CHAPTER 12
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Paper Guide

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INTRODUCTION

Confidential documents are normally shredded when the contents are no longer in use. The process involves selecting a single sheet of paper at a time, and guiding it into a paper shredder, which automatically engages the paper for shredding. To enable students with severe disabilities to participate in this type of activity, a paper guide was designed. Upon activation via a switch, a single sheet of paper will be delivered onto a platform and can then be guided down the platform to a shredder by a student with some grasp control. The platform can also be positioned at the proper angle to enable a dispensed sheet of paper to be guided into a shredder, requiring little or no grasp control.

SUMMARY OF IMPACT

The paper guide was designed for students with disabilities. It was intended to help them participate in group projects that require grasp control and other motor skills. The students may work independently or as a group. The first student is 15 years old and has severe developmental disabilities. He has only gross grasp and release capabilities. He cannot pick up one piece of paper at a time. The second student is quadriplegic and has cerebral palsy with severe spasticity. The third student has cerebral palsy and experiences difficulty with grasping. He is a single switch user, and could either grasp a single sheet of paper or slide it along a surface. The fourth student also has cerebral palsy and is confined to a wheelchair. She is a single pillow switch user. Although she cannot manipulate a paper into a shredder, she could participate in a group project by activating a switch. The paper guide was designed to enable the students to participate in a class project involving their dispensing

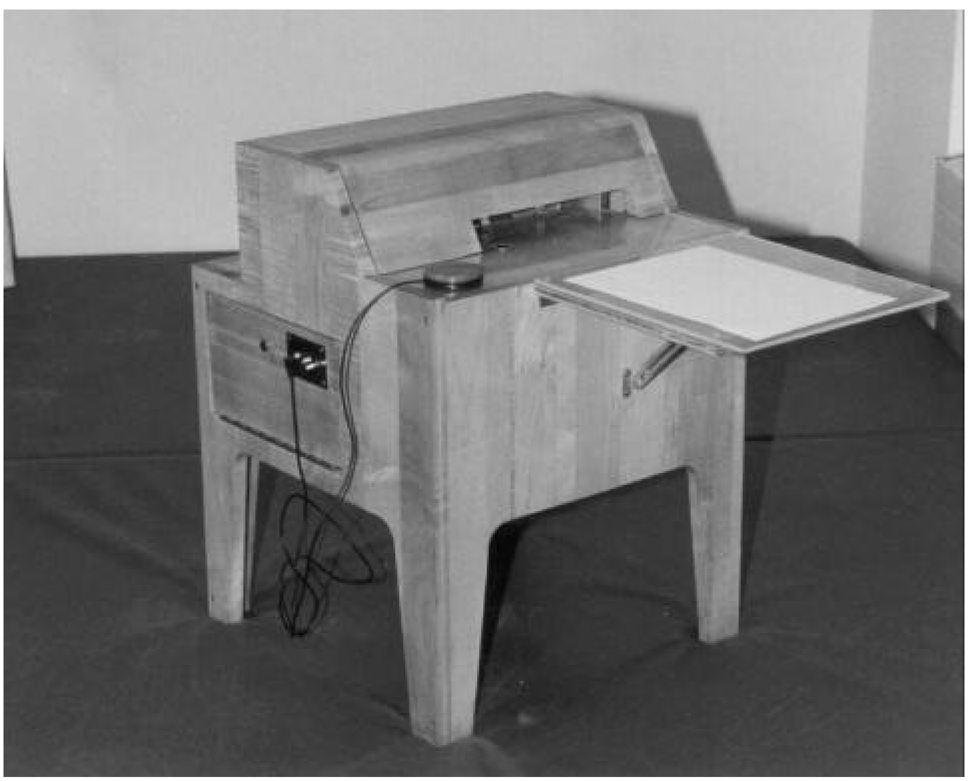

Figure 12.1. Paper Guide.

a single sheet of paper at a time into a paper shredder. The paper guide is shown in Figure 12.1.

TECHNICAL DESCRIPTION

The design consists of a single sheet advance roller. It was designed to articulate with the center of the top, primary drive roller shaft. The vertical position of the single sheet advance pick-up roller is controlled by a push type solenoid, which is activated by the start switch and an infra-red switch. As the advance passes the infra-red switch, the solenoid is deactivated and the spring support shaft returns to the home position approximately .1 inch above the top sheet of paper. Other technical considerations include application of appropriate drive current. The DC Drive Motor and Solenoid require a combined current of 2.6 amps, while the Buddy Button, required due to the students' disabilities, is rated for 1 amp maximum. To apply the appropriate current ratings, a latch/hold relay circuit was implemented. Instead of using the Buddy Button to start the motor and relay directly, it is used to latch a holding circuit, which operates as follows: When the Buddy Button is depressed, the coil of the third and fourth relays are energized. The third relay supplies a path for the current to the fourth and keeps the coil on the forth relay energized, holding the switch closed to the DC Gear motor. This is maintained until the infra-red switch is activated and the circuit is unlatched. Figure 12.2 illustrates the transport (rollers) and control (solenoid and infra-red switch) mechanisms. The total cost of this project is $699.

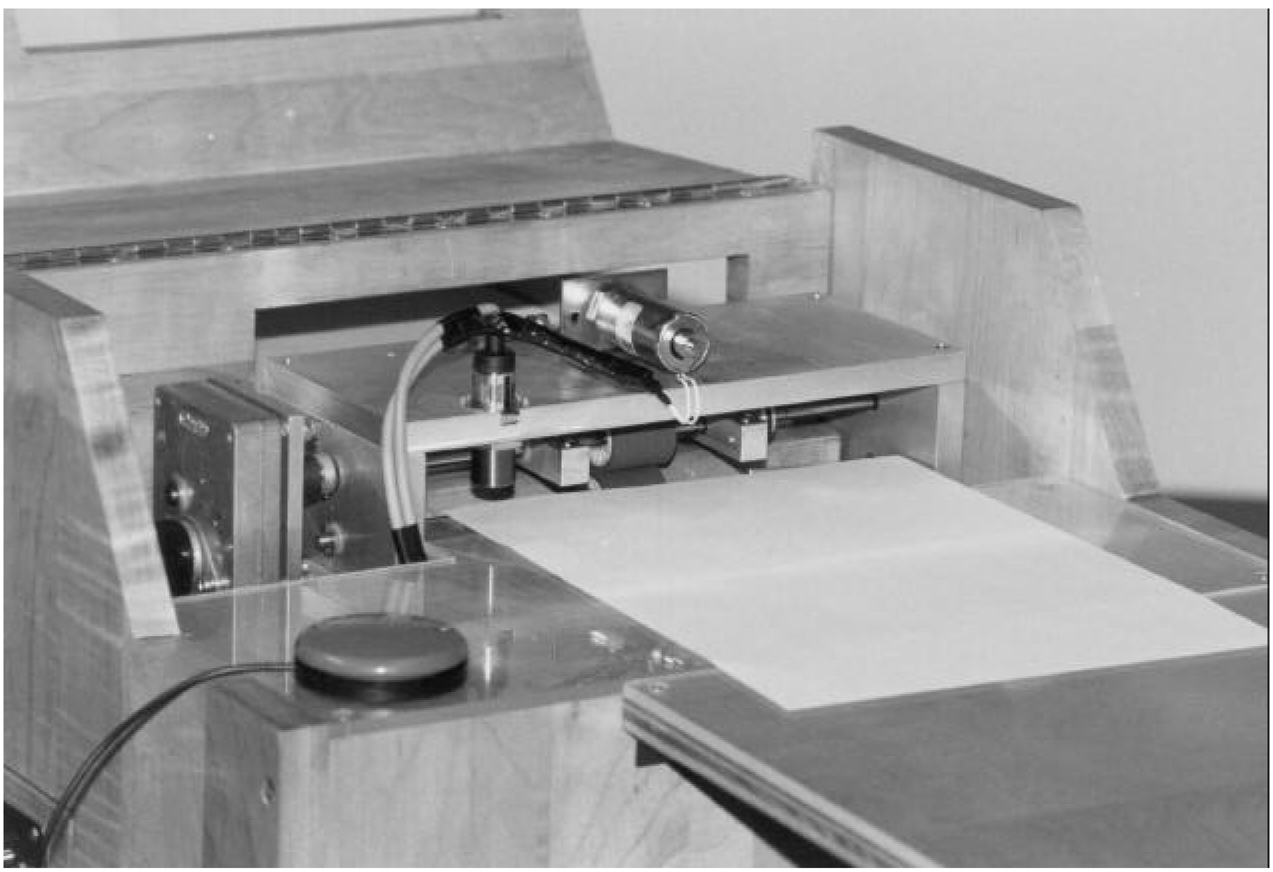

Figure 12.2. Close-Up of the Paper Guide.

Label Position Helper for Students with Cerebral Palsy

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INTRODUCTION

Schools, government agencies and businesses often use mass mailings to disseminate information inexpensively. In most cases, the task of placing labels on envelopes is performed by able-bodied individuals. However, this task can also be performed by persons with disabilities, given the means to achieve this goal. Students at the Wayne County Technology Resource Center currently conduct group mass mailing projects, some of which are funded projects by large department stores. Their teacher requested an assistive device to enable correct and consistent positioning of one-sided sticky labels on envelopes.

SUMMARY OF IMPACT

Children who are unable to position labels correctly are sometimes excluded from mailing tasks by their teachers. This system will enable all the students to be involved in mass mailing projects. In addition to having a positive impact on students' self-esteem, the device may enhance the potential of successful students to obtain employment at agencies that do frequent mailings.

TECHNICAL DESCRIPTION

The design of this assistive device consisted of three components: a mechanical grip, a sliding mechanism, and an electrical staff (solenoid and stop switch). The sliding mechanism is made of wood. The lever arm has an engaged spring under it to push it upward after label application. The lever arm is also on wheels to allow the label dispenser to slide to the place where the label is to be applied. The arm moves towards the dispenser in the medial-lateral axis as shown in Figure 12.3. The total cost of parts for this project was $62.

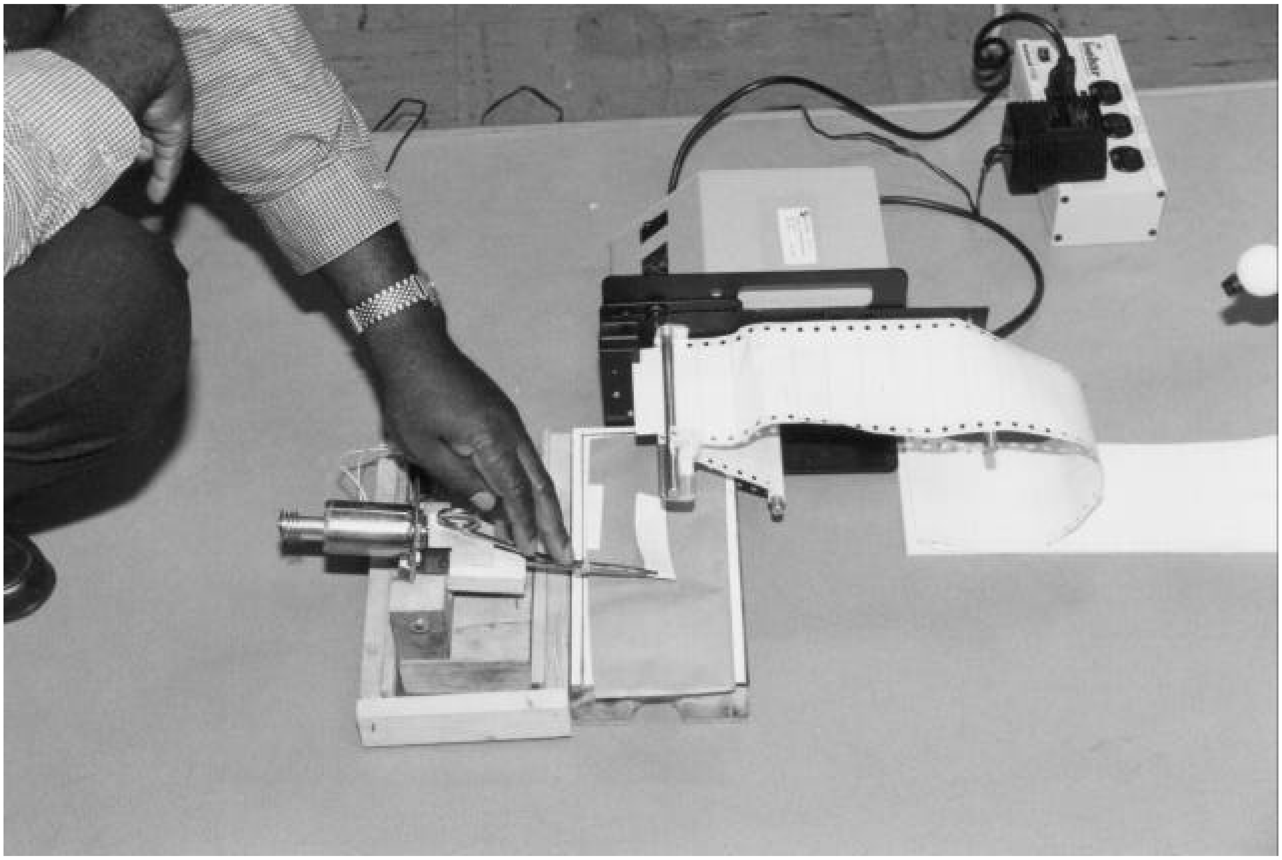

Figure 12.3. Label Position Helper for Students with Cerebral Palsy.

Adjustable Weight Bearing Mobile Walker for a Student with Cerebral Palsy

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INTRODUCTION

A teacher requested a walker for a seven-year-old student with cerebral palsy and spasticity. He needed assistance for walking and protections from falling. The child is about three feet ten inches tall and weighs about 38 pounds. System criteria were that it: 1) support him with his entire upper extremity relaxed (no arm support); 2) allow adjustments for weight support, ranging from no support to full support during ambulation; and 3) allow for height adjustment to accommodate the child's growth.

SUMMARY OF IMPACT

Due to his recovery process following a recent hip operation, the child had not been practicing ambulation. He could only bear his weight while standing still and holding his hands on a bar. The design will assist him in beginning to practice weight bearing while walking at school. When fully weight bearing, he may use the system for safe and independent ambulation around the school. The device may also enhance his confidence and reduce the teacher's burden, such that she is more available to help other students.

TECHNICAL DESCRIPTION

The device was designed to allow the child to walk and yet keep him from falling. The structure should be lightweight and yet sturdy enough to support the child's weight. It should be adjustable to accommodate growth, and flexible to support all or some of the child's weight. The design involved modifying and integrating what is already available to achieve the desired performance for the child. It has two major components: the Ambulating Aid and the Support Harness.

Ambulating Aid:

The KAYE Posture Control Walker from KAYE Products Inc. appeared to be the most appropriate for the application. The "B" frame walker illustrated in Figure 12.4 was chosen since it is expected that the child will often be loading it with his full weight. Swivel front wheels were used to enable frontal ambulation, with the option of being locked, while the back wheels were ratcheted, preventing backward movement. The walker legs can be extended as the child grows. The forearm support is adjustable as the child grows. The Pelvic Stabilizer was used because the child has asymmetrical posture when standing and cannot stay centered. The adjustable lateral pads aid symmetry and control pelvic and trunk alignment. In addition, it will serve as a padded surface to catch the child in the event that he begins to fall while being supported by the harness.

Supporting Harness:

A climbing style harness was chosen to support the child in case of falls. It can be adjusted to support the load fully or partially. However, if it is mounted in the traditional frontal loop (engage and move forward position) it will put too much pressure on the thighs. It was instead mounted in a modified format at the sides of the waist belt. This has a lessened tendency to draw the thighs up and forward and allows free movement of the lower extremities. It was important to ensure that it be practical for the child to get into and out of the walker and harness. This was accomplished by using a locking C-ring and an eye bolt, which enables the child to put on the harness before using the walker. Its only connection with the walker is between the locking C-ring in the harness and the eye bolts in the walker. The total cost of this project is $550.

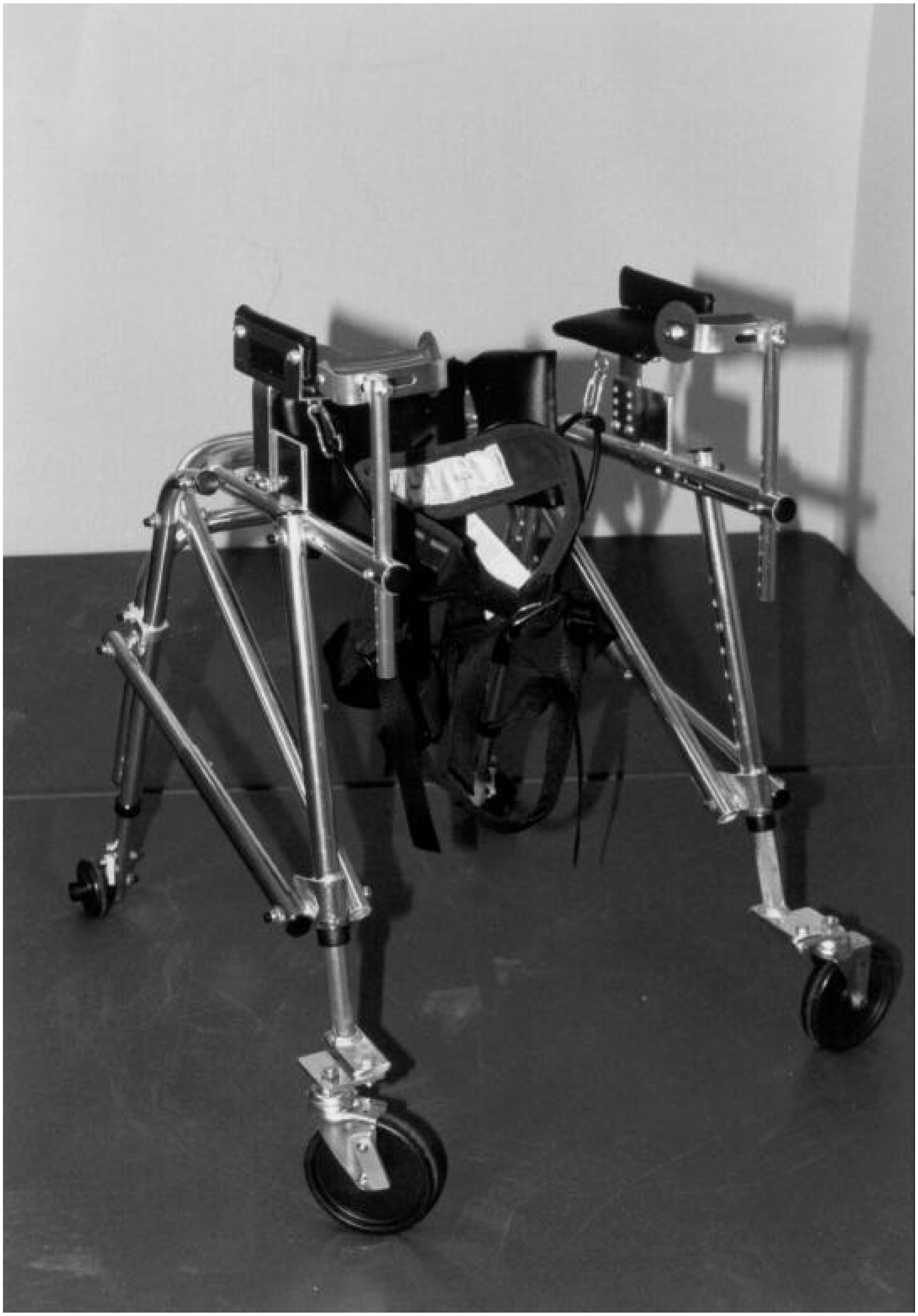

Figure 12.4. Adjustable Weight Bearing Mobile Walker for a Student with Cerebral Palsy.

Evac Chair Adaptation For Horizontal Patient Transport

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INTRODUCTION

When there is a house fire in a multi-level building, occupants take the stairs to the ground level, and then quickly move to a safe location away from the building. The Evac Chair was developed to enable the evacuation of persons with disabilities down the stairs to the ground level, and for their transport to a safe location.

This chair works very well for transporting persons with disabilities down the stairs. However, it is very difficult to use for transporting occupants to a safe location on a horizontal plane. Figure 12.5 shows the use of Evac Chair without adaptation. Figure 12.6 shows the use of Evac Chair with adaptation to facilitate easy transport of occupants across level ground.

SUMMARY OF IMPACT

The adaptation to the EVAC Chair was designed not to affect its performance as a down-the-stair evacuation system, for which it was originally developed. The adaptation offers the user a quick conversion mechanism from its original mode of use to a system for easy transportation of occupants across level ground. Figure 12.7 shows the impact of the use of the system with and without adaptation on the right bicep muscles. Similar dramatic reduction was seen in the left hand. The adaptation has a definite positive impact on people who use the system to evacuate persons with disabilities from multi-level buildings to safe grounds.

TECHNICAL DESCRIPTION

The first challenge was to design the adaptation so that it would not interfere with the normal operation of the chair, which works very well for transporting occupants down stairs. The second was to be able to deploy the adaptation quickly once on level ground. The third was that the adaptation be able to support the distributed weight of the passenger, lessening the burden of the person pushing the chair. Implementation was to enable quick conversion of the device from a two-wheel wheelbarrow-type design (Figure 12.5), to a four-wheel baby carriage type design (Figure 12.6).

Figure 12.5. Photograph of Evac Chair Adaptation.

Additional Wheels: The two additional wheels, which rotate about a 3/8-inch solid round axle, are supported on either side by 1-inch aluminum square tubing. On the opposite side of the axle and wheels, the tubing attaches through holes in the two square tubes to the solid round bar already existing

Figure 12.6. Use of Evac Chair with Adaptation to Facilitate Easy Transport

on the chair. The two square tubes also rotate about the existing round bar when they are released. After the square tubes and wheels are released, they lock vertically into place by means of a half-moon bracket and spring-loaded pushpin plunger. The bracket is screwed onto one of the square tubes and is grooved with a hole at the top for the pushpin to lock into when the bar is vertical. The pushpin (3/5-10 thread standard spring plunger), which is screwed into a support bracket located on the existing aluminum mainframe of the chair, will positively lock the square tubes into place when the push pin locks into the hole in the top of the bracket. This pin will prevent the square tubes from rotating once they are released and provide stability for the chair during movement.

Quick Release: The lever, from a standard bicycle hand break and cable system, is mounted via a hose clamp near the handles so that the person moving the chair can retain a firm grip on the chair when releasing the two wheels. When the lever is activated, the cable, which is attached to the lever and under tension, activates the standard spring plunger (3/4-10 thread) supporting the square tubes.

Locking Mechanism: The latch, which is a 3/4-10 thread standard spring plunger, is at rest when the plunger is supporting the square tubes. The plunger, when at rest, locks into a hole on the side of the square aluminum tube, locking the tubes into position. When the lever is activated, the tensioned cable applies a pulling force on the spring plunger, which compresses the internal spring. When this happens, the plunger moves from its position at rest, allowing the square tubes to fall from their supported position. The cost of this project is $157.

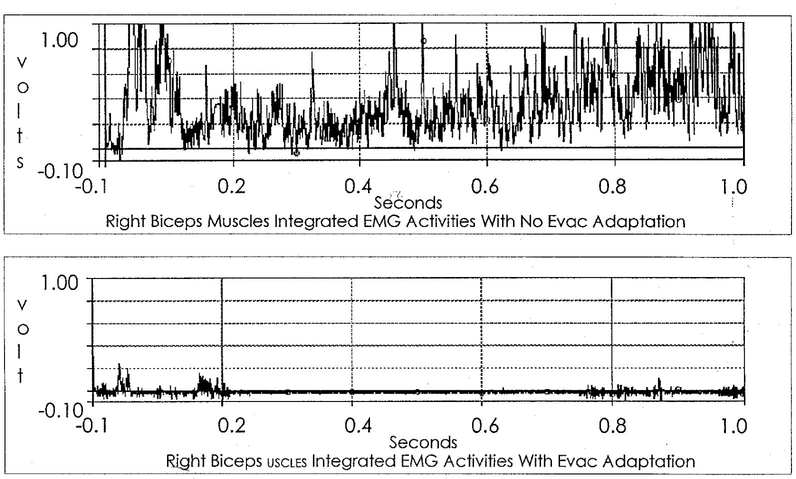

Figure 12.7. Use of the System with and without Adaptation on the Right Bicep Muscles.