THE NEW FIRST LAW OF CLASSICAL DYNAMICS

Kanarev Ph.M. kanphil@mail.ru
http://kubagro.ru/science/prof.php?kanarev

Abstract. Classical theoretical mechanics on a way of modernization.

Classical dynamics studies movement and interaction of material bodies. Its bases have been incorporated by Newton in 1687 in him «The Mathematical beginnings of natural philosophy». The first law of dynamics describes rectilinear and uniform ($\overline{V} = const$) movement of a body.

From **the new first law of dynamics** follows, that initial movement of any body is accelerated by active external force $\overline{F}$ which always is directed aside movements. It is more forces of resistance $\overline{F}_C$ at the accelerated movement of a body and it is equal to them $\overline{F} = \overline{F}_C$ when the body goes in regular intervals. At the accelerated movement of a body always there is the force of inertia $\overline{F}i$ directed opposite to movement. It **automatically** changes its direction on opposite at transition of a body to uniform movement. This implies, that on a moving body force always operates.

However, **the old first law of dynamics** asserts, that, at uniform rectilinear movement of a body, including asteroid in space (fig. 1, a), the sum of the forces working on it, is equal to zero. We shall check up correctness of this law.

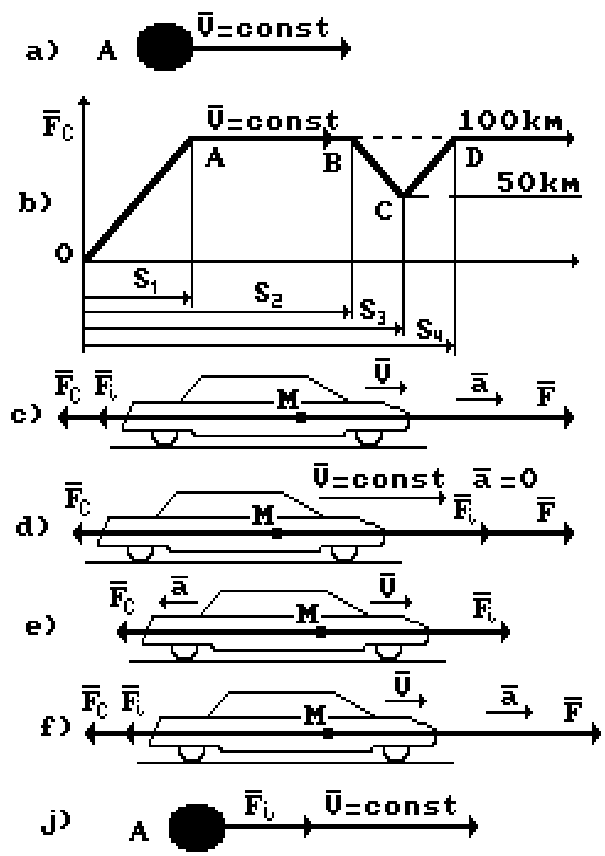

Fig. 1. The circuit of the forces working on: b) the automobile: c) at accelerated movement (OA); d) at uniform movement (AB); e) by switched off transfer (BC); f) at accelerated movement (CD); j) in regular intervals moving asteroid; M- the center of mass of the automobile

To understand essence of the contradictions incorporated in **the old** first law of dynamics, we shall look after change of the forces working on the automobile at its accelerated OA (fig. 1, b, c) and uniform AB (fig. 1, b, d) movements, and also at slowed down movement BC (fig. 1, b, e) with the switched off transfer and - repeated accelerated movement CD (fig. 1, b, f).

As soon as there is an external active influence $\overline{F}$ (fig. 1, b, point O) the automobile starts to move with acceleration $\overline{a}$ (fig. 1, c) and the kinematic equation of its movement describing change of speed V, enters the name so

$$\overline{V} = \overline{a} \cdot t . \tag{1}$$

Newton postulated, that the direction of force $\overline{F}$ of external influence on a body in mass m coincides with a direction of its acceleration $\overline{a}$ and pays off under the formula (fig. 1, c)

$$\overline{F} = m\overline{a} . \tag{2}$$

It is the mathematical model of the second law of Newton. Dalamber has added this law in 1743, having specified, that during each given moment of time for accelerated moving body force of inertia $\overline{F}i$ which size is equal and directed $m\overline{a}$ opposite to acceleration $\overline{a}$ (fig. 1, c) operates

$$\overline{F}i = -m\overline{a} . \tag{3}$$

In result it appears, that on a body moving with acceleration, two operate simultaneously equal on size and opposite forces $\overline{F}$ on a direction and $\overline{F}i$.

$$\overline{F} = -\overline{F}i . \tag{4}$$

If there are no forces of resistance $\overline{F}_C$ the sum of the forces working on a body, appears equal to zero.

$$\overline{F} + \overline{F}i = 0 . \tag{5}$$

It obviously contradicts the second law of dynamics describing accelerated movement of a rocket or the satellite in space where there are no resistance. Therefore it is necessary to find the reason of this contradiction. It is latent during transition of the accelerated movement of a body to uniform (fig. 1, b, c, d)

As force of inertia $\overline{F}i$ is directed to opposite accelerated movement of the automobile (fig. 1, b, OA, c) the sum of the forces working on it, will be written down so

$$\overline{F} = \overline{F}i + \overline{F}_C \tag{6}$$

or

$$m \cdot \overline{a} = m \cdot \overline{a}i + \overline{F}_C . \tag{7}$$

Apparently (7) automobiles $\overline{a}$ full acceleration not equally to its inertial acceleration $\overline{a}i$. And it is natural, otherwise force $\overline{F}_C$ of resistance to movement of the automobile would be equal to zero. The force of the inertia working on the automobile at its accelerated movement, is equal

$$\overline{F}i = m \cdot \overline{a}_i = \overline{F} - \overline{F}_C . \tag{8}$$

The acceleration $\overline{a}i$ corresponding to force of inertia $\overline{F}i$, is not equal to acceleration $\overline{a}$ of movement of the automobile under action of external force $\overline{F}$, as it ($\overline{a}_i$) corresponds to the accelerated movement of a body at full absence of external resistance ($\overline{F}_C = 0$). This implies, that it is possible to measure true size of force of inertia $\overline{F}i$, in conditions of full absence of external resistance or by subtraction of all forces of resistance $\overline{F}_C$ from external force $\overline{F}$ (8).

In result there is clear a force working on an asteroid at its rectilinear uniform movement (fig. 1, a). It - the force of inertia $\overline{F}i$ similar to that the automobile (fig. 1, d) operates on in regular intervals moving. There is a question: how the asteroid A (fig. 1, j) has got force of inertia $\overline{F}i$, which moving it rectilinearly and in regular intervals?

In a history of a life of an asteroid the moment when on it external force $\overline{F}$ operated was and accelerated its movement. In result the force of inertia $\overline{F}i$ directed opposite to movement of an asteroid has appeared. Then external force $\overline{F}$ has disappeared for any reasons, and force of inertia $\overline{F}i$, having changed the direction on opposite, began to carry out rectilinear and uniform movement of an asteroid (fig. 1, j). As the asteroid goes under action of force of inertia without acceleration it can be named passive force.

On fig. 1, b S_1 - the distance gone by the automobile at accelerated movement. At transition to uniform movement (fig. 1, b, AB) the force of the inertia $\overline{F}i$ interfering accelerated movement of the automobile, **automatically** changes the direction on opposite and turns valid, promoting its movement (fig. 1, d). Therefore the equation (6) becomes such

$$\overline{F} + \overline{F}i = \overline{F}_C . \qquad (9)$$

The essence of this equation consists that uniform movement of the automobile is provided with force of inertia $\overline{F}i$, and the force $\overline{F}$ generated by the engine of the automobile, overcomes all external resistance $\overline{F}_C$. This equation (9) describes uniform movement of the automobile on site AB (fig. 1, b, d). If to switch off transfer force $\overline{F}$ will disappear, and force of inertia $\overline{F}i$ appears insufficient to overcome external resistance $\overline{F}_C$ and the speed of the automobile will start to decrease.

If during the moment, when speed of the automobile will decrease till 50 km / hour (fig. 1, b, C), to include and to start to increase transfer speed till 100 km / hour the force of inertia $\overline{F}i = -m \cdot \overline{a}_i$ directed opposite to movement of the automobile again will appear, and its movement (fig. 1, f) will be described again by the equation (6).

When the automobile will reach speed 100 km / hour and the driver will make the decision to move further in regular intervals the force of inertia $\overline{F}i$ will automatically change a direction on opposite and movement of the automobile will be described by the equation (9).

Apparently (9), at uniform movement of the automobile the sum of the forces working on it, is not equal to zero. This implies the new first law of classical dynamics: **the sum of the forces working on the moving body, is never equal to zero. This is Kanarev's law.**

Now we can answer a question of the pilot: why the sum of the forces working on in regular intervals flying plane, is equal to zero? According to the new first law of dynamics, the sum of the forces working on in regular intervals flying plane, it is not equal to zero. The force driving the plane, is force of inertia which has been directed opposite to its movement when it flied accelerated. As soon as the plane started to fly in regular intervals force of inertia has changed the direction on opposite and has coincided with a direction of the force created by engines of the plane. In result force of inertia began to provide uniform flight of the plane, and force of engines of the plane - to overcome forces of resistance to flight. Thus, uniform flight of the plane is described by the formula (9) in which the sum of forces is not equal to zero.

There is a natural question: what force promotes economy of fuel at movement of the automobile? The answer is obvious - force of inertia $\overline{F}i$. It is quite natural, that on site BC (fig. 1, b) the automobile goes, not spending fuel.

At once there is also other question: whether it is impossible to use the force of inertia arising at rotation of a body, for economy of the electric energy consumed by the electric motor?

If to take into account, that at rotation of a body on it centrifugal force of inertia which does not change the direction at cancellation of the external active moment of forces it can be used not only for economy of the electric energy having the electric motor, but also for generating in its drive of additional power operates. This theoretical consequence is realized by Russian **engineer Linevich Edvid Ivanovichem.** he has proved experimentally, that presence in mechanical transfer of the electric motor disbalances results in increase in mechanical power at its shaft, which repeatedly exceeds electric power on a drive of the electric motor (fig. 2) [1].

If amplitudes of pulses of the mechanical moments generated by disbalance, there is more than size of resistance to rotation of the shaft formed by the consumer they will overcome resistance of the consumer and thus impulse to release a shaft of the electric motor from loading. In result as it is established experimentally, the charge of electric energy on work of the electric motor in 10 and more times decreases (fig. 3)[1].

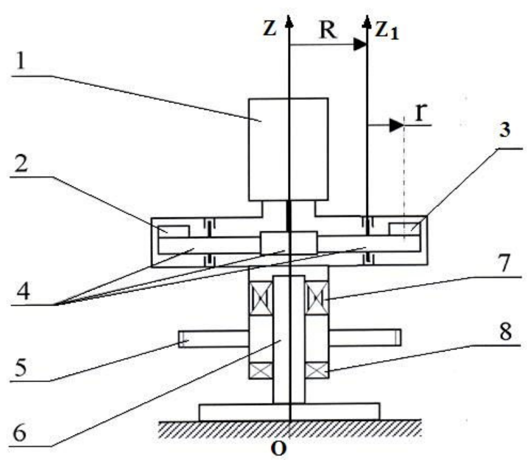

Fig. 2. The centrifugal store of energy and power: 1 – the electric motor; 2 and 3 – disbalances; 4 – gears, 5 – a cogwheel; 6 – a motionless axis; 7 – outrun muff; 8 – the bearing; r – radius of rotation of the center of mass of disbalance; R - distance from axis Z up to an axis Z_1 of rotation of disbalance

Fig. 3. Model of a drive of a rotor of the electrogenerator (on the right) power of 6 kWatt the electric motor (at the left) power of 500 Watt (Austria, January 2009.)

Results of experiment of the invention are submitted in tab. 1 [1].

Table 1. Results of measurements entrance P(input) and P(output) of Powers

№	U, Volt	I, Amp.	P(input)., Wt	P(output), Wt	К effect, %
1	19.10	18.00	344	6131	1782
2	19.30	20.00	386	6080	1575
3	19.60	22.00	431	6160	1429

The kinematic equation of change of angular speed ω of the electric motor at its accelerated rotation at the moment of start will be written down so

$$\omega = \varepsilon \cdot t , \tag{10}$$

where ε - angular acceleration.

The dynamic equation of change of the moment M_Z of the forces working on a shaft of the electric motor at its accelerated rotation, will be similar to the equation (6) forces working on accelerated moving body, and will be written down so

$$M_Z = M_i + \sum M_c , \tag{11}$$

where $M_i = \varepsilon \cdot I_z$ - the moment of the moments of inertia I_Z or the inertial moment of all accelerated rotating parts; $\sum M_C$ - the sum of the moments of forces of resistance to rotation.

At transition of the electric motor in a mode of uniform rotation the equation (11) becomes similar to the equation (9)

$$M_Z + M_i = \sum M_c . \tag{12}$$

Here M_Z - the twisting moment generated by the electric motor, due to electric energy; M_i - the inertial moment of all rotating parts generated during accelerated rotation of the electric motor; $\sum M_1$ - the sum of the moments of all forces of resistance. If in system of a drive is not present disbalance at uniform rotation of a shaft of the electric motor the sum of the moments $M_Z + M_i$ is constant (fig. 4).

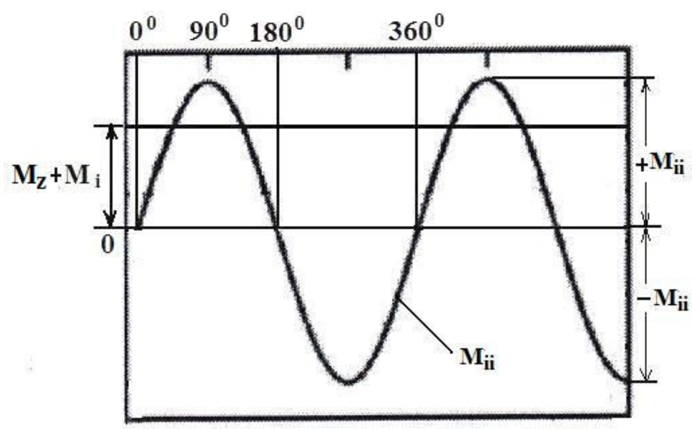

Fig. 4. The circuit of the constant sum of the moments $M_z + M_i$ working on a shaft of the electric motor and sine wave law of change of the inertial moment M_{ii}

Presence at the left part of the equation (12) moments M_Z generated by the electric motor, and the inertial moment M_i formed by all rotating parts, specifies that both they participate in overcoming the sum of the moments $\sum M_C$ of all forces of resistance. It means, that there is an opportunity to increase a share M_i in the left part of the equation (12) and to reduce a share M_Z in overcoming the moments of forces of resistance $\sum M_C$. To achieve it it is possible by generating such pulses of the inertial moments M_{ii} which amplitude will be more sums $M_Z + M_i$ (fig. 3). It is quite natural, that the positive amplitude $+M_{ii}$ will accelerate a shaft of the electric motor and pulce to release it from the loading going from the consumer. The negative amplitude $-M_{ii}$ will brake a shaft of the electric motor and cumulative effect of the moments $+M_{ii}$ and $-M_{ii}$ will be equal to zero. That it did not occur, it is necessary to put in system of a drive outrun muff 7 (fig. 2) which would cut off negative values of the moment $-M_{ii}$. Then the positive part of the inertial moment $+M_{ii}$ will submit pulses of the moments on a shaft of the electric motor and if these pulses will be more sums of the moments $M_z + M_i$ (fig. 4) they will be transferred the consumer through outrun muff and thus to exempt a shaft of the electric motor. In result on its shaft there will be basically a loading of idling that will lead to to sharp reduction of the charge of the electric power.

To understand the reason of it it is necessary will receive the equation describing the law of change of pulses of the moments of centrifugal forces disbalance. For this purpose we shall take for a basis the circuit of the author submitted on fig. 2. As rotating gears 2 and 3 are balanced, they do not generate the phenomenon disbalance.

On fig. 5 the circuit for a conclusion of the equation of a pulse of the moment of forces of the inertia, generated by disbalance D_1 and D_2 is shown. We shall pay attention that central шестерня 1 on a shaft of the electric motor and two gears 2 and 3 with disbalance D_1 and D_2 represent uniform mechanical system, therefore projections F_x and F_y centrifugal forces of inertia $\overline{F}$ of both disbalance form pairs with the moments (fig. 5):

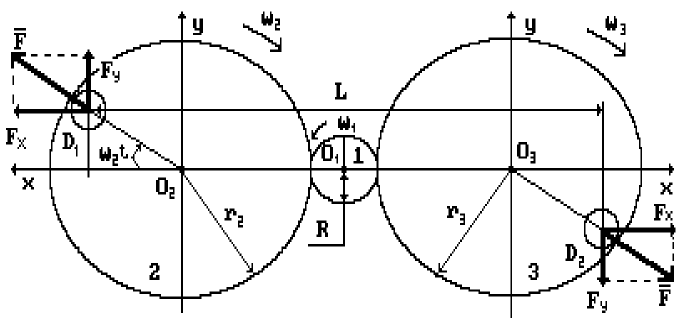

Fig. 5. The circuit for the analysis of action of force of inertia $\overline{F}$ on disbalance D_1 and D_2

$$M_1 = F \cdot \sin \omega_2 t \cdot L = m\omega_2^2 (r - r_0)^2 \cdot (2R + 2r + 2r \cos \omega_2 t - 2r_0 \cos \omega_2 t) \sin \omega_2 t;. \qquad (13)$$

$$M_2 = -F \cdot \cos \omega_2 t \cdot (r - r_0) \cdot \sin \omega_2 t = m\omega_2^2 \cdot (r - r_0)^2 \sin \omega_2 t \cdot \cos \omega_2 t.. \qquad (14)$$

Let's pay attention and to that (fig. 5), that during the initial moment M_1 promotes rotation of a shaft of 1 electric motor, therefore it is taken with plus is familiar, and - M_2 interferes with rotation, therefore is taken with the minus is familiar. Law of change of the moments of these pairs also will form additional influence on a shaft of electric motor.

The analysis is shown, that with theoretical law (15) changes of the sum of the moments $M_1 + M_2$ as scalar sizes, it is close to experimental law (fig. 6, the continuous deformed sinusoid).

$$M = M_1 + M_2 = m\omega_2^2 (r - r_0)^2 \cdot \sin\omega_2 (2R + 2r + 2r\cos\omega_2 t - 2r_0 \cos\omega_2 t) - \\ - m\omega_2^2 (r - r_0)^2 \sin\omega_2 t \cdot \cos\omega_2 t . \quad (15)$$

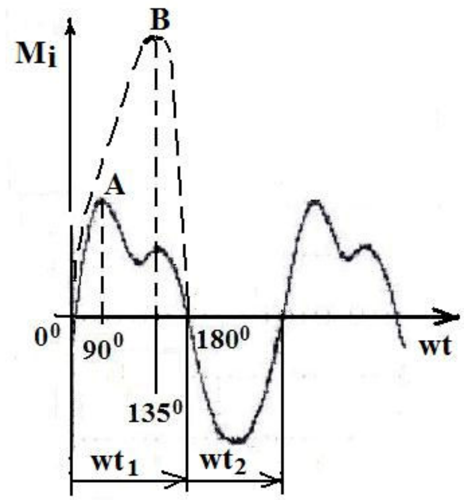

Fig. 6. Experimental (A) and theoretical (B) maxima of the sum of pulses components M_1 and M_2 the moments of centrifugal forces of inertia of disbalance

Let's pay attention to (fig. 6). The positive amplitude of pulses of the moments of centrifugal forces of inertia disbalances and a corner of turn ωt_1 of a shaft of the electric motor, forming positive amplitude, more negative amplitude and it is more than the corner ωt_2 forming negative amplitude of a pulse.

Further, as the positive pulse of power considerably surpasses average power of the electric motor it is transferred a shaft of the electric motor and thus exempt it from loading. Thus outrun muff cut the bottom, negative part of amplitude of a pulse (fig. 6) also exempt a shaft from braking action of this part of a pulse.

The analysis shows, that with increase in frequency of rotation of a shaft outrun muff backlashes in system of a drive and deformation of its elements start to carry out a role and need in outrun muff disappears. The inventor has confirmed reliability of this theoretical consequence experimentally [1].

Thus, for the working mechanical moment on a shaft of 1 electric motor (fig. 5) pulses of the moment M of centrifugal forces of the inertia, formed to two disbalance D_1 will be imposed and D_2. If sizes of the working moment of forces M of these pulses will be more than moment of resistance $\sum M_C$ they will be transferred a shaft of the consumer and to exempt the electric motor from external loading, translating it in a mode of single rotation.

THE CONCLUSION

The law of transformation of force of the inertia interfering accelerated movement of a body, by virtue of the inertia, driving a body is established at its transition to uniform movement. This law operates uniform and rectilinear movement of photons, and we on a way of the detailed description of dynamics of this movement [2], [3].

The literature

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