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Development of Milling Fixture by Practical and Adaptive Tooling System(Part 2)

—Fixture making System, Fixture components, Fixture Making and Tryout —

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Key Words : Fixture components, Fitting, Tolerance, Loading and unloading

Abstract : *This is the continued paper as part 2 in this study. In order to prevent the production defects, the optimum design of product, fixtures and their making are very significant devision. Especially the result of modelling and its analysis become the characteristics of this paper that nothing might be ever seen before such as this type of research method on all processes.*

1. Introduction

The fixture is a special device that supporting, locating, and clamping are placed on a part to be machined. It is a product tool so made that it not only locates and holds the workpiece but it also guides the milling cutters as the operation is performed. Fixtures are usually fitted with hardened steel set block for guiding cutters or other cutting tools. As a rule small fixtures are not fastened to milling machine table. It is usually necessary to nest or to securely fasten the fixture to milling machine table. In this paper, we designed one of a milling fixtures also production planning performed in part 1 . So, The goal of this paper the accomplishment to optimization of small size milling fixture design and making in practical and adaptive method with theoretical background, database, experiences, AUTO CAD, I-DEAS and WINDOW environment. Continually part 2 of this paper revealed production system, production plan, modelling of fixture and its analysis.

2. Production System

Fig. 1 shows the chart of production system in industrial. The tool design and its making department supports to production line using the product standards,

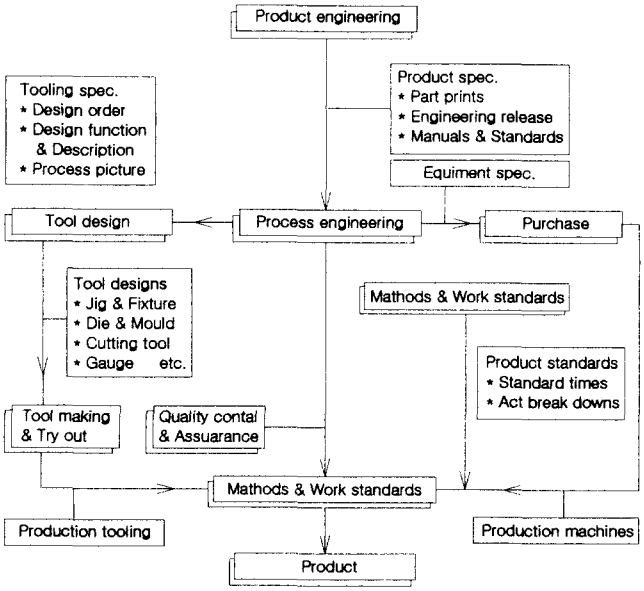


Fig. 1 The chart of production system in industrial

equipment specifications, methods etc. Also, the process engineering devision orders to tool design and making department with product drawing, production plan and especially related standards, anual, purchase information and whole methods of related instructions etc. Therefore we can be known related department of tool design and making department.

Fig. 2 shows the outline of the jig and fixture planning of process. In this figure, we consider the jig and fixture development through the many kinds of influence factors. Among these influencing factors, the cost analysis and evaluation is critical event factor.[1~3]

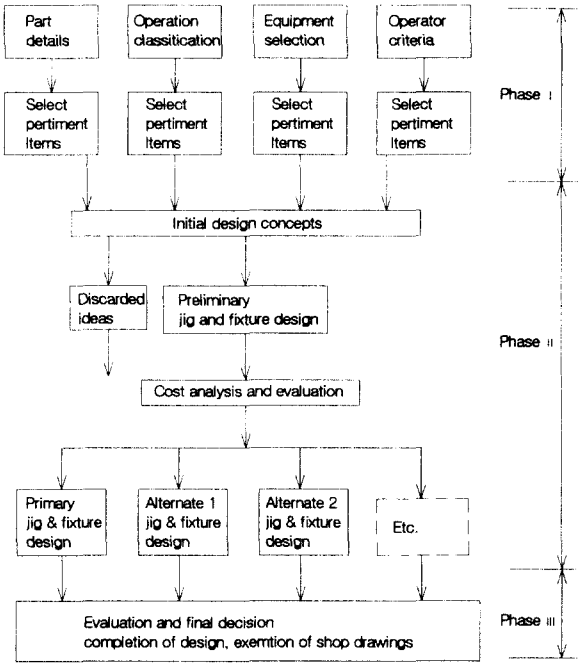


Fig. 2 Outline of the jig and fixture planning of process

2.1 Fixture making system

Fig, 3 shows the experimental production part drawing. According to this part drawing, we made production plan as Fig. 4. In Fig. 4, this study's milling fixture operation is performed at the operation number. Fig. 5 shows the components drawing of designed experimental milling fixture.

At this time, fitting tolerances are concerned with its performing situation, and then we tried to take higher accurate fitting by field exercise with hand making, experiences and related instructions. (example: H7/h6, H6/h5, H7/m6, H6/m5, H7/m5, H6/n5, H7/p6, H7/p5 etc.)

In this study, we decided the size of locator and set block depended on data base, theoretical back ground and our own field experiences. The machining of locator and bushing can belong to the precision machine tool working, continually raw material cutting, milling, turning, drilling, profiling and then heat treating, jig grinding, especially, CNC machining and mirror machining. On the accuracy of each fitting components, the first factor is set block and locator's fitting tolerance H7, H6, H5(hole) and m6, m5, m4, n6, n5, n4,p6, p5, p4(shaft)for a tight fitting with a minor interference. The second factor is whole of hinges pin's fitting tolerance as a minor allowance for slide fitting tolerance H7, H6, H5(hole) h6, h5, h4(shaft).

These fitting tolerances are very careful factors for fixture making that the cause is whole fixture assembling method must be within accurate central and parallel activities for production part tolerance.[4~7]

PRODUCTION PLAN			
Part No.	Part name : Precision component		
Operation No.	Description	Department	Machine tool
1	Cut off-t×D_1	#○○ Cut off room	Abrasive cut off saw #○○-○○
2	Turning and face cutting	#○○ Lathe room	Lathe #○○-○○
3	Drill-ØD_2	#○○ Drilling room	#○○-○○ Drill press
4	Milling cutter ○×○	#○○ Milling machine room	#○○-○○ Milling machine
5	Deburr	#○○ Deburring room	#○○-○○ Tumbler
6	Inspection of visual and dimension	Finishing	#○○-○○ Fine instruments and gauges
Operation No.	Tool description	Size	Spec. Tool
1	Cut off wheel	○×○×○mm	None
2	Turning tools	○×○×○	None
3	Drill	2-ØD_2	#J-○○○-1 Jig
4	Cutter	○×○×○	#F-○○○1
5	Gauge	○×○	#G-○○○-1

Fig. 4 Production plan

3. Consideration of modelling

Fig. 6 shows the result of modelling by I-DEAS for experimental production part. Also we checked every dimension of production part with tolerance control. We could find the milling fixture assembling function was minimized supposed minimized problems about the loading and unloading.

This problem was improved into the passing zone by trouble shooting of fixture component's repair and our own experiences. Furthermore, the production part from tryout was so fine into the production part tolerances.

Fig. 7 shows the fixture assembling and production part modeling.

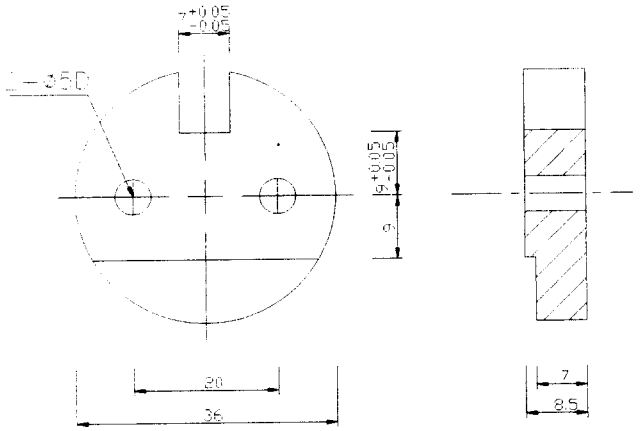
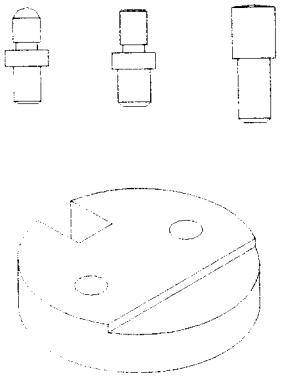


Fig. 5 Production Part Drawing



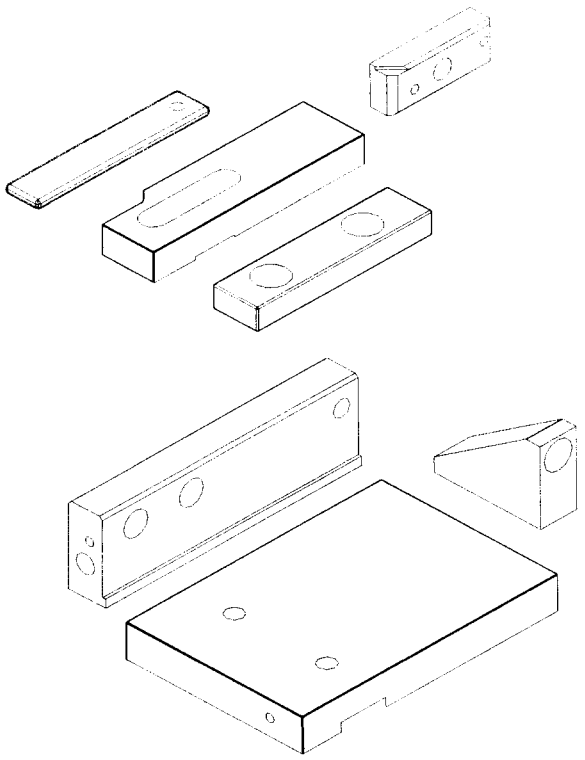


Fig. 6 Fixture Components and Production part modelling

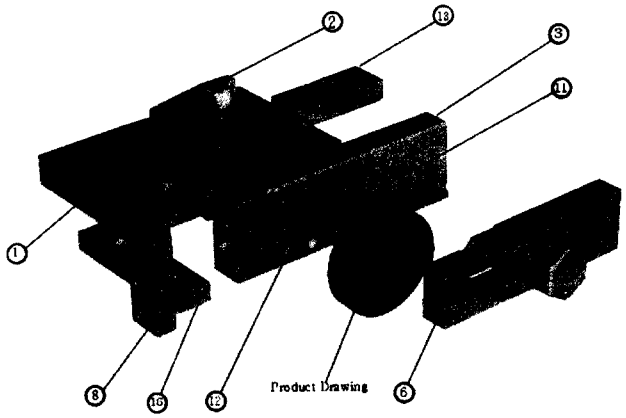


Fig. 7 Fixture assembling and Production Part modelling

4. Conclusion

In order to prevent the defect of fixture design and making, this study developed the practical and adaptive milling fixture and performed tryout and checked experimental production part result. This study could be carried out by the theoretical back ground, data base and our own field experiences. The results of study are as follows

1. The production part could be reviewed in adaptable tolerance to field application for assembling function on modelling.

2. The structure of milling fixture could be accomplished to field by database and author's experience.

3. The tryout of milling fixture could be checked on the site of structure, assembling function and outer-view by modelling.

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