to reach the goal of the present invention. In consequence, no application of the technology provided in the present invention has ever been demonstrated.

[0015] U.S. Pat. No. 4,585,282 uses oscillating circuits for the measurement of the levitating item displacements, but does not apply it to the detection of the exact equilibrium points. This requirement is essential for minimizing the power consumption, because this equilibrium point is not permanent. This point moves with the temperature, because magnets are not stable with the temperature, with the influence of magnetic sources around, with the influence of iron around, and with the fact that the levitating device can be put on a non horizontal surface.

[0016] Chinese patent CN2569440Y describes an automatic static magnetic levitation system for equilibrium, having a base and a levitating element. This system makes use of the magnetic repulsion produced by the magnet positioned in the base to balance said levitating element with a magnet in it above said base. The levitating element in this magnetic levitation system, however, must contain two connected levitating permanent magnets arranged horizontally such that the system usually can only levitate oblong items and the levitating item is not able to rotate horizontally around the vertical axis of its center.

[0017] Chinese patents CN115607C, CN2726048Y and CN1267121A describe some other different types of magnetic levitation systems mentioned above that are not able to levitate an element above a base and make said element rotate freely and horizontally.

[0018] U.S. Pat. No. 5,168,183 describes a device which claims lift above a source of magnetic field, different than the current invention. The difference between the present invention and this document is better understood in the light of the physical constraints of the magnetic levitation.

[0019] A theorem attributed to Ernshaw proves it impossible to obtain a static levitation by using a combination of fixed magnets. The static levitation implies a stable suspension of one item against gravity.

[0020] Magnetostatic and gravitational energies Em, Eg and total E of any system are given by:

$$Em=\int ym.B\ dv,\ Eg=\int \rho P\ dv,\ E=Em+Eg=\int ym.B+\rho P\ dv$$

[0021] Where m and ρ are the density of magnetic moment and of mass of the levitating item, B and P are the local magnetic fields and gravitational potential.

[0022] We call X, Y and Z the coordinates of the center of gravity of the item to be put in levitation. Equilibrium in a direction X takes place when the first derivative of E according to X from is zero, and this equilibrium is stable or unstable with respect to small displacements according to whether the second derivative of E according to X is positive or negative, that is whether:

$$\partial^2 E/\partial X^2>0, \text{ or } \partial^2 E/\partial X^2<0$$

[0023] and the same according to Y and Z. However (1)

$$\partial^2 E/\partial X^2+\partial^2 E/\partial Y^2+\partial^2 E/\partial Z^2=\int \mathrm{y}(m(\partial^2/\partial X^2+\partial^2/\partial Y^2+\partial^2/\partial Z^2)B+\rho(\partial^2/\partial X^2+\partial^2/\partial Y^2+\partial^2/\partial Z^2)P)dv=0$$

[0024] since in steady state the laplacians of B and P are zero outside of the matter which is their source.

[0025] The sum of these three stability criteria is thus necessarily zero: whatever is the choice of three axes perpendicular between them, the item is always unstable in one or two directions at most, and the more it is stable in a direction the more it is unstable in the two others.

[0026] This theorem applies even to the flexible and paramagnetic items (but not to the diamagnetic ones). They will be always unstable with respect to translation motions of the whole item for any equilibrium position.

[0027] U.S. Pat. No. 5,168,183 describes several implementations of levitation devices, that circumvent the limits of the Ernshaw theorem by means of variable magnetic fields which make it possible to control the position of the sustained item.

[0028] According to the presented principles, the item, a magnet, is stable in a horizontal plane by fields delivered by several permanent magnets, but unstable on a vertical axis, and stabilized by an electromagnet controlled by a measure of location of the item.

[0029] In both cases, the magnet is unstable in rotation. Indeed the sustained magnet turns over spontaneously such that it gets stuck to the permanent magnets, and no solution is indicated to prevent this condition. It is explained how to prevent overturning by connection of 2 or more levitating magnets over 2 or more bases. This systems, however limits the lift efficiency, as in compactness, and completely exposed to the viewer. Additionally, these conventional systems do not account for the effect of gravity on the items, nor the consequence which this gravity can have on the stability of the levitation. As it is, the expert seems to have to implement this levitation in weightlessness, which reduces considerably the capability of U.S. Pat. No. 5,168,183. It specifies well indeed that the device works independently of ambient gravity, and it is indeed very ineffective according to the described means if not in weightlessness. With NdFeB magnets it appears impossible that the best ferromagnetic alloys now available could carry just themselves in the bearing zone given by the magnet devices indicated (FIGS. 5, 6 and 10, 11, U.S. Pat. No. 5,168,183).

[0030] These deficiencies, however, are foreseeable for the conventional systems since unstable equilibrium along the axis X (perpendicular to in the plan of stability) stays at a distance from the magnets necessarily definitely larger than that of the bearing zone commonly used. Then, the field of gravity moves this equilibrium point even further from the magnets, however, the magnetic bearing decreases extremely rapidly with the distance to the magnets. Consequently, these conventional systems are intended for the applications in low or zero gravity.

[0031] FIGS. 4 and 5 respectively represent the potential of a magnetic tore without and with the gravitation. The higher and lower curves correspond globally respectively to the situation of the U.S. Pat. No. 5,168,183 and to that of this invention. The points of unstable equilibrium 41 and 51 are thus provided in the U.S. Pat. No. 5,168,183 and the points of steady equilibrium 42 and 52 are those of the present invention. Clearly the stability is much weaker for 51 than for 52.