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<p>(21) International Application Number: PCT/GB00/00405</p> <p>(22) International Filing Date: 10 February 2000 (10.02.00)</p> <p>(30) Priority Data:</p> <table border="0"> <tr> <td>9903208.8</td> <td>15 February 1999 (15.02.99)</td> <td>GB</td> </tr> <tr> <td>9917041.7</td> <td>21 July 1999 (21.07.99)</td> <td>GB</td> </tr> </table> <p>(71) Applicant (for all designated States except US): NEW TRANSDUCERS LIMITED [GB/GB]; 37 Ixworth Place, London SW3 3QH (GB).</p> <p>(72) Inventors; and</p> <p>(75) Inventors/Applicants (for US only): AZIMA, Henry [CA/GB]; 3 Southacre Close, Chaucer Road, Cambridge CB2 2TT (GB). OWEN, Neil, Simon [GB/GB]; Treewick Cottage, Silver Street, Buckden, Cambridgeshire PE18 9TS (GB). BREAM, Charles [GB/GB]; 31 Alma Road, Millfield, Peterborough PE1 3AN (GB). ELLIS, Christien [GB/GB]; Briar Cottage, 3 Barley Road, Great Chishill, Hertfordshire SG8 8SB (GB).</p> <p>(74) Agent: MAGUIRE BOSS; 5 Crown Street, St. Ives, Cambridgeshire PE17 4EB (GB).</p>		9903208.8	15 February 1999 (15.02.99)	GB	9917041.7	21 July 1999 (21.07.99)	GB	<p>(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).</p> <p>Published Without international search report and to be republished upon receipt of that report.</p>
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<p>(54) Title: LOUDSPEAKER</p> <div data-bbox="295 1243 1284 1848" style="text-align: center;"> </div> <p>(57) Abstract</p> <p>A vehicle windscreen accessory comprising a body member, an adjustable support structure for the body member whereby the position of the body member can be adjusted, the body member comprising a mirror member and a loudspeaker having a bending wave panel-form acoustic member, the mirror member and panel-form member being integral.</p>								

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TITLE: LOUDSPEAKER

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DESCRIPTION

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TECHNICAL FIELD

The invention relates to loudspeakers and more particularly to bending wave panel-form loudspeakers e.g. resonant panel loudspeakers of the general kind described in International patent application WO97/09842, the technology described in which application has come to be known as distributed mode or DM technology. In particular the present invention relates to bending wave panel-form loudspeakers integrated into or attached to vehicle windscreen or windshield accessories, e.g. as in an automobile or the like motor vehicle sun visor or rear-view mirror.

BACKGROUND ART

An automobile or the like vehicle sun visor is generally a hinged flap or panel which at rest is retracted against the roof of the vehicle but which may be moved on a hinge or other mechanism into a position of use to obscure part of the windscreen or windshield to shield the eyes of vehicle occupants, and particularly the vehicle driver's eyes, from the sun.

It is known to suggest the incorporation of slim-form loudspeakers in an automobile sun visor. Such an arrangement has certain disadvantages, amongst which is the fact that conventional pistononic loudspeakers are directional and thus when incorporated in a sun visor may only be optimally positioned when the visor is in a certain position. It is indeed likely that the optimal positioning of the loudspeaker in the sun visor will occur only when the visor is in use, whereas for most of the time the visor is likely to be in its retracted position. In addition conventional loudspeakers, even of slim-form are relatively bulky and heavy and may present an unacceptable injury risk positioned close to the head of the vehicle occupants.

It is an object of the invention to mitigate these disadvantages in a novel manner.

US 4362,907 of POLACSEK describes a combination automobile sun visor and radio and speaker assembly, and in which the speaker is a thin bi-directional device

DISCLOSURE OF INVENTION

According to the invention, there is provided a vehicle windscreen accessory comprising a body member, an adjustable support structure for the body member whereby the position of the body member can be adjusted, the body member comprising a mirror member and a loudspeaker having a bending wave panel-form acoustic member, the mirror member and panel-form member being integral.

From one aspect the invention is a vehicle sun visor comprising a sun shield member and an adjustable support structure for the shield member, whereby the position of the shield member can be adjusted from an inoperative position to at least one operative position, the shield member comprising a vanity mirror having a mirror member and a loudspeaker having a bending wave panel-form acoustic member, the mirror member and the panel-form member being integral. The shield member may define a hollow enclosure, in which one face of the panel-form member is enclosed to reduce or prevent sound radiation from the said one face. The panel-form member may be a resonant member, e.g. according to WO97/09842. The sun visor may comprise an inertial electrodynamic vibration exciter on the panel-form member to apply bending wave vibration thereto.

The application of DM technology to the problem of providing a loudspeaker in an automobile sun visor where the range of angles of adjustment of the visor causes large changes in response with conventional speakers, results in improved performance since a DM loudspeaker type has a highly consistent response over a range of angles.

The visor may be used for mobile telephony and/or for music reproduction with distributed mode action and acoustic output can result in superior clarity and intelligibility in this application. The panel-form device
5 may also form or incorporate a microphone to enhance its application to mobile telephony.

From another aspect the invention is a vehicle rear view mirror comprising a body member and an adjustable support structure for the body member, whereby the position
10 of the body member can be adjusted, the body member comprising a mirror member and a loudspeaker having a bending wave panel-form member, the mirror member and the panel-form member being integral. The body member may define a hollow enclosure, and one face of the panel-form
15 member may be enclosed in the hollow enclosure to reduce or prevent sound radiation from the said one face. The panel-form member may be a resonant member. The rear view mirror may comprise an inertial electrodynamic vibration exciter on the panel-form member to apply bending wave
20 vibration thereto.

BRIEF DESCRIPTION OF DRAWINGS

The invention is diagrammatically illustrated, by way of example, in the accompanying drawings in which:-

25 Figure 1 is a face view of a vehicle sun visor;

Figure 2 is an exploded partial sectional view to an enlarged scale of the sun visor of Figure 1;

Figure 3 is a face view of an automobile interior

rear-view mirror;

Figure 4 is a sectional plan view of the rear-view mirror of Figure 3;

Figure 5 is a face view of another embodiment of 5 interior rear view mirror, and

Figure 6 is a sectional plan view of the rear view mirror of Figure 5.

BEST MODES FOR CARRYING OUT THE INVENTION

In the drawings, and referring more particularly to 10 Figures 1 and 2, there is shown an automobile sun visor (1) comprising a generally rectangular flat sun shield member or body (2) adjustably supported on a support structure comprising a mounting bracket (3) fixed to the automobile (not shown) adjacent to the upper corner of the windshield 15 or windshield thereof (not shown), the bracket (3) carrying an arm (4) by means of a friction stabilised ball and socket joint (5) whereby the arm can be moved universally relative to the bracket (3). The arm (4) carries the shield member (2) such that the member (2) can pivot on the 20 arm (4) in conventional manner so that the member (2) can be adjusted in position as required. The member (2) is formed with a generally rectangular aperture (12) in which a vanity mirror assembly (6) is mounted by means of frame parts (9,9') which engage opposed faces of the member (2) 25 and which one secured together by fasteners (11). A mirror member (7) is clamped between the frame parts (9,9') and is held at its periphery in a resilient suspension (10) engaged between the frame parts (9,9'). It will be seen

that the frame part (9) at the front of the mirror is open whereas the frame part (9') at the rear is in the form of an open grille.

The mirror member (7) is in the form of a stiff
5 lightweight member e.g. of plastics or glass or of a composite construction, which acts as a bending wave panel-form loudspeaker diaphragm and is driven in bending by an inertial electrodynamic vibration exciter (8) fed with an audio signal in conventional manner. In operation of the
10 loudspeaker, the flexible movements of the panel (7) are very small and do not affect the function of the mirror. The loudspeaker is preferably a resonant device, e.g. of the kind described in WO97/09842. Since the panel (7) is open at both its front and back, both faces can radiate an
15 acoustic output.

In Figures 3 and 4 there is shown an automobile interior rear view mirror (13) comprising a body member (16) supported a generally conventional adjustable support structure (14) whereby the attitude of the mirror can be
20 adjusted as desired. The body (16) carries a mirror member (17) by means of peripheral resilient suspension 10. At its centre, the body is formed with an aperture (12) and at its rear the body is bulged at (18) to define a closed cavity (15) aligned with the aperture (12).

25 The central portion (7) of the mirror member (17) in the area of the aperture (12) is arranged to act as a bending wave panel-form loudspeaker and is acted on by an inertial electrodynamic vibration exciter (8) which applies

bending wave vibration to the central portion of the mirror member to produce an audio output. The flexible movement of the central portion of the mirror is however too small to adversely affect the operation of the view mirror. The 5 mirror may be of glass or plastics or may be of composite construction. In this arrangement, sound radiation from the rear face of the mirror is substantially attenuated by reason of its enclosure in the cavity (15).

The rear view mirror (20) of Figures 5 and 6 is very 10 similar to that of Figures 3 and 4, except in this case the whole of the body (16) forms a cavity (19) behind the front face of the mirror member (17). In this arrangement it may still be desirable that only part of the mirror member (17) is driven as a bending wave loudspeaker, and to achieve 15 this it may be necessary to mass load the mirror to define the required acoustically active area, e.g. as described in WO97/09842.

INDUSTRIAL APPLICABILITY

20 The invention thus provides novel and effective mirror/vehicle windscreen accessory devices.

CLAIMS

1. A vehicle windscreen accessory comprising a body member, an adjustable support structure for the body member
5 whereby the position of the body member can be adjusted, the body member comprising a mirror member and a loudspeaker having a bending wave panel-form acoustic member, the mirror member and panel-form member being integral.
- 10 2. A vehicle sun visor comprising a sun shield member and an adjustable support structure for the shield member, whereby the position of the shield member can be adjusted from an inoperative position to at least one operative position, the shield member comprising a vanity mirror
15 having a mirror member and a loudspeaker having a bending wave panel-form member, the mirror member and the panel-form member being integral.
3. A sun visor according to claim 2, wherein the shield member defines a hollow enclosure, and wherein one face of
20 the panel-form member is enclosed in the hollow enclosure to reduce or prevent sound radiation from the said one face.
4. A sun visor according to any preceding claim, wherein the panel-form member is a resonant member.
- 25 5. A sun visor according to any preceding claim, comprising an inertial electrodynamic vibration exciter on the panel-form member to apply bending wave vibration thereto.

6. A sun visor according to any preceding claim, comprising a microphone.

7. A vehicle rear view mirror comprising a body member and an adjustable support structure for the body member, 5 whereby the position of the body member can be adjusted, the body member comprising a mirror member and a loudspeaker having a bending wave panel-form member, the mirror member and the panel-form member being integral.

8. A rear view mirror according to claim 7, wherein the 10 body member defines a hollow enclosure, and wherein one face of the panel-form member is enclosed in the hollow enclosure to reduce or prevent sound radiation from the said one face.

9. A rear view mirror according to claim 7 or claim 8, 15 wherein the panel-form member is a resonant member.

10. A rear view mirror according to any one of claims 7 to 9, comprising an inertial electrodynamic vibration exciter on the panel-form member to apply bending wave vibration thereto.

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Figure 1

1 / 3

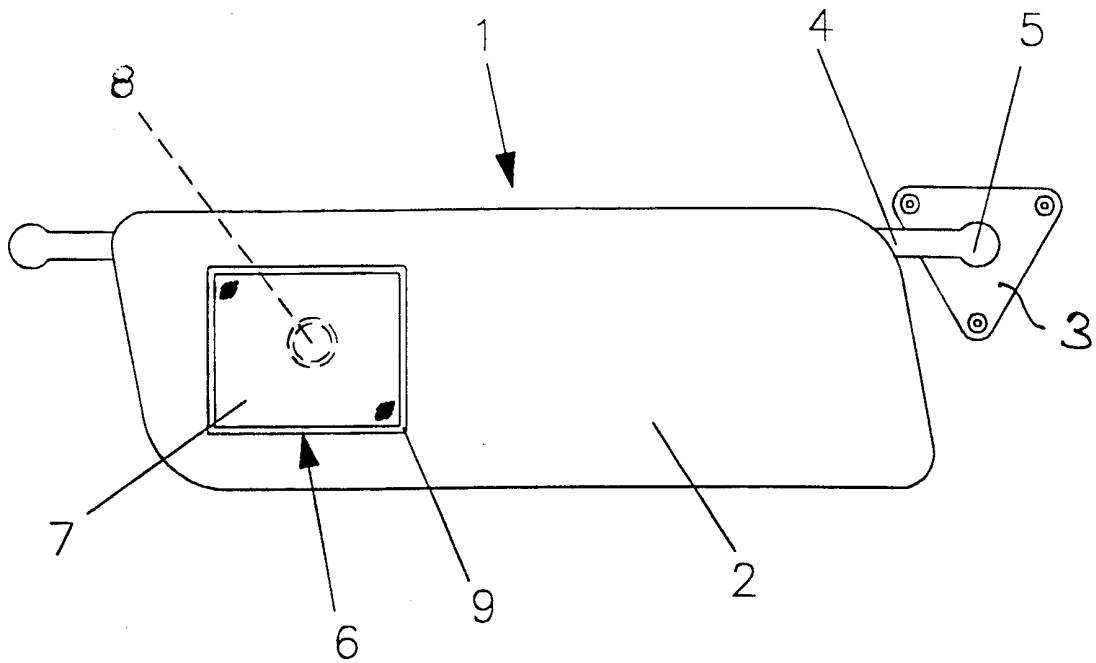


Figure 2

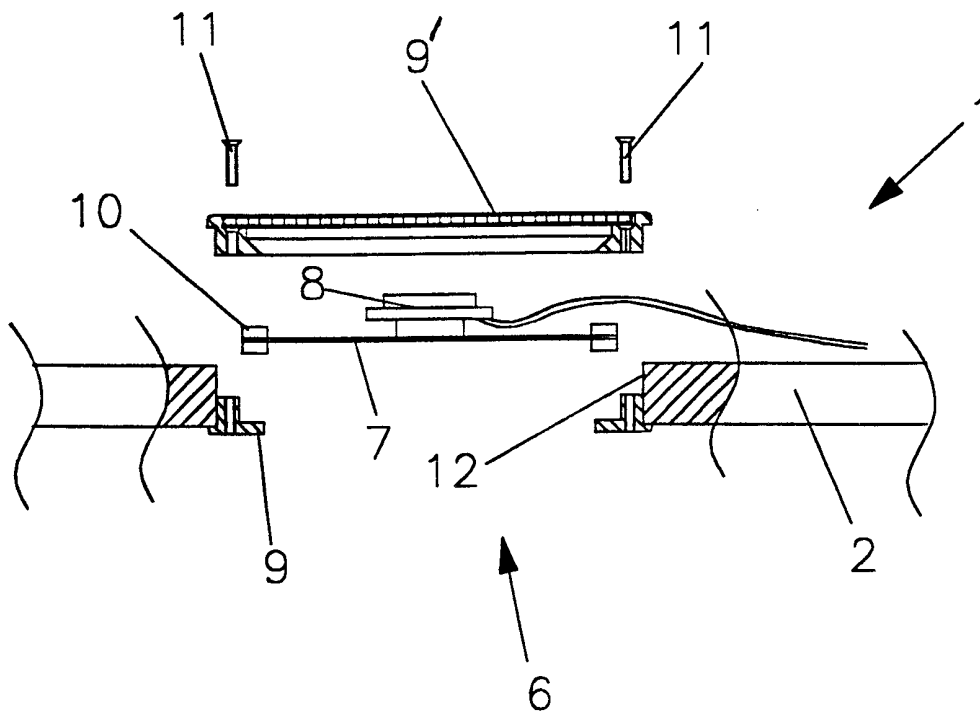


Figure 3

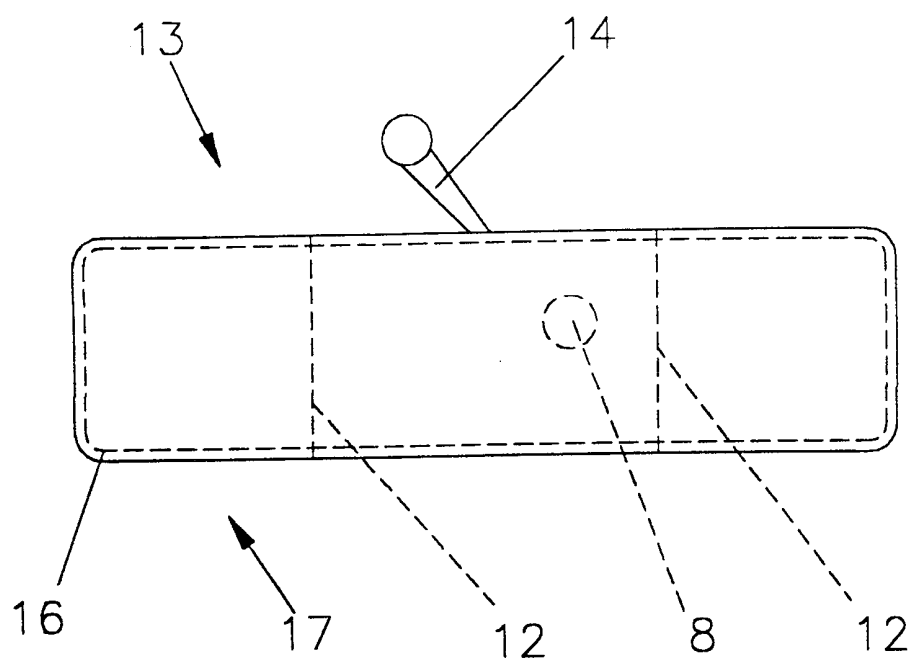


Figure 4

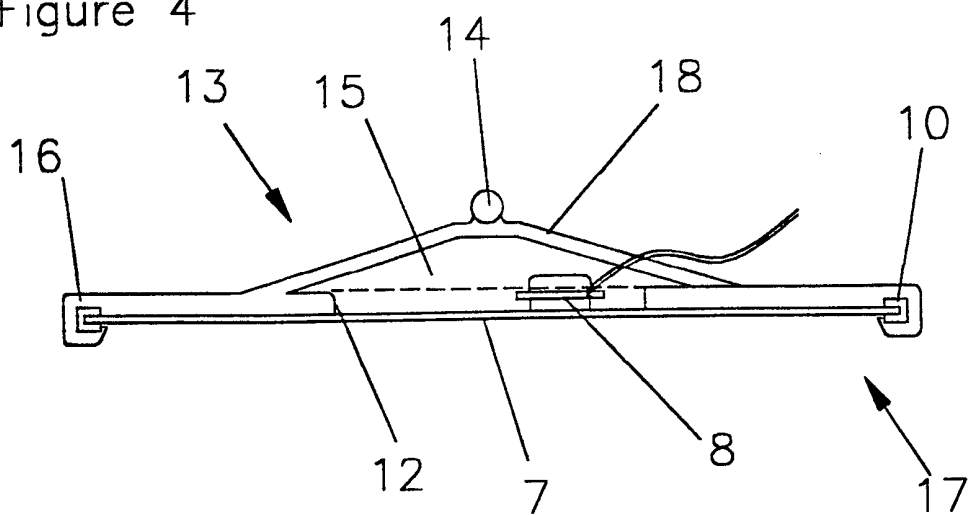


Figure 5

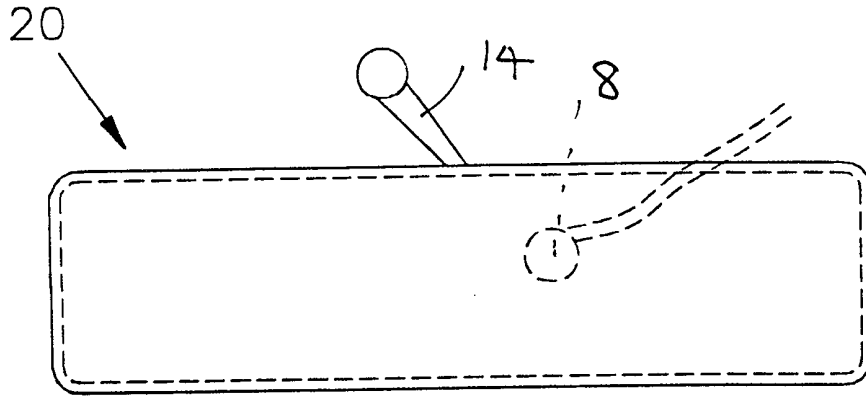


Figure 6

