CHAPTER 16
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CHILD STANDER

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INTRODUCTION

A standing support device was made to help children with cerebral palsy who have physical impairments and cannot stand independently. It is used in a day care program. An existing device was problematic in that it held the child suspended nearly one foot above the ground, making the child taller than his or her peers and impeding interaction. This device was constructed of wood and steel, and was ominous looking and not "child friendly". The rotational position of that stander was adjusted through manual cranking of a power screw, which was tiresome and caused wrist pain in some of the staff members. The device was further limited in adjustability of the straps and foot rests.

The new design rotates from horizontal to vertical through strategic placement of the pivot above the child's center of gravity, thereby eliminating the need for the power screw. Hydraulic dampers control the velocity of rotation when inclining and declining the backboard. Adjustability of foot, ankle and chest straps is improved and, in the vertical position, the child's feet are roughly 1 to 2 inches off the ground. The device is painted yellow and blue, which makes it attractive to both the children and staff. The completed device is shown in Figures 16.1 and 16.2.

SUMMARY OF IMPACT

The new child stander is the size of the users' peers, so enables users to engage socially with their peers. Teachers and therapists have noticed that other children now gather around individuals using the child stander instead of ignoring them, as was the case in the past when the previous device was used. Other standers can be adjusted to small size, but they take up large amounts of room in the classroom area and require two people to push them. This child stander is small enough to be easily moved by one person and can be easily stored. The adjustability features are such that many different children can be fitted into it.

Figure 16.1. Child Stander (Front View, Upright Position) with Plastic Tray, Adjustable Foot Rests, Straps, Pads and Extended Front Legs.

TECHNICAL DESCRIPTION

The backside of the Child Stander is shown in Figure 16.2. It shows the frame, constructed of 1" O.D., 1/8" wall thickness 304 stainless steel tubing. The legs on the bottom of the frame are extended to prevent forward tipping. A rear extension bar rises from the base to act as a support for backboard in horizontal position. The frame is connected by ASTM A 47 Grade 32510 malleable cast iron

structural fittings with hot dip galvanized ASTM AI53. The frame is 42″ long and 18.28″ high.

The backboard is 22″ x 26.5″ x ½″ filleted edge plywood with adjustment slots for head support pads, torso support straps, hip support pads, knee support straps, and foot rest with Velcro ties. When vertical, the bottom of backboard is four inches from the floor. Stainless steel tubing 1″ O.D., 1/8″ wall thickness, outlines backboard for support. Two adjustable compression velocity controllers (from Enidine, Orchard Park, NY) provide damping when inclining and declining the backboard. Special features include a rotor latch device with manual release to lock the backboard in the horizontal position and a stop mechanism to lock the stander in the vertical position. The stander is attached to two 8″ rear wheel and two 3″ front swivel castors with locks.

A 28″ x 24″ filleted edged detachable tray functions as a play surface for the child while standing. The tray is made from Plexiglas to allow the child to see the floor below. The maximum recommended child height is 42″ and the minimum child height is 30″. The maximum recommended load capacity is 50 lbs.

Total cost was approximately $900, not including stainless steel tubing that had been purchased previously.

Figure 16.2. Child Stander (Rear View, Upright Position) with Frame, Latch and Lock Mechanisms, Setscrews for Pad Adjustment, Radial Bearings and Hydraulic Dampers.

MODIFIED PAPER DRILLING MACHINE

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INTRODUCTION

The adult workshop provides nine-to-five employment for a number of adults with cerebral palsy (roughly 15 on any given day). The clients are currently employed to collate and package health care notebooks. To do this, they need a machine to drill holes in large amounts of paper so it can be compiled in 3-ring binders. Their existing paper puncher was an inexpensive electric device that could only punch a few sheets at a time and tended to overheat after a few uses, thereby slowing the productivity of the employees.

Initially, the designers intended to design their own device from scratch. Preliminary machine drawings were taken to a local machinist, who estimated parts and labor to cost over four thousand dollars. It was decided that a more cost-effective approach would be to purchase a new paper-drilling machine and modify it to operate safely.

SUMMARY OF IMPACT

Modification of the paper-drilling machine will enable the adult workshop to expand the contracts they have. By doing so, they will enable more adults with disabilities to work. The only problem with the design is that the guardrails minimize the ability of persons who use walkers to get close enough to the machine to operate it. Otherwise, the safety criteria and switch accessibility meet the needs of the workshop.

TECHNICAL DESCRIPTION

The machine purchased is a Lassco Product's Spinnit Floor Model FMMS-1-R. It is a self-contained, three-hole paper-drilling machine that operates on 110-volt current. Paper is drilled by placing it on the paper table and pressing a foot pedal to raise the table into the drilling bits. Guides built into the table align the paper. The guides may be adjusted to accommodate different paper sizes.

Figure 16.3. Modified Paper Drilling Machine with Plexiglas Safety Cage, Pallet Base and Guard Rails.

The machine, as purchased, has exposed fixed drilling spindles and no mechanism to prevent injuries to the operator or others when the spindles are turning. The spindles are turned on and off by a switch mounted at the top front of the machine and continue to spin as long as the switch is turned on.

To improve safety, a cage with hinged doors encompasses the drill bits, constructed with ¼ inch Plexiglas. The Plexiglas is bolted together with 1/16-inch thick angle aluminum with #6-32x1/2 inch bolts and nuts. The doors swing on piano hinges and are held closed by magnets. The entire drilling area is covered to prevent access during the drilling operation.

The spindle motor circuit is interrupted with a relay switch attached to a secondary electronic circuit. A transformer steps down the 110-volt circuit to 12 volts. The secondary circuit powers contact switches near the door hinges and a ¼ inch jack. The ¼ inch jack enables the workshop staff to plug in a large button switch to allow a client to turn the machine on and off. When the doors are fully closed, the Plexiglas engages the switches and completes the circuit. This trips the relay circuit and completes the 110-volt motor circuit that drives the spindles. The step down of the voltage is also a safety precaution to allow smaller amp switches to be used.

The staff member controls the master switch. A client is given the job of turning the machine on and off for each run. Under all circumstances, the drill bits will not spin without the cage doors being fully closed. The bits stop spinning if the doors are opened during operation. This effectively prevents a hand from accidentally being drilled or pinched during the drilling operation.

The paper-drilling machine is mounted securely on a wooden pallet for stability. Guardrails aid the clients in operating the machine and provide a barrier against someone falling into the machine. The completed product is shown in Figures 16.3 and 16.4

Total cost was approximately $2,350.

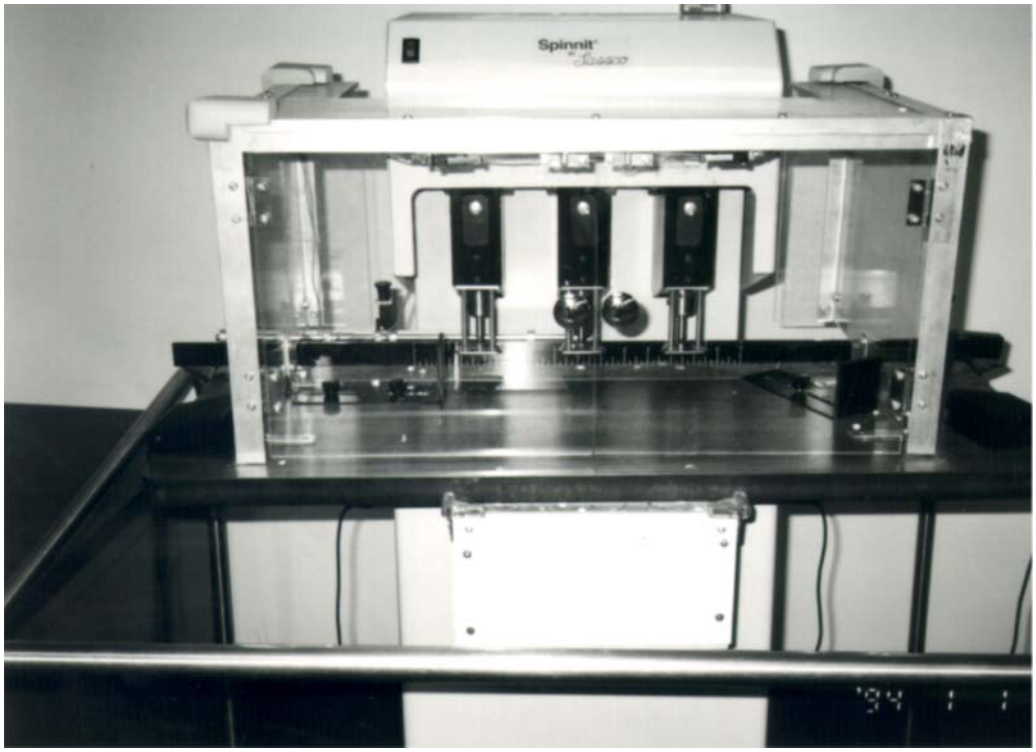

Figure 16.4. Close-Up of the Plexiglas Safety Cage, Showing the Hinged Doors and Magnetic Door Closers. The White Box Directly Beneath the Cage Houses the Secondary Electronic Circuit that Secures the Doors Closed During Operation.

THE ELMOBILE: A POWER-CHAIR USE ASSESSMENT VEHICLE

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INTRODUCTION:

Insurance companies require written confirmation that a child can function properly and safely in a powered wheelchair before they will cover the purchase cost of a new power chair. The Elmobile, designed and fabricated for a center for individuals with cerebral palsy, is used for assessing the ability of children to operate a powered wheel chair. The Elmobile is designed to look more like a go-cart than a wheelchair, in that it incorporates the fun look of a toy with the functionality of a wheelchair.

SUMMARY OF IMPACT

The ability to secure funding of powered mobility equipment is increasingly tied to pre-purchase documentation of the client's ability to drive equipment. This means that many children who cannot demonstrate good driving skills cannot get funding to purchase a power chair. The Elmobile functions as a training and assessment tool for staff to enable them to make assessments with greater authority and accuracy. Since the children attend programs at he center regularly, those who do not have good driving skill at first have the opportunity to practice over time and develop such skills. The resulting design met the specifications of the therapists.

TECHNICAL DESCRIPTION

The frame is constructed as one continuous curved frame that surrounds the entire vehicle and extends beyond the wheelbase, reducing the possibility that a wheel might run over something and cause damage. The 14-gauge mild steel tubing is lightweight and easy to cut, drill, bend, weld, and it provides adequate support for the vehicle and the children. The mild steel is also easier to paint.

A motor assembly with a joystick was available from an existing add-on package to a non-powered wheelchair. It operates by pressing a smaller driving wheel in contact with the Elmobile wheels to provide motion. The design incorporates a fender and trunk that encompass the entire drive assembly. This eliminates pinch points and keeps fingers and clothing out of harm's way.

A Tumble Form® seat is mounted to allow for quick easy change-out with seats of other sizes. The seat mount incorporates a hand brake operated tilting mechanism (+5 degrees) to position the child according to his or her posture. It has foot restraints, a chest harness and a separate lap belt for safety. The foot restraints help provide additional stability for the child and more controlled operation of the vehicle.

The vehicle is equipped with a speed control device to allow the staff to adjust for different skill levels. Most importantly, the vehicle is equipped with an easily accessible emergency shut-off switch and a key switch on the back handle that allows the vehicle to be operated while under competent supervision only.

Total cost was approximately $900.

Figure 16.5. Front View of Elmobile, Showing Continuous Frame, Joystick Control, Safety Belts, and Footrests.

Figure 16.6. Side View of Elmobile, Highlighting Graphically Enhanced Fenders and Trunk, Housing Battery, Drive Assembly, Seat Tilt Mechanism, and Safety Switch.