The Wheelchair Rocker: A Devise that Provides Sensory Stimulation to Children with

Multiple Handicaps

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INTRODUCTION

The wheelchair rocker (WR) was designed to provide sensory stimulation for children with multiple handicaps. This device is simply a motorized pivoting platform on which a wheelchair can be mounted. Once the wheelchair has been secured to the platform, it can be set into a rocking motion (see Figure 8.1). Upon completion, the WR was presented to the Center for Handicapped Children in Cheektowaga, New York. The children at this center have extremely poor motor skills. Most are not able to even sit up by themselves. Thus, they live a life of virtually no motion. Multiple handicaps frequently lead children to be bored and depressed, and to suffer from poor circulation. Ultimately, the WR is intended to give the children a sense of interaction with their environment.

Insert Photo 1

Note: Final picture size is 2 ½ × 3 inches
Thus, 1 ¼ " is necessary for the picture since it is to fit in one column.

Figure 8.1. The Wheelchair Rocker.

SUMMARY OF IMPACT

The design criteria for the WR were defined by the capabilities of the children and the needs of the center. The physical therapists (PT) are often very busy, and are unable to spend long periods of time with any one child. As a result, the PT desired a self-operative, portable device that both the children and PT will feel safe using. Further, it is especially stimulating for the children as well as convenient if the children themselves have some control over the device. This not only allows the PT to leave the WR unattended for short periods of time, but also allows the children to take part in the decision-making process concerning their interactions with the environment.

TECHNICAL DESCRIPTION

The overall structure of the WR was made from anodized aluminum tubing (1 by 2 by 1/8-inch). The high strength to weight ratio, which is characteristic of aluminum, provided the necessary structural integrity and low weight requirement needed for a portable device. The frame was designed in such a way that all members come together and are welded at 90 degree angles. All additional components of the WR are fastened to the frame by bolts.

The actual rocking of the platform is accomplished by a Grashof four bar crank-rocker mechanism (see Figure 8.2). The driving link in this mechanism is powered by a 1/2 horsepower DC electric gear motor. The motor was carefully selected to assure that it would not stall under the large loads induced by the rocking of child and wheelchair. As a result of the large torque and low speed requirements, the motor is very quiet. Speed control and cost were the two main reasons a DC motor was chosen over AC. It was decided that the PT should have control of the WR's rocking frequency. This is easily accomplished by varying the voltage across a DC motor. Further, the circuit contains a rectifier that converts the AC power from the wall outlet to the DC power needed by the motor.

Insert Photo 2

Figure 8.2. Crank-Rocker Mechanism.

Aside from the motor circuit, a switching circuit was also needed. Since it is unsafe to have large amperage going through switches, a steady-state relay was used to separate the two circuits. In this way, the motor circuit could carry five amps of current while the switches draw only a few milliamps. The WR has four switches, a power switch, a start/stop switch, a switch for the child, and a level-stop micro-switch. The power switch simply turns the machine on. This switch is placed in series with the motor. The start/stop switch is intended for the PT to use. This switch will actually set the platform into motion. The child's switch will differ from child to child, depending on the handicaps involved. Each child has a switch he or she can operate best. Thus, the WR is equipped with a universal jack to accommodate all types of switches. This switch operates in the same manner as the PT switch. The micro-switch is attached to the structure in such a way that the platform will only stop in the level position. Since all of these switches are interdependent, a series of mechanical relays were used in the control circuit to implement the logic.

The cost of parts/material was about $1500.