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Hornung et al.

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(54) **DEVICE FOR EXAMINING SHEET-LIKE ARTICLES USING ULTRASOUND**

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367/188; 73/597, 159

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,446,735 A * 5/1984 Weilacher 73/597

4,612,807 A * 9/1986 Wunderer 73/159
5,661,243 A * 8/1997 Bryan et al. 73/597
5,691,474 A * 11/1997 Gerz 73/159
5,922,960 A * 7/1999 Toda 73/597

FOREIGN PATENT DOCUMENTS

GB 001323844 A * 7/1973

* cited by examiner

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(57) **ABSTRACT**

The invention relates to an apparatus for testing sheet material, in particular bank notes, comprising a device for transporting the sheet material in a defined direction, at least one transducer pair with a transmitter which exposes the sheet material to soundwaves and a receiver which detects the sound fraction transmitted through the sheet material, transmitter and receiver being disposed obliquely to each other with respect to the transport plane.

The inventive apparatus is characterized in that the soundwaves emitted by a transducer are passed into a transport channel in which the sheet material to be tested is moved during irradiation, the sound fraction reflected by the sheet material being limited in its propagation by the transport channel such that said sound fraction cannot reach the receiver during irradiation of the sheet material.

15 Claims, 2 Drawing Sheets

