MEMS loudspeaker having an actuator structure and a diaphragm spaced apart therefrom

This invention relates to a MEMS loudspeaker for generating sound waves in the audible wavelength spectrum, with a carrier substrate that features a substrate cavity with two substrate openings, which are formed on two opposite sides of the carrier substrate, an actuator structure, which is arranged in the area of one of the two substrate openings and traverses it and is connected to the carrier substrate in its edge area, and a membrane anchored in its edge area, which, by means of the actuator structure, can be set into vibration for generating sound waves.

The term "MEMS" stands for microelectromechanical systems. With MEMS loudspeakers, sound generation takes place by means of a swivel-mounted membrane. The membrane can be set into vibration for generating a sound wave by means of actuators (in particular, piezoelectric actuators). As a rule, such a micro-loudspeaker must generate a high displacement of air volume in order to be able to reach a significant sound pressure level. Such a micro-loudspeaker is known, for example, from DE 10 2012 220 819 A1.

Furthermore, a micro-loudspeaker, which comprises a piezoelectric actuator and a membrane, which are arranged on a substrate, which features a cavity, is also known from US 2011/0051985 A1. The piezoelectric actuator comprises a piezoelectric layer, which is connected to the membrane over the entire area through an interposed electrode layer. Thus, together with the membrane, the piezoelectric layer forms a multi-layer unit. This restricts the design freedom for the formation of the membrane by the actuators. The design freedom of the actuator is also restricted by the membrane. Thus, the membrane must have a certain size, in order to ensure sufficiently good acoustic performance. On the other hand, the actuators must be formed as small as possible, in order to keep the cost of the MEMS loudspeaker low. However, with the MEMS loudspeakers known from the state of the art, an optimized configuration of one of these two components always adversely affects the other component.

MEMS loudspeaker with an actuator structure and a membrane spaced at a distance from it

This invention relates to a MEMS loudspeaker for generating sound waves in the audible wavelength spectrum, with a carrier substrate that features a substrate cavity with two substrate openings, which are formed on two opposite sides of the carrier substrate, an actuator structure, which is arranged in the area of one of the two substrate openings and traverses it and is connected to the carrier substrate in its edge area, and a membrane anchored in its edge area, which, by means of the actuator structure, can be set into vibration for generating sound waves.

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