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Using Magnets as a Depression Treatment

Neuronetics develops a device using power-off brakes to deliver transcranial magnetic simulation therapy as a non-pharmaceutical approach to treating depression.

By -- Design News, October 13, 2010

Major depression is a serious medical disorder affecting more than 14 million American adults every year. Often a debilitating condition, depression results in a persistent state of sadness which interferes with an individual's thoughts, behavior, mood and physical health.

Common treatment for sufferers involves pharmaceutical products prescribed by physicians that are sometimes required for extended periods of time. Medications and professional counseling will help usually help patients manage the negative effects of depression but for some, anti-depressants fail to provide improvement. Extreme cases can result in complete incapacitation of the patient and hospitalization.

This picture illustrates how a patient receives treatment with the Neurostar TMS Therapy System. Source: Ogura Industrial Corp.

As an alternative to the pharmaceutical approach to depression treatment, Neuronetics Corporation of Malvern, PA, has designed the NeuroStar TMS (transcranial magnetic stimulation) Therapy System. TMS is a non-invasive, non-systemic treatment for depression that applies a highly focused, pulsed magnetic field to stimulate function in targeted brain regions. NeuroStar TMS Therapy is performed in a physician's office. Each treatment lasts about 40 minutes and takes place daily for four to six weeks. To date, Neurostar reports that there are have been none of the physical effects reported that are commonplace with drug treatment. Patients can immediately return to normal daily activities.

Designing the TMS Device

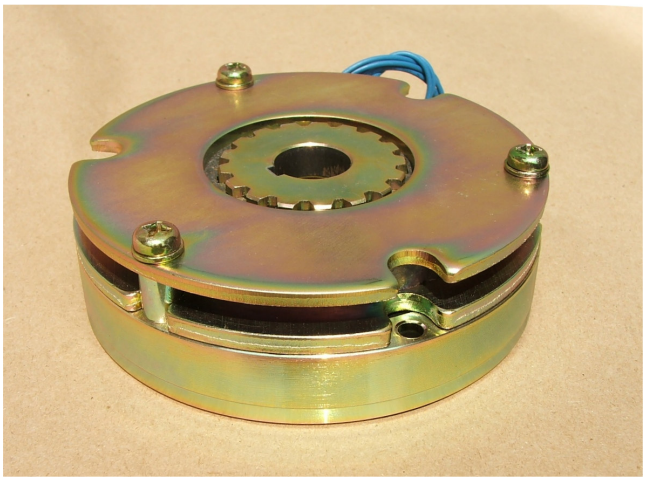
Neurostar engineers developing the TMS treatment needed a reliable means of holding the treatment coil in place during therapy sessions and turned to Ogura Industrial Corporation for suggestions. This was a major design consideration as it is necessary for the magnetic treatment coil to be able to be positioned in different axes of motion to accommodate the different physical characteristics of individual patients.

Once the patient is reclined in the treatment chair, the treatment coil is positioned so that magnetic pulses are focused on specific regions of the brain. It is critical that, once the coil is positioned and therapy commences, no slipping or wandering of focus location occurs. The magnetic pulses generated by the treatment coil must remain on the targeted area of the brain.

RNB electromagnetic spring-applied brakes from Ogura were selected to hold the mast and gantry arm of the TMS securely during the therapy sessions. These brakes, designed for holding and emergency braking, are considered power-off brakes in that no power is needed to hold the brake, due the use of a spring to keep it in place.

This was an important consideration in the TMS design, since quiet operation is essential in a therapeutic environment. Since the RNB power-off brakes are only energized when the treatment coil is being positioned, the treatment coil, once put into place, is held securely in place with no electrical noise or "hum" to distract the patient.

Because the RNB is a power-off brake, there is also no electrical signal to interfere with the TMS system during use. Power is only applied to release the brake when the treatment coil is adjusted to the individual patient. When power is removed, springs apply the friction surfaces locking the mast and gantry arm in place until the therapy session is completed. In addition, the zero backlash feature of the RNB design eliminated the possibility of flutter or drift of the gantry arm and mast during operation.



RNB electromagnetic spring-applied brakes from Ogura Industrial Corp. are spring-set type brakes, providing rapid torque buildup. They are available in two standard voltages, 90VDC and 24VDC. Source: Ogura Industrial Corp.

Although it was not a primary design consideration, cost of operation of the RNB is negligible. Power consumption is minimized since the RNB is only energized while adjusting the system to the individual patient. During treatment the RNB is static, stable, non-interfering and power-free.

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