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S. KHALIL
PNEUMATIC TIRE

2,524,808

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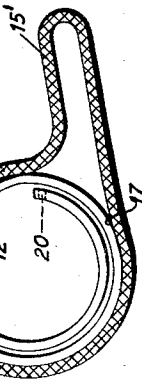
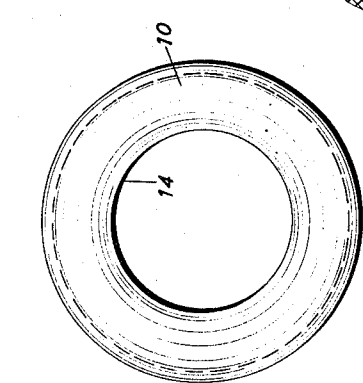
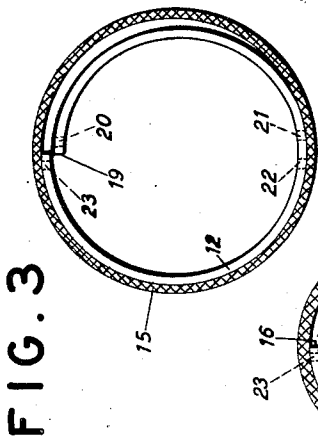
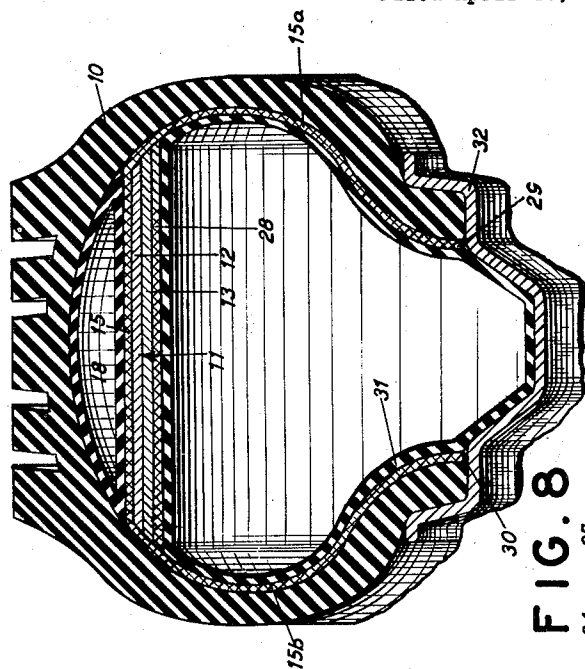


FIG. 1

FIG. 2

FIG. 3

FIG. 4

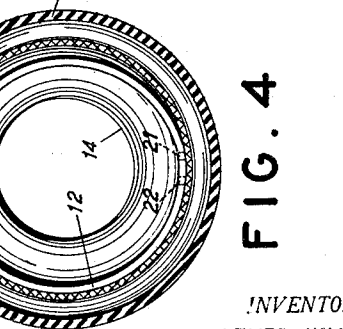
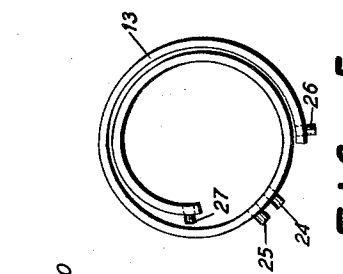
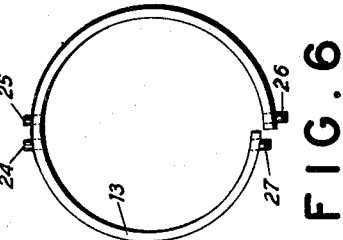
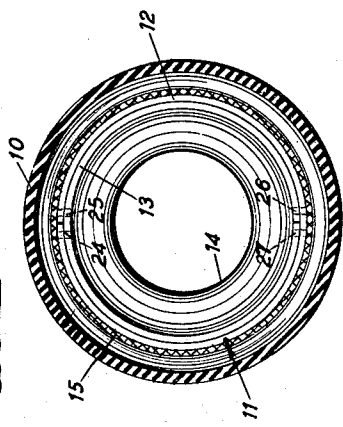


FIG. 5

FIG. 6

FIG. 7

INVENTOR.
SEYED KHALIL
BY *Van Dewater & Grier*
ATTORNEYS

UNITED STATES PATENT OFFICE

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PNEUMATIC TIRE

Seyed Khalil, New York, N. Y.

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17 Claims. (Cl. 152-340)

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This invention relates to improvements in pneumatic tires, and more particularly to adapting a plurality of inflated tubes in the casing of said tires so that a puncturing of, for example, one of said tubes, does not become flat.

It is a well known fact that the rubber of a pneumatic tube has very little resistance against inflated air. For example, if an inflated tube could be removed from its surrounding casing and rim, it would instantly expand to a point where it would burst. Thus, it is the casing and the rim which prevent the inner inflated tube from over-expanding.

Consequently, if a plurality, for example two, tubes are inserted in a casing, they may not, and often will not occupy definite portions of said casing when they are inflated.

To enable two or more tubes to each occupy definite predetermined portions of the volume of the interior of a casing, when they are inflated, I have devised a non-pneumatic annular element which I call herein a "shield." My shield may be made of several outlines, each and every one of which will have a smaller diameter than the diameter of said casing.

My shield, as shown in the accompanying drawings, is in the form of an annular laminated or composite ring, and these laminae may be formed of metallic or non-metallic materials. This shield is inserted in said casing and interlocked in a novel manner. These laminae are provided with fabric members which prevent the tubes from making physical contact with the composite ring.

When one of my composite shield rings is inserted into said casing, it divides the interior of said casing into two chambers which will be called herein "primary" and "secondary" chambers, respectively, the primary chamber being the space between said shield and the rim, and the secondary chamber being the space between the shield and the inner surface of the tread of said casing.

The relation between the size of said primary and secondary chambers depends upon the diameter of the shield ring. The larger the diameter of said ring, the larger the size of the primary chamber, and the size of the secondary chamber will be relatively smaller.

The composite ring is comprised of a plurality of spring annuli interlocked after they are positioned in the casing. A first fabric member is secured to the outer lamination of the composite shield ring (this is the lamination of largest diameter) and extends over the edges of the com-

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posite ring and overlies the inner wall of the primary chamber, so that when normally positioned in the casing, the edges of the fabric are substantially flush with the edges of the casing, bounding the inner diameter of the casing. The width of the composite ring is such that the edges of the ring, with the fabric therebetween, contact the inner wall of the casing. A fabric ring is secured to the inner lamination of the composite ring and it extends beyond the edges of the rim and contacts the first mentioned fabric.

If two tubes of suitable sizes are each inserted in one of the chambers and the tire is mounted on a rim, these tubes can be readily inflated. The primary tube (the tube in the primary chamber) will be bounded by the fabric ring which is secured to the inner lamination of the composite ring, by portions of the fabric member secured to the outer lamination of the ring where they overlie the walls of the casing in the primary chamber, and will further be bounded partly by the rim. The secondary tube will be bounded by a portion of the fabric member secured to the outer lamination of the shield ring and will also be bounded by the portion of the inner surface of the casing spanned by the composite ring.

Thus, each of the two surfaces of said shield limit the expansion of its enclosed tube, as said casing limits the expansion of its enclosed tube.

Due to the fact that the width of the composite shield ring is such that it contacts the inner wall of the casing, with thicknesses of the fabric member therebetween, the act of placing the ring in the casing centralizes it so that no other steps are necessary to insure the balance of the ring therein. This is important because if the tires are not perfectly balanced, difficulty is encountered in driving, particularly at high speeds.

When the tubes are positioned in the casing, with the ring therebetween, an initial balance is obtained, due to the width of the ring. The inflation of the tubes, due to the fact that the shield is subjected to the air pressure in all directions from each of the tubes, maintains this balance.

The assembling of my pneumatic tire is done preferably in the following order:

First, the secondary tube is inserted into the casing. Then, the outer lamination or ring of the composite ring is inserted with its secondary chamber fabric in contact with said secondary tube, and in contact with the inner wall of the casing from the secondary chamber to the opening in the casing. Next, the inner lamination of the composite ring is inserted and is interlocked with the first lamination. Then, the primary

chamber fabric is smoothly placed in contact with the surface of the inner lamination, and finally, the primary tube is inserted in the casing, and then the casing is applied to the rim.

After having been assembled with the casing, the tubes are inflated, either one at a time, or simultaneously. This makes no difference, due to the fact that the composite ring has its sides in contact with the inner wall of the casing (with the fabric therebetween) and is not subject to shifting. The primary tube may be inflated before inflating the secondary tube, if desired.

Now, it can be seen that one of said two tubes may blow out while the other one of said tubes remains intact. For instance, if the secondary tube is blown out, the tire will not become totally "flat" as said primary tube will support said casing. The extent to which said tire will become flat depends upon the relative diameters of said primary and secondary tubes, and the diameters of said tubes are determined by the diameter of said shield.

A vehicle, one wheel of which is of shorter radius than another wheel thereof, may be operated, particularly when its speed is reduced. In other words, the blowing out of the secondary tube will affect the speed of the vehicle, rather than the ability of said vehicle to run.

In addition to its office of enabling each of said tubes to be inflated properly and maintain balance, my composite ring shield has another important function. It is to protect the primary tube from being punctured.

Other objects and advantages of the invention will be apparent to those skilled in the art, upon a study of the following specification and the accompanying drawings.

Referring to the drawings:

Figure 1 is a side elevation of a casing into which my new and improved composite ring shield and the primary and secondary inner tubes are to be inserted;

Figure 2 is an elevation of the outer annulus or lamination of my composite ring with a fabric member adhered to a substantially arcuate portion of the outer surface thereof. In Figure 2, the annular lamination is spiraled to reduce its diameter so that it may enter the casing;

Figure 3 is an elevation showing the outer annular lamination spread to the point where its ends are just about to become in end-to-end relation with each other. This is what occurs when the lamination is spiraled in the form shown in Figure 2 and placed into position in the casing (Figure 1);

Figure 4 is a sectional elevation of the casing showing the outer lamination substantially in the position shown in Figure 3;

Figure 5 is an elevation of the inner annular lamination spiraled so as to get it positioned within the casing;

Figure 6 shows the inner lamination unspiraled and its ends just about to become in end-to-end butt relation;

Figure 7 is a sectional elevation of the tire with both of the laminations in interlocked relation; and

Figure 8 is a transverse sectional elevation of the casing mounted on a rim and with the primary and secondary tubes therein with my new and improved composite ring guard therebetween and showing the positions of the fabric member and the fabric ring.

Referring first to Figure 7, the casing 10 is shown with a composite ring 11 positioned there-

in. This composite ring consists of an outer annular lamination 12 and an inner lamination 13 which are preferably formed of flat spring steel formed into rings, and these are interlocked after they have been separately placed into the casing 10. The opening 14 in the casing is substantially smaller in diameter than the diameters of the laminations 12 and 13. Therefore, in order to get the composite ring into the casing via the opening 14 the following steps are taken:

Referring now to Figures 2, 3 and 4, the lamination 12 has a fabric member 15 hereinbefore referred to as "a fabric member," which is adhered to the annular lamination 12 from the point 16 to the point 17. Now, in order to place the annular lamination 12 into the casing 10, it is necessary to reduce its diameter sufficiently for it to enter the tire via the opening 14. This is done by spiraling the lamination 12 in the manner shown in Figure 2. Before the composite ring is positioned in the casing, the tube 18 hereinbefore referred to as the secondary tube, is inserted in the casing. However, in Figures 1 to 7, the tubes are omitted from the drawings for the sake of clarity.

With the lamination 12 spiraled, as shown in Figure 2, its diameter is substantially reduced and the unadhered portion of the fabric member 15 takes the form of a U-shaped loop 15'. The spiraled lamination 12 and its fabric member 15 are then inserted into the casing via the opening 14, the loop 15a of the fabric member being properly positioned in the casing and the lamination 12 is released, and due to its springiness, it tends to assume its original form, with the result that the end 19 assumes the position shown in Figure 3, and may be pushed by hand, so as to have the end 19 about the other end of the lamination 12 (see Figure 4). The lamination 12 has a hole 20 formed therein adjacent to the end 19. Spaced apart from the hole 20 is a second hole 21. Adjacent thereto is a third hole 22 and adjacent to the other end of the annulus is a hole 23.

The next step is to insert the annular lamination 13 into the casing. This lamination has a projecting stud 24, which is adapted to enter the hole 23, a stud 25 which is adapted to enter the hole 20, a stud 26 which is adapted to enter the hole 21, and a stud 27 which is adapted to enter the hole 22.

Before the lamination 13 is inserted into the casing 10, the petticoat extensions 15a and 15b of the fabric member 15 are smoothly pressed out against the inner walls of the casing, so that they are in the positions shown in Figure 8.

In Figures 2 and 3, which are diagrammatic showings, the fabric 15 has the petticoat extensions 15a and 15b omitted, for the sake of clarity. However, these petticoat extensions show and are indicated as 15a and 15b in Figure 8.

In order to place the lamination 13 into the casing 10 via the opening 14, it is spiraled up, as shown in Figure 5, and placed into the casing via the opening 14. The stud 26 is positioned in the hole 21 and the lamination is allowed to unspiral itself, so that the stud 25 enters the hole 20, the stud 24 enters the hole 23, and finally the stud 27 enters the hole 22, and the two laminations 12 and 13 forming the composite ring 11 are in the positions shown in Figure 7.

Referring now to Figure 8, the composite ring 11 comprised of an outer annulus 12 and an inner annulus 13 is shown in position in the casing. The secondary inner tube 18 is positioned in the casing adjacent to the tread and is in contact with the flat portion of the rubberized fabric

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member 15, and therefore it does not contact the composite ring, itself. It will be noted in Figure 8 that the fabric member 15 overhangs the edges of the annular composite ring 11 and is positioned between said edges and the inner wall of the casing, forming a snug fit therewith. Now, after the composite ring has been positioned in the casing 10 by taking the steps above described, and after the petticoat extensions 15a and 15b have been placed, a fabric ring 28 is positioned in the casing in contact with the inner annulus, or this fabric ring may be secured to a portion of the surface of the inner annulus 13, and it may be oriented to its proper position after being placed within the casing.

After the fabric ring is positioned in the casing, as just described, the primary inner tube 31 is positioned therein and the tire is applied to a rim 32. Although no tire valves are shown in the drawings, it will be understood that both the primary inner tube 31 and the secondary inner tube 18 are provided with individual valves, so that they may be properly inflated, and when so inflated, the tire has the appearance of that shown in Figure 8.

If the secondary tube 18 is punctured, with the result that it loses all of its air, the vehicle upon which the tire is positioned may still be driven at a lower rate of speed.

As stated above, the blowing out of the secondary tube will affect the speed of the vehicle rather than the running of the vehicle, and will further add to the safety of the passengers in the vehicle, because they would not be subjected to the dangers of blowouts, such as are encountered with ordinary conventional types of tires and tubes.

Although I have herein shown and described my new and improved tire comprised of a primary tube and a secondary tube within chambers formed in the casing by my new and improved laminated annular ring or shield, it is obvious that the casing may be divided into additional chambers by the addition of other laminated shield rings, and each chamber could be provided with an individual tube without departing from the spirit of the invention as set forth in the following claims.

What is claimed is:

1. In a tire, a casing, a plurality of pneumatic tubes in said casing with a plurality of interlocked annular springy metallic shielding members therebetween.

2. In a tire, a casing, a plurality of interlocked annular springy metallic shielding members within said casing, dividing it into a plurality of chambers, and a pneumatic tube in each of said chambers.

3. In a tire, a casing, a tube within said casing, a ring-like laminated metallic shield the laminations of which are interlocked within said casing bounding said tube, and a second tube within said casing and having its outer periphery bounded by said shield.

4. In a tire, a casing, a tube within said casing, a ring-like springy metallic shield within said casing carrying an annular fabric member extending beyond its edges and bounding said tube, a second tube within said casing and having its outer periphery bounded by a fabric ring contacting the inner surface of and also extending beyond the edges of said shield, the volumetric capacity of said first tube being less than the volumetric capacity of said second tube.

5. A tire according to claim 4, in which said

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ring-like shield is formed of a plurality of annular laminations each spiraled to a diameter smaller than the inner diameter of said casing, in order to place it within said casing, said laminations carrying cooperative interlocking means and being interlocked to form a composite ring after they have been placed within said casing.

6. In a tire, a casing, a pneumatic tube within said casing adjacent to the tread of said tire, an annular springy metallic shield positioned within said casing and having its extremities closely adjacent to the inner wall of said casing, an annular member including fabric positioned between said tube and the outer periphery of said shield and spanning the lines where said extremities are closely adjacent to said inner wall, a fabric ring positioned in contact with the interior surface of said shield and also spanning the lines where said extremities are closely adjacent to said inner wall, and a second tube within said casing and positioned between a rim and said second member when said tire is mounted on said rim, said shield isolating said tubes from each other when they are both inflated without, and to prevent said tubes from being chafed by the extremities of said shield.

7. A tire according to claim 4, in which said first fabric member is at least partially secured to the outer surface of said ring-like shield, and in which the edges of said fabric member overlap the edges of said ring-like member and overlie the inner walls of said casing from it to the inner diameter of the casing thereby preventing said second tube from physically contacting said shield and the interior of said casing.

8. In a tire, a casing, a tube within said casing a composite ring-like shield within said casing comprised of a plurality of interlocked spring rings, said shield carrying an annular fabric member in contact with said tube and having edges which overlap the edges of said ring-like shield and overlie the inner surface of said casing from said shield to the inner diameter of the casing, a flat fabric ring in contact with the inner surface of said ring-like shield, and a second tube within said casing bounded by said edges of said fabric member and by said fabric ring and adapted to be contacted by a rim upon which said tire is mounted, the volumetric capacity of said first tube being less than the volumetric capacity of said second tube.

9. In a pneumatic tire, a casing having a plurality of tubes therein, and a plurality of interlocked annular spring rings forming a partition therebetween.

10. In a pneumatic tire, a casing having a plurality of tubes therein with resistance means therebetween, said resistance means being comprised of at least two springy metallic rings carrying circumferentially disposed cooperative interlocking means.

11. In a pneumatic tire, a casing, a plurality of inflated tubes, and means to enable each of said tubes to occupy a given section of the interior of said casing, said sections being bounded by a composite barrier comprised of at least two interlocked spring rings, the abutting open ends of one of said rings being displaced from the abutting open ends of the other.

12. In a pneumatic tire, a casing, a plurality of tubes in said casing, shielding means in said casing isolating said tubes from each other and comprised of at least in part of interlocked annuli of spring steel and means to enable said tubes to be inflated independently.

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13. In a pneumatic tire, a casing, at least two tubes within said casing, and at least two flat springs forming a composite ring-like element within said casing between said tubes.

14. In a pneumatic tire, a casing, a tube within said casing, two flat springs spiraled into a small diameter inserted in and expandedly positioned in said casing, and cooperative locking means on said springs for interlocking them after they have been inserted in said casing to form a composite flexible ring contacting a portion of said tube.

15. In a pneumatic tire, a casing, a plurality of tubes in said casing, and a plurality of interlocked tempered metallic rings between said tubes isolating them.

16. In a tire, a casing, a pneumatic tube within said casing adjacent to the tread of said tire, an annular shield positioned within said casing and having its extremities closely adjacent to the inner wall of said casing, said annular shield being comprised of a plurality of spring ring members adapted to be interlocked with each other after they are placed within said casing, an annular member including fabric positioned between said tube and the outer periphery of said shield, a second annular member including fabric positioned in contact with the interior surface of said shield, and a second tube within said

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casing and adapted to be positioned between a rim and said second member when said tire is mounted on said rim, said shield being adapted to isolate said tubes from each other when they are both inflated.

17. In a tire, a casing, annular shielding means within said casing dividing it into a plurality of chambers, said annular shielding means being comprised of a plurality of laminations, each in the form of an openable ring, the ends of which abut each other, each of said laminations carrying means to cooperate with means on its mate to effect the interlocking of at least two of said laminations to form a composite ring.

SEYED KHALIL.

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