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Multi Purpose Scotch yoke Mechanism

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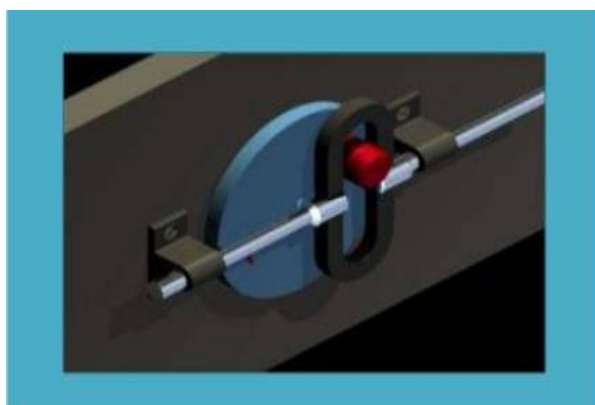
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ABSTRACT: There are many ways to cut metals, but all these ways take more time our aim isto reduce the cutting time by “DESIGN AND FABRICATION OF A MULTI PURPOSE SCOTCH YOKE MECHANISM” and increasing the number of productivity. By this method six operation can be performing. There are four cutting.one drilling and one grinding at the same time by using the bevel gear attachment. The time required to cut four works by power hacksaw multi metal cutter is the time taken by other methods to cut a two work. This method reduce human effort and saves the metal cutting time. Apart from other methods this method can be used in places were to cut more work at low cost. If we want to drilling or surface finishing work it is also possible. The sawing machine is faster and easier than hand sawing and is used principally to produce an accurate square or mitered cut on the work piece.

KEYWORDS: Multi purpose, Six operation, soild work design, Scotch yoke mechanism

I. INTRODUCTION



The **scotch yoke** mechanism is reciprocating motion mechanism, converting the liner motion of a slider into rotational motion, or vice versa. The piston or other reciprocating part is directly coupled to a sliding yoke with a slot that engages a pin on the rotating part. In many internal combustion engine, linear motion is converted into rotational motion by means of a crankshaft, a piston and a rod that connects them. The scotch yoke is considered to be a ,more efficient means of producing the rotational motion as it spends more time at the high point of its rotation than a piston and it has fewer parts.

II. LITERATURE REVIEW

•**Heinrich Arnold1(2001):** Rather long re-investment cycles of about 15 years have created the notion that innovation in the machine tool industry happens incrementally. But looking at its recent history, the integration of digital controls technology and computers into machine tools have hit the industry in three waves of technology shocks. Most

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companies underestimated the impact of this new technology. This article gives an overview of the history of the machine tool industry since numerical controls were invented and introduced and analysis the disruptive character of this new technology on the market. About 100 interviews were conducted with decision-makers and industry experts who witnessed the development of the industry over the last forty years.

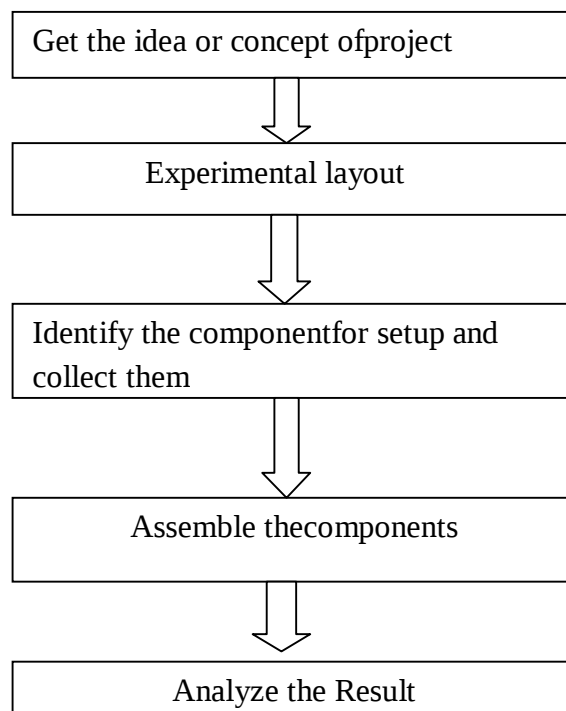
The study establishes a connection between radical technological change, industry structure, and competitive environment. It reveals a number of important occurrences and interrelations that have so far gone unnoticed.

Dr. Toshimichi Moriwaki (2006): Recent trends in the machine tool technologies are surveyed from the view points of high speed and high performance machine tools, combined multifunctional machine tools, ultra precision machine tools and advanced and intelligent control technologies

Frankfurt-am Main, 10 January 2011. : The crisis is over, but selling machinery remains a tough business. Machine tools nowadays have to be veritable “jack of all trades”, able to handle all kinds of materials, to manage without any process materials as far as possible, and be capable of adapting to new job profiles with maximized flexibility. Two highly respected experts on machining and forming from Dortmund and Chemnitz report on what’s in store for machine tool manufacturers and users.

Multi-purpose machines are the declarations of independence. The trend towards the kind of multi-purpose machining centers that are able to cost efficiently handle a broad portfolio of products with small batch sizes accelerated significantly during the crisis. “With a multi-purpose machine, you’re less dependent on particular products and sectors”, explains Biermann.

III. METHODOLOGY

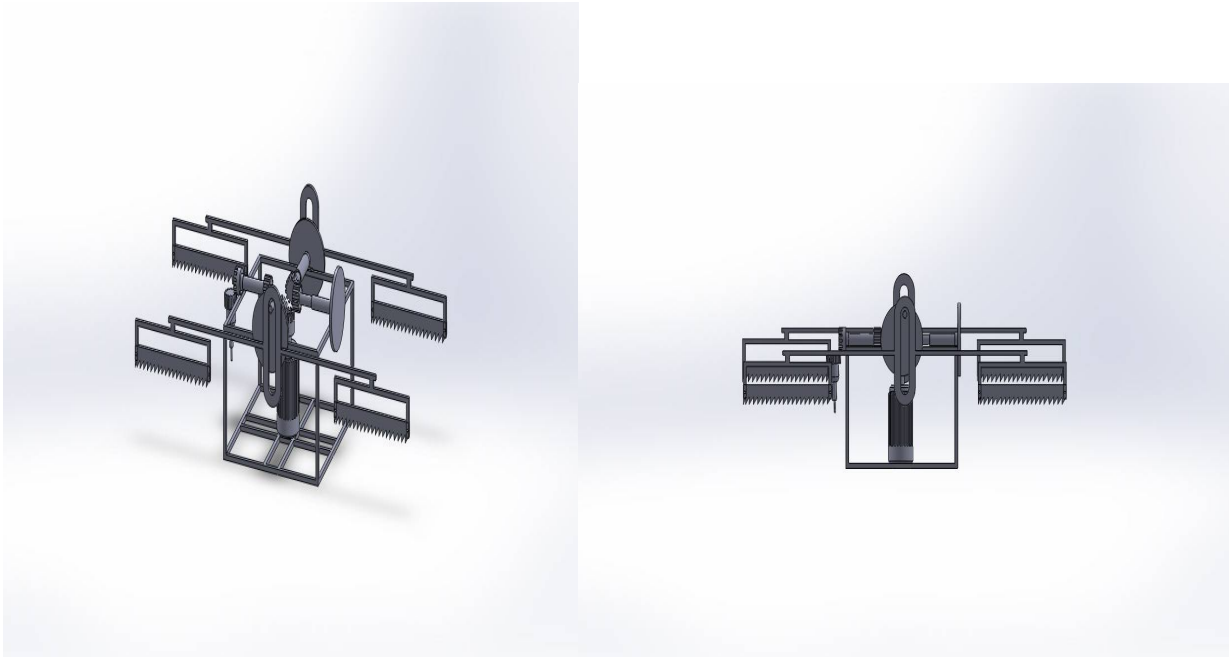


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IV. EXPERIMENTAL LAYOUT



V. WORKING PRINCIPLE

Scotch yoke mechanism is a simple type of mechanism which converts circular motion into reciprocating motion as discussed in construction part above. The power is supplied to the DC motor, shaft and crank attached to shaft start rotating. As the crank rotates the pin slides inside the yoke and also moves the yoke forward. When the crank rotates through in clockwise direction the yoke will get a displacement in the forward direction, initial position. For a complete rotation of crank the yoke moves through a length equal to double the length of the crank. The displacement of the yoke can be controlled maximum displacement will be equal to length of the crank. When the crank completes the next of rotation the yoke comes back to its initial position. For the next of rotation, yoke moves in the backward direction. When the crank completes a full rotation the yoke moves back to the d by varying the length of the crank.

BEVEL GEARS



Power Transmission Through Gears Bevel gears are gears where the axes of the two shafts intersect and the tooth-

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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 a gear is the imaginary toothless surface that you would have by averaging out the peaks and valleys of the individual teeth. The pitch surface of an ordinary gear is the shape of a cylinder. The pitch angle of a gear is the angle between the face of the pitch surface and the axis.

TWIST DRILL BIT DRILL PRESS SPEED CHART



MATERIAL	ACCESSORY	ROTATION PER MINUTE
SOFT WOOD(PINE)	11/16" - 1"	750
HARD WOOD(HARD MAPLE)	11/16" - 1"	500
ACRYLIC	7/16" - 5/8"	1500
BRASS	11/16" - 1"	400
ALUMINIUM	11/16" - 1"	1000
STEEL	11/16" - 1"	350

SHOP NOTES

Lubricate drill with oil when cutting steel
Use center punch on all holes to prevent drill
From wandering

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GRINDING WHEEL



HARDNESS RANGE FOR VARIOUS MATERIALS AND ABRASIVES.

MATERIAL AND ABRASIVES	HARDNESS RANGE
Titanium nitride	2000
Silicon carbide	2100-3000
Diamond	7000-8000
Hardened steels	700-1300
Tungsten carbide	1800-2400
Zirconium oxide	1000
Titanium carbide	800-1100
Quartz	800-1100
Aluminum oxide	2000-3000

CALCULATION

The pitch radius of pinion is $r_p = 1$ cm

pitch radius of gear $r_g = 2$ cm.

In layout of the model, the motor gear meshed 90 deg.

• $\tan \gamma_p = \sin \theta / (w_p/w_g) + \cos \theta$ where θ is the angle between the shaft.

• Putting θ and $\gamma_p = \sin \theta / (w_p/w_g) + \cos \theta$

We get $\theta = 1.428$ i.e. our velocity ratio is 1.428

• Then the two complete revolution of main shaft the drilling shaft and grinding shaft should have no of revolution = 2.856 (theoretically)

• But from our model the no of revolution measured at drilling and grinding axis . i.e. two complete revolution plus 240 rotation.

• Percentage Error in power transmission $= (2.856 - 2.67) / (2.856) * 100 = 6.51\%$

• Now diameter of circular disc of Scotch yoke mechanism = 7.9 cm

• Actual measured effective stroke length of yoke = 7.73 cm

• Percentage error in the stroke length $= (7.9 - 7.73) / (7.9) * 100 = 2.15\%$

• Similarly values of rpm at drilling and grinding axis can be measured on changing the input; in this conceptual model

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feed to the work piece is given through the work table.

•Hence the model is subjected to friction ,there is error of 6.51% and 2.15% during power transmission and transverse motion of sawing blade.

MOTOR

The reciprocating motion of the Hacksaw blade, which is where the cutting process takes place, is produced with the help of an AC motor shown in figure, which operates by a simple scotch yoke mechanism to convert rotary motion in to reciprocating motion.



SPCIFICATION

- Voltage and Power : 230
- Maximum Load Current
- HP : 0.25
- Speed : 1200 RPM
- Torque : 0.15 kg-m / 1.4
- Motor pulley diameter : 2

VI. 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-function operating 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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