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"DESIGN AND DEVELOPMENT OF MODIFIED BROACH TOOL"

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Abstract - Broaching is very common manufacturing process for the machining of internal and external complex shapes with high finishing. They are used for making keyway internal gears etc. It is hard to make variety of cuts with same tool so it is considered costly to work with different varieties of broach tool. Also one tool usually does one type of job and is hard to use it for other jobs. Also one tool can cut limited depth of cut, and is difficult for large depth of cut in single pass. To eliminate the limitations of normal broach tool and to get different cuts with same tool, by modifying in design of broach tool using it for variety of cut.

***Key Words*:** Broaching, Tool, Design, Modification, Improvement in Broach.

1. INTRODUCTION

Broaching is very common manufacturing process for the machining of internal and external complex shapes with high finishing. They are used for making keyway internal gears etc. It is hard to make variety of cuts with same tool so it is considered costly to work with different varieties of broach tool. Also one tool usually does one type of job and is hard to use it for other jobs. Also one tool can cut limited depth of cut, and is difficult for large depth of cut in single pass.

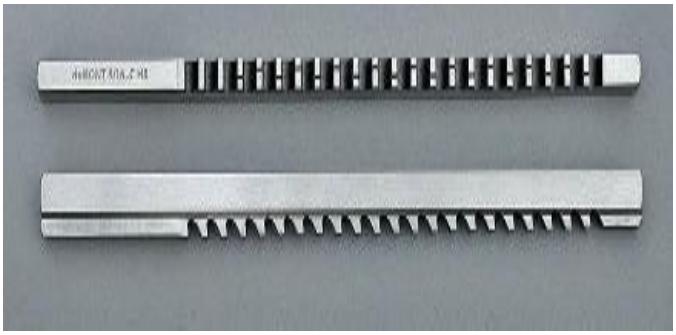

Fig -1: keyway broach tool

2. Methodology

Nowadays for conventional broach tool used in industries it is hard to get different types of cuts. Our modified broach tool consists of some parts such that by fixing one end of tool and allowing the tool to move in such a way to get desirable cuts.

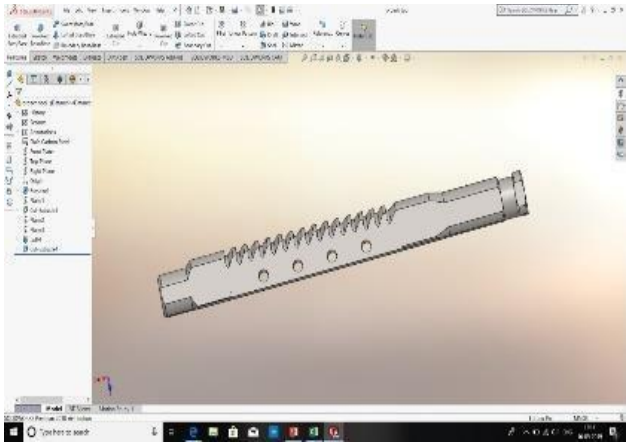

Fig -2: Modified broach tool 1

Spacer is provided at base so as to provide strength and preventing it from damage. Unlike normal broach tool providing movement to our tool for obtaining different types of depth of cut. Besides conventional tool our tool is flexible enough for different depth of cut in same tool.

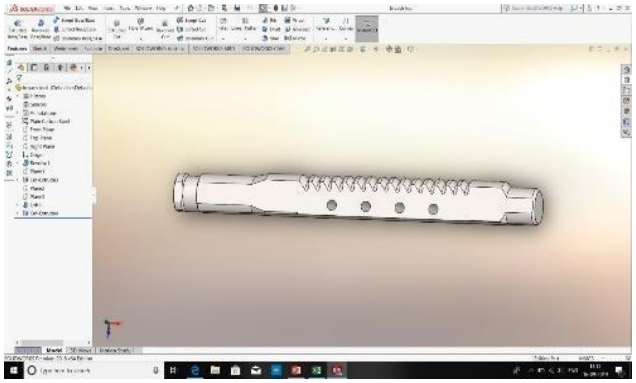

Fig -3: Modified broach tool 2

Our modified broach tool consists of some parts such that by fixing one end of tool and allowing the tool to move in such a way to get desirable cuts. Spacer is provided at base so as to provide strength and preventing it from damage.

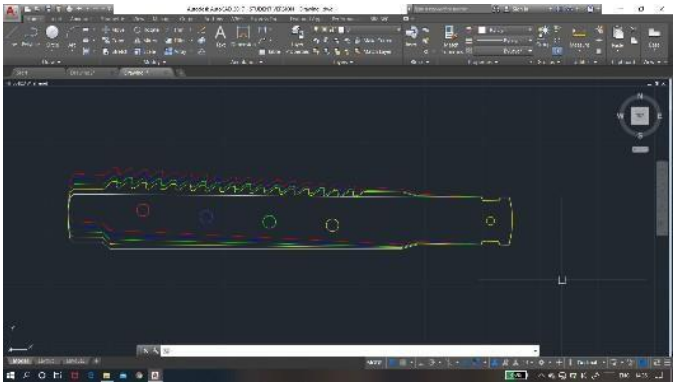

Fig -4: Modified broach tool 3

As we progressed in design, we faced some difficulties in design and decided to upgrade our basic design. So we punched holes in tool to fix the depth of cut. One pin is there for fixing the depth of cut. By changing position of the pin we can increase or decrease the depth of cut.

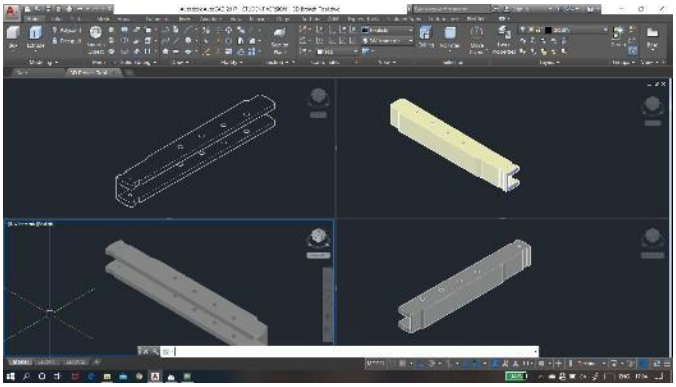

Fig -5: Modified broach tool 4

3. Parameter calculation

Initial reference angle =0
Initial depth of cut (D) =11.5 mm
Fixed length of tool = 132 mm
Increase depth of cut 2 mm

1. First hole
Depth of cut D1= D+ 2mm
D1= 13.5 mm
Increased angle = $\tan^{-1}$(11.5+2/132)
= 5.82°

2. Second hole
Depth of cut D2 =D1 + 2 mm
=13.5 + 2
=15.5 mm
Angle θ_2 = $\tan^{-1}$(15.5/132)
=6.69°

3. Third hole
Depth of cut D3 = D2 + 2mm
= 15.5 + 2
=17.5 mm
Angle θ3 = tan-1(17.5/132)
= 7.54°

4. Fourth hole
Depth of cut D4 = D3 + 2mm
=17.5 + 2
=19.5 mm
Angle θ4 = tan-1(19.5/132)
=8.40°

4. Iterations and optimization of process parameters

Hole	1st	2nd	3rd	4th
Angle	5.82	6.69	7.54	8.40
Depth of cut	13.5	15.5	17.5	19.5

Table -1: Process Parameters

5. Specimen development

Broach size	Tool	Broach Total Length	Keyway Depth	Shims	No. Of Cuts	Length Of Cut In Steel 50 (Min And Max)	Max Pressure
5 mm-C	JS9	299 mm		1	2	10-64 mm	666 kg
6 mm-C	JS9	299 mm	2,80 mm	1	2	10-64 mm	952 kg
7 mm-C	JS9	299 mm		1	2	10-64 mm	1315 kg
8 mm-C	JS9	299 mm	3,30 mm	2	3	10-64 mm	1669 kg
10 mm-D	JS9	299 mm	3,30 mm	2	3	25-150 mm	2948 kg

Table -2: Standard Keyway Broches Metric Sizes

6. Cost calculation of manufacturing

Sr. no.	Description	Amount (Rs)
1	Design related	3000
2	Material	10000
3	Fabrication	17000
4	Miscellaneous	15000
Total		45000

Table -3: Cost Estimation

7. Conclusion

To eliminate the limitations of normal broach tool and get different cut with single tool through modification of broach tool design.

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