

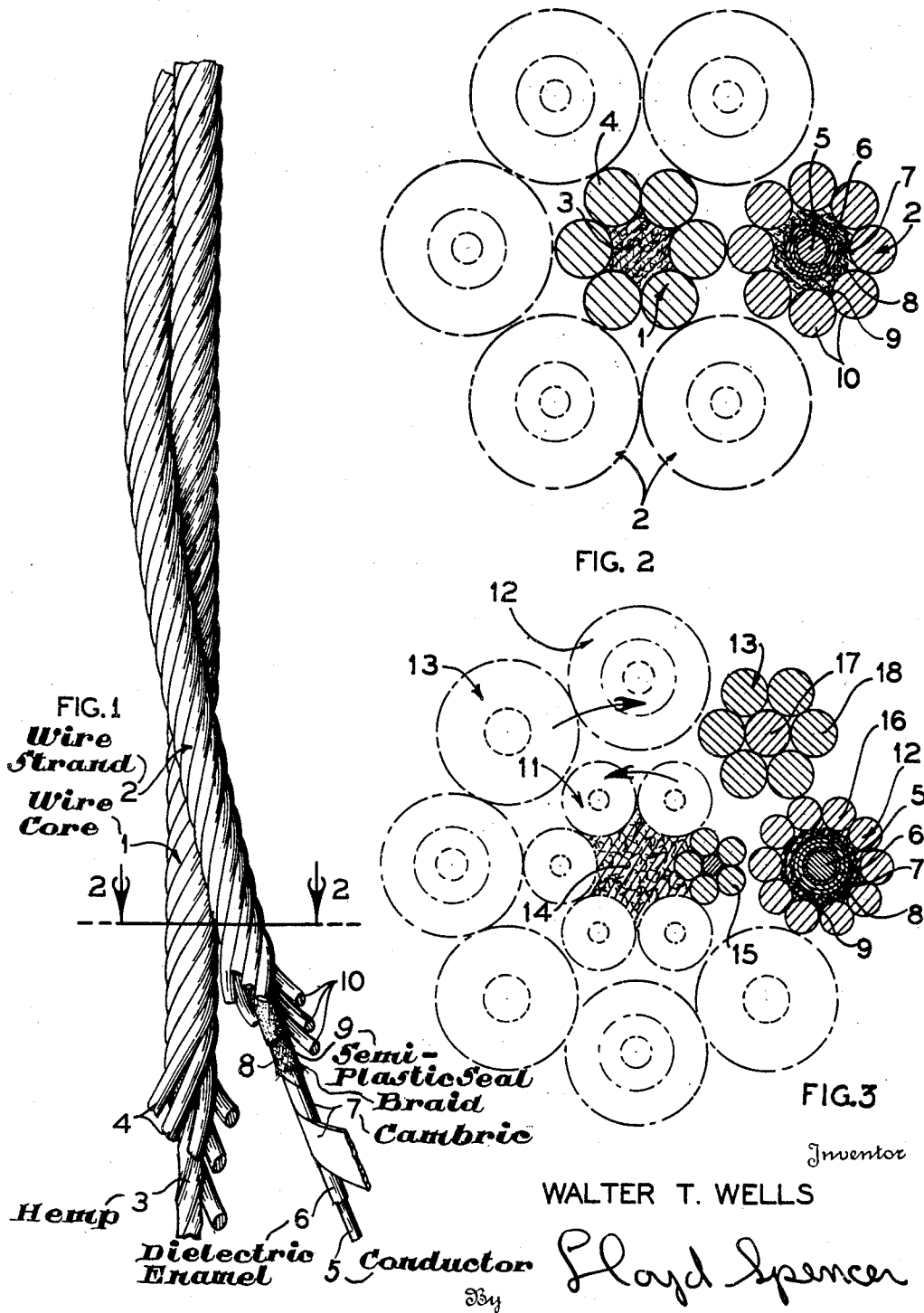
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STRAND-CARRIED MULTIPLE CONDUCTOR WIRE ROPE

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STRAND-CARRIED MULTIPLE CONDUCTOR WIRE ROPE

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My invention relates to strand-carried multiple conductor wire ropes, and among the objects of my invention are:

First, to provide a wire rope of the multiple wire strand type in which each or alternate strands are provided with conductor cores.

Second, to provide a wire rope of this character which may be made non-spinning without resorting to preforming of the conductor-core strands.

Third, to provide a wire rope of this character in which the several conductors are spaced radially from the center of the wire rope and twisted helically thereabout with the strands in which they are encased so that the conductors may be single-stranded and yet capable of withstanding the flexing and stretching of the wire rope in use.

Fourth, to provide a wire rope of this character which is designed to withstand extreme hydrostatic pressure such as encountered when lowered to great depths in well bores.

Fifth, to provide a conductor-carrying wire rope wherein little, if any, of the desired characteristics of haulage or transmission rope is sacrificed in order to accommodate the conductors and their electric and hydrostatic insulation.

Sixth, to provide a wire rope of this character which may be made up in a substantially conventional manner on conventional wire rope weaving machines.

With these and other objects in view as may appear hereinafter, reference is made to the accompanying drawing, in which:

Fig. 1 is an elevational view of my strand-carried multiple conductor wire rope in its one form, showing the main core with one of the strands in position; the other strands being omitted to facilitate the illustration.

Fig. 2 is a transverse sectional view through 2—2 of Fig. 1, showing the main core and one of the strands with the other strands indicated by dotted lines.

Fig. 3 is a similar cross-sectional view of a modified form of my rope wherein the strands are alternately weight-supporting and conductor-carrying strands.

In the arrangement shown in Figs. 1 and 2, the wire rope comprises a main core 1 and a plurality of conductor-carrying cables forming multiple wire strands 2. The core and strands are made up of steel wires as is the usual practice.

The main core 1 is provided with a center 3 preferably of hemp or analogous material, around which is twisted a plurality of relatively large

wires 4; which wires are given a comparatively short lay.

Each of the strands 2 is provided with a copper conductor 5 in its center which is coated with dielectric enamel 6 or analogous material, and wrapped with a serving of varnished cambric or other suitable covering 7. Around this is woven one or two servings of cloth braiding 8. The conductor 5 and the coverings 6, 7, and 8 thereon form a planetary core which is impregnated with an excess of dielectric semi-fluid material, such as "Glyptol", 9. Around the planetary core, with its excess coating of Glyptol, is laid a plurality of small wires 10. The small wires 10 are preferably short laid, but each strand 2 is long laid around the main core 1. The lay of the strands is in the opposite direction to the lay of the main core, and the relative lengths or pitch is so proportioned that the torques of the main core and the strands thereabout are equal and opposite so that the wire rope is substantially non-spinning. The strands 2 may be either regular lay, as shown, or lang-lay. As is shown in the drawing, the diameter of each strand 2 is substantially equal to the diameter of the main core 1.

The arrangement shown in Fig. 3 is in most respects similar to the foregoing construction with the exception that the main core 11 may comprise multiple wire strands, and the outer strands are alternately conductor-core strands 12 and supporting strands 13.

The core 11 is provided with a center 14 preferably of hemp or the like, around which is laid a plurality of multiple wire strands 15 which strands are preferably lang-lay, as is common practice with conventional non-twisting wire rope.

The conductor-core cables or strands 12 are similar to the strands 2 except that the core thereof may occupy a greater amount of its diameter. The core, as in the first construction, comprises the conductor 5, dielectric enamel 6, wrapping 7, braiding 8, and Glyptol or analogous semi-plastic sealing material 9. Around this core are provided small wires 16 which, as before stated, may be greater in number and, therefore, slightly smaller than the wires 10.

Between the strands 12 are laid the strands 13 which comprise metal core strands 17, around which are laid wear-resisting and weight-supporting strands 18.

If the main core 11 is lang-lay, the strands 12 and 13 are preferably regular lay; while the respective lays of the main core and strands 12 and 13, as a whole, are in opposite directions, and

their pitches are so proportioned that their torques are counter-balanced when the wire rope is under tension.

The strands 13 present a greater wearing surface than strands 12 and thereby compensate, to a certain extent, for the smallness of the wires 16 so as to increase the life of the wire rope.

The semi-plastic material, of which the substance "Glyptol" is an example, is more fully disclosed in my patents relating to wire rope, No. 2,043,400 and No. 2,043,401 of June 9, 1936. However, while this substance is specified, it should be understood that it serves merely as an example. Any substance which is impervious to liquids encountered in wells, which will withstand the heat also encountered therein, which can be completely impregnated in the fabric to eliminate all voids, and which has good dielectric properties will do.

These patents also show and describe a cable having a pronounced key-stoning effect which is a characteristic of my present invention as disclosed in the Figures 2 and 3 of the drawing. The strands are sufficiently few in number but occupy the major diameter of the wire rope so as to produce this result. That is, the several strands, tend to wedge one against the others and maintain their positions around the core. As the number of strands increase, and the strands occupy less than half the diameter of the wire rope or cable, the key-stoning effect becomes less pronounced with the result the wire rope cannot be wound on conventional drums as the core tends to push through or separate the strands when the wire rope is repeatedly flexed.

The fabric 8 and the semi-plastic material 9 provide a jacket for the core which conforms to the presented surfaces of the wires 10 or 16 in the manner of a conventional hemp core, and the semi-plastic material has a certain lubricant value.

The copper conductors have a lower elastic limit than the steel strands, but this difference is compensated for by placing a copper conductor in each helically wound strand whereby the copper conductors may untwist and twist with the steel strands so that under rope tension the elastic limit of the conductors shall not be exceeded.

It should be noted that the total area occupied by the several conductor cores of either structure illustrated is only a small proportion of the total area of the wire rope; hence, very little strength is sacrificed in providing for the conductors. In fact, the rope may be used very much in the manner of a conventional, non-twisting, hoisting rope; it being capable of passing over sheaves and the like and otherwise handled in the manner of a wire rope in which no provision for conductors is made. It should also be noted that the wires of the outer structure multiple wire strands are of a diameter less than the core strands which give the assembly a proper ratio to distribute the stresses incident to use.

Though I have shown and described certain constructions of my strand-carried multiple conductor wire rope, I do not wish to be limited to the embodiments thus illustrated, but desire to include in the scope of my invention the constructions, combinations, and arrangements as set forth in the appended claims.

I claim:

1. In a conductor-carrying wire rope structure, an inner wire rope structure formed of a core with a plurality of relatively large single wire strands, an outer wire rope structure comprising a plu-

rality of conductor cables each forming a strand made up of a number of relatively small wires encasing an electrical and hydrostatic insulated conductor, said strands being helically wound around the inner wire rope structure, said inner and outer wire rope structures oppositely wound to exert opposing torques under tension, and the diameter of a strand of the outer wire rope structure being substantially equal to the diameter of the inner wire rope structure.

2. In a conductor-carrying wire rope structure, an inner wire rope structure formed of a core with a plurality of helically wound wire strands, an outer wire rope structure formed of a plurality of multi-wire strands helically wound around the inner structure, certain of said outer strands being formed of relatively small wires with a planetary core comprising a conductor with electrical and hydrostatic insulation therearound, certain other of said outer strands being formed entirely of relatively large wires to act solely as weight supporting units, and said inner and outer wire rope structures being oppositely wound to exert opposing torques when under tension.

3. A hoisting and conducting wire rope formed of a multiple wire main core and a plurality of multiple wire strands helically wound thereon and occupying the major diameter of the wire rope to produce a pronounced key-stoning effect, insulated conductors within said strands having a lower elastic limit than the strands and subject to some tension with the stretch of the wire rope, and said core and strands being oppositely wound to exert opposing torque under tension to minimize twisting to a degree whereby the twisting of the conductors with the strands will prevent the elastic limit of the conductors being exceeded during the normal range of the stretch and retraction of the wire rope.

4. A hoisting and conducting wire rope formed of a multiple wire main core and a plurality of multiple wire strands helically wound thereon and occupying the major diameter of the wire rope to produce a pronounced key-stoning effect, insulated conductors within said strands having a lower elastic limit than the strands and subject to some tension with the stretch of the wire rope, a dielectric and hydrostatic insulation for each conductor, and said core and strands being oppositely wound to exert opposing torque under tension to minimize twisting to a degree whereby the twisting of the conductors with the strands will prevent the elastic limit of the conductors being exceeded during the normal range of the stretch and retraction of the wire rope.

5. A hoisting and conducting wire rope formed of a multiple wire main core and a plurality of multiple wire strands helically wound thereon and occupying the major diameter of the wire rope to produce a pronounced key-stoning effect, insulated conductors within said strands having a lower elastic limit than the strands and subject to some tension with the stretch of the wire rope, a dielectric covering for each conductor, a serving of fabric over the covering, a semi-plastic and pressure-resisting material impregnating said fabrics, and said core and strands being oppositely wound to exert opposing torque under tension to minimize twisting to a degree whereby the twisting of the conductors with the strands will prevent the elastic limit of the conductors being exceeded during the normal range of the stretch and retraction of the wire rope.

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