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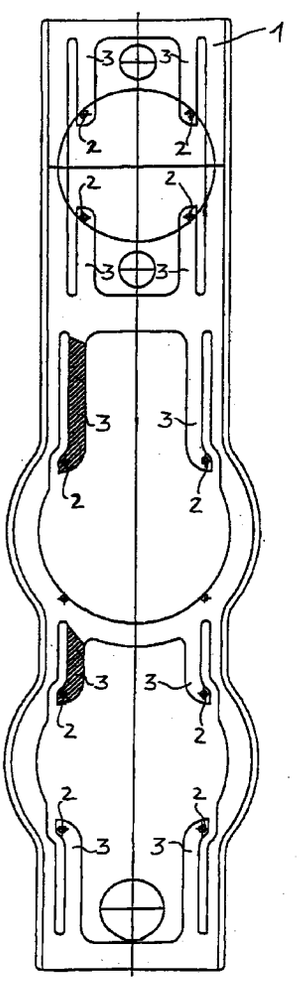
(71) Applicant:
SONY-WEGA PRODUKTIONS GmbH
70736 Fellbach (DE)

(72) Inventor: **Knackert, Stefan**
70734 Fellbach (DE)

(74) Representative:
Müller, Frithjof E., Dipl.-Ing.
Patentanwälte
MÜLLER & HOFFMANN,
Innere Wiener Strasse 17
81667 München (DE)

(54) Loudspeaker grille detachably mounted on a loudspeaker enclosure

(57) A Loudspeaker device according to the present invention comprising a loudspeaker or loudspeaker enclosure and a loudspeaker grille (1) detachably mounted thereon is characterized in that magnets (2) are holding said loudspeaker grille (1) on the loudspeaker or loudspeaker enclosure. Preferably either said magnets (2) or their respective counterparts are attached spring mounted on the loudspeaker grille (1) or on the loudspeaker or loudspeaker enlosure to compensate manufacturing tolerances.



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Description

The present invention relates to loudspeaker devices comprising a loudspeaker or a loudspeaker enclosure and a loudspeaker grille detachably mounted thereon.

The loudspeaker grille which serves to protect the loudspeaker horns of speaker systems is usually detachable mounted on the loudspeaker enclosures of high end loudspeakers. The loudspeaker grille should be removed during listening so that the high fidelity reproduction of sound signals will not be disturbed.

A conventional loudspeaker grille that can be detachably mounted on a loudspeaker enclosure comprises a pin fixedly attached to each edge of the grille frame. These pins can be inserted into corresponding catchers fixed in the front of the speaker enclosure to mount the loudspeaker grille on the loudspeaker enclosure. A catcher is normally a round plastic part with a diameter of approximately 1 cm and a hole in the center to insert the respective pin of the grille frame. Conventional floor standing speaker systems may need six to eight of these catchers to properly mount the loudspeaker grille on the loudspeaker enclosure.

The disadvantage of this method to detachably mount the loudspeaker grille to the loudspeaker enclosure is that it is not always easy to align all pins with all holes of the respective catchers to be able to mount the loudspeaker grille to the loudspeaker enclosure. Furtheron, it is very likely that during insertion and the removing procedure one or more of the pins will break off due to a tilt insertion or removal. Additionally, the six to eight additional black holes in the front of the loudspeaker enclosure that are created by the catchers are negatively influencing the design of the loudspeaker enclosure.

It is the object of the present invention to provide a loudspeaker device comprising a loudspeaker or loudspeaker enclosure and a loudspeaker grille detachably mounted thereon that does not have the disadvantages described above.

According to the present invention, such a loudspeaker device is characterized In that the loudspeaker grille is held by at least one magnet on the loudspeaker or the loudspeaker enclosure.

Further preferred embodiments of the invention are defined in the subclaims.

The loudspeaker device according to the present invention does not need additional catchers or other holes in the front of the loudspeaker enclosure where the loudspeaker grille should be detachably mounted. In fact, in certain embodiments of the invention, the loudspeaker enclosure does not need any modifications and does not have any additional attached parts thereon and can be equipped with a loudspeaker grille. According to the present invention it is possible that a respective grille frame that is manufactured with more or less the same effort as a conventional one, can be detachably mounted to every loudspeaker enclosure that does not need to have special catchers or holding devices.

The loudspeaker grille itself does not need any pins that can break off during awkward usage. The mounting of a loudspeaker grille according to the invention on a loudspeaker or loudspeaker enclosure according to the invention is just done by holding the loudspeaker grille in the correct position against the loudspeaker enclosure and leaving it there, since it will stick on the loudspeaker enclosure by magnetic force.

Therefore, great advantages are achieved in the handling of the loudspeaker grille and in the design of the loudspeaker enclosure.

The above and other objects, features and advantages of the invention will become more apparent from the following detailed description taken in conjunction with the accompanying only figure.

The only figure shows a frame of a loudspeaker grille according to one embodiment of the present invention.

The exemplatory loudspeaker frame 1 is a wooden multilayer board with a thicknesss of 6 mm. This frame has basically the same shape as the front of the corresponding loudspeaker enclosure. Holes with approximately the same diameter as the respective loudspeaker basket are milled in positions corresponding to the respective loudspeakers. These holes exclude the areas of the fixing screws of the loudspeakers. These areas serve as the tip of a latch 3 milled out of the wooden multilayer board. At the tip of each latch 3, i.e. in a position corresponding to the head of each fixing screw of the loudspeakers, a magnet 2 is fixed that is covered with a self-adhesive felt sticker. The diameter of the magnet should be similar to or bigger than the diameter of the head of the respective fixing screw. The number of the magnets depends on the absolute size and weight of the loudspeaker grille and the magnetic force of each of the magnets. It is not necessary that each fixing screw has a magnet in a corresponding position on the loudspeaker grille.

The radius at the tip of each of the latches is approximately the double radius as the one from the magnet which will be used. The radius depends on the processing equipment to manufacture the frame of the loudspeaker grille and on the strength of its material. Basically, it has to be determined so that it is big enough to hold the magnet or counterpart of the magnet and so that the latch will not break during the fabrication.

The latches are long enough to allow the magnet to move within $\pm$ 0.5 mm to compensate tolerances of the mounting depth of the screws.

The length of the latches has to be determined experimentally for each different type of wood used to fabricate the frame of the loudspeaker grille, since every type of wood has a different stiffness. Further, the length is dependent on the thickness of the frame of the loudspeaker grille.

With this construction, it is possible that every mag-

net will touch the corresponding screw and therewith can apply its whole magnetic force. Since every magnet Is covered with a felt sticker, the heades of the screws won't be scratched. It would be possible that the effective magnetic force is not strong enough, if the magnets would not be spring mounted on the frame of the loudspeaker grille, because then not every magnet sticks on its respective counterpart, since the manufacturing tolerances do not guarantee that every magnet or counterpart has always the same mounting height. Therefore it is possible that the loudspeaker grille will not stick on or fall off the loudspeaker enclosure.

To prevent the loudspeaker grille from eventually slipping vertically away from the loudspeaker enclosure, the frame of the loudspeaker grille can comprise a border that is in contact with the top surface of the loudspeaker enclosure or a tongue that is in contact with any edge of the loudspeaker enclosure when the loudspeaker grille is mounted.

Other than the above configurations are also possible, e.g. the magnets can have positions corresponding to other magnetic parts of the respective loudspeaker frame or loudspeaker enclosure. It is further possible that only plates made of magnetic material can be fixed to the tip of each latch 3 and magnets can be attached to the loudspeaker enclosure or magnetic screws can be used to fix the loudspeakers at the loudspeaker enclosure. It is also feasible that the loudspeaker grille is not mounted on a loudspeaker enclosure, but on a single loudspeaker. Furtheron, it is possible that the magnet or the magnetic counterpart is fixedly attached to the loudspeaker grille and the respective magnetic counterpart or magnet corresponding thereto is spring mounted on the loudspeaker or loudspeaker enclosure.

Claims

1. Loudspeaker device comprising a loudspeaker or loudspeaker enclosure and a loudspeaker grille (1) detachably mounted thereon, **characterized in that** at least one magnet (2) is holding said loudspeaker grille (1) on the loudspeaker or loudspeaker enclosure.

2. Loudspeaker device according to claim 1, **characterized in that** said at least one magnet (2) is respectively attached spring mounted on the loudspeaker grille (1) and has a respective counterpart where it can stick on that is made of magnetic material and fixed on the loudspeaker or loudspeaker enlosure.

3. Loudspeaker device according to claim 1, **characterized in that** said at least one magnet (2) is respectively fixed on the loudspeaker or loudspeaker enlosure and has a respective counterpart where it can stick on that is made of magnetic material and attached spring mounted on the loudspeaker grille (1).

4. Loudspeaker device according to claim 2 or 3, **characterized in that** said loudspeaker grille (1) comprises a leaf spring.

5. Loudspeaker device according to claim 4, **characterized in that** said leaf spring is a moveable latch (3) that is a part of said loudspeaker grille (1).

6. Loudspeaker device according to claim 4 or 5, **characterized in that** said latch (3) has a length dependent on the thickness and stiffness of its material so that the magnet (2) or the counterpart fixed to said latch (3) can move within a predetermined range to compensate the tolerances of the mounting depth of the counterpart or the magnet fixed on the loudspeaker or the loudspeaker enclosure, when said loudspeaker grille (1) is mounted on said loudspeaker or loudspeaker enclosure.

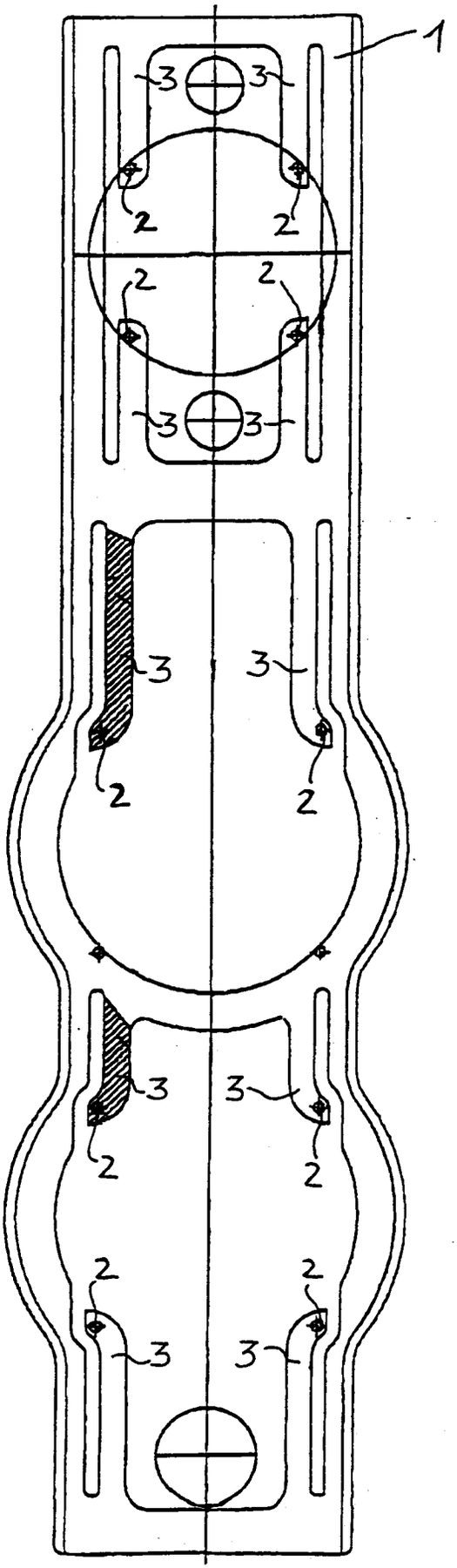
7. Loudspeaker device according to claim 6, **characterized in that** said predetermined range is ± 0,5 mm.

8. Loudspeaker device according to anyone of claims 2 and 4 to 7, **characterized in that** a screw head of a screw that is fixing a respective loudspeaker to the loudspeaker enclosure serves as counterpart.

9. Loudspeaker device according to anyone of claims 2 and 4 to 7, **characterized in that** magnetic material of the respective loudspeaker frame serves as counterpart.

10. Loudspeaker device according to anyone of claims 2 to 9, **characterized in that** said at least one magnet (2) or said counterpart is covered with a felt sticker.

11. Loudspeaker device according to anyone of the preceeding claims, **characterized in that** said loudspeaker grille (1) is held by 10 magnets (2) on the loudspeaker or loudspeaker enclosure.


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EUROPEAN SEARCH REPORT

Application Number
EP 97 10 7326

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
Y A	US 3 952 834 A (SOMA ET AL.) * column 1, line 7-12 * * column 2, line 17 - column 3, line 2 * ---	1-3,9,11 4,5,8	H04R1/02
Y A	US 5 113 968 A (LEMMON) * column 1, line 42-56 * * column 2, line 36-49 * * column 2, line 65-68 * * figure 1 * ---	1-3,9,11 4,5,8	
Y A	US 3 842 980 A (KUSHNER) * column 1, line 2-7 * * column 1, line 18-31 * * column 2, line 20 - column 3, line 23 * ---	1-3,9,11 6,7,10	
Y A	US 4 802 523 A (SCHOLTEN ET AL.) * column 1, line 4-7 * * column 1, line 42-55 * * column 2, line 43-64 * * figures 1,2 * -----	1-3,9,11 6,7,10	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

H04R
H01F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	29 September 1997	Zanti, P

CATEGORY OF CITED DOCUMENTS

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