A temporal evolution of an initial perturbation of a semi-bounded collisionless plasma with degenerate electrons (due to Pauli’s exclusion principle) is considered by solving the initial value problem, using the semi-classical mean-field kinetic model that takes into account the electron degeneracy. It is shown that the quantum degeneracy of plasma electrons, leading to non-trivial analytical properties of the electron response function, results in an “unusual” asymptotic temporal evolution of the surface potential: in addition to the “usual” exponentially attenuated potential surface oscillation, there appears a second oscillation with a different frequency and a non-exponentially (but rather an inverse-power-law) attenuated amplitude. This second oscillation, being attenuated slower than the first one, can become dominant at large times, and thus could potentially be detected experimentally.