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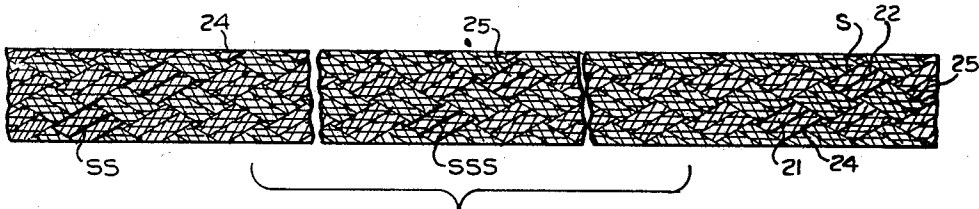
[56] **References Cited**  
**UNITED STATES PATENTS**  
 2,164,296 6/1939 Wilcox ..... 87/9X  
 2,608,124 8/1952 Jeckel ..... 87/9  
 2,740,316 4/1956 Crossley et al. .... 87/9  
 3,035,476 5/1962 Fogden ..... 87/9

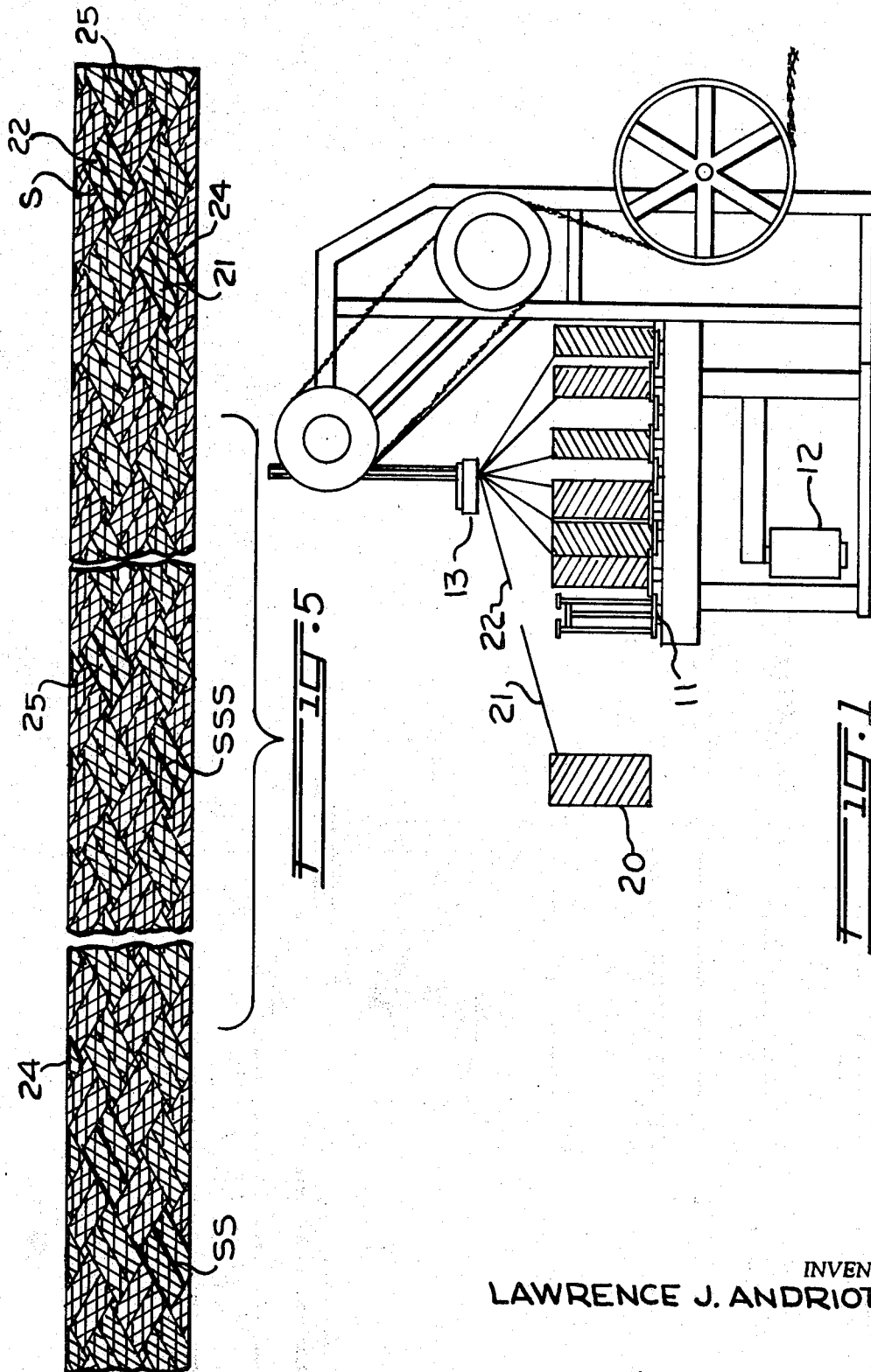
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[54] **ELONGATED BRAIDED ROPE AND METHOD FOR PRODUCING THE SAME**  
 5 Claims, 7 Drawing Figs.

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 87/8  
 [51] Int. Cl. .... D04c 1/12  
 [50] Field of Search ..... 87/5—9

**ABSTRACT:** A braided rope has a number of tubular major strands each of which is formed of a number of minor strands braided together, the major strand sections being spliced end to end, and the spliced portion itself being braided with other major strands. A method for producing a rope having an indefinite length greater than the length of any single section of a major strand, is disclosed.



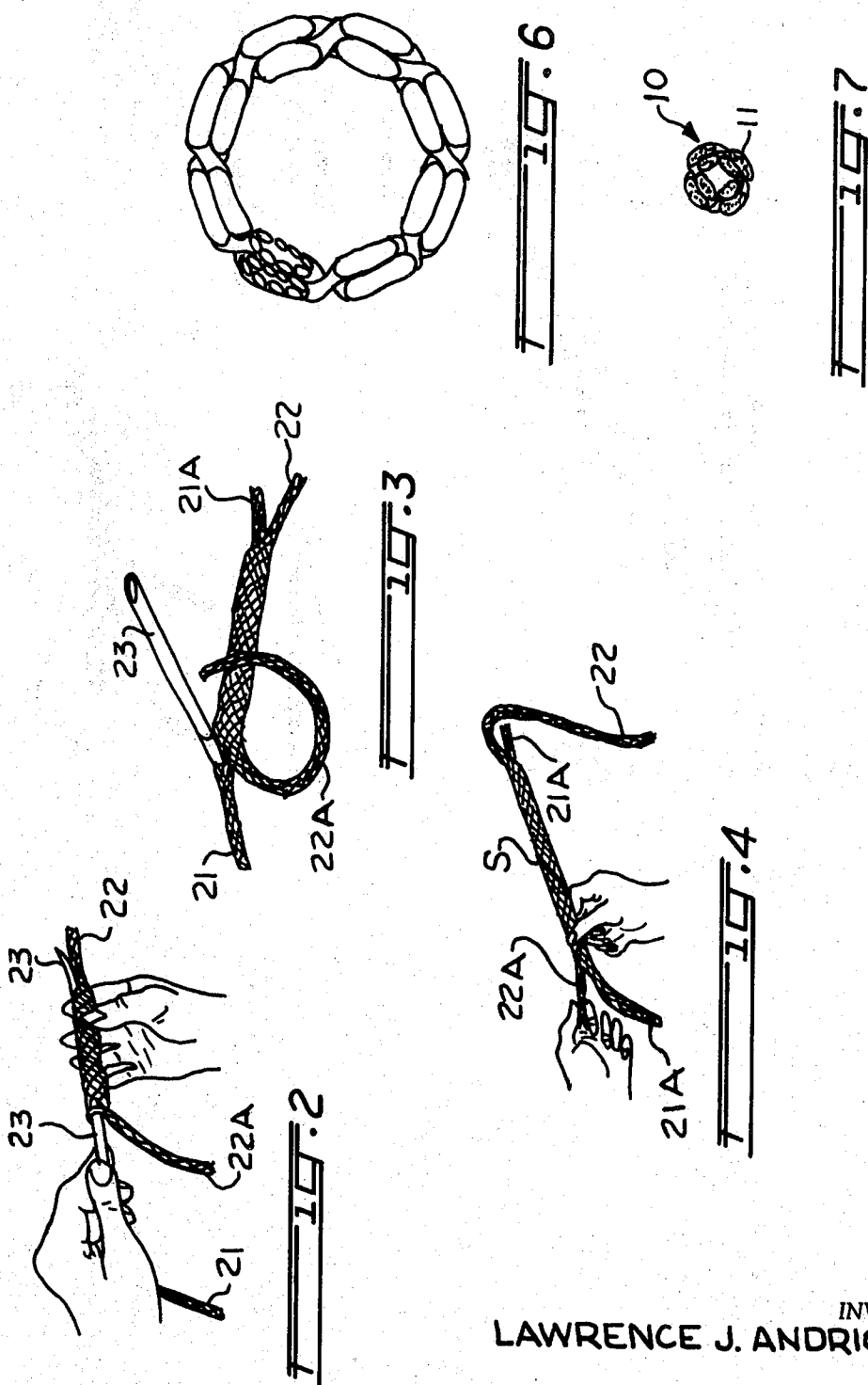


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# ELONGATED BRAIDED ROPE AND METHOD FOR PRODUCING THE SAME

## BACKGROUND OF THE INVENTION

The manufacture of large size rope intended for certain industrial uses requiring high tensile strength, resistance to abrasive wear and wear due to flexing, and availability in long lengths; for example, a mile or more; has traditionally presented a major problem. Due to the inherent size limitations of the bobbins in the cordage machines used for the strands of rope material, recourse to a joining of strands is had in order to form the elongated rope. Depending upon the rope structure, such a joining may involve a twisting of the corresponding strand ends into engagement with each other, the tying of strand ends with knots, or the heat bonding or adhesive securing of strand ends when the rope material lends itself to such a procedure.

However, such a juncture represents a point of lower tensile strength of the overall rope and when the splice is subjected to abrasive wear during use, the tensile strength is reduced even more. In fact, the tails of the joined strand sections frequently work loose and the appearance of the rope with a ruptured strand reduces the confidence of the user regarding the integrity of the entire rope. A requirement therefore exists for a rope which can be manufactured in long lengths with joined strands and which will possess substantially the same tensile strength as possessed by the strands of the rope before being incorporated into the rope. It is a purpose of the present invention to accomplish this objective by employing braided strands arranged in an improved manner and using end-to-end splicing. Such end-to-end splicing of a single braided strand, for example in the manufacture of endless bands, is suggested by the old U.S. Pat. to Binns No. 330,087.

## SUMMARY

The rope product of the invention comprises a number of tubular major strands braided together and braided with end-to-end splices of such major strands. Each major strand comprises a number of braided minor strands which by reason of the braiding presents a dimpled surface. The adjoining ends in the splices exert a mutual compression on each other as pull is placed upon the rope, and the splices have a length sufficient to provide substantial frictional engagement of their dimpled surfaces with the dimpled surfaces of the other major strands with which they are braided. The method of manufacture results in the production of a rope of indefinite long length and comprises the resupply to the braiding machine of bobbins holding the major strands in such manner that the several splices in the major strands will be spaced from each other. The braiding machine is stopped as each successive bobbin is exhausted and splicing of the major strand sections occurs while the machine is at rest.

Among the objects of the invention are the provision of an improved elongated braided rope having tubular major strands spliced end to end, the provision of an elongated braided rope characterized by its high tensile strength, and the protection of its spliced portions against abrasion and loosening of spliced ends; and the provision of an improved method for producing an elongated braided rope.

The above and other objectives of the invention will become more apparent as the description proceeds and when considered in conjunction with the accompanying drawings in which:

FIG. 1 is a diagrammatic view of a braiding machine having a plurality of bobbin carriers containing different lengths of braided major strands;

FIGS. 2, 3 and 4 are diagrammatic views illustrating the several steps of splicing the ends of corresponding major strands;

FIG. 5 is a side elevation view of portions of the completed rope showing the frictional braided engagement of the spliced major strands with other major strands and the spacing of spliced strands to avoid a cumulative weakening of the rope at a given point along its length;

FIG. 6 is a cross-sectional view of the rope shown in FIG. 5; and

FIG. 7 is a cross-sectional view to a larger scale of one of the major strands.

Referring first to FIG. 7, a tubular major strand 10 of stock material comprises a plurality of minor strands 11 braided to each other in a diamond-type pattern with each of the minor strands, here shown as eight in number, comprising a bundle of small filaments. Each such major strand may have a length of about 500 feet and be manufactured on a conventional type of braiding machine. Such a major strand when wound on a conventional bobbin is then mounted on one of the bobbin carriers of a conventional braiding machine as shown in FIG. 1.

This machine comprises a plurality, for example sixteen, of such bobbins and by means of the engagement of the bobbin carriers with the race plate 11 driven by motor 12, the major strands passing from the bobbins and through the die 13 are braided in the selected manner. Conveniently, a diamond braid employing the major strands in side-by-side groupings of two, as indicated in FIG. 5, may be used.

In practicing the method of the invention, when a given bobbin is exhausted the operation of the braiding machine is interrupted and a resupply bobbin 20 is brought to the machine with the leading end 21 of its braided tubular major supplementary strand available for splicing to the trailing end 22 of the major strand taken from that exhausted bobbin. This splicing is then conducted either manually or otherwise by the insertion of a tool 23, such as a fid, into the tubular major strand 22, at a point at least about

12 inches from the trailing end leaving a tail portion 22A, as seen in FIG. 2.

The tool carrying the leading end 21 of the supplementary major strand is then pushed a suitable distance through the tubular space and is withdrawn to one side of strand 22 leaving the two major strands interlocked for a appreciable distance and with a short projection 21A of the supplementary strand extending from the joined strands.

Thereafter, as seen in FIG. 3, the tool is reinserted in the opposite direction within the strand 21 beginning at the point where the tail portion 22A emerges from the joined strands and is pushed through the tubular space of strand 21 emerging at a distance somewhat less than the length of tail portion 22A. As the tool is pushed forward the tail portion 22A is housed within that tool and is then enveloped by the braided minor strands of major strand 21 thus to extend the interlocked distance of the two major strands 21 and 22. Following this, the splice as seen in FIG. 4 is tightened and the protruding ends 21A and 22A are cut off and pushed into the tubular spaces of the respective major strands. Thereafter the bobbin 20 is placed on its bobbin carrier, the tension of its major strand is adjusted, and the machine is ready to resume operation.

As will be apparent, the splicing of the single major strand has followed conventional practice for providing an elongated rope which would comprise only one such major strand, and the tensile strength of such rope would depend essentially upon the strength of the described splice. In such splice there is a mutual gripping action of the ends of strands 21, 22 upon each other as their tubular braids are compressed by axial pull thereon.

Referring now to FIG. 5 the rope of the present invention is not dependent for its tensile strength solely upon the holding strength of such a splice S of strands 21 and 22. Each of the minor strands 11 themselves are braided, thus producing a dimpled-like external surface for the major strand. At locations where two such surfaces contact each other and are subject to axial pull on the rope, a large measure of additional frictional resistance is imposed on the strands. It is a feature of the invention that the length of the splice S is sufficient to require a plurality of companion major strands of the rope to be in braided contact with the splice so that when the entire rope is subjected to tension this frictional engagement will add to the

inherent strength possessed by the splice S. As a further advantage of this arrangement, the spliced portion S is partially covered by adjacent companion major strands of the rope thus protecting the splice from abrasion by external objects. Moreover, since the major strands are tubular the interlocking of the strand sections as indicated in FIG. 4, does not materially increase the outside diameter of splice S and when such splice is braided with other major strands, as seen in FIG. 5, no significant difference in the overall diameter of the rope is found. The braided effect of the companion major strands with the spliced major strand also serves to exert force holding the severed extreme ends 21A and 22A in place within their housings provided by the tubular strands.

Referring now to FIG. 1 after the bobbin 20 is installed on its carrier, the machine is again operated until another bobbin is exhausted, after which the machine is again stopped and a similar splicing is conducted for the next major strand. By arranging to have the respective bobbins exhaust at substantially equally spaced intervals of time and with such bobbins each containing the same quantity of stock major strand, after the first array of bobbins have had their initial stock braided into the rope, the successive splices in the rope can be spaced longitudinally of that rope and if some accidental abrasion of the rope then occurs at a given point on the rope, it will not be adjacent a plurality of splices. For example, as shown in FIG. 5, the splice SS in the major strand 24 which lies alongside the strand 22 in which splice S occurs, would be located at a distance from splice S, and a splice SSS in one of the major strands 25 braided with the strand 22 in which splice S occurs would likewise be at a distance from splice S.

By following the method as indicated a braided rope of indeterminate length can thus be made. The invention may be incorporated in various forms of rope and is not necessarily limited to a tubular rope, although the major strands themselves are intended to be tubular in all cases. For example, the rope as shown in FIG. 5 may constitute a jacket for another rope material, or core, without departing from the invention. In view of the above disclosure, it will be noted that the several objectives of the invention are achieved and other advantageous results obtained.

I claim:

1. An elongated braided rope comprising a plurality of tubular major strands braided to each other to form said rope, each of said major strands comprising a plurality of minor strands braided to each other to form the tubular major strand, the

trailing end of each section of each major strand being spliced with the leading end of the next successive section of such major strand to provide a rope length greater than the length of any single section of a major strand, the spliced portions of said sections of each major strand being braided to a plurality of adjacent major strands and providing a frictional engagement therewith serving to enhance the tensile strength of said rope.

2. A rope as defined in claim 1 wherein the splices in each of said major strands are spaced from each other longitudinally of said rope.

3. A rope as defined in claim 1 wherein the extreme edge of said trailing end is housed within the tubular strand of said successive section and the extreme edge of said leading end is housed within the tubular strand of the section having said trailing end thereby to provide a splice of substantial length, the number of adjacent major strands braided to said splice being sufficient to hold said strand ends in place within their respective housings.

4. The method of forming a long rope comprising, providing a plurality of tubular major strand sections of predetermined length wound on bobbins, each major strand section comprising a plurality of minor strands braided to each other and forming a tubular major strand section, braiding said major strands to each other to form said rope, interrupting the braiding when the trailing end of the first of said major strand sections leaves its bobbin, splicing the trailing end of the first major strand section with the leading end of the next section of the same major strand provided by a replacement bobbin, continuing the braiding of the rope until the trailing end of a second major strand section leaves its bobbin, interrupting the braiding, splicing the trailing end of the second such major strand section with the leading end of the next section of such second major strand provided by a replacement bobbin; and continuing the braiding of the major strands into the rope with similar successive interruptions, splicings, and resumptions of braiding with respect to each major strand of the rope until a rope of desired length is braided.

5. The method of claim 4 wherein said splicing comprises forming an end-to-end splice of said trailing end and said leading end of each of said sections of each of said major strands, said trailing end and said leading end being housed respectively within the tubular confines of the other section to which they are spliced.

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