July 26, 1932. E. V. WYATT 1,868,681

ROPE

Filed March 5, 1930

Fig. 1

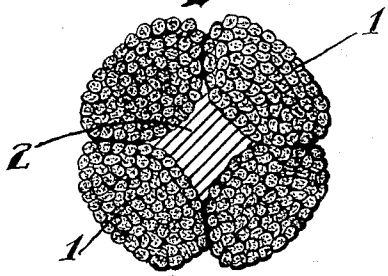


Fig. 2

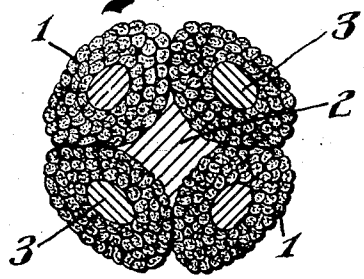


Fig. 3

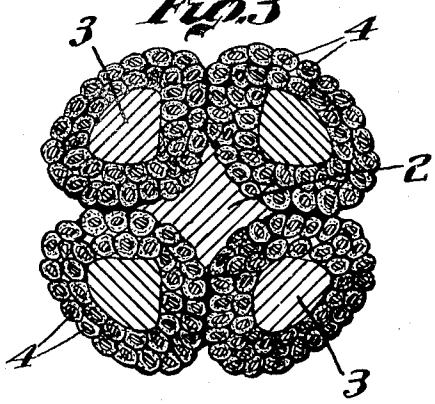


Fig. 4

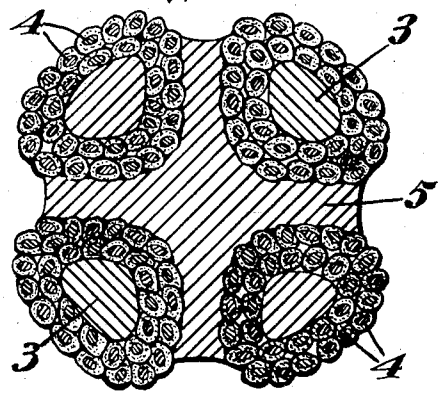


Fig. 7



Fig. 8



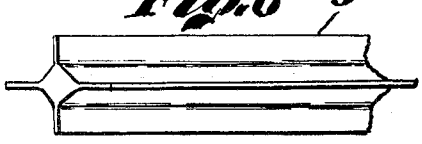
Fig. 9



Fig. 5



Fig. 6



Inventor
Ernest V. Wyatt
Ellis Spear, Jr.
By Attorney

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UNITED STATES PATENT OFFICE

ERNEST V. WYATT, OF SOMERVILLE, MASSACHUSETTS

ROPE

Application filed March 5, 1930. Serial No. 433,279.

This invention relates to rope construction and is intended to overcome certain weaknesses present in manila and the other fibrous ropes and cordage as known to the seafaring profession, which weaknesses have been recognized for many years but which, insofar as I am advised, have never been successfully overcome. For example, the ordinary four-strand manila rope as used in purchases, boat-falls and various tackles aboard ship frequently is laid up into rope at the rope-walk with a heart or core of hemp or other fibrous yarns twisted into a strand. This strand hereinafter referred to as the core is necessary because without it the outside spirally laid up strands would form sharp apexes in the center of the rope, and soon internal friction would wear out these sharply bent fibers, thus shortening the life of the rope. With the hemp core internal friction is not entirely eliminated as the fibers composing the core rub against the fibers composing the outer strands.

A weakness inherent in fiber core rope is apparent when a manila rope for instance is subjected to sudden strain as in the case of hoisting or lowering a lifeboat in a seaway. The strain on the rope will cause it to stretch considerably, due partly to the elasticity of the fiber, and also largely to the spirally twisted construction of the principal strands of the rope as laid around the core.

The core of the rope located centrally throughout the entire length of the rope will be and in fact actually is, subjected to a direct strain which is far greater than the strain taken up by the four outer spirally laid up strands. Frequently the core strand is a smaller and weaker strand. This being so, the core strand which is necessarily in the direct line of force will part under severe strain, causing the structure of the rope at the location of the break to collapse.

To overcome these difficulties, I have provided the improved rope of my invention with a core of rubber, rubber compound, or other elastic material. This is adapted not only to overcome the weaknesses above referred to, but also increases the elasticity and life of the rope by cushioning and protecting the fibers. The main spirally laid strands of the rope are in contact with the rubber core and chafing between the strands and the core is practically eliminated. Under severe strain the rubber core will stretch and be compressed to some extent by the strands.

To appreciate the rubber cushioning effect of my improved core, it is necessary to understand that there are occasions at sea and perhaps elsewhere that a rope such as I have reference to may be required to possess additional elastic qualities. For instance, when a heavy fibrous towing hawser or heavy rope laid anchor cable is subjected to its maximum strain suddenly as is often unavoidable with vessels at sea, the rope carries away, due to the fact that manila rope becomes hard and stiff, thus losing most of its elasticity after getting water-soaked. As a further improvement, to overcome this loss of elasticity in the rope, my rubber core is extended as a cushion between the strands and towards the circumference of the rope, thus completely cushioning each fibrous strand and separating them from each other. In this manner, not only is all friction between the strands overcome, but a sudden severe strain on a rope so constucted will be taken up gradually consequently preventing the rope from parting. Mooring lines used in docking vessels demonstrate the need of rope of this cushion construction as the operation subjects the rope to hard uses. The strands under strain will stretch, lengthen out and tend to press themselves into the cushion which due to its rubber composition is compressed. This compression slightly reduces the diameter of the rope, allowing the strands to lengthen extensively, thereby increasing the length of the rope. After the strain is removed, the rubber expands and the rope resumes its original shape.

As a modification of my rope, I may also provide a rubber core in the center of each strand, and thus increase the pliability of the strands. In the same manner a rubber core may be used in the center of the small yarns which make up the strands and the rope constructed from such yarns and strands with my rubber core or with the cushion extending between each strand and towards the cir-

cumference of the rope results in an extremely pliable rope. A rope so constructed with the rubber cushion or core, vulcanized to rubber coated fibers, has full protection against weather or water entirely overcoming all objections with which I am familiar. Should the fibers not be rubber coated the cushion or core as the case may be made to adhere to the strands by coating cores or cushions with adhesive composition previous to laying up in place.

In the accompanying specification and drawing, I have described and illustrated forms of my invention which have proved highly satisfactory under test and in practical use.

In the drawing:

Fig. 1 illustrates a cross section of a four-strand rope provided with my core of rubber.

Fig. 2 is a similar view showing each strand provided with a rubber core.

Fig. 3 is an enlarged similar view, but showing each yarn provided with a rubber heart.

Fig. 4 is an enlarged cross section showing my rubber cushion core extended to form a complete cushion between each strand and towards the circumference of the rope.

Fig. 5 is an angular perspective of the same.

Fig. 6 shows a straight ribbed rubber cushion core.

Figs. 7, 8 and 9 are other cross sections of my rubber cushion core.

My improved rope comprises a plurality of strands of twisted fiber 1 laid about a rubber or rubber composition core 2 to which core the fibres may be caused to adhere in any suitable manner. The cores may be laid up with plastic rubber or cement, or the cores may be made soft or semi-treated. This core prevents the chafing or wearing of the strands and is extensible to an extent equal to or greater than the extensibility under strain of the fibers of the strands 1 which is a marked improvement over rope constructions heretofore used.

In order further to increase the flexibility and elasticity of the finished rope, as a modification of my invention I also provide a rubber or other elastic core 3 for each strand of my rope. As a still further modfication, each yarn of each strand is in turn provided with a rubber core 4 which yarns are twisted about the rubber core 3 of each strand 1. (See Fig. 3).

In Fig. 4 I show my rubber core extended between each strand outwardly towards the circumference of the rope as ridges or ribs as shown at 5, thus completely cushioning each fiber strand and separating the strands from each other. As above pointed out, such a construction takes care of any sudden severe strain on the rope and provides an extensibility which is not present in ordinary fibrous rope. The straight core shown in Fig. 6 may be preferred for use in rope of hard lay as the soft rubber will of necessity take up and follow the lay of the strands. This is also true in varying degree of the forms of core illustrated in Figs. 7, 8 and 9.

By reason of the utilization of rubber cores in turn in the yarns, strands and rope, it is possible to use a cheaper commercial grade of fiber which is coarser and of greater tensile strength than is present in the highest grade rope. On the other hand, by coating the fibres of the strands with rubber or other elastic and adhesive material, the fibres are effectively protected against moisture and are caused to adhere to each other so that it is entirely feasible to form the strands without twisting and either with or without central cores. That is to say, when the fibres are coated they are caused by the coating to adhere to each other, whereby the rope fabrication as an entirety may be of unitary form, especially since the fibres next to the cores 3 and 4 can be adhesively united with said cores by the coatings of the fibres if said cores are used. In this connection, it is pointed out that the central core 2 of the rope is used regardless of the particular formation of the strands, i. e., whether the strands are or are not provided with cores and whether they are or are not twisted and made of fibres or other suitable non-metallic material. When the rope material is coated those strands adjacent to the core 2 may be adhesively united therewith by the coatings. Accordingly, where coated material is used the finished rope can be of unitary form with all of the elements thereof adhesively united with one another. Especially is this so when a single strand is used as a completed rope in which case a core 3 may be located centrally of said strand or rope.

It will be understood that my invention contemplates the use of my extensible core in any non-metallic rope construction regardless of the process of making the same or the manner of embodying the core therein. Strands of suitable fibrous or other non-metallic materials may be wound or twisted, if desired, and pluralities thereof again may be twisted to produce strands or ropes of greater diameter, in each case the central space throughout the resulting rope to be occupied in whole or in part by material of an extensibility at least equal to the extensibility of the surrounding fabrication.

Each strand, as well as the finished rope, may be provided with a similar extensible center. If an adhesive material is used to coat the strands or the parts thereof, the strands may be formed into rope without twisting, in which case the finished product is composed of non-metallic material all the spaces of which are filled with a rubber or similar elastic material. The strands may

be made to adhere to each other by such elastic material and to the core of the rope, or may adhere to the core only. Obviously the strands each may be treated without adhering to each other or to the core.

Various modifications in the manner of cushioning and laying up of my rope as well as in the process of preparing the same may obviously be resorted to without departing from the spirit of my invention if within the limits of the appended claims.

What I therefore claim and desire to secure by Letters Patent is:

1. A rope or cable comprising a plurality of strands of flexible material and a rubber cushion about which said strands are laid, each of said strands having a rubber core and a plurality of yarns laid thereabout, and each of said yarns in turn being provided with a rubber core.

2. A rope or cable comprising a plurality of rope strands and a rubber cushion about which said strands are laid, each of said strands having a rubber core of general triangular cross section, a plurality of yarns of rope material laid thereabout, each of said yarns in turn being provided with a rubber core.

3. A rope or cable comprising a plurality of rope strands and an elastic cushion about which said strands are laid, each of said strands having an elastic core of general triangular cross section, a plurality of yarns of rope material laid thereabout, each of said yarns in turn being provided with an elastic core.

4. A rope composed of fibres commonly twisted together into yarns, said yarns being twisted together forming strands, and said strands being twisted together to form a continuous fabrication of natural extensibility, a core axially of said fibrous fabrication and of an extensibility at least equal to the extensibility of the surrounding fibre fabrication whereby under tension said core will simultaneously follow in its extension the stretch of the fibre structure.

5. A rope composed of fibres commonly twisted together into yarns, said yarns being twisted together forming strands, and said strands being twisted together to form a continuous fabrication of natural extensibility, a core axially of said fibrous fabrication, said core being compressible and having an extensibility at least equal to the extensibility of the surrounding fibre fabrication whereby the rope is under tension said core is adapted to cushion relative inward movement of the strands and to stretch in harmony with stretching of the surrounding fibrous fabrication.

6. A rope comprising a plurality of fibrous strands each comprising long twisted vegetable fibres having individual longitudinal resiliency, and an extensible rubber core having a resilliency at least equal to the resiliency of said strands, whereby upon the longitudinal stretch of the individual strands there is permitted an equal longitudinal stretch of the core.

7. A rope composed of extensible non-metallic twisted strands, the center of said rope being filled at least in part by an elastic material having an extensibility at least equal to the extensibility of the non-metallic strands.

8. A rope composed of extensible non-metallic twisted strands including an elastic center element incorporated during the process of fabricating the rope, said elastic center element having an extensibility at least equal to the extensibility of the non-metallic strands.

9. A rope composed of a core and a surrounding rope fabrication of extensible fibrous material, the core being elastic and having an extensibility at least equal to the extensibility of the surrounding fibrous fabrication.

10. A rope comprising a core and a surrounding fibrous and extensible rope fabrication the fibres of which are coated with an elastic material and united with each other by said material, the core being elastic and having an extensibility at least equal to the extensibility of the surrounding fibrous fabrication.

11. A rope comprising a core and a surrounding fibrous and extensible rope fabrication the fibres of which are coated with an elastic material and united with each other and with the core by said material, the core being elastic and having an extensibility at least equal to the extensibility of the surrounding fibrous fabrication.

12. A rope as set forth in claim 10 in which the elastic material for the fibres consists of rubber.

13. A rope as set forth in claim 11 in which the elastic coating material for the fibres and the material from which the core is formed consists of rubber.

14. A rope or cable comprising a plurality of twisted strands of non-metallic material each of said strands having a core, said core being elastic and having an extensibility at least equal to the extensibility of the non-metallic material, said strands being fabricated to produce a rope, the center of said rope being filled in whole or in part by an elastic material having an extensibility at least equal to the extensibility of said strands.

In testimony whereof I affix my signature.

ERNEST V. WYATT.