DESIGN AND FABRICATION OF MULTI PURPOSE MACHINE

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ABSTRACT :

This deals with design, development and fabrication of MULTI PURPOSE MACHINE. This machine is designed for the purpose of MULTI PURPOSE MACHINE i.e; DRILLING, CUTTING AND GRINDING operations.

Industries are basically meant for production of useful goods and services at low production cost, machinery cost and low inventory cost. So in this project we have proposed a machine which can perform operations like cutting, drilling, grinding operations at one place simultaneously.

This machine is based on the mechanisam of withworths return mechanisam. The machine perform multi purpose operation at same time and automatic which is controlled or operated by motor which is run with the help of current. It can be used in small industries, workshops to work upon wood blocks, steel and pvc materials.

The machine motor not required high power voltage. The prices of drilling, cutting and grinding machine are so high and some are not portable, so we can try to made the multi purpose machine which are portable.

Key words: cutting, drilling, grinding.

INTRODUCTION:

Industries are basically meant for production of useful goods d services at low production cost, machinery cost and low inventory cost. Today in this world every task have been made quicker and fast due to technology advancement but this advancement also demands huge investments and expenditure, every industry desires to make high productivity rate maintaining the quality and standard of the product at low average cost in an industry a considerable portion of investment is being made for machinery installation. So in this paper we have proposed a machine operations like cutting, drilling, grinding, some lathe operations at different working centers simultaneously which implies that industrialist have not to pay for machine performing above tasks individually for operating operation simultaneously.

Multipurpose machine or MPM as we call it is a machine i.e; made especially for the small scale industries where labours working are have very little technology. MPM it is a machine that performs their work quickly and efficiently without the hassle of using different machines for performing different operations on workpiece. It has three arms on which three different operations are performed. This project is focused on design and fabrication of multipurpose machine assembly by using CATIA design software.

WORKING :

The multi purpose machine (drilling, cutting, grinding) consists of machining tools like driller machine, grinding machine, hack saw blade. This machine consists of two vices arranged on frame. Therefore processes like drilling, cutting and grinding can be done. Vices are mounted to the processing machines. One vice is left free for loading and un loading the work pieces. All these are fixed to a frame. A motor is fixed which is connected to chain to shafts so that all processes can be driven by a single motor. The tools in turn are connected to a motor by means of a chain and pulley mechanism. The motor rotates all the three tools rotate simultaneously. The workpiece is loaded in the vice. When it is at the right position the table is locked with the help of locknut and the

drilling operation is carried out. Similarly all the operations are done. In drilling machine a handle is provided to handle the workpiece to put a hole. By means of scotch yoke mechanism cutting operation take place.

Fig 1 : Fabrication of Multipurpose machine

LITERATURE REVIEW :

"DHARWA CHAITHANYA KIRTI KUMAR" Design and developed a multipurpose machine, which does not require electricity for several operations like cutting, drilling, grinding etc. This is a human powered machine runs on chain drives mainly with human efforts.

R SUBASH, K SAMUEL JAYA KARAN, (2014) In this paper author as designed pedal operated hack saw machine which can be used for industrial applications and house hold needs in which no specific input energy or power is needed.

T GIRISH, D PARAMESWARA MURTHY, (2014) In this paper author has designed to development of conceptual model of water pumping and battery charging cross trainer which is user friendly, easy to do exercise, save and stores the energy of the users muscle efforts.

DESIGN :

CATIA is an acronym for computer aided three dimensional interactive application. It is one of the leading 3D software used by organizations in multiple industries ranging from aerospace, automobile to consumer products.

CATIA is a multiplatform 3D software suit developed by Dassault systems , encompassing CAD, CAM as well as CAE. Dassault is a French engineering giant active in the field of aviation , 3D design, 3D digital mock-ups, and product life cycle management software.

Fig 2 : CATIA IN 3D EXPERIENCE

FINAL ASSEMBLY OF PROJECT IN 3D EXPERIENCE :

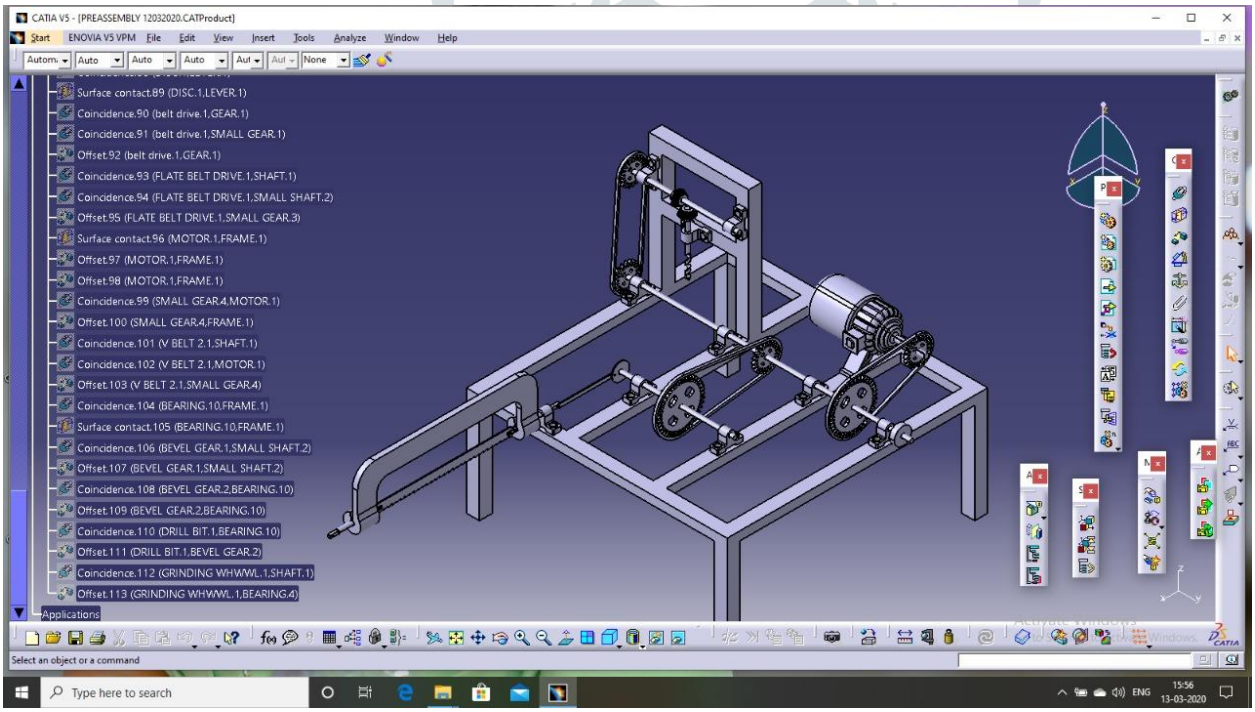

FIG 2 : FINAL ASSEMBLY

CONCLUSION :

In this line we have created and modified the model in the light of the writing survey and developed a superior idea of the use of machine tasks of multiple reasons with a single feeder. In a sector, a large segment of speculations are created for the creation of devices. Therefore in this document we have proposed a machine capable of performing activities such as cutting , drilling in various work approaches independently, as this machine will perform distinctive task separately. Your work should be possible in less space. Even incompetent work can deal with it effectively and , in light of this , we can reduce the cost of creation, which is the most essential factor in the industry.

SCOPE OF STUDY :

Other operations can also be incorporated into the machine. The machine can be made more portable. Cost can also be reduced to some extent by manufacturing it on a mass scale. Regulator can also be incorporated on to the A.C motor to regulate the speed of moving motor (varying speed of motor).

MODEL CALCULATIONS :

DESIGN OF SINGLE PHASE A.C MOTOR

Output power in H.P = (2 x Π x NT)/4500

Where,

T - Torque = Load x distance moved

Weight of the machine = 13 kg

Distance moved = 0.1 m

Torque = 13 x 0.1

= 1.3 kg-m

∴ Required output power in HP = (2 x Π x NT)/4500

= (2 x Π x 550 x 1.3) / 4500

= 0.998

≈ 1 H.P

Hence power required for the motor is = 1 H.P

CALCULATION OF SHAFT:

Power = 90W

Speed (N) = 60rpm

Assuming factor of safety = 2

Yield strength (σ_y) = 36 N/ mm^2

Shear Force of the shaft (F_s) = $\sigma_y/2n$

= 36/(2*2)

F_s = 9 N/mm^2

Power = 2πNT/60

90 = 2π*60*T/60

T = 14.33 N-m = 14.33*10^3 N-mm

Torque (T) = (π/16)*F_s*d^3

$14.33*10^3 = (\pi/16)*9*d^3$

$d^3 = (14.33*10^3*16)/(\pi*9)$

$d = \sqrt[3]{8113.23}$ d = 14.79

Standard value of diameter is = 15mm

DESIGN OF PULLEY:

SPEEDS IN PULLEYS:

Measured Specifications:

N1/N2 = D2/D1

Where,

N1 = Input speed to the Motor = 1440 rpm

N2 = Output speed from the pulley-2

D2 = Diameter of the pulley-2 = 200mm

D1 = Diameter of the Motor pulley=63mm

∴ N2 = (D1/D2) x N1

= (63 / 200) x 1440= 453.6 rpm

This speed is equal to the small Sprocket speed = 453.6 Rpm

The speed of the huller shaft (N4) = (D3/D4) x N3

Where,

N4 ---- Speed of the rolling huller Shaft

N3 ---- Speed of the Small sprocket = Speed of Pulley – 2 = 453.6 rpm

D3 ---- Diameter of Small sprocket = 61 mm

D4 ---- Diameter of Big sprocket = 183 mm

So the speed of the rolling huller shaft = (61/183) * 453.6

= **151.2 Rpm**

DESIGN OF BEARING

No. 6204

Outer Diameter of Bearing (D) = 47 mm

Thickness of Bearing (B) = 14 mm

Inner Diameter of the Bearing (d) = 25 mm

r_1 = Corner radii on shaft and housing

Maximum Speed = 14,000 rpm (From design data book)

Mean Diameter (d_m) = (D + d) / 2

= (47 + 25) / 2

d_m = 36 mm

Spring index (C) = (D /d)

= 12 / 2

C = 6

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