International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 05 Issue: 03 | Mar-2018 www.irjet.net p-ISSN: 2395-0072

Study of Fabrication of Multipurpose Tooling Machine

Yashraj V. Patil[1], Kamlesh M. Patil[2], Vipul J. Shimpi[3] , Shubham C. Jadhav[4]

Guided By: Prof. Rahul R. Deshpande

[1234]*Students, Department of Mechanical Engineering, Dilkap Research Institute of Engineering And Management Studies, Neral, Tal.-Karjat, Dist.-Raigad, Maharashtra, India.*

Abstract - *This paper deals with fabrication of multi-purpose tooling machine. This machine is based on the mechanism of belt drive with pulleys, bevel gears, and scotch yoke. The various machining process in manufacturing industries are carried out by separate machining machine. It requires more space requirement and time with high expenses. But the fabrication of multi-purpose tooling machine, which contains five operations in a single machine. The operations are namely drilling, shaping, cutting, buffing and grinding. It is a new concept specially meant to reduce the work time and save the cost. This machine can perform multi-purpose operation at the same time with required speed and this machine is automatic which is operated by motor which is run with the help of electric power supply.*

Key Words: Drilling, Shaping, Cutting, Buffing, Grinding.

1. INTRODUCTION

In an industry a considerable portion of investment is being made for machinery installment. We have proposed a machine which can perform operations like drilling, shaping, grinding, buffing, cutting at different working stations simultaneously which implies that industrialists have not to pay for machine performing above tasks individually for operating operation simultaneously. In this competitive world, speed is required in each and every field. Hence rapidness and quick working are the most important factors. The engineer constantly conformed with the challenges of bringing ideas and design in to reality new machine and techniques are being developed continuously to manufacture various products at cheaper rates and high quality. It is a compact, portable unit capable of doing many operations that normally require expensive single purpose machines. With different attachments that are available with the unit, cutting, drilling, shaping, buffing and grinding can be performed quickly and inexpensively. Industries are basically meant for production of useful goods and 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.

2. LITERATURE REVIEW

We have undergone through many research papers which indicates that for a production based industry machine installation is a tricky task as many factor being associated with it. Some research papers which have led us to approach to the idea of a machine which may give solution to these factors are as follows:

Sharad Srivastava et al [1] have fabricated a machine using scotch yoke mechanism, belt drive and gears. In an industry a considerable portion of investment is being made for machinery installation. They have proposed a machine which can perform operations like drilling, sawing, grinding at different working centers simultaneously which implies that industrialists do not have to pay for machine performing above tasks individually for operating operation simultaneously. Rakesh Ambade et al [2] designed and fabricated a human powered multipurpose machine. The main objective is to provide a multipurpose machine which can work when there is no electricity. It has to be understood that in rural areas where there is problem of electricity shortage or no electricity, it is a very stressful and laborious job to perform machining operations. It satisfies the need of rural people by giving them an alternative way of performing machining operations like drilling and grinding. The product designed has zero operating cost & cost effective. M. Prathyusha et al [3] developed a multiple operating machine. It has focused on the principle of scotch yoke mechanism, type of tooling and machining parameters and process performance measure, which include cutting speed, depth of cut, material removal rate with different type of equipment which can run simultaneously and fabricate the work piece in multipurpose machine has been presented. Dr. Toshimichi Moriwaki [4] recent trends in the machine tool technologies are surveyed from the viewpoints of high speed and high performance machine tools, combined multifunctional machine tools, ultra precision machine tools and advanced and intelligent control technologies. Singh Ankitkumar Awadhesh et al [5] implemented multipurpose mechanical machine. They have presented the development of multipurpose machine in various modes by which it can be actively adopted. Different types of attachment and tools which can be implemented on multipurpose machine have been discussed. Heinrich Arnold et al [6] rather long re-investment cycles of about 15 years have created the notion that innovation in the machine tool industry

happens incrementally. But looking at its recent history, the integration of digital controls technology and computers into machine tools have hit the industry in three waves of technology shocks. Most companies underestimated the impact of this new technology. This article gives an overview of the history of the machine tool industry since numerical controls were invented and introduced and analyzes the disruptive character of this new technology on the market. About 100 interviews were conducted with decision-makers and industry experts who witnessed the development of the industry over the last forty years. The study establishes a connection between radical technological change, industry structure, and competitive environment. It reveals a number of important occurrences and interrelations that have so far gone unnoticed. Frankfurt-am Main et al [7] the crisis is over, but selling machinery remains a tough business. Machine tools nowadays have to be veritable "jack of all trades", able to handle all kinds of materials, to manage without any process materials as far as possible, and be capable of adapting to new job profiles with maximized flexibility. Two highly respected experts on machining and forming from Dortmund and Chemnitz report on what's in store for machine tool manufacturers and users.

3. PROBLEM DEFINITION

The present machines have limited work stations on single machine, and the number of operations performed on them are limited. The cost of the existing machines is high, also the efficiency is low. The time required for work piece handling is more. The floor space utilization of these existing machines is poor as they require large space. The energy consumption is also high.

4. MATERIAL SELECTION

We are selecting mild steel (M.S.) as the main material for the frame construction. Mild steels have extremely low carbon content, ranging from near-zero up to 0.25%. That carbon content is the most important factor governing mild steel's mechanical properties – low carbon content results in greater ductility, while higher carbon content produces stronger steel.

Mild steel contains -
carbon 0.16 to 0.18 % (maximum 0.25% is allowable)
Manganese 0.70 to 0.90 %
Silicon maximum 0.40%
Sulfur maximum 0.04%
Phosphorous maximum 0.04%

The reason why mild steel is preferred over stainless steel is mild steel is less brittle than steel. Mild steel can be further strengthened through the addition of carbon. Generally speaking, Aluminum is also a great lightweight option, when weight-baring isn't a factor. For larger projects requiring strength, steel is a much stronger option. Also, mild steel is economical as compared with copper, brass, stainless steel and aluminum. And for fabrication and machining purpose mild steel is best suitable material.

The motor selected is a 2 horsepower 3 phase A.C. motor with 1440 RPM. The power of the motor is shared with two shafts, one being installed with the drilling arrangement and buffing wheel, and the other shaft being mounted with a grinding wheel and scotch yoke mechanism with shaping and cutting attachment.

5. METHODOLOGY

In this project, we will give the power supply from the electric motor to the shaft by pulley and belt drive on which a bevel gear is mounted on it, and a second bevel gear at a right angle to it has been mounted on a drill shaft to which a drill bit is being attached and at the other end of the shaft a buffing wheel is mounted. The second shaft is connected to power supply through pulley and belt drive, one end of the shaft is being joint to a circular disc, through this circular disc scotch yoke mechanism is being performed (rotary motion is being converted to reciprocating motion) and at the other end of the shaft motion is also transmitted to grinding wheel.

6. WORKING

In the present scenario the power required for the operations i.e. cutting, drilling, grinding, shaping, and buffing are achieved by using v belts, bevel gears and scotch yoke mechanism. The power to the shaft is supplied from the motor by means of pulleys and belt drive system.

Fig -1: Electric Motor

The motor is mounted at the base of the frame. One shaft is located at the center of the table and is supported between the bearings. There are two pulleys mounted on this shaft. Pulley 1 is used to drive the drilling and buffing shaft; there is a bevel gear arrangement to get drilling operation. Pulley 2 is used to drive the shaft on which shaping, cutting and grinding wheel is mounted. Drilling is unit is located at the left side of the machine and feed is given by lowering the lever.

There are mainly three major principles on which our proposed machine will work:

- Belt drive

- Bevel gears
- Scotch yoke mechanism

Fig-2: Belt & Pulley Drive

Fig 3: Bevel Gears

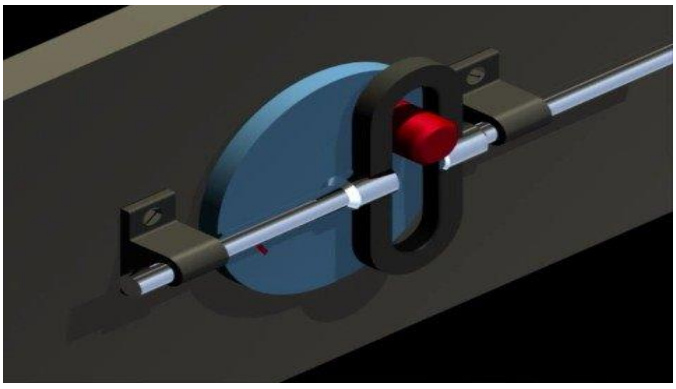

Fig 4: Scotch Yoke Mechanism

7. COMPONENTS

- Frame.
- Scotch yoke mechanism.
- Bevel gear.
- Belt drive.
- Bearing.
- Hacksaw blade.
- Drilling chuck.
- Drill bit.
- Grinding wheel.
- Buffing wheel.
- Single cutting tool.
- Motor.
- Pulley.
- Shaft.

8. OPERATIONS PERFORMED

1. Drilling.
2. Cutting.
3. Shaping.
4. Grinding.
5. Buffing.

Drilling is a cutting process that uses a drill bit to cut a hole of circular cross-section in solid materials. The drill bit is usually a rotary cutting tool, often multipoint. The bit is pressed against the workpiece and rotated at rates from hundreds to thousands of revolutions per minute. This forces the cutting edge against the workpiece, cutting off chips from the hole as it is drilled.

Cutting is the separation of a physical object, into two or more portions, through the application of an acutely directed force. Implements commonly used for cutting are the knife and saw, or in medicine and science the scalpel and microtome. However, any sufficiently sharp object is capable of cutting if it has a hardness sufficiently larger than the object being cut, and if it is applied with sufficient force. Sawing is a secondary machining process and saws are used mostly for cutting bar stock in preparation for other machining operations.

A shaper is a type of machine tool that uses linear relative motion between the workpiece and a single-point cutting tool to machine a linear toolpath. Its cut is analogous to that of a lathe, except that it is linear instead of helical. A wood shaper is a similar woodworking tool, typically with a powered rotating cutting head and manually fed workpiece. A metalworking shaper is somewhat analogous to a metalworking planer, with the cutter riding a ram that moves relative to a stationary workpiece, rather than the workpiece moving beneath the cutter. The ram is typically actuated by a mechanical crank inside the column, though hydraulically actuated shapers are increasingly used. Adding axes of motion to a shaper can yield helical toolpaths, as also done in helical planing.

Grinding is an abrasive machining process that uses a grinding wheel as the cutting tool. A wide variety of machines are used for grinding:

- Hand-cranked knife-sharpening stones (grindstones)
- Handheld power tools such as angle grinders and die grinders
- Various kinds of expensive industrial machine tools called grinding machines
- Bench grinders often found in residential garages and basements

Buffing is finishing processes for smoothing a workpiece's surface using an abrasive and a work wheel or a leather strap. Technically polishing refers to processes that use an abrasive that is glued to the work wheel, while buffing uses a loose abrasive applied to the work wheel. Polishing is a more aggressive process while buffing is less harsh, which leads to a smoother, brighter finish. A common misconception is that a polished surface has a mirror bright finish, however most mirror bright finishes are actually buffed.

9. CONCLUSION

We can see that all the production based industries wanted low production cost and high work rate which is possible through the utilization of the multi-function operating which will require less power as well as less time, since this machine provides working at different centers, it really reduced the time consumption up to appreciable limit.

In an industry, a considerable portion of investment is being made for machinery installation. So in this project we have proposed a machine which can perform operations like drilling, cutting, shaping, grinding and buffing at different working centers simultaneously which implies that industrialists have not to pay for machine performing above tasks individually for operating operations simultaneously.

By installation of this kind of multipurpose tooling machine, industrialists will spend less money on machinery as compared to individual machines for the same operations. Also the floor space required to setup this machine is also very less rather than setting up individual machines, the power consumption will also be reduced considerably.

10. REFERENCES

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

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

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

[4]Dr. ToshimichiMoriwaki “Trends in recent machine tool technologies”, NTN 2006.

[5]Singh Ankitkumar Awadhesh “Implementation of multipurpose mechanical machine”, IJARSE May 2017

[6]Heinrich Arnold1”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.

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

[8]V.B. Bhandari, Machine design book, vol(5),ISBN-13:978-0-07-068179-8,pp330- 333, 2011.

[9]PSG Design Data Book, (vol 5), Kalaikathir Achchagam – Coimbatore, May2010.

[10]www.wikipedia.com

[11]www.Scribd.com