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Jason Casatelli, production supervisor at MagicWheels, assembles a wheel equipped with the company's gear mechanism. A finished wheelchair is at center left. (Paul Joseph Brown / P-I Photos)

Seattle firm reinventing the wheel

Complex gear helps wheelchair users navigate difficult terrain

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By BILL VIRGIN
P-I REPORTER

Pedaling a bicycle uphill is hard work. That's why they put gears on bikes, to make the task a little easier.

Why couldn't the same idea be applied to manual wheelchairs?

In fact, it can, a point proven by a small Seattle manufacturer, MagicWheels Inc.

With a flip of a sliding switch on a MagicWheels hub, a wheelchair user can shift from a conventional 1:1 gear ratio to a 2:1 ratio (the rim on which the user pushes rotates twice for each revolution of the wheel), much as a bicycle rider shifts to a gear that offers less resistance.

That shift allows users to expend less effort in negotiating ramps, carpets, door thresholds, bumpy ground and other obstacles that are the bane of existence for those trying to get around in a manual wheelchair and supplying their own propulsion.

It's a deceptively simple concept, belying not just the complexity of the mechanism itself but the effort needed to get the product developed.

MagicWheels is 12 years old, but the company launched its first commercial product in 2006, after four generations of prototypes. The company, housed in small quarters south of the Lake Washington Ship Canal and east of the Ballard Bridge, has just 10 employees.

While the company doesn't disclose sales figures, MagicWheels Chief Executive Phil Baechler said sales doubled over the past year. "We haven't hit a million yet but we're working on it."

"People who have them absolutely love them," said Wendell Matas, an original backer of the company and until recently the owner of Bellevue-based vendor Wheelchairs Northwest. "It's not a sit-in-the-closet, gather-dust product." He related the evaluation of one customer: "It got me out of flat jail."

At the heart of MagicWheels is what's technically known as a hypocycloidal reduction drive. Inside the gearbox are 250 parts and lots of close tolerances and precision machining, making the mechanism as complex as the name.

Aside from making it easier to propel a wheelchair forward, the mechanism has a hill-holding feature that prevents the chair from rolling backward even if the user isn't gripping the hand rims.

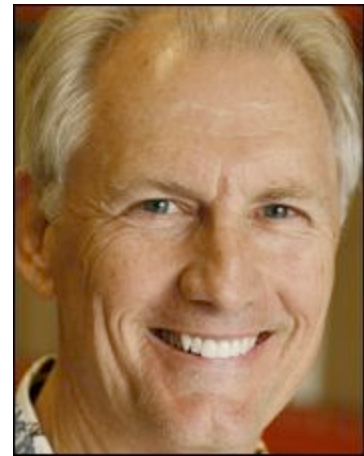
MagicWheels also developed a solid carbon-fiber disc to replace the traditional system of spokes on wheelchair wheels. Using the discs helps reduce weight and the width of the chair hubs; it also gives the chairs a sleek appearance. "We found people with wheelchairs don't want to put ugly stuff on their wheelchairs," Baechler said.

Once the concept was translated into a product, MagicWheels then had to persuade potential users to consider it, vendors to sell it ("It's not something you're going to stock on your shelf," Baechler said) and government or private insurers to pay for it. MagicWheels gear hubs aren't cheap. Between the expensive materials (a small strip of Kevlar, used for braking, costs \$30) and engineering-intensive design, a set can cost \$5,000, more than the cost of the chair itself.

All the while, MagicWheels' founders had to find money to get the company through the development stage. The challenge for small companies, said the co-founder and chief technology officer, Steve Meginniss, is the gap between grant funding and the compensation by third-party payers. "It's been a real drag finding investors for this," he says.

One attraction for investors is the serial entrepreneurs involved. Meginniss helped invent the Sonicare toothbrush. Baechler came up with the Baby Jogger, the basis of a Yakima company he eventually sold. Other MagicWheels founders included a model maker, an accountant and a physiatrist (a rehabilitation physician). The University of Washington also holds an equity stake stemming from an earlier patent licensing agreement.

So far MagicWheels has raised about \$2 million in grants from the National Institutes of Health and



Phil Baechler is CEO of MagicWheels.

the Washington Technology Center, another \$2 million from private investors and is raising more.

Adding to the challenge is that, unlike products in a sector like consumer electronics that can spread costs over thousands of units, MagicWheels is selling to a niche. "It's not scalable like telecom or Web technology," Baechler says.

But with several million manual-wheelchair users in the U.S. alone, and even more worldwide, Meginniss says getting MagicWheels on even a small percentage of those chairs would make for a decent market.

Next up for MagicWheels is building awareness and sales. As part of the publicity effort MagicWheels touts a medical-journal study that says use of the product can reduce shoulder pain, a point Matas ratifies. "So many people have been pushing wheelchairs for so long, their shoulders get torn up," he says.

The company has landed a federal supply services contract, making the product available through the Veterans Administration.

Baechler also hopes for more agreements with wheelchair manufacturers, who could then offer Magic Wheels as an option or accessory, selling the carbon-fiber composite wheels as an aftermarket product. He's also interested in developing the European market; the company plans to participate in a German trade fair in October.

Said Baechler, "We need to grow."

P-I reporter Bill Virgin can be reached at 206-448-8319 or billvirgin@seattlepi.com.

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