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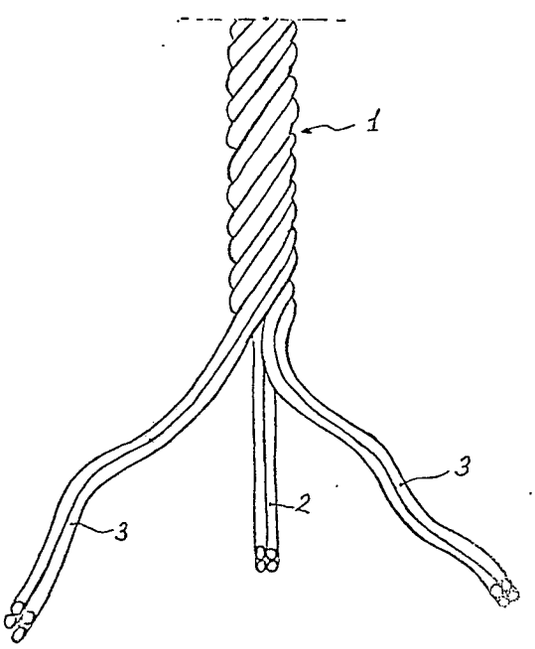
(54) Metal wire cord having strands with parallel filaments.

(57) The invention relates to a metal wire cord having strands with parallel filaments, consisting in winding a core strand (2) and outer strands (3), characterized by the fact that the core strand (2) has the function of support, thus always keeping its central position, and therefore is always formed by the same filaments, and at least the outer strands (3) are laid without torsion, i.e. with a substantially infinite pitch or length of lay. The so obtained metal wire cord (1) allows a greater penetration of rubber around and between the filaments up to the cord interior, and this improves corrosion strength and fatigue resistance of the cord.



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"Metal wire cord having strands with parallel filaments"

The present invention relates to a metal wire cord to be used for reinforcing articles made of rubber, elastomers, plastics and similar materials, such as conveyor belts, driving belts, high pressure pipes and mainly vehicle tires.

The known metal wire cords generally consist of strands with a predetermined length of lay or pitch, which are then laid up or twisted together to obtain the finished cord, which is generally comprised of a central core and an outer crown of filaments or strands.

Although these metal wire cords, when used for the above mentioned purposes, reached rather high performances, more particularly as to the mechanical properties, they are still undergoing several drawbacks as to corrosion strength and fatigue resistance. As the strand filaments are indeed twisted one another, this prevents a perfect penetration of the rubber, plastics and like materials inbetween the various filaments of the strands, so that microcavities are

formed, from which oxygen and moisture start the corrosive attack to the cord filaments, and moreover at the points of mutual contact between said filaments, fretting friction is generated, leading to wear which aggravated by corrosion, causes fatigue failure of the various filaments.

A metal wire cord was recently developed for the above mentioned purposes, consisting of several strands of filaments grouped together without torsion, which are then subjected all together to a torsional winding operation, so that the average length of lay of all the filaments in the strands is equal to the average length of lay of the strands in the cord, and the core is not formed always by the same filaments, but on the contrary at any cross-section of the cord the core is represented by the filaments which at that point are at the centre of the bundle of filaments (DE 29 09 832 A1); in this way one obtains a cord with a rather open structure, thus suitable for penetration of rubber or plastics, but lacking of a well defined core, which is the necessary basis to obtain high properties of mechanical strength.

In order to overcome these drawbacks, the present invention relates to a metal wire cord combining the advantages of the conventional cords having a core strand and a peripheral crown of strands or filaments as well as of the cords with parallel filaments wound together with a single pitch to from the cord but not wound around a core, at the same time eliminating the drawbacks of either prior type.

The metal wire cord according to the present invention consists in winding one or more outer strands around a core strand, with a normal length of lay comprised between 15 and 100 times the diameter of the strands forming the cord, and is characterized by the fact that the core strand is always in the central position, thus being always formed by the same filaments, and at least the outer strands are laid without twist, thus with a substantially infinite pitch or length of lay.

The term "substantially infinite pitch or length of lay" means a pitch or length of lay which is by far higher than any pitch or length of lay used in the technique of laying up ropes, cables and cords, and in any way of a length higher than 200 times the diameter of the single filaments forming the strand.

Preferably, but not necessarily, also the core strand is without torsion, namely with a substantially infinite pitch, but it could also be a twisted strand, and moreover said core strand could comprise two or more filaments having the same or a different diameter with respect to those forming the outer strands, the latter being generally comprised of two or more filaments generally having the same diameter. The diameter of the filaments normally but not necessarily used is 0.15 ÷ 0.35 mm.

The metal wire cord according to the present invention may be produced with a conventional laying up machine, where the cord forming strands may come from more parallel filaments wound on the same reel and a certain number of these spools may be loaded on the

laying up machine.

The method of making the cord according to the present invention is characterized by the fact that the cord forming strands are prepared in a preliminary stranding stage with a pitch equal to the pitch of the final cord, and for its manufacture a double torsion cord making machine is used, where the cord length of lay is of identical value but in the opposite direction of the strand lay, e.g. the cord lay is in the Z direction and the strand lay in the S direction, so that the final cord has parallel filaments in the strands and a core strand which is always the same.

The metal wire cord according to the present invention is shown in the single figure of the accompanying drawing, in one embodiment which is being given as a non limiting example only.

The figure shows diagrammatically a 7 x 4 cord construction, in which all the strands have an infinite pitch or length of lay. The metal wire cord 1 consists of a core strand 2 around which six outer strands 3 (to make understanding easier only two outer strands are shown) are wound with a predetermined pitch. The core strand 2 consists of four filaments which in the illustrative embodiment are not twisted one another, said filaments always taking the central position in the cord so as to form the cord core.

The outer strands 3 also consist of four filaments which in the illustrative embodiment have the same diameter of the core filaments, they are not twisted one another, but all the four filaments of a strand together are wound around the core with the same pitch of

all the other outer strands, all being formed by four filaments not twisted to one another. As the outer strands consist of filaments parallel to one another and not twisted, this allows during use to have an easier penetration of rubber and the like around and between the filaments up to the cord inner core.

The higher penetration of rubber between the filaments causes their protection from the corrosive phenomena and moreover increases the fatigue resistance of the cord as the wear effects arising from fretting between filaments at the direct contact points are reduced.

The resulting cord is uniform and with a regular geometric shape, with a well defined core having the function of support for the outer strands. When the cord is under strain, this gives rise to a greater uniformity in the stress distribution, thus obtaining high properties of mechanical strength.

For the production of the metal cord according to the present invention, it is clear that metal wires and generally steel wires may be used, having suitable features for the indicated purposes, which were subjected to any treatment known in the technique of manufacturing metal wire cords used for reinforcing articles made of rubber, elastomers, plastics and similar materials, such as conveyor belts, driving belts, high pressure pipes, and more particularly vehicle tires.

As an example only, it is to be mentioned the particular spiral wrapping process, consisting in winding a small diameter thread around a metal cord to increase its properties of compressive

strength.

It is also to be understood that many variations, modifications, additions and/or substitutions may be made to the details of the invention, without departing however from its spirit and scope as defined in the appended claims.

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CLAIMS

1) A metal wire cord having strands with parallel filaments, consisting of one or more outer strands wound around a core strand, characterized by the fact that the core strand is always kept in the central position and is always comprised of the same filaments, and at least the outer strands are laid without torsion, namely their filaments are not twisted to one another or are twisted with a substantially infinite pitch or length of lay, practically higher than 200 times the diameter of the single filaments forming the strand.

2) A metal wire cord according to Claim 1, characterized by the fact that also the core strand is laid without torsion, i.e. with a substantially infinite pitch or length of lay.

3) A metal wire cord according to Claims 1 and/or 2, characterized by the fact that the core strand consists of filaments having the same diameter of the filaments of the outer strands.

4) A metal wire cord according to Claims 1 and/or 2, characterized by the fact that the core strand consists of filaments having a different diameter from that of the filaments of the outer strands.

5) A metal wire cord according to the preceding Claims, characterized by the fact that each strand of the cord consists of two or more filaments of the same diameter, substantially not twisted to one another, or wound with a pitch or length of lay higher than 200 times the diameter of the filaments.

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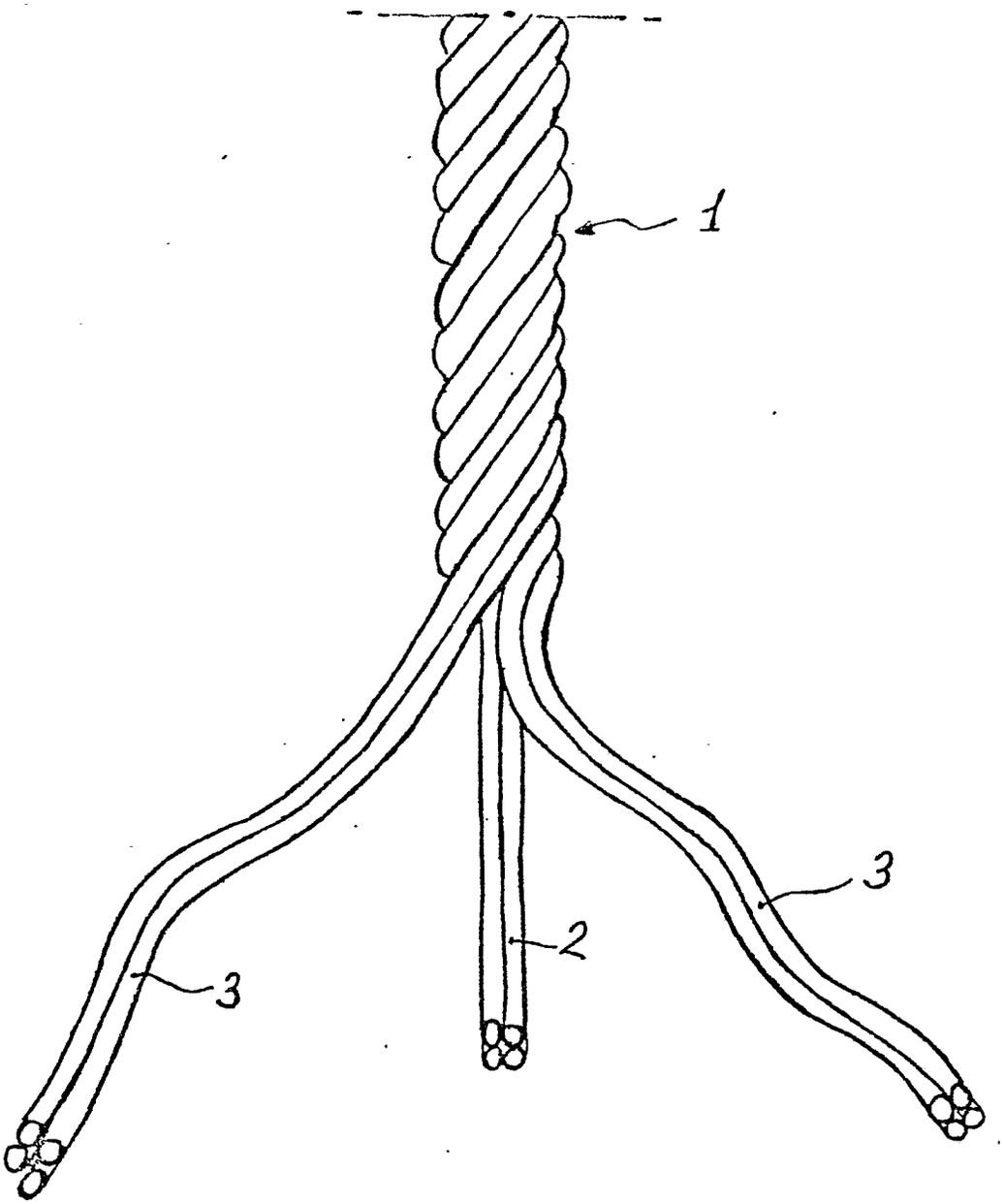

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EUROPEAN SEARCH REPORT

0040877

Application number
EP 81 20 0523

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
	LU - A - 65 329 (ARBED-FELTEN & GUILLEAUME) * the whole document * --	1,3,4,5
	DE - A - 1 918 288 (DUNLOP) * claims 8,9 * --	1,3,4,5
	GB - A - 1 190 916 (DUNLOP) * claims * --	1
	US - A - 4 022 009 (VAN ASSENDELFT) * claims * --	1
	US - A - 3 726 078 (NAKAMURA) * claims; column 3, lines 4-13; column 2, lines 1-4 * --	1,2,4
	FR - A - 2 087 903 (MARTINEZ MARIO) * claims 1-5; page 4, lines 4-37; page 5; page 6, lines 1-6 * --	1
A	FR - A - 2 453 933 (TOKYO ROPE) * claims; figures * -- ./.	1

CLASSIFICATION OF THE APPLICATION (Int. Cl.³)

D 07 B 1/06

TECHNICAL FIELDS SEARCHED (Int. Cl.³)

D 07 B
B 60 C

CATEGORY OF CITED DOCUMENTS

X: particularly relevant
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E: conflicting application
D: document cited in the application
L: citation for other reasons

&: member of the same patent family, corresponding document

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	02-09-1981	D'HULSTER

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EUROPEAN SEARCH REPORT

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DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
A	FR - A - 914 168 (BRITISH ROPES) * page 2, lines 57-104; page 3, lines 1-31; page 4, lines 3-12; abstract 4 *	
A	US - A - 3 922 841 (KATSUMATA) * claim 1 *	1

CLASSIFICATION OF THE APPLICATION (Int. Cl.³)

TECHNICAL FIELDS SEARCHED (Int. Cl ³)