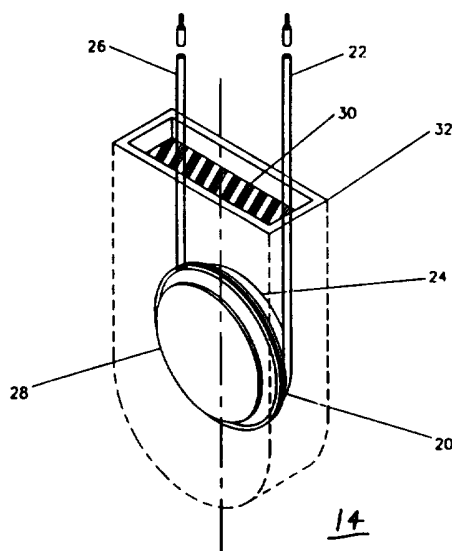




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification ⁶ : H04R 17/00</p>	<p>A3</p>	<p>(11) International Publication Number: WO 97/13163 (43) International Publication Date: 10 April 1997 (10.04.97)</p>
<p>(21) International Application Number: PCT/US96/15897 (22) International Filing Date: 2 October 1996 (02.10.96) (30) Priority Data: 08/537,972 2 October 1995 (02.10.95) US (71) Applicant: I/O EXPLORATION PRODUCTS (U.S.A.), INC. [US/US]; 12300 Parc Crest Drive, Stafford, TX 77477 (US). (72) Inventors: CHANG, Win, H.; 12115 Sugar Springs Drive, Houston, TX 77077 (US). BADGER, Algernon, S.; Rt. 1, Box 218 F, Bernard, TX 77435 (US). SIMENSKY, Bernard; 2111 Mid Lane, A-13, Houston, TX 77027 (US). (74) Agents: HEADLEY, Tim et al.; Haynes and Boone, L.L.P., 3100 NationsBank Plaza, 901 Main Street, Dallas, TX 75202-3789 (US).</p>	<p>(81) Designated States: AU, AZ, CN, NO, SG, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i> (88) Date of publication of the international search report: 15 May 1997 (15.05.97)</p>	

(54) Title: ACOUSTIC TRANSDUCER



(57) Abstract

An acoustic transducer assembly (20) includes a piezoelectric ceramic crystal (36). The assembly (20) also includes a pair of solid circular metal plates (24, 28) positioned to sandwich the piezoelectric ceramic crystal (36) between them, wherein each of the metal plates (24, 28) comprises: (i) an outer rim circling a concave portion formed in a first surface of the metal plate, the first surface oriented toward the piezoelectric ceramic crystal; and (ii) an epoxy wicking barrier formed in the first surface, adjacent to the outer rim. The assembly (20) also includes an epoxy adhesive interposed between the metal plates (24, 28) and the piezoelectric ceramic crystal (36), wherein the outer rim of each plate is bonded to the piezoelectric ceramic crystal (36) by the epoxy adhesive, the pair of plates thus forming a cavity between them. The assembly (20) also includes a flexing stop attached to each first surface.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US96/15897

A. CLASSIFICATION OF SUBJECT MATTER
 IPC(6) :H04R 17/00
 US CL :367/157, 165, 173; 29/25.35, 594; 310/337
 According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED
 Minimum documentation searched (classification system followed by classification symbols)
 U.S. : 367/157, 165, 173; 29/25.35, 594; 310/337

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
 NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
 NONE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5,276,657 A (NEWNHAM ET AL) 04 JANUARY 1994, SEE ENTIRE DOCUMENT	1-11
A	US 4,431,937 A (WHITE) 14 FEBRUARY 1984, SEE ENTIRE DOCUMENT	1-11
A	US 4,004,266 A (COOK ET AL) 18 JANUARY 1977, SEE ENTIRE DOCUMENT	1-11
Y	US 4,030,175 A, (MC SHANE) 21 JUNE 1977, SEE CLAIM 1	12

Further documents are listed in the continuation of Box C. See patent family annex.

<p>* Special categories of cited documents:</p> <p>*A* document defining the general state of the art which is not considered to be of particular relevance</p> <p>*E* earlier document published on or after the international filing date</p> <p>*L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>*O* document referring to an oral disclosure, use, exhibition or other means</p> <p>*P* document published prior to the international filing date but later than the priority date claimed</p>	<p>*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>*X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>*Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>*Z* document member of the same patent family</p>
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Date of the actual completion of the international search 11 MARCH 1997	Date of mailing of the international search report 27 MAR 1997
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Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer <i>Dean Gordon</i> IAN J. LOBO Telephone No. (703) 306-4161
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US96/15897

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

Please See Extra Sheet.

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- The additional search fees were accompanied by the applicant's protest.
 No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US96/15897

BOX II. OBSERVATIONS WHERE UNITY OF INVENTION WAS LACKING

This ISA found multiple inventions as follows:

This application contains the following inventions or groups of inventions which are not so linked as to form a single inventive concept under PCT Rule 13.1. In order for all inventions to be searched, the appropriate additional search fees must be paid.

Group I, claims 1-11, drawn to an acoustic transducer or hydrophone.

Group II, claim 12, drawn to a method of making a hydrophone.

The inventions listed as Groups I and II do not relate to a single inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

The technical features of curing an acoustic transducer assembly at temperatures less than 150 degrees centigrade, encapsulating the cured assembly and then curing the potted assembly, as claimed in Group II, are not common to the two Groups and thus, unity is lacking.