

Design and Fabrication of Manually Operated Wood Sawing Machine: Save Electric Power

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Abstract - In India power cut is big problem also having many remote places where electricity not reached and that will affect many small scale business and ongoing work, like Carpentry, ongoing work got stop because of power cut. To overcome this problem manually operated economical; conceptual model of a machine which would be capable of performing different operation like sawing/cutting and grinding without use of power i.e. wood working machine is introduced.

In this paper, design concept and fabrication of manually operated wood sawing/cutting machine is explained. It is designed and fabricated so portable that it can be move and used at various places. It is used for sawing/cutting of wood, plywood, thin metals ($\leq 2\text{mm}$), and pvc pipes. The material can be cut without any external energy like fuel or current. As machine uses no electric power and fuel, this will help to maintain green environment. The observations show that power required for pedaling is well below the capacity of an average healthy human being.

Keywords – Human Powered, sawing, wood

I. INTRODUCTION

In the today's world, wood working operations is done in large extent like Cutting, Drilling, and Grinding etc. For performing these operations, we have use different type of machines at different places, which consume lot of time and electricity. In the rural area, electricity cut-off is a major problem which causes discontinuity of work progress. For avoiding this problem, we have to go for an alternative machine called as manually operated wood working machine.

Before three to four decades, when there is unavailability of electricity for working of different machines viz. cutting, grinding, drilling etc. they used a manual hack saw for cutting a wood or they used an axe to cut a wood which was a very laborious task for humans and consumes a very much power. But in last decades the use of an electric equipment has increased for such an operations which is also not affordable for a small industries or a domestic wood cutting purpose. The used of an electrically power wood cutting and grinding machine consumes electric power as well as cost of operation of machines much more.

In this machine, the maximum attention is towards the saving of electrical power, for saving this, the substitute way is a utilization of Human power. The machine is made such that it would be applicable to the normal field work where there is a source of electricity. In this machine, the objective is to get

maximum machining operations. The whole machine is running on the pedal power which produces 500W. This paper helps to cutting and grinding operation, without any need of a power source. It is economically efficient machine and it helps to use for different operation without any of electricity source.

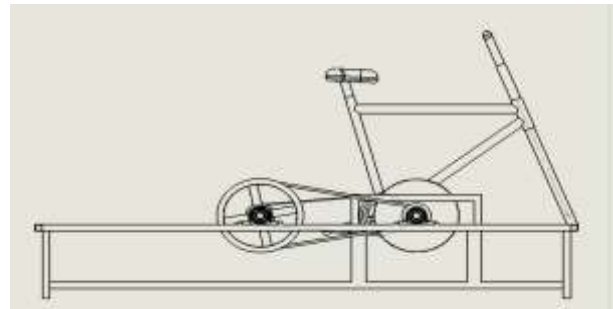


Fig 1 Schematic diagram of manually operated wood working machine.

II. LITERATURE REVIEW

1. Dharwa Chaithanya Kirthikumar, "A Research on Multi-Purpose Machine", International Journal for Technological Research in Engineering (Vol.1, Issue.1, ISSN: 2347-4718) (2013), In this paper, a human powered machine runs on chain drives mainly with human efforts. But if you wanted to operate this machine by electric power this machine can also does that. It has some special attachment so use both human power as well as electric power.

2. Dhanasegaran A, Dhilip Kumar H, Dinesh Kumar V T, Gopi Kumar K. and S.Gokul, "Design and Fabrication of Pedal Powered Circular Saw for Wood Working Applications".

The objective of this paper is using the conventional mechanical process which plays a vital role. This project consists of a larger sprocket which rotates with a help of human powered pedal. When the pedal is operated, circular saw rotated which in turn cuts the wooden block material. The main aim is to reduce the human effort for machining various materials such as wooden blocks etc.

3. Prof. Zoeb khan, Mr.Sushil Dopekar "Design and Fabrication of Human Powered Wood Cutting machine" International Journal on Recent and Innovation Trends in Computing and Communication. (ISSN: 2321-8169)

In this paper, improved design of the human powered wood cutting machine which gives the less efforts of man and commonly used in rural areas where there is no power supply.

The design ensures a smooth operation during the cutting process. It is light in weight and portable machine.

III. DESIGN PROCEDURE

A. Material selection

The proper selection of material for the different part of machine is the main objective in the fabrication of machine. For a mechanical engineer it is must that he is familiar with the effect, which the manufacturing process and heat treatment have on properties of material.

The choice of material for engineering purpose depends upon the following factors:

1. Availability of material.
2. Suitability of material for the working condition in service.
3. The cost of materials.
4. Physical and chemical properties of material.
5. Mechanical property of material.

Sr. No.	Part Name	Material	Qty.
1	Square Pipe And Square Angle	Iron	45ft
2	Pedestal Bearing	C. I. and steel alloy	4
3	Sprocket	Stainless Steel	1
4	Chain	Alloy Steel	1
5	Pedal	Cast iron	1
6	Freewheel	Steel alloy	1
7	Grinding wheel	Abrasive material	1
8	Cutting wheel	Steel alloy	1
9	Bicycle frame	Chromoly	1
10	Seat	Rubber	1
11	Fastening (Nut, Bolt, Washer)	Stainless Steel	-

Table 4.1 Raw Material and Standard Material Used

B. Design and modeling

Specification of Manually Operated Wood Working Machine

1. Frame width = 67 cm
2. Frame length = 152 cm
3. Frame height = 128 cm
4. Area of frame = 10184 cm²

Specification of Transmission System

1. Driving sprocket = 60 teeth
2. Driven freewheel = 18 teeth
3. Driving freewheel = 14 teeth
4. Shaft length = 45 cm
5. Bearing diameter = 2.5 cm
6. Chain length = 58 cm
7. Seat height = 75 cm
8. Handle height = 81 cm

1. Design of Flywheel

a) Calculation for Chain Drive:

Sprocket Dia. = 24 cm = 240 mm

D = dia. of pitch circle

T = number of teeth on sprocket

Find the pitch of chain

$$\Theta = \frac{360}{T} = \frac{360}{60} = 6^\circ$$

$$P = 2 \times \frac{180}{2} \times \sin\left(\frac{\Theta}{2}\right)$$

$$P = 9.42 \text{ mm}$$

Velocity ratio of chain drive

$$V.R. = \frac{N_1}{N_2} = \frac{T_2}{T_1}$$

N1 = speed of rotation of freewheel in R.P.M.

N2 = speed of rotation of sprocket in R.P.M.

T1 = number of teeth on freewheel

T2 = number of teeth sprocket

$$V.R. = \frac{T_2}{T_1} = \frac{60}{18} = 3.33$$

The average velocity of chain is given by

$$V = \frac{\pi \times D \times N}{60} = \frac{\pi \times 240 \times 12}{60}$$

$$V = 150.8 \text{ m/s}$$

b) Mass and Cross Section of Rim:

Outer dia. of rim = 500 mm

$$E = m \cdot k^2 \cdot \omega_n^2 \cdot k_s$$

Where,

K = radius of gyration = $D_m/2$ (D_m = Mean Diameter of Flywheel)

$$D_m = 0.9 \cdot D_o$$

$$D_m = 0.9 \cdot 0.5 = 0.45 \text{ m}$$

$$K = 0.45/2 = 0.225 \text{ m}$$

ω_n = mean angular speed in rad/sec = $2 \cdot \pi \cdot N/60$

$$N = (750 + 650)/2 = 700 \text{ rpm}$$

$$\omega_n = (2 \cdot 3.14 \cdot 700)/60 = 73.30 \text{ rad/sec}$$

From equation 1,

$$27 = m \cdot 0.225^2 \cdot 73.3^2 \cdot 0.02$$

$$M = 4.96 \text{ Kg} = 5 \text{ Kg}$$

Assuming rim provides 95% of required moment of inertia

$$\Delta E = 0.95 \cdot I \cdot \omega_n^2 \cdot k_s$$

$$I = 0.2644 \text{ Kg-m}^2$$

$$M = 5.22 \text{ Kg}$$

c) Rim Cross Section:

Mass of rim = A * length * p

$$M = A \cdot 3.14 \cdot D_m \cdot \text{Density}$$

$$5.5 = A * \pi * 0.45 * 7200$$

$$A = 5.4 * 10^{-4} \text{m}^2$$

If,

$b = 2h$ $b = \text{breadth}$

$A = 2h^2$ $h = \text{thickness}$

$$h = 0.03287 \text{m}$$

$$h = 32.87 \text{mm}$$

$$b = 2 * 32.87 = 65.8 \text{ mm}$$

Now, $D_o = D_m + h$

$$= 450 + 32.87$$

$$D_o = 482.87 \text{mm}$$

d) Stresses in Flywheel:

Tensile stress due to centrifugal force

$$\sigma_1 = P * V_s^2$$

$V_s = \text{Surface speed } \pi * D_o * N$

$$\sigma_1 = 7200 * [(3.14 * 0.5 * 700) / 60]^2$$

$$= 2.25 \text{mpa}$$

Stress due to bending of rim

$$\sigma_2 = (3.14 * V_s * p * D_o) / I^2 * h$$

$I = \text{no. of arms}$

$I = 6$ ($300 < D_o < 400 \text{mm}$)

$$\sigma_2 = (\pi * 313.13 * 7200 * 0.48280) / (6^2 * 0.03287)$$

$$\sigma_2 = 9.07 \text{mpa}$$

e) Resultant Stresses :

$$\sigma = 0.756 \sigma_1 + 0.25 \sigma_2$$

$$= 0.75 * 2.25 + 0.25 * 9.07$$

Stress = 3.955 Mpa < allowable stress for C.I. = 140 mpa

Therefore design is safe.

f) Flywheel Construction Details:

a) Hub dia. (D_h) = $2d = 2 * 30 = 60 \text{mm}$

b) Length of hub (l_h) = $2.25d$

$$= 2.5 * 30 = 75 \text{mm}$$

g) Total Weight of Flywheel:

Area of hub (A) = $(\pi/4) * (D_h^2 - d_s^2)$

$$= (3.14/4) * (60^2 - 30^2)$$

$$= 2.12 * 10^{-3} \text{m}^2$$

Volume of hub (V) = $A * L_h$

$$= 2.12 * 10^{-3} * 0.075$$

$$V = 1.59 * 10^{-4} \text{m}^3$$

Mass of hub (M_h) = $V * \text{density}$

$$= 1.59 * 10^{-4} * 7200$$

$$M_h = 1.145 \text{Kg}$$

Total weight of flywheel = mass of rim + mass of hub + mass of arm

$$= 5.5 + 1.145 + 0.5 = 7.145 \text{Kg}$$

$$\text{Total weight of flywheel} = 7.145 \text{Kg}$$

2. Design of Shaft

a). Assumption:

1) The shaft is considered as a simply supported beam

2) Material used for shaft is (SAE)1030

b) Reaction Calculation :

Weight of flywheel (approximately) = 70N

Pulley if Diameter = 30 cm

Pulley Radius = $6'' = 152.5 \text{mm}$

Diameter of sprocket = 63mm

Distance of paddle from center of larger sprocket = 0.18m

Torque which is getting by pedaling,

Torque = Force * Distance

$$= 300 * 0.18 = 54 \text{Nm}$$

Tension in the belt,

$$T1 = (54/2) / 0.1525 = 177 \text{N}$$

Pitch circle radius of larger sprocket = 0.1m

Total tension in the chain,

$$T2 = 54 / 0.1 = 540 \text{N}$$

c) Vertical Force Diagram:

R_{AV} and R_{FV} are vertical reaction support at support A & F resp.

Reaction at R_A and R_F

$$R_A + R_F = 25 + 20 + 70 = 115 \text{N} \text{-----1}$$

Taking moment about A,

$$\sum M_A = 0$$

$$R_{AV} * 0.5 = 25 * 0.15 + 20 * 0.25 + 70 * 0.30$$

$$R_{AV} = 59.5 \text{N}$$

$$R_{AV} + 59.5 = 115$$

$$R_{AV} = 55.5$$

d) Vertical Bending Moment Calculation:

Bending moment at A = 0

Bending moment at F = 0

Bending moment at E = $59.5 * 0.05 = 3 \text{Nm}$

Bending moment at D = $59.5 * 0.2 = 11.9 \text{Nm}$

Bending moment at C = $59.5 * 0.25 - 70 * 0.05 = 11.37 \text{Nm}$

Bending moment at B = $55.5 * 0.15 = 8.32 \text{Nm}$

e) Horizontal Force Diagram:

R_{AV} + R_{FH} are horizontal reaction at support A & F resp.

$$R_{AV} + R_{FH} = 200 + 540$$

$$= 740 \text{N} \text{-----2}$$

Taking moment about A,

$$\sum M_A = 0$$

$$R_{FH} * 0.5 = 540 * 0.45 + 200 * 0.15$$

$$R_{FH} = 546 \text{N}$$

Equation 2 -

$$R_{AH}+546=740$$

$$R_{AH}=194 \text{ N}$$

f) Horizontal Bending Moment Calculation:

Bending moment at A=0
 Bending moment at F=0
 Bending moment at E=546*0.05
 =27.3Nm
 Bending moment at D=546*0.2-540*0.15
 =28.2Nm
 Bending moment at C=546*0.25-540*0.2
 =28.2Nm
 Bending moment at B=546*0.35-540*0.3
 =29.1N

g) Resultant Bending Moment Calculation

Resultant bending moment at B= $\sqrt{8.32^2 + 29.1^2}$
 = 30.26Nm
 Resultant bending moment at C= $\sqrt{11.37^2 + 28.5^2}$
 = 30.68Nm
 Resultant bending moment at D= $\sqrt{11.9^2 + 28.2^2}$
 = 30.60Nm
 Resultant bending moment at E= $\sqrt{3^2 + 27.3^2}$
 = 27.46Nm

Selecting maximum bending moment=30.68Nm
 According to nature of loading, selecting constant for shaft design

For rotating shaft,
 Suddenly applied load (Minor shock)
 $K_b=1.5, K_t=1$
 Where K_b & K_t are constant for bending moment and torsion resp.

Selecting shaft material SAE 1030.

$$S_{yt}= 296 \text{ Mpa}, S_{ut}=527 \text{ Mpa}$$

Where S_{yt} = Yield stress.

S_{ut} =ultimate stress.

T_{max} = maximum shear stress.

Allowable shear stress,

$$T_{max}=0.3S_{yt} \text{ or } 0.18 S_{ut}$$

$$=0.3*296 \text{ or } 0.18*527$$

$$=88.8 \text{ Mpa or } 94.86 \text{ Mpa}$$

Considering key way effect

$$T_{max}=0.75*88.8 =66.5 \text{ Mpa}$$

Shaft diameter is given by,

For solid shaft,

$$T_{max} = \left\{ \frac{16}{\pi * d^3} * \left\{ (K_b * M_{max})^2 + (T_d * K_t)^2 \right\} \right\}$$

$$66.6 * 10^6 = \left\{ \frac{16}{3.14 * d^3} * \left\{ (1.5 * 30.68)^2 + (54)^2 \right\} \right\}$$

$$d = 0.0176 \text{ m} = 17.6 \text{ mm}$$

Selecting next standard higher value=20mm
 So, diameter of shaft=20mm

3. Design of V-Belt Drive

Data
 P_r =Rated power =0.565 kW.
 N_1 =500rpm
 $N_2 = 1500 \text{ rpm}$
 C = Center distance=500mm

a) Design Power:

$P_d = P_r * K_1$
 Where, K_1 = load factor =1.10
 $P_d = 0.565 * 1.10 = 0.6215 \text{ kW}$.
 Selecting section of belt on basis of design power
 From data book =w=13
 Nominal thickness=8mm
 Recommended min pulley diameter =75mm

b) Peripheral Velocity (V_p):

Selecting diameter of smaller pulley as 75 mm
 $V_p = 3.14 * D_2 * N_2 / 1000$
 $= 3.14 * 75 * 1500 / 1000$
 $= 355 \text{ m/min}$
 Since V_p is in the range of 300-1500m/min.

c) Tension Ratio:

Due to wedging action in v-belt slip is negligible small hence we can write,

$$N_2 D_2 = N_1 D_1$$

$$1500 * 75 = 500 * D_1$$

$$D_1 = 225 \text{ mm}$$

Angle of lap on smaller pulley (θ_A)
 $= 3.14 * \{ (D_1 - D_2) / c \} = \pi - \{ (225 - 75) / 500 \}$

$$\theta_A = 0.3$$

Angle of lap on larger pulley (θ_B)
 $\theta = 3.14 + \{ (D_1 - D_2) / c \} = 3.14 + \{ (225 - 75) / 1500 \}$
 $= 3.44$

Since value for smaller pulley is less hence smaller pulley governs the design,

$$F_1 / F_2 = e^{0.3 * \text{angle of lap} * \text{cosec}^2 \alpha / 2}$$

Where,

Groove angle=38°

Coefficient of friction=0.3

$$F_1 / F_2 = e^{0.3 * 0.3 * \text{cosec}^2 38 / 2} \dots\dots\dots 1$$

$$= 1.31$$

$$(F_1 - F_2) = P_d / V_p$$

$$= (0.6215 * 10^3 * 60) / 355$$

$$= 105 \text{ N} \dots\dots\dots 2$$

From equation 1 & 2

$F_2=338.7N$
 $F_1=443.7N$

d) Power Capacity per Belt:

Power belt= $(F_w-F_c) * (e^{0.3*0.3*cosec*38/2} - 1 / e^{0.3*0.3*cosec*38/2}) * V_p$

Where,

F_w =Working load= $w^2=13^2=169N$

F_c =Centrifugal tension

$F_c=K_c * (V_p/5)^2$

K_c =Tension Factor = 2.52

V_p = 5.9 m/sec.

$F_c=3.5N$

Power/ belt= $(169-3.59) * e^{0.30.3cosec*38/2} - 1 / e^{0.3*0.3cosec*38/2} * 5.9$

= $235.6w = 0.235kw$

e) Length of Belt:

$L=\pi/2 * (D_1+D_2)+2C+(D_1-D_2)^2/4C$
 $=3.14/2 * (225+75)+2*500+(225-75)^2/(4*500)$

$L=1482.5mm$

f) Shaft Design:

Selecting shaft material as SAE 1030, for which $S_{yt}=296Mpa$.

From maximum shear stress theory,

$T_{max}=S_{yt}/2 * FS$ -----($FS=2.5$)
 $=296/(2*2.5)$

$T_{max}=59.2Nmm$

From data book design torque for shaft

$T_d=60 * P_r * K_1 / 2 * \pi * N_1$
 $= (60 * 0.565 * 10^3 * 1.5) / 2 * 3.14 * 500$ ----- K_1 =load factor
 $=1.5$ for line shaft

$T_d=16.18N-m$

$T_{ma}=16 * T_d / 3.14d^3$

$d^3=(16 * 16.18 * 10^3) / (\pi * 59.2)$

$d=11.16mm$

In order to consider the bending effect, diameter is increased by 50% hence

$d = 11.16 * 1.5 = 16.75mm$

Select standard shaft diameter,

$d = 20mm$

g) Pulley Hub Proportions :

Hub diameter = $D_h=1.5d+25=1.5*20+25=55mm$

Hub length= $L_h=1.5d=1.5*20=30mm$

h) Arm Cross Section:

Moment of each arm

$M=(F_1-F_2) * (D_1-D_h)/n$ ----- n =no of arms
 $= (443.7-338.7) * (225-55)/6$

$M=2975 N-mm$

$M=2.975 N-m$

Assuming elliptical cross section for arm,

Section modulus for elliptical cross section is

$Z=\pi * h^3/64$ -----(h =major axis= $2 *$ minor axis.)

Allowable stress in bending for cast iron with steady load,

Bending stress= $15 Mpa$.

Bending stress= M/Z

$Z=M/Bending\ stress$

$=3.14/64=2975/15h=15.92mm$ say 16mm

IV. MODELING AND FABRICATION

A. Modeling of Wood Working Machine

Modeling of the machine components and assembly has been done by using Solid Work Software.

a) Frame:



Fig. 2 Frame

Frame plays a very important role in any machine, because it holds all the working part. All the parts are perfectly mounted on the frame. Generally M.S. pipe having rectangular cross-section is used for the frame. In this machine we will going to use light weighted and rigid frame. The base area required for this frame is 6x4 feet.

b) Flywheel:



Fig. 3 Flywheel

A flywheel is an inertial energy-storage device. It absorbs mechanical energy and serves as a reservoir, storing energy during the period when the supply of energy is more than the requirement and release it during the period when the requirement of energy is more than the supply. The main function of a flywheel is to smoothen out variation in the speed of a shaft caused by fluctuations. If the source of the driving torque or load torque is fluctuating in nature, then a flywheel is usually called for. Many machines have load

patterns that cause the torque time function to vary over the cycle.

c) Shaft:



Fig. 3 Shaft

A shaft is a rotating machine element which is used to transmit power from one place to another. The power is developed to the shaft by some tangential force and the resultant torque (or twisting moment) set up within the shaft permits the power to be transferred to various machines linked up to the shaft. In order to transfer the power from one shaft to another, the various members such as gear, pulleys etc., are mounted on it. These members along with the forces exerted upon them causes the shaft to bending. In other words, we may say that a shaft is used for the transmission of torque and bending moment. The various members are mounted on shaft by means of keys.

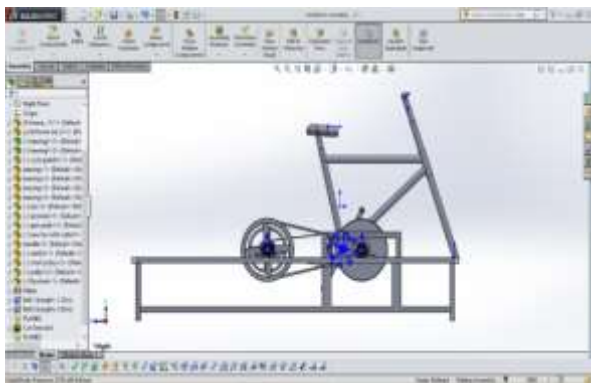


Fig 4 Front view Assembly



Fig 5 Side View Assembly

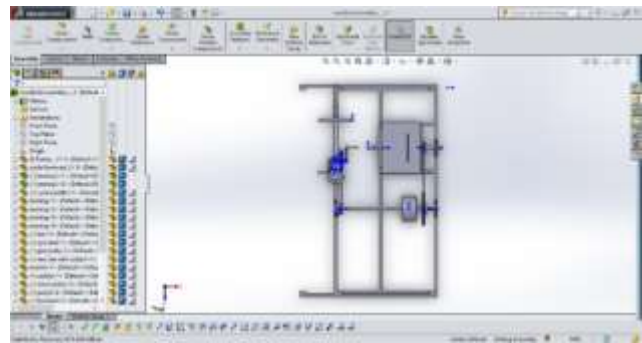


Fig 6 Top View Assembly



Fig 7 Isometric View

B. Fabrication of Wood Working Machine

Fabrication is the process of assembly of various parts. It includes operations such as cutting, grinding, drilling, turning, threading etc. with the help of different machines.

a) Frame

We have fabricated frame from rectangular and square tube. The base was made by rectangular cross-section of tube of dimensions 1”x2” and square cross-section of tube of dimensions 1”x1”. Firstly we cut the tubes according to our dimensions then grind it for removing burr from it. Then we welded the tubes together by using Arc Welding. Dimensions of frame – 6.2”x48”x12”.



Fig. 8 Frame of a Machine

b) Bicycle Frame

Bicycle frame was mounted on the Base frame by Arc welding. According to our suitable dimensions of design. The bicycle frame should be vertical in position it should be rigid. So as to avoid accidents. The handle of circular pipe was welded to the bicycle frame by considering the appropriate position of sitting. Height of handle from ground is 96cm and distance between operator seats to ground level is 102cm.



Fig. 9 Bicycle Frame

C) Circular Shaft

There are two shafts, which are having different purpose. Primary shaft (large in length) is attached to rear end of the bicycle sprocket. Which is run by the chain drive. It consist of a balanced flywheel at some distance from one end and driving pulley attached at other end by a belt drive. The secondary shaft is attached to the base frame. The secondary shaft consist of blade and driven pulley which is rotated by primary shaft by a belt drive.

As per design requirement step turning and threading operation perform on the circular solid MS shaft on Lathe machine. Shaft dimensions are 25 mm in diameter and cm (primary shaft), 20 mm diameter and 62 mm in length.



Fig. 10 Circular Shaft (large shaft)



Fig. 11 Circular Shaft (Small Shaft)

d) Wood Cutting Platform

Wood cutting platform made up of Square tube. Dimensions are 43x60 cm. a plywood of having 8mm thickness and same dimensions of platform fastened by using fasteners to the wood cutting platform.



Fig. 12 Wood Cutting Platform

These above parts of manually operated wood working machine are made by

C. Assembly Wood Working Machine

The arrangement of various component of “Manually Operated Wood Working Machine” is being done are as follows:

1. The foundation frame is being selected which carry the entire load of the machine.
2. The transmission system mounted on the base of frame.
3. The sprocket is connected to driven freewheel with the help of chain.
4. The freewheel shaft is mounted on the base of the foundation frame with the help of pedestals bearing which is fasten using nut and bolt. This shaft is connected to the driving freewheel of roller.
5. The roller shaft is mounted on the top face of the foundation frame with the help of pedestals bearing which is fasten using nut and bolt. This shaft is driven with the help of freewheel and chain connection.
6. The cutting wheel fixed on the rotating shaft at middle portion. And at the end of this shaft grinding

wheel is attached by using fastener for grinding operation.

7. Platform to place and moving of a wood fix on the main frame. It is fastened to the frame by using nut and bolt arrangement.
8. The platform taken above some height of main shaft and bellow to rotating cutter. The above arrangement ensure that all element of the project are balanced and also center of gravity of the assembly is on axis.



Fig. 13 Wood Cutting Machine Assembly

V. ADVANTAGES

1. It required no power for operation.
2. It is easy in maintenance.
3. It does not require any special skill for operation.
4. Cost of manually operated wood working machine is less than other machines because no source of electricity required.
5. Its construction is simple.

VI. DISADVANTAGES

1. For working operations, it needs two people to work on machine at a time.
2. It is time consuming but cheap process.
3. It require human effort for operating cutting machine.
4. Sometimes the small groundnut does not break.

VII. APPLICATION

1. It can be used in small carpentry workshop.
2. It is use for cutting wood where power source not available.
3. In rural areas where electricity cut-off problems occurs.
4. It is use for grinding operation.

VIII. CONCLUSION

Proper evaluation of the design will be performed and created something even better instead of electrically operated operations. Finally we conclude that this machine is better option to use for Carpenter. Thus a low cost and simple design pedal operated wood working machine is fabricated. This machine reduces the human effort and hence we need two persons to cut the wooden logs. This simple design of conventional design which can enhance day-to-day household needs and day-to-day purposes and it can be also used in for industrial applications during power shut down scenarios. By using this method we can do Cutting and grinding operation without the use of electricity. So we can save the electrical power.

Experimental result shows cutting depth of about 10 mm can be obtained can be obtained in one cycle of strokes for around 100rpm. The ply wood can be cut without any external energy like fuel or current. Since it uses no electric power and fuel, this is very cheap and best. The manually operated wood working machine by using pedal is easy to use hence does not require any skilled person. It is operated by pedaling action hence ensures comfort as compared to hand operated machines.

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