

# Accessible Medication Dispensing Device

Designed by

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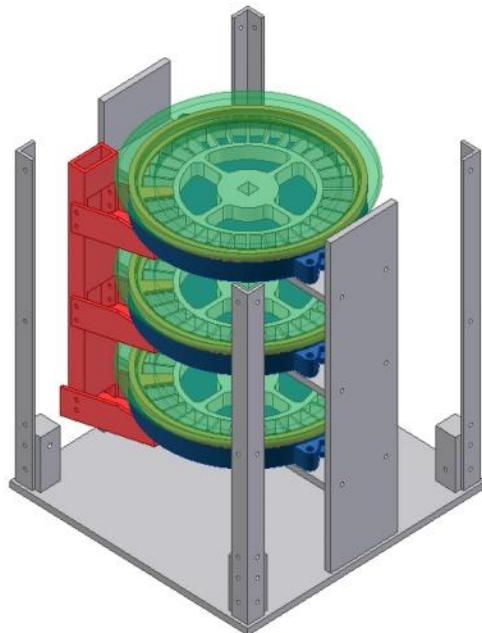
## **Introduction:**

Many people have to take several medications with specific dosages on a daily basis. It is difficult to remember to take a specific dose of a particular medication at the proper time of the day, especially for patients with disabilities, which can cause a lot of stress. There are devices on the market such as pillboxes, but these are inefficient. Pillboxes and other devices are only good for simple medication schedules. An innovative device that can keep track of a patient's complicated medication schedule and automatically alert and dispense the proper dosage is necessary. To accommodate for patients of different disabilities, the dispenser will have different notification methods. The system will also have the ability to keep track of what medications have been taken and what is currently in the inventory.

## **Mechanical Structure:**

Medication is stored in carousel systems which are discussed under dispensing system below. Figure on the right shows an assembly drawing of the prototype. The mechanical structure has a flat square base. Two crossbar uprights are erected on the opposite sides of the base. Then three beams are attached across the uprights. These beams support the dispensing structure. Also four right angle brackets are erected from the four corners of the base to support the enclosure. Clear polycarbonate lexan is used to make the cover for the enclosure and is attached to the uprights. For the front, a door is made of lexan and is attached via a hinge to the enclosure. A magnetic latch is used to hold the door closed.

The thickness is chosen to be 0.25" for the uprights and the beams to provide rigidity while keeping them light in weight. One stepper motor is placed at the middle of each beam. A large hole at the center of the beam allows for an adaptor shaft, which transmits power and motion from the motor to the carousel and dispensing system. A description of the carousels and the chute are given below under dispensing system.



### **Dispensing System:**

The dispensing system begins at the storage area. The medication pills, tablets, or capsules are contained in the dispensing carousel which has 31 usable compartments. The carousel tray has a cover that fits tightly because there is an o-ring seal between the cover and the tray wall. The carousel tray is located on the beam of the machine via two ¼” pins. This prevents any motion along the beam surface. To prevent the entire carousel from moving upward or falling off the motor shaft, a ball detent locks it into the divider disc. The dispensing system releases the medication by incrementing a stepper motor 11.25 degrees. Each rotation moves a filled compartment over an identically shaped hole in the carousel tray. The medication then falls into the dispensing chute.

### **Electrical System:**

The design of the medication carousel depends on a specific rotation each time. The design requires 11.25 degrees of rotation. This is accomplished by “half-stepping” the stepper motor. The motor has a 7.5 degree step, pulsing the motor to increment 3 “half-steps” provides 11.25 degrees. The motor and LCD screen is be controlled through a parallax electronic board powered by a 12V power supply. The microcontroller is programmed with BASIC Stamp.

### **Operation:**

The first step in using the accessible medication dispenser is for the user to enter his or her medication schedule. Each carousel is simply loaded by placing the medication into the compartments. If the user is not capable of loading their own medication carousels, loading may be done offsite by a caretaker, family member, or pharmacy. When the time is proper for taking the medication, an alarm will sound with a flashing light to alert the user. Upon hearing the alarm, the user pushes a button that causes the system to dispense the proper medication into a tray. On the LCD screen it displays that dispensing is complete and shows how much medication is left in the carousel. If the button is not pressed, after two minutes the alarm and the buzzer stops and it records the event.

