Feb. 26, 1929.

1,703,269

J. McC. GARRIS

CABLE OR SLING

Filed March 19, 1927

3 Sheets-Sheet 1

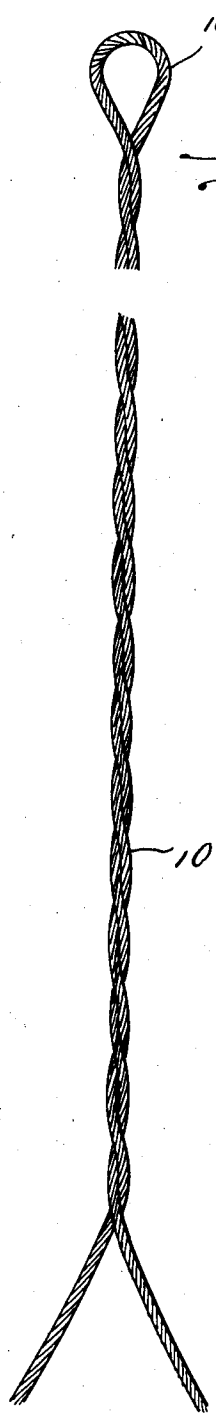


Fig. 1.

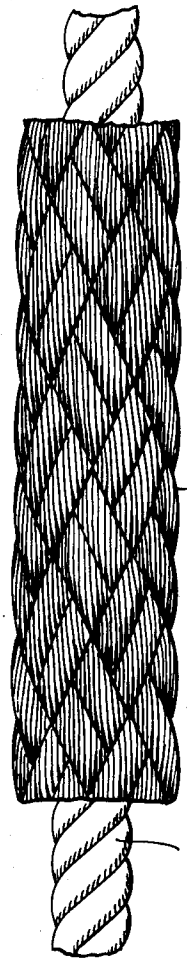


Fig. 8.

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Fig. 3.

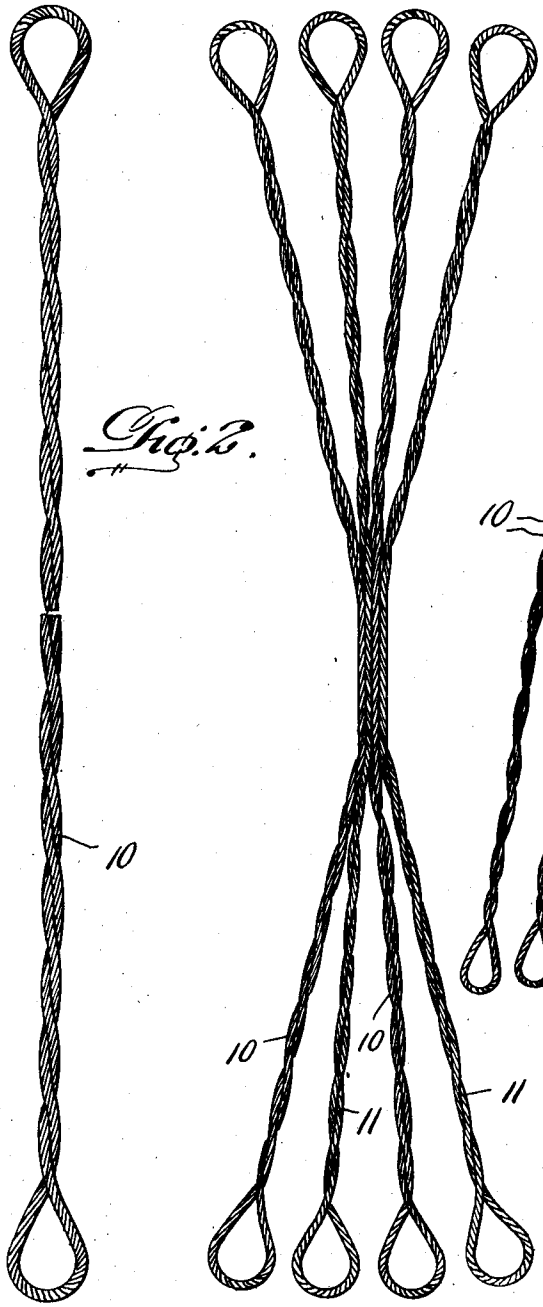
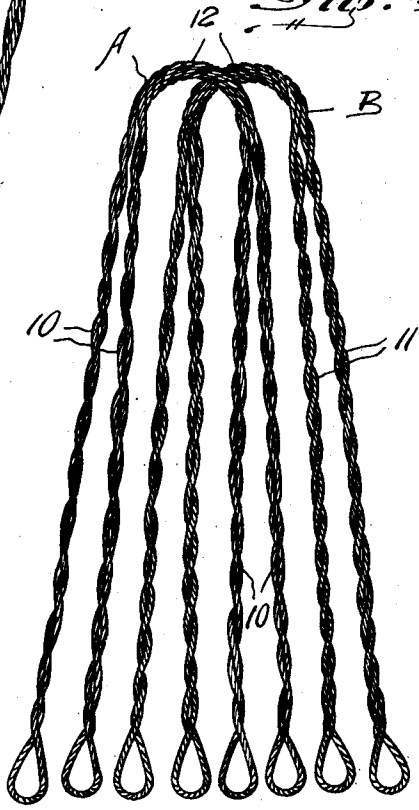


Fig. 2.

Fig. 4.



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Fig. 7.



Fig. 5.

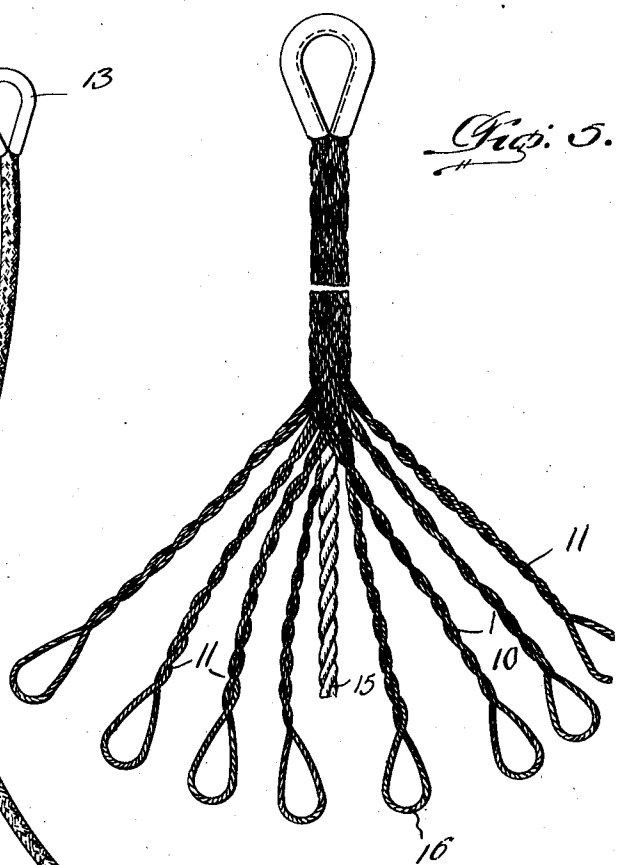


Fig. 6.

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UNITED STATES PATENT OFFICE.

JOSEPH McCLINTOCK GARRIS, OF AVALON, PENNSYLVANIA.

CABLE OR SLING.

Application filed March 19, 1927. Serial No. 176,714.

This invention relates generally to cables, and while it is herein illustrated and described as a sling of the character usually employed in lifting and handling heavy structures, a general application of the principles embodied in the invention is contemplated within the scope of the appended claims.

So called slings by reason of their use are always subjected to severe tension and strain, and all cable used for such purposes has been found to be objectionable for its insufficient flexibility, which prohibits it from readily conforming or adapting itself to the contour of the object to be lifted or handled. More important than this however, is the objectionable inherent friction and shearing action presented by the adjacent surfaces of the respective units of which the cable is composed, where said units intersect or cross each other. This obviously shortens the life of the cable or sling.

In addition to this, all of which is the direct result of the manner in which the units of the cable are associated in the finished product, it is a well known fact that when a sling or cable is used for lifting heavy structures, all the units of the cable are not subjected to equal shares of the total weight or load. Consequently the maximum strength of a cable or sling of a given size or weight is never obtained.

It is therefore, the object of the present invention to provide a cable capable of handling and sustaining heavy strains with a minimum of internal wear and friction, coupled with a maximum degree of flexibility, which combination not only produces a cable less liable to break under heavy loads, making it admirably advantageous for use as a sling, but which also contributes to the life of the cable.

One of the chief characteristics of the present invention resides in the provision of a cable, wherein the respective units of which it is composed are spirally interwoven in a novel and unique manner, to present relatively sliding surfaces to each other, whether under tension or otherwise, and thus obviate the serious objection found in present day constructions, of these units chaffing, shearing or cutting each other at their points of intersection.

In carrying this idea into effect, it is essential that the units of which the cable is composed, be caused to intersect each other at such an angle, that the strands of which the respective units are composed, approach and leave each other approximately in parallelism at their points of impingement, and also lie approximately parallel with the longitudinal center of the cable itself, thereby present sliding and gripping, rather than shearing or cutting surfaces to each other.

More specifically stated, it is my purpose to produce a cable made up of a plurality of oppositely twisted units, equally divided into what is termed right hand lays and left hand lays, each unit having a predetermined spiral path or pitch, so that as the opposed units are spirally interwoven, by passing over and under alternately, the said units intersect at natural and proper angles to maintain the strands of said units parallel with each other, and also parallel with the longitudinl axis of the cable itself.

The invention further contemplates a new and unique method of producing a cable embodying the foregoing desired characteristics, and essentially consists in what is termed "preforming" the right and left hand lay units, with a predetermined spiral pitch, to relieve said units of all distortional strain when they are untwisted and spirally interwoven into the finished product, and which preformation of said units permit the latter to approach and leave each other at their points of intersection, with the strands of the respective units lying in parallelism with each other and with the cable itself, or substantially so.

An important feature of the cable formed by my new and improved method, resides in the fact that the tensile strength of each unit and its component parts is fully developed under a strain or load, so that the latter is equally distributed over the various units, thereby materially enhancing the safety value of the cable for heavy work, and also prolonging the life of the same.

Another important characteristic of a cable constructed in accordance with my invention, resides in the fact that as each preformed unit is untwisted while being spirally wound into the finished product, the original lay of each unit is preserved, thereby causing the opposed units to co-act under tension to develop the maximum tensile strength of the cable, and to also revert to their normal positions when the strain is relieved, in which manner the original high degree of flexibility of the cable is maintained throughout the life of the latter.

Before entering into a detail description of the invention as illustrated in the accompanying drawings, I wish to have it understood that the terms "right hand lay" and "left hand lay" as used throughout the specification and claims have reference to the direction in which the strands themselves of which each unit is composed are twisted, while the terms or expressions "right hand twist" and "left hand twist" have reference to the manner or direction in which these units are initially preformed or twisted, prior to their association with each other in the production of the finished article.

The nature and advantages of the invention will be better understood when the following detail description is read in connection with the accompanying drawings, the latter being merely illustrative of the principles embodied in the invention, and in which drawings:

Figure 1 is a view showing one of the elements as preformed, and prior to splicing or connecting the free ends of the unit.

Figure 2 is a similar view showing both ends of the unit looped.

Figure 3 is a view showing how the units are arranged before they are spirally interwoven into the finished product.

Figure 4 is a view showing two groups of elements ready to be spirally interwoven into a cable or sling.

Figure 5 is a view showing the units partly interwoven to illustrate how the units are brought together to accomplish the foregoing objects.

Figure 6 is a view similar to Figure 5 showing the construction of a cable without a core.

Figure 7 is a view of a sling constructed in accordance with the invention.

Figure 8 is an enlarged fragmentary view of a cable embodying the principles of the invention.

As hereinabove pointed out, a cable constructed in accordance with the principles embodied in this invention, essentially makes use of an equal number of right and left hand lay units, and while these principles may be embodied in cables for general use, they will be hereinafter specifically described in connection with a sling, constituting one embodiment of the invention.

Each of the units of which the sling is composed, consists of a single length of rope, which may vary in length without departing from the inventive idea, and adapted to be folded upon itself, and have its free ends suitably spliced or otherwise joined together to make it endless. These units are divided into groups of equal numbers, one group being distinguished from the other group in the particular lay of the strands of which each unit is composed. It might here be stated that any equal number of units may be used to form a cable of any desired diameter, depending of course upon the strength and flexibility desired, and the particular purpose for which the cable is to be used. For instance, I have illustrated in Figure 4 two groups of these units, one group being indicated at A and the other group being indicated at B, each group for the purpose of illustration including two of said units. It will be observed that the strands of which the units are composed, forming group A are twisted to the right, and commonly known as right hand lay units; while the strands of which the units are composed, included in group B are twisted to the left, and are termed left hand lay units. The units of group A, or otherwise termed right hand lay uints are indicated at 10, while the left hand lay units of group B are indicated at 11. The units of each group are spirally interwoven at a point between their ends as at 12, and folded as illustrated in Figure 4, after which the respective groups are arranged side by side and further interwoven spirally to complete the sling. On the other hand these units may be arranged side by side as illustrated in Figure 3 and then folded at a point between their ends, and the units of the different groups alternately passed over and under each other in the formation of the sling. When the units are thus folded upon themselves they are spirally interwoven in a manner to provide a loop at one end of the sling formed by the folding of the units in the manner just described, while the free ends of the units are formed with loops which when the cable or sling is finished, lie side by side, so that the loops can be associated with a thimble or eye 13, of well known construction, and in any ordinary well known manner. When completed the sling will be similar to the article indicated at 14 in Figure 7.

It is essentially important that each unit of the sling be initially preformed, in order to provide an article which is subjected to a minimum of internal wear and friction, when subjected to heavy strains or lifts, and at the same time possess a maximum degree of flexibility, which is particularly advantageous in slings, permitting the latter to readily accommodate itself to the shape or contour of the object to be handled. Therefore, each unit is initially twisted as shown in Figure 1, and the unit is twisted in a direction opposite the lay of the strands of which the unit is composed. For instance every right hand lay unit is initially twisted to the left, and every left hand lay unit initially twisted to the right. This preformation of the units relieve the latter of any and all distortion, so that when they are incorporated into the cable or sling, the strands of the respective units lie parallel with the longitudinal axis of the finished product, and present relatively sliding surfaces to each other at their points of intersection, in contradistinction to the construction of cables and slings in pres-

ent day use, wherein the respective units present a chaffing and shearing action at their points or intersection.

It is of course understood that as these preformed units are being spirally interwoven with each other, they are untwisted as clearly illustrated in Figure 4, which is done to preserve the original lay of the respective units, thereby causing the opposed left and right hand lay units to co-act under tension and develop the maximum tensile strength of the product. It is by reason of this unique construction and arrangement, that when the cable or sling is subjected to heavy strains and loads, each and every unit of the article sustains its proportionate amount of the load, and inasmuch as the latter is equally distributed over the component parts, both the safety value and life of the cable is materially enhanced. It will be observed upon inspection of Figure 5 that as each unit is passed over or under the adjacent units, while being spirally interwoven into a cable, the particular unit is partly untwisted for the purposes above mentioned, and that the strands of the respective units approach and leave each other in parallelism at their points of intersection, and also lie parallel with the longitudinal axis of the cable itself. This fact alone not only contributes to the free relatively sliding movements of the respective units, as they seek a common center under the strain of a load, but also provides a cable with a comparatively smooth exterior capable of being slipped or slid about objects to be lifted with little possibility of the strands being cut or caught by sharp corners or projections on said objects. Equally important, however, is the fact that a cable constructed in the manner just described affords the product a relatively high degree of flexibility, in that the component parts immediately revert to their normal positions when relieved of strain, and in this manner the desired flexibility of the sling is maintained throughout the entire life of the latter.

In Figure 8 I have illustrated an enlarged fragmentary view of a cable constructed in accordance with the invention, and wherein 15 represents a core of relatively soft material about which the units are spirally interwoven, as contradistinguished from cables which are plaited or braided, and inasmuch as the units of the cable are capable of relative sliding movement parallel with the axis of the cable, the relatively soft core 15 serves as a cushion for these units as they seek a common center under strain, and also assists in minimizing internal friction. It is of course to be borne in mind that the core 15 is only used with cables or slings of particular sizes, and that the principles of the present invention may also be embodied in a sling without the use of the core, such as illustrated in Figure 6. Irrespective of this, however, the manner of preforming right and left hand lay units, and spirally interweaving the same in the manner above described results in a product where the strands of the respective units lie parallel with each other and parallel with the axis of the cable as clearly illustrated in Figure 8.

In accordance with my improved method of constructing a cable or sling, while I make use of endless units as hereinabove mentioned, it is to be understood that each unit is preformed while in the condition of a single length of rope. That is to say that a right or left hand lay unit is twisted in a direction opposite its lay, before the free ends of the unit are spliced or otherwise connected together to make it endless, so that each unit is in this manner relieved of its distortion, which fact permits the cable to be formed from a plurality of units all of equal lengths, and when the units are spirally interwoven together, the loops 16 will all lie side by side, in the same plane, so that they can be associated with the thimble or eye 13 without any difficulty. After each unit has been so preformed the free ends of each unit are then joined together in any suitable manner to form a loop 16, and the units are then arranged side by side as hereinabove set forth to form a component part of the cable or sling. Another important feature of the preformation of these units resides in the fact that by so doing each unit is given a predetermined spiral pitch, which is determined or governed by the length of the unit, and consequently when the various groups of units are being spirally interwoven together, each unit as it is untwisted to preserve its original lay falls into a natural position with the other units, allowing the strands of the component units to approach and leave each other in parallel lines at their points of intersection.

While it is believed that from the foregoing description the nature and advantages of the invention will be readily apparent, I desire to have it understood that I do not limit myself to anything shown or described, and that I reserve the right to make such changes and alterations in the construction and arrangement of parts, as fall within the scope of what is claimed.

What is claimed is:

1. A new and improved method of constructing cable, consisting in the use of a plurality of units equally divided into groups of right and left hand lays, then pre-twisting each unit in an opposite direction to its lay, to relieve said unit of distortion, and give said unit a predetermined spiral pitch, and then alternately untwisting said units of the respective groups as they are being spirally interwoven into a finished product, thereby preserving the original lay of the units and producing a cable of maximum tensile strength and flexibility.

2. A new and improved method of constructing a cable sling, consisting in the use of a plurality of single length units, folding each unit between its ends, then pretwisting the unit in a direction opposite the lay of the unit to relieve the latter of distortion, then splicing or connecting the free ends of the unit together to make it endless, and finally untwisting the component units while the latter are being spirally interwoven in the formation of the sling, and forming eyes by the ends of each unit.

3. A new and improved method of constructing a cable sling including a body portion and an eye at each end, said method consisting in the use of a plurality of single length units, equally divided into groups of right and left hand lays, folding each unit upon itself at a point between its ends and pretwisting the unit in a direction opposite that of its lay to give said unit a predetermined spiral pitch and relieve the unit of distortional strain, then joining the free ends of the unit together to make it endless and to form one of said eyes, the eye at the other end being formed by the initial folding of said unit, and finally untwisting the endless units step by step as each is spirally interwoven into the finished product.

4. As a new and improved method of forming a cable sling consisting in the use of a plurality of single length units equally divided into groups of right and left hand lays, folding each unit upon itself at a point between its ends and then pretwisting the unit in a direction opposite its lay, giving the unit a predetermined spiral pitch, and forming a loop at one end of the unit, then joining the free ends of the unit together in the formation of a loop at the other end of the unit, then laying the units side by side and folding all of said units upon themselves, then untwisting said units individually as they are spirally interwoven into a finished product, and in a manner to form a loop at one end thereof and bringing all of the first mentioned loops side by side, in the same plane, and finally providing said loops with a thimble at each end of the sling.

5. A new and improved method of constructing a cable sling consisting in the use of two groups of endless units, the units of the respective groups being equal in numbers, with the units of one group having a lay opposite to those of the other group, the units of each group being pretwisted in an opposite direction to their lays and given a predetermined spiral pitch, leaving a loop at each end of each unit, gathering the loops at each end to form the eyes of the sling, and then untwisting said units as they are being passed over and under each other in a clockwise and anti-clockwise direction to form the finished product.

6. A new and improved method of constructing a cable sling, consisting in the use of a plurality of endless units divided into groups of right and left hand lays, said units being pretwisted in opposite directions to their lay, and then untwisting said units as they are being spirally interwoven around a flexible core into a sling.

7. A new and improved method of constructing a cable sling, consisting in the use of a plurality of pretwisted endless units divided into groups of right and left hand lays, said units being pretwisted in opposite directions to their lay leaving loops at each end of each unit, gathering the loops at each end to form an eye for the sling, and untwisting said units of the respective groups alternately as they are being passed over and under each other in opposite directions around a flexible core.

8. A new and improved method of constructing a cable sling, consisting in the use of a plurality of pretwisted endless units, then folding said units upon themselves to form an eye at one end of the sling, then untwisting said units as they are being alternately extended helically in a clockwise and anti-clockwise direction about the longitudinal axis of the sling.

9. A new and improved method of constructing a cable sling, consisting in the use of a plurality of pretwisted endless units having looped ends, folding said units between their ends to form an eye at one end of the sling, untwisting said units as they are being extended helically in a clockwise and anti-clockwise direction about the longitudinal axis of the sling, and finally gathering the looped ends of said units together to form an eye for the other end of the sling.

10. A new and improved method of constructing a cable sling, consisting in the use of a plurality of endless units, each being pretwisted toward the ends thereof from spaced points in its length, leaving loops at the ends of each unit, associating all of said units and folding them in their entirety between their ends to form an eye for one end of the sling by the intermediate portions of said units, then helically extending said units alternately in a clockwise and anti-clockwise direction about the longitudinal axis of the sling and untwisting each unit as it is interwoven into a finished product, and finally gathering said looped ends together to form an eye at the other end of the sling.

11. A new and improved method of constructing a cable sling, consisting in the use of a plurality of endless units divided into groups of right and left hand lays, the units of each group being pretwisted toward their ends from spaced points in their lengths, and in opposite directions from the lay of said units, leaving loops at the ends of each unit.

then folding the units of the respective groups between their ends to form an eye for one end of the sling by the intermediate portions of the units, then alternately passing the units of the respective groups in a clockwise and anti-clockwise direction about the longitudinal axis of the sling, untwisting each unit as it is thus woven into the finished product, and finally gathering said loops together to form an eye for the other end of the sling.

12. A cable sling including a plurality of pretwisted endless units spirally interwoven in an untwisted condition so as to form a sling.

13. A cable sling including a plurality of pretwisted endless units equally divided into groups of right and left hand lays spirally interwoven in an untwisted condition to form a sling.

14. A cable sling including a plurality of pretwisted endless units equally divided into groups of right and left hand lays spirally interwoven in an untwisted condition and arranged to present relatively sliding surfaces to each other at their points of intersection.

15. A cable sling including a plurality of endless units pretwisted in opposite directions to their lay, and extended helically in a clockwise and anti-clockwise direction in an untwisted condition about the longitudinal axis of the sling.

16. A cable sling including a plurality of endless units equally divided into groups of right and left hand lays, pretwisted in opposite directions to their lay and spirally interwoven in an untwisted condition so as to form the sling, and an eye for each end of the sling.

17. A cable sling including a plurality of endless units equally divided into groups of right and left hand lays, pretwisted in opposite directions to their lay and having loops unitedly defining eyes for the opposed ends of the sling, and said units being spirally interwoven in an untwisted condition and in opposite directions to form a sling.

In testimony whereof I affix my signature.

JOSEPH McCLINTOCK GARRIS.