



The Chinese University of Hong Kong

Non-confidential Abstract of Technology Disclosure

Title:

MAGNETORHEOLOGICAL DEVICE FOR DELIVERY AND CONTROL OF MOTIVE FORCE

CUHK Ref. No. : 09/ENG/318

Inventor(s) : Professor LIAO Wei Hsin, Department of Mechanical and Automation Engineering

Patent Status : US Patent Pending **Licensing Status :** Available for licensing

Non-confidential abstract:

Powerful Support

Engineers at The Chinese University of Hong Kong (CUHK) have developed a compact device capable of acting as a motor, clutch and brake, all in one. This breakthrough has been achieved by refining existing technology that exploits the capability of magnetorheological fluids to produce and control motive force. Experts at CUHK have demonstrated a working device, based on this technology, which assists mobility-impaired or injured persons by providing active support and control for the knee.

Widespread Applications

Magnetorheological (MR) devices can be applied in a host of applications, wherever motive force, control and braking are required at relatively low power in a compact device. Vehicles, robots, medical devices, exercise equipment and rotary machinery could all exploit this approach.

MR-based devices have already been successfully commercialised as programmable resistance units in exercise machines; however, to date these have provided resistance (braking) only. CUHK's invention allows a single MR device to provide motive force and clutch control in addition to braking, opening up new possibilities where compact and efficient performance is paramount.

The Magnetorheological Device

CUHK's innovative MR device consists of a system of specially designed rotating plates suspended in a magnetorheological fluid. Normally, the plates are allowed to rotate freely. However, as soon as a magnetic field is applied, the magnetorheological fluid becomes viscous and restricts free rotation. This provides a braking effect on the plates. Changing the magnetic field allows the viscous liquid to form chains between sets of plates; the device now acts like a clutch, transmitting rotation between the input/output plates. Finally, applying current on coils, the permanent magnets are rotated to produce rotary movement, and this imparts a turning motion to the plates; the device is now performing as a motor.

MR-based devices offer many advantages over their conventional counterparts. The braking function requires less power than injecting direct current into a motor, and there is no risk of damage to the unit. The clutch function is free of backlash, affording greater control and increasing user confidence, especially in medical applications. The motor function has fewer moving parts, resulting in less friction, heat and wear. All these benefits, in addition to their wide operating temperature range, make a compelling case for selecting MR-based devices in numerous applications.

Opportunity

The invention offers an exceptional combination of multiple functions, exquisite controllability and rapid response, all contained in a single compact, efficient package. It offers a significant opportunity to move ahead in a wide range of end-user markets. Once the MR device has undergone extensive trials, it will be available for end users by 2012.

For further queries, please contact:

Mr Billy Lam
Technology Licensing Coordinator
Tel: (852) 2609 8882
Fax: (852) 2603 5451
Email: billylam@cuhk.edu.hk

Address:
Technology Licensing Office
The Chinese University of Hong Kong
Room 328, Pi Ch'iu Bldg, Shatin, New Territories
Hong Kong SAR