SINGLE-STAGE PNEUMATIC INSTALLATION FOR ACCELERATION OF MACROBODIES

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To conduct a wide range of experimental studies, such as the study of a directed high-speed impact, aerodynamic tests, experimental development of laser-optical measuring instrument complexes, it is necessary to develop a laboratory setup for accelerating bodies. There are setups that operate on different physical principles. For example, conventional powder setups [1], explosive shock-wave generators [2] and electromagnetic railgun accelerators [3]. When solving the above problems, a promising option is to use a pneumatic setup, which is a gas-dynamic propellant system that operates without the use of high-energy materials (HEM) and is subject to minimal wear during operation.

The objective of ballistic design is to determine the design parameters of the installation and the initial conditions of throwing to achieve a muzzle velocity of 500–600 m/s for a thrown assembly weighing 0.3–0.5 g with a caliber of 8 mm. Ballistic design was carried out using a software package for calculating gas-dynamic processes in throwing installations [4]. Based on the design results, the main geometric parameters of the installation were determined, the general diagram of which is shown in Figure 1. To measure the main throwing parameters, the installation is equipped with a modern measuring and recording complex (Fig. 1).



Fig. 1. General scheme of the pneumatic installation

1 – pressure gauge; 2 – high-pressure chamber; 3 – diaphragm block; 4 – throwing assembly; 5 – accelerator channel;
6 – muzzle velocity sensor; 7 – microwave reflector; 8 – microwave radar; 9 – target; 10 – oscilloscope

The main advantages of the designed installation. Carrying out work without the use of HEM, requiring special conditions of use. Minimal wear of the installation, since there is no combustion, and the working gas has a low temperature. Compactness compared to analogues [1-3]. Speed of preparation and conduct of the experiment. The developed installation can be used in the educational process in technical specialties of universities when conducting experimental and theoretical work with the participation of students.

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