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*Has received an application for a patent for a new and useful invention. The title and description of the invention are enclosed. The requirements of law have been complied with, and it has been determined that a patent on the invention shall be granted under the law.*

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**United States Patent**

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*David J. Kyfos*

*Director of the United States Patent and Trademark Office*



(12) **United States Patent**  
**Freakes**

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(45) **Date of Patent:** **Sep. 27, 2011**

(54) **SOLENOID DEVICE WITH STABLE ACTIVATION**

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**FOREIGN PATENT DOCUMENTS**

(\*) **Notice:** Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 227 days.

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(21) **Appl. No.:** **12/195,676**

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(51) **Int. Cl.**  
**H01F 7/10** (2006.01)

(52) **U.S. Cl.** ..... **335/245; 335/247; 335/249; 335/251**

(58) **Field of Classification Search** ..... **335/243-252**  
See application file for complete search history.

(57) **ABSTRACT**

A solenoid may include a core having a junction surface; a plunger having a junction surface and located adjacent to the core; a shading ring located proximate to an interface between the core junction surface and the plunger junction surface, the shading ring having an outside diameter slightly smaller than the diameter of the core, and operable to produce a concentration of magnetic attraction within an annular range of the interface between a center of the interface and a location of the shading ring; wherein a contact region between the core junction surface and the plunger junction surface is substantially smaller than the respective junction surfaces and located proximate to the annular range of the concentration of magnetic attraction.

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**13 Claims, 10 Drawing Sheets**

