

Tacking fixture, Relation Gauge & Drill jig for 334/D9622 M/c sway

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ABSTRACT

In machining fixtures, minimizing workpiece deformation due to clamping and cutting forces is essential to maintain the machining accuracy. Fixture is required in various industries according to their application. This can be achieved by selecting the optimal location of fixturing elements such as locators and clamps. The fixture set up for component is done manually. For that more cycle time required for loading and unloading the material. So, there is need to develop system which can help in improving productivity and time. Fixtures reduce operation time and increases productivity and high quality of operation is possible.

I. INTRODUCTION

Jigs or templates have been known long before the industrial age. There are many types of jigs, and each one is custom-tailored to do a specific job. Many jigs are created because there is a necessity to do so by the tradesman. Some are made to increase productivity through consistency, to do repetitive activities or to do a job more precisely. Jigs may be well made for frequent use or may be improvised from scrap for a single project, depending on the task. Some types of jigs are also called as a templates or guides. Jigs include machining jigs, woodworking jigs (e.g. tapering jig), welders' jigs, jeweler's jigs, and many others. A jig's primary purpose is to provide repeatability accuracy, and interchangeability in the manufacturing of products. A jig is often confused with a fixture; a fixture holds the work in a fixed location. A device that does both functions (holding the work and guiding a tool) is called a jig.

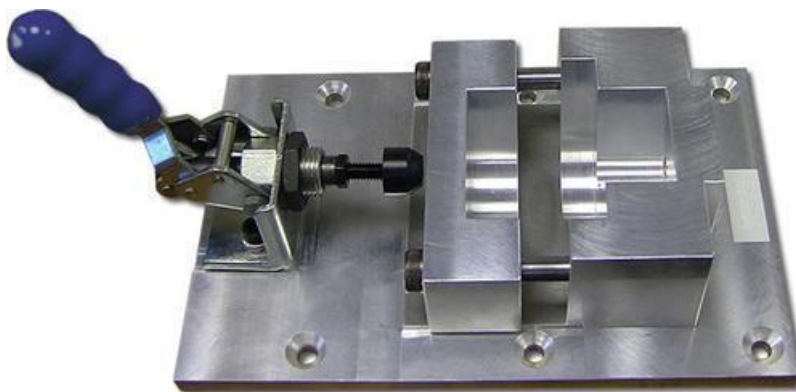


Fig. 1: Machining Fixture

II.LITERATURE REVIEW

- **A.S.Udgave et.al.** In this paper author studies and tries to study attachments for the radial drilling machine to make it special purpose machine. This will increase productivity and also reduces time. In this paper work is done on the currently going on job as well as it includes industrial case study. Multispindle head is developed to drill two holes simultaneously in one setting only. Two spindles are driven by a single motor with mechanism of changing speed. Different mechanism is given to the table and spindle head to adjust according to work piece. Also this paper gives information about types of multi spindle drilling head.[1]
- **Shailesh S. Pachbhai et.al.** The efficiency and reliability of the fixture design has enhanced by the system and the result of the fixture design has made more reasonable. To reduce cycle time required for loading and unloading of part, this approach is useful. If modern CAE, CAD are used in designing the systems then significant improvement can be assured. To fulfill the multifunctional and high performance fixturing requirements optimum design approach can be used to provide comprehensive analyses and determine an overall optimal design. Fixture layout and dynamic clamping forces optimization method based on optimal fixture layout could minimize the deformation and uniform the deformation most effectively industry.[2]
- **V. R. Basha et.al.** Traditionally, fixture design is a manual process and demands an expert's Knowledge and skilled engineering. . In this paper, a literature survey of fixture design and automation over the past decade is proposed with the introduction on the fixture applications inand the significant works done in the design field, including their approaches, requirements and working principles are discussed. Finally, some prospective research trends are also discussed.[3]

III.PRINCIPLE OF FIXTURE DESIGN

The basic principle used is in fixture design i.e. 3-2-1 principle. It has consideration that should be taken into account

- It represents the minimum requirement for the locating element.
- The locators along with clamps which hold the part in place, provides equilibrium for all the forces.
- Do not inecessarily guarantee stability during machining.
- Stability is satisfactory if three rest buttons are widely spaced and resultant cutting force hits within the triangular area between the buttons.
- If resultant cutting force hits outside the triangular area then it generates a moment which tends to tilt or overturn the part.

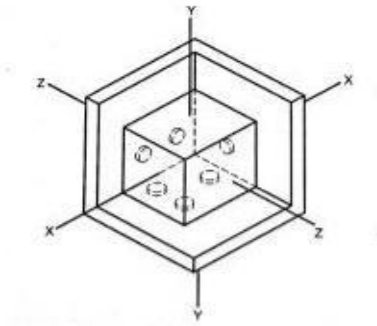


Fig. 2: 3-2-1 Principle

IV.METHODOLOGY

Problem Statement:

The industry faces the following difficulties while manufacturing the job without the use of fixture :-

- More Failure rate.
- Less Production rate.
- Skilled manpower required.
- More time required for manufacturing of each job □ Less dimensional accuracy.

Hence, there arises a need to design jig and fixtures to overcome the above problems.

Steps to be followed while designing jig and fixtures are as below:-

4.1.1 Stage I deals with information gathering and analysis, which includes study of the component which includes the shape of the component, size of the component, geometrical shape required, locating faces and clamping faces. Determination of setup work piece orientation and position

- Determine number of setup.
- Determine the workpiece orientation and position.
- Determine machining datum feature and locating surfaces.

4.1.2 Stage II involves product analysis such as the study of design specifications, process planning, examining the processing equipment's and considering operators safety and ease of use. Determination of clamping and locating position. In this stage all critical dimensions and feasible datum areas are examined in detail and layout of fixture is done.

- Determine locating positions.
- Determine clamping surfaces.
- Determine clamping positions.

4.1.3 Stage III involves design of fixture elements such as structure of the fixture body frame, locators, base plate, clamping and tool guiding arrangement.

- Generate base plate design .
- Generate location design.

- Generate clamping unit design.

4.1.4 Stage IV deals with final design and verification, assembly of the fixture elements, evaluation of the design, incorporating the design changes if any required and completion of design.

- Perform location Accuracy verification. □ Perform Cost, Weight Verification.

4.22D Drafting Of Fixture

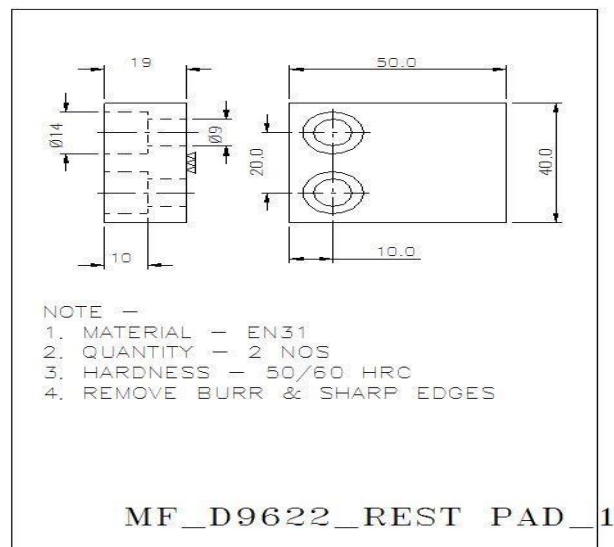


Fig. 3: Rest Pad 1

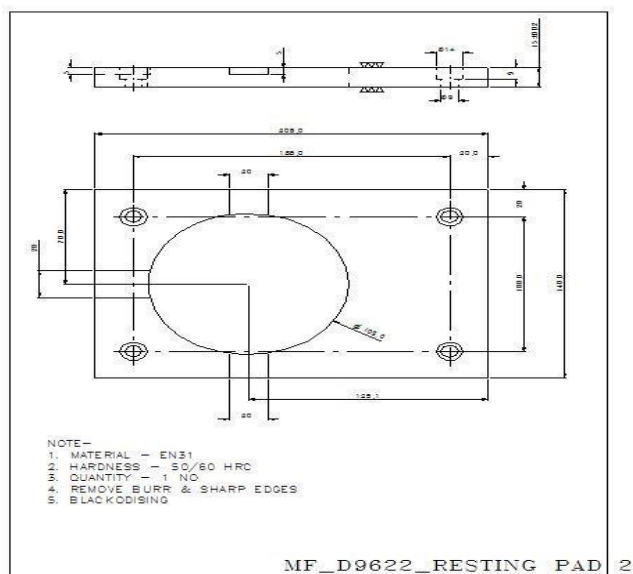


Fig. 4: Rest Pad 2

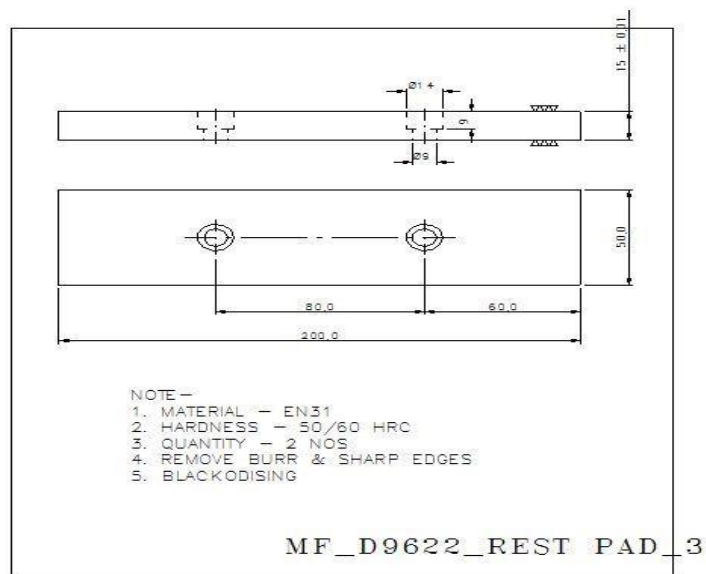


Fig. 5: Rest Pad 3

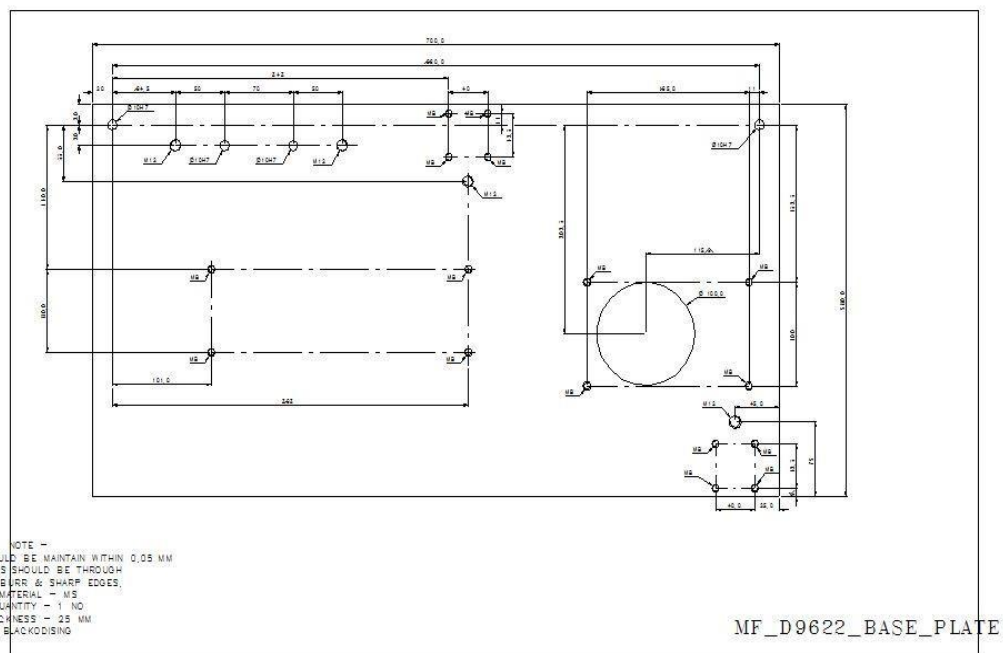


Fig 6: Base Plate

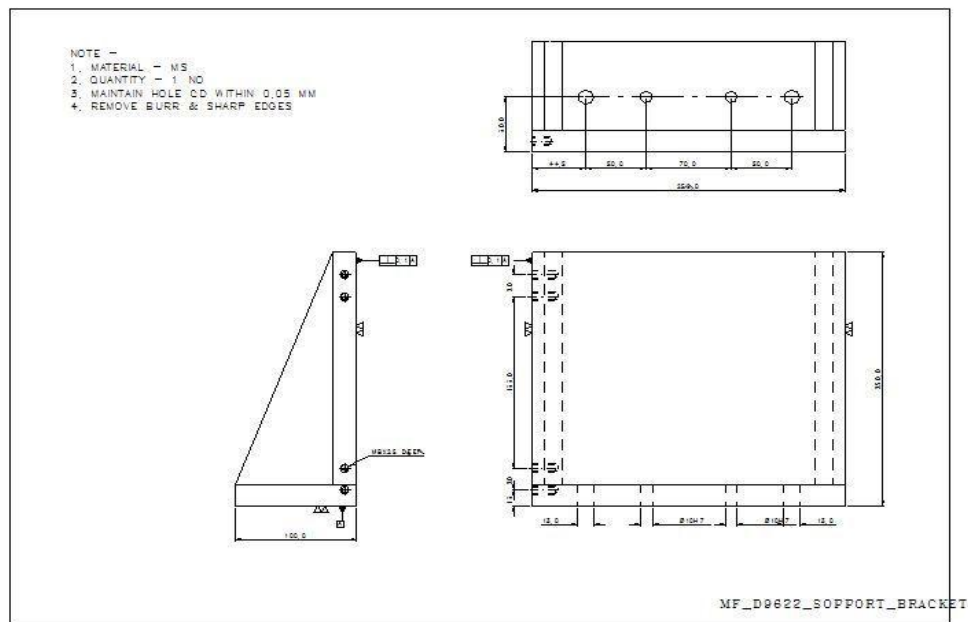


Fig. 7: Support Bracket

4.3 3D View of Machining Fixture

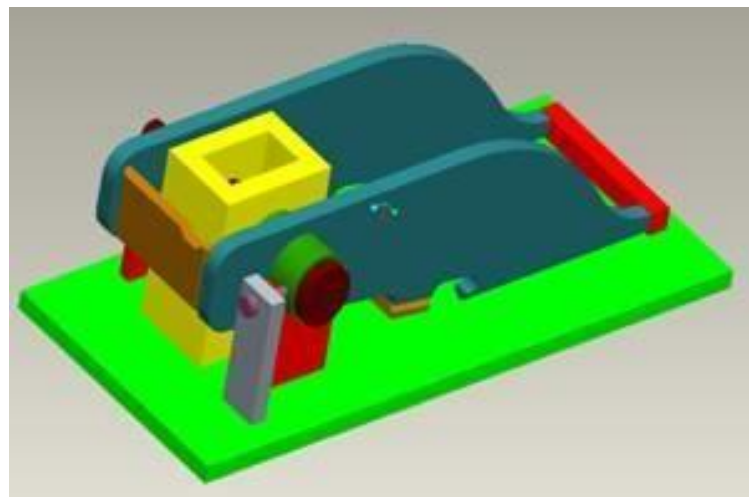


Fig. 8: 3D View of Fixture

V.PROBLEMS FACED AFTER MANUFACTURING OF FIXTURE

- There is a deflection in concentricity between aaxis of job annd bore axis of machining fixture.
- Vibrations were not completely eliminated.
- Difficult to maintain the distance between the two plates (RH plate and LH plate). □ Difficult to maitain distance between two boss.

VI.OVERCOMING OF PROBLEMS

- Problem analysis and redesign of fixture.
- Rest pad was added between two existing rest pads, increase in number of clamps.
- To maintain the distance between two plates, hydraulic clamps were introduced.
- To overcome the difficulty in maintaining distance between two boss, we designed of that spacing.

VII.RESULTS AND DISCUSSION

Table No.1.Time required for every operations

Sr. No.	Activity	Time(mins.)	
		Without Fixture	With Fixture
1.	Operation:		
	a)Boring	10.35	5.25
	b)Tacking	8.15	4.0
	c)Machining	12.15	6.50
	d)Drilling	6.50	3.15
Total Time		37.15	18.90

Table No.2.Productivity and Failure rate with and without fixture

Sr. No.	Activity	Without Fixture	With Fixture
1.	Productivity	12-15 per day	60-70 per day
2.	Failure Rate	30% in batch of 100	5% in batch of 100

VII.CONCLUSION

Designing of the machining fixture helped to save the time and money during production of part. The time consumed to assemble each component without fixture is very high as compare to using tacking fixture for assembly. Moreover, skilled worker were required to assemble without tacking fixture which was not necessary for with tacking fixture. This tacking fixture is robust to use with less maintenance. Thus in this paper we have design the machining fixture which will help in :

- Increase in Productivity
- Decrease in failure rate
- Decrease in cycle time

REFERENCES

- [1][https://en.m.wikipedia.org/wiki/Jig_\(tool\)](https://en.m.wikipedia.org/wiki/Jig_(tool))
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