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Fasteners Take 30° Turn To Secure Cabinets And Contents

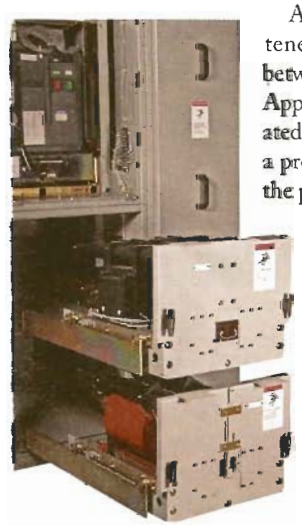
It's generally seen as the least glamorous part of the design cycle. Developers of heavy-duty data-center, industrial, commercial, and other critical equipment that resides in large cabinets and enclosures face the challenge of ensuring that these enclosures and their contents stay in place and in one piece under adverse conditions.

Often having to work with soft materials such as copper, zinc, and plastics, the possibilities abound for screws stripping during assembly and loosening during shipping, operation, and acts of nature. As per senior engineer Paul Parker at the electrical division of Eaton Corp., "Vibration and internal thread stripping can be the biggest challenges for soft materials like copper. Cross-country shipping can be even more brutal to equipment than seismic tests."

Traditional assembly strategies include lock washers, adhesives, torque rings, and the like. Though fairly reliable for a time, these techniques often incur further costs across the lifespan of a product in terms of replacement and servicing. In some designs, they may even prove inadequate.

Assembly-hardware maker Spiralock Corp. offers a simple solution to these reliability concerns in the form of a unique internal thread form that combats the effects of seismic, shipping, and operational forces while working in soft materials. Providing a viable alternative to traditional fastening methods, the internal thread form also promises to encourage design innovation while streamlining assembly and inventory-management chores.

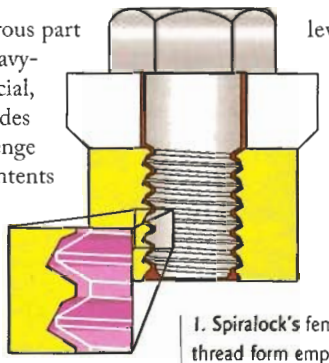
TRADITIONAL PROBLEMS AND A SOLUTION



2. Forgoing traditional fasteners in favor of the self-locking internal thread forms, Eaton's MEF switchgear provides complete front access, freeing up space in the rear, and maintenance-free operation.

According to Spiralock, most locking fasteners tend to overlook the gap that exists between the crest of male and female threads. Apparently this is a common problem associated with industry-standard, 60° thread forms, a problem conducive to thread loosening in the presence of vibration.

The company also points to the first few engaged threads of a fastener as a reliability risk. This area exhibits a high level of mechanical stress, and it adds to thread shearing due to axial loading. Obviously, expansions and contractions of the fastener due to extreme temperature variations present further compromises to structure integrity.



1. Spiralock's female thread form employs a 30° wedge clamp on the root of each thread that distributes load force evenly. The clamp also boosts joint reliability.

Resolving these issues, Spiralock's self-locking fasteners employ a re-engineered thread with a 30° wedge ramp at the base of each thread of the female half of the component *(Fig. 1)*. Mating with standard 60° male fasteners, the ramp enables the bolt to spin freely until tension builds in the male fastener, the threads of which tighten against the wedge ramp.

This eliminates radial clearances and creates continuous contact along the mated threads, spreading clamp force evenly over all engaged threads. The overall result is significantly higher resistance to vibration, axial loading, joint fatigue, and temperature extremes.

Another benefit of the fastener is a locking feature integrated within the thread form that compensates for variations in manufacturing tolerances. In addition to boosting joint reliability, the locking feature eliminates the need for extra thread-locking devices or procedures, opening the door for more design options in terms of layouts and configurations.

DESIGN OPTIONS

With reliability number one, the next two concerns surrounding these large installations are space savings and ease of access for upgrades and maintenance. Spiralock says its fasteners easily enable front access, which eliminates the need to allot space behind the cabinet.

One example is Eaton's electrical Cutler-Hammer brand metal enclosed front (MEF) accessible switchgear. After testing traditional fastening strategies, Eaton created front-accessible and maintenance-free MEF switchgear using the Spiralock thread forms *(Fig. 2)*.

"The self-locking threaded fasteners and internal thread form are capable of holding the MEF switchgear's bus joints secure for decades," said Eaton's Paul Parker. "By helping us attain a no-maintenance bus design, the fasteners and internal thread form opened up new design possibilities."

As yet another benefit, upgrading existing designs to the self-locking fasteners usually entails exchanging nuts, wire inserts, or drilling and re-tapping existing parts.

SPIRALOCK CORP. : www.spiralock.com