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Special Relativity: Condition of Performance of Preservation of Impulse and Energy Laws

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ABSTRACT: In article it is shown that use of laws of preservation of an impulse and energy of the closed mechanical system presumes to check up justice of the special theory of relativity theoretically.

KEYWORDS: Special theory of relativity, law of conservation of momentum of a closed mechanical system, dependence of weight of a body on its speed, symmetry of space and time, relativity principle.

I. INTRODUCTION

In [1] it has been shown that application of the special theory of relativity can lead to that in inertial system of readout the impulse and energy of the closed mechanical system can be variables on time in sizes, if in this closed mechanical system the interaction of the bodies, making this system, has constant character.

For the purpose of definition of conditions at which use of the special theory of relativity will provide performance of laws of preservation of an impulse and energy, it is offered:

- to consider the closed mechanical system of the bodies which interaction will have constant character;

- to choose mobile inertial system of readout and motionless inertial system of readout in which the center of weights of this closed system of bodies will be at rest;

- to choose two moments of time in mobile system;

- by means of Lorentz's transformation and transformation of speeds to define coordinates position of bodies of this closed system and their speed during the chosen moments of time in mobile system;

- to define values of impulses and kinetic energy of bodies during the chosen moments of time in mobile system, using dependences of an impulse and kinetic energy of a body on speed;

- to write down laws of preservation of an impulse and energy for this closed system of bodies for two chosen moments of time in mobile system and to define conditions of their performance.

II. DESCRIPTION OF A CLOSED MECHANICAL SYSTEM OF BODIES

Let's assume that there is the closed mechanical system of bodies shown on Fig.1 and

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consisting of dot bodies 1 and 2, having equal weight M_0 at rest, and thread 3, by considering that we take the elementary closed mechanical system of the bodies having constant interaction.

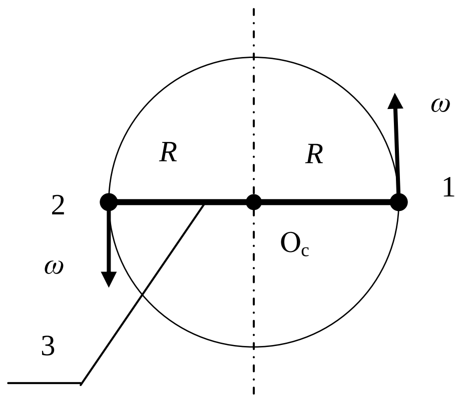

Fig.1

Bodies 1 and 2 are connected by a thread 3.

Bodies 1 and 2 rotate with angular speed ω round the general center of weights - point O_c.

Let's admit that the weight of a thread 3 is very small size and it can neglect by consideration.

The distance from a dot body 1 (body 2) to point O_c is equal R.

Let's place the considered closed mechanical system of bodies 1 and 2 with a thread 3 in motionless (inertial) system O*xyz* so that point O_c would be motionless in this system and coincided with the beginning of coordinates O, and rotation of bodies 1 and 2 round it would occur against an hour hand in plane O*xy*, as is shown in Fig.2.

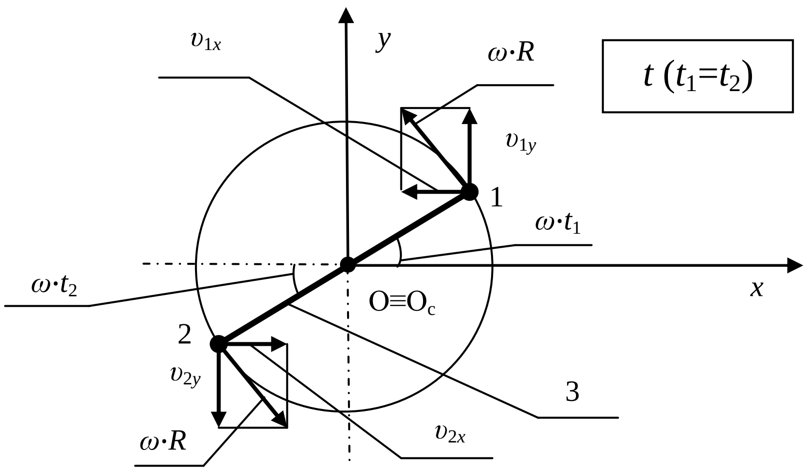

Fig.2

Also we will admit that at the moment of time reference mark (t=0) in system O*xyz* bodies 1 and 2 were on axes O*x*, and body 1 had positive coordinate, and body 2 – negative one.

- the body 1 has coordinates x_1 and y_1 and projections υ_{1x} and υ_{1y} of speed on axis O*x* and

O*y* accordingly depending on time moment *t*, equal t_1:

$$x_1 = R \cdot \cos(\omega \cdot t_1) \quad (1)$$

$$y_1 = R \cdot \sin(\omega \cdot t_1) \quad (2)$$

$$v_{1x} = -[\omega \cdot R \cdot \sin(\omega \cdot t_1)] \quad (3)$$

$$v_{1y} = [\omega \cdot R \cdot \cos(\omega \cdot t_1)] \quad (4)$$

- the body 2 has coordinates x_2 and y_2 and projections υ_{2x} and υ_{2y} of speed on axis O*x* and O*y* accordingly depending on time moment *t*, equal t_2:

$$x_2 = -[R \cdot \cos(\omega \cdot t_2)] \quad (5)$$

$$y_2 = -[R \cdot \sin(\omega \cdot t_2)] \quad (6)$$

$$v_{2x} = \omega \cdot R \cdot \sin(\omega \cdot t_2) \quad (7)$$

$$v_{2y} = -[\omega \cdot R \cdot \cos(\omega \cdot t_2)] \quad (8)$$

Let's enter one more mobile inertial systems O'*x*'*y*'*z*', shown on fig. 3.

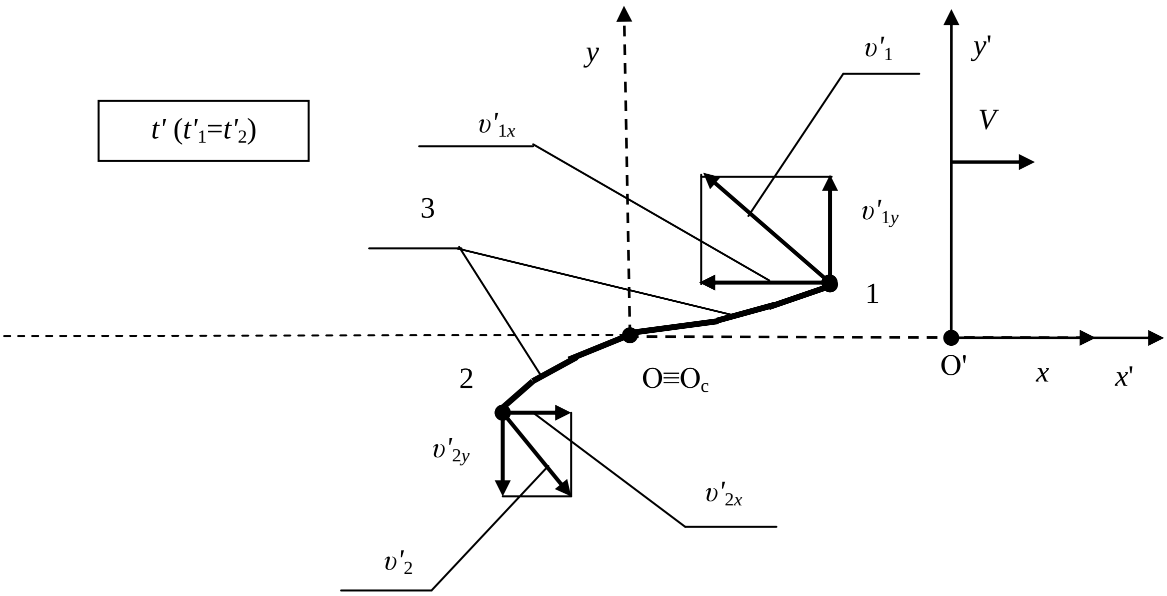

Fig.3

Let's admit that at inertial systems O*xyz* and O'*x*'*y*'*z*':

- similar axes of the Cartesian coordinates are in pairs parallel and equally directed;

- the system O'*x*'*y*'*z*' moves concerning system O*xyz* with constant speed *V* along axis O*x*;

- as time reference mark (*t*=0 and *t*'=0) in both systems that moment when the beginnings of coordinates O and O' these systems coincided is chosen.

Leaning against Lorentz's transformations and transformations of speeds [2] it is possible to write down:

- communication between coordinates x'_1 and y'_1 of body 1 at the moment of time t', equal t'_1, in system O'$x'y'z'$ and coordinates x_1 and y_1 of body 1 in system Oxyz at the moment of time t_1, corresponding to time moment t'_1 in system O'$x'y'z'$:

$$x'_1 = \frac{x_1 - (V \cdot t_1)}{\sqrt{1 - \frac{V^2}{c^2}}} \quad (9)$$

$$y'_1 = y_1 \quad (10)$$

where: c – a constant in Lorentz's transformations (according to the assumption c it is equal to a velocity of light in vacuum),

- communication between time moment t'_1 (event with a body 1) in system O'$x'y'z'$ and time moment t_1 (the same event with a body 1) in system Oxyz:

$$t'_1 = \frac{t_1 - \frac{V \cdot x_1}{c^2}}{\sqrt{1 - \frac{V^2}{c^2}}} = \frac{t_1 - \frac{V \cdot R \cdot \cos(\omega \cdot t_1)}{c^2}}{\sqrt{1 - \frac{V^2}{c^2}}} \quad (11)$$

- communication between projections v'_{x1} and v'_{y1} on axis O'x' and O'y' of speed v'_1 of body 1 at the moment of time t'_1 in system O'$x'y'z'$ and projections v_{x1} and v_{y1} on axis Ox and Oy of speed v_1 of body 1 in system Oxyz at the moment of time t_1:

$$v'_{x1} = \frac{v_{x1} - V}{1 - \frac{V \cdot v_{x1}}{c^2}} = -\frac{[\omega \cdot R \cdot \sin(\omega \cdot t_1)] + V}{1 + \frac{V \cdot \omega \cdot R \cdot \sin(\omega \cdot t_1)}{c^2}} \quad (12)$$

$$v'_{y1} = \frac{v_{y1} \cdot \sqrt{1 - \frac{V^2}{c^2}}}{1 - \frac{V \cdot v_{x1}}{c^2}} = \frac{\omega \cdot R \cdot \cos(\omega \cdot t_1) \cdot \sqrt{1 - \frac{V^2}{c^2}}}{1 + \frac{V \cdot \omega \cdot R \cdot \sin(\omega \cdot t_1)}{c^2}} \quad (13)$$

and besides:

$$v'^2_1 = v'^2_{x1} + v'^2_{y1} = \frac{\left\{1 + \frac{V \cdot \omega \cdot R \cdot \sin(\omega \cdot t_1)}{c^2}\right\}^2 - \left[\left(1 - \frac{V^2}{c^2}\right) \cdot \left(1 - \frac{\omega^2 \cdot R^2}{c^2}\right)\right]}{\left\{1 + \frac{V \cdot \omega \cdot R \cdot \sin(\omega \cdot t_1)}{c^2}\right\}^2} \cdot c^2 \quad (14)$$

- communication between coordinates x'_2 and y'_2 of body 2 at the moment of time t', equal t'_2, in system O'$x'y'z'$ and coordinates x_2 and y_2 of body 2 in system Oxyz at the moment of time t_2, corresponding to time moment t'_2 in system O'$x'y'z'$:

$$x'_2 = \frac{x_2 - (V \cdot t_2)}{\sqrt{1 - \frac{V^2}{c^2}}} \qquad (15)$$

$$y'_2 = y_2 \qquad (16)$$

- communication between time moment t'_2 (event with a body 2) in system O'*x*'*y*'*z*' and time moment t_2 (the same event with a body 2) in system O*xyz*:

$$t'_2 = \frac{t_2 - \frac{V \cdot x_2}{c^2}}{\sqrt{1 - \frac{V^2}{c^2}}} = \frac{t_2 + \frac{V \cdot R \cdot \cos(\omega \cdot t_2)}{c^2}}{\sqrt{1 - \frac{V^2}{c^2}}} \qquad (17)$$

- communication between projections v'_{x2} and v'_{y2} on axis O'x' and O'*y*' of speed v'_2 of body 2 at the moment of time t'_2 in system O'*x*'*y*'*z*' and projections v_{x2} and v_{y2} on axis O*x* and O*y* of speed v_2 of body 2 in system O*xyz* at the moment of time t_2:

$$v'_{x2} = \frac{v_{x2} - V}{1 - \frac{V \cdot v_{x2}}{c^2}} = \frac{[\omega \cdot R \cdot \sin(\omega \cdot t_2)] - V}{1 - \frac{V \cdot \omega \cdot R \cdot \sin(\omega \cdot t_2)}{c^2}} \qquad (18)$$

$$v'_{y2} = \frac{v_{y2} \cdot \sqrt{1 - \frac{V^2}{c^2}}}{1 - \frac{V \cdot v_{x2}}{c^2}} = -\frac{\omega \cdot R \cdot \cos(\omega \cdot t_2) \cdot \sqrt{1 - \frac{V^2}{c^2}}}{1 - \frac{V \cdot \omega \cdot R \cdot \sin(\omega \cdot t_2)}{c^2}} \qquad (19)$$

and besides:

$$v'^2_2 = v'^2_{x2} + v'^2_{y2} = \frac{\left\{1 - \frac{V \cdot \omega \cdot R \cdot \sin(\omega \cdot t_2)}{c^2}\right\}^2 - \left[\left(1 - \frac{V^2}{c^2}\right) \cdot \left(1 - \frac{\omega^2 \cdot R^2}{c^2}\right)\right]}{\left\{1 - \frac{V \cdot \omega \cdot R \cdot \sin(\omega \cdot t_2)}{c^2}\right\}^2} \cdot c^2 \qquad (20)$$

III. RECEPTION OF THE EQUATIONS OF AN IMPULSE AND KINETIC ENERGY OF SYSTEM

Knowing dependences of an impulse and kinetic energy of a moving body on its speed of movement [2] and using formulas (12) - (14) and (18-20), we can write down following formulas:

- formulas for projections P'_{x1} and P'_{y1} on axis O'*x*' and O'*y*' of impulse P'_1 and kinetic energy E'_1 of body 1 in system O'*x*'*y*'*z*' at the moment of time t'_1, corresponding to time moment t_1 in system O*xyz*:

$$P'_{x1} = \frac{v'_{x1} \cdot M_0}{\sqrt{1 - \frac{v'^2_1}{c^2}}} = -\frac{M_0 \cdot \{[\omega \cdot R \cdot \sin(\omega \cdot t_1)] + V\}}{\sqrt{1 - \frac{V^2}{c^2}} \cdot \sqrt{1 - \frac{\omega^2 \cdot R^2}{c^2}}} \qquad (21)$$

$$P'_{y1} = \frac{v'_{y1} \cdot M_0}{\sqrt{1 - \frac{{v'_1}^2}{c^2}}} = \frac{M_0 \cdot \omega \cdot R \cdot \cos(\omega \cdot t_1)}{\sqrt{1 - \frac{\omega^2 \cdot R^2}{c^2}}} \qquad (22)$$

$$E'_1 = M_0 \cdot c^2 \cdot \left(\frac{1}{\sqrt{1 - \frac{{v'_1}^2}{c^2}}} - 1 \right) = M_0 \cdot c^2 \cdot \left\{ \frac{\left[1 + \frac{V \cdot \omega \cdot R \cdot \sin(\omega \cdot t_1)}{c^2}\right]}{\sqrt{\left(1 - \frac{V^2}{c^2}\right) \cdot \left(1 - \frac{\omega^2 \cdot R^2}{c^2}\right)}} - 1 \right\} \qquad (23)$$

- formulas for projections P'_{x2} and P'_{y2} on axis O'*x*' and O'*y*' of impulse P'_2 and kinetic energy E'_2 of body 2 in system O'*x*'*y*'*z*' at the moment of time t'_2, corresponding to time moment t_2 in system O*xyz*:

$$P'_{x2} = \frac{v'_{x2} \cdot M_0}{\sqrt{1 - \frac{{v'_2}^2}{c^2}}} = \frac{M_0 \cdot \{[\omega \cdot R \cdot \sin(\omega \cdot t_2)] - V\}}{\sqrt{1 - \frac{V^2}{c^2}} \cdot \sqrt{1 - \frac{\omega^2 \cdot R^2}{c^2}}} \qquad (24)$$

$$P'_{y2} = \frac{v'_{y2} \cdot M_0}{\sqrt{1 - \frac{{v'_2}^2}{c^2}}} = - \frac{M_0 \cdot \omega \cdot R \cdot \cos(\omega \cdot t_2)}{\sqrt{1 - \frac{\omega^2 \cdot R^2}{c^2}}} \qquad (25)$$

$$E'_2 = M_0 \cdot c^2 \cdot \left(\frac{1}{\sqrt{1 - \frac{{v'_2}^2}{c^2}}} - 1 \right) = M_0 \cdot c^2 \cdot \left\{ \frac{\left[1 - \frac{V \cdot \omega \cdot R \cdot \sin(\omega \cdot t_2)}{c^2}\right]}{\sqrt{\left(1 - \frac{V^2}{c^2}\right) \cdot \left(1 - \frac{\omega^2 \cdot R^2}{c^2}\right)}} - 1 \right\} \qquad (26)$$

For definition of sizes of an impulse and kinetic energy of system of bodies 1 and 2 (and threads 3) in system O'*x*'*y*'*z*' at the moment of time *t*' it is necessary, that time moments t'_1 and t'_2 (formulas (11) and (17)) were equal among themselves and equal *t*', i.e.:

$$t' = t'_1 = t'_2 = \frac{t_1 - \frac{V \cdot R \cdot \cos(\omega \cdot t_1)}{c^2}}{\sqrt{1 - \frac{V^2}{c^2}}} = \frac{t_2 + \frac{V \cdot R \cdot \cos(\omega \cdot t_2)}{c^2}}{\sqrt{1 - \frac{V^2}{c^2}}} \qquad (27)$$

Considering that the system O'*x*'*y*'*z*' is inertial, it is possible to write down following formulas for kinetic energy *E*' and projections P'_x and P'_y on axis O'*x*' and O'*y*' of impulse *P*' of the closed mechanical system consisting of bodies 1 and 2 (and threads 3), for time moment *t*' in system O'*x*'*y*'*z*':

$$P'_x = P'_{x1} + P'_{x2} \qquad (28)$$

$$P'_y = P'_{y1} + P'_{y2} \qquad (29)$$

$$E' = E'_1 + E'_2 \qquad (30)$$

IV. TIME MOMENT t'_p

In inertial system O'*x*'*y*'*z*' as the first moment of time it is possible to choose the moment of time *t*', equal t'_p.

Let's admit that to position of a body 1 in system O'*x*'*y*'*z*' at the moment of time t'_1, equal t'_p, there will correspond position of a body 1 in system O*xyz* at the moment of time t_1, equal t_{1p}:

$$t_{1\mathrm{p}} = \frac{\pi}{2 \cdot \omega} \tag{31}$$

Then to position of a body 2 in inertial system O'*x*'*y*'*z*' at the moment of time t'_2, equal t'_p, there will correspond position of a body 2 in system O*xyz* at the moment of time t_2, equal t_{2p}.

The size of the moment of time t_{2p} can be defined from the equation (27):

$$t_{1\mathrm{p}} - \frac{V \cdot R \cdot \cos\left(\omega \cdot t_{1\mathrm{p}}\right)}{c^2} = t_{2\mathrm{p}} + \frac{V \cdot R \cdot \cos\left(\omega \cdot t_{2\mathrm{p}}\right)}{c^2} \tag{32}$$

Taking into account the equation (31) formula (32) will become:

$$\frac{c^2 \cdot \left[\frac{\pi}{2} - \left(\omega \cdot t_{2\mathrm{p}}\right)\right]}{V \cdot R \cdot \omega} = \cos\left(\omega \cdot t_{2\mathrm{p}}\right) \tag{33}$$

Using a graphic method of the decision of the equations [3], it is possible to receive that in the equation (33) moment of time t_{2p} is equal:

$$t_{2\mathrm{p}} = \frac{\pi}{2 \cdot \omega} \tag{34}$$

From formulas (31) and (34) follows that in inertial system O'*x*'*y*'*z*' at the moment of time t'_p a bodies 1 and 2 will be on a line parallel to axis O'*y*'.

Having inserted formulas (31), (34) in the equations (21) - (26) we will receive values of projections P'_{x1p} and P'_{y1p} of impulse P'_{1p} and kinetic energy E'_{1p} of body 1 and projections P'_{x2p} and P'_{y2p} of impulse P'_{2p} and kinetic energy E'_{2p} of body 2 at the moment of time t'_p in system O'*x*'*y*'*z*':

$$P'_{x1\mathrm{p}} = -\frac{M_0 \cdot \{V + [\omega \cdot R]\}}{\sqrt{1 - \frac{V^2}{c^2}} \cdot \sqrt{1 - \frac{\omega^2 \cdot R^2}{c^2}}} \tag{35}$$

$$P'_{y1\mathrm{p}} = 0 \tag{36}$$

$$E'_{1\mathrm{p}} = M_0 \cdot c^2 \cdot \left\{ \frac{\left[1 + \frac{V \cdot \omega \cdot R}{c^2}\right]}{\sqrt{\left(1 - \frac{V^2}{c^2}\right) \cdot \left(1 - \frac{\omega^2 \cdot R^2}{c^2}\right)}} - 1 \right\} \tag{37}$$

$$P'_{x2\mathrm{p}} = \frac{M_0 \cdot \{[\omega \cdot R] - V\}}{\sqrt{1 - \frac{V^2}{c^2}} \cdot \sqrt{1 - \frac{\omega^2 \cdot R^2}{c^2}}} \tag{38}$$

$$P'_{y2\mathrm{p}} = 0 \tag{39}$$

$$E'_{2\mathrm{p}} = M_0 \cdot c^2 \cdot \left\{ \frac{\left[1 - \frac{V \cdot \omega \cdot R}{c^2}\right]}{\sqrt{\left(1 - \frac{V^2}{c^2}\right) \cdot \left(1 - \frac{\omega^2 \cdot R^2}{c^2}\right)}} - 1 \right\} \tag{40}$$

V. TIME MOMENT t'_h

In inertial system O'*x*'*y*'*z*' as the second moment of time it is possible to choose the moment of time *t*', equal t'_h.

Let's admit that to position of a body 1 in system O'*x*'*y*'*z*' at the moment of time t'_1, equal t'_h, there will correspond position of a body 1 in system O*xyz* at the moment of time t_1, equal $t_{1\mathrm{h}}$:

$$t_{1\mathrm{h}} = 0 \tag{41}$$

Then to position of a body 2 in system O'*x*'*y*'*z*' at the moment of time t'_2, equal t'_h, there will correspond position of a body 2 in system O*xyz* at the moment of time t_2, equal $t_{2\mathrm{h}}$.

Using the formula (41), size of the moment of time $t_{2\mathrm{h}}$ can be defined from the equation (27):

$$\frac{c^2 \cdot \omega \cdot t_{2\mathrm{h}}}{V \cdot R \cdot \omega} = -1 - \cos(\omega \cdot t_{2\mathrm{h}}) \tag{42}$$

from the equation (42), value of the moment of time $t_{2\mathrm{h}}$ should be less than 0.

From formulas (41) and (42) follows that in system O'*x*'*y*'*z*' at the moment of time t'_h a body 1 will be on axis O'*x*', and the body 2 on axis O'*x*' cannot be.

Having inserted the formula (41) into the equations (21) - (23) it is possible to write down values of projections $P'_{x1\mathrm{h}}$ and $P'_{y1\mathrm{h}}$ of impulse $P'_{1\mathrm{h}}$ and kinetic energy $E'_{1\mathrm{h}}$ of body 1 at the moment of time t'_h in system O'*x*'*y*'*z*':

$$P'_{x1\mathrm{h}} = -\frac{M_0 \cdot V}{\sqrt{1 - \frac{V^2}{c^2}} \cdot \sqrt{1 - \frac{\omega^2 \cdot R^2}{c^2}}} \tag{43}$$

$$P'_{y1\mathrm{h}} = \frac{M_0 \cdot \omega \cdot R}{\sqrt{1 - \frac{\omega^2 \cdot R^2}{c^2}}} \tag{44}$$

$$E'_{1\mathrm{h}} = M_0 \cdot c^2 \cdot \left\{ \frac{1}{\sqrt{\left(1-\frac{V^2}{c^2}\right)\cdot\left(1-\frac{\omega^2 \cdot R^2}{c^2}\right)}} - 1 \right\} \quad (45)$$

Let's assume that the body 2 at the moment of time $t_{2\mathrm{h}}$ in system Oxyz has projections $v_{x2\mathrm{h}}$ and $v_{y2\mathrm{h}}$ of speed $v_{2\mathrm{h}}$, and as appears from formulas (7) and (8):

$$v_{2\mathrm{h}}{}^2 = v_{2x\mathrm{h}}{}^2 + v_{2y\mathrm{h}}{}^2 = \omega^2 \cdot R^2 \quad (46)$$

Then, proceeding from formulas (18) - (20), values of projections $v'_{x2\mathrm{h}}$ and $v'_{y2\mathrm{h}}$ of speed $v'_{2\mathrm{h}}$ of body 2 at the moment of time t'_h in system O'$x'y'z'$ will be defined as:

$$v'_{x2\mathrm{h}} = \frac{v_{x2\mathrm{h}} - V}{1-\frac{V \cdot v_{x2\mathrm{h}}}{c^2}} \quad (47)$$

$$v'_{y2\mathrm{h}} = \frac{v_{y2\mathrm{h}} \cdot \sqrt{1-\frac{V^2}{c^2}}}{1-\frac{V \cdot v_{x2\mathrm{h}}}{c^2}} \quad (48)$$

$$v'_{2\mathrm{h}}{}^2 = v'_{x2\mathrm{h}}{}^2 + v'_{y2\mathrm{h}}{}^2 = \frac{(v_{x2\mathrm{h}} - V)^2 + \left[v_{y2\mathrm{h}}{}^2 \cdot \left(1-\frac{V^2}{c^2}\right)\right]}{\left(1-\frac{V \cdot v_{x2\mathrm{h}}}{c^2}\right)^2} \quad (49)$$

Having inserted formulas (47) - (49) into the equations (24) - (26) taking into account the formula (46) it is possible to receive values of projections $P'_{x2\mathrm{h}}$ and $P'_{y2\mathrm{h}}$ of impulse $P'_{2\mathrm{h}}$ and kinetic energy $E'_{2\mathrm{h}}$ of body 2 at the moment of time t'_h in system O'$x'y'z'$:

$$P'_{x2\mathrm{h}} = \frac{v'_{x2\mathrm{h}} \cdot M_0}{\sqrt{1-\frac{v'_{2\mathrm{h}}{}^2}{c^2}}} = \frac{M_0 \cdot (v_{x2\mathrm{h}} - V)}{\sqrt{1-\frac{V^2}{c^2}} \cdot \sqrt{1-\frac{\omega^2 \cdot R^2}{c^2}}} \quad (50)$$

$$P'_{y2\mathrm{h}} = \frac{v'_{y2\mathrm{h}} \cdot M_0}{\sqrt{1-\frac{v'_{2\mathrm{h}}{}^2}{c^2}}} = \frac{M_0 \cdot v_{y2\mathrm{h}}}{\sqrt{1-\frac{\omega^2 \cdot R^2}{c^2}}} \quad (51)$$

$$E'_{2\mathrm{h}} = M_0 \cdot c^2 \cdot \left(\frac{1}{\sqrt{1-\frac{v'_{2\mathrm{h}}{}^2}{c^2}}} - 1 \right) = M_0 \cdot c^2 \cdot \left\{ \frac{\left[1-\frac{V \cdot v_{x2\mathrm{h}}}{c^2}\right]}{\sqrt{1-\frac{V^2}{c^2}} \cdot \sqrt{1-\frac{\omega^2 \cdot R^2}{c^2}}} - 1 \right\} \quad (52)$$

VI. CHECK OF PERFORMANCE OF THE LAW OF PRESERVATION OF AN IMPULSE

The law of preservation of an impulse of the closed mechanical system of the bodies, connected with property of symmetry of space – uniformity of space [2], asserts that the impulse of the closed mechanical system of bodies (on which external forces do not operate) is constant size, i.e. in any inertial system for any moment of time the size of an impulse of the closed mechanical system of bodies is constant size (since there is no external influence).

Because the mechanical system of bodies 1 and 2 (and threads 3) is closed, the law of preservation of an impulse allows writing down for time moments t'_{p} and t'_{h} in inertial system O'*x*'*y*'*z*' following equations:

$$P'_{x1\mathrm{p}} + P'_{x2\mathrm{p}} = P'_{x1\mathrm{h}} + P'_{x2\mathrm{h}} \qquad (53)$$

$$P'_{y1\mathrm{p}} + P'_{y2\mathrm{p}} = P'_{y1\mathrm{h}} + P'_{y2\mathrm{h}} \qquad (54)$$

Having inserted into the equation (53) formulas (35), (38), (43) and (50) we will receive:

$$-\frac{M_0 \cdot \{V + [\omega \cdot R]\}}{\sqrt{1-\frac{V^2}{c^2}} \cdot \sqrt{1-\frac{\omega^2 \cdot R^2}{c^2}}} + \frac{M_0 \cdot \{[\omega \cdot R] - V\}}{\sqrt{1-\frac{V^2}{c^2}} \cdot \sqrt{1-\frac{\omega^2 \cdot R^2}{c^2}}} = \\ = -\frac{M_0 \cdot V}{\sqrt{1-\frac{V^2}{c^2}} \cdot \sqrt{1-\frac{\omega^2 \cdot R^2}{c^2}}} + \frac{M_0 \cdot (v_{x2\mathrm{h}} - V)}{\sqrt{1-\frac{V^2}{c^2}} \cdot \sqrt{1-\frac{\omega^2 \cdot R^2}{c^2}}} \qquad (55)$$

or:

$$-\{V + [\omega \cdot R]\} + \{[\omega \cdot R] - V\} = -V + (v_{x2\mathrm{h}} - V) \qquad (56)$$

From the equation (56) it follows that:

$$v_{x2\mathrm{h}} = 0 \qquad (57)$$

Further having inserted into the equation (54) formulas (36), (39), (44) and (51) we will receive:

$$0 + 0 = \frac{M_0 \cdot \omega \cdot R}{\sqrt{1-\frac{\omega^2 \cdot R^2}{c^2}}} + \frac{M_0 \cdot v_{y2\mathrm{h}}}{\sqrt{1-\frac{\omega^2 \cdot R^2}{c^2}}} \qquad (58)$$

From the equation (58) follows that:

$$v_{y2\mathrm{h}} = -(\omega \cdot R) \qquad (59)$$

Equations (57) and (59) are necessary conditions (values of projections of speed $v'_{x2\mathrm{h}}$ and $v'_{y2\mathrm{h}}$) at which in a considered example the law of preservation of an impulse in inertial system O'*x*'*y*'*z*' will be carried out.

Having substituted conditions (57) and (59) in the equations (7) and (8), we will receive:

$$t_{2\mathrm{h}} = 0 \qquad (60)$$

And having substituted the equations (41) and (60) in the formula (27) or (42):

$$0 = \frac{V \cdot R}{c^2} \cdot [1 + 1] \qquad (61)$$

let's have one more condition of performance of the law of preservation of an impulse in inertial system O'*x*'*y*'*z*' for a considered example:

$$0 = \frac{1}{c^2} \qquad (62)$$

But since the size of a velocity of light *c* is not equal to infinity, therefore the condition (83) is not feasible at use of the special theory of relativity and therefore in this case the law of preservation of an impulse is executed cannot be.

It is possible that the made assumption that a constant *c* in Lorentz's transformations is a velocity of light, not truly.

As a result it is possible to draw a conclusion that in inertial system O'*x*'*y*'*z*' application of the special theory of relativity at the description of movement of the closed mechanical system of the bodies considered in the given example, leads to default of the law of preservation of an impulse.

VII. CHECK OF PERFORMANCE OF THE LAW OF CONSERVATION OF ENERGY

The law of conservation of energy of the closed mechanical system of the bodies, connected with property of symmetry of space and time – uniformity of time [2], asserts that energy of the closed mechanical system of bodies (on which external forces do not operate) is constant size, i.e. in any inertial system for any moment of time the size of energy of the closed mechanical system of bodies is constant size (since there is no external influence).

Prior to the beginning of consideration we will make the assumption that if in one inertial system at the closed mechanical system and its components do not occur change of sizes of potential energy and in any other inertial system at the same closed mechanical system and its components will not occur change of sizes of potential energy. (verb confusion, consider revising)

Taking into account the made assumption and because the mechanical system of bodies 1 and 2 (and threads 3) is closed, the law of conservation of energy allows writing down for time moments t'_{p} and t'_{h} in system O'*x*'*y*'*z*' a following equation:

$$E'_{1\mathrm{p}} + E'_{2\mathrm{p}} = E'_{1\mathrm{h}} + P'_{x2\mathrm{h}} \qquad (63)$$

Having inserted into the equation (63) formulas (37), (40), (45) and (52) we will receive:

$$\left[M_0 \cdot c^2 \cdot \left\{\frac{\left[1+\frac{V \cdot \omega \cdot R}{c^2}\right]}{\sqrt{\left(1-\frac{V^2}{c^2}\right) \cdot \left(1-\frac{\omega^2 \cdot R^2}{c^2}\right)}} - 1\right\}\right] + \left[M_0 \cdot c^2 \cdot \left\{\frac{\left[1-\frac{V \cdot \omega \cdot R}{c^2}\right]}{\sqrt{\left(1-\frac{V^2}{c^2}\right) \cdot \left(1-\frac{\omega^2 \cdot R^2}{c^2}\right)}} - 1\right\}\right] =$$

$$= \left[M_0 \cdot c^2 \cdot \left\{\frac{1}{\sqrt{\left(1-\frac{V^2}{c^2}\right) \cdot \left(1-\frac{\omega^2 \cdot R^2}{c^2}\right)}} - 1\right\}\right] + \left[M_0 \cdot c^2 \cdot \left\{\frac{\left[1-\frac{V \cdot v_{x2\mathrm{h}}}{c^2}\right]}{\sqrt{1-\frac{V^2}{c^2}} \cdot \sqrt{1-\frac{\omega^2 \cdot R^2}{c^2}}} - 1\right\}\right] \quad (64)$$

or:

$$\left[1+\frac{V \cdot \omega \cdot R}{c^2}\right] + \left[1-\frac{V \cdot \omega \cdot R}{c^2}\right] = 1 + \left[1-\frac{V \cdot v_{x2\mathrm{h}}}{c^2}\right] \quad (65)$$

From the equation (65) follows that:

$$v_{x2\mathrm{h}} = 0 \quad (57)$$

As a result here too, as well as at check of performance of the law of preservation of an impulse, it is possible to draw the following conclusion: in inertial system O'*x*'*y*'*z*' application of the special theory of relativity at the description of movement of the closed mechanical system of the bodies considered in the given example, leads to default of the law of conservation of energy (if the assumption is true that in inertial system O'*x*'*y*'*z*' in the closed mechanical system there is only a change of sizes of kinetic energy without change of sizes of potential energy).

VIII. CONCLUSION

In summary it is possible to notice that use of the special theory of relativity by consideration of separate examples can lead to default of laws of preservation of an impulse and energy of the closed mechanical system in inertial systems.

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