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Advanced Filing Machine

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Abstract- This paper outlines the effective filing process which is done by machine. Filing operation can be used on a wide range of materials as a finishing and burr removing operation. However mostly hand filing is done in industrial fields which is time consuming and not effective as much. Filing is probably very important and most frequent operation in metal work. The filing is done generally by hand with one hand on wood handle and other hand on tip of file. The aim of the present work is reduce human efforts in the filing process by designing the advanced filing machine. There are many problems related to hand filing. So, this paper describes filing process by use of small machine. Prior to the development of modern machining equipment it provided a relatively accurate means for the production of small parts, especially those with flat surfaces. This machine will definitely help in reducing time and human effort in metal as well as wood filing process. Filling machine is in compact size, portable and can be taken anywhere on shop floor. This machine is electrically operated and very easy to handle with one hand. The working model of filling machine is designed in Pro-Engineer software.

Keywords- Metal work, Wood work, Flat surfaces, Conventional filing, Human effort, Portable, Filing machine

1. INTRODUCTION

Filing is a material removing process in manufacturing which can be used on a wide range of materials as a finishing operation. Filing helps to achieve workpiece function by removing some excess material and deburring the surface. Prior to the industrialization of machining and the development of interchangeable parts during the 19th century, filing was much more important in the construction of mechanism [1, 2]. It is a versatile and almost used in every manufacturing process. File come in a wide variety of materials, sizes, shapes, cuts, and tooth configurations. File consists of blade with tang which is fitted in wood handle. These files are of different type and available with different cross section and no. of cut i.e. Single cut and double cut which are sometimes provided with tapers. This conventional filing process is easy but, requires more human effort and much time for different shape of workpiece.

Fig. 1 Hand File

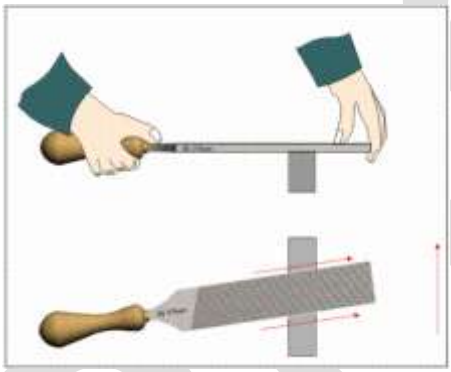

Fig. 2 Conventional filing process

Files come in a wide variety of materials, sizes, shapes, cuts, and tooth configurations. The cross-section of a file can be flat, round, half-round, triangular, square, knife edge or of a more specialized shape.

1.1 TYPES OF FILES

Square files: -These are gradually tapered and cut on all four sides. Used for a wide variety of things.

Three square files: - They are also called triangular files, have a triangular cross-section, which usually are used for many cuts, such as cutting angles less than 90 degrees. They are often employed for sharpening the teeth of wood saws.

Round files: - They are also called rat-tail files, are gradually tapered and are used for many tasks that require a round tool, such as enlarging round holes or cutting a scalloped edge Round parallel files are similar to round files, except that they do not taper. Shaped like a toothed cylinder.

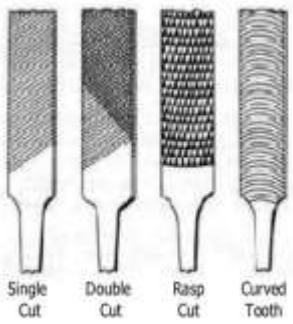

Fig. 3 Types of File

Crossing files: - They are half round on two sides with one side having a larger radius than the other. Tapered in width and thickness. For filing interior curved surfaces. The double radius makes possible filing at the junction of two curved surfaces or a straight and curved surface.

Crochet files: - They are tapered in width and gradually tapered in thickness, with two flats edges, cut all around. Used in filing junctions between flat and curved surface, and slots with rounded edges.

Knife files: - They are tapered in width and thickness, but the knife edge has the same thickness the whole length, with the knife edge having an arc to it. Used for slotting or wedging operations.

Pippin files: - They are tapered in width and thickness, generally of a teardrop cross section and having the edge of a knife file. Used for filing the junction of two curved surfaces and making V-shaped slots.

Equaling files: -They are parallel in width and thickness. Used for filing slots and corners.

Slitting files: - They are parallel in width with a diamond-shaped cross section. Thinner than knife files and use for filing slots.

Nut files: - They are fine, precise files in sets of graduated thickness, used dressing the slots at the end of the neck which support the strings of guitars, violins etc. in the correct position.

Pillar files: - They are parallel in width and tapered in thickness for perfectly flat filing. Double cut top and bottom with both sides safe; these are long, narrow files for precision work.

Warding files: - They are parallel in thickness, tapered in width, and thin. Like a hand or flat file that comes to a point on the end. Used for flat work and slotting.

In today's scenario, to reduce human effort and save time for manufacturing process is of prime importance. Considering the above need, the advanced filing machine is designed which will considerably reduce human effort and time in filing operation. In filing process one hand is kept on handle and another is kept on tip of file. When the surface which to be file is large then it is difficult to file as length of conventional file is limited to 10-15 inch and there is also disturbance due to handle of file [2, 3]. With advanced filing machine surface finishing is to be done with less human efforts and in short span of time. This advanced filing machine is electrically operated and having weight of 2-3.5 kg which can be easily operated by hand. There is an arrangement to replace the traditional hand file, so there is no need to design separate filing tool for this machine.

2. EXPERIMENTAL SETUP AND WORKING

2.1 WORKING PRINCIPLE

This advanced filing machine works on the principle of conversion of rotary motion of spindle into reciprocating motion of piston inside the slider which is shown in following fig.

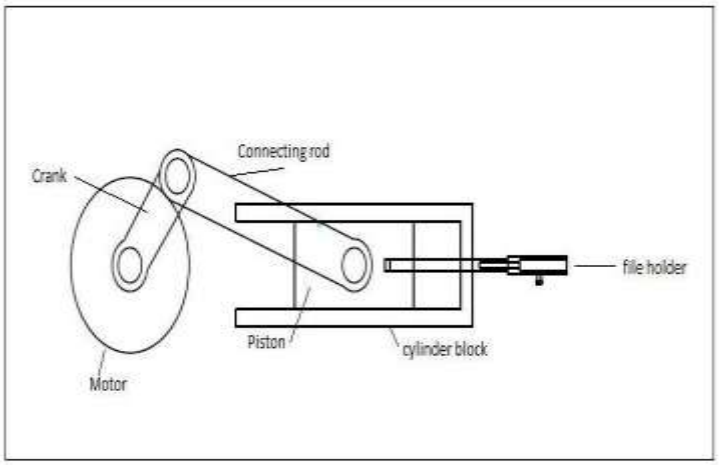

Fig. 4 Working Principle of Advanced Filing Machine

2.2 CONSTRUCTION

This advanced filing machine consists of an electrically operated ac motor and mechanism for conversion of rotary motion of spindle into reciprocating motion of file. The design of machine is simple and compact in size as shown in fig. The mechanism is similar to slider crank mechanism in which rotary motion of mechanism crankshaft converted into the reciprocating motion of piston slider arrangement. The motor is placed at one side of frame and crank is mounted on spindle. Piston and crank is connected by connecting rod with crank pin [4, 5]. The piston is fitted in sliding block by piston pin. The rod is rigidly attached to piston at one side and an arrangement for holding the file is then rigidly attached to this rod at another side. The tapping is also provided with tap screw on the file holding arrangement for fixing file in it. The whole assembly is covered by frame and for easy handling handle is provided as shown in fig.

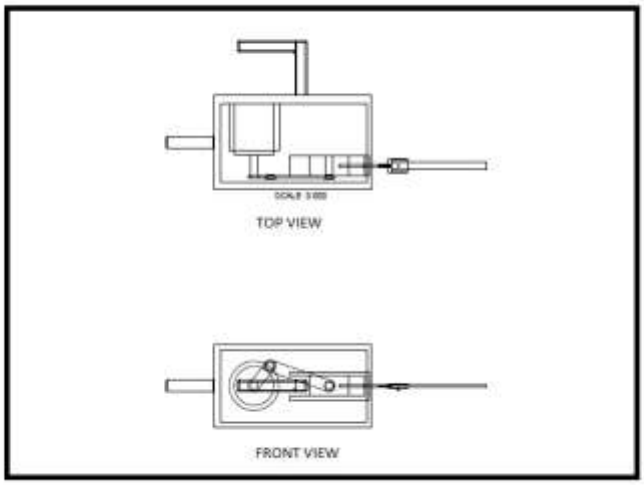

Fig. 5 Front and Top View of Advanced Filing Machine

2.3 WORKING

This advanced filing machine works on the principle of conversion of rotary motion of spindle into reciprocating motion of piston inside the slider. Electrical supply is given to the single phase ac motor and spindle rotates. The crank rotates with spindle and piston

start reciprocating inside the slider [6]. With the movement of piston the rigidly attached arrangement for holding the file also reciprocate horizontally as shown in fig. The file which is fitted inside the arrangement also reciprocates.

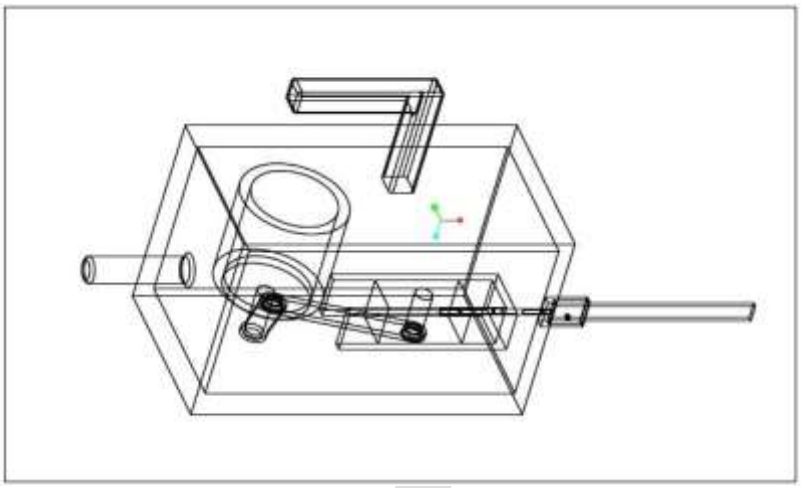

Fig. 6 Advanced Filing Machine (3-D view)

Fit the handle of the file in holder. Ensure that the file is fitted properly. Place the middle of the face of the file on the surface of job. The first stroke should be started with light pressure near the point of the file. Push file across the surface and increase pressure as you go, so that each file tooth will do its share of the job. When the file is reciprocated all the way across the surface of the job, raise file and start all over. Never use pressure on return stroke. Make sure your strokes are slow and steady. Too much speed will cause your file to "rock," and that will round off the edges of your job. As you file, the teeth of the file will clog up with some of the job shavings and prevent efficient filing. This is known as "pinning". Rubbing chalk between the teeth of the file can help to prevent this condition. But, better clean the file frequently with a brush, as shown in Figure (a). Brush with a pulling motion parallel to the rows of teeth, diagonally across the file, not up-and-down the length of the file. Clean the file after fifteen strokes and alter your angle of filing at the same time. Now repeat entire process with dowels or broom handle, so that you get practice in filing a rounded surface. Repeat entire practice procedure on metal.

Fig. 7 File Cleaning

3.CONCLUSION

This advanced filing process is much more effective than conventional filing process. Reciprocating action of file decreases the need of human efforts. This filling machine will have more importance when number of workpiece to be machine is more. Filling machine

is of compact size, portable and can be taken anywhere on shop floor. Also the machine is provided with a file holder with which different kind of files can be attached or removed easily and according to need one can use the proper file for smooth operation. However electrical supply is require to run the motor but this filing process require less time as compared to conventional filing process. Hence consumption of electrical energy is less. Files have forward-facing cutting teeth, and cut most effectively when pushed over the job. Pulling a file directly backwards on a job will cause the teeth to bend, permanently damaging the file (especially when an inexperienced user adopts a back-and-forth "sawing" motion).Draw filing involves laying the file sideways instead of head on, and a very fine shaving action is produced. There are also varying strokes that produce a combination of the straight ahead stroke and the draw filing stroke, and very fine work can be attained in this fashion. Using a combination of strokes, and progressively finer files, a skilled operator can attain a surface that is perfectly flat and near mirror finish. Pinning refers to the clogging of the file teeth with pins, which are material shaving. These pins cause the file to lose its cutting ability and can scratch the job. A file card, which is a brush with metal bristles, is used to clean the file.

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