

Thesis on Design & Fabrication of Semi-Automatic Dishwasher

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Abstract - Plate washing is the daily activity all over the globe in both domestic as well as commercial sectors. Conventional method of washing plates by hands require large amount of human efforts and time.

The main objective of semi-automatic dishwasher is to reduce the cost than that of fully automatic dishwasher, and to give good cleaning performance. Also, it requires less electricity as well as less water.

Key Words: Dishwasher, Semi-Automatic, Water wall

1. INTRODUCTION

This paper discusses about the design and fabrication of semi-automatic dishwasher. The dishwasher reduces and up to some extent eliminates the ample amount of human efforts required to wash dishes by conventional method i.e., by using hands. The survey we carried out among our localities, revealed that, in most of the homes the dishwashing is done by hands, which in turn causes a lot of fatigue to the individual and also the detergents, soap, liquids used to wash utensils causes an inimical effect to the skin of the individuals washing by hands. The concept of dishwasher came into the year 1850 in United States by Joel Houghton. From last 170 years advancement in this technology is being done by many researchers and engineers around the globe.

The usage and demand of dishwasher in western countries is always on increasing graph. Dishwasher is a basic need appliance in western homes.

In India maids are hired mainly to do household chores, but in post COVID-19 era the need of dishwasher in India will gush so as to avoid maids and to maintain hygiene and sanity.

Maids works in more than one house and the chances of spreading of disease are also more. Many middle-class families opt for electrical appliances during the lockdown because It made them to do the chores on their own. Clothes washing machine was easily available for millennials at low price but dishwashers are costly in Indian market.

The aims are to build a dishwasher at low cost and suitable for Indian market as well as consumers by innovative combination of existing and new technology of design, construction and working.

2. WORKING PRINCIPLE

The existing design of dishwashers mostly uses the spray arms for washing. The spray arms are elements having guided holes on its surface from where the high-pressure water is sprayed on utensils at high pressure. **Fig 1**

The water is sprayed in cycles:

1. Hot waters with detergent mixed,
2. Hot water

This arm rotates by the thrust that water creates while leaving the arm outlets i.e., guided holes. This is due to the inclination and direction provided to holes. Also the water is passed through stationary vertical pipe holding arm to the arms hole outlets at 90°. The the cost this element due to its working principle is high and not suitable for low cost dishwasher.

So we worked and sandwiched some methods and put forth the idea of water wall. Here straight blades are fixed on the top and base of dishwashers washing space, it has nozzles which sprays hot water as well as water-detergent mix on utensils to clean. This blade moves in to and fro motion horizontally. The water coming out from the blades nozzle make an wall of high pressure water which in sprayed on utensils to clean utensils, this is done from top as well as bottom. **Fig 2**

The figure of spray arm and water wall are as follow:



Fig 1 : Spray arm with holes

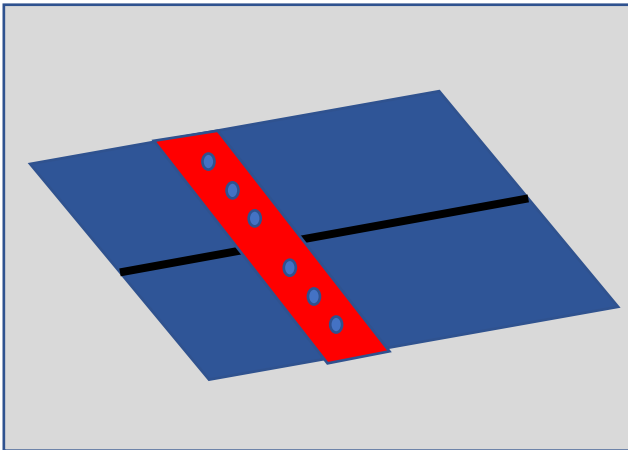


Fig 2 : Water wall blade with holes.

This water wall technique is available in Samsung dishwashers but the arrangement and working mechanism is different. The cost of Samsung water-wall dishwasher is also high.

The blade has channel to guide on both side and it moves on a rod by belt and pulley mechanism. This motion of blade gets input from a motor which rotates in clockwise as well as anticlockwise direction alternately.

A heating element is fitted into the basin at bottom which heats the water to pre-set value for rinsing cycles. The water temp is maintained by use of controller and temperature sensors dipped in basin.

The pump sucks the water from basin through a strainer so as to avoid entry of remnants of food into the pump, this water is then pressurized and then sent into the water-wall blades where it is sprayed on utensils.

3. LITERATURE REVIEW

- J.HOUGHTON- "Table furniture dish cleaning machine" (1850): This paper discuss on invention of semi-automatic dish washing machine. This paper tells about brief idea of semi-automatic dish washing machine construction and their design. The design indicates that the construction of the machine is made to wash the dishes. For this he had constructed a cylindrical vessel with a shaft resting upon, the rack within a conical rack, a hoop to hold a table furniture in a combination with a curb. The whole system is supported with a frame and by these mechanical means, cleansing the surface of dishes without uses of hand, the all parts are being arranged , combined and operated substantially as to work as a complete machine.
- J. G. COCHRAN- "Dish washing machine" [2] (1886): This paper gives brief idea described about improvement of dishwashing machine. It related to improvement in machine washing a dish in which a

continuous stream of either soap-soda or clean water is supply to crate holding the rack or cage hot water is supply to crate is rotate so as to bring the greater portion thereof under water. The result indicates that model is first reliable hand powered machine uses a water pressure instead of scrubber to clean the dishes inside the machine.

- Odesola & Afolabi- "Design, Fabrication and Performance Evaluation of a Domestic Dish Washing Machine" [3] (2012): This paper discusses about the design, fabrication and performance evaluation of a domestic dish washing machine. The result indicates that the dishes are cleaned by spraying hot water rather than cold water typically, between 55 to 75 °C (130 to 170 °F) to loosen the sticky and oily substances
- Dhale A. D. - "Design and development of semi-automatic dishwasher" [4] (2015): This paper discusses about the design, construction and evaluation of a dish washing machine. The result indicates that the detergent used is quite diluted and is biodegradable, with no phosphates, enzymes, or citrus additives. This leads to less requirement of detergent and cleaning is done mostly by use of water. This might leave a greater ecological footprint than other methods of dishwashing.
- Pranali Khatake- "Design of Gears in Semi-Automatic Dish Washing Machine" [5] (2016): This paper discusses about design of gears in semi-automatic dish washing machine. Automatic dishwasher uses large amount of water, time and is costly. And because of all these reasons, the usage of automatic dishwasher in our country is very less. The result indicate that in India semi-automatic dish washing machines are used than fully automatic dish washing machine as it is cheap, preferably gears are used in these semi-automatic dish washing machine with belt drive for better life and high efficiency. Paper focused on design of gears used in semi-automatic dish washing machine.
- Shaila S. Hedao- "Design and fabrication of semi-automatic dish and utensil washing machine" [6] (2016): This paper discusses the main objective of semi- automatic dishwashing machine is to reduce the cost of fully automatic dish washing machine and giving good cleaning performance.
- Shilpa N. Dehedkar- "Design of basic model of semi-automatic dish washer machine" [7] (2016): This paper gives a brief idea and analysis of the semi-automatic dish washer machine. It also states the mechanisms [1] incorporated in this model for the process of washing the dish. The result indicates that the model is built with very basic material and can be more standardize by altering motor used.

The product designed has minimal operating cost, cost effective, eco-friendly and it can be used with almost zero efforts.

- Hoak, D. Parker, D. Hermelink, A. American Council for an Energy Efficient Economy, Washington, DC, August 2008. This Journal helps that present measurements of three recent vintage dishwashers are very different efficiencies showing that while they substantially more efficient than older dishwashers, those tested will still use electric resistance elements for supplement heat, even when supplied by solar water heating system producing very hot water.
- International Journal for Scientific Research and Development| Vol. 3, Issue 11,2016 | ISSN (online):2321- 0613. This Journal represents the modified design of utensils automatic washer machine. In this, the adjustable conveyor containing utensils tends to rotate, and passing these utensils under three section scrubbing, water sprinkler and cleaner. This leads to making the design simpler and better than the present dishwashers.
- International Journal for Scientific Research and Development Vol.4, Issue 05,2016 | ISSN (online): 2321- 0613. This journal explain that using Galvanized iron material for inner and outer part,

the overall weight of the assembly is also reduced. The capacity of machine is to wash 24 pieces of dinner set at a time by using two rotary jet controlled by single pump using parallel connection.

- 11International Journal for Scientific Research and Development 2016 IJEDR | ISSN: 2321-9939.This journal suggests that this system multi jet technology is used to clean Utensils. Any type of Utensils will be washed in our system, No electronic circuit will be used. Multi jet system will be used to clean utensils from all side.

4. CONCLUSION

This optimized design gives the best outcomes from the machine. The dishwasher has the washing coverage in the corners of rectangular body of machine which was hard to achieve and also if achieved not efficient in spray arm mechanism. The design and construction of dishwasher is shown in **Fig 3** below. Thus, after study and comprehension of research paper the most feasible design was selected. There were very few studies were done on to the alternate mechanisms of spray arm. We made an attempt to bring a costly technology to low cost by optimizing the mechanism, components, etc.

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There are two ways of spreading the light, to be candle, or a mirror, which reflects it. In relation to the light of knowledge, this work carried out by me is just a 'Mirror'. There are some 'Candles' on the other side of mirror. I wish to express my gratitude to all of them.

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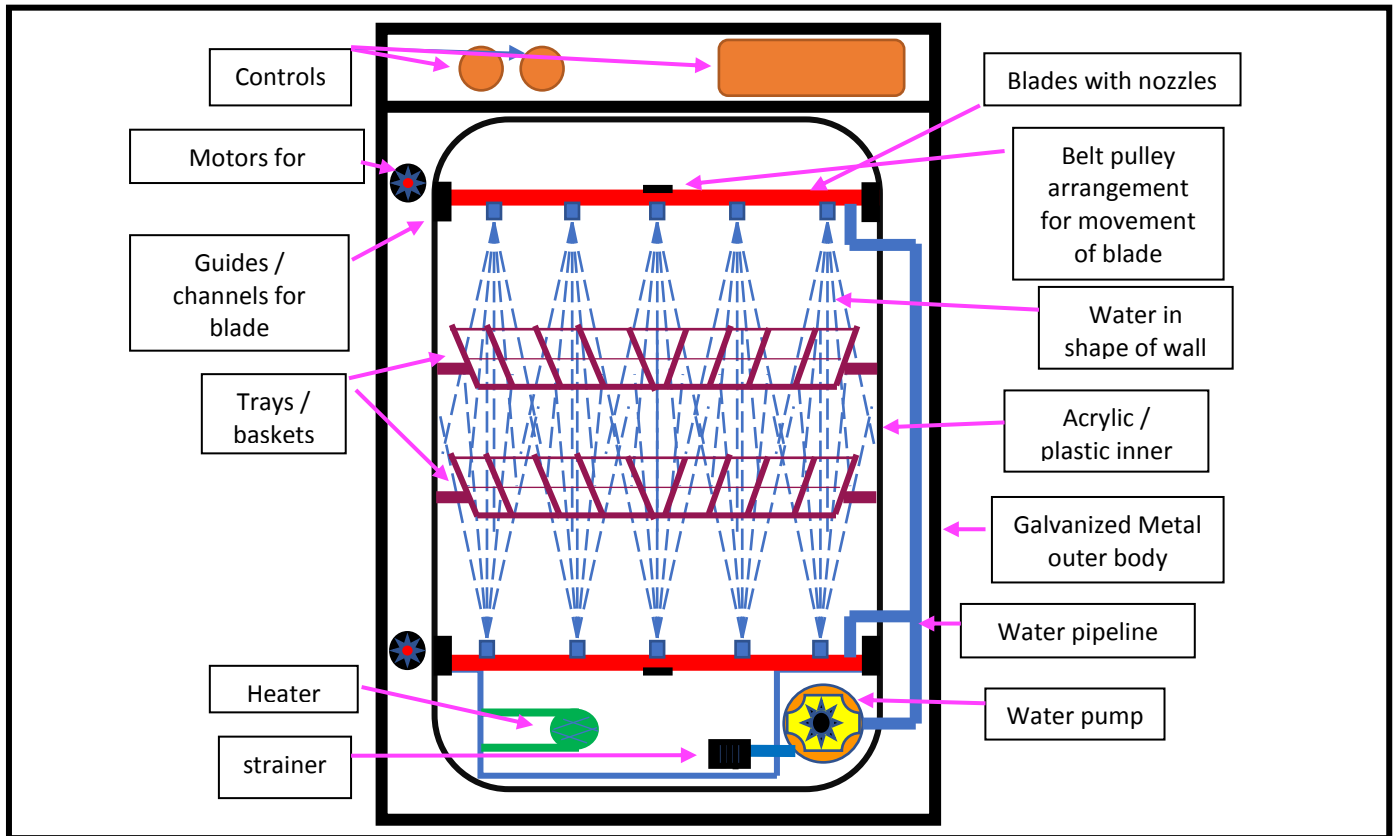


Fig 3 : Schematic of designed dishwasher with water wall

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