Project Identity

Adjustable Back Angle Controller
Week 6
March 14, 2007
Ray Pennoyer

Work Completed
This week we spent a good deal of time in the machine shop working directly with Rich. We brought over our bed frame, as well as the motor. For the bed frame, we needed the crossbar connectors moved to the center of the long rails so that the top of the bed would have enough room for the scissor jack assembly. The connectors were attached by large rivets, and we helped Rich position them on the miller so that he could plunge them out. He said it was a hard metal, but he removed the rivets with minimal problems. We did not have rivets large enough to replace the connectors at the middle of the bed, but there were screws available right there in the machine shop that fit perfectly.

Our intent with the motor was to ask Rich for his advice in attaching the scissor jack connector. This connector is the one that came with the jacks, but it was designed for use with a manual handle. When it was removed from the handle it was a small hollow cylinder that for one half is hexagonally cut, and for the other half is internally circular. The circular end is a perfect fit for the motor’s drive shaft, but the motor’s key is too large for it. We wanted to cut a part of the connector out so that the key would fit in, but Rich informed us that the motor’s key could be removed. Removing it turned out to be quite difficult, since the manufacturer had pressed it in tightly. Once we finally got it out, we found a screw that fit in an existing hole in the connector and into the key slot in the motor as shown in Figure 1 on the following page. This turned out well in that we have a solid connection and the motor can drive the scissor jack directly.
Once the motor could drive the scissor jack, we were anxious to test it out. We first tried it unloaded as shown in Figure 2, and it raised the jack the entire distance in around 12 seconds. This is slightly slower than we had hoped, but still within reason for operation.

The motor only required a small fraction of the 8.1A it is rated for with the jack unloaded. In order to test it under a high load situation we used the very professional and scientific method of one person balancing on top of the
jack while the others operated the motor and power source. I was volunteered as the load. This time the motor drew more current, but still below the maximum. Another good observation was that the motor required very small amount of stabilizing force to prevent it from rotating instead of the shaft. We had been slightly concerned that this would have been a problem considering the motor’s round design.

**Future Work**

We now have the capability of driving the scissor jack with the motor. This allows us to put together the motor frame and finish the bed frame design. We will also test the handle control system and make any adjustments to our design as needed. The control circuit is proving to be more of a problem than expected, but I believe that with an external H-Bridge using power MOSFETs, it can be done. I have set up an appointment with Dr. Fox specifically about this approach to the design.

**Project Review**

Parts of the project are coming together nicely, such as the motor and bed frame. This gives us a solid core to bring the project together on. However, other parts such as the control circuit have hit multiple dead ends. By seeking more help from faculty and peers, we are confident that the problems can be worked out. The project deadline is fast approaching, and we need to redouble our efforts in order to deliver an excellent prototype on time.

**Hours Worked**

Total hours worked this week: 13