Dear Professors!

I am very grateful to you for what you have responded to the call for help and sent their comments on my article "The special theory of relativity. Brief notes".

From you have received a lot of comments, which I will try to take into account when processing the article.

Again, I apologize for my horribly bad English.

The purpose of this general note, directed to you, is to consider only those observations that call into question the meaning of article.

**Note 1**: when considering the use dependence of mass $\mathbf{M}(\mathbf{v})$ of the moving body from its velocity **v** in the form:

$$\mathrm{M}(\mathrm{v}) \quad = \quad k \cdot \frac{\mathrm{M}_0}{\sqrt{1 - \frac{\mathrm{v}^2}{\mathrm{C}_1^2}}} \qquad (1)$$

where: ***k*** - a further factor.

Answer: in the article "Comments on the applicability of the special theory of relativity for inertial reference systems subject to the symmetry of space and time (amended and supplemented)" at the website of "Mathematical Physics. The theory of relativity" http://www.matphysics.ru/, was made attempt to show, that only the dependence:

$$\mathrm{M}(\mathrm{v}) \quad = \quad \frac{\mathrm{M}_0}{\sqrt{1 - \frac{\mathrm{v}^2}{\mathrm{C}_1^2}}} \qquad (2)$$

in inertial reference can provide the reference laws of conservation of energy and momentum of a closed mechanical system consisting of two point bodies, experiencing perfectly elastic collision center, bearing the instantaneous nature, when considering the various motions of these bodies relative to the axes of inertial reference systems.

**Note 2**: The magnitude of the mass **M** of the moving body in the inertial reference system is not the same in all directions, but depends on the angle **α** between the direction considered and the line of motion of the body, ie:

$$\mathrm{M}(\mathrm{v}) \;=\; f\,(\alpha) \qquad (3)$$

It turns out, that for the momentum **K** of the body motion can be written, that:

$$\mathrm{K}^2 \;\neq\; (\mathrm{M}\cdot\mathrm{v})^2 \;=\; (\mathrm{M}\cdot\mathrm{v_x})^2 \;+\; (\mathrm{M}\cdot\mathrm{v_y})^2 \qquad (4)$$

Or that the momentum vector of a moving body can decompose the vector according to the rule of the parallelogram on the projection on the axes.

Answer: the dependence (3) would violate the laws of conservation of energy and momentum of a closed system when considering the examples, mentioned in the reply to the note 1.

**Note 3**: In example № 1 (for determining the values of the constants $\mathbf{C_1}$ and $\mathbf{C_2}$) failure to comply with the law of conservation of momentum of a closed system was due to the fact that when assessing the pulse system was not taken into account momentum thread (as in considering it was assumed, that mass thread is infinitesimal, and therefore it is not taken into account).

Answer: try to assess the effect of the momentum of the thread 3 on the pulse of system of bodies 1 and 2 and thread 3.

Assume that there are two inertial reference systems - fixed $\mathbf{O_1x_1y_1z_1}$ and mobile $\mathbf{O_2x_2y_2z_2}$, that moves with speed **V** parallel to the axis $\mathbf{O_1x_1}$ on the system $\mathbf{O_1x_1y_1z_1}$.

Suppose that there is a closed mechanical system of bodies shown in Fig. 1 and consists of point bodies 1 and 2 with equal mass $\mathbf{M_o}$ at rest, and thread 3.

Bodies 1 and 2 are connected by a thread 3, which has uniformly distributed along the length of the mass $\mathbf{m_o}$ at rest.

Bodies 1 and 2 rotate with angular speed **ω** around a common center of mass – point **O**.

Distance from the point of body 1 (or body 2) to point **O** is equal to **R**.

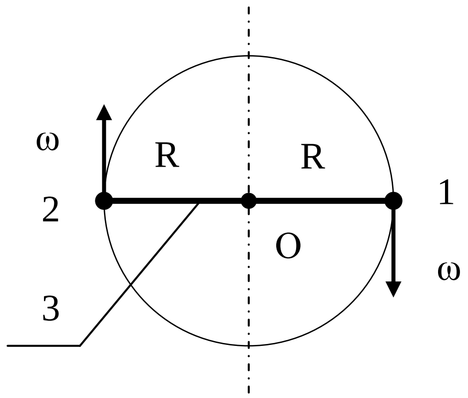


Fig. 1

Let's put a closed mechanical system of bodies 1 and 2 with a thread 3 in the mobile reference system $\mathbf{O_2x_2y_2z_2}$ so, that the point **O** would be stationary in this reference system and coincided with the beginning of the coordinates $\mathbf{O_2}$, and rotation of bodies 1 and 2 would occur around it clockwise plane $\mathbf{O_2x_2y_2}$, as shown in Fig. 2.

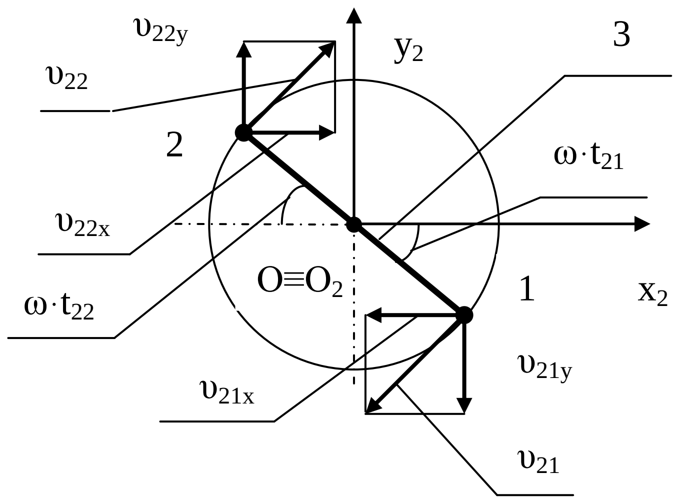


Fig. 2

Also assume, that at the time of commencement of the time ($t_2$=0) in the reference system $\mathbf{O_2x_2y_2z_2}$ bodies 1 and 2 were on the axis $\mathbf{O_2x_2}$, moreover, the body 1 had positive coordinates, and the body 2 - negative.

Based on the foregoing, it may be noted, that in the mobile reference system $\mathbf{O_2x_2y_2z_2}$ at any time $t_2$ bodies 1 and 2 will have the speed $\boldsymbol{\upsilon_{21}}$ and $\boldsymbol{\upsilon_{22}}$, respectively, equal to:

$$v_{21} = v_{22} = v = \omega \cdot \mathrm{R} \tag{5}$$

This projection $\boldsymbol{\upsilon}_{21x}$ and $\boldsymbol{\upsilon}_{21y}$ speed of the body 1 and the projection $\boldsymbol{\upsilon}_{22x}$ and $\boldsymbol{\upsilon}_{22y}$ speed of body 2 on the axis $\mathbf{O_2x_2}$ and $\mathbf{O_2y_2}$ for time $\boldsymbol{t_2}$ are equal:

$$v_{21\mathrm{x}} = -\left[v \cdot \sin(\omega \cdot t_2)\right] \tag{6}$$

$$v_{21\mathrm{y}} = -\left[v \cdot \cos(\omega \cdot t_2)\right] \tag{7}$$

$$v_{22\mathrm{x}} = v \cdot \sin(\omega \cdot t_2) \tag{8}$$

$$v_{22\mathrm{y}} = v \cdot \cos(\omega \cdot t_2) \tag{9}$$

Dependencies values of the coordinates $\mathbf{x_{21}}$ and $\mathbf{y_{21}}$ body 1 and the coordinates $\mathbf{x_{22}}$ and $\mathbf{y_{22}}$ body 2 from the time $\boldsymbol{t_2}$ in the mobile reference system $\mathbf{O_2x_2y_2z_2}$ can be written as:

$$\mathrm{x}_{21} = \mathrm{R} \cdot \cos(\omega \cdot t_2) \tag{10}$$

$$y_{21} = -\left[\mathrm{R} \cdot \sin(\omega \cdot t_2)\right] \tag{11}$$

$$\mathrm{x}_{22} = -\left[\mathrm{R} \cdot \cos(\omega \cdot t_2)\right] \tag{12}$$

$$y_{22} = \mathrm{R} \cdot \sin(\omega \cdot t_2) \tag{13}$$

Similarly, for the mobile reference system $\mathbf{O_2x_2y_2z_2}$ can be written according to:

- projections $\boldsymbol{\upsilon}_{21x\rho i}$ and $\boldsymbol{\upsilon}_{21y\rho i}$ speed $\boldsymbol{i}$ -point of the thread 3, at a distance $\boldsymbol{\rho_i}$ of the point **O** on the segment from point **O** to the body 1, on the axis $\mathbf{O_2x_2}$ and $\mathbf{O_2y_2}$ from the time $\boldsymbol{t_2}$:

$$v_{21\mathrm{x}\rho i} = -\left[v \cdot \frac{\rho_i}{\mathrm{R}} \cdot \sin(\omega \cdot t_2)\right] \tag{14}$$

$$v_{21\mathrm{y}\rho i} = -\left[v \cdot \frac{\rho_i}{\mathrm{R}} \cdot \cos(\omega \cdot t_2)\right] \tag{15}$$

- projections $\boldsymbol{\upsilon}_{22x\rho j}$ and $\boldsymbol{\upsilon}_{22y\rho j}$ speed of $\boldsymbol{j}$-point of the thread 3, at a distance $\boldsymbol{\rho_j}$ of the point **O** on the segment from point **O** to the body 2, on the axis $\mathbf{O_2x_2}$ and $\mathbf{O_2y_2}$ from the time $\boldsymbol{t_2}$:

$$v_{22\mathrm{x}\rho j} = v \cdot \frac{\rho_j}{\mathrm{R}} \cdot \sin(\omega \cdot t_2) \tag{16}$$

$$v_{22\mathrm{y}\rho j} = v \cdot \frac{\rho_j}{\mathrm{R}} \cdot \cos(\omega \cdot t_2) \tag{17}$$

- values of coordinates $\mathbf{x}_{21\rho i}$ and $\mathbf{y}_{21\rho i}$ $\boldsymbol{i}$-point of the thread 3 and the coordinates $\mathbf{x}_{22\rho j}$ and $\mathbf{y}_{22\rho j}$ $\boldsymbol{j}$-point of the thread 3:

$$x_{21\rho i} = \rho_i \cdot \cos(\omega \cdot t_2) \quad (18)$$

$$y_{21\rho i} = -[\rho_i \cdot \sin(\omega \cdot t_2)] \quad (19)$$

$$x_{22\rho j} = -[\rho_j \cdot \cos(\omega \cdot t_2)] \quad (20)$$

$$y_{22\rho j} = \rho_j \cdot \sin(\omega \cdot t_2) \quad (21)$$

Now you can proceed to consider the movement of bodies 1 and 2 and thread 3 in the fixed reference system $\mathbf{O_1x_1y_1z_1}$.

Assume that the mobile inertial reference system $\mathbf{O_2x_2y_2z_2}$ moves with speed **V** relative to a fixed reference system $\mathbf{O_1x_1y_1z_1}$, where as the origin of time ($t_1$=0 and $t_2$=0) in the two systems is selected, when the origin $\mathbf{O_1}$ and $\mathbf{O_2}$ of these systems are the same ( ie the same point $\mathbf{O_1}$, $\mathbf{O_2}$ and **O**), as shown in Fig. 3.

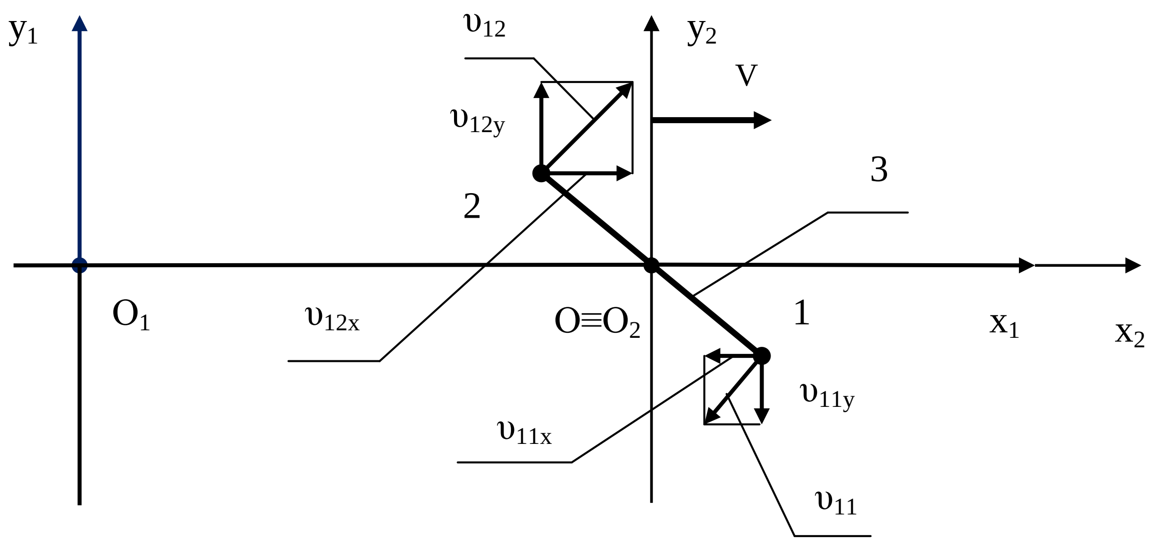


Fig. 3

For consideration of motion of the body 1, we can write the following:

- communication between coordinates $\mathbf{x_{11}}$ and $\mathbf{y_{11}}$ body 1 at time $\mathbf{t_1}$ in a fixed reference system $\mathbf{O_1x_1y_1z_1}$ and coordinates $\mathbf{x_{21}}$ and $\mathbf{y_{21}}$ body 1 at time $t_2$, the corresponding point in time $\mathbf{t_1}$ in a fixed reference system $\mathbf{O_1x_1y_1z_1}$, in a mobile reference system $\mathbf{O_2x_2y_2z_2}$:

$$x_{11} = \beta \cdot [x_{21} + (V \cdot t_2)] \quad (22)$$

$$x_{21} = \beta \cdot [x_{11} - (V \cdot t_1)] \quad (23)$$

$$y_{11} = y_{21} \quad (24)$$

- the relationship between the values of the times $t_1$ and $t_2$ in describing the motion of the body 1:

$$t_1 = \frac{(\beta^2 - 1) \cdot x_{21}}{\beta \cdot V} + (\beta \cdot t_2) \quad (25)$$

$$t_2 = \frac{(1 - \beta^2) \cdot x_{11}}{\beta \cdot V} + (\beta \cdot t_1) \quad (26)$$

while taking into account equation (10) formula (25) becomes:

$$t_1 = \frac{(\beta^2 - 1) \cdot R \cdot \cos(\omega \cdot t_2)}{\beta \cdot V} + (\beta \cdot t_2) \quad (27)$$

- the relationship between the projections $\mathbf{v_{x11}}$ and $\mathbf{v_{y11}}$ speed $\mathbf{v_{11}}$ motion of body 1 at time $t_1$ in a fixed inertial reference system $\mathbf{O_1x_1y_1z_1}$ and similar projections $\mathbf{v_{x21}}$ and $\mathbf{v_{y21}}$ speed $\mathbf{v_{21}}$ motion of the body 1 in the mobile inertial reference system $\mathbf{O_2x_2y_2z_2}$ at time $t_2$, the corresponding point in time $t_1$ in a fixed reference system $\mathbf{O_1x_1y_1z_1}$:

$$v_{x11} = \frac{v_{x21} + V}{\frac{(\beta^2 - 1) \cdot v_{x21}}{\beta^2 \cdot V} + 1} \quad (28)$$

$$v_{y11} = \frac{v_{y21}}{\frac{(\beta^2 - 1) \cdot v_{x21}}{\beta \cdot V} + \beta} \quad (29)$$

Similarly, for the consideration of motion of the body 2 can be written as follows:

- communication between coordinates $\mathbf{x_{12}}$ and $\mathbf{y_{12}}$ body 2 at time $\mathbf{t_1}$ in a fixed reference system $\mathbf{O_1x_1y_1z_1}$ and coordinates $\mathbf{x_{22}}$ and $\mathbf{y_{22}}$ body 2 at time $t_2$, the corresponding point in time $\mathbf{t_1}$ in a fixed reference system $\mathbf{O_1x_1y_1z_1}$, in a mobile reference system $\mathbf{O_2x_2y_2z_2}$:

$$x_{12} = \beta \cdot [x_{22} + (V \cdot t_2)] \quad (30)$$

$$x_{22} = \beta \cdot [x_{12} - (V \cdot t_1)] \quad (31)$$

$$y_{12} = y_{22} \quad (32)$$

- the relationship between the values of the times $t_1$ and $t_2$ in describing the motion of the body 2:

$$t_1 = \frac{(\beta^2 - 1) \cdot x_{22}}{\beta \cdot V} + (\beta \cdot t_2) \qquad (33)$$

$$t_2 = \frac{(1 - \beta^2) \cdot x_{12}}{\beta \cdot V} + (\beta \cdot t_1) \qquad (34)$$

while taking into account equation (12) formula (33) becomes:

$$t_1 = -\frac{(\beta^2 - 1) \cdot R \cdot \cos(\omega \cdot t_2)}{\beta \cdot V} + (\beta \cdot t_2) \qquad (35)$$

- the relationship between the projections $\mathbf{v_{x12}}$ and $\mathbf{v_{y12}}$ speed $\mathbf{v_{12}}$ motion of body 2 at time $t_1$ in a fixed inertial reference system $\mathbf{O_1x_1y_1z_1}$ and similar projections $\mathbf{v_{x22}}$ and $\mathbf{v_{y22}}$ speed $\mathbf{v_{22}}$ motion of the body 2 in the mobile inertial reference system $\mathbf{O_2x_2y_2z_2}$ at time $t_2$, the corresponding point in time $t_1$ in a fixed reference system $\mathbf{O_1x_1y_1z_1}$:

$$v_{x12} = \frac{v_{x22} + V}{\frac{(\beta^2 - 1) \cdot v_{x22}}{\beta^2 \cdot V} + 1} \qquad (36)$$

$$v_{y12} = \frac{v_{y22}}{\frac{(\beta^2 - 1) \cdot v_{x22}}{\beta \cdot V} + \beta} \qquad (37)$$

Also for consideration of motion of the ***i***-point thread 3 at a distance $\boldsymbol{\rho_i}$ of the point **O** on the segment from point **O** to the body 1 can write the following:

- the communication between coordinates $\mathbf{x_{11\rho i}}$ and $\mathbf{y_{11\rho i}}$ ***i*** -point of the thread 3 in the time $\mathbf{t_1}$ in a fixed reference system $\mathbf{O_1x_1y_1z_1}$ and coordinates $\mathbf{x_{21\rho i}}$ and $\mathbf{y_{21\rho i}}$ ***i***-point of the thread 3 in the time $t_2$, the corresponding point in time $\mathbf{t_1}$ in a fixed reference system $\mathbf{O_1x_1y_1z_1}$, in the mobile reference system $\mathbf{O_2x_2y_2z_2}$:

$$x_{11\rho i} = \beta \cdot [x_{21\rho i} + (V \cdot t_2)] \qquad (38)$$

$$x_{21\rho i} = \beta \cdot [x_{11\rho i} - (V \cdot t_1)] \qquad (39)$$

$$y_{11} = y_{21} \qquad (40)$$

- the relationship between the values of the times $t_1$ and $t_2$ in describing the motion of the ***i***-point of the thread 3:

$$t_1 = \frac{(\beta^2 - 1) \cdot x_{21\rho i}}{\beta \cdot V} + (\beta \cdot t_2) \quad (41)$$

$$t_2 = \frac{(1 - \beta^2) \cdot x_{11\rho i}}{\beta \cdot V} + (\beta \cdot t_1) \quad (42)$$

while taking into account equation (18) formula (41) becomes:

$$t_1 = \frac{(\beta^2 - 1) \cdot \rho_i \cdot \cos(\omega \cdot t_2)}{\beta \cdot V} + (\beta \cdot t_2) \quad (43)$$

- the relationship between the projections $\mathbf{v_{x11\rho i}}$ and $\mathbf{v_{y11\rho i}}$ speed $\mathbf{v_{11\rho i}}$ motion ***i***-the point of thread 3 at time $t_1$ in a fixed inertial reference system $\mathbf{O_1x_1y_1z_1}$ and similar projections $\mathbf{v_{x21\rho i}}$ and $\mathbf{v_{y21\rho i}}$ speed $\mathbf{v_{21\rho i}}$ motion of ***i***-the point of thread 3 in mobile inertial reference system $\mathbf{O_2x_2y_2z_2}$ at time $t_2$, the relevant time $t_1$ in the fixed reference system $\mathbf{O_1x_1y_1z_1}$:

$$v_{x11\rho i} = \frac{v_{x21\rho i} + V}{\dfrac{(\beta^2 - 1) \cdot v_{x21\rho i}}{\beta^2 \cdot V} + 1} \quad (44)$$

$$v_{y11\rho i} = \frac{v_{y21\rho i}}{\dfrac{(\beta^2 - 1) \cdot v_{x21\rho i}}{\beta \cdot V} + \beta} \quad (45)$$

And to consider the motion of the ***j***-point thread 3 can be written as follows:

- the relationship between coordinates $\mathbf{x_{12\rho j}}$ and $\mathbf{y_{12\rho j}}$ ***j***-point of the thread 3 in the time $\mathbf{t_1}$ in a fixed reference system $\mathbf{O_1x_1y_1z_1}$ and coordinates $\mathbf{x_{22\rho j}}$ and $\mathbf{y_{22\rho j}}$ ***j***-point of the thread 3 in the time $t_2$, the corresponding point in time $\mathbf{t_1}$ in a fixed reference system $\mathbf{O_1x_1y_1z_1}$, in the mobile reference system $\mathbf{O_2x_2y_2z_2}$:

$$x_{12\rho j} = \beta \cdot \left[x_{22\rho j} + (V \cdot t_2)\right] \quad (46)$$

$$x_{22\rho j} = \beta \cdot \left[x_{12\rho j} - (V \cdot t_1)\right] \quad (47)$$

$$y_{12\rho j} = y_{22\rho j} \quad (48)$$

- the relationship between the values of the times $t_1$ and $t_2$ in describing the motion of the ***j***-point thread 3:

$$t_1 = \frac{(\beta^2 - 1) \cdot x_{22\rho j}}{\beta \cdot V} + (\beta \cdot t_2) \quad (49)$$

$$t_2 = \frac{(1 - \beta^2) \cdot x_{12\rho j}}{\beta \cdot V} + (\beta \cdot t_1) \quad (50)$$

while taking into account equation (20) formula (49) becomes:

$$t_1 = -\frac{(\beta^2 - 1) \cdot \rho_j \cdot \cos(\omega \cdot t_2)}{\beta \cdot V} + (\beta \cdot t_2) \quad (51)$$

- the relationship between the projections $\mathbf{v}_{x12\rho j}$ and $\mathbf{v}_{y12\rho j}$ speed $\mathbf{v}_{12\rho j}$ motion of the ***j***-point thread 3 at time $t_1$ in a fixed inertial reference system $\mathbf{O_1x_1y_1z_1}$ and similar projections $\mathbf{v}_{x22\rho j}$ and $\mathbf{v}_{y22\rho j}$ speed $\mathbf{v}_{22\rho j}$ motion of the ***j***-point thread 3 in the mobile inertial reference system $\mathbf{O_2x_2y_2z_2}$ at time $t_2$, the relevant time $t_1$ in the fixed reference system $\mathbf{O_1x_1y_1z_1}$:

$$v_{x12\rho j} = \frac{v_{x22\rho j} + V}{\frac{(\beta^2 - 1) \cdot v_{x22\rho j}}{\beta^2 \cdot V} + 1} \quad (52)$$

$$v_{y12\rho j} = \frac{v_{y22\rho j}}{\frac{(\beta^2 - 1) \cdot v_{x22\rho j}}{\beta \cdot V} + \beta} \quad (53)$$

In order to proceed to verify the law of conservation of momentum must select two points in time in a fixed reference system $\mathbf{O_1x_1y_1z_1}$.

**Instant $t_{1p}$**

Suppose, that in a fixed reference system $\mathbf{O_1x_1y_1z_1}$ at time $t_1$, equal $t_{1p}$, the bodies 1 and 2 are on the line parallel to the axis $\mathbf{O_1y_1}$ (or coincides with it), ie where:

$$x_{11} = x_{12} \quad (54)$$

The condition (54) is possible only when in a mobile reference system $\mathbf{O_2x_2y_2z_2}$ at time $t_2$, equal $t_{2p}$, the relevant time $t_{1p}$ in a fixed reference system $\mathbf{O_1x_1y_1z_1}$, the following conditions:

$$x_{21} = x_{22} \quad (55)$$

$$\omega \cdot t_{2p} = \frac{\pi}{2} \quad (56)$$

As shown in Fig. 4, according to equations (56), (6) ÷ (9) in the mobile reference system $\mathbf{O_2x_2y_2z_2}$ at time $\boldsymbol{t_{2p}}$ bodies 1 and 2, respectively, have the following meanings projections $\boldsymbol{\upsilon_{21xp}}$, $\boldsymbol{\upsilon_{21yp}}$ and $\boldsymbol{\upsilon_{22xp}}$, $\boldsymbol{\upsilon_{22yp}}$ speed of his movement on the axis $\mathbf{O_2x_2}$ and $\mathbf{O_2y_2}$:

$$v_{21\mathrm{xp}} = -\,v \tag{57}$$

$$v_{21\mathrm{yp}} = 0 \tag{58}$$

$$v_{22\mathrm{xp}} = v \tag{59}$$

$$v_{22\mathrm{yp}} = 0 \tag{60}$$

And according to equations (56), (14) ÷ (17) in the mobile reference system $\mathbf{O_2x_2y_2z_2}$ at time $\boldsymbol{t_{2p}}$ ***i***-point of thread 3, located at a distance $\boldsymbol{\rho_i}$ of the point **O** on the segment from point **O** to the body 1, and ***j***-point of the thread 3, located at a distance $\boldsymbol{\rho_j}$ of the point **O** on the segment from point **O** to the body 2, respectively, have the following meanings projections $\boldsymbol{\upsilon_{21x\rho ip}}$, $\boldsymbol{\upsilon_{21y\rho ip}}$ and $\boldsymbol{\upsilon_{22x\rho jp}}$, $\boldsymbol{\upsilon_{22yp j\rho}}$ speed of the movement on the axis $\mathbf{O_2x_2}$ and $\mathbf{O_2y_2}$:

$$v_{21\mathrm{x}\rho i\mathrm{p}} = -(v \cdot \frac{\rho_i}{\mathrm{R}}) \tag{61}$$

$$v_{21\mathrm{y}\rho i\mathrm{p}} = 0 \tag{62}$$

$$v_{22\mathrm{x}\rho j\mathrm{p}} = v \cdot \frac{\rho_j}{\mathrm{R}} \tag{63}$$

$$v_{22\mathrm{y}\rho j\mathrm{p}} = 0 \tag{64}$$

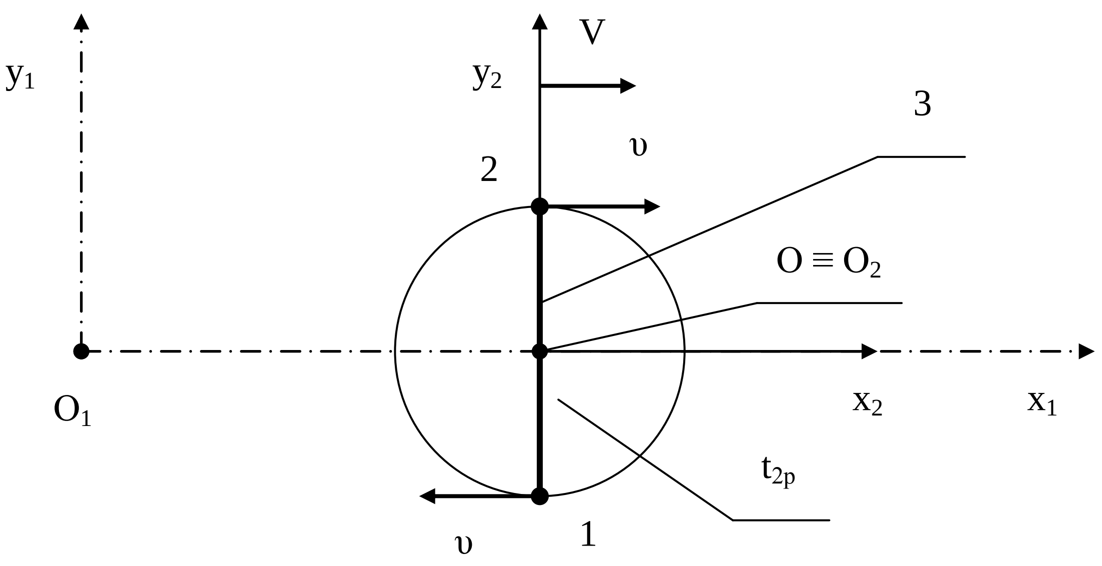


Fig. 4

**Instant $t_{1т}$**

Suppose as shown in Fig. 5, in the fixed reference system $\mathbf{O_1x_1y_1z_1}$ at time $t_1$, equal $t_{1т}$, the position of body 1 will be consistent with the body 1 at time $t_2$, equal $\mathbf{t_{21т}}$:

$$t_{21т} = 0 \qquad (65)$$

in the mobile reference system $\mathbf{O_2x_2y_2z_2}$, ie when the body 1 will be located on the axis $\mathbf{O_2x_2}$.

The value of time $t_{1т}$ can be determined from equation (27) starting from the condition (65):

$$t_{1т} = \frac{(\beta^2 - 1) \cdot R}{\beta \cdot V} \qquad (66)$$

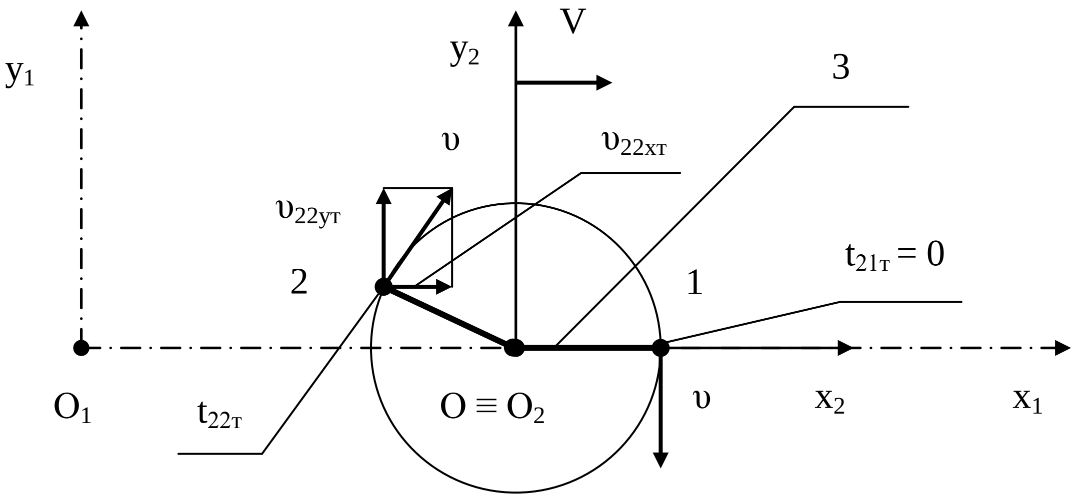


Fig. 5

According to equations (65), (6) ÷ (7) in the mobile reference system $\mathbf{O_2x_2y_2z_2}$ at time $\mathbf{t_{21т}}$ body 1 will have the following meanings projections $\boldsymbol{\upsilon_{21xp}}$ and $\boldsymbol{\upsilon_{21yp}}$ speed of his movement on the axis $\mathbf{O_2x_2}$ and $\mathbf{O_2y_2}$:

$$v_{21xт} = 0 \qquad (67)$$

$$v_{21yт} = -v \qquad (68)$$

Regulation of body 2 at time $t_1$, equal $t_{1т}$ in a fixed reference system $\mathbf{O_1x_1y_1z_1}$ will meet in the mobile inertial reference system $\mathbf{O_2x_2y_2z_2}$ position of body 2 at time $t_2$, equal $\mathbf{t_{22т}}$, which can be defined on the basis of equations (35) and (66):

$$\frac{(\beta^2 - 1) \cdot R}{\beta \cdot V} = -\frac{(\beta^2 - 1) \cdot R \cdot \cos(\omega \cdot t_{22т})}{\beta \cdot V} + (\beta \cdot t_{22т}) \qquad (69)$$

or

$$(\omega \cdot t_{22т}) = \frac{(\beta^2 - 1) \cdot [1 + \cos(\omega \cdot t_{22т})] \cdot v}{\beta^2 \cdot V} \qquad (70)$$

Similar to the situation of ***i***-point of the thread 3, at a distance $\boldsymbol{\rho_i}$ of the point **O** on the segment from point **O** to the body 1, at time $\boldsymbol{t_1}$, equal $\boldsymbol{t_{1т}}$ in a fixed reference system $\mathbf{O_1x_1y_1z_1}$ will meet in the mobile reference system $\mathbf{O_2x_2y_2z_2}$ position of ***i***-point of thread 3, at a distance $\boldsymbol{\rho_i}$ of the point **O** on the segment from point **O** to the body 1, at time $\boldsymbol{t_2}$, equal $\mathbf{t_{21\rho iт}}$ and which can be determined on the basis of equations (43) and (66):

$$\frac{(\beta^2 - 1) \cdot R}{\beta \cdot V} = \frac{(\beta^2 - 1) \cdot \rho_i \cdot \cos(\omega \cdot t_{21\rho iт})}{\beta \cdot V} + (\beta \cdot t_{21\rho iт}) \qquad (71)$$

or

$$(\omega \cdot t_{21\rho iт}) = \frac{(\beta^2 - 1) \cdot v}{\beta^2 \cdot V} \cdot \left\{1 - \left[\frac{\rho_i}{R} \cdot \cos(\omega \cdot t_{21\rho iт})\right]\right\} \qquad (72)$$

Similar to the situation of the ***j***-point of thread 3, at a distance $\boldsymbol{\rho_j}$ of the point **O** on the segment from point **O** to the body 2, at time $\boldsymbol{t_1}$, equal $\boldsymbol{t_{1т}}$ in a fixed reference system $\mathbf{O_1x_1y_1z_1}$ will meet in the mobile reference system $\mathbf{O_2x_2y_2z_2}$ position of the ***j***-point of thread 3, at a distance $\boldsymbol{\rho_j}$ of the point **O** on the segment from point **O** to the body 2, at time $\boldsymbol{t_2}$, equal $\mathbf{t_{22\rho jт}}$ and which can be determined on the basis of equations (51) and (66):

$$\frac{(\beta^2 - 1) \cdot R}{\beta \cdot V} = -\frac{(\beta^2 - 1) \cdot \rho_j \cdot \cos(\omega \cdot t_{22\rho jт})}{\beta \cdot V} + (\beta \cdot t_{22\rho jт}) \qquad (73)$$

or

$$(\omega \cdot t_{22\rho jт}) = \frac{(\beta^2 - 1) \cdot v}{\beta^2 \cdot V} \cdot \left\{1 + \left[\frac{\rho_j}{R} \cdot \cos(\omega \cdot t_{22\rho jт})\right]\right\} \qquad (74)$$

To handle complex calculations in equations (70), (72) and (74) values of pulses will try to determine by simple numerical examples.

**I. For the case, where the conversion factor β> 1**

Assume, that for the case **β > 1** conversion factor **β** is determined by the following formula:

$$\beta^2 = \frac{1}{1 - \frac{V^2}{C_1^2}} \qquad (75)$$

where: $\mathbf{C_1}$ - a constant (in the special theory of relativity $\mathbf{C_1}$ - is the speed of light **c**).

If the conversion factor **β > 1** in the inertial reference system **Oxyz** projection $\mathbf{K_x}$ and $\mathbf{K_y}$ of pulse moving with speed **v** of a point, having a rest mass $\boldsymbol{m_o}$, on the **Ox** and **Oy**, respectively, can be written:

$$K_x = \frac{m_o v_x}{\sqrt{1 - \frac{(v_x^2 + v_y^2)}{C_1^2}}} \qquad (76)$$

$$K_y = \frac{m_o v_y}{\sqrt{1 - \frac{(v_x^2 + v_y^2)}{C_1^2}}} \qquad (77)$$

where: $\mathbf{v_x}$ and $\mathbf{v_y}$ - the projection of the speed **v** of a point on the axis **Ox** and **Oy**, respectively.

We assume in this example (shown in Fig. 1 - Fig. 5), that:

$$\frac{V}{C_1} = 0{,}9 \qquad (78)$$

$$\frac{v}{C_1} = 0{,}8 \qquad (79)$$

$$\frac{m_0}{M_0} = 0{,}1 \qquad (80)$$

In the mobile reference system $\mathbf{O_2x_2y_2z_2}$ thread 3 divided by 17 equal parts (***i*** = 0, 1, 2, 3, 4, 5, 6, 7, 8 and ***j*** = 1, 2, 3, 4, 5, 6, 7, 8) with accommodation in the center of each part of the point of the body with rest mass $\mathbf{m_{017}}$, equal to:

$$m_{017} = \frac{m_0}{17} \qquad (81)$$

The distance $\boldsymbol{\rho_i}$ from point **O** to the ***i***-point of the thread 3, located on the segment from point **O** to the body 1 will be equal to:

$$\rho_i = \frac{2 \cdot i}{17} \qquad (82)$$

The distance $\boldsymbol{\rho_j}$ from point **O** to the ***j***-point of the thread 3, located on the segment from point **O** to the body 2, will be equal to:

$$\rho_j = \frac{2 \cdot j}{17} \qquad (83)$$

**a) An evaluation of the momentum of bodies 1 and 2 and thread 3 in the fixed reference system $\mathbf{O_1x_1y_1z_1}$ at time $t_{1p}$**

To determine the values of the momentum of the system of bodies 1 and 2 and thread 3 in the fixed reference system $\mathbf{O_1x_1y_1z_1}$ at time $t_{1p}$ will use equation (57) - (60), (76) - (77), baseline data (78) - (83) and equations obtained from equations (28), (29), (36), (37), (44), (45), (52) and (53) taking into account equation (75):

$$v_{x11} = \frac{v_{x21} + V}{1 + \frac{V \cdot v_{x21}}{C_1^2}} \qquad (84)$$

$$v_{y11} = \frac{v_{y21} \cdot \sqrt{1 - \frac{V^2}{C_1^2}}}{1 + \frac{V \cdot v_{x21}}{C_1^2}} \qquad (85)$$

$$v_{x12} = \frac{v_{x22} + V}{1 + \frac{V \cdot v_{x22}}{C_1^2}} \qquad (86)$$

$$v_{y12} = \frac{v_{y22} \cdot \sqrt{1 - \frac{V^2}{C_1^2}}}{1 + \frac{V \cdot v_{x22}}{C_1^2}} \qquad (87)$$

$$v_{x11\rho i} = \frac{v_{x21\rho i} + V}{1 + \frac{V \cdot v_{x21\rho i}}{C_1^2}} \qquad (88)$$

$$v_{y11\rho i} = \frac{v_{y21\rho i} \cdot \sqrt{1 - \frac{V^2}{C_1^2}}}{1 + \frac{V \cdot v_{x21\rho i}}{C_1^2}} \qquad (89)$$

$$v_{x12\rho j} = \frac{v_{x22\rho j} + V}{1 + \frac{V \cdot v_{x22\rho j}}{C_1^2}} \qquad (90)$$

$$v_{y12\rho j} = \frac{v_{y22\rho j} \cdot \sqrt{1 - \frac{V^2}{C_1^2}}}{1 + \frac{V \cdot v_{x22\rho j}}{C_1^2}} \qquad (91)$$

The results of digital calculations presented in the table:

| Object | Mobile reference system $\mathbf{O_2x_2y_2z_2}$ | | A fixed reference system $\mathbf{O_1x_1y_1z_1}$ | | | |
|---|---|---|---|---|---|---|
| | The projections of the speed (dimension $\mathbf{C_1}$) | | The projections of the speed (dimension $\mathbf{C_1}$) | | Projections momentum (dimension $\mathbf{C_1 \cdot M_0}$) | |
| | on the axis $\mathbf{O_2x_2}$ | on the axis $\mathbf{O_2y_2}$ | on the axis $\mathbf{O_1x_1}$ | on the axis $\mathbf{O_1y_1}$ | on the axis $\mathbf{O_1x_1}$ | on the axis $\mathbf{O_1y_1}$ |
| Body 1 | -0,8 | 0 | 0,3571429 | 0 | 0,3823596 | 0 |
| Body 2 | 0,8 | 0 | 0,9883721 | 0 | 6,5001125 | 0 |
| Body 1 and body 2 | | | | | 6,8824472 | 0 |
| Body 1, body 2 and thread 3 | | | | | 7,1214557 | 0 |

| Object | Mobile reference system $O_2x_2y_2z_2$ | | A fixed reference system $O_1x_1y_1z_1$ | | | |
|---|---|---|---|---|---|---|
| | The projections of the speed (dimension $C_1$) | | The projections of the speed (dimension $C_1$) | | Projections momentum (dimension $C_1 \cdot M_0$) | |
| | on the axis $O_2x_2$ | on the axis $O_2y_2$ | on the axis $O_1x_1$ | on the axis $O_1y_1$ | on the axis $O_1x_1$ | on the axis $O_1y_1$ |
| *i* = 0 | 0 | 0 | 0,9 | 0 | 0,0121455 | 0 |
| *i* = 1 | -0,09412 | 0 | 0,8804627 | 0 | 0,0109239 | 0 |
| *i* = 2 | -0,18824 | 0 | 0,8569405 | 0 | 0,0097801 | 0 |
| *i* = 3 | -0,28235 | 0 | 0,8280757 | 0 | 0,0086887 | 0 |
| *i* = 4 | -0,37647 | 0 | 0,7918149 | 0 | 0,0076261 | 0 |
| *i* = 5 | -0,47059 | 0 | 0,744898 | 0 | 0,0065676 | 0 |
| *i* = 6 | -0,56471 | 0 | 0,6818182 | 0 | 0,0054827 | 0 |
| *i* = 7 | -0,65882 | 0 | 0,5924855 | 0 | 0,0043263 | 0 |
| *i* = 8 | -0,75294 | 0 | 0,4562044 | 0 | 0,0030156 | 0 |
| *j*= 1 | 0,094118 | 0 | 0,9164859 | 0 | 0,0134755 | 0 |
| *j*= 2 | 0,188235 | 0 | 0,9305835 | 0 | 0,0149531 | 0 |
| *j*= 3 | 0,282353 | 0 | 0,99427767 | 0 | 0,0166327 | 0 |
| *j*= 4 | 0,376471 | 0 | 0,9534271 | 0 | 0,0185940 | 0 |
| *j*= 5 | 0,470588 | 0 | 0,9628099 | 0 | 0,0209623 | 0 |
| *j*= 6 | 0,564706 | 0 | 0,9711388 | 0 | 0,0239506 | 0 |
| *j*= 7 | 0,658824 | 0 | 0,978582 | 0 | 0,0279629 | 0 |
| *j*= 8 | 0,752941 | 0 | 0,9852735 | 0 | 0,0338959 | 0 |
| Thread 3 | | | | | 0,2389836 | 0 |

**b) An evaluation of the momentum of bodies 1 and 2 and thread 3 in the fixed frame of reference $O_1x_1y_1z_1$ at time $t_{1T}$**

To determine the values of the momentum of the system of bodies 1 and 2 and thread 3 in the fixed reference system $O_1x_1y_1z_1$ at time $t_{1T}$ will use equation (8) - (9), (14) - (17), (67) - (68), (76 ) - (77), (84) - (91), baseline data (78) - (83) and a formula derived from the equations (70), (72) and (74) taking into account equation (75):

$$(\omega \cdot t_{22\text{т}}) = \frac{V \cdot v \cdot [1 + \cos(\omega \cdot t_{22\text{т}})]}{C_1^2} \qquad (92)$$

$$(\omega \cdot t_{21\rho i\text{т}}) = \frac{V \cdot v}{C_1^2} \cdot \left\{1 - \left[\frac{\rho_i}{R} \cdot \cos(\omega \cdot t_{21\rho i\text{т}})\right]\right\} \qquad (93)$$

$$(\omega \cdot t_{22\rho j\text{т}}) = \frac{V \cdot v}{C_1^2} \cdot \left\{1 + \left[\frac{\rho_j}{R} \cdot \cos(\omega \cdot t_{22\rho j\text{т}})\right]\right\} \qquad (94)$$

The results of digital calculations presented in the table:

| Object | Mobile reference system $\mathbf{O_2x_2y_2z_2}$ | | A fixed reference system $\mathbf{O_1x_1y_1z_1}$ | | | |
|---|---|---|---|---|---|---|
| | The projections of the speed (dimension $\mathbf{C_1}$) | | The projections of the speed (dimension $\mathbf{C_1}$) | | Projections momentum (dimension $\mathbf{C_1 \cdot M_0}$) | |
| | on the axis $\mathbf{O_2x_2}$ | on the axis $\mathbf{O_2y_2}$ | on the axis $\mathbf{O_1x_1}$ | on the axis $\mathbf{O_1y_1}$ | on the axis $\mathbf{O_1x_1}$ | on the axis $\mathbf{O_1y_1}$ |
| Body 1 | 0 | -0,8 | 0,9 | -0,34871 | 3,441236 | -1,333333 |
| Body 2 | 0,700743 | 0,385953 | 0,9816482 | 0,103168 | 6,1205934 | 0,6432543 |
| Body 1 and body 2 | | | | | 9,5618294 | -0,690079 |
| Body 1, body 2 and thread 3 | | | | | 9,8354767 | -0,700351 |

| Object | Mobile reference system $O_2x_2y_2z_2$ | | A fixed reference system $O_1x_1y_1z_1$ | | | |
|---|---|---|---|---|---|---|
| | The projections of the speed (dimension $C_1$) | | The projections of the speed (dimension $C_1$) | | Projections momentum (dimension $C_1 \cdot M_0$) | |
| | on the axis $O_2x_2$ | on the axis $O_2y_2$ | on the axis $O_1x_1$ | on the axis $O_1y_1$ | on the axis $O_1x_1$ | on the axis $O_1y_1$ |
| *i* = 0 | 0 | 0 | 0,9 | 0 | 0,0121455 | 0 |
| *i* = 1 | -0,05716 | -0,07477 | 0,8885503 | -0,03436 | 0,0114249 | -0,000442 |
| *i* = 2 | -0,10286 | -0,15765 | 0,8784626 | -0,07573 | 0,0109532 | -0,000944 |
| *i* = 3 | -0,13452 | -0,24825 | 0,8709212 | -0,12311 | 0,0107684 | -0,001522 |
| *i* = 4 | -0,14977 | -0,3454 | 0,8671108 | -0,17401 | 0,0109284 | -0,002193 |
| *i* = 5 | -0,14699 | -0,44704 | 0,8678151 | -0,22457 | 0,0115169 | -0,002980 |
| *i* = 6 | -0,12573 | -0,55053 | 0,8730642 | -0,27059 | 0,0126608 | -0,003924 |
| *i* = 7 | -0,08687 | -0,65307 | 0,8820957 | -0,30881 | 0,0145863 | -0,005106 |
| *i* = 8 | -0,03235 | -0,75225 | 0,8936691 | -0,33773 | 0,0177924 | -0,006724 |
| *j*= 1 | 0,066205 | 0,066896 | 0,9118716 | 0,027519 | 0,013097 | 0,000395 |
| *j*= 2 | 0,139393 | 0,1265 | 0,9235324 | 0,048994 | 0,014282 | 0,000758 |
| *j*= 3 | 0,217908 | 0,179553 | 0,934614 | 0,065433 | 0,0157261 | 0,001101 |
| *j*= 4 | 0,300464 | 0,22683 | 0,9449365 | 0,077827 | 0,0174868 | 0,001440 |
| *j*= 5 | 0,386083 | 0,269061 | 0,9544394 | 0,087037 | 0,0196698 | 0,001794 |
| *j*= 6 | 0,474026 | 0,306907 | 0,9631315 | 0,093772 | 0,0224678 | 0,002187 |
| *j*= 7 | 0,563739 | 0,34095 | 0,971058 | 0,098594 | 0,0262572 | 0,002666 |
| *j*= 8 | 0,654805 | 0,371687 | 0,9782804 | 0,101939 | 0,0318835 | 0,003322 |
| Thread 3 | | | | | 0,2736473 | -0,010172 |

As a result of numerical calculation for the case, where the conversion factor $\boldsymbol{\beta > 1}$, it was found that in the fixed reference system $O_1x_1y_1z_1$ at time $t_{1p}$ closed system of bodies 1 and 2 and thread 3 is the projection of momentum on the axis $O_1x_1$, equal to **7,1214557** $\cdot$ $C_1 \cdot M_0$, and the projection of momentum on the axis $O_1y_1$, equal to **0**.

And in a fixed reference system $O_1x_1y_1z_1$ at time $t_{1т}$ closed system of bodies 1 and 2 and thread 3 is the projection of momentum on the axis $O_1x_1$, equal to **9,8354767** $\cdot$ $C_1 \cdot M_0$, and the projection of momentum on the axis $O_1y_1$, equal -

**0,700351** · $C_1$ · $M_0$.

As a result, again, we have a violation of the law of conservation of momentum for a closed mechanical system of bodies.

Moreover, integration of mass thread 3 in calculating the momentum of the system of bodies 1 and 2 and thread 3 leads to a greater aggravation of violations of the law of conservation of momentum.

## II. For the case, where the conversion factor $0 < \beta < 1$

Assume that for the case $0 < \beta < 1$ conversion factor **β** is determined by the following formula:

$$\beta^2 = \frac{1}{1 + \frac{V^2}{C_2^2}} \qquad (95)$$

where: $C_2$ - a constant.

If the conversion factor $0 < \beta < 1$ in the inertial reference system **Oxyz** projection $K_x$ and $K_y$ of pulse moving with velocity **v** of a point, having a rest mass $m_0$, on the **Ox** and **Oy**, respectively, can be written:

$$K_x = \frac{m_o v_x}{\sqrt{1 + \frac{(v_x^2 + v_y^2)}{C_2^2}}} \qquad (96)$$

$$K_y = \frac{m_o v_y}{\sqrt{1 + \frac{(v_x^2 + v_y^2)}{C_2^2}}} \qquad (97)$$

where: $v_x$ and $v_y$ - the projection of the velocity **v** of a point on the axis **Ox** and **Oy**, respectively.

We assume in this example (shown in Fig. 1 - Fig. 5), that:

$$\frac{V}{C_2} = 0{,}9 \qquad (98)$$

$$\frac{v}{C_2} = 0{,}8 \qquad (99)$$

$$\frac{m_0}{M_0} = 0{,}1 \qquad (80)$$

In the mobile reference system $\mathbf{O_2x_2y_2z_2}$ thread 3 divided by 17 equal parts (***i*** = 0, 1, 2, 3, 4, 5, 6, 7, 8 and ***j*** = 1, 2, 3, 4, 5, 6, 7, 8) with accommodation in the center of each part of the point of the body with rest mass $\mathbf{m_{017}}$, equal to:

$$m_{017} = \frac{m_0}{17} \qquad (81)$$

The distance $\boldsymbol{\rho_i}$ from point **O** to the ***i***-the point of the thread 3, located on the segment from point **O** to the body 1 will be equal to:

$$\rho_i = \frac{2 \cdot i}{17} \qquad (82)$$

The distance $\boldsymbol{\rho_j}$ from point **O** to the j-point of the thread 3, located on the segment from point **O** to the body 2, will be equal to:

$$\rho_j = \frac{2 \cdot j}{17} \qquad (83)$$

**a) An evaluation of the momentum of bodies 1 and 2 and thread 3 in the fixed frame of reference $\mathbf{O_1x_1y_1z_1}$ at time $\boldsymbol{t_{1p}}$**

To determine the values of the momentum of the system of bodies 1 and 2 and thread 3 in the fixed reference system $\mathbf{O_1x_1y_1z_1}$ at time $\boldsymbol{t_{1p}}$ will use equation (57) - (60), (96) - (97), baseline data (98) - (99), (80) - (83) and a formula derived from the equations (28), (29), (36), (37), (44), (45), (52) and (53) taking into account equation (95) :

$$v_{x11} = \frac{v_{x21} + V}{1 - \frac{V \cdot v_{x21}}{C_2^2}} \qquad (100)$$

$$v_{y11} = \frac{v_{y21} \cdot \sqrt{1 + \frac{V^2}{C_2^2}}}{1 - \frac{V \cdot v_{x21}}{C_2^2}} \qquad (101)$$

$$v_{x12} = \frac{v_{x22} + V}{1 - \frac{V \cdot v_{x22}}{C_2^2}} \qquad (102)$$

$$v_{y12} = \frac{v_{y22} \cdot \sqrt{1 + \frac{V^2}{C_2^2}}}{1 - \frac{V \cdot v_{x22}}{C_2^2}} \quad (103)$$

$$v_{x11\rho i} = \frac{v_{x21\rho i} + V}{1 - \frac{V \cdot v_{x21\rho i}}{C_2^2}} \quad (104)$$

$$v_{y11\rho i} = \frac{v_{y21\rho i} \cdot \sqrt{1 + \frac{V^2}{C_2^2}}}{1 - \frac{V \cdot v_{x21\rho i}}{C_2^2}} \quad (105)$$

$$v_{x12\rho j} = \frac{v_{x22\rho j} + V}{1 - \frac{V \cdot v_{x22\rho j}}{C_2^2}} \quad (106)$$

$$v_{y12\rho j} = \frac{v_{y22\rho j} \cdot \sqrt{1 + \frac{V^2}{C_2^2}}}{1 - \frac{V \cdot v_{x22\rho j}}{C_2^2}} \quad (107)$$

The results of digital calculations presented in the table:

| Object | Mobile reference system $\mathbf{O_2x_2y_2z_2}$ | | A fixed reference system $\mathbf{O_1x_1y_1z_1}$ | | | |
|---|---|---|---|---|---|---|
| | The projections of the speed (dimension $\mathbf{C_2}$) | | The projections of the speed (dimension $\mathbf{C_2}$) | | Projections momentum (dimension $\mathbf{C_2 \cdot M_0}$) | |
| | on the axis $\mathbf{O_2x_2}$ | on the axis $\mathbf{O_2y_2}$ | on the axis $\mathbf{O_1x_1}$ | on the axis $\mathbf{O_1y_1}$ | on the axis $\mathbf{O_1x_1}$ | on the axis $\mathbf{O_1y_1}$ |
| Body 1 | -0,8 | 0 | 0,0581395 | 0 | 0,0580415 | 0 |
| Body 2 | 0,8 | 0 | 6,0714286 | 0 | 0,9867059 | 0 |
| Body 1 and body 2 | | | | | 1,0447474 | 0 |
| Body 1, body 2 and thread 3 | | | | | 1,106025 | 0 |

| Object | Mobile reference system $O_2x_2y_2z_2$ | | A fixed reference system $O_1x_1y_1z_1$ | | | |
|---|---|---|---|---|---|---|
| | The projections of the speed (dimension $C_2$) | | The projections of the speed (dimension $C_2$) | | Projections momentum (dimension $C_2 \cdot M_0$) | |
| | on the axis $O_2x_2$ | on the axis $O_2y_2$ | on the axis $O_1x_1$ | on the axis $O_1y_1$ | on the axis $O_1x_1$ | on the axis $O_1y_1$ |
| *i* = 0 | 0 | 0 | 0,9 | 0 | 0,0039351 | 0 |
| *i* = 1 | -0,09412 | 0 | 0,7429501 | 0 | 0,0035081 | 0 |
| *i* = 2 | -0,18824 | 0 | 0,6086519 | 0 | 0,0030583 | 0 |
| *i* = 3 | -0,28235 | 0 | 0,4924953 | 0 | 0,0025989 | 0 |
| *i* = 4 | -0,37647 | 0 | 0,3910369 | 0 | 0,0021422 | 0 |
| *i* = 5 | -0,47059 | 0 | 0,3016529 | 0 | 0,0016988 | 0 |
| *i* = 6 | -0,56471 | 0 | 0,2223089 | 0 | 0,0012765 | 0 |
| *i* = 7 | -0,65882 | 0 | 0,1514032 | 0 | 0,0008806 | 0 |
| *i* = 8 | -0,75294 | 0 | 0,00876578 | 0 | 0,0005137 | 0 |
| *j*= 1 | 0,094118 | 0 | 1,0861183 | 0 | 0,0043275 | 0 |
| *j*= 2 | 0,188235 | 0 | 1,3101983 | 0 | 0,004676 | 0 |
| *j*= 3 | 0,282353 | 0 | 1,5851735 | 0 | 0,0049751 | 0 |
| *j*= 4 | 0,376471 | 0 | 1,930605 | 0 | 0,0052232 | 0 |
| *j*= 5 | 0,470588 | 0 | 2,377551 | 0 | 0,0054223 | 0 |
| *j*= 6 | 0,564706 | 0 | 2,9784689 | 0 | 0,0055764 | 0 |
| *j*= 7 | 0,658824 | 0 | 3,8294798 | 0 | 0,0056915 | 0 |
| *j*= 8 | 0,752941 | 0 | 5,1277372 | 0 | 0,0057736 | 0 |
| Thread 3 | | | | | 0,0612779 | 0 |

**b) An evaluation of the momentum of bodies 1 and 2 and thread 3 in the fixed frame of reference $O_1x_1y_1z_1$ at time $t_{1T}$**

To determine the values of the momentum of the system of bodies 1 and 2 and thread 3 in the fixed reference system $O_1x_1y_1z_1$ at time $t_{1T}$ will use equation (8) - (9), (14) - (17), (67) - (68), (96) - (97), (100) - (107), baseline data (98) - (99), (80) - (83) and a formula derived from the equations (70), (72) and (74) taking into account equation (95):

$$(\omega \cdot t_{22\text{т}}) \quad = \quad - \frac{\text{V} \cdot \ v \cdot [1 + \cos(\omega \ \cdot \ t_{22\text{т}})]}{\text{C}_2^2} \qquad (108)$$

$$\left(\omega \cdot t_{21\rho i\text{т}}\right) \quad = \ - \ \frac{\text{V} \cdot \ v}{\text{C}_2^2} \cdot \left\{1 - \left[\frac{\rho_i}{\text{R}} \cdot \cos\left(\omega \ \cdot \ t_{21\rho i\text{т}}\right)\right]\right\} \qquad (109)$$

$$\left(\omega \cdot t_{22\rho j\text{т}}\right) \quad = \ - \ \frac{\text{V} \cdot \ v}{\text{C}_2^2} \cdot \left\{1 + \left[\frac{\rho_j}{\text{R}} \cdot \cos\left(\omega \ \cdot \ t_{22\rho j\text{т}}\right)\right]\right\} \qquad (110)$$

The results of digital calculations presented in the table:

| Object | Mobile reference system $\mathbf{O_2x_2y_2z_2}$ | | A fixed reference system $\mathbf{O_1x_1y_1z_1}$ | | | |
|---|---|---|---|---|---|---|
| | The projections of the speed (dimension $\mathbf{C_2}$) | | The projections of the speed (dimension $\mathbf{C_2}$) | | Projections momentum (dimension $\mathbf{C_2} \cdot \mathbf{M_0}$) | |
| | on the axis $\mathbf{O_2x_2}$ | on the axis $\mathbf{O_2y_2}$ | on the axis $\mathbf{O_1x_1}$ | on the axis $\mathbf{O_1y_1}$ | on the axis $\mathbf{O_1x_1}$ | on the axis $\mathbf{O_1y_1}$ |
| Body 1 | 0 | -0,8 | 0,9 | -1,07629 | 0,5223737 | -0,624695 |
| Body 2 | -0,700743 | 0,385953 | 0,1221935 | 0,318425 | 0,1156519 | 0,3013783 |
| Body 1 and body 2 | | | | | 0,6380255 | -0,323317 |
| Body 1, body 2 and thread 3 | | | | | 0,6919523 | -0,330101 |

| Object | Mobile reference system $O_2x_2y_2z_2$ | | A fixed reference system $O_1x_1y_1z_1$ | | | |
|---|---|---|---|---|---|---|
| | The projections of the speed (dimension $C_2$) | | The projections of the speed (dimension $C_2$) | | Projections momentum (dimension $C_2 \cdot M_0$) | |
| | on the axis $O_2x_2$ | on the axis $O_2y_2$ | on the axis $O_1x_1$ | on the axis $O_1y_1$ | on the axis $O_1x_1$ | on the axis $O_1y_1$ |
| *i* = 0 | 0 | 0 | 0,9 | 0 | 0,0039351 | 0 |
| *i* = 1 | 0,05716 | -0,07477 | 1,0090732 | -0,10605 | 0,0041666 | -0,000438 |
| *i* = 2 | 0,10286 | -0,15765 | 1,1051724 | -0,23373 | 0,0043091 | -0,000911 |
| *i* = 3 | 0,13452 | -0,24825 | 1,177014 | -0,37999 | 0,004353 | -0,001405 |
| *i* = 4 | 0,14977 | -0,3454 | 1,2133127 | -0,53708 | 0,0042956 | -0,001901 |
| *i* = 5 | 0,14699 | -0,44704 | 1,2066039 | -0,69313 | 0,004142 | -0,002379 |
| *i* = 6 | 0,12573 | -0,55053 | 1,1565986 | -0,83517 | 0,0039051 | -0,00282 |
| *i* = 7 | 0,08687 | -0,65307 | 1,0705621 | -0,95313 | 0,0036032 | -0,003208 |
| *i* = 8 | 0,03235 | -0,75225 | 0,9603103 | -1,04239 | 0,0032566 | -0,003535 |
| *j*= 1 | -0,066205 | 0,066896 | 0,7869078 | 0,084938 | 0,0036296 | 0,000392 |
| *j*= 2 | -0,139393 | 0,1265 | 0,6758229 | 0,151217 | 0,0032682 | 0,000731 |
| *j*= 3 | -0,217908 | 0,179553 | 0,5702556 | 0,201957 | 0,0028701 | 0,001016 |
| *j*= 4 | -0,300464 | 0,22683 | 0,4719207 | 0,240211 | 0,0024533 | 0,001249 |
| *j*= 5 | -0,386083 | 0,269061 | 0,3813932 | 0,268639 | 0,0020331 | 0,001432 |
| *j*= 6 | -0,474026 | 0,306907 | 0,2985891 | 0,289426 | 0,0016218 | 0,001572 |
| *j*= 7 | -0,563739 | 0,34095 | 0,2230786 | 0,304306 | 0,0012277 | 0,001675 |
| *j*= 8 | -0,654805 | 0,371687 | 0,1542765 | 0,314633 | 0,0008564 | 0,001747 |
| Thread 3 | | | | | 0,0539268 | -0,006784 |

As a result of numerical calculation for the case, where a conversion factor $\mathbf{0 < \beta < 1}$, it was found that in the fixed reference system $\mathbf{O_1x_1y_1z_1}$ at time $\boldsymbol{t_{1p}}$ closed system of bodies 1 and 2 and thread 3 is the projection of momentum on the axis $\mathbf{O_1x_1}$, equal to $\mathbf{1{,}106025 \cdot C_2 \cdot M_0}$, and the projection of momentum on the axis $\mathbf{O_1y_1}$, equal to **0**.

And in a fixed reference system $\mathbf{O_1x_1y_1z_1}$ at time $\boldsymbol{t_{1T}}$ closed system of bodies 1 and 2 and thread 3 is the projection of momentum on the axis $\mathbf{O_1x_1}$, equal to $\mathbf{0{,}6919523 \cdot C_2 \cdot M_0}$, and the projection of momentum on the axis $\mathbf{O_1y_1}$, equal -

**0,330101 · $C_2$ · $M_0$.**

The result is also a violation of the law of conservation of momentum for a closed mechanical system of bodies.

Moreover, integration of mass thread 3 in calculating the momentum of the system of bodies 1 and 2 and thread 3 leads to an even greater violation of the law of conservation of momentum.

**Note 4:** in inertial systems are not laws of conservation of energy and momentum, because energy can go into momentum, and vice versa.

Answer: well, against scrap - no reception! No words. But do not agree. Probably refers to the total energy of the body on the momentum of its motion or that the difference of the square of the total energy of the body, divided by $c^2$, and the square of the momentum of the body does not depend on the choice of inertial reference system.

Ps: I apologize in advance if someone insulted your answers.

Best regards,

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