Magnetic field Concentrator and Amplifier : Wireless energy transfer

Summary

While magnetic shielding is a rather controlled technology, magnetic concentration still lacked satisficing solution in spite of numerous potential industrial applications.

A new passive device has been developed to concentrate / amplify magnetic fields using only conventional ferromagnetic and superconducting materials.

Applications in microelectronic, magnetic field sensing or magnetic resonance imagery are clearly in scope.

We are looking for a company partner to enter into a co-development and licensing agreement.

Innovative aspects and applications

- Passive device: no external energy needed to concentrate the magnetic field
- Complete freedom over the concentration level, governed by geometric parameters
- Only requires current commercial materials
- Conversely amplifies the magnetic field of a source placed inside the device
- Provides enhanced magnetic coupling of 2 dipoles

State of development

Device initially designed and developed based on analytical techniques and numerical simulation.

Experimental prototype shows its validity for DC and AC

Ongoing research

- Further testing
- Studies of different geometries

IP Rights

PCT Patent application (26/06/2013)
European Patent application
(priority date: 27/07/2012)

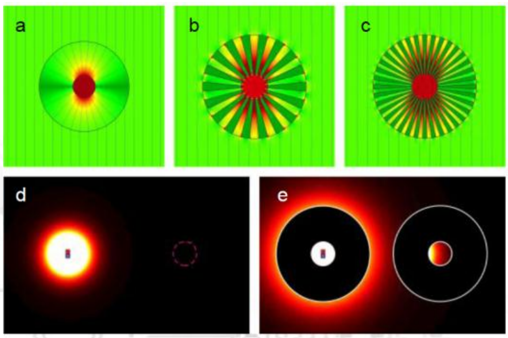

***Figure 1** An homogeneous anisotropic 'hypothetic' material (a) allows to concentrate an applied field in its interior, even when it is discretized in 36 (b) or 72(c) wedges, half of them made of ferromag-netic material and half of superconducting mate-rial. The same shell distributes the magnetic energy created by a small magnet (d) to farther points including concentration at distance (e)*

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The Invention

The Invention It has been discovered that an homogeneous anisotropic shell with radial and angular permeability tending to infinity and zero respectively allows to concentrate magnetic field in its interior and, at the same time, distribute the magnetic energy of an interior source towards the exterior (Figs.1a and e)

While this kind of material is not naturally occurring, radial alternations of ferromagnetic (with high permeability) and superconductor pieces achieve a very similar behaviour using only commercially available materials (Figs.1b and c).

Variation in designs (Fig.2) have been optimised, which ease manufacturing and decrease production costs, while only slightly impacting the performance. Open geometries have also been developed in the optic of allowing the placement of objects or electronic devices within the shell.

The device can be employed to:

- ✓ Enhance device performance (MRI scanners, inductors, motors…)
- ✓ Increase sensitivity of magnetic sensors (such as SQUIDs)
- ✓ Perform magnetic coupling between two magnetic sources
- ✓ Transfer magnetic energy through an empty space

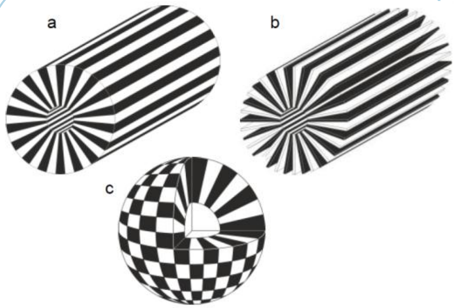

Figure 2 *Several approximate designs using feasible materials. Cylindrical concentrating shells made of 36 (a) and 72 (b) wedges. In both cases black and white alternated parts represent ferromagnetic and superconducting materials. The shell can also be designed with a spherical geometry (c)*

Scientific references

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