3-dimensional motion maglev system using I-shaped electromagnets

Keywords: magnetic levitation, 3-dimensional motion, I-shaped electromagnet, bias permanent magnet, manipulator, micro-robot

【Iron ball levitation device】

This is one of the most basic learning materials in magnetic levitation. The device;

〇passively controls an iron ball in fixed position (near operating point) directly under the electromagnet

〇enables slight vertical movement on assigning a target value

〇can be operated using zero-power control by giving a bias flux

●cannot move an iron ball from front to back, and from side to side.

【Move a position of levitated body】

There are various kinds of systems that move a levitated body as the following;

・Combined systems such as rail and mover, controlled planar stator and levitated body, and soft magnetic material and controlled mover,

・Systems that places magnetic levitation device on a head of arms and carry the levitated body by shifting the arms (Position of the center of gravity is set by motion of the arms.), and,

・Systems that control a leakage magnetic flux from pole pieces of a controlled electromagnet (This system magnetically realizes 3-dimensional motion of a center of gravity.)

【3-dimensional motion maglev system】

This is a device which allows to move a levitated body from front to back, side to side, and up and down. The device;

〇uses I-shaped electromagnets and moves a levitated magnet in inside region including right under each magnetic pole of multiple electromagnets

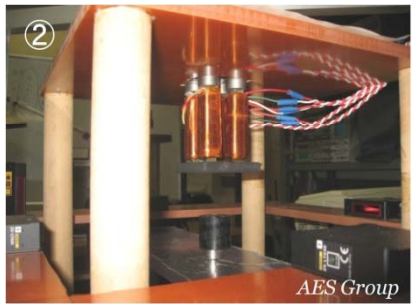
〇can operate the position of levitated body with a joy stick

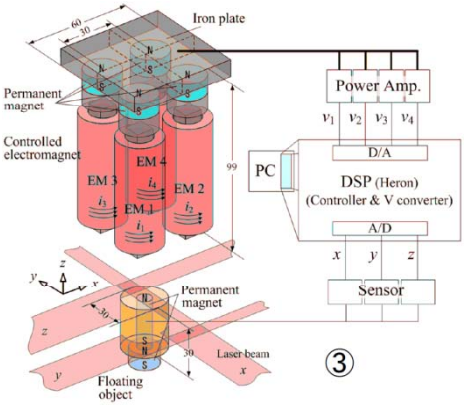
〇enables power saving by using bias magnets

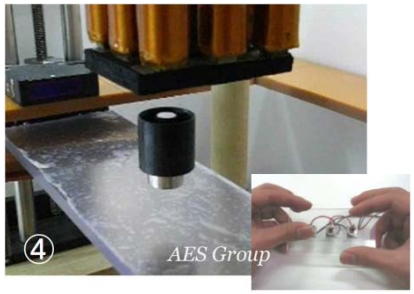
〇allows free combinations of I-shaped electromagnets

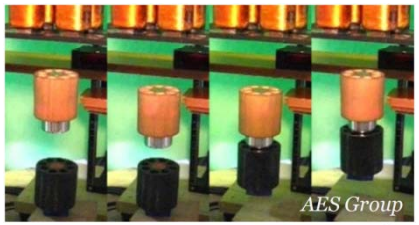
●needs additional electromagnets and sensors

●needs considerations of nonlinearity and system identification associated with a range of motion.









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①I-shaped electromagnet, ②the device appearance, ③control system, ④external input operation, ⑤object grip test

【Applicable use】

・This is applicable for devices used under special environment that vertical and horizontal movements are required.

・Since the system sets the levitated body itself to work, it is also desirable for devices such as a compact robot.