

# Pneumatic Operated Tyre Remover And Fitter

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**Abstract-** Removal of vehicle tyres has being so strenuous for road side in some garage due to the manual labour exerted during the process. In reducing the labour requirement as described by ergonomist Phelani in his book, an electrically operated tyre removing machine was developed. The objective of the project is to make the process of tyre removal from vehicles for repair purpose easier than the local method commonly used.

**Keywords-** Pneumatic circuit, Actuator's ,DC Vales, Mechanical advatages,etc..

## I. INTRODUCTION

The machine comprises of the actuator, plunger blade, tyre seat, switch control and frame supports. The elements of the machine were assembled and coupled together using both fastening and welding method. It was found that the efficiency of the machine was very high and it removes tires with ease The semi-automatic tyre changer is especially designed for demounting / mounting tyres from wheel rims[3]. This tire changer is specially designed for removing tire from rim and installing tire onto rim.Tire pressing machine involves the rotary motion of the lever which causes the bead breaker to press the tire[6]. it has two side arm to which the nuts are attached and through which screw passes and to that screw bead breaker is attached. As the lever is rotated it also rotates the screw to which bead breaker is mounted and it press the bead of the tire .instead of lever pneumatic gun can also be used to rotate the screw. This machine reduces the total efforts of the operator. And it also reduces total cost of product and process.[1]

## II. METHOLOGY

### Step 1:- Identification of problem

Removal of vehicle tyres has being is very critical process and it required more effort In reducing the effort of labour as per requirement, this purpose we desine a pneumatic operated tyre removing machine was developed. The objective of the project is to make the process of tyre removal from vehicles for repair purpose easier.

### Step 2:-Design and Proposed Project: Duration (5weeks)

The system design comprises of development of mechanism so that we give concept can perform the desire operation. The system design also determined system components, And procedure as per reference the standard parts are selected from the design data book and procedure of design is selected from design of machine element by V.B.Bhandari.

### Step 3:- Software Modelling:

Detailed drawing using AUTO-CAD software, CREO. Designed part is drawing using AUTO-CAD.

### Step 4:- Fabrication:

All the elements are manufactured in the workshop such as frame, shaft, motor, actuator, Bolts, DC valves as per selected specification etc., lower frame, rotary meahanism, pluger, are manufacturing in workshop.

**Step 5:- Assembly:**All the manufactured and selected parts are assembled together.

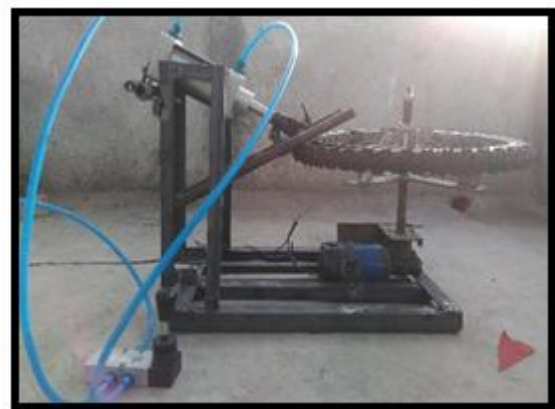


Fig.[a],

## III. CONSTRUCTION

The equipment base frame (H-beam) was welded at the two edges to the two rectangular hollow bar legs then to U – channel upright beam. The Upper support for actuator's hanging was welded to the top of the upright beam with the provision of two slotted holes for the hanging of the actuator.

Shaft with pillow bearing was bolted onto the base support and connected to the nut welded to the underneath of the U-channel that was welded to the seat carriage. A plate that served as a tyre seat was welded to the lead screw which was also welded to the seat carriage[5]. The actuator was hanged on the slotted end of the upper support using 19mm bolt and nut and rested on the bottom's support that was bolted to both upper and upright supports. The Knuckle joint was welded to plunger blade and bolted to the actuator; using 13mm bolt and nut[4]. The switch control was bolted to the upper right side of the machine, connected to the actuator and to the alternating current source. The current flows from the alternating current supply to the actuator via the switch control energized the actuators then providing forces that will push out the plunger shaft that will press down the shoulder of the tyre from the rim. The adjustable seat is used to adjust the tyre to provide for a sequence operation.[2]



Fig.[b],

#### IV. COMPONENTS AND DETAILS

##### A. Pneumatic Actuator

In this type of actuator, air is admitted on the both sides of piston. Hence this cylinder or actuator can perform useful work in both directions. There is no spring in this actuator[5].

When air admitted through port 'A' piston will move towards right and when air comes in through port 'B' piston will move right to left. It consists of following parts:

- 1) Cylinder body
- 2) End cover with bush and built in air-inlet port (B).
- 3) Piston with piston rings (O-rings) and piston Rod
- 4) Front cover threaded to cylinder tube with in-built air inlet port (A)

Compressed air will admit first through port (A). Due to pressure force piston will advance i.e. will move from

left to right. Then airflow from port (A) will stop and flow from port (B) will start. Now piston will retract i.e. it will move from right to left. During this movement air present in the cylinder during advance stroke will move out through port (A). This movement repeats.[3]



Fig.[c]

##### B. 4\*2 DC valve

In this valve consist of the 4 port i.e port P is pressurised port and port R is exhaust port. Port A and B are a consumer port. In normal position port p is connected to port A and port B is connected to port R, As push button is press downward all spring will be compressed and spool will be in such a position that port A will be connected to port R and port P will be connected to port B. It is used to direction control and it is used to compressed air.



Fig.[d]

##### C. FRAME

It is supported to all components of pneumatic tyre remover that is actuator, DC motor and Rotary tyre

##### D. BATTERY;

Battery is used to 12v.it is connected to motor. Battery is supply the electric power.



Fig.[e],

### E. DC MOTOR

A gear headed DC motor is used to rotate the tyre for remover purpose. Motor is 12 to 24 Volts and 30 to 40 RPM.



Fig.[f],

### V. WORKING

Tire pressing machine involves the rotary motion of the lever which causes the bead breaker to press the tire .it has two side arm to which the nuts are attached and through which screw passes and to that screw bead breaker is attached. As the lever is rotated it also rotates the screw to which bead breaker is mounted and it press the bead of the tire .instead of lever pneumatic gun can also be used to rotate the screw. This machine reduces the total efforts of the operator. And it also reduces total cost of product and process.

### VI. ADVANTAGES

- This machine reduces the total efforts of the operator
- To developed simple operation
- To save the time.
- Perform the faster operation
- Simple in construction
- Very lower in cost

### VII. DISADVANTAGES

- This machine required high capacity motor and high air pressure for heavy load tyre

### VIII. CONCLUSION

A tyre removing machine was designed, fabricated and tested From the above evaluation it could be concluded that the objective of convenient operation, faster speed operation and very little or no experiences acquired before operating the machine. The equipment is very easy to assembly and disassembly

### IX. FUTURE SCOPE

In our project if the operation of removing and fitting the tyre is done semi automatically or even automatically by using the software technology and making the system total automatic. This will minimize the requirement of the man power and effort are reduses and thus increasing the efficiency.For the purpose of automation the microcontroller and sensor are used. Thus we can make the system more flexible.

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### REFERENCES

- [1] <http://www.mechanicalengineeringblog.com>

- [2] O. Asabi, “Project Report on Pneumatic Removing Machine”. Mechanical Engineering Department, The Federal Polytechnic Ado, Ekiti State, 2000.
- [3] <https://patents.google.com/patent/US6619362B2>
- [4] J.E.Shigley and R.C.Mischik (1996): “Standard handbook of Machine design” 2nd Edition, McGrawHill, New York Pp 61– 68, 1969.
- [5] H.William and H. Middendorf “Design of Devices and System” New York, Marrel Dekker Pg 1 – 10, 1990.
- [6] K. K.William, Tobdolt, Larry John and Wsteven Olive(1989) Automotive encyclopedia, South Holland, Illinou, Good Heart Willcox Company Inc., 1989.