

GEARED TECHNOLOGY FOR MANUAL WHEELCHAIRS

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This presentation will present geared technology for manual wheelchairs. This is the first ever two-gear manual wheelchair wheel. There have been many developments in wheelchair and stroller mobility bases with lightweight materials and rehab manufacturers have evolved to address simple to complex pediatric to bariatric seating needs.

However, the design in self propulsion of manual wheelchairs with rear push wheels and front casters has changed very little since being patented in 1869. Today, more than 100 years later, handrims and wheels remain the same and wheelchairs have only one speed until now.

Wheels for manual wheelchairs are essentially unchanged since invented over 150 years ago. Traditional non-geared wheels have limited ability in varying terrain (hill climbing, hill descending, rough / uneven surfaces) and high driving loads can cause repetitive stress injuries to the shoulders, arms and hands. These problems are amplified for patients with limited upper body capability. The US Ed. Dept. - National Institute of Disability and Rehabilitation Research (NIDRR) and others have identified "innovative geared hubs for manual wheelchairs" as a major need. However, over 1 million users of special grade wheelchairs in the USA and their counterparts world-wide are still waiting for a solution.

The Magic Wheels product was designed from the ground up expressly to meet the needs of long term wheelchair users. This unique **patented** design not only meets almost all the design criteria identified by the NIDRR, but also includes two important additional features - automatic hill holding (with override) and down hill assisted braking.

To meet the exact needs of those using manual wheelchairs, Steve Meginniss, a successful inventor and product developer, and his engineers initiated a Test Pilot Program consisting of Seattle area wheelchair users. These Test Pilots have Magic Wheels on their daily chairs and use them in their every day activities. This program has giving extremely helpful feedback and recommendations on how to make the wheels lighter, easier to install and better looking. For example, the hill holding was shown as a way to limit the strain on shoulders when climbing so was incorporated as a feature into the wheels. It was also recommended to develop a Double Handrim option which when put on Magic Wheels gives the user a true 4 speed wheelchair wheel. This Double Handrim has become so popular it is the standard option on all new Magic Wheels.

Over the last 9 years Magic Wheels have gone through many changes and facelifts to develop the most usable and durable wheels possible. Below are pictures of the 4 Generations of Magic Wheels which led to the product which is available today.



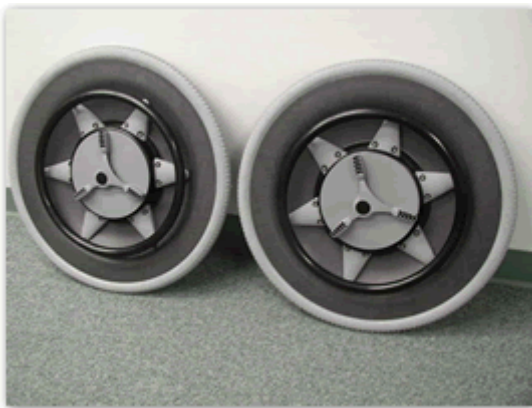
GENERATION 1 - 1999



GENERATION 2 - 2000



GENERATION 3 - 2002



GENERATION 4 - 2004



CURRENT

U.S. Patent 6,805,371; others pending.

The Magic Wheels 2-Speed Manual Wheelchair Wheel are all mechanical wheels providing the user with 2 easily shifted gears for mobility enhancement to navigate ramps, hills and all types of uneven or rough terrain.

Some of the features are as follows:

- No batteries or motors
- Easily adapts to fit most manual wheelchairs
- Adds no width to a wheelchair with standard spokes
- Added weight to your chair per pair of wheels with standard handrims is less than 10 lbs.
- Provides 2-speed drive
 - 1 to 1 pushes the same as a standard wheel
 - 2 to 1 provides 50% easier pushing, has automatic hill-holding feature, plus added braking power when descending
- Popular 4-speed double handrim offered as an option

The design and development of the hypocycloidal reduction gear. This patented technology allows manual wheelchair users to climb grades at half the effort of conventional wheels without the aid of

motors and batteries. With its built in automatic hill holding feature with override, individuals can ascend hills at their own pace.

Magic Wheels caters to both the active user who is in and out of their car all day, as well as those who just need a little assistance getting up and down simple ramps. Everyday use of the 2-speed drive may also lessen the possibility of stress and strain to your arms and shoulders as you push your wheelchair during daily activities.

There have been many studies done on shoulder pain and how wheelchair pushers suffer with pain due to long term manual wheelchair pushing. According to a US orthopedic surgeon, the present cost for rotator cuff surgery is approximately \$15,000 per shoulder that includes surgery and rehab.

Clinical case studies will be presented showing its benefits such as pain reduction, push efficiency and improved functional use in various settings. Many diagnoses may benefit from this wheel such as spinal cord injury, spina bifida, muscular dystrophy, cerebral palsy and other orthopedic and neurological disorders. Presently the adult spinal cord patient with both paraplegia and quadriplegia have greatly benefited from the Magic Wheels. There is great potential for its application in pediatrics as well as in geriatrics and the frail elderly.

In many cases, pushing up an incline can be fatiguing or impossible. In one case study, a gentleman who has purchased an expensive modified van with auto ramp and lowering of the vehicle still had difficulty pushing up the ramp. He relied on his wife to push him thus making him dependent for this transition to his independently driven vehicle.

On a slight but long hill, it has been difficult for some users to make the distance of the total climb, therefore, needing to turn the chair sideways or "power" hold on the hill. The fatigue is why the user is stopping and to simply allow the chair to hold itself gives the end user a tremendous opportunity to rest safely.



What are Magic Wheels?

Magic Wheels are all mechanical 2-gear wheels with no batteries which replace the standard spoke, mag or power assist wheels on your manual wheelchair.

How do Magic Wheels work?

Magic Wheels work very similar to a 2 speed bicycle allowing you to shift into a lower gear before you climb hills or roll over any type of uneven or rough terrain.

They have a simple and easy shifter for users with full or limited hand and arm strength. Plus quick release axles for those who regularly remove their wheels. Bolt on axles may also be adapted.

Another feature is the Hill Holder which eliminates the "Surge Affect" usually necessary when climbing hills or long ramps. While in low gear, the Hill Holding feature engages, allowing users to rest between every push without rolling backwards. This eliminates the



need to keep your momentum going thus relieving undue strain on your upper body caused by surging.

While going downhill in low gear, the braking feature allows for 50% less required force to stop. This substantially increases the stopping power you have with no extra strength required. The braking feature also allows those using vinyl to stop on hills with less "Hand Burn" usually felt with vinyl.

Unlike power assist wheels, Magic Wheels have no batteries and no motors. You only use them when you need them and the remainder of the time your wheelchair works very similar to how it does with standard wheels installed.

Also, unlike power assist products which can add up to 55 pounds to the weight of your wheelchair, Magic Wheels only add around 10 pounds depending on which handrim options you choose; 8.12 for the lightest options and 10.5 for the heaviest.

Also available are several handrim options allowing to choose from 2 or 4 speed models, aluminum or vinyl and a variety of quad handrim choices.