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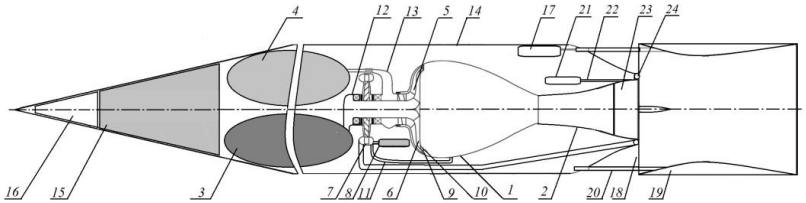
The experimentally investigation of the processes of supplying the liquid to the chamber with countercurrent

The processes of supplying the liquid to the chamber with countercurrent are experimentally investigated. For the first time, suggested schemes of a combined rocket engine for cavalcat rockets integrated with the combustion chamber by a system of supply of fuel components, for which the limits of throttling depth have been experimentally established.

The combined rocket engine.

The technical possibilities of creating a combined rocket engine, in which a smooth, deep throttling of the thrust is carried out. The scheme of the engine is presented, and is shown in Fig. 1.



1 - combustion chamber, 2 - first stage expansion nozzle, 3 - oxidizer cauldron, 4 - fuel caisson, 5 - fuel pump, 6 - oxidant pump, 7 - turbine, 8 - start gas generator, 9 - porous ring 10 - the porous oxidizer pump ring, 11 - the gas supply pipe of the turbine, 12 - the oxidant supply, 13 - the fuel supply, 14 - the shell, 15 - the payload, 16 - the automatic control system, 17 - the hydraulic control cylinder flow through the passive circuit, 18 - air intake channel, 19 - common jet nozzle, 20 - rod, 21-hydraulic cylinder regulated active stage nozzle, 22 - rod, 23 - jet nozzle of the second expansion stage, 24 - collector.

Fig. 1 Scheme of the combined engine of atmospheric use

A new technical solution is that the output sections of the pump units are located inside the combustion chamber, which makes it possible to avoid the use of a nozzle head, reduce the mass of the engine and realize the process of its throttling. The impellers of the fuel supply system pumps in the outlet section contain porous rings.

The porosity of the ring on the boundaries of the steady supply of liquid to the back pressure chamber was studied. Studies were carried out for the porosity of the ring from 0.2 to 0.0187.

The processes of supplying the liquid to the chamber with countercurrent are experimentally investigated. For the first time, suggested schemes of a combined rocket engine for cavalcat rockets integrated with the combustion chamber by a

system of supply of fuel components, for which the limits of throttling depth have been experimentally established varying from 3 to 13,6 times. For the first time, the parameters of porous rings from porosity to 0,02 were investigated, with which the depth of the choke droplet was 3,67-3,85 times. Porous rings with porosity m = 0,2 and more, made from anisotropic materials, allow providing depth of throttling to 13,6 times. With a decrease in the porosity of the pressure device from 0,2 to 0,0187, the beating zone of the component feed increased 1,55 times.

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