FABRICATION OF CUTTING AND GRINDING MACHINE USING SINGLE MOTOR

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ABSTRACT

The Metal Cutting process and grinding process are the major processes involved in industries. In this project, we are going to fabricate the metal cutting and grinding processes in the same machine. Normally the Metal Cutting machine is manually operated for medium and small scale industries. In this project we are replacing the low speed electric motor by high speed electric motor. It gives greater cutting thickness with less time consumption and provides greater efficiency when compared using low speed electric motor. It can also be implemented to carry-out the grinding process simultaneously with the similar apparatus. It reduces the time consumed to perform grinding process in same machine.

Keyword: - *Machining, Cutting, Grinding, and etc….*

1. INTRODUCTION

Machining is any of various processes in which a piece of raw material is cut into a desired final shape and size by a controlled material-removal process. The processes that have this common theme, controlled material removal, are today collectively known as subtractive manufacturing, in distinction from processes of controlled material addition, which are known as additive manufacturing. Exactly what the "controlled" part of the definition implies can vary, but it almost always implies the use of machine tools.Machining is a part of the manufacture of many metal products, but it can also be used on materials such as wood, plastic, ceramic, and composites.

1.1 THE CUTTING TOOL

In machining, a cutting tool or cutter is any tool that is used to remove material from the workpiece by means of shear deformation. Cutting tools must be made of a material harder than the material which is to be cut, and the tool must be able to withstand the heat generated in the metal-cutting process. Also, the tool must have a specific geometry, with clearance angles designed so that the cutting edge can contact the workpiece without the rest of the tool dragging on the workpiece surface. The angle of the cutting face is also important, as is the flute width, number of flutes or teeth, and margin size. In order to have a long working life, all of the above must be optimized, plus the speeds and feeds at which the tool is run.

Fig-1 Cutting tool

1.1 **GRINDING WHEEL**

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

The abrasive aggregate is selected according to the hardness of the material being cut.

- Aluminum oxide
- Silicon carbide
- Ceramic
- Diamond
- Cubic boron nitride

Fig-2 Grinding wheel

2. COMPONENT DESCRIPTION

2.1 ELECTRIC MOTOR

An electric motor is an electrical machine that converts electrical energy into mechanical energy. The reverse of this would be the conversion of mechanical energy into electrical energy and is done by an electric generator. Generally, Most of the motor have single end shaft. In some cases double end shaft is used in most of the purposes depending upon the type of work. In our project, Double end shaft motor is used ie., both end of the motor having shafts. It is similar to single end electric motor and it has more advantages compare to single shaft.

2.2 A.C MOTOR

An AC motor is an electric motor driven by an alternating current (AC). The AC motor commonly consists of two basic parts, an outside stationary stator having coils supplied with alternating current to produce a rotating magnetic field, and an inside rotor attached to the output shaft producing a second rotating magnetic field. The rotor magnetic field may be produced by permanent magnets, reluctance saliency, or DC or AC electrical windings.

Fig-3 Double shaft motor

2.3 MOTOR CONSTRUCTION PARTS

For every D.C or A.C motor, there are

1. Rotor
2. Stator
3. Air gap
4. Winding
5. Commutator

The speed of the AC motor is determined primarily by the frequency of the AC supply and the number of poles in the stator winding,

Where,

N_S = Synchronous speed, in revolutions per minute

F = AC power frequency

p = Number of poles per phase winding.

The slip of the AC motor is calculated by:

Where

N_r = Rotational speed, in revolutions per minute.

S = Normalised Slip, 0 to 1.

2.4 PULLEY AND BELT

Pulleys are assembled to form a block and tackle in order to provide mechanical advantage to apply large forces. Pulleys are also assembled as part of belt and chain drives in order to transmit power from one rotating shaft to another.

A belt is a loop of flexible material used to link two or more rotating shafts mechanically, most often parallel. Belts may be used as a source of motion, to transmit power efficiently, or to track relative movement.

Fig-4 Pulley

Fig-5 Belt

2.5 MACHINE VICE AND SHAFT

A vise or vice is a mechanical apparatus used to secure an object to allow work to be performed on it. Vises have two parallel jaws, one fixed and the other movable, threaded in and out by a screw and lever. Hand operated vises is one of the types of vice is used for our project.

A shaft is a rotating machine element, usually circular in cross section, which is used to transmit power from one part to another, or from a machine which produces power to a machine which absorbs power. The various members such as pulleys and gears are mounted on it.

Fig-6 Machine vice

Fig-7 Shaft

2.6 BUSHES AND BEARINGS

A bush is a mechanical fixing between two, possibly moving, parts, or a strengthened fixing point where one mechanical assembly is attached to another. In a car or other vehicle's suspension, bushes are used to connect the various moving arms and pivot points to the chassis and other parts of the suspension.

A bearing is a device to permit fixed direction motion between two parts, typically rotation or linear movement.

Fig-8 Ball bearing

2.7 WORKING

The Cutting machine and the grinding machine works with the help of electric motor. The motor's shaft is connected to the rotating shaft cutting tool with the aid of belt. The cutting tool is made of composite abrasive material. The rate of metal removal can be varied by controlling the feed rate using the lever. It is used to cut high strengthen steel or rod. Another one use is the grinding process ie., easy to remove the unwanted materials from the machining or other job. The machine is so easily transportable.

Fig-9 Photography of the project

2.8 SAFETY PRECAUTIONS

1. Never use electric equipment (such as drills, sanders, and saws) in wet or damp conditions.
2. Properly ground all electric tools prior to use.
3. Do not use electric tools near flammable liquids or gases.
4. Keep all equipment in proper working order.
5. Secure the work in a holding device, not in your hands.
6. Wear eye protection while operating these machines.
7. Ensure that all lock buttons or switches are off before plugging the machine tool into the power.

2.9 ADVANTAGES AND APPLICATIONS

1. The machine is so easily transportable.
2. Machining of larger workpiece is easier
3. It increases the life time of motor and cutting tool.
4. Easily replaceable
5. Used in all manufacturing industries.

3. RESULTS AND DISCUSSSIONS

3.1 ELECTRIC MOTOR SPECIFICATIONS

Motor type	A.C
Shaft type	Double end shaft
Phase	Single phase
Voltage	230 V
Amps	10 Ampere
Frequency	50 Hertz
Load	0.37 Kw
Horse power	0.5 H.P
Speed	2000 rpm

Table-1 Electric motor specifications

3.2 CUTTING TOOL SPECIFICATIONS

Type of material	Abrasive
Inner diameter	25.4 mm / 1 inchs
Outer diameter	355 mm / 14 inchs
Thickness	2.8 mm / 7/64 inchs
MRR	Max 4800 m/min

Table-2 Cutting tool specifications

3.3 GRINDING WHEEL SPECIFICATIONS

Type of material	Abrasive
Inner diameter	19.05 mm/ ¾ inch
Outer diameter	101.6 mm / 4 inchs
Thickness	19.05 mm / ¾ inch

Table-3 Grinding wheel specifications

4. CONCLUSION

The system branded as cutting and grinding system is widely found in almost all industries / fields in our country. The system is quiet safe for handling. In the case of overloading, the system will not face any fire hazard. We can rely on the system completely with respect to cost of operation. The operation cost is less in this system and continuous operation of the system is also possible without stopping.As cutting and grinding are done in one and the same equipment operation requires less time. The time taken for the finished goods is less when compared with the traditional industrial process. Above all the cost of maintenance of the project is considerably low.

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