WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Fabrication of Shaping Fixture for Cylindrical Rod to Reduce Manufacturing Lead Time

Thameemul Ansari. J, Jeeva R

[a] *Diploma membership, Electrical & Electronics Engineering, Indian Institute of Industry Interaction Education and Research*
[b] *Professor / Project Coordinator / Indian Institute of Industry Interaction Education and Research*
Doi: https://doi.org/10.55248/gengpi.5.0524.1208

A B S T R A C T

Generally this fixture is a common device used to hold cylindrical job for carrying out shaping and various operations due to quick loading and unloading capability. In this device used on the shop floor for holding the job during shaping and other machining operation. One of the most common methods of holding the work directly on the shaping machine table is by means of T-Bolt and Clamps. Shaping machines are provided with T-Bolt into which T of T slots usually ranges from 15 to 20mm. Before performing any operation in a shaping machine it is absolutely necessary to secure the work firmly on the shaping machine table. This shaping fixture has a screw at its one end which is used to level the clamp when it's often end rests against the work. The work may be quickly set up without any packing piece. In this project we have briefly explained about various types of machining process involved, classification of work holding device and types of clamps and design calculations.

1. Introduction:

This project namely "shaping fixture" is designed and fabricated by us is used for holding cylindrical rod for shaping and various purposes. It is mostly used in industries and other places. It has more advantages comparatively with other fixture for shaping. It is light in construction, having more capacity to hold other components. A clamp is most common device used to hold work, for carrying out various operations, due to its quick loading and unloading capability. They have two jaw one is fixed other one is movable jaw. It may be fitted on a work-bench (table) or on a machine table. The v block is used to hold the work piece . Provision is made in the decision of each clamp to adjust the distance between the two jaw its plate for accommodating different sized jobs. Usually a screwed pair is used for this purpose.

2. Principles of Clamping

2.1. Position:

Clamping should be positioned to direct the clamping force on a strong, supported part of the work piece. Clamping on unsupported part bends slender work pieces affects the accuracy of the operation.

The clamping system should not obstruct the path of loading and unloading of the work piece. The clamps in path of loading should be retractable or swinging type so that the clamps can be withdrawn or swung clear of the path of loading and unloading of the work piece. Clamps should not obstruct the path of the cutting tool. They should not get drilled, milled or welded during operation.

2.1.2 Strength:

The clamping system should be capable of holding the work piece security against the forces developed during operations. The clamping force should not dent or damage the work piece with excessive pressure.

For clamping weak or fragile work pieces, the clamping force should be distributed over a wider area of the work piece. While clamping soft work pieces, clamps should be fitted with pads of softer material, such as nylon or fibre to prevent damage and denting of the work piece.

2.1.3 Operator Fatigue:

Operator fatigue should be taken into account. If a considerable number of clamps are to be tightened and loosened repeatedly, it is better to use pneumatic or hydraulic clamping which, in addition to reducing operator fatigue, also saves clamping time. Power clamping facilitates tightening or loosening of many clamps simultaneously.

4. Fundamental Principles Fixtures Design

4.1.1 Clamping Device:

It should be as simple as possible without sacrificing effectiveness. The strength of the clamp should be such that not only to hold the workpiece firmly in place but also to also to take the strain of the cutting tools without springing or "giving" when designing the and fixtures.

4.1.2 Weight of the Fixtures:

The fixtures should easily be handled, smaller in size and lower in cost in regard to the amount of material used for their making. But at the same time, it should not sacrifice any of the rigidity and stiffness.

4.1.3 Materials Used For Fixtures:

Fixtures are made of hardened material to avoid frequent damage and to resist wear. The material used for jigs and fixtures are mild steel, cast iron, die steel, carbon steel, high speed steel, Nickel-chrome steel, phosphor bronze, plastic materials etc.,

4.2 Essential Features of Fixtures:

4.2.1 Reduction of Idle Time:

The design of fixtures should be such that the process of loading and unloading the components takes the minimum possible time and enables on easy location and clamping should be such that idle time is reduced to minimum.

4.2.2Replaceable Parts or Standardization:

The locating and supporting surfaces, as far as possible should be replaceable that is not permanently fastened. When worn out, new ones may replace them. Moreover, they should be standardized so that their interchangeable manufacture is possible.

4.2.3Position of Clamps:

The clamps should be so positioned that clamping occurs directly above the points supporting the workpiece so as to avoid distortion and springing of work, which otherwise will result in an inaccurate work. Moreover, the clamps should be strong enough to resist bending under clamping pressure.

5. Construction and Working:

This fixture has six parts which are assembled with the help of screw joints and weld. The parts are,

- Fixed jaw
- Moving jaw
- Base plate
- Guided block
- screw spindle
- Handle

5.1 Working Principle:

This fixture arrangement has two serrated jaws of which one is fixed jaw and another one is movable jaw in which the cylindrical workpiece is held between this jaws securely. The cylindrical job which is to be held at shaping machine can be made with the help of operating the movable jaw by means

of handle. When we have to load a job at the center of V block in between the two jaw and the total unit can be made opened to admit the cylindrical rod of certain height.

After loading the cylindrical work piece the shaping operation was carried out and after completion of our work , the job was reloaded by rotating the handle in anticlockwise direction . By this the movable jaw can be moved away from the work piece. Then the work piece was removed from the fixture.

6. Advantages and Applications

6.1 Advantage:

- Having more gripping power in gripping circular and cylindrical rod .
- It is mainly very useful to hold the lengthy circular rod in particular position.
- It's operated and maintenance is simple.
- It can be assembled in both horizontal and vertical position.
- It is compact and portable.
- It can be efficiently used.
- It is simple and rigid in construction.
- Manufacturing cost in lesser than other vice.

Productivity:

Fixtures increase the productivity by eliminating the individual marking positioning and frequent checking. The operation tike is also reduced due to increase in speed feed and depth of cut because of high clamping rigidity.

Interchangeability and Quality:

Fixtures facilitate the production of articles in large quantities with high degree if accuracy, uniform or semi quality and interchangeability at a competitive cost.

6.2 Application:

This fixture is mainly used in production field for clamping the cylindrical rod firmly and securely to perform operations such as shaping and various processes.

This device find place in.

- It is used almost in all types if industries (Large, Small & medium scale industries).
- This fixture is mainly used in manufacturing - oriented industries.
- This device is suitable to hold cylindrical rod of any diameter (maximum diameter of2 inches or 60mm)

7. Design for Screw Clamp

Size of the screw rod = M24

Pitch =3mm (P.S.G. pg:5.42)

Tensile stress (Ft) =310 N/mm*mm

For coarse thread dc =0.84*d

=0.84*24

dc=20.16mm

Stress area =3.14/4((d2+d3)/2)2

=397.40mm*mm

Initial tension in bolt P1=2860*d

=2860*24

=68640N

But this,P1 =3.14/4*dc*dc*ft

Tensile stress, ft =P1/(3.14/4*dc*dc)

=68640/((3.14/4)*20.16*20.16)

ft =215.03N/mm*mm

ft<[ft]

Therefore, the design is safe.

8. Analyzing Of Clamping Force For Screw Clamping:

Formula:

$$F_s = F_n * L / R * TAN (\varphi + \Theta)$$

Where,

F_s = force developed in screw

F_n = pull (or) push applied to handle .

R = Pitch radius of screw thread .

Θ = helix angle of thread

Φ = friction angle of thread

L = length of handle

8.1 Design of Clamping Force:

For our shaping fixture we considered:

push applied to handle (F_n) =1000 N

Pitch radius (R) = 10.212 mm (from P.S.G pg: 5.58)

helix angle of thread Θ = 60

friction angle of thread Φ = 17

length of handle L = 60 mm

Force developed in screw :

$F_s = F_n * L / R * TAN (\varphi + \Theta)$

F_s = 900 *60 /10.212*tan (17 + 60)

F_s = 1220.8 N

9. Line diagram

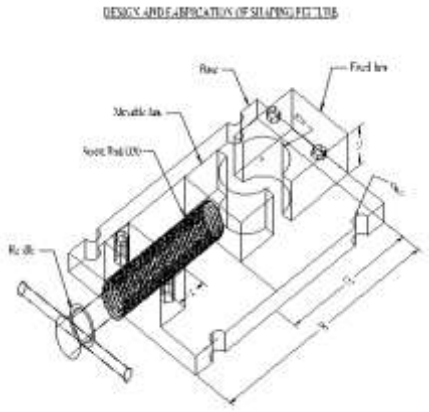

Figure:1 Line diagram

10. Conclusion

This report details with design and fabrication of shaping fixture and is attached with part drawing .The project carried out by us made an impressing task in the shaping works of cylindrical work piece .It is very useful for the labors to clamp cylindrical work piece of required length to perform the shaping operations to be carried out .This project has been designed to perform the entire requirement task , which has also been provided.

Reference

1. Hywel Murrell,1982,"Ergonomics Man in his working
    i. Environment" Chapman and Hall
2. Mustafa pulat,1992,"Fundamentals of Industrial Ergonomics",prentice
    i. Hall Inc.,
3. Design data by P.S.G COLLEGE OF TECHNOLOGY,1968,
    i. Kalaikathur Achagam
4. T.V.Sundararaja Moorthy, N.Shanmugam, 1972, "Machine Design"
    i. M.Sethuraman, Anuradha Agencies
5. Jigs and fixtures by P.H. Joshi
6. Machine tools by S.K.Hajra Choudry