Gas-dynamic generation of high-speed plasma jets by cylindrical explosive device

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The RFNC-VNIIEF Institute of Experimental Gas Dynamics and Explosion Physics is conducting work aimed at studying some areas of the controlled thermonuclear fusion. One of these areas is the development of a small-sized thermonuclear neutron source in the form of a cylindrical explosive device with gas-dynamic generation of a high-speed plasma jet of hydrogen isotopes. The first stage in the creation of such a source was the computational and experimental development of a device that allows generating high-speed plasma jets of air. The device is a steel pipe surrounded by a cylindrical explosive charge, inside which there is air. A specially designed cylindrical detonation distributor provides sequential initiation of explosive charge in annular zones located at a given distance from each other with a certain time interval. The scheme and mode of operation of the device are determined by calculation using 2D modeling. Three experiments were carried out with the developed device. In the experiments, the gas flow velocity U $\sim$ 40-50 km/s was recorded, which almost coincided with the predicted design velocity. The experiments have confirmed the possibility of generating the required gas jet velocity parameters in the developed device.