match the volume setting value indicated by the actual hardware volume. For example, a value corresponding to the volume setting value indicated by the hardware volume (for example, a value slightly larger or smaller than the volume setting value indicated by the hardware volume) may be set as a target volume setting value, and the volume may be changed to this target volume setting value. Alternatively, the target volume setting value may be the average value of the current volume of the output audio and the volume setting value indicated by the hardware volume.

[0012]

Furthermore, the audio output device of the present invention may also be embodied in the following manner. In other words, when the volume fixation operation is received, the volume control unit maintains the volume of the output audio at the volume setting value at the time of the volume fixation operation, regardless of the volume setting operation received by the volume reception unit, and when the volume fixation release operation is received, the control unit maintains the volume setting value of the output audio at the volume setting value at the time of the volume fixation operation, and after the volume setting value received by the volume reception unit matches the volume setting value at the time of the volume fixation operation, the volume control unit controls the volume of the output audio in response to the volume setting operation received by the volume reception unit.

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[0013]

In this case, even after the volume fix is released, the volume of the output audio is maintained as-is regardless of the volume setting value of the hardware volume, but when the hardware volume is operated and matches the volume of the output audio, the volume is changed in response to the volume setting value of the hardware volume. In this case as well, it is possible to realize an appropriate change in volume that reflects the user's intention in manipulating the volume, thereby reducing the sense of discomfort felt by the user.

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[Effect of Invention]

[0014]

According to the present invention, even when the volume setting value indicated by the hardware volume and the volume setting value by software control differ, the two volume setting values are made to match using a predetermined method after the volume fix is released, thereby reducing the sense of discomfort felt by the user.

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[Brief Description of Drawings]

[0015]

[FIG. 1] FIG. 1 (A) is a diagram illustrating a configuration of an audio output device, FIG. 1 (B) is an external perspective view, and FIG. 1 (C) is a diagram illustrating an installation example of the audio output device.

[FIG. 2] A diagram illustrating a first example of a volume change operation.

[FIG. 3] A diagram illustrating a variation of the volume change operation.

[FIG. 4] A diagram illustrating a second example of the volume change operation.

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[FIG. 5] A diagram illustrating a third example of the volume change operation.

[FIG. 6] A flowchart illustrating an operation of the audio output device in the first example.

[FIG. 7] A flowchart illustrating an operation of the audio output device in the second example.

[FIG. 8] A flowchart illustrating an operation of the audio output device in the third example.

[FIG. 9] A flowchart illustrating an operation of the audio output device when a warning sound is generated.

[FIG. 10] A diagram illustrating a configuration according to an application example of an audio output device when a warning sound is generated.

[FIG. 11] A flowchart illustrating a start-up operation.

[Embodiments of Invention]

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[0016]

FIG. 1 (A) is a block diagram illustrating a configuration of an audio output device, and FIG. 1 (B) is an external perspective view of the audio output device.

[0017]

The audio output device outputs audio of content including music and the like, and in the present embodiment, an example is illustrated in which a masking sound is output as the content. The masking sound disrupts the speech to be masked, so that a third party cannot understand the content of the speech to be masked (the content of remarks by a speaker). The masking sound used is a human voice that has

been altered on a time axis or a frequency axis so as to make such lexically meaningless (unintelligible).
[0018]

As illustrated in FIG. 1 (C), the audio output device is installed, for example, at a conversation counter or waiting area of a bank, a pharmacy, or the like, and emits a masking sound toward the waiting area. The masking sound is intended to mask the content of remarks of a person having a conversation within the dialogue counter, so that people in the waiting area cannot understand the content of the remarks. For example, in the example of FIG. 1 (C), an audio output device 1 is installed near a patient 92 waiting for their turn in the waiting area, so that the patient cannot understand the content of remarks by a pharmacist (administrator) 91 who is at the counter providing an explanation on medication, or by a patient 90 receiving the explanation.

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[0019]

Here, in order to achieve an appropriate masking effect, the volume setting of the masking sound is important. That is, when the volume of the masking sound is low, the desired masking effect is not obtained, and the listener can distinguish the content of the remarks. On the other hand, although the masking sound has the voice quality of a human, it cannot be recognized as conversational speech emitted by a person, and therefore, when the volume of the masking sound is high, it may cause discomfort (annoyance). Therefore, it is desirable to set the volume of the masking sound to an optimal volume and to fix such before use.

[0020]

However, since the audio output device is installed in a place in which many people are present, there is a risk that the volume setting may be changed due to mischief by a child or carelessness. As illustrated in FIG. 1 (C), an administrator 91 who wants to manage the volume is at the counter, and the audio output device 1 is placed at a remote location such as a waiting area. This makes it difficult to monitor changes to the volume setting due to tampering or the like. Therefore, the audio output device of the present embodiment is provided with a volume fixation function for fixing the volume setting, and also performs appropriate volume control when the volume fix is released.

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[0021]

The specific configuration and operation of the audio output device will be described below.

As illustrated in FIG. 1 (A), an audio output device 1 is provided with a control unit 11, a VR (hardware volume) 12, an A/D converter 13, a UI (user interface) 14, a setting storage unit 15, a content storage unit 16, a playback unit 17, an amplifier 18, an amp 19, and a speaker 20.

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[0022]

As illustrated in FIG. 1 (B), the audio output device 1 has a housing that is rectangular in appearance, and a speaker 20 is provided in the front direction of the housing so as to output the sound of the content in the front direction. In addition, a top surface of the housing is provided with a VR 12 (volume reception unit in the present invention) for receiving a volume setting operation from a user, and a UI 14 (volume fixation operation reception unit in the present invention) for receiving various operations such as content selection, a volume fixation operation, and a power on/off operation. Note that the external shape of the device body, the number of speakers, and the shapes of the VR 12 and UI 14 are not limited to the present example.

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[0023]

The content storage unit 16 stores audio of various content including the masking sound described above. Note that, in the present example, the audio output device 1 is provided with the content storage unit 16, but content may be input from another device (such as a server). The control unit 11 instructs the playback unit 17 to play back the content specified by the UI 14. The playback unit 17 reads out the specified content from the content storage unit 16 and performs playback processing. In the present embodiment, an example in which the masking sound is played back as content will be described.

[0024]

When the masking sound is human speech that has been altered on a time axis, the speech of predetermined specific speakers (the speech of multiple people, including both male and female) is recorded in advance, and an audio signal divided into sections of a certain length at predetermined times is read out in reverse or the like, to make the speech lexically meaningless. When modifying on a frequency axis, peaks (formants) of a spectral envelope are extracted, and specific formants that affect

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vocabulary are modified to make the speech lexically meaningless. Alternatively, speech of a speaker in the dialogue counter may be picked up by a microphone, and the picked up speech may be modified to generate new audio each time.

[0025]

The playback unit 17 reads out sound data relating to such a masking sound from the content storage unit 16 and performs playback processing. For example, when the sound data relating to the masking sound is encoded compressed data, the encoded compressed data is decoded and converted into a digital audio signal, and output to an amplifier 18. The amplifier 18 adjusts the level of the input digital audio signal in response to a volume setting value specified by the control unit 11, and outputs the adjusted signal to the amp 19. The amp 19 corresponds to a so-called power amp (final stage amplifier) and amplifies the input audio signal. The amplification method may be analog or digital. In the present embodiment, a D/A converter is omitted, but when an analog signal is to be amplified, a D/A converter is provided in the pre-stage of the amp 19, and when a digital signal is to be amplified, a D/A converter is provided in the post-stage of the amp 19.

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[0026]

The audio signal amplified by the amp 19 is output to the speaker 20 and emitted as sound. In this manner, the masking sound is output. The speaker 20 may be provided in another device instead of the audio output device 1, and the audio output device 1 may output an audio signal to this other device and output the masking sound from the speaker of the other device.

[0027]

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As described above, the control unit 11 sets a volume setting value in the amplifier 18 and performs volume control, and this set volume setting value is stored in the setting storage unit 15, which is made up of a non-volatile memory such as an EEPROM or a flash memory. As a basic operation of the audio output device of the present embodiment, the volume setting value is specified by the user using the VR 12.

[0028]

The VR 12 is a rotary knob that outputs a voltage value according to the rotation angle to the A/D converter 13. This voltage value is converted into a digital value by the A/D converter 13 and input to the control unit 11. The control unit 11 stores a volume setting value corresponding to the input voltage value in the setting storage unit 15 and sets the volume setting value in the amplifier 18. This sets the volume of the output audio.

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[0029]

FIG. 2 (A) is a diagram illustrating a first example of a volume change operation. The horizontal axis of the graph in the figure indicates the passage of time, and the lower column of the horizontal axis indicates the volume setting value of the VR 12 at each point in time. The vertical axis indicates the volume of the output audio (the volume setting value stored in the setting storage unit 15) or the volume setting value of the VR 12. In the graph, the thick solid line indicates the volume of the output audio, and the dotted line indicates the volume setting value of the VR12. Note that these volume setting values merely indicate relative volumes and do not indicate absolute volumes. For example, in the present embodiment, a volume setting value of 0 means no sound, and a volume setting value of 5 means that sound is output at the maximum output of the audio output device.

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[0030]

As illustrated in order from the left side of FIG. 2 (A), for example, when the volume setting value indicated by the VR 12 is 1, a volume setting value of 1 is stored in the setting storage unit 15, and a volume setting value of 1 is also set in the amplifier 18. Here, when the user operates the VR 12 and the volume setting value of the VR 12 changes to 2, the volume setting value stored in the setting storage unit 15 is changed to 2, and the volume setting value set in the amplifier 18 is also changed to 2. In the present example, the volume setting value set in the amplifier 18 changes continuously in response to the change in the volume setting value of the VR 12, but the volume setting value may also change intermittently as illustrated in FIG. 2 (B).

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[0031]

Next, the volume change operation at the time of the volume fixation operation and the volume fixation release operation will be described with reference to the graph in FIG. 2 (A) and the flowchart in FIG. 6. First, the control unit 11 receives a locking operation and determines whether or not locking has started (s11). Here, locking means that no operations other than turning the power on and off are received, and includes operations other than fixing the volume. For example, when a locking operation is received, not only is the volume setting by the VR 12 not received, but neither are other operations such as content

selection. However, even when the device is locked, only power on and off operations are received, thus reducing the trouble of the administrator performing an unlocking operation in order to perform a power off operation. The locking and unlocking operations are received, for example, by pressing and holding specific buttons simultaneously on the UI 14 or by pressing and holding a specific plurality of buttons simultaneously.

[0032]

When a locking operation is received (s11, Yes), the control unit 11 stores the volume setting value indicated by the VR 12 at that time in the setting storage unit 15, and fixes the volume of the output audio at this volume setting value (s12). In the example of FIG. 2 (A), since the volume setting value of the VR 12 indicates 2, the volume setting value 2 is stored in the setting storage unit 15 and the volume setting value set in the amplifier 18 is fixed at 2. Therefore, as illustrated in FIG. 2 (A), even when the volume setting value of the VR 12 is subsequently changed to 3 or 4, the volume setting value set in the amplifier 18 is fixed at the volume setting value of 2 at the time of the locking operation. At this time, it is preferable that the control unit 11 stores information indicating that the locking operation is in progress in the setting storage unit 15 (sets a flag for the locking operation) in order to maintain the locking operation even when the power is turned off and then restarted, as described below.

[0033]

When the unlocking operation is received (s13, Yes), the control unit 11 compares the volume setting value indicated by the VR 12 at that time and the volume setting value stored in the setting storage unit 15 (s14), and when these volume setting values are not identical (s15, Yes: when they are different), the control unit 11 changes the volume setting value set in the amplifier 18 at a predetermined rate of change (s16) to the volume setting value indicated by the VR 12. In the example of FIG. 2 (A), when the control unit 11 receives an unlocking operation, the volume setting value of 2 is stored in the setting storage unit 15 in response to a volume setting value of 4 being indicated by the VR 12, and the amplifier 18 is set to a volume setting value of 2, so the control unit 11 changes the volume setting value set in the amplifier 18 to the volume setting value of 4 indicated by the VR 12 and updates the volume setting value in the setting storage unit 15. When the volume setting value set in the amplifier 18 and the volume setting value of the VR 12 match, the volume setting value set in the amplifier 18 is changed according to the volume setting value indicated by the VR 12.

[0034]

At this time, the control unit 11 does not immediately change the volume to the volume setting value indicated by the VR 12, but changes it gradually at a predetermined rate of change. In the example of FIG. 2(A), the time required to match the volume setting value of the VR 12 is fixed (for example, 2 seconds), and the volume of the output audio is changed linearly (linearly) at a constant rate of change on a logarithmic axis (dB). However, the rate of change need not be fixed, and may be changed even during the volume change. For example, as shown in FIG. 3(A), when the VR 12 is operated while the volume is in the process of changing and the target volume setting value is being changed continuously, the rate of change is decreased (or increased). For example, when the user starts to operate the VR 12 to reduce the volume while the control unit 11 is in the process of changing the volume setting value set in the amplifier 18, the control unit 11 follows this operation of reducing the volume to reduce the rate of change. Similarly, when the user starts to operate the VR 12 to increase the volume while the control unit 11 is in the process of changing the volume setting value set in the amplifier 18, the control unit 11 follows this operation of increasing the volume of the VR 12 to increase the rate of change.

[0035]

That is, in FIG. 2 (A), the control unit 11 fixes the rate of change of the volume so that it takes, for example, 2 seconds to change from a volume setting value of 2 to a volume setting value of 4. However, in the example in FIG. 3 (A), while the control unit 11 is in the process of changing the volume of the amplifier 18 (in this example, the point at which the control unit 11 has changed the volume setting value to 3), the user operates the VR 12 to start an operation to decrease the volume, and continuously performs the operation to decrease the volume. Therefore, the control unit 11 detects this operation to reduce the volume, and reduces the rate of change (in the example of the same figure, the rate of change is halved). In this manner, when the user starts to operate the VR 12 to reduce the volume and continuously performs the operation to decrease the volume, the volume will match the volume setting value of the VR 12 sooner than the initial required time (for example, 2 seconds) if the rate of change remains the same. However, by reducing the rate of change midway, the time until the volume matches the volume setting value of the

VR 12 can be extended, making it possible to approach the initial required time. Contrary to the example of FIG. 3 (A), when the user starts to operate the VR 12 to increase the volume and continuously performs the operation to increase the volume, the volume will match the volume setting value of the VR 12 later than the initial required time (for example, 2 seconds) at the same rate of change. However, when the control unit 11 detects the operation by the user of operating the VR 12 to increase the volume, the control unit 11 follows this operation of increasing the volume of the VR 12 to increase the rate of change, thereby shortening the time until the volume matches the volume setting value of the VR 12, thus making it possible to approach the initial required time.

[0036]

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The volume change is not limited to the continuous change illustrated in FIG. 2 (A), and is naturally not limited to the example of linear change. For example, as shown in FIG. 2 (B), an aspect in which the change is intermittent is possible, and as shown in FIG. 3 (B), an aspect in which the change is non-linear is also possible. When the change is made non-linearly, it is possible to set the rate of change in consideration of, for example, human hearing characteristics. Also, since human hearing is sensitive to increases in volume, the volume may be changed more gradually when increasing the volume, or the volume may be changed non-linearly when increasing the volume and changed linearly when decreasing the volume, and the like.

[0037]

Furthermore, the target volume setting value does not need to perfectly match the actual volume setting value indicated by the VR 12. For example, a value corresponding to the volume setting value indicated by the VR 12 (for example, a value slightly higher or lower than the volume setting value of the VR 12) may be used as the target volume setting value, and the volume may be changed up to this target volume setting value. Alternatively, the target volume setting value may be the average value of the volume setting value currently set in the amplifier 18 and the volume setting value indicated by the VR 12.

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[0038]

In this manner, the audio output device of the present embodiment maintains the volume indicated by the VR 12 at the time the locking operation is received, and does not change the volume even when the VR 12 is operated, but gradually matches the volume of the output audio to the volume indicated by the VR 12 when the lock is released. Thus, even when the volume setting value indicated by the VR 12 and the volume setting value set in amplifier 18 (volume setting value by software control) differ, the volume changes gradually after the lock is released to match the volume setting value of the VR 12, thereby reducing the sense of discomfort felt by the user.

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[0039]

As described above, the audio output device 1 of the present embodiment is configured to receive only power on/off operations when a locking operation is received, but even when the power is turned off or cut off (for example, the AC adapter is unplugged from the outlet) during the locking operation, the next time the power is turned on and restarted, it is possible to resume output of the masking sound at the volume setting value maintained immediately before, thereby maintaining the locking operation.

[0040]

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In this case, the audio output device 1 performs an operation as illustrated in FIG. 11. This operation is performed when the power supply of the audio output device 1 is turned on. First, the control unit 11 reads out various pieces of information stored in the setting storage unit 15 (s51). The setting storage unit 15 is a non-volatile memory, and therefore stores various pieces of information that were stored immediately before the power was turned off, unchanged. Therefore, the control unit 11 determines whether or not information indicating that the locking operation is in progress is stored in the setting storage unit 15 (s52). When information indicating that the locking operation is in progress is not stored in the setting storage unit 15 (s52, No), the volume setting value set in the amplifier 18 is changed according to the volume setting value indicated by the VR 12 (s53), and the startup operation is terminated. After that, the process moves to a normal operation (for example, the operation in the flowchart illustrated in FIG. 6).

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[0041]

On the other hand, when information indicating that the locking operation is in progress is stored in the setting storage unit 15 (s52, Yes), the control unit 11 moves to the processing in s12 in the flowchart in FIG. 6. That is, the control unit 11 sets the volume setting value stored in the setting storage unit 15 in the amplifier 18, and fixes the volume of the output audio at this volume setting value. Thereafter, the locking operation (the processing from s13 onwards in the example in FIG. 6) is maintained. When an

unlocking operation is received (in the example in FIG. 6, s13, Yes), the control unit 11 erases the information stored in the setting storage unit 15 indicating that the locking operation is in progress.

[0042]

In this manner, the audio output device 1 maintains the locking operation even when the power is turned off, interrupted, or the like. Therefore, even in an aspect in which only power on/off operations are received during the locking operation, the locking operation can be continued, and not only does this eliminate the need for the administrator to perform an unlocking operation when the power is turned off, but this also eliminates the need to perform the locking operation again after the power is turned on.

[0043]

Next, a second example of the volume change operation will be described with reference to FIG. 4 and FIG. 7. As with the graph in FIG. 2 (A), the horizontal axis of the graph in FIG. 4 indicates the passage of time, and lower column of the horizontal axis indicates the volume setting value of the VR 12 at each point in time. The vertical axis indicates the volume of the output audio (the volume setting value stored in the setting storage unit 15) or the volume setting value of the VR 12. In the graph, the thick solid line indicates the volume of the output audio, and the dotted line indicates the volume setting value of the VR 12. The difference from FIG. 2 (A) is the operation performed when the unlocking operation is received. Therefore, only the operation performed when the unlocking operation is received will be described. Also, in regard to the flowchart shown in FIG. 7, only the differences from the flowchart illustrated in FIG. 6 will be described.

[0044]

In this second example, when an unlocking operation is received (s13, Yes), the control unit 11 first checks whether the VR 12 is being operated (s24). This determination is repeated until the VR 12 is operated. In other words, the volume setting value of the amplifier 18 remains fixed. When the VR 12 is operated (s24, Yes), the control unit 11 compares the volume setting value indicated by the VR 12 and the volume setting value stored in the setting storage unit 15 (s25), and when these volume setting values are not identical (s26, Yes: they are different), the process is repeated from the determination of s24, and when they become identical (s26, No: not different), the volume setting value of the amplifier 18 is changed according to the volume setting value indicated by the VR 12.

[0045]

In other words, in the first example (example in FIG. 2 (A)), when an unlocking operation is received, the control unit 11 matches the volume setting value set in the amplifier 18 to the volume setting value indicated by the VR 12, but in this second example, even when an unlocking operation is received as shown in FIG. 4, the volume setting value set in the amplifier 18 is maintained regardless of the volume setting value of the VR 12. However, when the VR 12 is operated and the volume setting value of the VR 12 matches the volume setting value set in the amplifier 18, the volume is changed according to the volume setting value indicated by the VR 12 (s27). In this case, when the user operates the VR 12 to a certain extent and instructs a volume change, the actual volume changes, making it possible to realize an appropriate volume change that reflects the user's intention in operating the volume, thereby reducing the sense of discomfort felt by the user.

[0046]

Next, a third example of the volume change operation will be described with reference to FIG. 5 and FIG. 8. As with the graph in FIG. 2 (A), the horizontal axis of the graph in FIG. 5 also indicates the passage of time, and lower column of the horizontal axis also indicates the volume setting value of the VR 12 at each point in time. The vertical axis indicates the volume of the output audio (the volume setting value stored in the setting storage unit 15) or the volume setting value of the VR 12. In the graph, the thick solid line indicates the volume of the output audio, and the dotted line indicates the volume setting value of the VR 12. The difference from FIG. 2 (A) is the operation performed when the unlocking operation is received. Therefore, only the operation performed when the unlocking operation is received will be described. In the flowchart illustrated in FIG. 8, only the differences from the flowchart illustrated in FIG. 6 will be described.

[0047]

In this third example, when the unlocking operation is received (s13, Yes), the control unit 11 first checks whether the VR 12 is being operated (s34). This determination is repeated until the VR 12 is operated. In other words, the volume setting value of the amplifier 18 remains fixed. When the VR 12 is operated (s34, Yes), the control unit 11 compares the volume setting value indicated by the VR 12 and the volume setting value stored in the setting storage unit 15 (s35), and when these volume setting values are not identical (s36, Yes: if they are different), the volume setting value set in the amplifier 18 is changed

at a predetermined rate of change to the volume setting value indicated by the VR 12 (s37). In the example in FIG. 5, when the unlocking operation is received, the control unit 11 changes the volume setting value set in the amplifier 18 to the volume setting value of 4 indicated by the VR 12 to update the volume setting value of the setting storage 15, because a volume setting value of 2 is stored in the setting storage unit 15 and a volume setting value of 2 is set in the amplifier 18, while the VR 12 indicates the volume setting value of 4. When the volume setting value indicated by the VR 12 matches the volume setting value set in amplifier 18, the volume setting value set in amplifier 18 is changed according to the volume setting value indicated by the VR 12.

[0048]

However, in the present example, since the volume setting value indicated by the VR 12 changes continuously from the volume setting value of 4 to the volume setting value of 2, the rate of change of the amplifier 18 is not fixed, but is gradually reduced to be non-linear. Of course, the rate of change may be gradually increased, or may be changed linearly or intermittently.

[0049]

Also, in the present example, the target volume setting value does not need to perfectly match the actual VR 12 value. For example, the target volume setting value may be a value slightly higher or lower than the volume setting value indicated by the VR 12. Alternatively, the target volume setting value may be the average value of the current volume of the output audio and the volume setting value indicated by the VR 12.

[0050]

In the third example, the user's operation of the VR 12 triggers a volume change, thereby reducing the sense of discomfort that occurs when the volume does not change even when the VR 12 is operated, and making it possible to achieve an appropriate volume change that reflects the user's intention in changing the volume.

[0051]

In addition, in all of the first, second and third examples above, it is preferable that the audio output device performs an operation of emitting a warning sound as follows during the locking operation.

FIG. 9 is a flowchart illustrating an operation of the audio output device when emitting a warning sound. The operation illustrated in FIG. 9 is triggered when the control unit 11 receives a locking operation.

[0052]

First, when a locking operation is received, the control unit 11 checks whether the VR 12 is being operated (s41). When the control unit 11 determines that the VR 12 has been operated (s41, Yes), the same control unit instructs the playback unit 17 to play a warning sound (s42). Sound data relating to the warning sound is stored in the content storage unit 16. The playback unit 17 reads out sound data relating to the warning sound from the content storage unit 16, and performs processing to output the sound from the speaker 20 in the same manner as the masking sound.

[0053]

The control unit 11 performs the processing from s41 to s42 until an unlocking operation is received (s43, Yes). When an unlocking operation is received, the operation in FIG. 9 ends and no warning sound is emitted thereafter.

[0054]

In this manner, by emitting a warning sound when the VR 12 is operated during the locking operation, the administrator 91 or the like is able to notice that the VR 12 has been operated. For example, when the VR 12 is operated due to mischief by a child or carelessness, the administrator 91 can immediately rush to the scene and return the volume to the original volume setting value, or can warn the child not to cause further mischief (or have the child voluntarily refrain from mischief).

[0055]

In particular, as shown in FIG. 1 (C), when the audio output device is a device that outputs a masking sound as in the present embodiment, even when the administrator 91 is located away from the audio output device 1 and it is difficult for him to monitor for mischief or the like, the administrator 91 is able to notice that the device has been operated out of mischief or carelessness due to the audio output device emitting a warning sound.

[0056]

The warning sound may simply be an electronic sound such as “beep-beep-beep” or the like, or may be speech such as “Child lock is on”. In addition, the volume of the warning sound may be set according to the volume setting value stored in the setting storage unit 15 (for example, the volume setting value set in the amplifier 18), but the warning sound alone may also be set to a volume different from the volume setting value set in the amplifier 18, such as maximum volume or the like.

[0057]

For example, as illustrated in the block diagram of the audio output device according to an application example in FIG. 10, a second amplifier 21 different from the amplifier 18 and a mixer 22 for mixing an audio signal output from the amplifier 18 and the amplifier 21 are provided. In this case, the playback unit 17 inputs an audio signal related to the masking sound to the amplifier 18 and an audio signal related to the warning sound to the amplifier 21. Here, when the volume setting value of the amplifier 21 is preset to a fixed value (for example, always at maximum volume), only the warning sound will be output at maximum volume. In this case, even when the volume setting value of the VR 12 is low and the masking sound is output at a low volume, the administrator 91 will notice the warning sound and realize that the VR 12 has been operated, or the child will be startled, thereby preventing further mischief.

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[0058]

Also, a volume setting value may be set for each type of warning sound to be output. For example, an electronic sound such as “beep-beep-beep” attracts a person’s attention, but speech such as “Child lock is on” attracts relatively little attention compared to the electronic sound. Therefore, the volume of the speech such as “Child lock is on” is set relatively loud.

20

[0059]

In this case, in the audio output device 1 of FIG. 10, when storing sound data related to speech such as “Child lock is on” in the content storage unit 16, a relatively high volume setting value (for example, maximum volume) is set in the amplifier 21, and when storing sound data related to an electronic sound such as “beep-beep-beep” in the content storage unit 16, a relatively low volume setting value (for example, about half of the maximum volume) is set in the amplifier 21.

[Description of Reference Numerals]

[0060]

1...Audio output device

30

11...Control unit

12...VR

13...A/D converter

14...UI

15...Setting storage unit

16...Content storage unit

17...Playback unit

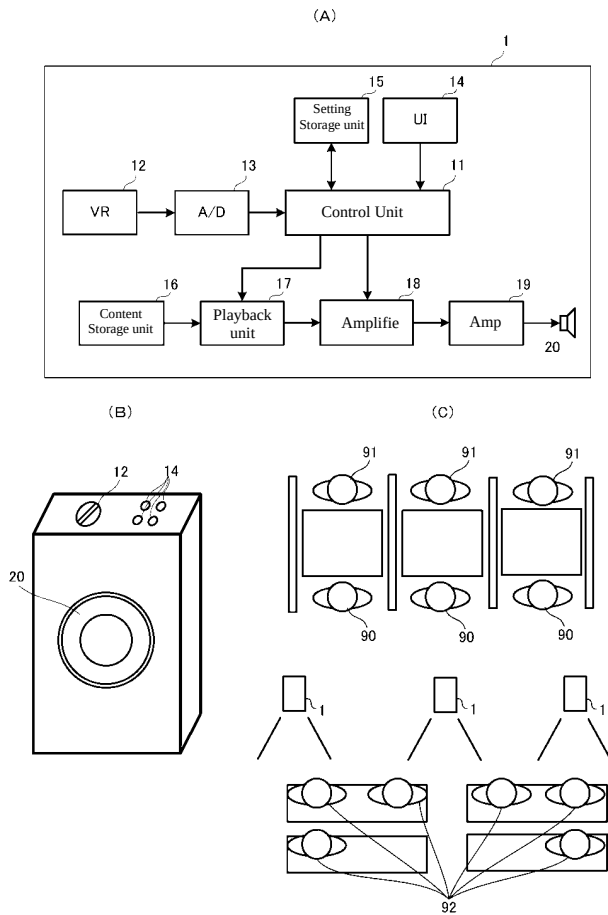
18...Amplifier

19...Amp

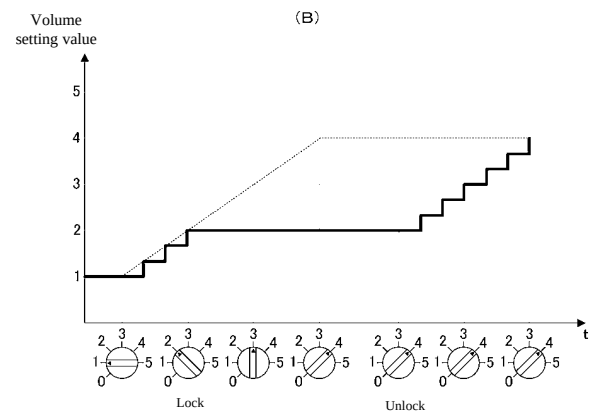
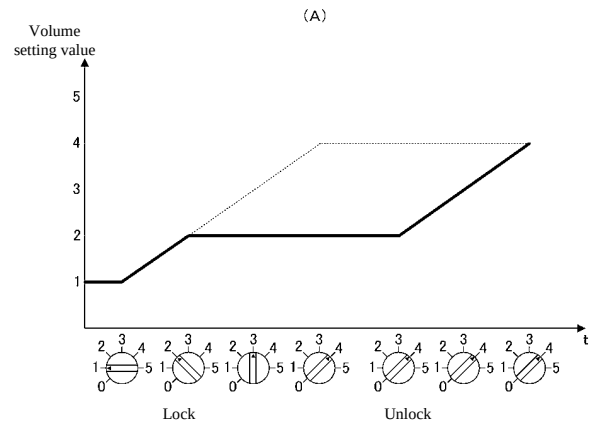
20...Speaker

40

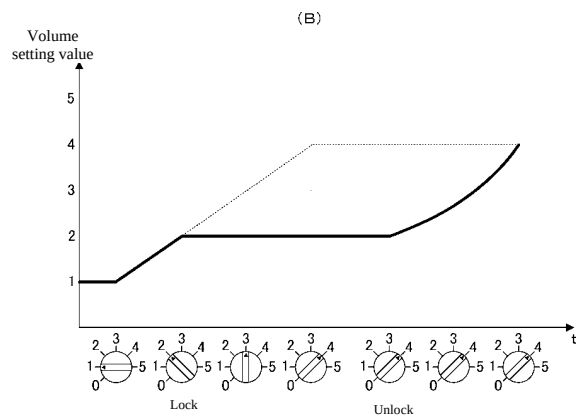
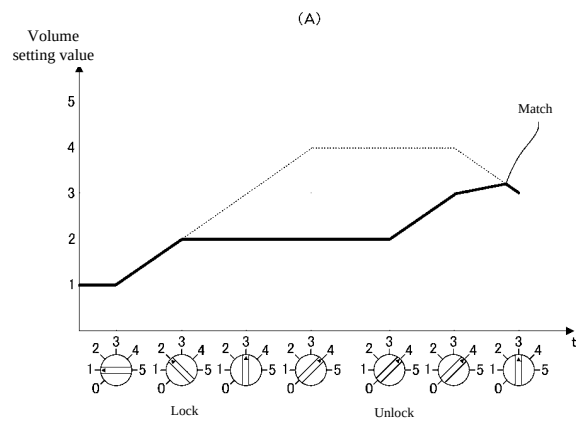
[FIG. 1]



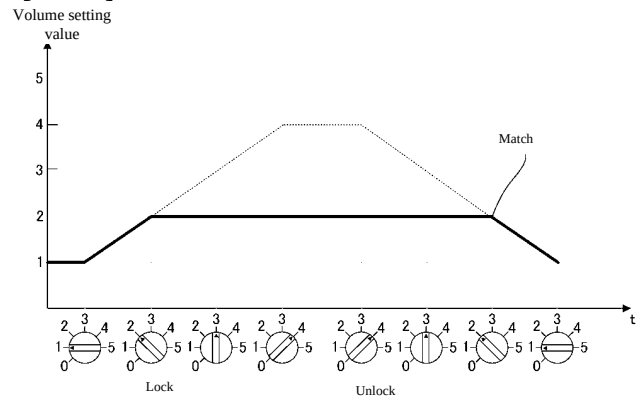
[FIG. 2]



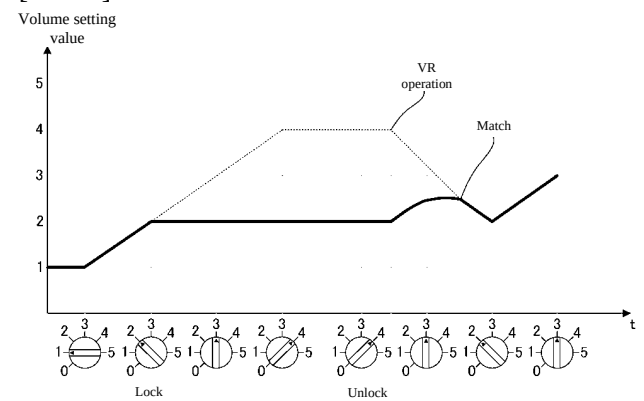
[FIG. 3]



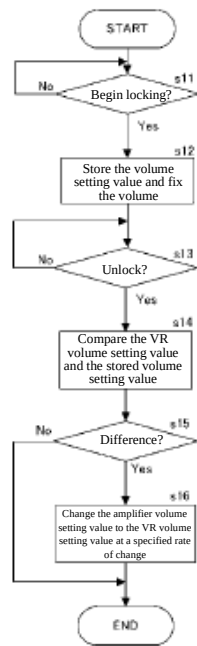
[FIG. 4]



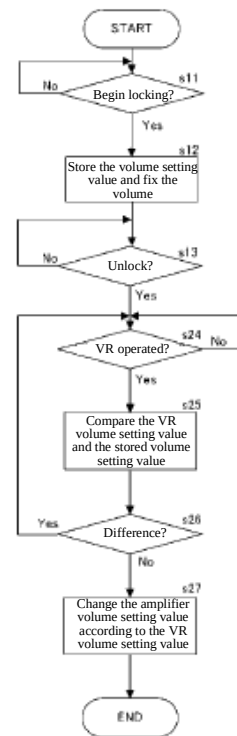
[FIG. 5]



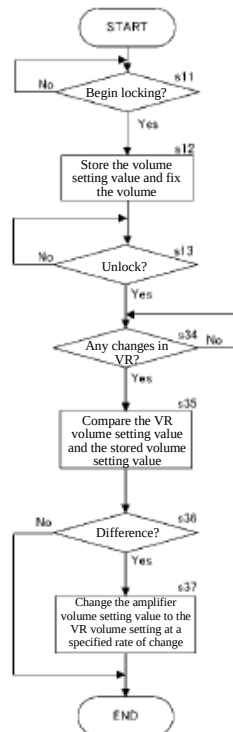
[FIG. 6]



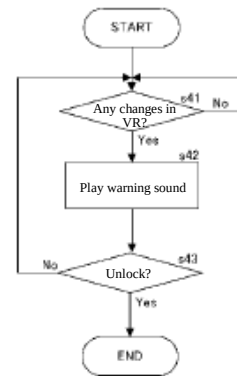
[FIG. 7]



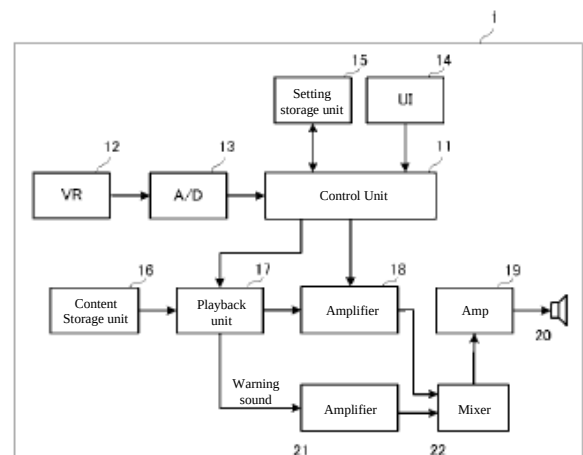
[FIG. 8]



[FIG. 9]



[FIG. 10]



[FIG. 11]

