
Thermionic method of cooling turbine blades of spacecraft gas turbine converters

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We describe a device for cooling turbine blades of spacecraft gas turbine converters, based on a new physical principle called thermionic emission, i.e. electrons being emitted by heated metal. This device will allow the reliability and durability of turbine blades of gas turbine converters to be enhanced, and their efficiency factor to be significantly increased, leading to the possibility of creating spacecraft with higher power consumption and longer active functioning period.

Keywords: *thermionic emission, turbine blades, gas turbine converter, emission layer, work function, electronic cooling loop.*

REFERENCES

- [1] Tryanov A.E. *Osobennosti konstruksii uzlov i sistem aviatsionnykh dvigateley i energeticheskikh ustanovok* [Design specifics of aircraft engine and power plant units and systems]. Samara, Samara State Aerospace University Publ., 2011, 202 p.
 - [2] Falaleev S.V. *Sovremennye problemy sozdaniya dvigateley letatelnykh apparatov* [Contemporary challenges in creating aircraft engines]. Samara, Samara State Aerospace University Publ., 2012, 106 p.
 - [3] Danilchenko V.P., ed. *Proektirovanie aviatsionnykh gazoturbinnnykh dvigateley* [Aviation gas turbine engine design]. Samara, Samara Scientific Centre of the Russian Academy of Sciences Publ., 2008, 620 p.
 - [4] Inozemtsev A. A., Nikhamkin M.A., Sandratskiy V.L. *Osnovy konstruirovaniya aviatsionnykh dvigateley i energeticheskikh ustanovok* [Fundamentals of aircraft engine and power plant design]. Moscow, Mashinostroenie Publ., 2008, vol. 2, 366 p.
 - [5] Ushakov B.A., Nikitin V.D., Emelyanov I.Ya. *Osnovy termoemissionnogo preobrazovaniya energii* [Fundamentals of thermionic energy conversion]. Moscow, Atomizdat Publ., 1974, 288 p.
 - [6] Kvasnikov L.A., Kaybyshev V.Z., Kalendarishvili A.G. *Rabochie protsessy v termoemissionnykh preobrazovatelyakh yadernykh energeticheskikh ustanovok* [Working processes in thermionic converters of nuclear power plants]. Moscow, MAI Publ., 2001, 240 p.
 - [7] Fomenko V.S. *Emissionnyye svoystva materialov* [Emission properties of materials]. Kiev, Naukova Dumka Publ., 1981, 338 p.
 - [8] Kolychev A.V., Kernozhitskiy V.A. (RU) *Sposob okhlazhdeniya lopatok turbin gazoturbinnnykh ustanovok* [A method of turbine blade cooling for gas turbine installations]. Patent RU 2573551, 2016, bulletin no. 2, 7 p.
 - [9] Kolychev A.V., Kernozhitskiy V.A. (RU) *Ustroystvo okhlazhdeniya lopatok turbin gazoturbinnnykh ustanovok* [A device for cooling turbine blades of gas turbine installations]. Patent RU 2578387, 2016, bulletin no. 9, 8 p.
 - [10] Kolychev A.V., Kernozhitskiy V.A., Okhochinskiy M.N. (RU) *Ustroystvo okhlazhdeniya lopatok turbiny gazoturbinnoy ustanovki* [A device for cooling turbine blades in a gas turbine installation]. Patent RU 151082, 2015, bulletin no. 8, 8 p.
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