(19) Europäisches Patentamt
European Patent Office
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(11) **EP 2 317 775 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
04.05.2011 Bulletin 2011/18

(51) Int Cl.:
H04R 7/18 *(2006.01)*

(21) Application number: **10012998.0**

(22) Date of filing: **18.01.2002**

(84) Designated Contracting States:
DE FR GB IT

(30) Priority: **19.01.2001 US 783837**

(62) Document number(s) of the earlier application(s) in accordance with Art. 76 EPC:
02704186.2 / 1 364 556

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Remarks:
This application was filed on 01-10-2010 as a divisional application to the application mentioned under INID code 62.

(54) **Speaker surround structure for maximizing cone diameter**

(57) The invention provides a loudspeaker comprising:
a basket (10) having an outer rim and a landing,
a cone (14A);
a surround-suspension (30) extending between the cone (14A) and the basket (10), said surround-suspension (30) having an attachment skirt and a fastening flange extending outwardly from the edge of the attachment skirt and being fastened adhesively to the landing of the basket and to a lower portion of the mounting adaptor; and
a mounting adaptor (32);
wherein said mounting adaptor (32) is positioned inside a peripheral region of the basket (10) between an inner wall of said outer rim of the basket (10) and an outer wall of said attachment skirt, wherein said mounting adaptor (32) forms a spacer between the main speaker frame and a panel interfacing the top horizontal surface of the mounting adaptor

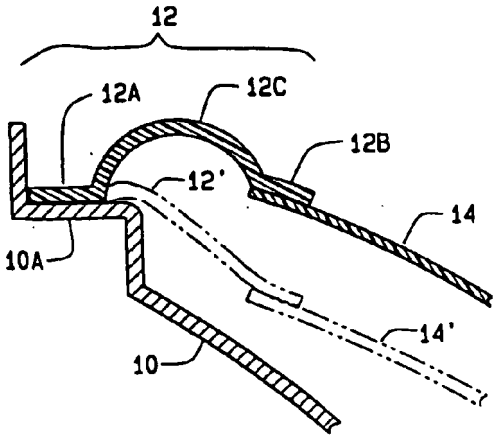

FIG. 1
PRIOR ART

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to the field of audio loudspeakers/transducers and more particularly to improvement of midrange and low frequency response of full range speakers in popular compact size categories.

BACKGROUND OF THE INVENTION

[0002] Compact speakers are categorized by outer dimensions, e.g., the diameter of a round speaker, while their main performance limitation, i.e., midrange and low frequency performance, is determined mainly by diaphragm area and excursion capability, i.e., the volume of air moved by the effective moving portion of the diaphragm acting as a piston.

[0003] Large quantities of small-sized speakers are used in vehicles such as cars, trucks, boats, aircraft, etc. Such speakers are generally designed to mechanically fit a particular mounting pattern used by vehicle manufacturers, typically including a main cutout and surrounding mounting holes, dimensioned according to standards originating from different world regions. Replacement speakers are generally required to fit the mounting pattern and space originally provided in the vehicle.

[0004] Round speakers having basket diameters in the 4"-7" size range are in extremely high quantity vehicular usage in the U.S. and throughout the world. Most of these in the 6"-7" range are made to either a JIS Japanese standard that specifies 6.18 inches (157 mm) diameter or a DIN German standard used in Europe that specifies 6.69 inches (170 mm) diameter.

[0005] A useful factor representing efficiency is obtained by comparing the cone area to the total projected basket area. This ratio is tabulated along with typical basket diameters and associated cone diameters in TABLE 1.

TABLE1 KEY DIMENSIONS OF POPULAR COMPACT SPEAKERS

Nominal	Version	Cone diam. (mm)	Basket diam. (mm)	Cone Area to Basket Area Ratio
4 inch		73	102.3	0.51
5¼ inch		92	129	0.51
6 ½ inch	JIS Japan	(a) 111.8	157	0.51
		(b) 115.3	157	0.54
	DIN Europe	119.3	170	0.49

[0006] TABLE 1 shows that conventional speaker structure typically provides a cone to basket area ratio of about 0.51. The (b) version of the JIS type represents an effort to upgrade part way toward the DIN cone sized and corresponding midrange and low frequency performance capability while retaining the smaller JIS basket size.

[0007] All practical speakers are subject to an inherent dropout of acoustic efficiency at a low-end cutoff frequency in inverse proportion to the cone area (for a given cone excursion). Thus, it is very beneficial to increase the cone diameter of full range speakers since each percent that the cone diameter can be increased yields more than double the percent increase in cone area. Accomplishing increased cone area without increasing the outer dimensions of the speaker basket, whether it is round, oval or another shape, is particularly beneficial to vehicular sound systems as well as in small personal radio/stereo players, multi-media computer systems, etc..

DISCUSSION OF RELATED KNOWN ART

[0008] FIG. 1 is a cross-section taken at an edge portion of a formed sheet-metal basket 10 of a typical loudspeaker of known art. A typical surround-suspension 12 has as its outwardly-extending peripheral portion a radial planar outer flange 12A by for adhesive attachment to a planar margin landing 10A in the peripheral region of basket 10, and has as its inwardly-extending peripheral portion a conical inner flange 12B for adhesive attachment to the cone 14, shown in part. The central arched flexible portion 12C of the annular surround suspension member 12 constrains cone 14 radially but allows it to vibrate in an axial direction when driven by the voice coil.

[0009] The position of the cone 14 and its surround-suspension 12 are shown in solid lines for the normal "at rest" condition. The displaced position of surround 12' and cone 14' is shown in dashed lines for a maximum driven condition at maximum downward cone excursion. Displacement of the arched portion 12C of the surround-suspension 12 provides an effective piston diameter that is somewhat larger than the cone diameter extending to a mid-region of the arched

portion 12C.

[0010] FIG. 1A is a cross-section of a basket 10A which, as an alternative to pressed sheet metal construction, is molded from plastic or cast from metal such as aluminum, and configured to form a landing as shown, equivalent to that of a pressed sheet metal basket as in FIG. 1, for adhesive attachment of the outer flange 12A of the surround-suspension 12.

[0011] U.S. patents 5,111,510 to Mitobe and 5,115,474 to Tsuchiya et al show cross-sectional drawings that represent typical conventional speaker surround-suspension structure. Their standard cone mounting configuration features an outwardly extending fastening flange on the surround-suspension, as shown in FIGs. 1 and 1A and as practiced in the great majority of conventional speakers.

[0012] U.S. Patent 5,867,583 to inventors Hazelwood, Espiritu and Jorgensen for TWIST-LOCK MOUNTABLE VERSATILE LOUDSPEAKER MOUNT discloses non-conventional mounting systems including special surround-suspension configurations that yield increased cone area to basket area ratios; e.g., enabling a DIN cone to be utilized in a JIS basket accomplished a cone area to basket area ratio of 0.58, i.e., more than 13% increase over that of conventional speakers (typically 0.51; refer to TABLE 1 above).

SUMMARY OF THE INVENTION

[0013] It is a primary object of the present invention to provide non-conventional mountings for the surround-suspension of cone-type speakers that enable the use of larger-than-conventional cone sizes and thus provide an increased cone area to basket area ratio, and accordingly enhance the midrange and low frequency performance of the speakers.

[0014] It is a further object to provide novel configuration and mounting systems wherein the surround-suspensions are configured in a manner to enable a larger cone area by occupying less space in the outer fastening region and yet provide at least equal the cone excursion capability available in a comparable conventional speaker.

[0015] It is a further object to provide embodiments that utilize standard speaker baskets of the formed sheet metal type as well as baskets that are molded from plastic or cast from metal such as aluminum.

[0016] It is a further object, in the special surround-suspension attachment configurations of the invention to provide a high level of adhesive attachment performance and reliability, e.g., by maximizing the interface area of adhesive attachment.

[0017] The above mentioned objects have been accomplished by the subject speaker of the present invention by utilizing a diaphragm of larger diameter than is used conventionally for the corresponding basket size, and by making the outer peripheral portion of the surround-suspension in a special configuration that retains the required resilience and capability of full excursion while enlarging the effective piston area substantially by deploying a larger cone and/or increasing the width of the flexible arched portion of the surround-suspension and thus increasing the effective vibrating area thereof.

[0018] Instead of the conventional planar shape of the surround-suspension outer attachment member extending radially outward from the flexible arched portion, in the novel departure of the present invention, the outer attachment member of the surround-suspension is made in the form of an axial skirt, i.e., generally tubular, extending rearwardly and dimensioned to fit closely inside a corresponding rim extending forwardly from the periphery of the basket, adhesively fastened at the interfacing region.

[0019] The axial skirt may be specially shaped to maximize the adhesive fastening area.

[0020] For various embodiments and versions, the basket may be of the type that is stamped from metal, similar to the conventional JIS speakers, or it may be of the type that is cast from metal or molded from suitable plastic material.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] The above and further objects, features and advantages of the present invention will be more fully understood from the following description taken with the accompanying drawings in which:

FIGs 1-9 each show a cross-sectional view of a rim region of a speaker.

FIG. 1 and FIG. 1A depict partial cross sections of typical conventional speakers.

FIGs. 2-9 depict partial cross section of speaker cone suspension systems structured in accordance with the present invention.

FIG. 2 depicts a partial cross section of a first embodiment of a suspension system of the present invention having a surround-suspension specially formed with an outer skirt, with its outer surface interfacing and adhesively attached to the inner surface of the flange at the basket rim.

FIG. 3 depicts a partial cross section of a second embodiment of a suspension system of the present invention.

FIG. 4 depicts a partial cross section of a third embodiment of a suspension system of the present invention.

FIG. 5 depicts a partial cross section of a fourth embodiment of a suspension system of the present invention.

FIG. 6 depicts a partial cross section of a fifth embodiment of a suspension system of the present invention.
FIG. 7 depicts a partial cross section of a sixth embodiment of a suspension system of the present invention.
FIG. 8 depicts a partial cross section of a seventh embodiment of a suspension system of the present invention.
FIG. 9 depicts a partial cross section of a eighth embodiment of a suspension system of the present invention.

DETAILED DESCRIPTION

[0022] FIGs. 1-9 each show a cross-sectional view of a basket rim region of a speaker.

[0023] FIGs. 1 and 1A depict the surround-suspension mounting and attachment configurations of typical conventional speakers using formed sheet metal or molded/cast baskets respectively, as discussed above.

[0024] FIGs. 2-9 depict different embodiments and versions of novel cone surround-suspensions configured in accordance with the present invention.

[0025] FIG. 2 depicts a basic embodiment of the present invention. A specially configured surround-suspension 16 is made with its outer attachment member formed as an axial skirt 16A extending rearwardly, constituting a basic departure from the conventional practice of attachment via a outwardly-extending radial-planar flange 12A as shown in FIGs. 1 and 1A.

[0026] The skirt 16A interfaces the inner surface of the basket rim and its lower edge rests on the planar margin landing The skirt 16A is adhesively attached at the interfacing surfaces. This basic embodiment can be utilized with a pressed sheet metal basket 10 as shown, or with a basket that is molded from plastic or cast from metal such as aluminum.

[0027] The increased size of cone 14A, i.e., increased diameter in the case of a round speaker, made possible by the present invention, is evident by comparing FIG. 2 with the conventional cone 14 in FIGs. 1 and 1A.

[0028] FIG. 3 depicts an embodiment that utilizes the specially shaped surround-suspension 16 as in FIG. 2; however, skirt 16A is fitted into an annular channel having an outer wall formed by the inner wall of the basket rim 18 and an inner wall formed by a thickened region 18A of the basket 18, which is molded from plastic or cast from metal such as aluminum. This configuration provides superior attachment reliability due to increased adhesive area in the interface between the inner wall surface of the peripheral flange of the basket 18 and the outer wall surface of the skirt 16A of the surround-suspension 16.

[0029] FIG. 4 depicts a version of the basic embodiment of FIG. 2 wherein the surround-suspension 16 is the same as in FIGs. 2 and 3, but it is retained by an annular retainer ring 20 shaped as shown and adhesively fastened to the landing of the basket 10. The skirt 16A of surround-suspension 16 is fastened adhesively in place to the rim of the basket 10 and to the ring 20.

[0030] FIG. 5 depicts a version of the general embodiment of FIG. 4 wherein the retainer ring 22 is configured with an annular channel that accepts the skirt 16A of the surround-suspension 16. The thickness of the outer wall of the channel in the ring 22 should be taken into account in dimensioning the basket, the cone and/or the span of the flexible arched portion of the surround-suspension 16.

[0031] FIG. 6 depicts an embodiment of the present invention wherein the surround-suspension 24 is specially shaped to provide a flared cross-sectional shape, as shown, adjacent the planar margin landing. This shape enables both the axial and radial interface regions to be fastened adhesively, so that high reliability is obtained by the increase in fastening area compared to fastening areas of conventional speakers as shown in FIGs. 1 and 1A.

[0032] FIG. 7 depicts an alternative embodiment wherein the skirt 26A of the surround-suspension 26 is doubled back upon itself as shown and adhesively fastened to the inner side of the peripheral flange of basket 10, as well as, to the planar margin landing.

[0033] FIG. 8 depicts an embodiment similar to that of FIG. 6 but with the skirt 28A of special surround-suspension 28 molded to form the shape shown which flares to a thickness that enables an enlarged area of adhesive fastening including substantially the entire area of the planar margin landing 20 of the basket 10.

[0034] FIG. 9 depicts an embodiment of the invention that further includes a mounting adaptor 32, fitted inside the axial peripheral flange of basket 10, that enables the speaker to be mounted onto the rear side of a panel. The skirt of the surround-suspension 30 is made with a narrow fastening flange 30A extending outwardly from the edge of the skirt and fastened adhesively to the margin landing of the basket 10 and to a lower portion of an annular speaker mounting adaptor 32, which can be molded from plastic or formed/cast from metal. The adaptor 32 forms a spacer between the speaker and a panel interfacing the top horizontal surface of the adaptor 32. Fastened adhesively to the inner surface of the rim of the basket 10, the lower end of the vertical portion of the adaptor 32 clamps the narrow fastening flange 30A and provides additional interfacing area for enhancing the adhesive fastening.

[0035] In a 4" round speaker with a conventional basket having a 129 mm outer diameter, incorporation of most embodiments of the present invention will enable the conventional cone diameter (92 mm) to be increased to 102.6 mm; an increase of 11.5% in diameter and 24.4% in area providing significant improvement of low frequency response. With reference to TABLE 1, the cone area to basket area ratio accomplished by the present invention in the 4" category is 0.633, compared to 0.51 for conventional speakers; an increase of 24%.

[0036] In any of the embodiments, the arched portion of the surround-suspension may be made uniform in thickness or specially varied in thickness for increased compliance. E.g., the surround-suspension may be shaped to be thinner in a central region and/or one or both flanges may be tapered.

[0037] The invention could be implemented in an alternative configuration wherein the surround-suspension skirt is disposed around the outside of the basket rim instead of around the inside as shown. Thus, the inside axial wall surface of the surround-suspension skirt would interface and be adhesively attached to the outside axial wall surface of the basket rim.

[0038] Typically, in the different embodiments disclosed, the specially configured surround-suspension of the invention functions in cooperation with a conventional second cone suspension member, typically a concentric spider suspension deployed in a well known manner attached to a central voice coil region of the cone; however, the present invention can also be practiced in embodiments wherein the special surround-suspension functions as the sole cone suspension element.

[0039] Although shown herein for illustrative purposes as being applied to round style basket speakers, the principle of the present invention, i.e., foreshortening or eliminating the outwardly extending mounting flange of the surround-suspension, is not limited to round style speakers; it may be practiced with speakers having baskets of any practical shape including oval or rectangular.

[0040] This invention may be embodied and practiced in other specific forms without departing from the spirit and essential characteristics thereof. The present embodiments therefore are considered in all respects as illustrative and not restrictive. The scope of the invention is indicated by the appended claims rather than by the foregoing description. All variations substitutions, and changes that come within the meaning and range of equivalency of the claims therefore are intended to be embraced therein.

[0041] The invention further provides the following embodiments :

1. A speaker cone-surround support system for increasing effective piston area of a forwardly-facing cone constituting an acoustic diaphragm in a compact full-range speaker having a basket constituting a main speaker frame with an outer boundary in a frontal plane perpendicular to a central axis of the speaker, encompassing a designated basket area, said cone-surround system comprising:

a surround-suspension, made and arranged to surround the cone and provide support thereto in a manner that allows vibration thereof for acoustic purposes, configured with a cross-sectional shape, taken at a radial axis of the speaker, defining (a) a main flexible portion, made and arranged to allow functional vibration of the cone for acoustic purposes, extending between inner and outer suspension points located substantially in the frontal plane, (b) a cone-attachment flange extending inward and rearward from the inner suspension point, overlapping and adhesively attached to a peripheral suspension-attachment margin of the cone, and (c) an axial basket-attachment skirt extending rearward from the outer suspension point sized and shaped to overlap and interface with a peripheral region of the basket and being substantially free of radial portions; and

attachment means for securing the basket-attachment skirt of said surround-suspension to the peripheral region of basket;

wherein the cone is made to have an area in the frontal plane at the inner suspension point that is greater than that of a cone of a comparable conventional speaker having a cone-suspension configured with a conventional planar radial basket-attachment flange for a given basket area and a given span dimension of the main flexible portion of said surround-suspension measured between the inner and outer suspension points; and

said surround-suspension has an outer profile encompassing an area in the frontal plane that is at least about 95% percent of the designated basket area and a maximum outer dimension less than a maximum outer dimension of the basket.

2. The speaker cone-surround support system as defined in embodiment 1 wherein said attachment means comprises:

a suspension-attachment rim of substantially uniform thickness, configured as part of the basket and extending axially from a planar margin landing disposed radially around a margin of the basket, extending in a forward direction to the frontal plane, having a predetermined shape and size to overlap the basket-attachment skirt of said surround-suspension.

3. The speaker cone-surround support system as defined in embodiment 2 wherein the basket-attachment skirt of said surround-suspension is made to have a peripheral outer wall surface shaped and sized to engage an inner wall of said suspension-attachment rim of the basket, adhesive material being applied during assembly in a manner to permanently attach the outer wall surface of the basket-attachment skirt of said surround-suspension to the inner

wall of said suspension-attachment rim of the basket.

4. The speaker cone-surround support system as defined in embodiment 3 wherein said basket-attachment skirt of said surround-suspension has a cross-sectional shape that flares to an increased edge thickness defining a flat basket-attachment surface substantially perpendicular to the outer surface of said basket-attachment skirt, made and arranged to interface the planar margin landing of said speaker basket, provided contiguous with the suspension-attachment rim thereof and extending radially inward therefrom, said adhesive material being also applied between the flat basket-attachment surface of the suspension-attachment rim and the planar margin landing of said speaker basket so as to substantially increase a total interfacing area attached by adhesive.

5. The speaker cone-surround support system as defined in embodiment 3 wherein said attachment means comprises:

a peripheral channel formed around said speaker basket, said channel having a first wall surface formed by the inner wall of said suspension-attachment rim of the basket and having a second and opposing wall surface spaced from the first wall surface so as to provide a close fit with the basket-attachment skirt of said surround-suspension, and wherein said basket-attachment shirt is inserted and retained in said channel in a mating manner, and further secured in place by adhesive material applied during initial assembly to all interfacing areas between said channel and the basket-attachment skirt.

6. The speaker cone-surround support system as defined in embodiment 5 further comprising:

a built-up region forming the second wall surface;
said speaker basket, including said suspension-attachment rim, being formed from plastic material in a molding process.

7. The speaker cone-surround support system as defined in embodiment 5 further comprising:

a wall member, attached to the planar margin landing of said basket and separated from the inner surface of said suspension-attachment rim, providing the second wall surface of the channel;
said speaker basket, including said suspension-attachment rim, being formed from sheet metal in a stamping process.

8. The speaker cone-surround support system as defined in embodiment 7 wherein the wall member includes a channel floor liner located so as to interface with the planar margin landing of said speaker basket, extending substantially to the inner wall of said suspension-attachment rim of the basket, the channel floor liner being adhesively attached to the planar margin landing of said basket and arranged to interface and support an end of the basket-attachment skirt of said surround-suspension.

9. The speaker cone-surround support system as defined in embodiment 8 further comprising:

a peripheral attachment liner made contiguous with the channel floor liner and arranged to interface an outer surface of the basket-attachment skirt of said surround-suspension.

10. The speaker cone-surround support system as defined in embodiment 2 wherein the basket-attachment skirt has a cross-sectional shape characterized by a first portion thereof extending from the outer suspension point to the planar margin landing of the basket, at that point, folding back outward upon itself and extending substantially back to the outer suspension point while interfacing an inner wall of said suspension-attachment rim of the basket, and being attached thereto adhesively to form a two-layer outer attachment flange.

11. The speaker cone-surround support system as defined in embodiment 2 wherein said attachment means further comprises:

a speaker mounting adaptor for mounting onto a rear side of a panel, said adaptor having a cross-sectional L-shape characterized by an axial portion interfacing an inner wall of said suspension-attachment rim and extending beyond the frontal plane to a corner junction with a radial portion that extends generally parallel to the frontal plane so as to form a panel-mounting flange;
the basket-attachment skirt of said surround-suspension being made and arranged to have a peripheral outer

wall surface shaped and sized to engage at least a section of an inner wall of the axial portion of said speaker mounting adaptor, adhesive material being applied during assembly to permanently attach the outer wall surface of the basket-attachment skirt of said surround-suspension to said section of the inner wall of the axial portion of said speaker mounting adaptor.

12. The speaker cone-surround support system as defined ir embodiment 11 wherein the basket-attachment skirt includes an end flange extending radially outward to an inner wall of said suspension-attachment rim thus forming a floor liner disposed between a rear edge of said speaker mounting adaptor and the planar margin landing of the basket.

13. A speaker cone-surround support system comprising:

a speaker cone having a peripheral suspension-attachment margin;
a surround-suspension having a conical cone-attachment flange attached to the peripheral suspension-attachment margin of the cone, a main flexible portion extending outward from the cone-attachment flange configured to allow vibration of the cone to produce sound, and a basket-attachment skirt substantially free of radial portions extending rearward from the main flexible portion and having an outer surface and an inner surface; and a basket including a suspension-attachment rim extending forwardly adjacent an outer boundary of the basket sized to engage an outer surface of the basket-attachment skirt of the surround-suspension.

14. A speaker cone-surround support system as set forth in embodiment 13 wherein said surround-suspension has an outer profile encompassing an area at least about 95 percent of a designated area of the basket defined by the outer boundary of the basket.

15. A speaker cone-surround support system as set forth in embodiment 13 wherein said basket-attachment skirt of said surround-suspension is flared to an increased rearward edge thickness defining a basket-attachment surface extending perpendicular to the outer surface of said basket-attachment skirt, and said basket includes a planar margin landing adapted to engage the basket-attachment surface of the basket-attachment skirt.

16. A speaker cone-surround support system as set forth in embodiment 13 wherein said basket includes a peripheral channel partially defined by the suspension-attachment rim, said channel being sized and shaped to receive the basket-attachment skirt of said surround-suspension.

17. A speaker cone-surround support system as set forth in embodiment 13 wherein the suspension-attachment rim of said basket includes a speaker mount for mounting the system onto a rear side of a panel, said mount including an axial portion extending forwardly to a radial portion adapted to mount the basket to the rear side of the panel.

18. A surround-suspension for a speaker cone-surround support system including a speaker cone having a peripheral suspension-attachment margin, and a basket having a suspension-attachment rim extending forward adjacent an outer boundary of the basket, said surround-suspension comprising:

a conical cone-attachment flange sized and shaped for attachment to the peripheral suspension-attachment margin of the cone;
a main flexible portion extending outward from the cone-attachment flange configured to allow vibration of the cone relative to the basket thereby to produce sound; and
a basket-attachment skirt substantially free of radial portions extending rearward from the main flexible portion having a maximum outer dimension less than a maximum outer dimension of the suspension-attachment rim of the basket.

19. A speaker cone-surround support system comprising:

a speaker cone having a peripheral suspension-attachment margin adjacent a forward boundary of the cone;
a surround-suspension having a cone-attachment flange attached to the peripheral suspension-attachment margin of the cone, a main flexible portion extending outward from the cone-attachment flange configured to allow vibration of the cone to produce sound, and a basket-attachment skirt extending rearward from the main flexible portion and having an outer surface and an inner surface; and
a basket including a radially disposed planar landing and a suspension-attachment rim extending forward from the planar landing adjacent an outer boundary of said planar landing, said suspension-attachment rim being

sized to engage said outer surface of the basket-attachment skirt of the surround-suspension.

20. A speaker cone-surround support system comprising:

a speaker cone having a peripheral suspension-attachment margin adjacent a forward boundary of the cone;
a surround-suspension having a cone-attachment flange attached to the peripheral suspension-attachment margin of the cone, a main flexible portion extending outward from the cone-attachment flange configured to allow vibration of the cone to produce sound and a basket-attachment skirt extending rearward from the main flexible portion; and
a basket including a suspension-attachment rim extending forward adjacent an outer boundary of the basket to a front edge;
wherein said main flexible portion of said surround-suspension has an undeflected position in front of the front edge of said suspension-attachment rim and said basket-attachment skirt has an outer surface engaged with said suspension-attachment rim.

Claims

1. A loudspeaker comprising:

a basket (10) having an outer rim and a landing,
a cone (14A);
a surround-suspension (30) extending between the cone (14A) and the basket (10),
said surround-suspension (30) having an attachment skirt and a fastening flange extending outwardly from the edge of the attachment skirt and being fastened adhesively to the landing of the basket and to a lower portion of the mounting adaptor; and
a mounting adaptor (32);
wherein said mounting adaptor (32) is positioned inside a peripheral region of the basket (10) between an inner wall of said outer rim of the basket (10) and an outer wall of said attachment skirt, wherein said mounting adaptor (32) forms a spacer between the main speaker frame and a panel interfacing the top horizontal surface of the mounting adaptor (32).

2. The loudspeaker of claim 1, wherein a lower end of the mounting adaptor (32) acts downwardly on the fastening flange (30A).

3. The loudspeaker of claim 1 or 2, where a cross-section of the surround-suspension (16) is arch shaped.

4. The loudspeaker of one of the preceding claims, where the surround-suspension (16) is affixed to the first wall surface and the second wall surface by an adhesive.

5. The loudspeaker of one of the preceding claims, where the basket (10) is formed of pressed sheet metal.

6. The loudspeaker of one of the preceding claims, where the basket (10) is molded from plastic.

7. The loudspeaker of one of the preceding claims, wherein the mounting adaptor is fastened adhesively to the inner surface of the outer rim of the basket.

8. The loudspeaker of one of the preceding claims, wherein the attachment skirt is an outer attachment skirt extending in axial direction.

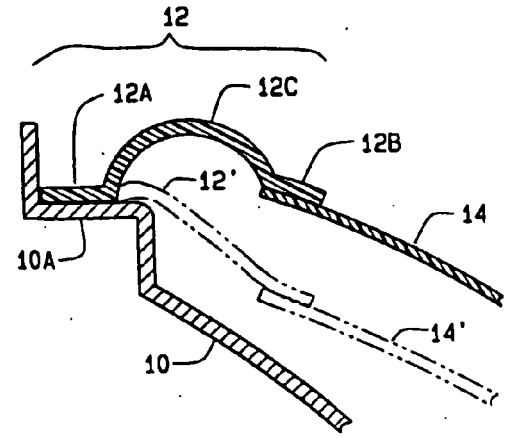

FIG. 1
PRIOR ART

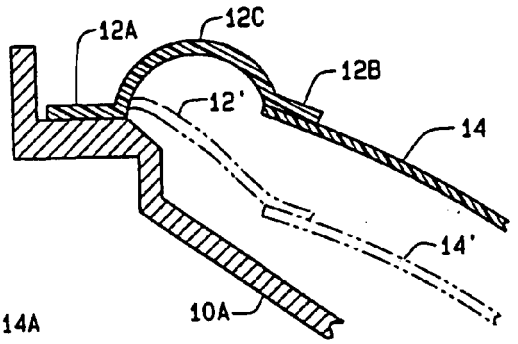

FIG. 1A
PRIOR ART

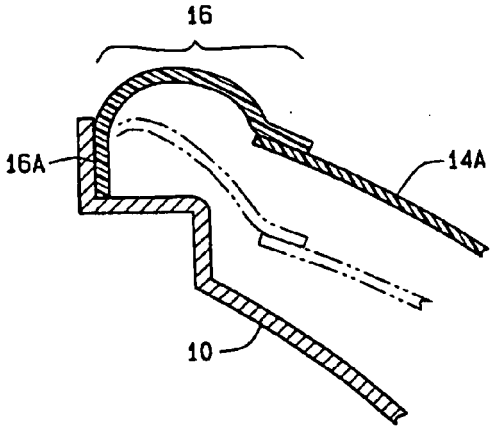

FIG. 2

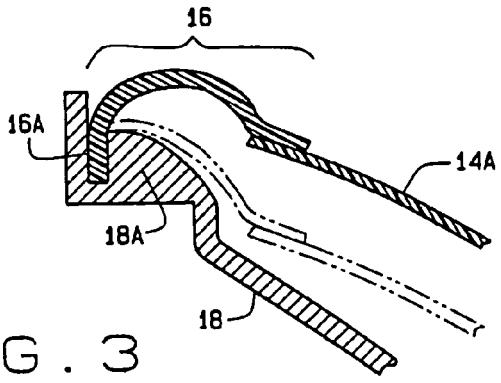

FIG. 3

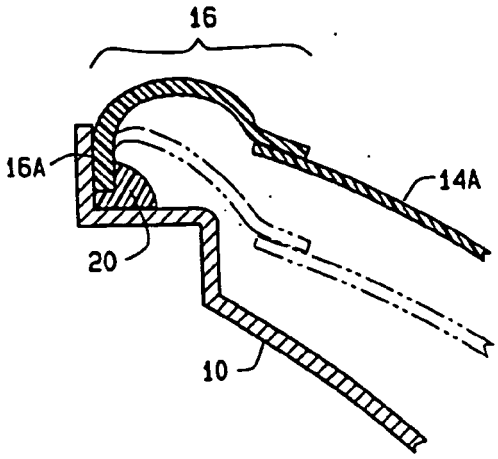

FIG. 4

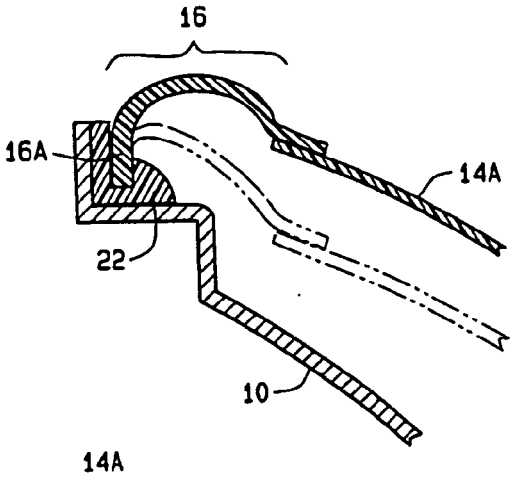

FIG. 5

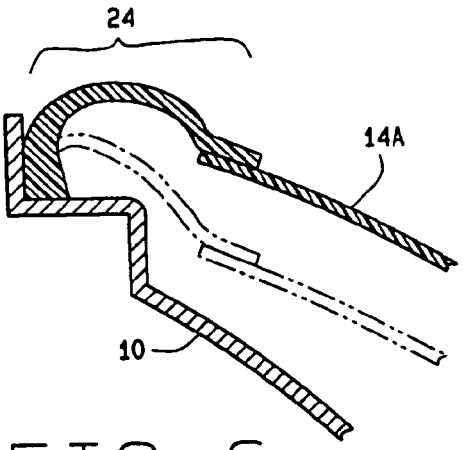

FIG. 6

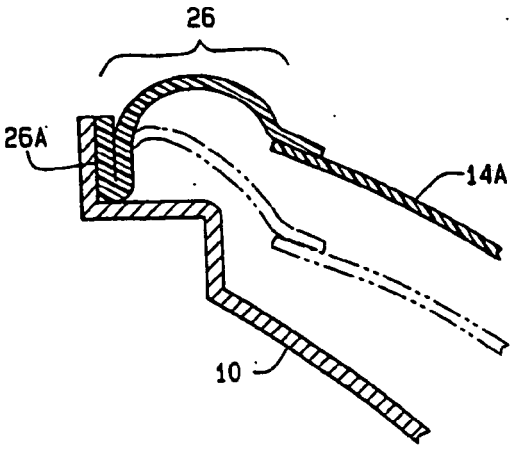

FIG. 7

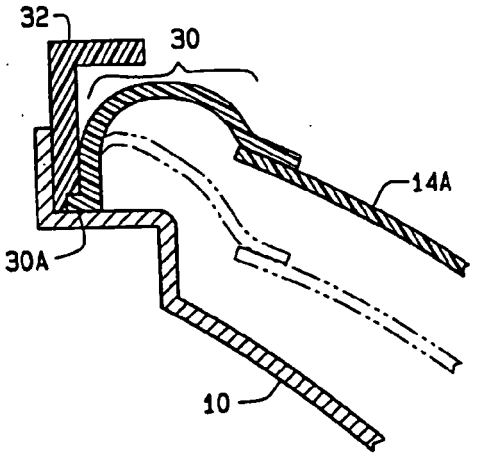

FIG. 9

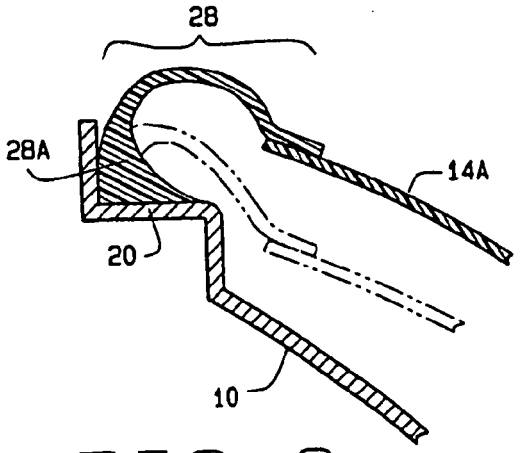

FIG. 8

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EUROPEAN SEARCH REPORT

Application Number
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DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	JP 11 164391 A (MATSUSHITA ELECTRIC IND CO LTD) 18 June 1999 (1999-06-18) * abstract; figures 1-3 * -----	1-8	INV. H04R7/18
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TECHNICAL FIELDS SEARCHED (IPC)

H04R

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	4 March 2011	Righetti, Marco

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