

Rowheel wheelchair is pulled to move forward

October 8 2010, by Lin Edwards

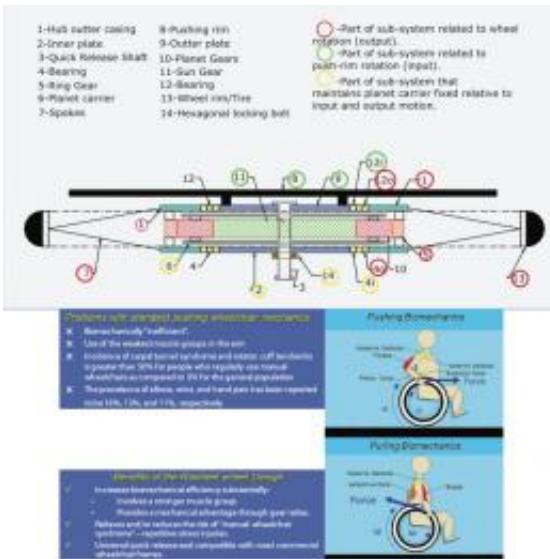


(PhysOrg.com) -- Wheelchairs have a basic problem because the occupant must push the wheels forward to turn the chair's wheels, but this action is physically stressful on the anterior deltoid muscles in the shoulder and the triceps and flexor carpi muscles in the arms. Using these smaller and relatively weak muscles can result in muscle and joint pain and degredation, torn rotor cuffs, repetitive stress injury, and carpal tunnel syndrome. Now a new wheelchair, the Rowheel System, uses the much more natural pulling (rowing) motion to move the chair forward.

Using a pulling motion transfers the loads to the stronger muscles of the upper back, the biceps in the arms, and posterior deltoids in the shoulders, which increases the occupant's range and endurance and reduces the chance of stress injuries.

The system, invented by Salim Nasser of Merritt Island, Florida, uses a planetary gear system in the center of the [wheels](#) that converts the pulling movement of the wheelchair occupant into a forward movement of the chair. The planet carrier motion is attached to the chair frame and a ring gear is attached to the wheel hub fixed in the wheel via spokes. When the occupant pulls the standard rim, which is connected to the planetary system sun gear, the planet gears are engaged, and they in turn engage the ring gear fixed to the wheel hub. The bearings fixed to the inner and outer hub plates have a large bore and small cross-section to allow relative motion between the plates and the hub casings.

Nasser developed the wheelchair design as a university project during his time as a student at the Florida International University. Over a four-month period he constructed a working prototype from standard third-party tires, spokes, rims and bearings. The gear system and hubs were specially constructed.



The Rowheel system can be fitted to any standard manual wheelchair without modifications to the frame, and is easy and quick to dismantle for wheelchair portability. It looks similar to standard manual wheelchairs. Nasser said a commercial version would use a carbon fiber material for the hub, spoke and wheel rim assembly for lower weight and ease of assembly and dismantling.

The design won Nasser the \$20,000 grand prize in the Create the Future Design Contest run by the publishers of the NASA Tech Briefs magazine. The annual contest attracts around a thousand product designs from over 50 countries.

Nasser is now a NASA engineer working at the Kennedy Space Center in Florida. He is a wheelchair user himself, and like 75 percent of people using wheelchairs, relies on a manual [wheelchair](#).

More information: contest.techbriefs.com/compose...

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