Fabrication Of Semi-Automatic Dish And Utensil Washing Machine

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Abstract - **We all know that dish and utensil washing are most difficult and time consuming work. But if it is done by Automatic dish washing machine ,it become costly for every person. so that we introduce Semi-automatic dish and utensil washing machine.The dishwasher has made cleaning and drying dishes much easier and more efficient. This Concept discusses the problems faced in Automatic Dishwasher and solutions on those problems. Automatic dishwasher uses large amount of energy, time and is costly. And being costly, the usage of automatic dishwasher in our country is very less. By using semi-automatic dishwasher, we can reduce time as well as human efforts significantly. Also by using Galvanized iron material for inner & 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**.

IndexTerms - **Rotary jet, Centrifugal pump, Ball valve, Utensil Grills, Regulator, Drain pipe, PVC pipe**

I. INTRODUCTION

Washing dishes is most commonly done activity in the world, in most of families people wash dishes by hand which is straining to muscles and detergent is chemically harmful.. As far as manual process is concerned in houses of India, washing is done by hand scrubbing which is straining to the muscles through its energy and postural requirements. It may also lead to clinical, anatomical disorders and back pain which may affect the operator‘s health. Many of their household chores are performed by the women and some can be very physically challenging and time-consuming. So in several ways in which we can improve their lifestyle, and one aspect that we can improve on is the way they wash their dishes. Currently the chore of washing dishes is performed by the women, and can be very labor intensive as it is done for up to several hours each week. The same can be experienced in marriage ceremony with caterers. In today‘s world of Automation Era it is barely possible to find any field that implemented atomization which reduces Human effort, improves Production rate and also increases Efficiency. Then it could be the biggest manufacturing industry,Pharmaceutical industry, Hospitality field and even Household or Kitchen automation. Washing dishes is not the most rewarding task. Cooking can be creative, but cleaning up afterward seems like a waste of time and leaves the person washing complaining about "dishpan hands." Most conventional dishwashers installed in U.S. households today use 7-14 gallons per load and account for less than 2 percent of the water used in an average American home. Energy savings also result from upgrading to an efficient dishwasher because fewer gallons of water need to be heated per cycle. Many new dishwashers feature microprocessor-controlled, sensor-assisted wash cycles that adjust the wash duration to the quantity of dirty dishes or the amount of dirt in the rinse water. This can save water and energy if the user runs a partial load. The dishwasher has made cleaning and drying dishes much easier and more efficient. The Concept discusses how to reduce human efforts in dishwasher. The problems faced in usage of Automatic Dishwasher and solutions on those problems. Automatic dishwasher uses large amount of energy, time and is costly. And being costly, the usage of automatic dishwasher in our country is very less. By using semi-automatic dishwasher, we can reduce time as well as human efforts significantly. Washing dishes is most commonly done activity in the world, in most of families people wash dishes by hand which is straining to muscles and detergent is chemically harmful.

II. OBJECTIVE

Main objective of semi-automatic dishwashing machine is to reduce the cost of fully automatic dish washing machine and giving good cleaning performance. It required less energy and less water consumption. Time of washing dish can be adjust as per customer requirement. In this system multi jet Technology is used to clean Utensils. Any type of utensil will be washed in our system, No Electronic Circuit Will be used.Multi jet system will be used to Clean utensil from all side.

III. PROPOSED SYSTEM

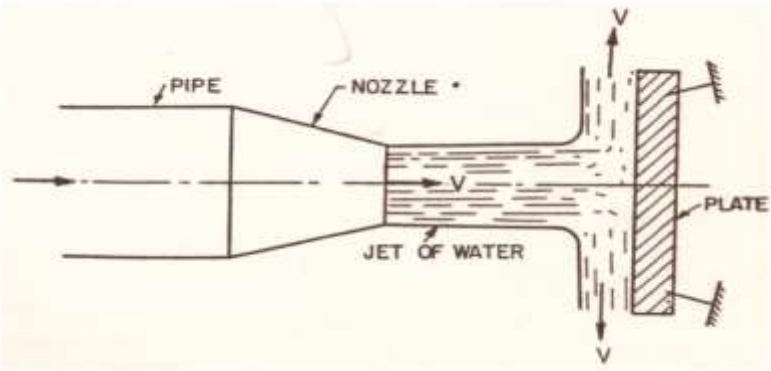
- Semi-automatic
- No use of electronic Circuit Controlled by knobs and switches
- No programming necessary
- Material used GI(Galvanized iron) to reduce cost
- Light in weight
- Single centrifugal pump used
- 2 rotary jets controlled by single pump using parallel connection
- No gears used to reduce cost
- Jets are directly connected via pump through PVC pipes
- Less time To wash due to high pressure
- Can change washing time no fixed cycle necessary

IV. DESIGN CALCULATION

- **DESIGN FOR JET :(From the book of R.K.Bansal)**

a)Force exerted by the on a stationary vertical plate

V = Velocity of the jet,
D= diameter of the jet,
A = area of cross-section of the jet = $\pi/4\ d^2$



Force exerted by the on a stationary vertical plate Force exerted by the on a stationary vertical plate.The jet after striking the plate, will move along the plate. But the plate is at right angles to the jet. Hence the jet after striking will get deflected through

90º . Hence the component of the velocity of jet, in the direction of jet, after striking will be zero.The force exerted by the jet on the plate in the direction of jet,

F× = Rate of change of momentum in the direction of force
= Initial momentum – Final momentum/ Time
= (Mass x Initial velocity –Mass × Final velocity)/Time
= Mass/time X (Initial Velocity- Final Velocity)
= (Mass/sec) × (velocity of jet before striking — Final velocity of jet after striking)

mass/sec = ρ x a V
= ρaV (V-0)
Fx = ρaV²

The value of density (ρ) of water = 1000 kg/m³

We know,

d = diameter of jet = 0.002m

a) Area of jet ,A = π/4 d²
= π/4 (0.002)²
A = 3.14x10⁻⁶ m²

b) Flow rate Q = 30 lit/min
= 5x10⁻⁵ m³/s

Flow of water in four direction in jet,

So, it is divided by 4

Q1= Q2 = Q3 = Q4 = 1.25x10⁻⁵m³/s

Q = AxV

1.25x10-5 = 3.14x10⁻⁶ xV

V = 3.98m/s

C) Fx = ρaV²
= 1000 x 3.14x10⁻⁶x 3.98²
Fx = 0.0497 N

b) Force exerted by a jet on stationary inclined flat plate

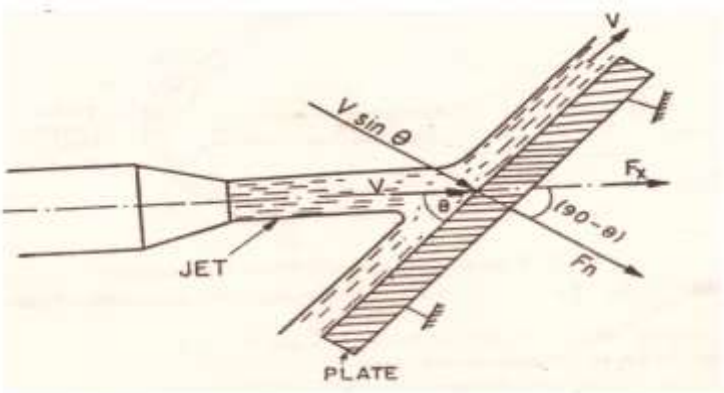
Let a jet of water,coming out from the nozzle ,strikes an inclined flat plate as shown in fig.

Let V=Velocity of jet in the direction of x,

θ = Angle between the jet & plate,

a = Area of cross section of jet.

Then mass of water per sec striking the plate = ρaV



If the plate is smooth and if it is assumed that there is no loss of energy due to impact of the jet , then jet will move over the plate after striking with a velocity equal to intial velocity i.e., with a velocity V. Let us find the force exerted by the jet on the plate in the direction normal to the plate. Let this force is represented by F

Fn = mass of jet striking per second×[Intitial velocity of jet before striking in the direction of n –Find velocity of jet after striking in the direction of n]

ρaV[V sin θ– 0] = ρaV² sin θ

This force can be resolved into two components ,one in the direction of jet & other perpendicular to the direction of flow. Then we have,

Fx = Component of Fn in the direction of flow
= Fn cos (90° – θ)= Fn sin θ
= ρaV² sin θ x sin θ
= ρaV² sin² θ

And, Fy = Component of Fn,perpendicular to flow
= Fn sin (90° – θ) = Fn cos θ
= ρaV² sin θ cos θ

Consider, Diameter of jet d = 0.002m

Area of jet ,A = $\pi/4\ d^2$

A = $3.14x10^{-6}$ m^2

Velocity of jet V = 3.98 m/s

Angle between jet & plate

θ = 60°

a) The force exerted by the jet of water in the direction normal to the plate is given by

Fn = $\rho aV^2 \sin\theta$

= 1000 x 3.14x10-6x 3.98^2 x sin 60°

Fn = 0.04307 N

b) The force in the direction of the jet is given by

Fx = $\rho aV^2 \sin^2\theta$

= 1000 x3.14x10-6x 3.98^2 x $\sin^2$ 60°

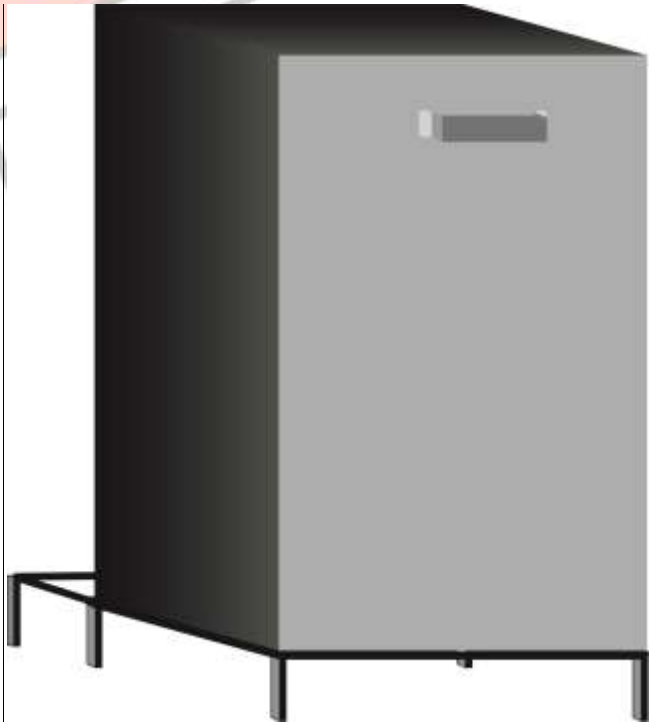
Fx = 0.0373 N

V. SPECIFICATION

Sr.no.	Specification and material		
	Part of the machine	**L x W x H in mm**	**Material**
1	Outer Body	585 x 570 x430	GI
2	Inner Body	510 x 470 x 430	GI
3	Door	585 x 570 x 75	GI
4	First Grill	480 x 380 x 150	SS
5	Second Grill	480 x 380 x 100	SS

Galvanized iron[GI] :- It is used for outer body, inner body and door. It is low cost.Great corrosion resistance. It is coated with layer of zinc oxide which provide protective layer, protect from rusting.It is more durable.

Stainless steel [SS]:- It is used for both Grill.(6mm Rod,4mm base rod),Costing is low .Corrosion resistance and easily available.



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