The Handi-Grill

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Figure 10. Finished Prototype

Figure 11. Gas and Flip Control Systems

Figure 12. Chain Drive for Flipping Mechanism

INTRODUCTION

An automatic flipping and temperature-controlled grill was designed for two purposes. The primary reason was to assist people that may have trouble in grilling foods due to not being able to stand for extended periods of time, being sensitive to smoke, or even having wrist or elbow injuries that make grilling difficult or painful. The secondary reason was to provide a product for people that do not know how to grill or feel that it is a waste of time. A normal grill requires relatively consistent attention from the user to produce quality cooked food. This requires being able to stand outside for extended periods of time around smoke, dexterity to the flip food and a working knowledge of the grilling process. If any of these abilities is lack, a normal grill is just not sufficient. Our solution to this problem was to create a grill that can be programmed to cook your food properly without any supervision. The user can now place the food on the grill, touch a few words on a screen, and then just come back when the food is done. It eliminates the hassles of supervision and the frustration of poorly cooked food.

SUMMARY OF IMPACT

A normal barbeque grill provides some users with a cooking method that is simple and convenient, and produces flavorful food. Some people, though, have difficulty cooking on a grill due to physical disadvantages or even a lack of know-how. By automating the grilling process, all users will now be able to enjoy the results of cooking on a real grill without all the hassle that normally comes with it. The grill no longer needs constant supervision, which means that the user no longer needs to stand for extended periods of time. The automatic grill also flips the food by itself so people that are sensitive to heat or simply cannot perform the flipping motion for any reason can still enjoy the use of a grill. If the user can flip a switch and press a few words on a screen, then he can grill.

TECHANICAL DESCRIPTION

The automatic grill still utilizes many of the parts of a standard grill. The body of the grill and the burners still remain. The fuel source is still a standard propane tank, but that is where the similarities end. The standard low-pressure propane regulator and knob controls have been replaced by a 10psi regulator that is in line with a variable controlled solenoid pressure valve. This allows the gas to be controlled by the Arduino Mega microcontroller. The temperature is monitored by a type-K thermocouple mounted to the grill surface. The microcontroller can then increase or decrease the gas supplied to the burners depending on the temperature setting.

The grill surface itself is a completely customized piece. The grill bars, flipping shafts and main shafts are stainless steel, meeting the food industry regulations and strength and heat resistance. The main frame and other moving parts are made of aluminum due to cost and its ability to act as a heat sink. The shafts are held in place by oil-impregnated bearings. The steel-on-brass fitment greatly reduces the friction on the joints. The main shafts have sprockets attached at the rear of the grill and are flipped by a stepper motor by means of a chain and sprocket. The motor, driven by a power supply through a motor driver, is controlled by the Arduino Mega. The microcontroller is programmed to cook different types of food to different doneness. All of the options are selected on the touch screen. A manual override is available just in case there is a time when automated cooking is not desired.

The cost of the parts and supplies for this project was about $675.

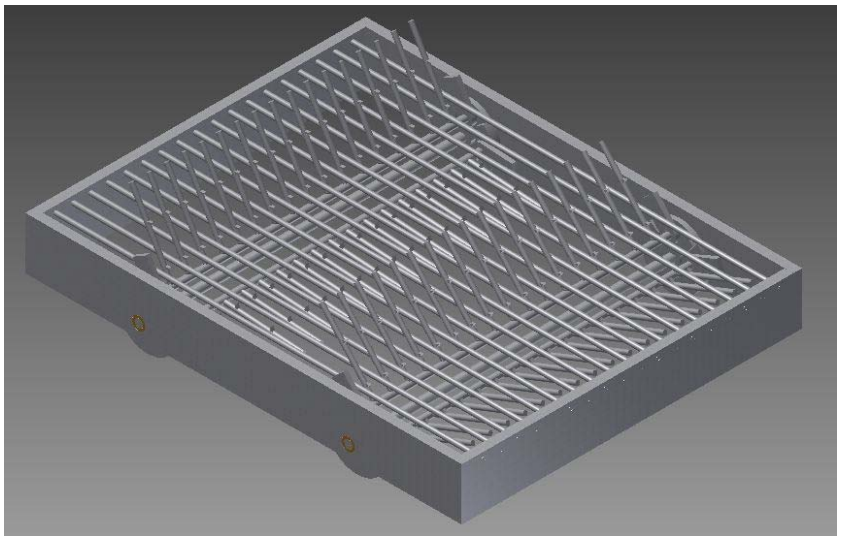

Figure 13. CAD Model of the Grill Assembly