



(12) **United States Patent**  
**DeLine et al.**

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(54) **INTERIOR REARVIEW MIRROR SOUND PROCESSING SYSTEM**

4,187,396 A	2/1980	Luhowy	179/1
4,484,344 A	11/1984	Mai et al.	381/46
4,736,432 A	4/1988	Cantrell	381/83
4,833,719 A	5/1989	Carne et al.	381/72

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(List continued on next page.)

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**FOREIGN PATENT DOCUMENTS**

(\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

JP	3169199	7/1991
JP	10036144 A	2/1998
JP	10330131 A	12/1998
JP	11050006 A	2/1999
WO	WO 9734780	9/1997
WO	WO 9817046	4/1998
WO	WO 9830415	7/1998

This patent is subject to a terminal disclaimer.

**OTHER PUBLICATIONS**

(21) Appl. No.: **09/466,010**

Adaptive Noise Cancelling: Principles and Applications, Proc. IEEE, vol. 63, pp. 1692-1716, Dec. 1975 by B. Widrow et al.

(22) Filed: **Dec. 17, 1999**

Adaptive Noise Cancelling for Speech Signals, IEEE Trans. Acoust. Speech and Signal Proc., vol. ASSP-26, No. 5, Oct. 1978 by M. Sambur.

**Related U.S. Application Data**

(63) Continuation-in-part of application No. 09/449,121, filed on Nov. 24, 1999, and a continuation-in-part of application No. 09/448,700, filed on Nov. 24, 1999, now Pat. No. 6,329,925, and a continuation-in-part of application No. 09/433,467, filed on Nov. 4, 1999, now Pat. No. 6,326,613, and a continuation-in-part of application No. 09/396,179, filed on Sep. 14, 1999, now Pat. No. 6,278,377, which is a continuation-in-part of application No. 09/382,720, filed on Aug. 25, 1999, now Pat. No. 6,243,003.

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- (51) **Int. Cl.**<sup>7</sup> ..... **B60Q 1/00; H04R 29/00**
- (52) **U.S. Cl.** ..... **340/815.4; 340/425.5; 381/56; 381/86; 381/169; 381/361; 381/365**
- (58) **Field of Search** ..... **340/315.4, 425.5; 381/71.1, 71.4, 56-58, 86, 91; 379/454, 446; 455/74.1, 569, 566, 567, 575, 90, 99, 100**

**ABSTRACT**

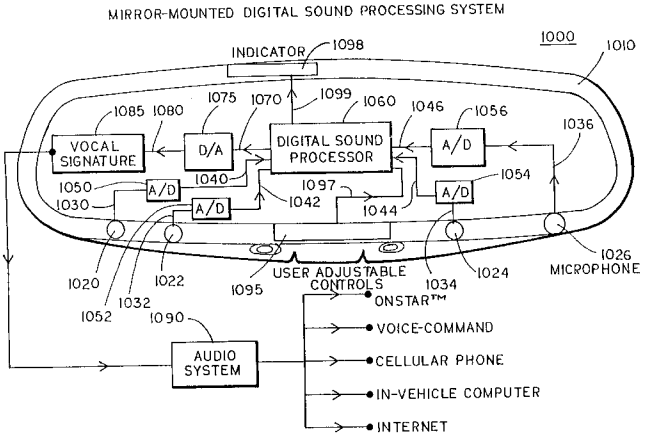
A digital sound processor is provided to enhance the vocal to non-vocal noise ratio of the signal processed by a vehicle audio system such as a cellular telephone, emergency communication device, or other audio device. Optionally, an indicator is provided for use with the vehicular audio system in order to provide a user of the audio system with a status signal relating to a reception quality of a vocal signal from the user. The microphone of the audio system may be mounted within an accessory module, which may be mounted to an interior surface of a vehicle windshield. The accessory module provides a fixed orientation of the microphone and is easily installed to the vehicle as it is manufactured or as an aftermarket device. The indicator may be mounted at the accessory module or elsewhere at the mirror assembly.

**References Cited**

**U.S. PATENT DOCUMENTS**

2,972,018 A	2/1961	Hawley et al.	179/1
3,098,121 A	7/1963	Wadsworth	179/1
4,052,568 A	10/1977	Jankowski	179/15

**43 Claims, 10 Drawing Sheets**



## U.S. PATENT DOCUMENTS

4,878,188	A	10/1989	Ziegler, Jr. ....	364/724.01	5,732,143	A	3/1998	Andrea et al. ....	381/71.6
4,930,742	A	* 6/1990	Schofield et al. ....	248/475.1	5,760,962	A	6/1998	Schofield et al. ....	359/604
4,959,865	A	9/1990	Stettiner et al. ....	381/46	5,786,772	A	7/1998	Schofield et al. ....	340/903
4,977,600	A	12/1990	Ziegler .....	381/71	5,796,176	A	8/1998	Kramer et al. ....	307/10.1
5,033,082	A	7/1991	Eriksson et al. ....	379/410	5,798,575	A	8/1998	O'Farrell et al. ....	307/10.1
5,138,664	A	8/1992	Kimura et al. ....	381/72	5,798,688	A	8/1998	Schofield .....	340/438
5,178,448	A	1/1993	Adams et al. ....	362/83.1	5,813,745	A	9/1998	Fant, Jr. et al. ....	362/83.1
5,251,263	A	10/1993	Andrea et al. ....	381/71	5,820,245	A	10/1998	Desmond et al. ....	362/83.1
5,381,473	A	1/1995	Andrea et al. ....	379/387	5,825,897	A	10/1998	Andrea et al. ....	381/71.6
5,530,240	A	6/1996	Larson et al. ....	250/214	5,877,897	A	3/1999	Schofield et al. ....	359/604
5,546,458	A	* 8/1996	Iwami .....	379/390	5,878,353	A	* 3/1999	ul Azam et al. ....	455/550
5,550,677	A	8/1996	Schofield et al. ....	359/604	5,909,495	A	6/1999	Andrea .....	381/67
5,649,756	A	7/1997	Adams et al. ....	362/83.1	5,924,212	A	7/1999	Domanski .....	33/355
5,671,996	A	9/1997	Bos et al. ....	362/83.1	5,929,786	A	7/1999	Schofield et al. ....	340/903
5,673,325	A	9/1997	Andrea et al. ....	381/92	5,938,321	A	8/1999	Bos et al. ....	362/494
5,673,994	A	10/1997	Fant, Jr. et al. ....	362/831	5,971,552	A	10/1999	O'Farrell et al. ....	359/871
5,715,093	A	2/1998	Schierbeck et al. ....	359/601	6,091,411	A	2/2000	Carter et al. ....	296/37.7
5,715,321	A	2/1998	Andrea et al. ....	381/92	6,243,003	B1	* 6/2001	DeLine et al. ....	340/425.5
5,724,187	A	3/1998	Varaprasad et al. ....	359/608					

\* cited by examiner

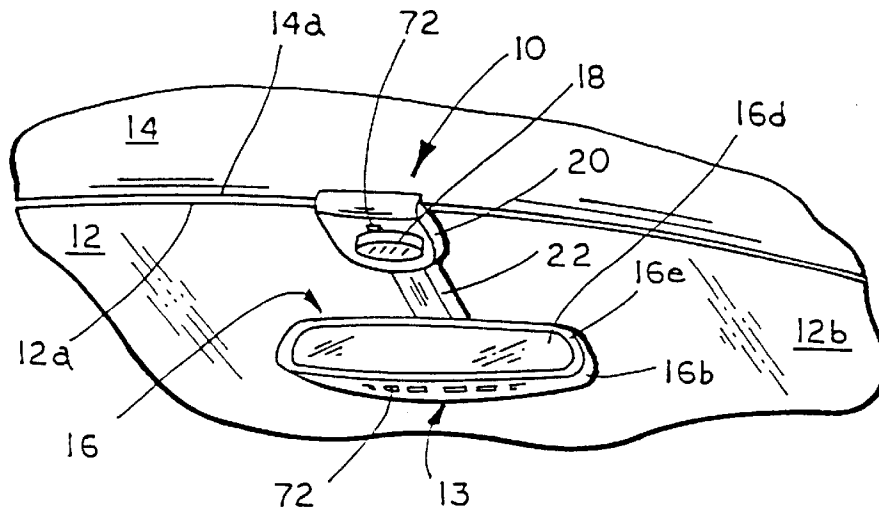


FIG. 1

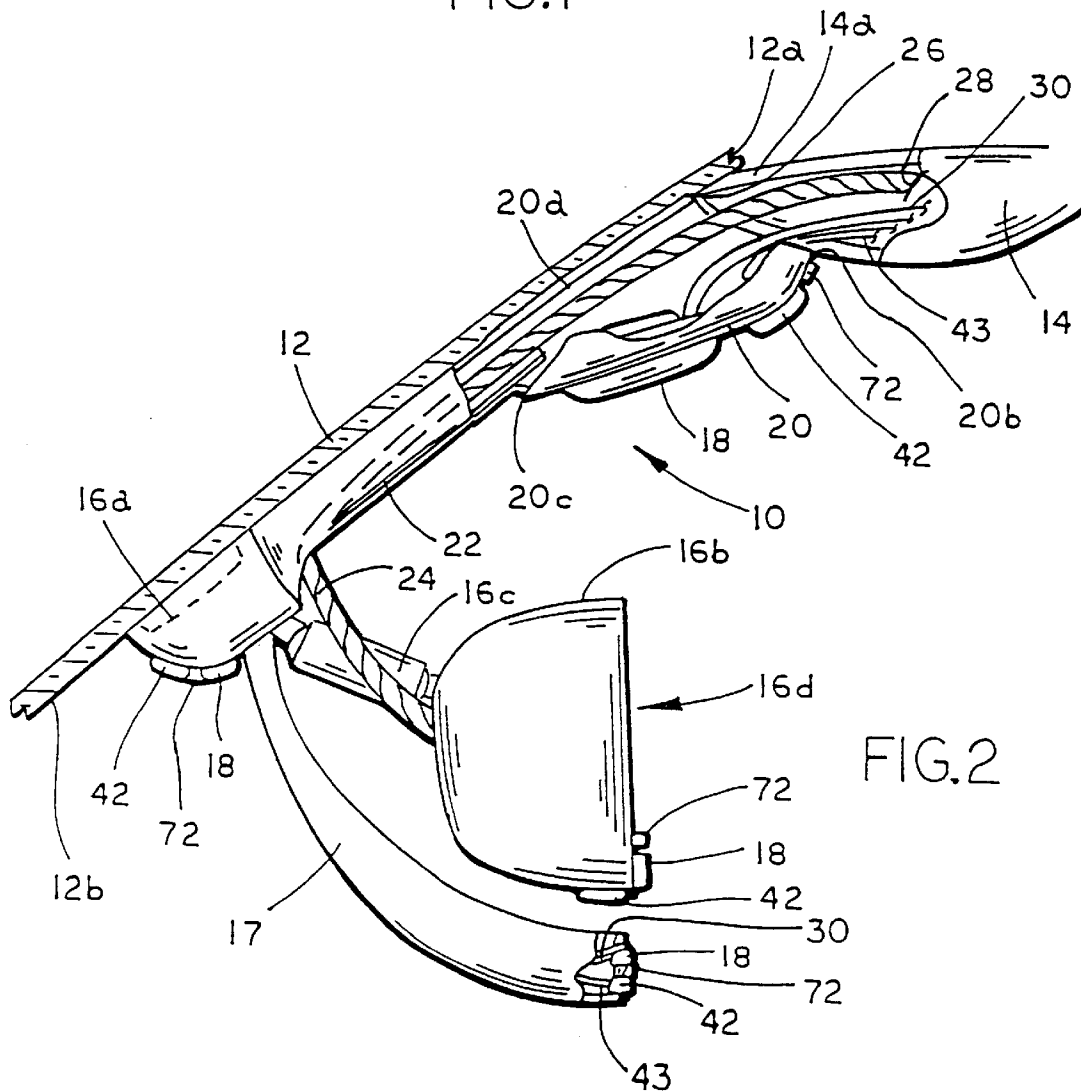
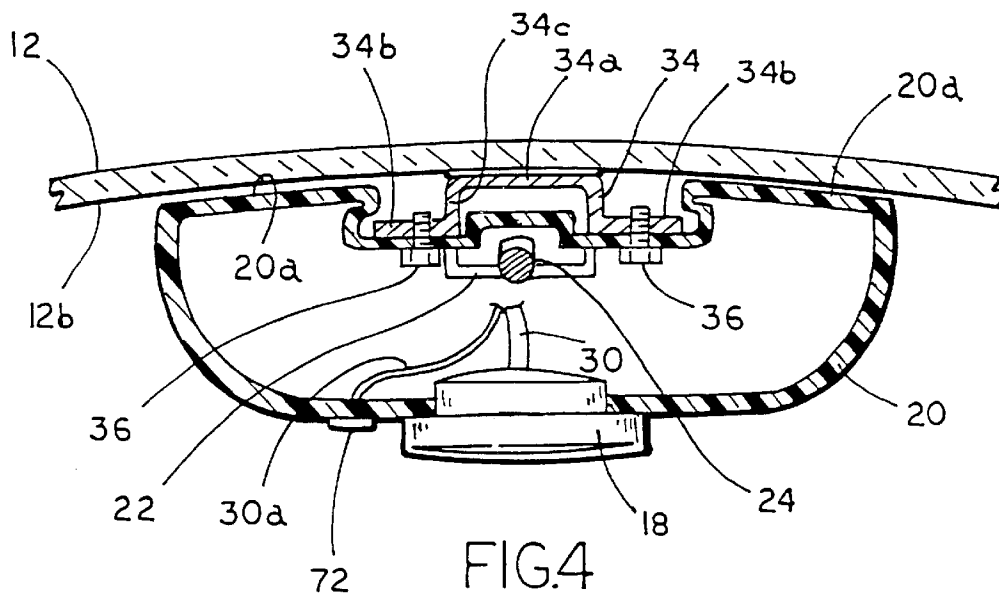
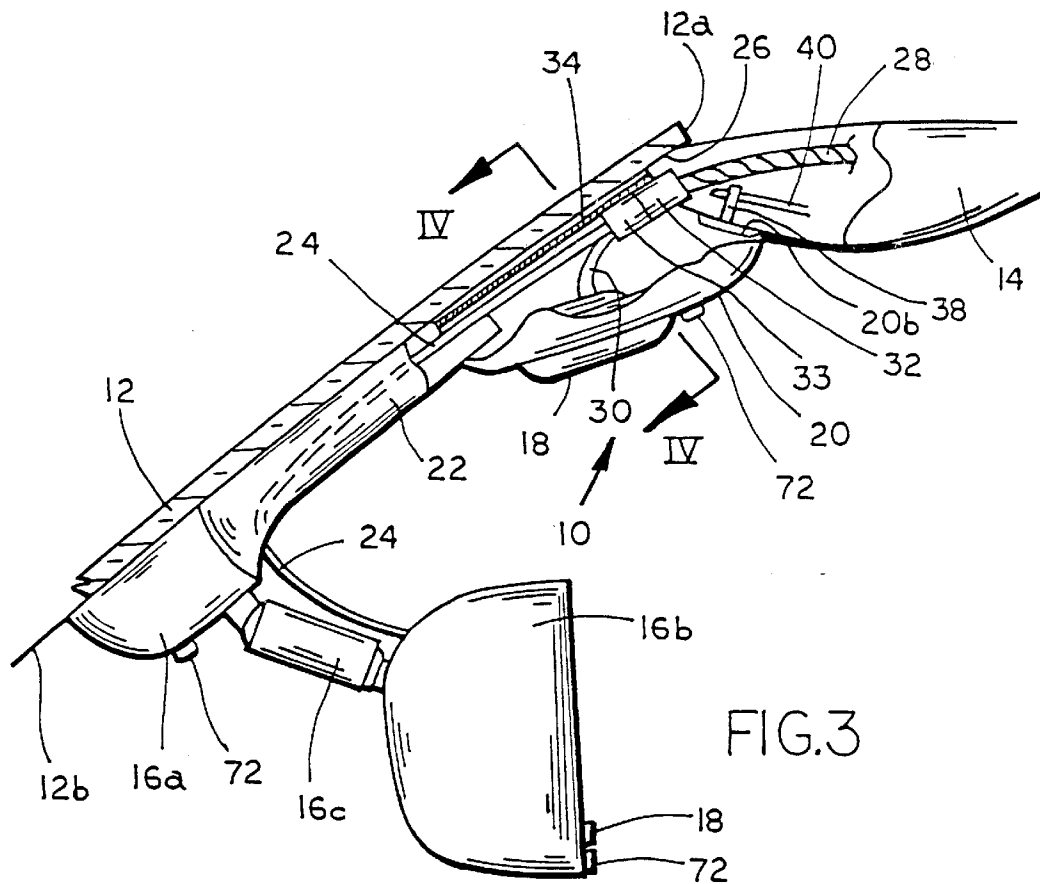


FIG. 2



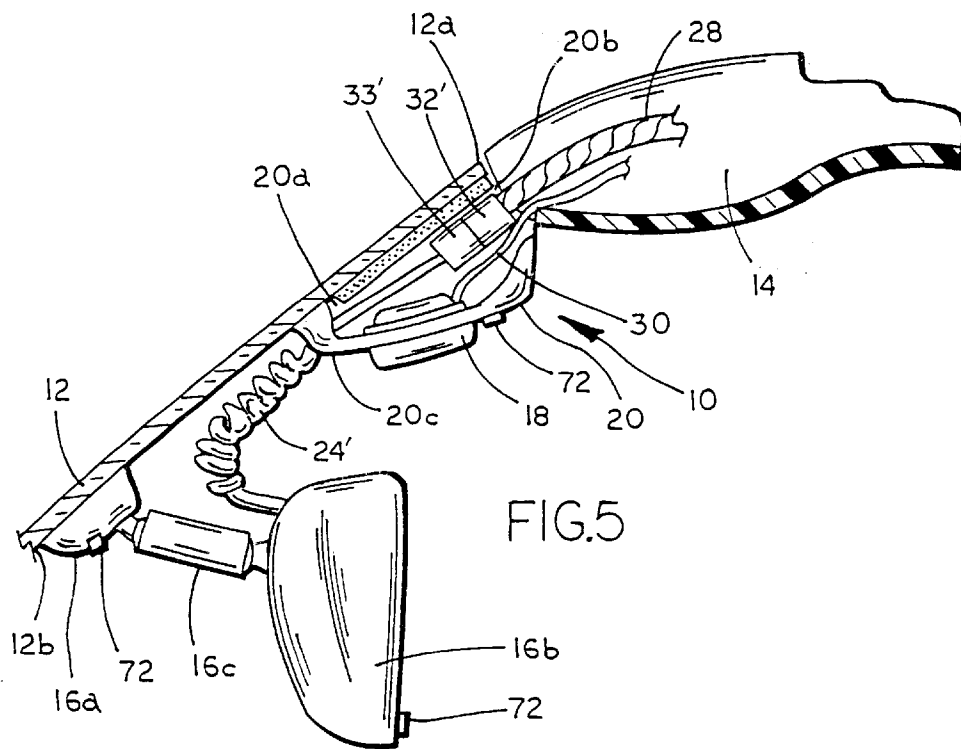


FIG.5

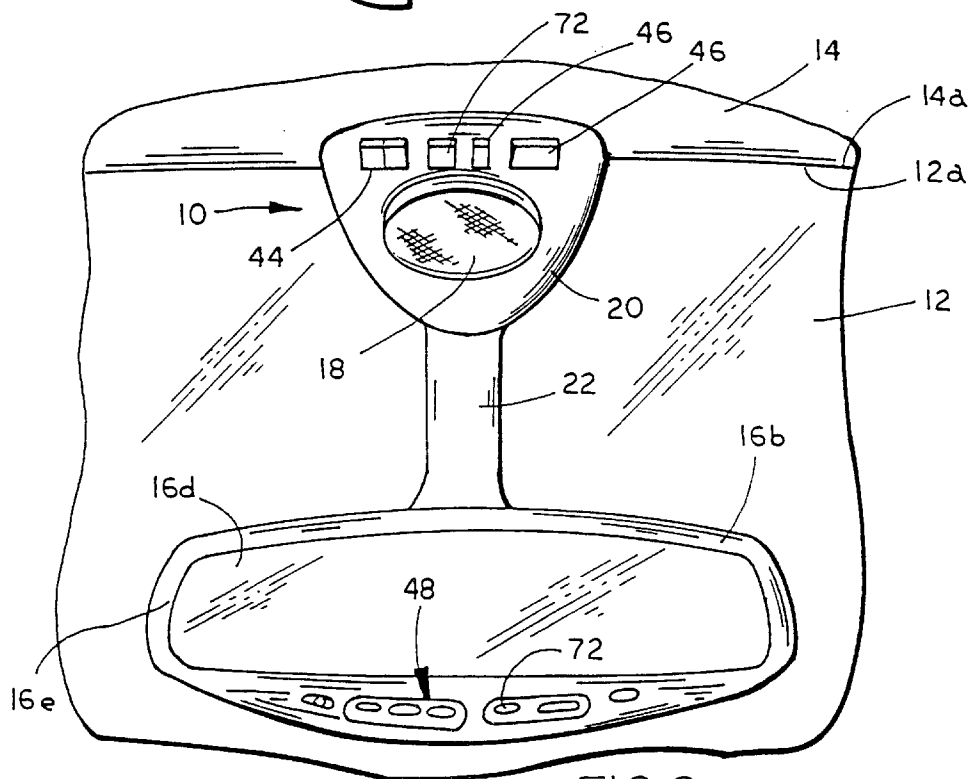


FIG.6

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