Table: R17

Toothpick Lovers!

Automated Toothpick Flag Manufacturing

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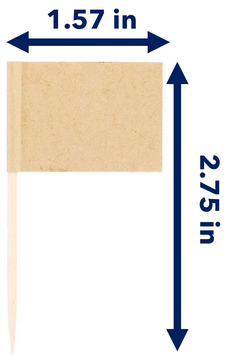
Project

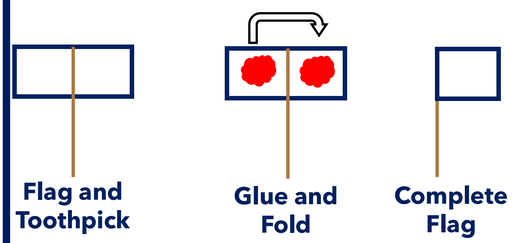
Product



- High Quality Paper Flag
- 2.75in Bamboo Toothpick
- Food Safe Glue

Problem

Due to their manual process of creating toothpick flags, FlagCo. is restricted in scaling and manufacturing capability.



An automated solution will allow FlagCo. to scale production and free up employees for higher value tasks.

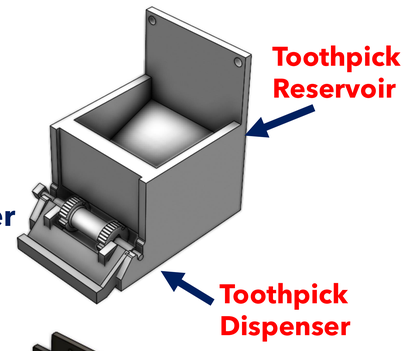
Target Metrics

- 33 Flags Per Hour
- 8 hour per day run time
- Easy set up/tear down
- Wall power use
- Fit on 94” x 41” table
- Uphold food safety standards

Prototype Functions

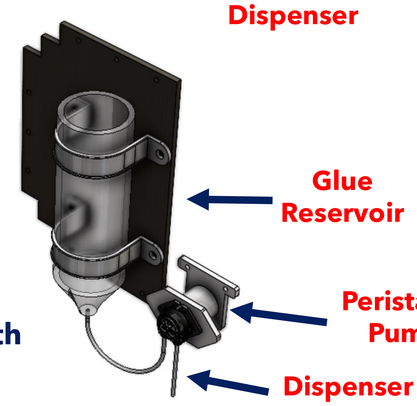
Toothpick Dispenser

- Toothpick reservoir with slotted dispenser and mounting plate
- 28BYJ48 Motor with custom coupler



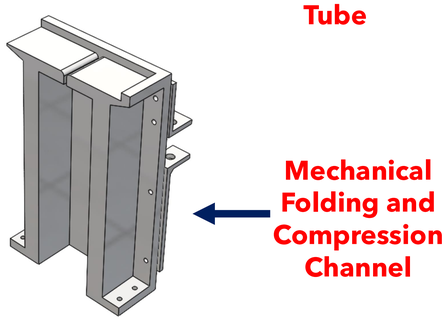
Glue Dispenser

- Glue reservoir with level sensor
- Peristaltic pump to eliminate contact with paper



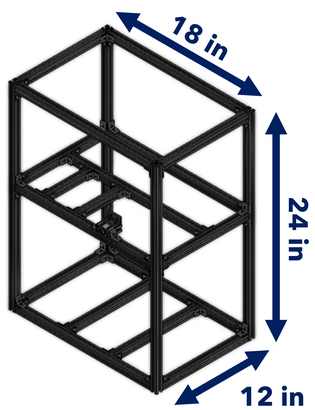
Folder and Compressor

- Polyurethane (PE) foam to achieve clean fold.
- Guide rails for alignment
- Custom L-brackets



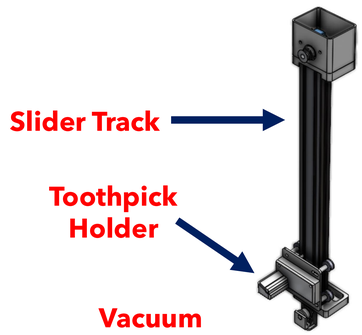
Aluminum Frame

- 20/20 aluminum frame
- Easy adjustment
- Acrylic panels for safety



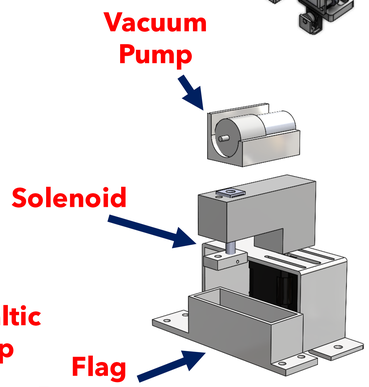
Slider Mechanism

- 40/20 aluminum belt driven slider
- Toothpick slot focused on security



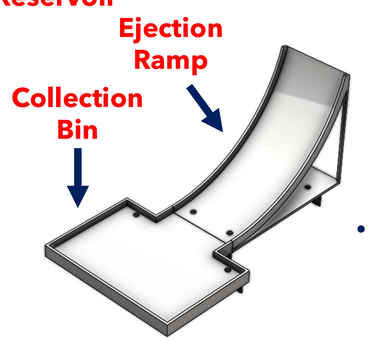
Flag Dispenser

- Vacuum pump design
- Solenoid used to create vacuum
- NEMA-17 driven moment arm to position paper



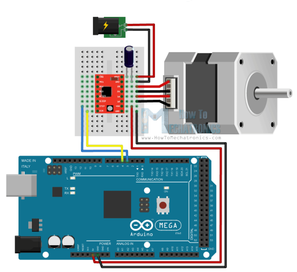
Ejection Bin

- Ramp leading into collection tray for easy bundling



Automation and Mechatronics

- **3** Stepper Motors
- **1** Vacuum Pump
- **1** Peristaltic Pump
- **1** Solenoid
- **2** Pushbuttons
- **120V** AC Input
  12V/5V DC Control



Arduino Mega for Automation

Performance

Results

- 17 Seconds per Flag (211/hr)
- Currently Semi-Automatic
- 50% of Flags are useable
- Glue contained within flag fold >90% of the time
- Toothpicks dispensed properly >90% of the time

Next Steps

- Implement better vacuum pump to increase suction
- Create ejection system to remove completed flags
- Improve electronics timing and replace breadboards with custom PCBs