April 18, 1933. A. J. MICHELIN 1,904,502

PROCESS FOR APPLYING RUBBER TO METAL AND OTHER HARD MATERIALS

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Fig. 1



Fig. 2



Fig. 3

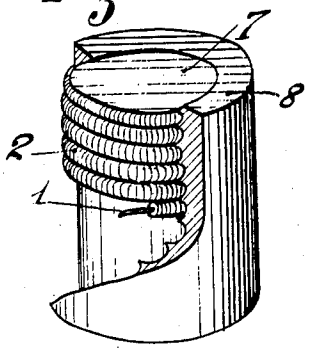


Fig. 4

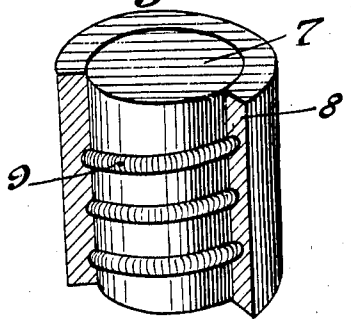


Fig. 5

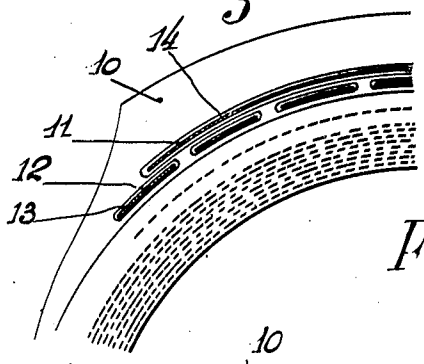


Fig. 7

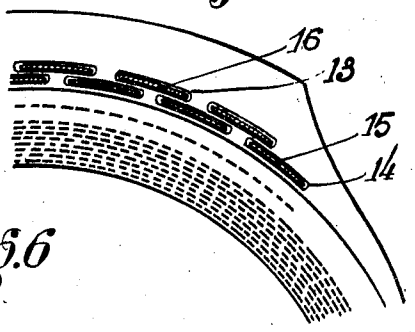
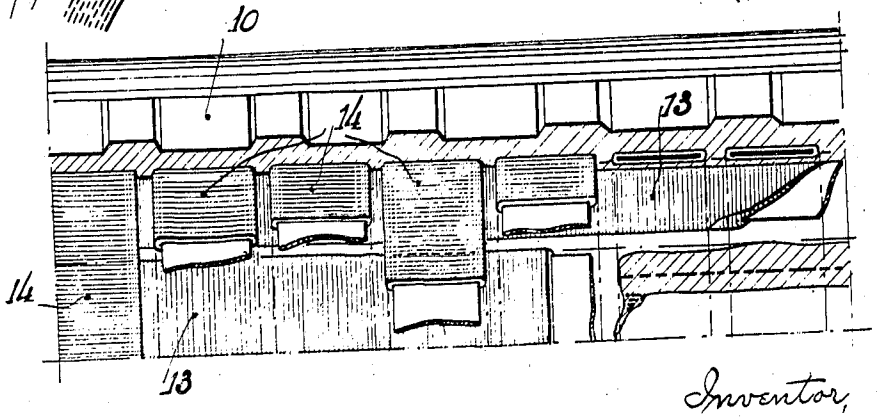


Fig. 6



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Fig. 8

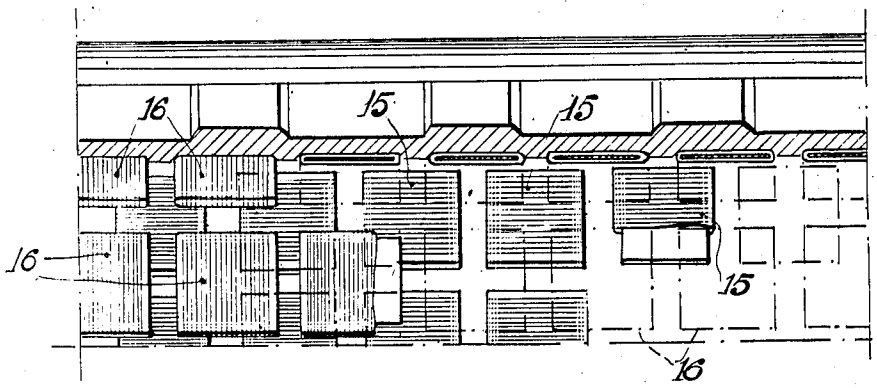


Fig. 9

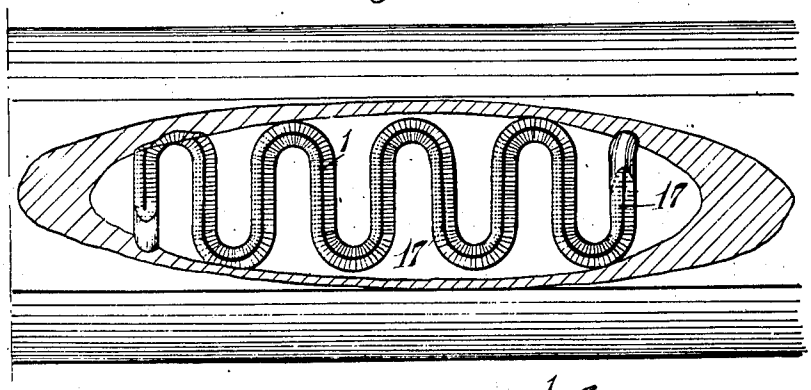


Fig. 11

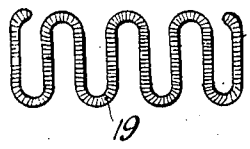
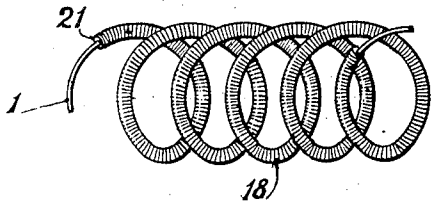


Fig. 12



Fig. 10



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Patented Apr. 18, 1933 1,904,502

UNITED STATES PATENT OFFICE

ANDRÉ JULES MICHELIN, OF PARIS, FRANCE, ASSIGNOR TO MICHELIN ET CIE, OF CLERMONT-FERRAND, FRANCE, A CORPORATION OF FRANCE

PROCESS FOR APPLYING RUBBER TO METAL AND OTHER HARD MATERIALS

Application filed May 19, 1930, Serial No. 453,844, and in France May 23, 1929.

I have discovered that an excellent adhesion can be obtained between india rubber and wires, strips or bodies of metal or any other hard substance, to which rubber may be insufficiently adhesive, by interposing between the rubber covering, and said wires, strips or bodies, a textile substance, preferably cotton, capable of sticking strongly to the rubber and which is made to adhere to the metal or other hard substance by tightly binding it thereon.

In the case of threads, the textile material is applied directly by lapping, cabling or braiding. The small radius of curvature of the hard wires makes it possible to obtain a sufficient adhesion between the textile threads and the hard wires without requiring such a tensioning of the tensile threads that said threads could not support it without breaking.

On the other hand, in the case of voluminous bodies, presenting in certain parts a fairly large radius of curvature, the textile thread cannot be rendered sufficiently adherent. In that case I make use of a strong cord of a textile material or of a strong wire (metallic for example) surrounded, as previously indicated, by textile material in order to ensure, by being tightly bound around the body to be coated with rubber, the intimate connection between said body and the rubber coating.

The rubber sticks to the textile material and said material adheres to the strong wire above mentioned due to its being tightly bound thereon, or forms by itself a strong cord of textile material so that said wire or cord can be sufficiently tightened to cause it to adhere tightly to the voluminous body, owing to the strong tension which said strong wire or cord is capable of withstanding.

The wires, strips or bodies thus enclosed can be utilized for example as reinforcing elements for a pneumatic tire. These reinforcing elements, which must necessarily be very flexible, can be either continuous (such as wires, ribbons and the like) or separated (such as plates, discs or the like). Their extremities are enclosed in caps of textile material in order to prevent them from damaging the rubber.

Said elements can be disposed in one or several layers separated by rubber. When there are several layers of separate elements the elements of one layer are so arranged as to register with the spaces between the elements of the adjacent layer, or in other words they are arranged in staggered relationship.

The ribbons and discs are preferably placed parallel to the surface of the tire tread.

Several embodiments of my invention are illustrated by way of example in the accompanying drawings.

Figure 1 shows in perspective a wire having a covering of textile material.

Figure 2 shows a strip similarly covered.

Figure 3 shows in perspective a cylinder to which the rubber coating is rendered adhesive by means of a metal wire covered with textile material and wound round the cylinder in contacting turns.

Figure 4 shows a modification in which the thread employed consists solely of textile material and is wound about the cylinder in non-contacting turns.

Figure 5 is a transverse section of a portion of a tire reinforced by continuous elements coated according to my invention.

Figure 6 is a plan view, partly broken away, of the tire shown in Figure 5.

Figures 7 and 8 are corresponding views of a tire reinforced by separate elements.

Figure 9 is a horizontal section of a tire provided with a reinforcing element consisting of a continuous covered wire.

Figures 10, 11 and 12 show in plan view modifications of the reinforcing elements constituted by wires provided with a coating according to the invention.

Referring first to Figure 1, a wire 1 of a hard substance, such for example as metal, is provided with a covering of a textile material 2, such as cotton and of a layer of rubber 3 the adhesion of which to the wire is ensured by the textile covering which is tightly wound upon the wire.

In Figure 2, 4 is a strip provided with a

woven cotton covering 5 and a layer of rubber 6 the adhesion of which to the strip is ensured by the textile material.

Referring now to Figure 3, 7 is a cylinder of a hard substance which is covered with a coil of metal wire 1 provided with a lapping 2 of cotton. Said wire is wound about the cylinder 7 in spiral contacting turns so as to form a continuous coating. The layer of rubber 8 adheres to the textile material forming the woven covering 2.

Owing to the fact that the wire 1 is drawn tightly round the cylinder 7, the rubber adheres strongly to the cylinder.

The extremities of the wire can be fixed to the surface of the cylinder by soldering or by any other suitable means of attachment. In the example shown on Figure 3 the wire is wound in contacting turns. It is manifest that this is not essential and that, as shown in Figure 4, the turns could be at a certain distance from one another.

In Figure 4 cylinder 7 is provided with a thread 9 composed entirely of textile material, wound, as has been stated, in non-contacting turns. Obviously these turns might contact with one another. The layer of rubber is indicated at 8.

Figure 5 shows one method of applying the invention to pneumatic tires.

In this figure, 10 is the tire in which are disposed continuous reinforcing elements 11 and 12 clothed with coatings of textile material 13 and 14; the directions of these elements being at right angles to one another as shown in Figure 6.

In Figures 7 and 8 another example of a reinforcement for a tire is shown, consisting of elements clothed according to the invention.

In this case said elements are spaced apart and are indicated at 15 and 16. Their textile coverings are shown at 13 and 14. The elements 16 are adapted to register with the spaces between the elements 15 of the first layer.

In Figures 9, 10, 11 and 12 several practical methods of carrying out my invention are shown.

In Figure 9, 17 is a continuous reinforcing element formed by a wire bent in zig-zag fashion.

In Figure 10, 18 is a wire element wound in the form of a flattened helix.

In Figure 11, 19 are zig-zag elements like the one shown in Figure 9 but separate instead of being continuous, and forming sort of pastilles of rectangular shape.

In Figure 12, 20 is a separate element consisting of a wire wound in spiral form.

The coverings according to this invention are shown in all cases at 21.

What I claim is:—

1. As a new article of manufacture, a structure comprising a metallic core, a strong metal wire provided with a textile wrapper tightly wound around said core, and a rubber coating applied over said wire.

2. As a new article of manufacture, a structure comprising a metallic core, a strong metal wire provided with a textile wrapper tightly wound around said core so as to form contacting turns, and a rubber coating applied over said wire.

3. As a new article of manufacture, a structure comprising a metallic core, a strong metal wire provided with a textile wrapper tightly wound around said core in non-contacting turns, and a rubber coating applied over said wire.

In testimony whereof he affixes his signature.

ANDRÉ JULES MICHELIN.