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H4J 30H 30N 31J AB
U1S 1915 2141 G1G H4D H4J

(56) Documents cited
GB A 2184237 **GB 1088469**

(58) Field of search
G1G
H4J
Selected US specifications from IPC sub-classes
G01H G01S G01V H04R

(54) Acoustic Sensor

(57) An acoustic sensor comprises a sensor element 1 and a compensation element 4, the two elements having different sensitivities to mechanical loads, such that element 1 is sensitive to ambient pressure changes and element 4 is not, and being positioned together such that they will both be subject to the same spectrum of disturbing phenomena, outputs from the two elements 1, 4 being applied to suitable circuit means to provide an acoustic output signal in which noise due to unwanted vibration effects is substantially reduced.

The sensor element 1 may be an optical fibre core surrounded by a jacket of a plastics material and the compensation element 4 may be a similar core with a rubber jacket. The construction is suitable for a linear or a planar optical fibre sensor array, e.g. hydrophones. Alternative sensor elements may be piezoelectric plastics or ceramic material or ceramic loaded rubber. Application to an optical fibre magnetometer is mentioned.

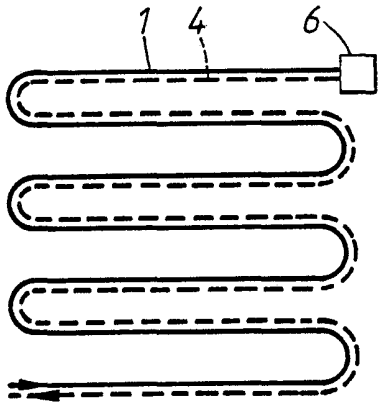

FIG.4.

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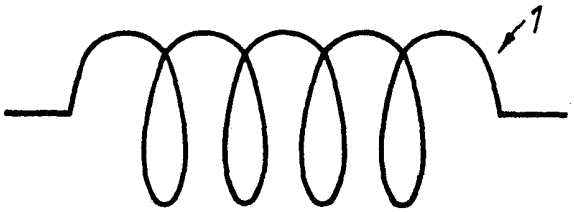

FIG. 1.

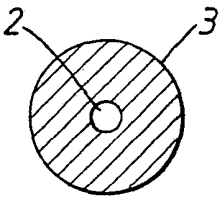

FIG. 2.

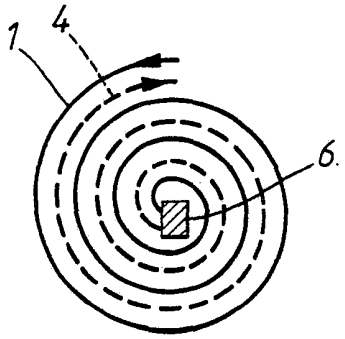

FIG. 3.

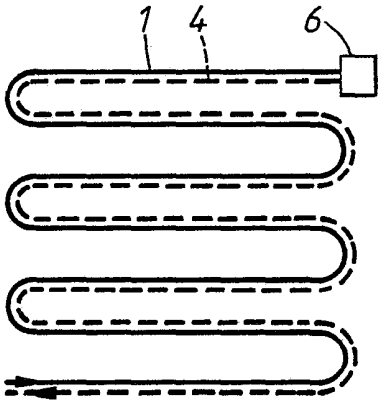

FIG. 4.

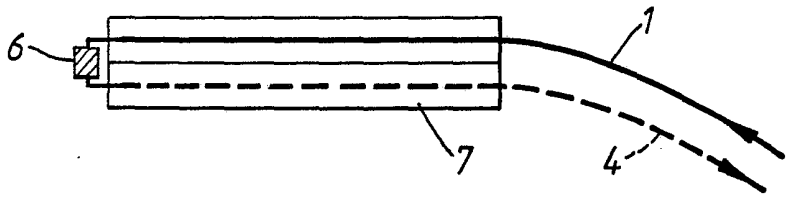

FIG. 5.

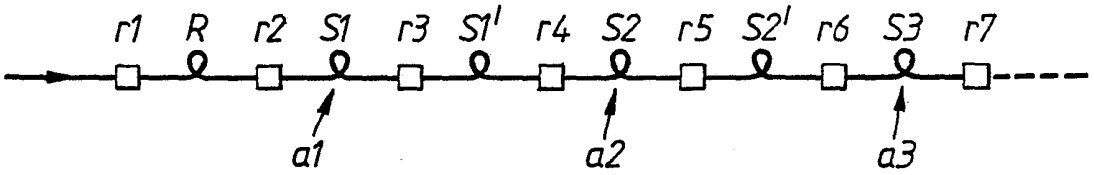

FIG. 6.

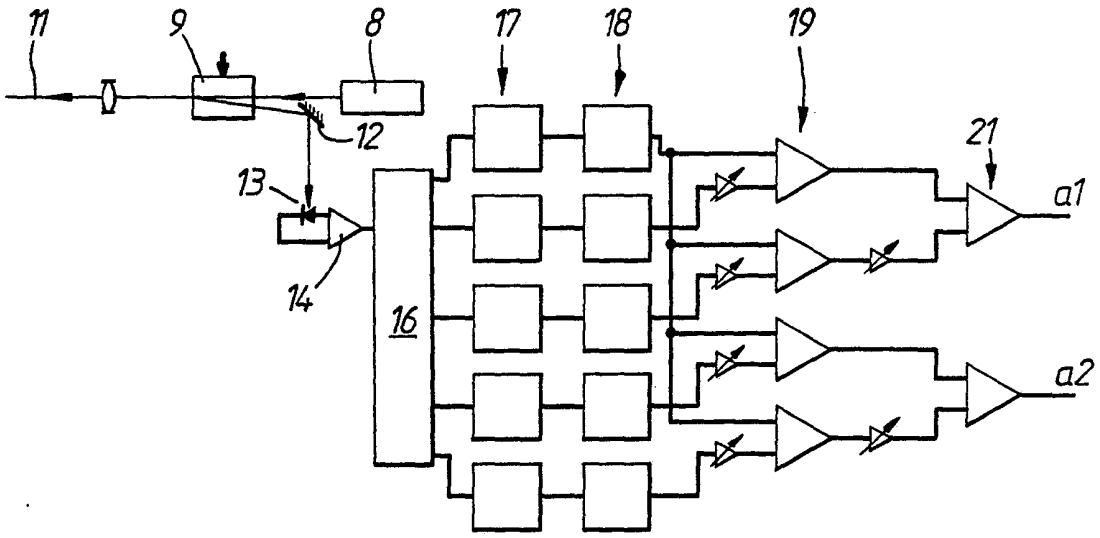

FIG. 7.

ACOUSTIC SENSOR

This invention relates to an acoustic sensor. It relates particularly to a sensor construction that can be used to form a linear or a planar arrangement of sensitive pattern and in which the effect of one source of interference with the possible output of the sensor can be reduced.

In many applications of an acoustic sensor, the device is required to detect acoustic signals in an environment where there is a high ambient level of vibration, for example in the presence of machinery noise. One example of this is in the construction of a hydrophone which is intended to be towed behind a marine vessel or to be mounted in a planar arrangement as a flank array on a hull surface of the vessel. The output from such a hydrophone will be heavily influenced by vibration from the vessel's own machinery and this will make it difficult for any weaker signals to be detected. Sometimes it has been proposed that the sensing system which receives signals from the hydrophone will have a built-in capability for cancelling out the unwanted noise. The present invention provides an alternative approach in which the sensor itself has an inherent ability to reject the unwanted noise.

According to the invention, there is provided an acoustic sensor comprising a sensor element and a compensation element, the two elements having different sensitivities and being positioned together such that they will both be subject to the same spectrum of disturbing phenomena, outputs from the two elements being applied to suitable circuit means to provide an acoustic output signal in which noise due to unwanted vibration effects is substantially reduced.

Preferably, the elements comprise similar core constructions which are encapsulated in jacket materials having differing sensitivities to mechanical loads, such that one element is sensitive and the other element is insensitive to ambient pressure changes. The two elements may be located together in an interleaved arrangement whereby they will be subjected to similar acoustic and mechanical stresses when in operation.

The elements may be constructed in linear form such as an optical fibre, a length of piezoelectric plastics material or a piezoelectric rubber strip. Where the final sensor shape is required to be in a planar rather than a linear form, the shape may be formed from a spirally wound or folded arrangement of the linear form.

By way of example, some particular embodiments of the invention will now be described with reference to the

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