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(54) **MOUNTING ARRANGEMENT FOR A LOUDSPEAKER GRILLE**

(57) A mounting arrangement comprises a frame (10) configured to accommodate a speaker grille (184), at least one guiding element (202) connected to the frame (10), wherein each of the at least one guiding element (202) is configured to be inserted into a corresponding first counterpart (222) that is connected to a loudspeaker enclosure (30), wherein, when the at least one guiding element (202) is inserted into the corresponding first counterpart (222), the frame (10) is fixated at least in a first direction or plane with respect to the loudspeaker enclosure (30), and at least one fastening element (204)

connected to the frame (10), wherein each of the at least one fastening element (204) is configured to be inserted into a corresponding second counterpart (224) that is connected to the loudspeaker enclosure (30), wherein, when the at least one fastening element (204) is inserted into the corresponding second counterpart (224), the frame (10) is fixated at least in a second direction or plane with respect to the loudspeaker enclosure (30), wherein the second direction or plane is different from the first direction or plane.

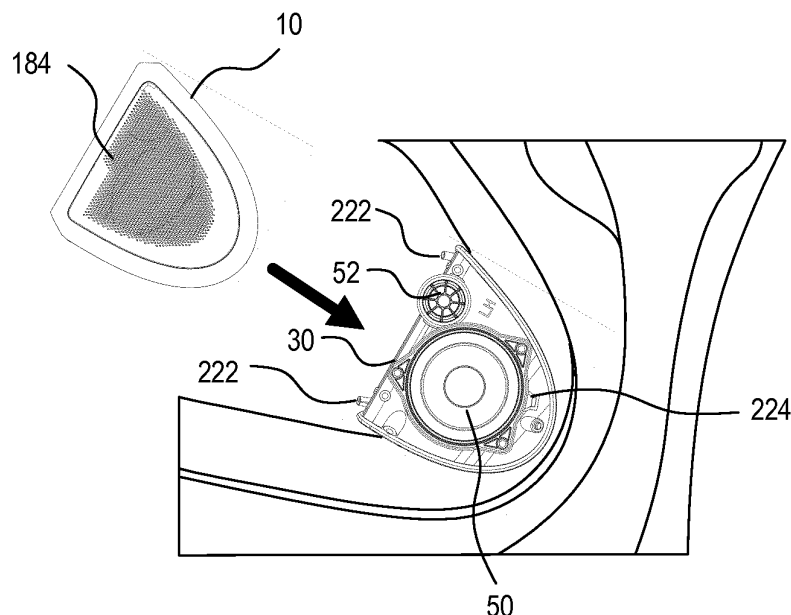


FIG 16

Description

TECHNICAL FIELD

[0001] The disclosure relates to a mounting arrangement for a loudspeaker grille, in particular for a loudspeaker grille of a loudspeaker arrangement inside a vehicle.

BACKGROUND

[0002] Loudspeaker arrangements usually comprise a plurality of different components. A loudspeaker enclosure usually accommodates one or more loudspeakers. The loudspeaker enclosure may be mounted on a wall, e.g., on a panel in a passenger compartment of a vehicle. The loudspeaker enclosure often is screwed on a wall, for example. A loudspeaker grille is mounted in front of the at least one loudspeaker. Especially in the automotive industry, it is often crucial that the different parts of a loudspeaker assembly may be assembled in a fast and cost effective way. Further, consumers expect the loudspeaker arrangement to have an appealing look.

SUMMARY

[0003] A mounting arrangement includes a frame configured to accommodate a speaker grille, at least one guiding element connected to the frame, wherein each of the at least one guiding elements is configured to be inserted into a corresponding first counterpart that is connected to a loudspeaker enclosure, wherein, when the at least one guiding element is inserted into the corresponding first counterpart, the frame is fixated at least in a first direction or plane with respect to the loudspeaker enclosure, and at least one fastening element connected to the frame, wherein each of the at least one fastening elements is configured to be inserted into a corresponding second counterpart that is connected to the loudspeaker enclosure, wherein, when the at least one fastening element is inserted into the corresponding second counterpart, the frame is fixated at least in a second direction or plane with respect to the loudspeaker enclosure, wherein the second direction or plane is different from the first direction or plane.

[0004] A loudspeaker enclosure configured to accommodate at least one loudspeaker includes at least one first counterpart, wherein each of the at least one first counterparts is configured to receive a corresponding guiding element that is connected to a frame, wherein the frame is configured to accommodate a speaker grille, and wherein, when the at least one guiding element is inserted into the corresponding first counterpart, the frame is fixated at least in a first direction or plane with respect to the loudspeaker enclosure. The loudspeaker enclosure further includes at least one second counterpart, wherein each of the at least one second counterparts is configured to receive a corresponding fastening

element that is connected to the frame, wherein, when the at least one fastening element is inserted into the corresponding second counterpart, the frame is fixated at least in a second direction or plane with respect to the loudspeaker enclosure, wherein the second direction or plane is different from the first direction or plane.

[0005] A loudspeaker arrangement includes a loudspeaker enclosure configured to accommodate at least one loudspeaker, a frame configured to accommodate a speaker grille, at least one guiding element connected to the frame, wherein each of the at least one guiding elements is configured to be inserted into a corresponding first counterpart that is connected to the loudspeaker enclosure, wherein, when the at least one guiding element is inserted into the corresponding first counterpart, the frame is fixated at least in a first direction or plane with respect to the loudspeaker enclosure, and at least one fastening element connected to the frame, wherein each of the at least one fastening elements is configured to be inserted into a corresponding second counterpart that is connected to the loudspeaker enclosure, wherein, when the at least one fastening element is inserted into the corresponding second counterpart, the frame is fixated at least in a second direction or plane with respect to the loudspeaker enclosure, wherein the second direction or plane is different from the first direction or plane.

[0006] Other systems, methods, features and advantages will be or will become apparent to one with skill in the art upon examination of the following detailed description and figures. It is intended that all such additional systems, methods, features and advantages be included within this description, be within the scope of the invention and be protected by the following claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] The method may be better understood with reference to the following description and drawings. The components in the figures are not necessarily to scale, emphasis instead being placed upon illustrating the principles of the invention. Moreover, in the figures, like referenced numerals designate corresponding parts throughout the different views.

Figure 1 schematically illustrates an example of a loudspeaker arrangement.

Figure 2 schematically illustrates a further example of a loudspeaker arrangement.

Figure 3, including Figures 3A and 3B schematically illustrates an example of a loudspeaker arrangement in an unassembled state and in an assembled state.

Figure 4 schematically illustrates a front view of an exemplary loudspeaker enclosure.

Figure 5, including Figures 5A to 5C, schematically

illustrates an exemplary loudspeaker enclosure, a detailed view of an exemplary fastening element, and a detailed view of an exemplary guiding element.

Figure 6, including Figures 6A to 6C, schematically illustrates a front view, a side view and a rear view of an exemplary frame for a loudspeaker arrangement.

Figure 7 schematically illustrates a detailed view of a fastening element.

Figure 8 schematically illustrates a loudspeaker arrangement comprising a frame and a loudspeaker enclosure according to an example.

Figure 9 schematically illustrates a detailed view of a fastening element and a corresponding counterpart according to an example.

Figure 10, including Figures 10A and 10B, schematically illustrates a side view and a rear view of a loudspeaker enclosure of a loudspeaker arrangement according to another example.

Figure 11, including Figures 11A to 11C, schematically illustrates a front view, a side view and a rear view of an exemplary frame for a loudspeaker arrangement.

Figure 12 schematically illustrates an exploded view of an exemplary frame for a loudspeaker arrangement.

Figure 13 schematically illustrates an exploded view of a frame including a loudspeaker grille according to one example.

Figure 14, including Figures 14A to 14C, schematically illustrates a front view, a side view and a rear view of an exemplary frame including a loudspeaker grille.

Figure 15 schematically illustrates an exploded view of a loudspeaker enclosure including a plurality of loudspeakers.

Figure 16 schematically illustrates a loudspeaker enclosure and corresponding frame mounted in a vehicle according to one example.

Figure 17, including Figures 17A to 17C, schematically illustrates an exemplary loudspeaker arrangement including a frame and a loudspeaker enclosure in an unassembled state.

DETAILED DESCRIPTION

[0008] Referring to Figure 1, a loudspeaker arrangement is schematically illustrated. In particular, Figure 1 schematically illustrates a side view of a loudspeaker arrangement. The loudspeaker arrangement comprises a loudspeaker enclosure 30 and a frame 10. The loudspeaker enclosure 30 is configured to accommodate at least one loudspeaker (loudspeaker not specifically illustrated in Figure 1). The frame 10 is configured to accommodate a speaker grille (speaker grille not specifically illustrated in Figure 1). When the frame 10 is connected to the loudspeaker enclosure 30 and a speaker grille is attached to the frame 10, the speaker grille 10 is arranged in front of the at least one loudspeaker arranged within the loudspeaker enclosure 30.

[0009] The frame 10 comprises a connection element 20 that is configured to connect the frame 10 to the loudspeaker enclosure 30. The loudspeaker enclosure 30 may be mounted to a wall 40, for example. According to one example, the wall 40 is a panel in a passenger compartment of a vehicle. For example, the loudspeaker enclosure 30 may be screwed to the wall 40. However, the loudspeaker enclosure 30 may also be connected to the wall 40 in any other suitable way.

[0010] The loudspeaker enclosure 30 may comprise a counterpart 22 for the connection element 20. That is, when connecting the frame 10 to the loudspeaker enclosure 30, the connection element 20 may be inserted into the counterpart 22, or may be connected to the counterpart 22 in any other suitable way. This is schematically illustrated in Figure 2. In Figures 1 and 2, the different elements are illustrated in an unassembled state.

[0011] Now referring to Figure 3, one example of a loudspeaker arrangement is schematically illustrated. A guiding element 202 is connected to the frame 10. The guiding element 202 is configured to be inserted into a corresponding first counterpart 222, which is connected to the loudspeaker enclosure 30. As is exemplarily illustrated with an arrow in Figure 3A, the guiding element 202 may be inserted into the corresponding first counterpart 222 in a vertical direction y. This, however, is only an example. The guiding element 202 does not necessarily have to be inserted into the corresponding counterpart 222 vertically. It is also possible that the guiding element 202 be inserted into the corresponding first counterpart 222 in a direction that is beveled with respect to the vertical direction y. Figure 3B illustrates the guiding element 202 that is inserted into the corresponding counterpart 222.

[0012] The guiding element 202 may not be permanently coupled to the first counterpart 222. It may be possible to disconnect the guiding element 202 from the first counterpart 222 by moving the guiding element 202 upwards in the vertical direction y. However, when the guiding element 202 is inserted into the first counterpart 222, the frame 10 is fixated with respect to the loudspeaker enclosure 30 in at least one first (e.g., horizontal) direction

x. Generally, the frame 10 may be fixated with respect to the loudspeaker enclosure 30 in a horizontal plane, for example.

[0013] Further, a fastening element 204 is connected to the frame 10 which is arranged distant to the guiding element 202. The fastening element 204 is configured to be inserted into a corresponding second counterpart 224, which is connected to the loudspeaker enclosure 30. As is exemplarily illustrated with an arrow in Figure 3A, the fastening element 202 may be inserted into the corresponding second counterpart 224 in a horizontal direction x. This, however, is only an example. The fastening element 204 does not necessarily have to be inserted into the corresponding second counterpart 224 horizontally. It is also possible that the fastening element 204 be inserted into the corresponding second counterpart 224 in a direction that is beveled with respect to the horizontal direction x. Figure 3B illustrates the fastening element 204 that is inserted into the corresponding second counterpart 224. According to one example, the fastening element 204 may snap into the corresponding second counterpart 224 (e.g., snap-in or snap mechanism).

[0014] The fastening element 204 may not be permanently coupled to the second counterpart 224. It may be possible to disconnect the fastening element 204 from the second counterpart 224, e.g., by moving the fastening element 204 in the horizontal direction x away from the loudspeaker enclosure 30. However, when the fastening element 204 is inserted into the second counterpart 224, the frame 10 is fixated with respect to the loudspeaker enclosure 30 in at least one second (e.g., vertical) direction y. Generally, the frame 10 may be fixated with respect to the loudspeaker enclosure 30 in a vertical plane, for example. The fastening element 204 fixates the frame 10 with respect to the loudspeaker enclosure 30 in at least one second direction that is different from the first direction.

[0015] Therefore, after inserting the guiding element 202 into the corresponding first counterpart 222 and inserting the fastening element 204 into the corresponding second counterpart 224, the frame 10 is securely fastened to the loudspeaker enclosure 30. The guiding element 202, the fastening element 204 as well as the first counterpart 222 and the second counterpart 224 may be arranged on the frame 10 and the loudspeaker enclosure, respectively, such that they are no longer visible after mounting the frame 10 to the loudspeaker enclosure 30. Further, the frame 10 may completely cover the loudspeaker enclosure 30 such that the loudspeaker enclosure 30 and any connection mechanism that is used to mount the loudspeaker enclosure 30 on a wall 40 are no longer visible. The loudspeaker arrangement, therefore, has a very appealing look after mounting the frame 10 on the loudspeaker enclosure 30.

[0016] Figure 3 schematically illustrates a frame 10 with only one guiding element 202 and only one fastening element 204. This, however, is only an example. The arrangement may also comprise more than one guiding

element 202 and more than one fastening element 204. The number of first counterparts 222 may correspond to the number of guiding elements 202, and the number of second counterparts 224 may correspond to the number of fastening elements 224.

[0017] Now referring to Figure 4, a front view of an exemplary loudspeaker enclosure is illustrated. The loudspeaker enclosure 30 comprises a casing 301. In the example of Figure 4, a first loudspeaker 50 and a second loudspeaker 52 are arranged inside the casing 301. The first loudspeaker 50 may be a mid-range speaker, and the second loudspeaker 52 may be a tweeter, for example. This, however, is only an example. Generally, at least one loudspeaker may be arranged inside the casing 301. The at least one loudspeaker may be any kind of loudspeaker such as a mid-range speaker, full-range speaker, woofer, subwoofer, or tweeter, for example. Any other types of loudspeakers are also possible. The casing 301 may comprise at least one opening. Each of the at least one loudspeakers may be arranged in one of the openings such that a first side of the loudspeaker faces an inside of the casing 301, and a second side of the loudspeaker faces an outside of the casing 301. According to one example, the first loudspeaker 50 may be mounted on the casing 301 by means of screws 600. This, however, is only an example. The first loudspeaker 50 and any other additional loudspeakers may be mounted on the casing 301 in any suitable way.

[0018] The loudspeaker enclosure 30 illustrated in Figure 4 comprises two first counterparts 222. The first counterparts 222 are arranged in an upper section of the casing 301. The loudspeaker enclosure 30 further comprises one second counterpart 224 arranged in a lower section on the front of the loudspeaker enclosure 30, distant to the first counterparts 222. "Upper section" and "lower section" in this context, however, only refer to the positions with regard to the loudspeaker enclosure 30 as illustrated, not with regard to the ground surface. When mounted in a vehicle, for example, the loudspeaker enclosure 30 illustrated in Figure 4 may be turned or rotated in any suitable way to fit in the interior of the vehicle.

[0019] Figure 5A schematically illustrates a front view of a loudspeaker enclosure 30 without the loudspeakers 50, 52 arranged inside the casing 301. However, Figure 5A does not illustrate a complete loudspeaker enclosure 30 or casing 301, but merely a front baffle of the loudspeaker enclosure 30 (see, e.g., Figure 15). Any other parts of the loudspeaker enclosure 30 (e.g., a rear panel 34 or a rear enclosure 36, see Figure 15) are not specifically illustrated in Figure 5A. The loudspeaker enclosure 30 may generally be shaped to fit in the interior of a vehicle. Generally, however, the loudspeaker enclosure 30 may have any other suitable shape. The loudspeaker enclosure 30 illustrated in Figure 4 may be mounted on the righthand side of a passenger compartment, and the loudspeaker enclosure 30 (front baffle) illustrated in Figure 5A may be mounted on the left-hand side of a passenger compartment, for example.

[0020] As is schematically illustrated in the section view D-D in Figure 5B, the fastening element 204 may snap into the second counterpart 224 when arranged in its final mounting position. Figure 5B illustrates the fastening element 204 before snapping into the second counterpart 224. The direction of movement of the fastening element 204 is illustrated with an arrow in Figure 5B. The second counterpart 224 may comprise a recess that the fastening element 204 may snap into.

[0021] Now referring to Figure 5C, an exemplary guiding element 202 and corresponding first counterpart 222 are illustrated. The first counterpart 222 in the example of Figure 5C comprises a sleeve. That is, the first counterpart 222 may comprise a hollow tubular part or bushing which allows the guiding element 202 to be inserted into the first counterpart 222. The guiding element 202 may comprise a pin, for example, which fits into the first counterpart 222. That is, a diameter d1 of the pin may correspond to or may be slightly smaller than a diameter d2 of the inside of the first counterpart 222. The guiding element 202 may have a rounded cross-section, as is exemplarily illustrated in Figure 5C. Any other suitable cross-sections such as oval, rectangular, square, or diamond shaped, for example, are also possible.

[0022] Now referring to Figure 6, a frame 10 is exemplarily illustrated, wherein Figure 6A illustrates a front view, Figure 6B illustrates a side view, and Figure 6C illustrates a rear view of the frame 10. The at least one guiding element 202 may be arranged on a rear side of the frame 10. In Figure 6 two guiding elements 202 are exemplarily illustrated. As can be seen in Figure 6B, the guiding elements 202 may form an angle α with respect to the front face of the frame 10. This angle α may be between 5° and 60°, for example.

[0023] The frame 10 may comprise a first opening 54 and a second opening 56. When the frame 10 is connected to a loudspeaker enclosure 30, the first opening 54 may be arranged in front of a first loudspeaker (e.g., first loudspeaker 50 as illustrated in Figure 4), and the second opening 56 may be arranged in front of a second loudspeaker 52 (e.g., second loudspeaker 52 as illustrated in Figure 4). This allows sound produced by the loudspeakers to freely pass the frame 10. As will be described in more detail further below, a speaker grille may be arranged in front of the openings 54, 56, for example. The speaker grille may be configured to protect the loudspeakers and any other audio components while at the same time allowing the sound produced by the loudspeakers to clearly pass. The number of openings in the frame 10 generally may correspond to the number of loudspeakers in the loudspeaker enclosure 30.

[0024] Now referring to the section view C-C of Figure 7 (concerning section view C-C, see also Figure 6C), a fastening element 204 is illustrated in further detail. The fastening element 204 may comprise a rigid flap, for example, that is mounted to the frame 10. For example, the fastening element 204 may be glued or welded to the frame 10. It is, however, also possible that the frame 10

and the fastening element 204 are integrally formed as a single piece.

[0025] Now referring to Figure 8, a side view of a frame 10 and one part of a loudspeaker enclosure 30 is schematically illustrated. In Figure 8, a part of a loudspeaker enclosure 30 is illustrated, which may form a front panel or front face of the loudspeaker enclosure 30. A rear enclosure and/or rear gasket are not specifically illustrated in Figure 8. The frame 10 illustrated in Figure 8 corresponds to the frame 10 as illustrated in Figure 6. Arrows in Figure 8 indicate the directions in which the guiding elements 202 are inserted into the first counterparts (not visible in Figure 8), and in which a fastening element 204 is inserted into a second counterpart 224.

[0026] Each of the second counterparts 224 may comprise a guiding section 2242 and a recess 2244, for example. This is schematically illustrated in the enlarged detail view A of Figure 9 (see also Figure 5A for detail view A). A fastening element 204 may be inserted into the guiding section 2242 first. The guiding section 2242 may be funnel-shaped and may taper towards the recess 2244. When moving the fastening element 204 through the guiding element 2242, it is guided towards the recess 2244. This allows for certain tolerances when inserting the fastening element 204 into the second counterpart 224. This is indicated in short arrows in Figure 9. When mounting the frame 10 to the loudspeaker enclosure 30, it is therefore not necessary to exactly position the fastening element 204 with respect to the recess 2244 of the corresponding second counterpart 224. A certain misalignment is permissible, as the mouth formed by the guiding section 2242 has larger dimensions than the recess 2244 and also has larger dimensions than the fastening element 204.

[0027] Now referring to Figure 10, an example of a loudspeaker enclosure 30 is exemplarily illustrated, with Figure 10A illustrating a side view and Figure 10B illustrating a rear view of the loudspeaker enclosure 30. Loudspeakers that are arranged inside the loudspeaker enclosure 30 are not freely visible in Figure 10 as they are concealed behind the parts of the loudspeaker enclosure 30. The loudspeaker enclosure 30 may comprise further openings 70. According to one example, electrical connections 80 that are needed to connect the loudspeakers to a vehicle battery, for example, may pass through such further openings 70. One or more first counterparts 222 may be arranged at an upper end of the loudspeaker enclosure. Each of the first counterparts 222 may be beveled with respect to a front panel of the loudspeaker enclosure 30 at a respective angle β . The front panel of the loudspeaker enclosure 30 may be arranged parallel to a vertical axis, for example. This, however, is only an example. The loudspeaker enclosure 30 illustrated in Figure 10 may generally be rotated in any suitable way to suitably arrange it in a passenger compartment of a vehicle.

[0028] Now referring to Figure 11, an exemplary frame 10 is illustrated, with Figure 11A illustrating a front view,

Figure 11B illustrating a side view, and Figure 11C illustrating a rear view of the frame 10. The frame 10 may comprise a front section 12 and a rear section 14. The front section 12 and the rear section 14 are arranged at a defined angle γ with respect to each other. The defined angle γ may be between 20° and 70°, for example. The front section 12 and the rear section 14 may be connected to each other by means of a bent connecting element 16. In an assembled state, the front section 12 may cover a front side of a loudspeaker enclosure 30, and the rear section 14 may at least partly cover a rear side of a loudspeaker enclosure 30. This is exemplarily illustrated in Figure 17, wherein Figure 17A illustrates a front view, Figure 17B illustrates a side view, and Figure 17C illustrates a rear view of a frame 10 and a loudspeaker enclosure 30 in an unassembled state. A direction in which the frame 10 is mounted to the loudspeaker enclosure 30 is illustrated by bold arrows in Figure 17.

[0029] A first fastening element 204 may be connected to the front section 12, and a second fastening element 204 may be connected to the rear section 14. The first fastening element 204 is not specifically illustrated in Figure 11. At least one guiding element 202 may be connected to the bent connecting element 16. The guiding elements 202 may be arranged on a side of the bent connecting element 16 (e.g., inside of bent connecting element) which faces the loudspeaker enclosure 30, when the frame 10 is mounted to the loudspeaker enclosure 30. Therefore, no guiding elements 202 are visible in the views illustrated in Figure 11 as they are shielded by the other components of the frame 10.

[0030] In the example illustrated in Figure 11, the front section 12 of the frame 10 comprises a single opening. Therefore, in the view of Figure 11A it is possible to see the rear section 16 through the opening. As has been described above, however, it is also possible that the front section 12 of the frame comprises more than one opening.

[0031] According to another example, as is schematically illustrated in Figure 12, a cover 18 may be mounted to the frame 10. The cover 18 may partly cover the opening of the frame 10 and may comprise any number of openings 54, 56, wherein the number of openings 54, 56 in the cover 18 may correspond to the number of loudspeakers that are arranged in the corresponding loudspeaker enclosure 30 (loudspeaker enclosure 30 not illustrated in Figure 12). As is exemplarily illustrated in Figure 12, it is also possible that one or more guiding elements 202 be mounted on or integrally formed by the cover 18. In this case, the frame 10 itself may not comprise any further guiding element 202. The cover 18 may be regarded as being part of the frame 10, even if the cover is formed as a separate part and is subsequently mounted on the frame 10. The frame 10 may be mounted on a loudspeaker enclosure 30 after mounting the cover 18 on the frame 10, for example.

[0032] Figure 13 schematically illustrates an exploded view of an exemplary frame 10 and further components

that may be mounted on the frame 10. As has been described with respect to Figure 12 above, a cover 18 may be mounted on the frame 10, the cover 18 comprising one or more guiding elements 202. A loudspeaker grille 184 may be mounted on the cover 18 and to the frame 10. When the frame 10 is mounted on a loudspeaker enclosure 30, the grille 184 that is mounted on the frame 10 may cover the at least one loudspeaker arranged in the loudspeaker enclosure 30. Optionally, a layer of scrim material, fabric, or cloth 182 may be arranged between the loudspeaker grille 184 and the cover 18.

[0033] In the examples illustrated in Figures 11, 12 and 13, the frame 10 together with one or more of the additional components, e.g., cover 18 and loudspeaker grille 184, may also be referred to as grille assembly, front enclosure or upper enclosure, for example.

[0034] According to one example, the loudspeaker grille 184 may comprise stainless steel. The cover 18 may comprise the material PC-GF 10 (material number 2311), for example. PC-GF 10 is a polycarbonate injection molding type comprised of 10% glass fiber. The frame 10 may be comprised of carbon fiber, for example. Any other suitable materials, however, are also possible. For example, the different elements may be comprised of any suitable carbon, metallic or plastic material.

[0035] According to one example, the loudspeaker grille 184 may comprise a plurality of projections 902. In an unassembled state, the projections 902 may extend perpendicular to a back side of the loudspeaker grille 184. When mounting the loudspeaker grille 184 on the cover 18 or the frame 10, the projections 902 may be inserted into corresponding holes 904 in the cover 18 or in the frame 10. Subsequently, the projections 902 may be bent in order to fixate the loudspeaker grille 184 to the cover 18 or to the frame 10. The projections 902 may be bent by 90°, for example, in order to prevent them from sliding back out of the respective holes 904. After bending the projections 902 by 90°, they may be essentially parallel to the back side of the loudspeaker grille 184.

[0036] Now referring to Figure 14, the frame 10 and further elements 18, 182, 184 are illustrated in an assembled state, with Figure 14A illustrating a front view, Figure 14B illustrating a side view and Figure 14C illustrating a rear view. The frame 10 illustrated in Figure 14 is similar to the frame of Figure 11, however, with the loudspeaker grille 184 mounted on the frame 10. A cover 18 and an optional layer of scrim material, fabric, or cloth 182 are not visible in Figure 14, as they are covered by other elements.

[0037] Now referring to Figure 15, an exploded view of an exemplary loudspeaker enclosure 30 and two loudspeakers 50, 52 as well as electrical connections 80 is schematically illustrated. The loudspeaker enclosure 30 may comprise a plurality of separate components. For example, the loudspeaker enclosure 30 may comprise a rear gasket 32, a rear panel 34, and a rear enclosure 36, forming a main enclosure in an assembled state. A first

and a second loudspeaker 50, 52 may be arranged in this main enclosure. For example, the loudspeakers 50, 52 may be mounted on a front baffle 38. The front baffle 38 may be mounted on the main enclosure and may form a front panel of the main enclosure. The front baffle 38 may comprise openings for receiving the loudspeakers. One or more loudspeakers 50, 52 may be fixated to the front baffle 38 by means of screws 88, for example. It is also possible to fixate the rear panel to the rear enclosure 36 by means of screws 86, for example. Electrical connections 80 may extend through openings in the rear enclosure 36, as has been described with respect to Figure 10 above.

[0038] Figure 16 exemplarily illustrates a loudspeaker arrangement in a passenger compartment of a vehicle. Only a small detail of the interior of a vehicle is schematically illustrated in Figure 16. The general form of the loudspeaker enclosure 30 and the frame 10 may be adapted to the shape of the interior equipment. The loudspeaker enclosure 30 may be assembled and all necessary components (e.g., loudspeakers 50, 52) may be arranged in the loudspeaker enclosure 30. The pre-assembled loudspeaker enclosure 30 may then be mounted inside the vehicle. As has been described above, the loudspeaker enclosure 30 may be mounted on a panel of the passenger compartment by means of screws, for example (screws not specifically illustrated in Figure 16).

[0039] The frame 10 may also be pre-assembled if the separate elements are not formed integrally. According to one example, the loudspeaker grille 184 may be formed integrally with the frame 10 or with a cover 18. The frame 10 may then be mounted on the loudspeaker enclosure 30 in a very easy and fast way. The frame 10 may be held in one hand by a technician assembling the frame 10 to the loudspeaker enclosure 30. The frame 10 may be placed on the loudspeaker enclosure 30 such that each of the at least one guiding element 202 is aligned with the corresponding first counterpart 222 of the loudspeaker enclosure 30. The guiding elements 202 may then be inserted into the corresponding first counterparts 222 in a direction schematically illustrated by a bold arrow in Figure 16. When the guiding elements 202 are aligned with the corresponding first counterparts 222, each of the at least one fastening element 204 is automatically aligned with the corresponding second counterpart 224. As has been described with respect to Figure 9 above, certain tolerances are allowed, as the fastening elements 204 may be first aligned with guiding sections 2242 of the second counterparts 224. When the guiding elements 202 are inserted into the first counterparts 222, the fastening elements 204 are, at the same time, inserted into the second counterparts 224 until they snap into their final position in the recesses 2244.

[0040] Once the frame 10 is mounted on the loudspeaker enclosure 30, a user is not able to perceive any fastening means. That is, the loudspeaker arrangement has a very pleasant appearance. Generally, the user is not able to remove the frame 10 from the loudspeaker

enclosure 30 easily. Special tools may be necessary to remove the fastening elements 204 from their final resting positions in the recesses 2244 of the second counterparts 224. A user, therefore, cannot unintentionally damage the loudspeaker arrangement without deliberately applying force.

[0041] While various embodiments of the invention have been described, it will be apparent to those of ordinary skill in the art that many more embodiments and implementations are possible within the scope of the invention. In particular, the skilled person will recognize the interchangeability of various features from different embodiments. Although these techniques and systems have been disclosed in the context of certain embodiments and examples, it will be understood that these techniques and systems may be extended beyond the specifically disclosed embodiments to other embodiments and/or uses and obvious modifications thereof. Accordingly, the invention is not to be restricted except in light of the attached claims and their equivalents.

[0042] The description of embodiments has been presented for purposes of illustration and description. Suitable modifications and variations to the embodiments may be performed in light of the above description or may be acquired from practicing the methods. The described arrangements are exemplary in nature, and may include additional elements and/or omit elements. As used in this application, an element recited in the singular and proceeded with the word "a" or "an" should be understood as not excluding plural of said elements, unless such exclusion is stated. Furthermore, references to "one embodiment" or "one example" of the present disclosure are not intended to be interpreted as excluding the existence of additional embodiments that also incorporate the recited features. The terms "first," "second," and "third," etc. are used merely as labels, and are not intended to impose numerical requirements or a particular positional order on their objects. The described systems are exemplary in nature, and may include additional elements and/or omit elements. The subject matter of the present disclosure includes all novel and non-obvious combinations and sub-combinations of the various systems and configurations, and other features, functions, and/or properties disclosed. The following claims particularly point out subject matter from the above disclosure that is regarded as novel and non-obvious.

Claims

1. A mounting arrangement comprising:

a frame (10) configured to accommodate a speaker grille (184),
at least one guiding element (202) connected to the frame (10), wherein each of the at least one guiding element (202) is configured to be inserted into a corresponding first counterpart (222)

- that is connected to a loudspeaker enclosure (30), wherein, when the at least one guiding element (202) is inserted into the corresponding first counterpart (222), the frame (10) is fixated at least in a first direction or plane with respect to the loudspeaker enclosure (30), and at least one fastening element (204) connected to the frame (10), wherein each of the at least one fastening element (204) is configured to be inserted into a corresponding second counterpart (224) that is connected to the loudspeaker enclosure (30), wherein, when the at least one fastening element (204) is inserted into the corresponding second counterpart (224), the frame (10) is fixated at least in a second direction or plane with respect to the loudspeaker enclosure (30), wherein the second direction or plane is different from the first direction or plane.
2. The mounting arrangement of claim 1, wherein
 - each of the at least one guiding element (202) comprises a pin, and
 - each of the at least one first counterpart (222) comprises a sleeve.
 3. The mounting arrangement of claim 1 or 2, wherein
 - each of the at least one fastening element (204) comprises a rigid flap, and
 - each of the at least one second counterpart (224) comprises a slot or groove.
 4. The mounting arrangement of any of claims 1 to 3, comprising exactly two guiding elements (202).
 5. The mounting arrangement of any of claims 1 to 4, wherein the frame (10) comprises a front section (12) and a rear section (14), wherein the front section (12) is configured to be arranged on a front side of the loudspeaker enclosure (30), and the rear section (14) is configured to be arranged on a rear side of the loudspeaker enclosure (30).
 6. The mounting arrangement of claim 5, wherein the front section (12) and the rear section (14) are arranged at a defined angle (γ) with respect to each other, wherein the defined angle (γ) is between 20° and 70°.
 7. The mounting arrangement of any of claims 5 and 6, wherein a first fastening element (204) is attached to the front section (12) of the frame (10), and a second fastening element (204) is attached to the rear section (14) of the frame (10).
 8. The mounting arrangement of any claims 5 to 7, wherein front section (12) of the frame (10) and the rear section (14) of the frame (10) are connected to each other by means of a bent connecting element (16), and wherein the at least one guiding element (202) is connected to the bent connecting element (16) and arranged between the front section (12) and the rear section (14).
 9. The mounting arrangement of any of the preceding claims, further comprising a speaker grille (184), wherein
 - the frame (10) comprises at least one opening; and
 - the speaker grille (184) is configured to cover the at least one opening and to let sound clearly pass through the speaker grille (184).
 10. The mounting arrangement of any of the preceding claims, wherein each of the at least one guiding element (202) is beveled at a defined angle (α) with respect to a front face of the frame (10), and wherein the defined angle (α) is between 5° and 60°.
 11. A loudspeaker enclosure (30) configured to accommodate at least one loudspeaker (50, 52), the loudspeaker enclosure (30) comprising:
 - at least one first counterpart (222), wherein each of the at least one first counterpart (222) is configured to receive a corresponding guiding element (202) that is connected to a frame (10), wherein the frame (10) is configured to accommodate a speaker grille (184), and wherein, when the at least one guiding element (202) is inserted into the corresponding first counterpart (222), the frame (10) is fixated at least in a first direction or plane with respect to the loudspeaker enclosure (30), and
 - at least one second counterpart (224), wherein each of the at least one second counterpart (224) is configured to receive a corresponding fastening element (204) that is connected to the frame (10), wherein, when the at least one fastening element (204) is inserted into the corresponding second counterpart (224), the frame (10) is fixated at least in a second direction or plane with respect to the loudspeaker enclosure (30), wherein the second direction or plane is different from the first direction or plane.
 12. The loudspeaker enclosure (30) of claim 11, wherein
 - each of the at least one guiding element (202) comprises a pin, and
 - each of the at least one first counterpart (222) comprises a sleeve.
 13. The loudspeaker enclosure of claim 11 or 12, where-

in

each of the at least one fastening element (204)
comprises a rigid flap, and
each of the at least one second counterpart (224) comprises a slot or groove 5

14. The loudspeaker enclosure of claim 13, wherein
each of the at least one second counterpart (224)
further comprises a guiding section (2242), wherein 10
each guiding section (2242) is funnel-shaped and
tapers towards a recess (2244) such that a fastening
element (204) that is inserted into the guiding section
(2242) is guided through the guiding section (2242)
towards the recess (2244). 15

15. A loudspeaker arrangement comprising:

a loudspeaker enclosure (30) configured to ac-
commodate at least one loudspeaker (50, 52), 20
a frame (10) configured to accommodate a
speaker grille (184),
at least one guiding element (202) connected to
the frame (10), wherein each of the at least one
guiding element (202) is configured to be insert- 25
ed into a corresponding first counterpart (222)
that is connected to the loudspeaker enclosure
(30), wherein, when the at least one guiding el-
ement (202) is inserted into the corresponding
first counterpart (222), the frame (10) is fixated 30
at least in a first direction or plane with respect
to the loudspeaker enclosure (30), and
at least one fastening element (204) connected
to the frame (10), wherein each of the at least
one fastening element (204) is configured to be 35
inserted into a corresponding second counter-
part (224) that is connected to the loudspeaker
enclosure (30), wherein, when the at least one
fastening element (204) is inserted into the cor-
responding second counterpart (224), the frame 40
(10) is fixated at least in a second direction or
plane with respect to the loudspeaker enclosure
(30), wherein the second direction or plane is
different from the first direction or plane.

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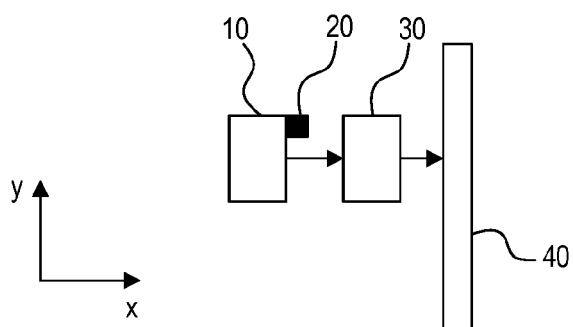


FIG 1

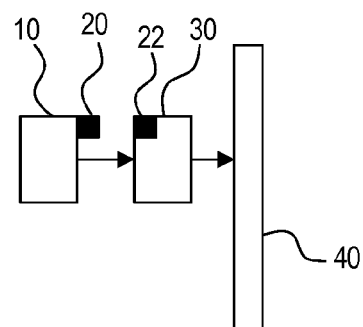


FIG 2

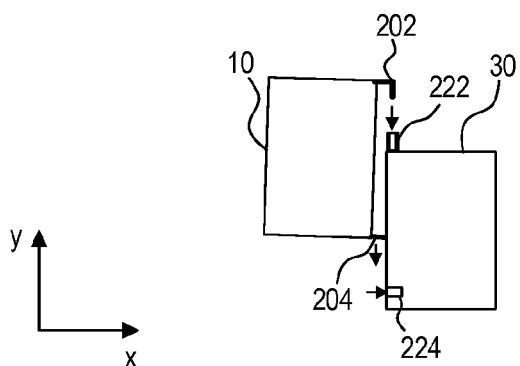


FIG 3A

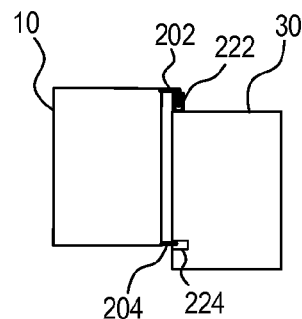


FIG 3B

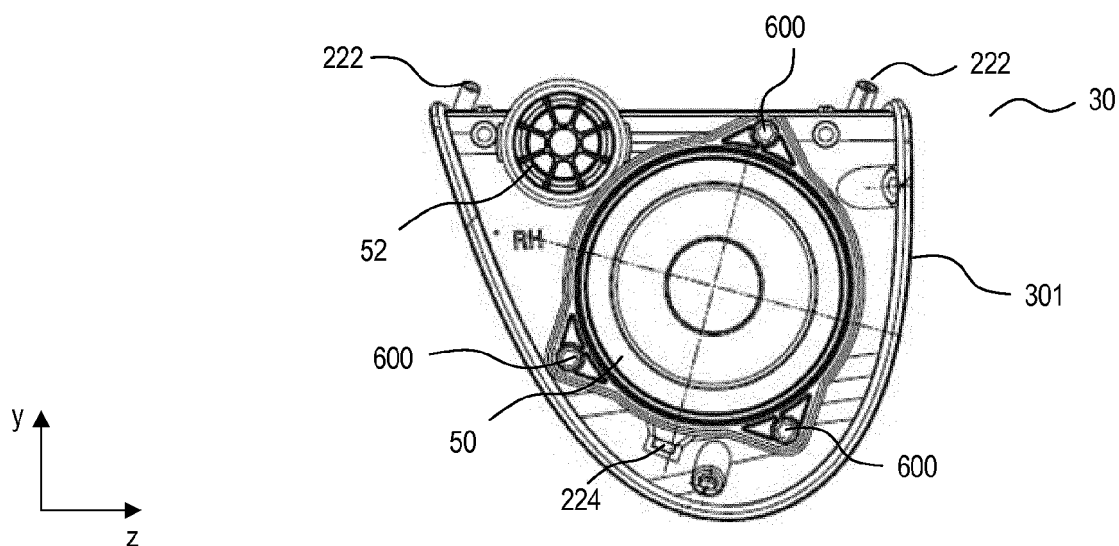
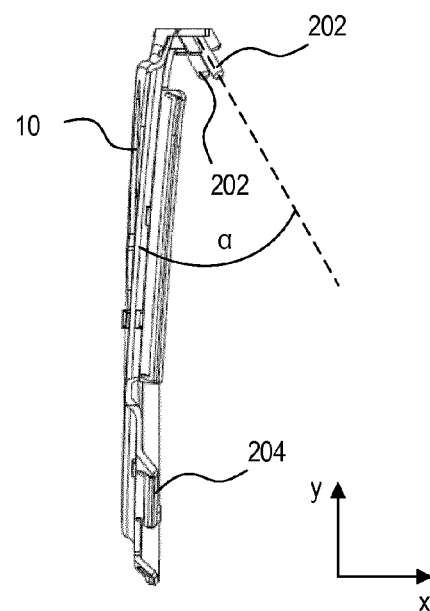
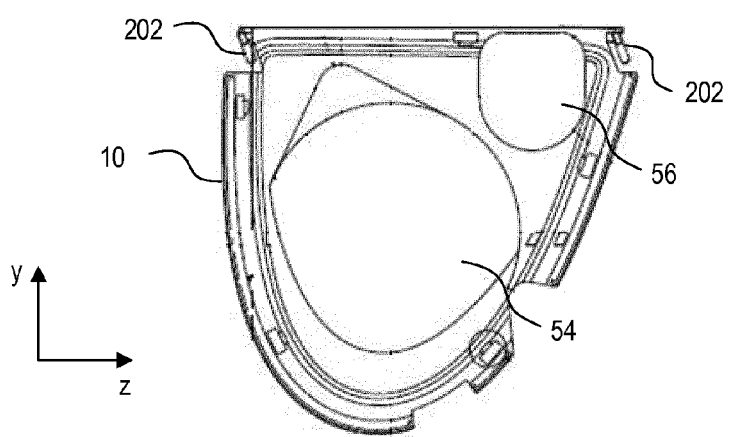
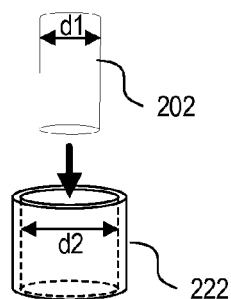
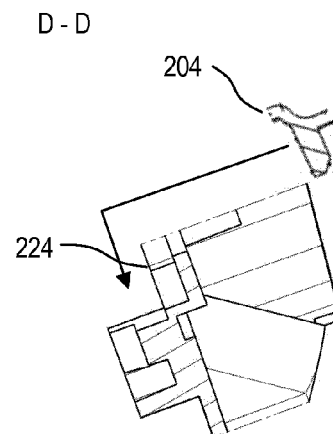
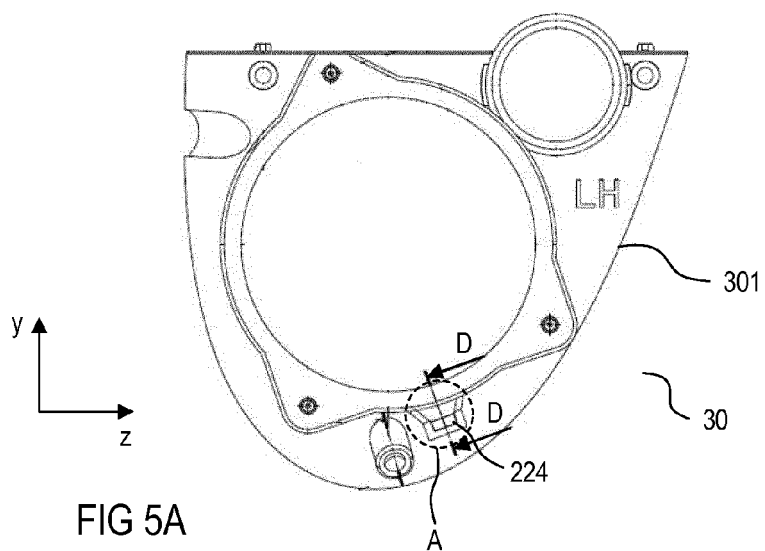
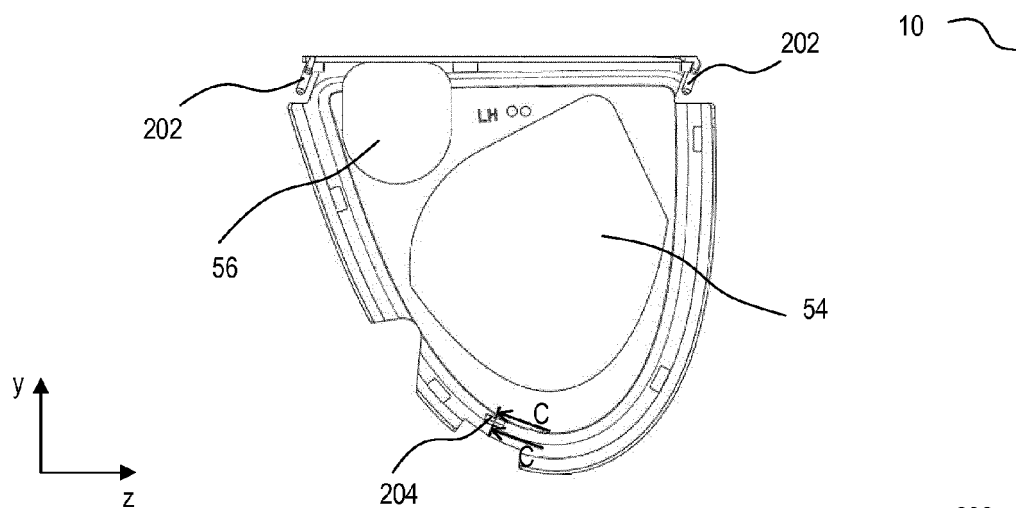
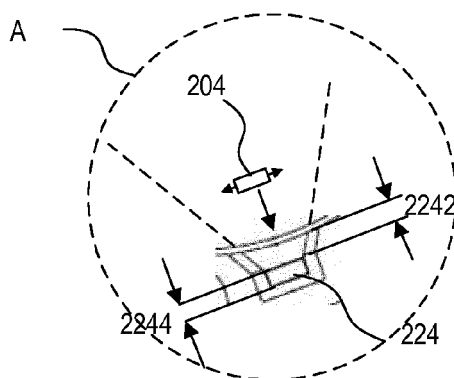
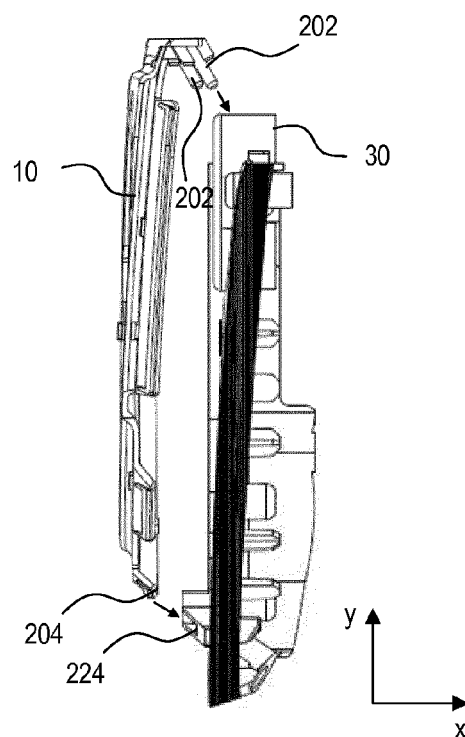


FIG 4





C - C



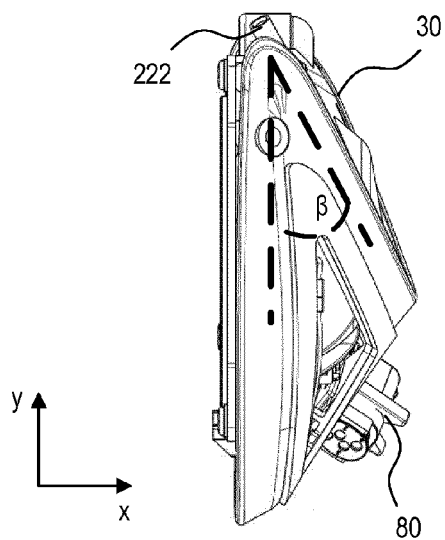


FIG 10A

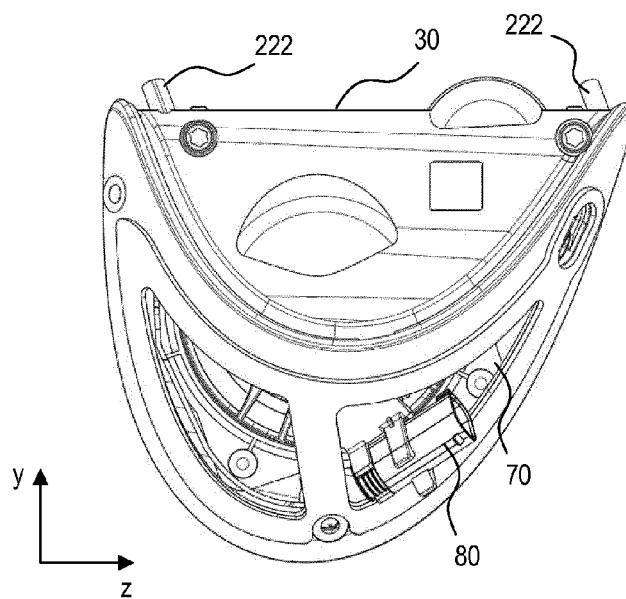


FIG 10B

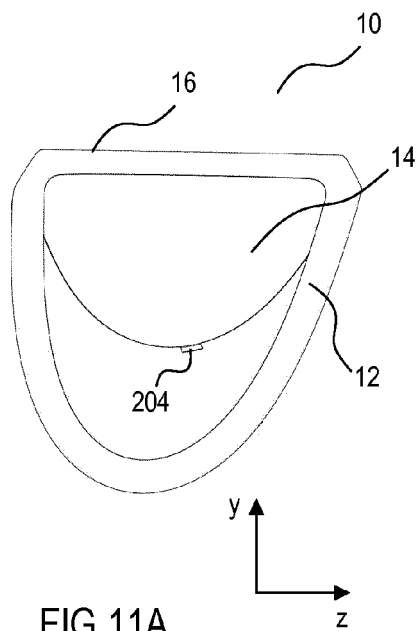


FIG 11A

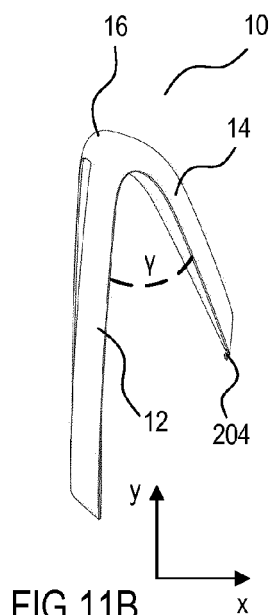


FIG 11B

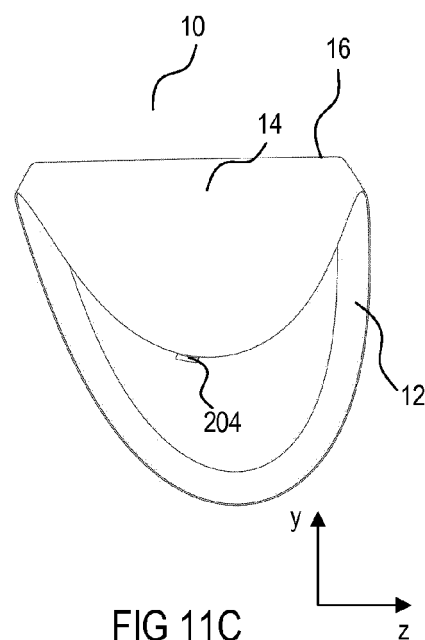


FIG 11C

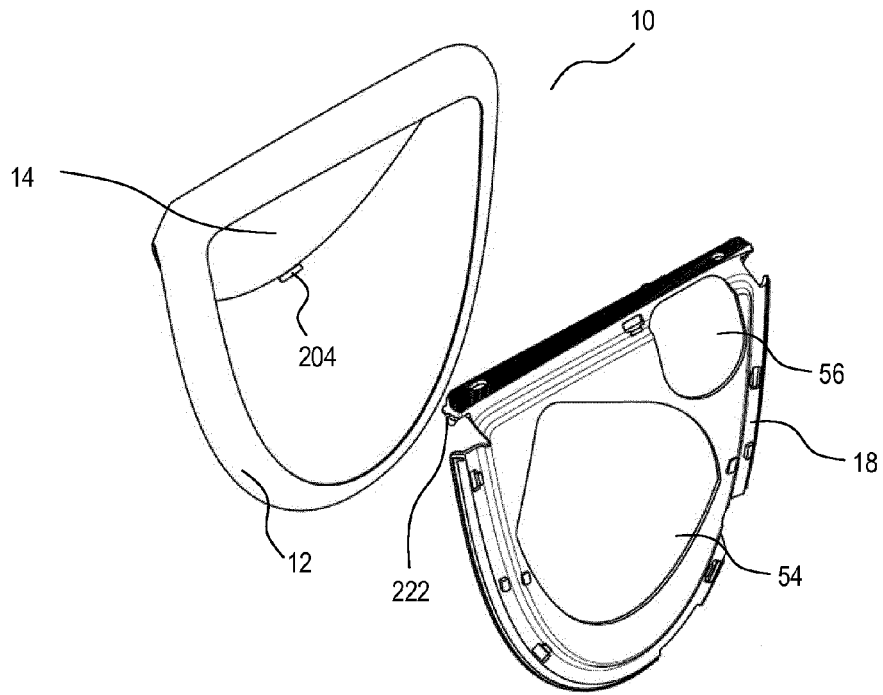


FIG 12

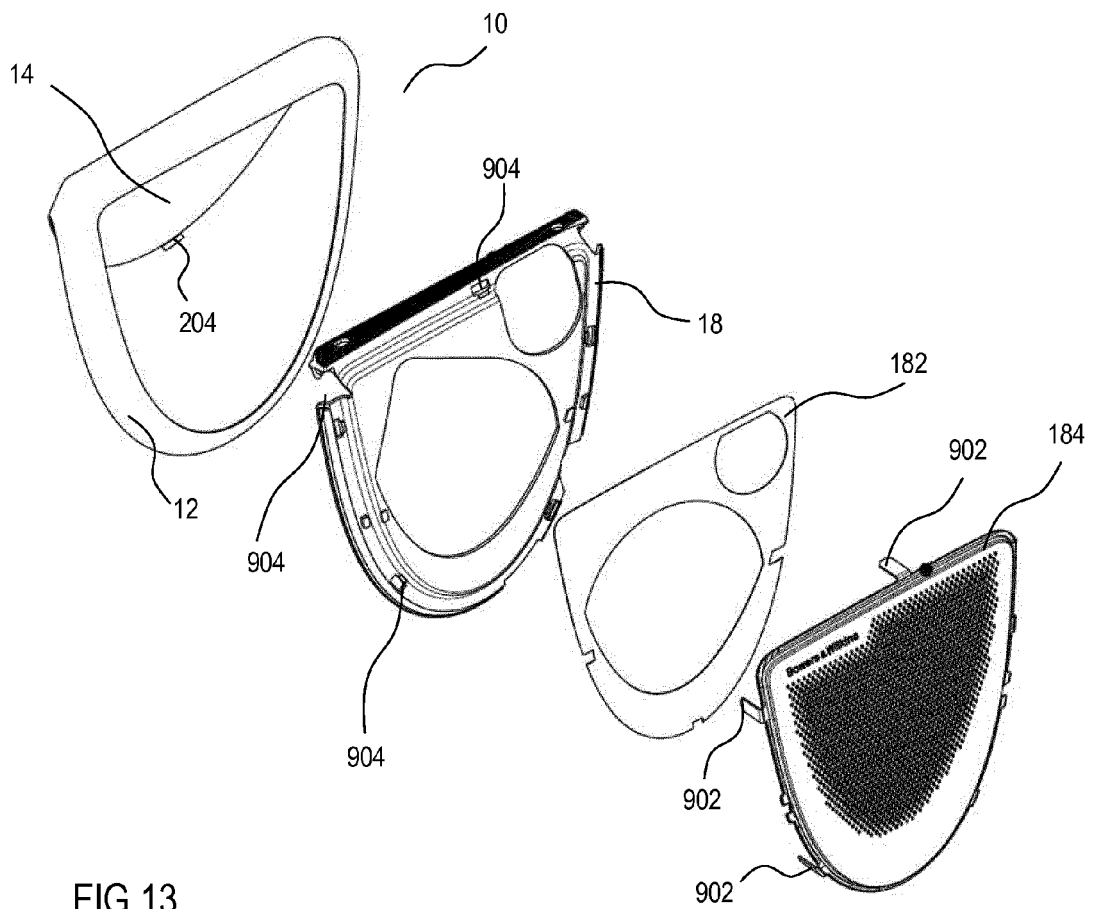


FIG 13

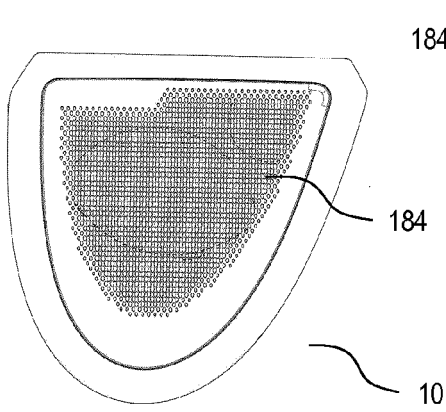


FIG 14A

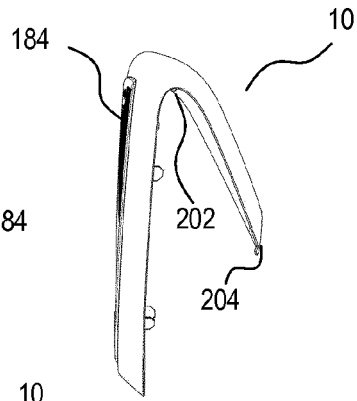


FIG 14B

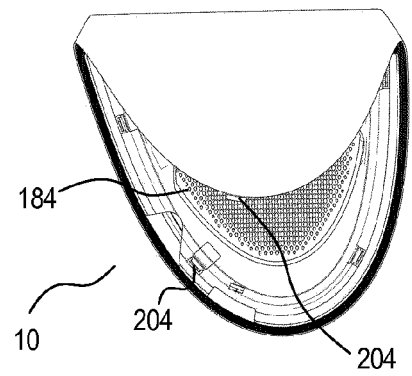


FIG 14C

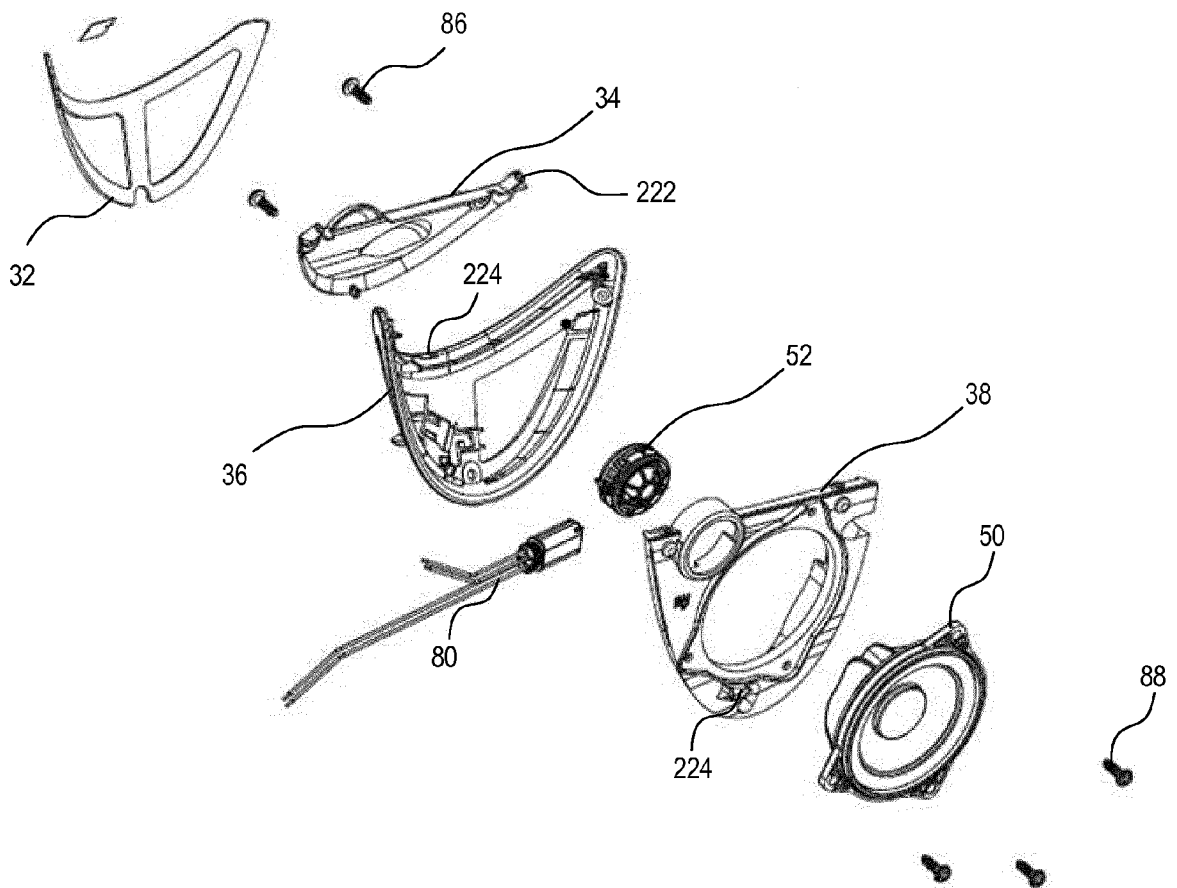


FIG 15

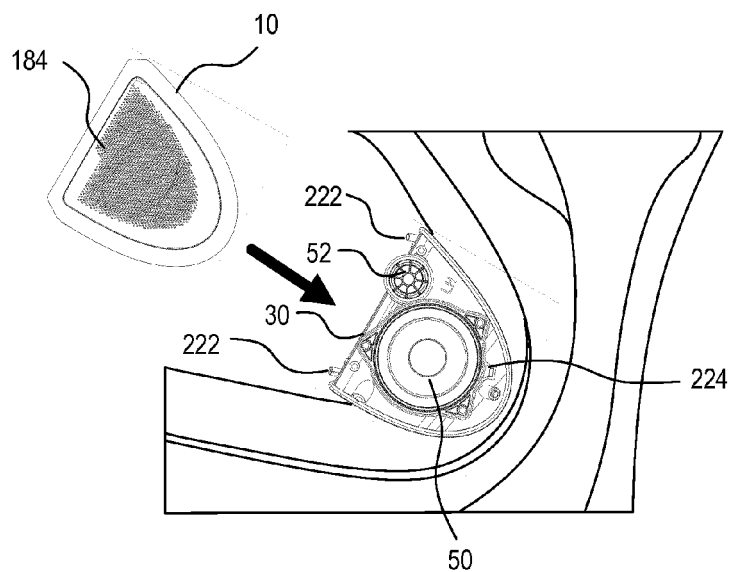


FIG 16

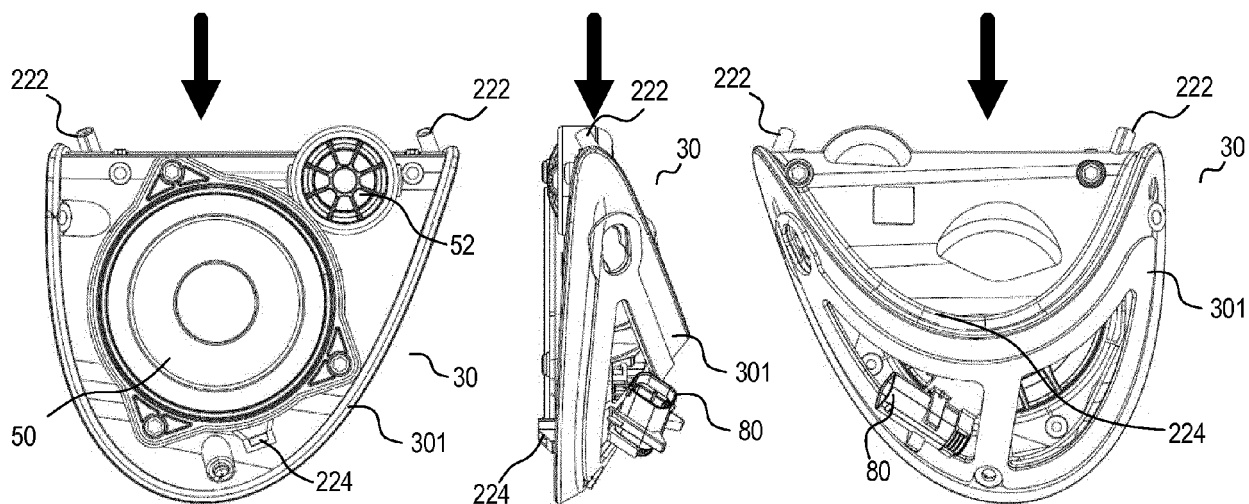
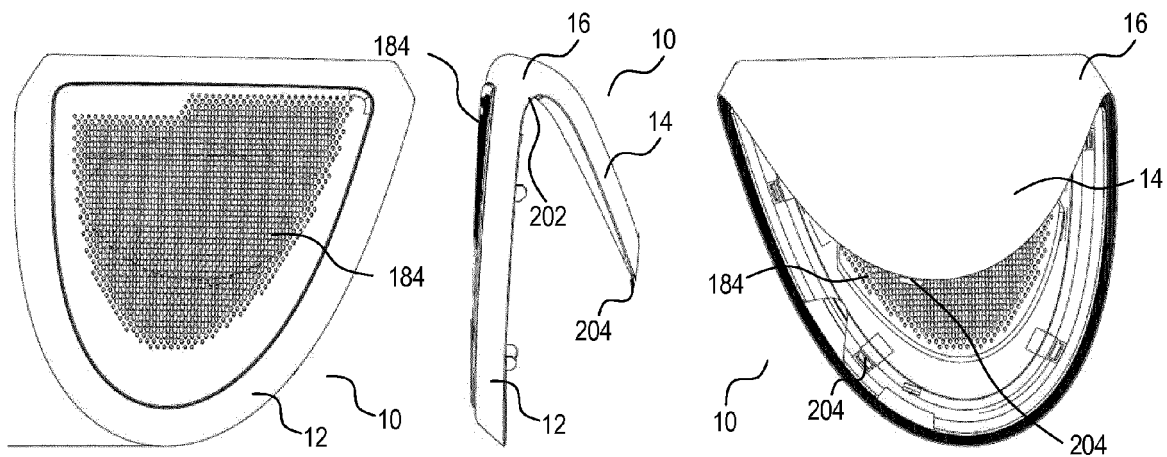


FIG 17A

FIG 17B

FIG 17C



EUROPEAN SEARCH REPORT

 Application Number
 EP 19 16 9139

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			H04R B60J
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 29 May 2019	Examiner Timms, Olegs
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			

EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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5 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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