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(54) **ULTRASONIC FLOW METER UNIT WITH AN INSULATING DAMPING MEMBER COVERING THE ULTRASONIC TRANSDUCERS, A MEASURING CIRCUIT AND LEAD WIRES**

(58) **Field of Classification Search**
None
See application file for complete search history.

(56) **References Cited**

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U.S. PATENT DOCUMENTS

3,925,692 A * 12/1975 Leschek B06B 1/0685
310/327
3,979,565 A * 9/1976 McShane H04R 17/00
310/312

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(Continued)

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FOREIGN PATENT DOCUMENTS

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JP 04-192397 A 7/1992
JP 2003-302385 A 10/2003
(Continued)

OTHER PUBLICATIONS

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English Translation of International Search Report for PCT/JP2013/003506 dated Aug. 7, 2013, 2 pages.

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(Continued)

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(57) **ABSTRACT**

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An ultrasonic flow meter unit, mounted to a fluid passage through which a measurement target fluid flows, comprises a pair of ultrasonic transducers each including a piezoelectric substrate, and an acoustic matching member; a measuring circuit which measures a flow of a target fluid based on time for which an ultrasonic pulse propagates between the pair of ultrasonic transducers; and an insulating damping member unitarily formed to cover at least a portion of each of a portion of each of the pair of ultrasonic transducers, which portion contacts the fluid passage, the piezoelectric substrate, and the measuring circuit.

(30) **Foreign Application Priority Data**

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G01F 1/66 (2006.01)

(52) **U.S. Cl.**
CPC **G01F 1/66** (2013.01); **G01F 1/662** (2013.01)

5 Claims, 9 Drawing Sheets

