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(19)

(54) IMPROVEMENTS IN AND RELATING TO FLEXIBLE REINFORCING STRUCTURES

(71) We DUNLOP LIMITED, a British Company of Dunlop House, Ryder Street, St. James's, London SW.1, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:

This invention relates to a flexible reinforcing structure and in particular, though not exclusively, to a reinforcing structure for a radial ply tyre.

A radial ply tyre commonly comprises a flexible reinforcement extending circumferentially around the tyre in the form of a substantially inextensible reinforcing belt to restrain extension of the tyre in its circumferential direction. Reinforcing belts for this application conventionally are formed from a plurality of substantially parallel reinforcing cords embedded in flexible polymeric material, and the belts so formed are applied to a partly built tyre such that in the final assembly of the tyre the reinforcing cords extend at a small angle to the circumferential direction of the tyre.

Various reinforcing cord materials such as cotton, rayon, man-made fibres including polyvinyl, alcohol, aramids, and steel, and glass fibres have been proposed and have specific advantages for certain applications. However, associated with each of these materials are certain disadvantages and it has not hereto been possible to provide a reinforcing belt which overcomes the disadvantages of certain reinforcing materials without introducing further disadvantages.

Thus, organic fibres such as cotton and rayon have the disadvantage of being difficult to handle especially under certain humidity conditions, whilst glass fibres which are not prone to humidity difficulties and are relatively easily handleable have a poor compression resistance. Other materials such as steel and like metals do not suffer the problems associated with organic fibres and glass fibres as aforementioned but are relatively expensive. They are also of a high weight in terms of density and this results in the quality of a wire reinforced tyre being very dependent on the uniformity with which the wires are positioned in the tyre.

One object of the present invention is to provide an improved flexible reinforcing structure.

According to the present invention there is provided a flexible reinforcing structure comprising reinforcing cords embedded with mutually parallel alignment in a flexible polymeric material, said cords being individually one or the other of two materials, one of which materials is glass and the other of which materials is metallic, said cords being arranged so that in plan view two or more cords of a first of said two materials alternate with one or more cords of the second of said two materials.

Embodiments of the invention will now be described by way of example only with reference to the accompanying drawings in which:

Figure 1 is a cross-section of a tyre;

Figure 2 is an enlarged view of part of the tyre with portions of the tyre removed for clarity;

Figure 3 is a view similar to Figure 2 showing a further embodiment.

Referring now to Figure 1, a tyre 10 includes one pair of beads 12, 14 and a carcass 16 extending between the beads.

A breaker assembly 18 is positioned on the carcass 16 and extends circumferentially below a tread portion 20 moulded on the tyre.

As can best be seen in Figure 2 the breaker assembly comprises a plurality of cords 22 embedded in a layer of polymeric material 24. The cords 22 extend circum-

ferentially around the tyre and traverse the equatorial plane at an angle of 20°. The cords 22 are formed individually from one or the other of two materials, one of which materials is metallic and the other of which materials is glass. The metallic cords are designated 22s and the glass cords are designated 22g. The cords 22 are arranged in a single layer in which a pair of glass cords 22g alternate with a single steel cord 22s.

In the embodiment of Figure 3 the cords 22 are arranged in two layers with the glass cords 22g above the steel cords 22s. The glass cords 22g are arranged in pairs above but between a pair of steel cords 22s. Thus when viewed in plan, i.e. in the direction of arrow A of Figure 1, the pair of glass cords 22g alternate with a single steel cord 22s.

The use of glass cords in the reinforcing structure reduces the weight and cost of the structure as compared with one formed wholly from cords of a metal such as steel whilst the presence of some metal, preferably steel, cords enables adequate reinforcing strength to be obtained without the use of an otherwise large number of glass or other cords which would increase the bulk of the reinforcing structure. Accordingly, the number of metal cords used in relation to the number of glass cords is to be selected depending on the required strength to weight and strength to volume ratios of the reinforcing structure.

It has been found that a particularly suitable reinforcing structure for use as a reinforcing belt of a radial ply tyre can be formed by a weftless construction of 1 × 4 × 0.25 mm steel cords each alternating with two ECG 75-5/0 glass filament cords embedded in a rubber-like material such as resorcinol/formaldehyde latex composition arranged in the form of two layers embedded in styrene butadiene rubber.

In the designation ECG 75-5/0 (as supplied by Pittsburg Plate Glass) for the glass filament cords,

- E indicates that the glass composition is electrical
- C indicates that filaments are continuous
- G indicates a filament diameter in the range 0.00035 to 0.00040
- 75 indicates a spun yarn linear density or count of 7,500 yards/lb.
- -5 indicates that the cord comprises 5 strands twisted together
- /0 indicates that the cord is a simple bunch of 5 strands.

WHAT WE CLAIM IS:—

1. A flexible reinforcing structure comprising reinforcing cords embedded with mutually parallel alignment in a flexible polymeric material, said cords being individually one or the other of two materials, one of which materials is glass and the other of which materials is metallic, said cords being arranged so that in plan view two or more cords of a first of said two materials alternate with one or more cords of the second of said two materials.

2. A flexible reinforcing structure according to claim 1 wherein said reinforcing cords are arranged in two layers, the cords of one of said layers being of metallic material and the cords of the other of said layers being of glass.

3. A flexible reinforcing structure according to claim 1 wherein said cords are arranged in a single layer.

4. A flexible reinforcing structure according to any preceding claim wherein equal numbers of cords of the first of said materials alternate with an equal number of cords of the second of said materials.

5. A flexible reinforcing structure according to any preceding claim wherein said glass cords are formed from a plurality of filaments.

6. A flexible reinforcing structure according to any preceding claim wherein said metallic material is steel.

7. A flexible reinforcing structure according to claim 6 wherein each of said steel cords are formed from a single cord having four strands each of 0.25 mm diameter.

8. A flexible reinforcing structure according to claim 7 wherein for each steel cord there is provided a pair of glass cords.

9. A flexible reinforcing structure according to claim 8 when claims 4, 5, or 6 are directly or indirectly dependent on claim 1 or claim 2, wherein said steel cords are arranged in one layer and said glass cords are arranged in another layer.

10. A reinforcing structure according to any preceding claim wherein said polymeric material is a styrene butadiene rubber.

11. A breaker including a reinforcing structure as claimed in any one of claims 1 to 10.

12. A tyre including a breaker according to claim 11.

13. A tyre constructed and arranged substantially as herein described with reference to the accompanying drawings.

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1574425 COMPLETE SPECIFICATION
1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

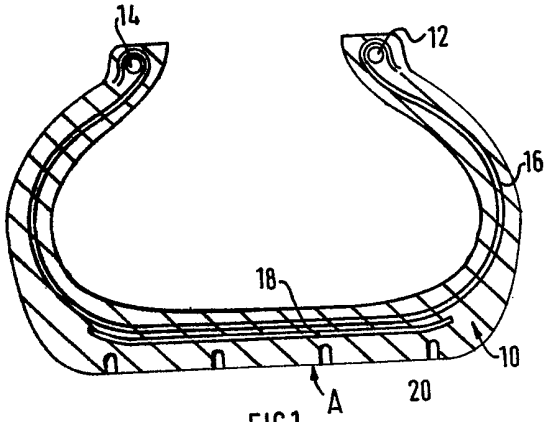

FIG.1

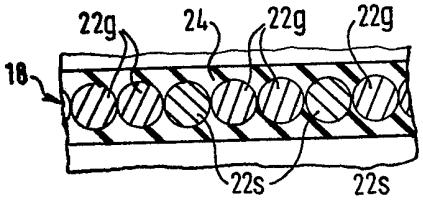

FIG.2

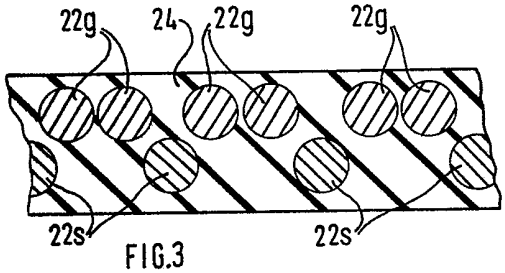

FIG.3