

# Machine for Tire Removing and Fitting on Rim of Wheel: A Review

Pornima T. Godbole<sup>1</sup> C. C. Handa<sup>2</sup> S. P. Bhorkar<sup>3</sup>

<sup>1</sup>PG student <sup>2</sup>Professor and Head <sup>3</sup>Assistant Professor

<sup>1,2,3</sup>Department of Mechanical Engineering

<sup>1,2,3</sup>K.D.K.C.E. Nagpur, India

**Abstract**— In the present context of market situation, there is always a need for better design of the equipment with the maximum reduction in cost. Added to these is the human comfort which enables a person to operate it with ease and least consumption of human effort. The 'tire-changer' equipment is used by vulcanizing shops, retailers of tires, tire retreading works and servicing stations for easy tire demounting and mounting operations from or on to the wheel disc or rim of light motor vehicles. With these 'tire-changer' machines, no extra manpower is required as only one person can do the entire job in less time. The main objective provide information of existing tire changer equipments and fabricate low cost manual 'tire-changer' equipment to develop self-employment opportunities. In this paper some existing machine related to tire changer machine is discussed.

**Key words:** Vertical shaft, tool, tool holder, wheel mounting, wheel clamping, lever

## I. INTRODUCTION

This machine is use for tire removing and fitting on Rim of wheel. In this machine wheel is clamped on the mounting base. The wheel rim is tightly fixed on the mounting wheel. This tire removing and fitting machine used to help tire technicians dismount and mount tires of automobile wheels. After the wheel and tire assembly are removed from the automobile, the tire changer has all the components necessary to remove and replace the tire from the wheel. This machine allow technicians to replace tires on automobiles, motorcycles and heavy-duty.

## II. CONCEPT

The very regular tire changer process is manually tire changer may involve high force to remove tire from heavy wheels or tires. It also involves bending, reaching and twisting. This can cause musculoskeletal injuries to the shoulder, lower back, wrist and knees. Injuries can occur suddenly or gradually over time. Some other major factor is taken in consideration while doing this paper are as follows

- Cost of powered tire removing and fitting machine is much higher as compared to traditional manual tire removing and fitting process.
- Removing or fitting of tire on rim of wheel by manual is very effortful process and time consuming.
- Some time, hand tool which is use for removing the tire from rim of wheel is damage the tube and tire of wheel due to it is not properly handle, or due to human handling error.
- Manually removing and fitting of tire on rim wheel is very skilled and experienced operator is required.

## III. LITERATURE REVIEW

The review of literature is one of the important aspects in the research process which helps researcher to get acquainted with the subject matter under study and future channelize

efforts in desirable direction. It also provides necessary guidelines and helps the researcher to delineate his research problem. Literature Review is an assignment of previous task done by some authors or collection of information or data from research papers published in journals. It is a way through which we can find new ideas, concepts. Though there is a lot of literatures were published, on related task; the selected literature have studied to accomplish the desired work of the project. This chapter summarized the literature, related to the tire changer machine.

### A. Demounting and Mounting Procedures for Tube--Type Truck and Bus Tiire Manual

In this manual we study with the procedures in the tire/wheel manufacturer's catalogs, instruction manuals or other industry and government instructional materials.

- Before loosening any nuts or clamps that attach a tube-type tire/rim assembly to a vehicle, always completely deflate the tire (or both tires of a dual assembly) by taking out the valve core(s).
- Use a non-flammable vegetable or soap-based rubber lubricant on the beads and rim surfaces to make tire demounting and mounting easier.
- Use proper tools to demount or mount tires and rims (refer to "Typical Tire Service Tools"). Never use a steel hammer to seat rim components— use only rubber, plastic or brass-tipped mallets. Striking a rim/wheel assembly with a hard-faced hammer can damage the components and endanger the installer. Use a steel duck bill hammer only as a wedge to unseat the bead of tube-type tires. Never strike the tire/wheel assembly with a steel duck bill hammer to unseat the beads and do not strike the head of the duck bill hammer with another hard-faced hammer – use a rubber mallet or plastic dead blow hammer. Slide impact tools and hydraulic bead unseating tools can also be used to unseat beads on tube-type tires.
- Never reinflate any tire that has been operated in a run-flat or underinflated condition (i.e., operated at 80% or less of recommended operating pressure). Demount, inspect and match all tire and rim components before reinflating in a restraining device with the valve core removed Completely deflate any tire by removing the valve core before removing the tire/wheel assembly from the axle if there is known or suspected damage to the tire or wheel or if the tire has been operated at 80% or less of its recommended operating pressure. Demount, inspect and match all tire and rim parts before re-inflating in a restraining device.

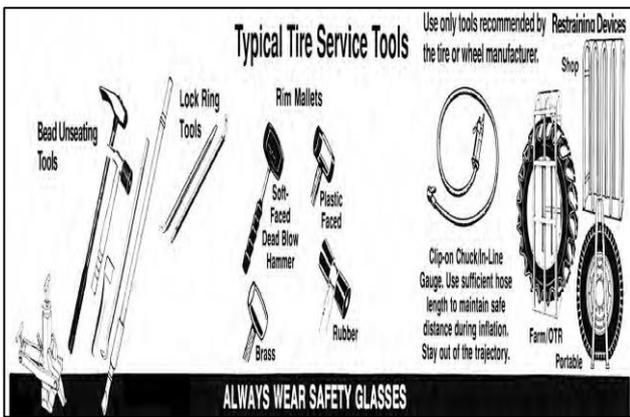


Fig. 1:

### B. Tom Duke Contributing Editor Tire Mounting and Demounting Manual:

This manual include that there are two basic types of tire changers: the tabletop or rim clamp style, and the center post style. There are tabletop/rim clamp changers that will do a fine job in any dealership, and there are more automated models and changers that specialize in handling high performance and UHP tires. Some tabletop models will automatically lock to preset wheel diameter and width positions. The more expensive automated models – like the center-post style changer above – can handle tires of various diameters and feature a high torque motor. These changers can mount and demount tires without the use of hand-held levers, which relieves the stress on the beads and the operator. This particular model can be adjusted to three different heights to allow the technician to work at the most effective position. Switches and foot pedals control virtually all tire changing operations, which ensures the same simple operation on all assemblies regardless of the size, design or fitment. Some changers are designed to handle the largest wheel assemblies, including ultra low profile high performance and ultra-high performance tires. An articulated mounting arm allows the polymer mounting head to follow the rim flange edge. The polymer head helps protect against marring damage on custom and high-end wheels, and reduces the stress to beads on stiff, low-profile tires. An optional pneumatic wheel lift helps technicians mount tires effortlessly; preventing potential injuries and fatigue from manually lifting heavy wheels into place. Let's look at the steps involved in a basic, generic tire removal using a tabletop tire changer.

### C. Michelin Truck Tire Data Book Mounting and Safety Instructions:

These books include safety instruction for mounting the tire on the rim of wheels. This paper include there are several tire changer machines available for the mount and demount procedure. For safe handling we know some safety instructions that are as follows.

Mounting the tire everyone who services the tire in their operations has read and understands the warnings given in this paper. Serious injury or date can result from failure to follow the safety warnings. No matter how well any tire is constructed, punctures, impact damage, improper inflammation, improper maintenance, or service factory may cause the tire failure creating a risk of property damage and serious or fatal injury. Use of starting fluid or any other

flammable material to lubricate seal or seat or unseat the beads of tire can cause the tire to explode or can cause the explosive separation of the tire and rim wheel assembly resulting in serious injury or death. The use of any flammable material during tire servicing is absolutely prohibited. Any inflated tire mounted on a rim wheel contains explosive energy. The use of damage mismatch, or improper assembly tire and rim wheel part can cause the tire to explode or can cause the assembly to burst apart with explosive force. If you are struck by an exploding tire rim wheel part, or air blast, you can be seriously injured or killed.

### D. Installation and Operational Manual:

In this manual various installations of parts and component are given. Again it consist various wheel mounting instruction so that we can make sure that we assembled the machine in proper way and no future problems accrued.

Various wheel mounting information are given in this manual like

- 1) It is important to understand that tires and/or tire beads do not stretch. It is nearly impossible to mount or dismount the top bead of the tire unless the top bead of the tire is positioned deep into the drop center area of the wheel.
- 2) By finding indentifies position of the drop center on the wheel. Clearly identify the Drop Center, Narrow Side and Wide Side flanges.
- 3) The tire must always be demounted or mounted with the wheel positioned on the turntable with the Narrow Side facing upward and the deepest part of the Drop Center facing upward.

In this manual I have studied the use of an approved inflation chamber or inflation cage equipped with a self-gripping chuck and remote inflation gauge and valve. Inflate the tire to manufacturer's recommended cold operating pressure. Tire or wheel failure during and after inflation may result in an explosion capable of causing severe injury or death. Late a tire that has been run under inflated or flat without first demounting the tire and checking for wheel and tire damage. Inspect the tire interior for loose or broken cords, cuts, penetrating objects, and other damage. Discard tires that cannot be properly repaired. Never rework, weld, heat or braze wheels. And never strike the tire or wheel with a hammer. Always be sure the tire diameter exactly matches the wheel diameter. Tire failure under pressure can be hazardous. When possible, always place wheels inside an approved inflation chamber or cage before inflating. Use an approved remote inflation valve, hose, and gauge. Always wear safety goggles for eye protection. Do not stand beside the wheel or cage during inflation. Keep hands and other parts of the body out of the cage during inflation. Observe the tire pressure frequently. Do not exceed the manufacturers

Recommended maximum inflation pressure. Failure to follow these instructions may cause the tire and rim to separate with tremendous force, resulting in serious personal injury or death.

### E. Radial Truck Tire and Retread Service Manual:

This manual was prepared as a guide to the selection, operation, and maintenance of Goodyear radial truck tires. The subjects covered are all essential to good tire performance. Detailed explanations on selection, mounting, air pressure, vehicle alignment, and other important issues are

supported by illustrations for clarity. Use this manual often as a reference. It will help you get

Extended fuel economy, tread wear, and casing life from your Goodyear radial tires.

The Tire & Rim Association Yearbook provides essential information for the interchangeability of tire, wheel and rim products for cars, trucks, buses, cycles, off-the-road, agricultural and industrial vehicles.

Mounting process – it is essential that good mounting process be followed in order to obtain optimum tire performance and operating efficiency. Also tire and rim servicing can be dangerous. To prevent serious injury, understand and follow all the safety instructions and process.

Do not mount or demount tires without proper training. Wall charts containing mounting and demounting instructions for all on-highway rims should be available through your normal rim supplier. "Safety Precautions for Mounting and Demounting Tube Type Truck/Bus Tires" are also available through the United States Department of Transportation, National Highway Traffic Safety Administration.

Wheel Inspection Guidelines

Remove any and all cracked wheels from service. Cracked wheels not removed from service will fail.

Lubrication

A non-water base commercial bead lubricant should be used since water in the tire can cause excessive rim corrosion problems. However, thin vegetable oil soap solutions with a water base are approved. Lubricants which contain a rust inhibitor can be an advantage. Avoid the use of excessive lubricant

*F. M. Guiggiani, The Science of Vehicle Dynamics Mechanics of the Wheel with Tire:*

A wheel with tire is barely a wheel; in the sense that it behaves quite differently from a rigid wheel. For instance, a rigid wheel touches the (flat) tool at one point, whereas a tire has a fairly large contact patch. Pure rolling of a rigid wheel is a clear kinematic concept, but, without further discussion, it is not obvious whether an analogous concept is even meaningful for a tire. Therefore, we have to be careful in stating as clearly as possible the concepts needed to study the mechanics of wheels with tire. Moreover, the analysis of tire mechanics will be developed with no direct reference to the dynamics of the vehicle. This may sound a bit odd, but it is not. The goal here is to describe the relationship between the motion and position of the rim and the force exchanged with the tool through the contact path.

*G. Nicholas D. Smith Colorado State University, 2004 Formula Sae Platform Understanding Parameters Influencing Tire Modeling:*

The purpose of this document is to describe important tire characteristics and their effect on vehicle performance. Characteristics like coefficient of friction, slip angle, slip ratio, camber angle, cornering stiffness, camber stiffness, self-aligning torque, normal load sensitivity, load transfer sensitivity and pneumatic trail.

There are several forces, moments and angles that prove to be very important in tire behavior. First, there are two main angles to consider, the camber angle and the slip angle. The camber angle is the inclination angle from its

vertical position while the slip angle is the difference in wheel heading and direction. These two angles are associated with the lateral force. Forces include the longitudinal force in the X direction, the lateral force in the Y direction and the normal force in the Z direction. Longitudinal force (FX) is the result of the tire exerting force on the road and becomes negative during braking. The lateral force (FY) is the resultant of the forces produced by a non-zero camber angle and by a non-zero slip angle during cornering. Normal force (FZ) can also be viewed as the negative of the upward vertical force. Moments include the overturning moment, the rolling resistance moment, the wheel torque and the aligning moment. The overturning moment (MX) is caused by a lateral shift of the vertical load during cornering. Rolling resistance (MY) is created by various factors that lead to a loss of energy. The aligning moment (MZ), also known as the self-aligning torque, produces a restoring moment on the tire to realign the direction of travel with the direction of heading when the slip angle is non-zero. It should also be noted that there is also a moment produced by the axle on the wheel.

#### IV. CONCLUSION

According to related literature review, we will collect required data and will design and modify tire removing and fitting machine. The approach will be synthesis, design, development & testing of the machine. The various parameters such as design of tool, design mounting base will be carried out to make the machine.

Methodology is a systematic theoretical analysis of the body of methods and principles associated with a branch of knowledge typically it encompasses concepts such as, theoretical model, phases and quantitative and qualitative techniques.

The above references can be used by designer interested in design of tire changer.

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