CHAPTER 13
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Plastic Coated Exercise Hand-Weight Cutting Machine

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INTRODUCTION

Commercial plastic-coated hand weights are a component that allows a walker or runner to develop their upper body strength. During the manufacturing process, defects such as bubbles in the coating, bald spots, etc. are often encountered. To reclaim the weights in the defective hand weights, a cutting machine has to be designed. The objective of this project is to design and build a machine to cut the plastic coating on hand weights so that it can be removed and reused in the manufacturing process. Two factors are taken into account in the design process:

1) the machine has to be safe, and

2) the machine can be operated by a cerebral palsy client who has the use of only one hand.

The use of the cutting machine allows cerebral palsy clients to perform the task of removing plastic coating on the hand weights.

SUMMARY OF IMPACT

The cutting machine greatly simplifies the task of removing plastic coating on the exercise hand weights. Previously, the clients were required to manually cut the plastic after the hand weights had been baked in an oven. This procedure of removing the plastic is hazardous because cerebral palsy clients have to handle the heated hand weights and very often their hands are accidentally burned . The cutting machine reduces the period of time required by the clients to handle the heated hand weights. Once the hand weight is baked, it is placed on the cutting machine (Fig. 13.1) and the cutting of the plastic only required the clients to rotate the wood base (Fig. 13.2). The newly designed cutting machine used by the cerebral palsy coordinator and clients has improved the efficiency of recycling the plastic coating process.

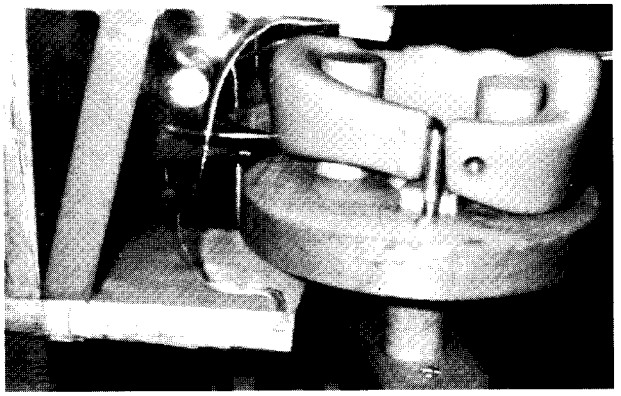

Figure 13.1. Plastic Hand Weight Placed On The Wood Base.

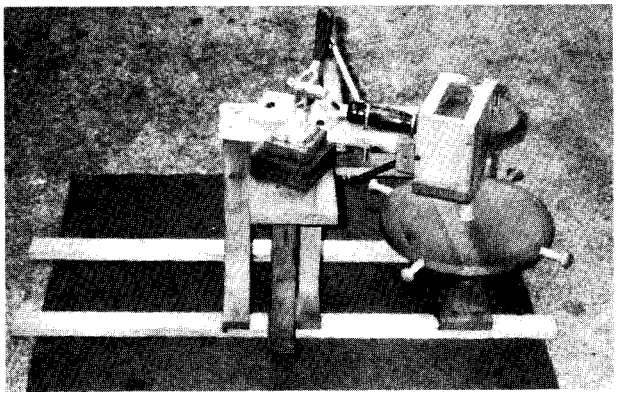

Figure 13.2. Rotating Base Of The Cutting Machine.

TECHNICAL DESCRIPTION

The frame structure and most parts of the cutting machine are constructed with wood. The hand weight is placed on a round disk that is glued to a wood dowel that rotates on a screw at its base. A metal insert was placed at the base of the dowel to

allow the screw to spin easier and eliminate wear in the wood. A larger disk with handles is also glued to the dowel so that it can be turned relatively easily with the use of one or two hands.

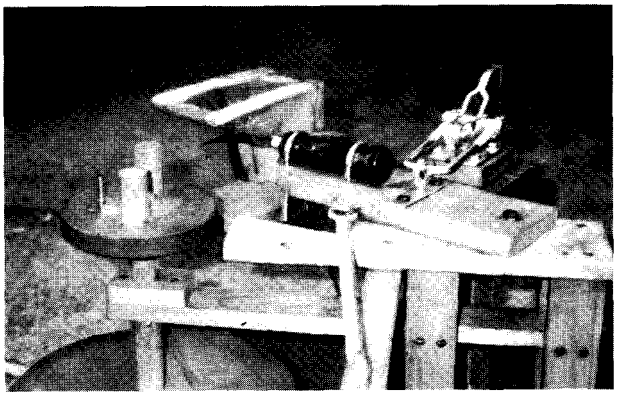

Figure 13.3. Cutting Device.

The main cutting device (Fig. 13.3) is a curved knife blade with a tension spring that applies the pressure that holds the knife to the hand weight. The knife is attached to a base piece that pivots, as the piece rotates, keeping the blade against the part. The spring is attached to the frame and base piece by two eye bolts. One of the eye bolts has several adjustment holes to change the tension of the spring, if necessary. The angle of the knife was carefully selected so that the point of the knife was in contact with the piece as much as possible. Because of the sharp-angled shape of the hand weight, the knife cannot be turned around one corner of the weight. It is best to start cutting right after this turn, and finish just before the knife reaches it (or when the wheel cannot be turned anymore). Since the machine is set up so that the piece can only be set on the machine one way, the arrow on the disk and frame should align so that the hand weight is in its proper starting position.

A lever is attached to the knife's base to pull it away from the piece. The lever locks when it is fully engaged so that the weight can be easily removed from or placed on the machine. To insure safety, a shield was built around the knife so that the user could not accidentally cut his or her hand. The shield was made partially from clear plastic so that the user could see the knife cutting the plastic coating. A wooden sheath was also made to put on the knife when the cutting machine is not in use.

Excluding machinists' fees, the entire cutting component costs approximately $125.00 to build. Schematic drawings with dimensions of the top, front and side views of the cutting machine are shown on Fig.'s 13.4-13.6, respectively.

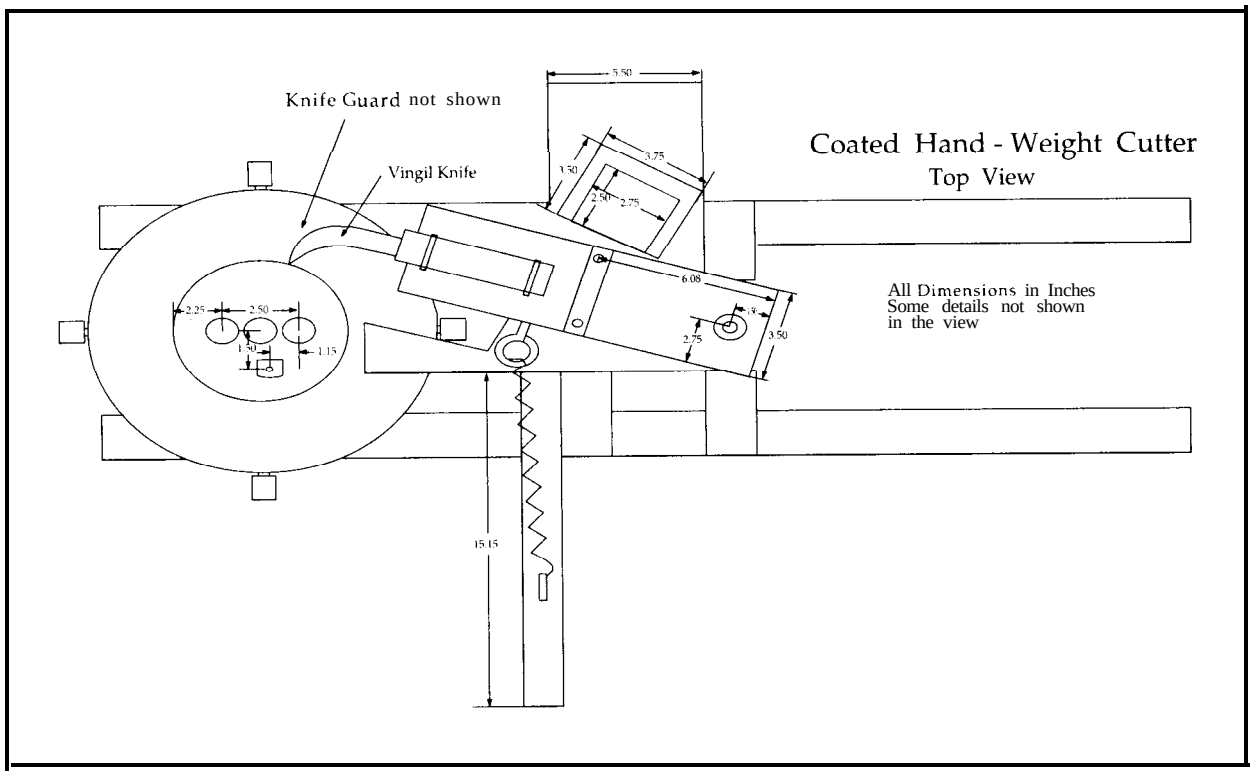

Figure 13.4. Coated Hand-Weight Cutter Top View.

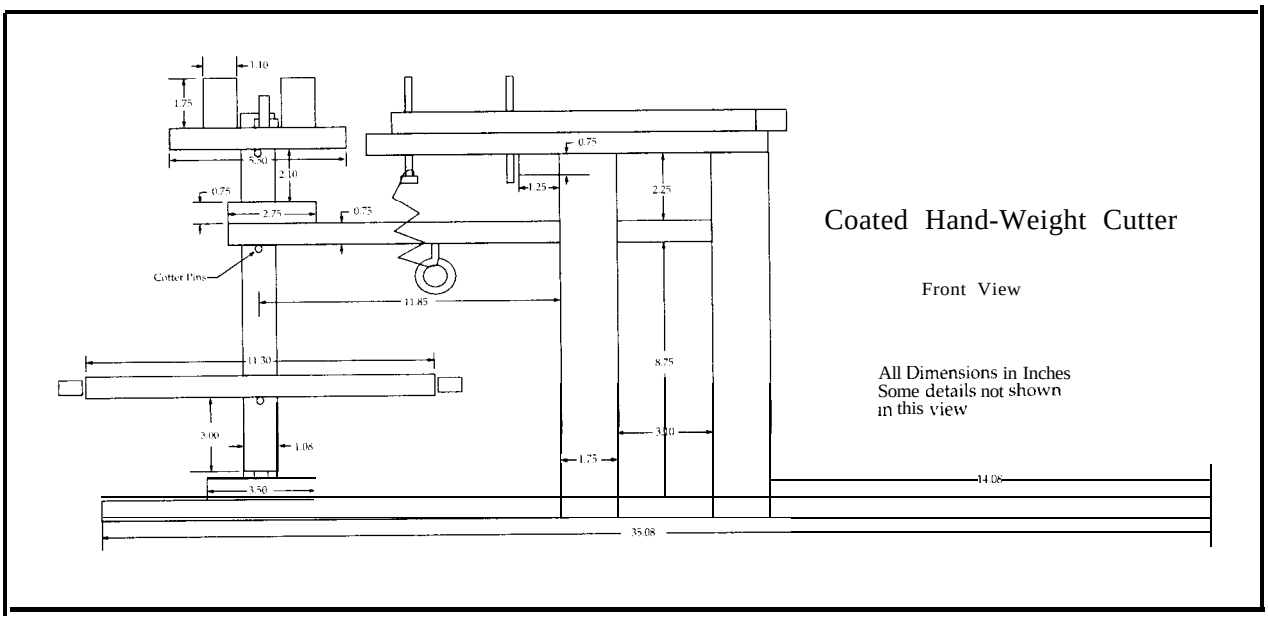

Figure 13.5. Coated Hand-Weight Cutter Front View.

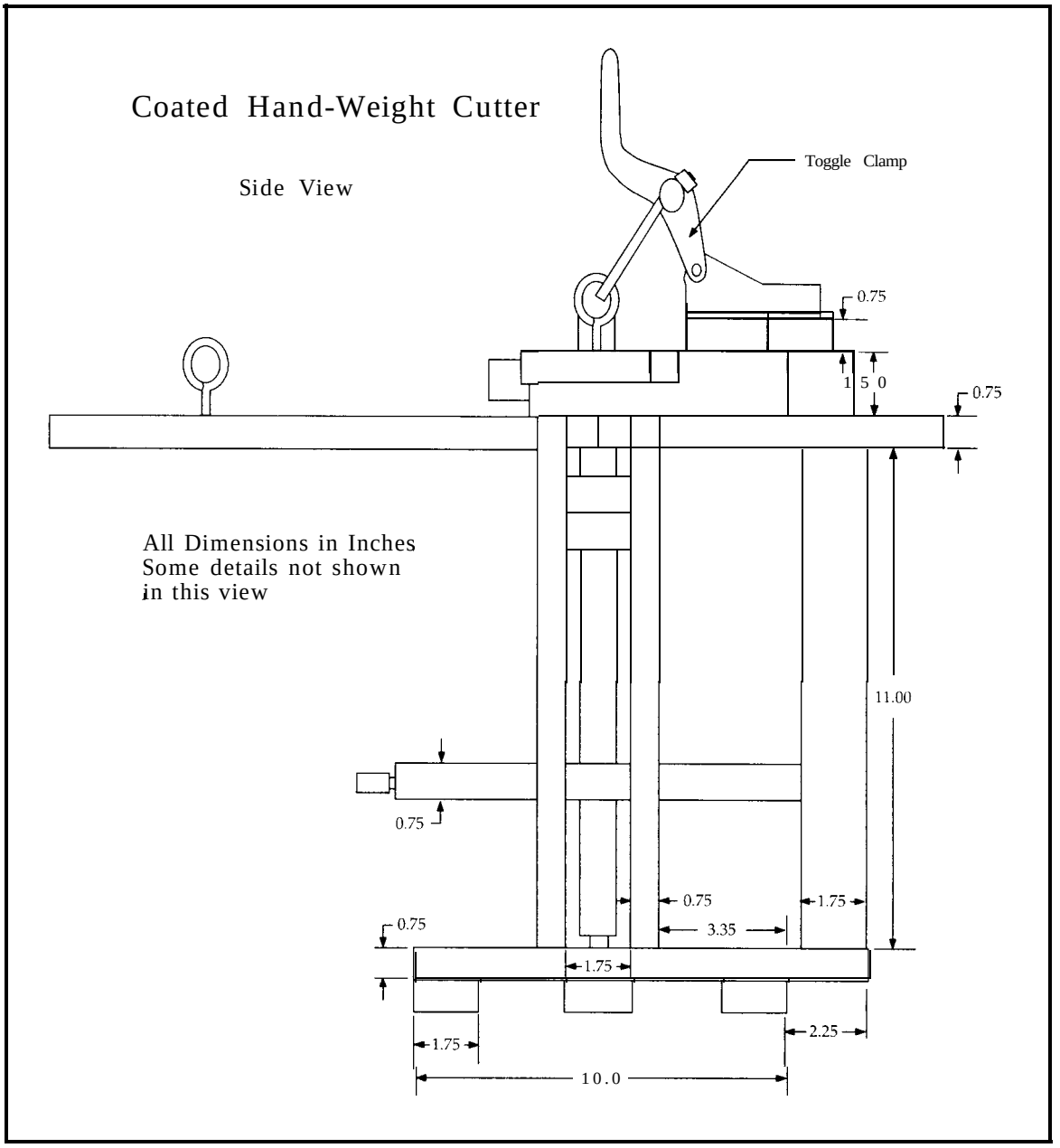

Figure 13.6. Coated hand-weight cutter side view

Whistle Shaver - An Adaptive Device for the Cerebral Palsy Clients

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INTRODUCTION

The objective of this project is to shave excess plastic off the mouthpiece part of a whistle so that a flute instrument can be assembled. It must be shaved enough to assemble, but not too much that would change the shape of the piece and create an air leak in the flute. Two factors are taken into account in the design process:

1) the machine has to be safe, and

2) the machine can be operated by a cerebral palsy client who has the use of only one hand.

The target for UCPSH to meet is to shave excess plastic chips off forty thousand mouthpiece parts in a one-month time period.

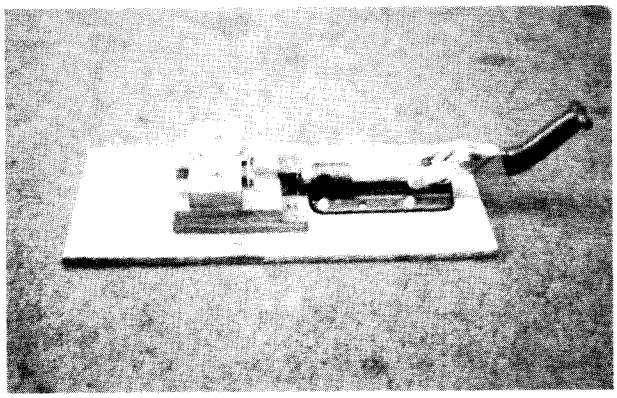

Figure 13.7. Whistle Shaving Device.

SUMMARY OF IMPACT

The whistle shaver adaptive device shown in Fig. 13.7 has been used by a cerebral palsy client successfully. The client has completed shaving six hundred mouthpiece parts in four hours. Previously, this task would require five clients working together for the entire week. In particular, the client who has limited manual dexterity can now perform this job with one hand. Because of the adaptive device, many clients have increased their level of productivity. The adaptive device will provide increased independence for many clients. In addition, the shaving process is much safer than before because clients do not have to use the belt sander to sand the excess plastic chips. Their hands will not be caught in the sander and the mouthpiece does not fly off the sander.

TECHNICAL DESCRIPTION

The main concept of the whistle shaver device is a lever that pushes the part through a carbide die that is cut to the radius of the plastic part. The frame is constructed mainly of wood, except for the carbide die, metal pieces to hold the die in place, and a sheet metal slide plate. Schematic drawings with whistle shaver's dimensions of the top, front and side views are shown in Fig.'s 13.8-13.10, respectively. The design allows for the position of the die to be moved by adjusting the top screw and/or the two front screws that hold the die in place. These screws allow the operator to control the amount of plastic that is trimmed from the part.

One of the main problems with this design is that the wood frame that holds the die and adjusting screws deflects more than is desired. The placement of the die needs to be fairly precise to take off the right amount of plastic. The wood frame gives, so that adjustments may need to be made often. We are in a process of redesigning the device by making the entire unit out of metal block, using the same carbide die. This would make a sturdier device that would require fewer adjustments. An improvement

for the device is to cut the radius of the whistle on all four edges of the carbide die so it can be rotated for more use. Also, a basket can be attached to the back of the device so that whistle pieces can be collected after they have been shaved. Excluding machinists' fees, the entire cutting component costs less than $100.00 to build.

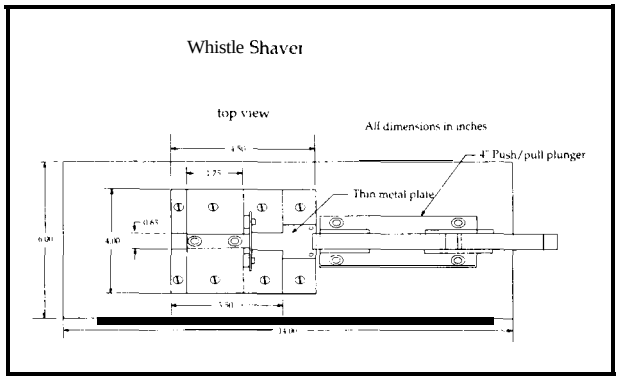

Figure 13.8. Whistle Shaver Top View.

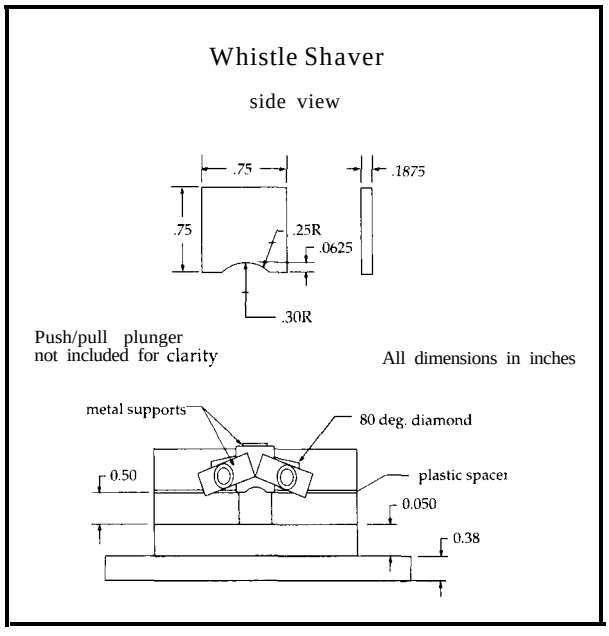

Figure 13.10. Whistle Shaver Side View.

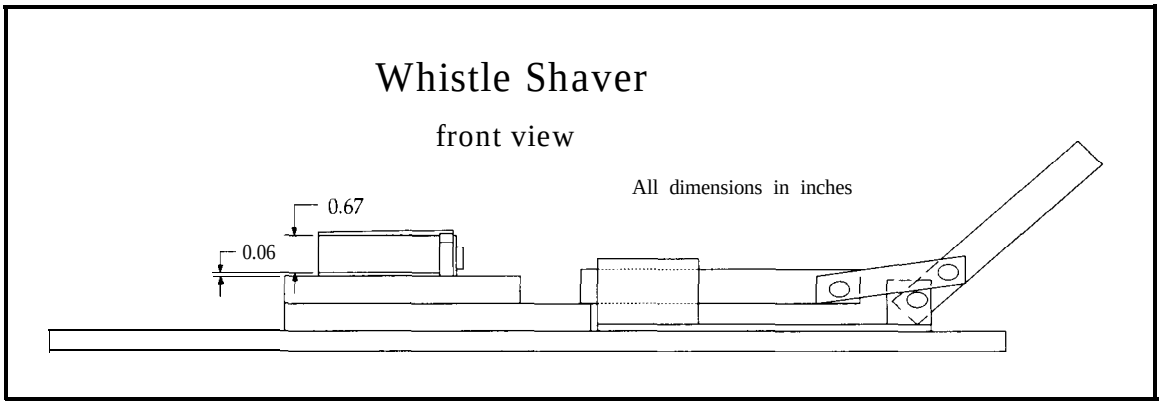

Figure 13.9. Whistle Shaver Front View.