Project Identity

Monitor Lift & Paint Cap Remover Project

Progress Report #3- Katie Zilm

Week 3: September 21-September 27

Work Completed

Monitor Lift Project

The linear actuator that we ordered for our project arrived. We tested it and found that the built-in limit switch will stop the actuator when the stroke has reached its maximum or minimum; there is no switch to stop it at an intermediate height. Since the monitor needs to be lifted only 12 inches we will need to create a way to override or change the built-in limit switch. We are still waiting for the bracket that we ordered to arrive to work on how to mount it.

Our linear actuator and guide bars (which just arrived at the end of this week, see below for a picture) are each rated to be able to handle a 400 lb load. Considering the weight of the lift itself in addition to the monitor we wanted to be sure that these devices would suffice in bearing the load if supported with proper bracing.

If we overestimate the weight of the lift to be 80 lbs and assume that all 80 lbs of the monitor’s weight is in the screen (which it is concentrated although not all), then the moment caused by them would be about as follows…

\[ 80\text{lb}*6” + 80\text{lb}*11” = 1360 \text{ lb-in or } 113.3 \text{ lb-ft} \]

Incorporation of triangle braces on the front side and a tension system that works basically like a bungee cord or seat belt on the backside would counteract this force. However, the guide rails and linear actuator will do most of that themselves.

Last week we visited the machine shop to explore our options for materials to build the lift out of. After taking into account the weight of the monitor and the manner in which we are going to contruct the open face-top box part of the lift, we realized that we would need to
make this piece out of steel. Using steel at 1/8” thickness, the lift itself would weigh around 70 pounds. We were concerned that a lift of this weight would be too difficult for people to move or reloacted. Ideas about ways to cut down on the amount of steel used include eliminating part of the sides of the ‘box’ or using a lighter material for some parts. We consulted our sponsor to see if a lift this heavy would be satisfactory. The only other alternative would be to invest in a newer, lighter monitor so we expressed this idea to the sponsor as well. We are now in the process of possibly redesigning the lift for a much lighter monitor and of different dimensions.

If a new 27” flat panel LCD monitor is chosen to replace the current monitor, the lift will be significantly less bulky. Rather than have an open front-top box to enclose the monitor, only a back wall may be necessary. Twenty-seven inch flat panel LCD monitors typically weigh around 30 lbs so that would be a significant difference.

**Paint Cap Remover**

We recently discovered that Grumbacher no longer makes the same style paint cap for their 1.25 oz tubes of paint. The paint cap that we have been customizing this project for has many teeth, which are small yet still large enough to grip and supply some torque. However, all of the tubes at the store, except for the very old looking ones, had a paint cap with no teeth. Rather than teeth, the paint caps now have only small ribs all the way around. This new paint cap will not work with our current cap head design because there is nowhere for a tough mold to grip. The new paint cap design is great for people who manually remove the tops because the cap with teeth could be painful. However, the new cap is not very good for our project because the teeth of the cap were a main component to the mechanism we were going to use to remove it (mold fit-torque). The ribs on the new style to provide to grip but we may have to redesign our cap head in light of this new information. We have been brainstorming about how to redesign the cap head so that it will fit any paint cap of a circular shape regardless of detail and be more universal.

One idea was to make or incorporate a device similar to a chuck on a drill bit. A chuck in which the prongs were made out of a heavy duty rubber rather than metal would be perfect for our application. Even if the chuck was made out of metal, it would still work well as long as the areas where the inner edges where the chuck comes into contact with the paint cap had rubber grips on them.

A suitable soft chuck had not been easy to find to order so we have also experimented with a regular clamp that we found in the lab. Even a clamp that has two straight edges as the areas coming into contact with the device will work for our application. The clamp just needs to be tightened enough and hopefully we will be able to make this an automated process.

On a better note, the new motor for the paint cap project arrived at the end of this
week. The motor that we previously ordered could not supply enough torque to remove the paint cap, especially if it was to be stuck from dried paint or something of the like. The new motor was hooked up to a power source and tested for functionality. The shaft of the motor spun rather slowly which is fine for our application since it only has to rotate a small number of times and it is safer than one that spins too quickly. Most importantly, when the shaft was held, the motor was strong enough that we could not stop the shaft from spinning. We could do this with the previous motor.

We also worked on building a holder for the paint tube out of a sheet of polyethylene. Currently, the plan is to have this holder that the paint tube will be dropped into and then the clamp will come from the top or sides. We have to keep in mind that the paint cap is only about 3/8” tall so we do not have a lot of space to work with and the clamp must be precisely positioned for the paint cap remover to function reliably.

**Future Work**

Further testing of the motor for the paintcap project will be done including integrating it into the circuit we have built.

Upon receiving feedback on the dimensions or type of monitor that will be used (the current model or a new flat panel monitor) we will work on finalizing the lift design once again.

Regardless of the monitor that we are going to use, we will be able to begin to build the base for the monitor lift since it will be the same regardless of the type of monitor that is used in the end.

The springs that we ordered for the old design of the monitor lift (and are no longer needed) have been repackaged and are ready to be returned. They will be mailed this week so that we can be reimbursed for our purchase.

**Project Review**

Setbacks, revisions and major changes continue be encountered on what feels like a daily basis although it is not actually that often. Our team continues to deal with these problems and changes well. Crucial components of each project arrived at the end of this week and this will make it easier for our group to accomplish some good work this week.

**Hours Worked**: 12