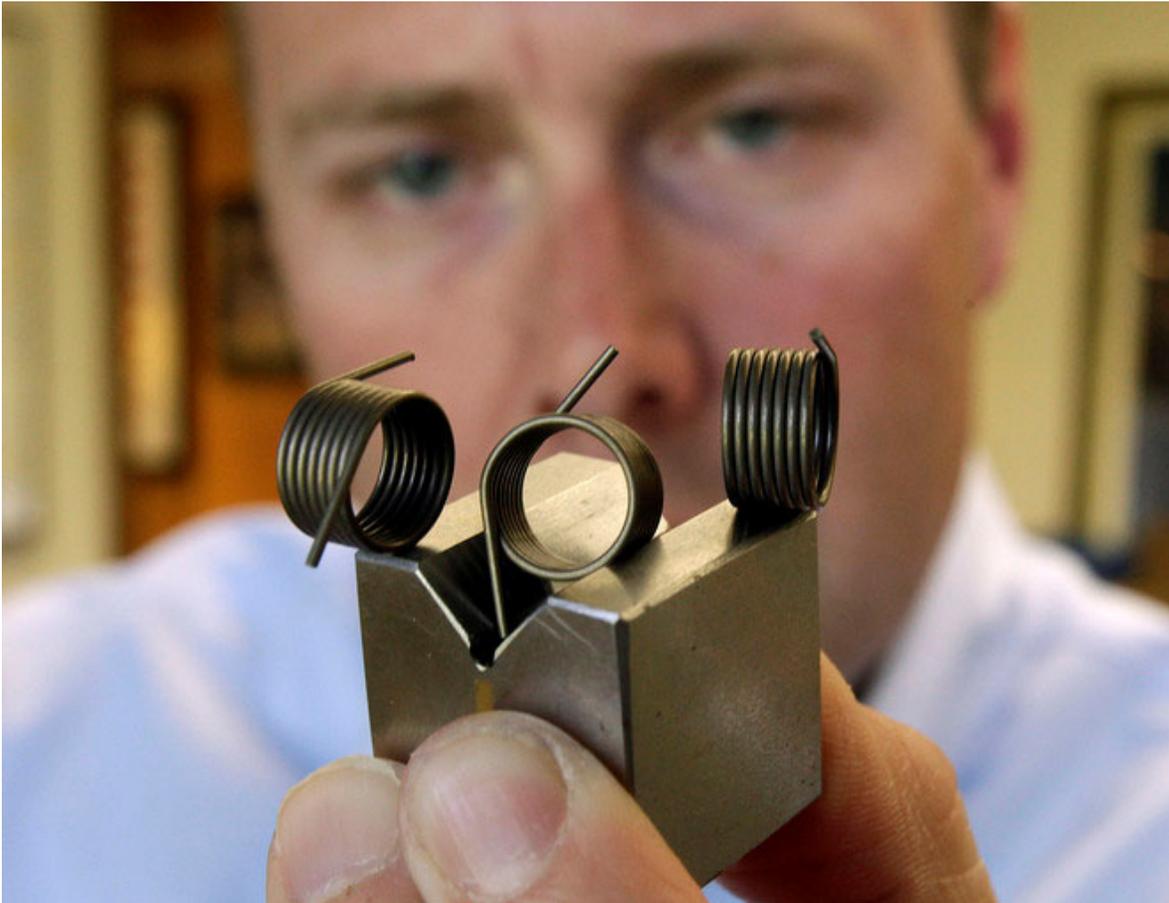


Grafton firm's products go into new prosthetic hand



Benny Sieu

Greg Heitz, president of Exacto Spring Corp., holds custom-designed torsion springs used for a prosthetic hand that is one of Popular Science's inventions of the year.

By Rick Barrett of the Journal Sentinel



A new prosthetic hand - strong enough to lift a chair, yet gentle enough to hold an egg - has won accolades from Popular Science magazine, thanks partly to custom-made springs from a Grafton firm.

The springs tighten until each finger comes to rest on an object, including odd-shaped items that other prostheses can't grasp well. They're from Exacto Spring Corp., whose products are used in everything from medical devices to military helicopters.

"It's pretty cool to be part of someone getting hand movement back," Greg Heitz, company president, said about Exacto's role in developing the prosthesis.

The project started in 2004 when Mark Stark, a mechanical designer from St. Louis, wanted to help a friend who did not have a left hand.

The first prototype of what became the Stark Hand was made from hardware-store parts. With it, Stark's friend was able to catch a ball left-handed for the first time in his life.

Several prototypes later, the prosthesis is closer to replicating a natural hand.

It attaches to a cable that runs from a shoulder harness worn by an amputee. A lever on the palm opens all five fingers at once, while cables and springs allow the fingers to open and close individually.

Precision work

Exacto worked closely with Stark to make tiny springs for the mechanical hand.

The size, tension and reliability had to be just right for the hand to perform as well as it does.

"A lot of people don't give springs much credit. But in many designs, they're one of the most important components," Heitz said.

Popular Science named the hand one of its five inventions of the year, putting it on the cover of the June issue.

Prosthetic hands typically come in three varieties, according to the magazine: purely cosmetic models; hooks and other low-cost mechanical appendages; and electronic versions that mimic natural hand movements but are expensive, heavy and complicated.

The magazine's editors were impressed with the Stark Hand's simplicity and functionality.

"I never want to knock down expensive, high-tech things, because they're great; but we need simpler things, too," said Luke Mitchell, a Popular Science deputy editor.

"There are all kinds of aspects to prosthetics that can be improved," Mitchell said. "Mark Stark was able to make a real leap forward based on his own ingenuity and engineering know-how."

Stark is still making improvements to the hand, including changing the grip surface and making it more natural in appearance.

Some of the changes have come slowly, since he has a full-time job designing valves for dryers and other appliances.

"Time was a big issue," Stark said. "I think we have captured the function of the hand, and I feel pretty good about the strength and spring forces."

It cost \$18,000 to develop the prototypes that Stark hopes will result in a finished product in the next couple of years.

One of his goals is to keep the hand affordable.

"I see it being more important globally than in the U.S. It's a viable alternative to the mechanical hook that many people have," Stark said.

Seeking manufacturer

Stark has signed a deal with Edison Nation, a Charlotte, N.C., firm that helps inventors connect with manufacturers and retailers.

If it works out, he will split the proceeds from any licensing agreement with Edison Nation.

"Until we get a manufacturer, this isn't a reality yet," Stark said.

Some of Stark's inspiration for the mechanical hand came from the NASA robot Dextre used by astronauts during spacewalks. Sensors allow the robot to "feel" objects it is dealing with and automatically react to movements or changes.

But complex problems must be solved before a prosthesis can respond to human nerve impulses and muscle movements, said Charles Tritt, director of the biomedical engineering program at Milwaukee School of Engineering.

"At a minimum, we have to put electrodes on the skin. Beyond that, there are various surgical things we can do. But it's hard to get the original (nerve) signal to control the prosthetic device," he said.

The Stark Hand seems to have found a "sweet spot" between older, very functional hooks and futuristic powered hands, according to Tritt.

And cost is important to many people because insurance tends to only pay for the lowest-cost prosthesis.

Stark says he will work with Exacto to further develop the mechanical hand.

About 25% of Exacto's business comes from medical devices. "We put a lot of parts into people," company president Heitz said.

The company dabbles in niches such as springs used to bring animated characters to life in Hollywood films and work for NASA's space shuttle.

It often gets inquiries from inventors seeking custom-made springs. Some of those inquiries result in a few prototypes, and then the project dies.

The prosthetic hand seems to have gone beyond that stage, according to Heitz.

"It's just cool to see things like this happen," he said.