Multi-Functional Machine with Electro-Magnetic Clutch

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Abstract—This paper takes into consideration the concept of Multi-Functional Machine for especially for generation base businesses. Main aim is to ensure the low generation cost, hardware cost and low stock expense. Now a days the invention are targeted so as to produce in such a way that it provides a quick yet effective solution as innovation headway yet this progression likewise requests gigantic ventures and consumption. Heavy profit is to be obtained but not compromising with the quality of produced machine. We have built up a machine which could perform in a multidimensional way, and also being productive at the same time. In this machine we are really offering drive to the primary shaft to which scotch burden system is legitimately connected, scotch burden instrument is utilized for sawing task. Fundamental uses slope gear framework to provide power transmission at two areas. Through slant gear we will offer drive to boring focus and crushing focus. The representation encourage us to get the activity performed at various working focus all the while as it is getting drive from single power source. Goal of this prototypical are lookout of power (regulator source), decrease in expense related with power use, increment in efficiency.

Keywords—Electro-Magnetic Clutch, Multi-Functional Machine.

I. INTRODUCTION

Ideally we know industries stands for Production of required products at low manufacture charge, equipment charge and moderate storage charge. Now a days each endeavour have been accelerated and swift due to technical knowledge improvement but this improvement too demand large speculations and expenditure, each fabrication targets to fabricate high productivity rate sustaining the quality and standard of the product at moderate mean cost. Mainly in production a significant part of speculations is done machinery erection. So in this paper we have a shown a machine which can perform tasks like penetrating, sawing, building, some lathe processes at disparate labouring areas at the same time which infers that industrialist don’t have to bother paying for machine performing those tasks independently for operating operation at the same time.

II. EXPLORATORY SET-UP

In this proposal, we have provided the gear technique in order to provide power transfer at various operating areas, typically gear is a rotatory machine part comprising of teeth, or cogs, which interconnects with additional toothed part so as to transfer turning force, over a large scale, with teeth on the one gear being of same form, then frequently also with that form on the later gear. Two or more gears operating in cohesion are called a transmission and can generate mechanical suitability by a gear ratio and hence may be defined a simple machine. Geared devices can alter the speed, torque, as well as way of a power source. The commonly occurring case is for a gear to interconnect with another gear; however, a gear can also interconnect with a non-spinning toothed portion, called a rack, thereby making translational motion in its place of rotatory motion.

III. OPERATIONAL STANDARD

(COMPONENTS)

Here only two considerable standards on which we proposed our machine (theoretical display) operates:

1. Scotch-Yoke system
2. Power transmission through gears (bevel gear)

![Fig.1: Scotch yoke mechanism](image-url)
The Scotch Yoke (else name dun locked assembly tool) is a responding drive system, altering the direct movement of a slider into revolving drive, or the different mode nearby. The cylinder or other responding part is directly linked to a sliding burden with a space that connects in a stick on the latter.

Slope gears are important when the course of a pole's pivot should be altered. They are basically placed on slides that are 90 degrees left, however can be made to work at other edges also. The teeth on incline instruments can vary from straight, winding or hypoid.

Central function:
The three tasks are drilling, pounding and cutting. The reason for the machine is to reduce the assembling time and cost reduction. A similar machine is used for doing all these three activity, rather than using separate machines, for example, penetrating machine, granulating machine and hacksaw cutting machine.

1. Drilling
Penetrating is a cutting procedure that uses a penetrating device to cut a hole of roundabout irritable-area in strong materials. The penetrating apparatus is normally a rotatory cutting device, commonly multi-point. The bitsqueezed alongside the work-piece and hinged at proportions from hundreds to thousands of rounds for each moment. This energises the forefront against the work-piece, cutting off chips from the hole as it is bored.

2. Grinding
Grinding is machining processes in which we use a grinding wheel consist of an abrasive compound for machining operation. The grinding wheels are consumable but life of different grinding wheel can vary, it depends on the type of their stone used. It is mainly made of aluminium oxide or silicon carbide or ceramics. In grinding process speed is very high as compare to other
machining process so their may use of coolant should be there to avoid overheating. Grinding is used to provide high surface quality, shape and, size.

Material specification
1. Transformer
2. Gear
3. DC gear motor
4. Conveyor belt
5. Capacitor
6. Diode
7. Cast iron rod
8. Pulley
9. Electromagnetic clutch

4. Gear
Gear is a mechanical device used for transfer of power from one shaft to another shaft. The speed of gear depend on the gear ratio means the ratio of teeth of driven and driving gear. In power transmission from one gear to another the larger diameter gear is called as driven gear and smaller one is called as pinion gear. It is mainly used for varying speed. It is used in industries, automobiles, watches.

5. DC Gear Motor
An adapted DC Motor has an apparatus gathering connected with the engine. The speed of engine is measure in terms of RPM (Revolution per minute). It is mainly used in lower voltage supply. In this gear and motor are combined together for working.

6. Conveyor Belt
A conveyor belt system is used for transferring power from one pulley to another pulley. These belt are made of thermoplastics, metal, rubber, leather and fabric.
Types of conveyor belt:
1. Gravity conveyor
2. Wire mesh conveyors
3. Plastic belt conveyors
4. Elastic conveyors
5. Perpendicular conveyors

Fig. 10: Conveyor Belt

7. Capacitor
A capacitor is a small battery which stores some electrical energy. It is mainly used for power conditioning, signal coupling or decoupling and also for remote sensing.

Fig. 11: Capacitor

8. Diode
It is an in electronic device in which current move only in one direction. It is basically a semiconductor device which have two terminal one is p another one is n in which current flow in one direction. Diode is made of semiconductor, for example silicon, germanium are some of its type.

Fig. 12: Diode

9. Cast iron rod
Cast iron bar is utilized for connecting the pulleys and to append the electromagnetic grip on it, and furthermore for fixing the apparatus on it.

Fig. 13: Cast iron rod

10. Pulley
A pulley is a wheel on a pivot or shaft that is planned to help progress and modify of course of a snug linkage or belt, or interchange of intensity among the pole and link or belt. On account of a pulley upheld by an edge or shell that does not interchange capacity to a pole, still is used to control the linkage or apply a power, the backup shell is identified as a square, and the pulley might be identified as a sheave.

Fig. 14: Pulley

11. Electromagnetic clutch
Electromagnetic grips are most reasonable for remote activity since no mechanical linkages are required to control their commitment, giving quick, smooth task. Notwithstanding, on the grounds that the initiation vitality disperses as warmth in the electromagnetic actuator when the grip is locked in, there is a threat of high temperature. Consequently, the peak risky employed heat of the grip is constrained by the heat rating of the safety of the electromagnet. This is a notable captivity. Another impairment is higher introductory expense.
IV. THEORETICAL SPECIFICATION

i. Dimension of the typical: length=75 cm, width=60 cm, height=30 cm.
ii. For gear: Base radius = 20 mm, pitch cone angle=55 degree, pitch dia. = 40 mm.
iii. For Pinion Base radius = 1.4 cm, Pitch Cone Angle=35 degree, pitch dia. = 28 mm.
iv. Bevel gear: no. of teeth T1=12, T2=9.
v. Roller bearings of inner dia.=9.6 mm.
vi. Constituent of bevel gears steel.
vii. Rod is also of steel.
viii. Size of Binding = 30 mm.
ix. Wideness of belt=15 mm.
x. Diameter of pulley= 60 mm.
xi. Belt type = V-belt.
xii. Structure is built of woodland.
xiii. Shaft dia. =10 mm (round), shaft length=2.5 ft.

\[ \tan \gamma_p = \sin B / (W_p/W_g) + \cos B \]

Where B is the edge between the pole.

On placing B=90 deg and \( \gamma_p = 39 \) deg we get \( W_p/W_g = 1.234 \) for example our speed proportion is 1.428. Presently for the two complete upheaval of principle shaft the Penetrating slide and Granulating shaft ought to have no of insurgency = 2.858 (tentatively)

In any case, from our model the no of transformation estimated at penetrating and crushing axis=2.68 (for example two complete insurgency in addition to 240 pivot).

Rate blunder in power transfer = (2.858-2.68)/2.858*100 = 6.18%

Presently measurement of round plate of scotch burden mechanism=78 mm

Real estimated powerful blow size of drag = 76 mm
Rate blunder in the stroke length= (78-76)/78*100 = 2.56%

Essentially numerous estimations of rpm at penetrating and crushing pivot can be estimated on changing the contribution; in this calculated model feed to the work piece is given through the work table. As the prototypical is exposed to grating in this way there is a mistake of 6.18% and 2.56% amid power transmission and transverse movement of sawing edge separately.

V. CALCULATION

Our primary point is to speak to our creative idea, we have taken some helpful information from our applied model and attempted to assess the rate deviation from the standard determined qualities which is as per the following:

Since pitch sweep of pinion is \( p = 14 \) mm, pitch span of rigging \( r_g = 20 \) mm.

By the connection among pitch cone edge and speed proportion we can discover the speed proportion as we have pitch cone plot for both rigging and pinion as 55 deg. furthermore, 35 deg.

VI. CONCLUSION

We perceive that all the generation centred ventures required low creation charge and extraordinary work level which is conceivable by the use of multi-work working machine which will reduce power just as fewer time, later this machine gives functioning at various focus it truly diminished the time utilization up to apparent edge. In an industry a considerable bit of speculation is being made for hardware establishment. Therefore in this paper we have planned a machine which can perform tasks like boring, cutting, crushing at various working focuses all the while which indicates that manufacturer have not to recompense for machine performing above assignments autonomously for working task concurrently.

Since this machine will perform diverse activities all the while this machine can be used in remote spots where
power is unpredictable or lacking. It very well may be used for light obligation cutting and boring activities of compressed wood. Likewise the granulating task can be utilized to sharpen the instruments edges just as to evacuate additional materials its functioning should be possible in less floor space. Untalented work can similarly deal with it effectively as a result of this we can diminish the expense of production which is the most important factor in production industry.

REFERENCES
[1] Heinrich Arnold “The recent history of the machine tool industry and the effects of technological change “University of Munich, Institute for Innovation Research and Technology Management, November 2001.
[2] Dr. Toshimichi Moriwaki “Trends in Recent Machine Tool Technologies” Professor Department of Mechanical Engineering Kobe University, NTN Technical Review No.74(2006).
[3] T. Moriwaki “Multi-functional machine tool”, Department of Industrial and Systems Engineering, Setsunan University, Neyagawa, Japan CIRP Annals - Manufacturing Technology DOI:10.1016/j.cirp.2008.09.004.
[4] Frankfurt am Main “Multi-purpose machines ensure enhanced”, 1 January 11.
[5] “Selecting and Planning the Process of Manufacture: Dr. Pulak M. Pandey, http://paniit.iitd.ac.in/~pmpandey
[6] https://en.wikipedia.org/wiki/Scotch_yoke
[7] https://en.wikipedia.org/wiki/Gear
[8] https://www.engineersgarage.com/insight/how-g geared-dc-motor-works
[9] https://www.emworks.com/application/electromagnetic-clutch
[10] https://techminy.com/scotch-yoke-mechanism/
[11] https://science.howstuffworks.com/transport/engine- equipment/gear4.htm
[12] P. Solanki, V. Chuahan, G. Mitesh and S. Darshan, "Design, Modeling and Failure Analysis of Rolling Key in 10-Ton C-Type Mechanical Power Press", International Journal of Advanced Engineering, Management and Science, vol. 2, no. 4, pp. 113-116, 2019. Available: https://ijaems.com/detail/design-modeling-and-failure-analysis-of-rolling-key-in-10-ton-c-type-mechanical-power-press/.
[13] https://www.lboro.ac.uk/microsites/mechman/resear ch/ipm-ktn/pdf/Technology_review/machine -technology-developments.pdf
[14] https://www.gsb.stanford.edu/faculty-research/publications/economics-modern-manufacturing-technology-strategy-organization