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Design and simplification of multipurpose cutter using Scotch Yoke Mechanism

Pallepattu Madhu
madhupallepattu123@gmail.com
Saveetha School of Engineering, Kuthambakkam, Tamil Nadu

Settipalli Uma Maheswar Reddy
umamaheshwarreddy074@gmail.com
Saveetha School of Engineering, Kuthambakkam, Tamil Nadu

ABSTRACT

The Scotch yoke (also known as slotted page link mechanism) is a reciprocating motion mechanism, converting the linear 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. The location of the piston versus time is a sine wave of constant amplitude, and constant frequency is given a constant rotational speed. This project aims to fabricate the "mechanical Multi-cutter" by using Scotch Yoke mechanism with lower price to improve productivity and to reduce the time. The machine is designed such a way that a smooth trace of each cut stump can be obtained using reciprocating blades. The machine performs eventually even in small and soft fields. The mechanical cutters' innovation will bring a revolution in the development of the agricultural industry.

Keywords— *AutoCAD, Scotch Yoke Mechanism, Slider, Reciprocating, Solid Works*

1. INTRODUCTION

In this project, it includes the design of a double acting hacksaw machine. In industries saving the time and saving the manpower is an important thing all over the world. To satisfy the needs of the industries, the machine is exclusively intended for the mass production and they represent a fast and more effective way to cut the materials. There are numerous types of cutting machines in the engineering field, which are useful in fulfilling the requirements. This new machine is used to avoid energy loss and save time. Scotch Yoke [1] Mechanism is used for this purpose. Increasing productivity is one of the main requirements of production engineering in any kind of manufacturing industry. Either by reducing the operation time or by improving the capability of the machine to produce the components in an increased number at the same time is very essential for an industry to achieve the same. This project employs the Scotch yoke mechanism in power hacksaw machine which enables it to cut two components at a time thereby improving the productivity. In today's world time a machine should be less time-consuming. Power hacksaw cut one piece at one time so there was a loss in production rate. Double acting power hacksaw overcomes this time-consuming problem. Power hacksaw is a fine-tooth power saw with the blade held under tension in the frame. Double acting power hacksaw cuts two materials simultaneously by its scotch yoke mechanism, so the production rate increase twice than that of power hacksaw. Double acting power hacksaw works under by the scotch yoke [1] mechanism. The scotch yoke mechanism converts the rotary motion into the reciprocating motion.

2. SCOTCH YOKE MECHANISM

The Scotch Yoke [1] (also known as slotted link mechanism) is a reciprocating motion mechanism, converting the linear 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. The location of the piston versus time is a sine wave of constant amplitude, and constant frequency is given a constant rotational speed. This setup is most commonly used in control valve actuators in high-pressure oil and gas pipelines. Although not a common metalworking machine nowadays, crude shapers can use Scotch yokes. Almost all those use a Whitworth linkage, which gives a slow speed forward cutting stroke and a faster return. It has been used in various internal combustion engines, such as the Bourke engine, SyTech engine, and many hot air engines and steam engines.

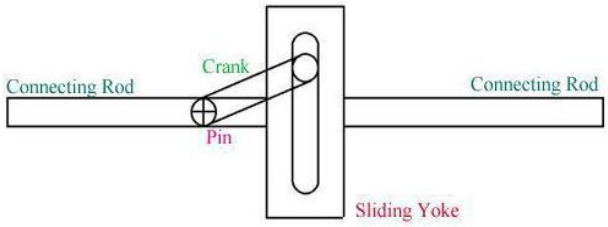

Fig. 1: Scotch Yoke Mechanism

2.1 History

This linkage was called by Scotsman in 1869 "a crank and a lot headed rod"but now it is known as Scotch yoke [1] mechanism because, in America at least, a scotch was a slotted bar that was slipped under a collar on a string of well drilling tools to support them while a section was being added. In 1940, Russell Bourke applied this mechanism to internal combustion engine called Bourke 30 Engine.

3. SOLIDWORKS OVERVIEW

SolidWorks [4] main idea is used to create drawing directly in 3D or solid form. From this solid user can assemble it directly on their workstation checking clashes and functionality of it. Creating drawing is pretty easy just drag and drop the solid to drawing block. SolidWorks [4] is published by Dassault Systèmes. Those of us having served any amount of time as a 3D CAD designer, the name SolidWorks is a name well known. Even though software packages with more complex functionality exist, SolidWorks is an industry favorite. It has a user base larger than any other 3D CAD package, almost as large as AutoCAD (which is primarily 2D drafting and drawing). This is because of SolidWorks [4] intuitive interface, logical and smart innovations in the user experience and clean whilst thorough function set. It is literally a favorite in the sports, fashion as well as the automobile industry with small to large scale projects employing the package just the same. Apart from specific industries that utilize SolidWorks [4] for its resilience as well as functionality, it is common in the hobbyist community of AutoCAD. SolidWorks [4] is a mature software package but does not offer the complexities that you may find in AutoCAD. Although both packages virtually target a different domain, people who have worked with AutoCAD for over a decade will not have complete knowledge of the package's vast scope. SolidWorks [4], however, offer intuitive options and eases the learning curve of 3D design and modeling as well as keeping the overall experience consistent over a longer duration of use.

Fig. 2: SolidWorks taskbars

3.1 Basics of SolidWorks

The menu bar contains nearly all the SolidWorks [4] commands. Menus and menu items are available depending on the active document type. Many commands are also available in:

3.1.1. Command Manager
3.1.2. Toolbars (by default it is hidden)
3.1.3. Manipulating the display using the Mouse
3.1.4. Sketcher
3.1.5. Part -Features

The Command Manager is a context-sensitive toolbar that dynamically updates based on the toolbar you want to access. By default, it has toolbars embedded in it based on the document type. When you click a tab below the Command Manager, it updates to show that toolbar. For example, if you click the Sketches tab, the Sketch toolbar appears. To toggle the descriptions and size of the buttons, right-click in the Command Manager and select or clear Use Large Buttons with Text.

4. DESIGN

4.1 List of parts

- Disc
- Frame
- Yoke
- Rod
- Normal blade
- Hacksaw blade

4.1.1. Disc: A flat, thin circular object and part resembling a disc in shape **or** appearance. It is a rotating part, which rotates itself. It is made of iron having a pin at the center.

4.1.2. Frame: It is a supporting part, and which is act as the base of the whole device.

4.1.3. Yoke and Rod: A wooden bar that is fastened over the necks of two animals, especially cattle, and connected to the vehicle or load that they are pulling. A thin straight bar, especially of wood or metal.

4.1.4. Normal Blade and Hacksaw blade: The flat cutting edge of a knife, saw, or other tool or weapon. Which is used for cutting?

Fine-tooth saw with a blade under tension in a frame that is used for cutting hard materials (such as metal).

5. DESIGNING OF PARTS

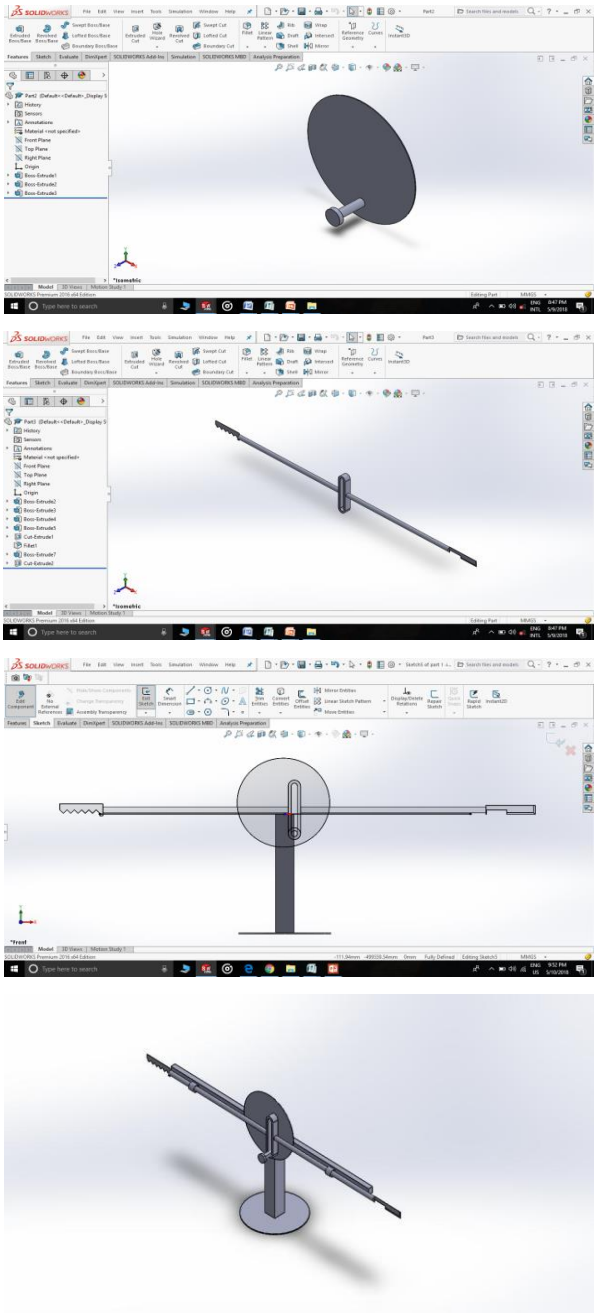

Fig. 3: Design of the whole project

6. CONCLUSION

The scotch yoke mechanism is made and its advantages and disadvantages are discussed. Its motion characteristics are studied. It is concluded that this mechanism is a good choice to convert rotating motion into reciprocating motion because of fewer moving parts and smoother operation. It can be used in direct injection engines like diesel engines, hot air engines. In this project report, we provide an overview of the issues concerning different aspects of the multipurpose machine using a scotch yoke mechanism. The paper focused on the principle of scotch yoke mechanism, type of tooling and machining parameters and process performance measure, which include cutting speed, depth of cut, material removal rate with a different type of equipment which can be run simultaneously and fabricate the workpiece in the multipurpose machine has been presented. The presented results can help to plan the machining of the workpiece with expected tolerance. The following major conclusions may be drawn from the study.

7. REFERENCES

[1] Dharwa Chaitanya Kirtikumar(April 2014):-Design and Fabrication of Automated Hacksaw Machine".

[2] R. Subash, K Samuel Jayakaran(July 2014):- Fabrication pedal powered hacksaw using dual chain drive".

[3] Sharad Srivastava & Shivam Srivastava Shri Ramswaroop (2014):-Multi-Function Operating Machine: A Conceptual Model.

[4] whpark@optics.arizona.edu, OPTI 421/521, Won Hyun Park.

[5] City University London School of Engineering and Mathematical Sciences RoomCLG34." introduction to SolidWorks.

