

A Review on Design and Analysis of Work Holding Fixture

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Abstract—The design of a fixture is a highly complex and intuitive process, which require knowledge. Fixture design plays an important role at the setup planning phase. Proper fixture design is crucial for developing product quality in different terms of accuracy, surface finish and precision of the machined parts. In existing design the fixture set up is done manually, so the aim of this project is to replace with fixture to save time for loading and unloading of component. fixture provides the manufacturer for flexibility in holding forces and to optimize design for machine operation as well as process function ability.

Keywords— Fixture, product Quality, Quick holding ability, Firmly Locating work piece, Improve Accuracy, Save time

INTRODUCTION

Fixtures are the tool used to locate and hold the work piece in position during the manufacturing process. Fixtures are used to hold the parts firmly which are to be machined, it is used to produce the duplicate parts accurately. In order to produce parts with required accuracy and dimensions the parts must be firmly and accurately fixed to the fixtures. To do this, a fixture is designed and built to hold, support and locate the work piece to ensure that each work piece is machined within the specified limits. Set blocks, feeler or thickness gauges are used in the fixture to refer the work piece with the cutter tool.

A fixture should be securely fastened to the table of the machine upon which the work is to be done. Though largely used on milling machines, fixtures are also designed to hold the work for various operations on most of the standard machine tools. Fixtures vary in design based on the use of relatively simple tools to expensive or complicated devices. Fixture helps to simplify metalworking operations performed on special equipments.

The fixture is a special tool for holding a work piece in proper position during manufacturing operation. For supporting and clamping the work piece, device is provided. Frequent checking, positioning, individual marking and non-uniform quality in manufacturing process is eliminated by fixture. This increase productivity and reduce operation time. Fixture is widely used in the industry practical production because of feature and advantages. To locate and immobilize workpieces for machining, inspection, assembly and other operations fixtures are used. A fixture consists of a set of locators and clamps. Locators are used to determine the position and orientation of a workpiece, whereas clamps exert clamping forces so that the workpiece is pressed firmly against locators. Clamping has to be appropriately planned at the stage of machining fixture design.

LITERATURE REVIEW

Chen Luo, LiMinZhu, Han Ding[1] In his paper Two-Sided Quadratic Model for Work piece Fixturing Analysis, 2011 proposed that presents a novel model for work piece positioning analysis. Existing fixturing models may under estimate the positioning error due to neglect of the curvature of one or both contacting bodies.

S. Kashyap W.R. DeVries[2] In their paper Finite element analysis and optimization in fixture, proposed with minimizing deformation of the work piece due to machining loads about fixturing support positions, especially in thin castings.

Y. Zheng & Y. Rong & Z. Hou [3] In their paper, A finite element analysis for stiffness of fixture units, proposed a systematic finite element model to predict the fixture unit stiffness by introducing nonlinear contact elements on the contact surface between fixture components.

M. Y. Dakhole, Prof. P.G. Mehar, Prof. V.N. Mujbaile [4] In their paper, Design And Analysis Of Dedicated Fixture With Chain Conveyor, gives a feasible solution on conventional roller chain conveyorised arrangement with dedicated moving fixture with conveyor for the tractor components like rear axle carrier, bull gear and shaft of a tractor model.

J. C. Trappey and C. R. Liu [5] This paper gives a review of fixture-design research, most of it done in the 1980s. The major topics of the review are the fixturing principals (supporting, locating and clamping), automated fixtures design (configuration, assembly and verification) and fixtures hardware design (dedicated, modular and electric /magnetic type).

Shrikant.V.Peshatwar, L.P Raut [6] This paper presents a fixture design system of eccentric shaft for ginning machine. Fixture is required in various industries according to their application. Designer designs fixture according to dimension required by industry to fulfill our production target. In traditional manufacturing process performing operation on eccentric shaft is critical. So holding a work piece in proper position during a manufacturing operation fixture is very necessary and important. Because the shaft is eccentric so for this requirement of manufacturing process Designer designs proper fixture for eccentric shaft. Fixtures reduce operation time and increase productivity and high quality of operation is possible.

IDENTIFIED GAPS IN THE LITERATURE

In existing design the fixture set up is done manually, so the aim of this project is to replace with fixture to save time for loading and unloading of component. Fixture provides the manufacturer for flexibility in holding forces and to optimize design for machine operation as well as process function ability.

PROBLEM FORMULATION

Workpiece is held in to workpiece holder and this all attachment fix in to the fixture plate. A rigid positioning of the workpiece with least time takes place. Springs are designed such a way to carry the pressure don't allow to deflect the work piece, Cam is used for mounting and un-mounting purpose. Cam is fixed into frames slot. Base plate for rigid support to fixture. Two mesh bull gear are fitted to rotating purpose to take the advantages of rotation and increase the application of fixture. Fixed plate with center attachment is provided to locking purpose. When fixture in use center push in to the fixed plate hole so hole attachment is getting fixed.

This fixture used in vertical milling machine. Different electrode profiles are easily manufactured by using this fixture. Mounting, un-mounting and locating of workpiece is very easy and 1 than this electrode is used on electro discharge machine to manufacture molds. Complicated mold profile are done with this process. Graphite or Cooper material is used to manufacture electrode.

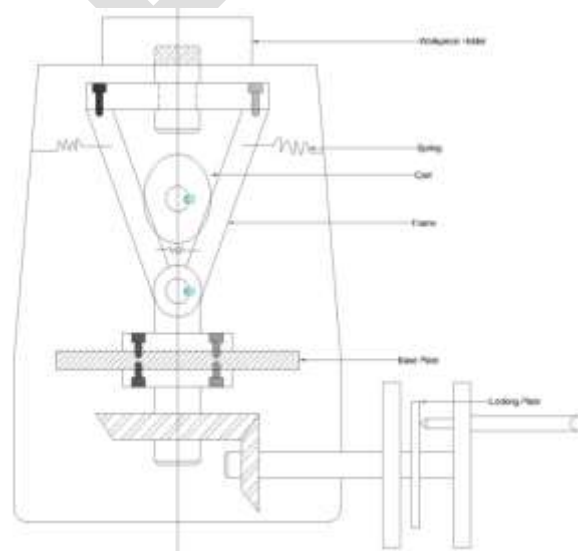


Fig1 Concept design of Work holding Fixture

CONCLUSION

It reduces or sometimes eliminates the efforts of marking, measuring and setting of workpiece on a machine and maintains the accuracy of performance. The workpiece and tool are relatively located at their exact positions before the operation automatically within negligible time. So it reduces product cycle time. Variability of dimension in mass production is very low so manufacturing processes supported by use of jigs and fixtures maintain a consistent quality. Due to low variability in dimension assembly operation becomes easy, low rejection due to less defective production is observed. It reduces the production cycle time so increases production capacity. Simultaneously working by more than one tool on the same workpiece is possible. The operating conditions like speed, feed rate and depth of cut can be set to higher values due to rigidity of clamping of work piece by fixtures. Operators working become comfortable as his efforts in setting the work piece can be eliminated. Semi-skilled operators can be assigned the work so it saves the cost of manpower also. There is no need to examine the quality of produce provided that quality of employed fixtures is ensured

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