

# Mechanism for Drilling Holes along PCD or Welding Using Proximity Sensors

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**ABSTRACT:** Quality and efficiency assume imperative part in today's assembling advertise. Auto indexing which is imperative for large scale manufacturing in commercial enterprises related with round welding and penetrating. Presently a day's because of solid and vicious focused economic situation in assembling commercial ventures. The principle target of businesses uncover with creating better quality item at least cost and build profitability. Penetrating machine is most indispensable and regular machine utilized for delivering entire operation use for create machine part with yearning surface quality and cost oblige. To acquire fundamental target of organization respects quality and efficiency. For this framework Worm and worm wheel, Cummutator engine, Belt drive, Proximity sensor, Ball bearing, Electronic transfer, Inching switch, inputs are required. In the present venture an endeavor is made to lessen the impact of machining perfect time parameters as a result of mounting, getting off, checking and so on that are impacts on responsive yield parameters, for example, time of delivering gap, amount of occupation, nature of employment. this is finished by utilizing indexing. The push to examine ideal time of creating gap and their commitment on delivering better Surface quality and higher Productivity with less cost robotization. The procedure of boring along PCD is generally utilized. The vast majority of TWO WHEELER vehicles have plate brakes which have openings along PCDs, couplings, flywheels and so forth. To take care of the demand of such occupations, the assembling is carried on NCs, CNCs and so on. The fundamental trouble in such machining innovation is prerequisite of immense capital and talented administrators.

**KEYWORDS:** Automation, indexing, Manufacturing industry, Productivity, Quality, Ball Bearing, Worm Wheel, Welding, Drilling, Sensors.

## I. INTRODUCTION

The procedure of boring along PCD is ordinarily utilized. The greater part of TWO WHEELER vehicles have circle brakes which have gaps along PCDs, couplings, flywheels and so on. To take care of the demand of such employments, the assembling is carried on NCs, CNCs and so on. The primary trouble in such machining innovation is necessity of tremendous capital and talented administrators. Subsequently this Drilling Machine Indexing Mechanism concentrates on planning straightforward penetrating table where in the boring tool won't be conveyed from one position to other however the employment itself will be adjusted in such a design, to the point that on basic revolution of worm the new position will be accomplished. In light of basic building information, get together is outlined and manufactured in order to diminish overhead misfortunes with regards to penetrating along PCD (Pitch Circle Diameter). Indexing process is surely understood to us with regards to apparatus producing however we are presenting same process yet without massive indexing plate get together in boring operation. The development comprises of get together of worm and worm wheel mounted on vertical shaft which promote conveys Rotary round table on upper agree with sensor. The indexing table is fueled by little electrical engine. The speed of table is control by the speed controller. The administrator needs to pivot worm through couple of degrees to accomplish fancied Position of the employment which contains the few openings. Contrasted with accessible indexing instrument the cost of this Drilling Machine Indexing Mechanism is entirely less. Once more, when contrasted with other robotized machine the speculation here is very low. Consequently this Drilling Machine Indexing Mechanism holds low beginning cost, low working cost, low support cost and low development cost. Since no power is use to produce rotational movement there are no electric misfortunes. Nowadays producing manages computerization and howdy tech forms expending tremendous power supply. In such situation our Drilling Machine Indexing Mechanism gives the speed as well as Manual Handling. Consequently this Drilling

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Machine Indexing Mechanism concentrates on planning straightforward boring table where in the boring tool won't be conveyed from one position to other however the occupation itself will be adjusted in such a form, to the point that on basic turn of worm the new position will be accomplished. Taking into account straightforward building learning, gathering is composed and created in order to diminish overhead misfortunes with regards to penetrating along PCD (Pitch Circle Diameter). Indexing process is surely understood to us with regards to rigging fabricating however we are presenting same process yet without cumbersome indexing plate get together in boring operation. The development comprises of gathering of worm and worm wheel mounted on vertical shaft which encourage conveys penetrating table. The administrator needs to turn worm through couple of degrees to accomplish sought Position. Contrasted with accessible indexing system the cost of this Drilling Machine Indexing Mechanism is entirely less. Once more, when contrasted with other computerized machine the speculation here is entirely low. Consequently this Drilling Machine Indexing Mechanism holds low starting cost, low working cost, low upkeep cost and low development cost. Since no power is use to produce rotational movement there are no electric misfortunes. Nowadays fabricating manages mechanization and howdy tech forms expending enormous power supply. In such situation our Drilling Machine Indexing Mechanism gives the speed as well as Manual Handling. A Drill is an apparatus with a pivoting boring tool utilized for boring gaps as a part of different materials. Bores are ordinarily utilized as a part of carpentry, metalworking, and development and most "Do it without anyone's help" Drilling Machine Indexing Mechanisms. Exceptional outlined penetrates are likewise utilized as a part of restorative and different applications, for example, in space missions. The boring apparatus is held by a toss toward one side of the penetrate and pivoted while squeezed against the objective material. The tip of the bore takes every necessary step of cutting into the objective material, either cutting off thin shavings (turn penetrates or wood screw bits), pounding off little particles (oil boring), or pulverizing and uprooting bits of the work piece (SDS stone work drill). The boring machine is a standout amongst the most vital machine device in workshop. Despite the fact that it was basically intended to begin opening it perform such a large number of operations notwithstanding boring, for example, tapping, reaming and exhausting too. In penetrating machine utilizing control drive the gaps are bored rapidly and with ease.

## II. NEED OF DRILLING INDEXING MECHANISM

In previous conditions there is no any indexing mechanism used for working of drilling machine, so it was very time consuming process of marking , loading , unloading , processes . Every time it becomes necessary to do all these processes by manual handling. Now a day's many industries use NC and CNC machines, but these machines are very costly so we understood that there is a requirement of such a mechanism which can used on drilling machine that can reduce time required for indexing, marking etc. and also available at low cost.

## III. LITERATURE SURVEY

### 1. Ranjeet Mithari and Amar Patil [1]

Abstract - This paper describe the welding Positioner with auto indexing which is very important for mass production industries related with circular welding. As it depends upon the skill of worker to move electrode along the welding line. This special device can rotate the job at fixed rate to assist the welding process for circular components and ensure good profile and homogenous welding. This model has applications in small cylinder welding, compressors, and bottle filling plants etc. Automated welding Positioner machine for circular weld is totally satisfying the requirements. For this system Worm and worm wheel, Cummutator motor, Belt drive, Proximity sensor, Ball bearing, Electronic relay, Inching switch, inputs are required.

### 2. Funaru, M[Arian]; Mihaila, L[Ucian]; Pascu, M[Arius] & Andrioaia, D[Ragos][2]

Abstract: Growing performance demands in the mechanical manufacturing field have lead to a great development of the machine tools domain, during the past decades, regarding especially the productivity and the manufacturing precision. When equipping a machine tool with an automatic tool changer and an automatic pallet mechanism, the obtained result is a machining center. For single or small series products, multi-axis machining centers fulfill the precision and productivity requirements, through the advantages of a reduced auxiliary time and reduced operating

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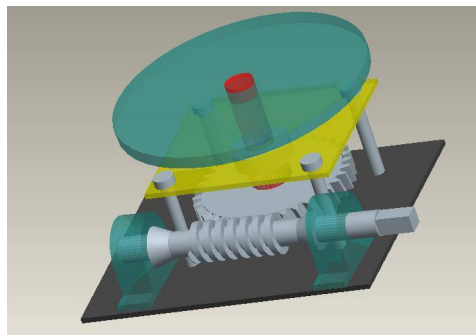
errors. This paper presents a new technical solution of the index table mechanism used on multi-axis machining centers, which significantly helps reduce the auxiliary time in the manufacturing process. The mechanical structure of the table mechanism described in this paper offers the possibility to obtain a very high positioning precision, using a curvy coupling and a hydraulically driven table clamp/unclamp mechanism.

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Now a day's machining of component within single setup is more important concept for manufacturing of any product. As single set up machining results dimensional and geometrical tolerance within specific limit, this concept with specific product like rotary table, indexing table, work holding devices, special jig and fixtures etc. with machining center is more predominate. Single setup concept will increase productivity with cost effectiveness and consistent accuracy. The paper deals with the rotary indexing mechanism which is used for getting angular motion in required time. Different types of indexing mechanism are available in market like cylindrical cam with roller follower, duplex worm gear based, and Geneva mechanism. The Paper covers in designing of indexing mechanism, cam and follower and its motion curve is major part for creating its profile for getting particular indexing with required time, accuracy and cost.

## IV. CONSTRUCTION OF INDEXING MECHANISM

Indexing mechanism is made up of mainly worm and worm wheel. In this setup the worm and worm wheel setup is coupled with vertical shaft on which detachable rotary table is connected. For the automatic rotation of worm and worm wheel setup small motor is coupled with help of v belt. The automatic rotation of the rotary table is control by using sensors according to requirement. As job which has to get drilled is mounted on the rotary table is have certain hole or clamping setups as per suited to job.



## V. DRILLING MACHINE INDEXING MECHANISM OBJECTIVES

- 1) Indexing of the table
- 2) Decrease machining time
- 3) Minimize idleness of machine
- 4) Manual Handling
- 5) Increase rate of production
- 6) Alternative to use of CNC & NC

### 1. INDEXING OF THE TABLE

Many times a machinist is required to machine features into a part that are located radially instead of linearly. Examples of such features are the disc of disc brake, flywheels, couplings, and flats on a nut, the teeth on a gear or the

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splines on a shaft. The indexing attachment is a unique design that provides a very economical means of accurately rotating of work piece so that these kinds of features can be machined.

### 2. DECREASE MACHINING TIME

It is always advisable to minimize lead time of any task in industries. Our Drilling Machine Indexing Mechanism is oriented in that direction, by avoiding continuous alignment and misalignment of job. Hence we can generate number of holes in single alignment & in less time as compared to traditional drilling operation.

### 3. MINIMIZE IDLENESS OF MACHINE

As stated above by avoiding continuous alignment and misalignment of job the idleness of machine is minimized. Here we save the time in engaging and disengaging the work piece that is done on traditional drilling machine hence we can increase utilization of machine for a given span.

### 4. MANUAL HANDLING

These days manufacturing deal with automation and hi-tech processes consuming huge power supply.

In such scenario our Drilling Machine Indexing Mechanism provides not only Speed but also simply manual handling operation.

### 5. INCREASE RATE OF PRODUCTION

Reduced estimated time and minimized idleness of machine results in rise in production rate.

### 6. ALTERNATIVE TO USE OF CNC & NC

By employing Indexing Mechanism for production of job involving drilling along PCD's, NC & CNC machines can be freed to produce other jobs. Even in small scale industries which don't use NC & CNCs mass production can be achieved when it comes to drilling along PCD.

## VI. SELECTION OF BEARING VERTICAL SHAFT

### 1. Pedestal Bearing:

Since Pedestal bearing is not used for high speed negligible force acts on it. In this Drilling Machine Indexing Mechanism the bearing is use to support the worm of worm and worm wheel. Hence standard bearing that suits the diameter of worm wheel is selected.

#### Selection of Pedestal Bearing:

$$\begin{aligned} \text{Axial Force (Pa)} &= 7.6111\text{N} \\ \text{Radial Force (Pr)} &= 7.6111\text{N} \\ \text{Diameter of shaft} &= 40\text{mm} \\ \text{Bearing Life (L)} &= 15 \times 300 \times 24 \times 60 \times 60 \\ &= 3.888 \times 10^8 \text{hr} \end{aligned}$$

Consider Static load capacity ( $C_0$ ) = 19000N

$$\text{Hence, } \frac{Pa}{C_0} = \frac{7.6111}{19000} = 0.0004$$

$$\text{And } \frac{Pa}{Pr} = \frac{7.6111}{7.6111} = 1,$$

$$\text{Hence, } X = 0.56, Y = 2.0$$

$$P = XPr + YPa = 19.4811\text{N}$$

$$\begin{aligned} \text{Dynamic Load Capacity (C)} &= PL^{\frac{1}{3}} \\ &= 19.4811(3.888 \times 10^8)^{\frac{1}{3}} \\ &= 14218.5582\text{N} \end{aligned}$$

Consider Factor of Safety = 1.5

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$$C = 25593.4047N$$

Hence, we selected the Pedestal Ball Bearing = SY 40 TF/ VA201

### Specifications of Pedestal bearing:

Dimensions											
D	A	B	H	H <sub>1</sub>	H <sub>2</sub>	J	L	N	N <sub>1</sub>	G	S <sub>1</sub>
40	48	49.2	99	49.2	19	135.5	175	24.5	14	12	30.2
Basic Load Rating			Limiting Speed with shaft tolerance h6			Mass	Designations				
Dynamic C		Static C <sub>0</sub>	r/min			kg	Bearing Unit		Bearing		
N		N					SY 40 TF		SY 40 TF/ VA201		
30700		19000	4800			1.80					

### 2. Deep Groove Ball Bearing

In this type of ball bearing, the radius of ball is slightly less than the radii of curvature of grooves in the races. This gives a point of contact between the balls and the races. Therefore, the balls and the races may roll freely without sliding. Deep groove ball bearing has following advantages:

1. Due to relatively large size of the balls, deep groove ball bearing has high load carrying capacity.
2. Deep groove ball bearing takes load in radial as well as in axial direction.
3. Due to point contact between ball and the races, friction loss and resultant temperature rise is less in this bearing. The maximum permissible speed of the shaft depends upon the temperature rise of the bearing. Therefore Deep groove ball bearing gives excellent performance.

The main aim of using the ball bearing is to support the shaft at center. Since the force acting on one end of working table by drilling operation creates moment which can lead to bending failure of shaft, the shaft needs to be supported at two points.

#### Selection of Deep Groove Ball Bearing:

$$\begin{aligned} \text{Axial Force (Pa)} &= 7.6111N \\ \text{Radial Force (Pr)} &= 7.6111N \\ \text{Diameter of shaft} &= 30\text{mm} \\ \text{Bearing Life (L)} &= 15 \times 300 \times 24 \times 60 \times 60 \\ &= 3.888 \times 10^8 \text{hr} \end{aligned}$$

Consider Static load capacity (C<sub>0</sub>) = 10000N

$$\text{Hence, } \frac{Pa}{C_0} = \frac{7.6111}{10000} = 0.0008$$

$$\text{And } \frac{Pa}{Pr} = \frac{7.6111}{7.6111} = 1,$$

$$\begin{aligned} \text{Hence, } X &= 0.56, Y = 2.0 \\ P &= XPr + YPa = 19.4811N \end{aligned}$$

$$\begin{aligned} \text{Dynamic Load Capacity (C)} &= PL^{\frac{1}{3}} \\ &= 19.4811(3.888 \times 10^8)^{\frac{1}{3}} \\ C &= 14218.5582N \end{aligned}$$

Consider Factor of Safety = 1.2

$$C = 17062.2698N$$

Hence, we selected the Deep Groove Ball Bearing = 6226

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<i>Principle Dimensions ( mm )</i>			<i>Basic Load Ratings ( N )</i>		<i>Designation</i>
<i>Bore 'd' mm</i>	<i>Outside Diameter 'D' mm</i>	<i>Width 'B' mm</i>	<i>Dynamic 'C' N</i>	<i>Static 'C<sub>0</sub>' N</i>	
30	62	16	19500	10000	6206

### 3. Design of Working Table

The function of working table is to support the work piece during drilling operation, rotate the work piece after the hole is drilled and transfer the force acted by drill bit during drilling to the rigid base. The table also transfers the moment acting at extreme side of work piece to the upper end of shaft hence the table should have maximum contact with the Vertical shaft.

As the disc of disc brake is of diameter 248mm the working table should be greater than 248mm. so it is to be taken as 275mm.

**Material** : Mild Steel (40C8)

**Dimensions** : Inner Dia. - 25mm, Outer Dia. – 275, Thickness – 15mm.

### 4. DESIGN OF RIGID BASE

**Selection of Material:**

**Material Used:** M.S

**Dimensions** : 270×270×5 mm<sup>3</sup>

#### 1. Electronic Speed Regulator

Motor is an Cummutator motor ie, the current to motor is supplied to motor by means of carbon brushes. The power input to motor is varied by changing the current supply to these brushes by the electronic speed variator; thereby the speed is also is changes.

#### 2. Electronic relay

The electronic relay is mounted on the sheet metal panel on the base frame. The electronic relay is connected to the proximity sensor and the motor input circuit. The function of the electronic relay is to cut off power supply when the proximity sensor is operated.

#### 3. Electronic Proximity sensor

The electronic proximity sensor is mounted on the sheet metal panel on the base frame by means of an Z shaped clamp. The proximity sensor as the name suggests senses the proximity of the indexer buttons which acts as stops, such that when they come in front of the proximity sensor the table the relay is operated to stop the table motion. The proximity sensor is connected to the electronic relay and the power source.

## VII. ADVANTAGES

Following are the various advantages to make our **Drilling Indexing Mechanism**, the popular one:

1. It requires less power for its operation.
2. Multiple drilling operations is done in single setting, hence the setting time is eliminated to almost 1/20th of the previous case mostly at the time of mass production.
3. It is convenient to convey it from one place to another place, due to its compact size and being installed on the single frame.
4. It requires very less skill for its operation.
5. They give very fast, smooth and jerk free indexing motion.
6. They have very high indexing accuracy.
7. Indexing speeds can be as high as 60 indexes / min.
8. There is no backlash.
9. They can be used in either direction of rotation.
10. They are maintenance free and designed for very long operational life.

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### VIII. ASSEMBLY WITHOUT WORKING TABLE

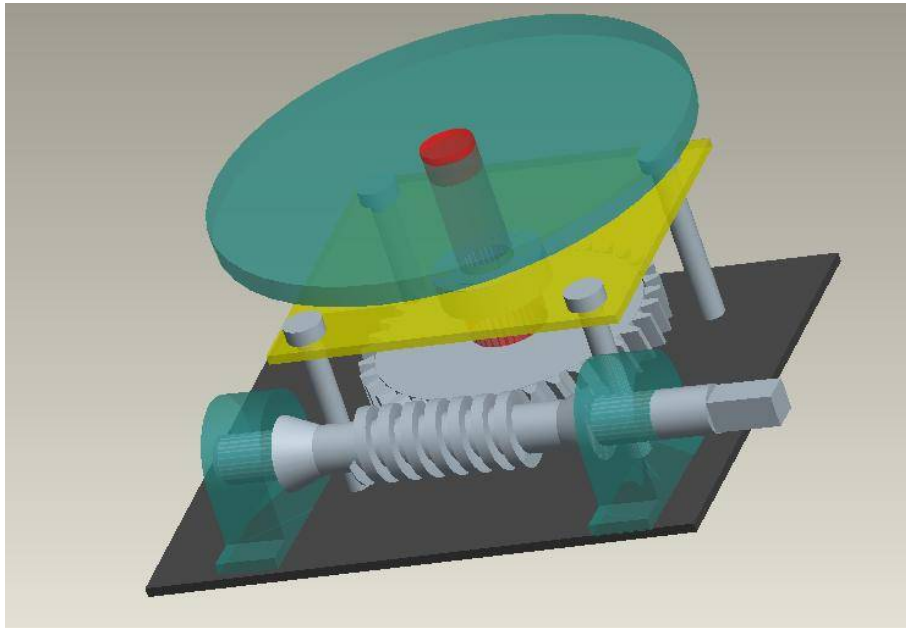


Fig No 1 Assembly without Working Table

### IX. INSTALLATION OF INDEXING MECHANISM AND WORKING OF INDEXING MECHANISM

The automatic indexing mechanism is portable device and gets mounted on any simple drilling machine. It can be placed rigidly on the work table of drill machine without any special arrangements. In this mechanism the upper round table is rotate which has marking according to requirement. Marking is in angle in which we have to index the table. This marking is nothing but metallic stopper which can detect by the proximity sensor and proximity sensor simply break the circuit of current to stop the rotary table. This causes the indexing in accurate angular displacement.

### X. CONCLUSION

From above we can say that we diminished the aggregate indexing system can lessen the aggregate assembling time amid large scale manufacturing in basic penetrating machine. So it diminishes the cost of work and builds the generation. This instrument likewise gives indexing in penetrating operation. A penetrating machine is a gadget for making gaps in parts. The physically worked sort of penetrating machine makes issues, for example, low exactness, high setup time, low profitability, and so on. A CNC machine beats every one of these issues yet the fundamental burden of a CNC boring machine is the high starting cost and prerequisite of gifted work for working the machine. Consequently, there emerges a requirement for a minimal effort CNC machine which cannot just bore openings with high exactness and low machining time additionally have low beginning cost. The requirement for gifted administrator is wiped out by furnishing programming with a more easy to understand graphical client interface.

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