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RESEARCH ON CIRCUIT WITH IGNITION CONSTANT CURRENT FUNCTION IN RADIO FREQUENCY ION THRUSTER

Abstract

ABSTRCT: As a kind of electric propulsion, the radio frequency ion thruster(RIT) has the advantages of high specific impulse, compact structure and light weight. RIT is suitable for completing tasks such as orbit control and deep space exploration. The neutralizer ignition output module is an important part of the RIT, which has high voltage ignition and low voltage constant current maintenance functions. The existing neutralizer ignition output module adopts different circuits to realize the two functions, which increases circuit complexity, reduces circuit reliability, and does not meet the requirements of aerospace for high power density. In this regard, this paper proposes a constant current source circuit with ignition function, which integrates two functions into one circuit. It uses a voltage-doubler rectifier circuit for high voltage ignition, and automatically switches to a constant current circuit after successful ignition. Perform continuous ignition. Aiming at the characteristic that the constant current source cannot operate in an open circuit, a closed-loop switching control strategy of voltage and current with voltage limiting function is proposed. When the output terminal is unloaded, the output voltage is limited by control system to prevent the device from being damaged by overvoltage on the output terminal. The experimental results show that the proposed circuit and control strategy can simultaneously realize the neutralizer ignition and constant current functions, and at the same time solve the problem that the constant current source cannot operate in an open circuit, and improve the power density and operational reliability of the system.

KEY WORDS: RF ion thruster, neutralizer, electric propulsion, high-pressure ignition, constant current maintenance