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Design of Candle Making Machine

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ABSTRACT -India is a vast country and the Indian people follow various religions, speak different languages and follow different customs and traditions. In spite of this diversity, one thing is common among all Indians is they are all deeply religious and practice their religious activities on a daily basis. So depending upon their belief, practice method and convenience, almost all the people use any one or two from agarbatti(incense sticks), candles or Kapoor(camphor tablets). Candle making is an art. A skilled candle maker makes beautiful designs and styles of candles which you can behold all day long. Many people learn candle making as a hobby, while, they can also make it a successful business. If you are interested to start a candle making business, then take candle making classes so that u gain skills in this art, which would further help you to make good profits in your business. India has huge production as well as consumption of candles, which has given candle making the market a strong foot in the economy. This is emerging to be a great business idea in India. Also, India is a country famous for its rich culture and traditional festivals. Festivals like Diwali, Janmashtami etc. are known for candle decoration. India shimmers in candle lights during these festivals. Which clearly means, huge usage of candles. Thus, candle making idea is a great proposition for business in this country.

Keywords: Candle Making Machine, Pawl &Rachet Mechanism, Eccentric Cam & Follower Mechanism, Die Holder, Wax.

I. INTRODUCTION

Norma Coney (1999) defined a candle is an ignitable wick embedded in a wax or another flammable substance such as tallow that provides light and in some cases, a fragrance. It can also be used to provide heat, or as a method of keeping time. A candle manufacturer is traditionally known as a chandler. The candle making has been practiced and despite the introduction of mass production methods, candles can still be made by well-established methods which require only simple equipment. Much of this equipment can be made by rural craft men. the wick size, therefore, must be related to the diameter of the candle (as well as to the type of fuel). Although a rough guide to wick size is given later on in this profile, the only way is to provide a good candle is by trial and error. The main purpose of the wax is to provide the fuel for the flame so the burning characteristics of the wax are extremely important

According toWikipedia encyclopedia (2015), the methods includepress method, single mould method and machinecandle making process. The most popular candlemaking process is the use of machine. This processinvolves:

1.1 Wick centering
1.2 Melting and additives adding
1.3 Cooling and finishing

The candle making machine is made up of two mainparts namely

a) The mould which is designed to be housed by thecooling chamber

b) The ejection system which is used to extract thesolidified candles from the mould. The machine ismade of mild steel because mild steel is cheaper andhas good properties such as toughness, has goodtensile strength.

c)After the candles are ejected they need to be properlycooled and later on inspected so to make sure thatcandles are in desired shapes

II. OBJECTIVE

The main aim of this project is to develop eco-friendly, cost effective, non-polluting and environmental friendly candle making machine.

III. COMPONENETS AND THEIR SPECIFICATIONS

The Design of Candle Making machine is as shown in following fig.

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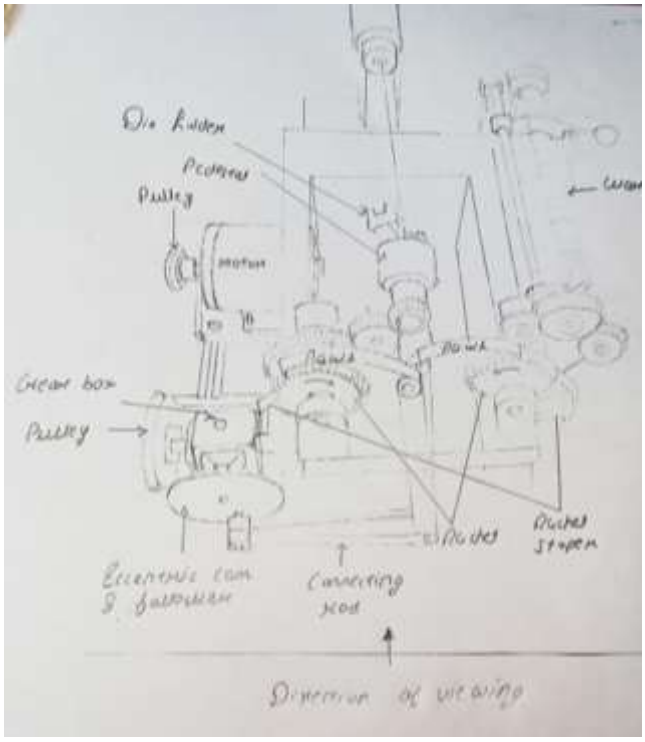
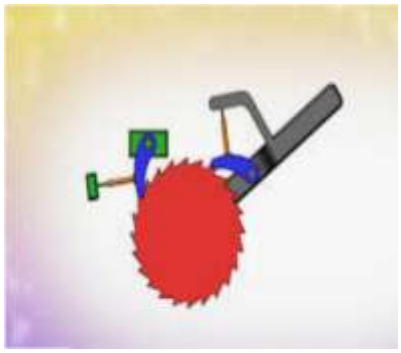


Fig. Construction of candle making machine

- Width of machine : 585mm
- Length of machine:670mm
- Height of machine :740mm
- Die Length: 315mm
- No. Of Gears : 9
- Pair of Pawl and ratchet
- One feed rod
- One motor
- One gearbox
- Pulley
- Cam and follower mechanism

IV. MECHANISMUSED

I. Pawl and Rachet



- On the either side of the connecting rod a pair of pawl an ratchet are connected.
- Ratchet is connected to gear on either side in which one gear give rotational motion to die holder and other gear gives motion to feed rod.
- On one rotation of feed rod die holder rotates 360 and winding is done on die.

II. Eccentric cam and Follower

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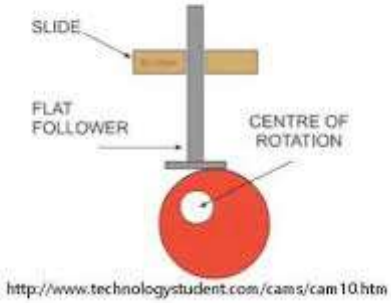
ECCENTRIC CAM



The cam and follower is connected to gear box and gear box is connected to prime mover due to this arrangement cam and follower gives rotary motion to ratchet.

V. CONSTRUCTION

- The construction of candle making machine consist of parts such as gears, motor, gear box,belt,pulley,connecting rod , ratchet pawl,feed rod ,pedestal,die holder,ratchet stopper, etc..
- The frame is made up of mild steel upon which the whole assembly is setup.
- The gears are in mesh in each other which transmits power further.

The whole machine assembly is centric on viewing from all sides

VI. WORKING

- The prime mover (motor) gives a motion to gearbox which further transmits to connecting rod via pulley.
- On the either side of the connecting rod a pair of pawl an ratchet are connected.
- Ratchet is connected to gear on either side in which one gear give rotational motion to die holder and other gear gives motion to feed rod.
- On one rotation of feed rod die holder rotates 360 and winding is done on die.

VII. CALCULATION

Calculation 1 :-

Power (P) =31.41 W
Speed of motor (N) = 75RPM
Load factor (kl) =1.75 for electric motor Data book Table XI-1
To find :- shaft diameter (d)
Design torque (Td)

$$Td = \frac{60 \times P \times Kl}{2 \times \pi \times N}$$

$$Td = \frac{60 \times 31.41 \times 1.75}{2 \times \pi \times 75}$$

Td = 7 N.m

Maximum stress Data book Table XI-1

$$\tau max = \frac{16 \times T}{\pi \times d^3}$$

Shaft material SAE1030

Data book Table II-7
S_{yt}=296 S_{ut}= 527

For design Max stress
$\tau max < 0.30\ S_{yt}$ or $\tau max < 0.18\ S_{ut}$
Therefore,
τmax = 88.8 MPa
Now,

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$88.8 = \frac{16\times7\times10^3}{\pi \times d^3}$

D = 7.33 mm

calculation no 2 :-

Power (P) = 23.93 W
Speed of motor (N) = 50 RPM
Load factor (kl) =1.75 (for electric motor) Data book Table XI-1
To find :- shaft diameter (d)
Design torque (Td)

$Td = \frac{60\times P\times Kl}{2\times\pi\times N}$

$Td = \frac{60\times23.93\times1.75}{2\times\pi\times50}$

Td = 8 N.m
Maximum stress Data book Table XI-1

$\tau max = \frac{16\times T}{\pi \times d^3}$

Shaft material SAE1030 Data book Table II-7
S_{yt}=296 S_{ut}= 527

For design Max stress
$\tau max < 0.30\ S_{yt}$ or $\tau max < 0.18\ S_{ut}$
Therefore,
τmax = 88.8 MPa
Now,

$88.8 = \frac{16\times8\times10^3}{\pi \times d^3}$

D = 7.71 mm

Calculation 3 :-

Power (P) =0.18 KW = 0.18 X 10^3 w
Speed of motor (N) = 1440 RPM
Load factor kl) =1.75 for electric motor Data book Table XI-1
To find :- shaft diameter (d)
Design torque (Td)

$Td = \frac{60\times P\times Kl}{2\times\pi\times N}$

Td = 2.08 NM
Maximum stress

$\tau max = \frac{16\times T}{\pi \times d^3}$

Data book Table XI-1
$\tau_{max}=16T\div\Pi d^3$
Shaft material SAE1030 Data book Table II-7

S_{yt}=296 S_{ut}= 527

For design Max stress
$\tau max < 0.30\ S_{yt}$ or $\tau max < 0.18\ S_{ut}$
Therefore,
τmax = 88.8 MPa

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Now,

$88.8 = \frac{16\times8\times10^3}{\pi \times d^3}$

D = 5 mm

SELECTED VALUE OF FABRICATION OF MACHINE

SR. N0.	INPUT DATA	OUTPUT DATA				SHAFT DIAMETER
	SPEED (RPM)	POWER (WATT)	τmax(MPa)	TORQUE (N.m.)	SHAFT MATERIAL	
1	75	31.41	88.8	7	SAE 1030	7.377
2	50	23.93	88.8	8	SAE1030	7.71
3	1440	0.18 X 10^3	88.8	2.08	SAE 1030	5

VIII. CONCLUSIONS

1]The floor space required for this machine is less
2]The cost of this machine is less as compared to the injection molding machine
3] It takes less time to give more productivity.
4] Economical for small scale industries
5] The cost of this machine is less as compared to the injection molding machine.
6] The floor space required for this machine is less
7] The winding operation is done with the help of gear mechanism.
8]Reduction in working stage and working area so that it can work on compact places and suitable for both small scale industries and large scale industries.
9]The winding operation reduces the labour cost.

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