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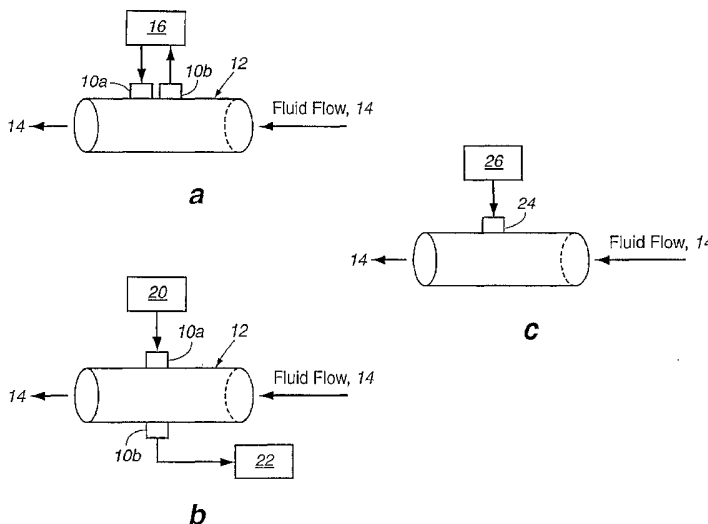
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(54) Title: NONINVASIVE CHARACTERIZATION OF A FLOWING MULTIPHASE FLUID USING ULTRASONIC INTERFEROMETRY



(57) Abstract: An apparatus for noninvasively monitoring the flow and/or the composition of a flowing liquid using ultrasound is described. The position of the resonance peaks for a fluid excited by a swept-frequency ultrasonic signal have been found to change frequency both in response to a change in composition and in response to a change in the flow velocity thereof. Additionally, the distance between successive resonance peaks does not change as a function of flow, but rather in response to a change in composition. Thus, a measurement of both parameters (resonance position and resonance spacing), once calibrated, permits the simultaneous determination of flow rate and composition using the apparatus and method of the present invention.

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## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US03/18576

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(7) :G01B 9/02

US CL :73/657

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. : 73/64.53, 579, 657, 861.18

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)

flow, fluid, liquid, water, oil, acoustic, sound, echo, vibrate, vibration, rate, periodic, resonance, frequency, measure, detect, determine, compute, calculate

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,606,130 A (SINHA et al) 25 February 1997, abstract, col. 2-5.	1-32
Y	US 5,886,262 A (Sinha) 23 March 1999, abstract, col. 2-6.	1-32

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

* Special categories of cited documents:	"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
"A" document defining the general state of the art which is not considered to be of particular relevance	"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
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"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)	"&" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

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