Multi Operational Mechanical Machine

Nagaraja K U, Chandrashekar H M, Megharaja K T, Rakesh D, Kantesh Talawar
Department of Mechanical Engineering, Jain Institute of Technology
Davanagere, India

***Abstract*—: This paper explains the concept of "Multi-Purpose Mechanical Machine'' is purposefully carried out for the production-base industries. Industries are typically for Production of the beneficial products at low price, price of machinery and minimum price storage houses. In the recent times this market every operation has been made better and quicker due to advance technology but this advancement also expects huge investments and expenditure, every industry wishes to make high productivity rate. So, in this project, we propose a machine that can concurrently do operations such as drilling, cutting, grinding, and some lathe operations at many working centres. allowing business owners to avoid investing for devices that execute the aforementioned tasks separately. Which industrialist does not have to pay for a machine that performs all of the following jobs at the same time? Scotch yoke mechanism is directly linked and used for cutting operations in this machine. Power transmits on main shaft through a mechanism of chain-sprocket, The opposite shaft features a drill chuck with a drill bit for drilling operations on one end and an abrasive grinding wheel for surface finishing and grinding operations on the other end, similar to FMS concurrent engineering technology.**

Keywords— Concurrent Engineering, FMS, Scotch Yoke Mechanism, Power Transmission (Chain& Sprocket), Scotch Yoke Mechanism (Flexible Manufacturing System).

INTRODUCTION

Without transporting the project to the work table, the multi-operational mechanical machine for cutting, grinding, and drilling can be used to form slots in the work piece. The slotter is used to cut grooves, keyways, and uneven surfaces on both internal and exterior surfaces, to handle huge and cumbersome work parts, to cut internal or external gears, and to do a variety of other tasks that are difficult to accomplish with other equipment.

ELEMENTS OF THE PROJECT DRILLNG:

Drilling is a cutting technique that involves using a drill bit to make a circular cross-section hole in solid materials. The drill bit is a rotary cutting instrument with several points. The bit is pressed on the workpiece and rotated at hundreds to thousands of revolutions per minute. The cutting edge is pressed against the workpiece while the hole is drilled, cutting off chips (swarf).

Fig 1: Types of drill bit

METAL CUTTING:

The process of removing undesirable material from a block of metal in the form of chips is known as metal cutting or machining. Cutting processes function by shattering the substance being cut.

Chips are typically found in the chipped away portion of the bone. Sawing, shaping (or planing), broaching, drilling, grinding, turning, and milling are all cutting procedures. Despite the fact that the cutting machines, equipment, and processes appear to be somewhat diverse, the basic mechanism that generates the fracture may be explained by a simple model called orthogonal cutting.

Fig 2: Cutting mechanism (Hacksawblades)

Grinding:

In this we have used grinding wheel made of abrasive materials which is used giving a good corner finish by cutting. These types of operating machines are used in the machining operators. These types of materials are made by using one or more materials commonly called as composite materials, which are having course materials and they are pressured with aggregate and they are well combined and attached to form a bond ,which is very very hard solid material and circular in structure to form a grinding wheel.

Fig 3: Grinding Wheel

Scotch Yoke Mechanism

This mechanism can be defined like the conversion of linear motion of a slider to rotational motion or it can be rotational to linear, both are the commonly known as Scotch Yoke mechanism. Here the piston is attached to the sliding yoke which is again attached to slot which comes with a pin on rotating pin. This mechanism can also be used for various operations like cutting, grinding at the same time

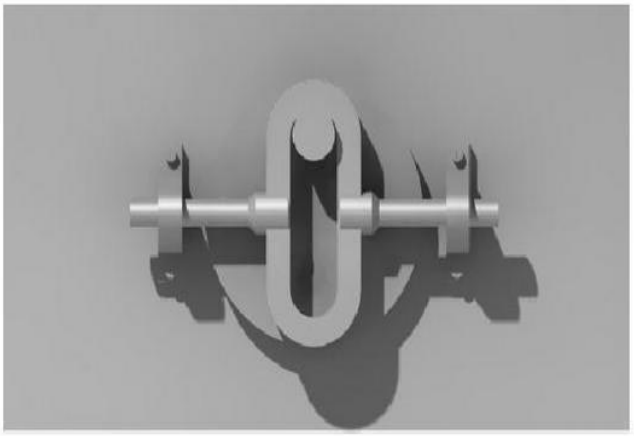

Fig 4: Scotch Yoke Mechanism

Frame:

The Multi-Operational Machine's setup frame has four ends that are inclined at different angles. to transmit power from an AC motor connected to a shaft at one end to another parallel shaft via a chain sprocket system (time driving chain) with a drill chuck fitted with a drill bit at one end and a grinding wheel at the other end for the other two operations to be performed under a single workstation The frame is built of mild steel and can hold a lot of weight. the project's mainframe in place during operation to reduce vibrations and oscillations. Mechanical clamps are used to secure all four ends of the frame in place.

Fig 5: Frame

Bearing

A bearing is a device that allows for limited relative motion between two objects, most commonly rotation or linear movement. Bearings are classified in basic terms based on the kind of motions they allow and how they work. Low-friction bearings are commonly utilised to improve efficiency, minimise wear, and enable faster speeds. A bearing can minimise friction due to its form, material, or the introduction and containment of a fluid between two surfaces. To get an edge, he uses spheres or rollers. It makes use of the bearing material's properties. Bush journal bearings, sleeve bearings, rifle bearings, and plain bearings are examples of sliding bearings. This is done with rolling-element bearings like ball bearings and roller bearings. Bearings, such as roller ball bearings.

Fig6: Bearing

AC MOTOR:

A alternating current (AC) motor is an electric motor that runs on alternating current (AC) (AC). An external stator with alternating current coils generates a rotating magnetic field, while an inner rotor coupled to the output shaft generates a second revolving magnetic field. Permanent magnets, reluctance saliency, or DC or AC electrical windings can all produce a magnetic field in the rotor. Linear AC motors, which are less prevalent, have the same basics as rotational motors. However,

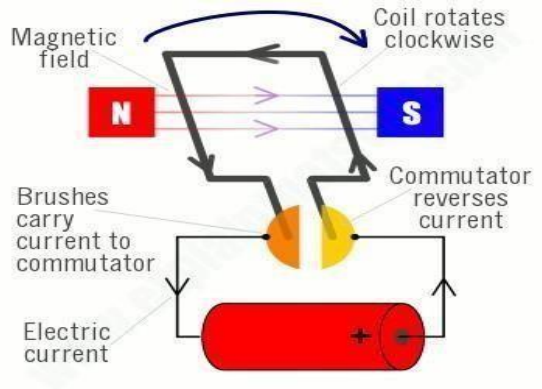

Fig 7: AC Motor

Shaft

In this mechanism of operations, a shaft is commonly used as for the rotating element which is actually circular in shape. Mainly this shaft is used to supply the power source from one part of body to another and also it can produce and absorb the power at a time. This shaft comes with the members like chain and sprocket and bearings which are usually mounted on the surface of the shaft. We actually used mild steel material to prepare the shaft body because it is used for only normal usage.

Fig 8: Shaft (Mild Steel)

PROPOSED METHODOLOGY

The methodology is very simple in this mechanism because starting we give power supply to chain itself where This scotch yoke mechanism is really done for various tasks by an AC

motor linked to one end of the shaft. The other shaft and is connects to rotating disc where these rotating operations, is performed. Next this is attached to the grinding wheel which is used as an operations.

WORKING PRINCIPLE

The Multipurpose Mechanical Machine consists of machining tools like Driller machine, Grinding machine, Hacksaw Blade, Abrasive saw. This machine consists of two vices arranged on a frame. Therefor processes like drilling, cutting and grinding can be done. Vices are mounted to the processing machines. One vice is left free for loading and unloading the work pieces. All these are fixed to a frame. A motor is fixed which is connected to belts 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 belt and pulley mechanism. When the motor rotates, all the four tools rotate simultaneously. The work piece is loaded in the vice and the work table is rotated with the help of bevel gear. When it is at the right position the table is locked with the help of a lock nut and the drilling operation is carried out. Similarly, all the operations are done. In drilling machine, a handle is provided to handle the work piece to put a hole. For hack saw cutting and slotting separate vises are provided.

MAINTAINANCE & LUBRICATION

Whenever we perform any operations, regular service should be done carefully for the machine parts. We use many bearings in these operations, so regular fluids should be used compulsorily. Lubricating and cleaning should be done in regular intervals of time.

Therefore, it is important to maintain theeach parts regularly before using the machine.

ADVANTAGES;

The MULTI-PURPOSE MACHINE FOR CUTTING, SHAPING, GRINDING, AND DRILLING can be relocated to any location near the job and customised. This avoids the possibility of the task being carried to the machine table. This machine can be also be used for punching small washers if suitable dies and brake arrangement are fitted.

- At the same time, multiple operations can be carried out.
- Cutting is done with the return stroke.
- Only one motor handles the entire operation.
- Small in size and requires small space.
- Time can be saved.
- Man power can be reduced.
- Low production and maintenance costs.

DISADVANTAGES

- This machine can be used to make slots only to a smaller depth.
- Only small cuts should be given at a time.

APPLICATIONS

- It is commonly employed in a machine shop of the industry's manufacturing department, where it is utilised to cut grooves, keyways, and slots of various forms, as well as to make regular and irregular interior and external surfaces.
- This machine is capable of handling huge and difficult working parts, internal or exterior cutting gears, and a variety of many operations that are difficult to accomplish with other machines.

FUTURE SCOPE

- Except these operations many other operations canbe performed.
- It is a portable machine
- When the manufacture goes with the mass production the estimated cost can easily be reduced.
- When the speed of the motor is increased regulators can be used to maintain the speed of the motor.

CONCLUSION

This initiative has given us a fantastic opportunity to put our little expertise to use. While working on this project, we received a lot of practical experience with planning, sourcing, assembly, and machining. We believe that project work is important. is an excellent way to bridge the gap between institutions and industries. As a result, we created a "MULTI OPERATIONAL MECHANICAL MACHINE FOR CUTTING, SHAPING, GRINDING, AND

DRILLING," which enables shaping and slotting operations to be performed in multiple locations using a single mechanism in a single machine. They can be customised and developed according to the applications by employing various technique. Our last thoughts on our project work. As a result, we created a "MULTI OPERATIONAL MACHINE" to assist in the creation of a robot. We combined the processes of robotic and monitoring systems in this project by employing an electronic control unit that moves and records the instants of movement.

REFERENCES

[1] Dr. Toshimichi Moriwaki “Trends in Recent Machine Tool Technologies” Professor Department f Mechanical Engineering Kobe University ,NTN Technical Review No.74(2006).

[2] T. Moriwaki “Multi-functional machine tool” Department of Industrial and SystemsEngineering, Setsunan University, Neyagawa, Japan CIRP Annals - Manufacturing Technology DOI:10.1016/j.cirp.2008.09.004 .

[3] Frankfurt am Main “Multi-purpose machines ensure enhanced “, 1 January 11.

[4] “Selecting and Planning the Process of Manufacture: Dr. Pulak M. Pandey. http://paniit.iitd.ac.in/~pmpandey

[5] B. H. Amstead, P. Ostwald, M.L.Begaman,Manufacturing Processes,(8 Edition)

[6] Moltrecht, Karl Hans: Machine Shop Practice, 2nd ed. New York: Industrial Press, 1981, Volume 1, p. 403.

[7] El – Hoffy : Advance Machining Process, McGraw Hill Companies, 0.007- 1466940, 2005

[8] Sharad Srivastava “Multi-function operating machine: A conceptual model”, IOSR-JMCE May- June 2014.

[9] Rakesh Ambade “Design & fabrication of human powered multi-purpose machine”, IJATES April 2015.

[10] M. Prathyusha “Multiple operating machines (drilling, sawing, shaping)”, IJMETMR May 2016.

[11] Dr. Toshimichi Moriwaki “Trends in recent machine tool technologies”, NTN 2006

[12] SinghAnkitkuma Awadhesh “Implementation of multipurpose mechanical machine”, IJARSEMay 2017