Title (en)

DEVICE FOR MEASURING IN A COMPRESSIBLE MEDIUM THE LOCAL DENSITY AND THE TIME VARIATION THEREOF.

Title (de)

ANORDNUNG ZUR MESSUNG DER LOKALEN DICHTE UND DEREN ZEITLICHER ÄNDERUNGEN IN KOMPRESSIBLEN MEDIEN.

Title (fr)

AGENCEMENT POUR LA MESURE, DANS UN MILIEU COMPRESSIBLE, DE LA DENSITE LOCALE ET DE SA VARIATION DANS LE TEMPS.

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Application

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Abstract (en)

[origin: WO8001953A1] The device for measuring the local density and the time variation thereof is based on the measure of the local refraction index and the variations thereof. The device is particularly used for measuring the local density of compressible mediums when such mediums, for example gas liquid flows, must not be disturbed. The measuring device is applicable to monitoring flows having a speed close to or higher than the sound speed for monitoring the flow of mediums having temperature gradients and it is also applicable to the flow acoustic field. To this effect, the problem to be solved is to provide a device which is readily transportable and easy to manipulate, with which it is possible to measure, by means of the measurement of the corresponding refraction index, the local density of the medium at the measurement location or within the measurement volume and to follow the evolution thereof in the time. To solve this problem, two laser beams (1, 1") coherent between each other are directed so as to intersect within the measurement volume (2) so as to cause interference fringes (3) spaced between each other by a distance (a) to appear at this location. By means of powerful optical means (5) sufficiently remote from the measuring volume (2), an intermediary optical image of the interference fringes (3") is generated and, by means of a micro-lens (6), a considerably enlarged image of a transversal cross-section of this measuring volume is projected in a recording region in the form of a system of parallel interference fringes (3""). At this location, intensity sensitive detectors, for example opto-electronic detectors (8, 8", 8"", 8"""), are arranged in a predetermined configuration. By zero-adjusting the differential signal provided by the detectors (8, and 8"), the particular extreme value of the intensity of the interference fringes (3""") appearing between them is fixed in the space and such value is used as a reference point for the enlargement of the fringe system when the interval (a"") between the fringes varies. At the recording detectors (8"" and 8"""") a differentiel electric signal appears corresponding to the spacing of the fringes. This differential signal which is proportional to the spacing (a) of the fringes and, subsequently, inversely proportional to the refraction index, therefore to the density of the medium contained within the measuring volume (2), is converted into a measuring signal (U(t)) by means of an electronic circuit (9").

Abstract (fr)

L'agencement pour la mesure de la densite locale et de sa variation dans le temps est base sur la mesure de l'indice de refraction local et de ses variations. L'agencement est notamment utilise pour la mesure de la densite locale de milieux compressibles lorsque ces milieux eux-memes, par exemple sous la forme d'un ecoulement de gaz ou de liquide, ne doivent pas etre perturbes. L'agencement de mesure est applicable a l'examen d'ecoulements a vitesse voisine ou superieure a celle du son ou de l'ecoulement de milieux presentant des gradients de temperature ainsi qu'au domaine de l'acoustique d'ecoulement. Le probleme a resoudre a cet effet est de fournir un agencement aisement transportable et simple a manier, grace auquel il est possible de mesurer, au moyen de la mesure de l'indice de refraction correspondant, la densite locale du milieu a l'endroit ou dans le volume de mesure et de suivre son evolution dans le temps. Pour resoudre ce probleme, deux faisceaux de rayonnement laser (1, 1') coherents entre eux sont diriges de maniere a se couper dans le volume de mesure (2), de sorte que des franges d'interference (3) espacees entre elles d'une distance (a) apparaissent a cet endroit. A l'aide d'une optique (5) puissante suffisamment eloignee du volume de mesure (2), une image optique intermediaire des franges d'interference (3') est engendree et ensuite, a l'aide d'un micro-objectif (6), une image fortement agrandie d'une coupe transversale de ce volume de mesure est projetee dans une zone d'enregistrement sous la forme d'un systeme de franges d'interferences paralleles (3"). A cet endroit, des detecteurs sensibles a l'intensite par exemple des detecteurs opto-electroniques (8, 8', 8", 8"'), sont disposes d'une maniere determinee. Par un reglage de zero du signal differentiel fourni par les detecteurs (8 et 8'), on fixe dans l'espace la valeur extreme particuliere de l'intensite des franges d'interference (3") apparaissant entre ceux-ci et cette valeur sert ainsi de point de reference pour l'elargissement du

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