10. Kinematic-Dynamic Exchange of a system with environment

10.1. $\hat{P}$ -level exchange

We will consider dynamic-kinematic exchange of a system with the environment on the P-level represented in Fig. 2.13 by a graph of exchange.

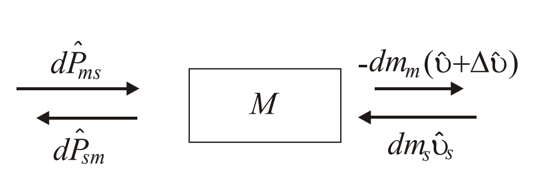

Fig. 2.13. A graph of $\hat{P}$ -level exchange.

Kinematic variation in the momentum of the system is

$$d\hat{P}_{\upsilon} = d\hat{P}_{sm} - d\hat{P}_{ms}, \qquad (2.236)$$

where $d\hat{P}_{sm}$ is the partial kinematic momentum transferred from the environment, $d\hat{P}_{ms}$ is the partial kinematic momentum transferred by the system to the environment.

Dynamic variation of the momentum is

$$d\hat{P}_m = dm_s\hat{\upsilon}_s - dm_m(\hat{\upsilon} + \Delta\hat{\upsilon}), \qquad (2.237)$$

where $dm_s\hat{\upsilon}_s$ is partial dynamic momentum transferred from the environment, $dm_m(\hat{\upsilon} + \Delta\hat{\upsilon})$ is partial dynamic momentum transferred by the system to the environment; $\hat{\upsilon} + \Delta\hat{\upsilon}$ is the velocity of mass dm_m; $\hat{\upsilon}$ is the velocity of the system; $\Delta\hat{\upsilon}$ is a discrete jump of the velocity.

The resultant transfer is

$$d(m\hat{\upsilon}) = d\hat{P}_{\upsilon} + d\hat{P}_m, \qquad (2.238)$$

and

$$\frac{d(m\hat{\upsilon})}{dt} = \hat{F}_{\upsilon} + q_s\hat{\upsilon}_s + q_m(\hat{\upsilon} + \Delta\hat{\upsilon}), \qquad (2.239)$$

where $\hat{F}_{\upsilon} = \frac{d\hat{P}_{\upsilon}}{dt}$ is the kinematic kinema, $q_s = \frac{dm_s}{dt}$ and $q_m = -\frac{dm_m}{dt}$ are dynamic mass charges.

Since the total rate of change of momentum is

$$\frac{d(m\hat{\upsilon})}{dt} = q\hat{\upsilon} + m\frac{d\hat{\upsilon}}{dt}, \quad \text{где } q = q_s + q_m, \tag{2.240}$$

expression (2.239) can be written as

$$m\frac{d\hat{\upsilon}}{dt} = \hat{F}_\upsilon + q_s\Delta\hat{\upsilon}_s + q_m\Delta\hat{\upsilon} \tag{2.241}$$

or

$$m\frac{d\hat{\upsilon}}{dt} = \hat{F}_\upsilon + q_s\Delta\hat{\upsilon}_s + q_m\Delta l\delta t, \tag{2.241a}$$

where $\Delta\hat{\upsilon}_s = \hat{\upsilon}_s - \hat{\upsilon}$ и $\Delta\hat{\upsilon} = \Delta l\delta t$ is a discrete derivative, describing the jump of the velocity,

In steady-state dynamic exchange, we have

$$q_m = -q_s = q, \quad \Delta\hat{\upsilon} = 0, \tag{2.242}$$

$$m\frac{d\hat{\upsilon}}{dt} = \hat{F}_\upsilon + q\hat{E}, \tag{2.243}$$

where $\hat{E} = \hat{\upsilon} - \hat{\upsilon}_s$ is an effective velocity which we will call the vector of field strength of rest-motion in dynamic exchange.

When dynamic exchange prevail, we have

$$m\frac{d\hat{\upsilon}}{dt} = q\hat{E}. \tag{2.244}$$

This formula is, however, valid for kinematic exchange as well, if q is meant as a kinematic charge modulus.

10.2. *Field Strengths of Rest-Motion*

The effective potential E_p and kinetic E_k field velocities strengths of circular motion will be determined from formulas (2.184)-(2.186) and (2.244):

$$\mathbf{E}_p = \frac{m}{q}\left[(\eta + \beta^2 - \omega^2)\mathbf{n} + (\varepsilon + 2\beta\omega)r\boldsymbol{\tau}\right], \tag{2.245}$$

$$\mathbf{E}_k = \frac{m}{q}\left[(-\varepsilon - 2\beta\omega)r\mathbf{n} + (\eta + \beta^2 - \omega^2)r\boldsymbol{\tau}\right]i. \tag{2.246}$$

The axial field strength has the form

$$\mathbf{E}_0 = \frac{m}{q}\left[(-\eta - \beta^2 + \omega^2) + (\varepsilon + 2\beta\omega)ir\right]\mathbf{k}. \tag{2.247}$$

The potential field strength describes the Yes-subfield, the kinetic field strength, the No-subfield; and the axial field strength describes the Yes-No subfield of the circular motion-rest field.

If motion is uniform,

$$\mathbf{E}_p = -\frac{m}{q}\omega^2 a\mathbf{n}, \tag{2.248}$$

$$\mathbf{E}_k = -\frac{m}{q}\omega^2 ai\boldsymbol{\tau}\,, \tag{2.249}$$

$$\mathbf{E}_o = -\frac{m}{q}\omega^2 a\mathbf{k}\,. \tag{2.250}$$

The total energy of the fields of all three levels of rest-motion of the system with mass *m* is:

$$E = \frac{mE_p^2}{2} + \frac{mE_k^2}{2} + \frac{mE_o^2}{2} = \frac{mE_o^2}{2}. \tag{2.251}$$

The energy structure of this motion-rest field is shown in Fig. 2.14.

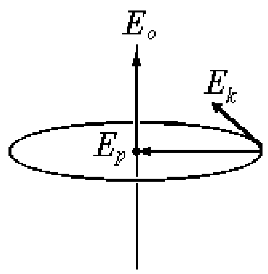

Fig. 2.14.A graqph of energies

Motion of a material point with the charge q in the field of circular rest-motion,characterized by vectors E_p, E_k and E_0, can be expressed in the form:

$$q\mathbf{E}_p = \frac{m\upsilon^2}{a}\mathbf{n}\,,\quad q\mathbf{E}_k = -\frac{m\upsilon^2 i}{a}\boldsymbol{\tau}\,,\quad q\mathbf{E}_o = -\frac{m\upsilon^2 i}{a}\mathbf{k}\,. \tag{2.252}$$

Such structure is valid for any level of motion-rest because the ratio of charge to mass of a moving object (motator) defines an effective field frequency

$$\omega_c = \frac{q}{m}, \tag{2.253}$$

Its fundamental wavelength will be

$$\lambda = 2\pi\frac{mc}{q}, \tag{2.254}$$

where *c* is the wave velocity of the field.

We will supplement these equations by simple relations between the oscillation amplitude *a,* oscillation velocity υ, wavelength λ, and the wave velocity *c*:

$$2\pi a = \frac{\upsilon}{c}\lambda \qquad \text{или} \quad a = \frac{\upsilon}{c}\bar{\lambda}\,, \tag{2.255}$$

where

$$\bar{\lambda} = \frac{\lambda}{2\pi} \tag{2.256}$$

is a wave radius.

The similar correlation between the local *E* and wave *A* velocities-strengths of the motion-rest field

$$E = \frac{\upsilon}{c} A \tag{2.257}$$

follows from the last relations.

The same relation also holds between the local and wave moments of charge:

$$P_a = \frac{\upsilon}{c} P_v , \tag{2.258}$$

where $P_a = qa$ is a local moment and $P_v = q\bar{\lambda}$ is a wave moment.

It is evident that the relation between the local moment of charge and the wave moment of momentum has the form

$$\frac{\hat{P}_a}{\hat{L}_v} = \frac{q_m}{mc} . \tag{2.259}$$

On the basis of formula (2.257), all three vector equations of motion in (2.252) can be expressed by a general equation

$$\frac{\upsilon}{c} qA = \frac{m\upsilon^2}{a} . \tag{2.260}$$

Since $\upsilon = \omega a$ and $q = m\omega_c$, then

$$\omega_c = \frac{c}{A}\omega \quad \text{or} \quad \omega = \frac{A}{c}\omega_c . \tag{2.261}$$

One can see from the above equation that when the field strength A approaches the wave velocity c, the specific velocity ω tends to the limiting fundamental frequency ω_c of the field.