FABRICATION OF MINI VERTICAL BELT GRINDER

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IN

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CERTIFICATE

This is to certify that the Exploration project report entitled **"FABRICATION OF MINI BELT GRINDER"** submitted by **Mr. CH. ANOOP (21PA5A0310), Mr. A. ROHIT (20PA1A0306), Mr. K. VASU (20PA1A0346), Mr. G. MUKESH (20PA1A0338)** in partial fulfilment for the award of the Degree of **Bachelor of Technology** in **Mechanical Engineering, VISHNU INSTITUTE OF TECHNOLOGY**, **Bhimavaram** is a record of bonafide work carried out by them under our guidance and supervision. The results embodied in this report have not been submitted to any other University or Institute for the award of any degree or diploma.

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With sincere regards

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ABSTRACT

Griding is an abrasive machining process that uses a grinding wheel as the cutting tool. A wide variety of machines are used for grinding. Although mini belt grinding abrasive belt have stronger cutting ability than that on the grinding wheel. The main aim of this paper is to design vertical abrasive belts grinding machine to achieve good tolerance as well as better surface finish for various materials such as metal, glass, ceramic, rock and specified material. The abrasive belt grinding can reduce the surface roughness of work pieces and accuracy meanwhile Aluminium oxide belt with high stock removal cleaning and polishing is effectual. The abrasive belt grinding as compared to wheel grinding have more efficient with efficiency and parameter range. It is concluded that Aluminium oxide belt hardness makes it suitable for use as an abrasive and as a component in cutting tools with significant proportion. We have designed such Abrasive Belt Grinding Machine having better advantages over wheel grinding machine.

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CHAPTER – 1

INTRODUCTION

1.1 ABRASIVE BELT GRINDING

Abrasive belt grinding is a common finishing process in the metal and wood working industries. Coated abrasive belts are used in the same speed range as bonded wheels, but they are not generally dressed when the abrasive becomes dull. Abrasive belt grinding is a kind of grinding tool with special form, which needs straining device and driving wheel and to make abrasive belt strained and moved at high speed, and under certain pressure, the contact between abrasive belt and work piece surface can help to realize the whole process of grinding and machining. Belt grinding is a rough machining procedure utilized on wood and different materials. It is commonly utilized as a completing procedure in industry. A belt, covered in rough material, is kept running over the surface to be handled so as to evacuate material or create the ideal finish.

Grinding is an abrasive machining process that uses a grinding wheel as the cutting tool. A wide variety of machines are used for grinding. Although mini belt grinding abrasive belt have stronger cutting ability than that on the grinding wheel.

Fig. 1.1 Abrasive belt grinder

1.2 TYPES OF GRINDING

Surface grinding

Surface grinding is generally called Heiken or Hiraken, which uses either a vertical axis grinding machine or a horizontal axis grinding machine, with a square table or a circular table, and a straight type wheel or a cup type wheel.

The workpiece is fixed on a table and the wheel is rotated at high speed to perform grinding.

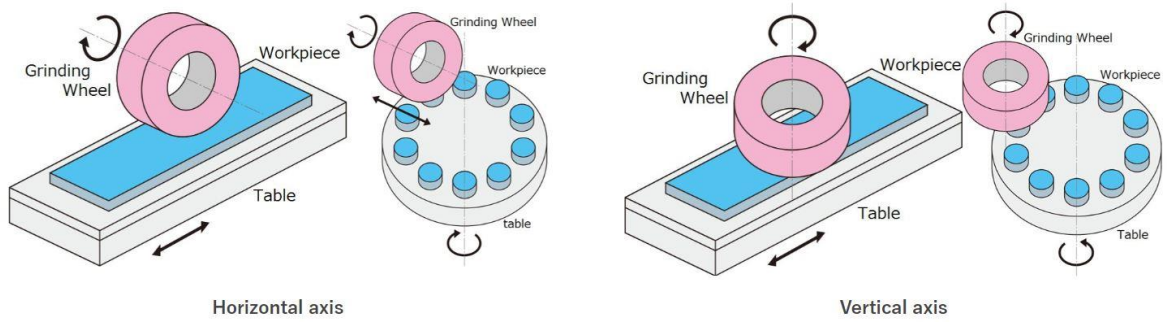

Fig. 1.2 Surface grinding

The double-ended type is equipped with wheels above and below to perform grinding the workpiece in between. Surface grinding is the most common grinding method and is used in a wide range of fields.

Cylindrical grinding

Cylindrical grinding is often called Enken, using either a cylindrical grinding machine or a universal grinding machine. Both the cylindrical workpiece and the wheel are rotated and the outer periphery of the workpiece is machined. The various grinding methods include straight cylindrical, taper, end face, and total shape grinding. Similar to surface grinding, it is a general grinding method in wide use.

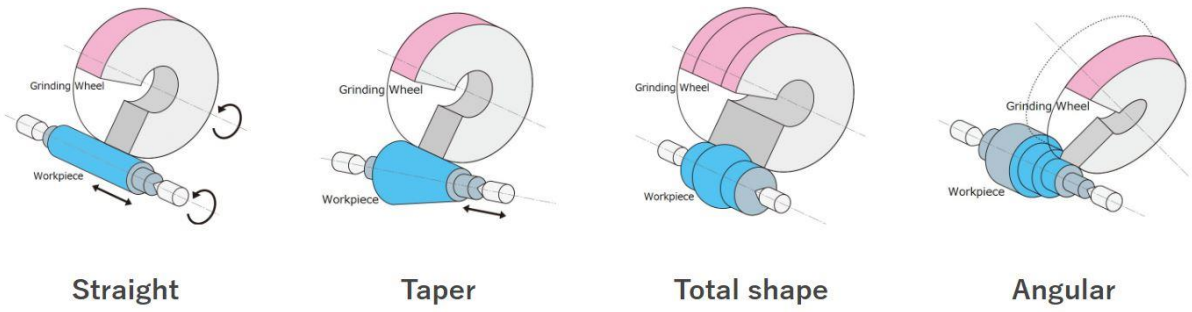

Fig. 1.3 Cylindrical grinding

Internal grinding

Internal grinding is also called Naiken, using an internal grinding machine or a cylindrical grinding machine, or internal grinding equipment attached to a universal grinding machine. The workpiece is fixed and the inner surface of the workpiece is machined with the rotating axle wheel. Grinding may sometimes be performed by rotating the workpiece. Similar to the cylindrical grinding, the grinding method includes taper and end face grinding.

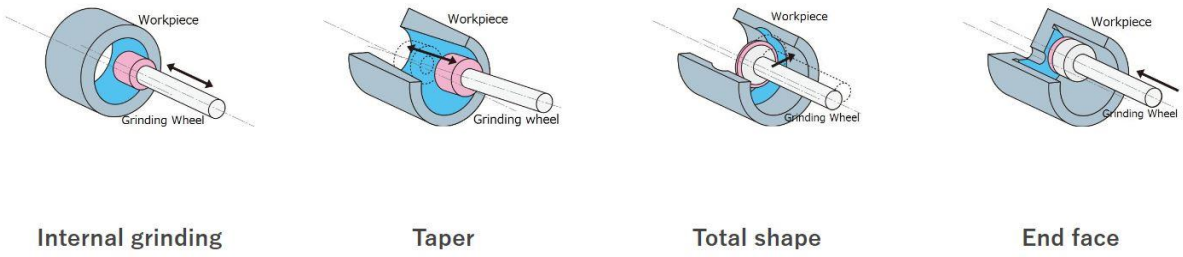

Fig 1.4 Internal grinding

Centerless grinding

Centerless grinding is also called Shinnashi grinding, and processes the outer periphery of a cylindrical workpiece using a centerless grinding machine. A workpiece is supported between a fixed blade and a rotating adjusting wheel and a grinding wheel. The rotation and feed of the workpiece are then adjusted by rotation of the adjusting wheel to grind the outer circumference of the workpiece. Centerless grinding requires neither a center hole in the workpiece nor the workpiece's installation on and removal from the grinding machine. These advantages make it suitable for mass production.

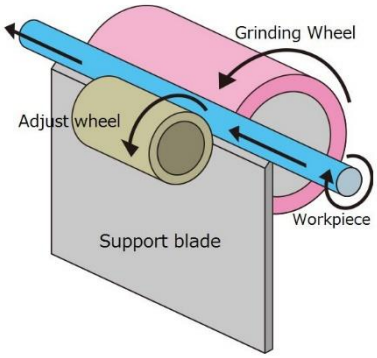

Fig 1.5 Centerless grinding

1.3 ADVANTAGES

- This can produce a high surface finish with accurate can obtain.
- This can machine hard materials.
- This operation can be done with less pressure applied on work.
- It can obtain highly accurate dimensions.
- It can work at high temperature also.
- Speed of cutting can be done by this process.
- In grinding abrasive particles, they are self-sharpened action.
- This can operate for complex things also.
- Smooth surface can obtain.

1.4 DISADVANTAGES

- Required tool is high cost.
- Process is also a costly one.
- It cannot remove the high amount of material, it only removes a little amount.
- For removing the required amount from work, it consumes more time.
- You should work carefully, because imperfect contact may lead to damages.

1.5 APPLICATIONS

Belt grinding is a versatile process suitable for all kinds of different applications. They are:

- Let’s talk about the Finishing. The surface roughness, removal of micro burrs, cosmetic finishes, polishing can perform good by this Machine
- The process of deburring can be done with this equipment with removal of burr, edge breaking, etc.
- Stock removal such as tool marks, dimensioning, cleaning of corrosion will be done
- This Mini vertical belt grinder machine can solve the problem of time consumption
- Waste of resources in face of labour cost is reduced.
- The machine can be used in carpentry section to get the good finish surface of the wood.

CHAPTER – 2

LITERATURE SURVEY

The vast review of literature will help to understand the concepts, theorems.

- **Yun Huang,** presented the literature survey on belt grinding shows certain limited understanding of material removal, wear and grinding process. The importance of belt related parameters in grinding and finishing of work piece can be seen in the illustration on grinding. Compared to the grinding with wheels, involving non rigid wheel with belt grinding is another way to enhance the flexibility. In abrasive belt grinding Titanium alloy blade of aviation engine experiment, through the single factor experiment method, the influence of abrasive belt linear speed and work-piece feeding speed on the grinding quantity is discussed. In abrasive belt grinding Titanium alloy blade of aviation engine experiment, through the single factor experiment method, the influence of abrasive belt linear speed and work-piece feeding speed on the grinding quantity is discussed.

- **Robert Henry,** studied Machining processing industries have continuously developed and improved technologies and processes to transform finished product to obtain better super finished product quality and thus increase products. Abrasive machining is one of the most important of these Processes and therefore merits special attention and study. Belt grinding is an abrasive machining process used on metals and other materials it is typically used as a finishing process in industry. The main objective of this project is to design and fabricate an abrasive belt grinding which can be used as versatile grinding machine, the work area can be rotated from 0 degree to 180 degree. The 0-degree work area can be used for bottom grinding of component, the 90-degree work area can be used for vertical grinding of component and the 180-degree work area can be used for top grinding of component.

- **Huang,** presented the surface finishing and stock removal of complicated geometries is the principal objective for grinding with compliant abrasive tools. To understand and achieve optimum material removal in a tertiary finishing process such as Abrasive Belt

Grinding, it is essential to look in more detail at the process parameters/variables that affect the stock removal rate. The process variables involved in a belt grinding process include the grit and abrasive type of grinding belt, belt speed, contact wheel hardness, serration, and grinding force. Changing these process variables will affect the performance of the process.

CHAPTER – 3

LIST OF COMPONENTS

3.1 PULLEY

A pulley is a wheel on an axle or shaft that is designed to support movement and change of direction of a taut cable or belt, or transfer of power between the shaft and cable or belt. In the case of a pulley supported by a frame or shell that does not transfer power to a shaft, but is used to guide the cable or exert a force, the supporting shell is called a block, and the pulley may be called a sheave.

A pulley may have a groove or grooves between flanges around its circumference to locate the cable or belt. The drive element of a pulley system can be a rope, cable, belt or chain.

Fig 3.1 Pulley

3.2 ABRASIVE BELT

Belt grinding is an abrasive machining process used on metals and other materials. It is typically used as a finishing process in industry. A belt, coated in abrasive material, is run over the surface to be processed in order to remove material or produce the desired finish.

Fig 3.2 Abrasive belt

3.3 DC MOTOR

A DC motor is any of a class of rotary electrical motors that converts direct current (DC) electrical energy into mechanical energy. The most common types rely on the forces produced by induced magnetic fields due to flowing current in the coil. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current in part of the motor.

Fig 3.3 DC Motor

3.4 COUPLING

A coupling is a device used to connect two shafts together at their ends for the purpose of transmitting power. The primary purpose of couplings is to join two pieces of rotating equipment while permitting some degree of misalignment or end movement or both. In a more general context, a coupling can also be a mechanical device that serves to connect the ends of adjacent parts or objects. Couplings do not normally allow disconnection of shafts during

operation, however there are torque-limiting couplings which can slip or disconnect when some torque limit is exceeded.

Fig 3.4 Coupling

3.5 JOINTS

A mechanical joint is a section of a machine which is used to connect one or more mechanical part to another. Mechanical joints may be temporary or permanent, most types are designed to be disassembled. Most mechanical joints are designed to allow relative movement of these mechanical parts of the machine in one degree of freedom, and restrict movement in one or more others.

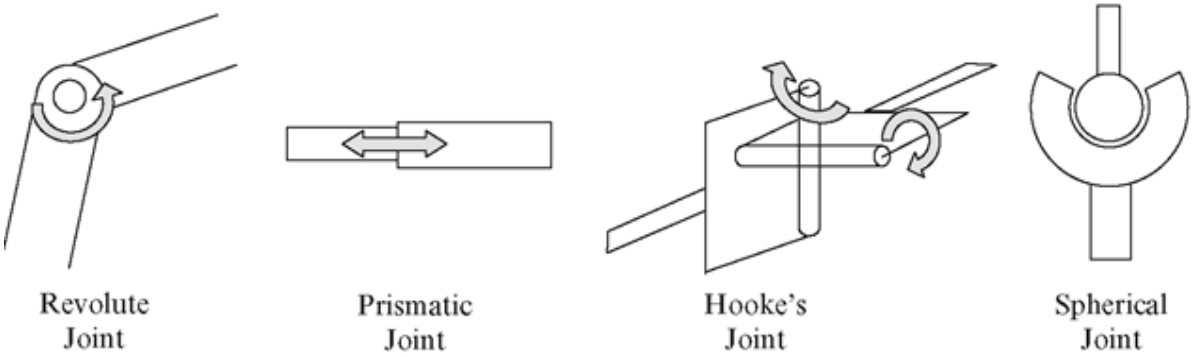

Fig 3.5 Joints

3.6 RODS

A rod is a long circular bar of raw material. A dipstick is a metal rod with marks along one end, used to measure the amount of liquid in a container. The connecting rod connects the piston to the crank or crankshaft. A rod is a long circular bar of raw material.

Fig 3.6 Rods

3.7 BASE FRAME

A base frame is often a structural system that supports other components of a physical construction and steel frame that limits the construction's extent.

3.8 SCREWS & BOLTS

A screw and a bolt (see Differentiation between bolt and screw below) are similar types of fastener typically made of metal and characterized by a helical ridge, called a male thread (external thread). Screws and bolts are used to fasten materials by the engagement of the screw thread with a similar female thread (internal thread) in a matching part.

Fig 3.7 Screws, Nut and bolts

Table 3.1 List of Components

S. No.	Component	Material
1.	Pulley	Mild Steel
2.	Abrasive Belt	Abrasive
3.	DC Motor	500 Rpm
4.	Couplings	Mild Steel
5.	Rods	Stainless steel
6.	Base Frame	Wood
7.	Screws & Bolts	Carbon Steel

CHAPTER – 4

CONSTRUCTION AND WORKING

4.1 CONSTRUCTION

The below figure 4.1 represents the construction of abrasive belt grinding machine with all its important components. This machine is constructed on one base plate and is supported through vertical column shown in both figure 4.1 and figure 4.2. The motor is also mounted on base plate from which drive is given to grinding belts through pulleys shown in figure 4.1. One adjustable column is also provided to attach and remove the belts easily. The grinding belt rotates when motor starts and its movement used to grind or finish the surface similar to grinding wheel. The table is also attached to vertical column to put the workpiece while performing the grinding operation shown in above figure 4.2. Due this vertical rotation of belts its maximum area is utilized for finish the surface due to which less time is required for grinding with maximum material removal rate than wheel grinding operation.

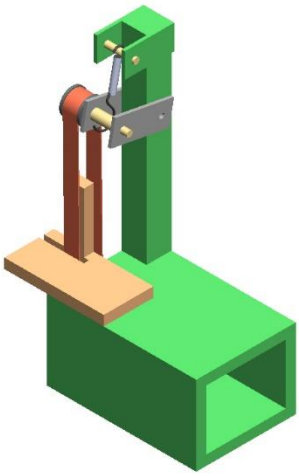

Fig 4.1 Isometric view

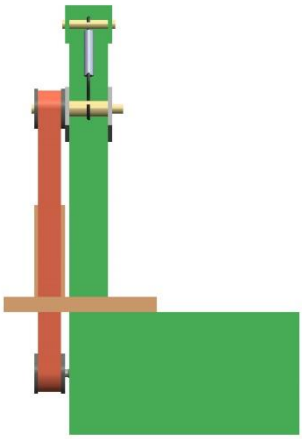

Fig 4.2 Front view

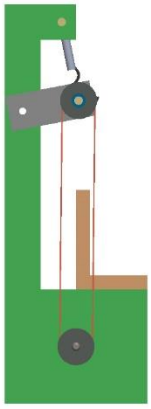

Fig 4.3 Front view

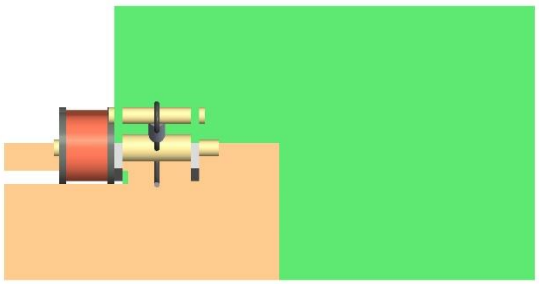

Fig 4.4 Top view

4.2 PRINCIPLE OF WORKING

As you know that nowadays wheel grinding machines are mostly used for grinding operation. In most the workshops it is used for grinding, to remove the sharpen edges, sharpen the cutting tools by giving different angles. But in such wheel grinding machines there is one problem that very less area of wheel available to perform the grinding operation. Due to this area of contact in between grinding wheel and workpiece maximum time is required finish the surface or to grand the surface. To avoid this major disadvantage, we have developed this vertical belt grinding machine. The above figure 4.1 shows the Isometric view of this machine with all important components. The basic working principal of this machine is too grand or to finish the surface using abrasive belts which to be mounted on this designed machine. Due to this abrasive belt used maximum area of belt is comes in contact with work piece due to which material removal rate or surface finish rate is more in less time as compared to wheel grinding machine

4.3 WORKING

In this construction DC Motor is used to drive the abrasive belt. This rotational motion is given to the pulley. At the end of pulley one rod is connected to the DC Motor by using the coupling

for the pulley rotation. The coupling is used for transmission of power from DC Motor to the pulley. The abrasive belt is held in between the two pulleys. The other end pulley consists of spring action so that we can held the different sizes of belts. As the first shaft from the motor is rotated then all the pulleys rotated with same speed because of abrasive blet wound over the pulley surfaces. When we keep the any small part on abrasive blet and apply the pressure over the surface of the blet, then small component polished.

CHAPTER – 5

RESULTS AND DISCUSSION

Like grain type and grit grade the material you are processing will also affect recommended surface speed. The greater the density of the material the harder it will be and the higher the abrasive speed will generally need to be effective recommended surface speed by material can be found in the table below

Table 5.1 Surface speed for the following material

S.NO	Material to be proceed	Surface speed (SFM)
1.	Acrylic	960-2700
2.	Glass, ceramic and stone	1560-2700
3.	Hard and hardened steel	1560-2940
4.	Plastic and rubber	1920-3540
5.	Titanium and titanium alloys	1920-4920
6.	Wood	2940-4920
7.	Aluminium and zinc	3540-5880
8.	Stainless steel, tool steel and high speed steel	3540-5880
9.	Copper and brass	4820-6840
10.	Cast iron and carbon steel	4920-8820

CHAPTER - 6

CONCLUSION

Grinding is an abrasive machining process that uses a grinding wheel as the cutting tool. A wide variety of machines are used for grinding. Although mini vertical belt grinding have stronger cutting ability than that on the grinding wheel. But as wheel grinding is having some disadvantages in form of time required to finish the surface, material removal rate, surface finish obtained etc.

To over such disadvantages this vertical abrasive belt grinding machine is designed using CATIA v5 software to overcome disadvantages of wheel grinding machine. Also, this machine helps too grand or to finish the surface using abrasive belts which to be mounted on this designed machine. Due to these abrasive belts used maximum area of belt is comes in contact with workpiece due to which material removal rate or surface finish rate is more in less time as compared to wheel grinding machine.

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