FORM PTO-1595 11/29/00 R
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U.S. DEPARTMENT OF COMMERCE
Patent and Trademark Office

To the Honorable Commissioner of Patents and Trademarks: Please record the attached original documents or copy thereof.

jc914 U.S. PTO
09/740760
11/29/00

1. Name of conveying party(ies):

Allen R. Davis, Daniel L. Gysling, Charles R. Winston,

John M. Faustino and Rebecca S. McGuinn

Additional name(s) of conveying party(ies) attached? yes no

3. **Nature of conveyance:**

X Assignment ___ Merger

___ Security Agreement ___ Change of Name

___ Other

Execution Date: November 29, 2000

2. Name and address of receiving party(ies):

Name: CiDRA Corporation

Internal Address: _____

Street Address: 50 Barnes Park North

City: Wallingford State: CT Zip: 06492

Additional name(s) and addresses(es) attached? _ yes X no

4. **Application number(s) or patent number(s):** 9/740760

If this document is being filed together with a new application, the execution date of the application is: November 29, 2000

Patent Application No.(s) B. Patent No.(s)

Additional numbers attached? _ yes X no

5. **Name and Address of party to whom correspondence concerning document should be mailed:**

Name: Matthew J. Patterson

Internal Address: CiDRA Corporation

Street Address: 50 Barnes Park North

City: Wallingford State: CT Zip: 06492

6. **Total number of applications and patents involved:** 1

7. **Total fee (37 CFR 3.41).....$** 40.00

___ Enclosed

X Authorized to be charged to deposit account

8. **Deposit account number:**

50-260, Order No. CC-0308

(Attach duplicate copy of this page if paying by deposit account)

DO NOT USE THIS SPACE

9. **Statement and signature.**

To the best of my knowledge and belief, the foregoing information is true and correct and any attached copy is a true copy of the original document.

Matthew J. Patterson
Name of Person Signing
Registration No. 41,244

Signature

November 29, 2000
Date

Total number of pages including cover sheet, attachments, and document: 2

Mail documents to be recorded with required cover sheet information to:
Commissioner of Patents & Trademarks, Box Assignments
Washington, D.C. 20231

01/05/2001 MTHAI1 00000225 500260 09740760
01 FC:581 40.00 CH

ASSIGNMENT

USSN:_____
Filed: _____

WHEREAS, WE, Allen R. Davis of 615 Poplar Drive, Falls Church, Virginia 22046; Daniel L. Gysling of 763 Chestnut Hill Road, Glastonbury, Connecticut 06033; Charles R. Winston of 109 Cambridge Drive, Glastonbury, Connecticut 06033; John M. Faustino of 560 Silver Sands Road, East Haven, Connecticut 06512 and Rebecca S. McGuinn of 139 Powder Hill Road, Middlefield, Connecticut 06455; have invented certain improvements in **Apparatus for Sensing Fluid Flow in a Pipe** identified as Attorney Docket No. CC-0308, and described in a patent application executed by the undersigned on the date(s) set after the signature(s) hereto, being owner(s) of all right, title and interest in and to said application and in and to any invention described therein, free from all prior assignments, agreements, licenses, mortgages, or other encumbrances whatsoever, and having full right to convey the entire interest both legal and equitable herein assigned; and

WHEREAS, CiDRA Corporation, of Wallingford, Connecticut, a corporation of the State of Delaware (assignee) is desirous of acquiring the entire United States right, title and interest in and to said invention or inventions and any and all U.S. Patents to be obtained therefor;

NOW, THEREFORE, in consideration of One Dollar ($1.00) and other good and valuable consideration, the receipt of which is hereby acknowledged by the undersigned, the undersigned do hereby sell, assign, transfer and set over unto said assignee, its successors and assigns, the entire right, title and interest in and to said invention or inventions, as described in the aforesaid U.S. Patent application, in any form or embodiment thereof, and in and to the aforesaid application; and in and to any application filed in any foreign country based thereon, including the right to file said foreign applications under the provisions of the International Convention; also the entire right, title and interest in and to any and all patents or reissues or extensions thereof to be obtained in this or any foreign country upon said invention or inventions and any divisional, continuation, continuation-in-part or substitute applications which may be filed upon said invention or inventions in this or any foreign country; and the undersigned hereby authorize(s) and request(s) the issuing authority to issue any and all patents on said application or applications to said assignee or its successors and assigns.

The undersigned further agree(s), without any further payment or compensation by said assignee or its successors and assigns, to communicate to said assignee, its representatives or agents or its successors and assigns, any facts relating to said invention or inventions including evidence for interference purposes or for other legal proceedings whenever requested; testify in any interference or other legal proceedings, whenever requested; execute and deliver, on request, all lawful papers required to make any of the foregoing provisions effective; and generally do everything possible to aid said assignee, its successors or assigns and nominees to obtain and enforce proper patent protection for said invention or inventions in this or any foreign country.

IN TESTIMONY WHEREOF, the undersigned has(have) hereunto set his(their) hand(s) and seal(s) on the date after his(their) signature(s).

L.S.	Allen R. Davis	29 Nov 00 Date
L.S.	Daniel L. Gysling	29 NOV 00 Date
L.S.	Charles R. Winston	29 Nov 00 Date
L.S.	John M. Faustino	11/29/00 Date
L.S.	Rebecca S. McGuinn	29 Nov 00 Date

State of Connecticut)
) ss: Wallingford
County of New Haven)

On this 29th day of November, 2000, before me personally appeared A. R. Davis, D. L. Gysling, C. R. Winston, J. M. Faustino and R. S. McGuinn to me personally known, and known to me to be the person(s) who signed the foregoing assignment, and acknowledged the signing of same as his/her(their) free act and deed.

SEAL

Notary Public

SHERRY B. HOLT
Notary Public
My Commission Expires Feb. 28, 2005

Apparatus for Sensing Fluid Flow in a Pipe

BACKGROUND OF THE INVENTION

1. Technical Field

This invention relates to fluid flow sensing devices that use fiber optics and more particularly to those devices that measure the speed of sound, flow velocity, and other parameters within a pipe using acoustic signals, and local short duration pressure variations within the flow.

2. Background Information

In the petroleum industry, there is considerable value in the ability to monitor the flow of petroleum products in the production pipe of a well in real time. Historically, flow parameters such as the bulk velocity of a fluid have been sensed with venturi type devices directly disposed within the fluid flow. These type devices have several drawbacks including the fact that they provide an undesirable flow impediment, are subject to the hostile environment within the pipe, and typically provide undesirable potential leak paths into or out of the pipe. In addition, these type devices are also only able to provide information relating to the bulk fluid flow and are therefore unable to provide information specific to constituents within a multi-phase flow.

Some techniques utilize the speed of sound to determine various parameters of the fluid flow within a pipe. One technique measures the amount of time it takes for sound signals to travel back and forth between ultrasonic acoustic transmitters/receivers (transceivers). This is sometimes referred to a "sing-around" or "transit time" method. United States Patent numbers 4,080,837, 4,114,439, 5,115,670 disclose variations of this method. A disadvantage of this type of technique is that gas bubbles and/or particulates in the fluid flow can interfere with the signals traveling back and forth between the transceivers. Another disadvantage of this type of technique is that it considers only the fluid disposed between transceivers during the signal transit time. Fluid flow within a well will very often be non-homogeneous, for example containing localized concentration variations ("slugs") of water or oil. Localized concentration variations can affect the accuracy of the data collected.