International Journal of Psychosocial Rehabilitation, Vol. 23, Issue 03, 2019
ISSN: 1475-7192

Pneumatic Reciprocating Hack Saw Machine

S. Manavalan

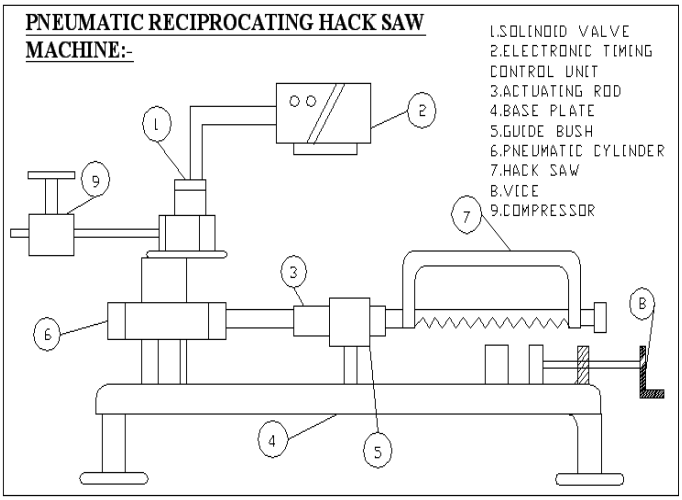
Abstract--- *The hacksaw is a metal cutting machine tool designed to cut metal by applying pneumatic pressure. The machine is exclusively intended for mass production and they represent fasten and more efficient way to cut a metal. Hacksaws are used to cut thin and soft metals. The operation of the unit is simplified to a few simple operations involving a cylinder block and piston arrangement. There are numerous types of cutting machines in Engineering field, which are used to fulfill the requirements. We are interested to introduce pneumatic system in Hacksaw machine. The main function of Pneumatic hacksaw is to cut thin and soft metals by pneumatic power.*

Keywords--- *Saw Machine, Pneumatic Reciprocating, Atmosphere, Damping Feature.*

I. INTRODUCTION

Principles of Working

- The compressed air from the compressor reaches the solenoid valve. The solenoid valve changes the direction of flow according to the signals from the timing device.
- The compressed air pass through the solenoid valve and it is admitted into the front end of the cylinder block. The air pushes the piston for the cutting stroke. At the end of the cutting stroke air from the solenoid valve reaches the rear end of the cylinder block. The pressure remains the same but the area is less due to the presence of piston rod. This exerts greater pressure on the piston, pushing it at a faster rate thus enabling faster return stroke.
- The weight attached at the end of the hacksaw frame gives constant loads which lower the hacksaw to enable continuous cutting of the work.
- The stroke length of the piston can be changed by making suitable adjustment in the timer.



S. Manavalan, Assistant Professor, Department of Mechanical Engineering, BIST, BIHER, Bharath Institute of Higher Education & Research, Selaiyur, Chennai. E-mail: manavalan.kannan@gmail.com

Received: 19 Feb 2019 | Revised: 07 Mar 2019 | Accepted: 02 Apr 2019

II. COMPONENTS AND DESCRIPTION

Pneumatic Control Component

Pneumatic Cylinder

An air cylinder is an operative device in which the state input energy of compressed air i.e. pneumatic power is converted in to mechanical output power, by reducing the pressure of the air to that of the atmosphere.

Single Acting Cylinder

Single acting cylinder is only capable of performing an operating medium in only one direction. Single acting cylinders equipped with one inlet for the operating air pressure, can be production in several fundamentally different designs.

Double Acting Cylinders

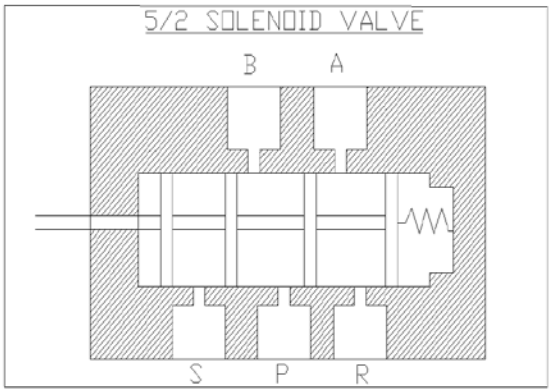
A double acting cylinder is employed in control systems with the full pneumatic cushioning and it is essential when the cylinder itself is required to retard heavy messes. This can only be done at the end positions of the piston stock. In all intermediate position a separate externally mounted cushioning derive most be provided with the damping feature.

Valves

a) 5/2 Double Acting Solenoid Valve

The directional valve is one of the important parts of a pneumatic system. Commonly known as DCV, this valve is used to control the direction of air flow in the pneumatic system. The directional valve does this by changing the position of its internal movable parts.

This valve was selected for speedy operation and to reduce the manual effort and also for the modification of the machine into automatic machine by means of using a solenoid valve.



Piston

The piston is fitted in the cylinder block and reciprocates inside. When the solenoid valve supplies the air in the front end of the piston, the piston is pushed forward. This moves the hacksaw and the cutting stroke takes place. Then the solenoid valve supplies air to the rear end of the piston.

Received: 19 Feb 2019 | Revised: 07 Mar 2019 | Accepted: 02 Apr 2019

The pressure is same but the contact area is less due to the presence of the piston rod and pushes the piston at a greater pressure thus resulting in a fast return stroke. The material for the piston is Aluminum.

Actuating Rod

The actuating rod is fitted inside the bush. It is connected at one end to the piston rod and at the other end it is connected to the hacksaw frame. It reciprocates inside the bush. The material for the actuating rod is mild steel.

Hacksaw Frame

The hacksaw frame is connected to one end of the actuating rod and the weights are mounted at the other end. The hacksaw is fitted in the slots provided in the frame. The material for the frame is mild steel.

Timing Device

The timing device supplied signal alternatively to the solenoid valve. The clock fitted in the device actuates the operation of the valve. The timing can be changed to obtain different speeds.

APPLICATION

1. Agriculture:
    - Crop forming
    - Stock breeding
    - Animal food industries
    - Foresting
2. Utilities:
    - Power Station
    - Nuclear Engineering
    - Water Supply
3. Mining
4. Chemical Industry
5. Plastics and rubber industries
6. Stone, Ceramic and glass industries
7. Metal Industries:
    - Iron and Steel
    - Non-ferrous metals
    - Foundries
    - Scrap and recycled metals

Advantages

- There is no need of giving feed during every cut due to the presence of weight.
- The cutting speed can be varied according to our needs by adjusting the timer.

Received: 19 Feb 2019 | Revised: 07 Mar 2019 | Accepted: 02 Apr 2019

- It is portable.
- It does not have any Prime mover, like electric motor related to the unit.
- As the air is freely available, we can utilize the air to cut the metal and hence it is economical.
- Simple in construction than mechanical hacksaw
- It is a compact one
- Less Maintenance

Limitations

- Only smaller size and soft metal can be cut
- It is costlier than the mechanical hacksaw because of compressor unit.
- Less efficiency when compressed to mechanical device.
- Leakage of air affects the working of the unit.

Need for Automation

Nowadays almost all the manufacturing process is being atomized in order to deliver the products at a faster rate. The manufacturing operation is being automised for the following reasons.

To achieve mass production

- To reduce man power
- To increase the efficiency of the plant
- To reduce the work load
- To reduce the production cost
- To reduce the production time
- To reduce the material handling
- To reduce the fatigue of workers
- To achieve good product quality
- Less Maintenance

III. CONCLUSION

In the pneumatic hacksaw variable speeds can be obtained by adjusting the timer device and pressure of the compressed air. Since the mechanism is so simple and versatile it can be handled by any operator, constriction of the unit is very simple. Handling the machine is easy and smooth operation is achieved.

REFERENCES

[1] Thooyamani, K.P., Khanaa, V., & Udayakumar, R. (2014). Virtual instrumentation based process of agriculture by automation. *Middle-East Journal of Scientific Research, 20*(12): 2604-2612.

Received: 19 Feb 2019 | Revised: 07 Mar 2019 | Accepted: 02 Apr 2019

[2] Udayakumar, R., Kaliyamurthie, K.P., & Khanaa, T.K. (2014). Data mining a boon: Predictive system for university topper women in academia. *World Applied Sciences Journal*, *29*(14): 86-90.

[3] Anbuselvi, S., Rebecca, L.J., Kumar, M.S., & Senthilvelan, T. (2012). GC-MS study of phytochemicals in black gram using two different organic manures. *J Chem Pharm Res*., *4*, 1246-1250.

[4] Subramanian, A.P., Jaganathan, S.K., Manikandan, A., Pandiaraj, K.N., Gomathi, N., & Supriyanto, E. (2016). Recent trends in nano-based drug delivery systems for efficient delivery of phytochemicals in chemotherapy. *RSC Advances*, *6*(54), 48294-48314.

[5] Thooyamani, K.P., Khanaa, V., & Udayakumar, R. (2014). Partial encryption and partial inference control based disclosure in effective cost cloud. *Middle-East Journal of Scientific Research*, 20(12), 2456-2459.

[6] Lingeswaran, K., Prasad Karamcheti, S.S., Gopikrishnan, M., & Ramu, G. (2014). Preparation and characterization of chemical bath deposited cds thin film for solar cell. *Middle-East Journal of Scientific Research*, *20*(7), 812-814.

[7] Maruthamani, D., Vadivel, S., Kumaravel, M., Saravanakumar, B., Paul, B., Dhar, S.S., Manikandan, A., & Ramadoss, G. (2017). Fine cutting edge shaped Bi2O3rods/reduced graphene oxide (RGO) composite for supercapacitor and visible-light photocatalytic applications. *Journal of colloid and interface science*, *498*, 449-459.

[8] Gopalakrishnan, K., Sundeep Aanand, J., & Udayakumar, R. (2014). Electrical properties of doped azopolyester. *Middle-East Journal of Scientific Research*, *20*(11). 1402-1412.

[9] Subhashree, A.R., Parameaswari, P.J., Shanthi, B., Revathy, C., & Parijatham, B.O. (2012). The reference intervals for the haematological parameters in healthy adult population of chennai, southern India. *Journal of Clinical and Diagnostic Research: JCDR*, *6*(10), 1675-1680.

[10] Niranjan, U., Subramanyam, R.B.V., & Khanaa, V. (2010, September). Developing a web recommendation system based on closed sequential patterns. In *International Conference on Advances in Information and Communication Technologies*, *101*, 171-179. Springer, Berlin, Heidelberg.

[11] Slimani, Y., Baykal, A., & Manikandan, A. (2018). Effect of Cr3+ substitution on AC susceptibility of Ba hexaferrite nanoparticles. *Journal of Magnetism and Magnetic Materials*, *458*, 204-212.

[12] Premkumar, S., Ramu, G., Gunasekaran, S., & Baskar, D. (2014). Solar industrial process heating associated with thermal energy storage for feed water heating. *Middle East Journal of Scientific Research*, *20*(11), 1686-1688.

[13] Kumar, S.S., Karrunakaran, C.M., Rao, M.R.K., & Balasubramanian, M.P. (2011). Inhibitory effects of Indigofera aspalathoides on 20-methylcholanthrene-induced chemical carcinogenesis in rats. *Journal of carcinogenesis*, *10*.

[14] Beula Devamalar, P.M., Thulasi Bai, V., & Srivatsa, S.K. (2009). Design and architecture of real time web-centric tele health diabetes diagnosis expert system. *International Journal of Medical Engineering and Informatics*, *1*(3), 307-317.

[15] Ravichandran, A.T., Srinivas, J., Karthick, R., Manikandan, A., & Baykal, A. (2018). Facile combustion synthesis, structural, morphological, optical and antibacterial studies of Bi1− xAlxFeO3 ($0.0 \leq x \leq 0.15$) nanoparticles. *Ceramics International*, *44*(11), 13247-13252.

[16] Thovhogi, N., Park, E., Manikandan, E., Maaza, M., & Gurib-Fakim, A. (2016). Physical properties of CdO nanoparticles synthesized by green chemistry via Hibiscus Sabdariffa flower extract. *Journal of Alloys and Compounds*, *655*, 314-320.

[17] Thooyamani, K.P., Khanaa, V., & Udayakumar, R. (2014). Wide area wireless networks-IETF. *Middle-East Journal of Scientific Research*, *20*(12), 2042-2046.

[18] Sundar Raj, M., Saravanan, T., & Srinivasan, V. (2014). Design of silicon-carbide based cascaded multilevel inverter. *Middle-East Journal of Scientific Research*, *20*(12), 1785- 1791.

[19] Achudhan, M., Jayakumar M.P. (2014). Mathematical modeling and control of an electrically-heated catalyst. *International Journal of Applied Engineering Research*, *9*(23), 23013.

[20] Thooyamani, K.P., Khanaa, V., & Udayakumar, R. (2013). Application of pattern recognition for farsi license plate recognition. *Middle-East Journal of Scientific Research*, *18*(12), 1768-1774.

[21] Jebaraj, S., Iniyan S. (2006). Renewable energy programmes in India. *International Journal of Global Energy Issues*, *26*(43528), 232-257.

[22] Sharmila, S., & Jeyanthi Rebecca, L. (2013). Md Saduzzaman., Biodegradation of domestic effluent using different solvent extracts of Murraya koenigii. *J Chem and Pharm Res*, *5*(2), 279-282.

[23] Asiri, S., Sertkol, M., Guner, S., Gungunes, H., Batoo, K.M., Saleh, T.A., Manikandan A., & Baykal, A. (2018). Hydrothermal synthesis of CoyZnyMn1-2yFe2O4 nanoferrites: magneto-optical investigation. *Ceramics International*, *44*(5), 5751-5759.

[24] Rani, A.J., & Mythili, S.V. (2014). Study on total antioxidant status in relation to oxidative stress in type 2 diabetes mellitus. *Journal of clinical and diagnostic research: JCDR*, *8*(3), 108-110.

[25] Karthik, B. (2014). Arulselvi, Noise removal using mixtures of projected gaussian scale mixtures. *Middle-East Journal of Scientific Research*, *20*(12), 2335-2340.

[26] Karthik, B., Arulselvi, & Selvaraj, A. (2014). Test data compression architecture for low power VLSI testing. *Middle - East Journal of Scientific Research*, *20*(12), 2331-2334.

[27] Vijayaragavan, S.P., Karthik, B., & Kiran Kumar, T.V.U. (2014). Privacy conscious screening framework for frequently moving objects. *Middle-East Journal of Scientific Research*, *20*(8), 1000-1005.

[28] Kaliyamurthie, K.P., Parameswari, D., & Udayakumar, R. (2013). QOS aware privacy preserving location monitoring in wireless sensor network. *Indian Journal of Science and Technology*, *6*(5), 4648-4652.

[29] Silambarasu, A., Manikandan, A., & Balakrishnan, K. (2017). Room-temperature superparamagnetism and enhanced photocatalytic activity of magnetically reusable spinel ZnFe 2 O 4 nanocatalysts. *Journal of Superconductivity and Novel Magnetism*, *30*(9), 2631-2640.

[30] Jasmin, M., Vigneshwaran, T., & Beulah Hemalatha, S. (2015). Design of power aware on chip embedded memory based FSM encoding in FPGA. *International Journal of Applied Engineering Research*, *10*(2), 4487-4496.

[31] Philomina, S., & Karthik, B. (2014). Wi-Fi energy meter implementation using embedded linux in ARM 9. *Middle-East Journal of Scientific Research*, *20*, 2434-2438.

[32] Vijayaragavan, S.P., Karthik, B., & Kiran Kumar, T.V.U. (2014). A DFIG based wind generation system with unbalanced stator and grid condition. *Middle-East Journal of Scientific Research*, *20*(8), 913-917.

[33] Rajakumari, S.B., & Nalini, C. (2014). An efficient data mining dataset preparation using aggregation in relational database. *Indian Journal of Science and Technology*, *7*, 44-46.

[34] Karthik, B., Kiran Kumar, T.V.U., Vijayaragavan, P., & Bharath Kumaran, E. (2013). Design of a digital PLL using 0.35 Î¼m CMOS technology. *Middle-East Journal of Scientific Research*, *18*(12), 1803-1806.

[35] Sudhakara, P., Jagadeesh, D., Wang, Y., Prasad, C.V., Devi, A.K., Balakrishnan, G., Kim B.S., & Song, J.I. (2013). Fabrication of Borassus fruit lignocellulose fiber/PP composites and comparison with jute, sisal and coir fibers. *Carbohydrate polymers*, *98*(1), 1002-1010.

[36] Kanniga, E., & Sundararajan, M. (2011). Modelling and characterization of DCO using pass transistors. In *Future Intelligent Information Systems*, 86(1), 451-457. Springer, Berlin, Heidelberg.

[37] Sachithanandam, P., Meikandaan, T.P., & Srividya, T. Steel framed multi storey residential building analysis and design. *International Journal of Applied Engineering Research*, *9*(22), 5527-5529.

[38] Kaliyamurthie, K.P., Udayakumar, R., Parameswari, D., & Mugunthan, S.N. (2013). Highly secured online voting system over network. *Indian Journal of Science and Technology*, *6*(S6), 4831-4836.

[39] Sathyaseelan, B., Manikandan, E., Lakshmanan, V., Baskaran, I., Sivakumar, K., Ladchumananandasivam, R., Kennedy, J., & Maaza, M. (2016). Structural, optical and morphological properties of post-growth calcined TiO2 nanopowder for opto-electronic device application: Ex-situ studies. *Journal of Alloys and Compounds*, *671*, 486-492.

[40] Saravanan, T., Sundar Raj M., & Gopalakrishnan K. (2014). SMES technology, SMES and facts system, applications, advantages and technical limitations. *Middle - East Journal of Scientific Research*, *20*(11), 1353-1358.

[41] Anand, K., Palanisamy, T., & Loganathan, R. (2014). Analysis of Torque Ripple and Speed Control of Five Phase BLDC Motor. *International Scientific Journal on Science Engineering & Technology*, *17*(9), 886-892.

[42] Niranjana Murthy, H.S., & Dr.Meenakshi, M. (2015). ANN, SVM and KNN Classifiers for Prognosis of Cardiac Ischemia- A Comparison. *Bonfring International Journal of Research in Communication Engineering*, *5*(2), 7-11.

[43] Sakuma, H. (2013). Improvement of One-shot FringeProjection for Shape Measurement. *The SIJ Transactions on Computer Science Engineering & its Applications*, *1*(5), 7-11.

[44] Vidhya, K., & Saravanan, N. (2018). Enhanced Automatically Mining Facets for Queries and Clustering with Side Information Model. *Bonfring International Journal of Software Engineering and Soft Computing*, 8(2), 1-6.

[45] Aodsup, K., & Kulworawanichpong, T. (2014).FDTD Method for Lightning Surge Propagation of Power Transmission Lines. *The SIJ Transactions on Computer Networks & Communication Engineering (CNCE)*, *2*(4), 7-11.

[46] Sulyukova. (2019). Analysis of Low power and reliable XOR-XNOR circuit for high Speed Applications. *Journal of VLSI Circuits And Systems*, *1*(1), 23-26.

[47] Deshpande, G.B., & Dr. Ramesha, K. (2015). MRI Brain Image Enhancement Using XILINX System Generator and DWT. *Bonfring International Journal of Advances in Image Processing, 5*(2), 16-22.

[48] Salimoddin, & Mohammed, A.M. (2018). Design of Error Detection Reed Solomon Codes at the Receiver.*Journal of Computational Information Systems, 14*(4), 1 - 6.

[49] Raj Raghul, S. (2014). A General View about Grid Computing and Its Concepts. *International Journal of Advances in Engineering and Emerging Technology, 5*(5), 225-233.

[50] Saranya, K., & Rajesh Kumar, B. (2015). Design and Implementation of GCPV System Based on GGC in Symmentrical LMV Network for Grid Stabilization. *Excel International Journal of Technology, Engineering and Management, 2*(1), 19-21.