Magnetic Resonance System Using Superconducting Materials
Technology #11408

Applications
The current technology applies to the development of improved magnetic resonance systems. Such systems are used in spectroscopy, or magnetic resonance imaging (MRIs).

Problem Addressed
A promising superconducting material known as Yttrium Barium Copper Oxide (YBCO) has demonstrated very favorable properties for use in magnetic resonance systems. These include having a much wider temperature range of application, and greater current density than existing materials. However, YBCO (and other superconducting materials with similar properties) have not yet had widespread incorporation into magnetic resonance systems, due to the complexity of their interactions with many other components of a magnetic resonance system. This technology describes system designs that can incorporate the use of superconducting materials in magnetic resonance systems.

Technology
The current technology describes various design configurations for the use of superconducting materials in magnetic resonance systems. The design considers not only the design parameters for an operating system, but the manufacture, transport and maintenance of the system as well. Some of these design parameters include: the types of superconducting materials that can be used (such as the thermal and electrical conductivity required); their arrangement in annular layers so as to produce a persistent-mode magnet (where a magnetic field can be maintained even without power); methods for cooling these materials during transport; the ideal operating temperature and current of the system, and so on.

Advantages
- Enables implementation of superconducting materials in magnetic resonance systems

Categories For This Invention:
Life Sciences
Imaging
MRI
Instrumentation
Spectroscopy (Instrumentation)
Intellectual Property:

Annular magnet system for magnetic resonance spectroscopy
Issued US Patent
7,859,374
Persistent-mode magnet comprised of high temperature superconducting annuli
Issued US Patent
8,228,148

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Publications:

High-Temperature Superconducting Magnets for NMR and MRI: R&D Activities at the MIT Francis Bitter Magnet Laboratory
IEEE Transactions on Applied Superconductivity
Volume: 20, Issue: 3, June 2010
A Persistent Mode Magnet Comprised of YBCO Annulli
IEEE Transactions on Applied Superconductivity
15(2):2352 - 2355 · July 2005

External Links:

Plasma Science and Fusion Center
https://www.psfc.mit.edu/
Francis Bitter Magnet Laboratory
http://web.mit.edu/fbml/

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