Multipurpose Fixture for Angle Measurement in Components with Centric Holes

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Abstract — the purpose of this fixture is to facilitate angle measurement in hollow jobs by making use of a small probe like attachment to the work holding device. This fixture can be utilized for angle measurement and maneuvering even for extremely large workpieces (upto 800 cm diameter), which can be used in large scale production industries. In this device we make use of a variable position chuck and a measuring probe with an attachment for manipulating a wide range of job sizes. The fixture design will serve for the economic production for the component.

Index Terms — Fixture, Angle Measuring Probe, Hollow Jobs, Chuck, Servo Motor

I. INTRODUCTION
Nowadays, in mass production with developments being done to ease the manufacturing processes which requires a lot of effort from the labors; the present technique used for measuring angles for hollow work pieces requires manufacturing of a template with almost similar size to that of the work piece and the inscribing the angles in the template for measurement. Such procedure requires large number of templates and new template needs to be fabricated for every new job. Moving the template along the work piece is a skill full work and especially for circular components become much more difficult. To reduce the constrains, we implement a multipurpose fixture along with a servo motor which can be used for measuring a wide range of dimensions as well as can be rotated for easy accessibility and future automation. The need of a special device which can rotate the job at a fixed rate is to assist other manufacturing process for circular components and to ensure good profile and homogeneous machining. The fixture can axially clamp the job to prevent lateral movement. It can also be utilized to hold the job rigidly to prevent vibrations and shattering while machining. This project will ultimately reduce the cycle time which inturn will increase the productivity to greater extents.

II. TRADITIONAL METHOD
Though use of templates for measuring angles in ultra large workpieces has been in use traditionally for a very long time, the time taken for development of these templates are very high and involves much work force.

Moreover, this method requires machining of new templates, incase if the size of the workpiece is altered. We have discovered that, use of templates is the prime cause of all the losses and we have proposed a solution to this problem with the development of a new multipurpose fixture.

III. PROPOSED DESIGN
The proposed design utilizes a chuck as a work holding device used to affix the job to the work centre and a measuring probe used to determine the angle from the centre of the workpiece. A metal attachment is to be provided for hassle-free measurement. A chuck is to be designed such that it can hold jobs up to 8m in diameter and is to be powered with a gear mechanism or using servo motor to achieve 180° rotary motion. A circular hole is to be made in the chuck bed for fixation of measuring probe. A measuring probe comprising of a telescopic cylinder and an angle measuring plate is to be made portable for attachment to the cylinder. The probe (telescopic cylinder) is to be designed equal to the size of hole on the chuck. A metal
IV. TECHNICAL BACKGROUND

A Fixture is a work holding device used in the manufacturing industries. Fixtures are used to securely locate the position or location and to support the work, ensured that all parts produced using the fixture will maintain conformity and inter-change ability. Using this fixture improves the economy of production by allowing smooth operation and reduced production time.

IV.I. CHUCK

A chuck is a specialized type of clamp used to hold an object, usually an object with radial symmetry, especially a cylindrical object. It is most commonly used to hold a rotating tool (such as the drill bit or a rotating work piece (such as the bar or blank in the headstock spindle of a lathe). Some chucks can also hold irregularly shaped objects (ones that lack radial symmetry). Many chucks have jaws, which are dogs that are arranged in a radially symmetrical pattern (like the points of a star) to hold the tool or work piece. Often the jaws will be tightened or loosened with the help of a chuck key, which is a wrench-like tool made for the purpose. A Self-centering chuck, also known as a scroll chuck, uses dogs (usually called jaws), interconnected via a scroll gear (scroll plate) is used to hold onto a tool or work piece because they most often have three or four jaws, the term three-jaw chuck without other qualification is understood by machinists to mean a self-centering three-jaw chuck. The term universal chuck also refers to this type. These chucks are best suited to grip circular or hexagonal cross-sections when very fast, reasonably accurate (±0.005 inch [0.125 mm]) centering is desired.

IV.II. MEASURING PROBE

Our measuring probe consist of three components
1. Angle inscribed plate
2. Telescopic cylinder
3. Metal attachment to a bearing

The telescopic cylinder acts as the base component to which angle inscribed plate is attached. The purpose of the telescopic cylinder is to extend the span depending upon the height of the job where the measuring has to be done. The angle inscribed plate attached to the telescopic cylinder is fixed to the top with angle markings from 1-360 degrees. The metal attachment is bolstered over the angle inscribed plate and is free to rotate 360\(^\circ\) and is used to mark the measured angle for the impeller hub. This entire set up acts as a measuring probe.

IV.III. SERVOMOTOR

Servomotor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors. Servomotors are not a specific class of motor although the term servomotor is often used to refer to a motor suitable for use in a closed-loop control system.

V. CONSTRUCTION

The fixture construction begins with manufacturing of a chuck with repositionable jaws such that it can be used to maneuver a wide range of jobs. The chuck is to be powered by a servomotor.
which is being used. At the centre of the chuck bed, the measuring probe is mounted once the work piece is clamped. Angle measured from the metal plate is marked on the work piece by drawing straight lines from the centre which is facilitated by the metal attachment. Further markings are enabled using servomotor by rotating the workpiece to the necessary angle and marking again. This thereby sets the laystone for automation in angle measuring and machining processes in the future.

VII. CONCLUSION

Thus with the development of this multipurpose fixture, the benefits are both reduction in production time which aids in improved productivity as well as hassle free work experience for labourers handling such big jobs where maneuverability is extremely difficult. Wide range of jobs can be handled using this fixture, improving accuracy in angle marking. Thus, it ultimately improves maneuverability along with setting up a base for automation in machining near future.

This project can also be used as an attachment to the conventional chuck by fabricating the above mentioned measuring probe equal to the size of the hole which can possibly be drilled to the centre of the existing chuck.

VIII. REFERENCES

[7] This website http://www.youtube.com/watch?v=dEhXLnm1oFM

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