FACULTY OF INFORMATION TECHNOLOGY

IN 1900 - ICT PROJECT

AUTOMATED BABY FOOD MAKING MACHINE

Contents

1.0 Introduction

Foods are essential not only for adults but also babies; we must consider more about baby's food because they want more nutrition to grow up well. Sometimes we forget to give enough nutrition to them. Sometimes we try to give good and nutritional foods, but it does not work properly because of some erroneous food preparing methods such as overboiling, over blending, overheating etc. So, most the of nutritional value is destroyed. Therefore, we must make foods in good ways. Food time and number of meals per day are difference according to babies' age. In our busy lifestyles we forget to feed them at the correct time. When they cry, that time, we try to feed them but it's not good for their growth. So, we must give them foods correct time.

Although there are some machines for baby food preparing purposes, there are several limitations such as available only as separate machines to buy, user require to present on-scene, user must perform a considerable amount of work to get the work done pressing so many buttons. That's why we created this **automated baby-food making machine.**

This machine is fully automated and operated by a website so it's very easy to handle. It has an alarm system so we can feed them correct time; we can prepare vegetables and rice puree, fruits pulps etc.… if we use this machine, we can save our energy and time and take care of our babies properly.

2.0 Problem in brief

Preparing foods for babies especially considering about their health and age is one of the most important practice and most intensive task of baby caring for mothers. Some parents who've tried and given up on homemade baby food point out these problems to making it:

- It takes considerable time to make and prepare lots of little savings of homemade baby food.
- Though it is faster and more convenient to pick up prepackaged instant foods, we can't assure the real quality and healthiness as they might include harmful preservatives, flavors etc.
- For working mothers always preparing foods on time is arduous in their busy schedules. So, they tend to prepare them at once before and refrigerate and use but it may be a cause to reduce the nutritional value of foods.
- Homemade baby foods may spoil more quickly and require refrigeration which may take up room in your fridge or freezer if you make a lot of servings ahead of time. So, storage problems occur.
- It is very inconvenient and exhaustive to manually prepare all the things alone.
- Buying store-bought baby foods seems to be expensive than preparing them at home.

3.0 Aim and objectives

Aim

- ✓ Create an automated baby food making machine with a minimum hassle to mothers.

Objectives

- ✓ To prepare a complete nutritional meal according to user's choice such as vegetable and rice puree, fruit pulps etc. automatically.
- ✓ To prepare foods with a simple click of few buttons and less human interaction.
- ✓ To prepare meals healthily within a short time.
- ✓ To make a portable machine

About the design

We can divide the main bin into 3 separate parts as a, b, and c. That is for easyness of cleaning process and to put vegetables and rice separately into the main bin.The cutting net (5) is made of aluminium. There is a alumunium funnel under the cutting net. Cylinder shape net (18) is made of aluminium. There are temperature and water level sensor(magnetic float switch) inside the main bin. Water-in pipe and drain pipe are connencted to the main bin. There is a valve between main bin and mashing bin. There are 2 separate plugs for the heater and the main circuit of the machine. In the mashing bin, the piston is connected to the threaded bar and the bar is connected to the motor.

Procedure of the machine

In this baby food-making machine, we have mainly 3 sections.

1. Chopping/cutting section
2. Boiling section
3. Mashing section

We use a keypad with LCD - display to input the food types, mashing level according to the user's desire, types of food, and the number of portions.

Firstly, users have to put the necessary things to prepare food such as vegetables, rice and green grain, fruits etc. into the machine by opening the upper lid .

. Users can mainly prepare two types of foods.

1.) Rice and vegetable puree

To make this type of food user can put one or more than one thing chosen from the below-mentioned list only according to her choice.

- Rice, carrots, potatoes, pumpkin, green grain, sprat, fish

2.) Fruit pulp

To make the fruit pulp user can put one or more than one thing from the below list. The requirement is to put soft type fruit with high moisture in order to the mashing process to be occurred at the expected level.

- Papaya, banana, avocado, mango

Before putting these foods user has to peel/remove the outer coverage of required vegetables or fruits, remove the seeds, wash and clean them properly.

\Secondly user must turn on the machine by using on/off switch on the keypad. Then it will display two options to choose, on LCD display.

Option 1 - Rice and vegetable puree ⟶ 1

Option 2 - Fruit pulp ⟶ 2

So, user have to press number 1 or number 2. Then a message will appear on the display to confirm it.

After inputting of food type, a message will appear on the display to choose the required mashing level according to the age group.

6 – 9 months - high ⟶ press number 1

9 – 12 months - low ⟶ press number 2

We set this type of 2 levels because it is recommended to lower the mashing level when the baby grows up for well growth of their teeth. So, the puree must not be totally creamy (means over-mashing/blending)

Finally, the user have to enter food quantity using the keypad. For that, a message will appear on the LCD screen to select the quantity. Users have to take the approximate value of grams of food.

Option 1 40g-50g

Option 2 90g-100g

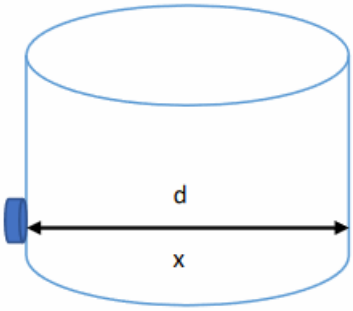
Option 3 140-150g

The purpose of this selecting options of food quantities is, for the machine itself to measure the time taken to boil and measure the water level required. After entering these 3 inputs the machine will start the food preparing process automatically.

If you try to switch on a machine without foods in the compressor bin (cutting bin), then the Alarm will ring to notify the user and the machine will not execute other parts as well. We are planning to use an ultrasonic sensor to identify whether there are foods or not.

Process for determining whether there are foods or not.

We are giving specific length to the circuit by programming. If the measuring distance is less than that distance, we can determine there are foods. If the measuring distance is greater than the specific length, we can determine there aren’t foods.

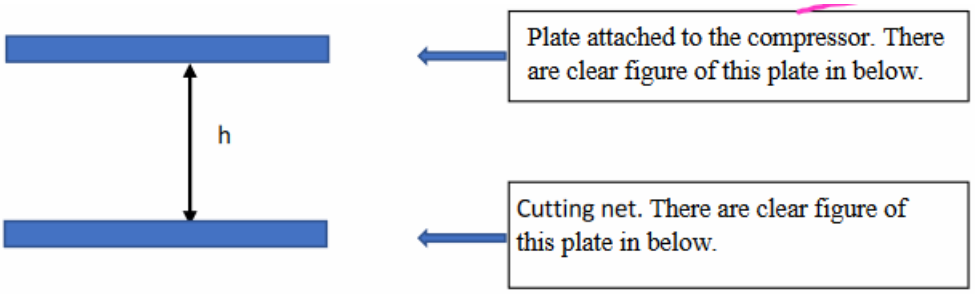


If x < d (given specific length), we can identify there are foods available in the bin

$$d = \frac{v\ (\text{Velosity}) \times t\ (\text{Time})}{2}$$

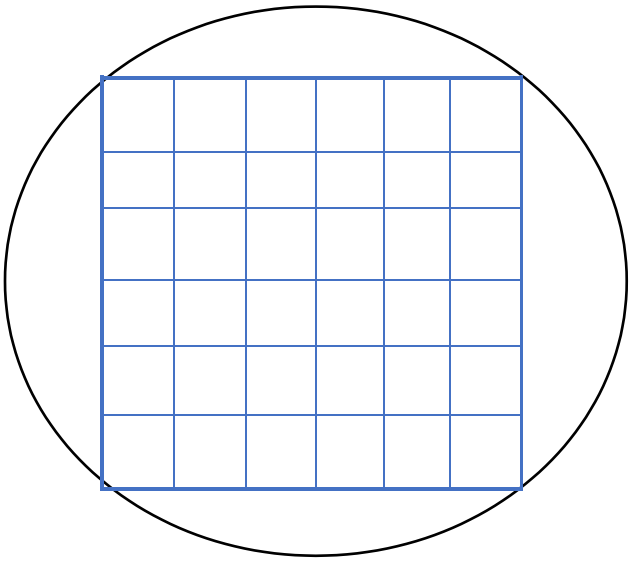
x also measured by same procedure

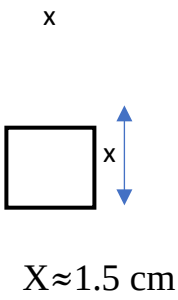
If there are some foods, the sensor will identify and inform the microcontroller circuit. Then, the next cutting part will be executed slowly.



- The first compressor will turn on automatically. Before that Plate is located at a height of **h**. We measure the time taken for the compressor to move **h** distance downward and set that time in the microcontroller.
- The plate attached to the compressor will be going down slowly for height **h** in that pre-set time phase by pushing foods.
- Then foods will go through the cutting net and be cut into small pieces.

The upper view of an outline of the cutting net is below.





X≈1.5 cm

In the plate that is used to push foods, have a shape like below to avoid getting stuck in holes.

T ≈ 1.5cm

Small flat sticks

When compressing, small flat sticks go through the holes in the cutting net. Therefore, food pieces will not be getting stuck. Then after like 3 minutes, the next part will be executed.

Boiling part of vegetables

After the vegetables (that have been cut) fall down into the bottom part of the bin, the machine automatically starts the boiling part. If the food type is fruit pulp, then the machine will not implement this boiling part and straightly move to the mashing part. If we want to take the boiled food without mashing, mashing part will not be executed. To prevent the spreading of food pieces all over the bin we have put a cylinder-shaped net and a funnel-shaped net. So, the food pieces are only put into the cylinder net and it is easy to gather them into one place.

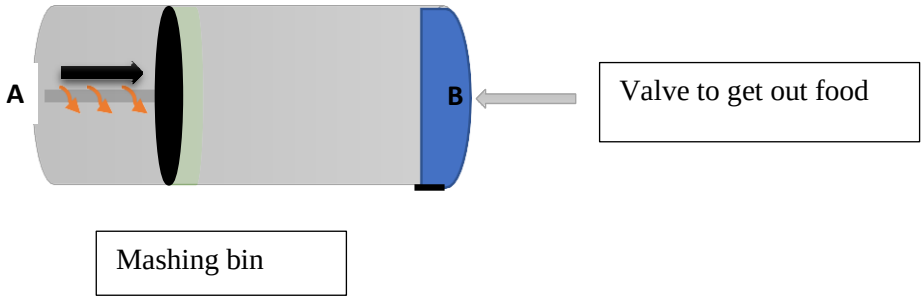
So, to start the boiling part, firstly the bin should be filled by water. As the whole machine run on pre-set timings, when the time is completed, machine identifies vegetable pieces have already fallen into the bin, so the valve attached to the water tap will automatically open and water coming in starts. We have set a level sensor to identify the required quantity of water and then to close the water pipe valves. We have set the required water quantity into a pre-set value after doing some experiments on the needed quantities for boiling foods. Actually, in here we have added some extra quantity of water to the needed milliliters of water in order to prevent under-boiling. After the required quantity of water has been filled to the bin, heater will be on automatically. The heater is always fully sink in water during the boiling process. Heater has to be connected to power from outside.

So, the boiling of foods starts. For the boiling duration also, we have set a pre-set time phrase. For an example one time phrase for lower food quantity and higher time phrase higher food quantity. We set these values after experimenting these things practically, so that there will be no worries for under-boiling. After the specific time period over machine identifies that the boiling process is over. Next the valve attached to water-out pipe will be opened in order to release the excessive water in the bin. Then the foods are kept for a while (for a pre-set time period) in that bin until the temperature to be equal or less than pre-set temperature value (50^0 c). When this condition fulfilled, the valve in the bottom of the bin will open slowly so that the boiled food will fall into the mashing bin.

Mashing part

First, boiled food should fall if they have enough temperature (At about 60 Celsius) or fruit also should be fallen into mashing bin. The temperature will be measured by using a temperature sensor. Until all the foods fall into the mashing bin, it will take some time (About 3 minutes) to start. Then mashing part will be started and executed in the mashing bin.

Mashing is controlled by a programmed circuit. First It will make the axel spin while going forward and mashing will happen slowly from A to B



Then again plate will go from B to A by making it a spin. This process will happen at least 3 times. It will depend on the portion we have chosen. After the mashing process, the valve of the mashing bin will be open automatically and the mashed foods will be pushed by the piston to serving plate (user's plate)

Compressing Process

In this process we use stepper motors and thread bars with threaded hole(nut) for the compressing. The stepper motor is connected to the thread bar. When the motor is rotating, the thread bar is going through the threaded hole(nut) according to the screw mechanism so that threaded bar is moving upward and downward (in the food cutting process) or forward and backward (in the mashing process).

5.0 Resource Requirements

Software

- Atmel Studio
- Microchip Studio
- Visual studio code

Hardware

- Microcontroller (PIC16F877A)
- Motors
- Wi-Fi Module-ESP 8266
- Ultrasonic sensor
- Temperature sensor
- Compressor
- Level sensor

Table 1:Cost list

Name	Unit price (Rs.)	Quantity	Amount (Rs.)
Microcontroller (Atmega32)	600.00	1	600.00
Motor	1950.00	2	3800.00
Ultrasonic sensor	300.00	1	300.00
Temperature sensor	290.00	1	290.00
Level sensor	265.00	1	265.00
Heater	2830.00	1	2830.00
LCD display with keypad	650.00	1	650.00
Valves	-	-	4000.00
Other equipment			6000.00
TOTAL			Rs. 18.735.00//=

6.0 Reference

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Action plan:

https://uniofmora-my.sharepoint.com/:x:/g/personal/silvawhi_20_uom_lk/EbeG9O_kmupGgmKuAqV5qJYBGroU_LFHjtI3N3o3mwo5mg?e=NvcgM0