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(12) **United States Patent**  
**Allen**

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(54) **ULTRASONIC FLOW METER HAVING A  
PORT COVER ASSEMBLY**

2011/0162460 A1\* 7/2011 Allen et al. .... 73/861.18  
2011/0162461 A1\* 7/2011 Allen .... 73/861.18  
2011/0162463 A1\* 7/2011 Allen .... 73/861.18

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(\*) Notice: Subject to any disclaimer, the term of this  
patent is extended or adjusted under 35  
U.S.C. 154(b) by 331 days.

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and Written Opinion dated Aug. 18, 2011.

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This patent is subject to a terminal dis-  
claimer.

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(57) **ABSTRACT**

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An ultrasonic flow meter for measuring the flow of a fluid through a pipeline. In some embodiments, the ultrasonic flow meter includes a spool piece, a transducer assembly, and a port cover assembly. The spool piece has a throughbore and a transducer port extending between the throughbore and an outer surface of the spool piece. The transducer assembly is disposed within the transducer port and includes a transformer, a piezoelectric element, and an electrical coupling therebetween. The port cover assembly is coupled to the transducer assembly. The port cover assembly receives a cable coupled to the transducer assembly and is spring-loaded to bias the port cover assembly toward the transducer assembly to resist the cable from being electrically uncoupled from the transducer assembly.

(51) **Int. Cl.**

**G01F 1/20** (2006.01)

**G01F 1/66** (2006.01)

(52) **U.S. Cl.** ..... **73/861.18; 73/861.27**

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

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**33 Claims, 29 Drawing Sheets**

