

Development & Fabrication of Pedal Operated Multi-Purpose Incense Stick Making Machine

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ABSTRACT

Incense sticks called agarbattis in India, are becoming internationally known as a ritual product used for spiritual purpose producing fragrance for aromatherapy and meditation. The agarbatti workers in India lack efficient tools and education to develop better means of processing agarbattis. The Development And Fabrication Of Pedal Operated Multi-purpose Incense Stick Making Machine to alleviate the labor intensive work associated with the production of bamboo-cored incense sticks is the main purpose of this paper. The machine is based on the mechanism of extruding the incense stick paste over the bamboo stick. The main components of this machine include a foot-pedal, a pawl and ratchet mechanism, rack and pinion system and an extruder. As the paste used is of a semi-solid nature and a high force was needed for extrusion, the foot lever and a pawl and ratchet mechanism was designed ergonomically to obtain an estimation of the force required for the extrusion so that the applied force results in a minimal foot-muscle fatigue for the operator.

Keyword : - Rack & pinion, Die , Nozzle, Piston, Cylinder, Chain, ratchet and pawl

1. INTRODUCTION

Incense-stick making machines that are currently available in India remain unaffordable to many poor workers who continue to make them manually by smearing the paste, which is a mixture of charcoal powder, wood powder and binding agent, around a bamboo stick. Such labor intensive work mostly involves about half a million poor women in rural and urban slum areas across India[1]. To aid the process of incense-stick making and to overcome the issue of health problem arising from working for more than 8 hours a day in degraded workspaces and also to boost the income of poverty-stricken women workers, a foot operated mechanism is being developed. Various mechanisms have been developed in many Asian countries such as Vietnam, China etc. to produce incense sticks which usually do not have bamboo cores. However, in India incense-sticks with bamboo core is very popular.

A mechanism is use to produce such incense-sticks having a bamboo core was developed recently but because of high cost and limitations make it an unviable solution. Market search of available electric incense-stick machines shows that most worked on principle of extrusion where in the continuous flowing of paste and bamboo stick feed was easy to design. In view of rural region in India, electric machines are also not viable. Most of the machines are too large to be used within the small living spaces of these worker's homes.

1.1 EVOLUTION OF INCENSE STICK & CONES MAKING MACHINE

India is the world's main incense producing country, [2] and is a healthy exporter to other countries. The main method of burning **incense in India** is the incense stick or agarbatti. The basic ingredients of an incense stick are

bamboo sticks, paste (generally made of charcoal dust or sawdust and joss/jiggit/gum/tabu powder – an adhesive made from the bark of *litsea glutinosa* and other trees),^[3] and the perfume ingredients – which traditionally would be a masala (powder of ground ingredients).^[3]

Agarbatti are an integral part of any Hindu ritual. During rituals, an incense stick is lighted to remove unpleasant odors in the air. It creates the perfect setting for an auspicious ritual by filling the air with a pleasant smell. As they release smoke, they also act as organic disinfectants that drive away insects.

Production may be partly or completely by hand, or partly or completely by machine. There are semi-automatic machine for applying paste, semi-automatic machine for perfume-dipping, semi-automatic machine for packing, or fully automated machines which apply paste and scent, though the bulk of production is done by hand-rolling at home.

The workers in the agarbatti industry face severe health hazards ranging from bruising of palm-skin to back-pain problems and are paid a pittance for such arduous work. A machine that will reduce the labour of incense-stick making is needed, as about 0.5 million women workers in India are involved in the industry^[4].

2. AIM AND OBJECTIVES

2.1 AIM:-To design a low cost manually operated incense-stick & cones making machine for the micro- enterprises.

2.2 OBJECTIVE:-

1. To minimize the human effort.
2. To combine two different machines into one machine.
3. To improve the quality of incense-stick & get different size of sticks.
4. To develop a simple mechanism to convert the manual input into force required to carry out the extrusion process for making the incense stick.
5. To develop a machine which can be used mostly where there is shortage of electricity.
6. To reduce the health hazards caused by the manual process i.e. the application of palm pressure over the bamboo stick.

3. PROBLEM IDENTIFICATION

Following are the problems identified while studying about the Agarbatti making process:-

- The manually incense-stick making process is time consuming as it is executed by the application of palm pressure over the bamboo stick. (As shown in Fig.3.1)
- It is health hazardous.
- The workers in the incense-stick industry face severe health hazards ranging from bruising of palm-skin to back-pain problems.
- The incense stick obtained is uneven.
- In view of the electric machines are also not viable. Most of the machines are too large to be used within the small living spaces of these worker's homes.



Fig.3.1:- Agarbatti making by hand.

4. DEVELOPMENT

4.1. MARKET SURVEY

The table 4.1 shows the type of incense stick machine available in India. From this table we can come to know that the availability of machine at high cost around our country. The power consumed can also add to the monthly expenditure on the machines. The capacities of machines are also shown in table. The requirement of floral space is also more for the cheapest machine available which increases the weight of machine.

S.N	Machine Available	Machine Wt.(Kg)	Power HP	Capacity	Price(Rs)
1.	Auto dhoopbatti Making Machine	175	2	13-15Kg/24Hr	1,12,000/-
2.	High Speed Agarbatti Making machine	50	5	12-15kg/10Hr	1,40,000/-
3.	Incense Powder Mixing Machine	50	0.5	15-20Kg/24Hr	84,000/-

Table 4.1: Types of machines available



(a) Auto dhoopbatti machine



(b) High speed agarbatti making machine



(c) Incense powder mixing machine

Fig 4.1

4.2. MECHANISM

The foot pedal actuates the ratchet and pinion which is on the same shaft of the first gear of the gear train. The second gear is co-axial with the pinion of the rack and pinion arrangement which drives the piston. The rack pressurizes the incense paste which is fed into the cylinder and pushes the paste into extrusion housing. The block diagram of the mechanism is shown in figure 2.

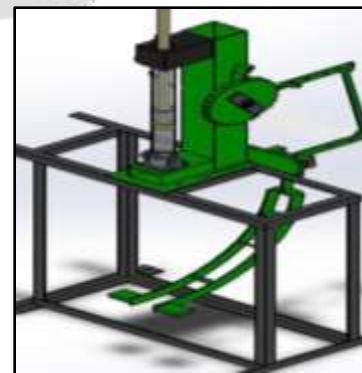


Fig 4.2:-Project Model

4.3 COMPONENTS

The project model is designed to transmit the force applied on the foot pedal to the piston in the cylinder which contains the agarbatti paste. This compressive force then causes the extrusion of the agarbatti stick. The project model has been shown in fig 4.2. The major components of the prototype model are:

1. Die kit
2. Extrusion housing
3. Cylinder and piston
4. Rack and pinion
5. Gear trains
6. Body
7. Foot pedal

4.4 FABRICATION

The following table shows the list of operation performed for the fabrication of each components and its material.

COMPONENT	MATERIAL	OPERATIONS REQUIRED
1.Base plate	Mild Steel	Gas cutting ,Grinding Drilling, Welding,Turning,etc
2.Cylinder	Stainless Steel	
3.Rack	Stainless Steel	
4.Links	Mild Steel	
5.Ratchet	Stainless Steel	
6.Nozzle & Die set	Stainless Steel	
7.Sprocket	Cast Iron	
8.Foot Pedal	Hard Plastic	

5. WORKING

From Fig.4.2, Incense stick machine works on principle of extrusion, chain and sprocket, rack and pinion. The machine includes the nozzle which is very important part in our machine. The nozzle is the where extrusion takes place. In this extrusion process the semi solid incense powder gets adhered to the bamboo stick coming from the circular hole present. Above the nozzle there is a vertical cylinder where the semi solid incense powder is put in. This cylinder is then fitted with piston which reciprocates vertically in the cylinder. Force put to the piston is then acted on the semi solid incense powder which rushes into the spaces present inside the nozzle. When the operator pedals and using the gear arrangements the force is transmitted such that rack moves downward. The rack and pinion attached to the piston then makes the piston to move downwards.

The bamboo stick is first inserted in and then the force is applied since there must be no wastage of the semi solid incense powder. This semi solid incense powder moves tangentially to the bamboo stick. Hence the force from the powder is applied to the stick and stick moves forward.

And the other product of our project is Incense cone, we can easily make incense cone by simply making some arrangement. That is the outer die which is use for making incense sticks is only change for the production of Incense Cone.

We can also make different shapes of Incense Cone according to the requirement.

6. FINAL PRODUCT



Fig 6.1:- Agarbatti sticks & cone

7. COST ANALYSIS

Sr.NO.	Component	QUANTITY	COST (IN RS)
1.	Cylinder	1	600
2.	Chain Sprocket	2	500
3.	Rack And Pinion	1	1500
4.	Chain	1	500
5.	Ratchet And Pawl	1	1150
6.	Nozzle And Die Apparatus	1	900
7.	Plummer Blocks	3	600
8.	Shaft	1	400
9.	Links	4	1200
10.	Frame	1	1200
11.	Channel	1	200
12.	Plywood	1	400
13.	Nut And Bolt	15	150
14.	Color Paint	1ltr	250
15.	Paddle	2	100
16.	Operations (Turning, Drilling, Welding, Cutting)	1	1500
17.	Labor Cost	1	1000
18.	Incense Sticks & Masala Cost	-	300
	Total Cost		12,450

8. CONCLUSION

It has been demonstrated that the mechanism developed makes the good quality incense-sticks. The incense stick machine is cheaper than the existing machine, and the foot-pedal causes less fatigue to the operator so it is easier to operate. It is compact making it easier to be kept in a small living space. The quality of incense-sticks, various cross-sectional shapes and length that can be produced by the machine cannot be achieved manually. It is felt that this incense stick machine can succeed as a viable product in India.

9. FUTURE SCOPE:

- One can either motorize the setup or use hydraulic mechanism for operating the machine by replacing the foot lever by piston cylinder arrangement, if electric power is made available in the rural areas.
- Pneumatic compressor can be used to put force and make it work with air.
- By using heating coil at the nozzle exit, a dry agarbatti stick can be obtained, which in turn reduces the production time.
- Can mix the fragrance material with incense paste and reduce the overall production time.

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