

Analysis of the Structure and Classification of Airless Tires

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ABSTRACT

Information about the prospects for the use of airless tires in the field of mechanical engineering, as well as in all areas, is covered in the media and literature with a detailed analysis of its design, manufacturing processes and structural dimensions.

Keywords:

Car, airless tire, rubber, tubeless, wheel, pneumatics, tread, atmosphere, soil.

From the very beginning of the emergence of the engineering sector, automobile wheels appeared, wheels of different methods were used. They were made of rubber, before there was also an inflatable chamber inside, now tires are made with and without a camera to simplify the design. This type of non-pneumatic tyre has found its confirmation in analyses carried out from the literature that asphalt and soil are very good both on roads and in places where there are no such roads. Another advantage is the relatively low price of such products. But at the peak of wheel evolution, manufacturers also learned for the first time about the production of airless tires for several years [1].

At the moment, the two largest companies producing airless wheels - Michelin and Hankook - are the Namoy esters of their products.

The main purpose of the article is to consider airless tires, their advantages and disadvantages, and also to try to compare them with existing pneumatic tires [2].

A few years ago, Michelin decided to start production of wheels of this type. It's

called a "tweet" brain, and that acronym consists of two words: a tire and a wheel. The main feature of such a wheel is that the classic center is not used to fasten it. Such wheels are made directly with the help of curved rods that are attached to the shaft of the axle of the car. A special flexible clamp is installed on the tread of the tire, which creates the outer part of the tire, the part that comes into contact with the road surface (base point) can no longer function normally [3].



Fig.1. Elements of an airless tire:

The drivers of the wheel are made as elastic as possible and actually repeat the movement of air inside the rubber tires. In addition, there is a significant difference from existing "air" tires - the stiffness of the cushion is variable and can be adjusted depending on the purpose of the wheels. The company produces discs of different hardness, Michelin installed its first prototypes on the Audi A4. Compared to factory pneumatic tires, driving has become much easier, and walking on the road has become more reliable [4].

The result showed that the tweet is 10-15% lighter than the current version. This shows that the car consumes significantly less fuel. In addition, in view of the increase in the useful coefficient of the wheels, taking into account further developments, an increase in these indicators should be expected.

It's impossible to know the benefits of airless wheels without knowing how existing tires for auto tractors will work. You need to know that the tires with air are completely sealed, inside the air is at an average atmospheric pressure of 2.2. Since the pressure in the tire is greater than in the surrounding atmosphere, the wheels retain their shape and do not deform under the weight of the car. The biggest drawback is the possibility of a defect, as a result of which the wheels can no longer function normally.

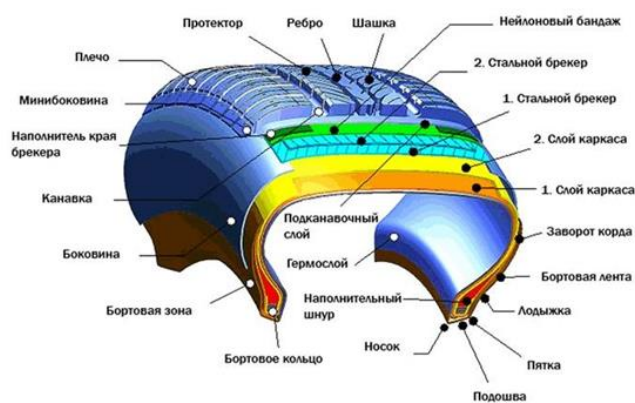


Fig.2. Elements of pneumatic tire

It is extremely dangerous for drivers to drive at high speed, as this can lead to a vehicle tipping over. At the same time, it will not be possible to slow down the car enough, since it is impossible to control a perforated wheel. Loss of control of a car due to a tire rupture

often leads to serious accidents and death. In turn, airless tires are devoid of such disadvantages when pressing a nail or something sharp does not cause the driver any problems [5,6].

In addition to the fact that a sharp rupture of the tire can lead to an unpleasant phenomenon, such wheels are also highly dependent on internal pressure. The lower the pressure, the greater the pulling force. At the same time, smooth operation of the machine is ensured, the tire is in more contact with the road. It should also be remembered that the air, in addition to adjusting the stiffness, retains the shape of the wheel, and if it moves for a long time in flat tires, the rubber will deform and become unsuitable for normal use. When driving on existing and traditional vehicles, it is necessary to know the following characteristics:

1. Filled tires are suitable for driving on asphalt and good dirt roads;
2. To pass through the clay, it is required to replace the rubber with a special one;
3. There are problems when driving on sand and loose soil.

With airless tires, things are a bit simpler, but the cost of affordable rubber is much lower. Therefore, in the current environment, when more flexible airless tires are still more expensive, it is preferable to use conventional tires, which are cheaper for drivers.

Another Korean rubber manufacturer, Hankook, is also testing airless tires, a technology called IFlex. When building here, in addition to the lack of air, the company preferred to use only environmentally friendly materials, which it strictly classifies.

According to the manufacturer, the wheels of the latest generation in no case will remain from their existence. Instead of knitting needles along the entire length, special layers of micro-mesh were used, which evenly distribute the load. Such tires are made of refractory materials, so the service life here is somewhat higher. In addition, if serious changes were required in the design of previous Russian tractors, then here you can put tires on a standard disk [7,8,9].

The parameters of the test samples were compared with high-quality automotive pneumatic tires at a speed of 120-150 km / h. Comparing a number of parameters, the developers said that in practical use, the new airless wheels are in no way inferior, and to some extent superior to the characteristics of conventional tires. In addition, attention is also paid to environmental cleanliness in airless tires - in the production of such tires, much less resources and information about environmental damage are spent, and after the end of their service life, such wheels will be much easier to destroy and send back into production.



Fig.3. The next version of the airless tire

Despite the many advantages considered in relation to existing tires, airless tires have a number of characteristic disadvantages, the main of which is vibration. When a car accelerates at speeds above 120 km per hour, even on a perfect road, such wheels begin to vibrate and the car's handling deteriorates. In addition, the wheels begin to make noise and warm up at this speed. The sound is very loud, long movement is difficult for the driver, it is characterized by rapid fatigue.

Conclusion: Instead, the tire manufacturing companies that are currently trying to produce both Michelin and Hankook variants are very difficult to produce, although they use mostly natural materials. The difficulty lies in the fact that for mass production it will be necessary to reconstruct factories, attract new employees and rebuild

the structure of the car [10]. Therefore, in the near future, the development of technology can and will be in prototypes, but when it comes to improving the economic component of mass production technology, we must also be able to apply technological and design requirements that are aimed at carrying out research in this area.

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