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(54) **Suspension for high power micro speaker, and high power micro speaker having the same**

Aufhängung für Hochleistungs-Mikrolautsprecher und Hochleistungs-Mikrolautsprecher damit

Suspension pour micro haut-parleur à puissance élevée et micro haut-parleur à puissance élevée
l'utilisant

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Description

TECHNICAL FIELD

[0001] The present invention relates to a suspension structure for a high power micro speaker and, more particularly, to a shape of a suspension which ensures a lightweight of the suspension as well as high reliability and a conductive pattern which applies electric signals.

BACKGROUND ART

[0002] Sound reproduction techniques of mobile multimedia have been improved with the development of mobile communication technologies, as a result of which high performance, high sound quality and high power are required of a micro speaker.

[0003] In most cases, a conventional micro speaker does not use a special suspension to ensure a lightweight of a diaphragm and connects a lead wire of a voice coil to the diaphragm via bonding to apply external electric signals to the voice coil. Therefore, unbalanced vibration is often generated due to the absence of the suspension, and the lead wire of the coil is often down in high power due to a tensile force, which makes it difficult for the micro speaker to be applied to high power.

[0004] In order to solve the foregoing problem, there has been developed a micro speaker using a suspension provided with a conductive pattern for transmitting electric signals. In the case of the micro speaker using the suspension, an increase in weight of the diaphragm, which results from the use of the suspension, leads to a decrease in sound pressure of the micro speaker. In addition, cracks may occur in the conductive pattern in high power, causing a defect.

[0005] FIG. 1 is a view showing a shape of a voice coil and a lead wire used in a conventional suspension type micro speaker, FIG. 2 is a view showing fabrication of a rectangular coil of FIG. 1, and FIG. 3 is a view showing a shape of a suspension used in the conventional micro speaker. As illustrated in FIG. 2, a circular voice coil 10 is changed to a rectangular voice coil 20 using a jig 30. Here, lead wires 22 and 24 of the voice coil 20 are positioned on the short side of the rectangular shape. Referring to FIG. 3, a suspension 40 includes an outer peripheral portion 42, an inner peripheral portion 46, and a connection portion 44 connecting the outer peripheral portion 42 to the inner peripheral portion 46. A conductive pattern 50 as well as land portions 60 for use in soldering or bonding the lead wires 22 and 24 of the voice coil 20 are formed on the surface of the suspension 40. In the conventional suspension 40, the land portions 60 for use in soldering or bonding the lead wires 22 and 24 of the voice coil 20 are formed on the connection portion 44 disposed on the short side adjacent to the positions of the lead wires 22 and 24 of the coil.

[0006] FIG. 4 is a view showing stress distribution of each portion that is generated in the event of vibration of

the conventional suspension.

[0007] Here, it can be seen that a significant surface tension occurs inside the short connection portion 44 disposed on the short side of the suspension 40, as a result of which cracks may easily occur in the conductive pattern 50 formed on the surface of the suspension 40.

[0008] WO 2011/027995 A2 discloses a microspeaker comprising: a frame having a hollow interior; a cover for covering one open side of the frame; a yoke for covering the other open side of the frame; an external magnet inserted into the frame and having a hollow interior, and which generates a magnetic field having a predetermined intensity and direction; an external plate for concentrating, in a specific direction, the magnetic field generated by the external magnet; an internal magnet for generating a magnetic field in a direction identical to that of the magnetic field of the external magnet; and an internal plate mounted on an upper surface of the internal magnet to concentrate, in a specific direction, the magnetic field generated by the internal magnet. Further, a voice coil is arranged to vibrate in the height direction of the external magnet and internal magnet. A vibrating body is arranged to vibrate along with the voice coil in the upward and downward directions. A vibrating diaphragm is interposed between the cover and the vibrating body so as to vibrate in the upward and downward directions by means of the vibrating body which vibrates in the upward and downward directions, in order to generate sound. A solder pad is mounted on the vibrating body to transmit an electrical control signal transmitted from the outside of the frame to the vibrating body. The thus-configured microspeaker having a high output vibrating diaphragm joining structure prevents the disconnection of both ends of the voice coil coupled to the vibrating body, improves the vibrating strength of the vibrating diaphragm, and thus achieves a higher sound output.

DISCLOSURE OF THE INVENTION

[0009] An object of the present invention is to provide a suspension structure which can resist high power in a micro speaker.

[0010] Another object of the present invention is to provide a conductive pattern of a suspension for a micro speaker which can transmit electric signals even when cracks occur in some part of the suspension.

[0011] A further object of the present invention is to provide a shape of a suspension and a conductive pattern which can minimize a further decrease in sound pressure caused by the use of the suspension.

[0012] A still further object of the present invention is to provide a suspension which does not interrupt a smooth vertical movement of a diaphragm.

[0013] These objects are solved by the subject-matter of the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014]

FIG. 1 is a view showing a shape of a voice coil and a lead wire used in a conventional micro speaker having a suspension.

FIG. 2 is a view showing fabrication of a rectangular coil of FIG. 1.

FIG. 3 is a view showing the suspension used in the conventional micro speaker.

FIG. 4 is a view showing stress distribution of each portion that is generated in the event of vibration of the conventional suspension.

FIG. 5 is a view showing a voice coil lead-in wire structure provided in a micro speaker according to a first embodiment of the present invention.

FIG. 6 is a view showing positions of land portions of a suspension for the high power micro speaker according to the present invention.

FIG. 7 is a view showing the position, from which a protective film is removed, on the suspension for the high power micro speaker according to the present invention.

FIGS. 8 to 10 are views showing a high power micro speaker according to further examples.

BEST MODE FOR CARRYING OUT THE INVENTION

[0015] Hereinafter, preferred embodiments of the present invention will be described in detail with reference to the accompanying drawings.

[0016] FIG. 5 is a view showing a voice coil lead-in wire structure provided in a high power micro speaker according to the present invention. A voice coil 100 provided in the high power micro speaker according to the present invention is formed in a rectangular shape like a conventional rectangular coil 10. However, the voice coil 100 provided in the high power micro speaker of the present invention and the voice coil 10 of the prior art have a difference in drawing-out directions of lead wires 120 and 140. The lead wires 120 and 140 of the voice coil 100 are not disposed on the same side of the rectangular shape side by side but drawn out from opposite diagonal sides. Preferably, the lead wires 120 and 140 are drawn out from ends of two longer sides among the four sides of the rectangle. These positions are adjacent to the positions of land portions of the suspension for the high power micro speaker according to the present invention and are easy to weld or solder the lead wires 120 and 140 to the land portions, as will be discussed later. Meanwhile, after drawn out, the lead wires 120 and 140 of the voice coil 100 are shaped in a right-angle direction according to a shape of a connection portion of the suspension discussed later.

[0017] FIG. 6 is a view showing the suspension for the high power micro speaker according to the present invention. A suspension 200 according to the present in-

vention includes an outer peripheral portion 210, connection portions 220' and 220" and a central portion 230, and also includes a terminal portion 240 for providing electric connection to an external terminal on one side.

In addition, a conductive pattern 250 is formed on the suspension 200, in particular, on the outer peripheral portion 210, the terminal portion 240 on one side of the outer peripheral portion 210, and the connection portions 220' and 220". Meanwhile, the suspension 200 is formed in a rectangular shape, and land portions 260 for use in welding or soldering the lead wires 120 and 140 of the voice coil 100 are disposed on the connection portions 220' (longer sides of the rectangle) connecting the outer peripheral portion 210 to the central portion 230 among the connection portions 220' and 220". That is, the land portions 260 for use in welding or soldering the lead wires 120 and 140 are symmetrically positioned in a diagonal direction. The land portions 260 for use in welding or soldering the lead wires 120 and 140 of the voice coil 100 are disposed on the longer connection portions 220' among the connection portions 220' and 220", which prevents cracks from occurring in the conductive pattern 250 in high power, and the land portions 260 are symmetrically positioned, which prevents unbalanced vibration.

[0018] FIG. 7 is a view showing the position, from which a protective film is removed, on the suspension for the high power micro speaker according to the present invention. Protective films 310, 320 and 330 for protecting the conductive pattern 250 formed on the suspension 200 as well as the suspension 200 itself are attached to the top and bottom of the suspension for the high power micro speaker according to one embodiment of the present invention. The protective films 310, 320 and 330 are attached to the outer peripheral portion 210, the connection portions 220' and 220", and the central portion 230 of the suspension 200. Some sections 320', 320" and 330' of the protective films 310, 320 and 330 attached to the top of the suspension 200 (where the voice coil 100 is not attached) are removed to improve sound characteristics of the high power micro speaker. The sections 320', 320" and 330', from which the protective films are removed, are designated as shaded sections in FIG. 7.

[0019] In particular, the protective films 320 attached to the longer connection portions 220' disposed on the long sides among the connection portions 220' and 220" of the suspension 200 are partially or wholly removed (320') to reduce the intensity of vertical vibration, which facilitates low sound vibration when the speaker is mounted.

[0020] Additionally, according to an embodiment of the present invention, the protective films 320 attached to the connection portions 220" disposed on the short sides among the connection portions 220' and 220" of the suspension 200 are partially removed (320") to reduce the intensity of vertical vibration, which facilitates low sound vibration when the speaker is mounted.

[0021] Moreover, according to an embodiment of the present invention, the central portion of the protective

film 330 attached to the central portion 230 of the suspension 200 is partially removed (330') to reduce a weight of the entire suspension 200, which improves a sound pressure.

[0022] FIGS. 8 to 10 are views showing a micro speaker according to a further example. In the micro speaker according to this example, some parts of a top plate corresponding to solder land portions are removed to prevent a suspension from colliding against the top surface of the top plate and thus getting damaged due to its excess vibration caused by high power vibration.

Claims

1. A suspension (200) for a high power micro speaker that includes an outer peripheral portion (210), a central portion (230) and connection portions (220', 220"), the suspension (200) being provided with a conductive pattern (250), and the outer peripheral portion (210) and the central portion being (230) formed in a rectangular shape, wherein the connection portions (220', 220") comprise a pair of long connection portions (220') connecting long sides of the outer peripheral portion (210) and the central portion (230) and a pair of short connection portions (220") connecting short sides of the outer peripheral portion (210) and the central portion (230), wherein land portions (260) for use in soldering or welding lead-in wires (120, 140) of a voice coil (100) are formed on the long connection portions (220'), wherein the suspension further comprises a protective film (310, 320, 330) for protecting the conductive pattern (250), which protective film (310, 320, 330) is attached to the outer peripheral portion (210), at least a part of the central portion (230) and at least a part of the connection portions (220', 220"), **characterized in that** the protective film (310, 320, 330) is not attached to parts of the long connection portions (220') disposed on the long sides, or is not attached to the long connection portions (220').
2. The suspension (200) of claim 1, wherein the protective film (310, 320, 330) is not attached to a part of the central portion (230).
3. The suspension (200) of claim 1, wherein the protective film (310, 320, 330) is not attached to parts of the short connection portions (220").

Patentansprüche

1. Aufhängung (200) für einen Hochleistungs-Mikro-lautsprecher, die ein äußeres Umfangsteilstück (210), ein zentrales Teilstück (230) und Verbin-

dungsteilstücke (220', 220") umfasst, wobei die Aufhängung (200) mit einer leitfähigen Struktur (250) versehen ist und das äußere Umfangsteilstück (210) und das zentrale Teilstück (230) in einer rechtwinkligen Form ausgebildet sind,

wobei die Verbindungsteilstücke (220', 220") ein Paar lange Verbindungsteilstücke (220'), die lange Seiten des äußeren Umfangsteilstücks (210) und des zentralen Teilstücks (230) verbinden, und ein Paar kurze Verbindungsteilstücke (220") umfassen, die kurze Seiten des äußeren Umfangsteilstücks (210) und des zentralen Teilstücks (230) verbinden, wobei Lötangenteilstücke (260) zur Verwendung beim Löten oder Schweißen von Zuleitungsdrähten (120, 140) einer Schwingspule (100) auf den langen Verbindungsteilstücken (220') ausgebildet sind, wobei die Aufhängung ferner einen Schutzfilm (310, 320, 330) aufweist, um die leitfähige Struktur (250) zu schützen, welcher Schutzfilm (310, 320, 330) an dem äußeren Umfangsteilstück (210), zumindest einem Teil des zentralen Teilstücks (230) und zumindest einem Teil der Verbindungsteilstücke (220', 220") angebracht ist, **dadurch gekennzeichnet, dass**

der Schutzfilm (310, 320, 330) nicht an Teilen der langen Verbindungsteilstücke (220), die auf den langen Seiten angeordnet sind, oder nicht an den langen Verbindungsteilstücken (220') angebracht ist.

2. Aufhängung (200) nach Anspruch 1, wobei der Schutzfilm (310, 320, 330) nicht an einem Teil des zentralen Teilstücks (230) angebracht ist.

3. Aufhängung (200) nach Anspruch 1, wobei der Schutzfilm (310, 320, 330) nicht an Teilen der kurzen Verbindungsteilstücke (220") angebracht ist.

Revendications

1. Suspension (200) pour un micro haut-parleur à grande puissance, qui inclut une partie périphérique extérieure (210), une partie centrale (230) et des parties de liaison (220', 220"), la suspension (200) étant pourvue d'un motif conducteur (250), et la partie périphérique extérieure (210) et la partie centrale étant (230) de forme rectangulaire, dans laquelle les parties de liaison (220', 220") comprennent deux parties de liaison longues (220') reliant les côtés longs de la partie périphérique extérieure (210) et la partie centrale (230), et deux parties de liaison courtes (220") reliant les côtés courts de la partie périphérique extérieure (210) et la partie centrale (230), dans laquelle des parties de pastille (260) à utiliser lors du brasage ou du soudage de fils d'entrée (120, 140) d'une bobine acoustique (100) sont formées sur les parties de liaison longues (220'),

dans laquelle la suspension comprend également un film protecteur (310, 320, 330) pour protéger le motif conducteur (250), lequel film protecteur (310, 320, 330) est fixé à la partie périphérique extérieure (210), à une partie au moins de la partie centrale (230) et à une partie au moins des parties de liaison (220', 220"), **caractérisée en ce que** le film protecteur (310, 320, 330) n'est pas fixé à des parties des parties de liaison longues (220') disposées sur les côtés longs, ou n'est pas fixé aux parties de liaison longues (220').

2. Suspension (200) de la revendication 1, dans laquelle le film protecteur (310, 320, 330) n'est pas fixé à une partie de la partie centrale (230).
3. Suspension (200) de la revendication 1, dans laquelle le film protecteur (310, 320, 330) n'est pas fixé à des parties des parties de liaison courtes (220").

FIG. 1

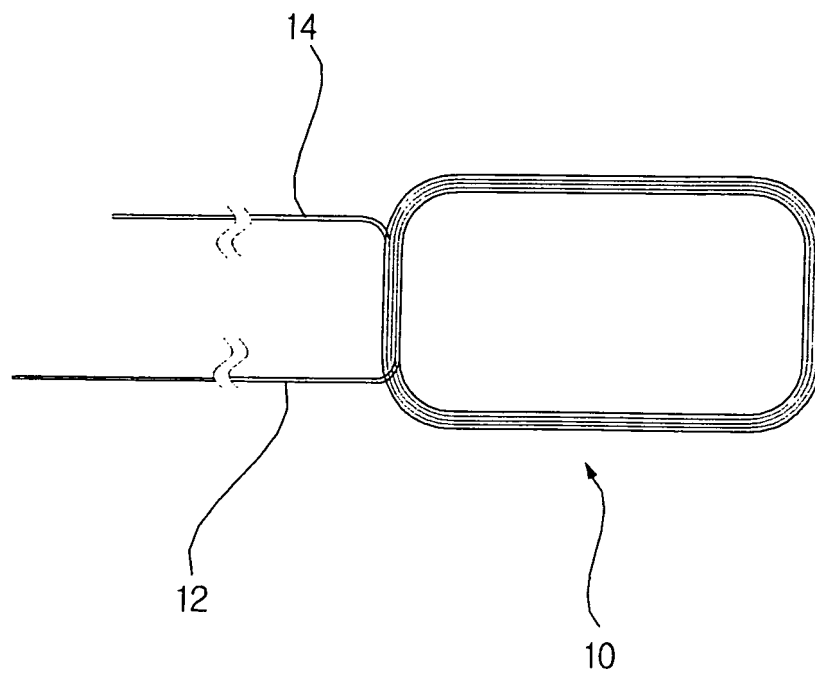


FIG. 2

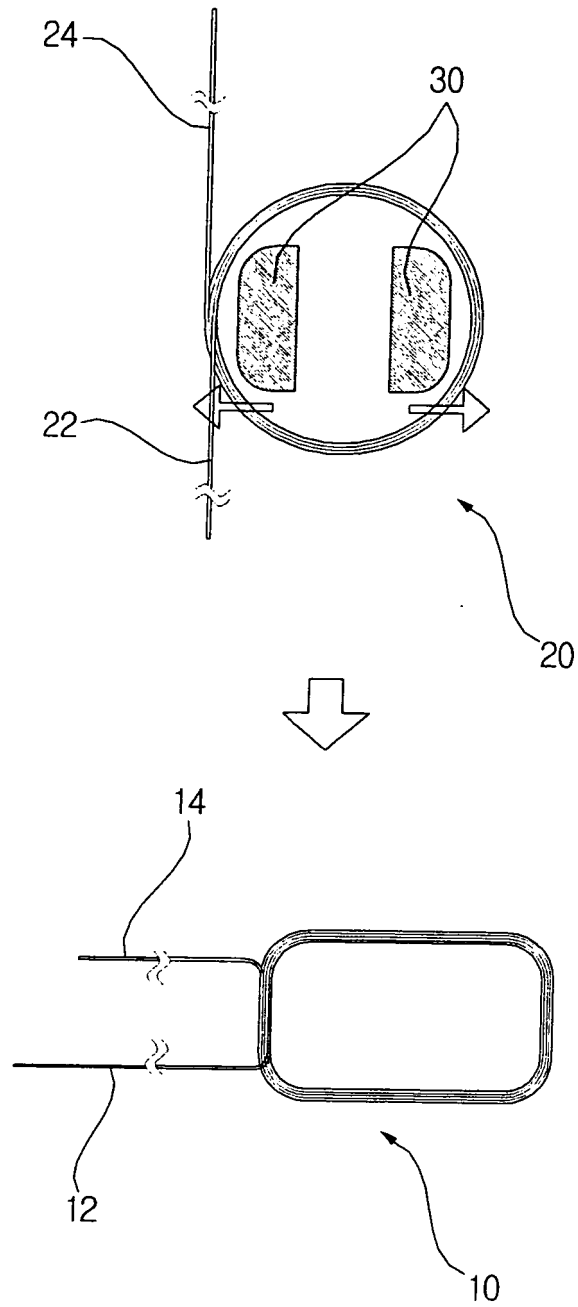


FIG. 3

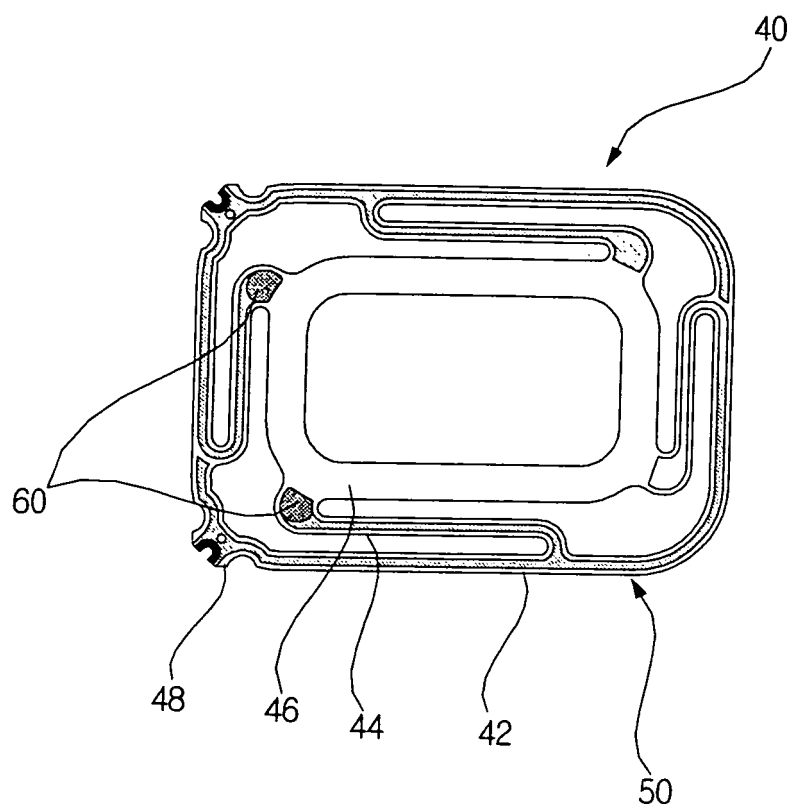


FIG. 4

MODAL SOLUTION
 STEP=1
 SUB =1
 FREQ=800
 REAL ONLY
 SEQV (AVG)
 CMX =.588E-03
 SMN =35.915
 SMX =.415E+08

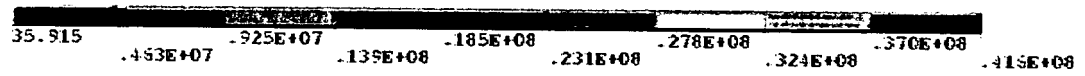
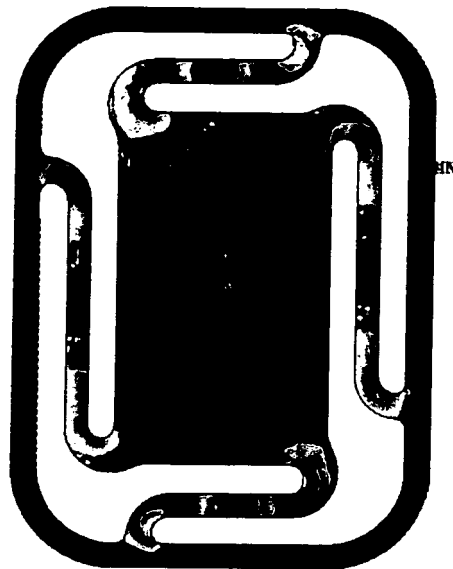


FIG. 5

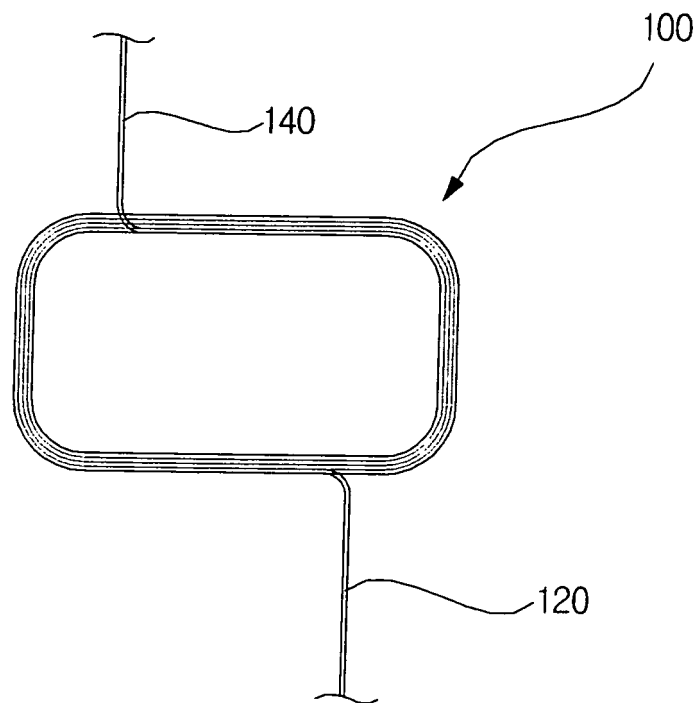


FIG. 6

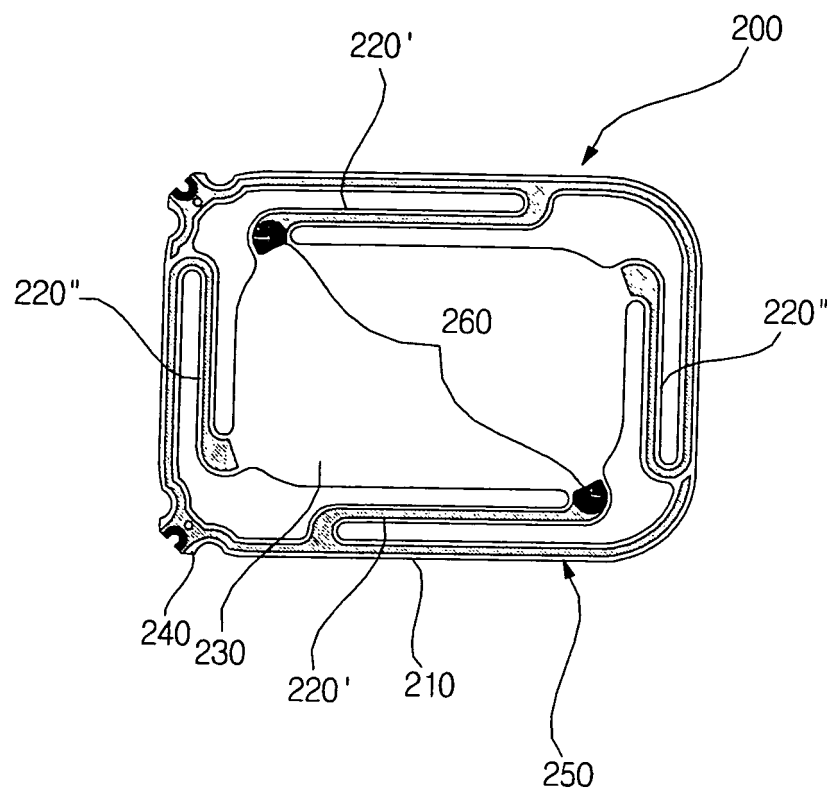


FIG. 7

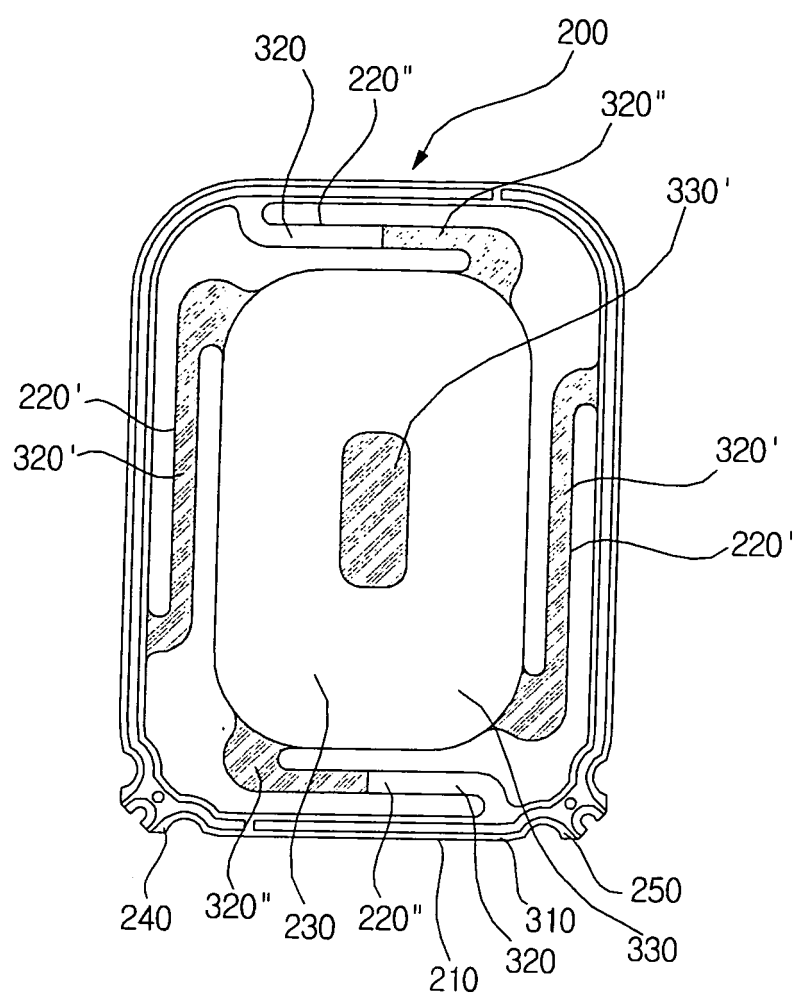


FIG. 8

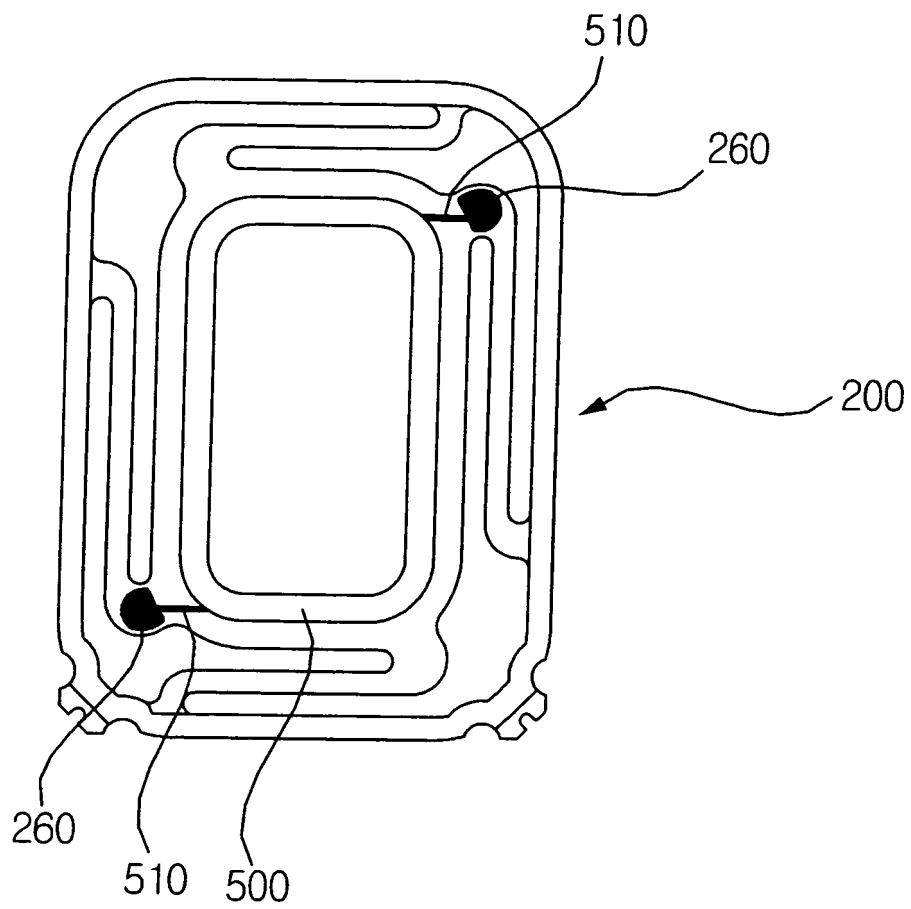


FIG. 9

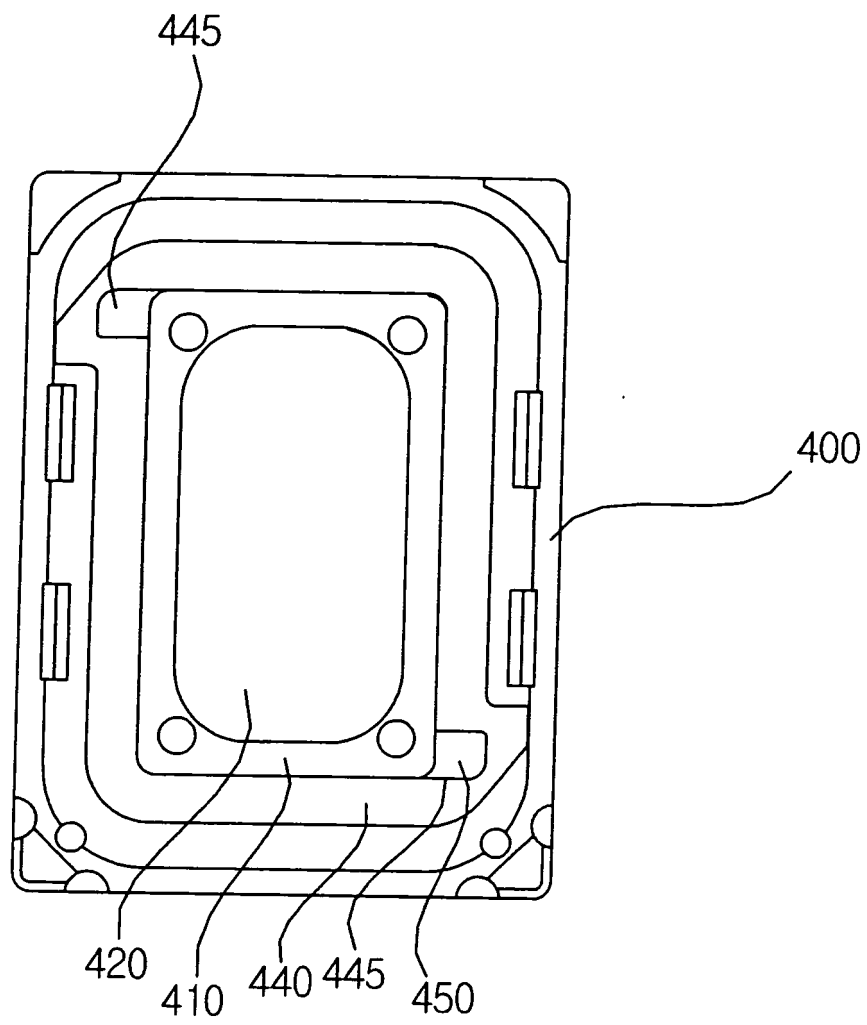
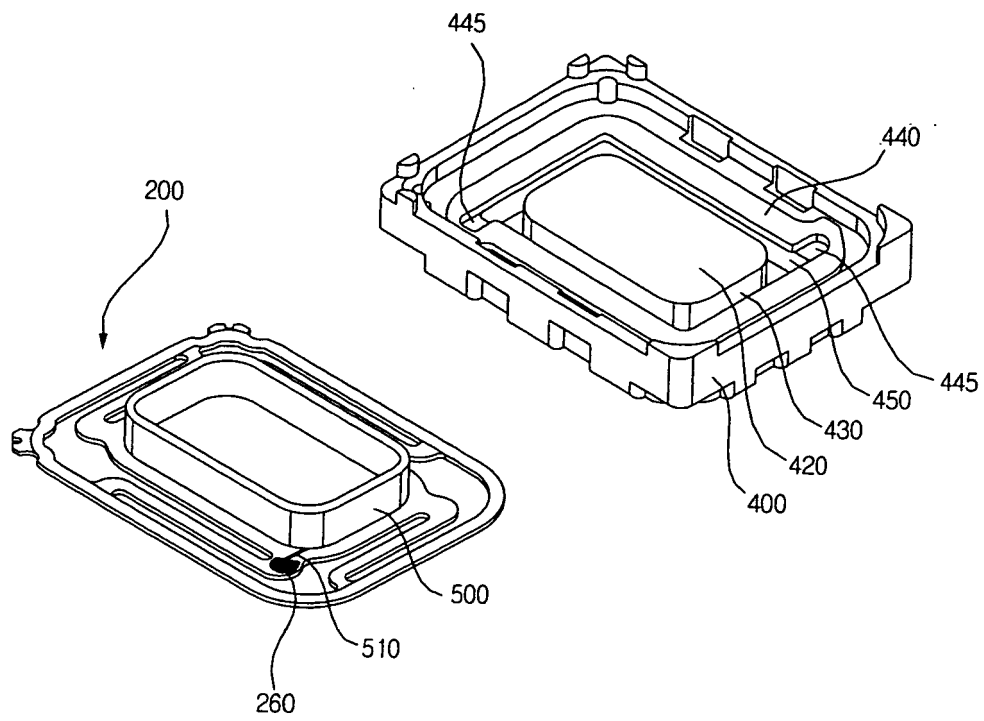


FIG. 10



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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