THE DEVELOPMENT OF SMART GRILLING MACHINE

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Abstract

Satay is made from cubed meat, then barbecued or grilled over charcoal fire and served with peanut sauce. Satay is one of the food that are easy to find either at home or street stalls. Their main source of heat is supply in common type grill equipment which is charcoal. It is also unfriendly to the environment. Effect of combustion charcoal has become one of the reasons of air pollution. Subsequently, the operator is exposed to unfriendly working conditions since the flow of heat cannot be easily controlled. Food health problems are also affected in the emission of smoke during operation, indirectly will be polluted the satay. If it is not treated with anxiety, food poisoning may occur. Ashes also can be present in the satay which can change their taste. Moreover, it is also difficult to attain uniform heat distribution. So, the new smart grilling machine has been designed to solve all the problems mentioned above. The heat source of smart grilling machines is using electricity. A special heating coil has been designed and provided to supply heat to the machine. Their heating can be adjusted according to the appropriate heating degree to all parts of the grilling machine. In conclusion, this smart grilling machine with its safe operating conditions, economical usage, faster cooking time rate, complete burning processes, environmentally friendly characteristics, uniform heat distribution and heat regulating abilities, make it the best alternative if compare to the other charcoal grilling method.

Keywords : grilling, barbecue, satay

1.0 Introduction

Satay can be found throughout all the states of Malaysia in restaurants and on the street, with hawkers selling satay in food courts and night market. The popular kinds of satay are usually beef and chicken satay, different regions of Malaysia have developed their own unique variations. There are a number of well-known satay outlets in Kajang, Selangor which is dubbed the Satay City in the country [1]. Satay Kajang is a generic name for a style of satay where the meat chunks are bigger than normal, and the sweet peanut sauce served along with a portion of fried chili paste. Another type of meat satay is the satay lok-lok from Penang and satay celup or dip satay from Melaka [1]. Both are Malaysian Chinese fusions of the hotpot and the Malay satay. Satay may consist of diced or sliced chicken, mutton, beef, fish or other meats. The more authentic version uses skewers from the midrib of the coconut palm frond, although bamboo skewers are widely used nowadays [1]. These are grilled or barbecued over a wood or charcoal fire, then served with various spicy seasonings [2]. Satay can be served in various sauces. However, most often they are served as a complete meal accompanied with peanut sauce, cuts of cucumber, onion and ketupat or steamed rice [2]. The peanut sauce are made from a combination of ground peanuts, chilies and other spices. Hence, peanut sauce is often called satay sauce. Ketupat is steamed rice that wrapped in woven leaf.

Satay originated from the Indonesia Island of Java Sumatra [3]. It is available almost everywhere in Indonesia, where it has become their national dish [3]. It is also popular in many other Southeast Asia countries particularly Malaysia, Indonesia, Singapore, Brunei, Southern Philippines and Thailand [3]. Satay is a very popular delicacy in Indonesia, the country's diverse ethnic groups culinary arts have produced a wide variety of satay. In Indonesia, satay is a popular street food, it can be obtained from a
satay vendor, a street-side tent-restaurant, an upper-class restaurant, or during traditional celebration feasts [3]. Normally, barbecue is both a cooking method and an apparatus or machine [1]. Barbecuing is done slowly over low, indirect heat and the food is flavored by the smoking process, while grilling, a related process, is generally done quickly over moderate-to-high direct heat that produces little smoke [1]. There are several varieties of grills such gas-fueled and charcoal.

The first modern barbecue grill was made in 1952 by George Stephen, a welder at Weber Brothers Metal Works, in Mount Prospect, Illinois [4]. Before this, people occasionally cooked outside, but it was done by burning charcoal in a shallow sheet-metal pan that stood on thin legs [4]. It didn't provide much control over the cooking, so food was often burnt outside, undercooked inside, and covered with ash from the burnt charcoal [4]. George's version was easier to use, and made barbecuing much more popular [4]. Charcoal briquettes have been a staple of the barbecue for many years. The charcoal briquette was patented in 1897 by Ellsworth B. A. Zwoyer, of Pennsylvania [4]. The portable gas grill was invented in 1954 by Don McGlaughlin, owner of the Chicago Combustion Corporation [4]. The majority of modern gas grills have a cart design: the grill unit itself is attached to a wheeled frame that holds the fuel tank [4].

The problem faced by using charcoal grill are the emission of soot during the grilling process pollutes the environment and leads to health problems. The uncontrollable heat conditions from charcoal combustion and exposure to non-friendly environments may make it possible to pollute food which may affect the health of consumers [2]. Besides, this situation can change the taste of food. Therefore, a new smart grilling machine is designed to solve the existing problem. The main objective of smart grilling machine is to overcome the healthy food and environmentally friendly problems. The second objective is to ensure safe operations of the grilling process by avoiding our hand from injury due to extended heat distribution. The third objective is to increase the productivity of satay during grilling process by reduced the man power, time and cost. The smart grilling machine is designed only for grilling satay. Satay stick should not exceeds 20 mm of diameter and 180 mm of length. At one time, the grilling process are limited to 20 sticks only. A few minute needed to heat up the heater coil in the machine to reach a certain temperature before begin to grill the satay.

Figure 1.1: Satay Served In Peanut Sauce, Cuts of Cucumber and Onion
2.0 Design of a New Grilling Machine
In designing the smart grilling machine, it is separated into two sections which is the main structure or body and the heating controller section. In the body section, it can also divided into 2 main parts. The first part is main structure including moveable tray, 4 pieces of wheel for easy moving and body thermal insulation. The second part of machine is made up of 20 stick holders and top casing which are welded together as well as the main body. This machine are designed only for grilling satay. The stick holders is designed in such a way that 20 sticks satay can grilled at one time. The dimension of stick holder is 24 mm of diameter and 160 mm of length. As for the latter, the heat source of smart barbecue machines is fully using electricity and the heating controller system is designed to be able to heat up the heating coil and also control their cooking temperature.
Figure 2.2: Assembly of Stick Holders with Top Facing Plate

Figure 2.3: Assembly of Heating Coil

Figure 2.4: Heating Coil Controller
3.0 Experiment and Results

A series of experiments had been carried out to test the functionality of the machine and its system integrity. First, it was tested on adjustment cooking temperature and function of heating coil controller. Second, it was tested on cooking time. Third, it was tested on taste and cooking stages of satay. The machine working and functioning very well when tested on adjustment cooking temperature and the function of heating coil controller. Apart from that, the machine also able to grill 20 sticks satay at once. A culinary cycle with the appropriate cooking temperature is 200 °C and the time taken is 8 minutes. During all the tests, no any malfunction either on the heating coil controller or main body was noticed.

4.0 Conclusion

As a conclusion, the overall design of this machine provided opportunities for future generations to contribute the ideas that is suitable and dramatically improved by technological change. The smart grilling machine that was designed and developed has shown its capability of grilling satay very well as per design. This machine with its safe operating conditions, economical usage, faster cooking time rate, complete burning processes, environmentally friendly characteristics, uniform heat distribution and heat regulating abilities, proved that it is the best alternative compare to the other charcoal grill method. Thus, it can assist and complement human in the grilling tasks in general and very useful in production of satay in specific for satay traders and entrepreneurs.
5.0 Suggestion

Each design has its own distinctive advantages and disadvantages such time to time maintenance to further improve its performance. Improvement suggestion as create more stick holder to improve the quantity product produced. Redesign the machine design from manual to semiautomatic machine or fully automatic machine. Change the design from cubic shape to semicircle shape on the top facing plate so that it will look more convenient and will attract the customer easily.

Bibliography


