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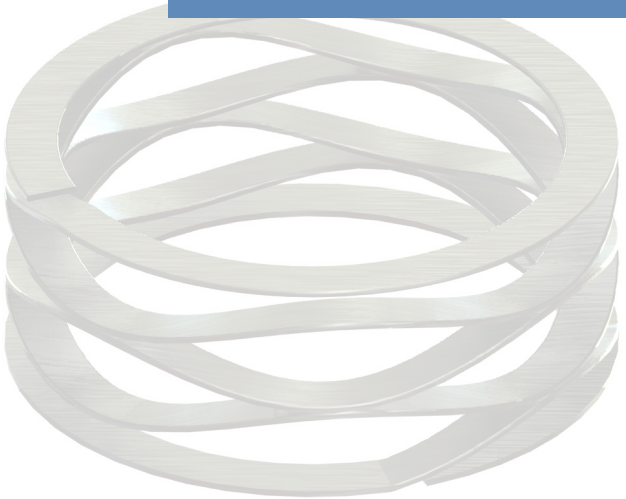
ROTOR CLIP®

TRUWAVE®

APPLICATION SPOTLIGHT

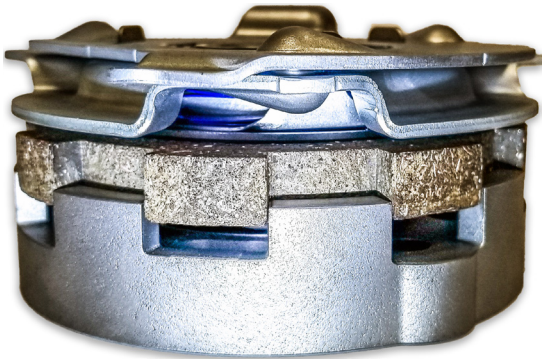
WAVE SPRING DELIVERS DESIGN SIMPLIFICATION AND SPACE SAVINGS



Compact blade brake clutch design takes advantage of a multi-turn wave spring to reduce assembly height and number of components.

Flat wire wave springs are often used in compact applications where axial space is limited and traditional round wire springs cannot produce the needed force at the desired work height. As the spring element of choice for many design engineers, wave springs are used in a wide range of applications ranging from bearing preloads in electric motors over injection pens to directional drilling devices.

Another application that requires a compact size is the blade brake clutch as found under the mower deck of high-end lawn mowers. Originally designed as a safety feature when emptying the mower bag, it allows for the mower engine to run without the mower blade being engaged and spinning. When the blade brake clutch is activated, the mower blade is uncoupled from the mower drive and simultaneously braked to a stop.

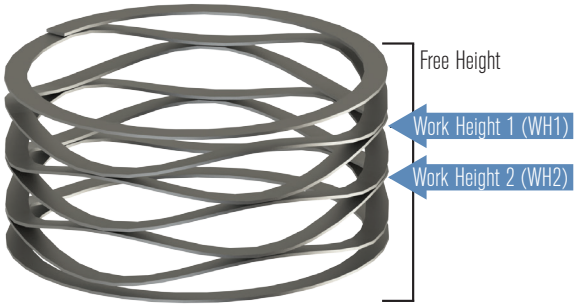


Single unit blade brake clutch.

Blade Brake Clutch systems are designed as either a combination of two main assemblies, a separate brake and clutch, or as one compact assembly. The drawback of the separate assemblies design is its complexity due to the larger number of parts needed, making it harder to assemble and maintain. The larger number of parts also add weight

Multi-turn wave spring used in blade brake clutch.

and take up more room under the mower deck where the available space is limited. The single unit design on the other hand reduces complexity and achieves space savings by sharing components between the brake and clutch, which reduces the number of total parts needed and shrinks the assembly in size and weight.

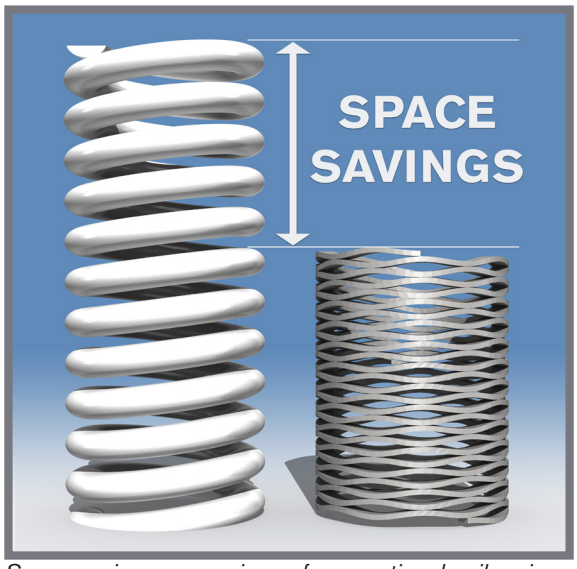


The single unit design utilizes a multi-turn wave spring with a free height of 12mm. When the spring operates at its first work height of 8mm (WH1) it holds the brake member at a predefined distance away from the brake actuator.

When the operator engages the blade brake clutch via the control lever, the wave spring is further compressed to its second work height of 6mm (WH2) and allows the braking surface to connect with the brake surface, stopping the blade from spinning.

The two main reasons why a wave spring was chosen for this blade brake clutch design are space savings and design simplification. The most visible benefit of the wave spring is its space savings aspect, reducing the overall height of the assembly under the mower deck.

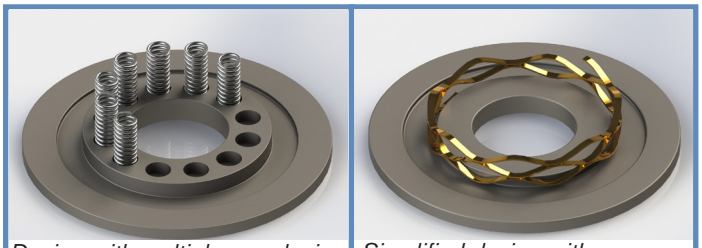
SPACE SAVINGS



Space savings comparison of conventional coil spring versus multi-turn wave spring.

In static applications, a wave spring will typically need just 50% of the work height of coil spring to deliver an equivalent force. In dynamic applications, the work height advantage is typically about 30%, less than static applications but still substantial.

DESIGN SIMPLIFICATION

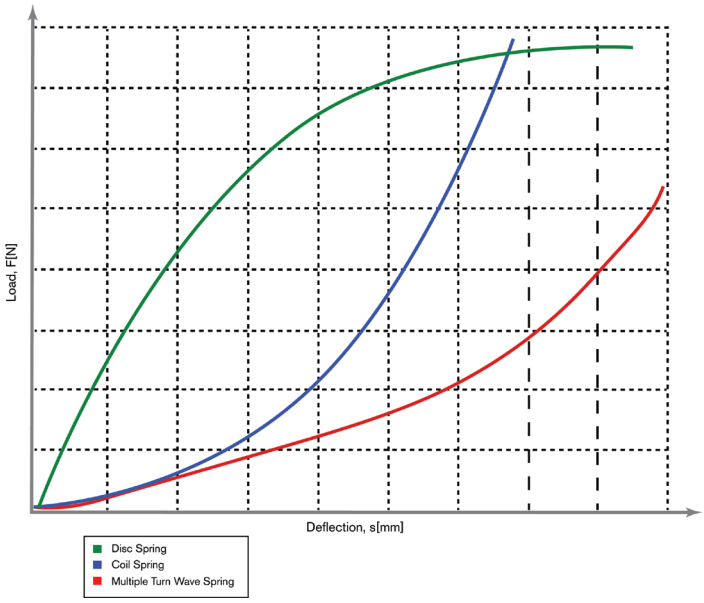


Design with multiple round wire coil springs. | *Simplified design with one multi-turn wave spring.*

Additionally, the wave spring simplifies the design. Only one component is needed to achieve the desired spring function, which usually requires multiple round wire coil springs. The result is a lighter, less complex, module that is easier to assemble and maintain.

As the blade brake clutch example shows, wave springs can offer the design engineer advantages when tasked with developing components and assemblies that need to be compact, less complex, and yet reliably perform the functions in safety-critical applications.

LOAD-DEFLECTION CURVES COMPARED



In addition to design simplification and space savings, wave springs offer other design advantages such as a consistent force over a wide range of deflections, transmitting those forces only in the intended axial direction while improving dimensional tolerances. Wave springs do not suffer from torsional loading and twisting that can cause wear. They also offer increased travel distances and the ability to self-locate in bored holes and shafts.

Wave springs can be customized quickly with no tooling costs. They are produced in standard carbon and stainless steels as well as various special alloys, i.e. Inconel, Hastelloy, Beryllium-Copper, to suit specific industries and their environments.

Rotor Clip's technical sales engineers are available to assist you with finding or developing the perfect wave spring for your application needs and will support you from initial concept through series production.

INTERESTED IN FINDING OUT IF A WAVE SPRING CAN EMPOWER YOUR APPLICATION DESIGN?

Connect with Rotor Clip's technical sales engineers via email at info@rotorclip.com or call 732-469-7333.