The influence of backing element geometry on the efficiency of the piezoelectric transducer

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The work examines the influence of the backing element geometry on the efficiency of its operation. The shape of the backing element in the form of a truncated cone is chosen based on the a priori assumption that this helps to increase the path of the wave in the damper material due to numerous reflections in it. The damper is located on the back side of the piezoelectric plate loaded on the aquatic environment. The task is to determine the angle between the generatrix of the truncated cone and the diameter of the plate at which the damper works most effectively. A criterion has been proposed that reflects the efficiency of its operation: if the plate is excited by an electrical signal of a given amplitude and duration, then an acoustic signal will be emitted into the thickness of the backing element. The reflection of this signal can be recorded by the same plate. The most effective will be a backing element for which the ratio of the amplitudes of the two indicated signals at a certain angle value will be minimal. The problem was solved by theoretical calculations using the finite element method. The results of the numerical experiment were compared with the results obtained during the experiment. To experimentally verify the calculated values, PZT piezoceramics with nominal frequencies of 2.5 and 1.25 MHz and a diameter of 12 mm were used. A good agreement between theoretical and experimental data was found. The work also describes the backing element manufacturing technology.