

Hybrid Multipurpose Machine

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Abstract-Machines help to reduce human efforts as well as save lot of time. There are so many machines available in market. Some of them are single purpose and some are multipurpose. Multipurpose machine is a combination of more than one machine each having its own single purpose. These machines having huge variety of motions like rotating, reciprocating, oscillating, etc. But they mostly have common input method i.e., Chain Drive. In chain drive there is always a chance of elongation, sometimes breaking too. Also chain drive transmits low power as compare to Gear Drive. Hence we are introducing a multipurpose machine named as 'Hybrid Multipurpose Machine' in which gears are used to transmit the power. Hybrid Multipurpose Machine is a multipurpose machine which is compact in size, in which three operations are carried out with the help of gear drive that are Cutting, Grinding and Drilling. There will be two modes of power input first is Human Power Input and another one is Electrical Power Input i.e., it comes with multi power input methods too. The machine is provided with Hacksaw Blade, Grinding Wheel and Drilling bit which will give multiple applications.

Keywords-Grinding, Pedalling, Multipurpose, Drilling, Hacksaw

I. INTRODUCTION

Pedal powered hacksaw cutting machine is a manually pedal operated system which is mainly used for cutting metals, wood and plastics. The pedal powered hacksaw setup has a simple mechanism operated with chain and sprocket gear arrangement. During pedalling, the wheel rotary motion is converted into the "To and Fro" motion of the cutting tool (Hacksaw). That is the principle of slider crank mechanism. The size and shape is similar to a bicycle, it can be operated by very low power since it requires a very low pedalling power. The means of transmission is through a simplex chain mechanism and thus it transmits power without much loss.

Pedal operated multipurpose Machine is manually operated system which is mainly use for grinding & drilling operation without electricity. This Pedal operated machine has a simple mechanism including a chain drive, Belt drive & sprocket's arrangement. During a Pedalling process human power is convert into a mechanical energy which use for machining. Nowadays every task have been made quicker and faster due to high advancement of technology. But this advancement of technology also demand a huge investment in industries here main goal of every industries is to make high productivity rate with maintaining a quality at a low production cost. Pedal operated multipurpose machine mainly work on that. It's Reduce a human effort and human time and carryout number of operations simultaneously on a one platform. This machine is economical and it can be used in rural area where electricity is insufficient. This machine is a cheap and also usable for mobile application.

This machine will work on two power inputs i.e., Human Power Input and another one is Electrical Power Input. In case of power failure we can continue our work, hence it will save the time.

II. PROBLEM STATEMENT

To Design and development of multipurpose machine a structure which is designed for the purpose of multi operations i.e., Drilling, Cutting and Grinding.

Normal single purpose machine, requires more space and cost of the machine is so high. These machines work on only one type of power input, either human power or electric power. These machines are not able to perform multiple operations at the same time.

III. OBJECTIVES

- To find alternate effective solution for metal cutting, grinding & drilling in workshops generally in rural regions where electricity is a major concern.
- Increase production by minimizing time loss due to electricity failure.
- Better space utilization.

IV. LITERATURE REVIEW

The survey and review of the literature regarding the evolution of multifunctional machines tools are chronologically listed below:

[1] Dr.Saif Imam designed and developed a paper "Design, Construction and Application of Synchronous Operation Machine Tool" in July 2016. A machine tool is a mechanical instrument used for shaping and machining metals or other materials, usually by cutting, boring, grinding or shearing. There are situations when the individual components of an assembled unit are finished by a sequence of processes which may include various cutting, grinding, plastic deformation, heat treatment etc. In order to manufacture such parts in large quantity, it is necessary to have one machine tool which can perform various manufacturing processes as opposed to distributing the operations to a series of many single purpose machine tools. With the objective of solving this commonly encountered problem, a synchronous operation machine tool design is proposed which will

offer an appropriate substitute to the magnanimous collection of machines thereby reducing the time and complications involved in order to complete a task at hand.

From the test he carried out the following conclusion made. It has been established after the completion of the project that this project offers a simple low capital machine tool for the machine shop producing a job that follows a particular sequence of operation. The capital cost involved in the construction of a machine tool is much lower to that of a commercially available other single unit machine tool. Also, from the project carried out, the simple and inexpensive synchronous operation machine tool was designed and constructed using locally sourced materials. The machine is tested for different materials mainly wood, mild steel, aluminium and plastic. The synchronous operation machine tool constructed was tested for efficiency under experimental conditions and it was found to be effective for the variety of jobs involving different materials mentioned above.

[2] SharadShrivastava, ShivamShrivastava, C.B. Khatri had designed and developed the paper “Multi-Function Operating Machine: A Conceptual Model” in May-June 2013. This paper presents the concept of Multi-Function Operating Machine mainly carried out for production based industries. 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. We have developed a conceptual model of a machine which would be capable of performing different operation simultaneously, and it should be economically efficient .In this machine we are actually giving drive to the main shaft to which scotch yoke mechanism is directly attached, scotch yoke mechanism is used for sawing operation. On the main shaft we have use bevel gear system for power transmission at two locations. Through bevel gear we will give drive to drilling centre and grinding centre. The model facilitate us to get the operation performed at different working centre simultaneously as it is getting drive from single power source. Objective of this model are conservation of electricity (power supply), reduction in cost associated with power usage, increase in productivity, reduced floor space.

We can see that from his research paper all the production based industries wanted low production cost and high work rate which is possible through the utilization of multi-function operating machine which will less power as well as less time, since this machine provides working at different center 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 paper we have proposed a machine which can perform operations like drilling, sawing, grinding at different working centers simultaneously which implies that industrialist have not to pay for machine performing above tasks individually for operating operation simultaneously.

[3] SahuSamirkumarSatishkumar, Ashish Kumar Senapati, Sanjeev Kumar Pal, SibabrataMohanty had designed and developed “Fabrication of two-way pedal powered hacksaw machine” in March 2016. In this Pedal operated two-way hacksaw machine which can be used for industrial applications for cutting of wooden block, metal bar and pipe too. The machine works on the principle of slider crank mechanism. In this machine peddle in connected to the crank which is connected directly to the hacksaw frame from both the side and the power is supplied to the hacksaw frame by means of chain. The main objective behind this machine to reduce both cutting time and energy in which no external power is required for cutting operation, it also available in affordable cost. The peddle power two-way hacksaw machine, which runs on human power, works on the principle of the conversion of rotational motion to oscillatory motion. This is a green project which saves our electricity need and can be easily applicable in day today’s life.

By successfully completion of the project they can be able to eliminate the shortcomings of the one way acting hacksaw machine. The two way acting pedal powered hacksaw machine will cut two workpiece at the same time reducing the amount of time taken by the earlier one. The two way acting pedal power hacksaw machine will efficiently cut 2 workpiece at the same time.

[4] YashHiragar, Ketul Dantani, GautamPrajapati, RixitKakani, had designed and developed a research paper “Design & Fabrication of Pedal Operated MultiPurpose Machine” in April 2018. Their concept is regarding “Design & Fabrication of Pedal Operated Multi-Purpose Machine”. Nowadays most of the machines are performing one operation at one time because of that it consume much more time & also those machines are driven by electricity and highly expensive. The machine operating by means of electricity has limited application in the rural area. Therefore it is possible to convert human applied energy through pedaling into mechanical work. It will save cost, electricity as well as find application in rural area. Two operations like grinding and drilling will be done by pedaling. A person can generate four times more power by pedaling than by hand cranking. The system is also useful for the work out purpose because pedaling will act as a health exercise and also doing a useful work.

By using this machine we can perform more than two operations simultaneously which save the production time as well as cost. For operating this machine there is no need of very high skilled worker. This machine is very useful in rural area because regular power cut-off is takes place in rural area. This machine is perform drilling & grinding operation on materials like wood, aluminum& steel which having less hardness & thickness.

[5] Stephen, Tambari, Dan Orawari Gloria, Oruene W. Diabi, Ayejah Victor had designed and developed a research paper “Technical Study on the Design and Construction of a Pedal Powered Hacksaw Cutting Machine” in July-Aug 2015. This project work deals with the design and fabrication of a pedal powered hacksaw cutting machine. The aim of this work is to develop a modernized and less stressful operation for cutting wood, metals and plastic materials. It is very useful for cutting PVC materials (pipes) and can be used widely in lather and in furniture making industries. This work can also serve as an

exercising machine for fitness while cutting, it uses the principle of a slider crank mechanism which converts the rotary motion of the flywheel to the reciprocating motion of the hacksaw during pedaling. The machine was tested and continued to be very efficient with an ideal mechanical Advantage of 0.5 (less than 1), velocity ratio of 0.65 (less than 1), a power output of 5.72KW and an efficiency of 76.9%, which makes it very adequate and capable for cutting.

At the end of the design, construction and testing, a satisfactory pedal powered hacksaw machine having Ideal Mechanical Advantage of 0.4 and a power output of 30KW was fabricated using available raw materials and techniques. Metals pipes, plastics and pieces of wood were cut successfully using this machine and the overall performance was confirmed to be efficient compared to already existing ones. The cost of production and maintenance is relatively cheap. Hence, the machine will be welcomed by industries given its performance, affordability and simplicity.

V. CONSTRUCTION

It consists of frame on which we mounted sprocket, bicycle pedal, electric motor, pedestal bearing, pulleys, shafts, grinder, hacksaw, drilling machine, etc. Sprocket is connected to gear which is mounted on another shaft by using chain. Pulleys are provided alongside gear on same shaft.

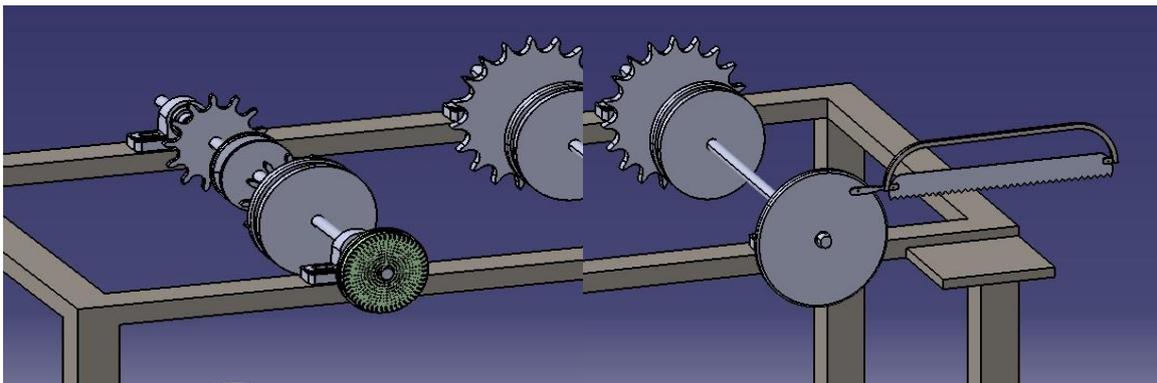


Fig. 1

Fig. 2

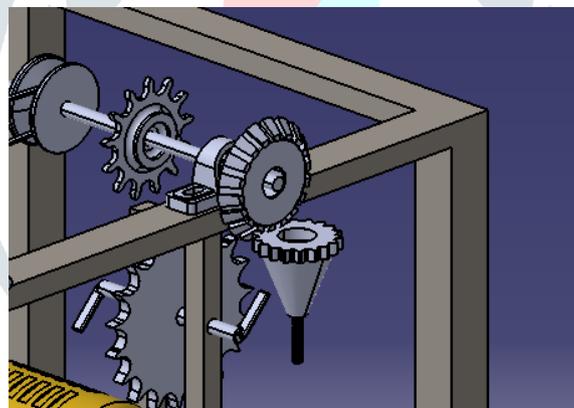


Fig. 3

They are connected by V belts. Rotary motion generated by pedal or electric motor is converted into linear motion by using slider crank mechanism and will be used for cutting operation. Rotary motion of shaft will be used for grinding and drilling operation.

VI. WORKING

It works on two modes of power inputs, one is human power input and another is electric power input. Human power is provided by means of pedal mechanism. Rotary motion developed by this pedal mechanism is transmitted to the gear which is mounted on 1st shaft at some height. On the same shaft grinder and drilling machine are attached at the both ends of the shaft.

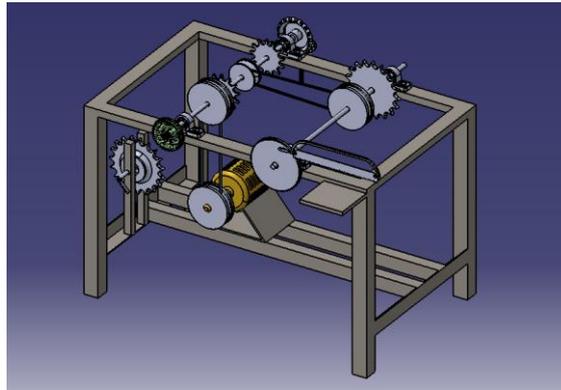


Fig. 4

Further the power will transfer to the 2nd shaft where cutting operation will be performed. The electric motor is fixed below the 1st shaft. The rotary motion of motor is transfer by using V belt. All three operations can be separately or simultaneously as per the will of the operator. The machine can run on one of the two power inputs as per the conditions and requirement.

VII. FUTURE SCOPE

We can use gear drives instead of chain and belt drives to reduce space, increase efficiency, ease of transmission and minimize power losses. We can provide wheels at each leg of frame for ease of transportation of machine.

VIII. CONCLUSION

It is concluded that by using an electric motor and also a pedal-operated mechanism, we can perform operations continuously. It also helps to reduce space which is required to perform grinding, cutting, and drilling operations.

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