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(54) **Rotation joint for satellite speaker system**

(57) The invention relates to a rotation joint for con-joining two stacked speakers for a rotational satellite speaker system. The joint comprises first and second bases, the first base being integrally formed with a first fixing plate and a first connecting means, the second base being integrally formed with a second fixing plate and a second connecting means. The first and second fixing plates are extending parallelly in perpendicular to

a common rotation axis of the joint. The first connecting means is rotatably engaged with the second connecting means. The first and second bases are detachably inserted into corresponding receiving spaces defined in upper and lower speakers. Advantageously, the rotation joint can be made at low cost and easily assembled and disassembled. Preferably, the first and second bases of the joint are interchangeable with each other.

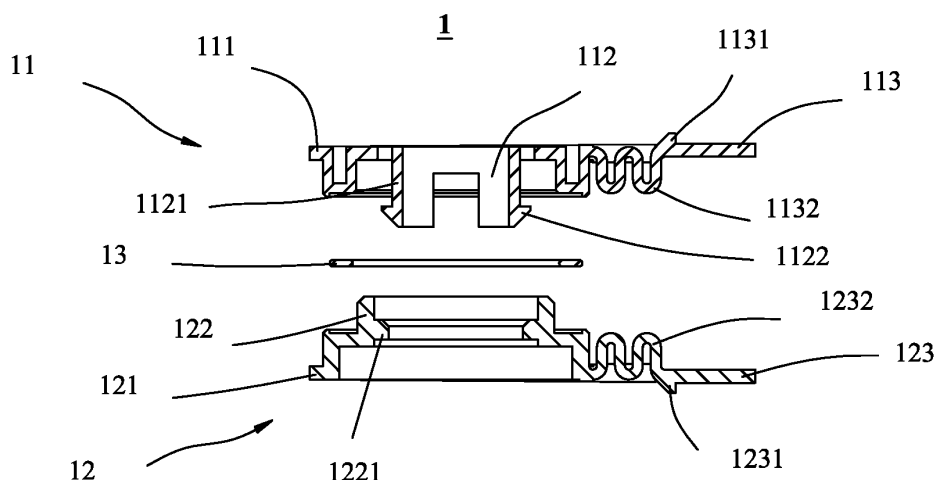


FIG. 5

Description

FIELD OF THE INVENTION

[0001] The present invention relates to a field of speaker system, and more particularly to a rotation joint for conjoining two stacked speakers of a satellite speaker system.

BACKGROUND OF THE INVENTION

[0002] A common multiple-slots audio system generally includes multiple loudspeakers. An example of a modern speaker suite is a multi-slot 5.1 slot speaker system comprising six separate speakers (or electroacoustic transducers) namely: a center speaker, front left speaker, front right speaker, rear left speaker, rear right speaker, and a subwoofer speaker. The center, front left, front right, rear left, and rear right speakers (commonly referred to as satellite speakers) of such systems generally provide moderate to high frequency sound waves, and the subwoofer provides low frequency sound waves.

[0003] Recently, a rotation satellite speaker system is starting to be introduced into the audio industry for enhancing the sound field and surround effect. So-called rotation satellite speaker system includes two speakers, an upper and a lower speaker stacked together. For instance, Macally IceTune is such a rotation satellite speaker system which is compatible with many different audio systems, such as MP3, CD players, desktop computers and laptops, etc. The upper and lower speakers are coupled by a rotation joint to enable the two speakers to rotate about a common vertical axis with respect to the each other.

[0004] Most of conventional rotation joints are composed of a bottom unit mounted on a top of the lower speaker, and a top unit mounted on a bottom of the upper speaker. The bottom unit of the lower speaker is rotatably coupled with the top unit of the upper speaker by means of various mechanism, such as some metal parts and/or screws etc. Due to the cosmetic and structure issue, the conventional rotation joints are usually expensive and difficult to manufacture. As the bottom and top units of the convention joint are not interchangeable, the upper and lower speakers are non-interchangeable either. Even the upper and lower speakers of the rotation satellite speaker system is detachable, some mechanical parts, such as metal parts and/or screw locking means are always difficult to be disassembled. These kinds of issues make the cosmetic design and production costs up a lot. It is also inconvenient to assemble/disassemble the two speakers using the conventional rotation joints.

[0005] Therefore an improved speaker rotation joint is desirable to overcome the above mentioned drawbacks.

SUMMARY OF THE INVENTION

[0006] One aspect of the present invention is to provide

a rotation joint for conjoining two stacked speakers for rotational satellite speaker system, particularly to provide a joint which is easy to be assembled and disassembled with the speaker system and made at low cost.

[0007] The rotation joint according to the present invention comprises a first base and a second base, the first base being integrally formed with a first fixing plate and a first connecting means, and the second base being integrally formed with a second fixing plate and a second connecting means, wherein the first and second fixing plates are extending parallelly in perpendicular to a common rotation axis of the joint and the satellite speaker system, the first connecting means are rotatably engaged with the second connecting means, which is characterized is that the first and second bases are respectively received in corresponding receiving spaces defined in upper and lower end surfaces of the two stacked speakers and, the first and second fixing plates are detachably inserted into corresponding fixing slots defined in side surfaces of the receiving spaces.

[0008] Advantageously, the joint can be made in at cost, and assembled easily with the satellite speaker system, due to its single mold and simple structure.

[0009] According to another aspect of the present invention, the first and second fixing plates inserted into the corresponding fixing slots of the two stacked speakers are retained in the corresponding fixing slots by first and second retaining means formed on the first and second bases in respective. The first and second retaining means are resilient plates having first ends connecting with the first and second bases and second ends extending parallelly outwards from the first and second bases, each one being formed with a locking stopper for preventing the base from escaping away from the corresponding receiving spaces.

[0010] Advantageously, the joint can be retained by the retaining means when it is assembled, and easily disassembled by pressing inwardly free ends of the resilient retaining means so as to allow the first and second bases to be disassembled from the receiving spaces and the fixing slots.

[0011] According to a further aspect of the present invention, the first fixing plate of the first base is formed in a shape identical to the shape of the second fixing plate of the second base, so that the first and second bases are interchangeable.

[0012] According to yet another aspect of the present invention, the first connecting means forms a cylinder member extending downwardly from the first base and having multiple spaced fastening legs formed therearound, each fastening leg having a barb formed at a lower end thereof. The second connecting means has a hole defined in the centre thereof to receive the cylinder of the first connecting means to be rotatably fitted therein, and a flange formed around an internal side surface of the hole. Advantageously the barbs of the fastening legs of the first connecting means are retained by the flange in the hole of the second connecting means so as to

prevent the second connecting means from escaping away from the first connecting means.

[0013] According to still another aspect of the present invention, a cushion is provided outside around the cylinder member and sandwiched between the first base and second base, so as to advantageously benefit fitting stability and operation reliability of the speaker system conjoined by means of the inventive rotation joint.

BRIEF DESCRIPTION OF DRAWINGS

[0014]

Fig. 1 is a perspective view showing a rotation speaker system assembled by a joint according to one embodiment of the present invention;

Fig. 2 is a perspective view schematically showing a rotation status of the speaker system of Fig. 1;

Fig. 3 is a cross sectional perspective view showing the assembling of the joint in the speaker system of Fig. 1;

Fig. 4 is an exploded perspective view of one embodiment of the joint in accordance with the present invention;

Fig. 5 is an exploded cross sectional view showing the joint of Fig. 4;

Fig. 6 is a perspective view showing the assembled joint in accordance with the present invention;

Fig. 7 is a cross sectional view showing the assembled joint of Fig. 6;

Fig. 8 is a cross sectional view showing the two stacked speakers of the speaker system before the joint assembled therein; and

Fig. 9 is a cross sectional view showing the joint assembled in the speaker system.

DETAIL DESCRIPTION OF PREFERRED EMBODIMENTS

[0015] With reference to Fig. 1, according to the present invention a rotation joint 1 is used in a rotation speaker system 5 which includes an upper speaker 5a and a lower speaker 5b stacked together. The rotation joint 1 is mounted between the upper and lower speakers 5a, 5b to enable the stacked upper and lower speakers 5a, 5b to rotate with respect to each other about a common rotation axis. An example of rotation status of the speaker system 5 is as illustrated in Fig. 2.

[0016] Fig. 3 is a cross sectional perspective view of the rotation speaker system 5 showing the joint 1 being assembled between the upper and lower speakers 5a, 5b of the rotation satellite speaker system 5.

[0017] Now with reference to Figs. 4 and 5, as exhibited more clearly in an exploded perspective view and a cross sectional view, the joint 1 comprises a first base 11 and a second base 12 which are respectively fitted in corresponding first and second receiving spaces (not shown) defined in the upper and lower speakers. The first base

11 integrally forms a first fixing plate 111 and a first connecting means 112. The first fixing plate 111 is inserted into a corresponding first fixing slot (not shown) defined in side surfaces of the first receiving space of the upper speaker. The second base 12 integrally forms a second fixing plate 121 and a second connecting means 122. The second fixing plate is inserted into a corresponding second fixing slot (not shown) defined in side surfaces of the second receiving spaces (not shown) of the lower speaker. Accordingly, the first and second receiving spaces (not shown) and fixing slots (not shown) of the speakers are formed in conformity with the shape of the first and second bases 11, 12 and the first and second fixing plates 111, 121. The first and second fixing plates 111, 121 are extending parallelly in perpendicular to the common rotation axis of the joint 1. The first connecting means 112 of the first base 11 is rotatably engaged with the second connecting means 122 of the second base 12, as shown in Figs. 6 and 7.

[0018] Now return to Figs. 4 and 5, more detailed structure of the joint 1 will be described. As shown in the drawings, the first and second fixing plates 111, 121 are shaped as whole plates identical with each other. In this embodiment as shown in the drawing, the fixing plate has a round shape formed at a first end thereof and a substantially flat shape formed at a second end thereof. Accordingly and as described in foregoing description, the receiving spaces (not shown) and the fixing slots (not shown) are designed in a shape in conformity with the profiles of the bases 11, 12 and the fixing plates 111, 112, so that when the fixing plates 111, 112 are inserted into the fixing slots (not shown), the first and second bases 11, 12 are fitted in the receiving spaces (not shown), while the flat shaped second ends of the fixing plates 111, 121 are substantially flush with the opening edges of the receiving spaces (not shown), therefore a good cosmetic appearance of the product is achieved. However, as the skilled person in the art may understand, the fixing plates 111, 121 are not only limited to the embodiment as shown in the drawings, but many different shapes and variants may be applicable, which enable opposite side edges of the fixing plates 111, 121 to be inserted from opening ends into the corresponding fixing slots (not shown) in respective.

[0019] The first connecting means 112 of the first base 11 is a cylinder member formed in a centre thereof extending downwardly. The cylinder member of the first connecting means 112 is further separated into multiple legs 1121 at a lower end thereof, each one of the multiple legs 1121 being formed with a barb 1122 at the lower end.

[0020] The second connecting means 122 of the second base 12 is defined with a connecting hole in a centre thereof corresponding to the cylinder member of the first connecting means 112 of the first base 11. A flange 1221 is formed around an inner side surface of the connecting hole, so as to retain the barbs 1122 of the first connecting means 112 after the multiple legs 1121 of the first connecting means 112 are inserted into the connecting hole

of the second connecting means 122 by overcoming the resilient force of the legs 1121 and resiled back to its original status. Preferably, a slope is formed around an upper edge of the flange 1221 which is facing towards the legs 1121 of the first connecting means 112, so as to facilitate insertion of the cylinder member of the first connecting means 112.

[0021] Additionally, a cushion 13 is provided around the cylinder member of the first connecting means 112 and sandwiched between the first and second bases 11, 12 in order to facilitate fitting stability and operation reliability of the joint.

[0022] The first and second bases 11, 12 are respectively formed with first and second retaining means 113, 123 at the second ends thereof. The first and second means are preferably formed in identical shape having first ends thereof connecting with the first and second base 11, 12, and second ends thereof extending parallel outwards. The first and second retaining means 113, 123 are designed with resiliency and formed with two locking stoppers 1131, 1231 thereon corresponding to two locking recesses (not shown) defined on the upper and lower speakers respectively. According to the embodiment as shown in the drawings, two spring parts 1132, 1232 are provided between the first ends and the locking stoppers 1131, 1231 of the retaining means 113, 123.

[0023] With reference to Fig. 6, when the first base 11 and the second base 12 are assembled together by the first and second connecting means 112, 122, the first base 11 and the second base 12 are capable of rotating with each other about a common rotation axis, as the cylinder member of the first connecting means is rotatable within the connecting hole of the second connecting means 122.

[0024] As shown in Fig. 7, when the free ends of the first and second retaining means 113, 123 are pressed inwardly by fingers, they will deform due to their resiliency, and the locking stoppers 1131, 1231 will be released from the locking recesses (not shown) defined in the speakers. Thus as will be more clearly shown in Figs. 8 and 9, the assembling and disassembling of the joint 1 with the stacked speakers 5a, 5b is very simple and easy.

[0025] As shown in Fig. 8, the upper and lower speaker 5a, 5b are respectively designed with receiving spaces 51a, 51b in conformity with the shape of the first and second bases 11, 12, and two fixing slots 52a, 52b defined in side surfaces of the receiving spaces 51a, 51b and formed in conformity with the shape of the first and second fixing plates 111, 121. The first and second bases 11, 12 can be respectively fitted into the receiving spaces 51a, 51b from opening ends of the receiving spaces 51a, 51b, while the first and second fixing plates 111, 121 can be respectively inserted into the fixing slots 52a, 52b from opening ends of the fixing slots 52a, 52b.

[0026] As shown in Fig. 9, once the conjoined upper and lower bases 11, 12 of the joint 1 are respectively inserted into the receiving spaces 51a, 51b of the speaker system 5, the first and second locking stoppers 1131,

1231 will respectively slide over the outer edge of the opening of the receiving spaces 51a, 51b, and then resile back and be retained in two corresponding locking recesses 53a, 53b defined on surfaces of receiving spaces 51a, 51b of the upper and lower speakers 5a, 5b. Therefore, the first and second bases 11, 12 are locked in the receiving spaces 51a, 51b, while the fixing plates 111, 112 are respectively connected with upper and lower speakers 5a, 5b by engagement with the fixing slots 52a, 52b. The upper and lower speakers 5a, 5b are rotatable with each other by the joint.

[0027] When a user presses the free ends of the retaining means 113, 123 of the joint inwardly, the locking stoppers 1131, 1231 are released from the locking recesses 53a, 53b, and then the whole joint can be easily disassembled from the speaker system 5.

[0028] As one preferred embodiment shown in the drawings, each one of the upper and lower speakers 50a, 50b is designed with counter connecting part, i.e. the receiving spaces 51a, 51b, the fixing slots 52a, 52b and the locking recesses 53a, 53b, for connecting with the bases of the joint at both top and bottom end surfaces. Advantageously, the joint can be fitted for either the top end surface or the bottom end surface for the speaker, thus an interchange of the speakers is allowable, and various combination of the speakers can be easily carried out.

[0029] Overall, the rotation joint as described above is used to conjoin two stacked speakers of the rotational satellite speaker system, however, as understood by the skilled in the art, this rotation joint can also be used in other circumstances, in a short, in any kind of combination and connection of two members, such as two boxes or similar electronic devices, etc.

[0030] Even though numerous characteristics and advantages of the present invention have been set forth in the foregoing description, together with details of the structure and function of the invention, the disclosure is illustrative only. Changes may be made in detail, especially in matters of shape, size, and arrangement of parts within the principles of the invention to the full extent indicated by the broad general meaning of the terms in which the appended claims are expressed.

Claims

1. A rotation joint (1) for rotationally conjoining two stacked members which are respectively rotatable about a common axis thereof, comprising a first base (11) and a second base (12), the first base (11) being integrally formed with a first fixing plate (111) and a first connecting means (112), and the second base (12) being integrally formed with a second fixing plate (121) and a second connecting means (122), wherein the first and second fixing plates (111, 121) are extending parallelly in perpendicular to the common rotation axis of the joint (1), the first connecting

means (112) is rotatably engaged with the second connecting means (122);

characterized in that

the first and second bases (11, 12) are respectively fitted in corresponding receiving spaces (51a, 51b) defined in upper and lower surfaces of the two stacked member;

the first and second fixing plates (111, 121) are respectively detachably inserted into corresponding fixing slots (52a, 52b) defined in sides surfaces of the receiving spaces (51a, 51b).

2. The rotation joint (1) as claimed in claim 1, **characterized in that** the first and second bases (11, 12) are retained in the corresponding receiving spaces (51a, 51b) by means of first and second retaining means (113, 123) formed on the first and second bases in respective.
3. The rotation joint (1) as claimed in claim 2, **characterized in that** the first and second retaining means (113, 123) are resilient plates having first ends connecting with the first and second bases (11, 12) and second ends extending parallelly outwards from the first and second bases (11, 12), and each one being formed with locking stoppers (1131, 1231) for preventing the first and second bases (11, 12) from escaping away from the corresponding receiving spaces (51a, 51b).
4. The rotation joint (1) as claimed in claim 3, **characterized in that** the locking stoppers (1131, 1231) are respectively retained in corresponding locking recesses (53a, 53b) defined in the upper and lower members (5a, 5b), when the joint (1) is fitted in the stacked members (5a, 5b).
5. The rotation joint (1) as claimed in any one of claims 1 to 4, **characterized in that** the first fixing plate (111) of the first base (11) is identical in shape with the second fixing plate (121) of the second base (12), so as to enable the first and second bases (11, 12) to be interchangeable.
6. The rotation joint (1) as claimed in any one of the preceding claims, **characterized in that** the first connecting means (112) forms a cylinder which is composed of multiple legs (1121) extending downwardly from the first base (11), each leg (1121) being formed with a barb (1122) on a lower end thereof; and the second connecting means (122) has a hole defined in the centre thereof to receive the cylinder of the first connecting means (112) to be rotatably fitted therein, and a flange (1221) formed around an inner side surface of the hole to retain the barbs (1122) of the legs (1121) to prevent the second connecting means (122) from releasing away from the first con-

necting means (112).

7. The rotation joint (1) as claimed in any one of the preceding claims, **characterized in that** a cushion (13) is provided around the cylinder and sandwiched between the first base (11) and the second base (12).
8. The rotation joint (1) as claimed in any one of the preceding claims, **characterized in that**
 - the stacked members are stacked upper and lower speakers for satellite speaker system.

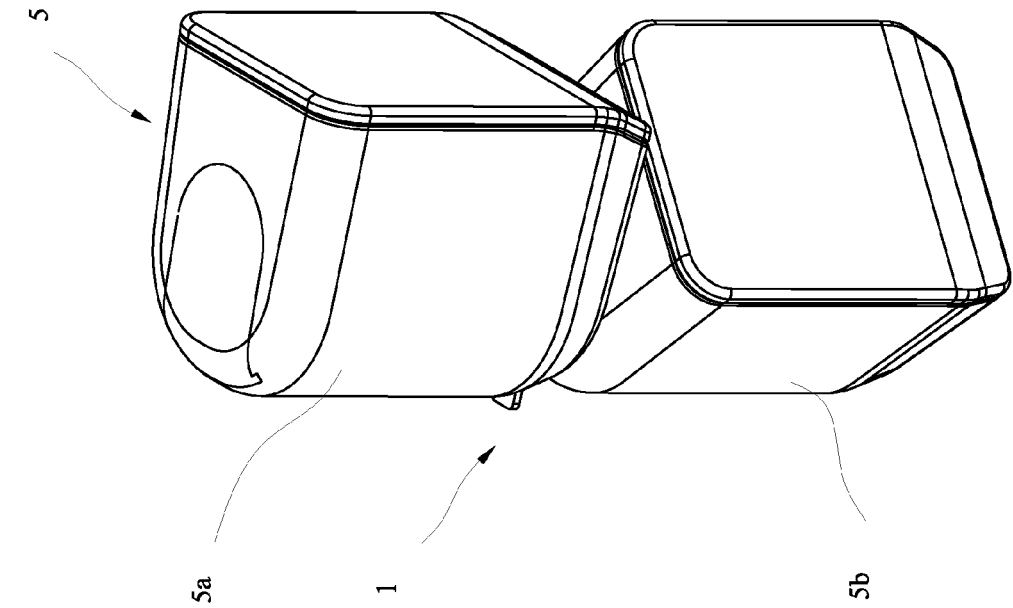


FIG. 1

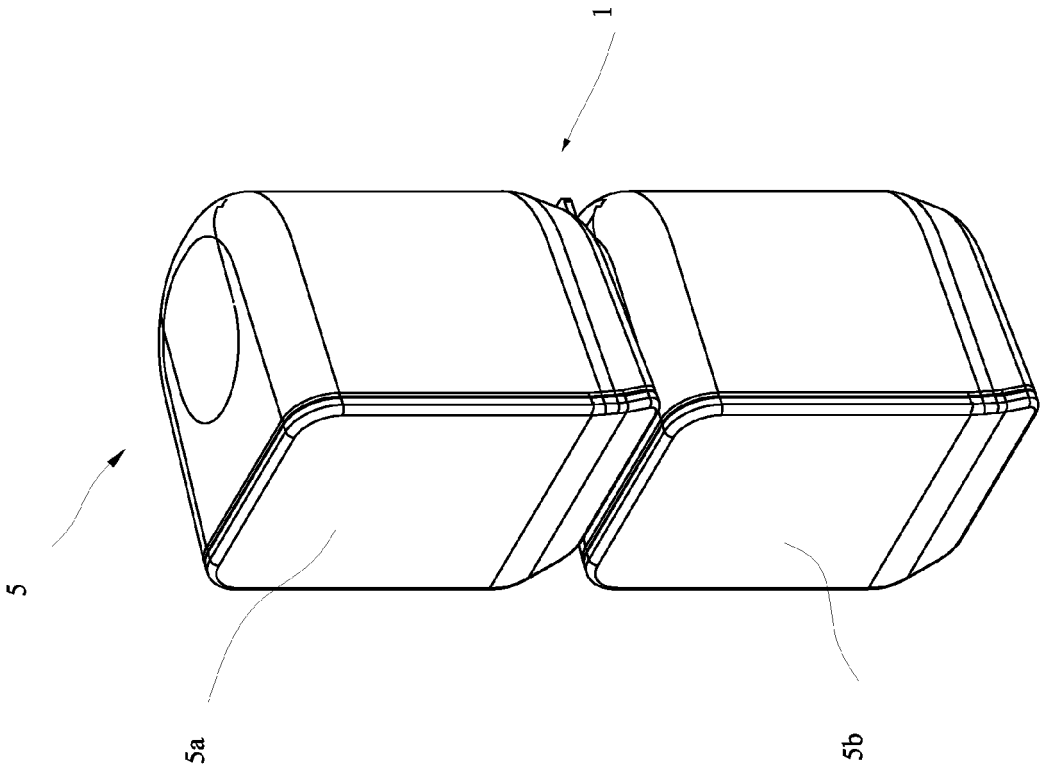


FIG. 2

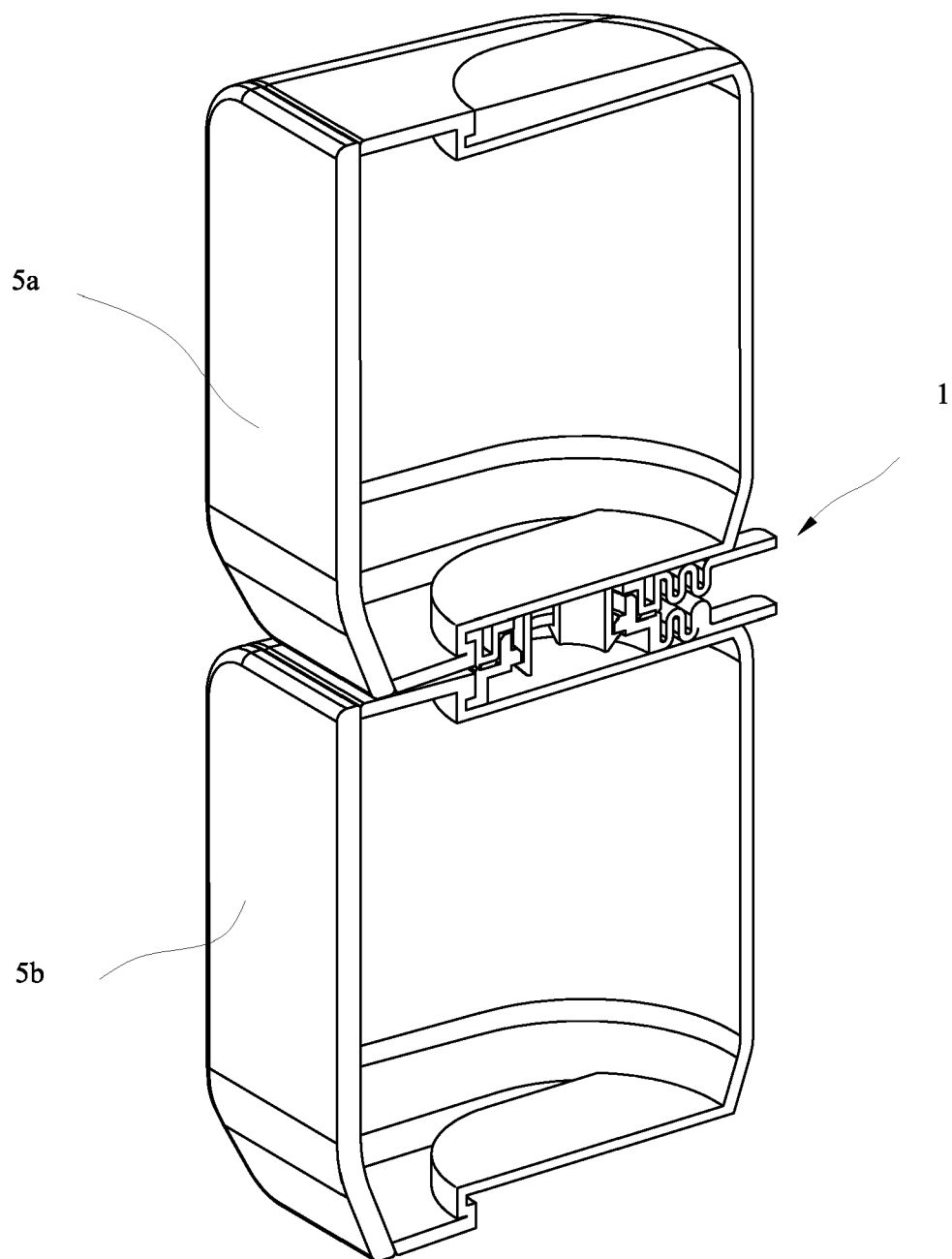


FIG. 3

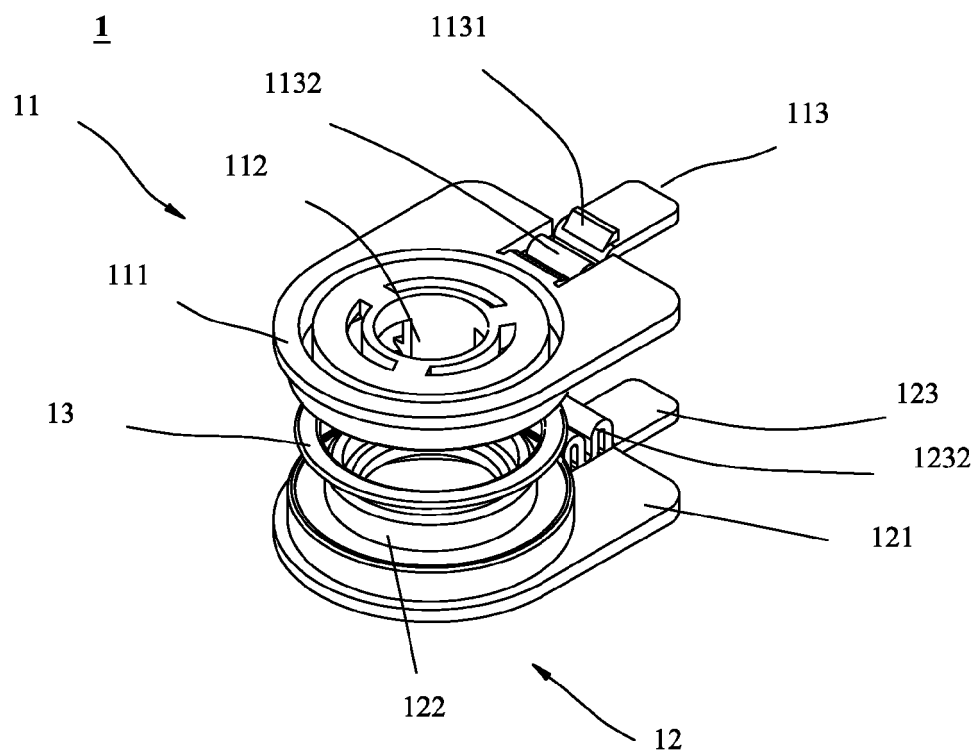


FIG. 4

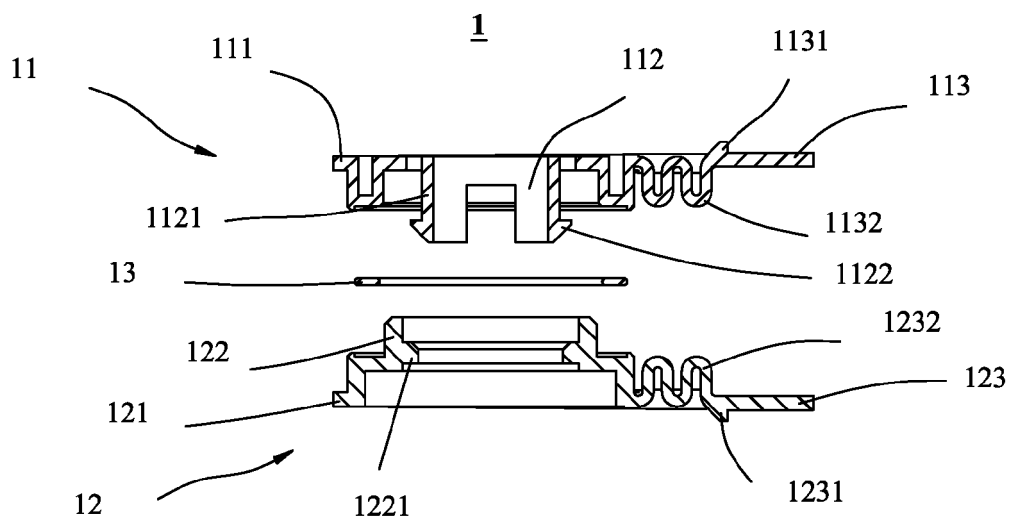


FIG. 5

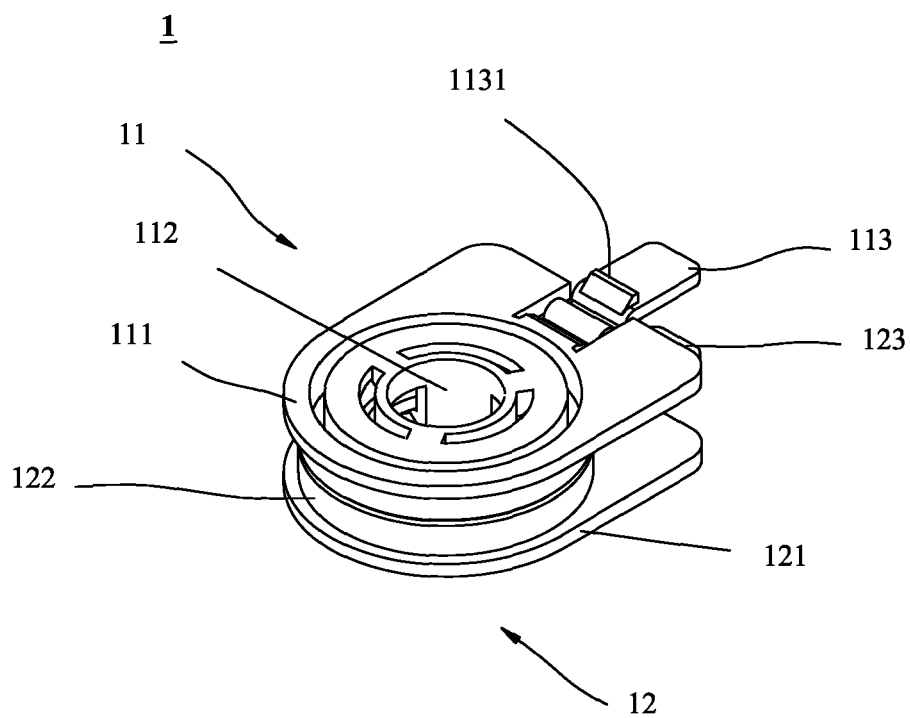


FIG. 6

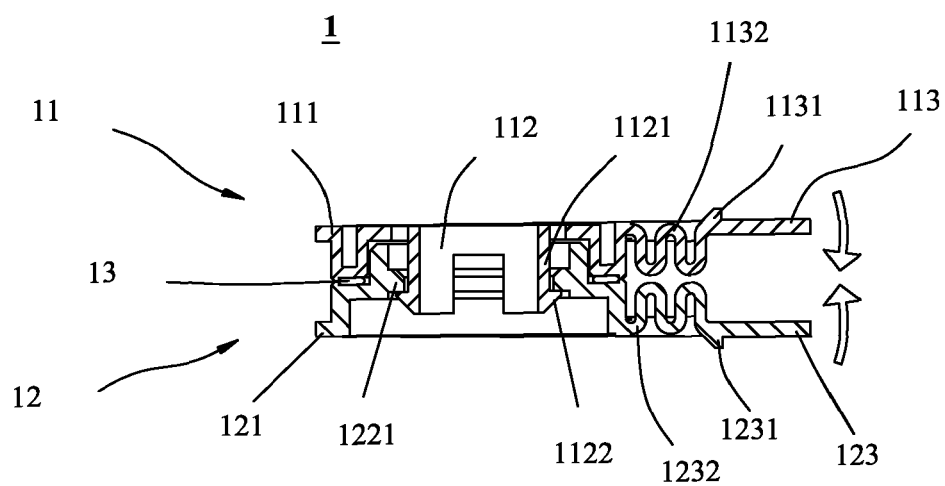


FIG. 7

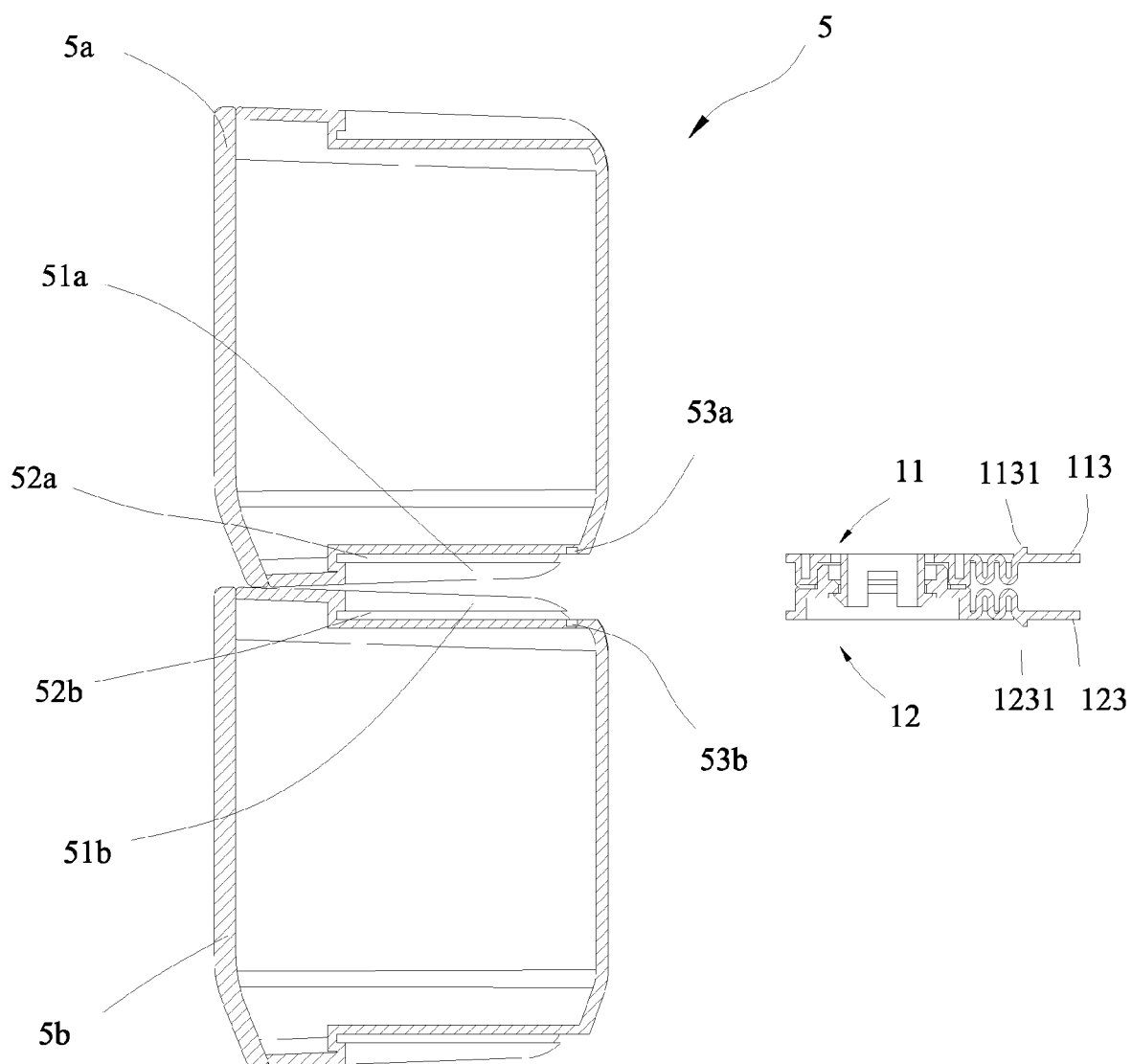


FIG. 8

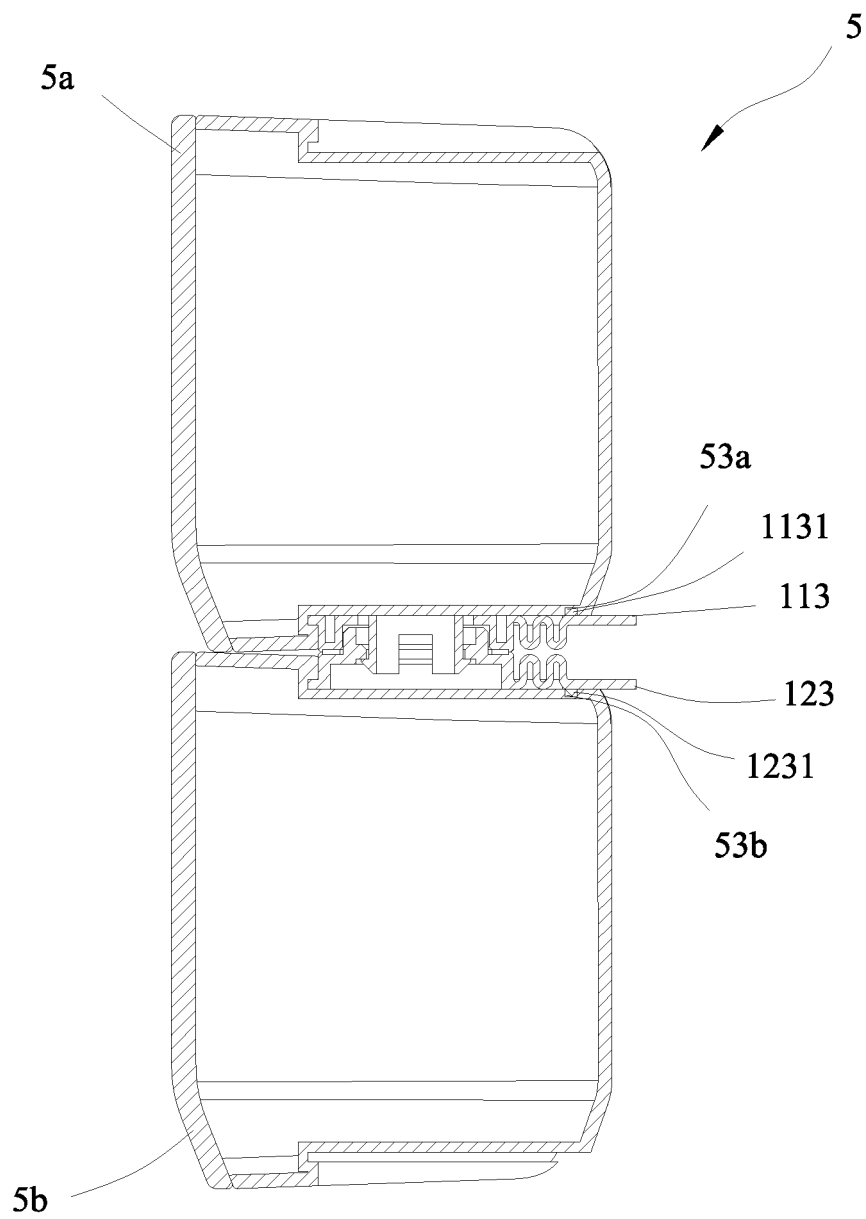


FIG. 9



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 06 30 0533

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	GB 2 044 038 A (HENDREN D E) 8 October 1980 (1980-10-08) * abstract * * page 1, line 126 - page 2, line 100; claim 9; figure 1 *	1-8	
A	JP 60 186192 A (MITSUBISHI ELECTRIC CORP) 21 September 1985 (1985-09-21) * abstract; figures 2-12 *	1-8	
			TECHNICAL FIELDS SEARCHED (IPC)
			H04R
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 22 November 2006	Examiner Fülöp, István
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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 06 30 0533

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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22-11-2006

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