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(54) **Title:** METHOD OF COLD RETREADING TYRES

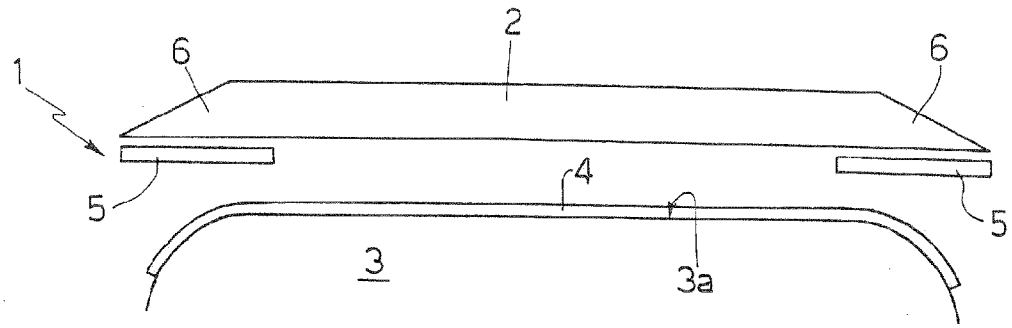


Fig.1

(57) **Abstract:** A method of cold retreading tyres, including an assembly step, in which a green-rubber cushion (4) is inserted between a carcass (3) of the worn tyre and a pre-cured new tread (2); and a curing step, in which the cushion (4) is cured. At the assembly step, one or more calendered strips (5) of a high-adhesion green rubber mix are interposed between the cushion (4) and at least two lateral portions (6) of the pre-cured tread (2); and the calendered strips (5) of green mix are cured at the curing step, together with the cushion (4).

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METHOD OF COLD RETREADING TYRES

TECHNICAL FIELD

The present invention relates to a method of cold retreading tyres.

BACKGROUND ART

The term "cross-linkable unsaturated-chain polymer base" is intended to mean any natural or synthetic non-cross-linked polymer capable of assuming all the chemical, physical, and mechanical characteristics typical of elastomers when cross-linked (cured) with sulphur-based systems.

When the tread portion of a tyre wears out, the rest of the tyre is normally still as good as new, which means disposal of the whole tyre not only poses environmental problems, but is also economically unfeasible.

Accordingly, it is now common practice to produce so-called retreaded tyres, by replacing the tread on the used carcass.

Two tyre retreading techniques are mainly adopted : hot and cold retreading.

Cold retreading is so called because of the low temperature at which the retreaded tyre is cured (80-130°C), and has the advantages, with respect to hot retreading, of not subjecting the used tyre carcass to particular thermal stress, and of being applicable to any type of tread (different tread patterns).

In cold retreading, a green-rubber connecting layer

or so-called "cushion" is interposed between the cleaned carcass and the new tread, the mating surface of which is coated with an adhesive mixture commonly known as cement. The cement and cushion ensure adhesion of the new tread to the carcass when cold cured; and the cushion normally comprises a cross-linkable polymer base, a curing system, and a so-called "tackifier" resin.

The drawback of this technique lies in the cement being organic-solvent-based. As is known, organic solvents are highly volatile, and constitute a hazard both to the environment and, above all, to the health of workers coming into contact with them.

For all these reasons, recent European directives have imposed a drastic reduction in the use of organic solvents in tyre manufacturing, thus forcing manufacturers to devise alternative solutions to ensure correct adhesion of rubber layers.

A need is therefore felt for a cold tyre retreading technique employing no cement, but without comprising adhesion of the new tread to the tyre carcass.

DISCLOSURE OF INVENTION

According to the present invention, there is provided a method of cold retreading tyres, comprising an assembly step, in which a green-rubber cushion is inserted between a carcass of the worn tyre and a pre-cured new tread; and a curing step, in which said cushion is cured; said method being characterized in that, at said assembly step, one or more calendered strips of a

high-adhesion green rubber mix are interposed between the cushion and at least two lateral portions of the pre-cured tread; said calendered strips of green mix being cured at said curing step, together with said cushion.

Preferably, the green rubber mix of the calendered strips has a t90 rheometric value of less than 5 min as per ASTM standard D5298.

Preferably, the calendered strips are two in number, each of which is located at a respective lateral portion of said tread.

Preferably, the green rubber mix of the calendered strips comprises a polymer base, a reinforcing filler, a curing system, and a tackifier resin.

Preferably, the tackifier resin is a para-t-butylphenolacetylene resin present in a quantity ranging from 0.5 to 15 phr.

The pre-cured tread is thus secured to the carcass without using cement, while at the same time ensuring firm adhesion of the more critical, detachable lateral portions of the tread.

BRIEF DESCRIPTION OF THE DRAWING

A non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a section of assembly of the tread and carcass according to the method of the present invention;

Figure 2 shows the Figure 1 section at a further

assembly stage.

BEST MODE FOR CARRYING OUT THE INVENTION

Number 1 in the accompanying drawings indicates as a whole a retreaded tyre.

Retreaded tyre 1 comprises a pre-cured tread 2; a used-tyre carcass 3; a green-rubber cushion 4 placed on a mating surface 3a of carcass 3; and two green-rubber calendered strips 5, each inserted between cushion 4 and a respective lateral portion 6 of tread 2.

Green-rubber calendered strips 5 are made from a mix having the composition in phr (parts per hundred parts of polymer base) shown in Table I.

TABLE I

Natural rubber	100
Carbon black	40
Zinc oxide	5
Stearic acid	1
Antioxidants	5
Sulphur	2.5
Accelerants	1
Aromatic-hydrocarbon resin	2
Para-t-butylphenolacetylene resin	10

The above mix was rheometric tested as per ASTM Standard D5298. The results are shown in Table II.

TABLE II

Ml (dNm)	1.0
Mh (dNm)	10.6

t10 (min)	0.69
t90 (min)	1.36

Each strip 5 is long enough to cover the whole length of tread 2, and is 3 cm wide and 2 cm thick.

Tyres retreaded as described above were tested to determine grip of the tread to the carcass.

Testing included :

- durability drum testing (ref. ECE 54);

- shearography testing to determine adhesion status; and

- peeling test as per ASTM Standard D1876-01.

For a better evaluation, a comparison peeling test was also performed on a tyre retreaded using the conventional method employing organic-base cement.

Durability drum testing and shearography testing proved positive, whereas the peeling test gave the results shown in Table III.

TABLE III

	Tyre retreaded using cement	Tyre retreaded in accordance with the invention
Peeling test Mean force (N/mm)	28.8	26.7

As will be clear to an expert, the peeling test results in Table III show substantially no change as compared with the known technique using cement.

As will be clear from the above description and data, the solution according to the present invention

provides for effectively cold retreading tyres without using cement. Moreover, using only two green-rubber strips at the lateral edges of the pre-cured tread, the present invention also provides for considerable saving in material.

In fact, as shown in Figure 2, the two green-rubber strips 5 at lateral portions 6 of pre-cured tread 2 ensure firm adhesion at the more critical points, subjected to stress caused by folding lateral portions 6 onto the sidewalls of the carcass.

CLAIMS

1) A method of cold retreading tyres, comprising an assembly step, in which a green-rubber cushion (4) is inserted between a carcass (3) of the worn tyre and a pre-cured new tread (2); and a curing step, in which said cushion (4) is cured; said method being characterized in that, at said assembly step, one or more calendered strips (5) of a high-adhesion green rubber mix are interposed between the cushion (4) and at least two lateral portions (6) of the pre-cured tread (2); said calendered strips (5) of green mix being cured at said curing step, together with said cushion (4).

2) A method of cold retreading tyres, as claimed in Claim 1, characterized in that the green rubber mix of the calendered strips (5) has a t90 rheometric value of less than 5 min as per ASTM standard D5298.

3) A method of cold retreading tyres, as claimed in Claim 2, characterized in that the calendered strips (5) are two in number, each of which is located at a respective lateral portion (6) of said tread (2).

4) A method of cold retreading tyres, as claimed in one of the foregoing Claims, characterized in that the mix of said calendered strips (5) comprises a cross-linkable unsaturated-chain polymer base, a reinforcing filler, a curing system, and a tackifier resin.

5) A method of cold retreading tyres, as claimed in Claim 4, characterized in that said tackifier resin is a

para-t-butylphenolacetylene resin present in a quantity ranging from 0.5 to 15 phr.

6) A cold-retreaded tyre (1), characterized by being retreaded using the method as claimed in any one of the foregoing Claims.

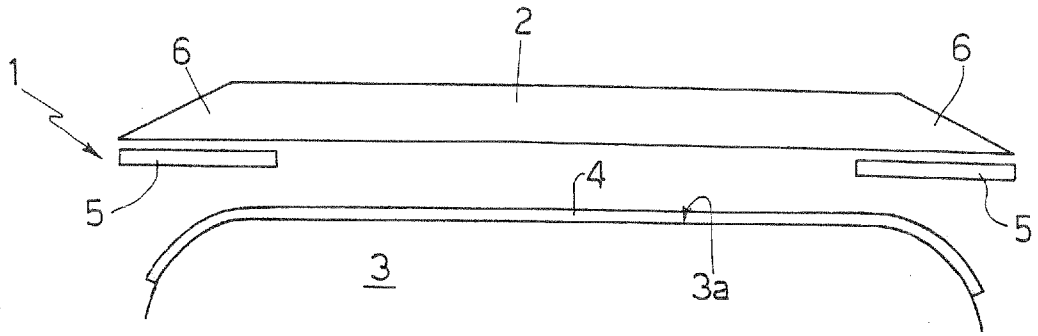


Fig.1

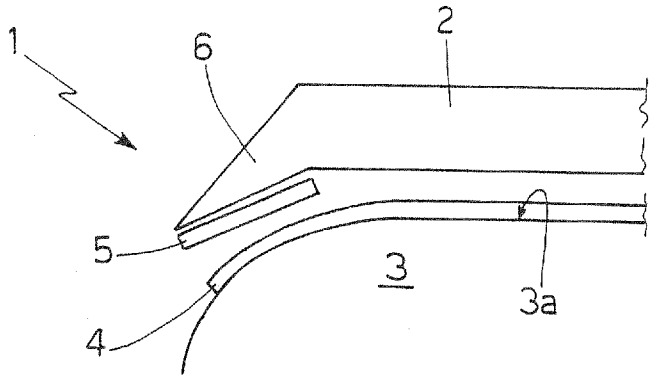


Fig.2

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2008/054458

A. CLASSIFICATION OF SUBJECT MATTER
INV. B29D30/56

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B29D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 715 948 A (EDLER KURT [AT]) 12 June 1996 (1996-06-12)	1,6
Y	claims 1,5; figure 2a page 1, line 42 - page 2, line 2	2-5
X	US 3 136 673 A (CARVER ROY J) 9 June 1964 (1964-06-09)	1,6
Y	column 2, line 32 - column 3, line 14; claim 1; figures	2-5
X	DE 25 60 403 C2 (VAKUUM VULK HOLDING LTD, NASSAU (BS)) 10 March 1983 (1983-03-10)	1,6
Y	column 4, paragraphs 2,3; figure	2-5
X	JP 62 119029 A (OHTSU TIRE & RUBBER CO LTD) 30 May 1987 (1987-05-30)	1,6
Y	abstract; figures	2-5

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"P" document published prior to the international filing date but later than the priority date claimed

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
19 June 2008	07/07/2008

Name and mailing address of the ISA/	Authorized officer
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INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2008/054458

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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A	AT 335 861 B (EDLER KURT [ST] EDLER KURT [AT]; EDLER KURT [ST]) 12 April 1997 (1997-04-12) figures	1-6

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Information on patent family members

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