Multi Machining Operating Machine with Single Power Source

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Abstract – Industries are basically meant for Production of useful goods and services at low production cost, machinery cost and low inventory cost. Today in this world every task have been made quicker and fast due to technology advancement but this advancement also demands huge investments and expenditure, every industry desires to make high productivity rate maintaining the quality and standard of the product at low average cost. In an industry a considerable portion of investment is being made for machinery installation. So in this project we have a proposed a machine which can perform operations like drilling, sawing & grinding at different working centers simultaneously which implies that industrialist have not to pay for machine performing above tasks individually for operating operation simultaneously.

Index Terms – Industries, Production, Cost, Machinery, Single Power Source.

1. INTRODUCTION

1.1. About multi machining process with single power source

Fig: 1.1 Multi machining process with Single power source

This machine can perform three operations simultaneously or individually. We can perform operations individually by engaging or disengaging of belts from pulleys. We are providing left side of the machine drilling & grinding and right side cutting. From motor power is transmitted through belts and pulleys to the counter shaft. We are providing big pulley to motor and short pulley to counter shaft because to increase the speed of counter shaft.

2.1 Slider crank mechanism:

2.1.1 Definition:-

The Slider-crank mechanism is used to transform rotational motion into translational motion by means of a rotating driving beam, a connection rod and a sliding body. In the present example, a flexible body is used for the connection rod. The sliding mass is not allowed to rotate and three revolute joints are used to connect the bodies. While each body has six degrees of freedom in space, the kinematical conditions lead to one degree of freedom for the whole system.

2.1.2 Explanation:-

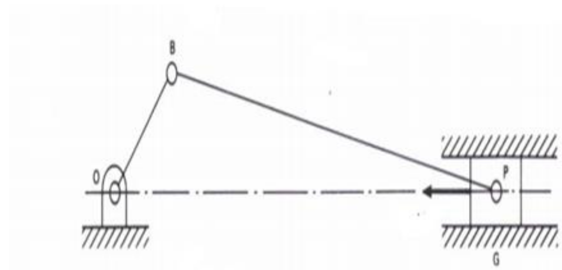

Fig: 2.1 slider crank mechanism

When point O is rotating in anti-clockwise direction, then point B also starts rotating in anti-clockwise direction because points

O & B are connected. When point B is rotating , point P will starts coming towards point O because points P & B are connected. By this the rotary motion is converted in to linear motion. It is not quick return mechanism. In this 180^0 of crank rotation moves forward direction of ram and remaining 180^0 of crank rotation moves reverse direction. When points OBP are in same line the ram is in maximum front direction and similarly, when points BOP are in same line the ram is in maximum return direction.

2.2 Power transmissions:

Fig: 2.3 Belt and Pulleys

Belts are the cheapest utility for power transmission between shafts that may not be axially aligned. Power transmission is achieved by specially designed belts and pulleys. The demands on a belt drive transmission system are large and this has led to many variations on the theme. They run smoothly and with little noise, and cushion motor and bearings against load changes, albeit with less strength than gears or chains. However, improvements in belt engineering allow use of belts in systems that only formerly allowed chains or gears.

2.2.2 Belts and Pulleys:-

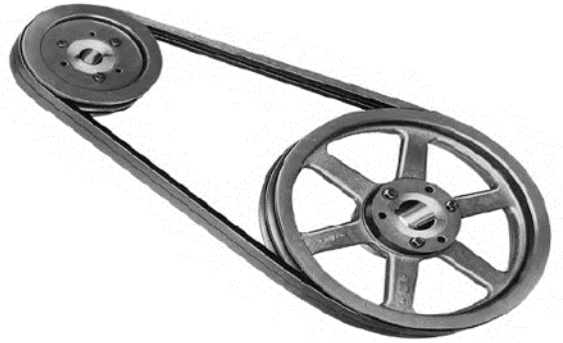

Fig: 2.3 Belt and Pulleys

3.1 Drilling:

3.1.1 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.

3.2 Cutting:

3.2.1 Introduction

The power hacksaw is commonly used for cutting bar stock. The power hacksaw is simple to operate and has only a few simple components as seen by Figure 1 below. The power hacksaw works by moving a straight cutting blade in a linear motion over the work piece to be cut. The blade cuts in one direction and a hydraulic feed moves the blade down through the work piece being cut.

3.2.2 Safety Considerations:-

The following is a list of things that should be done before and while operating the power hacksaw.

1. Wear safety goggles at all times in the machine shop.

2. Do not wear loose clothing.

3. Keep long hair away from the moving parts of the machine by keeping it tied back. 4. Wear footwear that covers your toes in the machine shop (i.e. No Sandals).

5. Make sure that the material being cut by the power hacksaw is well supported in the vise.

Of that the cut will be straight and the blade will not break.

6. Always use common sense and be aware of moving machine parts in the machine shop.

7. No horseplay in the shop.

8. Ask the instructor if in doubt.

9. Never leave an operating machine unattended.

3.2.3 Operating Procedures

Operating procedures for the power hacksaw are listed below in a general operating order.

1. Check that the machine has adequate coolant.
2. Place stock to the desired length past the cutting blade.
3. Tighten vise grips.
4. Lower the blade to top of stock, and then start machine.
5. Turn on coolant valve until blade is done cutting.
6. When machine is done cutting stop machine and return cutting arm to upright, locked Position.
7. Remove desired piece and clean out the filings.

4.1 Design

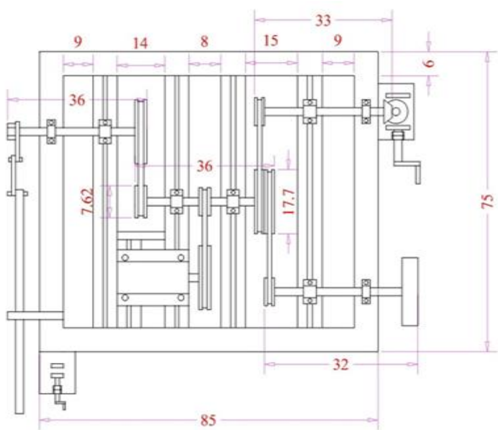

Fig: 4.1 Top view with dimensions

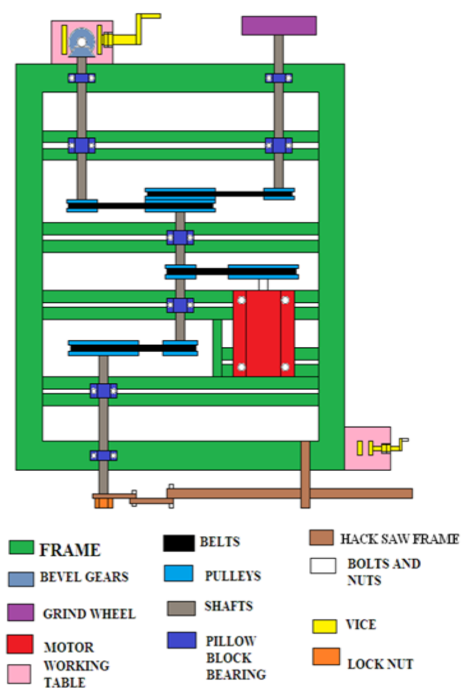

Fig: 4.2 Top view with component names

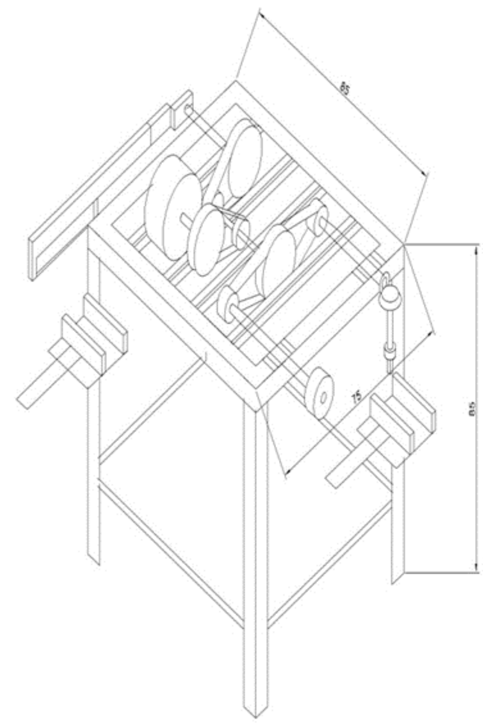

Fig: 4.3 Isometric view

4.2 Calculations:

4.2.1 Speed of drilling:

Speed of Motor (N_m): 600 RPM

Speed of Counter shaft (N_c):

Dia. of motor pulley (A) = 178 mm

Dia. of counter shaft pulley (B) = 76 mm

W.K.T,

$N_c/N_m = D_a/D_b$

$N_c = (D_a/D_b)*N_m$

$N_c = (76/178)*600$

$N_C = 1400$ RPM

Therefore, Speed of Counter shaft (N_c): 1400 RPM

Speed of Pinion shaft (N_p):

Dia. of counter shaft pulley (A) = 178 mm

Dia. of Pinion gear shaft pulley (B) = 76 mm

W.K.T,

$N_p/N_c = D_a/D_b$

$N_p = (D_a/D_b)*N_c$

N_p= (178/76)*1400

N_p=3200 RPM

Therefore, Speed of Pinion shaft (N_p): 3200 RPM

Speed of Driven shaft (N_d):

No. of teeth on Pinion (T_p): 9

No. of teeth on Driven gear (T_d):13

$N_d / N_p = T_p / T_d$

$N_d = (T_p / T_d)*N_p$

N_d = (9/13)*3200

N_d = 2215 RPM.

Therefore, Speed of Driven shaft (N_p): 2215 RPM

4.2.2 Speed of cutting:

Speed of Motor (N_m): 600 RPM

Speed of Counter shaft ($N_{c)}$:

Dia. of motor pulley (A) = 178 mm

Dia. of counter shaft pulley (B) = 76 mm

W.K.T,

$N_c/N_m = D_a/D_b$

$N_c= (D_a/D_b)*N_m$

N_c= (76/178)*600

N_c=1400 RPM

Therefore, Speed of Counter shaft ($N_{c)}$: 1400 RPM

Speed of Cutting shaft (N_{cs}):

Dia. of counter shaft pulley (A) = 76 mm

Dia. of Cutting shaft pulley (B) = 178 mm

W.K.T,

$N_{cs}/N_c = D_a/D_b$

$N_{cs}= (D_a/D_b)*N_c$

N_{cs}= (76/178)*1400

N_{cs}=600 RPM

Therefore, Speed of Cutting shaft (N_{cs}): 600 RPM

W.K.T,

One stroke of ram is completed in one revolution of Cutting Shaft.

Velocity of Cutting Machine:

Velocity (V) = {L*N*(1+K)}/1000 m/min

Length of ram stroke (L) = 50mm

Number of full stroke (N) = 600 stroke/min

Ratio of return time to cutting time (K) =1

Hence,

V= {L*N*(1+K)}/1000

V= {60*600*(1+1)}/1000

Therefore, Velocity of ram of cutting machine is 72 m/min

4.2.3 Speed of grinding:

Speed of Motor (N_m): 600 RPM

Speed of Counter shaft ($N_{c)}$:

Dia. of motor pulley (A) = 178 mm

Dia. of counter shaft pulley (B) = 76 mm

W.K.T,

$N_c/N_m = D_a/D_b$

$N_c= (D_a/D_b)*N_m$

N_c= (76/178)*600

N_c=1400 RPM

Therefore, Speed of Counter shaft ($N_{c)}$: 1400 RPM

Speed of Grind wheel shaft (N_g):

Dia. of counter shaft pulley (A) = 178 mm

Dia. of Grind wheel shaft pulley (B) = 76 mm

W.K.T,

$N_g/N_c = D_a/D_b$

$N_g= (D_a/D_b)*N_c$

N_g= (178/76)*1400

N_g=3200 RPM

Therefore, Speed of Grind wheel shaft (N_g): 3200 RPM

5. FUTURE SCOPE

- We can perform various operations like cutting, drilling and grinding individually when operation completed by e ngaging and disengaging of pulleys.
- We can perform various operations like cutting, drilling and grinding individually when operation completed by e ngaging and disengaging of gears by introducing gearbo x for transmitting 100% of power.
- We can change the speed of motor by regulator.

- We can perform shaping operation at another end of slid er crank mechanism.
- We can perform some of the lathe operations by replacing lathe chuck instead of drill chuck.

6. CONCLUSION

We can see that all the production based industries wanted low production cost and high work rate which is possible through the utilization of multi machining process with single power source machine which will less power as well as less time, since this machine provides working at different center it really reduced the time consumption up to appreciable limit.

In an industry a considerable portion of investment is being made for machinery installation. So in this paper we have proposed a machine which can perform operations like drilling, sawing, grinding at different working centers simultaneously which implies that industrialist have not to pay for machine performing above tasks individually for operating operation simultaneously.

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