

Non pneumatic tyre for electric vehicle

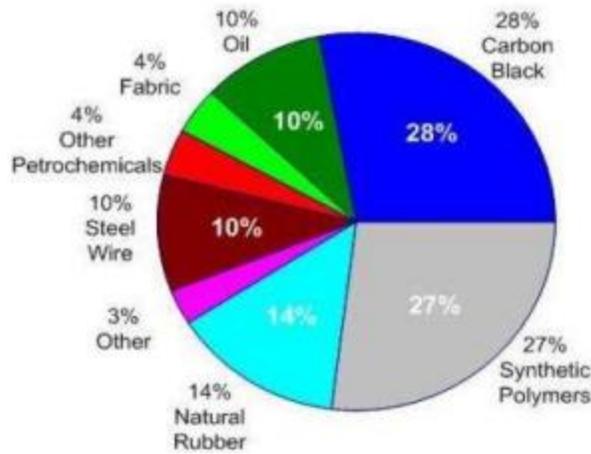
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Abstract: The most important part on car is tyre. In olden days firstly wheel are made up of wood or stone later it was developed in to tube (rubber tyre) and tube less tyre. Such tyre are tested on bicycle and the applied on various vehicle. But both have problems of puncture, tube tyre get quickly puncture where tubeless tyre take some time for air leakage. In recent years a number of companies and inventors have been working on creating airless tires that would be impossible to puncture. Non pneumatic tyre are the tires which does not supported by air i.e. they are airless.

Keywords: Pneumatic tyre, Non pneumatic tyre, pneumatic tyre, EV vehicle.

- 1. Introduction:** A tyre is most important part of any vehicle. Tyre is a rubber member which provides cushioning effect as well as provides clearance to vehicle. The rubber member is mounted on wheel rim. In tube tyre, tube is present inside the tyre while in tubeless tyre there is no tube. A tire is a ring shaped component that was mounted on a wheel's rim to transfer the vehicle's load from the axle. Tyre which is used in automobile, bicycle, motorcycle is pneumatically inflated structures which provide a good rolling, cushioning effect. [1]Such tyre is using numbers of year and they are developing. Some companies are trying to develop tyre which are airless that means they are non pneumatic[2]. Michelin and Bridgestone are the tyre which are firstly design,[3] they are non pneumatic. So begins an article discussing the development [4]of air less tires, something that has become more prevalent in the past few years. Honeycomb tire are also a type of non pneumatic tyre.
- 2. Materials for non-pneumatic tyre:** Materials of modern non pneumatic tires can be divided into two groups, the cords that make up the ply and the elastomer which encases them. The tyre consists of a band of conventional tyre rubber with molded tread, a shear beam just below the tread that creates a compliant contact patch, a series of energy absorbing polyurethane spoke. In short the hole tyre are made up of polyurethane which is a polymer which can sustain heavy shock and can with stand over it.



There are generally two types of tyre:-

- Tube tyre
- Tubeless Tyre

A. Tube Tyre: It is a traditional tyre. It encloses a tube in which air is forced to a high pressure as a cushioning medium. The tyre is manufactured from different parts that are molded together to form a complete Structure.

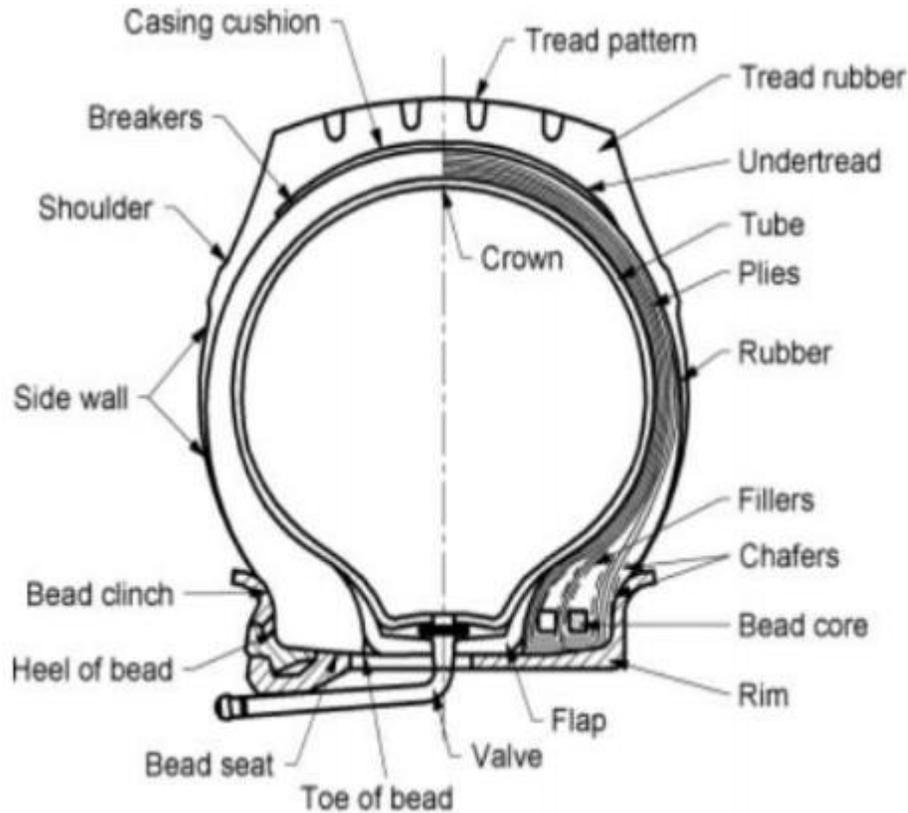


Fig:-Tube Tyre

The Parts of tyre are:-

- A. Liner.
- B. Tread layer.
- C. Cord and piles.
- D. Bead or rib.
- E. Side wall.
- F. Outer rubber
- G. covering

The liner and piles form together called as carcass or inner casing. The tire is manufactured by vulcanization process in which rubber[5] is heated under pressure to obtained desired properties like load caring capacity, cushioning, uniform wear, balancing, none skidding, fuel or power consumption and Noise.

- B. **Tubeless Tyre:** Tubeless tyre is an advance version of tube tyre. The basic difference between tube and tubeless is that there is no presence of tube inside it. In this type of tyre there is a special air retaining bead arrangement. These tires are directly mounted on the rim. In this tyre the air is filled with the help of non returning valve which provide restriction to air to do not leave it from tube. The valve is mounted on rim. The bead is the air tight part which fit on the circumference of the wheel rim. It consists of bead cores made of number of strand of steel wire. Carcass is the main structural element that takes the load and consist of rubber bounded cords and beads. Tread is the surface part that comes in contact with road surface made of synthetic rubber. Non return valve is an integral part which allows high pressure air in one way. The tubeless tyre is lighter and runs cooler than the tube tyre.

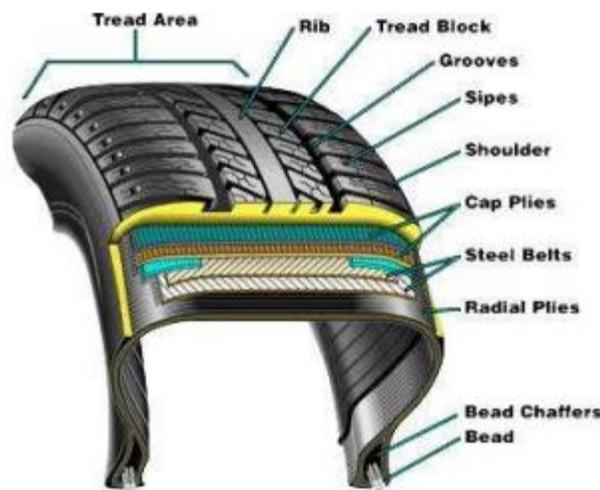
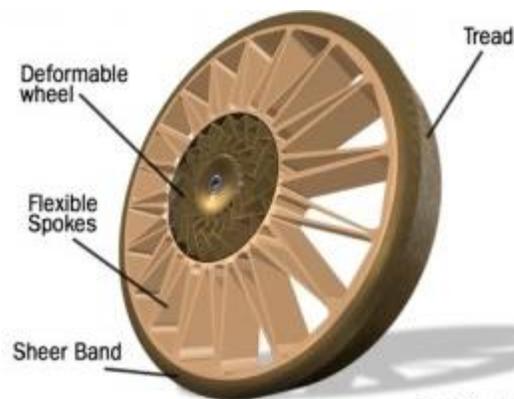


Fig:-Tubeless Tyre

- 3. Non pneumatic tire:** Non-pneumatic tyre (Airless tires) are tyre that is not supported by air pressure. Airless tire generally have higher rolling friction and provide much less suspension than similarly shaped and sized pneumatic tires. Other problems for airless tyre include dissipating the heat buildup that occurs when they are driven. Airless tyre is often filled with compressed polymers (plastic), rather than air. Specializing in Polymer Engineering and design are creating a "non-pneumatic tyre" (no air required) which is basically a round polymeric honeycomb wrapped with a thick, black tread and that will support the weight of add on armor, survive an IED attack, and the tires are expected to maintain a speed of 75 mph for 60 miles with 10% damage to the honey comb structure.[6] Honeycomb structure is designed to support the load placed on the tyre, dissipate heat and offset some of these issues. The patent-pending design mimics the precise; six sided cell pattern found in a honeycomb and best duplicates the "ride feel" of pneumatic tires, according to the developers. The goal was to reduce the variation in the stiffness of the tyre, to make it transmit loads uniformly and become more homogenous, and the best design, as nature gives it to us, is really the honeycomb.
- 4. Construction and working:** The pneumatic tyre is made up of polymer which has high resistance to shock of road as well as have good elastic property. They are made up of tread, shear band, deformable wheel and flexible spoke[7]. Thread is place on the upper side of wheel which provides good tensile strength and help to wheel to stay in position. Shear band is outer covering of the pneumatic tyre which transmits shock. Flexible spokes are attached to the shear band which is generally in triangular in shape. The shock from the shear band was get absorb by these spokes. The spokes are further attached to deformable wheel. The wheel are attach to the vehicle. While the vehicle is in running various shock effects by the vehicle. As the shock get trapped the flexible spokes get bend and the shock get absorb.



- 5. Conclusion:** Tyre may seem to be a trivial part of an automobile that cannot be improved, but research into airless tyre can gives more efficiency as well as more rolling effect. This new technology will increase the safety of cars as well as have a positive impact environmentally. As this tyre are made up of high quality polymer, the cost of such tires is high which cannot be affordable to people. But research into it can make it cheaper than pneumatic tyre. This innovative project is also backed and guided by engineering codes of ethics which will ensure

that the development is conducted in a way that it responsible and fair. This type of innovation will become increasingly valuable in the future because of the advantages that this tyre has and the wide range of applications in which it can be used. So that in all cases non pneumatic tyre is more valuable and has more scope in future.

6. References:

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