with field responsive material **319** and rotor periphery produce an electromagnetic flux represented by flux lines **329** represented as dashed in **FIG. 5**. As shown in **FIG. 5** the field responsive material is located in the annular gap separating the outer periphery of the rotor and the field generator.

[**0051**] In the fifth embodiment brake **301**, the plates **351** and **371** that close the axial ends of chamber **307** comprises tapered inner walls **331** and **333** respectively. As shown in **FIG. 5**, the walls generally taper outwardly from the axis of rotation **373**. In this way, the chamber narrows progressively as the distance from the axis decreases and, conversely, the chamber widens progressively as the distance from the axis increases. The maximum axial dimension of the chamber occurs proximate the rotor outer periphery and field generator **350**. As a result of the foregoing chamber taper, the shear rate of the field responsive material can be made substantially constant or increase as the distance from the axis increases and the axial chamber dimension decreases such that migration of controllable material **319** is promoted in the direction of arrow **335** away from seals **321**. The seal **321** in this embodiment can take the shape of v-seals which provide a material-free region between an extension of the seal **321** which slides against the surface of rotor **315** as it rotates, preventing material from contacting the bearing **313**, in this case dry shaft bearing **313**. Other face seal and lip seal configurations can be used in this region. Similarly, a well structure **314** as shown, creates a tortuous path tending to keep the material away from the seals **321**.

[**0052**] **FIG. 6** illustrates in cross-sectional view along lines **6-6** of **FIG. 5** and represents one arrangement for connecting the shaft **309** and rotor **315**. As shown in **FIG. 6**, shaft **309** is shaped as a rectangle at the region of the rotor **315** to fit within a mating square-shaped aperture within the rotor. It is possible in such a configuration to allow for relative slippage or backlash between the shaft **309** and the rotor **315**. In some cases it may be desirable to allow for such slippage or backlash. For example, when the device with which the brake is associated has reached its end-of-motion point and the electromagnetic field is at full strength, such slippage or backlash may be desirable to allow a relatively small movement of the shaft **309** without movement of the rotor being detected by a sensor of the control means which would trigger a reduction of the electromagnetic field thereby allowing an operator to move the device associated with the brake away from the end-of-motion position. In this way the device could be displaced away from the end of motion position without first having to overcome the strong material shear stress associated with being at the end of travel location. While a square arrangement is shown, it will be appreciated that other configurations, such as a grooved circular cross section such as a splined shaft and grooved engagement surfaces on the rotor, slightly mismatched in dimension, can provide a similar function, as well as other arrangements as will be readily apparent to those of ordinary skill in the art.

[**0053**] As will also be readily apparent to those of ordinary skill in the art, the various features of the various embodiments can be interchanged as may be appropriate for the particular configuration, by providing a brake in which the rotor is supported by a shaft on one side only and having two bearings to support the shaft, in all cases a cavity can be created in which, in one housing can be housed various sensors, control means electronics and other items that the system may require in an integrated package.

[**0054**] Thus, there has been shown and described an improved brake with field controllable material. It will be apparent to those skilled in the art, however, that many changes, variations, modifications, and other uses and applications for the subject device are possible, and all such changes, variations, modifications, and other uses and applications which do not depart from the spirit and scope of the invention are deemed to be covered by the invention which is limited only by the claims which follow.

What is claimed is:

1. A controllable brake comprising:

(a) a housing comprising a first chamber and a second chamber;

(b) a shaft comprising a first shaft end, the shaft extending through the first and second housing chambers;

(c) a rotor made integral with the shaft substantially at the first shaft end, the rotor having an outer periphery, said rotor being located in the first housing chamber;

(d) field generating means located in the first housing chamber proximate the outer periphery of the rotor;

(e) field responsive material located in said first chamber, the rheology of said material being affected by said field generating means; and

(f) means for controlling and/or monitoring the operation of the brake, said means located in said second chamber.

2. A controllable brake, comprising:

(a) a rotor comprising first and second rotor surfaces, an outer periphery and at least one working portion proximate to or at the outer periphery;

(b) a shaft comprising a first shaft end, the rotor being made integral with the shaft at the first shaft end in a manner to restrain relative rotation therebetween;

(c) a housing having a first chamber and a second chamber said first chamber adapted to house the rotor therein,

(d) a field controllable material contained within said first chamber in contact with the at least one working portion of the rotor;

(e) a magnetic field generator located in said first chamber spaced from the rotor, said field generator being adapted to generate a magnetic flux in a direction through a controllable material toward the at least one working portion of the rotor;

(f) electronics, for operation with the brake, housed in said second chamber.

3. The controllable brake of claim 2, wherein said second chamber is sealed from said first chamber in a manner such that controllable material is not permitted to flow from said first chamber into contact with said second chamber or into contact with said bearings and the shaft extending outside of said first chamber.

4. The controllable brake of claim 2, further comprising a return-to-center acting device in at least one of the first chamber and the second chamber to urge the rotor to return to a relative center position.