

ABSTRACT

This invention embodies a linear reciprocating actuator that is powered by a modified conventional brushless DC (BLDC) motor and comprises a hollow spindle, a lead screw, a mounting plate and a position feedback system. The hollow spindle has an internal thread and rotates with the rotor. The lead screw is made up of a threaded shaft which is mated with the internal thread of the hollow spindle, and an anti-rotating shaft that has a cross-section that is shaped to prevent rotational motion when fitted through a fixed hole that has a matching profile. This hole forms part mounting plate which is fixed to the stator of the BLDC motor. As the rotor turns, the internal thread of the hollow spindle causes the lead screw to move in a straight line along the rotor axis. When the lead screw reaches the end of the stroke, the feedback system incorporated into the drive electronics senses this position and switches the direction of the revolving rotor. This causes the lead screw to move linearly in the opposite direction. The rotor switches direction again when the lead screw reaches the end of the opposing stroke and the cycle is repeated. Unlike current linear actuators which utilize a slide component takes up precious space in addition to the nut and lead screw, this linear actuator invention has only a single shaft extending from the actuator body. This is useful when the device to be driven can only be accessed through a small opening, such as in the case of a vacuum pump.



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