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3 HIGH-SPEED, PUNCTURE PROOF TIRE

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5 STATEMENT OF GOVERNMENT INTEREST

6 The invention described herein may be manufactured and used
7 by or for the Government of the United States of America for
8 governmental purposes without the payment of any royalties
9 thereon or therefor.

10
11 BACKGROUND OF THE INVENTION

12 (1) Field of the Invention

13 This invention relates generally to vehicle tires, and
14 more particularly to a high-speed, puncture proof tire.

15 (2) Description of the Prior Art

16 Puncture proof tires are well known in the art. In this
17 regard, reference can be made to U.S. Patent Nos. 487,419 to Lee;
18 2,070,066 to Picardi; 3,127,920 to Hercules; 4,945,965 to Kim;
19 5,180,455 to Cheng, and 5,385,191 to Aflague et al., as
20 representative prior art in this area.

21 More specifically, Lee discloses a tire construction having
22 an outer covering and air filled tubular cells formed between
23 compressed areas disposed within the outer covering. As shown in
24 Lee, the cells occupy the entire volume of the outer covering.
25 Picardi shows a pneumatic tire having a tube and a casing
26 disposed around the tube. A plurality of partitions serve to
27 create sealable compartments such that if one compartment is

1 punctured, the other compartments are not deflated. The
2 compartments are positioned throughout nearly the entire volume
3 of the casing. Kim illustrates a tube assembly for tires
4 including a tire casing and a plurality of small inflated
5 balloons positioned adjacent a tread wall of the tire casing.
6 The arrangement is such that upon puncturing the tire, only one
7 of the balloons deflates while the balloons surrounding the
8 punctured balloon expand to occupy the area of the punctured
9 balloon. The remaining patents to Hercules, Cheng, and Aflague
10 et al. are of a more general interest.

11 Low-speed, puncture proof tires are also well known. In
12 this regard, such tires consist of pressurized foamed rubber that
13 is injected into a conventionally constructed tire and allowed to
14 cure at a specific pressure. Such tires are only appropriate for
15 low-speed applications since at high speeds, the resulting shear
16 forces destroy the pressurized foamed rubber through mechanical
17 tearing.

18 19 SUMMARY OF THE INVENTION

20 The instant invention is directed to a high-speed, puncture
21 proof tire comprising a tire casing having a tread portion and a
22 pair of side wall portions, the tread and side wall portions
23 defining an annular space therewithin. The tire further
24 comprises a plurality of small diameter pressurized tubes
25 disposed within the annular space of the tire casing. Each
26 pressurized tube has an elongate body fabricated from film
27 material resistant to shear forces. The body of each pressurized

1 tube is sealed crosswise along the length of the body to define
2 at least two compartments that contain gas under pressure.

3 In a second aspect of the invention, a high-speed, puncture
4 proof tire comprises a tire casing and at least one panel of film
5 material resistant to shear forces disposed within the annular
6 space of the tire casing. The panel is sealed lengthwise thereof
7 to define a plurality of small diameter pressurized tubes. Each
8 pressurized tube is sealed crosswise along the length of the tube
9 to define at least two compartments that contain gas under
10 pressure.

11 In a third aspect of the invention, a high-speed, puncture
12 proof tire comprises a tire casing and a plurality of small
13 diameter pressurized tubes disposed within the annular space of
14 the tire casing. Each pressurized tube has an elongate body
15 fabricated from film material resistant to shear forces wherein
16 the tubes are oriented radially within the annular space of the
17 tire casing.

18 In a fourth aspect of the invention, a high-speed, puncture
19 proof tire comprises a tire casing and a plurality of small
20 diameter pressurized tubes disposed within the annular space of
21 the tire casing. Each pressurized tube has an elongate body
22 fabricated from film material resistant to shear forces wherein
23 the tubes are oriented circumferentially within the annular space
24 of the tire casing.

1 Accordingly, it is an object of the present invention to
2 provide an improved high-speed, puncture proof tire which is
3 designed to prevent complete destruction of the tire when
4 impacting a sharp object.
5

6 BRIEF DESCRIPTION OF THE DRAWINGS

7 A more complete understanding of the invention and many of
8 the attendant advantages thereto will be readily appreciated as
9 the same become better understood by reference to the following
10 detailed description when considered in conjunction with the
11 accompanying drawings wherein:

12 FIG. 1 is an elevational view of a high-speed, puncture
13 proof tire of the present invention with a portion of a side wall
14 of the tire removed for revealing individual small-diameter
15 pressurized tubes contained therein;

16 FIG. 2 is an elevational view of a high-speed, puncture
17 proof tire of another preferred embodiment with a portion removed
18 for revealing the pressurized tubes;

19 FIG. 3 is an enlarged view of the pressurized tube shown in
20 FIGS. 1 and 2; and

21 FIG. 4 is a perspective view of a pressurized tube of
22 another preferred embodiment.
23

24 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

25 Referring now to the drawing figures, and more particularly
26 FIG. 1, there is generally indicated at 10 a high-speed, puncture
27 proof tire of the present invention. The tire 10 of the instant

invention improves on the tire constructions disclosed in the Lee, Picardi and Kim patents, along with the prior art low-speed tire described above.

As shown, the tire 10 comprises a hub or rim 12 adapted to be secured to a conventional axle and a tire casing 14 mounted on the hub 12 in the well known manner. The tire casing 14 has a tread portion 16 and a pair of side wall portions 18 integrally formed with the tread portion 16. FIGS. 1 and 2 only illustrate one side wall portion 18; however, it is understood that the other side wall portion which is not shown is identically constructed. The tread and side wall portions 16, 18 define an annular space therewithin which, with conventionally constructed tires, is adapted to receive an inner tube.

Moreover, in a typical tire construction, the inner tube is filled with pressurized gas, such as air. However, the tire 10 of the present invention includes a plurality of small diameter pressurized tubes, each generally indicated at 20 in FIGS. 1-3, disposed within the annular space of the tire casing 14. Referring to FIG. 1, the pressurized tubes 20 are oriented radially within the annular space in that they extend from the hub 12 along the side wall portion 18 of the tire casing 14, crosswise along the tread portion 16, and back along the other side wall portion. Turning briefly to FIG. 2, the pressurized tubes 20 are oriented circumferentially within the annular space of the tire casing 14. Preferably, the tubes 20 are bonded by any suitable fashion (e.g., adhesive, heat/pressure bonding, etc.) to the tire casing 14.

1 The tubes 20 can be fabricated from a variety of film
2 materials that are resistant to shear forces. For example,
3 tubes 20 fabricated from high-density polyethylene film or
4 laminates of high-density and/or low-density polyethylene film
5 are preferred since such films can be produced in mass quantities
6 quickly and cost-efficiently. Referring to FIG. 3, each tube 20
7 has an elongate body 22 that is sealed crosswise along the length
8 of the body at locations designated by reference numeral 24 so as
9 to define a plurality of compartments 26 that contain pressurized
10 gas. During its manufacture, each tube 20 is pressurized and
11 heat sealed at locations 24. It should be noted that to increase
12 the shear resistance of the tube 20, the tube body 22 diameter,
13 density, thickness, and configuration (e.g., radial or
14 circumferential orientation) can be optimized.

15 Turning now to FIG. 4, there is generally indicated at 28 a
16 panel of film material that can also be utilized in constructing
17 tire 10. Specifically, the panel 28 is sealed lengthwise thereof
18 at locations 30 to define a plurality of small diameter
19 pressurized tubes, each indicated at 32, similar to the tube 20
20 illustrated in FIGS. 1-3. Each pressurized tube 32 of the panel
21 is sealed crosswise at locations 34 along the length of the tube
22 to define a plurality of compartments that contain pressurized
23 gas. The panel is fabricated from polyethylene film material as
24 described above, and the sealing is preferably achieved by heat
25 sealing.

26 It should be observed that the tire 10 of the present
27 invention is puncture proof in that any sharp object penetrating

1 the tire would only puncture a single compartment of a tube (20,
2 32), or at most two compartments of a tube thereby enabling
3 continued use of the tire 10. Accordingly, for these reasons,
4 the instant invention is believed to represent a significant
5 advancement in the art which has substantial commercial merit.

6 While there is shown and described herein certain specific
7 structure embodying the invention, it will be manifest to those
8 skilled in the art that various modifications and rearrangements
9 of the parts may be made without departing from the spirit and
10 scope of the underlying inventive concept and that the same is
11 not limited to the particular forms herein shown and described.
12

3 HIGH-SPEED, PUNCTURE PROOF TIRE

5 ABSTRACT OF THE DISCLOSURE

6 The invention is directed to a high-speed, puncture proof
7 tire including a tire casing having a tread portion and a pair of
8 side wall portions and a plurality of small diameter pressurized
9 tubes disposed within the tire casing. Each pressurized tube has
10 an elongate body fabricated from film material that is sealed
11 crosswise along the length of the body to define at least two
12 compartments that contain gas under pressure. The tubes can be
13 oriented radially or circumferentially within the annular space
14 of the tire casing. In another embodiment of the tire, at least
15 one panel of film material resistant to shear forces is disposed
16 within the annular space of the tire casing. The panel is sealed
17 lengthwise thereof to define a plurality of small diameter
18 pressurized tubes. Each pressurized tube is sealed crosswise
19 along the length of the tube to define at least two compartments
20 that contain gas under pressure.

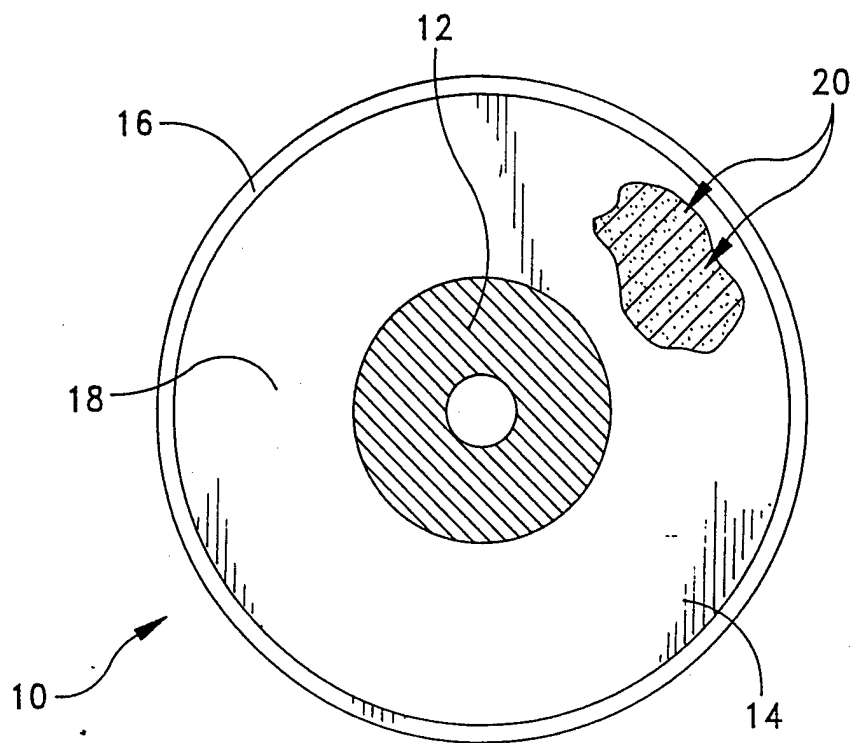


FIG. 1

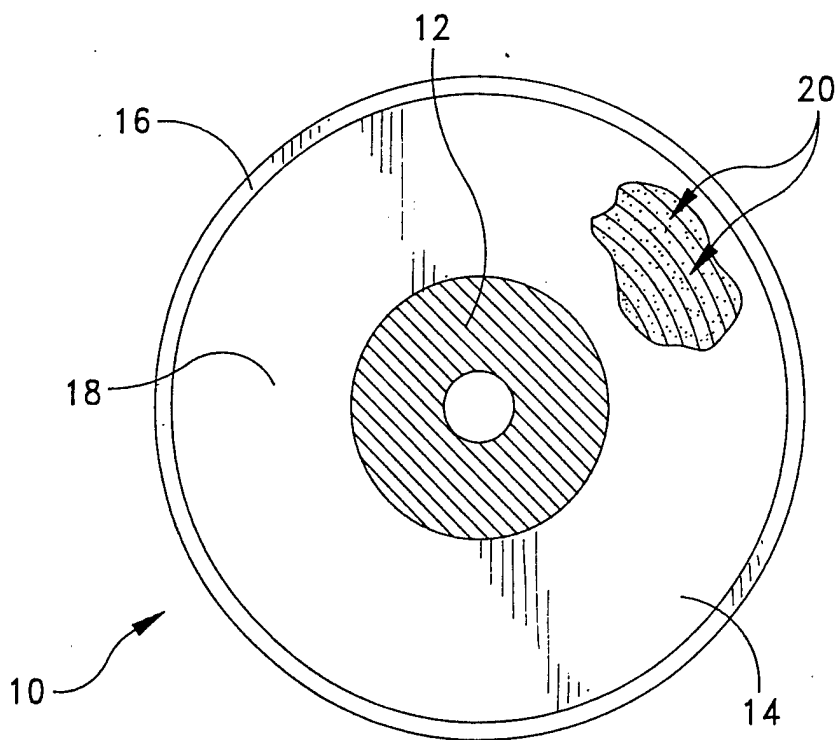


FIG. 2

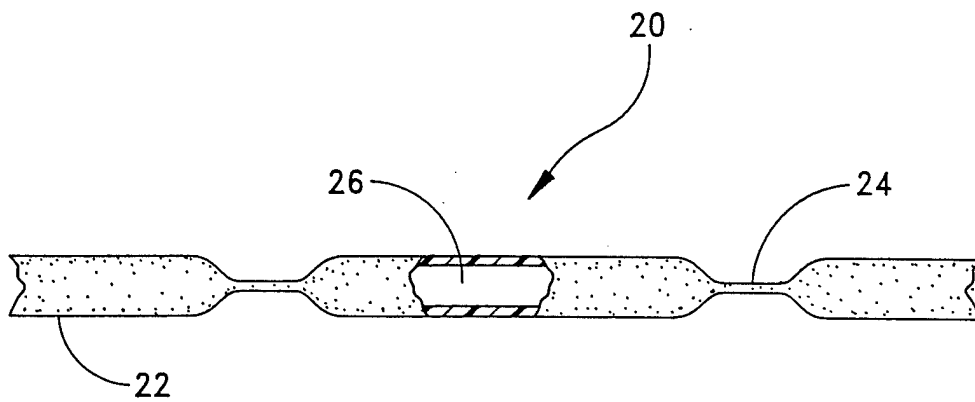


FIG. 3

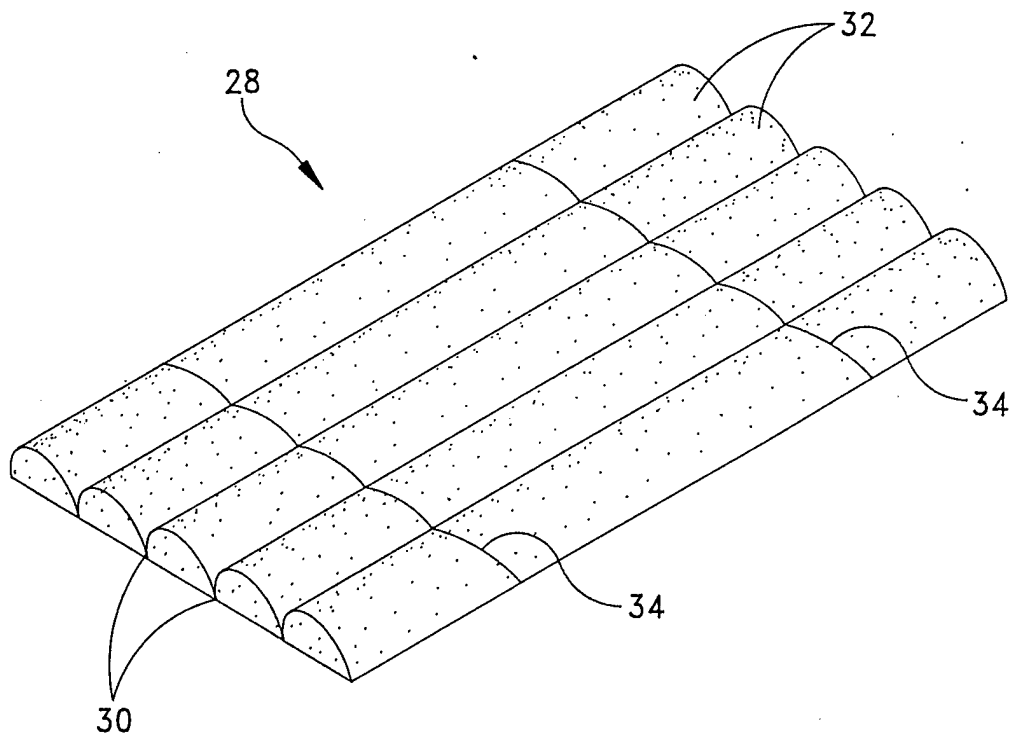


FIG. 4