Oct. 28, 1941. M. D. V. MILLARD 2,261,070

SPRING LAY WIRE ROPE

Filed July 27, 1940

FIG. 1.

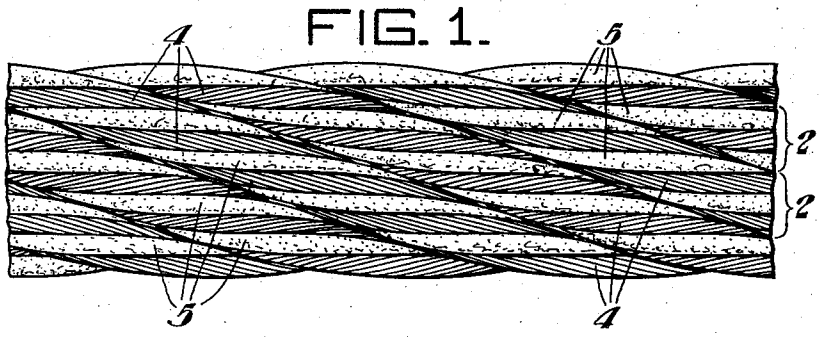



FIG. 3.

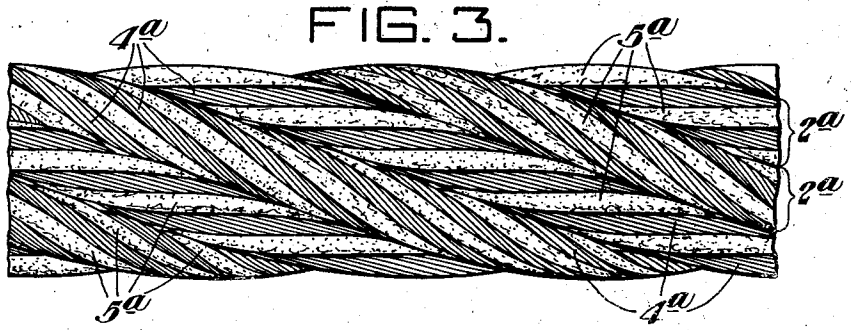
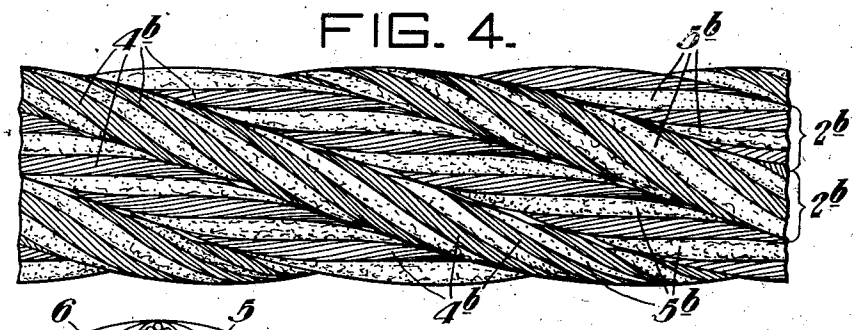



FIG. 4.



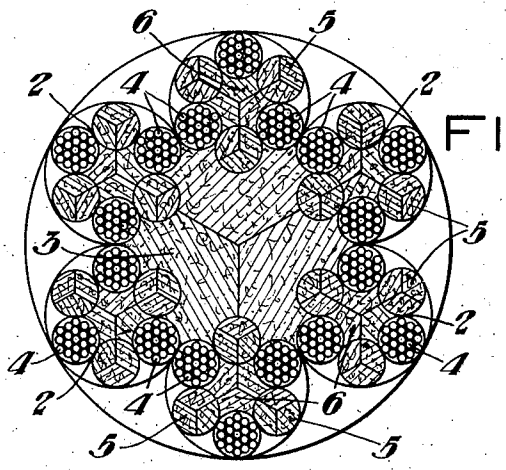




FIG. 2.

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## SPRING LAY WIRE ROPE

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4 Claims. (Cl. 57—147)

This invention relates to improvements in spring lay wire rope generally employed for mooring lines, towing lines, boom guide tackle and the like.

Spring lay wire rope generally comprises a composite structure of steel and hemp designed for high flexibility, whereby the same may be readily subjected to small radius bends, and is further characterized by being of smaller size than an all-hemp rope of equivalent strength.

While the hemp elements or strands in such rope tend to cushion and protect the steel members, the latter sometimes fracture due to interfering contact with each other, causing nicks, abrasion or shearing of the individual steel wires. This possibility of failure is critical due to the potential loss and danger attendant upon failure of such ropes in their field of use.

It is an object of this invention to provide a spring lay wire rope in which the possibility of failure by interference of the steel strands or elements with each other is eliminated.

My invention contemplates the provision of an improved relation of the lay of the steel strands or elements, whereby contacting movement of adjacent strands will take place substantially along said strands or elements, thereby minimizing the effect of such contact. In other words, my invention provides for the longitudinal slippage of the contacting wires of adjacent steel strands, whereby the contact is reduced to mere sliding friction and eliminates abrading and shearing forces between the wires.

The present improvement may be readily incorporated in spring lay wire rope without material cost addition to the manufacture thereof. At the same time, the improved rope will have greatly increased life in service, and provides a rope which is safer and more reliable in use.

Additional objects and advantages will become apparent from the following description taken in connection with the accompanying drawing, wherein:

Fig. 1 is an elevational view of a portion of a regular spring lay wire rope embodying my invention;

Fig. 2 is an enlarged sectional view thereof; and

Figs. 3 and 4 are views similar to Fig. 1, showing embodiments of my invention in reverse spring lay wire ropes.

Referring to Figs. 1 and 2, the rope illustrated is a right regular spring lay rope, wherein a plurality of left lay composite strands 2 are right lay about a main central core 3 of hemp or other similar material. Each composite strand consists of alternate individual steel wire strands 4 and fiber or hemp strands 5 which are left lay about central strand cores 6 of hemp or the like.

The steel strands 4 are each composed of a plurality of wires laid opposite lay in alternate composite strands 2, whereby the steel wire or elements of adjacent strands 4 will have non-interfering relation to each other.

All of the strands, both the composite strands 2 and their individual strands 4 and 5 are helically wound, and by relating the lay thereof as described, the steel wire strands 4 of adjacent composite strands will have their individual wires or elements disposed in substantially unidirectional relation at the loci of contact between the steel strands of said adjacent composite strands, as when the rope is bent or otherwise stressed.

The said non-interfering relation of the steel strands or elements 4 of adjacent composite strands thereby permits relative longitudinal movement or slippage therebetween, eliminating the abrading or injurious effect which has heretofore resulted from interference between said strands.

My invention may likewise be incorporated in reverse lay wire ropes by properly relating the lay of the strands and elements thereof. Thus, Fig. 3 illustrates a right reverse lay wire rope which may have substantially the same cross-section as Fig. 2, and wherein alternate right and left lay composite strands $2^a$ are right lay about a central core, each composite strand consisting of separate steel wire strands 4a and fiber or hemp strands $5^a$, the individual wires of the said strands $4^a$ being all the same lay in the composite strands $2^a$.

As shown, the wires of the individual strands $4^a$ are all right lay, whereby due to the opposite lay of the alternate composite strands $2^a$, the said wires will have the desired unidirectional relation at the loci of contact, between said steel strands of adjacent composite strands. Similarly, the same result may be attained in the rope of Fig. 3 by providing the steel wires of the strands $4^a$ all left lay.

In the form of Fig. 4, the right reverse lay wire rope shown may also have substantially the cross-section of Fig. 2. In such further modification, alternate right and left lay strands $2^b$ are right lay about a central core, and comprise separate steel wire strands $4^b$ and fiber or hemp strands $5^b$. However, in this form, the individual wires of the steel strands $4^b$ are the same lay in alternate composite strands. For example, as shown, the wires of the strands $4^b$ are right

lay in the right lay strands $2^b$ and left lay in the left lay composite strands $2^b$.

Thus, the form of Fig. 4 also affords the desired unidirectional disposition of the individual steel wires at the loci of contact between the steel strands in adjacent composite strands $2^b$. Similarly, the same result may be obtained in the rope of Fig. 4, by providing the steel wires of strands $4^b$ of left lay in the right lay composite strands $2^a$, and the right lay in the left lay composite strands $2^a$.

In fabricating the wire ropes of the character herein set forth, the hemp or fiber strands 5, $5^a$ or $5^b$ may be of any suitable form, the same functioning as resilient cushioning elements between the steel strands. For example, they may consist of small hemp ropes, the twist or lay of their individual members or strands being in either direction without reference to the lay of the steel strands.

It is to be understood that the forms embodying my invention shown and described herein are merely by way of illustration. For example, six composite strands 2 are shown in the cross-section of Fig. 2, whereas, eight or other numbers of composite strands may be employed with satisfactory results. Likewise, the cross-sectional areas of the entire rope, the composite strands, the individual steel and hemp strands, and the size and number of the steel wires in the steel strands may be varied at will by the skilled designer in accordance with a desired weight, size and flexibility for the rope.

Furthermore, the ropes illustrated herein are all known as right lay ropes, either right regular lay or right reverse lay, but it will be apparent that the invention may be as well incorporated in left lay ropes by following the proper relation of the elements or strands thereof as described.

The foregoing as well as other variations, are contemplated within the scope of the following claims.

I claim:

1. A spring lay wire rope including a plurality of composite strands formed of individual steel strands and hemp strands, said steel strands comprising a plurality of wires, the composite strands, the individual strands of said composite strands, and the wires of the steel strands being so related by reason of their lay as to dispose said wires in substantially unidirectional relation at the loci of contact of the steel strands of adjacent composite strands.

2. A spring regular lay wire rope including a plurality of composite strands wound about a central core, said composite strands comprising alternate steel strands and hemp strands, the steel strands composed of a plurality of wires, said wires being right lay in alternate composite strands and left lay in the other composite strands, as and for the purposes described.

3. A spring reverse lay wire rope including a plurality of composite strands wound about a central core, said composite strands comprising alternate steel strands and hemp strands and disposed in opposite lay in alternate composite strands, said steel strands composed of a plurality of wires, said wires being the same lay in all of the composite strands, as and for the purposes described.

4. A spring reverse lay wire rope including a plurality of composite strands wound about a central core, said composite strands comprising alternate steel strands and hemp strands and disposed in opposite lay in alternate composite strands, said steel strands composed of a plurality of wires, said wires being opposite lay in alternate composite strands, as and for the purpose described.

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