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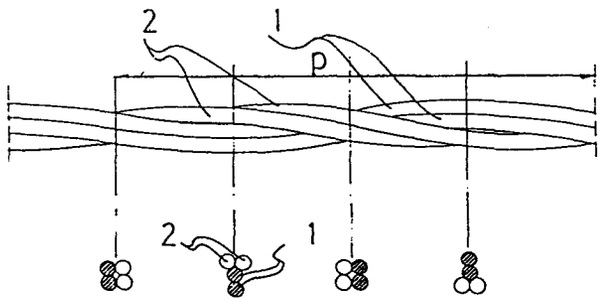
(54) Composite cord for the reinforcement of elastomers.

(57) Steel cord for the reinforcement of elastomer material, such as rubber, and comprising at least two strands. Each strand has a structure comprising two wire bundles (1, 2) twisted around each other to form two helicoids of same diameter and pitch. In the first bundle (1) the wires run in parallel, or nearly in parallel, and in the second bundle (2) the wires are twisted with a pitch (2) in the same sense and of the same value as the pitch (2) of said helicoids. A larger stiffness is obtained without remarkably increasing the cord diameter.



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COMPOSITE CORD FOR THE REINFORCEMENT OF ELASTOMERS

The invention relates to a steel cord for the reinforcement of an elastomer material, such as rubber, and comprising at least two strands. These strands can be arranged in the cord, e.g. as a given number n of strands which are twisted all together, the one around the other ones for forming helicoids of substantially same diameter and pitch. These strands can also be arranged in the form of one strand forming the core, and a layer of strands running helicoidally around the core strand.

Up to now, strands were used in the form of a group of m wires, which are twisted together and which form helicoids of same diameter and pitch, such as the strands 3 x 0.15 (3 wires of 0.15 mm diameter), 4 x 0.175, 4 x 0.22, having a pitch ranging from 15 to 25 millimeter. These strands are then twisted together into a cord, e.g. one core strand with six strands around it (7 strands of 3 or 4 wires each, i.e. a cord 7 x 3 or 4) or a cord having three strands twisted around each other (cord 3 x 3 or 4).

In certain cases of application of the cord, it is desirable to have at one's disposal a variant of the cord type mentioned hereabove, which shows about a similar structure with the same number of wires and the same tensile strength, but having other physical characteristics, e.g. a higher stiffness.

According to the invention, this is obtained by using a special type strand, of which the structure is sufficiently round and compact to be used as a strand for forming a cord of acceptable diameter and roundness.

According to the invention, each strand comprises two groups of wires, these groups being twisted around each other such as to form helicoids of about the same form, the wires of the first group having a pitch of more than 300 mm, and the wires of the second group having a pitch in the same sense and of the same value as the pitch of said helicoids.

Preferably, the number of wires of the second group is equal to the number of wires of the first group and ranges from two to four, preferably two. The twist pitch of the wires in the first group will preferably have an infinite value, such as to form in the strand a bundle of parallel wires. The wires have in general a diameter ranging from 0.10 to 0.40 mm.

The characteristics and advantages of the invention will appear from the description hereinafter, given by way of non-limitative example, and with the appended drawings in which :

Figure 1 represents a cord used as a strand in the cord according to the invention.

Figure 2 shows a section of a cord according to the invention and more specially the way in which the strands are joined to form the cord.

The strand, used in the test explained hereunder, is shown in detail in Figure 1. It comprises a first group of two wires 1 and a second group of two wires 2. The two groups are twisted together the one around the other into helices having a pitch p. Figure 1 shows a side view and four sections, taken at a quarter of a pitch distance from each other. The wires 1 of the first group have no twist around each other,

and the wires 2 of the second group show a twist pitch p around each other and in the same sense and with the same twist pitch. Instead of a group of parallel wires 1, it is also possible to use a group of wires, twisted with a very high pitch, e.g. above 300 mm. Such strand is indicated by the symbol "2+2".

Seven strands 2+2 of the type shown in Figure 1, are then used in a 7 x (2+2)-cord, as shown in Figure 2, in which the pitch q of the strands in the cord is in opposite sense of the pitch p of the groups of wires in the strands. With the strand shown in Figure 1 (having a pitch in the "Z" sense), an "S/Z"-structure is so obtained. The pitch q of the strands along the cord is to determine with respect to a direction AA which remains fixed along the cable. The pitches p and q have in general a value between 5 and 30 mm, preferably q about 10 mm and p about 20 mm. Such cord is called a 7 x (2+2)-cord having the pitches "10/20".

Other cords can be made of the same type, for instance 3 x (2+2)-cords or others. A conventional 7x4 or 3x4-cord is in general further enveloped with a wire that helicoidally runs around the cable with a rather short pitch of about half or one third of the pitch of the strands and in a sense opposite to the pitch of the strands. This can also be done in a cord according to the invention, which is then called a 7 x (2+2) + 1-cord or a 3 x (2+2) + 1-cord having a pitch "q/p/r", r being the pitch, in mm, of the enveloping wire.

With a view to a test of the quality properties of the cord according to the invention, the following specimens have been taken :

Sample	Diameter wire(mm)	Construction	Pitch	
A (1)	0.22	7 x 4+1	10/20/3,5	S/Z/S
B	0.22	7 x (2+2) + 1	10/20/3,5	S/Z/S
C	0.22	7 x (2+2) + 1	12,5/20/3,5	S/Z/S
D	0.22	7 x (2+2) + 1	14/20/3,5	S/Z/S

(1) conventional sample

The stiffness has been measured over a length section of 70 mm. The necessary bending moment M_o is measured to incurve the length section by 15° over its length. Then the necessary bending moment M'_o is measured to bring the specimen back to the straight form. The measurement is done according to the method of Taber and the moments are measured in Taber units (T.S.U.). With the specimen of 70 mm used, one Taber unit corresponds to 98,1 x 10^{-3} Nmm.

With these specimens, the following results are found:

Sample	Tensile strength (N/mm^2)	Cord diameter (mm) (enveloping wire excluded)	Stiffness(T.S.U.)	
			M_o	M'_o
A	2.633	1.563	139	40
B	2.553	1.660	204.5	71.5
C	2.596	1.681	208	79.5
D	2.619	1.677	222	90

It can be concluded that the use of a 2+2-strand remarkably raises the stiffness of the cord, without remarkably raising its diameter.

CLAIMS :

1. Steel cord for the reinforcement of an elastomer material, such as rubber, and comprising at least two strands, characterized in that each strand comprises two groups of wires, these groups being twisted around each other such as to form helicoids of about the same form, the wires of the first group having a pitch of more than 300 mm, and the wires of the second group having a pitch in the same sense and of the same value as the pitch of said helicoids.

2. Cord according to claim 1, characterized in that the number of wires in the second group is equal to the number of wires of the first group, and ranges from two to four.

3. Cord according to claim 2, characterized in that the pitch of the first group has an infinite value.

4. Cord according to claim 3, characterized in that each group comprises two wires.

5. Cord according to any one of the claims 1 to 4, characterized in that it comprises one core strand and six strands running helicoidally around the core strand, and with a pitch opposite to the pitch of the strands.

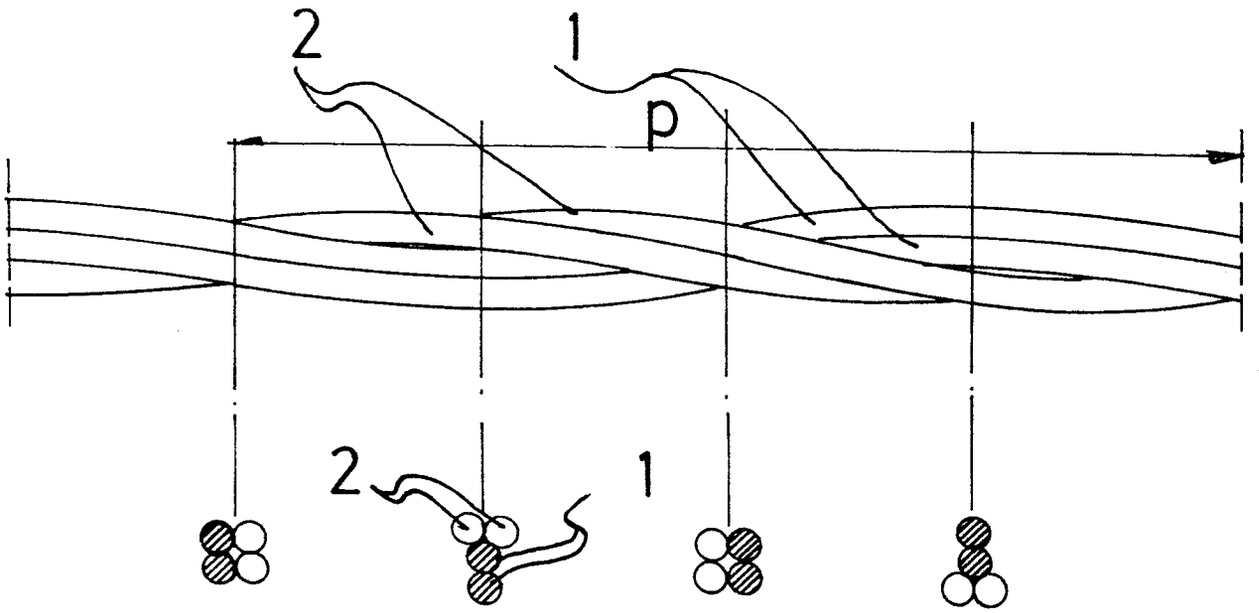

FIG.1

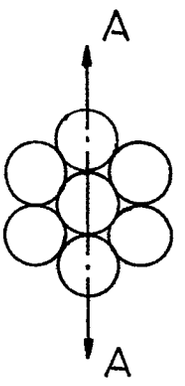

FIG.2

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EUROPEAN SEARCH REPORT

0110437
Application number

EP 83 20 1453

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
E	EP-A-0 092 696 (AKZO) * Claims 11-14; page 5, line 6 - end; page 6; page 7, lines 1-11 *	1-5	D 07 B 1/06
Y	LU-A- 84 130 (BEKAERT) * Whole document *	1-5	
Y	FR-A- 997 343 (DUNLOP) * Whole document *	1-5	
Y	BE-A- 622 904 (NATIONAL-STANDARD) * Page 5, lines 4-21; claims *	1-5	
A	US-A-2 900 785 (FENNER) * Column 1, lines 52-61 *	1-5	TECHNICAL FIELDS SEARCHED (Int. Cl. ³)
A	EP-A-0 040 877 (GENCORD) * Claims *	1,5	D 07 B B 60 C
A	DE-C-2 619 086 (AKZO)		

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	07-02-1984	D HULSTER E.W.F.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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