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Airless Tire for Commercial Vehicles

***Abstract*—In this paper, we have tried to present a new tire design i.e. Airless Tire. This airless tire will be a revolution in the field of automation. The motive of this paper is to remove the problem of flat tire and to minimize the maintenance of the tire. In this study, Solidworks software is used for part modeling and ANSYS software is used for meshing.**

Index term— Airless tire, Meshing, Geometry, Materials, Tread of the tire.

I. INTRODUCTION

Tires are the rolling parts of an automobile which form the base of the automobile and makes motion (of automobile) possible . Tires also protect the wheel rim by fitting around it. Tires provide traction between the vehicle and road and also absorb shock. The ancient wheels of Mahabharata period were made up of wood. To avoid wearing of wood, iron band was fixed on the wooden frame, providing it strength as well as durability. Scottish inventor John Boyd Dunlop made first practical pneumatic tire in 1887. Pneumatic tires are made up of synthetic rubber, natural rubber, fabric and wire. Pneumatic tires are, at present, the most widely used tires across the world but every invention has a drawback or limitation. A puncture in tire leads to total failure. A blow out at high speed may result in a dangerous accident. Another problem is its variations in air pressure and tire performance. To avoid these problems, we considered Sesame wood to act as wheel while alloy steel band is fixed on it like tire. It reduces the friction coefficient and brings it to a value of 0.02- 0.05. But, it had its own drawbacks too. Sesame wood is very costly, and the production requires a lot of trees to cut-off. It is not eco-friendly. Also, once the wood is broken, it is no use for the vehicle. Then we decided to do something else and came up with "Airless Tires". It reduces the wearing of the tire as well as eliminate the problem of flat tire as there is no tube and no air in this tire.

Airless tires are those tires which are not supported by air pressure. These tires are made up of Alloy steel, Polyurethane and Silicon rubber . The rubber material, on striking a rough surface, bends inside deforming the flexible polyurethane material and then comes back to its normal position on smooth surface. The strength in the tire is provided by reinforcement of an alloy steel band in it. This alloy steel band provides great stiffness while resisting damages from impact and penetration.

One more advantage of adapting this method is that it eliminates the need of shock absorber as it uses a very flexible material – Polyurethane, which temporarily deforms & absorbs the shock when obstacle comes in way.

We have designed a wheel on solidworks (refer Figures). Instead of spokes, we have provided holes on the polyurethane material. The holes provide many functions. It helps in balancing of the wheel. It reduces the weight of the wheel. Material consumption is less. Since the tires are entirely solid, they do not require regular maintenance.

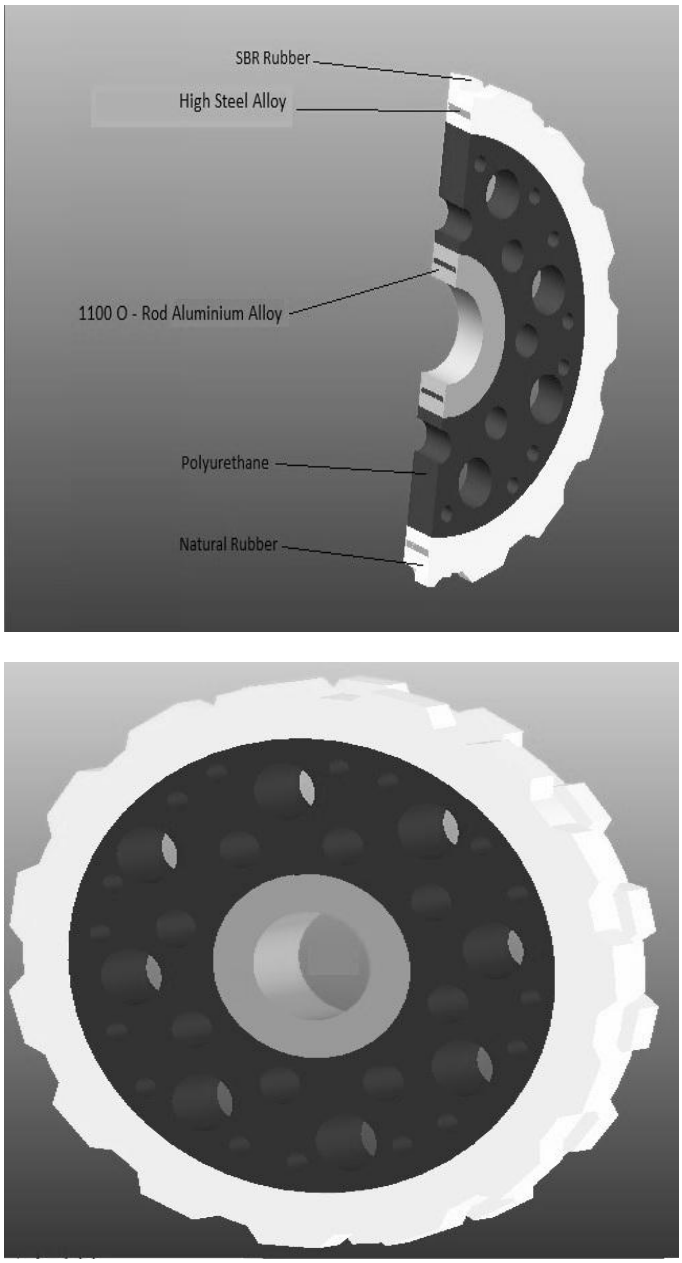

Fig 1: A part model of the airless tire (designed in Solidworks 2012)

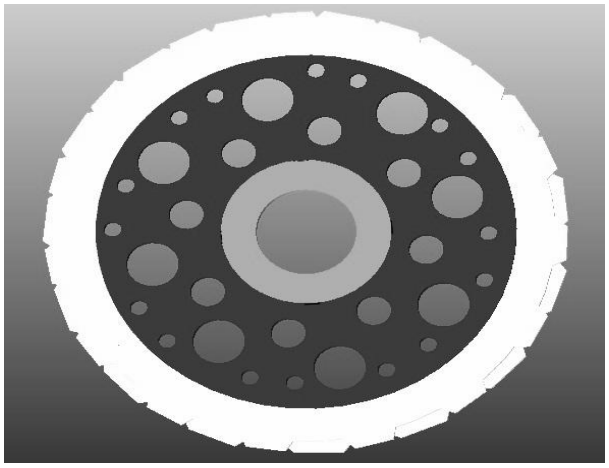

Fig 2: Front view of the tire

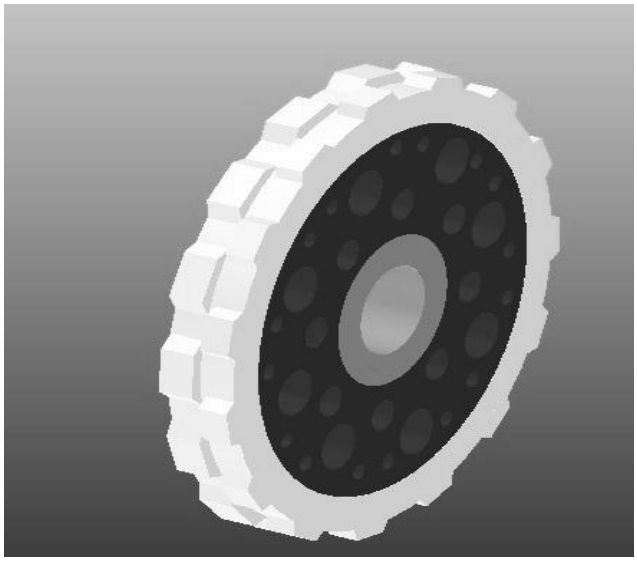

Fig 3: Image showing the Tread of the tire.

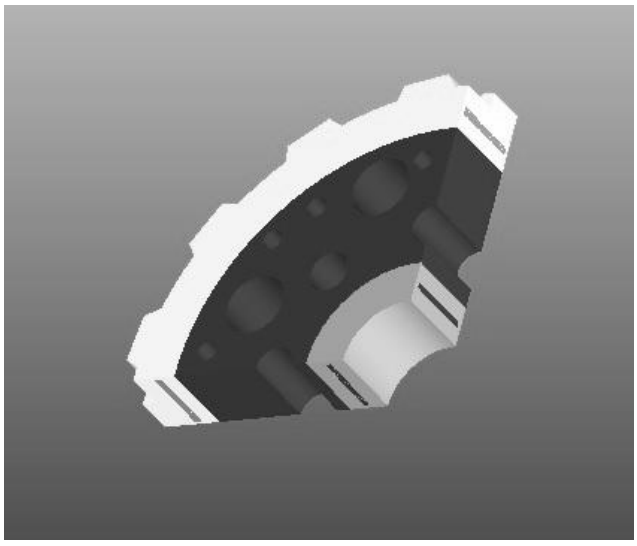

Fig 4: Sectional View

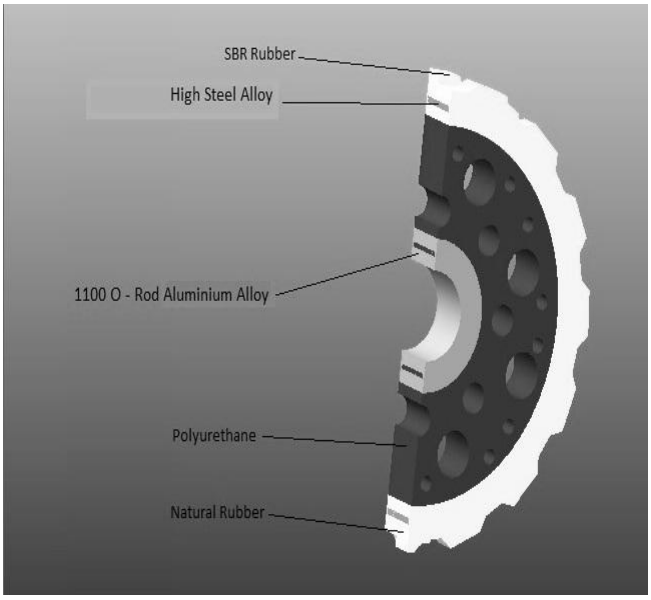

Fig 5 : Materials

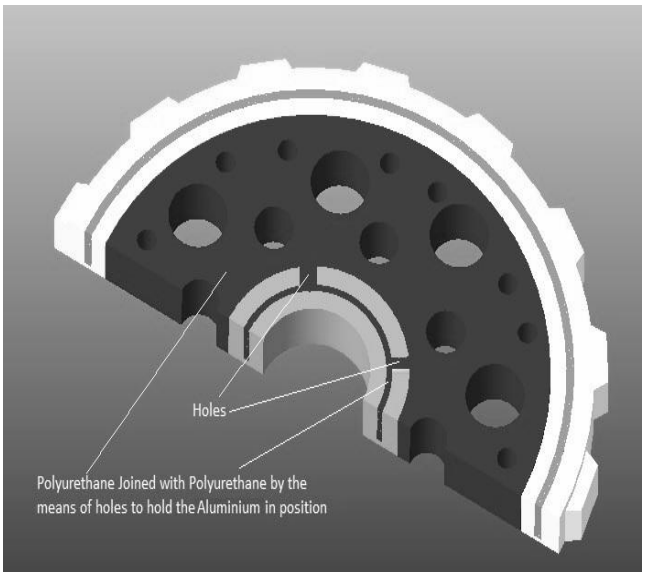

Fig 6 : How it is assembled

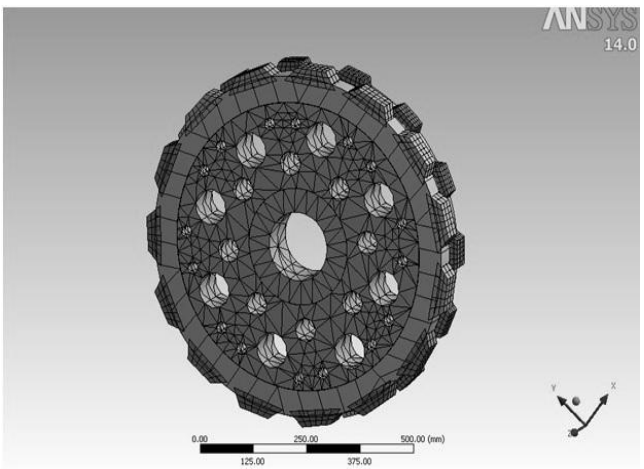

Fig 7: Meshed view of the tire

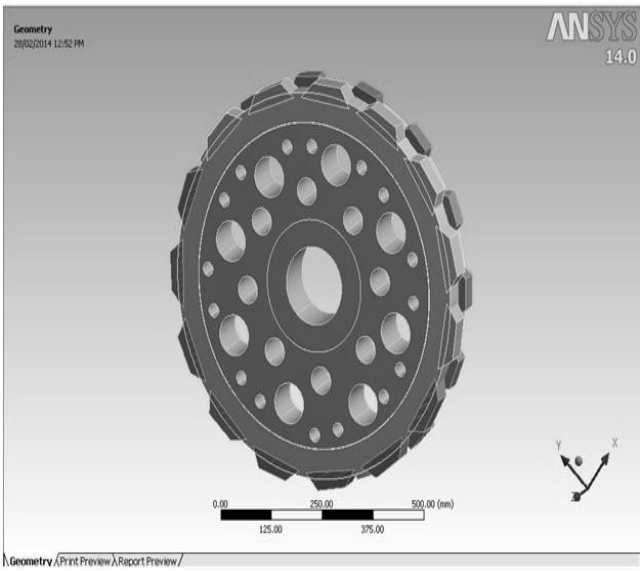

Fig 8: Geometry of the tire

CONCLUSIONS

The expected results by adapting this tire are –

1) Stability of vehicle
2) Minimization of materials
3) No need of shock absorbers
4) No need of regular maintenance
5) Weight of wheel is reduced.
6) Problem of flat tire is removed.

ACKNOWLEDGMENT

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