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DESIGN AND FABRICATION OF DRILL BIT GRINDING ATTACHMENT MACHINE

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Abstract-*Drill bits have so far been manually grinded in order to restore their functionality conforming to specified lip angle. Usually drill bits have been grinded manually by some skilled operators. Due to this sometimes imperfections may occur, leading to reduced drill bit's efficiency. This project aims at developing a fixture which is capable of holding drill bit firmly against the grinding wheel during reconditioning or re-sharpening process making it less susceptible to minor deviations from specified lip angle. This fixture could be mechanically operated by even a less skilled operator. Also this fixture will eliminate the need for tool inspection during or after reconditioning. It also reduces wastage of drill tools which have been not preferred after a wearer condition. In addition, the cost of buying a new drill bit can be reduced by using this fixture and can prolong the lifespan of the drill. It also helps the drill bits to be more economic. However, this fixture is a hope that will be a successful product and be able to use to sharpen blunt drill bits to the exact angle safely and effectively.*

Keywords: Lip angle, Skilled operators, Holding, Drill bit, Fixture.

1. INTRODUCTION

In many industries, high speed drilling operations were carried out, as it was a preliminary step for mass production. During this operation we have many possibilities for wear of the drill bits i.e. the edges of the drill bits get more wear. At that time the drill bits have been re-grinded. The grinding may be done manually or by using some automated arrangements. Manual grinding may cause damages to the drill bit chisel edges. This manual grinding or sharpening of drill bits were called off-hand method. It requires that the operator should have the knowledge of drill tool's geometry. So our idea is here to implement a fixture arrangement in order to avoid those kinds of failures. The fixture arrangement is very simple and leads to a smooth grinding operation and also to increase the repeatable usage of such drill bits. This fixture is fixed to the bench grinder by means of some clamping arrangements. Various types of drill bits can also be grinded by using this fixture by with respect their respective tool geometry. Thisfixture arrangement will be fixed nearer to the bench grinder setup. This was more simple and a time consuming process for the sharpening of the drill bits.

1.1 GENERAL DESCRIPTION OF FIXTURE

A fixture is a work-holding or supporting device, which is used in the most of the manufacturing industry. Fixtures are used to securely locate (position in a specific location or orientation) and support the work, ensuring that all parts produced using the fixture will maintain conformity and interchangeability. Fixture is used in order to improve the production economy. This can be achieved by allowing smooth operation and mainly quick transition from part to part, reducing the requirement for skilled labor by simplifying how work pieces are mounted, and increasing conformity across a production run. Fixtures must always be designed in an economic way; the purpose of these devices is to reduce costs, and so it must be designed in such a way that the cost reduction outweighs the cost of implementing the fixture. These design considerations include many factors like weight of the component .The frame of fixture should be strong in nature in order to withstand deflection. The reason for the deflection of fixture is because of cutting force, work piece clamping or clamping to the machine table. The frame of the fixture should have the enough mass to prevent vibration. Frames may be built from simple sections so that frames may be fastened with screws or weldedWhenever necessary.

1.2 DRILLING

Drilling is a cutting process that uses a drill bit to cut a hole of circular cross-section in solid materials. The drill bit is usually a rotary cutting tool, often multi-point. The bit is pressed against the work-piece and rotated at rates from hundreds to thousands of revolutions per minute. This forces the cutting edge against the work-piece, cutting off chips (swarf) from the hole as it is drilled.

FIG NO: 1.1 DRILLING OPERATION

In rock drilling, the hole is usually not made through a circular cutting motion, though the bit is usually rotated. Instead, the hole is usually made by hammering a drill bit into the hole with quickly repeated short movements. The hammering action can be performed from outside the hole (top-hammer drill) or within the hole (down-the-hole drill, DTH). Drills used for horizontal drilling are called drifter drills.In rare cases, specially-shaped bits are used to cut holes of non-circular cross-section; a square cross-section is possible.

1.2.1 PROCESS

Drilled holes are characterized by their sharp edge on the entrance side and the presence of burrs on the exit side (unless they have been removed). Also, the inside of the hole usually has helical feed marks.

Drilling may affect the mechanical properties of the workpiece by creating low residual stresses around the hole opening and a very thin layer of highly stressed and disturbed material on the newly formed surface. This causes the workpiece to become more susceptible to corrosion and crack propagation at the stressed surface. A finish operation may be done to avoid these detrimental conditions

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For fluted drill bits, any chips are removed via the flutes. Chips may form long spirals or small flakes, depending on the material, and process parameters.[2] The type of chips formed can be an indicator of the machinability of the material, with long chips suggesting good material machinability. When possible drilled holes should be located perpendicular to the work piece surface. This minimizes the drill bit's tendency to "walk", that is, to be deflected from the intended center-line of the bore, causing the hole to be misplaced. The higher the length-to-diameter ratio of the drill bit, the greater the tendency to walk

.

1.2.2 DEEP HOLE DRILLING

Deep hole drilling is defined as a hole depth greater than ten times the diameter of the hole. These types of holes require special equipment to maintain the straightness and tolerances. Other considerations are roundness and surface finish.

A high tech monitoring system is used to control force, torque, vibrations, and acoustic emission. Vibration is considered a major defect in deep hole drilling which can often cause the drill to break. A special coolant is usually used to aid in this type of drilling

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1.2.3 GUN DRILLING

Gun drilling was originally developed to drill out gun barrels and is used commonly for drilling smaller diameter deep holes. The depth-to-diameter ratio can be even greater than 300:1. The key feature of gun drilling is that the bits are self-centering; this is what allows for such deep accurate holes. The bits use a rotary motion similar to a twist drill; however, the bits are designed with bearing pads that slide along the surface of the hole keeping the drill bit on center. Gun drilling is usually done at high speeds and low feed rates.

1.2.4 MICRODRILLING

Micro drilling refers to the drilling of holes less than 0.5 mm (0.020 in). Drilling of holes at this small diameter presents greater problems since coolant fed drills cannot be used and high spindle speeds are required. High spindle speeds that exceed 10,000 RPM also require the use of balanced tool holders.

1.2.5 VIBRATION DRILLING

The first studies into vibration drilling began in the 1950s (Pr. V.N. Poduraev, Moscow Bauman University). The main principle consists in generating axial vibrations or oscillations in addition to the feed movement of the drill so that the chips break up and are then easily removed from the cutting zone.
There are two main technologies of vibration drilling: self-maintained vibration systems and forced vibration

2.PROBLEM IDENTIFICATION

We identified that the drill bits which have been re-grinded manually, may exhibit some imperfections .These imperfections are due to improper grinding of drill bits with respect to their lip angle and relief angle .This leads to a problem called negative relief which affects the drill bits life. It also impacts on economic factors. Usually a common

problem which arises from drill bit sharpening will be called as negative relief. This negative relief will occurs when the material is taken from the trailing edge of the bit surface. This trailing edge will be at the same stage or higher than the cutting edges. The sharpening wheel creates a flat cutting surface on the point of the bit, but this must be "trimmed" in order for the cutting surface on the bit to work correctly. Negative relief can be caused by a broken or worn sharpening tube. It also depends on the type of drill bit being sharpened, a usage of dirty chuck, or by incorrect technique. This manually sharpening method is raw at best and it is mainly depend on the eye of the operator to place the correct angle on the drill bit. In a drill bit, usually the two sides were sharpened at various angles.

3.WORKING PRINCIPLE

Loose the locking bolt and pivot bolt so as to be able to set correct position of the drill. Unscrew the hold-down bolt and insert the drill bit appropriately against the grinding wheel. Tighten the hold-down bolt to hold the drill firmly.Then, the pivot bolt is tightening to set the drill at the appropriate angle. Switch on the grinder to commence grinding. During operation, the drill is moved into the grinding wheel through a small angle of 590 until the required tool geometry is generated. Move the clamp unit away, loose the hold-down bolt to turn the drill, tighten the hold-down bolt and continue re-grinding until it is completed.

4.ADVANTAGES

1. It reduces drill tool failure due to improper grinding.
2. It is very economic when compared to CNC drill sharpener.
3. Not only twist drills; split and counter sink drills can be ground.
4. Suitable and cost efficient for small scale industries.
5. Time consumption is less.
6. An unskilled operator can also operate.
7. Safety of the operator is ensured.

4.1 APPLICATIONS

1. This project suits well applicable in production and manufacturing industries.
2. Mainly it can be used in small scale industry.
3. Serves more efficiently in mass production areas.

5.CONCLUSION

Thus the fixture was fabricated. The scope of this project lies in fully determining and understanding the functioning of fixture and exploring the different possibilities of utilizing the fixture for different processes, etc. This project has addressed the most common problem arising from drill bit sharpening called negative relief, thus redefining the conventional drill bit re-conditioning techniques. Thus this fixture will not only serve as an effective and efficient means, but also it will ensure the safety of the operating personnel. We can further develop more features in this fixture. We can encrypt the idea of multi chuck arrangement similar to lathe machines, so that we can grind drill bits with diameters more than 12mm as we were using a ½ inch chuck in this fixture. Some changes in the clamping arrangement can also be made in order to fix this fixture not only with bench grinder but also with tool and cutter grinder, as this fixture was a portable one. We can improve the clamping arrangement in order to provide suitable relief angle for with respect to the type of grinder.

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