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Tool Indexing Multi Chuck Drilling Machine

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Abstract:-This project entitles *"Tool Indexing multi Chuck Drilling Machine"* to develop the drilling machine by adding the features of as fixing four tools in the chuck for frequent machining. In this project we design multi chuck drilling machine with indexing to reduce time conception for drilling various size holes in work piece. In a single machine multiple drilling operations can be carried out. By this we tried to fulfill the industrial requirements.

Keywords: Attachment, Drilling, Indexing, Tool

1. INTRODUCTION:

A chuck is a specialized type of clamp used to hold an object, usually an object with radial symmetry, especially a cylindrical object. It is most commonly used to hold a rotating tool (such as the drill bit in a power tool) or a rotating work piece (such as the bar or blank in the headstock spindle of a lathe). Some chucks can also hold irregularly shaped objects (ones that lack radial symmetry). In some applications, the tool or work piece being held by the chuck remains stationary while another tool or work piece rotates (for example, a drill bit in the tailstock spindle of a lathe, or a round work piece being milled by a milling cutter).

Many chucks have jaws, which are dogs that are arranged in a radically symmetrical pattern (like the points of a star) to hold the tool or work piece. Often the jaws will be tightened or loosened with the help of a chuck key, which is a wrench-like tool made for the purpose. Many jawed chucks, however, are of the keyless variety, and their tightening and loosening is by hand force alone. Keyless designs offer the convenience of quicker and easier chucking and unchucking, but have lower gripping force to hold the tool or work piece, which is potentially more of a problem with cylindrical than, say, hexagonal shanks. Collet chucks, rather than having jaws, have collets, which are flexible collars or sleeves that fit closely around the tool or work piece and grip it when squeezed.

A few chuck designs are more complex yet, and they involve specially shaped jaws, higher numbers of jaws, quick-release mechanisms, or other special features.

Some chucks, such as magnetic chucks and vacuum chucks, are of a different sort from the radically symmetrical mechanical clamps mentioned above. Instead, they may be surfaces (typically flat) against which work pieces or tools are firmly held by magnetic or vacuum force.

To chuck a tool or work piece is to hold it with a chuck, in which case it has been chucked. Lathe work whose work holding involves chucking individual slugs or blanks is often called chucking work, in contrast to *bar work* (*bar feed work*), which is parted off from bar stock. Automatic lathes that specialize in chucking work are often called chucker.

2. LITERATURE REVIEW:

A drill chuck is the part of a drill that holds the rotating bit. Drill chucks are designed to hold the bit tightly and not loosen even when there is a high amount of torque. They can also be used to hold other types of rotating tools, such as screwdrivers or rotating spades for making large holes. Drill chucks can be keyed or keyless, depending on the preference of the user and the requirements of the tool.

A keyed drill chuck requires a removable key to open and close it. The key is a T-shaped tool that is inserted next to the chuck. When the chuck key is turned, it moves a gear that makes the collar rotate around the jaws to open or close them. A keyless drill chuck works on a similar principle, but instead of a key, the user turns the chuck with a sleeve at the end of the drill to open and close the

jaws. Some people prefer keyless chucks, especially for home power drills, because the chuck key can easily be misplaced. However, a keyed chuck can hold the bit more tightly since it gives more torque and can be tightened by hand more efficiently using less force.

The price and availability of particular size bits does not change uniformly across the size range. Bits at size increments of 1 mm are most commonly available and lowest price. Sets of bits in 1 mm increments might be found on a market stall. In 0.5 mm increments, any hardware store. In 0.1 mm increments, any engineers' store. Sets are not commonly available in smaller size increments, except for drill bits below 1 mm diameter. Drill bits of the less routinely used sizes, such as 2.55 mm, would have to be ordered from a specialist drill bit supplier. This sub setting of standard sizes is in contrast to general practice with number gauge drill bits, where it is rare to find a set on the market which does not contain every gauge.

Metric dimensioning is routinely used for drill bits of all types, although the details of BS328 apply only to twist drill bits. For example, a set of forester bits may contain 10, 15, 20, 25 and 30 mm diameter cutters.

The shank is the part of a drill bit grasped by the chuck of a drill. The cutting edges of the drill bit are at one end, and the shank is at the other. Different styles of shank/chuck combination deliver different performance, such as allowing higher torque or greater centering accuracy.

The straight shank is the most usual style on modern drill bits, by number manufactured. It is most often made the same diameter as the drill bit, for economy. It's then held in a 3-jaw drill chuck. Very small bits can have straight shanks larger than the drill diameter, often for holding in a standard size collet. Large drill bits can have straight shanks smaller than their drill diameter, so that medium-size chucks can be used to drill large holes. Such a drill bit is called reduced-shank or a blacksmith's drill. One particular type of reduced-shank drill bits are Silver & Deming (S&D) bits, which have a 1/2" reduced shank, and are 6" long with a 3" flute length.

- Easy to make on a lathe
- Minimum of turning or grinding needed if the drill bit is made from appropriately sized round bar stock
- Can be held in a collet chuck
- Can be held in a drill chuck, the commonest sort
- very accurate centering
- low torque transmission

3. DESCRIPTION OF EQUIPMENTS

3.1 BEVEL GEAR

Bevel gears are gears where the axes of the two shafts intersect and the tooth-bearing faces of the gears themselves are conically shaped. Bevel gears are most often mounted on shafts that are 90 degrees apart, but can be designed to work at other angles as well. The pitch surface of bevel gears is a cone.

Straight bevel gears are used for transmitting power between intersecting shafts. They can operate under high speeds and high loads. Their precision rating is fair to good. They are suitable for 1:1 and higher velocity ratios and for right-angle meshes to any other angles. Their good choice is for right angle drive of particularly low ratios. However, complicated both form and fabrication limits achievement of precision. They should be located at one of the less critical meshes of the train. Wide applications of the straight bevel drives are in automotive differentials, right angle drives of blenders and conveyors.

3.2 WORM DRIVE

A worm gear is type of mechanical gear. Worm gears are used when large gear reductions are needed. It is common for worm gears to have reductions of 20:1, and even up to 300:1 or greater.

Many worm gears have an interesting property that no other gear set has: the worm can easily turn the gear, but the gear cannot turn the worm. This is because the angle on the worm is so shallow that when the gear tries to spin it, the friction between the gear and the worm holds the worm in place.

Very interesting usage of worm gears is in the Torsion differential, which is used on some high-performance cars and trucks. A gear consisting of a spirally threaded shaft and a wheel with marginal teeth that meshes into it. The toothed wheel of this gear is called a worm wheel. Compact structure saves mounting space.

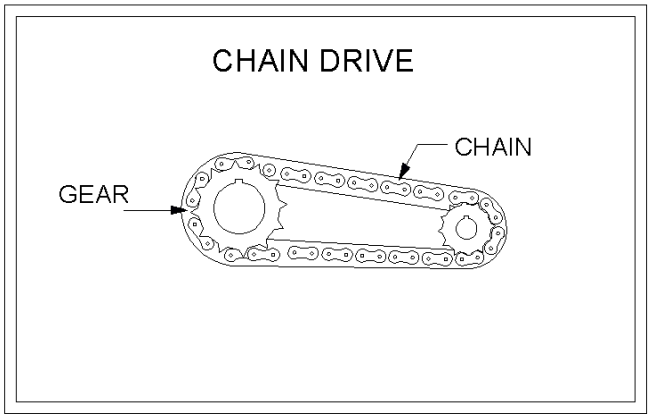
3.3 BELT DRIVE

A belt is a loop of flexible material used to link two or more rotating shafts mechanically. Belts may be used as a source of motion, to transmit power efficiently, or to track relative movement. Belts are looped over pulleys. In a two pulley system, the belt can either drive the pulleys in the same direction, or the belt may be crossed, so that the direction of the shafts is opposite. As a source of motion, a conveyor belt is one application where the belt is adapted to continuously carry a load between two points.

3.4 CHAIN DRIVE

Chain drive is a way of transmitting mechanical power from one place to another. It is often used to convey power to the wheels of a vehicle, particularly bicycles and motorcycles.

It is also used in a wide variety of machines besides vehicles. The power is conveyed by a roller chain, known as the drive chain, passing over a sprocket gear, with the teeth of the gear meshing with the holes in the links of the chain. The gear is turned, and this pulls the chain putting mechanical force.



3.5 BOTTLE JACK

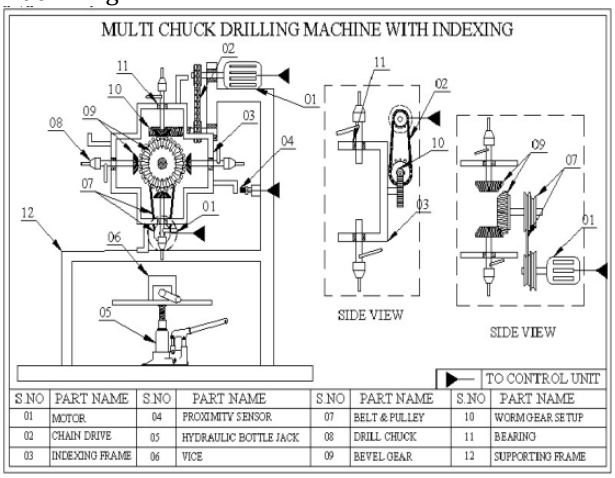
Bottle jacks are hydraulic jacks that are placed in a horizontal position. These jacks push against a lever, which lifts the main lift arm. Bottle jacks have a longer handle than most hydraulic jacks, however, and it is possible to get more lift per stroke with the increased leverage they provide when compared to regular models of jacks. Bottle jacks are versatile because their horizontal position makes it possible to place them in tight spots and provides good leverage. Recently bottle jacks have proven useful in search and rescue missions following earthquake damage. As a result, bottle jacks are standard equipment in firehouses and for search and rescue teams. They are also used for lifting, spreading, bending, pushing, pressing, or straightening requirements. The base and cylinders of bottle jacks are electrically welded for strength, and all models are capable of working in upright, angled, or horizontal positions.

3.6 VICE

It is a device consisting of two parallel jaws for holding a work piece; one of the jaws is fixed and the other movable by a screw, a lever, or a cam. When used for holding a work piece during hand operations, such as filing, hammering, or sawing, the vise may be permanently bolted to a bench. In vises designed to hold metallic work pieces, the active faces of the jaws are hardened steel plates, often removable, with serrations that grip the work piece; to prevent damage to soft parts, the permanent jaws can be covered with temporary jaws made from sheet copper or leather. Pipe vises have double V-shaped jaws that grip in four places instead of only two. Woodworking vises have smooth jaws, often of wood, and rely on friction alone rather than on serrations.

4. WORKING PRINCIPLE

The special type of index mechanism implemented in drilling machine for drilling various size holes in single work piece without unclamping in short period of machining time.



S.NO	PART NAME	S.NO	PART NAME	S.NO	PART NAME	S.NO	PART NAME
01	MOTOR	04	PROXIMITY SENSOR	07	BELT & PULLEY	10	WORM GEAR SETUP
02	CHAIN DRIVE	05	HYDRAULIC BOTTLE JACK	08	DRILL CHUCK	11	BEARING
03	INDEXING FRAME	06	VICE	09	BEVEL GEAR	12	SUPPORTING FRAME

Drill chuck Indexing mechanism was properly designed to achieve with following components that drill bit and bevel gear, worm gear, belt drive, chain drive, vice, proximity sensor, bottle jack and drill chuck. In drilling machine contain four drill chucks that run with help of motor through belt and bevel gear arrangement. Each drill chuck carries a small bevel gear that engaged with large bevel gear. Motor drives the large bevel gear through belt drive. Here step pulley bet drive is used to vary the drilling speed according to kind of material as a workpiece or drill bit is used.

The whole drilling set up can be titled with help of another motor through various mechanical drives. The drilling set up is coupled with a worm wheel that is driven by a worm shaft. Here motor and chain drive arrangement rotate the worm shaft in order to index the four drill chuck. In drill indexing set up have four rod that is right angle to each other for purpose of sensing the indexing angle with proximity sensor. According to signal received from proximity sensor is to control the indexing motor.

Here hydraulic bottle jack carries a vice to feed the work piece upward smoothly. Bottle jack is capable of carrying heavy weight material. The whole drilling machining works under sensor control. On the other hand feed of work piece is thoroughly manual operated.

5. FACTORS DETERMINING THE CHOICE OF MATERIALS:

The various factors which determine the choice of material are discussed below.

5.1 PROPERTIES

The material selected must posses the necessary properties for the proposed application. The various requirements to be satisfied Can be weight, surface finish, rigidity, ability to withstand environmental attack from chemicals, service life, reliability etc.

The following four types of principle properties of materials decisively affect their selection

a. Physical
b. Mechanical
c. From manufacturing point of view
d. Chemical

The various physical properties concerned are melting point, thermal Conductivity, specific heat, coefficient of thermal expansion, specific gravity, electrical conductivity, magnetic purposes etc.

The various Mechanical properties Concerned are strength in tensile, Compressive shear, bending, torsional and

buckling load, fatigue resistance, impact resistance, elastic limit, endurance limit, and modulus of elasticity, hardness, wear resistance and sliding properties.

The various properties concerned from the manufacturing point of view are,

- Cast ability
- Weld ability
- Surface properties
- Shrinkage
- Deep drawing etc.

5.2 MANUFACTURING CASE

Sometimes the demand for lowest possible manufacturing cost or surface qualities obtainable by the application of suitable coating substances may demand the use of special materials.

5.3 QUALITY REQUIRED

This generally affects the manufacturing process and ultimately the material. For example, it would never be desirable to go casting of a less number of components which can be fabricated much more economically by welding or hand forging the steel.

5.4 AVAILABILITY OF MATERIAL

Some materials may be scarce or in short supply, it then becomes obligatory for the designer to use some other material which though may not be a perfect substitute for the material designed. The delivery of materials and the delivery date of product should also be kept in mind.

5.5 SPACE CONSIDERATION

Sometimes high strength materials have to be selected because the forces involved are high and space limitations are there.

5.6 COST

As in any other problem, in selection of material the cost of material plays an important part and should not be ignored.

Sometimes factors like scrap utilization, appearance, and non-maintenance of the designed part are involved in the selection of proper materials.

6. CONCLUSION

This project is made with pre planning, that it provides flexibility in operation.

This innovation has made the more desirable and economical. This project *"TOOL INDEXING MULTI CHUCK DRILLING MACHINE"* is designed with the hope that it is very much economical and help full to large scale industries, workshops, etc...

This project helped us to know the periodic steps in completing a project work. Thus we have completed the project successfully.

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