



Design of Small Golden Egg Halogen Machine Based on Arduino

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Abstract: In order to solve the traditional production method of halogen egg yolk taste dry, easy to choke people lead to hiccups ; it's hard to taste after breaking the shell ; aiming at the problems of complex operation of large mechanical equipment, a small golden egg halogen machine based on arduino is designed according to the family demand and market situation in China. The machine is mainly composed of golden egg shaking mechanism, shell breaking mechanism, heating pot core and arduino control circuit. The arduino control board is used to realize the mutual cooperation between the agencies of the golden egg halogen egg machine. Using solidwroks three-dimensional modeling software to complete the three-dimensional modeling of egg machine.

Keywords: Arduino ; Golden Eggs ; Egg Machine ; Automatic Shell Breaking

1 INTRODUCTION

As a large country of eggs, China is rich in egg resources^[1]. Among them, marinated eggs are favored by consumers because of their unique taste and flavor and easy storage and carrying after processing and packaging. However, artificial marinated eggs not only complicated process and time-consuming, more importantly, the safety factor is not high. It can be seen that artificial marinated eggs have been unable to meet people 's needs, so the birth of marinated eggs machine is essential. Nowadays, large-scale marinated egg machines at home and abroad have been marketed globally, but large-scale marinated egg machines are suitable for large factories and not for families. However, the household small-scale marinating machine is not yet mature, and most of them are operated by the combination of manpower and machine. Therefore, the design of a household small-scale marinating machine that can not only automatically boil marinated eggs at home, without time-consuming, high safety factor, but also automatically complete the operation of boiled eggs, broken shells, marinated eggs, and heat preservation has great market prospects.

Traditional marinated eggs, egg yolk and egg white separation, many people will pick out the egg yolk, only eat delicate taste of the protein, especially the children who are growing up, which not only caused waste, but also will lead to the loss of egg yolk nutrition^[2]. After investigation and study, most people do not like to eat marinated eggs or boiled egg yolk, are because of its dry taste, easy to choke people lead to hiccups, and easy to attach to the teeth. In order to solve this problem, many scholars

have proposed an egg that mixes egg white and egg yolk evenly without breaking the eggshell, called golden egg.

Combined with the needs of most families in China, the design of a simple and convenient operation, safe and reliable, suitable for the family 's small household gold egg brine egg machine is particularly important. The golden egg marinating machine is mainly composed of the egg shaking part and the marinated egg part. The golden egg marinating part is an innovative design based on the existing golden egg production machine on the market^[3],and the marinated egg part is a set of device designed according to the marinated egg production method and process, which can put the cleaned eggs into the next key forming device. Not only can the egg be evenly heated,but also can the formed egg shell be evenly cracked to make the egg fully tasty. The pot core of the golden egg marinating machine is divided into two circles inside and outside, which can add different flavors of marinade at the same time, cook different flavors of golden eggs, and meet different tastes of different people.

2 STRUCTURE DESIGN OF SMALL GOLDEN EGG HALOGEN EGG MACHINE

2.1 DESIGN REQUIREMENTS

In view of the needs of ordinary families to use marinated egg machine and solve the waste problem caused by the taste of marinated egg yolk, as well as the economic requirements, the designed marinated egg machine should have the following

functions : shaking golden eggs, breaking shell into taste, marinating heat preservation, miniaturization, simple operation, low manufacturing and maintenance costs.

2.2 EGG-SHAKING MECHANISM

The egg shaking mechanism is mainly composed of fixed claw, torsion spring, support base, synchronous wheel and so on, as shown in Figure 1.

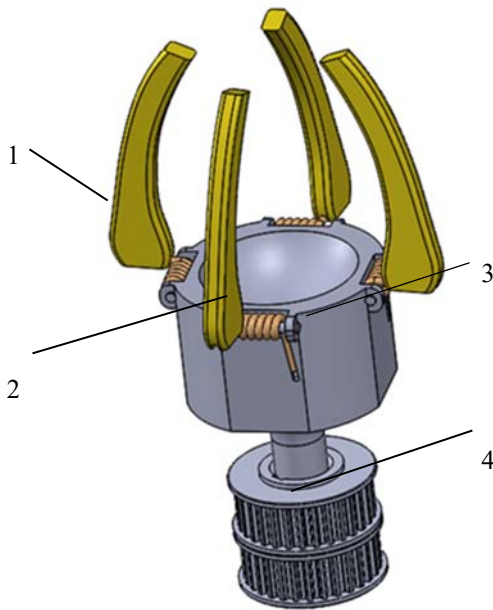


FIGURE 1. EGG SHAKER WHERE 1 - FIXED CLAW ; 2- TORSION SPRING ; 3 - SUPPORTING BASE ; 4-SYNCHRONOUS WHEEL

Working principle : The fixed claw with round shaft and support base connected together, the middle is equipped with torsion spring, so that it has a certain holding force, into the eggs will not crush the eggs, will not be caused by high-speed rotation eggs fall off. Two synchronous wheels are fixedly connected with the support base, and a motor can be used to make 12 egg shaking mechanisms rotate at high speed at the same time through a synchronous belt to obtain a golden egg with a uniform mixture of egg yolk and egg white^[4], which not only solves the problem that the egg yolk tastes dry and choking, but also fully retains the nutrition in the egg.

2.3 SHELL-BREAKING MECHANISM

Shell breaking mechanism is mainly composed of spindle, spring frame, spring, ball hammer, etc. As shown in Figure 2.

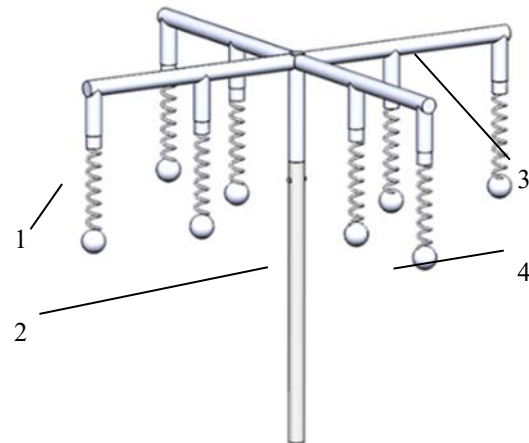


FIGURE 2. SHELL BREAKING MECHANISM WHERE 1 - BALL HAMMER ; 2 - MAIN SHAFT ; 3 - SPRING FRAME ; 4-SPRING

Working principle : The main shaft and the spring frame are fixedly connected, so that the spring frame can rotate with the main shaft, and the spring frame and the ball hammer are flexibly connected with a spring, so that after the ball hammer hits the first egg, it can cross the egg to hit the next one^[5]. Adjust the initial position, control the speed of the main shaft motor of the egg shaking mechanism and the shell breaking mechanism to be the same, so that when the egg rotates 90 °, the ball hammer of the shell breaking mechanism also rotates 90 °, so that the vertically clamped eggs can be hit evenly in four directions to achieve uniform shell breaking and full flavor.

2.4 HEATING POT CORE

Heating pot core is divided into two layers inside and outside, the middle of the inner layer has a spindle through the hole, there are four egg-shaking mechanism through the hole around, can cook 4 minority taste golden eggs : the outer layer has 8 egg-shaking mechanism through the hole, can cook 8 ordinary taste halogen golden eggs, as shown in Figure 3.

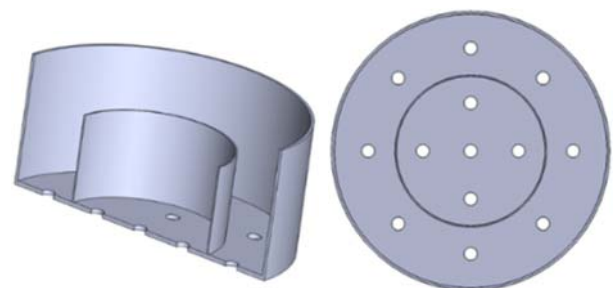


FIGURE (A) FIGURE (B)

FIGURE 3. HEATING PAN

Working principle : There are a total of 13 through-holes in the heating pot core. All of them are connected with the main shaft of the shell breaking mechanism and the supporting shaft of the egg shaking mechanism by food-grade special bearings, which ensures the smooth rotation of the main shaft of the shell breaking mechanism and the supporting shaft of the egg shaking mechanism. The application of food-grade special bearings makes the through-hole of the heating pot core not leak during use to ensure its sealing, and it is also non-toxic and harmless to the cooked golden eggs. A heating resistance coil is installed at the bottom of the heating core, which can provide enough heat for it to realize the function of cooking and heat preservation of stewed eggs.

2.5 3D MODELING

The assembly of small golden egg bittern egg machine is divided into functional module assembly. First, the assembly of egg shaking device, shell breaking device, heating pot core, machine shell and control device is completed respectively, and then the assembly of the whole model is completed according to the overall assembly relationship of the model, as shown in figure 4.



FIGURE 4. THREE-DIMENSIONAL MODEL OF SMALL GOLDEN EGG MACHINE

3 ARDUINO CONTROL SYSTEM

3.1 OPERATION PANEL DESIGN

The control panel is mainly composed of a digital display screen, a cooking red light, a heat preservation green light and 4 input buttons. As shown in Figure 5.

Use process : After the user can put the cleaned eggs into the marinating machine, close the lid and click the golden egg button, the marinating machine will start to shake the eggs into golden eggs mixed with egg white and yolk. At the same time, the display screen will also show the time of shaking the eggs. After the countdown of the eggs on the display screen is zero, the user can open the lid and pour the appropriate amount of water and brine bag. Cover the lid and click the cooking button, and the display screen will show the cooking time. The user can add and subtract the time according to his own preferences. Finally, click again to cook, and the marinating machine will start to work.

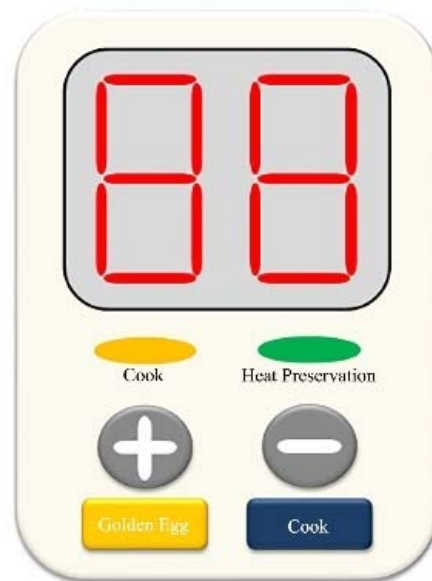


FIGURE 5. CONTROL PANEL

3.2 PROGRAMMING

3.2.1 SHAKE GOLDEN EGGS

Through the arduino control motherboard to control the A4988 stepper motor drive board to make the stepper motor 1 high-speed rotation^[4], to achieve eggs in the egg yolk and egg white fully mixed to form a golden egg. The program is shown in Figure 6.

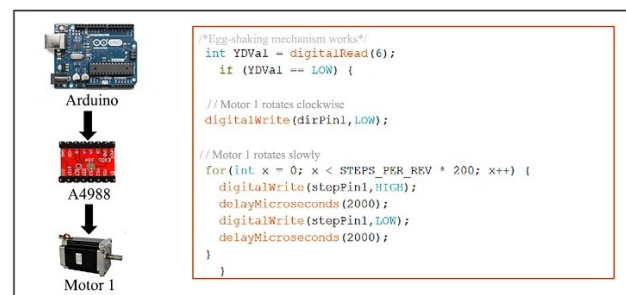


FIGURE 6. PROGRAM OF SHAKING GOLDEN EGGS

3.2.2 COOKING GOLDEN EGGS

After the user presses the cooking button, the arduino controls^[6] the main board to control the heating resistor coil to start working^[7], heating the marinade in the pan to marinate the egg or golden egg in the pan core, and the entire marinating process lasts 30 minutes. The program is shown in Figure 7.

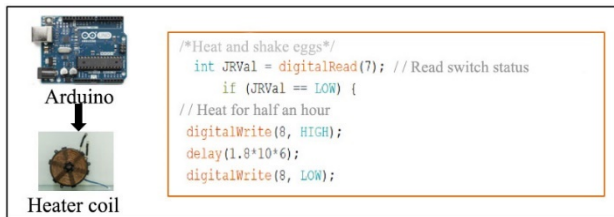


FIGURE 7. COOKING GOLDEN EGGS PROGRAM DIAGRAM

3.2.3 BROKEN SHELL GOLDEN EGGS

When the cooking machine is completed, the arduino control motherboard through the A4988 motor drive board 1 and 2 control motor 1 and 2 at the same speed slow rotation, to achieve the same angle of synchronous operation of the two motors, to achieve the ball hammer precise tapping eggs in four different directions parts. The program is shown in Figure8.

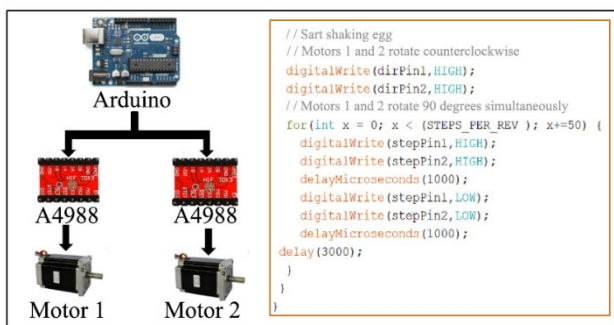
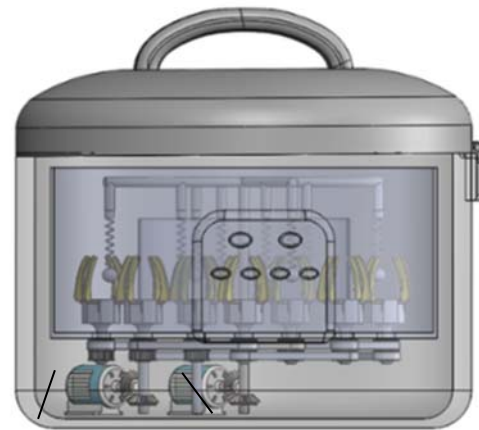


FIGURE 8. BROKEN GOLDEN EGG PROGRAM

4 USE EFFECT

After the user inputs the golden egg command, the control circuit controls the high-speed rotation of the motor 1. The motor 1 makes the egg shaker rotate at high speed with the motor 1 through the transmission mechanism. Due to the centrifugal force, the egg yolk and egg white in the egg are fully mixed at high speed. Open the golden egg marinade machine and pour the marinade for cooking. The pot core is divided into inner and outer layers, and the inner and outer layers are completely closed, and will not affect each other. Therefore, when pouring brine, two different brines can be poured and two flavors of stewed

eggs can be cooked at the same time. When the egg is initially formed, the control board controls the motor 1 and the motor 2 to rotate at the same speed to achieve uniform beating of the egg, so as to achieve the effect of uniform shell breaking to make the egg more delicious. As shown in Figure 9.



Motor 1 Motor 2

FIGURE 9 GOLDEN EGG MARINADE MACHINE

5 CONCLUSION

Nowadays, the large-scale marinated egg machine at home and abroad has been marketized globally, but the large-scale marinated egg machine is suitable for large factories, not for families. However, the domestic small-scale marinated egg machine is not yet mature, and most of them are operated by the combination of manpower and machine. Therefore, this paper designs a domestic small-scale marinated egg machine that can not only automatically cook marinated eggs at home, but also automatically cook eggs, break shells, marinated eggs, heat preservation and other operations. The marinating egg machine will provide a convenient, safe and efficient method for household cooking marinating eggs, and has great market prospects.

FUNDS

College Students ' Innovation and Entrepreneurship Training Project (S202010664020)

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