NOTICE: When government or other drawings, specifications or other data are used for any purpose other than in connection with a definitely related government procurement operation, the U. S. Government thereby incurs no responsibility, nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use or sell any patented invention that may in any way be related thereto.
The author considers the motion in the absence of external forces, assuming that the fuel mass $\delta m$ used during a time $dt$ is split into two parts, which he calls defect mass $\delta m_d$ and slag mass $\delta m_s$. One part of $\delta m_d$ is converted into electromagnetic radiation and the other is used for disposing of $\delta m_s$. Velocities close to the velocity of light are considered. The basic equations of motion are taken from a paper by V. F. Kotov. Using the relativistic formula of addition of velocities, the author obtains the differential equation of the problem, whose solution is

$$\frac{M_e}{M_{eo}} = B \left[ \frac{F(v)}{F(0)} \right]^{1/5} \frac{f(0)}{f(v)} \quad (1.7)$$

where $M_e$ denotes the rest mass of the body, $B = v/c$. 

$$\Delta = \left\{ 4u_r c^2 \left[ \xi \varepsilon c + (1-\xi)u_r \right] + \varepsilon^2 c^2 \left( u_r - c \right)^2 \right\}$$

$$u_r v^2 + (u_r - c) \varepsilon c v - c^2 \left[ \xi \varepsilon c + (1-\xi)u_r \right] = f(v)$$

Theory of motion...

\[ \frac{2u_r v + \varepsilon c(\alpha u_r - c) - \sqrt{-\Delta}}{2u_r v + \varepsilon c(\alpha u_r - c) + \sqrt{-\Delta}} = F(v); \frac{c[(2 - \varepsilon)c + \varepsilon \alpha u_r]}{\sqrt{-\Delta}} = \delta \]

\( u_r \) is the relative velocity with which the slag mass is ejected, \( \alpha \) is the radiation coefficient and \( \varepsilon \) the mass defect coefficient, the initial values are

\[ M_0 = M_{so}; v = 0; f(v) = f(0); F(v) = F(0) \]

An implicit formula is obtained for the final velocity of the body, when the fuel has been consumed. For \( u_r \):

\[ u_r = c \left( 1 - \frac{1}{\varepsilon(1-\alpha) + (1 - \varepsilon)} \right)^{\frac{1}{2}} \]  

(2.2)

is derived. When \( \alpha = \varepsilon = 1, u_r = 0 \), a differential equation is obtained which was solved by Kotov. When \( v^2/c^2 \) is small, another result of Kotov is obtained.

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