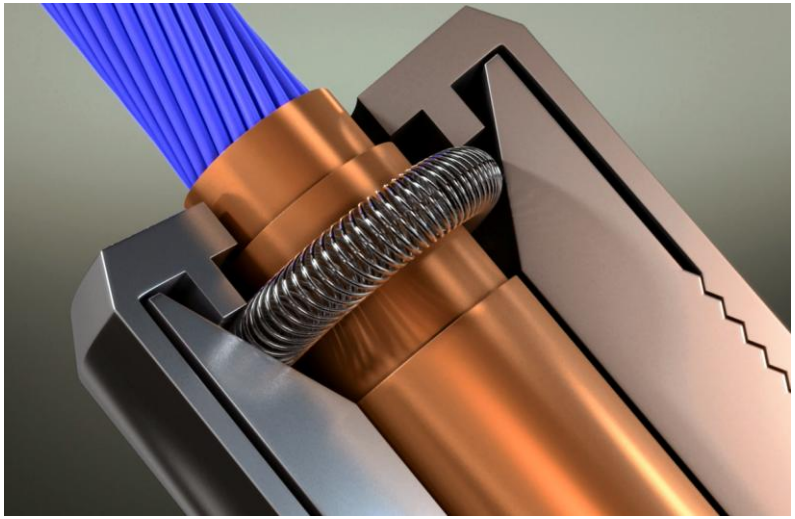
EMC LIVE 2016

Product Demo

Complex problem, simple solution: Achieving lower transfer impedance and more effective EMI shielding with springs

April 28, 2016/11:50-12:05



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Agenda

- Your speaker
- The challenge
- Shielding types
- The canted coil spring
  - Advantages
  - Performance
  - Applications
- Conclusion
- Resources

Your Speaker

- David Wang, BSEE, MBA
  - Senior Project Engineer at Bal Seal Engineering, Inc.
  - 10 years of EMI/RFI shielding design experience
  - Worked with Celestron, Toyota, Broadcom

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The Challenge

- Designing for long-term EMI/RFI shielding effectiveness
  - Understanding operating conditions and attenuation requirements (i.e., MIL, other specs)
  - Optimizing hardware configuration
  - **Choosing the right shielding type to achieve desired EMI shielding effectiveness in repeated use**

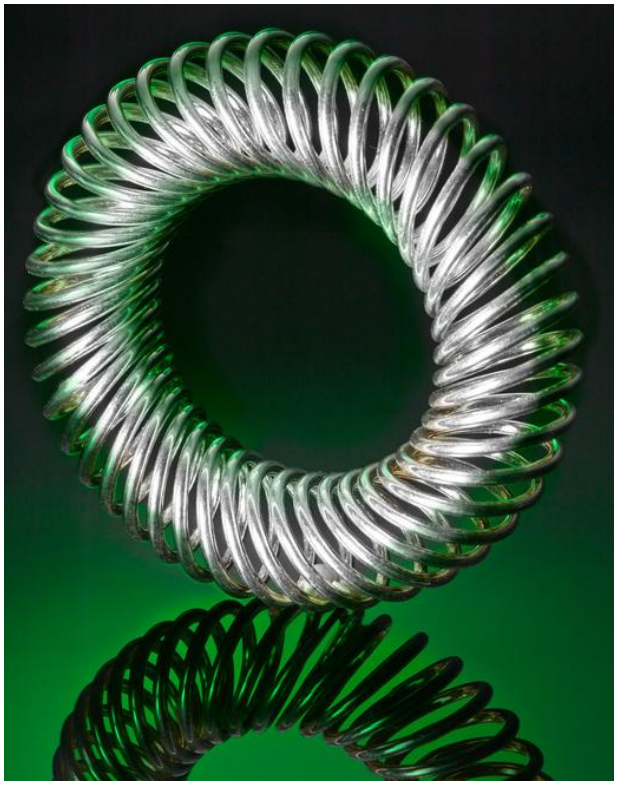
Shielding Types

- *Huge* variety of options, including
  - Conductive elastomers
  - Conductive fabric/foam
  - Wire mesh, wire/foam
  - Conductive paints/coatings
  - Molded/impregnated materials
  - Ferrites
  - Fingerstock
  - **Springs (canted coil)**

The Canted Coil Spring

- What is it?
  - A simple, elegant component consisting of coiled wire with precisely engineered coil angles
  - Tested/proven to provide effective shielding in EMI critical applications
  - Supplied in welded rings or lengths
  - Electrical and mechanical capabilities
    - Shields, but also holds, latches, and locks
  - Completely customizable
    - Resistance and mechanical forces are adjustable

The Canted Coil Spring: Advantages



- An ideal tool for designers seeking:
  - Superior shielding in high-frequency, small-package applications
  - A much higher level of resistance to compression set (as compared with alternative shielding types)
  - A way to “do more with less”

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The Canted Coil Spring: Performance

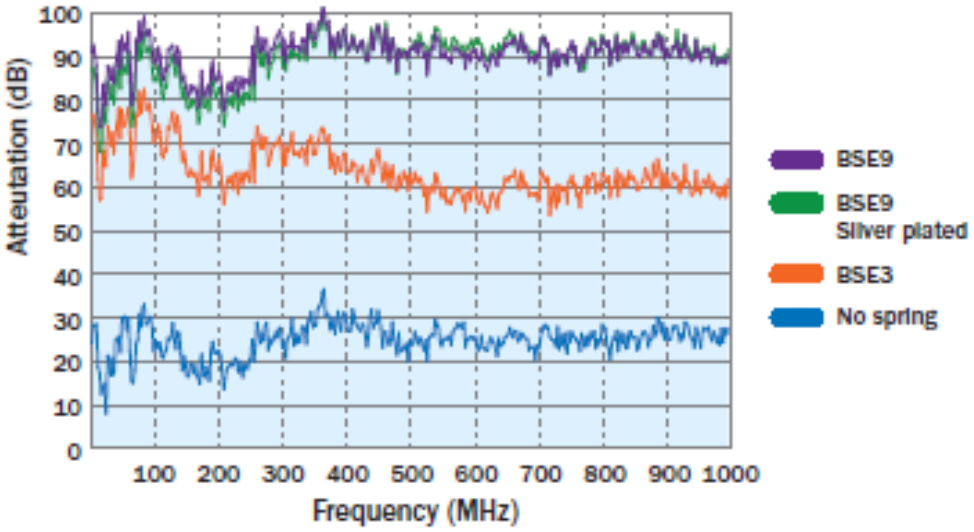

Figure 3. 100 MHz–1 GHz, attenuation vs. frequency.

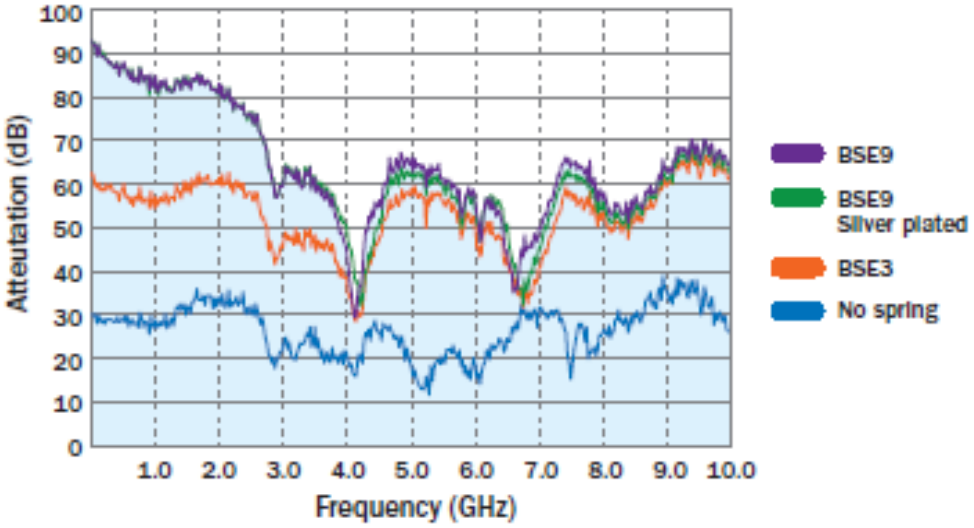

Figure 4. 1–10 GHz, attenuation vs. frequency.

- Test conducted at frequency ranges of 100 MHz – 10 GHz
  - 50-Ω characteristic impedance coaxial connector w/copper alloy spring w/silver plating
  - Provided up to 90 dB attenuation
  - Compared w/no spring, material type BSE3 showed greatly improved effectiveness
  - BSE9, which showed even greater shielding effectiveness, is recommended for high-performance shielding requirements

The Canted Coil Spring: Applications

- Life signs monitor/diagnostic unit connector
  - Used in dynamic environments where effective shielding and quick disconnect capabilities are critical
- Benefits of spring use:
  - Acts as latching component, providing an audible click that confirms secure connection w/no threading, easy removal
  - Conductive/shielding properties of spring provide protection against cross-talk, interference from other devices in use

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The Canted Coil Spring: Applications

- F-35, F-22 aircraft
  - Established air defense platforms for U.S.
- Benefits of spring use:
  - Springs absorb manufacturing tolerances
  - Tiny and lightweight
  - **2,799** welded springs used on each aircraft for EMI prevention

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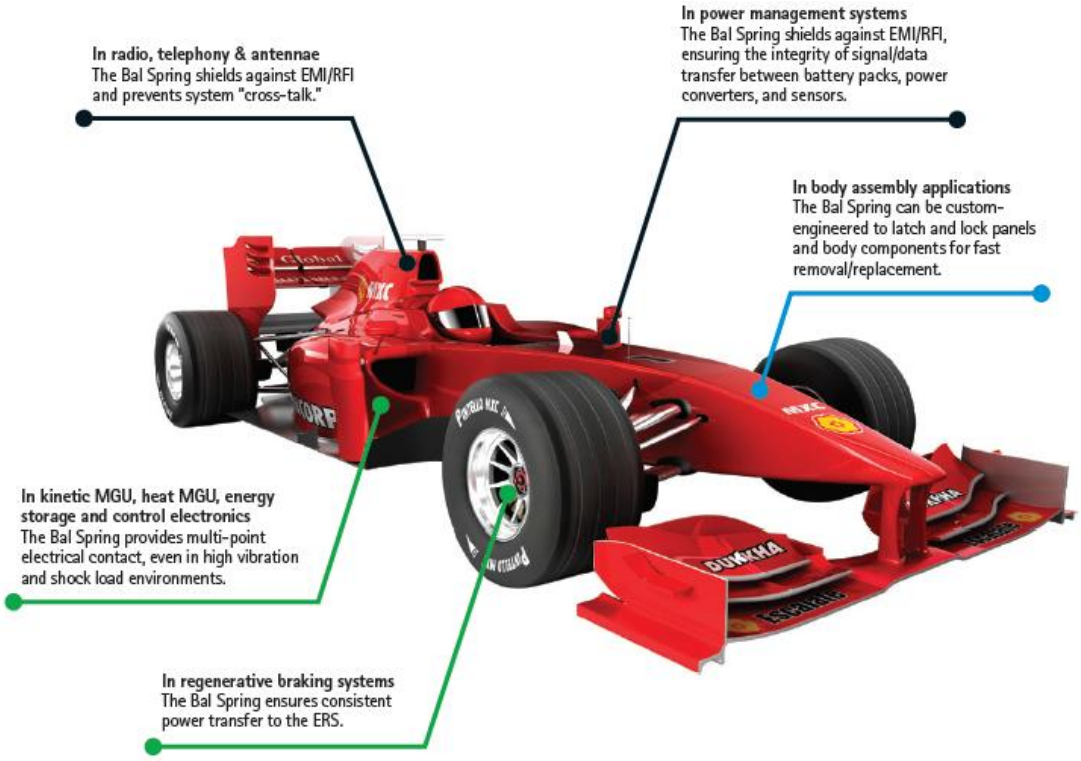
The Canted Coil Spring: Applications

- F1/FE Racing
  - Elite sport in which technology develops, “trickles down” into consumer vehicles
    - Driver information and safety systems
    - Radio, telephony, and antennae
    - Power management (battery packs, power converters and sensors)
    - Vehicle performance monitoring




EMI/RFI shielding


Electrical conducting


Mechanical fastening/ connecting

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The Canted Coil Spring: Applications

TYPICAL AXIAL APPLICATION
ELECTRONIC ENCLOSURE

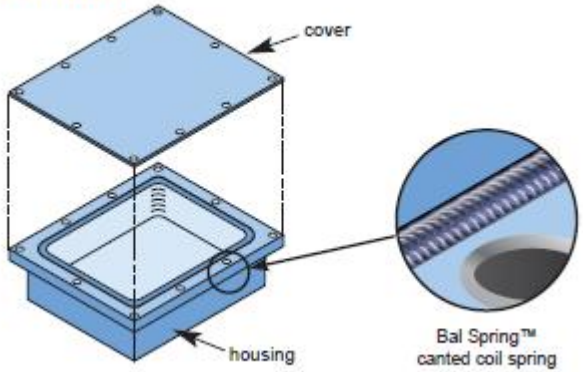

Figure 5

TYPICAL RADIAL APPLICATION
ELECTRICAL CONNECTOR

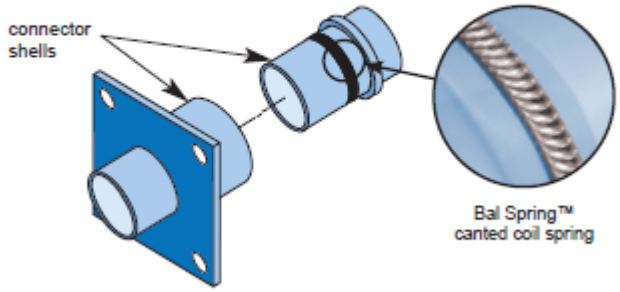

Figure 6

TYPICAL CONNECT/DISCONNECT ASSEMBLY

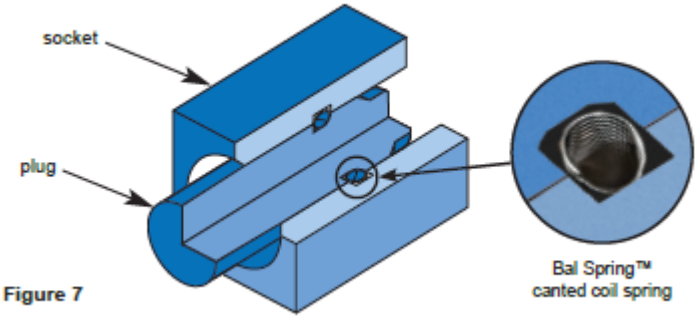

Figure 7

COAXIAL CONNECTOR

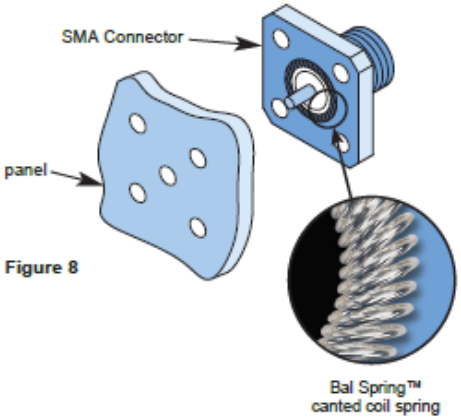

Figure 8

WAVEGUIDE FLANGES

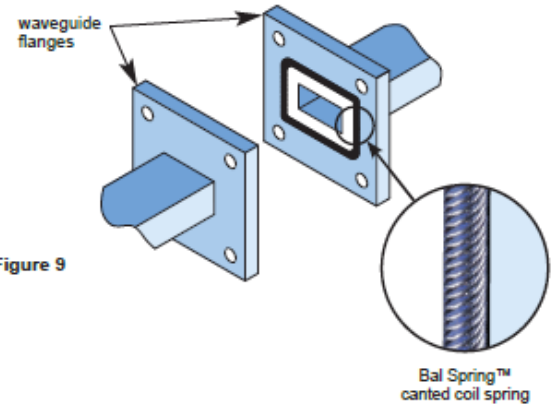

Figure 9

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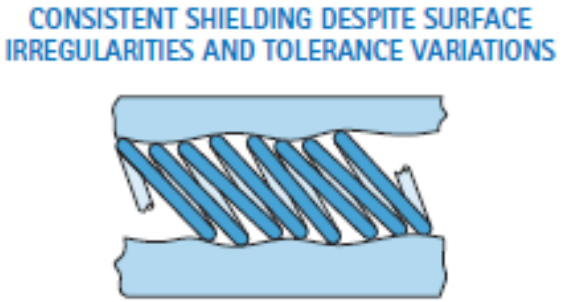
Conclusion

- Canted coil springs offer designers a smart, proven alternative to fingerstock, filled elastomers, and other shielding types
  - 3-in-1 functionality
    - Shielding/conducting/connecting, reduces weight and complexity of designs
  - Resistance to compression set
    - Individual coils exert near constant force, compensate for misalignment, surface irregularities
  - Ability to enable tool-less modular designs
    - Allow for maintenance, part-switching
  - Broad range of wire materials and sizes
    - Down to 0.41mm (0.016 in)



Resources

- Bal Seal Engineering, Inc. offers Bal Spring™ canted coil springs for EMI/RFI shielding applications
  - 50+ years of engineering experience – deep sea to deep space
    - Undersea oil rig connections, Mars Rover, Hubble space telescope tools
  - www.balseal.com – catalogs, videos, design request form
  - Call 949.460.2100 or e-mail sales@balseal.com for immediate help with your challenge!

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