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Magnetic System of Multipole Trap–Galatea on the Basis of Levitating Quadrupole

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The possibility of the creation of the magnetic system of multipole trap-Galatea on the basis of the levitating quadrupole from the superconducting coils-rings is considered. Based upon the superconductor property to conserve the trapped magnetic flux the analytical dependence of the potential energy of the proposed configurations from the coordinates of the levitating coils and the deflection angle of their axis has been obtained. The calculations in Mathcad system have shown that under the definite values of the physical parameters (the trapped magnetic flux, dimensions and masses of coils, etc.) this dependence has local minimums, which correspond to the stable equilibrium states of levitating coils. For carrying out experiments with levitation several multiturn short-circuited coils-rings have been made from the high-temperature superconducting (HTSC) wire of the SCS4050-i-AP 2G HTS type. HTSC rings have been made also from the preliminary synthesized powder of HTSC phase $\text{YBa}_2\text{Cu}_3\text{O}_y$ with the help of melt textured growth (MTG) method. Using the experimental data on the trapped magnetic fluxes for HTSC rings, their dimensions and masses, and also the parameters of the ordinary coil with the current, with the help of calculations of the pointed out dependence for the potential energy the search of the equilibrium states for the different cases has been carried out. Under the magnetic fluxes of the same polarity in coils, the stable levitating states of: 1) single HTSC ring both in the field of other HTSC ring and in the field of the ordinary coil with the current; 2) two HTSC rings in the field of the ordinary coil with the constant current are observed experimentally in positions corresponding to calculated values.

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