Design and Fabrication of Motorized Multi Purpose Machine (Drilling, Grinding, Cutting)

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***Abstract*:- The motorized multi-operation machine contains three operations in a single machine. The three operations are drilling, grinding and cutting. The purpose of the machine is to reduce the manufacturing time and cost reduction. The same machine is used for doing all these three operation, instead of using separate machines such as drilling machine, grinding machine and hacksaw cutting machine. The machine operates through motor drive with bevel gear mechanism, which paves the ways to carry out all these three operations exactly at the same time.**

INTRODUCTION DRILLING

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 multi-point. The bit is pressed against the work- piece and rotated at rates from hundreds to thousands of revolutions per minute. This forces the cutting edge against the work-piece, cutting off chips from the hole as it is drilled. A drill is a tool fitted with a cutting tool attachment or driving tool attachment, usually a drill bit or driver bit, used for boring holes in various materials together.

GRINDING

A grinding machine, often shortened to grinder, is any of various power of tools used for grinding, which is a type of machining using an abrasive wheel as the cutting tool Each grains of abrasive on the wheel`s surface cuts a small chip from the work- piece via shear deformation.

CUTTING

In the context of machining, a cutting tool or cutter is any tool that is used to remove material from the work-piece by means of shear deformation. Cutting may be accomplished by single-point or multi-point tools. Single-point tools are used in turning, shaping, planning, similar operations, and remove material by means of one cutting edge. Milling and drilling tools are often multipoint tools. Grinding tools are also multipoint tools. Each grain of abrasive function as a microscopic single point cutting edge (although of high negative rake angle), and shears a tiny chip.

A drill is a tool fitted with a cutting tool attachment or driving tool attachment, usually a drill bit or driver bit, used for drilling holes in various materials or fastening various materials together with the use of fasteners. The attachment is gripped by a chuck at one end of the drill and rotated while pressed against the target material. The tip, and sometimes edges, of the cutting tool does the work of cutting into the target material. This may be slicing off thin shavings (twist drills or auger bits), grinding off small particles (oil drilling), crushing and removing pieces of the work-piece (SDS masonry drill), countersinking, counter boring, or other operations.

Drills are commonly used in woodworking, metalworking, construction and do-it-yourself projects. Specially designed drills are also used in medicine, space missions and other applications. Drills are available with a wide variety of performance characteristics, such as power and capacity.

LITERATURE REVIEW

As a general-purpose machine tool that includes the functions of a milling machine, drill press, and lathe, the multi machine can be used for many projects important for humanitarian and economic development in developing countries:

The multi machine is an all-purpose open source machine tool that can be built inexpensively by a semi-skilled mechanic with common hand tools, from discarded car and truck parts, using only commonly available hand tools and no electricity. Its size can range from being small enough to fit in a closet to one hundred times that size. The multi machine can accurately perform all the functions of an entire machine shop by itself.

The multi machine was first developed as a personal project by Pat Delaney, than grew into an open source project organized via a Yahoo! group. The 2,600 member support group that has grown up around its creation is made up of engineers, machinists, and experimenters who have proven that the machine works. As an open-source machine tool that can be built cheaply on-site, the Multi machine could have many uses in developing countries. The multi machine group is currently focused on the humanitarian aspects of the multi machine, and on promulgating the concept of the multi machine as a means to create jobs and economic growth in developing countries.

The multi machine first became known to a wider audience

as the result of the 2006 Open Source Gift Guide article on the Make Magazine website, in which the multi machine was mentioned under the caption "Multi machine - Open Source machine tool".

DESCRIPTION OF EQUIPMENTS BEARING

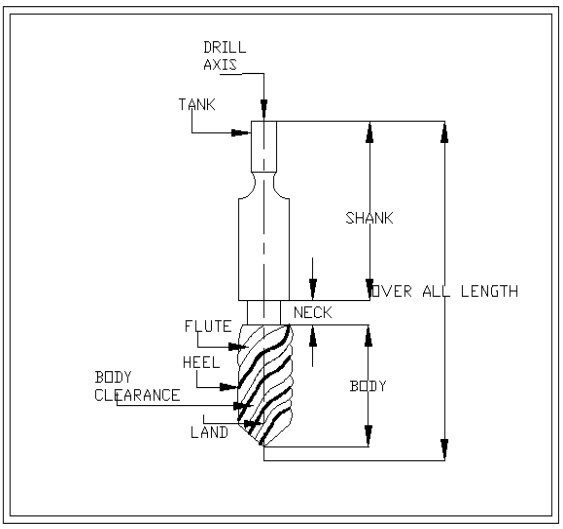
A bearing is a device to permit constrained relative motion between two parts, typically rotation or linear movement. Bearings may be classified broadly according to the motions they allow and according to their principle of operation. Low friction bearings are often important for efficiency, to reduce wear and to facilitate high speeds. Essentially, a bearing can reduce friction by virtue of its shape, by its material, or by introducing and containing a fluid between surfaces. By shape, gains advantage usually by using spheres or rollers.

LINEAR BEARING

A linear-motion bearing or linear slide is a designed to provide free motion in one dimension. There are many different types of linear motion bearings and this family of products is generally broken down into two sub-categories: rolling- element and plane.

DRILLING TOOL

Drilling tool is a cylindrical end-cutting tool used to originate or enlarge circular holes in solid material. Usually, drills are rotated by a drilling machine and fed into stationary work, but on other types of machines a stationary drill may be fed into rotating work or drill and work may rotate in opposite directions.



INDUCTION MOTOR

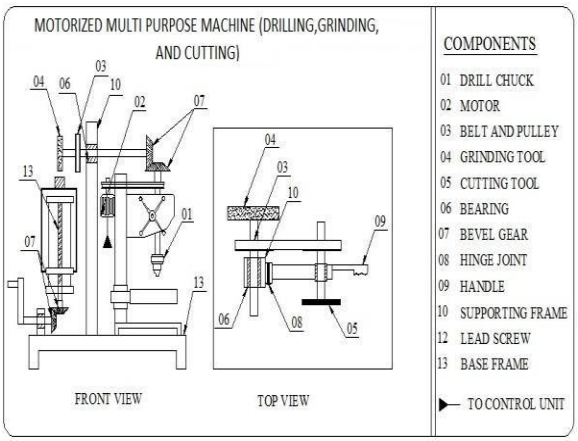
An induction motor (or asynchronous motor) is a type of alternating current motor where power is supplied to the rotor by means of electromagnetic induction. An electric motor converts electrical power to mechanical power in its rotor (rotating part). There are several ways to supply power to the rotor. In a DC motor this power is supplied to the armature directly from a DC source, while in an induction motor this power is induced in the rotating device. An induction motor is sometimes called a rotating transformer because the stator (stationary part) is essentially the primary side of the transformer and the rotor (rotating part) is the secondary side. The primary side's currents evokes a magnetic field which interacts with the secondary sides emf to produce a resultant torque, henceforth serving the purpose of producing mechanical energy. Induction motors are widely used, especially polyphase induction motors, which are frequently used in industrial drives.

CONSTRUCTION

The stator consists of wound 'poles' that carry the supply current to induce a magnetic field that penetrates the rotor. In a very simple motor, there would be a single projecting piece of the stator (a salient pole) for each pole, with windings around it; in fact, to optimize the distribution of the magnetic field, the windings are distributed in many slots located around the stator, but the magnetic field still has the same number of north-south alternations. The number of 'poles' can vary between motor types but the poles are always in pairs (i.e. 2, 4, 6, etc.).

Induction motors are most commonly built to run on single-phase or three-phase power, but two-phase motors also exist. In theory, two-phase and more than three phase induction motors are possible; many single-phase motors having two windings and requiring a capacitor can actually be viewed as two-phase motors, since the capacitor generates a second power phase 90 degrees from the single-phase supply and feeds it to a separate motor winding. Single-phase power is more widely available in residential buildings, but cannot produce a rotating field in the motor (the field merely oscillates back and forth), so single-phase induction motors must incorporate some kind of starting mechanism to produce a rotating field. They would, using the simplified analogy of salient poles, have one salient pole per pole number; a four-pole motor would have four salient poles. Three-phase motors have three salient poles per pole number, so a four-pole motor would have twelve salient poles. This allows the motor to produce a rotating field, allowing the motor to start with no extra equipment and run more efficiently than a similar single-phase motor.

DRAWING FOR HAND OPERATED MULTI PURPOSE MACHINE



WORKING PRINCIPLE

One of the bevel gear is connected with the main shaft and another one with the drill chuck hence when the motor is rotated the drill chuck also rotates. Here the bevel gear arrangement is used for carrying out the operations. The grinding tool and cutting tool is powered by the main shaft. The grinding tool is attached in the secondary shaft and from which the power is transmitted to the cutting tool. Thus all the three operations are done in the same machine in same time.

ADVANTAGES

Less employee cost- By adding multi purpose machine to an operation, means less employees are needed to get the job done. It also indicates less safety issues, which leads to financial saving.

Reduction in production time -Having a machine that is automated definitely speeds up the production time since no thinking needed by the machine, there is better repeatability, and less human error.

APPLICATIONS

- Used in small scale industries to reduce machine cost.
- In such places where frequent change in operation are required.

CONCLUSION

The project has been designed to perform different task in a single machine. Hence this project has made an impact in the field of manufacturing among the small scale industries. It is very use full for the micro small and medium entre pre new to have only minimum space to accommodate this machine. Also this project will reduce the cost involve in the manufacturing of small scale industries.

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