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(54) **ACOUSTIC ALERTING DEVICE FOR VEHICLE**

(57) An acoustic alerting device for a vehicle, includes a mounting base, a diaphragm, a voice coil, a magnetic driver and a front cover. The diaphragm includes a center portion, a tapered portion surrounding the center portion, and a suspension ring portion surrounding the tapered portion, the center portion, the tapered portion and the suspension ring portion are integrally provided, the upper end portion of the voice coil is connected to the tapered portion, the center portion covers the voice coil, and the suspension ring portion is connected to an upper end portion of the mounting base. The acoustic alerting device for a vehicle has a relatively high sound pressure, and can emit a vehicle alerting sound.

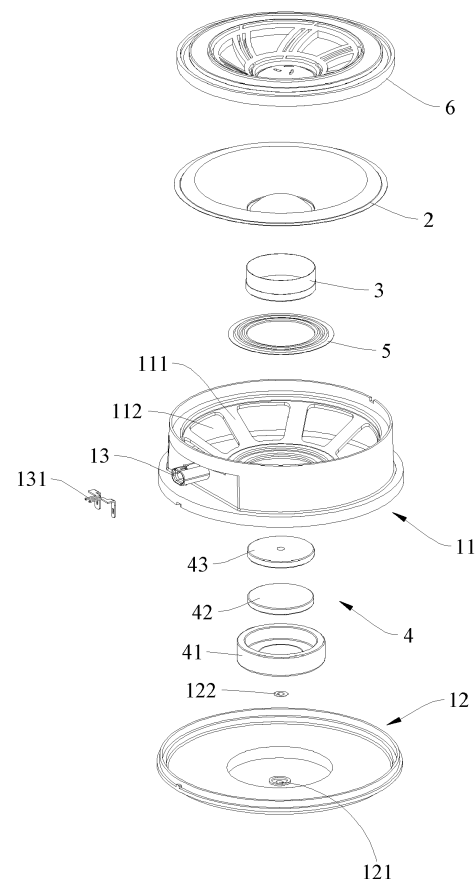


Fig. 1

Description

Field of Technology

[0001] The present disclosure belongs to acoustic vehicle alerting system, in particular relates to an acoustic alerting device for a vehicle.

Background

[0002] At present, the new energy vehicle industry has developed rapidly. Since new energy vehicles do not have engines like traditional fuel vehicles, so the new energy vehicles have relatively low noise when driving at low speeds, which is difficult for pedestrians to observe, and there is a potential safety risk. In a crowded and complex environment, it is easy to lead to a traffic accident. Therefore, a kind of acoustic alerting device for electric vehicles has been developed, which can ensure that when the electric vehicle is running at a low speed, it can alert pedestrians by simulating sound, so as to avoid the risk of traffic accidents, and can give the driver an intuitive driving experience when driving electric vehicles, increasing the driving joy of driving electric vehicles as well as avoiding the risk of fatigue driving of the driver.

[0003] An acoustic alerting device as disclosed in CN208585167U, comprises an alerting device body, the alerting device body has a cavity and an open end portion, inner components are mounted in the cavity, such as a sound generating device for emitting pedestrian warning sounds. The sound generating device is specifically a loudspeaker, which has a frame, a vibrating system composed of a cone or the like, and a magnetic circuit system composed of a U-yoke or the like, wherein the cone is connected to an upper end of the frame through a suspension ring. However, the sound pressure level of the existing acoustic alerting devices is relatively low, and if it is needed to obtain sufficient sound pressure, a plurality of sound generating devices needs to be used in combination.

Summary

[0004] The present disclosure relates to an acoustic alerting device for a vehicle, which has a relatively high sound pressure, and can emit a vehicle alerting sound.

[0005] A first aspect of the present disclosure provides an acoustic alerting device for a vehicle, which comprises:

- a mounting base;
- a diaphragm;
- a voice coil, having an upper end portion and a lower end portion;
- a magnetic driver, arranged at a lower portion of the mounting base; and
- a front cover, connected to the mounting base and

covering the diaphragm;

wherein, the upper end portion of the voice coil is connected to the diaphragm, the magnetic driver has a magnetic gap, and the lower end portion of the voice coil is inserted into the magnetic gap; the diaphragm comprises a center portion, a tapered portion surrounding the center portion, and a suspension ring portion surrounding the tapered portion, the center portion, the tapered portion and the suspension ring portion are integrally formed, the upper end portion of the voice coil is connected to the tapered portion, the center portion covers the voice coil, and the suspension ring portion is connected to an upper end portion of the mounting base.

[0006] In some embodiments, the diaphragm comprises a main body formed by fiber.

[0007] In some embodiments, the main body comprises or is composed of a basalt fiber layer or a glass fiber layer.

[0008] In some embodiments, the entire diaphragm is formed by knitting fiber followed by shaping. Further, shaping comprises coating a layer of coating on at least one side surface (for example the back side) of the knitted fiber, and the coating comprises epoxy resin, for waterproofing and gas leak-proofing.

[0009] In some embodiments, the diaphragm comprises a single-layer fabric with its back covered by a resin coating.

[0010] In some embodiments, the resin coating is formed by curing a mixture containing epoxy resin.

[0011] In some embodiments, the mixture further contains dicyandiamide.

[0012] In some embodiments, the mixture further contains a solvent, and the solvent is acetone.

[0013] In some embodiments, the mixture contains 50 ~ 70 wt% of epoxy resin, 30 ~ 50 wt% of the solvent, and dicyandiamide, and a content of dicyandiamide is less than 13 wt%.

[0014] In some embodiments, the fabric is one selected from nonwoven fabric, woven fabric, fibres, and yarn.

[0015] In some embodiments, the magnetic driver comprises a magnetic steel, and the magnetic steel is a rare earth permanent magnet material. Specifically, the magnetic steel is an N48 magnetic steel.

[0016] In some embodiments, the front cover comprises a dome portion, a middle portion surrounding the dome portion, and a connecting edge surrounding the middle portion, the connecting edge is connected to the upper end portion of the mounting base, the connecting edge is located above the tapered portion, the dome portion is located above the center portion and is lower than the connecting edge, and the connecting edge gradually tilts downwards from the outside to inside. A front cavity formed between the front cover and the diaphragm can effectively compress sound.

[0017] In some embodiments, the dome portion is provided with one or more sound through holes.

[0018] In some embodiments, the middle portion is provided with a plurality of sound transmitting passages in shape of slit, each of the sound transmitting passages has an inlet and an outlet, and the inlet deviates directly below of the outlet.

[0019] In some embodiments, each of the sound transmitting passages comprises an inlet section and an outlet section arranged staggered, the inlet section and the outlet section have side surfaces extending up and down, respectively, and an upper portion of the inlet section is directly communicated or communicated through a transferring passage with a lower portion of the outlet section.

[0020] In some embodiments, in a top-down view, each of the sound transmitting passages extends along a circumferential direction of the front cover. In some other embodiments, in a top-down view, each of the sound transmitting passage extends radially from inside to outside. In still some embodiments, some sound transmitting passages extend along the circumferential direction of the front cover, and some other sound transmitting passages extend radially from the inside to outside, and the extension direction deviates from the diameter direction of the front cover.

[0021] In some embodiments, the connecting edge has an arc-shaped transitional inner surface, and the arc-shaped transitional inner surface is located above the suspension ring portion.

[0022] In some embodiments, the mounting base comprises a support and a rear cover, the diaphragm and the front cover are connected to an upper end portion of the support, the magnetic driver is arranged at a lower end portion of the support, the support further has a plurality of connecting ribs connected between its upper end portion and its lower end portion, with hollowed-out portions between adjacent connecting ribs, and the back cover is covered on the support and covers the hollowed-out portions.

[0023] In some embodiments, the rear cover is provided with a through-hole, with a closing membrane covered on the through-hole.

[0024] In some embodiments, a rear cavity that can be communicated with the external atmosphere is formed between the diaphragm, the support and the rear cover, and a porous sound-absorbing material is arranged in the rear cavity.

[0025] In some embodiments, the material of the diaphragm has a Young's modulus of elasticity greater than 2500 MPa along its meridian or weft direction, and a Young's modulus of elasticity greater than 2000 MPa along a direction that deviates 45 degrees from the meridian direction.

[0026] The present disclosure has the following advantages:

the acoustic alerting device for a vehicle of the present disclosure has high sensitivity, a low overall height, good dust-proof and waterproof splashing effects, and can effectively compress sound. It has a relatively high sound pressure level in the 1800 to 3550 Hz frequency band

and can be used for vehicle alerting sound; and it still has a relatively wide bandwidth and relatively good sound pressure at 160 to 5000 Hz, to meet the requirements of the vehicle alerting system.

Brief Description of the Drawings

[0027] For more clearly explaining the technical solutions in the embodiments of the present disclosure, the accompanying drawings required to be used to in the description of the embodiments will be simply introduced below. Apparently, the drawings in the following description show merely some embodiments of the present disclosure, and those of ordinary skill in the art may derive other drawings from these accompanying drawings without creative efforts.

Fig. 1 is an exploded view of an acoustic alerting device for a vehicle according to an embodiment of the present disclosure.

Fig. 2 is a cross-sectional view of an acoustic alerting device for a vehicle according to an embodiment of the present disclosure.

Fig. 3 is a partial enlarged diagram of Part A in Fig. 2.

Fig. 4 is a structure diagram of a diaphragm according to an embodiment of the present disclosure.

Fig. 5 is a structure diagram of a front cover according to an embodiment of the present disclosure.

Fig. 6 shows the sound pressure curves of two acoustic alerting devices for a vehicle of an embodiment and a comparison.

[0028] Wherein:

- 1 - mounting base; 11 - support; 111 - connecting rib; 112 - hollowed-out portion; 12 - rear cover; 121 - through-hole; 122 - closing membrane; 13 - socket; 131 - soldering lug;
- 2 - diaphragm; 21 - center portion; 22 - tapered portion; 23 - suspension ring portion;
- 3 - voice coil;
- 4 - magnetic driver; 40 - magnetic gap; 41 - U-yoke; 42 - magnetic steel; 43 - front piece;
- 5 - damper;
- 6 - front cover; 61 - dome portion; 611 - sound though hole; 62 - middle portion; 621 - sound transmitting passage; 6211 - inlet; 6212 - outlet; 621a - inlet section; 621b - outlet section; 63 - connecting edge; 631 - arc-shaped transitional inner surface.

Detailed Description of Exemplary Embodiments

[0029] The preferable embodiments of the present disclosure are explained below in detail combining with the accompanying drawings so that the advantages and features of the present disclosure can be easily understood by the skilled persons in the art. It should be noted that the explanation on these implementations is to help un-

derstanding of the present disclosure, and is not intended to limit the present disclosure. Further, the technical features involved in the various embodiments of the present disclosure described below may be combined with each other as long as they do not conflict with each other.

[0030] In this disclosure, "inside" and "outside" are defined with reference to the centerline of the voice coil, with the orientation closer to the centerline of the voice coil as the inside, and the opposite as the outside. The directional words "up", "down", and "horizontal" are intended to facilitate the understanding of the structure of the loudspeaker module by those in the art, and are not used to limit the state of the loudspeaker module after installation in the usage scenario; for example, loudspeakers can be installed on a tilted or upright component or the lower surface of a component.

[0031] This embodiment provides an acoustic alerting device for a vehicle, which is mounted on a new energy vehicle (such as an electric vehicle) powered by a battery, specifically on the head or bottom plate of the vehicle, for emitting alerting sound to pedestrians or other vehicles outside the vehicle, such as simulating the sound of a traditional vehicle's engine. As shown in Fig. 1 to Fig. 5, the acoustic alerting device for a vehicle comprises a mounting base 1, a diaphragm 2, a voice coil 3, a magnetic driver 4, and a front cover 6. The mounting base 1 provides support and protection for the entire acoustic alerting device, and the diaphragm 2, the voice coil 3 and the magnetic driver 4 are basically located in the chamber between the front cover 6 and the mounting base 1. An upper end portion of the voice coil 3 is connected to the diaphragm 2; the magnetic driver 4 is arranged at a lower portion of the mounting base 1, and has a magnetic gap 40, and a lower portion of the voice coil 3 is inserted into the magnetic gap 40. The front cover 6 is connected to the mounting base 1 and covers the diaphragm 2. The acoustic alerting device for a vehicle further comprises a damper 5, which is sleeved on the voice coil 3 and tightly connected to the voice coil 3, and of which the outer edge is fixedly connected to the mounting base 1.

[0032] The mounting base 1 specifically comprises a support 11 and a rear cover 12. The diaphragm 2 and the front cover 6 are connected to an upper end portion of the support 11, the magnetic driver 4 is arranged at a lower end portion of the support 11, the support 11 further has a plurality of connecting ribs 111 connected between its upper end portion and its lower end portion, with a hollowed-out portion 112 between adjacent connecting ribs 111. The back cover 12 covers the support 11 and covers the hollowed-out portions 112, and the rear cover 12 is provided with a through-hole 121, with a closing membrane 122 covered on the through-hole 121. A front cavity is formed between the diaphragm 2 and the front cover 6, and a rear cavity that can be communicated with the external atmosphere is formed between the diaphragm 2, the support 11 and the rear cover 12. The rear cavity can be further provided with a porous sound-absorbing material therein. The magnetic driver 4 specifi-

cally comprises a U-yoke 41, a magnetic steel 42, and a front piece 43, the U-yoke 41 has a cavity with an open upper end, the magnetic steel 42 and the front piece 43 are stacked and placed in this cavity, a lower surface of the magnetic steel 42 is fixedly connected to the U-yoke 41, and a lower surface of the front piece 43 is fixedly connected to an upper surface of the magnetic steel 42, the magnetic gap 40 is formed between an inner surface of the U-yoke 41, an outer surface of the front piece 43, and an outer surface of the magnetic steel 42. The magnetic steel adopts a rare earth permanent magnet material, such as N48 magnetic steel. The support 11 of the mounting base 1 is further provided with a socket 13 that can connect to an external power amplifier for accessing the sound source; the socket 13 is provided with a soldering lug 131, which is connected to the lead of the voice coil 3 in a turning-on manner.

[0033] The diaphragm 2 may be a single-layer fabric with the back surface covered by a resin coating. The resin coating is formed by curing a mixture containing epoxy resin. The mixture contains 50 ~ 70 wt% of epoxy resin, 30 ~ 50 wt% of the solvent, and dicyandiamide, wherein the content of dicyandiamide is less than 13 wt%, and the solvent specifically is acetone. Wherein, the fabric is one selected from nonwoven fabric, woven fabric, fibres, and yarn. The ratio of the thickness of the resin coating to the total thickness of the diaphragm 2 is less than 1:10. The resin coating can be applied to the fabric through coating, spin coating, dip coating, and other coating methods.

[0034] As shown in Fig. 1, Fig. 2, and Fig. 4, the diaphragm 2 comprises a center portion 21, a tapered portion 22 surrounding the center portion 21, and a suspension ring portion 23 surrounding the tapered portion 22. The center portion 21, the tapered portion 22 and the suspension ring portion 23 are integrally formed, the upper end portion of the voice coil 3 is connected to the tapered portion 22, the center portion 21 covers above the voice coil 3, and the suspension ring portion 23 is connected to an upper end portion of the mounting base 1. It should be noted that the center portion 21 can seal the upper end of the voice coil 3, so there is no need to provide an additional dust cap. The diaphragm 2 comprises a main body formed by fiber braiding. Further, the diaphragm 2 is mainly formed by the main body, namely formed by knitting fiber followed by shaping. The main body is a basalt fiber braided layer or a glass fiber braided layer. Specifically, in this embodiment, the diaphragm 2 comprises an integrated basalt fiber layer, and further comprises an epoxy resin coating covered on the back surface of the basalt fiber layer. As shown in Fig. 1, Fig. 2, and Fig. 5, the front cover 6 comprises a dome portion 61, a middle portion 62 surrounding the dome portion 61, and a connecting edge 63 surrounding the middle portion 62. The connecting edge 63 is connected to the upper end portion of the mounting base 1, the connecting edge 63 is located above the tapered body 22, the dome portion 61 is located above the center portion 21 and is lower

than the connecting edge 63, and the connecting edge 63 gradually tilts downwards from the outside to inside. The front cover 6 is made of plastic by injection molding, such as plastic injection molding.

[0035] The shape of the front cover 6 is designed based on the shape of the diaphragm 2. Specifically, the center portion 21 of the diaphragm 2 is an arc that arches upwards in the middle, and its shape is a part of a spherical shell; the dome portion 61 of the front cover 6 is also correspondingly an arc that arches upwards in the middle, and its shape is also a part of a spherical shell. The tapered portion 22 of the diaphragm 2 is generally in the shape of a truncated cone or truncated pyramid with a large top and a small bottom; the middle portion 62 of the front cover 6 is also generally in the shape of a truncated cone or truncated pyramid with a large top and a small bottom. The yoke ring is circular, and the connecting edge 63 is also circular; in this embodiment, the shape of the two is specifically circular. Thus, a front cavity formed between the front cover 6 and the diaphragm 2 can effectively compress sound.

[0036] Further, the suspension ring portion 23 has an outer edge and an inner edge, and the height of the suspension ring portion 23 first increases and then decreases from its outer edge to the inner edge. As shown in the cross-sectional view of Fig. 2, the section of the suspension ring portion 23 has an arc-shaped outer contour that arches upwards in the middle. The connecting edge 63 has an arc-shaped transitional inner surface 631, and the arc-shaped transitional inner surface 631 is located above the suspension ring portion 23.

[0037] The dome portion 61 is provided with one or more sound through holes 611, which are long or slit-shaped. The middle portion 62 is provided with one or more sound transmitting passages 621, each sound transmitting passage 621 has an inlet 6211 and an outlet 6212, and the inlet 6211 deviates directly below of the outlet 6212. Further, as shown in Fig. 3, the or each sound transmitting passage 621 comprises an inlet section 621a and an outlet section 621b arranged in a staggered manner, the inlet section 621a and the outlet section 621b have side surfaces extending up and down, respectively, and an upper portion of one of side surfaces at the inlet section is aligned with a lower portion of one of side surfaces at the outlet section 621b in the up-down direction, and also may be staggered from each other. The inlet section 621a is directly communicated or communicated through a transferring passage with the outlet section 621b. In this embodiment, several sound transmitting passages 621 are spaced along the circumferential direction of the front cover 6, extend along the circumferential direction, and are arranged adjacent to the dome portion 61; several sound transmitting passages 621 generally extend radially from the inside out, with their inner ends close to the dome portion 61 and the outer ends close the connecting edge 63, and their extension direction deviates from the diameter direction of the front cover 6. The inlets and the outlets of the sound transmit-

ting passages 621 are both slit-shaped, and are not directly opposite, but staggered. This configuration of the sound through hole(s) 611 and the sound transmitting passage(s) 621 effectively prevents liquid (such as rain-water) from splashing onto the diaphragm 2, while also allowing sound to be transmitted.

Comparison:

[0038] The acoustic alerting device of the comparison adopts the same structure as disclosed in CN208585167U. That is, the diaphragm comprises a tapered body and a suspension ring, the suspension ring is bonded to an outer edge of the tapered body through glue, and an inner edge of the tapered body is bonded to a dust cap through glue.

[0039] The sound pressure curves of two acoustic alerting devices for a vehicle of the embodiment and this comparative example is shown in Fig. 6. The sound pressure frequency band of the embodiment has an average sensitivity of about 95 dB (1 M/1 W) between 160 Hz and 5000 Hz (with a sensitivity of about 86 dB for the acoustic alerting device of this comparative example), and can reach a sound pressure level of 97 dB at local frequency points. In the frequency band from 1800 to 3550 Hz, it has a higher sensitivity compared to other frequency bands, ensuring the normal use of the acoustic alerting device while also using the frequency band from 1800 to 3550 Hz for horn warning function. It saves the amount of horns of the entire vehicle used for warning, thereby saving space in the front cabin environment of the vehicle. And this structure can achieve a vehicle level IP6K9K protection level, ensuring reliability in use.

[0040] The acoustic alerting device for a vehicle of this embodiment has high sensitivity, a low overall height, good dust-proof and waterproof splashing effects, and can effectively compress sound. It has a relatively high sound pressure level in the 1800 to 3550 Hz frequency band and can be used for vehicle horn warnings; and it still has a relatively wide bandwidth and relatively good sound pressure at 160 to 5000 Hz, to meet the requirements of the vehicle warning tone system.

[0041] As shown in the description and claims of the present disclosure, the terms "comprising" and "containing" only indicate that the clearly identified steps and elements are included, and these steps and elements do not constitute an exclusive list, and the method or device may also include other steps or elements.

[0042] Those skilled in the art can understand that unless specifically stated, the singular forms "a", "said", and "the" used herein may also include the plural form. It should be further understood that in the present disclosure, "a plurality of" refers to two or more, and other quantifiers are similar.

[0043] It can be further understood that the terms "first", "second", etc. are used to describe various information, but this information should not be limited to these terms. These terms are only used to distinguish the same

type of information from each other and do not indicate a specific order or degree of importance. In fact, expressions such as "first" and "second" can be used interchangeably. For example, without departing from the scope of the present disclosure, the first information can also be referred to as the second information, and similarly, the second information can also be referred to as the first information.

[0044] In the disclosure, unless otherwise expressly specified and limited, a first feature being "on" or "under" a second feature may include direct contact between the first feature and the second feature, as well as contact between the first feature and the second feature through an intermediate medium between them rather than direct contact. Also, the first feature being "on", "above", or "over" the second feature includes that the first feature is directly above or obliquely above the second feature, or simply means that the first feature is level higher than the second feature. The first feature being "under", "below" or "underneath" the second feature includes that the first feature is directly below or obliquely below the second feature, or simply means that the first feature has a lower level than the second feature.

[0045] The embodiments described above are only for illustrating the technical concepts and features of the present disclosure, are preferred embodiments, and are intended to make those skilled in the art being able to understand the present disclosure and thereby implement it, and should not be concluded to limit the protective scope of this disclosure.

Claims

1. An acoustic alerting device for a vehicle, comprising
 - a mounting base;
 - a diaphragm;
 - a voice coil, having an upper end portion and a lower end portion;
 - a magnetic driver, arranged at a lower portion of the mounting base; and
 - a front cover, connected to the mounting base and covering the diaphragm;
 wherein, the upper end portion of the voice coil is connected to the diaphragm, the magnetic driver has a magnetic gap, and the lower end portion of the voice coil is inserted into the magnetic gap;

characterized in that, the diaphragm comprises a center portion, a tapered portion surrounding the center portion, and a suspension ring portion surrounding the tapered portion, the center portion, the tapered portion and the suspension ring portion are integrally formed, the upper end portion of the voice coil is connected to the tapered portion, the center portion covers the voice coil, and the suspension ring portion

is connected to an upper end portion of the mounting base.

2. The acoustic alerting device for a vehicle according to claim 1, **characterized in that**, the diaphragm has a main body formed by fiber; preferably, the main body comprises or is composed of a basalt fiber layer or a glass fiber layer; more preferably, the entire diaphragm is formed by knitting fiber followed by shaping.
3. The acoustic alerting device for a vehicle according to any one of previous claims, **characterized in that**, the diaphragm comprises a single-layer fabric, and a resin coating formed on a front and/or back surface of the fabric.
4. The acoustic alerting device for a vehicle according to claim 3, **characterized in that**, the resin coating is formed by curing a mixture containing epoxy resin.
5. The acoustic alerting device for a vehicle according to claim 4, **characterized in that**, the mixture further contains dicyandiamide; and/or, the mixture further contains a solvent, and the solvent is acetone; and/or, the fabric is one selected from nonwoven fabric, woven fabric, fibres, and yarn.
6. The acoustic alerting device for a vehicle according to claim 4 or 5, **characterized in that**, the mixture contains 50 ~ 70 wt% of epoxy resin, 30 ~ 50 wt% of the solvent, and dicyandiamide, wherein a content of dicyandiamide is less than 13 wt%.
7. The acoustic alerting device for a vehicle according to any one of previous claims, **characterized in that**, the magnetic driver comprises a magnetic steel, and the magnetic steel is a rare earth permanent magnet material.
8. The acoustic alerting device for a vehicle according to any one of previous claims, **characterized in that**, the front cover comprises a dome portion, a middle portion surrounding the dome portion, and a connecting edge surrounding the middle portion, the connecting edge is connected to the upper end portion of the mounting base, the connecting edge is located above the tapered portion, the dome portion is located above the center portion and is lower than the connecting edge, and the connecting edge gradually tilts downwards from outside to inside; preferably, the dome portion is provided with one or more sound though holes.
9. The acoustic alerting device for a vehicle according to claim 8, **characterized in that**, the middle portion is provided with a plurality of sound transmitting passages in shaped of slit, each of the sound transmit-

ting passages has an inlet and an outlet, and the inlet deviates directly below of the outlet.

10. The acoustic alerting device for a vehicle according to claim 9, **characterized in that**, each of the sound transmitting passages comprises an inlet section and an outlet section arranged staggered, the inlet section and the outlet section has two side surfaces extending up and down, respectively, and an upper portion of the inlet section is staggered from a lower portion of the outlet section along an up-down direction, and the inlet section is communicated through a transferring passage with the outlet section. 5 10
11. The acoustic alerting device for a vehicle according to claim 9, **characterized in that**, in a top-down view, each of the sound transmitting passages extends along a circumferential direction of the front cover or extends radially from inside to outside. 15 20
12. The acoustic alerting device for a vehicle according to claim 8, **characterized in that**, the connecting edge has an arc-shaped transitional inner surface, and the arc-shaped transitional inner surface is located above the suspension ring portion. 25
13. The acoustic alerting device for a vehicle according any one of previous claims, **characterized in that**, the mounting base comprises a support and a rear cover, the diaphragm and the front cover are connected to an upper end portion of the support, the magnetic driver is arranged at a lower end portion of the support, the support further has a plurality of connecting ribs connected between its upper end portion and its lower end portion, with hollowed-out portions between adjacent connecting ribs, and the back cover is covered on the support and covers the hollowed-out portions. 30 35
14. The acoustic alerting device for a vehicle according to claim 13, **characterized in that**, the rear cover is provided with a through-hole, with a closing membrane covering thereon; a rear cavity capable of communicating with the external atmosphere is formed between the diaphragm, the support and the rear cover, and a porous sound-absorbing material is arranged in the rear cavity. 40 45
15. The acoustic alerting device for a vehicle according any one of previous claims, **characterized in that**, material of the diaphragm has a Young's modulus of elasticity greater than 2500 MPa along its meridian direction, and a Young's modulus of elasticity greater than 2000 MPa along a direction that deviates 45 degrees from the meridian direction. 50 55

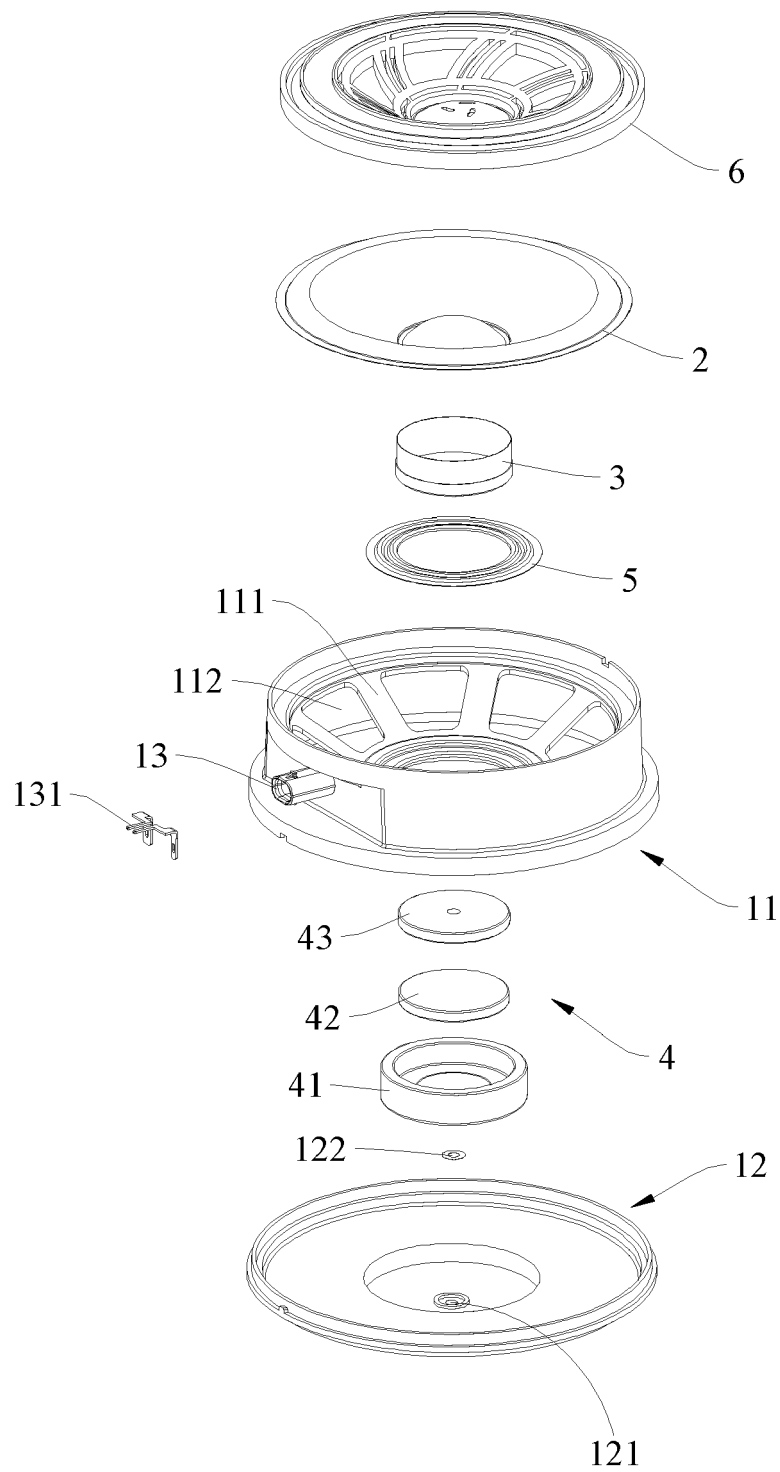


Fig. 1

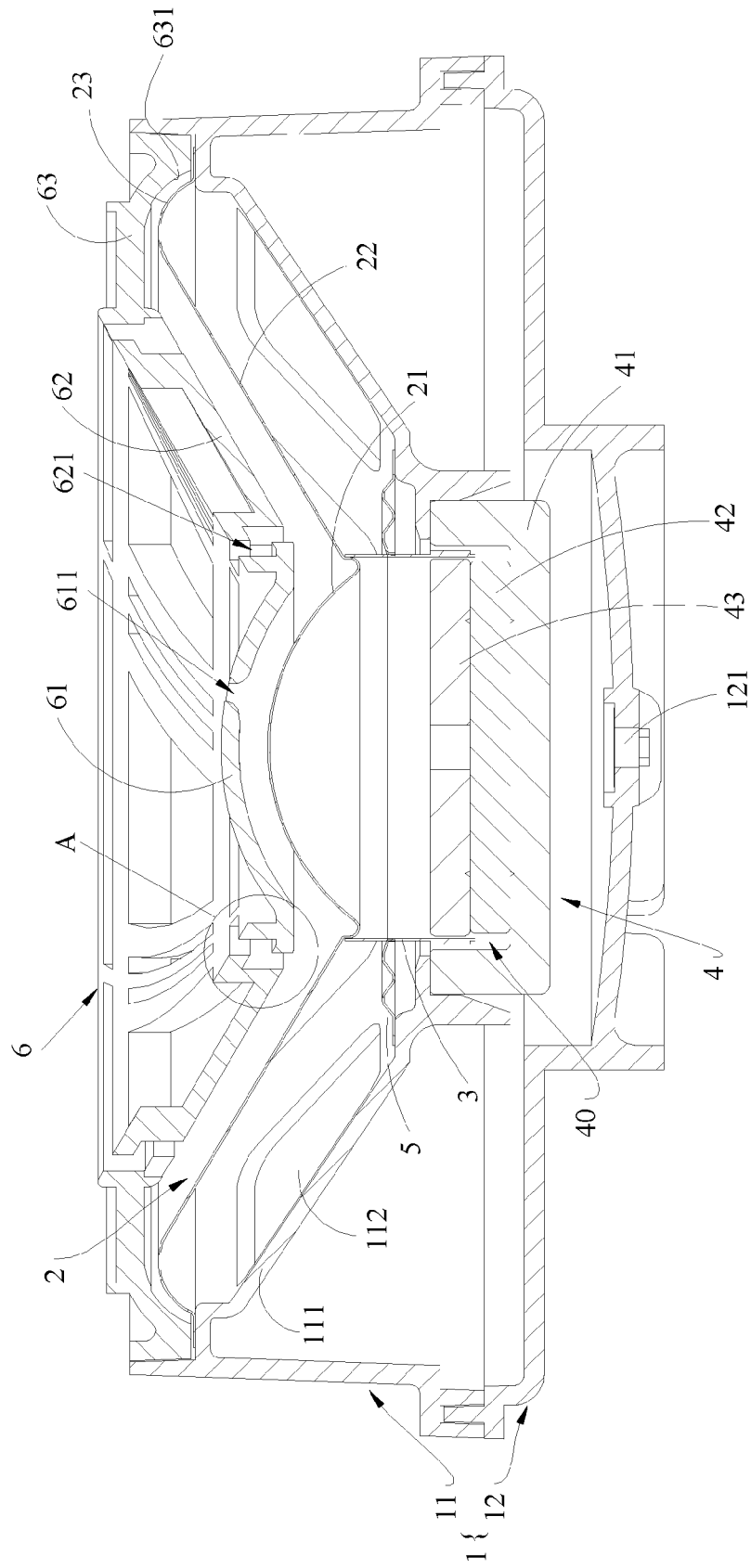


Fig. 2

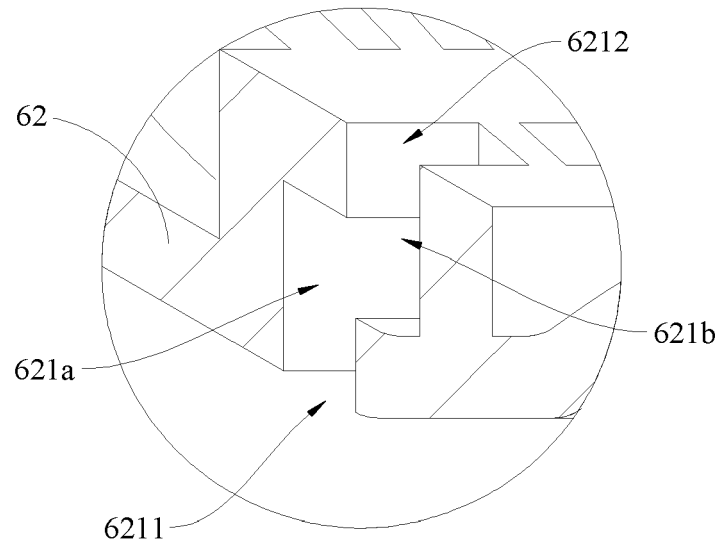


Fig. 3

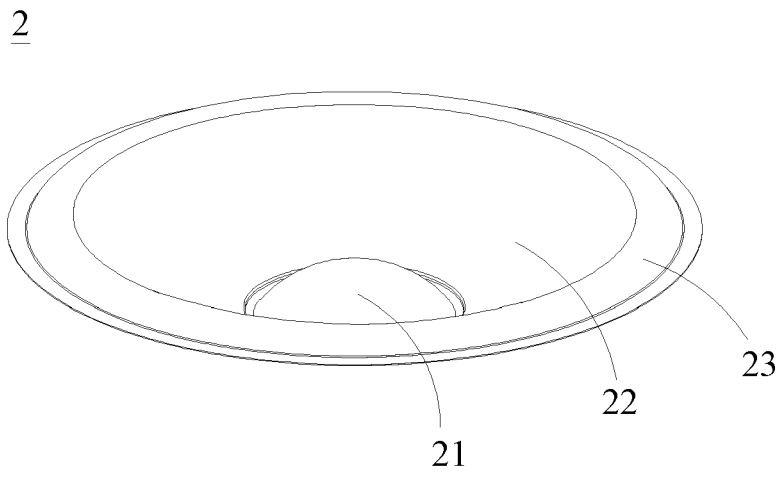


Fig. 4

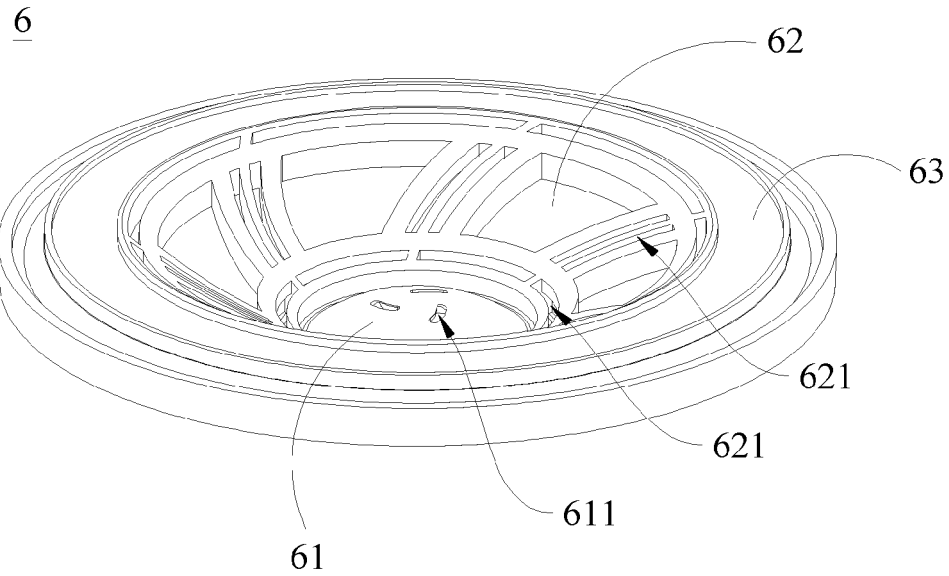


Fig. 5

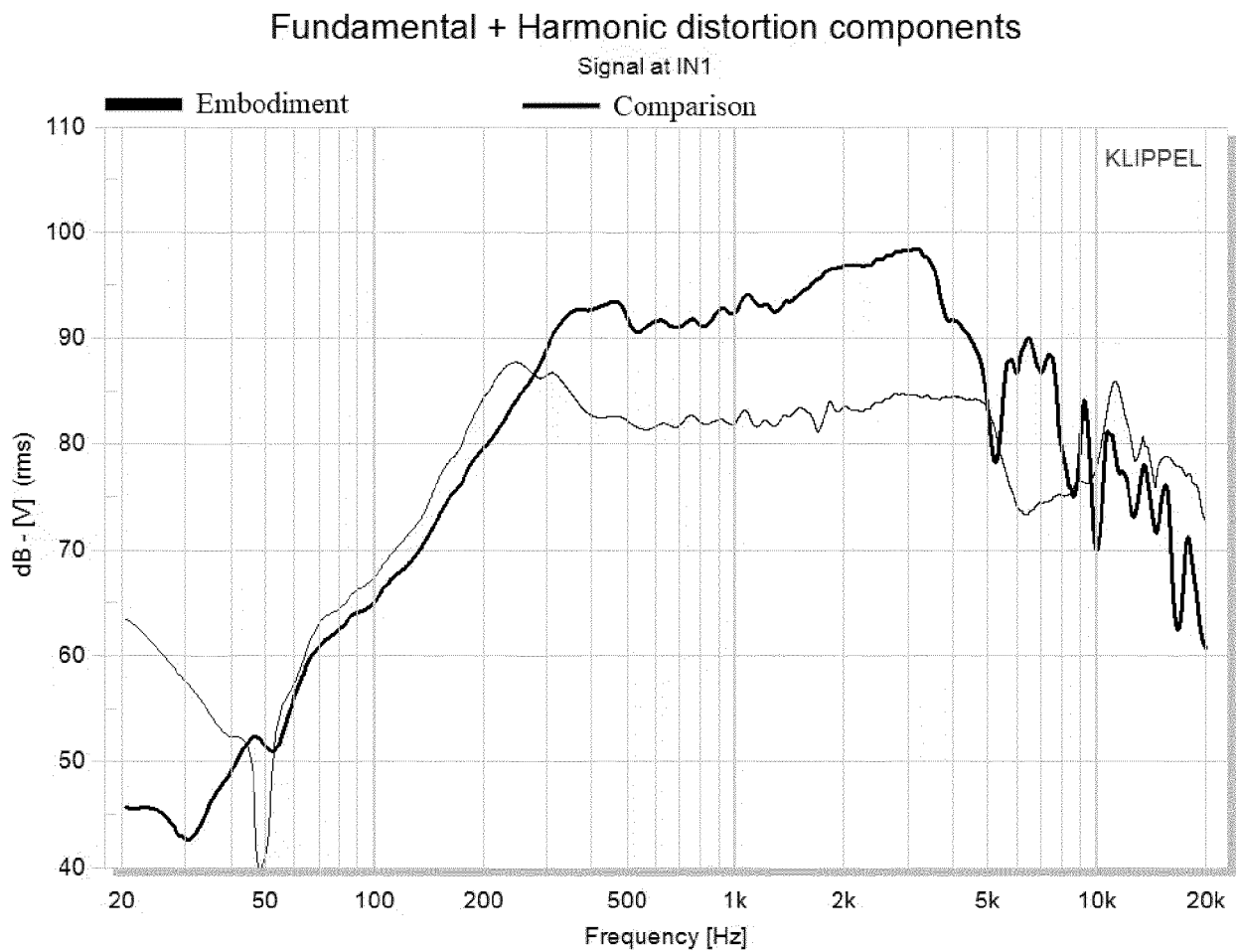


Fig. 6



EUROPEAN SEARCH REPORT

Application Number

EP 23 21 3599

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EPO FORM 1503 03.82 (P04C01)

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	WO 2022/189546 A1 (PSS BELGIUM NV [BE]) 15 September 2022 (2022-09-15) * claims 1, 14 * * page 14, line 23 - line 35 * * figures 2A, 2B, 2D, 2E * -----	1-15	INV. G10K9/13 H04R1/02 H04R7/12 H04R9/02
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