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DESIGN AND FABRICATION OF HYDRAULIC CYLINDER LINER PULLER

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ABSTRACT

Now a day is an Automobile garage, it is very difficult to remove the cylinder liner for that we have to dismantle the engine fully for removing a cylinder liner without hydraulic press. It intakes more time and heavy work. To overcome all this difficulties we adopted a new system named "Fabrication of hydraulic cylinder liner puller". In this project, there is a triple column by which a rod is connected to it. At the centre of the column a Hydraulic jack is provided to lift the column. A rod is connected to the puller to remove the cylinder liner. We have to remove the head of the engine piston, crank case, and connecting rod. Then inserted the Pulling rod into the cylinder liner. When the hydraulic jack is operated pulling rod pull the liner very easily without damage to the other liner. This project is applicable for all heavy and light vehicles.

Key words: Hydraulic System, Liner, Automotive Engine, Jack.

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1. INTRODUCTION

A Hydraulic cylinder liner puller is a device which enables the single persons to operate it alone and Remove the cylinder from engine block without removing the engine block from the chassis of the Engine. So special skill is needed to operate or remove the liner from the engine block. It can widely use. It is to Fit on the engine block and removing. It is need not necessity of work place for setting the puller. This can be effectively used for removing cylinder liners for such as LEYLAND 370, BENZI 1210E**,** Perkins and generators oil engines etc [1-6].

2. HISTORY OF HYDRAULIC SYSTEMS

The hydraulic cylinder liner puller is a mechanical device which widely used in automobile works. The hydraulic cylinder liner puller increases the efficiency of the man power in removing the liner from the engine block. The reason for the development and in the introduction of the hydraulic cylinder liner puller is given below. The hydraulic cylinder liner puller is one of the improved hand operated device. The operation of removing cylinder liner

from the engine block done by this device can also be don be by other methods. But this one is very compact, simple and versatile. Now a day the removing of cylinder liner from engine block is carried out by hydraulic devices. But in this case the engine block must be removed from chassis of engine. Since it needs more than one person and it will make more time consuming and increases the cost of reconditioning the liners. The workers strained very due to heavy weight of engine blocks. Also they felt that it was not safety as the engine blocks removed from the chassis. Also great care should be taken out damage engine block and to prevent injury to the persons engaged. Development of more than two persons to remove engine block from chassis and then to remove liner from engine block is not only the great loss to the automobile workshops but also wastage of time and increased labor cost resulting the over head cost of reconditioning the liners[7-13].

3. WORKING PRINCIPLE

This device is worked by the principles of hydraulic lifting system. To except the pulling power to remove the liner from the engine block. This is operated by hydraulic power without use of man power. As the bottom flange has a step which is settled below the bottom portion of the liner in the cylinder block, makes to provide grip or support between the bottom portions by connecting of each with other. This bottom flange having a centre hole. A centre rod into the bottom flange. The centre rod projections top of the engine block. Then a top flange is connected at the top of the centre rod. This top flange positioned at the top of a hydraulic jack. If we lift the jack, the top flange pulled the centre rod. So the centre rod raided with bottom flange gradually with liner. Thus the liner removed. This is the principle of operation of the "HYDRAULIC CYLINDER LINER PULLER".

4. DESIGN CALCULATION

Before opening the jacks, first insert the notched end of the handle into the release valve, turn the operating handle clock wise until release valve is closed. Do not over tighten the valve. Insert operating handle into the socket and ram is steadily raised by the load is thus raised. The ram will stop rising when the required height is reached. Lower the ram by turning the release valve. Counter-clockwise with the notched end slaked it slowly when a load is applied or accidents would occur. Before operating, estimate the weight of the load. Do boot overload the jack beyond its rated load. Select point of action according to the gravitational centre place the jack on the hardness ground if necessary; place a hard plank under the jacks so as to avoid tottering or falling during operation. When more than one jack is used at the same time is important to operate the different jacks at a speed with equal load. Otherwise, there is danger of falling of the entire fixture. For best results use specially blended jack oil. If such oil is not readily obtainable, the equivalent international oil specification is SAE10.Violent shocks must be avoided during the operation. Do not overload, do not adjust the valve.

Maximum load=4000kg

BOTTOM FLANGE

It is made up of mild steel. The middle screw rod one is fixed to this bottom flange.

Length=300mm

TOP FLANGE

It is made up of mild steel. The hydraulic jack is lifting this top flange.

Length=300mm

SQUARE PLATE

Material selection, weld ability, toughness, low cost, hardness, easily to machine, and easily available in the market.

Machines used; Lathe, drilling and shaping machines

Quantity; 1

Area; 250mm*250mm

Thickness ; 8mm

SCREW ROD

Material; C15

Material selection ; due to weld ability ability, toughness, low cost, hardness, easy to machine, and available in the market.

Quantity; 4

Length; 350mm

Diameter of: 16mm

LIFTING R0D

This is made up of C15 material. This rod is used to lifting the hydraulic cylinder puller.

Quantity: 2

Length; 450mm

Diameter of; 16mm

CENTRECIRCULARPLATE

Inner diameter; 16mm

Outer diameter; 85mm

Thickness; 8mm

Area of circular plate= (3.14/4)*(d1^2-d2^2)*thickness

= (3.14/4)*(85^2-16^2)*8

=437.87mm^2

Stress

Maximum stress of MS Rod is 120N/mm^2

stress =load/area

=(4000*9.81)/437.87

=89.61 N/mm^2 <120N/mm^2

So design is safe.

5. FABRICATION DETAILS

Fabrication of hydraulic cylinder liner puller is quite simple, but the fabrication work is not a fixed one. The fabrication device is done one work spot in each operation time. First the bottom flange is positioned at the bottom and top of the cylinder liner. The one inch square thread main rod is inserted freely through the centre holeof the bottom flanges. One of the top flanges inserted in the one inch main rod on the top flange. It is also tightened by square nut with main rod. The G.I pipes positioned with supporting rods on the engine block. Supporting plate placed

over the G.I pipe and tightens by ½" nuts with supporting rod. The hydraulic jack is placed over the supporting plate. Again the one of the top flange over the jack top side. The top flanges connected by means of two ½" rods through supporting plate. The jack is lifted by a handle. Thus this device is fabricated. After removing on liner if we want to remove another liner the fabrication will be matched and then fabricated once again. Thus this device is fabricated again and again to remove number of liner from cylinder block [13-20].

6. CONCLUSION

We the project designers of the HYDRAULIC CYLINDER PULLER hope and belief that the automobile workshop will definitely welcome this, as there are many advantages in using this device. It occupies less space and it can be directed to any work spot. It is quick acting device. Only one person is enough to do operation and can perform individually. The hydraulic cylinder liner puller reduces the man power. It also reduces the occurrence of accident causing injuries. Great showing is achieved by reduction of labor cost and handling time. This reduces overhead cost of reconditioning the cylinder liner puller and employ single person instead of more than two. Although there many advantage the different size of the flanges has to be used when non standards liner to be removed. Now the hydraulic liner puller which has developed is suitable only for standard size liners such as LEYLAND-370, BENZI-1210E, and PERKINS etc.

REFERENCES

[1] Budynas, G.R. and Nisbett, K.J., (2008), "Shigley"s Mechanical Engineering Design", McGraw-Hill Companies, 8th Edition, pp 67-- 410. ISBN: 978 – 007 - 125763 – 3.

[2] L.Escalin Tresa & Dr.M.Sundhararajan," An Intelligent repeated objects tracking on Video Sequences", Published in International Journal of Applied Engineering Research, Vol. 10 No.5 (2015).pp 11803-11810.

[3] Gopalakrishnan, K., Prem Jeya Kumar, M., Sundeep Aanand, J., Udayakumar, R., Thermal properties of doped azopolyester and its application, Indian Journal of Science and Technology, v-6, i-SUPPL.6, pp-4722-4725, 2013.

[4] Revati Shriram & Dr.M.Sundhararajan," Coherence Analysis of Pressure Pulse and Photoplethysmogram at Various sites", Published in International Journal of Applied Engineering Research, Vol. 10 No.6 (2015).pp 14959-14968.

[5] james, M. Gere (2006), "Mechanics of material" Sixth edition Chris Carson ISBN - 13:9780495073079. ISBN -10:0495073075 pages 150-300.

[6] Sharmila, S., Jeyanthi Rebecca, L., Das, M.P., Saduzzaman, M., Isolation and partial purification of protease from plant leaves, Journal of Chemical and Pharmaceutical Research, v-4, i-8, pp-3808-3812, 2012.

[7] James, M. Gere and Stephen, P. Timoshenko (1991), "Mechanics of Materials" 3rd SI Edition, Chapman and Hall. 807 pp. ISBN 0-7487-4084-8.

[8] Nivedita Daimiwal, Dr.M.Sundhararajan & Revati Shriram," NIRS Based PPG Sensor For Detection of Oxy –Hb and Deoxy-Hb Change During Activity", Published in International Journal of Applied Engineering Research, Vol. 10 No.7 (2015).pp 17347-17356.

[9] Khurmi, R.S. and Gupta, J.K. (2005), "A Textbook of Machine Design", Eurasia Publishing House (P.V.T) Ltd.14th Edition, 1230 pp. ISBN: 81 - 219 - 2537 – 1

[10] Sengottuvel, P., Satishkumar, S., Dinakaran, D., Optimization of multiple characteristics of EDM parameters based on desirability approach and fuzzy modeling, Procedia Engineering, v-64, i-, pp-1069-1078, 2013.

[11] Rajput, R.K, (2007), A Textbook of Manufacturing Technology" Laxmi Publications, 1st Edition, 899 pp. ISBN 978-81-318-0244-1.

[12] S.Arul Selvi & M.Sundararajan," A Combined Framework for Routing and Channel Allocation for Dynamic Spectrum Sharing using Cognitive Radio", Published in International Journal of Applied Engineering Research, Vol. 11 No.7 (2015).pp 4951--4953.

[13] Rajput, R.K. (2010), "Strength of Materials" Revised Edition, S. Chand and Company Limited. 1448 pp ISBN 81-219-2594-0.

[14] Anbazhagan, R., Satheesh, B., Gopalakrishnan, K., Mathematical modeling and simulation of modern cars in the role of stability analysis, Indian Journal of Science and Technology, v-6, i-SUPPL5, pp-4633-4641, 2013.

[15] M.Sundararajan, C.Lakshmi & Dr.M.Ponnavaikko, "Improved Kernel Common Vector Method for Face Recognition", Proceeding of 2nd IEEE International Conference on Machine Vision-2009, Dubai, UAE, December 28-30, pp. 13-17, 2009 and Published in IEEE Explorer.

[16] Sharmila, S., Jeyanthi Rebecca, L., Das, M.P., Production of Biodiesel from Chaetomorpha antennina and Gracilaria corticata, Journal of Chemical and Pharmaceutical Research, v-4, i-11, pp-4870-4874, 2012.

[17] M.Sundararajan, C.Lakshmi & P.Manikandan, "Hierarchical Approach of Discriminative Common Vectors for Bio Metric Security", Proceeding of 2nd IEEE International Conference on Computer and Automation Engineering-2010, Singapore, February 26-28, 2010.vol 2 pp. 784-790.

[18] Jayalakshmi, V., Gunasekar, N.O., Implementation of discrete PWM control scheme on Dynamic Voltage Restorer for the mitigation of voltage sag /swell, 2013 International Conference on Energy Efficient Technologies for Sustainability, ICEETS 2013, pp-1036-1040, 2013.

[19] Revati Shiram, Dr.M.Sundhararajan & Nivedita Daimiwal, "Effect of Change in Intensity of Infrared LED on Photoplethysmogram", Proceeding of IEEE International Conference on Communication & Signal Processing (ICCSP), Mellmaruvathur, Chennai, April 3-4, 2014. Pp: 1064-1067.

[20] P. Yogesh, C. Arun, R. Arunkumar, S. Muruganantham and P. Abinesh, Elimination of Rejection in Injector Manufacturing Process by using Hydraulic Fixture. International Journal of Mechanical Engineering and Technology, 8(3), 2017, pp. 331–343.

[21] S. Sathishkumar, R. Swaminathan, S. Mithun Sena and P.T. Dinakaran, Design and Development of Special Purpose Machine Using Hydropneumatic Cylinders to do 4 Holes and 2 Holes Piercing in a Square Tube. International Journal of Mechanical Engineering and Technology, 8(3), 2017, pp. 209–218.

[22] Gopalakrishnan, K., Prem Jeya Kumar, M., Sundeep Aanand, J., Udayakumar, R., Analysis of static and dynamic load on hydrostatic bearing with variable viscosity and pressure, Indian Journal of Science and Technology, v-6, i-SUPPL.6, pp-4783-4788, 2013.