Design And Manufacturing Of Welding Fixture

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Abstract- *During manufacturing of air filter of automobiles it is first step to weld fan to main shell of filter at correct position and height from bottom of shell. Previously only single fan is used in filter but in order to reduce entry of dust particles, modification is done and two fans are used one over another to reduce gap between two blades. In this project main aim is to design and manufacture fixture to locate and hold fan in correct position with respect to shell for welding which saves time and improves productivity and accuracy. Also in this project we make use of different design softwares such as creo and autocad for design of fixture. It helps in reduction of production loss and also manufacturing lead time for welding, positioning and holding parts.*

1. INTRODUCTION

The jigs and fixtures are the economical ways to produce a component in mass. So jigs and fixtures are used and serve as one of the most important facility of mass production system. These are special work holding and tool guiding device. Quality of performance largely influenced by quality of jigs and fixtures used for this purpose. What makes a fixture unique is that each one is built to fit a particular part or shape. The main purpose of a fixture is to locate and in the cases hold a work piece during an operation. A jig differs from a fixture in the sense that it guides the tool to its correct position or towards its correct movement during an operation in addition to locating and supporting the work piece.

Fixture has direct impact upon welding quality, productivity and cost. Welding fixtures are used for holding different parts that have to be welded together. Other use of purpose of fixture is to reduce distortion that is generated during welding. It helps in reduction of production loss and also manufacturing lead time for welding, positioning and holding parts.

2. OBJECTIVES OF THIS PROJECT:

1. To weld fan with main shell in correct angle.
2. To weld fan to main shell at correct height from bottom.
3. To check concentricity
4. To check height of lower cylindrical part of shell

3. PRINCIPLES OF JIGS AND FIXTURES DESIGN

1. Reduction of idle time – Should enable easy clamping and unloading such that idle time is minimum.
2. Cleanliness of machining process – Design must be such that not much time is wasted in cleaning of scarfs, burrs, chips etc.
3. Replaceable part or standardization – The locating and supporting surfaces as far as possible should be replaceable, should be standardized so that their interchangeable manufacture is possible.
4. Provision for coolant – Provision should be there so that the tool is cooled and the swarfs and chips are washed away.
5. Hardened surfaces – All locating and supporting surfaces should be hardened materials as far as conditions permit so that they are not quickly worn out and accuracy is retained for a long time.
6. Inserts and pads – Should always be riveted to those faces of the clamps which will come in contact with finished surfaces of the work piece so that they are not spoilt.
7. Fool-proofing – Pins and other devices of simple nature incorporated in such a position that they will always spoil the placement of the component or hinder the fitting of the cutting tool until the latter are in correct position.
8. Economic soundness – Equipment should be economically sound, cost of design and manufacture should be in proportion to the quantity and price of producer.
9. Easy manipulation – It should be as light in weight as possible and easy to handle so that workman is not subjected to fatigue, should be provided with adequate lift aids.
10. Initial location – Should be ensured that work piece is not located on more than 3 points in anyone plane test to avoid rocking, spring loading should be done.
11. Position of clamps – Clamping should occur directly above the points supporting the work piece to avoid distortion and springing.
12. Clearance – Sufficient amount of clearance should be provided around the work so that operator's hands can easily enter the body for placing the work piece and any variations of work can be accommodated.

13. Ejecting devices – Proper ejecting devices should be incorporated in the body to push the work piece out after operation.
14. Rigidity and stability – It should remain perfectly rigid and stable during operation. Provision should be made for proper positioning and rigidly holding the jigs and fixtures.
15. Safety – The design should assure perfect safety of the operator

4. GENERAL RULES FOR FIXTURE DESIGNING

1. Compare the cost of production of work with present tools with the expected cost of production, using the tool to be made and see that the cost of buildings is not in excess of expected gain. Decide upon locating points and outline clamping arrangement.
2. Make all clamping and binding devices as quick acting as possible.
3. Make the jig fool proof.
4. Make some locating points adjustable.
5. Avoid complicated clamping arrangements.
6. Round all corners.
7. Provide handles wherever these will make handling easy.
8. Provide abundant clearance.
9. Provide holes on escapes for chips.
10. Locate clamps so that they will be in best position to resist the pressure of the cutting tool when at work.
11. Place all clamps as nearly as possible opposite some bearing point of the work to avoid springing action.
12. Before using in the shop, test all jigs as soon as made

5. MATERIALS USED FOR FIXTURE

Jigs and Fixtures are made of variety of materials, some of which can be hardened to resist wear.

Materials generally used:

1. High speed Steel: Cutting tools like drills, reamers and milling cutters.
2. Die steels: Used for press tools, contain 1% carbon, 0.5 to 1% ,tungsten and less quantities of silicon and manganese.
3. Carbon steels: Used for standard cutting tools.
4. Collet steels: Spring steels containing 1% carbon, 0.5% ,manganese and less of silicon.
5. Non shrinking tool steels: High carbon or high chromium. Very little distortion during heat treatment. Used widely for fine, intricate press tools.
6. Nickel chrome steels: Used for gears.
7. High tensile steels: Used for fasteners like high tensile screws.
8. Mild steel: Used in most part of Jigs and Fixtures. Cheapest material. Contains less than 0.3% carbon.
9. Cast Iron: Used for odd shapes to some machining and laborious fabrication. CI usage requires a pattern for casting. Contains more than 2% carbon. Has self-lubricating properties. Can withstand vibrations and suitable for base.
10. Nylon and Fiber: Used for soft lining for clamps to damage to work piece due to clamping pressure.
11. Phosphor bronze: Used for nuts as have high tensile strength. Used for nuts of the lead screw.

6. COMPONENT DRAWING

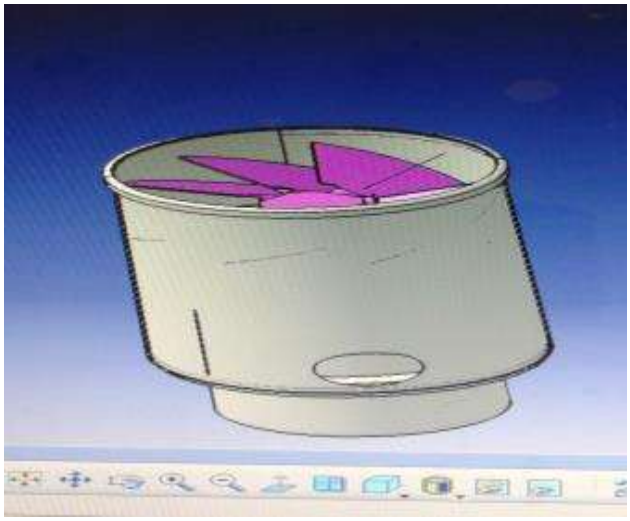

fig. 1: component

7. PARTS TO BE WELDED

Main shell

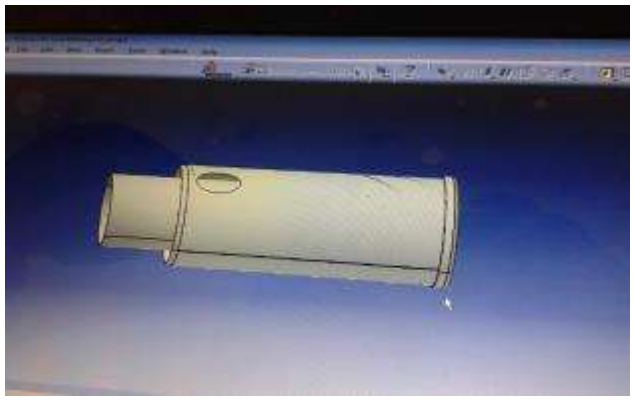

fig. 2: shell

B. Fan

fig.3 Fan

8. FIXTURE CREO MODEL (ASSEMBLY)

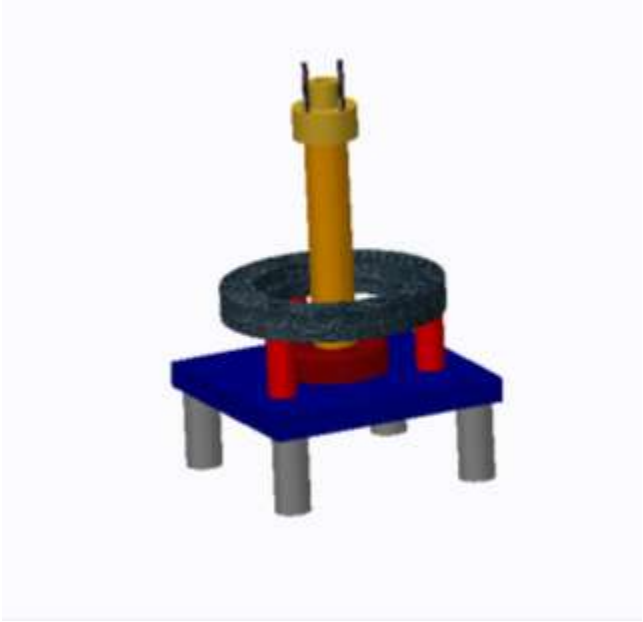

fig. 4 - Fixture assembly

9. ADVANTAGES OF FIXTURES

1. Productivity Jigs and fixtures increase the productivity by eliminating the individual
2. marking, positioning and frequent checking. The operation time is also reduced due to increase in speed, feed and depth of cut because of high clamping rigidity.
3. Interchangeability and quality
   Jigs and fixtures facilitate the production of articles in large quantities with high degree of accuracy, uniform quality and interchangeability at a competitive cost.
4. Skill reduction
   There is no need for skilful setting of work on tool. Jigs and fixtures makes possible to employ unskilled or semi-skilled machine operator to make savings in labour cost.
5. Cost reduction
   Higher production, reduction in scrap, easy assembly and savings in labour cost results in ultimate reduction in unit cost.

10. CONCLUSION

This paper shows the use of fixture for welding fan to main shell of air filter. Due to use of this fixture time of assembly and welding reduces, accuracy and quality increases and hence productivity increases.

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