DESIGN AND FABRICATION OF DUAL SIDE SHAPER MACHINE USING SCOTCH YOKE MECHANISM

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ABSTRACT

This paper describes about dual side shaper machine using a scotch yoke mechanism which can be used in industries for cutting process. A Shaper is a machine used for shaping (metal removal) operation on the work piece. A usual shaper machine operates by a principle of whit worth quick return mechanism where materials are processed at one end and other end remains idle. But in a dual side shaper machine, materials are processed at both ends which become advantageous when compared to usual shaper. Nowadays, Industries try to achieve high production rate at a minimal amount of time, cost etc. Usage of dual side shaper machine eliminates most disadvantages faced by a single side shaper. The main advantage of dual side shaper is that it decreases time as well as production cost. Thereby it increases productivity. Another advantage is that number of moving parts is less when compared to usual machine. This model uses a single power source which can be connected to gears for increasing or decreasing the speed of cut.

KEYWORDS: *Shaper Calculations, Analysis.*

1. INTRODUCTION

A Shaper is a type of machine tool that uses linear relative motion between the work piece and a single-point cutting tool to machine a linear tool path. Its cut is analogous to that of a lathe, except that it is linear instead of helical. The work piece mounts on a rigid, box-shaped table in front of the machine. The height of the table can be adjusted to suit the work piece, and the table can traverse sideways underneath the reciprocating tool, which is mounted on the ram. Table motion may be controlled manually, but is usually advanced by automatic feed mechanism acting on the feed screw. The ram slides back and forth above the work. At the front end of the ram is a vertical tool slide that may be adjusted to either side of the vertical plane along the stroke axis. This tool-slide holds the clapper box and tool post, from which the tool can be positioned to cut a straight, flat surface on the top of the work piece. The tool-slide permits feeding the tool downwards to deepen a cut. The tool-slide permits feeding the tool downwards to deepen a cut. When a load is placed on the input rod of the scotch yoke by an actuator, sideward thrust causes the input rod and yoke arm to bow and twist. This increases the friction on the sliding nut. At the extreme positions of travel of the sliding nut, the bowing and twisting become severe and the yoke arm tends to bind. Diagrammatic representation of tool feed direction.

2 .Components

- AC Motor

- Bearing And Bearing Cap
- Belt Drive
- Metal Frame

2.1 AC MOTOR

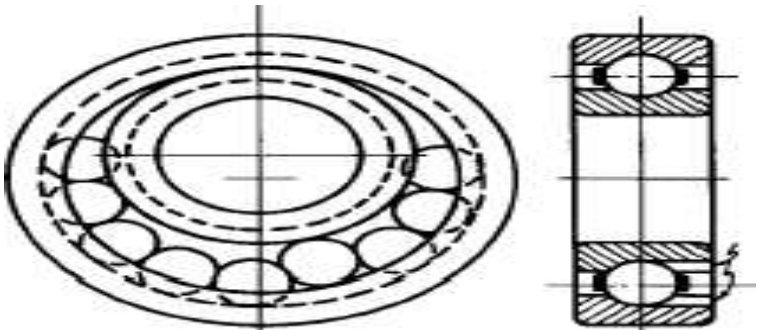
AC induction motors are the most common motors used in industrial motion control systems, as well as in main powered home appliances. Simple and rugged design, low-cost, low maintenance and direct connection to an AC power source are the main advantages of AC induction motors. Various types of AC induction motors are available in the market.

Different motors are suitable for different applications. Although AC induction motors are easier to design than DC motors, the speed and the torque control in various types of AC induction motors require a greater understanding of the design and the characteristics of these motors.This application note discusses the basics of an AC induction motor; the different types, their characteristics, the selection criteria for different applications and basic control techniques.

- A.C MOTOR DATETAILS:
- Voltage - 230 V,
- Frequency - 50 HZ, 1PH PSC,
- AMPS - 2.5 AMPS,
- Power - ¼ HP,
- Watt - 180W,
- RPM - 1440rpm.

2.2 Bearing

Outer Diameter of Bearing (D) = 37 mm
Thickness of Bearing (B) = 12 mm
Inner Diameter of the Bearing (d) = 12 mm



Ball and roller bearings are used widely in instruments and machines in order to minimize friction and power loss. While the concept of the ball bearing dates back at least to Leonardo da Vinci, their design and manufacture has become remarkably sophisticated.

This technology was brought to its p resent state of perfection only after a long period of research and development. The benefits of such specialized research can be obtained when it is possible to use a standardized bearing of the proper size and type. However, such bearings cannot be used indiscriminately without a careful study of the loads and operating conditions. In addition, the bearing must be provided with adequate mounting, lubrication and sealing. Design engineers have usually two possible sources for obtaining information which they can use to select a bearing for their particular application:

2.3 Belt

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. Belts are looped over pulleys and may have a twist between the pulleys, and the shafts need not be parallel. In a two pulley system, the belt can either drive the pulleys normally in one direction (the same if on parallel shafts), or the belt may be crossed, so that the direction of the driven shaft is reversed (the opposite direction to the driver if on parallel shafts). As a source of motion, a conveyor belt is one application where the belt is adapted to carry a load continuously between two points.

2.4 Metal Frame:

The metal frame is generally made of **mild steel** bars for machining, suitable for lightly stressed components including studs, bolts, gears and shafts. It can be case-hardened to improve wear resistance. They are available in bright rounds, squares and flats, and hot rolled rounds

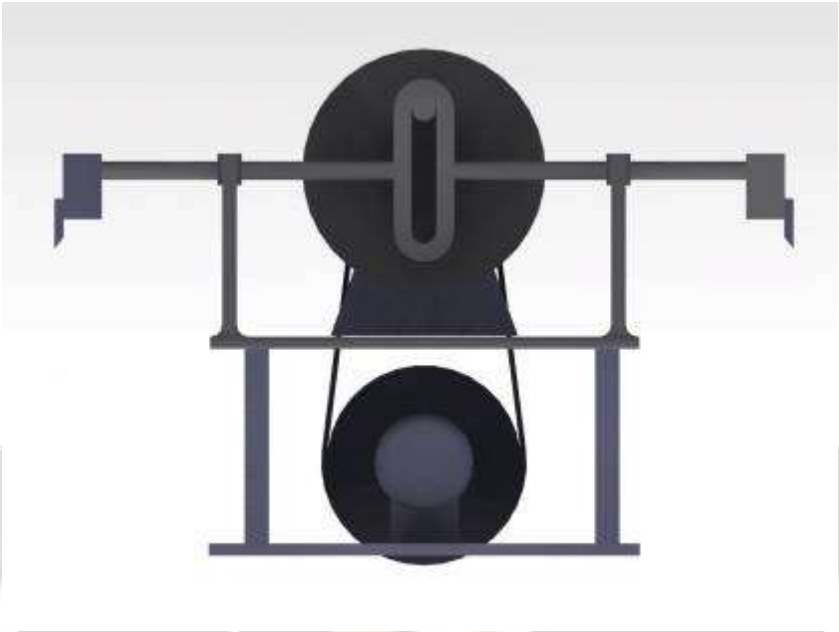
Suitable machining allowances should therefore be added when ordering. It does not contain any additions for enhancing mechanical or machining properties. Bright drawn mild steel is an improved quality material, free of scale, and has been cold worked (drawn or rolled) to size. It is produced to close dimensional tolerances. Straightness and flatness are better than black steel. It is more suitable for repetition precision machining. Bright drawn steel has more consistent hardness, and increased tensile strength. Bright steel can also be obtained in precision turned or ground form if desired.

3.WORKING PRINCIPLE

Shaper is the metal cutting machine tool designed for cutting flat work piece by a tool. Shaping is used to machine thin and soft plates. The operation of machine is simplified to few simple operations involving a motor and tool head arrangement. When the crank is driven by a motor or by handle, the crank rotates about the axis, so the crankpin slides inside the slot of the slotted plate. As the crank rotates, the slotted bar reciprocates due to the sliding of crank pin. The connecting rod attached with the slotted plate on both sides, reciprocates as the crank rotates. The cutting tool is attached at the both sides of connecting rod, to carry out the cutting operation. Since the cutting tool is placed on both sides, operation can be done at both the sides of the machine i.e. the return stroke at one end is

converted into cutting stroke at the other end, thereby it reduces the production time and increases the Metal removal rate (MRR).

4. EXPERIMENTAL MODEL



5.Construction

TheFrame is a rigid body that supports the entire mechanism. Mild steel tubes- rectangular Cross section Crank is a rotating part, Which is either a hand driven or motor driven. Slotted bar has a slot in which the crank pin engages or slides over it. Crank pin is welded on a crank at a pitch circle diameter (PCD)of 130 mm. Mild steel Ø25 mm and 70mm length Shaft is a rotating machine element, which is used to transmit the torque. One end of the shaft is connected to the handle slot and other end of the shaft is welded to the centre of the crank disc.Steel Connecting rod is used to connect the slotted bar to the cutting tool on either sides of the bar. The connecting rod is supported at the frame. Mild steel Plummer block is used for holding rotating shafts with help of bearing and other parts. Brass Ø30 mm the fabricated system has the ability of quick lifting and portability. It is easier to use and maintained cost is less.Cutting tool is a tool that is used to remove material from the work piece by means of shear deformation. Cutting tool must be stronger than work piece. In shaper machine the cutting tool moves in a direction normal to the work piece. Ex: High speed steel, carbon steel, carbides, etc. The cutting tool material must have the properties such ashigh hardness and strength at high temperature, good toughness and high tool life. High Speed Steel(HSS)
Nut is a hollow material where bolts are inserted. Mild steel Ø6 mm Bolt is moved inside nut. It has head, shank, thread portion. Mild steel Ø10 mm.

CONCLUSION

This project is made with pre planning, that it provides flexibility in operation. This innovation has made the more Desirable and Economical. This project is designed with the hope that it is very much economical and it also helped us to know the periodic steps in completing a project work. Thus we have completed the project successfully.

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