CHAPTER 4
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Light Interaction Board

Designers: Marc Mauro, Peter Sawicki, Chris Shuler
Client Coordinators: Anjum Lome and Dan Schipf, Brandywine Nursing Home, Briarcliff Manor, NY
Supervising Professor: Dr. Daniel W. Haines
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INTRODUCTION

Some stroke victims can be helped by therapy that includes exercises in eye/hand coordination. Light interaction boards are devices that incorporate the matching of colored lights and geometric shapes. Typically, a therapist poses a geometric form or color and the patient attempts to indicate recognition by matching the required aspects by means within the capability of the patient.

SUMMARY OF IMPACT

Anjum Lome, an occupational therapist at Brandywine Nursing Home, requested a light interaction board for use with her patients. She gave the initial specifications and contributed criticisms as the project evolved. She is pleased with the outcome.

Figure 4.1. Photograph of the Light Interaction

TECHNICAL DESCRIPTION

The product is composed of three components: 1) the display board, a large wall-mounted board containing the assortment of colored lights and shapes; 2) the patient response board, a desk top board with the pattern that matches the wall-mounted board used by the patient; and 3) the control panel used by the therapist. Twenty-two shapes consist of stars and circles and five colors range from red to purple.

Figure 4.2. Light Interaction Board after Installation on the Wall.

These three elements are shown in the background and in the hands of the designers in Figure 4.1.

Figure 4.2 shows the Light Interaction Board after installation on the wall of the Brandywine recreation room. The cables that connect the patient response board with the control panel are sufficiently long that they can be located as desired for convenience.

Figure 4.3 shows a schematic of the circuit for the elements. The front panel of the display board is ¼-inch thick pressboard. The back panel is a 5/8-inch thick sheet of particleboard. The frame is constructed of red oak. The inside of the display board is made accessible by the use of studs and wing nuts. The display board lights were attached inside the frame and covered with shapes of varied colored Plexiglas. The lights were placed inside silver cups and spray painted silver, so that the light bulbs reflect as much light as possible. The cups also confined the light so that no lights other than that intended are illuminated. The front panel is painted black to ensure that the lights are easily seen. The black color did not please all involved, but this problem was resolved through the artistic talents of one of the designers. It was agreed to regard the black field as representing outer space. Solar systems, consisting of planets and stars were painted on the board. The outcome delighted all.

The patient response board was constructed of the same wood as the display board. The switches were mounted inside the box below the top sheet of wood. The wires were connected to the switches. This board was then mounted inside the box with all wires protected. Holes were drilled in the top to match the location of the switches. This was a critical step in order for a peg placed in the hole by the patient to match the button below. These pegs are 1.25 inches in diameter and 2 inches long. The patient response board is painted to match the display board. The switches are single pole, single throw and momentary push button that are normally closed. Until the switch is pressed, there is a constant flow of electricity. If the patient places a peg in the wrong hole, nothing happens. However, if a patient places a peg in the correct hole, the corresponding light goes off. Figure 4.4 shows some detail of the patient response board.

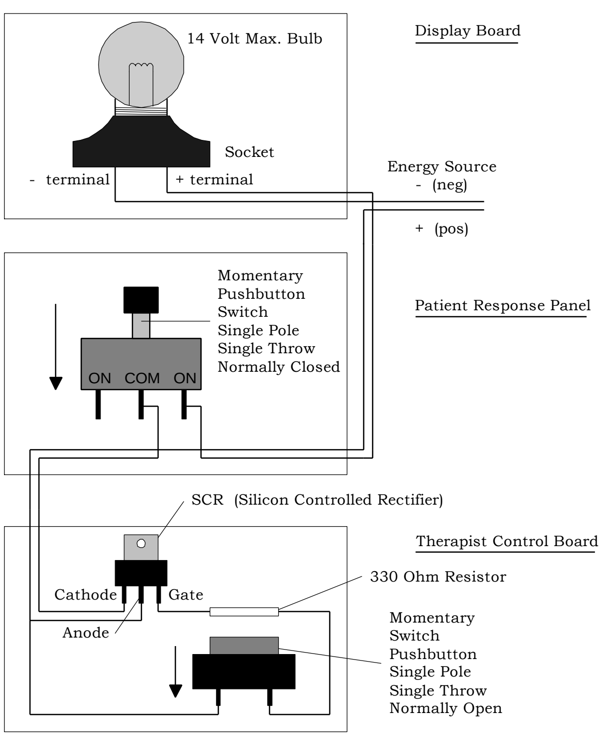

Figure 4.3. Schematic of Circuit for the Light Interaction Board

The control panel enables the therapist to turn on as many lights as he or she wishes within the range of one to 12. The control panel was purchased from Radio Shack. The power source is a 12 volt battery. This panel has single pole, single throw, normally open push-button switches. These switches are positioned in the same pattern as the display board. Silicon controlled rectifiers (SCR) were incorporated in the circuits to allow lights to be illuminated only by the therapist. The SCR acts as a gate. When the therapist's switch is pressed, the gate closes and the circuit is closed. Since the gate has a nine-volt limit, a 330 ohm resistor was placed in the line. When the patient presses the correct switch a pulse sent to the SCR opens the gate. This breaks the loop and shuts off the light. Figure 4.4 shows some detail of the control panel.

The cost of the Light Interaction Board is $412.

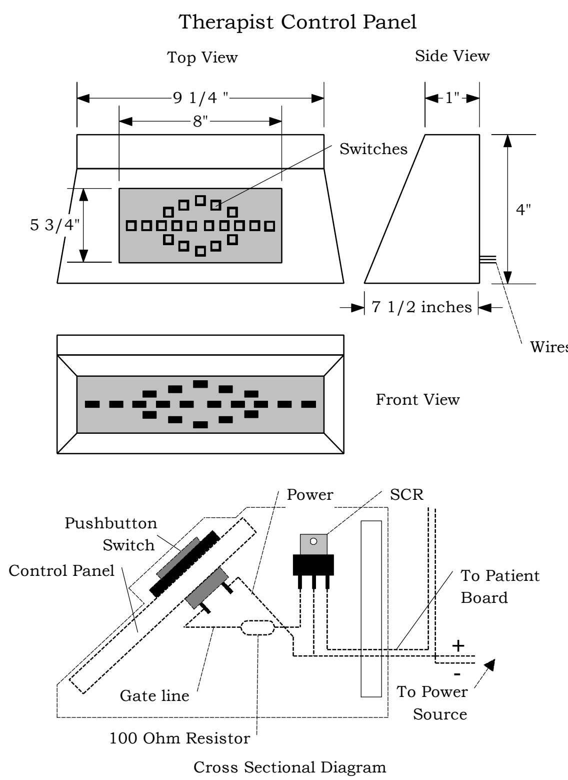

Figure 4.4. Details of the Control Panel.

Up 'N Down Adjustable Table

Designers: Chris Cantelmi, Eugene Hundertmark, Peter Slater
Client Coordinators: Susan Holmes, OT, Dan Schipf
Brandywine Nursing Home, Briarcliff Manor, NY
Supervising Professor: Dr. Daniel W. Haines
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Riverdale, NY 10471

INTRODUCTION

People who were once active gardeners, but have suffered a physical disability, can receive great satisfaction by resuming activities such as setting plants in soil and trimming and watering plants. Susan Holmes, a horticultural therapist at Brandywine Nursing Home, requested a custom-built table with specific dimensions and adjustments for the greenhouse.

SUMMARY OF IMPACT

Wheelchairs are of varied heights. The tables in the Brandywine greenhouse are fine for use with small wheelchairs; however in order for residents in large wheelchairs to use the tables, the tables had to be raised by stacking books beneath them. A table with adjustable height was preferable. The table had to have wheels so that it could be placed in the desired position by Ms. Holmes and so that the residents did not have to maneuver around it in their wheelchairs. Finally, the table had accommodated all wheelchairs. The adjustable Up 'N Down table was the result, and it is now in regular use in the Brandywine greenhouse. It has provided all of the functions requested by the coordinator.

TECHNICAL DESCRIPTION

Figure 4.5 shows the three designers standing behind the Up 'N Down table. The adjustable table is based on a C-shaped frame of aluminum square tubing. The connections are welded, rather than bolted, for greater strength. In order to provide adjustability, the lower section of each leg is constructed of one-inch (nom.) tubing and the upper portion of each leg is constructed of ¾-inch tubing. This allowed the upper part of the leg to slide in and out of the lower half, creating a telescoping motion. The legs have gussets welded to the joints for additional strength. The legs are joined by two cross bars, one at the base and another about midway up from the base. A side view of the table is seen in Figure 4.6.

Figure 4.5. Photograph of the Up 'N Down Adjustable Table.

To provide the means to adjust the table height, a Fulton marine trailer jack was chosen. The jack originally had a single wheel at the bottom and a hinge on the side, but these were removed, leaving only the crank and shaft. The bottom of the jack is bolted to the cross bar on the legs. The cap at the top of the jack is screwed to the underside of the table. The jack, when cranked, can provide a 9.5-inch range of vertical motion. A clamp that fit around the jack cylinder was bolted to triangular braces that were in turn bolted to the back of the legs. This system was installed to ensure that the table remained horizontal as the height was adjusted. The bracing system, jack and crank are shown in Figure 4.7.

The dimensions of the table top, 32 by 19 inches, were determined by Susan Holmes. The top is a store-bought Formica-laminated wood panel, cut to the specified size. The corners are rounded and black rubber molding is glued along the edges. Plastic stoppers are placed in the tube ends to prevent harm to the residents. Stock wheels were obtained and attached to the legs. The frame is painted greenhouse green.

Cost of materials is $200.

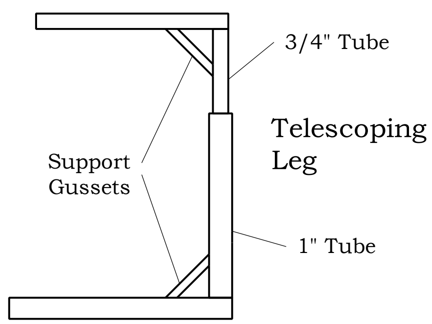

Figure 4.6. Side View Mechanical Drawing of the Up 'N Down Adjustable Table.

Figure 4.7. Another view of the Up 'N Down Adjustable Table.

Skill Saver Busyboard

Designers: Joseph DeNivo, Jennifer Nold, Peter Murphy
Client Coordinators: Laura Meza, OT, Dan Schipf
Brandywine Nursing Home, Briarcliff Manor, NY
Supervising Professor: Dr. Daniel W. Haines
Mechanical Engineering Department
Manhattan College
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INTRODUCTION

Busyboards are panels on which everyday objects are fixed; they serve to stimulate and amuse people with limited skills. Design considerations required that it have:

- smooth edges
- padded surfaces
- securely fastened elements
- multiple and interchangeable boards
- removal provision positioned low to the base
- no loose objects

and be:

- lightweight (less than 20 pounds)
- durable
- capable of being securely fastened to a wheelchair

and provide:

- practice of typical daily skills
- sense of satisfaction
- challenge

SUMMARY OF IMPACT

The Skill Saver Busyboard meets the requirements above and is in regular use at Brandywine Nursing Home. It provides the anticipated activity for those in need of its features.

TECHNICAL DESCRIPTION

The Skill Saver Busyboard is comprised of two boards, each with a set of objects. The two boards fit in a frame and are interchangeable. The center board shown in Figure 4.8 shows the Skill Saver Busyboard with Board 1 in place. Board 2 is shown to the right. The three individuals are the designers.

Figure 4.8. Skill Saver Busyboard.

The busyboard is framed with one by two-inch poplar, forming a rectangle 21 inches high and 20 inches wide. On the inside surface of the frame, a channel was cut ½ inch wide by 3/8 inch deep, and the frame can be opened from the side to accommodate the interchangeable boards. The base is an 8 by 18 inch piece of birch, ½ inch thick mounted on two feet of poplar. The frame weighs four pounds 12 ounces without the busyboard in place, which is light enough for the staff to move and mount to the wheelchairs.

The two interchangeable boards are constructed of ½-inch thick plywood with dimensions of 18 by 20 inches. All edges were beveled in order to slide the boards into the frame.

The components of Board 1 permit a variety of manipulations: the slide locks allow for linear motion; the key lock provides rotational motion along with the opportunity to manipulate small objects; the door knob and mechanical valve present opportunities for rotational motion at different angles. A drawing of Board 1 is shown in Figure 4.9.

Board 2 contains cabinet doors that require a pulling motion, light switches that require a force in two directions, and a shoelace that requires a threading motion and dexterity in tying a bow. The flashlight bulbs operated by the switches are powered by two AA batteries accessible from the back of the board. A drawing of Board 2 is shown in Figure 4.10.

The cost of materials for the Skill Saver Busyboard is $200

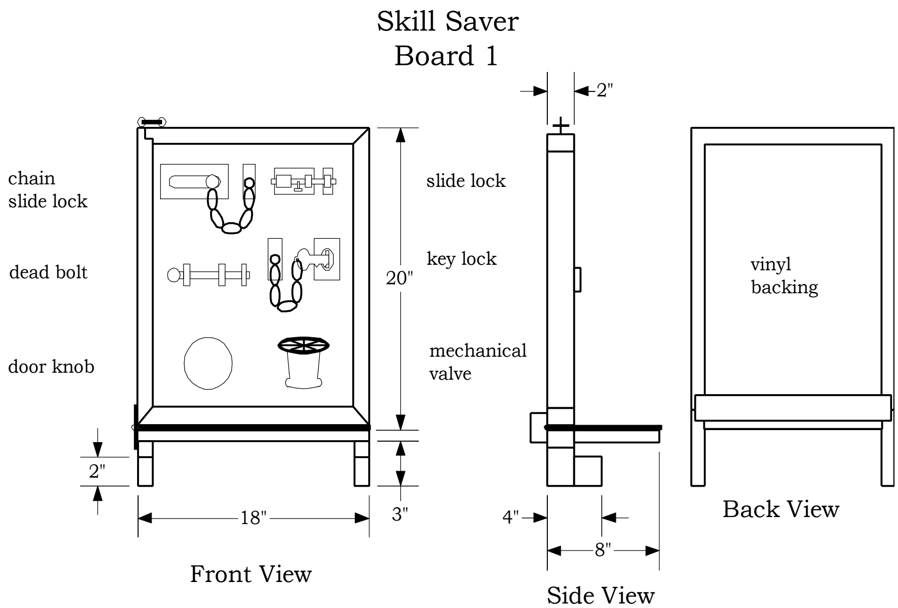

Figure 4.9. Drawing of Board 1.

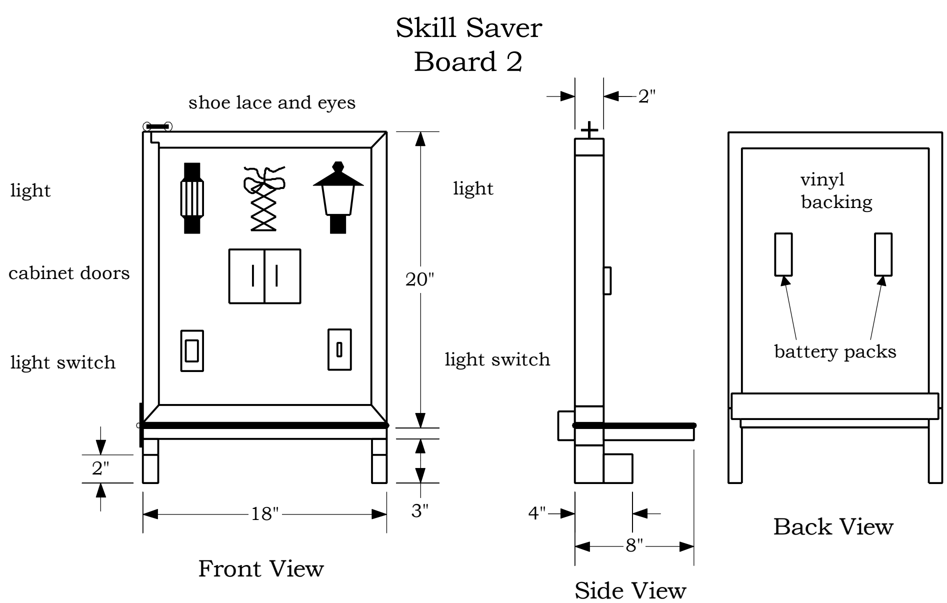

Figure 4.10 Drawing of Board 2.

GEO on the Go

Designers: Christina Curry, Richard Eskew, Katherine Giles
Client Coordinators: Margaret Mann, PTR, Anjum Lome, OT, Dan Schipf
Brandywine Nursing Home, Briarcliff Manor, NY
Supervising Professor: Dr. Daniel W. Haines
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Manhattan College
Riverdale, NY 10471

INTRODUCTION

People who have experienced a stroke or have a brain injury tend to lose their motor coordination and their ability to grasp objects. In order to relearn such abilities, a puzzle board with various shapes and colors to match proves helpful to the therapist. Margaret Mann, a physical therapist at Brandywine Nursing Home, knew of certain products available for purchase, but none that met the particular requirements she had in mind. She requested a board that could be mounted on the wall and adjusted in height. The puzzles would optimally have elements with a variety of sizes and shapes. The GEO Puzzle was designed and constructed to meet her request.

After working with the GEO Puzzle for a year, Margaret Mann requested that the mechanism be motorized. This was accomplished with a system operated by push buttons. The GEO on the Go is the successful result.

Figure 4.11. GEO on the Go.

SUMMARY OF IMPACT

The GEO on the Go is mounted on the wall in the recreation room of the Brandywine Nursing Home. It has proved to be a useful and needed enhancement to the original GEO Puzzle. Therapists Margaret Mann and Anjum Lome use it with one or more residents on nearly a daily basis.

TECHNICAL DESCRIPTION

Figure 4.11 shows the three designers with the Geo on the Go.

Vertical motion of the Geo Puzzle is now provided by means of a one inch diameter power screw, 4-1/2 feet long with four threads per inch. It is mounted at the top with a simple wood block and at the bottom with a lubricated pillow block that decreases the friction of the turning screw. The ball bearing nut that travels on the screw is encased in a wooden housing that is attached to the Geo Puzzle by a piano hinge.

The screw is powered by a 200 rpm brush motor operated by a three-way toggle switch under the motor housing. In the neutral position the motor is off. The board moves down when the switch is moved towards the wall and up when moved toward the therapist. Green LEDs on the side of the motor casing indicate the direction of board movement. Limit switches are at the top and bottom of the range of movement of the board. Red LEDs on the side of the motor casing are illuminated when the limits have been reached. These limits prevent the screw from jamming when the ball reaches the extreme positions. The detailed schematic of the circuitry is presented in Figure 4.12.

To engage the table function for use by a patient, the board is lowered to a low position. The bottom of the board is then pulled out while the top pivots on the piano hinge. Support legs, which are attached to the back of the board, are then swung into position and the board is in position for use by the patient. This position is represented in Figure 4.13.

The cost of the Geo on the Go is $306.

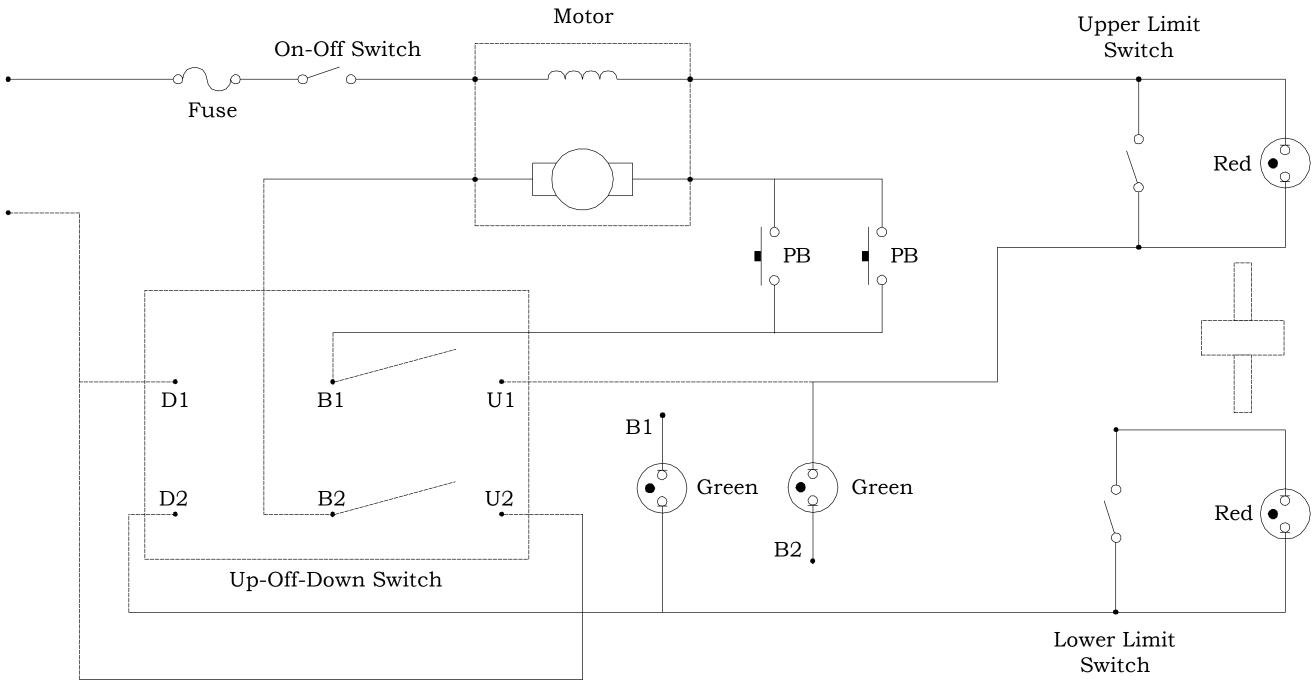

Figure 4.12. Detailed Schematic of the Circuitry for GEO on the Go.

Figure 4.13. Another View of GEO on the Go.

ADL Busyboard

Designers: Lee Pavone, Jeffrey Shutz
Client Coordinators: Laura Meza, OT, Dan Schipf
Brandywine Nursing Home, Briarcliff Manor, NY
Supervising Professor: Dr. Daniel W. Haines
Mechanical Engineering Department
Manhattan College
Riverdale, NY 10471

INTRODUCTION

The basic requirements for busyboards are discussed earlier the section on the Skill Saver Busyboard. In this case Laura Meza, an occupational therapist, requested one for residents when working at a table. The term "ADL" stands for "activities of daily living."

SUMMARY OF IMPACT

The ADL Busy Board is in everyday use at the Brandywine Nursing Home.

Figure 4.14. ADL Busy Board.

TECHNICAL DESCRIPTION

Given that the ADL busyboard is to be used on a table surface, a wider space was provided to enable two panels to be mounted simultaneously. In order to provide greater variety, a third panel is available with different objects mounted on it. The three panels are interchangeable. Figure 14 shows the three panels on display, held by the two designers. The ADL busyboard with two panels in place is at the right.

Figure 4.15. Another View of the ADL Busy Board.

Another view of all components is shown in Figure 4.15.

Items selected for use in this busyboard included a kitchen faucet, and the items were mounted on two panels to provide variety. The ADL busyboard is 30 inches high and 22 inches wide. The objects are mounted on two panels each of ½-inch plywood, 21 inches high, 13.5 inches wide. For the panels to fit and be installed conveniently, slots were created in the side rails of the frame by dado cuts. The slots are ½ inch wide by 3/8 inch deep.

Figure 16 shows the dimensions of the frame of the ADL busyboard.

The cost of materials for the ADL busyboard is $169.

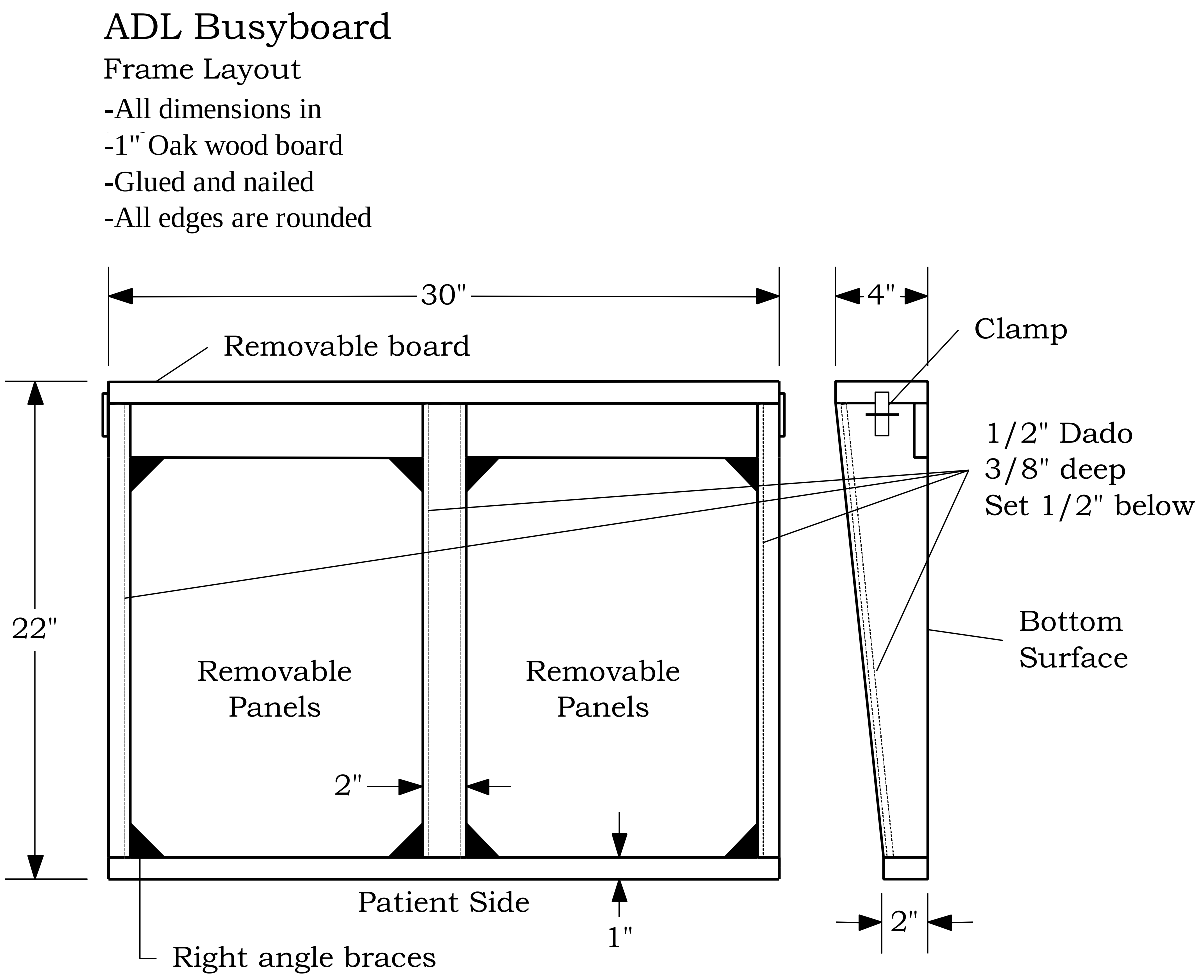

Figure 4.16. Mechanical Details of the ADL Busyboard

Repairs and Enhancements of Mr. Shifter and the Voice Activation of System of Waterworks III

Designers: Patrick Gordon, Alfred Nagib, Robert Kostadina
Client Coordinators: Susan Holmes, OT, Dan Schipf
Brandywine Nursing Home, Briarcliff Manor, NY
Supervising Professor: Dr. Daniel W. Haines
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INTRODUCTION

Mr. Shifter

Some gardeners with disabilities have difficulty handling the tools to transfer soil to a pot. Susan Holmes, OT at Brandywine Nursing Home requested a means to enable such people to perform a meaningful task related to the need. It was determined that if the gardener could operate the controls to transfer soil from a hopper to the pot, that contribution would be significant. The product produced by the designers is Mr. Shifter, a machine that contains at the base of the hopper an opening that allows soil to drop through and be received by a horizontal rotating auger. The rotating auger carries the soil horizontally to be deposited in the flowerpot. The auger is turned by an electric motor that is controlled by adapted switches developed previously for such projects as Waterworks. As original delivered the previous year, the motor operated under severe strain and the device vibrated excessively. The designers undertook the task of resolving these problems.

Waterworks III

Waterworks is a series of products developed for Brandywine to water plants. As its name indicates, Waterworks III is the third generation of this series, developed in the spring term of 1995. Its distinctive enhancement is a system of voice activation for use by residents with severe limitations of hand dexterity. During the summer of 1995, it was reported to us that the voice activation had ceased to operate.

SUMMARY OF IMPACT

As delivered in 1995, Mr. Shifter transferred soil only at the highest speed. The reduced speed range under load was determined to be a result of friction and path of soil transfer, two factors that had been

Figure 4.17. Photograph of Repairs and Enhancements of Mr. Shifter and the voice activation of system of Waterworks III.

underestimated. In addition, the unit vibrated excessively and was extremely noisy. Both of these problems have been resolved and Mr. Shifter is now a valued addition to the greenhouse.

The designers found that the reported problem with Waterworks III could be solved by simply replacing a drained battery in the circuit. However, they undertook a program to aid future investigations should more problems occur with the voice activation unit.

TECHNICAL DESCRIPTION

Figure 4.17 shows the repaired and enhanced Mr. Shifter, the voice activation system of Waterworks III, and its three designers. In the hand of the Patrick Gordon, the central figure, is the microphone for Waterworks III. These elements of the two projects are shown together since the voice activation is a versatile switching unit and can operate Mr. Shifter as well as Waterworks III.

Figure 4.18. The New Mr. Shifter.

The friction problem of Mr. Shifter was resolved by replacing the original 1-inch diameter pipe with a larger 1.25-inch diameter PVC pipe. Also, the slope to the entrance to the auger was altered to allow the soil to settle into the teeth. The vibration problem was nearly eliminated by this modification, and the noise level was made fully satisfactory by the addition of DynaMat vibration damping material to the panels of the bin.

The new Mr. Shifter is shown close-up in Figure 4.18. Visible is the new 1.25-inch white, horizontal, PVC pipe that serves to conduct the soil from the bottom of the bin to the end of the pipe where it drops into the pail.

Also in the photograph are the essential elements of Waterworks III, the white case containing the circuitry and the microphone with its decorative flower.

As part of the project, the designers developed a diagnostic flow chart in order to aid future project designers to trouble shoot the voice activation system. This flow chart is shown in Figure 4.19.

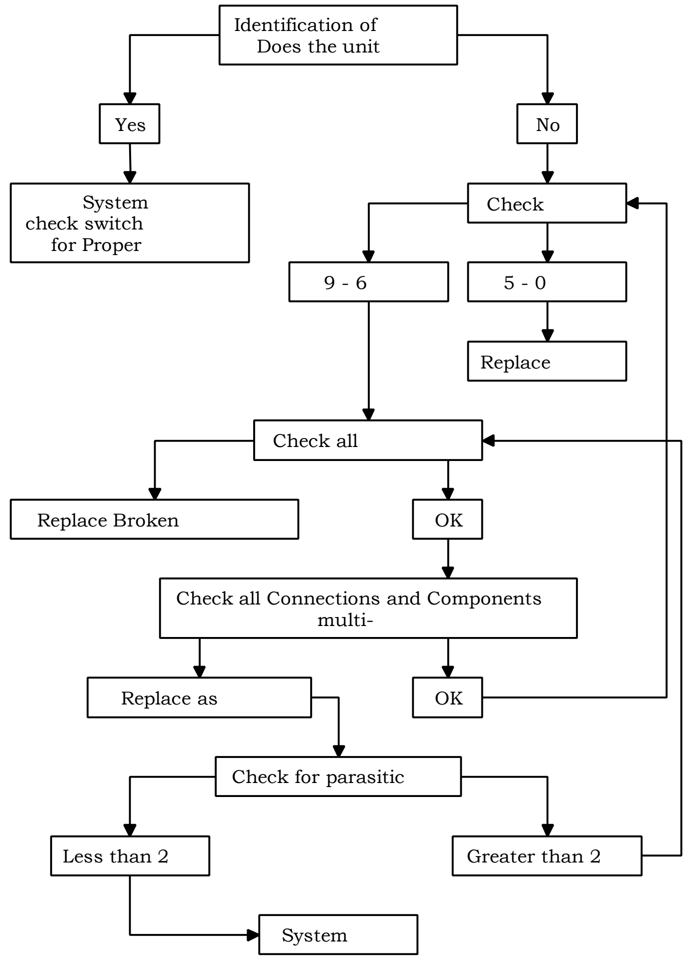

Figure 4.19. Flow Chart.

The total cost of the materials for the repairs and enhancements to Mr. Shifter and Waterworks III is less than $100.

Kite and Blimp Flying Machine for a Person in a Wheelchair

Designers: Marc Mauro, Chris Shuler, Peter Slater
Client Coordinator: Dan Schipf
Brandywine Nursing Home, Briarcliff Manor, NY
Supervising Professor: Dr. Daniel W. Haines
Mechanical Engineering Department
Manhattan College
Riverdale, NY 10471

INTRODUCTION

Hobbies are crucial activities for people with disabilities. Before his diving accident, the client enjoyed flying kites. He expressed the desire to be able to do this activity again from his wheelchair. The designers drew on their knowledge of fishing equipment and planned to mount a downrigger to the wheelchair. Starting with this possibility, they dealt with the power and safety aspects, and decided on a battery operated system that did not depend on the power of the chair. In the course of development they introduced the concept of helium balloons both to launch the kite and to provide additional entertainment.

SUMMARY OF IMPACT

The specific requirements met are:

- The unit fits on the wheelchair securely; and
- Problems of liftoff and retrieval have been minimized.

The client spent several days with the designers, trying out several kites and balloons. He now has the system available to him.

Figure 4.20. Kite and Blimp Flying Machine for a Person in a Wheelchair.

Figure 4.21. Client with Pole Mounted on Chair.

TECHNICAL DESCRIPTION

Figure 4.20 shows the three designers with the essential components of the fishing equipment and kite used in the project. The kites and blimp are controlled by a fishing pole, six feet long, attached to the wheelchair and outfitted with an electric reel. Experiments were conducted with state-of-the-art fishing equipment until an optimum combination was found. The resulting apparatus consisted of an aluminum holster to hold the base of the pole that fits neatly on the wheelchair. The holster had a swivel feature that is well suited for the client's needs. After experimentation, it was determined that he would require an extremely light kite. Four such light kites were purchased and were found useful. Also, the designers contributed the concept that the project should include objects lighter than air to provide amusement, i.e., mini-blimps. These were constructed and proved to be a welcome feature. Figure 4.21 shows the client with the pole mounted on his chair and one of the mini-blimps, the Star Trek Mylar balloon, hovering overhead.

Figure 4.22 depicts the assembly of components for the project, including the manner of attachment of the fishing pole to the chair and the position of the battery.

Initially, the wheelchair battery was considered as the power source as it had been in earlier projects, e.g., Batteries not Included (1992). However, analysis proved that the kite flying machine would likely drain the battery quickly and that an independent power source was needed. This power source consists of a 12-volt rechargeable battery that is capable of providing continuous power for eight hours. The dimensions of this battery are 12 x 8 x 6 inches, very compact for mounting on the wheelchair. Figure 4.23 shows details of the battery placement.

The cost of the Kite and Blimp Flying Machine is $863.

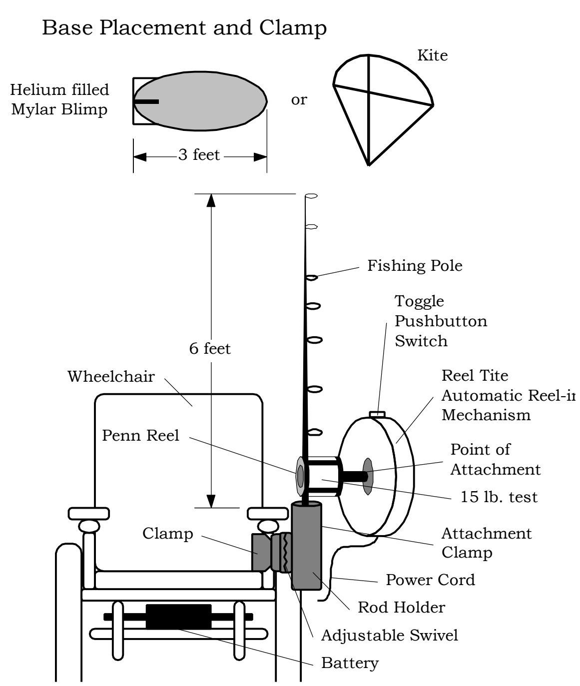

Figure 4.22. Assembly of Components.

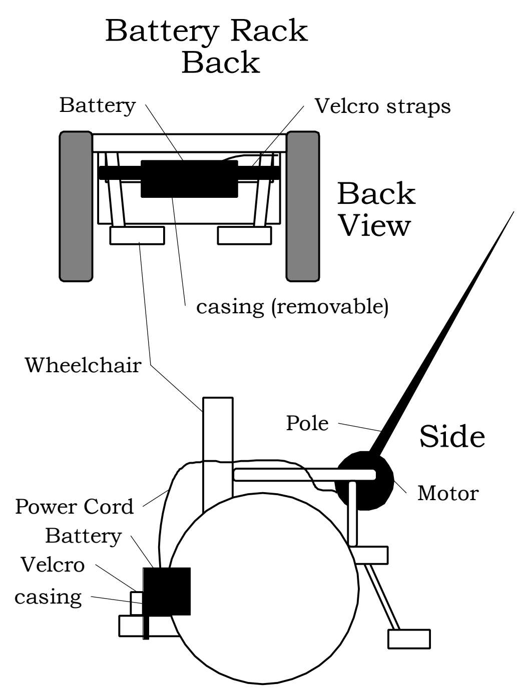

Figure 4.23. Detail of Battery Placement.

Pop-a-Wheelie Hair Washing Stand

Designers: Chris Cantelmi, Eugene Hundertmark, Peter Slater
Client Coordinator: Dan Schipf
Brandywine Nursing Home, Briarcliff Manor, NY
Supervising Professor: Dr. Daniel W. Haines
Mechanical Engineering Department
Manhattan College
Riverdale, NY 10471

INTRODUCTION

Residents of the Brandywine Nursing Home expressed the wish to have a means of washing their hair that more closely resembled normal conditions. The new design involved the ability tilt a person backward with the back of his or head over a basin. Most residents in wheelchairs are unable to be tilted in this way with conventional equipment. The solution was an L-shaped platform on which the wheelchair is mounted. The entire unit, wheelchair and platform are tilted back by means of a hinge and foot pump.

Figure 4.24. Pop-a-Wheelie Hair Washing Stand.

Figure 4.25. Pop-a-Wheelie Hair Washing Stand in Raised Position.

SUMMARY OF IMPACT

This project fell short of expectations because of a misunderstanding of specifications. The designers carried out the project with customary contact and review of progress with the customer. However, when the Pop-a-Wheelie was delivered to Brandywine, it was found to have a back rest that was too high for convenience in the hair salon. This outcome was disappointing, but the opportunity to modify the device during the next year is anticipated.

TECHNICAL DESCRIPTION

After two major design revisions the final design was determined to consist of an L-shaped platform that rotates on a hinge mounted on a portable base. The frame is built of 1.5 inch welded steel tubing. Figure 4.24 shows the Pop-a-wheel Hair Washing Stand in the lowered position with the three designers.

The most important component of the device is the jack mechanism. A Dayton bottle jack was selected; however, it needed modification. A pin connection was needed at the base to allow the jack to rotate with the frame. This was accomplished with modified tubing components and a bolt. The jack originally was operated by hand pumping action. This action was altered with the addition of a foot pedal with a strap. Also a lever was added to the release valve switch to make it easily operated by foot. The travel of the lever was limited so that descent was at a slow, comfortable rate. Figure 4.25 shows the Pop-a-Wheelie in the raised position.

Since the Pop-a-Wheelie had to be portable, wheels were needed. Any available set of wheels required far too much space beneath the platform; the wheelchair would be much too high. The solution was to mount the wheels outboard. This step required special mounts that were also fabricated from the square tubing stock. The front wheels are swivel castors, capable of 360-degree rotation. These castors had foot locks that can lock both the swivel and rotation. A side view of the device with parts labeled is shown in Figure 4.26.

Safety considerations were met by the creation of a railing around three sides with the steel tubing. Also, a safety strap is provided to hold down the front of the wheelchair when the platform is tipped during use.

The cost of the Pop-a-Wheelie is $258.

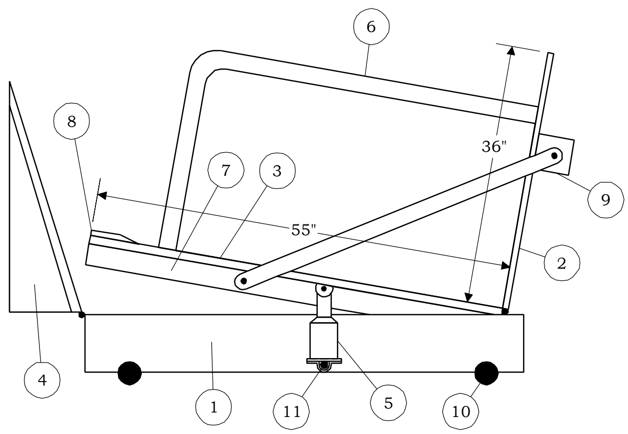

Figure 4.26. Diagram of Hair Washing Stand.

1. Wooden Frame: ¾-inch particle board with 2×4 bracing
2. Platform Back: ¾-inch particle board
3. Platform Base: ¾-inch particle board
4. Hinged Ramp: ¾-inch particle board with 1×1 bracing
5. Dayton Bottle Jack: 2 ton capacity, 6.5-inch vertical lift
6. Safety Bar: 1.24-inch diameter Steel tubing
7. Angle Iron Reinforcement: 1.5×1.5×0.125- inch steel
8. Safety Wheel Chock: angle cut wood stock
9. Angle Iron Mounting Bracket: 1.5×1.5×0.125-inch steel
10. Wheels: Self locking, industrial
11. Jack Mountain Bar: 1×0.125-inch steel tubing

Lazy Susan Plant Watering Device

Designers: Joseph DeNivo; Peter Murphy, Jennifer Nold
Client Coordinators: Susan Holmes, OT, Dan Schipf
Brandywine Nursing Home; Briarcliff Manor, NY
Supervising Professor: Dr. Daniel W. Haines
Mechanical Engineering Department
Manhattan College
Riverdale, NY 10471

INTRODUCTION

Susan Holmes, an occupational therapist, has found the Waterworks devices very helpful in her greenhouse projects. She suggested a new device to allow one resident to apply water to several plants without the need of assistance. The Lazy Susan is a compact device that allows at least four plants to be so treated. It is motorized and operated by the conventional assortment of switches developed for other projects. Technology developed from former Waterworks projects enabled the designers to build another Waterworks tank and pump assembly for use with this Lazy Susan.

SUMMARY OF IMPACT

The Lazy Susan provides the desired versatility to greenhouse activities. It fits, as required, in a 22-inch square area. To meet the request that as much of the device as possible be visible, much of the material is clear acrylic. Finally, as is customary with all greenhouse projects, it was required that the device not depend on line current. Therefore, DC power was provided. Final determination of its acceptability depends on the upcoming feedback from Susan Holmes and the residents.

Figure 4.27. Lazy Susan Plant Watering Device.

TECHNICAL DESCRIPTION

Figure 4.27 shows the three designers with the Lazy Susan and Waterworks unit.

The Lazy Susan consists of a 22-inch diameter circular platform that rotates and forms the surface on which the plants rest. This platform surface is made of clear acrylic and is mounted on a metal rotating base adapted from Lazy Susan cabinet shelving. After several stages in the design process, the drive train selected was a chain and sprocket. A sprocket is mounted on the shaft of a 12-volt DC motor. The second sprocket is mounted on the central axes of the platform. It rotates with the platform. Fig. 3.28 shows a close-up view of the Lazy Susan and companion Waterworks.

A side view of the Lazy Susan with labeled parts is shown in Figure 4.29.

The power supply is a 12-volt, seven-amp rechargeable battery. The high amperage is needed for the requirements of the DC motor.

Since Lazy Susan is to be used in conjunction with the plant watering tasks, the technology for the wa-

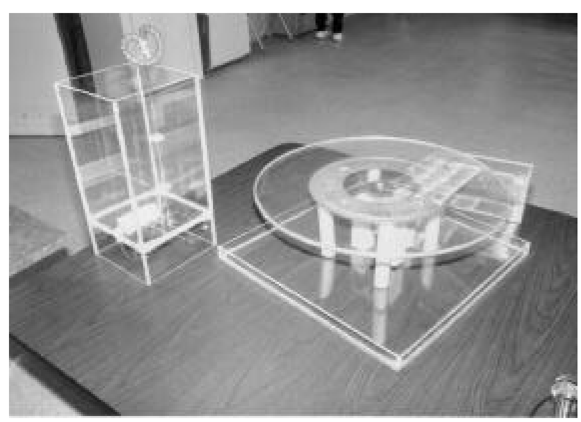

Figure 4.28. Close-up View of The Lazy Susan and Companion Waterworks.

tering operation was borrowed from the Waterworks II project of 1994. A separate Waterworks unit was built for Lazy Susan.

The Waterworks element is featured in Figure 4.30.

The cost of materials for the Lazy Susan is $356.

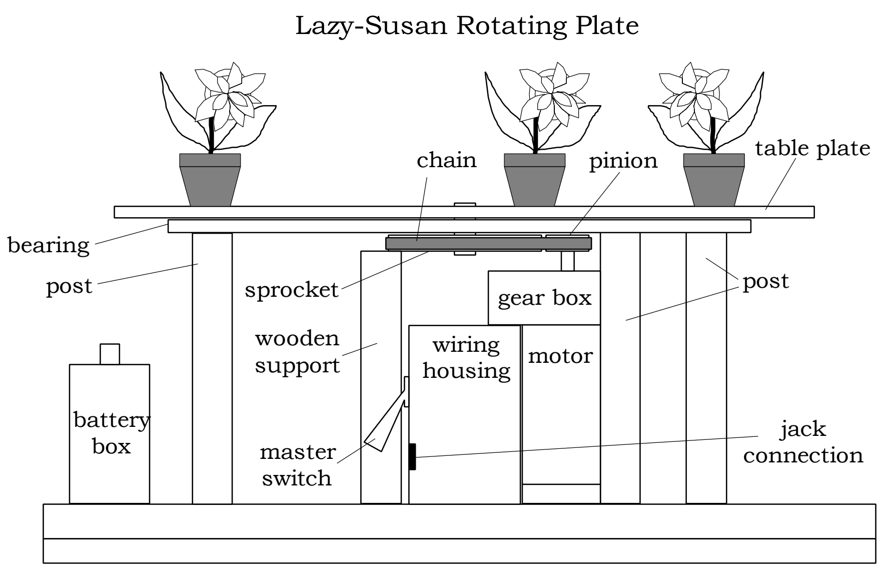

Figure 4.29. Side View of the Lazy Susan.

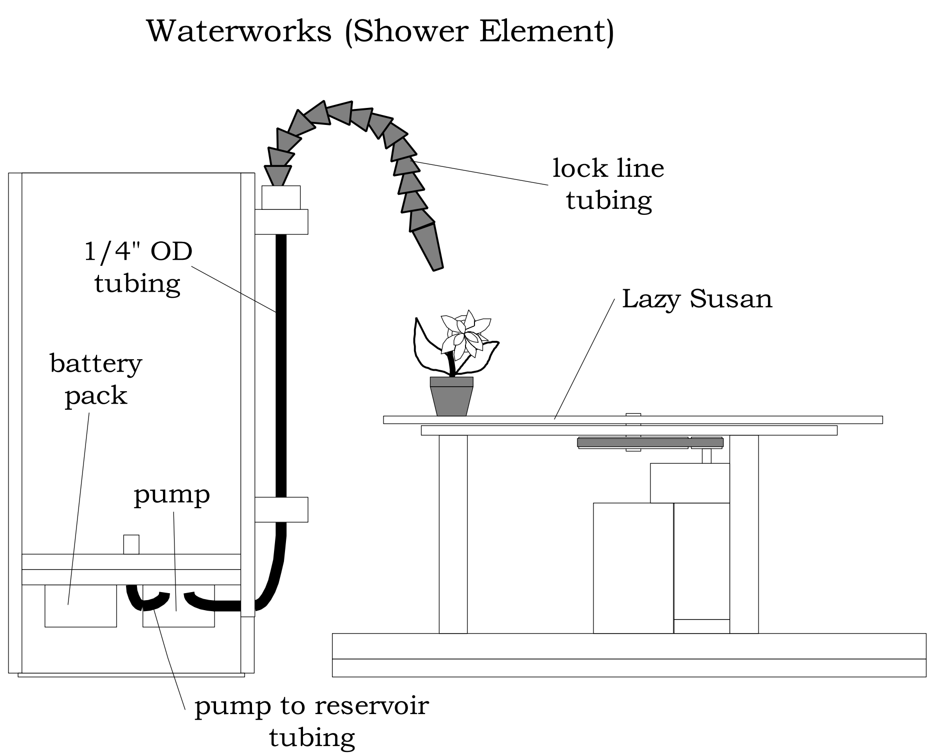

Figure 4.30. Waterworks Element.

Happy Motion Wheelchair

Designers: Christina Curry, Richard Eskew, Katherine Giles
Client Coordinators: Laura Meza; OT, Dan Schipf
Brandywine Nursing Home, Briarcliff Manor, NY
Supervising Professor: Dr. Daniel W. Haines
Mechanical Engineering Department
Manhattan College
Riverdale, NY 10471

INTRODUCTION

Some nursing home residents are unable to sit in an ordinary rocking chair but wish that they could. Some devices that allow wheelchair-bound patients to rock are commercially available, but expensive. Laura Meza, an occupational therapist, requested a rocking device on which a wheelchair could be easily mounted at reasonable cost.

SUMMARY OF IMPACT

Two custom-built Happy Motion rockers were provided, one for general purposes and another for a resident with special requirements.

TECHNICAL DESCRIPTION

After considering use of various materials, including aluminum, wood was selected as the primary material because of its suitability, low cost and ease of fabrication. Happy Motion is basically a platform with a curved base to permit the rocking motion. The wheelchair is mounted on the platform surface composed of ¼-inch plywood, reinforced on the underside. The platform is set in two side rails with a curved base which are cut from two sections of 2 x 6 inch Douglas fir. The radius of curvature of the basic Happy Motion base is 60 inches, while that of the special Happy Motion is 90 inches. Straight slots, ¼- inch wide, to accommodate the platform, were cut in these side rails. Figure 4.31 shows the two Happy Motion rockers side by side. Figure 4.32 shows the basic rocker in use by one of the Brandywine residents.

To assist in the use of Happy Motion, a small hinged ramp is provided at the rear. This ramp was requested in order to assure that only one attendant would be required to assist in the embarking and disembarking of the wheelchairs. However, it was found that highly functional residents and those in motorized wheelchairs could easily embark without any assistance at all.

Figure 4.31. Happy Motion Wheelchair.

Figure 4.32. Basic Rocker in Use.

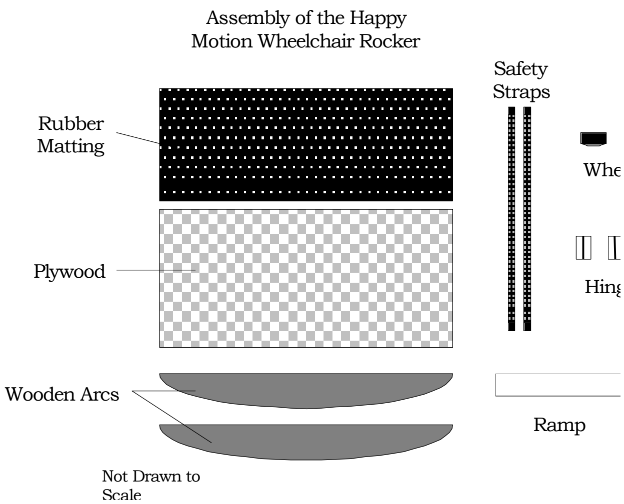

Figure 4.33. Assembly View of Happy Motion Rocker.

The flat surface proved to be slippery when testing began. The wheelchair wheels would skid on the surface. The designers added three safety features to address this problem. Rubber treads were added to the platform surface. An adjustable wooden bumper was added, and tie down straps were added to hold down the front of the chair while rocking. An assembly view of the Happy Motion rocker is shown in Figure 4.33.

Figure 4.34 shows the three designers with the smaller Happy Motion rocker.

Figure 4.34. Designers with Happy Motion Rocker.

The total cost of materials for the two Happy Motion rockers is $194.

Lazy Walker

Designers: Juan Cazorla, Patrick Gordon, Alfred Nagib
Client Coordinators: Kathy Ruff; PT, Dan Schipf
Brandywine Nursing Home, Briarcliff Manor, NY
Supervising Professor: Dr. Daniel W. Haines
Mechanical Engineering Department
Manhattan College
Riverdale, NY 10471

INTRODUCTION

Kathy Ruff, an occupational therapist at the Brandywine Nursing Home, requested a walker that would allow the user to rest from time to time in a seated position without assistance. A walker was modified to include a seat that can be stored as the patient walks but easily installed by the user when needed.

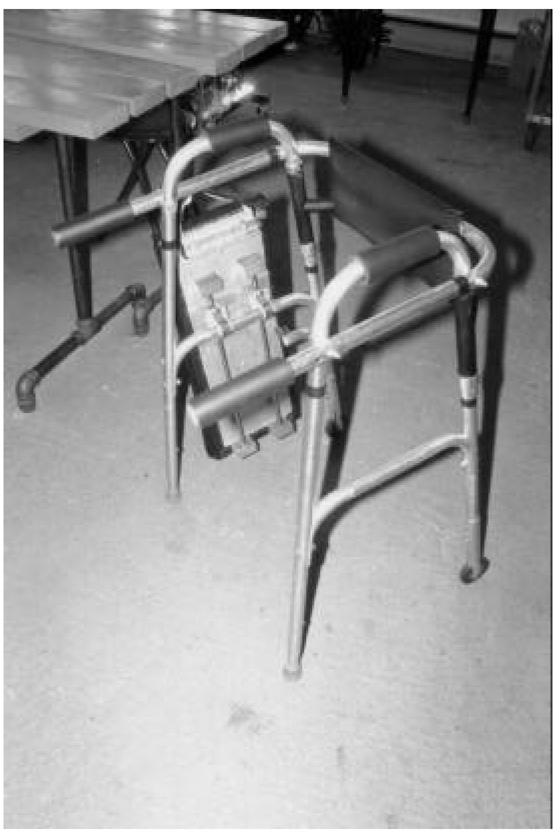

Figure 4.35. Lazy Walker.

SUMMARY OF IMPACT

The device was to include:

- A seat incorporated into the walker;
- Easy storage for the seat;
- A back rest for the seat; and
- Extension handrails to facilitate operation in the standing position

Additional design criteria were that:

- While using the seat mechanism, the walker remains stationary; and
- The walker must glide easily on smooth surfaces, even with the added weight of the seat

Due to an accident during the academic year, one of the designers, Juan Cazorla, was under the care of several physical therapists. He took this opportunity to have his therapists review the progress of the Lazy Walker. The client coordinators also reviewed the device. Several modifications were then made. When delivered to the clients, the additional improvements were appreciated. The clients are pleased with the product.

TECHNICAL DESCRIPTION

The basic challenge of this project was to add a seat to a standard walker. The walker had two wheels in front and two rubber stoppers on the rear legs. The side supports are horizontal and adjustable in height. This feature made it possible to accommodate the seat with minimal complication. The seat incorporated sandwich construction, a core of 3/8-inch plywood between two faces of 1/8-inch aluminum. This construction resulted in a seat with sufficient bending stiffness with minimal weight. Figure 4.35 shows the Lazy Walker with the seat retracted, ready for normal walking.

Figure 4.36. Lazy Walker with Seat in Place.

Figure 4.37 shows the three designers with their Lazy Walker.

The seat had to be capable of placement in a convenient location for seating, i.e., horizontal at the appropriate height between the side supports. It also had to be storable. It was installed at the side within one of the side supports such that it could be pivoted laterally for seating and then returned to storage position within the side support. Lateral motion for the seat is provided by two shafts mounted to the underside of the seat. The shafts slide through two linear motion pillow block bearings. Collars are mounted on the shafts to limit the amount of travel. Figure 4.38 shows the seat mechanism detail. To provide for the pivot action, the pillow block bearings are mounted on angular motion bearings that rotate on the horizontal side support bars. These bearings were adapted from vibration damping pipe supports. Figure 4.39 shows the movement of the seat. The total cost of materials for the Lazy Walker is $140, not including the basic walker that was provided to the designers.

Figure 4.37. Designers with Lazy Walker.

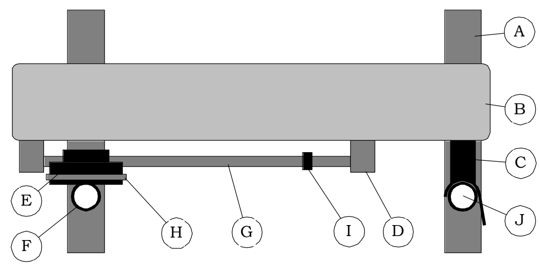

Figure 4.38. Seat Detail Mechanism.

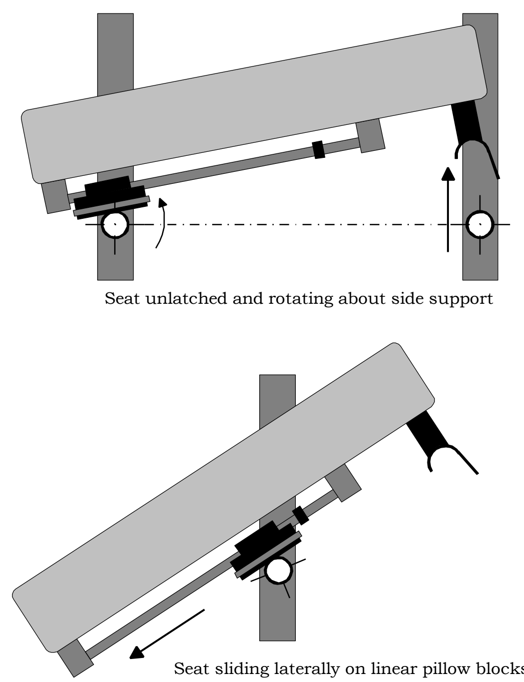

Figure 4.39. Movement of Seat Diagrammed.