

Model of Multipurpose Sheet Metal Processing Machine

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Abstract— Increasing demand for mass production has revived the interest in the use of multipurpose machines for reducing total elapsed time making the industries self-reliance on varieties of products manufactured. Rolling, V-grooving, and Cutting are the most widely used operations in the fabrication industry. Hence these are the operations we are going to club them together to make 3 in 1 m/c. So that total space requirement and maintenance cost of machine decreases.

Key words: Shearing, V- grooving

I. INTRODUCTION

In sheet metal industries operations like V-grooving, Rolling, Shearing are performed on different machines which leads to increase in installation and maintenance cost of the machine. It increases the handling time of a material for different operations, resulting in the loss of time. So for the above mentioned problem we have solution, to bring these machines together and make it multipurpose.

II. METHODOLOGY

A. V- GROOVING:

This process is also known as bending process. For V-grooving we are using Male and Female dies. The male die presses the sheet against the female die with a wedging force, leading in bending of sheet metal in the shape of dies. As the punch descends the contact forces at the die corner produce a sufficiently large bending movement at the punch corner to cause the necessary deformation to maintains to be plane strain the side creep of the part during the bending is prevented or reduce by incorporation a spring loaded knurled pin the part will help to achieve this Plane strain conditions will also be established in the centre of the sheet if it width is more than 10 times its thickness. The bending angle kept in our machine is 40 – 45 degrees. This angle can be obtuse or also at right angle. The bending dies are shown in figure 1.



Fig. 1: V-Grooving dies

B. Shearing:

Shears are relatively simple and durable machines that should provide years of dependable service when properly maintained and adjusted. Blade-alignment, squareness, and alignment of the upper blade assembly are all interrelated and must be correct in order to produces perfect cuts. When a shear starts to yield poor cuts, it is likely that the blades have become dull. They need to be sharpened several times before their use. Hence, to reduce the cost and time of machining we are using rotary blades of 50 mm diameter as it is a small scale prototype. It is shown in figure 2. The force required to shear the metal is maximum, hence the entire machine is designed based on the force acting during shearing operation. The material used for shearing cutters is WPS (War Purpose Steel).

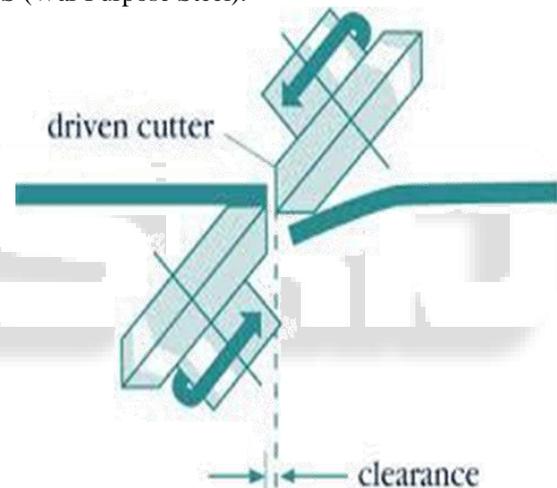


Fig. 2: Shearing Rotary Cutters

C. Denting:

Denting is a Sheet Metal Forming process in which dent on sheet metal is removed; by passing it in between two rollers. The process used in our machine is cold rolling process. In the rolling process the forces acting are of compressive nature and other force which is essential during rolling process is frictional force; which resist the Spring Back action in sheet metal. The denting process can be converted in to shape rolling by adding one more roller at an angle of 120 degrees. The material used for roller is Mild Steel. They are of dia 60 mm integral of 20 mm shaft. This assembly is fitted on housing made of Cast Iron. This entire assembly is known as Rolling Die. This is the main component as the power transmission for other two operations is transmitted via this machine by using gears and chain drive. The rolling die assembly is as shown in figure 3.



Fig. 3: Rolling dies

D. Working Principles:

The power supply to run the multipurpose sheet processing machine is 3 – phase supply. The motor used is three phase induction motor which transmits power of 0.75 HP to the machine. As the torque requirement of our machine is very high. Hence, we installed gear box having reduction ratio of 60. Power is transmitted from motor to gear box, which decreases speed and increases torque.

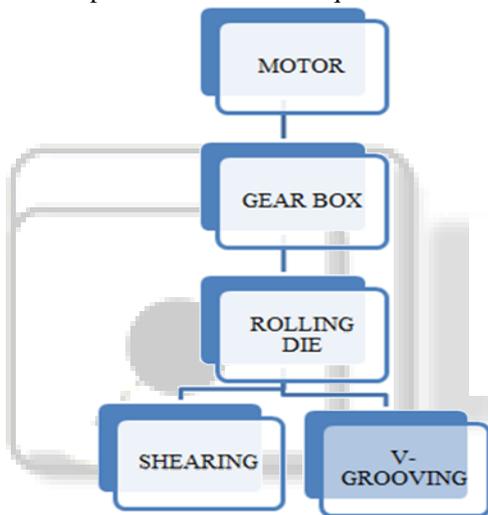


Fig. 4: Block Diagram

Then from gearbox to common shaft of rolling die via chain drive. From common shaft power is transmitted to rollers of rolling die via spur gears. Shaft on which roller is mounted is extended to mount V- groove dies on it. As a result V-grooving process starts. The common shaft also transmits the power to shearing cutters via chain drive having equal sprockets and angle of lap 180 degrees. When we use these machines separately the motor and gearbox required are more in numbers. The actual machine is as shown in figure 5.



Fig. 5: Actual Machine Setup

III. CONCLUSION

Different operations can be combined all together to minimise the actual machining time. As well the maximum shearing is found in shearing operation, and the total amount of energy used for the all operations together on one machine is optimised as compared to the conventional machines separately. For rolling operations better adjustments are effective for increasing load to get required thickness of sheet. So such multipurpose machines are economical and reduces the investment and labour cost.

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