To Change the Speed of Drilling Machine During Running Condition

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Abstract

Today the drilling machine is available in the market with speed changer mechanism but we can't change the speed of the drilling machine without stop the machine means if we want to change the speed of the machine we have to stop the machine and thereafter we can change the speed. But our project is focus on the change of the speed without stop the machine and this does not affect on the motor so eliminate this we are use gear mechanism -.This drilling machine has four gears. Here we used the gear mechanism to change the speed of the drilling machine by using lever arrangement. This will reduce the machining time and increased productivity.

Keywords: Speed Changer Drill Machine, Gear Box, Reduced Time of Drill Operation, Pulley, Uncertainty, Efficiency

I. INTRODUCTION

Drilling is the operation of producing circular hole in the work-piece by using a rotating cutter called DRILL. The machine used for drilling is called drilling machine. The drilling operation can also be accomplished in lathe, in which the drill is held in tailstock and the work is held by the chuck .The most common drill used is the twist drill. It is the simplest and accurate machine used in production shop. The work piece is held stationary Clamped in position and the drill rotates to make a hole.

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 work piece by creating low residual stresses around the whole opening and a very thin layer of highly stressed and disturbed material on the newly formed surface. This causes the work piece to become more susceptible to corrosion at the stressed surface.

For fluted drill bits, any chips are removed via the flutes. Chips may be long spirals or small flakes, depending on the material, and process parameters. The type of chips formed can be an indicator of the machinbility of the material, with long gummy chips reducing machinability

Surface finish in drilling may range from 32 to 500 micro inches. Finish cuts will generate surfaces near 32 micro inches, and roughing will be near 500 micro inches.

Cutting fluid is commonly used to cool the drill bit, increase tool life, increase speeds and feeds, increase the surface finish, and aid in ejecting chips. Application of these fluids is usually done by flooding the work piece or by applying a spray mist

II. PROBLEM FIND IN CURRENT DRILLING MACHINE

1) In current drilling machine if we want to change speed of the spindle we need to stop drilling machine and then after remove the cover of pulley arrangement and fit the belt on new required step. In this process time required and during this time production is stop.
2) More effort required in drilling process so we need more capacity of motor to drive machine.
3) All pulleys and drive belts must be completely shrouded by guarding to prohibit access and we can't change gear in running.
4) Difficult to change speed in drilling machine.
5) We cannot make any adjustments while the machine is operating.
6) Special drills are needed for some applications that a normal general purpose drill cannot accomplish quickly or accurately.
7) Work on constant speed create problem when more harden portion is in the part.

8) The constant speed also create problem when we change the material.
9) For same speed no Factor variation like cutting speed (v)feed rate (f)depth of cut (d) machining time (t) material removal rate.

III. PROBLEM SOLVED IN OUR PROJECT

1) In our drilling machine shifting of speed faster than a regular drilling machine mechanical system.
2) Allow for an accurate and effortless shift, even in difficult circumstances.
3) The smoothness of lever can reduce the shock on drive train components.
4) Gear mechanism set which can change drilling speed as per required during operation.
5) Can maintain drilling speed as per required.
6) This drilling machine can use for different speed for different material.
7) This machine can use for all different hardness material.
8) We want to improve capacity and working area of drilling machine. With the help of this gear changing arrangement.
9) Here total motion of spindle is directly connected with gear train so less effort required in drilling process so we need less capacity of motor to drive machine. Ex. If we want 1HP motor in current drilling machine then we required 1/2HP motor in our drilling machine.
10) By lever easy to adjust gear so that they can be set correct

IV. CONSTRUTION

A. Parts Required and Description of Gear Arrangement System:

1) Belt – CHF 2270
2) Four step pulley – 100mm
3) Motor – 1440 RPM. AC 220volt
4) Gears – Hard MS
5) Switch
6) Main drill machine body – cast iron
7) Hand lever to up and down the drilling spindle
8) Gear lever adjustment
9) Drill bit fitting chuck
10) Main Shafting MS Hard material
11) Feed mechanism

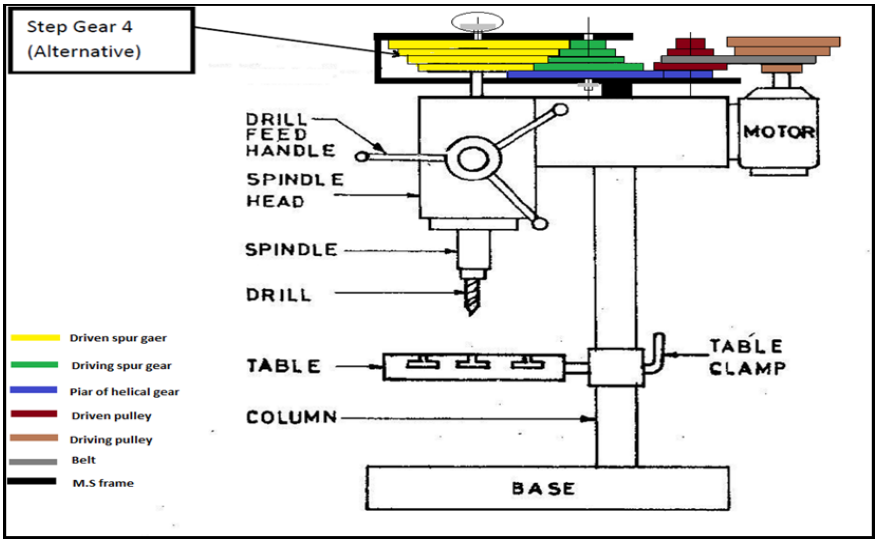

Fig.1 Model Diagram of Drilling Machine

Here we used the regular drilling machine as per IS standard but wehave changed the pulley by the gear box arrangement in this drilling machine and put the all the components remain same e.g. column,spindle,base,table
Our main concept in this drill machine is reduced the time for drill and changed the speed of drill in running condition so we have to decide to put gear mechanism in this machine.by the use of gear mechanism directly change the speed of the drilling during running condition. Here is some images of gear mechanism how we set the the mechanism

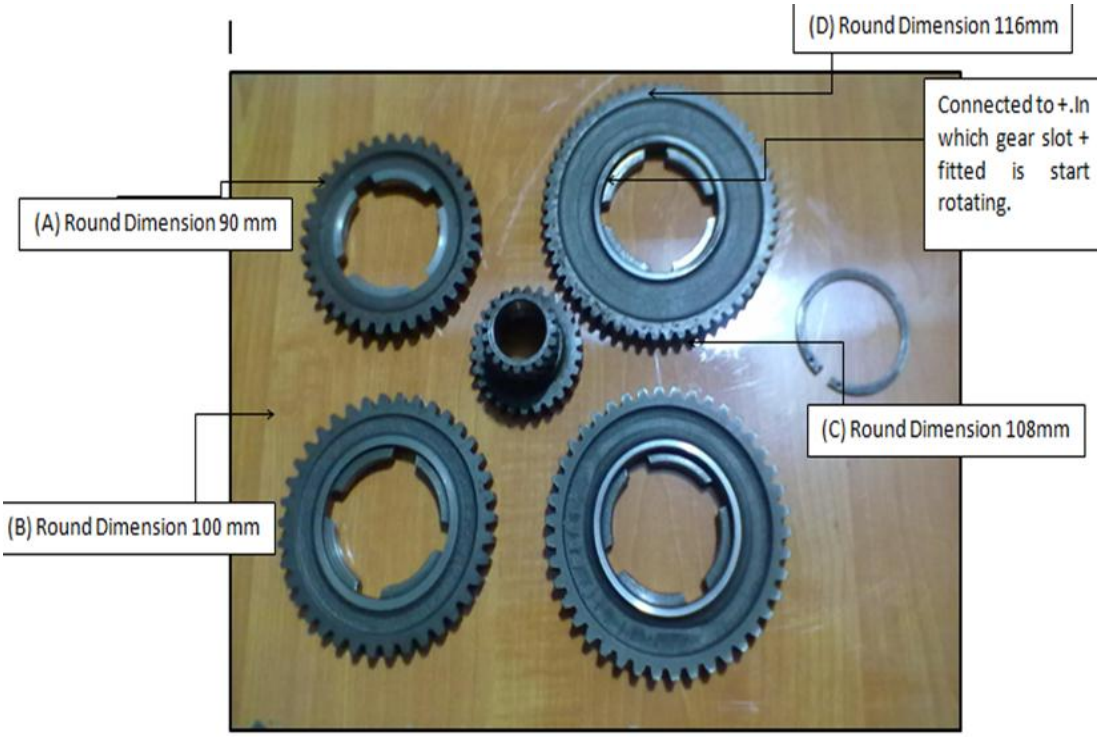

Fig .2: Driven Gear

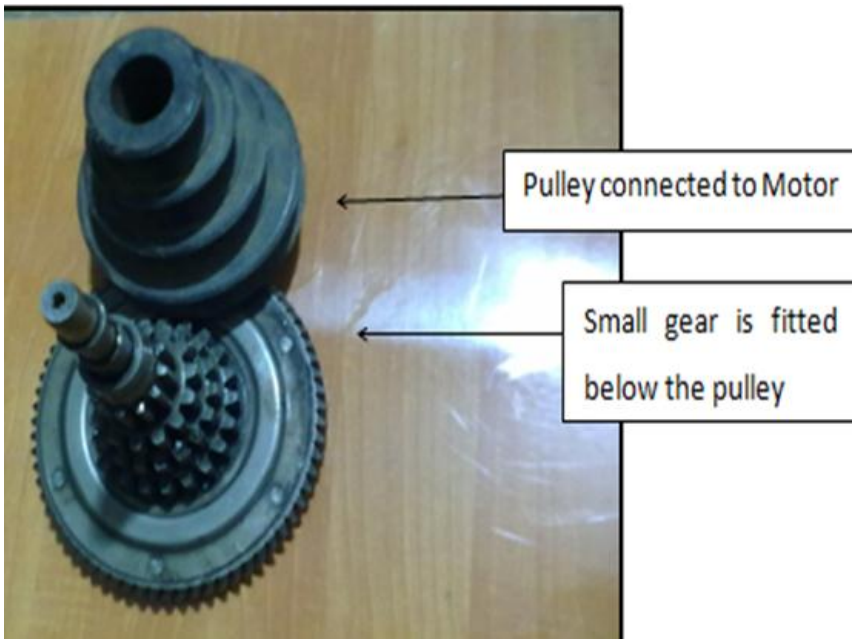

Fig .3 Small Gears Is Fitted Below the Pulley

Fig. 4: Drilling Shaft

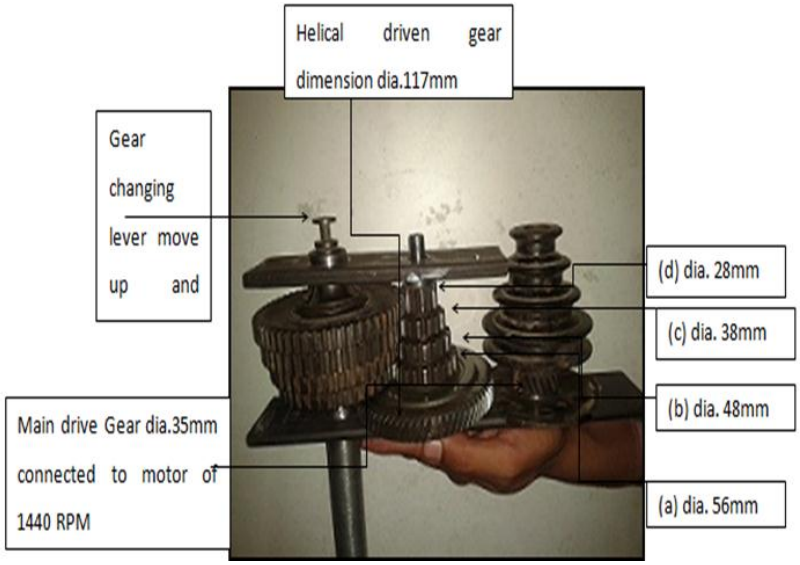

Fig. 5: Complete Gear Arrangement

There is calculation of gear changing mechanism what kind of different speed we have achieved

V. CALCULATION

Table -1
Teeth and Diameter of Driver and Driven Gear

Drive Gear	*No. of teeth*	*Dia of Gear*	*Driven Gear*	*No. of gear*	*Dia of Gear*
1(Ts4)	*21*	*56mm*	*1(ts4)*	*35*	*90mm*
2(Ts3)	*18*	*48mm*	*2(ts3)*	*38*	*100mm*
3(Ts2)	*14*	*38mm*	*3(ts2)*	*42*	*108mm*
4(Ts1)	*12*	*28mm*	*4(ts1)*	*57*	*116mm*
Helical gear	*20*	*35mm*	*Helical gear*	*70*	*117mm*

Table -2
Here is the Calculation of Pulley

Pulley steps diameter	*Driver pulley(Dm)*	*Driven pulley(dm)*
1st	*104mm*	*40mm*
2nd	*84mm*	*53mm*
3rd	*64mm*	*59mm*
4th	*46mm*	*87mm*

B. Calculation For Driven Pulley Speed:

$$\frac{Dm3}{dm3} = \frac{n3}{N3}$$

$$\therefore \frac{64}{59} = \frac{n3}{1440}$$

$$\therefore n3 = 1563\ rpm \quad \text{(But n3=Nh1)}$$

1) *Calculation For Driven Helical Gear Speed:*

$$\frac{th1}{Th1} = \frac{Nh1}{nh1}$$
$$\therefore \frac{20}{70} = \frac{1563}{nh1}$$
$$\therefore nh1 = 447\ rpm$$ (where nh1=Ns1=Ns2=Ns3=Ns4)

2) *Final Spindle Speed Calculation:*

$$\frac{ts1}{Ts1} = \frac{Ns1}{ns1}$$
$$\therefore \frac{12}{57} = \frac{447}{ns1}$$
$$\therefore ns1 = 94\ rpm$$ (speed of first gear)

From table no 7.4 we can calculate the remaining three speeds of spindle in running condition as above So,

- ns2=150 rpm (speed of second gear)
- ns3=212 rpm (speed of third gear)
- ns4=268 rpm (speed of fourth gear)

VI. ANALYSIS TABLE

Table-3
Calculation of Drilling Time

MATERIAL	*FEED RATE (MM/REV.)*	*SPINDLE SPEED, N (RPM)*	*NORMAL DRILLING MACHINE (CUTTING TIME,MIN)*	*PROJECT DRILLING MCHINE (CUTTING TIME,MIN)*
	Standard		*{[CT =(L+A)/(fr*N)]+[Belt changing time*]}*	*[CT =(L+A)/(fr*N)]*
Cast iron (soft)	*0.10*	*94*	*1.3230*	*1.3230*
Mild steel	*0.13*	*150*	*1.6412*	*0.6412*
Copper	*0.16*	*212*	*1.3667*	*0.3667*
Aluminum	*0.08*	*268*	*1.5788*	*0.5788*
Total Time			*5.9077*	*2.9097*

C. Analysis:

- By performing this practical we analyzed that time required for drilling in different material is less than conventional drilling machine.
- We obtain better surface finish in material
- Here is some data and reading and calculation taken by us for different material above table

D. Advantages:

1) Gear mechanism set which can change drilling speed as per required during operation.
2) Can maintain drilling speed as per required.
3) Can use different speed for different material.
4) Can use for all different hardness material.
5) Can use for slotting with the use of sliding wise.
6) Reduced manufact1uring time
7) Avoid manual adjustment

VII. CONCLUSION

- After performing this experimental setup of speed changer drilling machine during condition, we have eliminate time consume in change the speed of conventional drilling machine by changing the belt.
- We have obtained four different speeds in running condition for different material.

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