and a similar term would occur in the *right-hand part* of equation (4b). This contradicts our initial assumption that the electromagnetic field generated by electrical charges and the electromagnetic field generated by magnetic charges are described independently and, hence, with varying potentials A_e and B_μ we should not vary the terms of full action, containing the effective potentials. The source-containing terms of equations (4b), (15b) make no sense to quantization of a free electromagnetic field in relativistic quantum field theory.

III. MAGNETIC MONOPOLE IN RELATIVISTIC QUANTUM FIELD THEORY

Since a distinction between action (23) and an ordinary action without magnetic charges is not important, from viewpoint of relativistic quantum field theory, the Feynman rules for the calculation of the interaction cross-sections for elementary particles interacting with electrical or magnetic charges can be formulated by generalizing the known results of relativistic quantum field theory for an electromagnetic field without magnetic charges (see, for example, [8], §24).

Operator S (S-matrix), which relates amplitudes of the initial $\Phi(-\infty)$ and the final $\Phi(\infty)$ states:

$$\Phi(\infty) = S\Phi(-\infty), \tag{30}$$

– can be expressed via chronological exponent

$$S = T\left\{\exp\left[\frac{i}{\hbar}\int \mathscr{L}_I(x) d^4x\right]\right\}, \tag{31}$$

where $\mathscr{L}_I(x)$ is Lagrangian of interaction

$$\mathscr{L}_I(x) = -\frac{1}{c^2}\left(A_e^k + A_\mu^k\right) j_{e\,k} - \frac{1}{c^2}\left(B_\mu^k + B_e^k\right) j_{\mu\,k} \tag{32}$$

and

$$j_e^k = \sum_a c e_a \bar{\psi}_a \gamma^k \psi_a, \qquad j_\mu^k = \sum_b c\mu_b \bar{\psi}_b \gamma^k \psi_b. \tag{33}$$

For the charged particle propagator we have an ordinary expression in terms of function $D^c(x-y)$ for scalar particle of mass m_n – compare with [8], (15.17), (22.9):

$$\left\langle T\{\psi_n(x)\,\bar{\psi}_n(y)\}\right\rangle = -i\left(i\gamma^k\partial_k + \frac{m_n c}{\hbar}\right) D^c(x-y). \tag{34}$$