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**Hsu et al.**

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(54) **AUDIO OUTPUT DEVICE CAPABLE OF SWITCHING A SOUND FIELD**

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(51) **Int. Cl.**

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| ***H04R 3/00*** | (2006.01) |
| ***H04R 3/04*** | (2006.01) |
| *H04S 7/00* | (2006.01) |

(52) **U.S. Cl.**

CPC ..... ***H04R 3/04*** (2013.01); *H04R 2201/021* (2013.01); *H04R 2499/15* (2013.01); *H04S 7/30* (2013.01)

(58) **Field of Classification Search**

None

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

| | | | | |
|---|---|---|---|---|
| 8,098,856 | B2 | 1/2012 | Hjort | |
| 2005/0053246 | A1 * | 3/2005 | Yoshino | 381/96 |
| 2007/0098191 | A1 | 5/2007 | Wan | |
| 2011/0010663 | A1 * | 1/2011 | Shim | 715/808 |
| 2011/0216930 | A1 * | 9/2011 | Kobayashi | 381/332 |

* cited by examiner

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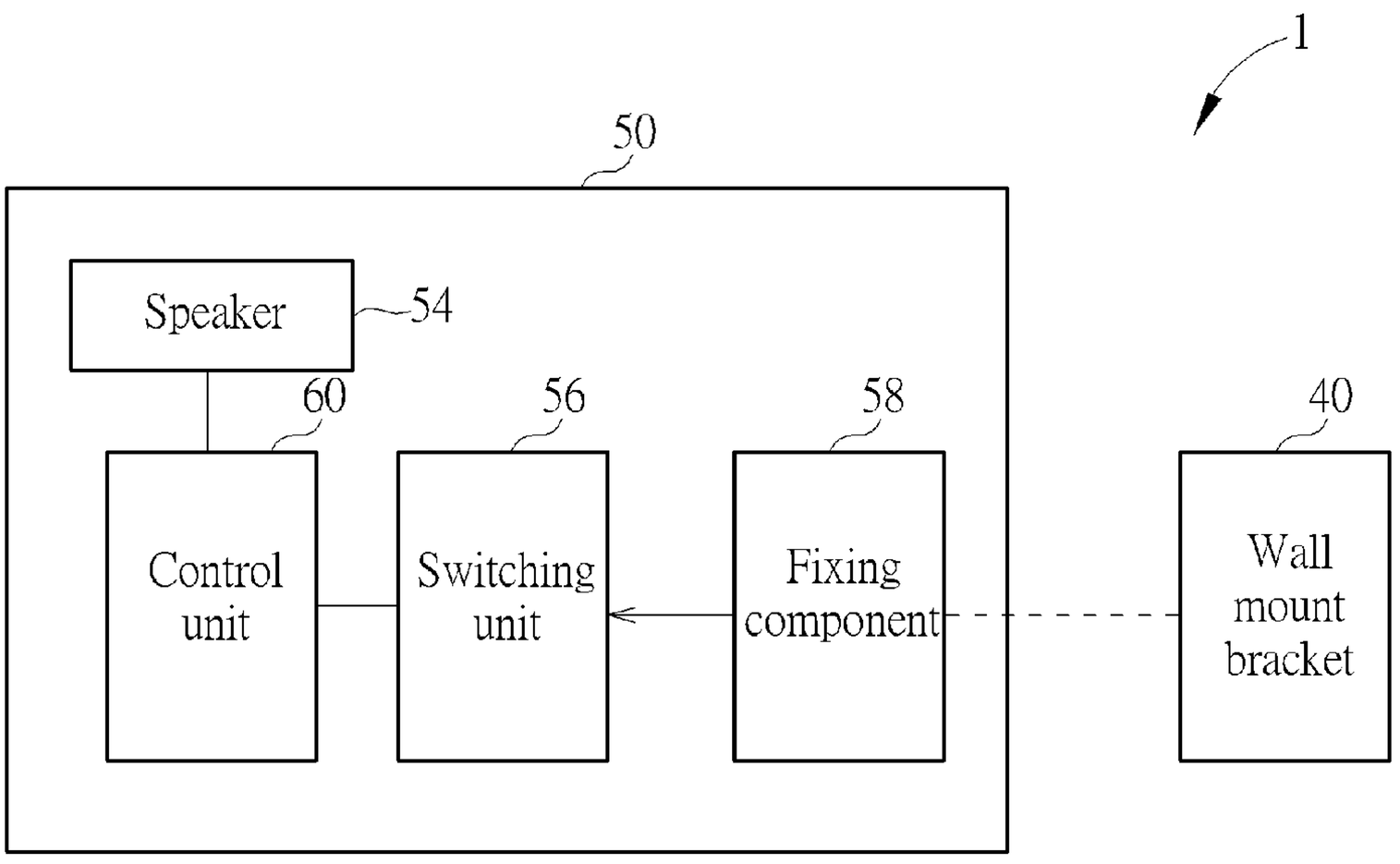
(57) **ABSTRACT**

An audio output device includes a housing, a speaker, a switching unit, a fixing component and a control unit. An opening is formed on the housing. The speaker is for outputting sound. The switching unit is installed inside the housing. The fixing component is fixed in the opening of the housing for triggering the switching unit so that the switching unit outputs a switching signal. The control unit is electrically connected to the switching unit and the speaker, and the control unit controls the speaker to output sound in a corresponding sound field as the control unit receives the switching signal.

**20 Claims, 8 Drawing Sheets**



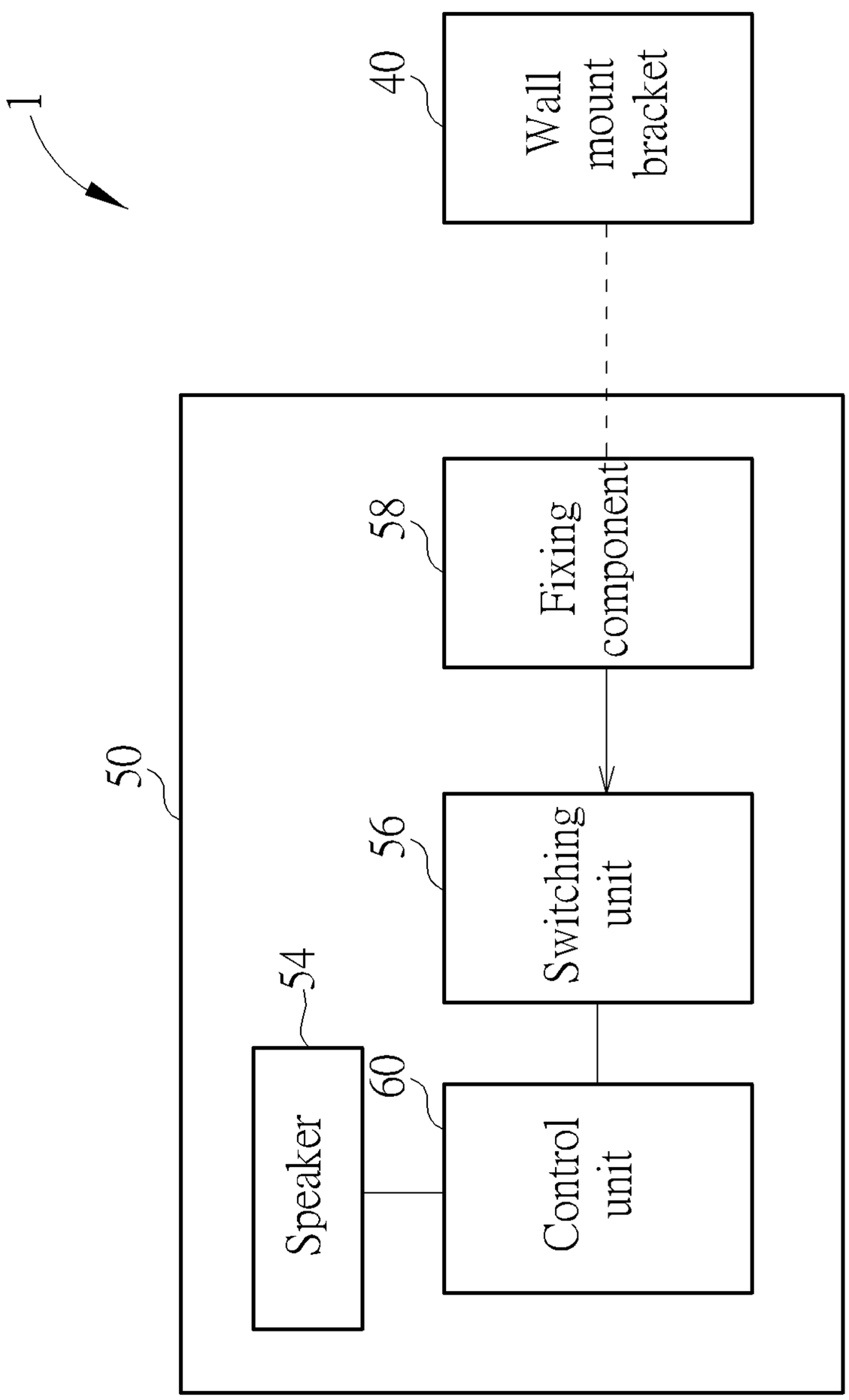

1
40
Wall mount bracket
50
58
Fixing component
56
Switching unit
54
Speaker
60
Control unit

FIG. 1

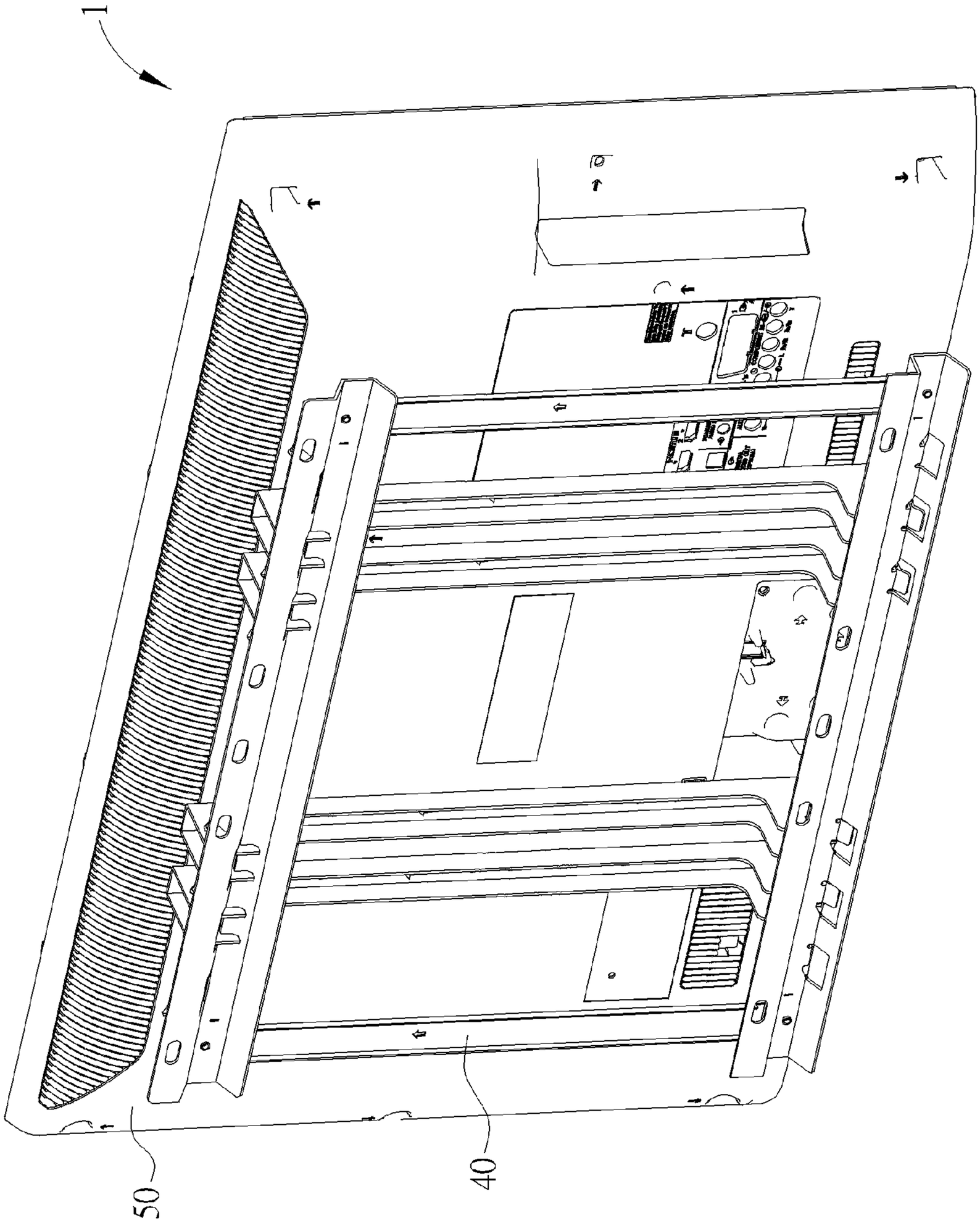



FIG. 2

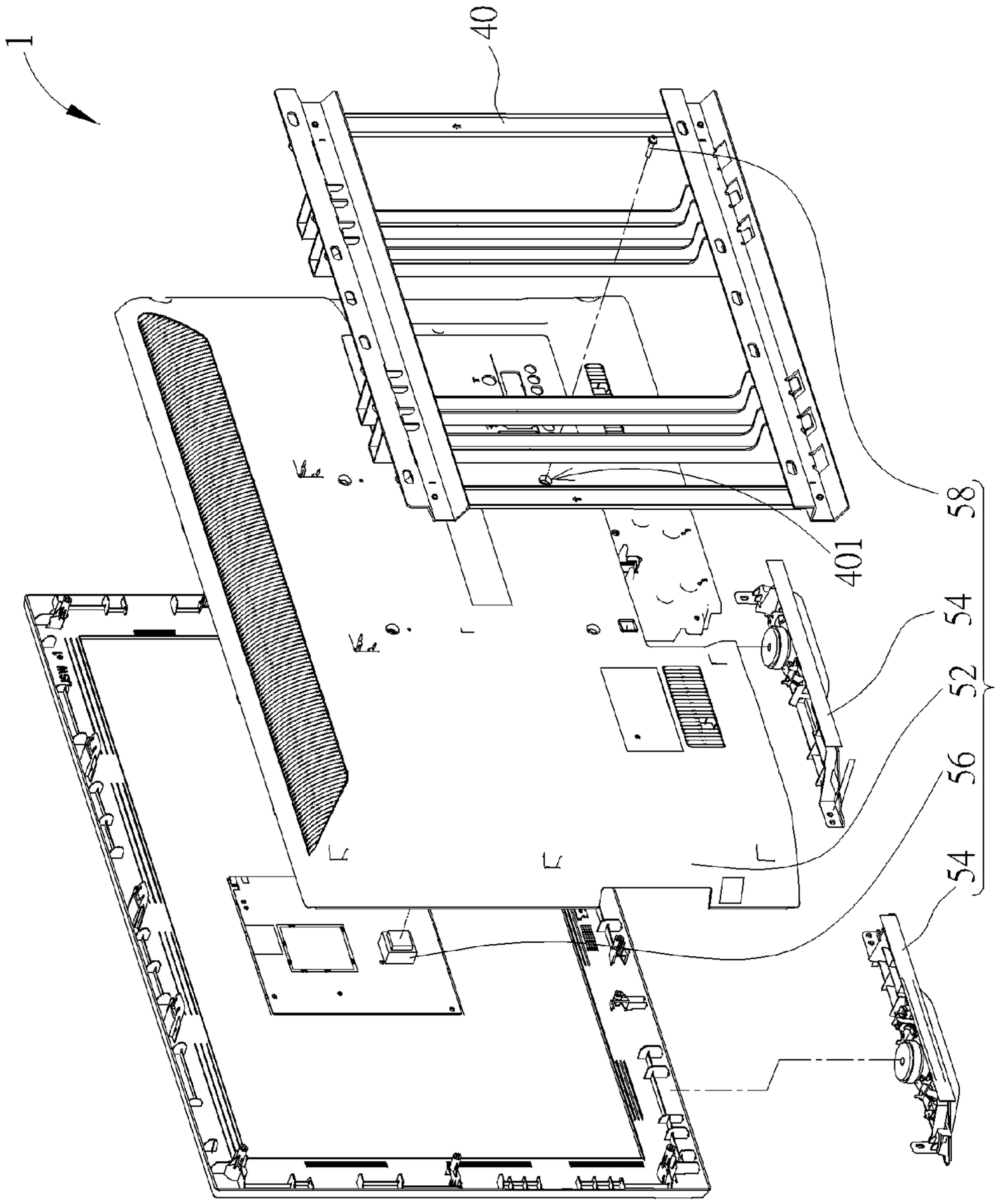



FIG. 3

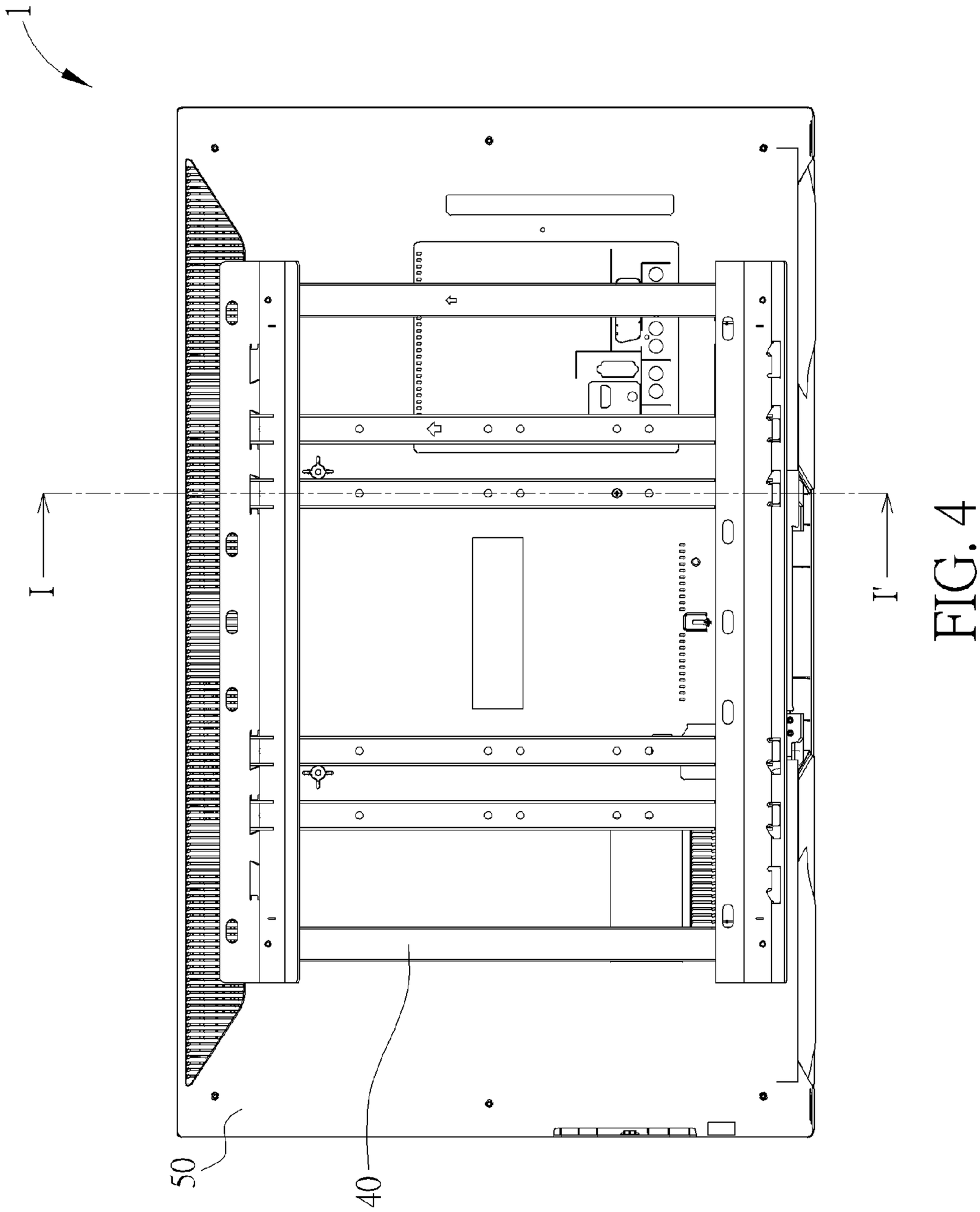



FIG. 4

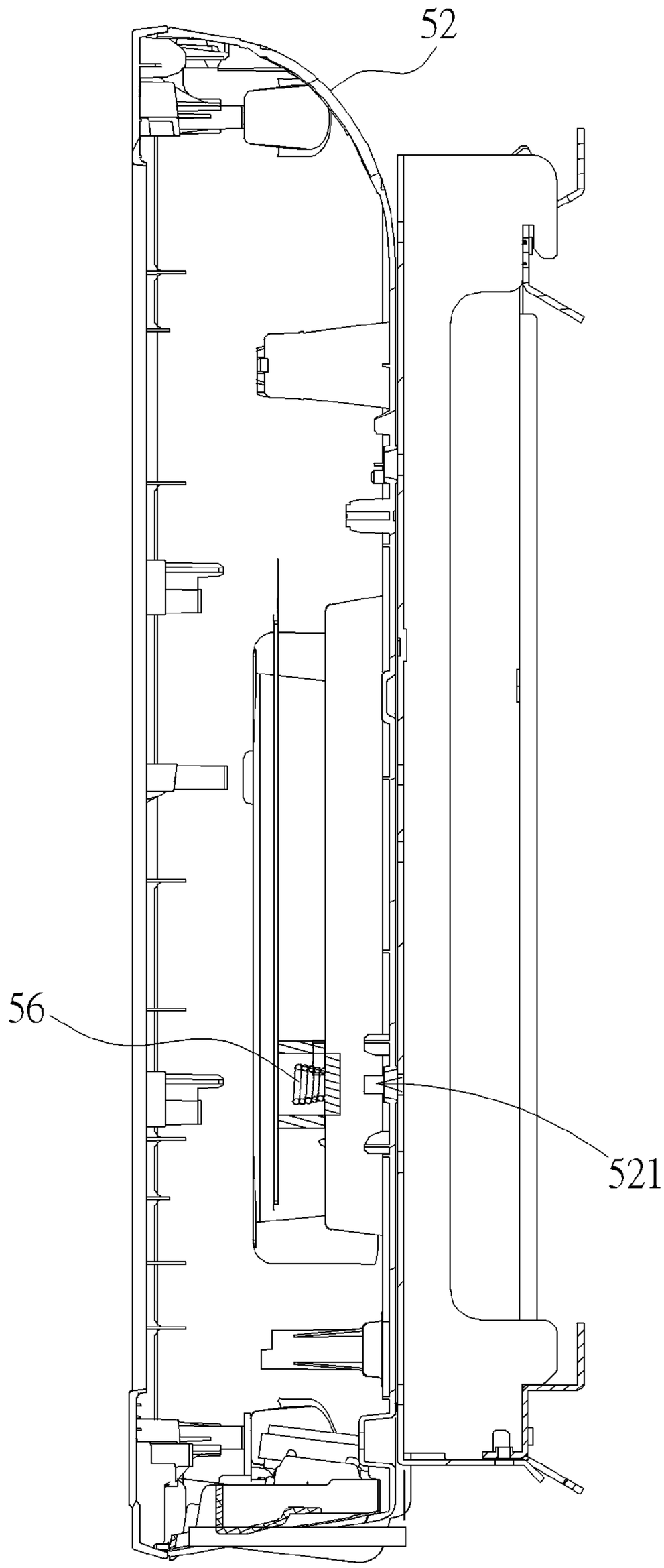



FIG. 5

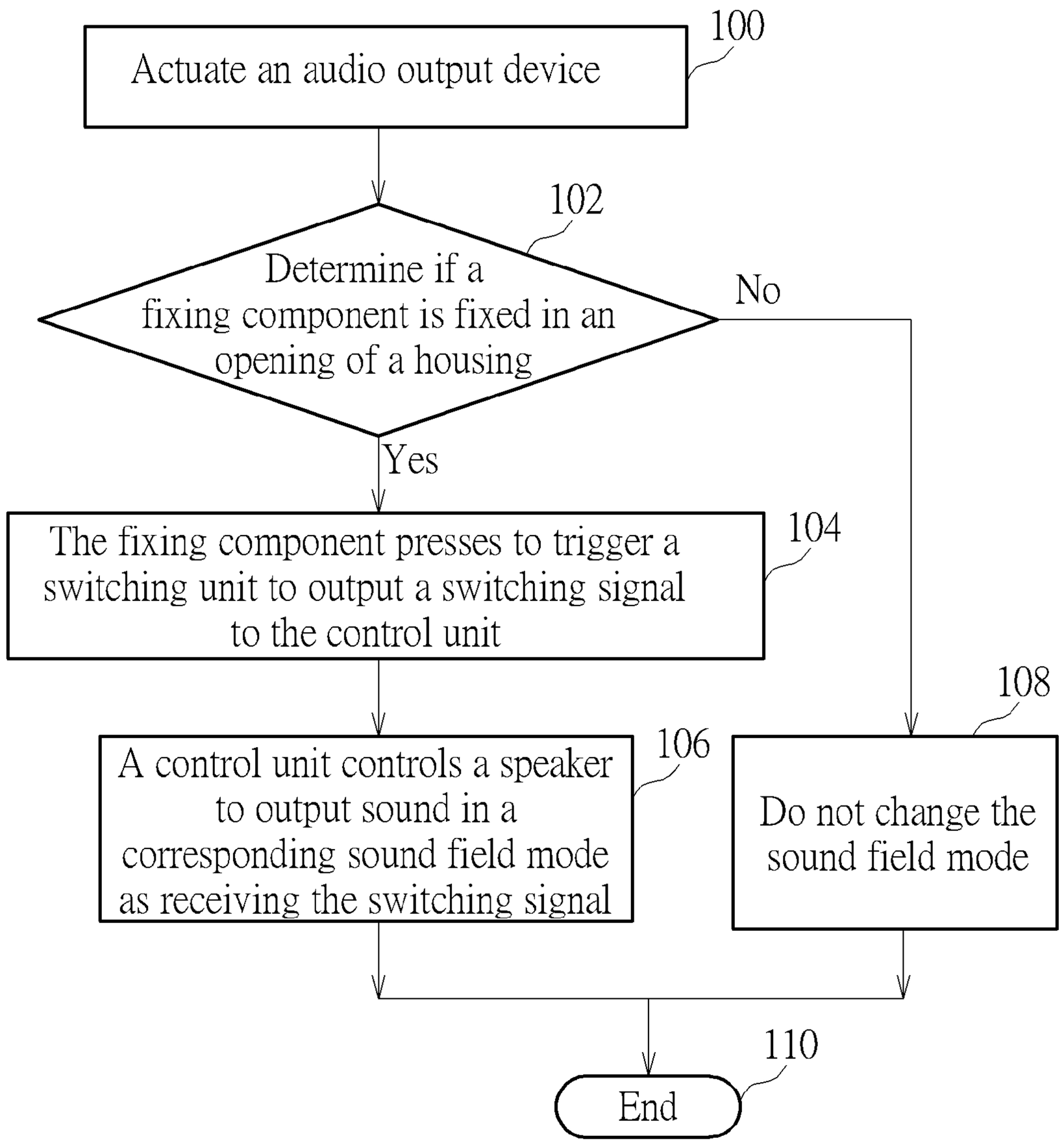

Actuate an audio output device
100
Determine if a fixing component is fixed in an opening of a housing
102
No
Yes
The fixing component presses to trigger a switching unit to output a switching signal to the control unit
104
A control unit controls a speaker to output sound in a corresponding sound field mode as receiving the switching signal
106
Do not change the sound field mode
108
End
110

FIG. 6

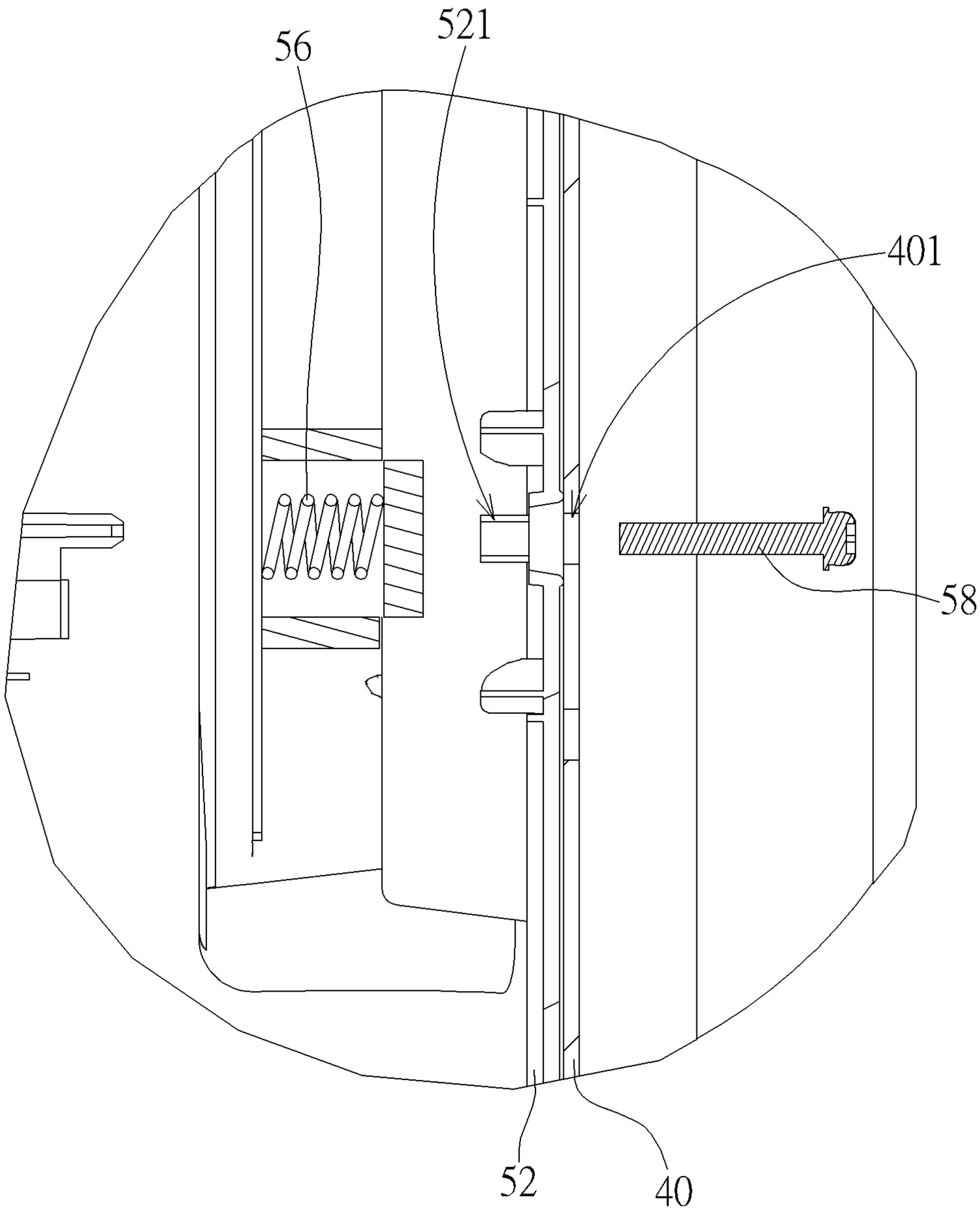



FIG. 7

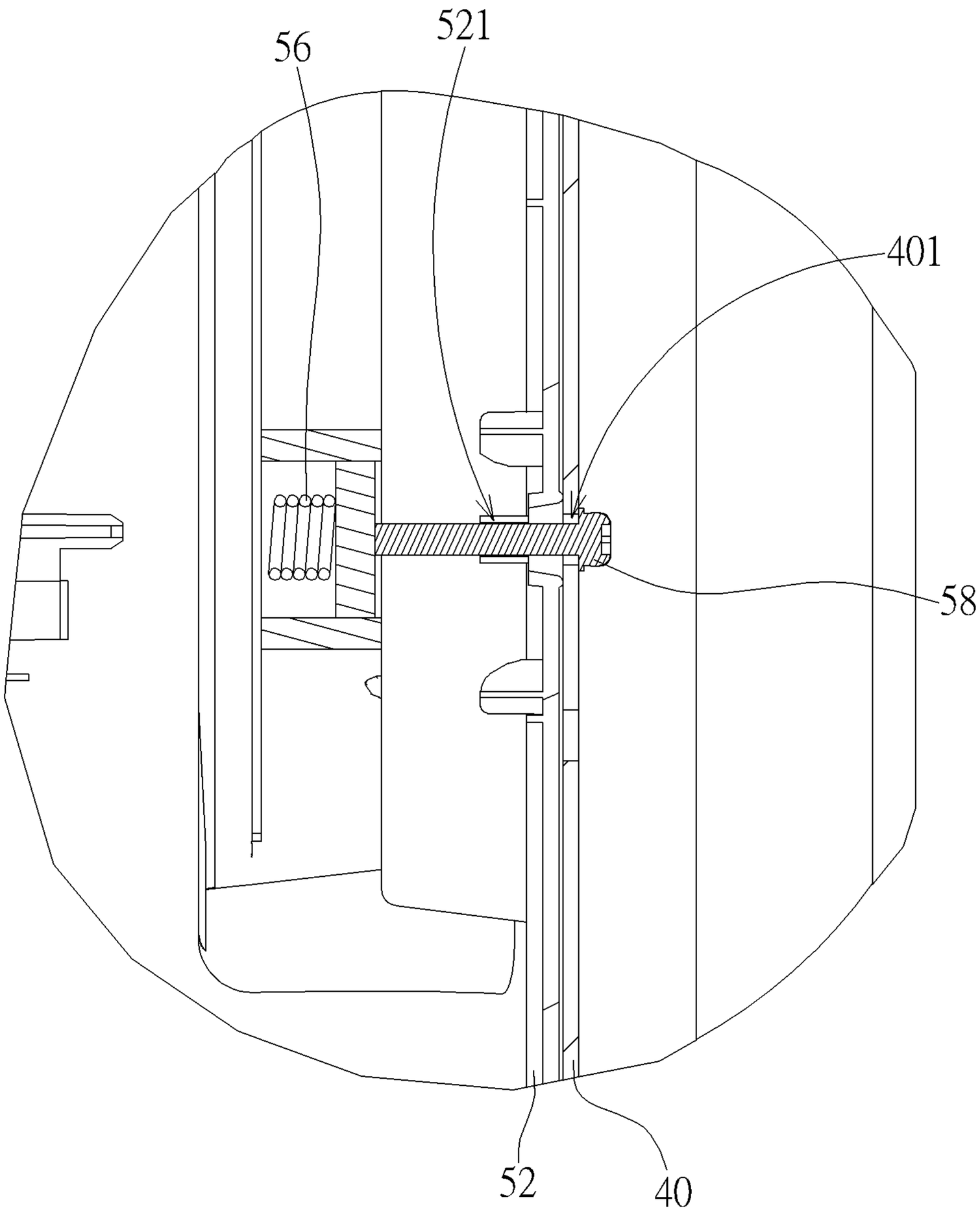



FIG. 8

# AUDIO OUTPUT DEVICE CAPABLE OF SWITCHING A SOUND FIELD

## BACKGROUND OF THE INVENTION

1. Field of the Invention

The present disclosure is to provide an audio output device, and more specifically, to an audio output device capable of switching a sound field when being installed in a wall-mounting mode.

2. Description of the Prior Art

A flat-screen television (TV) can be installed in a wall-mounting mode or a standing mode. Practically, there is much difference in outputting sound as the flat-screen television is installed in the wall-mounting mode or in the standing mode. In general, the flat-screen TV is often set in the standing mode as a default setting of the standard sound field mode, which is regarded as being installed in the standing mode, and a speaker of the flat-screen TV is facedown in the standing mode so that a supporting surface, such as a ground or a desk, can be a reflective surface for the sound. However, there is no reflective surface for the speaker as the flat-screen TV is installed in the wall-mounting mode, resulting in lack of quality of high frequency audio signals. It is necessary to adjust the sound field mode for the flat-screen TV installed in the wall-mounting mode to amplify the high frequency audio signals, such as manually switching the sound field mode by a user. Hence, it is an important issue to design a simple mechanism for correspondingly switching the sound field to amplify the high frequency audio signals as the flat-screen TV is installed in the wall-mounting mode, and for automatically restoring to the standard sound field mode as the flat-screen TV is installed in the standing mode.

## SUMMARY OF THE INVENTION

The present disclosure is to provide an audio output device capable of switching a sound field when installing in a wall-mounting mode, to solve the above drawbacks.

According to the disclosure, the audio output device includes a housing, a speaker, a switching unit, a fixing component and a control unit. An opening is formed on the housing. The speaker is for outputting sound. The switching unit is installed inside the housing. The fixing component is fixed in the opening of the housing for pressing to trigger the switching unit so that the switching unit outputs a switching signal. The control unit is electrically connected to the switching unit and the speaker, and the control unit controls the speaker to output sound in a corresponding sound field mode as the control unit receives the switching signal.

According to the disclosure, the control unit includes a general purpose input/output (GPIO) port electrically connected to the switching unit.

According to the disclosure, the switching unit is grounded to output a low level switching signal to the general purpose input/output port, as the fixing component is fixed in the opening and presses to trigger the switching unit.

According to the disclosure, the control unit amplifies amplitude of a high frequency audio signal output from the speaker so as to control the speaker to output the sound in a wall-mounting sound field mode, as the control unit receives the switching signal.

According to the disclosure, the control unit does not amplify the amplitude of the high frequency audio signal output from the speaker so as to control the speaker to output the sound in a standing sound field mode, as the fixing component is not fixed in the opening of the housing.



According to the disclosure, the switching unit is a push switch.

According to the disclosure, the opening is a thread opening, and the fixing component is a wall-mounting screw for screwing the housing on a wall-mounting bracket.

According to the disclosure, the audio output device is a television device.

According to the disclosure, an audio output system includes a wall-mounting bracket and an audio output device. The wall-mounting bracket is installed on a supporting plane, and a hole is formed on the wall-mounting bracket. The audio output device includes a housing, a speaker, a switching unit, a fixing component and a control unit. An opening is formed on the housing. The speaker is for outputting sound. The switching unit is installed inside the housing. The fixing component is fixed in the opening of the housing for pressing to trigger the switching unit so that the switching unit outputs a switching signal. The control unit is electrically connected to the switching unit and the speaker, the control unit controls the speaker to output sound in a corresponding sound field mode as the control unit receives the switching signal.

The audio output system controls the speaker to output sound in the wall-mounting sound field mode by simply fixing the fixing component on the housing to press the switching unit, in the present disclosure. When the fixing component is not fixed on the housing and does not trigger the switching unit, the speaker can output sound in the standard standing sound field mode, that is, the audio output system is installed in the standing mode. The simple-structured fixing component can achieve both functions of fixing the housing on the wall-mounting bracket and triggering the switching unit to switch the sound field mode simultaneously, so that the inconvenience in switching the sound field mode manually by a user in a conventional system is improved.

These and other objectives of the present disclosure will no doubt become obvious to those of ordinary skill in the art after reading the following detailed description of the preferred embodiment that is illustrated in the various figures and drawings.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a functional block diagram of an audio output system according to an embodiment of the present disclosure.

FIG. **2** is a schematic drawing of the audio output system according to the embodiment of the present disclosure.

FIG. **3** is an exploded diagram of the audio output system according to the embodiment of the present disclosure.

FIG. **4** is a rear view of the audio output system according to the embodiment of the present disclosure.

FIG. **5** is a cross-sectional diagram of the audio output system along line I-I' in FIG. **4** according to the embodiment of the present disclosure.

FIG. **6** is a flow chart of the audio output system outputting sound in a corresponding sound field mode according to the embodiment of the present disclosure.

FIG. **7** is a partial enlarged cross-sectional diagram of the audio output system as a fixing component is not fixed in a housing of an audio output device according to the embodiment of the present disclosure.

FIG. **8** is a partial enlarged cross-sectional diagram of the audio output system as the fixing component is fixed in the housing of the audio output device according to the embodiment of the present disclosure.

## DETAILED DESCRIPTION

Please refer to FIG. **1** to FIG. **3**. FIG. **1** is a functional block diagram of an audio output system **1** according to an embodi-

ment of the present disclosure. FIG. **2** is a schematic drawing of the audio output system **1** according to the embodiment of the present disclosure. FIG. **3** is an exploded diagram of the audio output system **1** according to the embodiment of the present disclosure. The audio output system **1** includes a wall-mounting bracket **40** and an audio output device **50**. The audio output device **50** can be a television device, such as a flat-screen TV. The wall-mounting bracket **40** is installed on a supporting plane, such as a wall, so that the audio output device **50** can be fixed on the supporting plane, and a hole **401** is formed on the wall-mounting bracket **40**. The audio output device **50** includes a housing **52**, a speaker **54**, a switching unit **56**, a fixing component **58** and a control unit **60**.

Please refer to FIG. **1** to FIG. **5**. FIG. **4** is a rear view of the audio output system **1** according to the embodiment of the present disclosure. FIG. **5** is a cross-sectional diagram of the audio output system **1** along line I-I' in FIG. **4** according to the embodiment of the present disclosure. An opening **521** is formed on the housing **52**, and the switching unit **56** is installed inside the housing **52**. The fixing component **58** can pass through the hole **401** of the wall-mounting bracket **40** to be fixed in the opening **521** of the housing **52**, so as to fix the housing **52** on the wall-mounting bracket **40**. The opening **521** of the housing **52** can be a thread opening, and the fixing component **58** can be a wall-mounting screw correspondingly for screwing the housing **52** on the wall-mounting bracket **40**. The fixing component **58** is fixed in the opening **521** for pressing to trigger the switching unit **56**, so that the switching unit **56** outputs a switching signal. The switching unit **56** can be a push switch. The control unit **60** is electrically connected to the switching unit **56** and the speaker **54**. The control unit **60** controls the speaker **54** to output sound in a corresponding sound field mode as the control unit **60** receives the switching signal. The control unit **60** can include a general purpose input/output (GPIO) port electrically connected to the switching unit **56** for receiving the switching signal transmitted from the switching unit **56**.

Please refer to FIG. **6**. FIG. **6** is a flow chart of the audio output system **1** outputting sound in the corresponding sound field mode according to the embodiment of the present disclosure. The flow chart includes the following steps:

Step **100**: Actuate the audio output device **50**.

Step **102**: Determine if the fixing component **58** is fixed in the opening **521** of the housing **52**. If yes, go to step **104**; if no go to step **108**.

Step **104**: The fixing component **58** presses to trigger the switching unit **56** so that the switching unit **56** outputs the switching signal to the control unit **60**.

Step **106**: The control unit **60** controls the speaker **54** to output sound in the corresponding sound field mode as receiving the switching signal.

Step **108**: Do not change the sound field mode.

Step **110**: End.

The above-mentioned steps are introduced in detail as follows. Please refer to FIG. **1**, and FIG. **6** to FIG. **8**. FIG. **7** is a partial enlarged cross-sectional diagram of the audio output system **1** as the fixing component **58** is not fixed in the housing **52** of the audio output device **50** according to the embodiment of the present disclosure. FIG. **8** is a partial enlarged cross-sectional diagram of the audio output system **1** as the fixing component **58** is fixed in the housing **52** of the audio output device **50** according to the embodiment of the present disclosure. Generally speaking, the audio output device **50**, such as a flat-screen TV, can be optionally used in a standing mode without the wall-mounting bracket **40** or mounted on the wall by the wall-mounting bracket **40**. As the audio output device **50** is not assembled with the wall-mounting bracket **40**, the fixing component **58** is not fixed on the housing **52** and the wall-mounting bracket **40**. As the audio output device **50** is assembled with the wall-mounting bracket **40**, the fixing component **58** has to be fixed on the housing **52** of the audio output device **50** through the hole **401** of the wall-mounting bracket **40**, so that the audio output device **50** is fixed with the wall-mounting bracket **40**.

After the audio output device **50** is actuated, the switching unit **56** is not pressed by the fixing component **58** so that the sound field mode output by the speaker **54** is not changed, when the switching unit **56** is not pressed by the fixing component **58**. When the fixing component **58** is fixed in the opening **521** of the housing **52**, the fixing component **58** is designed to press to trigger the switching unit **56**, so that the switching unit **56** output the switching signal to the control unit **60**. The control unit **60** then controls the speaker **54** to output sounds in a corresponding sound field mode as receiving the switching signal. For example, the switching unit **56** is not grounded and output a high level switching signal to the GPIO port of the control unit **60**, as the switching unit **56** is not pressed and not triggered by the fixing component **58**. The control unit **60** does not amplify amplitude of a high frequency audio signal output from the speaker **54**, so as to control the speaker **54** to output the sound in a standing sound field mode. The switching unit **56** is grounded to output a low level switching signal to the GPIO port, as the fixing component **58** is fixed in the opening **521** and presses to trigger the switching unit **56**. The control unit **60** receives the corresponding switching signal, and the control unit **60** amplifies amplitude of a high frequency audio signal output from the speaker **54** so as to control the speaker **54** to output the sound in a wall-mounting sound field mode. That is, the frequency response of the speaker **54** is switched from the standard standing sound field mode to the wall-mounting sound field mode for high acoustic quality.

One of preferred embodiments is introduced above, and the present disclosure is not limited to this. For another example, the switching unit **56** can output a high level switching signal to the GPIO port of the control unit **60**, as the fixing component **58** is fixed in the opening **521** of the housing **52** and presses to trigger the switching unit **56**. And the switching unit **56** is grounded to output a low level switching signal to the GPIO port of the control unit **60**, as the fixing component **58** is not fixed in the opening **521** of the housing **52**. In addition, the sound field modes of the audio output device **50** are not limited to the wall-mounting sound field mode and the standing sound field mode, and it depends on the practical requirements. That is, the mechanism, which utilizes the fixing component **58** to be fixed on the opening **521** of the housing **52** for triggering the switching unit **56** so as to switch the sound field mode output by the speaker **54**, is within the scope of the present disclosure.

In contrast to the prior art, the audio output system controls the speaker to output sound in the wall-mounting sound field mode by simply fixing the fixing component on the housing to press the switching unit, in the present disclosure. When the fixing component is not fixed on the housing and does not trigger the switching unit, the speaker can output sound in the standard standing sound field mode, that is, the audio output system is installed in the standing mode. The simple-structured fixing component can achieve both functions of fixing the housing on the wall-mounting bracket and triggering the switching unit to switch the sound field mode simultaneously, so that the inconvenience in switching the sound field mode manually by a user in a conventional system is improved.

Those skilled in the art will readily observe that numerous modifications and alterations of the device and method may

be made while retaining the teachings of the disclosure. Accordingly, the above disclosure should be construed as limited only by the metes and bounds of the appended claims.

What is claimed is:

**1**. An audio output device comprising:

a housing, an opening being formed on the housing;

a speaker for outputting sound;

a switching unit installed inside the housing;

a fixing component fixed in the opening of the housing for pressing to trigger the switching unit so that the switching unit outputs a switching signal; and

a control unit electrically connected to the switching unit and the speaker, the control unit controlling the speaker to output sound in a corresponding sound field mode as the control unit receives the switching signal.

**2**. The audio output device of claim **1**, wherein the control unit comprises a general purpose input/output (GPIO) port electrically connected to the switching unit.

**3**. The audio output device of claim **2**, wherein the switching unit is grounded to output a low level switching signal to the general purpose input/output port, as the fixing component is fixed in the opening and presses to trigger the switching unit.

**4**. The audio output device of claim **1**, wherein the control unit amplifies amplitude of a high frequency audio signal output from the speaker so as to control the speaker to output the sound in a wall-mounting sound field mode, as the control unit receives the switching signal.

**5**. The audio output device of claim **4**, wherein the control unit does not amplify the amplitude of the high frequency audio signal output from the speaker so as to control the speaker to output the sound in a standing sound field mode, as the fixing component is not fixed in the opening of the housing.

**6**. The audio output device of claim **1**, wherein the switching unit is a push switch.

**7**. The audio output device of claim **1**, wherein the opening is a thread opening, and the fixing component is a wall-mounting screw for screwing the housing on a wall-mounting bracket.

**8**. The audio output device of claim **1**, being a television device.

**9**. An audio output system comprising:

a wall-mounting bracket installed on a supporting plane, a hole being formed on the wall-mounting bracket; and

an audio output device comprising:

a housing, an opening being formed on the housing;

a speaker for outputting sound;

a switching unit installed inside the housing;

a fixing component fixed in the opening of the housing for pressing to trigger the switching unit so that the switching unit outputs a switching signal; and

a control unit electrically connected to the switching unit and the speaker, the control unit controlling the speaker to output sound in a corresponding sound field mode as the control unit receives the switching signal.

**10**. The audio output system of claim **9**, wherein the control unit comprises a general purpose input/output (GPIO) port electrically connected to the switching unit.

**11**. The audio output system of claim **10**, wherein the switching unit is grounded to output a low level switching signal to the general purpose input/output port, as the fixing component is fixed in the opening and presses to trigger the switching unit.

**12**. The audio output system of claim **11**, wherein the control unit amplifies amplitude of a high frequency audio signal output from the speaker so as to control the speaker to output the sound in a wall-mounting sound field mode, as the control unit receives the switching signal.

**13**. The audio output system of claim **12**, wherein the control unit does not amplify the amplitude of the high frequency audio signal output from the speaker so as to control the speaker to output the sound in a standing sound field mode, as the fixing component is not fixed in the opening of the housing.

**14**. The audio output system of claim **13**, wherein the switching unit is a push switch.

**15**. The audio output system of claim **14**, wherein the opening is a thread opening, and the fixing component is a wall-mounting screw for screwing a wall-mounting bracket on the housing.

**16**. The audio output system of claim **9**, wherein the audio output device is a television device.

**17**. The audio output system of claim **9**, wherein the control unit amplifies amplitude of a high frequency audio signal output from the speaker so as to control the speaker to output the sound in a wall-mounting sound field mode, as the control unit receives the switching signal.

**18**. The audio output system of claim **17**, wherein the control unit does not amplify the amplitude of the high frequency audio signal output from the speaker so as to control the speaker to output the sound in a standing sound field mode, as the fixing component is not fixed in the opening of the housing.

**19**. The audio output system of claim **9**, wherein the switching unit is a push switch.

**20**. The audio output system of claim **9**, wherein the opening is a thread opening, and the fixing component is a wall-mounting screw for screwing a wall-mounting bracket on the housing.

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