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MODERN ENERGY EFFICIENT ELECTRIC MOGOGO

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ABSTRACT

This electrical engineering project is to design and improve electrical traditional mogogo as energy efficient, power consumption reliable and automatic controllable. This efficient mogogo has a great hope for solving the energy crisis in our nation as well as to reduce the monthly electric bill payment for individual users. The power to be reduced by this project is about ¾ of the power of the excited mogogo. In addition to this it can prepare injera by automated microcontroller based control. In achieving this project goals material selection is the key factor, which we considered the most.

KEY WORDS

Mogogo and Modern energy efficient.

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INTRODUCTION

The idea of this project is generated from the problem of power limitations in Eritrea. Our nation has recently faced some electrical power generation crisis. As we all have noticed the government has distributed electrical power to many rural sites. As the number of consumers connected to the national grid increased, the generation capacity is unable to satisfy the demand. The main power consuming device in almost every house is the electrical traditional stove (which we call it the MOGOGO). This electrical device was big dough in the past times, since it was much better and healthier than the wood using traditional stoves[1]. Though it has these benefits, it also has some major disadvantages. The

main disadvantage is that it consumes huge amount of energy. It consumes energy at a range of 3500 up to 5000 watts per hour. These devices are continuously causing problems to the electric authority and their equipment, especially in occasions where there is a need of more injera like holidays. But in this modern time energy efficiency is a major concern.

Working Principle

The microcontroller[2, 3] being the brain of the system controls and provides control signal for the entire system. First it checks whether a dough are present or not by reading the signal from the level sensor. Then if yes, all the procedures is about to begin. Then orders are to be transmitted for the stirring motor, cover motor, axial motor, pump and pouring motor respectively as the delay time given in the program. In addition to the mechanical controlling, also timer is controlled via microcontroller. The microcontroller gives an alarm when the predetermined time reaches as set in the program of the microcontroller. The thermostat can perform an override turn OFF if the temperature. When it reaches maximum heat range and switching ON when temperature is minimum.

As we designed the electric mogogo is automated (Figure No.1 and 2). It is fully controllable to prepare injera with the help of microcontroller that operates to all of the automatic mechanical part, as we give the delay time and steps. In our project the output part is injera so as we designed we got good quality of injera in appearance and taste at a temperature of 180 ^{0}C and in between seconds. Therefore the time taken to bake one injera is reduced as a result the power consumption per hour is also reduced from the traditional electric mogogo already excited[4].

After we push the starting button our first output we expected the microcontroller check the level and open the cover of mogogo. When the cover is fully opened the axial arm is getting in to center of the mogogo and this is our next output. After those two actions are done, the next step in our program is to start the pump, but before few seconds the controller sends a command to the string motor to start (this is important to mix the dough). When the pump is started and pump out the dough in high pressure. This pressure acts as switch for the pouring motor. Soon the dough is reach in to the arm of the pouring motor uniformly; the valves of this arm are open due to the high pressure of the dough. Parallel to this action the pouring motor also rotating up to 360^0. This means it covers full parts of the circular plate (mogogo). When the pouring motor reach 360^0, the microcontroller send two stop signals, one for the pump motor and second to the pouring motor. Soon after those actions are completed, the axial is out from the surface of the mogogo, and the cover is closed.

After all those above procedure, our last expecting output will to open the cover and give alarm after the proper time set in the program. And all those sequential actions are to be recycles for the next baking injera.

Advantage

Small size and minimal weight, allowing the development of miniaturized electronic devices.

Highly automated manufacturing processes, resulting in low per-unit cost.

Lower possible operating voltages, making transistors suitable for small, battery-powered applications.

No warm-up period for cathode heaters required after power application.

Lower power dissipation and generally greater energy efficiency.

Higher reliability and greater physical ruggedness.

Limitation

The main disadvantage of this transistor is amplifying noise current. That is unwanted current amplified and made disturbance in relay.

DISCUSSION

The design of the modern energy efficient electric mogogo is simple and less power consuming. This modern mogogo will save at least two third (2/3) of the power previously consumed by the traditional mogogo. We also focused on its portability, we tried to make it portable so as the people with small residents will be benefited. Not only that, we increased the durability of the system by making the

stove from a metal (note that the traditional mogogo is made from clay and is easily breakable).

Our main goal, the power consumption reduction. We hope that our project will partly solve the current power crisis. Since the highest consuming device in almost every house is the mogogo. This high consumption has been creating problems to solar power using houses. This is because if they have to use mogogo, the solar system sizing gets very high and these the cost of the system gets extremely high. Due to this reason most solar power users in our country avoid using mogogo via solar. But with our new project we hope this problem will be solved. The design of the modern mogogo is in such a way that it will reduce the power losses to the limit. To do this we had designed a new stove plate. This new design is made to capture and use the most heat energy generated. It also uses some techniques to prevent heat loss by the surfaces other than the top. To do this we designed a bottom cover with air spacing. The nonstick behavior of the mogogo is very important. Our mothers use some seeds or animal fat to provide the nonstick. We will use the new tech Teflon coating to provide the nonstick property. These Teflon coating had been used in many kitchen utensils and works well. We have a great hope for our automated mogogo that it will also reduce the manual human power required and time delay in places where more injera is required at a time. Due the effect of globalization there may be a chance that the culture of preparing injera would reduce due to it work and time required. In such cases our automated mogogo can be used to produce injera for markets. Then injera can be sold like bread in market. As stated in the above at least 2000 watts can be saved by using the new mogogo instead of the old one. According to the research of ministry of energy there are about 70,000 clay electric mogogos already installed in Eritrea. Since it's out culture, every family bakes injera at least ones in a week. So if the modern energy efficient electric mogogo is installed to the public, we would at least save our one 16 M watts generator. This would may avoid the power distribution by method currently used (Table No.1 and 2).

In terms of money also we can save millions of foreign currency. That is the expense for the furnace. Our installed generators consume 4000 litres of furnace per hour. The people can imagine the currency to be saved by introducing this system.

Power save per week = number of mogogo*

Powers save from one mogogo

= 70,000*2500 watt

Power save per week = 175MW

Obviously all the mogogos will not be on at the same time.

There for installing this modern energy efficient electric mogogo is a big solution for the current power problem.

EXPERIMENTAL RESULTS

Table No.1: Experimental results of tested heating element

S.No	Material resistivity	Diameter	Length	Power rate
1	1.87Ω.m	1.5mm	10m	2645.5watt
2	2.35 Ω.m	0.9mm	12m 10m	--
3	0.93 Ω.m	0.52mm	11m	1000watt
4	1.94 Ω.m	0.6mm	9m	780watt
5	3.03 Ω.m	0.45mm	15m	250watt

Table No.2: Comparison between clay electric mogogo and modern energy efficient electric mogogo

S.No	Parameters	Traditional electric mogogo	Modern energy efficient electric mogogo
1	Power consumption	3500- 5000 watt	800- 1000 watt
2	Time taken for one injera	5- 7 minutes	2 – 3 minutes
3	Initial cost	4500 – 7000 nakfa	4000 – 4500 nakfa (in mass production the price may go lower)
4	Controllability	Without controlling	Controlled
5	Electrical Efficiency	Low efficiency due to excess power loss	High efficiency (no power loss)
6	Type of heating element	Uninsulated high power rating	Insulated low power rating
7	Type of plate	Clay	Cast metal plate
8	Monthly Bill payment	It is high	Low bill payment
9	Man power required time	For long time	Comparatively less time
10	Amount of product	For the given time it produce less injera	For the given time it produce cumulative more product!!
11	Efficient	It has less efficient	It has high efficient

PICTURE OF THE PROJECT SETUP

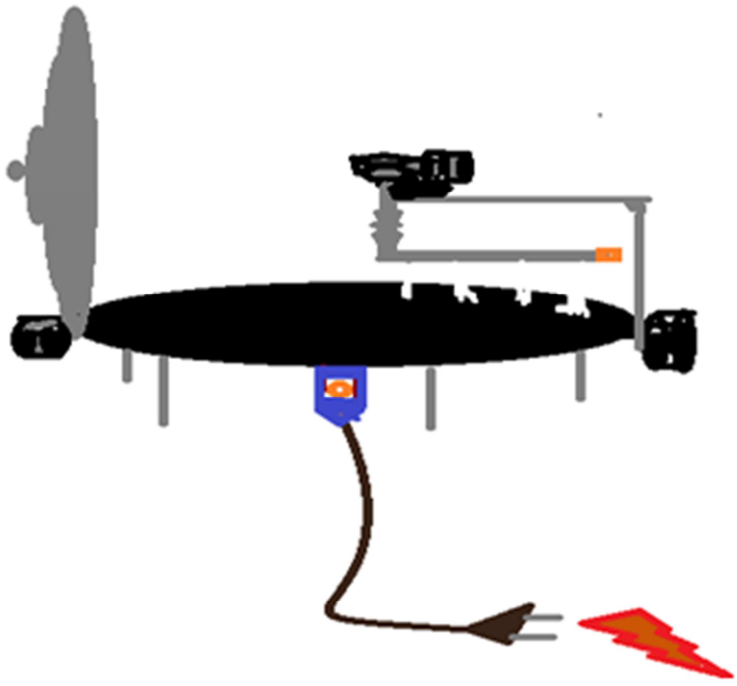
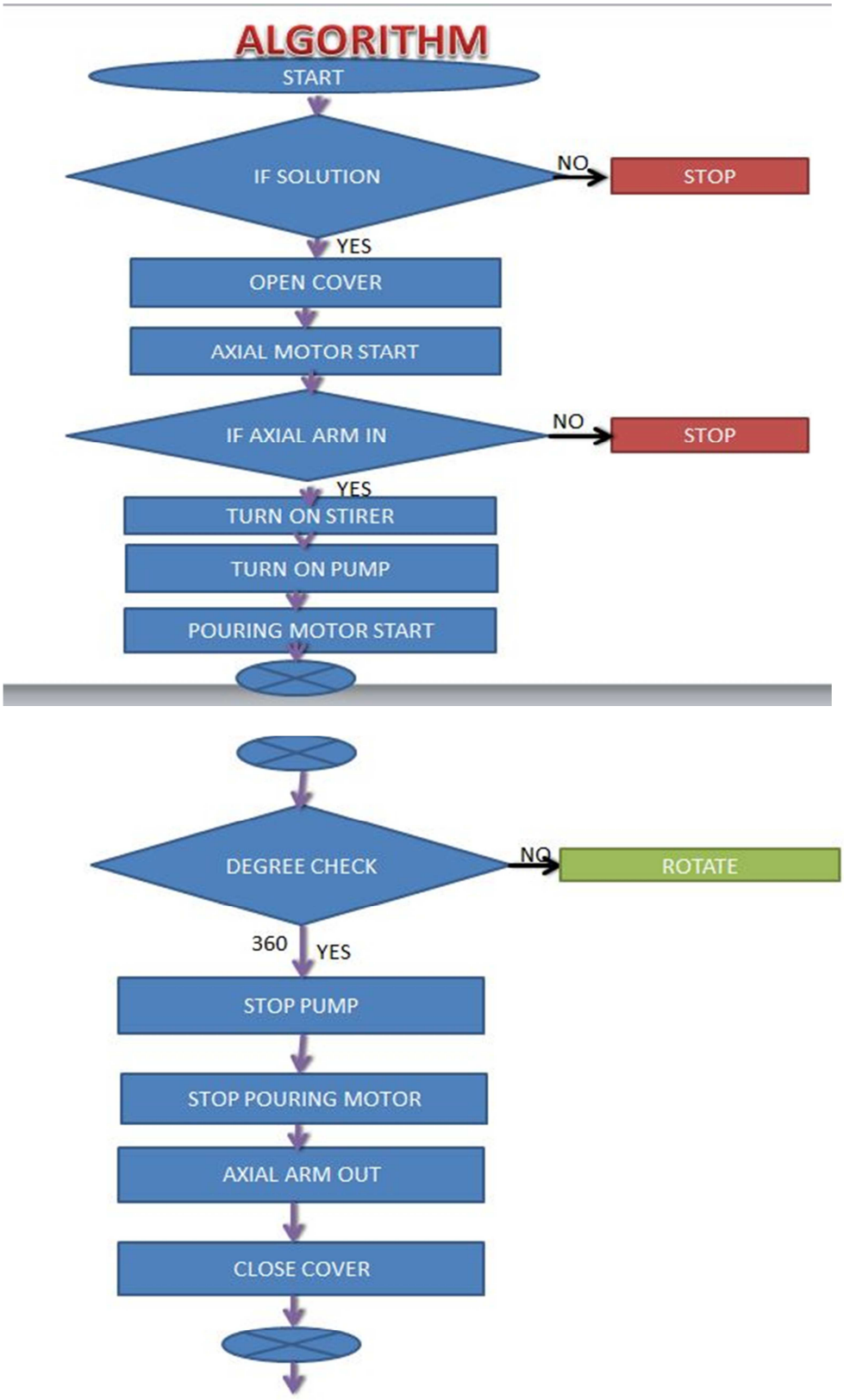


Figure No.1: General graphical picture of the automatic mogogo


ALGORITHM
START
IF SOLUTION
NO
STOP
YES
OPEN COVER
AXIAL MOTOR START
IF AXIAL ARM IN
NO
STOP
YES
TURN ON STIRER
TURN ON PUMP
POURING MOTOR START
DEGREE CHECK
NO
ROTATE
360
YES
STOP PUMP
STOP POURING MOTOR
AXIAL ARM OUT
CLOSE COVER

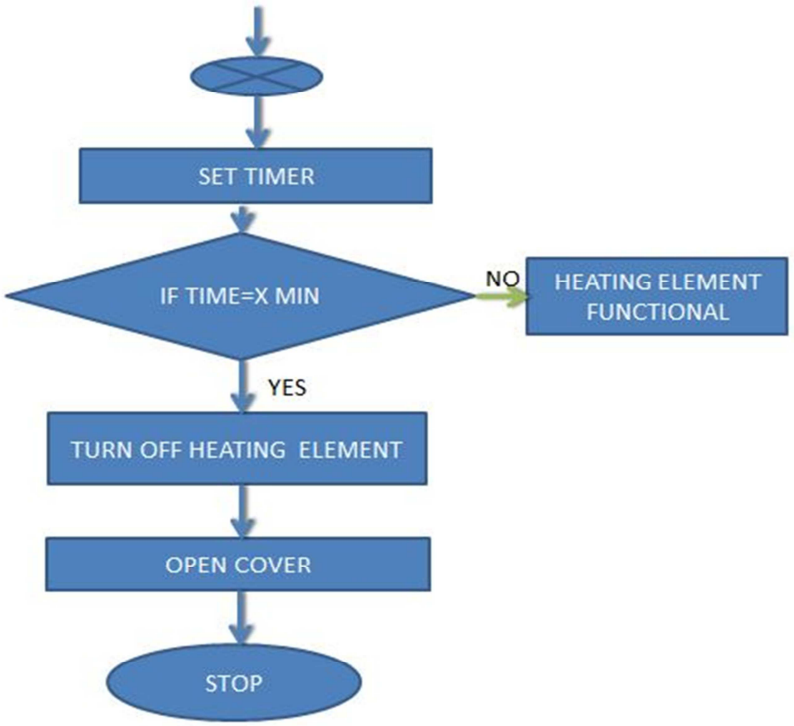


Figure No.2: Proposed Algorithm

CONCLUSION

We are currently working with the ministry of energy to reach the project goals. The ministry is also cooperating well. We will work hard to reach the minimum power possible. If the government offers a fund, this stove can be distributed for tryouts. From that time on the public would know its benefits and feel confident to buy the product[5]. The mentioned price would also go lower when produced as mass. A continuous modification will be done if we saw anything that has to be modified.

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CONFLICT OF INTEREST

We declare that have no conflict of interest.

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