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(54) **SPEAKER MOUNTING MEMBER, SPEAKER INCLUDING THE SAME, AND ELECTRONIC MUSIC INSTRUMENT**

(57) Problem: To provide a speaker mounting member which also handles a case of a full range speaker in which a frequency band of a radiated sound wave is wide, a speaker including the speaker mounting member and an electronic musical instrument.

Solution: A speaker mounting member includes an annular concave surface part which forms an annular concave surface which is extended substantially along with a cone shape diaphragm of a speaker which radiates a sound wave and influences directional characteristics. The speaker mounting member includes an inner diameter part which defines a hole that the diaphragm of a speaker unit exposes and a flange part which extends from an outer diameter side edge part of the annular convex surface part to an outer diameter side and engages with an edge part of an opening part.

Fig. 4

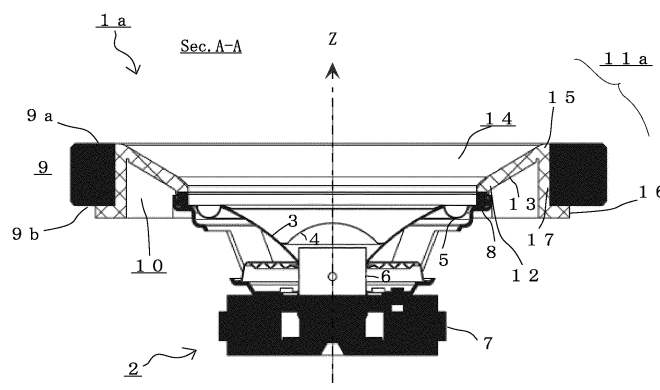
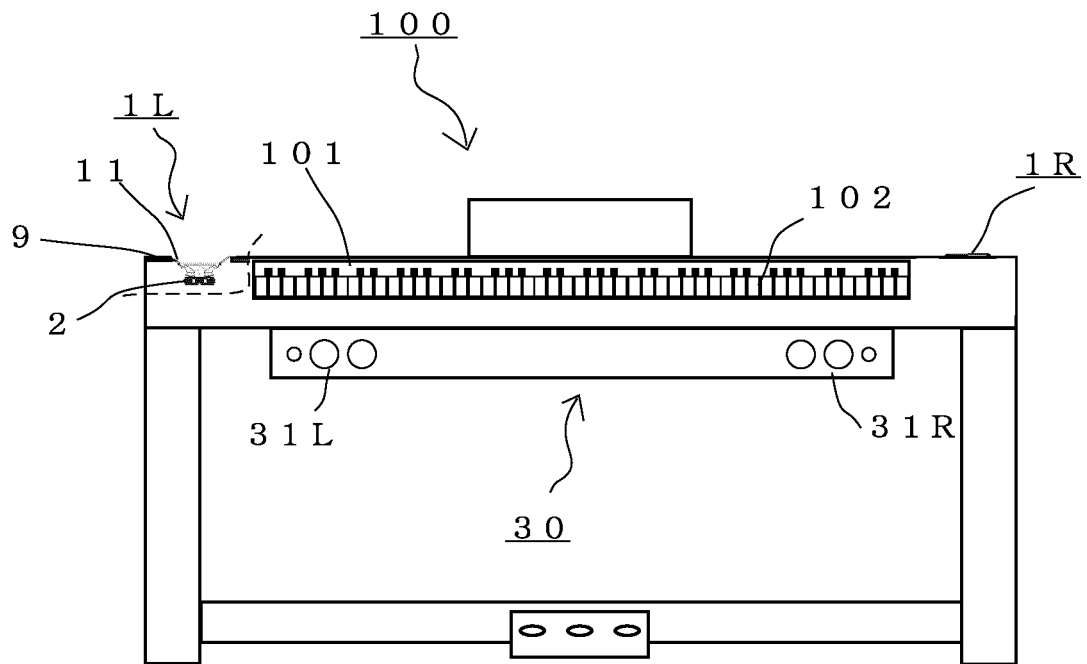


Fig. 5



Description**[TECHNICAL FIELD]**

[0001] The present invention relates to a speaker mounting member which mounts a speaker unit which has a cone shape diaphragm which radiates a sound wave at an opening part which is provided on a mounting surface of an enclosure, a speaker including the same, and an electronic music instrument.

[BACKGROUND ART]

[0002] An electrodynamic type speaker which has a diaphragm radiates sound waves by vibrating tends to become nondirectional characteristics that sound pressure level is almost uniform to an outside diameter direction in the low frequency band in which wavelength of the radiated sound waves against a diaphragm diameter is relatively long. On the other hand, in the high frequency band in which wavelength of the radiated sound waves is relatively short against the diaphragm diameter, sound pressure of the sound waves which is radiated to a front face direction that the diaphragm vibrates is high and the electrodynamic type speaker tends to have directional characteristics that sound pressure of the sound waves which are radiated to a side face direction becomes low.

[0003] In a normal speaker system that a speaker is mounted to a cabinet, since radiation characteristics tends to have directional characteristics, there is a problem that reproduction sound quality changes depending on a direction of the speaker against a listener. Therefore, when the speaker is mounted at a front surface or a rear surface of a baffle made of a wood, there is a case where a processing such as performing a C surface cut against a perimeter of a mounting hole in a wide range is necessary.

[0004] Further, a speaker mounting member is conventionally disclosed (Patent Literatures 1 and 2).

[PRIOR ART DOCUMENT]**[PATENT LITERATURE]****[0005]**

[Patent Literature 1] JP S54-15077 Y (Fig. 3)

[Patent Literature 1] JP S54-1230 Y (Fig. 3)

[SUMMARY OF THE INVENTION]**[PROBLEM TO BE RESOLVED BY THE INVENTION]**

[0006] The invention is invented for solving a problem that the above described conventional technology has, an objective of the present invention is to provide a speaker mounting member which also handles a case of a full range speaker in which a frequency band of a radiated

sound wave is wide, a speaker including the same and an electronic musical instrument.

[MEANS FOR SOLVING THE PROBLEM]

[0007] A speaker mounting member of the present invention which mounts a speaker unit which has a cone shape diaphragm which radiates a sound wave at an opening part which is provided at a mounting surface of an enclosure comprising: an inner diameter part which defines a hole that the diaphragm of the speaker unit exposes; an annular concave surface part which forms an annular concave surface which is extended substantially along with the cone shape of the diaphragm from the inner diameter part to an outer diameter side; and a flange part which extends from an outer diameter side edge part to an outer diameter side of the annular concave surface part and engages with an edge part of the opening part.

[0008] Preferably, the speaker mounting member of the present invention further includes an almost long cylindrical shape rib shape part which extends from one side which is the outer diameter side edge part of the annular convex surface part and that the diaphragm of the mounting surface exposes to the other side and the flange part extends from the other side of the mounting surface of the rib shape part to an outer diameter side.

[0009] Further, a speaker of the present invention comprising: the above described speaker mounting member; and the speaker unit which is mounted at the inner diameter part of the speaker mounting member.

[0010] Further, an electronic music instrument of the present invention as least comprising: the above described speaker; and the enclosure to which the speaker is mounted.

[0011] An effects of the present invention is described below.

[0012] A speaker mounting member of the present invention includes an annular convex surface part which forms an annular convex surface which is extended substantially along with a cone shape diaphragm of a speaker which radiates a sound wave and influences directional characteristics. The speaker mounting member includes an inner diameter part which defines a hole that a diaphragm of a speaker unit exposes and a flange part which extends from an outer diameter side edge part of the annular convex surface part to an outer diameter side and engages with an edge part of an opening part.

[0013] Herein, the speaker mounting member may further include a substantially long cylindrical shape rib shape part which extends one side which is an outer diameter side edge part of the annular convex surface part and that a diaphragm of a mounting surface exposes to the other side and the flange part may extend from the other side of a mounting surface of the rib shape part to an outer diameter side. There is a merit that an entire height becomes low, a speaker cannot be projected from the mounting surface to an upper side much, the speaker

does not become noticeable, and a limitation of a product design of the speaker or an electronic musical instrument that the speaker is mounted decreases.

[EFFECT OF THE INVENTION]

[0014] A speaker mounting member of the present invention can provide a speaker mounting member which also handles a case of a full range speaker in which a frequency band of a radiated sound wave is wide, a speaker including the speaker mounting member and an electronic musical instrument.

BRIEF DESCRIPTION OF THE DRAWINGS

[BRIEF DESCRIPTION OF THE DRAWINGS]

[0015]

Fig. 1 is a top diagram for describing a speaker mounting member and a speaker including the speaker mounting member according to one embodiment of the present invention.

Fig. 2 is a cross sectional diagram for describing a speaker mounting member and a speaker including the speaker mounting member according to one embodiment of the present invention.

Fig. 3 is a top diagram for describing the other speaker mounting member and a speaker including the other speaker mounting member according to one embodiment of the present invention.

Fig. 4 is a cross sectional diagram for describing the other speaker mounting member and a speaker including the other speaker mounting member according to one embodiment of the present invention.

Fig. 5 is a front diagram for describing an electronic musical instrument according to one embodiment of the present invention.

[DESCRIPTION OF THE EMBODIMENTS]

[0016] A speaker mounting member, a speaker including the speaker mounting member, and an electronic musical instrument according to preferable embodiments of the present invention are described below. However, the present invention is not limited to these embodiments.

(Embodiment 1)

[0017] Each of Fig. 1 and Fig. 2 is a diagram for describing a speaker mounting member and a speaker including the speaker mounting member according to a preferable embodiment of the present invention. Concretely, Fig. 1 is a cross sectional diagram of a speaker 1 including a speaker mounting member 11. Further, Fig. 2 is a perspective diagram of this speaker 1 in view from a front surface upper side. Configurations of the speaker mounting member 11 and the speaker 1 are not limited

to a case of the present embodiment. Further, with regard to unnecessary configurations of the speaker mounting member 11 and the speaker 1 for description of the present invention, illustration and description are omitted.

[0018] The speaker 1 of the present embodiment is a speaker system in which a speaker unit 2 is mounted at a cabinet 9 via the speaker mounting member 11 so that a diaphragm 3 of the speaker unit 2 is facing upward and which is unaffected by a baffle.

[0019] The speaker unit 2 is an electrodynamic type speaker which includes the cone type diaphragm 3 in which a cross section is a concave shape. Since a bobbin of a voice coil 6 is connected to an inner diameter part of the diaphragm 3, a dust cap 4 of which cross section is a convex shape is mounted so as to cover the inner diameter part. An inner diameter side of a flexible edge 5 is mounted at an outer diameter part of the diaphragm 3 and the edge 5 and a damper vibratably support a diaphragm part which includes the diaphragm 3 that radiates a sound wave and the dust cap 4. The coil which is wound to the bobbin of the voice coil 6 is arranged in a magnetic cavity of a magnetic circuit 7. A frame 8 is connected to an outer diameter side of the edge 5 and the magnetic circuit 7.

[0020] Therefore, in the speaker unit 2, when an audio signal current is supplied to the coil of the voice coil 6 which is arranged in the magnetic cavity of the magnetic circuit 7 that a strong DC magnetic field occurs, a driving force occurs in an illustrated Z axis direction and a speaker vibration system which is composed of the voice coil 6, the diaphragm 3 and the dust cap 4 vibrates in the Z axis direction. As a result, in an air which exists in front and rear of the diaphragm 3 and the dust cap 4, a pressure change occurs, the audio signal current is converted into the sound wave (audio).

[0021] The frame 8 of the speaker unit 2 is mounted at an opening part 10 which is provided at a mounting surface 9a of an upper surface side of a cabinet 9 via the speaker mounting member 11. In Fig. 1 and Fig. 2, while an entirety is not illustrated, the cabinet 9 of the present embodiment is a closed type cabinet which functions as a baffle which acoustically separates one surface side and the other surface side of the diaphragm 3. The cabinet 9 may be a phase inverted type (a bass reflex type) cabinet that an acoustic capacity which is defined at an inside of the cabinet and an acoustic mass of a duct resonate.

[0022] The speaker mounting member 11 of the present embodiment mounts the speaker unit 2 which has the cone shape diaphragm 3 which radiates the sound wave at the opening part 10 which is provided at the mounting surface 9a of the cabinet 9. The speaker mounting member 11 includes an inner diameter part 12 which defines a hole that the diaphragm 3 of the speaker unit 2 exposes, an annular concave surface part 13 which forms an annular concave surface 14 which is extended substantially along with a cone shape of the diaphragm

3 from the inner diameter part 12 to an outer diameter side, and a flange part 16 which extends from an outer diameter side edge part 15 to the outer diameter side of the annular concave surface part 13 and engages with the mounting surface 9a which is an edge part of the opening part 10.

[0023] As illustrated in Fig. 1 and Fig. 2, the opening part 10 which is provided at the mounting surface 9a of the cabinet 9 is a circular shape hole. Further, an outer shape of a flange part 16 is an almost square and is larger than a diameter size of the opening part 10. Therefore, the outer diameter side edge part 15 of the annular concave surface part 13 and the flange part 16 appear so that they get on an upper side of the mounting surface 9a. The outer shape of the flange part 16 is not limited to a square and may be a circular shape or a polygon.

[0024] In the full range type electrodynamic type speaker unit 2 which reproduces all bands, both of a low frequency sound wave in which a wavelength is long and a high frequency sound wave in which a wavelength is short are radiated from the vibrating diaphragm 3 and the dust cap 4. In the actual electrodynamic type speaker unit 2, while the diaphragm 3 and the dust cap 4 can almost piston-vibrate in middle and low sound bands, since the diaphragm 3 division-vibrates in the middle and high sound bands, a center part of the diaphragm 3 and the dust cap 4 mainly contribute to a radiation of the sound wave of middle and high sound bands.

[0025] In the speaker 1 of the present embodiment, the sound wave which is radiated from the diaphragm 3 and the dust cap 4 of the speaker unit 2 is reflected by the annular concave surface 14 of the annular concave surface part 13 of the speaker mounting member 11. Since the annular concave surface 14 is formed so as to extend substantially along with the cone shape of the diaphragm 3, the speaker 1 can reproduce an audio with relatively decreasing an influence of a reflection of the annular concave surface 14.

[0026] In the speaker mounting member 11 of the present embodiment, a sectional curve which defines the annular concave surface 14 of the annular concave surface part 13 is an almost straight line. These cross sections of the annular concave surface 14 may be composed so as to be defined by a plurality of continuous straight lines or curves which nonlinearly change. When the annular concave surface 14 of the annular concave surface part 13 extends substantially along with the cone shape of the diaphragm 3 from the inner diameter part 12 to the outer diameter side, the annular concave surface 14 may be defined by the other sectional curve. Further, when the diaphragm 3 which is included by the electrodynamic type speaker unit 2 is a cone shape which forms a concave surface, a shape of the dust cap 4 is not limited to a convex shape as the present embodiment and may be the other shape such as including a concave surface or the other shape as called a double cone.

[0027] Further, in the speaker 1 of the present embodiment, the speaker mounting member 11 is provided at

the full range type speaker unit 2. The speaker mounting member 11 may be provided at the speaker unit 2 such as a woofer, squawker, or tweeter which is suitable for a reproduction of a specific frequency band. The speaker 1 may be composed as a multiway speaker system which combines a plurality of speaker units and the speaker mounting member 11 may be mounted so as to face to a diaphragm of any one of speaker units.

10 (Embodiment 2)

[0028] Each of Fig. 3 and Fig. 4 is a diagram for describing a speaker mounting member and a speaker including the speaker mounting member according to a preferable embodiment of the present invention. Concretely, Fig. 3 is a top diagram of a speaker 1a including a speaker mounting member 11a and Fig. 4 is a cross sectional diagram corresponding to A-A cross section in Fig. 3 of the speaker 1a which is mounted at the cabinet 9.

[0029] While the speaker mounting member 11a and the speaker 1a of the present embodiment has a common configuration with the speaker mounting member 11 and the speaker 1 of the previous embodiment, a configuration of a part of the speaker mounting member 11a and the speaker 1a is different from the speaker mounting member 11 and the speaker 1 of the previous embodiment. Therefore, a common sign is attached to a common configuration, an explanation is omitted, and a different configuration is described. With regard to an unnecessary configuration of the speaker mounting member 11a and the speaker 1a for an explanation of the present invention, an illustration and an explanation are omitted.

[0030] The speaker mounting member 11a is different from the previous speaker mounting member 11 in such point that the speaker mounting member 11a is formed so that the flange part 16 engages with a mounting surface 9b of an inner part side of the cabinet 9 of the embodiment. The reason is that the speaker mounting member 11a further includes a substantially long cylindrical shape rib shape part 17 which is the outer diameter side edge part 15 of the annular concave surface part 13 and extends from a side of the mounting surface 9a that the diaphragm 3 exposes to a side of the mounting surface 9b which is the other side and the flange part 16 extends from the mounting surface 9b side of this rib shape part 17 to the outer diameter side.

[0031] Namely, the flange part 16 of the speaker mounting member 11a composing the speaker 1a is mounted at the cabinet 9 from an inner part side (a lower side in the figure). Considering a thickness size of the cabinet 9 in the opening part 10, a height of the rib shape part 17 of the speaker mounting part 11a is set so that the outer diameter side edge part 15 of the annular concave surface part 13 does not project from the mounting surface 9a. The flange part 16 which is extended in the outer circumferential side at four places from a lower edge side of the rib shape part 17 and does not appear so as to get on an upper side of the mounting surface

9a, is hidden by the mounting surface 9a and is not seen.

[0032] The flange part 16 mounts the speaker mounting member 11a and the speaker 1a including the speaker unit 2 at the cabinet 9 by engaging with an edge part of the opening par 10 which is provided at the mounting surface 9a of an upper surface side of the cabinet 9 from the mounting surface 9b of a lower side.

[0033] The inner diameter part of each of the speaker mounting member 11 and the speaker mounting member 11a may be an ellipse shape or a track shape so as to correspond to the other speaker unit 2 including an ellipse shape or a track shape diaphragm 3.

(Embodiment 3)

[0034] Fig. 5 is a diagram for describing an electronic musical instrument according to the preferable embodiment of the present invention. Concretely, Fig. 5 is a front diagram (a part cross sectional diagram) of an electronic piano 100 provided with the speaker 1 including the speaker mounting member 11 of the above described embodiment as left and right speakers 1L and 1R. The embodiment of the electronic piano 100 is not limited to a case of the present embodiment. Further, with regard to an unnecessary configuration of the electronic piano 100 for an explanation of the present invention, an illustration and the explanation are omitted.

[0035] The electronic piano 100 of the present embodiment is an electronic musical instrument which outputs an audio signal corresponding to a keyboard from a sound source circuit (not shown), amplifies the audio signal by an amplifier (not shown), outputs the amplified audio signal to a speaker, and reproduces a playing sound when a player operates keyboards 102 which are operators provided at an enclosure 101 of the electronic piano 100. This electronic piano 100 includes speakers 1L and 1R which are respectively mounted at left and right of an upper side of the keyboards 102 of the enclosure 101 and a speaker 30 which is mounted at a lower surface side of the keyboards 102 of the enclosure 101 as speakers.

[0036] Each of the speakers 1L and 1R includes the speaker mounting member 11 of the above described embodiment and is mounted at the cabinet 9. Therefore, in the speaker unit 2 which is included in each of the speakers 1L and 1R, the diaphragm 3 vibrates in upper and lower direction. The speaker 1L radiates the playing sound corresponding to a left audio signal of stereo reproduction without an influence of a baffle plate thickness with regard to a horizontal direction. Further, the speaker 1R radiates the playing sound corresponding to a right audio signal of stereo reproduction without the influence of the baffle plate thickness with regard to the horizontal direction.

[0037] Further, the speaker 30 has a cabinet which is laterally long and includes the speaker 31L corresponding to the left audio signal of the stereo reproduction at a left side of the cabinet and the speaker 31R correspond-

ing to the right audio signal of the stereo reproduction at a right side of the cabinet. Since each of the speakers 31L and 31R includes a plurality of speaker units which are arranged so that a direction that the diaphragm vibrates becomes to a front and rear direction and does not especially include a diffuser and so on, each of the speakers 31R and 31L has directional characteristics that sound pressure becomes high in the front direction. Therefore, the speakers 31L and 31R respectively radiate the playing sound with corresponding to the left and right audio signals of the stereo reproduction and having directionality in the front direction. When an audio frequency band which is reproduced by a plurality of speaker units of each of the speakers 31L and 31R is divided, the speaker 30 may compose a multiway speaker system.

[0038] The speaker 30 is arranged near a knee of the player of the electronic piano 100 and is suitable for reproducing a direct sound component of the playing sound of the electronic piano 100. On the other hand, each of the speakers 1L and 1R is suitable for reproducing an indirect sound component of the playing sound. A balance of a volume of the playing sound which is reproduced by the speaker 30 and the speakers 1L and 1R can be controlled by a setting of the electronic piano 100. It can be expected that the player and a listener can perceive that the playing sound of the electronic piano 100 is close to the playing sound of an original acoustic piano by adopting such a configuration in the speaker of the electronic piano 100.

[0039] The electronic piano 100 may only include the speakers 1L and 1R and may not include the speaker 30. In such a case, the speakers 1L and 1R may reproduce the direct sound component and the indirect sound component of the playing sound together.

[0040] While the electronic piano 100 of the present embodiment is an electronic musical instrument which includes keyboards, an electronic musical instrument may be other electronic musical instrument.

[INDUSTRIAL APPLICABILITY]

[0041] The speaker mounting member is not limited to the electrodynamic type speaker unit as illustrated and may be a speaker unit which further includes an electrostatic type or an electromagnetic type driving part and has a diaphragm.

[DESCRIPTION OF REFERENCE SIGNS]

[0042]

1, 1a	Speaker
2	Speaker unit
3	Diaphragm
4	Dust cap
9	Cabinet
10	Opening part

11, 11a	Speaker mounting member	
12	Inner diameter part	
13	Annular concave surface part	
14	Annular concave surface	
15	Outer diameter side edge part	5
16	Flange part	
17	Rib shape part	

Claims 10

1. A speaker mounting member which mounts a speaker unit which has a cone shape diaphragm which radiates a sound wave at an opening part which is provided at a mounting surface of an enclosure comprising: 15

an inner diameter part which defines a hole that the diaphragm of the speaker unit exposes;
 an annular concave surface part which forms an annular concave surface which is extended substantially along with the cone shape of the diaphragm from the inner diameter part to an outer diameter side; and
 a flange part which extends from an outer diameter side edge part to an outer diameter side of the annular concave surface part and engages with an edge part of the opening part. 20 25

2. The speaker mounting member according to claim 1, wherein the speaker mounting member further includes an almost long cylindrical shape rib shape part which extends from one side which is the outer diameter side edge part of the annular convex surface part and that the diaphragm of the mounting surface exposes to the other side and the flange part extends from the other side of the mounting surface of the rib shape part to an outer diameter side. 30 35

3. A speaker comprising:
 the speaker mounting member according to claim 1 or 2; and
 the speaker unit which is mounted at the inner diameter part of the speaker mounting member. 40 45

4. An electronic musical instrument as least comprising:
 the speaker according to claim 3; and
 the enclosure to which the speaker is mounted. 50

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Fig. 1

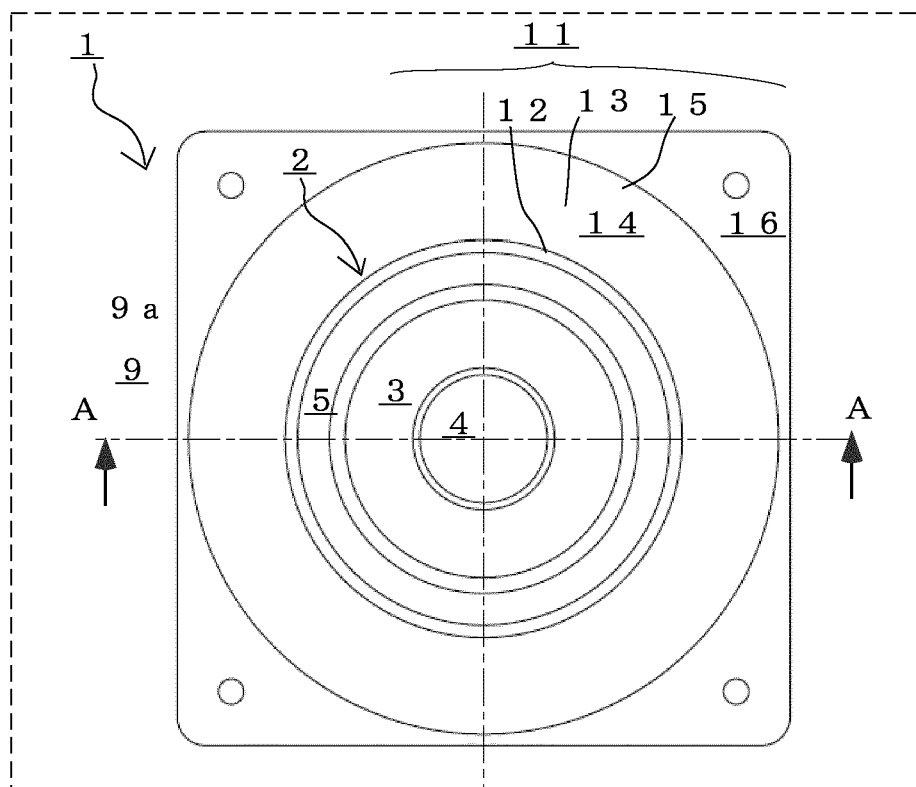


Fig. 2

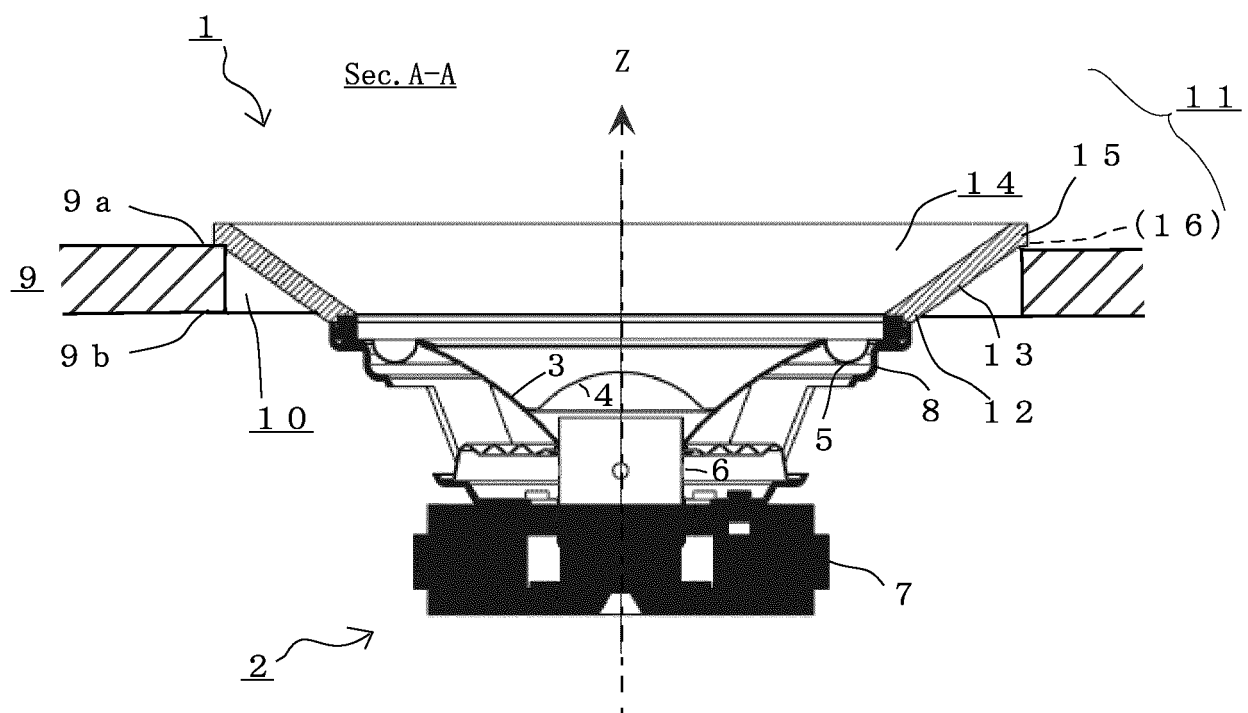


Fig. 3

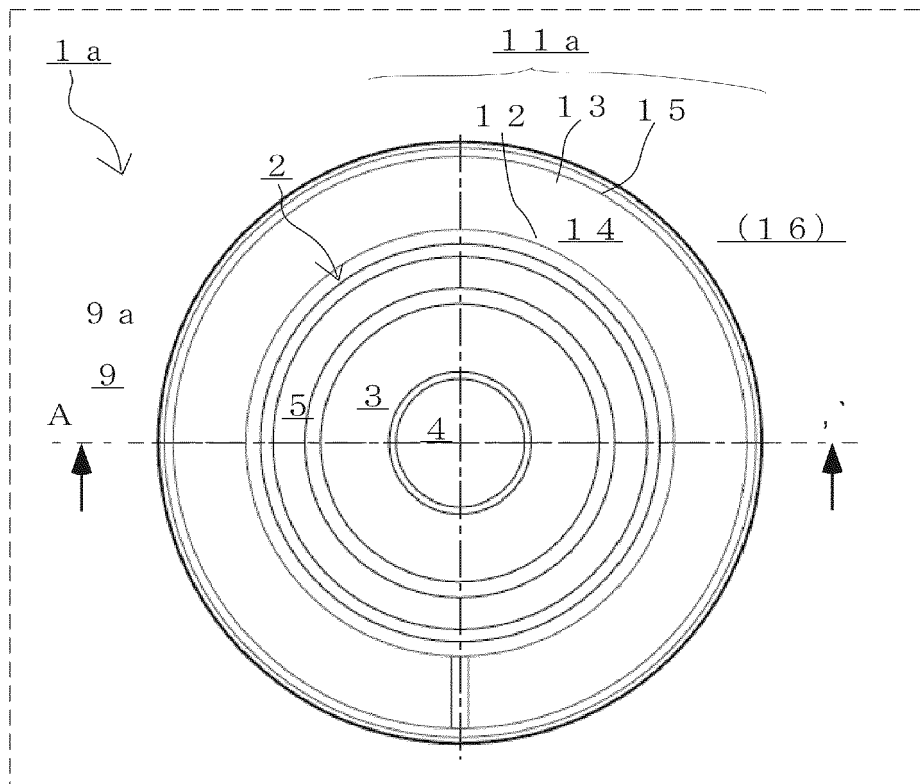


Fig. 4

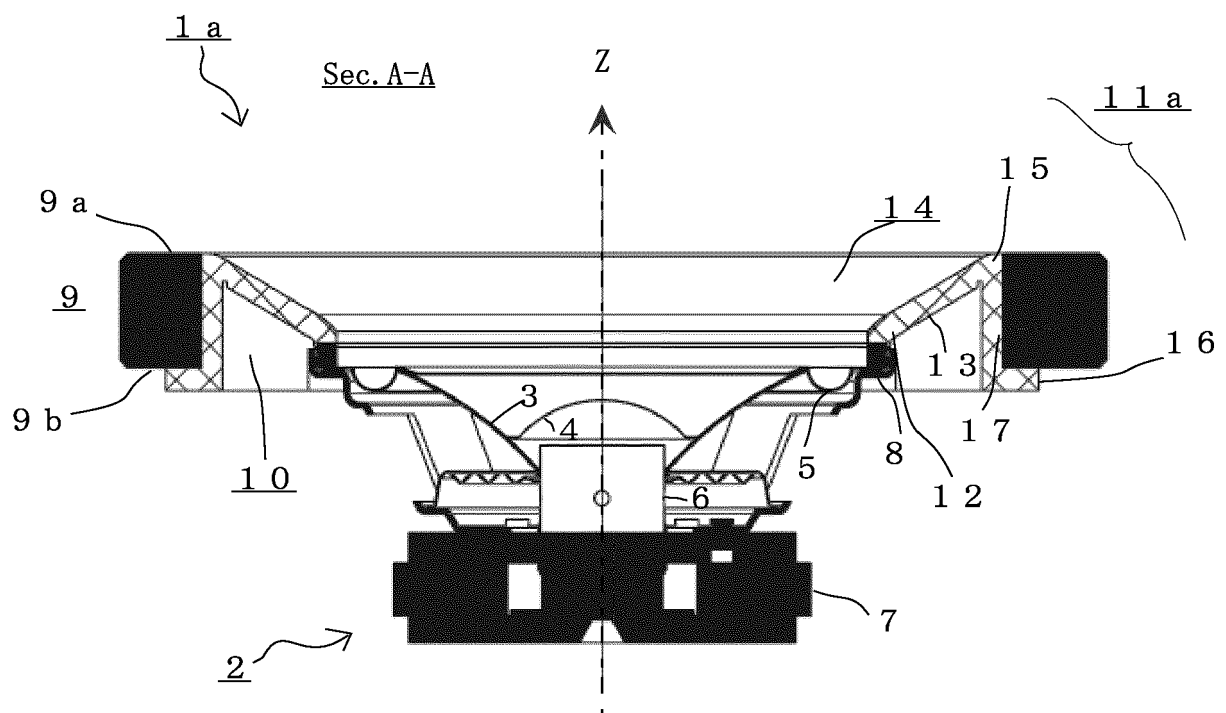
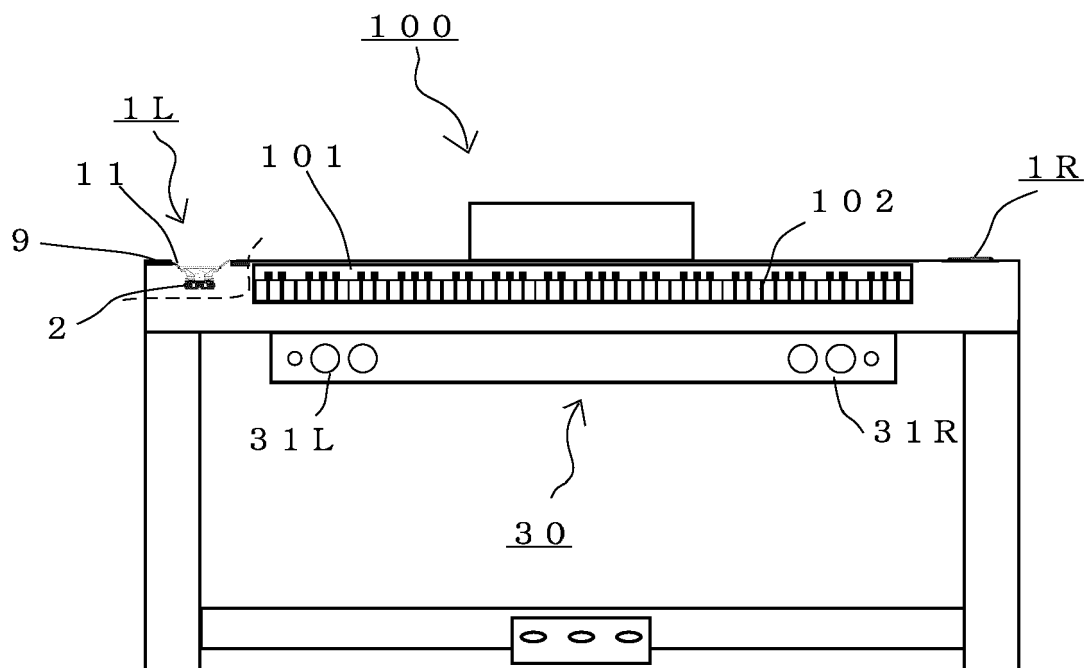


Fig. 5





EUROPEAN SEARCH REPORT

 Application Number
 EP 20 02 0420

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A	* paragraph [0001]; figures 1, 2, 7 *	2	
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A	* paragraphs [0002], [0043] - paragraph [0054]; figure 9 *	2	
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A	KR 2011 0031570 A (YU KOOK IL [KR]) 29 March 2011 (2011-03-29) * paragraph [0001]; figures 2-5 *	1-4	
			TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		10 February 2021	Fachado Romano, A
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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10-02-2021

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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