

Fabrication of De-Burring Machine for M10 Slotted Nut

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Abstract: -- The aim of this project is to create a machine which is used to remove burrs. A burr is a raised edge or small pieces of material remained attached to a work piece after a modification process. It has a potential to cause injury, in order to prevent such accidents de-burring is necessary. De-burring is important for quality, aesthetics, functionality and smooth operation of working parts.

Keywords:-- De-burring, Burr, Shavings, Filing, Sanding, PLC, Solenoid valve, Hydro feed regulator

I. INTRODUCTION

Metal is frequently machined using many processes in order to create pieces of specific shape and size. For example, metal may be welded, molded, cast, trimmed, slit or sheared. These procedures often create ragged edges or protrusions. The raised particles and shavings that appear when metal blanks are machined are referred to as burrs, and the process by which they are removed is known as de-burring.

A burr is a raised edge or small pieces of material remained attached to a work piece after a modification process. It may be present in the form of a fine wire on the edge of a freshly sharpened tool or as a raised portion on a surface, after being struck a blow from an equally hard or heavy object.

Burr formation in machining accounts for a significant portion of machining costs for manufacturers throughout the world. De-burring is important for quality, aesthetics, functionality and smooth operation of working parts. It is also important for safety. Even a small notch can cause moving parts to catch, creating the potential for accident, injury or unnecessary delay in production.

A. Burr Formation

Due to the slot formation in the nut the metal at the inner side of the work tends to fold which will form the burr at the inner face. This burr is formed before the threading operation.

B. Needs For De-Burring

De-burring is important for quality, aesthetics, functionality and smooth operation of working parts. It is also important for safety.

Even a small notch can cause moving parts to catch, creating the potential for accident, injury or unnecessary delay in production.

Rough edges can also cause injury when individuals are required to handle blanks.

Each of these preventable problems can cost companies a great deal of money.

C. Methods Of De-Burring

Abrasive substances may be applied, or abrasive cloths may be used to rub the metal in order to remove thin shavings and small notches, as well as to polish the piece.

Water under high pressure is forced at the targeted area.

By repetitive filing or use of a grinder to smooth away nicks and fragments.

De-burring can also be done by designing a machine with a de-burring unit.

The most common methods of de-burring are sanding and filing. Sanding may be accomplished with a power sander, or simply by touching up the worst spots by hand. Edges may also be finished with a router.

II. COMPONENTS

2.1 Base

Machine base is used to withstand the weight of the entire machine. Figure 2.1 shows the base.



Fig 2.1



Fig2.2

2.2 Supporting Plates For Guide ways

This is given with an inclination of 35° and it supports the guide plate over which the guide ways for nut is placed. Figure 2.2 shows the supporting plates for guide ways.



Fig 2.3



Fig 2.4

2.3 Supporting Plate for Drill Head

This is given with an inclination of 55° and it supports the guide plate over which the drill head is placed. Figure 2.3 shows the supporting plates for drill head.

2.4 Guide Plate for Drill Head

This is used to support the drilling unit and in turn bolted to the supporting plate. Figure 2.4 shows the guide plate for drill head.



Fig 2.5



Fig 2.6

2.5 Guide Plate for Guide Ways

This is used to support the guide ways which is used to guide the nut. Figure 2.5 shows the guide plate for guide ways.

2.6 Guide Ways

The guide ways are also fabricated based upon the availability. The guide ways is bolted to the guide plate. These are used to guide the nuts and the ways are designed to the size of M10 with some clearance. Figure 2.6 shows the guide ways.

2.7 Mechanical Operations

Milling the base plate.
Brazing the end effecters of the cylinders.
Grinding the extra metal in the end effecters.
Drilling the plates for fastening.



Fig 2.7

III. FABRICATION PROCESS

The machine which is made using a dismantled drill head attachment of a US based machine. The guide ways are also fabricated based upon the availability. The guide ways is

bolted to the guide plate. The pneumatic cylinders are bolted to the guide plate. The guide plate which is used is then attached to the supporting plate with an inclination of 35 degrees for gravity feed of work. The drill head is also attached to its inclined guide base and to then bolted to the supporting base. Four separate cylinders are used to fulfill the sequence of operation out of which two are single acting and two are double acting cylinders.

The single acting cylinders are used for the stopping action and is controlled by a 3/2 DCV. The double acting cylinders are used for tool feeding, separating and for the clamping action and is controlled by a 5/2 DCV. Pencil cylinder is used to control the mechanical actuator switch in the tool cylinder.

3.1 Electrical Phase

Selecting the appropriate motor for the spindle.
 Fixing a DOL starter for the main spindle motor.
 Wiring the solenoid coil for actuation
 PLC.

3.2 PLC

The basic components of a PLC are listed below

a. Power Supply

Provides all the voltage level needed to operate the PLC. Converts 110V ac or 240V ac to the dc voltage required by the CPU, memory, I/O interface

b. Central Processing Unit

Receives information from input interface, process according to the program stored, update the output information.

c. Memory

Memory location is an address in RAM or ROM where a group of bits (binary digits) can be stored.

d. Input Module

To receive and convert field signals from pushbuttons, sensors or switches into a form that can be used by the CPU

e. Output Module

Takes signal from the CPU and translates them into forms that are appropriate to produce control actions by external devices such as indicator lights, solenoids or motor starters.

3.3 Pneumatic Phase

a. Solenoid Operated Valves

A solenoid is a coil with an iron plunger inside it. When current flows in the coil, the plunger becomes magnetized and tries to move out of the coil. If a spring is used to resist the movement, the distance moved is directly proportional to the current in the coil. Solenoids are used in relays where they operate an electric switch.

b. Air Cylinder

Air cylinders are components in a pneumatic or compressed air control or power system.

c. Hydro Speed Regulator:

The regulator will control the forward speed of the spindle to any desired rate. The suitable feed can be set to the work piece.

A constant smooth rate of travel is obtained. The regulator prevents sudden forward surge breakthrough and thus prevents the drill damage. It is a compact and essential unit for precision and maintenance of accuracy, clean finish and long life.

IV. WORKING PRINCIPLE

The burr in the nut has to be de-burred. So the guide ways for the work is machined to satisfy the sequence.

The nut is then dropped in to guide ways and it flows in to the stopper cylinder which is in extended position and prevents the work to be flow down.

Then continuous feeding of the nut is done. The clamping cylinder extends to clamp the work. The separator cylinder extends to separate the penultimate work. The stopper cylinder retracts for effective clamping.

The main spindle extends and the de-burring action is satisfied. The clamping cylinder retracts to release the machined work which gets collected at the collection box.

The stopper cylinder now extends to stop the flow of the work. The separator cylinder retracts and the penultimate work becomes the ultimate one.

V. CONCLUSION

We have fabricated a de-burring machine for the slotted nut of size M10. We planned to have a vibratory bowl for the automatic work feed. In the mere future we will implement the guide ways for different sizes and of adjustable type.

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