

July 9, 1968

W. I. LEX

3,391,530

WIRE ROPE

Filed Sept. 29, 1966

2 Sheets-Sheet 1

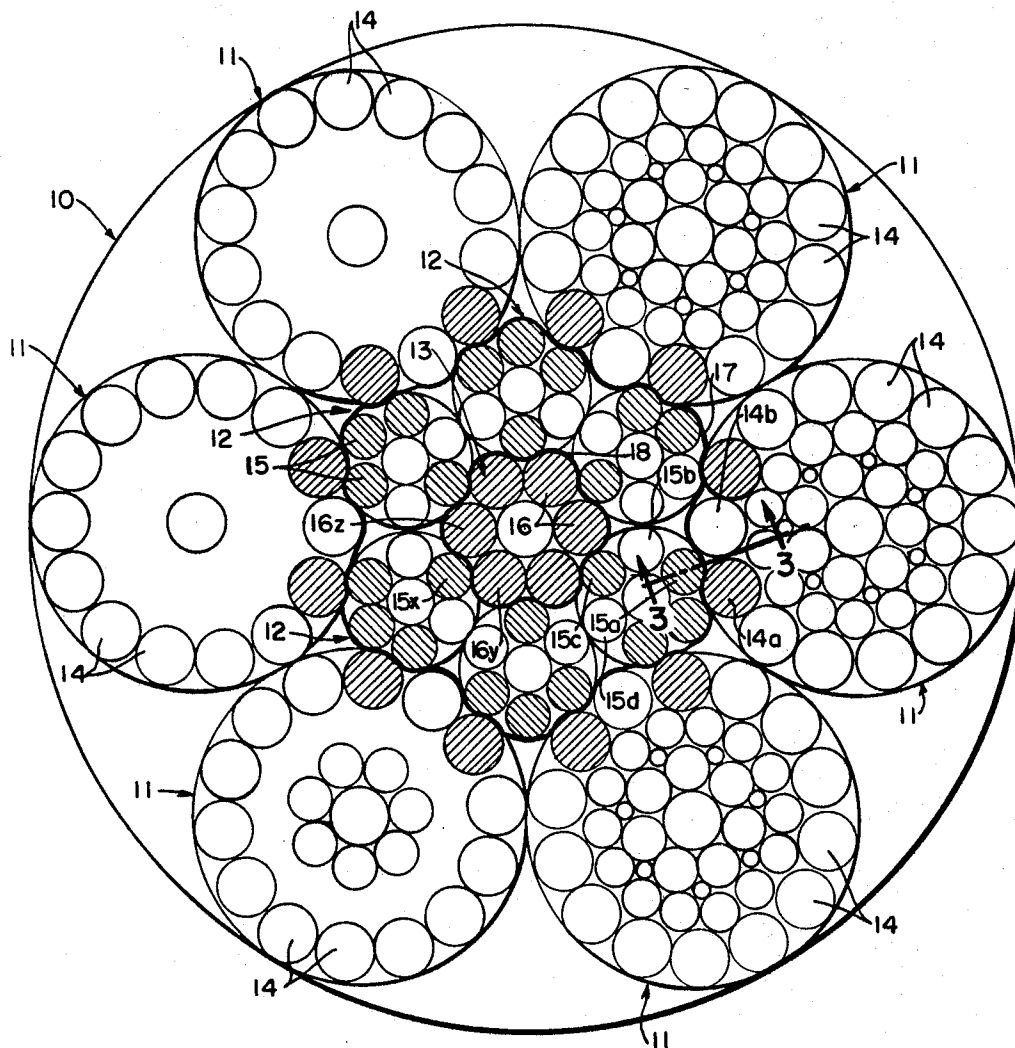


FIG. 1

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FIG. 2

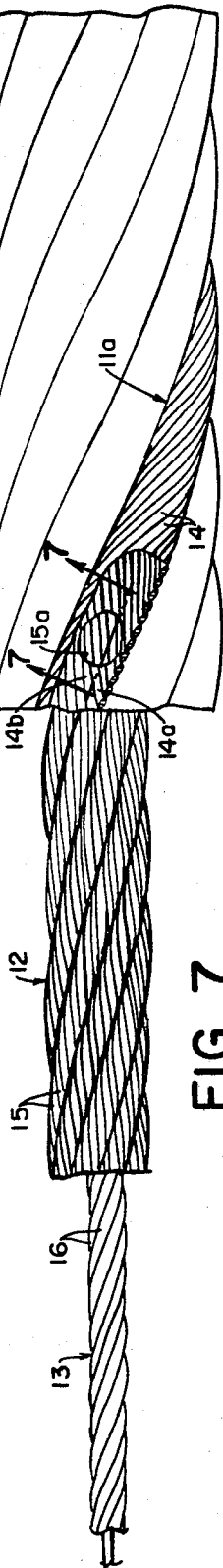


FIG. 7

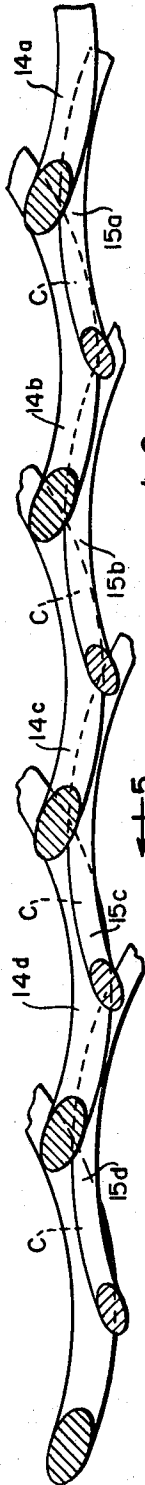


FIG. 3

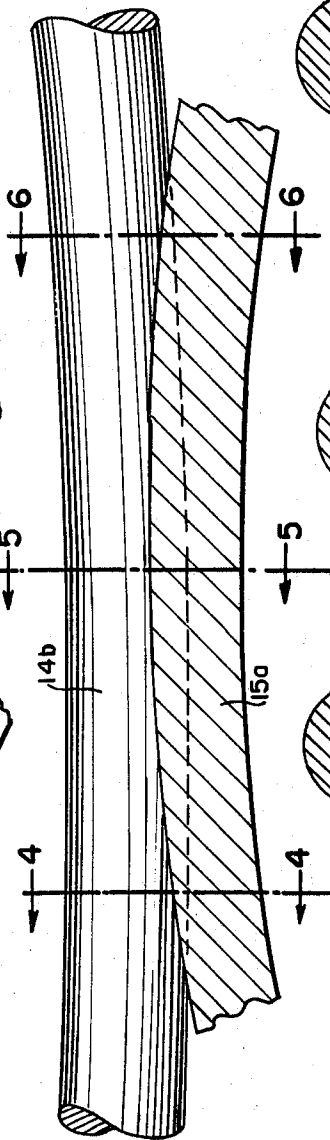


FIG. 4

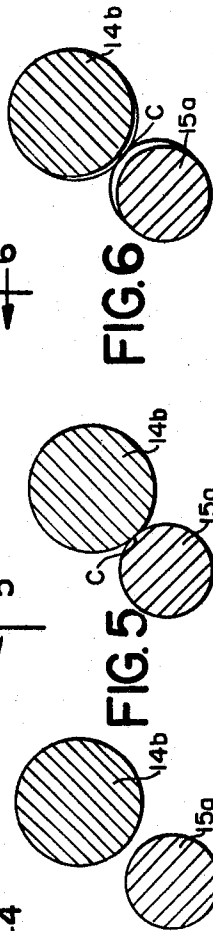


FIG. 5

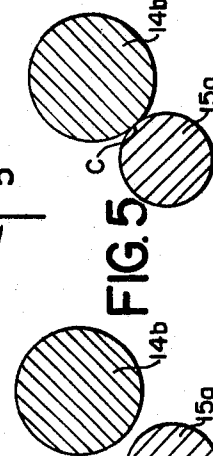
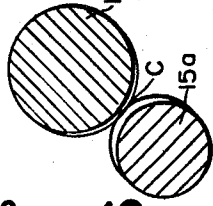


FIG. 6



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WIRE ROPE

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1 Claim. (Cl. 57-145)

ABSTRACT OF THE DISCLOSURE

A stranded core wire rope wherein the core strand has one direction of lay and each succeeding layer of strands has a direction of lay opposite to that layer preceding. By so constructing said core wire rope, nesting areas for adjacent lays of rope are provided and reduced friction results.

This invention relates to helically stranded steel wire rope intended for operation under heavily loaded conditions where high lateral pressures are encountered when operating over drums or sheaves. Ropes intended for such purposes are usually constructed to have the main or outer strands supported by a steel core which may be of a stranded construction with several intermediate strands helically arranged around a single core strand.

In ropes of this kind as heretofore constructed considerable difficulty has been experienced through the interaction of the main strands on the intermediate strands and of the intermediate strands on the central core strand. In these previous constructions the contacting wires in these areas have crossed one another at certain points in spite of ingenious arrangements which attempted to prevent such cross contact. Slight movement and high pressure between the wires of the strands at such crossing points will cause nicking of the wires which eventually will result in breakage and the weakening of the wire rope.

The aim of the present invention is to provide an arrangement of the main strands, intermediate strands and core strand such that this cross contact of wires is avoided. Among the other objects of the invention are: to provide a rope which has a greater metallic area in cross-section than heretofore; to provide a Lang lay rope having the wires in the main strands laid in the same direction as the strands in the rope, the wires in the intermediate strands being laid in the opposite direction, and the wires in the core strand laid in the same direction as the wires in the main strands; and to provide a 6 x 43 rope with six 7-wire intermediate strands and a 7-wire core strand and ropes having different numbers of wires and strands fabricated in accordance with the invention.

In accordance with the invention the wire rope is constructed to have main and intermediate strands all having the same lay about the core strand but with the wires of the intermediate strands having an opposite lay from the wires of the main and core strands. The rope is further constructed to have a peripheral interlocking surface between the main and intermediate strands which comprises lengthwise areas in each of which the wires of one strand are nested between wires of the adjacent strand, such nesting areas lying one wire apart around the rope and extending throughout the length of the rope, and also having a second peripheral interlocking surface between the intermediate and core strands of similar arrangement wherein a wire of one of the strands is nested between wires of the adjacent strand, such nesting areas extending throughout the length of the rope one wire apart around the rope.

The invention will be illustrated in connection with the accompanying drawings in which:

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FIG. 1 is a view of the rope in cross-section wherein the individual wires are shown conventionally as circles instead of ellipses which are their actual shapes because of the lay;

FIG. 2 is a view in elevation of a section of a Lang lay wire rope with the main strands broken away to show the intermediate strands and also with the intermediate strands broken away to show the central core strand;

FIG. 3 is a greatly enlarged view of two short portions of wires taken on the line 3-3 and in the direction of the arrows shown in FIG. 1;

FIGS. 4, 5 and 6 are cross-sectional views taken respectively on lines 4-4, 5-5 and 6-6 of FIG. 3; and

FIG. 7 is a view taken on line 7-7 of FIG. 2 looking in the direction of the arrows and located at the interlocking surfaces between one of the main strands and one of the intermediate strands, and drawn to a scale intermediate between the scales of FIGS. 2 and 3.

The particular improved wire rope shown in these drawings and represented generally by numeral 10 is composed of 6 main or outer strands 11 (FIG. 1) each containing 43 wires, 6 intermediate strands 12 and a center or core strand 13. The main strands 11 each contain an outer row of wires 14 of the same diameter. Intermediate strands 12 each contain 6 outer wires 15 of the same diameter, and the core or center strand 13 contains 6 outer wires 16 of the same diameter.

From FIG. 2 it may be seen that the lay of wires 14 is the same as the lay of the strands 11. The lay of wires 15 is opposite to the lay strands 12. The lay of wires 16 of strand 13 is the opposite of the lay of wires 15 of strands 12. Consequently the direction of rotation of wires 14 at the bottom of each strand 11 is the same as the direction of the wires 15 on the outside of the adjacent strand 12. This is evident particularly in FIG. 2 where the left end portion of one of strands 11—strand 11a—has been broken away to show the direction of the wires 14 on the bottom or inner side of this strand. Also these bottom wires are further broken away in a small area to show a few of the wires of two of the intermediate strands 12. The length of lay of strands 11 and 12 is the same and the lays of wires 14, 15 and 16 are so chosen as to have the wires essentially parallel on contact.

The rope is constructed to have outer peripheral interlocking surfaces (indicated by an undulating line 17 in FIG. 1) between the main strands 11 and the intermediate strands 12, and also inner peripheral interlocking surfaces (indicated by a second undulating line 18) between the wires of the intermediate strands 12 and the wires of center or core strand 13. In each of these pairs of interlocking surfaces wires of the adjacent strands are nested together. Thus for example a wire 15a (FIG. 2) of an intermediate strand 12 nests between two wires 14a and 14b of a main strand 11 in the outer pair of peripheral interlocking surfaces 17 (FIG. 1). Also in the second pair of interlocking surfaces 18 a wire 15x of another intermediate strand 12 nests between two wires 16y and 16z of core strand 13.

The sectional view shown in FIG. 3 and taken on line 3-3 of FIG. 1 shows an area of nesting and the manner in which this nesting takes place. A portion of wire 14b is hidden by wire 15a (in section) and the lower surface of wire 14b is shown by dotted line behind the wire 15a. The cross-sectional views 4, 5 and 6 show the positions of these two wires in this nesting area. Actual contact between the two wires 15a and 14b is shown at C in FIG. 5 whereas in FIG. 4 the wires are out of actual contact but wire 15a is positioned or nested between the two adjacent wires 14a and 14b between approximately the points where the sections of FIGS 4 and 6 are taken.

FIG. 7 which is a sectional view taken on line 7-7

of FIG. 2 shows a succession of nesting areas (similar to the one shown in FIG. 3) as they occur between successive wires both lengthwise and circumferentially of the rope. It will be understood from FIGS. 1 and 3 that wire 15a of one of the intermediate strands is nested between wires 14a and 14b of the adjacent main strand, but that wire 14a is not shown in FIG. 3 because it is in front of the plane 3—3 (FIG. 1) where the section is taken.

However in FIG. 7 the section is taken on a plane which extends lengthwise of strand 11a. The wires 15a—15d and 14a—14d are in the respective intermediate and main strands which turn and therefore approach and cut or pass through the section plane as is indicated in FIG. 7. Accordingly wire 14b nests behind wire 15a as indicated both in FIG. 3 and FIG. 7; wire 14c nests behind wire 15b as shown in FIG. 7 and as may be visualized from FIG. 1 making allowance for the turning of the wires as the different positions of FIG. 7 are reached; wire 14d nests behind wire 15c. Wire 14b nests behind wire 14a as shown in FIG. 7 and as described in connection with FIG. 3, the right end portion of wire 14b as shown in FIG. 7 being located behind the forward end portion of wire 14a. Similarly wire 14c nests behind wire 14b and wire 14d nests behind wire 14c as shown by their overlapping end portions.

Accordingly there are provided along the peripheral interlocking surfaces 17 lengthwise areas, regions or sections, of intermittent nesting of the wires of either an intermediate strand 12 or a main strand 11 which lengthwise areas are positioned one wire apart around the rope and which extend throughout the length of the rope. These several nesting areas as they occur in the transverse plane of FIG. 1 are shown in that figure by the shading of the wires in question.

The wires of the main strands 11 as well as the wires of the intermediate strands 12 do not nest with each other but, on the other hand, cross one another. This is shown by the tangent points which lie on circles passing substantially through the centers of the 6 main strands 11 and the 6 intermediate strands 12 of FIG. 1. Such cross contact between these wires however is not detrimental because of the absence of high pressure at these tangent points during the operation of the rope.

The wires 15 of the intermediate strands are arranged in lengthwise areas of intermittent nesting as described above in connection with the outer peripheral interlocking surfaces 17. Such intermittent nesting of the intermediate and core strand wires takes place along the inner continuous peripheral interlocking surfaces 18 as shown in FIG. 1. In this connection wire 15x of one of the intermediate core strands 12 at the left of FIG. 1 is in a position corresponding to wire 15a of the intermediate strand shown at the right. Wire 15x is in the same position with

respect to wires 16y and 16z of core strand 13 as is wire 15a with respect to wires 14a and 14b of main strand 11.

By thus arranging the wires of the core strand 13 and those of intermediate strands 12, and the wires of the main strands 11 and the intermediate strands 12 so as to cause these wires to have lengthwise areas of intermittent nesting of the wires of one strand between those of the adjacent strand along both of the inner pair of peripheral interlocking surfaces 18 and the outer pair of peripheral interlocking surfaces 17, not only is cross contact avoided between wires which are subjected to movement under high pressure during the operation of the rope, but the metallic area of the rope is considerably increased. This will be observed from FIG. 1 where the rope is shown to have comparatively small open spaces or areas between wires.

I claim:

1. A wire rope comprising a plurality of main strands and a core strand the wires of both strands having the same direction of lay, and a plurality of intermediate strands the wires of which have an opposite lay from the wires of the main and core strands, the rope having substantially continuous peripheral interlocking surfaces between the main and intermediate strands comprising lengthwise areas of intermittent nesting of the wires of one strand between wires of the adjacent strand, said nesting area lying one wire apart around the rope and extending throughout the length of the rope, and the rope also having substantially continuous peripheral interlocking surfaces between the intermediate and core strands comprising lengthwise areas of intermittent nesting of the wires of one strand between wires of the adjacent strand, such nesting areas extending throughout the length of the rope and lying one wire apart around the rope.

References Cited

UNITED STATES PATENTS

1,427,471	8/1922	Howe	57—145
1,492,977	5/1924	Gore et al.	57—144
2,055,037	9/1936	MacKinnon	57—144
2,587,521	2/1952	Peterson	57—145 XR
2,779,149	1/1957	Schuller	57—166 XR
2,900,785	8/1959	Fenner	57—149 XR
2,971,321	2/1961	Himmelfarb et al.	57—139

FOREIGN PATENTS

695,148	7/1940	Germany.
975,386	10/1961	Germany.

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