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D E C I S I O N
of 17 March 1997

Case Number: T 0754/94 - 3.2.5

Application Number: 89303156.7

Publication Number: 0335718

IPC: B29D 30/38

Language of the proceedings: EN

Title of invention:

Method of producing tire reinforcing member

Patentee:

BRIDGESTONE CORPORATION

Opponent:

-

Headword:

-

Relevant legal provisions:

EPC Art. 56

Keyword:

"Inventive step - yes"

Decisions cited:

-

Catchword:

-



Case Number: T 0754/94 - 3.2.5

D E C I S I O N
of the Technical Board of Appeal 3.2.5
of 17 March 1997

Appellant: BRIDGESTONE CORPORATION
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JP-Tokyo 104 (JP)

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Decision under appeal: Decision of the Examining Division of the
European Patent Office posted 19 May 1994
refusing European patent application
No. 89 303 156.7 pursuant to Article 97(1) EPC.

Composition of the Board:

Chairman: G. O. J. Gall
Members: A. Burkhart
H. P. Ostertag

Summary of Facts and Submissions

- I. The appellant (applicant) lodged an appeal against the decision of the Examining Division on the refusal of the application No. 0 335 718.

The Examining Division held that the claimed method did not involve an inventive step having regard to the state of the art according to the documents:

D1: EP-A-0 216 122, and
D3: JP-A-47/13684.

- II. The appellant requested that the decision under appeal be set aside and a patent be granted on the basis of the following documents:

description: pages 1 to 4 and 8 to 15, filed on
14 January 1993;
pages 5, 6, 7, 16, 17, filed on
22 December 1995;

claims: 1 to 5, filed on 22 December 1995;

drawings: Figures 1 to 9, as originally filed.

In his statement of grounds of appeal the appellant referred to the document D4 (US-A-3 700 012) corresponding to the document D3, and to the document D2 (US-A- 4 452 837) cited already during the examination procedure.

III. The wording of claim 1 reads as follows:

"1. A method of producing a tire reinforcing member comprising the steps of paying off chemical fiber cords (1) from bobbins (2) to pass through respective small apertures of a guide plate (3) to arrange them in a predetermined positional relation, passing the cords over winding type braking means (4) including winding rolls (5, 6) each having an outer surface coated with rubber, diverting the cords about a dancer roller (8), causing the cords to pass in parallel through respective small apertures (11a) of a movable guide plate (11) reciprocated in horizontal directions perpendicular to the advancing direction of the cords, feeding the cords reciprocatively moved by the movable guide plate (11) to pressing rolls (13, 14) of a calender (12) for rubber coating, provided closely adjacent the movable guide plate (11), sandwiching the cords in the form of waves without overlapping the cords between two rubber sheets (20), and pressing the rubber sheets to each other to embed the cords into the rubber sheets and adhere closed surfaces of the rubber sheets to be integrated, thereby obtaining the tire reinforcing member (21)."

IV. The appellant argued essentially as follows:

Document D3 (D4) aimed to form plastically deformable steel wires into spirals. This known method could not be used for soft cords such as chemical fibres because they were difficult to be permanently set. Moreover, the method of the present invention differed from the method according to document D3 (D4) by a number of

features which solved the problem of producing a tyre reinforcing member comprising chemical fibre cords sandwiched in the form of waves between two rubber sheets, without overlapping the cords.

These differentiating features were not rendered obvious by the documents D1 or D2.

Reasons for the Decision

1. *Amendments*

The method of the amended claim 1 is disclosed in the originally filed application documents as follows:

Originally filed Claim 1; originally filed description, page 5, lines 11 to 13, page 7, lines 1 to 3, page 8, lines 18 to 20, page 9, lines 14 to 16, page 16, lines 1 to 3 and lines 6 to 17, page 17, lines 14 to 20.

Claims 2 to 5 are identical with original claims 2 to 5.

The description has been adapted to the wording of the amended claim 1.

Therefore, the amendments are not objectionable under Article 123(2) EPC.

2. *Novelty*

Document D3 (D4) discloses a method of producing a tyre reinforcing member, wherein wire filaments are caused to pass through the apertures of a fixed guide plate and moving guide plates moved along orbits of circular arcs, so that each filament is individually twisted into a helical configuration, and the helically deformed filaments, after having been passed through apertures of a further fixed guide unit, are pressed between rubber-like elastic sheets by means of upper and lower pressure rollers of a calender to form a rubber-like reinforced elastic structure having helically formed wire filaments sandwiched therein.

The method of Claim 1 differs from this prior art method by the following features:

- (a) chemical fibre cords are used instead of wire filaments,
- (b) on the way of supplying the cords, they are passed over winding type breaking means including winding rolls each having an outer surface coated with rubber, and they are diverted about a dancer roller,
- (c) the moving guide plate is reciprocated in horizontal directions perpendicular to the advancing direction of the cords, so that the cords are swung in a horizontal plane,
- (d) the moving guide plate is provided closely adjacent the calender rolls,
- (e) the cords are sandwiched between the rubber sheets in the form of waves without overlapping each other.

Document D1 does not relate to the production of a tyre reinforcing member but to the production of a conveyor belt made of polyurethane. This method does not use calender rollers for sandwiching the cords between two rubber sheets.

Document D2 does not refer to the production of cord-reinforced rubber members but to the production of paper webs reinforced with string type adhesive which webs can be used in strong paper bags.

Therefore, the method of Claim 1 is novel with respect to the aforementioned prior art methods.

3. *Inventive step*

3.1 Problem underlying the invention

The inventor of the patent application has found that the helical wire deformation method according to document D3 (D4) cannot be used for soft cords, such as chemical fibres, because they are difficult to be permanently set, and that the apparatus necessary to carry out this method is comparatively complicated.

Therefore, the problem underlying the invention consists in providing a method for producing tyre reinforcing members comprising cords in the form of waves embedded between two rubber sheets, which method is able to use chemical fibres as cord material and which method can be carried out by the use of a comparatively simple apparatus.

3.2 Solution

This problem is solved in that the method of document D3 (D4) is modified by the combination of the features (a) to (e) mentioned in point 2 above.

With the above method, cords snugly arranged by the guide plates are fed through the winding type braking means and the dancer roller and caused to pass through the small apertures of the movable guide plate. Therefore, the cords upstream of the movable guide plate are maintained under a predetermined tensile force with the aid of the winding type braking means. Moreover, any slack in the cords caused by the reciprocative movements of the movable guide plate is taken up by the dancer roller so that cords are uniformly moved together under the uniform tensile force to the movable guide plate. Therefore, the cords are always stably supplied in this manner. Since the cords passed through the movable plate are fed to the calender for rubber coating which is arranged closely adjacent the movable guide plate, the respective cords are under the predetermined tensile force and sandwiched between and coated with the rubber sheets, while the waves are formed (see page 6 of the description).

3.3 The documents D1 and D2 cannot render obvious this solution for the following reasons:

Document D1 (cf. Claims 1 to 4 and Figures 1 and 2) discloses a method of making a reinforced conveyor belt comprising the steps of directing a plurality of parallel cords in laterally spaced alignment in a

longitudinal direction, imparting a wave-form configuration to said cords as they are embedded into a liquid polyurethane body, curing said polyurethane with said cords embedded therein in laterally spaced wave alignment.

Apparently, in this method the steps of wave-form imparting, liquid pouring and quick curing of the polyurethane are as a combination of steps necessary in order to fix the desired wave-form configuration of the cords within the belt.

Moreover, the statement on page 2, lines 3 to 10 of document D1 stresses the superior properties of the homogeneous belt produced by the method of document D1 with respect to plied-up rubber belts.

Therefore, the teaching of document D1 leads away from replacing the liquid-embedding method of the cords according to document D1 by a sandwich-embedding method of the cords within plied-up rubber sheets according to document D3 (D4), and thus document D1 cannot suggest the method of Claim 1 of the patent application.

Document D2 relates to the production of reinforced paper substrates, a technique which is remote from the technical field of producing tyre reinforcing members. Moreover, the method of D2 does not comprise any of the above-mentioned features (a), (b), (d) or (e) of the method of Claim 1.

Therefore, also document D2 cannot suggest the method of Claim 1.

3.4 For the above-mentioned reasons, the method of claim 1 also involves an inventive step within the meaning of Article 56 EPC.

4. Consequently, claim 1 and the dependent claims 2 to 5 are allowable, and the patent can be granted according to the request of the appellant.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the first instance with the order to grant a patent in the following version:

description: pages 1 to 4 and 8 to 15, filed on
14 January 1993;
pages 5, 6, 7, 16, 17, filed on
22 December 1995;

claims: 1 to 5, filed on 22 December 1995;

drawings: Figures 1 to 9 (sheets 1 to 6), as
originally filed.

The Registrar:



A. Townend

The Chairman:



G. Gall