Painting Solutions for Limited Mobility
Week 8: March 16, 2006 to March 22, 2006
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BME 291

Work Completed

During the eighth week, we began constructing the final prototypes of both our designs. During the construction process of arm support system, we noticed a few errors which needed to be addressed. The bracket used to connect the GCX clamp to the arm support mounted the GCX clamp in the middle of the bracket. This did not allow for enough adjustment towards the arm support user. A redesign and reconstruction of the bracket was done during the eighth week.

To allow ample adjustment of the arm support system towards the user, the bracket design was changed. Instead of mounting the clamp centered on the bracket, the clamp was moved to all the way to one side (see Figure 1). Mounting the clamp on one side allows more adjustment of the arm support for the user. Once we established a new design, the AutoCAD drawing of the bracket was altered so we could have a correct template. The template drawing was then printed so it could later be transferred to the stock material used to construct the bracket.

Figure 1: New template with the mounting area moved to the side.

To start the construction of the bracket, the template was first attached to the stock 6061 aluminum. A duct tape straight line was then placed on the stock material to act as a guideline to follow while cutting the material. This guideline placed on the material modeled a bracket larger than that of the template. This allows the template to be cut from the aluminum and then the edges can be grinded to ensure safety without having a final product smaller than what is wanted. The template was removed from the material and the material was then ready to be cut (see Figure 2). An angle grinder with a cut-off wheel was used to cut the desired shape from the stock piece of aluminum. The angle grinder was used because the aluminum, at one inch thick, is very strong for its desired purpose; however, it is relatively soft and easy to cut using an angle grinder.
Once the bracket shape was cut from the stock piece, the ends were ready to be rounded to ensure safety. A grinding flap-disc was put on the angle grinder to sand down the edges. All the edges were sanded down to now sharp corners would act as a hazard. Now the solid piece of aluminum cut to the desired shape was ready to have the holes drilled to mount the GCX clamp. The template was used again to locate the desired location of the mounting holes. The location of these holes was marked on the aluminum using a punch. The holes were drilled into the aluminum in the necessary position, and then they were tapped. The tapped holes were then countersunk to provide a flat, flush mounting surface.

One problem we ran into with the old bracket is we could not achieve a flush mounting face, even with the countersunk attachment screw holes. We realized that the countersunk holes were not completely rounded off using the existing countersink bit.
The pitch of the countersink bit used was too steep. This meant that the holes had to be drilled extremely deep just to countersink the screws. With the size countersink bit used, the deeper you went, the less round the countersink would be. With an out of round countersink hole, when the screws were used to mount the bracket to the clamp, the screws would not sit flush in the holes. This caused the mounting face of the bracket to be non-flat, yielding a non-flush contact between the bracket and the arm support. To solve the problem, I purchased a new countersink bit with a less steep pitch. This bit was tested on the old bracket and did ensure a flush mounting surface.

Figure 4: Non-round countersunk hole on the left versus round countersunk hole on the right.

**Future Work**

During the ninth week, the final prototypes will be constructed and retested. The finishing touches will be placed on the paintbrush/marker wrist attachment device, so that it can undergo the final phase of testing. The holder unit needs to be tack-welded to the screw which holds the spring in place to create a single unit. Once this single unit is created, the unit will be complete and can be attached to the wrist guard. We plan to test the unit individually, and then have other people use the unit for testing to ensure it works as planned.

We also plan to test the arm support system. The unit will be completed and we plan to mount the unit to the wheelchair in the lab, and simulate all types of arm movement while the arm is supported by the system. We also plan to have other people test the arm support system, simulating the types of movements the support will see from our client.
**Project Review**

Overall, we are on track with our project. Although we have moved backwards by making changes to both our designs and reconstructing components to our designs, we allotted two weeks for making new orders and changes to our designs. Once these changes are made to our project, they will be ready for the final testing phase, which will ultimately prove whether the product functions properly or not. As of now, and with the testing that has already been completed, we are on track with time and with creating a successful product.

**Hours Worked**

Hours spent on the project for Week 8: 14.00