PITTMAN®

Cartridge Brush Design for

DC Motors & Gearmotors

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The traditional method for mounting copper or silver graphite brushes in brush commutated DC motor and gearmotor assemblies has been to solder the brushes onto standard cantilever springs to enable the required constant contact with the commutator. However, this conventional spring design carries inherent drawbacks.

- The amount of brush material that can be used is limited by the width of each spring where brushes are attached.
- As brushes wear in an uneven pattern, force levels diminish over time and motor failure can result.

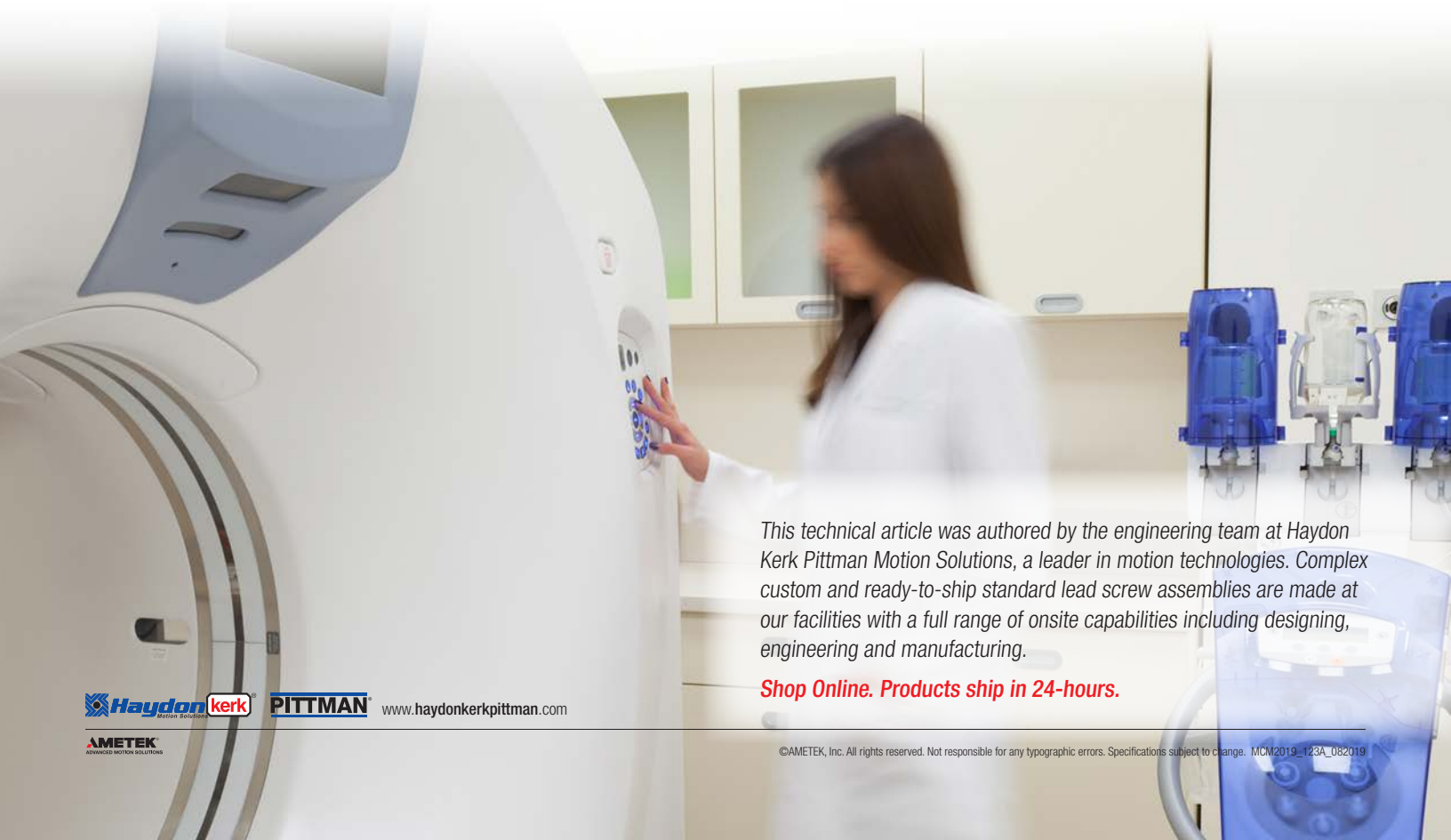
Such challenges can be overcome by housing the brushes within a specially designed cartridge and utilizing torsion springs to ensure desired even force over the life of a motor.

Cartridge brush housings also can serve as an ideal location for passive components for EMI suppression. The cartridge design allows these components to be placed closest to the noise source where they will prove most effective.

The cartridge, which fits into the motor base, consists of a two-piece, high temperature plastic snap-together assembly in which each of two brushes is seated securely within its own specially constructed slot. This design effectively restricts the brushes to traveling in a track in a desired linear motion. Torsion springs, which utilize the basic principle of force vectors and consist of a coiled spring and spring arm, are angled against each brush to promote even force. When the brushes travel on their centerlines, the angle of the spring arm self-adjusts from an extreme position in the beginning when maximum torque is present to a more direct angle as the brushes wear. As the angle of the springs pushing against the brushes changes in response to brush wear, the force vectors change as well. The result is optimum commutation for the life of the motor, due to the combination of the track keeping brushes in line and the torsion springs applying consistent force. The cartridge design further provides for an ideal region of pressure (6-8 lbs. psi) for the brushes to withstand the detrimental effects of electrical erosion.

The housing also serves as a ready-made vehicle for the incorporation of passive components to reduce EMI emissions. For motor applications ranging from medical diagnostic to office automation equipment, the need to suppress noise is critical, especially in light of increasingly stringent electromagnetic compatibility (EMC) requirements. The challenges are to maintain system integrity and DC motor performance without adding significant cost or weight to a subassembly.

To achieve these goals, the cartridges can be customized with pre-mounted capacitors (for low-frequency EMI, typically below 30 MHz), whose values can range from 0.001 microfarad to 0.47 microfarad up to 100 working volts. Pre-installed capacitors eliminate the need for costly and time-consuming secondary assembly operations (soldering and hole-tapping). Perhaps most importantly, they can be situated in the cartridge closest to the noise source for optimum filtering and maximum suppression effectiveness. To reduce high-frequency noise (generally above 30 MHz), ferrite beads can additionally be installed on the lead wires of the pre-wired cartridge.



This technical article was authored by the engineering team at Haydon Kerk Pittman Motion Solutions, a leader in motion technologies. Complex custom and ready-to-ship standard lead screw assemblies are made at our facilities with a full range of onsite capabilities including designing, engineering and manufacturing.

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