Gradient Coil Arrangement and Method for Use

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Description of Technology:
This technology is an innovative approach to user-defined adjustable effective geometry of gradient coils to improve quality, speed, and flexibility of imaging systems.

The principal application in this technology is medical imaging, particularly in magnetic resonance imaging (MRI), but it can also be applied to other fields, including spectroscopy.

The gradient coil arrangement and method permits the user to electronically reconfigure each coil set of a conductive gradient coil arrangement which generates magnetic field gradients. By doing so, a single MRI system can be configured, by electrical switching, to produce a conventional field (with large region of uniform gradient strength) or a ZOOM™ (ZOnally OptiMized) field (with optimized restricted and user-defined orientation and higher gradient strength).

Important advantages over other methods, provided by the ZOOM™ capability are:

- Optimized effective geometry of the gradient for a region of interest to be imaged. Resultant direction and profile of the magnetic field can be specified by the user; the effective number, length and spacing of the turns of the coil arrangement are controlled by switches.
- Higher image resolution. User-specified localized region of interest and "tunable field" permits optimizing direction and strength of the field in the region of interest while simultaneously improving homogeneity spoiling to suppress unwanted magnetization excitation.
- Faster image acquisition. Gradient switching is fast and aliasing problems are minimized.
- Expanded information acquisition. Fast switching, in conjunction with higher gradients, permits expanded information acquisition for diagnosis and/or research, including better weighting in diffusion studies and measuring short T2 relaxation times among others.
- Improved linearity of transverse gradients The transverse gradient mode of this coil arrangement allows operation with high gradient linearity over a user-selectable axial length.

Patent Status:
U.S. Patent Pending.

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