DESIGN OF FIXTURE FOR RADIUS TURNING ON LATHE MACHINE

Milan Patel[1], Divyesh Pateliya[2], Ankur Parmar[3], Bharat Kapadiya[4]

[1] *Student, mechanical, V.I.E.R., Gujarat, INDIA*
[2] *Student, mechanical, V.I.E.R., Gujarat, INDIA*
[3] *Student, mechanical, V.I.E.R., Gujarat, INDIA*
[4] *Asst.Prof. , mechanical, V.I.E.R., Gujarat, INDIA*

ABSTRACT

Now a days in industries CNC machines are widely used but they are costly. So commonly conventional machines are being used for cost reduction purpose of any product. But the radius of cylindrical part can only be done with the help of CNC machines. Thus to overcome this limitation we are design a fixture for radius turning on lathe machine & more over for high precision it can also be used with auto feed. Thus as an outcome of this highly precise products will be produced at low cost comparatively.

Keyword: - *Radius Turning, Lathe Machine, Fixture*

1. INTRODUCTION

1.1 Problem statement

We will replace the tool post by worm and worm wheel for radius turning. On the worm wheel it has a slot for clamping of single point cutting tool. Worm is rotate by the motor which is fixed at the end of shaft for auto feed purpose. So we can achieve highly precise products.

1.2 Problem identification

Now, let me introduced you the objective behind our project we have deals with lathe machine in our 4 years bachelor degree course. This machine is the heart of every mechanical engineer. We can perform several operation on this machine such as threading, turning, facing, drilling, grooving, chamfer, fillet etc. And so on. But when it comes to make radius of any object, we have to send our job to another inventory. For to give a simple radius shape we required to bear lots of human hard work during handling the job and transportation cost. During transportation some of the job even gets destroyed also. Our main objective is overcome all those problem which give lots of advantage to our production industry. We have seen the tool post which is mounted on the lathe bed. We have replaced that tool post by our attachment. By this we can perform spherical turning on our lathe machine. Our objective is to reduce the stress and cost of the production industry so that it gives benefits to our nation. This attachment is cheap (no bushings or bearings), so even small scale industry can afford it. Production industry invest

₹30,000 for a tool that would be used only occasionally. So, we have designed a quick (simple setups), cheap and easy to make radius turning. It took less than one day to make and works beautifully for 80mm to 120mm radius. We can scale up if we need larger radius. Since producing the drawing took as long as actually building the tool. Our main aim is make an attachment which can be easily operated by less skills worker.

1.3 Aims and objectives

Radius of object is successfully made from this attachment. Good surface finish is achieved. By adjusting the tool from tool holder a different range of radius is achieved. No skilled labour on the part of operator is required to operate the machine. The attachment does not vibrate due to machine vibrations good clamping arrangement has been made. The attachment is not that much heavy it can be easily transfer from one place to another. Mounting the radius turning attachment on the lathe machine is easy. Different size of radius has been manufactured from this attachment.

2. DESIGN & MECHANISM

This 3D model had been made in AUTODESK INVENTOR PROFESSIONAL 2014 by actual dimension and selected mechanism of worm gear also.

Fig -1 : 3D Model

2.1 Mechanism

Radius turning fixture is to fixtures of the-type employed in lathes and similar turning machine tools for forming radii or partially spherical surfaces on work pieces, the principal object being the provision of a fixture of the type described that is simple and rugged in construction, efficient in operation, economical to build, and easy to operate.

Objects of the invention include the provision of a radius fixture for lathes and similar machine tools capable of turning both convex and concave radiant partially spherical surfaces; the provision of a fixture of the type described adapted to be mounted on a lathe or similar machine tooling a new and novel manner; the provision of a radius fixture of the type described that is responsive in movement to the usual tool feeding movements of a lathe or' like machine tool both longitudinally and transversely thereof; the provision of a radius fixture of the type described which while fully responsive to all of the movements of the usual tool supporting member of the lathe or the like does not depend solely upon the carriage and the cross-slide of the lathe for support; the provision of a radius fixture of the type described which derives its principal support directly from the bed of the lathe or the like with which it is

associated; the provision of a radius fixture of the type described having novel means associated therewith for accurately locating the point of the tool in the. Turning of a radius or a partially spherical surface of a predetermined radius; the provision of a radius fixture of the type described providing a novel outboard support for a cutting tool when. Employed for turning concave surfaces; and the provision of a radius fixture of the type described constructed for power operation.

2.2 Worm and worm gear

Worm gears are used when large gear reductions are needed. It is common for worm gears to have reductions of 20:1, and even up to 300:1 or greater.

Many worm gears have an interesting property that no other gear set has: the worm can easily turn the gear, but the gear cannot turn the worm. This is because the angle on the worm is so shallow that when the gear tries to spin it, the friction between the gear and the worm holds the worm in place.
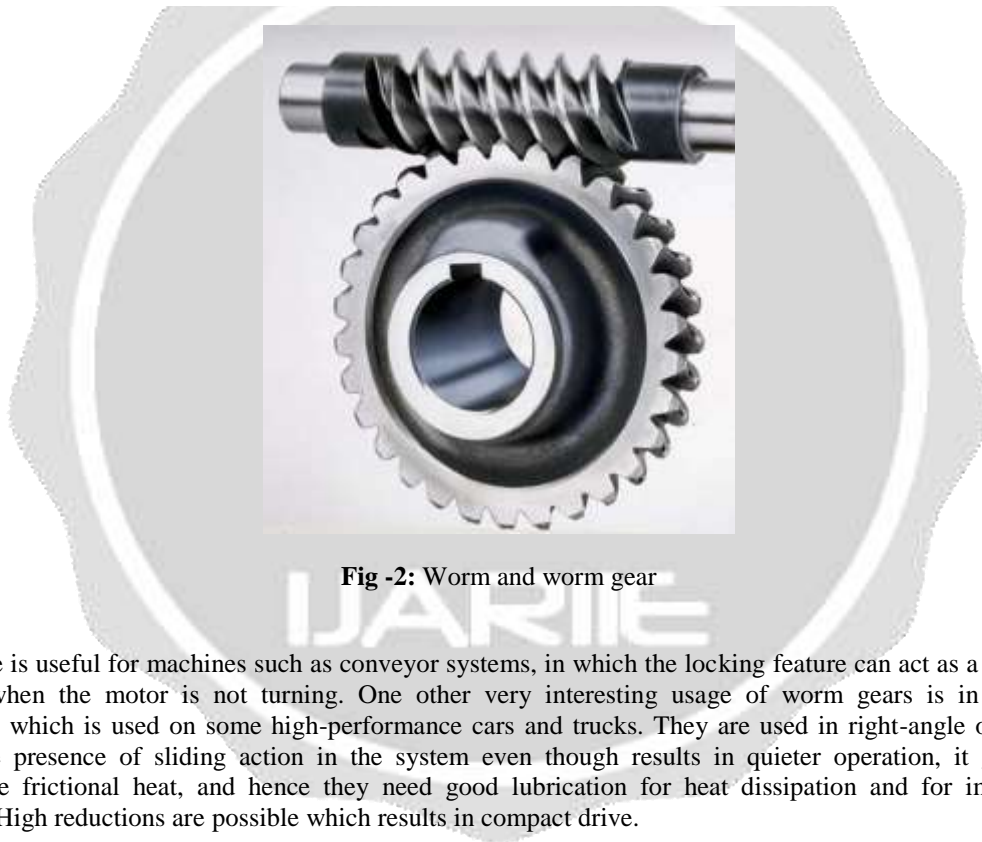
Fig -2: Worm and worm gear

This feature is useful for machines such as conveyor systems, in which the locking feature can act as a brake for the conveyor when the motor is not turning. One other very interesting usage of worm gears is in the Torsion differential, which is used on some high-performance cars and trucks. They are used in right-angle or skew shaft drives. The presence of sliding action in the system even though results in quieter operation, it gives rise to considerable frictional heat, and hence they need good lubrication for heat dissipation and for improving the efficiency. High reductions are possible which results in compact drive.

3. OPERATION OF FIXTURE

3.1 Radius turning

Radius turning operation can be perform by many attachment on lathe machine like ball turning attachment, radius turning attachment, with the use of stylus, form tool etc.

Below attachments are good but not better for good accuracy and precise workpieces like manufacture of bearing radius.

Fig -3: Radius turning

As shown in figure this radius turning attachment is operate by hand lever so it is manually operated. Also it hasn't any heavy foundation so it can be vibrate during operation. It is cheapest in price but not so good for maintain accuracy.

3.2 Concave and convex

Two types of radius convex and concave.

Convex means curving out or extending outward as shown in figure. It can also be defined as having an outline or surface curved like the exterior of a circle or sphere.
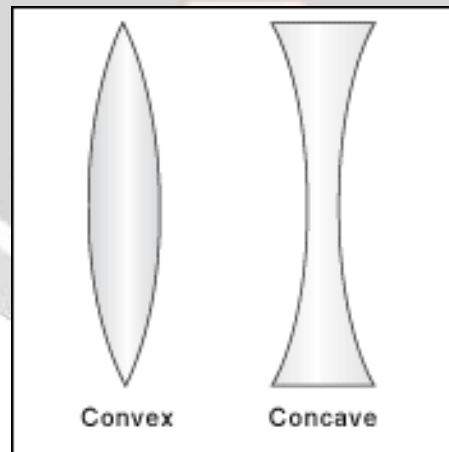
Fig -4: Concave & convex

Concave means curving in or hollowed inward, as opposed to convex shown in figure. It can also be defined as having an outline or surface that curves inwards like the interior of a circle or sphere.

Bearing radius is concave shape so we will design the fixture to turning of concave radius only not convex radius. This is limitation of our fixture. But bearing radius is main aim of our fixture for now we will redesign the fixture to

overcome this limitation. Then we can easily manufacture concave as well as convex radius with the help of radius turning fixture.

3.3 Bearing radius

In industry radius turning of bearing shown in figure is perform on computerized numerical control machines for higher accuracy and impossible to perform on lathe machine. It is very costlier and time consuming.
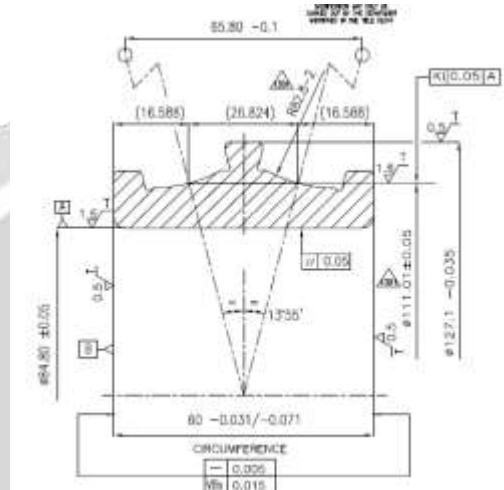

Fig -5: bearing radius

We can perform radius turning operation of bearing with the use of radius turning fixture on lathe machine. So it will be very cheap in cost and we can increase productivity also.

4. OBJECTIVE

Main purpose of this device is to reduce the cost. Radius turning with auto feed. Fixture holding the mechanical tool and also give the direction to the tool. Made spherical surface of a work piece by attached of radius turning fixture which is made for lathe machine.

5. ADVANTAGES

Radius turning of bearing is successfully made from this attachment. Good surface finish is achieved due to achieved. By adjusting the tool from tool holder a different range of radius is achieved. No skilled labour on the part of operator is required to operate the machine. The attachment does not vibrate due to machine vibrations good clamping arrangement has been made. The attachment is not that much heavy it can be easily transfer from one place to another. Mounting the radius turning attachment on the lathe machine is easy. Different size of radius has been manufactured from this attachment. This operation is noiseless. Operation is environmental friendly. Less coolant required for this operation.

6. DISADVANTAGES

Setup time is more of radius turning fixture. Radius turning of convex shape is not possible by this fixture. Accurate alignment of fixture is required. Electric motor with high torque is required for auto feed. It can obtain radius range of 80 to 120 mm. It cannot work at high depth of cut.

7. APPLICATIONS

It can be used in small scale industries for radius turning of bearing parts. It can also be used at wood working industries to make radius on wooden parts.

8. SCOPE OF FUTURE WORK

We can redesign radius turning fixture for turning of concave as well as convex radius on lathe machine. We can use the servomotor with drive for achieve large number of speed. We can use heavy foundation bolts to reduce the vibration problem. We can perform different radius turning operation by change the tool.

9. CONCLUSIONS

Due to this research so many conclusion taken which is as follows. Radius turning of any objects can be manufacture easily. Concave type design can be given to the component. It can be implemented on every lathe machine in college at cheap cost. NC machine which is available in the market is costlier than our attachment. Accuracy is equal to 0.4 which is enough to have finished surface. It can obtain radius range 80mm to 120mm. We can reduce the product cost by use of radius turning fixture.

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