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(54) **SPEAKER SURROUND STRUCTURE FOR MAXIMIZING CONE DIAMETER**

LAUTSPRECHEREINFASSUNGSSTRUKTUR ZUR MAXIMIERUNG DES
KONUSDURCHMESSERS

STRUCTURE D'ENTOURAGE DE HAUT-PARLEUR PERMETTANT DE MAXIMISER LE DIAMETRE
DE CONE

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Description

FIELD OF THE INVENTION

- 5 **[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

- 10 **[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.
- 15 **[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.
- 20 **[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.

TABLE 1 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
5 ¼ 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

- 35 **[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 midrange and low frequency performance of compact speakers that are subject to strict constraints on basket size, e.g., as used in large quantities in vehicular sound systems as well as in small personal radio/stereo players, multi-media computer systems, etc.
- 40 **[0008]** FIG. 1 is a cross-section taken at an edge portion of a formed sheet-metal basket of a typical conventional speaker. A typical surround-suspension 12 has as its outwardly-extending peripheral portion a radial planar outer flange 12A for adhesive attachment to a planar margin landing IOA at a peripheral region of a basket 10, and has as its inwardly-extending peripheral portion a conical inner flange 12B for adhesive attachment to a cone 14, shown in part. A central arched flexible portion 12C of the annular surround-suspension 12 constrains cone 14 radially but allows it to vibrate in an axial direction when driven by the voice coil (not shown).
- 45 **[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 positions of the surround-suspension 12' and the cone 14' are 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.
- 50 **[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 radial planar 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).

[0013] The document JP 09 327088 A solves the problem of keeping the structure of a loudspeaker being durable by adhering an edge so as to be along the erecting part of a frame. The erecting part is arranged in a direction being vertical against the vibration direction and is constituted by permitting the vertical direction adhering surface of the edge to be adhered along the erecting part. The horizontal direction adhering surface of the edge is adhered with the step part of the frame in the horizontal direction. Therefore, an adhesion by an adhesive resin between the frame and the edge is firmly executed without affecting the size of the vibration plate (or rather it becomes larger).

SUMMARY OF THE INVENTION

[0014] 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.

[0015] 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.

[0016] 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.

[0017] 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.

[0018] 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.

[0019] 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.

[0020] The axial skirt may be specially shaped to maximize the adhesive fastening area.

[0021] 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

[0022] 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 exemplary embodiment of a suspension system excluded from the scope of the 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 exemplary embodiment of a suspension system excluded from the
 5 scope of the invention
 FIG. 7 depicts a partial cross section of a sixth exemplary embodiment of a suspension system excluded from the
 scope of the invention
 FIG. 8 depicts a partial cross section of a seventh exemplary embodiment of a suspension system excluded from
 the scope of the invention
 10 FIG. 9 depicts a partial cross section of a eighth exemplary embodiment of a suspension system excluded from the
 scope of the invention

DETAILED DESCRIPTION

15 **[0023]** FIGs. 1-9 each show a cross-sectional view of a basket rim region of a speaker.

[0024] 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.

[0025] FIGs. 2-9 depict different embodiments and versions of cone surround-suspensions.

20 **[0026]** FIG. 2 depicts a basic exemplary embodiment excluded from the scope of the 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.

[0027] 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
 25 sheet metal basket 10 as shown, or with a basket that is molded from plastic or cast from metal such as aluminum.

[0028] 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.

[0029] 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
 30 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.

[0030] FIG. 4 depicts a version of the basic embodiment of FIG. 2 wherein the surround-suspension 16 is the same
 35 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.

[0031] 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
 40 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.

[0032] FIG. 6 depicts an exemplary embodiment excluded from the scope of the 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
 45 is obtained by the increase in fastening area compared to fastening areas of conventional speakers as shown in FIGs. 1 and 1A.

[0033] FIG. 7 depicts an alternative exemplary embodiment excluded from the scope of the invention 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.

50 **[0034]** FIG. 8 depicts an exemplary embodiment excluded from the scope of the invention 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.

[0035] FIG. 9 depicts an exemplary embodiment excluded from the scope of the invention that further includes a
 55 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.

[0036] 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%.

[0037] 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.

[0038] 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.

[0039] 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.

[0040] 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.

[0041] This invention may be embodied and practiced in other specific forms. 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.

Claims

1. A loudspeaker comprising:

a basket (18) having an outer rim and a thickened region (18A);
 a cone (14A); and
 a surround-suspension (16) extending between the cone (14A) and the basket (18),
 said surround-suspension (16) having an outer attachment skirt (16A) extending in axial direction;
 wherein a peripheral channel is formed around said basket (18), said channel having a first wall surface formed by an inner wall of said outer rim of the basket (18) and
 having a second wall surface spaced from the first wall surface formed by said thickened region (18A) of the basket (18), and wherein the attachment skirt (16A) is retained in said channel in a mating manner.

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

3. The loudspeaker of claim 1, where the surround-suspension (16) is affixed to the first wall surface and the second wall surface by an adhesive.

4. The loudspeaker of claim 1, where the basket (18) is formed of pressed sheet metal.

5. The loudspeaker of claim 1, where the basket (18) is molded from plastic.

6. The loudspeaker of claim 1, where the basket (18) is cast from metal.

7. A loudspeaker comprising:

a basket (10) having an outer rim and a landing;
 an annular retainer ring (20) fastened to the landing;
 a cone (14A); and

a cone (14A); and
a surround-suspension (16) extending between the cone (14A) and the basket (18),
said surround-suspension (16) having an outer attachment skirt (16A) extending in axial direction;
wherein a peripheral channel is formed around said basket (10), said channel having
a first wall surface formed by an inner wall of said outer rim of the basket (10) and
having a second wall surface spaced from the first wall surface formed by said annular retainer ring (20), and
wherein the attachment skirt (16A) is retained in said channel in a mating manner.

8. The loudspeaker of claim 7, where a cross-section of the surround-suspension (16) is arch shaped.

9. The loudspeaker of claim 7, where the surround-suspension (16) is affixed to the first wall surface and the second wall surface by an adhesive.

10. The loudspeaker of claim 7, where the basket (10) is formed of pressed sheet metal.

11. The loudspeaker of claim 7, where the basket (10) is molded from plastic.

12. The loudspeaker of claim 7, where the basket (10) is cast from metal.

13. A loudspeaker comprising:

a basket (10) having an outer rim and a landing;
an annular retainer ring (22) fastened to the landing, the annular retainer ring (22) configured with an annular channel;
a cone (14A); and
a surround-suspension (16) extending between the cone (14A) and the basket (18),
said surround-suspension (16) having an outer attachment skirt (16A) extending in axial direction;
wherein the attachment skirt (16A) is retained in said channel in a mating manner.

14. The loudspeaker of claim 13, where a cross-section of the surround-suspension (16) is arch shaped.

15. The loudspeaker of claim 13, where the surround-suspension (16) is affixed to the first wall surface and the second wall surface by an adhesive.

16. The loudspeaker of claim 13, where the basket (10) is formed of pressed sheet metal.

17. The loudspeaker of claim 13, where the basket (10) is molded from plastic.

18. The loudspeaker of claim 13, where the basket (10) is cast from metal.

Patentansprüche

1. Lautsprecher, der umfasst:

ein Chassis (18) mit einem äußeren Rand und einem verdickten Bereich (18A);
einen Konus (14A); und
eine Umrandungs-Aufhängung (16), die sich zwischen dem Konus (14A) und dem Chassis (18) erstreckt, wobei die Umrandungs-Aufhängung (16) eine äußere Anbringungsschürze (16A) aufweist, die sich in axialer Richtung erstreckt; und
wobei eine Umfangsrinne um das Chassis (18) herum ausgebildet ist, die Rinne eine erste Wandfläche hat, die durch eine Innenwand des äußeren Randes des Chassis (18) gebildet wird, und eine von der ersten Wandfläche beabstandete zweite Wandfläche hat, die durch den verdickten Bereich (18A) des Chassis (18) gebildet wird, und die Anbringungsschürze (16A) eingreifend in der Rinne gehalten wird.

2. Lautsprecher nach Anspruch 1, wobei ein Querschnitt der Umrandungs-Aufhängung (16) bogenförmig ist.

3. Lautsprecher nach Anspruch 1, wobei die Umrandungs-Aufhängung (16) mit einem Klebstoff an der ersten Wand-

fläche und der zweiten Wandfläche befestigt ist.

4. Lautsprecher nach Anspruch 1, wobei das Chassis (18) aus gepresstem Blech besteht.

5 5. Lautsprecher nach Anspruch 1, wobei das Chassis (18) aus Kunststoff geformt ist.

6. Lautsprecher nach Anspruch 1, wobei das Chassis (18) aus Metall gegossen ist.

7. Lautsprecher, der umfasst:

10 ein Chassis (10) mit einem äußeren Rand und einem Absatz;
einen ringförmigen Haltering (20), der an dem Absatz befestigt ist;
einen Konus (14A); und
15 eine Umrandungs-Aufhängung (16), die sich zwischen dem Konus (14A) und dem Chassis (18) erstreckt, wobei
die Umrandungs-Aufhängung (16) eine äußere Anbringungsschürze (16A) aufweist, die sich in axialer Richtung
erstreckt; und
wobei eine Umfangsrinne um das Chassis (18) herum ausgebildet ist, die Rinne eine erste Wandfläche hat,
die durch eine Innenwand des äußeren Randes des Chassis (10) gebildet wird, und eine von der ersten Wand-
20 fläche beabstandete zweite Wandfläche hat, die durch den ringförmigen Haltering (20) gebildet wird, und die
Anbringungsschürze (16A) eingreifend in der Rinne gehalten wird.

8. Lautsprecher nach Anspruch 7, wobei ein Querschnitt der Umrandungs-Aufhängung (16) bogenförmig ist.

9. Lautsprecher nach Anspruch 7, wobei die Umrandungs-Aufhängung (16) mit einem Klebstoff an der ersten Wand-
25 fläche und der zweiten Wandfläche befestigt ist.

10. Lautsprecher nach Anspruch 7, wobei das Chassis (10) aus gepresstem Blech besteht.

11. Lautsprecher nach Anspruch 7, wobei das Chassis (10) aus Kunststoff geformt ist.

30 12. Lautsprecher nach Anspruch 7, wobei das Chassis (10) aus Metall gegossen ist.

13. Lautsprecher, der umfasst:

35 ein Chassis (10) mit einem äußeren Rand und einem Absatz;
einen ringförmigen Haltering (22), der an dem Absatz befestigt ist, wobei der ringförmige Haltering (22) mit
einer ringförmigen Rinne versehen ist;
einen Konus (14A); und
40 eine Umrandungs-Aufhängung (16), die sich zwischen dem Konus (14A) und dem Chassis (18) erstreckt, wobei
die Umrandungs-Aufhängung (16) eine äußere Anbringungsschürze (16A) aufweist, die sich in axialer Richtung
erstreckt;
wobei die Anbringungsschürze (16A) eingreifend in der Rinne gehalten wird.

14. Lautsprecher nach Anspruch 13, wobei ein Querschnitt der Umrandungs-Aufhängung (16) bogenförmig ist.

45 15. Lautsprecher nach Anspruch 13, wobei die Umrandungs-Aufhängung (16) mit einem Klebstoff an der ersten Wand-
fläche und der zweiten Wandfläche befestigt ist.

16. Lautsprecher nach Anspruch 13, wobei das Chassis (10) aus gepresstem Blech besteht.

50 17. Lautsprecher nach Anspruch 13, wobei das Chassis (10) aus Kunststoff geformt ist.

18. Lautsprecher nach Anspruch 13, wobei das Chassis (10) aus Metall gegossen ist.

55 Revendications

1. Haut-parleur comprenant :

un panier (18) ayant une couronne extérieure et une région épaissie (18A) ;
 un cône (14A) ; et
 une suspension d'entourage (16) s'étendant entre le cône (14A) et le panier (18), ladite suspension d'entourage (16) comportant une jupe de fixation extérieure (16A) s'étendant dans la direction axiale ;
 dans lequel un canal périphérique est formé autour dudit panier (18), ledit canal ayant une première surface de paroi formée par la paroi intérieure de ladite couronne extérieure du panier (18) et ayant une seconde surface de paroi espacée de la première surface de paroi formée par ladite région épaissie (18A) du panier (18) et dans lequel la jupe de fixation (16A) est retenue dans ledit canal d'une manière par appariement.

2. Haut-parleur selon la revendication 1, dans lequel la section transversale de la suspension d'entourage (16) est en forme de voûte.

3. Haut-parleur selon la revendication 1, dans lequel la suspension d'entourage (16) est fixée à la première surface de paroi et à la seconde surface de paroi par un adhésif.

4. Haut-parleur selon la revendication 1, dans lequel le panier (18) est formé d'une tôle métallique emboutie.

5. Haut-parleur selon la revendication 1, dans lequel le panier (18) est moulé dans du plastique.

6. Haut-parleur selon la revendication 1, dans lequel le panier (18) est coulé à partir d'un métal.

7. Haut-parleur comprenant :

un panier (10) ayant une couronne extérieure et un palier ;
 une bague de maintien annulaire (20) fixée au palier ;
 un cône (14A) ; et
 une suspension d'entourage (16) s'étendant entre le cône (14A) et le panier (18), ladite suspension d'entourage (16) comportant une jupe de fixation extérieure (16A) s'étendant dans la direction axiale ;
 dans lequel un canal périphérique est formé autour dudit panier (10), ledit canal ayant une première surface de paroi formée par la paroi intérieure de ladite couronne extérieure du panier (10) et ayant une seconde surface de paroi espacée de la première surface de paroi formée par ladite bague de maintien annulaire (20) et dans lequel la jupe de fixation (16A) est retenue dans ledit canal d'une manière par appariement.

8. Haut-parleur selon la revendication 7, dans lequel la section transversale de la suspension d'entourage (16) est en forme de voûte.

9. Haut-parleur selon la revendication 7, dans lequel la suspension d'entourage (16) est fixée à la première surface de paroi et à la seconde surface de paroi par un adhésif.

10. Haut-parleur selon la revendication 7, dans lequel le panier (10) est formé d'une tôle métallique emboutie.

11. Haut-parleur selon la revendication 7, dans lequel le panier (10) est moulé dans du plastique.

12. Haut-parleur selon la revendication 7, dans lequel le panier (10) est coulé à partir d'un métal.

13. Haut-parleur comprenant :

un panier (10) ayant une couronne extérieure et un palier ;
 une bague de maintien annulaire (22) fixée au palier, la bague de maintien annulaire (22) étant configurée avec un canal annulaire ;
 un cône (14A) ; et
 une suspension d'entourage (16) s'étendant entre le cône (14A) et le panier (18), ladite suspension d'entourage (16) comportant une jupe de fixation extérieure (16A) s'étendant dans la direction axiale ;
 dans lequel la jupe de fixation (16A) est retenue dans ledit canal d'une manière par appariement.

14. Haut-parleur selon la revendication 13, dans lequel la section transversale de la suspension d'entourage (16) est en forme de voûte.

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15. Haut-parleur selon la revendication 13, dans lequel la suspension d'entourage (16) est fixée à la première surface de paroi et à la seconde surface de paroi par un adhésif.
16. Haut-parleur selon la revendication 13, dans lequel le panier (10) est formé d'une tôle métallique emboutie.
17. Haut-parleur selon la revendication 13, dans lequel le panier (10) est moulé dans du plastique.
18. Haut-parleur selon la revendication 13, dans lequel le panier (10) est coulé à partir d'un métal.

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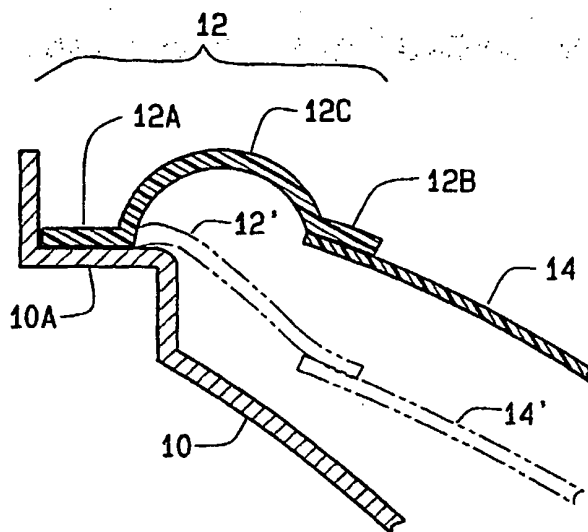


FIG. 1
PRIOR ART

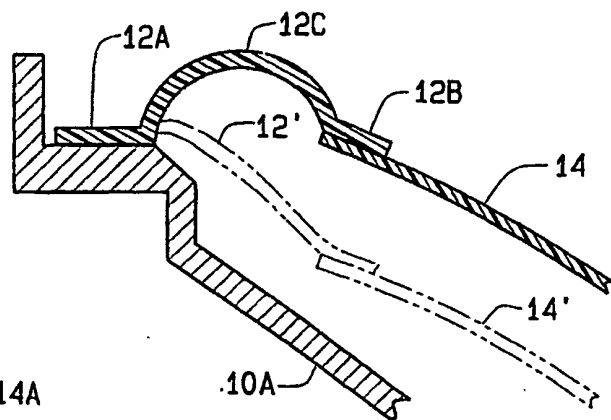


FIG. 1A
PRIOR ART

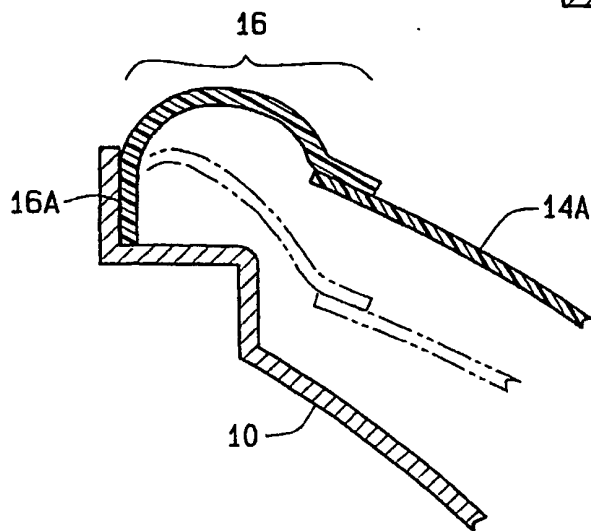


FIG. 2

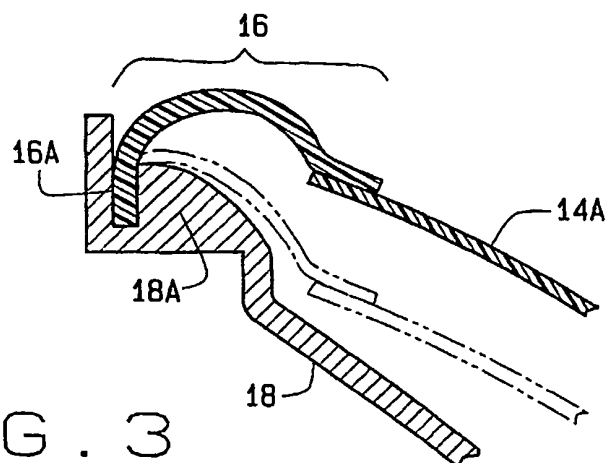


FIG. 3

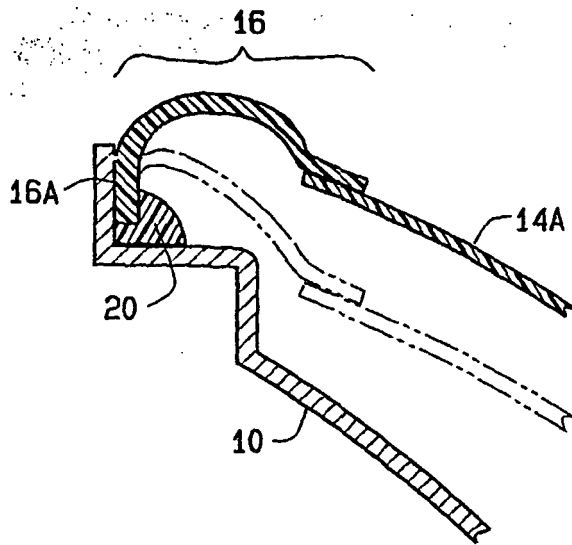


FIG. 4

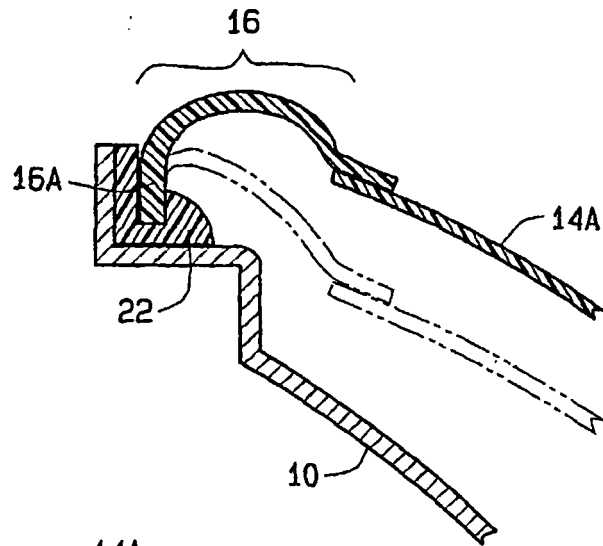


FIG. 5

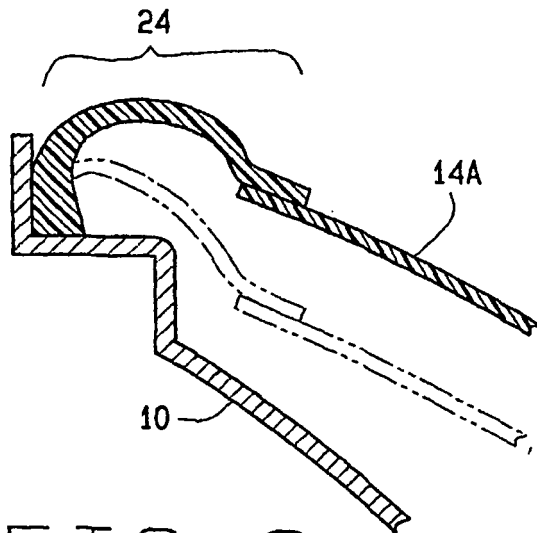


FIG. 6

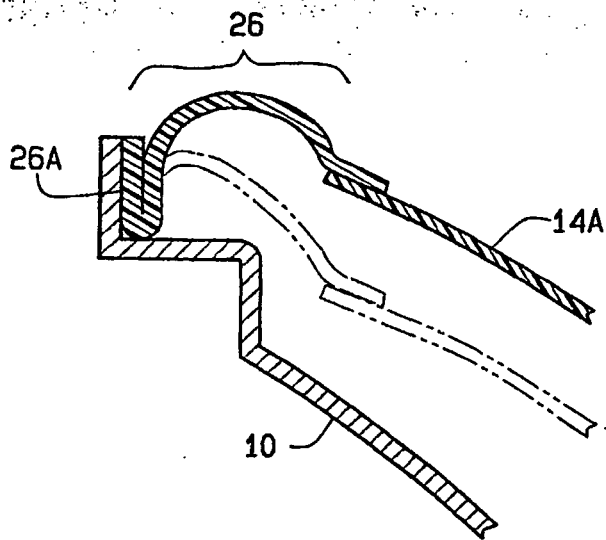


FIG. 7

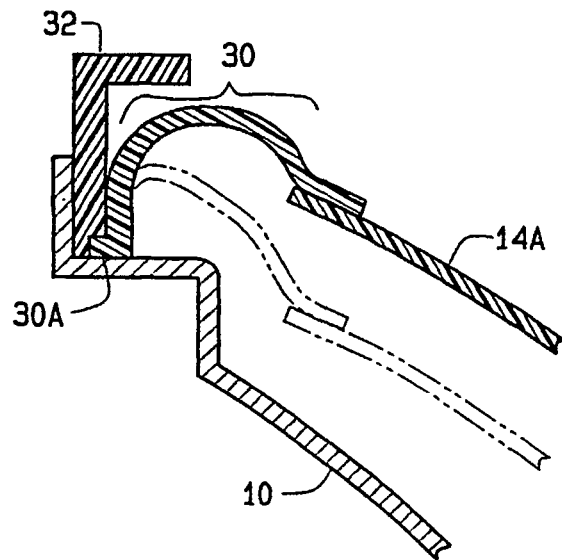


FIG. 9

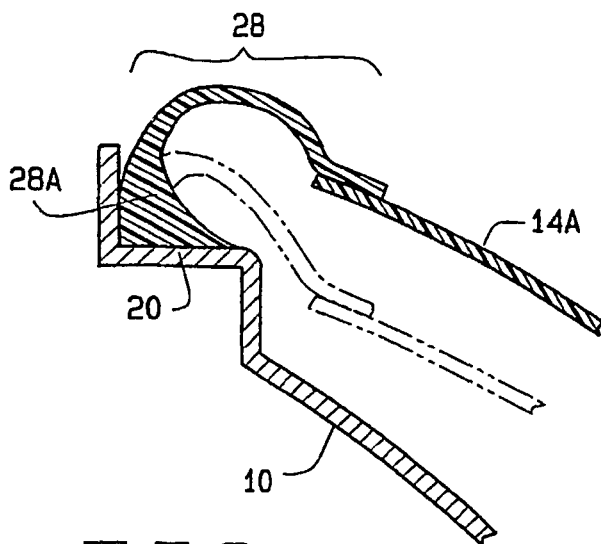


FIG. 8

REFERENCES CITED IN THE DESCRIPTION

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