Design, Development & Fabrication of Automatic Flatbread Machine

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Abstract - *The objective of the paper was 'Design and Development of Automatic Flatbread Machine for Indian Households' by considering cost, usability, care, easy handling and hygiene. Flatbread is an inevitable food item in most of the Indian families. Throughout the study some simple traditional flatbread making procedures were examined and implemented for concept selection and mechanism. Market study was directed to understand the existing flatbread making methods, and numerous flatbread making machines were studied in this market study.*

Key Words: Automatic, Flatbread, Households, Concept, Machine, Market, Safety.

1. INTRODUCTION

In the fast-moving world when everything is automated, even our kitchen is turned to an unmanned atmosphere. Employed people find it tough to cook after a tedious work culture.

An automatic flatbread baking machine wherein, at a programmed period preceding to a pre-set time, oil is supplied into a vessel, in which the constituents of flat bread are mixed by revolving a rotary vane provided in the vessel, making dough. A moving base is provided in the container spaced from the rotary vane, and the dough is twisted by the rotary vane & moving base plate and kneaded at relatively moderate speed by the assistance of the rotary vane and the base plate. The dough making process occurs for programmed time, and when the it has reached a programmed time, the dough kneading operation is concluded. The paper relates to an automatic flat bread baking machine for automatically baking a small amount of flat bread, primarily for home use.

Efforts have been made to make the design compact & user friendly.

1.1 FLATBREAD MAKING

Compact Flatbread making machine developed can make 15 to 20 roti's in one hour, saving a lot of time and labor. The flatbread made by this machine are totally home like and 100% hygienic. You can use normal wheat flour with this Flatbread Making Machine for making soft and high in quality chapattis in mass numbers. The Flatbread made will surely remain fresh and soft even after few hours. This Flatbread Maker Machine is specially designed to give out the best performance at domestic level.

Features:

- Portable machine in domestic segment.
- Simple rugged and very compact
- Requires no special skills to operate.
- Uniformly baked final product.
- Robust Construction.
- Versatile.
- Eco friendly.
- Hygienic production.
- Fully automatic.
- Aesthetically Attractive.

2. COMPONENTS

The flatbread maker is divided into three units i.e., Storing unit, Mixing Unit & Pressing Unit.

2.1 STORING UNIT

A storage container used to collect flour & is designed to easily dispense these materials through the use of Archimedes screw. The storage is a small, conical shaped container used to store oil in the lower section here. The quantities of oil & flour are controlled by pump & Archimedes

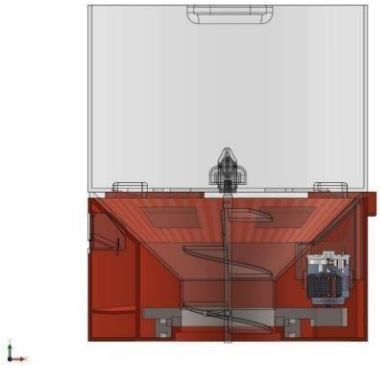

Fig.2.1 Storing Unit

screw respectively, as shown in Fig 2.1

2.2 MIXING

The Mixing unit comprises of a cylindrical chamber. The upper portion of the cylinder, a blade is fixed & it is the one mainly responsible for kneading & dough making. The lower portion consists of a bed which is attached to lifting mechanism as shown is Fig.2.2

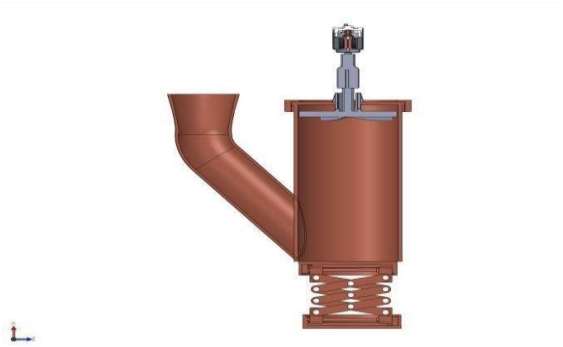

Fig 2.2 Mixing Unit

2.3 PRESSING & BAKING MECHANISM

The dough is flattened & heated with the help of the mechanism shown in Fig.1.3. The flattened dough is heated with the help of induction cooking method.

Fig. 2.3 Pressing Unit

3. WORKING

The constituents of flat bread are put in the flask in advance, and by a regulator, water in the water tank is provided into the vessel and the rotary vane is rotated to mix the constituents with the water to obtain dough. Under the control of the regulator, the dough is kneaded in the vessel and the rotary vane is driven for a short period of time to process the dough, after which the dough is kneaded again, and the molded dough is baked by the coil in the press.

In the container, a moving bed is provided to extend in the vertical path & placed at a distance to the circle of rotation of the rotary vane in parallel relation thereto. When kneaded, the dough is twisted around and hard-pressed around it by the rotary vane; namely, the dough is sufficiently kneaded by the assistance of the moving bed and the rotary vane. In this case, even if the rotary vane is driven at, for example, only 200-400 rpm or so, exceptional kneading can be achieved. Upon noticing that, as a result of the kneading, the dough formation time has risen to a programmed time value, for example, 1.5 minutes., the kneading step is proximately finished. For perceiving the dough roundness, a camera module is predisposed in the bottommost portion of container and the perceived yield from the camera module is used.

The drive of bed in the container is caused due to scissor jack mechanism. The motor drives the scissor jack shaft to produce vertical motion.

After inspection of roundness of dough, the bed conveys the dough to the bottom where further pressing of dough takes place in order to achieve flatness. Simultaneous pressing & baking of flatbread takes place.

At the end of this process, the flat bread is cast out from the press to make way for next flat bread.

4. METHODOLOGY

The fabrication process of proposed design was initiated by selecting method of molding by thermoplastic material acrylic. The molding was done by using electric induction coil as a heat source. The acrylic sheet was cut in accurate profiles by laser cutting technique.

This technique of fabrication was discarded due to following reasons:

- Difficulty in making intrinsic parts.
- The parts fabricated were of low dimensional accuracy.
- Low strength.
- Time consuming process.
- Tedious process.
- High Material cost.

So, due to the following disadvantages, other fabrication process was opted.

Fig.4.1 Molded Part

Rapid Prototyping mentions to any manufacturing process which additively builds or forms 3D parts in layers from CAD data. The technology is noteworthy because it offers straight manufacturing, sense a design drives right from you to physical product through a computer and a printer.

Rapid Prototyping printing starts with a digital file resulting from computer aided design (CAD) software. When a design is accomplished, it must then be transferred as a standard tessellation language (STL) file, meaning the file is decoded into triangulated surfaces and vertices. The STL file then has to be sliced into hundreds of 2-D layers. A rapid prototyper then reads the 2-D layers as building blocks which it layers one over the other, thus forming a three-dimensional object. All design files, irrespective of the Rapid Prototyping technology, are sliced into layers before lithography. Layer depth – the size of each individual layer of the sliced design – is determined partly by technology, partly by material, and partly by desired resolution and plan timeline; denser layers equates to quicker builds, thinner layers equate to finer resolution, less visible layer lines and therefore less concentrated post-processing work. After a part is sliced, it is oriented for build.

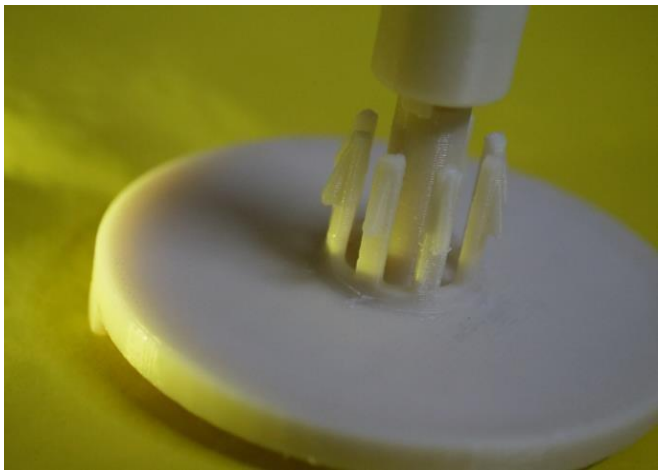

Fig 4.2 3D Printed Rotary Blade

5. HARDWARE

Raspberry Pi is a, small sized CPU that wads into a monitor or TV and practices a typical peripheral. It is a capable device that permits individuals to determine calculating, and to study how to program in different programming languages. It's proficient of doing all expected from a computer to do, from surfing the internet and, to creation of spreadsheets, word-processing, and playing games.

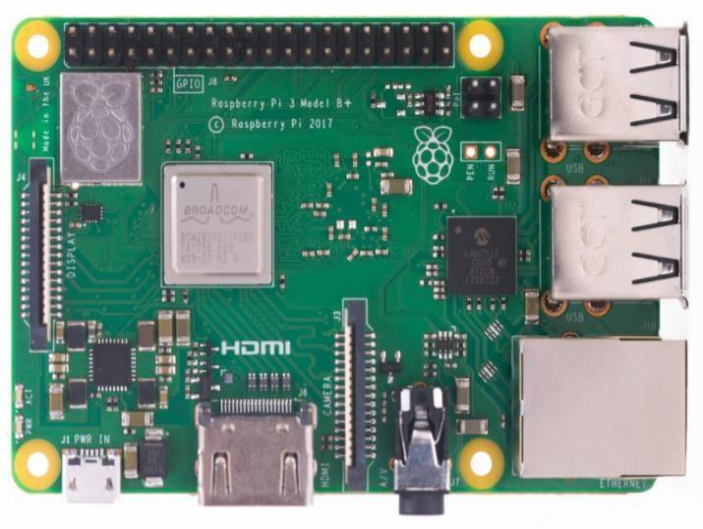

Fig 5.1 Raspberry Pi ModelB+

5.1 CIRCUIT DIAGRAM

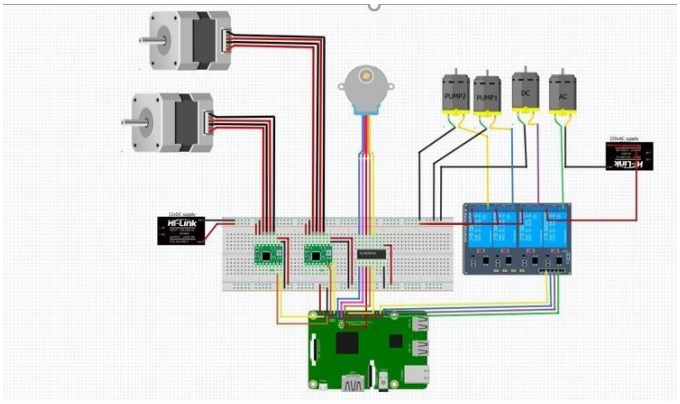

Fig 5.2 Circuit Diagram

5.2 SCHEMATIC DIAGRAM

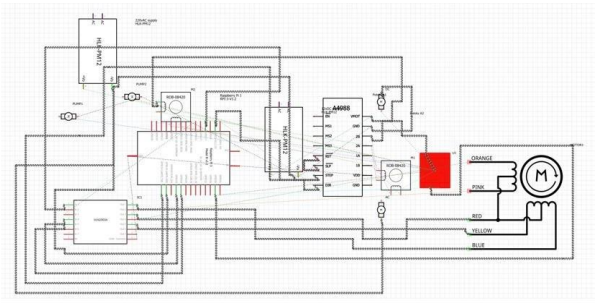

Fig 5.3 Schematic Diagram

6. CHALLENGES FACED

6.1 Kneading

In the initial stages, the dough was non uniform & sticky, so, to overcome this we designed a blade that performs kneading & mixing. Fig below shows design of blade. The blade was manufactured with the help of 3D printing technique.

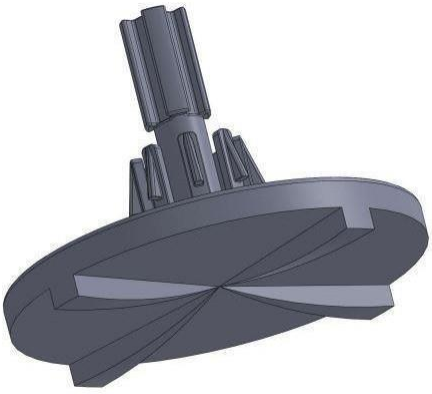

Fig 6.1 Blade CAD Model

6.2 Cleaning

To make this machine, more user friendly for cleaning the parts were designed keeping that intent in mind.

6.3 Modularization

The parts are made easy to remove so as to ensure efficient maintenance & service.

7. CONCLUDING REMARKS

The quality of dough made was tested with the help of 3D printed blades.

The following results were obtained.

1. Texture :

The texture obtained was closed to home made roti.

2. Kneading time :

It was observe that the kneading time was nearly 50 seconds & varies with the quality of flour used.

3. Mixing time:

It was observed that for uniform mixing, the average time required was about 30 seconds.

4. Quantity of Ingredients:

The quantity of flour required for making 1 roti: 63g. The quantity of water required for making 1 roti: 30ml The quantity of oil required for making 1 roti: 5ml

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