

Research status of semi-automatic pancake machine

Minghua Yuan, Bingyan Chen, Yiju Sun, Jindao Li

Guangdong University of Science & Technology, Dongguan China

Abstract: Research status of semi-automatic pancake machine this paper studies a kind of semi-automatic pancake machine, which is composed of a rotating pan driven by a motor, an electromagnetic heating device, a frame, a controller and a spreading manipulator. The controller controls the motor to drive the tapioca to pave the plane pulp by the mechanical arm. At the same time, the controller controls the electromagnetic heating device to heat the dough to make the dough cake. All the manual operation procedures of making pancakes are semi-automatic, which simplifies the pancake making, improves the processing efficiency, reduces the labor intensity, and the pancakes still have the taste of manual production.

Keywords: Semi-automatic pancake machine; Domestic research status; Foreign research status; Development trend

1. INTRODUCTION

Traditional pancakes have a long waiting time and high labor intensity, which is a challenge to customers and sellers. Therefore, there is an urgent need for a machine that can reduce the pancake time and labor intensity. The designed semi-automatic pancake machine can meet the above requirements. It is driven by the motor and heated by the electromagnetic device. In the traditional pancake equipment, the structure design is optimized and the heating mode is improved. At the same time, Solidworks motion simulation is used to ensure the safety and reliability of the equipment. Pancake equipment by the traditional manual development, now has a variety of functions of higher automation equipment. The common ones on the market are: Electric pancake machine, roller pancake machine, automatic pancake machine, imitation manual pancake machine, automatic gas pancake machine.

2. DOMESTIC RESEARCH STATUS STATUS OF PANCAKE MACHINE

2.1 Pan type pancake machine

The characteristics of the pancake machine are rapid heating. The pancake machine is divided into upper and lower pan. The upper pan is equipped with handle, fire observation port and cooling hole, which are convenient for lifting and preventing hand scald, checking the heat and cooling temperature. The lower pan is equipped with oil box, oil leakage hole temperature switch, hydraulic gauge, etc. Equipped with temperature control system, pressure control system and heating system. The pancake is heated by heating the cake drum. The bottom of the cake drum is provided with a groove to improve

the heat absorption efficiency. The road heating element can be embedded in the cake pan to transfer heat accurately. The heating system element can be resistance wire, and coal or heating plate can be used to increase the efficiency of electric heating conversion. It can reduce the surface oxidation resistance and power per unit area of electrical components, and prolong the service life of electrical components.

2.2 Roller pancake machine

The common roller pancake machines on the market are mostly used for commercial mass production. The overall structure is that the motor drives the drum to rotate, the cutter cuts off the pan fried pancakes, and the conveyor belt is transported to the folding device for folding. The system includes heating system, conveying system, transmission system, cutting system, folding system, oiling system and feeding system. The feeding system consists of feeding hopper, coaxial stirring cage and hose. One end face of the hose is connected with the feeding pipe and faces the roller, and one end is connected with flour slurry which is evenly stirred. A stirring cage is arranged at the bottom of the feeding hopper to make the flour pulp with different concentrations fully stirred and transported to the hose evenly under the stirring cage with uniform rotation speed. The mixing cage is connected with the transmission system, so that the flour slurry is evenly distributed on the drum, and the axis of the material pipe is parallel to the axial direction of the drum. The cooked cake is transported to the cutting device by the transmission device. The invention relates to an automatic pancake making machine which imitates the manual to realize complete automation in the production process. It consists of control system, transmission system, heating system, air pressure system and other auxiliary systems. The motion mechanism is that the motor drives the shaft to drive the spindle to rotate. One end of the shaft is equipped with a pulley and connected with the motor through the belt. The other end of the shaft is connected with the plug by key.

3. FOREIGN RESEARCH STATUS

Pancake is a special food in northern China. There are few large commercial pancake machines abroad, and people pay more attention to small household pancake machines. Most of the foreign domestic pancakes are made of sandwiches, crispy cookies, egg tarts and other breakfast foods. Japan's vitannio waffle machine is a more practical domestic pancake machine abroad. The design is similar to the pancake machine. Its characteristic is that the baking pan can be replaced. The baking pan has the shape of snapper, waffle, flying saucer, etc. Similar to mold casting, different shapes of baking dishes can produce different foods. The baking tray is made of fluorine resin processing aluminum die casting, and the body material is phenolic resin and stainless steel. The ks-351h pancake machine under the German EPO brand pays more attention to temperature and soot. The design is integrated, the frying plate is not detachable, and the temperature is controlled by microcomputer. The rough structure of lotus leaf surface was simulated on the surface of frying plate, and the oil smoke was reduced by combining with non stick materials.

4. THE PRESENT DESIGN STATUS AND FUTURE DEVELOPMENT TREND OF PANCAKE MACHINE

4.1 Current design status of pancake machine

Scheme 1: the driving source is arranged horizontally to save space and make the design equipment more compact. The whole system is composed of driving device, transmission device and heating device. Drive control route: control source - motor - transmission device - plug - brake device; heating control route: control source - electric heating device - temperature detection device

The design of semi-automatic pancake machine in scheme 1 follows the principle of compactness, which makes the equipment compact, avoids unnecessary waste of space resources, and is convenient for operators to carry and place. Only the servo motor is used in the drive device, and the external rubber reduces the buffer, vibration and noise. The transmission device is composed of spiral bevel gear steering box, which makes the operation stable and reliable. The resistance material with high oxidation resistance is used on the heating device. The resistance material is built into the heating plate. The heating plate is smaller than the plug and the size is just placed in the groove reserved at the bottom of the heating device to reduce the heating time and improve the heating efficiency. The surface of the heating device is sprayed with spray paint with high insulation, and the parts are inserted to facilitate inspection and replacement. The outer iron box is made of stainless steel to prolong the service life of the semi-automatic pancake machine.

AS is follow composed of large bevel gear, output shaft, bearing, end cover, spiral bevel gear, input shaft, base, box, lubricating oil cooling device, vibration transmission rod and vibration detector. The motor transmits the power to the input shaft through the connector, one end of the output shaft rotates to drive the plug to rotate anticlockwise, and the other end transmits the power to other auxiliary equipment.

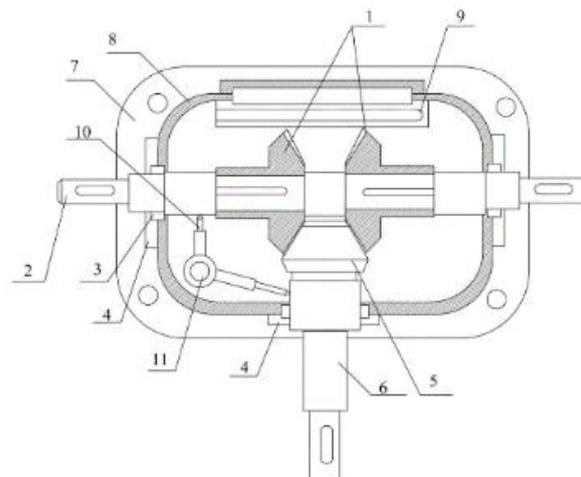
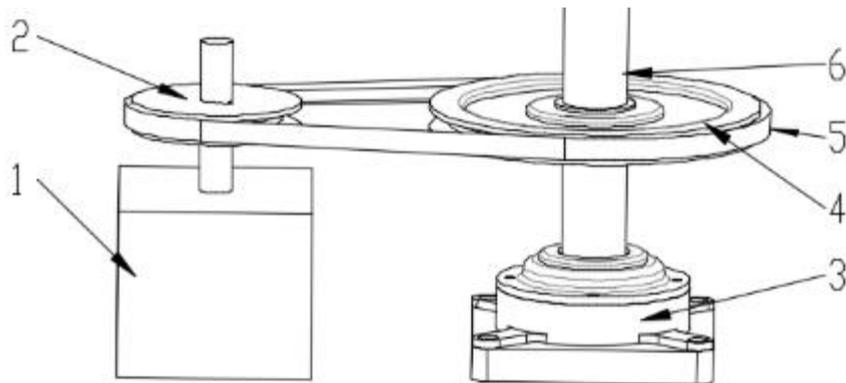


Figure 1 Structure of spiral bevel gear steering box

(1) It consists of bevel gear, (2) output shaft, (3) bearing, (4) end cover, (5) spiral bevel gear, (6) input shaft, (7) base, (8) box, (9) lubricating oil cooling device, (10) vibration transmission rod and (11) vibration detector

Scheme 2: the structure of down drive and up moving is adopted, and the belt pulley and pulley are used as the intermediate transmission medium. Taking up a certain space, more auxiliary functions can be added, such as adding a mechanical arm that can be applied with paste on the pan, reducing the working intensity of the operator, and adding an anti-scalding ring around the pan, which can not

only prevent scalding, but also have the function of braking. In the heating system, the advanced electromagnetic heating method is adopted. The heating element uses its high resistance and strong thermal conductivity to improve the conversion efficiency of electric heating. At the same time, the temperature detection feedback device is installed to detect the temperature from time to time to ensure the safety of pancake making process. The robot arm is driven by an independent small motor. The left side of the manipulator is equipped with a paste smoothing device, and the right side is equipped with an automatic oil spreading device, which can reduce the pancake making time and labor intensity of operators, so as to improve economic benefits.



(1) Servo motor motor, (2) small pulley, (3) bearing seat, (4) large pulley, (5) V-belt and (6) shaft
(2) Fig. 2 transmission mechanism of scheme 2

Compared with scheme 1, scheme 2 has higher automation, more perfect functions, stronger security and more reliable performance. The disadvantage of scheme 2 is that it takes up a certain amount of space. Electromagnetic heating and motor operation require a lot of power supply, so people need to put the paste by themselves. It is suitable for small workshops or mobile vendors, but not suitable for household use.

4.2 Future development trend of pancake machine

(In order to improve the production efficiency and reduce the labor intensity of the operator, the pancake machine should be more automatic and intelligent, and can be controlled by microcomputer to realize complete automation. Improving and optimizing the heating system and selecting more suitable heating materials can retain the original flavor and improve the heating effect. The frying pan material can be made of materials with strong thermal conductivity, non-toxic surface spraying and oil fume reduction, which makes pancakes more environmentally friendly. The home pancake machine can also miniaturize the equipment while considering the intelligence. The frying plate adopts the replaceable type to make pancakes of different shapes according to their own preferences.

5. CONCLUSION

Conclusion through this research, I have gained a lot in all aspects, and it makes me further deepen the understanding of mechanical design and other courses, which makes me have a great improvement in theory. For the design of this study, there are the following conclusions:

(1) Adding automatic rotation function can improve the processing speed and production efficiency of pancakes

- (2) Electromagnetic heating is adopted to make the heating more uniform, hygienic and fast, and reduce the energy cost at the same time.
- (3) Adopting intelligent control system, it has the characteristics of easy operation and low risk, while retaining the original flavor.

REFERENCES

- [1] Xu gning. Xu Kejin. Mechanical design [M]. Beijing: China Machine Press, December 2018,11-14.
- [2] Zhang Hongcheng, Xiang Peng, Hu Qingsong, Chen Leilei, Li Jun. design and parameter analysis of artificial egg cake processing machine [J]. Science and technology perspective, 2019 (04): 11-14.
- [3] Cheng yuliai, Wang Bo. Research and design of infrared heating roller pancake machine [J]. Food industry, 2010, 31 (01): 96-97.
- [3] Liu Hongzheng. Detailed explanation of SolidWorks motion motion motion simulation example: micro video version [M]. Beijing: China Machine Press, August 2018,90-95.
- [4] Wang Xiaorui. Study on temperature distribution of instant rice reheated by microwave [D]. Northeast Agricultural University, 2019, 21-24.
- [5] Zhai Zicheng, he Jianyun, an Ying, et al. Scheme design of electromagnetic heating vulcanization hot plate [J]. Mechanical design and manufacturing, 2019, (5): 5-9.