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MAKING THE ROTARY TABLE LOCK OF SCHAUBLIN 13 MILLING MACHINE

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ABSTRACT

The milling machine in the workshop of Bandung Manufacturing Polytechnic works not too optimally in the process of the incision. This is due to the disappearance of two rotary table lock milling machine which makes the cutting process less than perfect. This study attempts to make a rotary table lock milling machines schaublin 13. The stages in this study are the study of literature, making work drawings, preparing tools and materials, and execution. Data obtained in the process of making the rotary table lock was analyzed qualitative descriptive. The results of this study are (1) there are several parameters that must be considered such as spindle rotation, feeding motion, and depth of cut, (2) the milling process must be carried out in accordance with the procedure to ensure the operator and engine safety, (3) the milling process must be carried out carefully so that the workpiece can match to the work drawings. Perseverance in the milling process is needed for maximum results

Keywords: rotary table lock, schaublin 13 milling machine

INTRODUCTION

Large-scale industry aims to produce workpieces in various types and quality standards set. The standard quality of results is determined by the machine and by humans as work equipment and the operator of the engine operation. (A. Efendi; D, 2019) Machinery, people, and safety are important industrial factors. The machine often used in engineering processes is a milling machine. The milling machine can do all the execution machine tools such as peg hole work, angle cutting, gear cutting, and flat fieldwork (Zen, 2017). According to (Susila, Risano, & Hertanto, 2016) the milling machine process is most often used to make a complex profile or trajectory component, so high accuracy is needed in this process.

In general, the milling machine is classified into four types. First, the horizontal milling machine. This milling machine has a nose spindle that is mounted horizontally. This machine can do movements in three directions; in the form of transverse, longitudinal, and vertical.

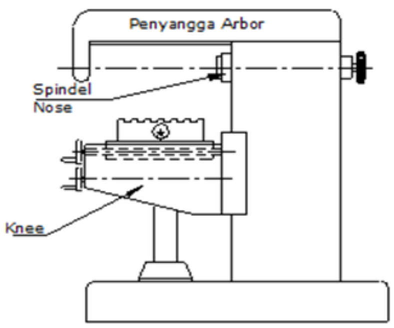

Figure 1. Horizontal Milling Machine

Second, the vertical milling machine. This is a production milling machine with spindles mounted vertically on the machine head. The head of this machine can be fixed type, movable type, or tilted type. While the machine table can be bed type or knee type.

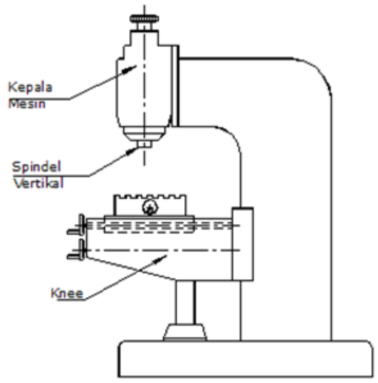

Figure 2. Vertical Milling Machine

Third, the bed-type milling machines. This type of milling machine is able to withstand heavier loads compared to other types of milling machines. This is because the table is placed above a strong stand. This type of table can only be moved in a longitudinal direction while transverse and vertical movements can be carried out by a cutter spindle.

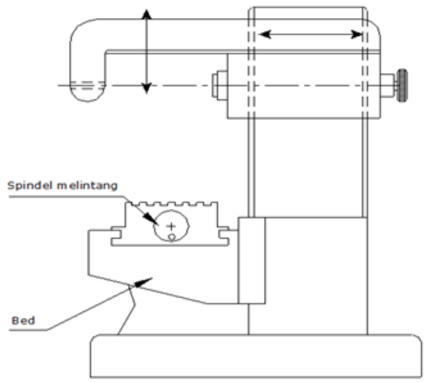

Figure 2. Bed Milling Machine

Fourth, the universal milling machine. It is a combination of types of vertical and horizontal milling machines so that the cut spindles can be arranged transversely or upright as needed. The machine table can be tilted or horizontal. Universal type is a type of milling that is complete and widely used. One of them is used in the manufacturing workshop of Bandung Manufacturing Polytechnic for the learning process.

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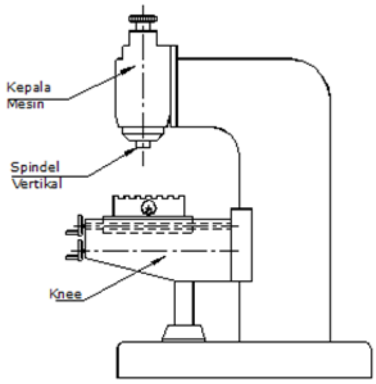

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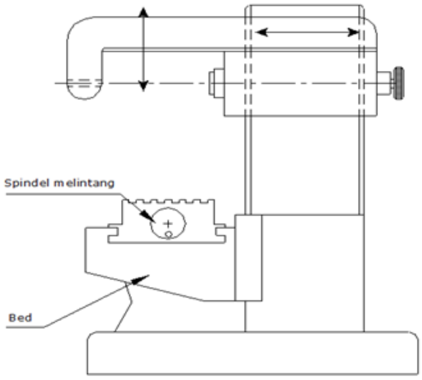

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Figure 4. Universal Milling Machine

According to (Londa, 2016) the milling machine is a machine that moves automatically and has a high level of accuracy. High production capacity in making components can be achieved when the milling machine works briefly and quickly (Suteja, Candra, & Aquarista, 2017). Shortness and speed can be achieved if all the components of the milling machine are installed in good condition. Installation of components that are not good or in disability condition will greatly affect the results of the workpiece obtained later.

The milling process is a very effective process of cutting workpieces because the milling knife has multiple cutting edges. When compared with a lathe knife, the milling knife is analogous to several more efficient lathe blades. The milling process can be classified into three types. The classification is based on incision direction, tool type, and relative position of the tool to the workpiece (Mujiono, 2016).

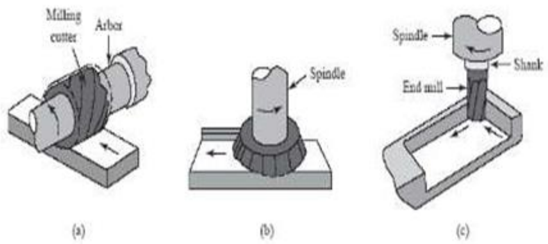


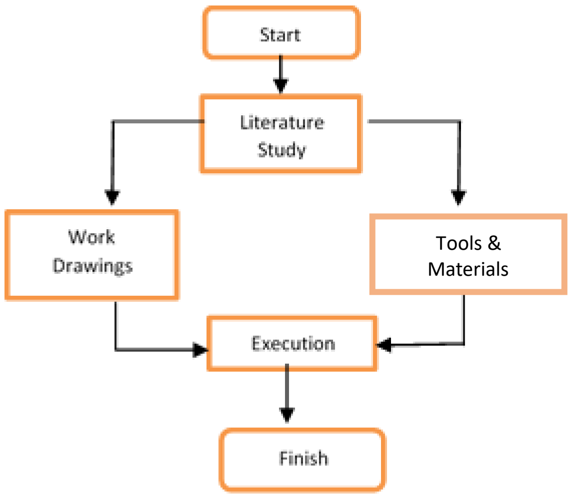
Figure 5. Milling process (a) peripheral milling (b) face milling, (c) finger milling

One component of the workpiece holder in the milling machine is a rotary table. This turntable is placed on the table of the milling machine, then the vise or triple jaw can be placed on top of it. With the help of this turntable, the processing of the workpiece fields can be faster because to cut the sides of the workpiece does not need to remove the workpiece, simply rotate the turntable handle with the desired angle. In addition, this rotary table can be made in a circular shape, either a full circle of 360^0 or less than 360^0.

Based on the observation results of the research team, the milling machine in the workshop of Bandung Manufacturing Polytechnic works not too optimally in the process of the incision. This is due to the disappearance of two rotary table lock milling machine which makes the cutting process less than perfect. The angle on the rotary table can change by itself if it is not locked. The pressure received by the rotary table can rotate the rotary table, which makes the workpiece being processed will be damaged.

Research method

The process of data collection in this study was conducted at the Polytechnic Manufacturing Bandung for three months. Data were analyzed by descriptive qualitative. Stages of the research is as follows:



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Results and Discussion

Tools and Materials

1. Milling machine
2. Vernier Caliver
3. Brush
4. Cut Saw
5. Height gauge
6. Markers
7. Hammer
8. Endmill Cutter Ø16
9. Drill Bit Ø6
10. Center Pin
11. Counterbore Drill M6
12. VCN with dimensions of 70x20x20 mm
13. Coolant
14. Dust Cloth

Work Drawings

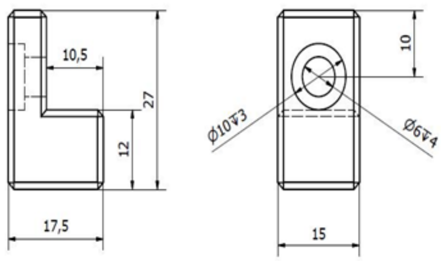

Figure 7. Table Lock Work Drawings

Work Steps

This process is the process of preparing all forms of materials and workpieces to be used such as a vise, measuring instruments, work objects, and work safety equipment.

After the tools and materials are ready, set the engine rotation speed (n) using the formula:

$$n = \frac{vc.1000}{\pi.d}$$

a. n when leveling the surface with an Endmill Ø16

Keterangan :

n = Kecepatan spindle (rpm)
Vc = 18 mm/m
π = 3.14
d = 160 mm

$$n = \frac{vc.1000}{\pi.d}$$

$$n = \frac{18.1000}{3.14 \times 160}$$

$$n = \frac{18000}{502.4}$$

$$n = 35.82$$

b. n when making a hole with a drill bit Ø6

Keterangan :

n = Kecepatan spindle (rpm)
Vc = 18 mm/m
π = 3.14
d = 60 mm

$$n = \frac{vc.1000}{\pi.d}$$

$$n = \frac{18.1000}{3.14 \times 60}$$

$$n = \frac{18000}{188.4}$$

$$n = 95.54$$

c. n when creating a counterbore with drill M6

Keterangan :

n = Kecepatan spindle (rpm)
Vc = 18 mm/m
π = 3.14
d = 100 mm

$$n = \frac{vc.1000}{\pi.d}$$

$$n = \frac{18.1000}{3.14 \times 100}$$

$$n = \frac{18000}{314}$$

$$n = 57{,}32$$

Milling Process

1. Install the cutter on the adapter collet.
2. Install the adapter collet on the milling machine spindle.
3. Attach vise to the table of the milling machine, then tighten it.
4. Complete the vise with the parallel pad to flatten the position of the workpiece.

5. Clamp the workpiece into the vise, and make sure the workpiece is not tilted.
6. Tighten the grip on the workpiece.
7. Pay attention to the conditions around the engine before turning on the engine.
8. Use protective glasses.
9. Look for a zero point, that is by attaching the knife to the workpiece and then turning it on, if it has been cut then the zero points can already be determined.
10. Flatten all sides and make the workpiece dimension 65 x 17.5 x 15 mm

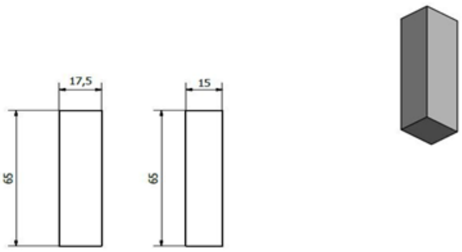

Figure 8. Levelling Dimension

Figure 9. Workpiece Leveling Process

11. Remove the workpiece, then cut it into 2 parts using a hand saw.
12. Install one of the workpieces on the milling vise, and do the cutting to a dimension of 27 x 17.5 x 15 mm

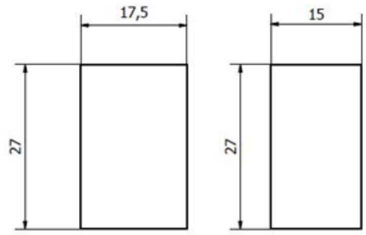

Figure 10. Desired dimensions

13. Do it on the second workpiece.

Figure 11. Cutting and Incision Results

14. Remove the workpiece, give a mark on the point to be punched using height gauge and marker.

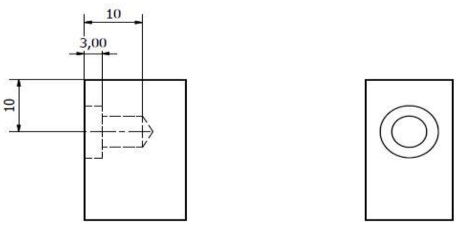

Figure 12. Dimensions of Hole Center Points

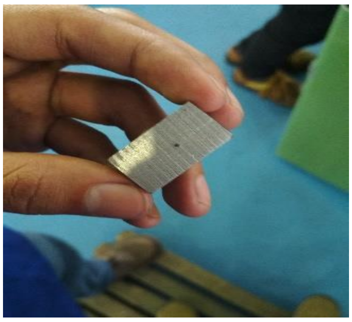

Figure 13. Marked workpieces

Figure 14. Drilling process

15. Remove the cutter on the spindle.
16. Install the center pin on the drill chuck.
17. Install the drill chuck on the spindle.
18. Perform the drilling process as deep as 2 mm at the point that has been marked.
19. Perform the same process on the second workpiece
20. Remove the center pin, and attach the drill bit 6 to the drill chuck.
21. Perform the drilling process as deep as 10 mm.
22. Do the same process on the second workpiece.
23. Remove the drill bit 6 on the drill chuck.
24. Pair the M6 counterbore drill on the drill chuck.
25. Perform the drilling process as deep as 3 mm.
26. Do the same process on the second workpiece.
27. Remove the drill chuck on the spindle.
28. Remove the drill counterbore on the drill chuck.
29. Install the cutter on the adapter collet.
30. Install the adapter collet on the spindle.
31. Perform the engraving process so that the two workpieces are in accordance with the working drawing.

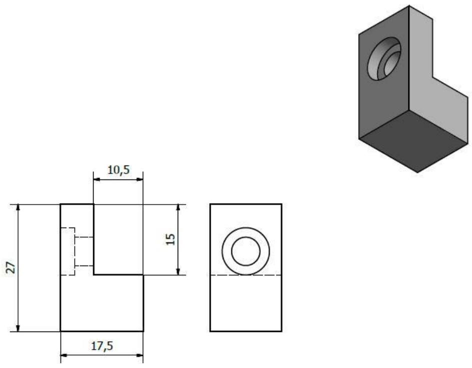

Figure 15. Desired dimensions

Figure 16. Process of Incision

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32. Remove the workpiece. Clean and trim the milling machine.
33. Make a camper on each side of the two workpiece.

Figure 17. Results of scrape

34. Perform the blackening process

Figure 18. Blackening Process

Figure 19. Blackening Process Result

35. Locking assembly and rotary table.

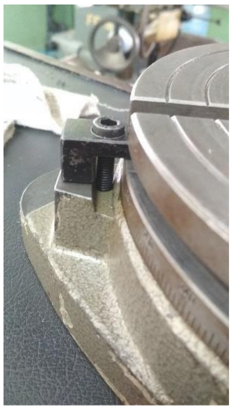

Figure 20. Assembly Process

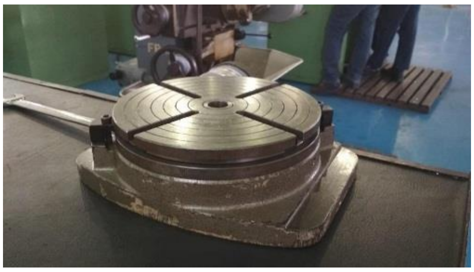

Figure 21. Assembly results

Conclusion

Based on the results of the practicum of making locking rotary table spare parts, several conclusions can be taken:

1. There are several parameters that must be considered such as spindle rotation, feeding motion, and depth of cut.
2. The milling process must be carried out in accordance with the procedure to ensure the safety of the operator and also the engine.
3. The milling process must be carried out carefully so that the workpiece can fit the working picture. Tenacity in the milling process is needed for maximum results.

Acknowledgments

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