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FABRICATION OF MULTIFUNCTIONAL MACHINE TOOL

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Abstract

Industries are primarily designed to produce accessible products and services at cheap production, equipment, and inventory costs. Consequently, we have suggested a machine in this study that can do out activities such.

A "MULTI-FUNCTIONAL MACHINE" is a systematic arrangement that combines drilling, grinding, and cutting. This idea is primarily used in production-based businesses where purchasing multiple tools for a single task costs a lot of money. The model makes it possible for us to complete the operation at multiple working locations at the same time because it is powered by a single power source. Utilizing a bevel gear arrangement, obtained power is transferred to the shaft to carry out various tasks. An additional advantage is that cutting and grinding processes can be stopped whenever they are not being used.

Key Words: Drilling, Cutting, Grinding.

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1. INTRODUCTION

The development of a MULTI-FUNCTIONAL MACHINE is the subject of this. The idea mainly applies to sectors of an economy centering on production. Industries have the primary objective of manufacturing useful goods and services at reasonable rates. production costs, machinery costs, and low inventory costs. A machine that can execute various operations concurrently, such as drilling, grinding, and cutting, has been conceptualized by our team. Given that the model is powered by a single power source, it enables us to perform the operation at multiple working locations at once.

This technique aims to reduce costs connected with power usage, boost productivity, and conserve electricity (power supply). It also uses less space on the ground. Both industrial and home use of this machine is possible. the present. The progress of knowledge is speeding up every action in this planet, but this development also calls for enormous investments and outlays. All actions in the society of today have quickened as a result of technological improvement; yet, this advancement also calls for large investments and outlays. Every industry strives for high productivity rates while maintaining product standards together with quality at low average costs. A major amount of a sector's investment is spent on machine installation [10–15]. As a result, it is suggested in this proposal that a machine be built that can perform tasks like drilling, cutting, and grinding concurrently at a number of work centres, suggesting that the Industrial won't have to pay a high price for the machine

2. LITERATURE REVIEW

We have read multiple study articles, and they all suggest that installing a machine in a field that depends on production can be challenging due to the myriad factors involved. Following are some research publications that have inspired us to

consider the idea of a machine that may offer a solution to these factors:

A machine built by Sharad Srivastava et al [1] uses a belt drive, gears, and a scotch yoke mechanism. In one industry, installing machinery accounts for a considerable amount of investment. They have suggested a device that can drill, saw, and grind concurrently at several workstations, which suggests that industrialists won't have to shell out money for separate devices to carry out the aforementioned activities.

An all-purpose machine that can be operated by humans was invented and created by Rakesh Am bade et al [2]. The major goal is to create a versatile device that can operate without electricity. It must be recognized that performing machining operations in remote regions where there is an issue with electricity scarcity or no electricity is a very taxing task. By providing them with an alternative method of carrying out machining operations like drilling and grinding, it meets the needs of rural residents. The created item is both cost-effective and has no operational expenses.

Dr. Saif Imam Et al.[3] Synchronous operation machine tool design, construction, and use. A machine tool is a machine that is used to cut, bore, grind, or shear metals or other materials into desired shapes. In certain instances, the individual parts of a put-together unit are finished through a series of operations that may involve different cutting, grinding, plastic deformation, heat treatment, etc. It is vital to have one machine tool that can carry out many manufacturing processes in order to produce such parts in big quantities as opposed to allocating the operations to a succession of distinct single-purpose machine tools. A synchronous operation machine tool design is suggested with the aim of eliminating the frequently encountered issue, which will provide a suitable substitute for.

Ravi Teggina Shivanand Kavadinattib Et al [4] Machine tools have got better machining

accuracy and speed as the need to make parts with higher quality at cheaper prices grows. In this project, a machine that can drill, cut, and grind concurrently has been provided. This implies that manufacturers will not be required to pay for distinct machines to accomplish all of these, tasks simultaneously. Rohit U Naresh B, Ravindra S, Arun N Akshaya Z, Ravindra G Et al [5] The advancement of technology has sped up every work in the world today, but this growth requires significant investments and expenditure. Every industry strives to accomplish high rates of production while keeping the quality and standard of the product at low average costs. We have created a conceptual model of a machine that would be capable of accomplishing several tasks at once and be cost-effective. In this machine, the multi-grinding machine operation is in fact powered by a single electric motor whereas the main shaft is given drive by a v-belt drive another shaft.

3. CONSTRUCTION

Square tubes and channels are used to build the foundation frame for installing the entire arrangement using a metal-cutting and metal-joining process known as welding. The base frame is where the rotating source is attached, and a bevel gear structure connects it to the operational shafts. In order to achieve friction-free rotation, two operational shafts are mounted to the left and right sides of the framework with the aid of bearing supports. The operative shafts' inner ends connect to pinion gears in a bevel gear configuration, while their outer ends are connected to grinding and cutting wheels. to limit the rotation that moves from the drive to the work center. Between each operation's shafts, a flange connection

4. MATERIAL SELECTION

AC Motor

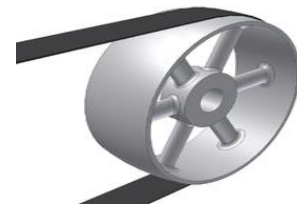
The AC motor produces the wheel's rotational motion. By using

electromagnetic induction, electric motors transform electrical power into mechanical energy. The motor being used in this instance is a standard grinder motor.



Pulley And Belt Pulley

Material: Mild steel Type: V belt type Inner diameter: 15mm



SPECIFICATION

Material: CLOTH/NYLON Width : 25cm

Helical Spring

A mechanical tool known as a coil spring, usually referred to as a helical spring, is frequently utilized to sustain force between surfaces that contact and absorb shock. and store energy until unleashing it. They consist of the helix-shaped elastic material is an elastic material that, when unloaded, recovers to its original length



Chuck

A particular type of clamp is called a chuck. It is employed to support radially symmetrical objects, especially cylinders. While it holds the revolving tool in drills

and mills, it holds the rotary workpiece in lathes. The chuck is fixed to the spindle of a lathe and rotate the headstock's inside. On the non-rotating tailstock, a second chuck could be installed for certain needs



Drill Bit

Drill bits are cutting instruments that almost always possess circular cross-sections and are used for removing material in order to create holes. Drill bits can make various types of holes in a number of materials and are available in a variety of sizes and forms.



Cutting Wheel

A circular saw can be hand-held or machine-mounted and is used to cut an array of materials, such as stone, wood, plastic, and metal. The terms "table saw" and "chop saw" are used interchangeably in the context of woodworking, although the phrase "circular saw" only applies to the hand-held variety. Additional common designs of circular saws. The term "skill saw" has evolved into a generic brand for traditional hand-held circular saw



Grinding wheel

A grinding wheel is a wheel constructed of an abrasive mixture and is usually employed for various grinding (also known as abrasive cutting) and abrasive machining techniques. Such wheels are utilized in grinding machines.



Machine Vices

Vices are used by tool makers to hold jobs fixed if operating machines like lathes, milling machines, drilling machines, etc. Three types of vices, the simple vice, the swivel vice, and the tool makers vice are all frequently utilised in terms of design called bench vice



Bevel Gear

Gear type: Straight bevel gear

Material type: Steel

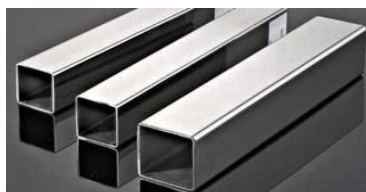
Quantity: Driven gear teeth: 16

Ratio: 1:1



Frame

Material: Mild steel



Shaft

A shaft is an operational component that transmits power from one part to another or from a power-generating machine to a power-absorbing machine. Shafts frequently have circular cross-sections.

Diameter: 12mm

Material: mild steel

Length:25 cm



Design Of Ball Bearing

For instance, the bearing's design could allow the moving part to move freely in either direction along a fixed axis. On the other hand, controlling the typical force vectors acting on the components that move, might halt a motion.



Metal Strip

Specifications

Material: Mild Steel Strip

Length:40cm

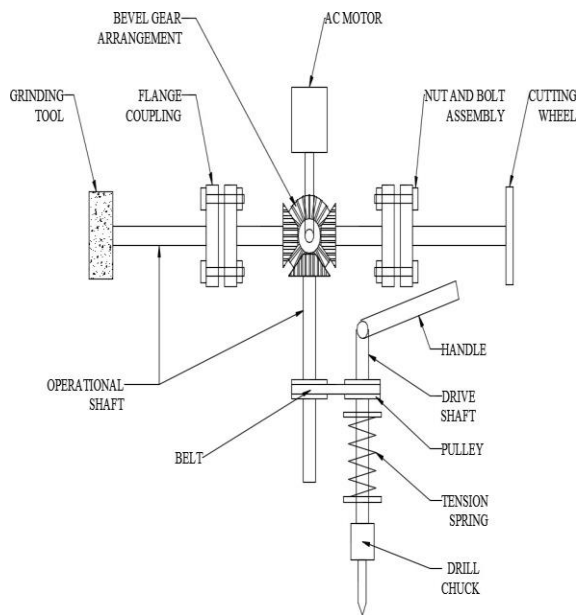
Width:5cm



MATERIAL USED

S.No	DESCRIPTION	QTY	MATERIAL
1.	A C MOTOR	1	ELECTRICAL
2.	FRAME	AS PER REQUIREMENT	MILD STEEL
3..	SHAFT	AS PER REQUIREMENT	MILD STEEL
4.	METAL STRIP	AS PER REQUIREMENT	MILD STEEL
5..	BEARING	10	STAINLESS STEEL
6.	BELT, PULLEY	1	NYLON, CAST IRON
7.	CHUCK	1	STAINLESS STEEL
8.	DRILL BIT	1	STAINLESS STEEL
9.	VICE	1	CAST IRON
10.	BEVEL GEAR,SPRING	1	STAINLESS STEEL
11.	CUTTING WHEEL	1	STAINLESS STEEL
12	GRINDING WHEEL	1	ROUGH WHEEL

5. BLOCK DIAGRAM



6. WORKING

In the initial phase, the flange is connected to the driving center using a nut and bolt assembly, depending on the needs of the user and the operation. When the motor is turned on, it drives the operational shaft that has been engaged via the bevel gear drive.

The cutting and grinding wheels are activated by this shaft to carry out the cutting and grinding process.

The rotation is additionally received by the third operational shaft, and then it is again transferred to the driving shaft with the assistance of a belt drive mechanism.

The drill bit rotates as a result of the drive shaft. Internal force is provided to the handlebar to feed the drill bit against the workpiece, which tends to compress the tension spring and permits the drill bit to move inside the workpiece.

ADVANTAGES

- Power consumption is completely reduced
- Floor space occupied by these machines are completely less when

compared to other machineries

- Simple in construction
- Less maintenance
- Increased production rate
- Components used in for construction are less costly and easily available

APPLICATION

- In small, medium and large scale industries
- In institutes workshop
- For commercial purposes

7. COMPONENTS

- AC MOTOR
- PULLEY AND BELT
- HELICAL SPRING
- CHUCK
- DRILL BIT
- CUTTING WHEEL
- GRINDING WHEEL
- MACHINE VICES
- BEVEL GEAR
- FRAME
- SHAFT
- DESIGN OF BALL BEARING
- METAL STRIP

8. ACTIVITIES PERFORMED

1. Drilling Operation
2. Cutting Operation
3. Grinding Operation

1. Drilling Operation

A drill bit is used in the cutting process of drilling to create a hole with a circular cross-section in solid materials. The drill bit is often a multipoint, rotary cutting tool. With the workpiece pressed against it, the bit is rotated at rates ranging from hundreds to thousands per minute. Revolution. Pressing the cutting edge against the workpiece prevents chips from falling into the hole as it is being drilled.

2. Cutting Operation

Cutting is the application of a strongly directed force to divide a physical item into two or more pieces. The knife, the saw, or the scalpel and microtome are tools that are frequently employed for cutting in science and medicine. Even so, any A sufficiently sharp object can be cut if it is applied with enough force and has a hardness that is sufficiently greater than the object it is intended to cut. Sawing is a secondary machining operation, and saws are primarily used to cut bar material in order to prepare for further machining operations.

3. Grinding Operation

A grinding wheel is the cutting tool used in the abrasive machining process of grinding. For grinding, an array of equipment is used. Hand-operated grinding stones for knives. Angle grinders and die grinders are examples of portable power tools. Grinding machines are pricey industrial machine equipment. Bench grinders are frequently seen in basements and garages of homes.

9. CONCLUSION

We can see that all production-based companies wanted high work rates and cheap production costs, which is feasible by using multi-function operating that will demand less power and time because this machine delivers work at a high rate. It substantially reduced the period of time spent on each center to a significant degree. In one industry, installing machinery accounts for a considerable amount of investment. So, in this project, we've suggested a machine that can carry out tasks like drilling, cutting, shaping, grinding, and buffing at various workstations simultaneously, implying that industrialists won't have to pay for machines that can carry out the aforementioned tasks individually to carry out tasks simultaneously. Industrialists will spend less money by installing this kind of versatile tooling machine.

10. REFERENCES

1. Dharwa Chaithanya Kirthikumar, "A Research on Multi Purpose Machine", International Journal for Technological Research in Engineering (Vol.1, Issue.1, ISSN:2347-4718) (2013).
2. S.G.Bahaley,Dr.A.U.Awate,S.V.Sahar kar, "Performance Analysis of Pedal Powered Multipurpose Machine", International Journal of Engineering Research and Development (IJERD) (Vol.1, Issue.5,eISSN:2278-0181) (2012).
3. Linxu, Weinan Bai, Jingyu Ru,Qiang Li, "Design and Implementaion of the Reciprocating Pedal Powered Electricity Generating Device", Advanced Materials Research (Vol.282-283 (2011) pp 735-738.
4. Rohit U, Naresh B , Ravindra S , Arun N , Akshaya Z , Ravindra GDESIGN AND FABRICATION OF MULTIPURPOSE GRINDING MACHINE

5. Dr. Toshimichi Moriwaki “Trends in Recent Machine Tool Technologies” Professor Department of Mechanical Engineering Kobe University ,NTN Technical Review No.74(2006).
6. Rakesh Ambade, Amit Sartabe, Meghraj Arekar, Vaibhav Khachane, Prajakta Gawali, “Design & fabrication of human powered multi-purpose machine”, IJATES April 2015.
7. Dr. Saif Imam Asst. Professor, Dept. of Mechanical Engineering, College of Engineering, Jazan University, Jazan, K.S.A Design, Construction and Application of Synchronous Operation Machine Tool Vol. 5, Issue 7, July 2016
8. Shubhamkar Dhoble , Ghanshyam Kannake , Kunal Nannaware Prof. Ajay Bonde Design and Fabrication of Multipurpose Mechanical Machine International Journal of Innovations in Engineering and Science, 29 December,2020
9. RAVI Tegmina Shivanand Kavadinattib And Shashank Hebbal Design And Fabrication Of Machine Performing Multiple Wood Working Operations. Proceedingof NCRIET-2015 & Indian J.Sci.Res. 12(1):162-167, 2015
10. Sharad Srivastava “Multi-function operating machine: A conceptual model”, IOSRJMCE May-June
11. Frankfurt am Main “Multi-purpose machines ensure enhanced “, 1 January 11.