Jan. 15, 1963 K. BENK ETAL 3,073,209

MOUNTAINEERING ROPES OF CORE-MANTLE STRUCTURE

Filed Jan. 18, 1960

FIG. 1

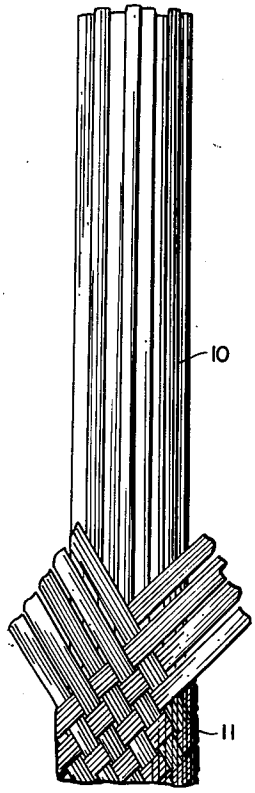


FIG. 2

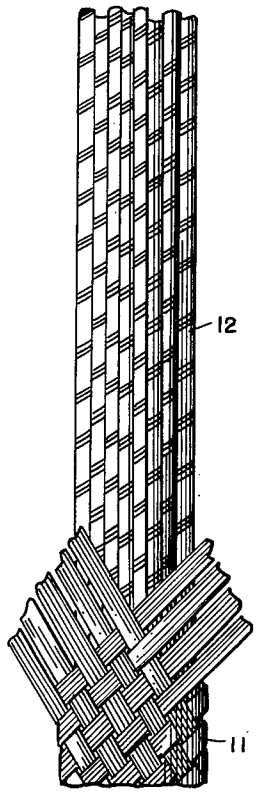


FIG. 3

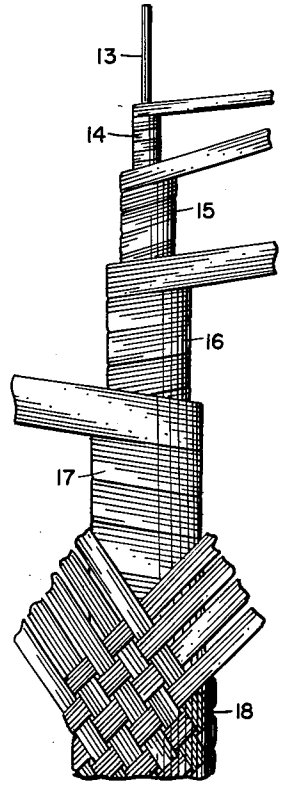


FIG. 4

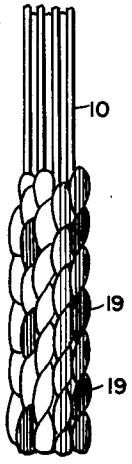


FIG. 5

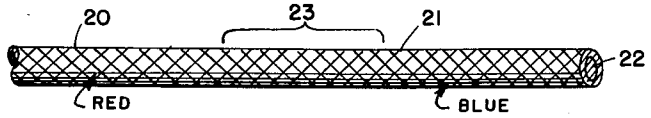
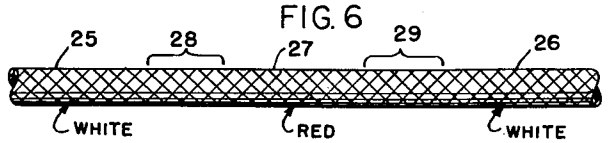


FIG. 6



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MOUNTAINEERING ROPES OF CORE-MANTLE STRUCTURE

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3 Claims. (Cl. 87—6)

This invention, in general, relates to improvements in mountaineering ropes and more particularly relates to improvements in core-mantle mountaineering ropes provided by novel arrangements of colored threads or yarns in the mantle of the ropes.

Mountaineering ropes which are approved by the German Alpine Association must be manufactured in core-mantle structure. The mantle generally consists of yarns in Barmen braiding, which surrounds a core composed of yarns lying parallel in the direction of pull, the yarns being either untwisted or mildly twisted. In other instances the core is made up of yarns S-twisted and Z-twisted about a central strand or strands as disclosed in application serial No. 761,408, filed September 16, 1958, now Patent No. 3,036,490.

These ropes are used not only as safety ropes, but also as double rope of, say, 80 to 100 meters in length, used in climbing. In double ropes, it is important to be able to find or identify the middle of the rope quickly.

We have found that it is possible in a very simple manner to distinguish the two halves of the rope, by using different colored, constrasting yarns for the braided mantle, so that the color change occurs at the middle of the rope—giving a rope with each half a different color. By overlapping of the variously colored yarns at the middle part of the rope, it is possible to carry out the transition from one color to the other in a very simple manner and avoid knots or enlarged segments with impair the good run-off of the rope through snap hooks and the like.

The change of the mantle color without a knotting of the yarns is achieved by having the colored yarns for the first half color and the different, contrasting colored yarns for the second half co-braided over a sufficient length so that a weakening of the mantle is avoided. We have found that an overlapping zone, in which, therefore, both colors are visible, of 0.5 to 1.0 meter is sufficient to achieve this purpose.

In special instances, the mountain climber may wish to estimate how many meters of his rope have run out. For this purpose, the color alternation can be made more than once, according to the given requirements, for example, every 10 or 20 meters. The same technique is employed to smoothly change from one color to another in the mantle.

In our invention, white, of course, is to be regarded as a color, but the mantles of colors other than white, especially those clearly contrasting with white, have the advantage that damaged places in the mantle are easily recognized by the appearance and easy recognition of the white yarns of the core at the damaged mantle area.

In the instance where easy identification at the middle of the rope is the only feature of importance, the rope halves may be white and connected by a short, contrasting color zone of, for example, about one meter in length, said zone being located at the middle of the rope. In this embodiment, the colored middle zone, through overlapping of the co-braided colored yarns of the mantle, is mixed for short distances, e.g., 0.5–1 meter, with the white segments.

Embodiments of our invention are illustrated in the drawing wherein:

FIG. 1 is a plan view of one type of core-mantle rope during manufacture thereof—illustrating arrangements of the yarns in the core and mantle;

FIGS. 2–4 are plan views similar to FIG. 1 and illustrate other types of yarn arrangements in the rope core or mantle;

FIG. 5 is a plan view of a rope segment illustrating the junction between contrasting yarn colors at the middle of the rope or at equally spaced intervals along the length ofthe rope; and

FIG. 6 is a plan view of the middle segment of a rope showing the junctions between two white rope halves and a contrasting colored middle segment of the rope.

The yarns making up the core and mantle may be made of synthetic or natural fibers satisfying tensile strength, bending strength, shock load, and other requirements for the rope. The most satisfactory ropes are made from nylon yarns, e.g., polyamides of e-caprolactam, adipic acid and hexamethylene diamine, or the like. The core is usually at least about 50% by weight of the rope.

In FIG. 1, the core **10** is made up of axially parallel, untwisted nylon yarns. The mantle **11** is composed of a plurality of cross-braided nylon yarns placed around the core **10** by the known Barmen braiding technique. In FIG. 2, the rope is similar to FIG. 1 except that the parallel yarns of core **12** are mildly twisted.

The rope of FIG. 3 has a cable-twisted core made of a single nylon yarn **13** about which is S-twisted a plurality, e.g., six, of yarns of nylon to give core segment **14**. About core segment **14** is further S-twisted a plurality, e.g., twelve, of nylon yarns to give core segment **15**. The core is further built up by S-twisting a plurality, e.g., eighteen, of additional nylon yarns to provide core segment **16**. The outer core segment **17** is composed of a plurality, e.g., twenty-four, nylon yarns Z-twisted about segment **16**. The core is surrounded by the cross-braided mantle **18**, braided by the Barmen technique, and composes about 35% of the weight of the rope.

In FIG. 4, the core is axially parallel, untwisted nylon yarns, and mantle **19** is made of spirally braided nylon yarns.

The embodiment of FIG. 5 shows a rope segment with braided mantle segments **20** and **21** of contrasting colors, in this instance red and blue. These colors, as is true of many others, such as orange, violet, black, green, etc., contrast sharply with the white core yarns **22** of the rope—which core may be any of those in FIGS. 1–4—and thus facilitate the visual inspection of the rope for yarn breaks in the mantle. The zone **23** of the rope, about 0.5–1 meter long, is the junction of the red and blue mantle threads and is made up of co-braided red and blue mantle yarns to give an even surface at the junction.

The rope of FIG. 6 is composed of two halves **25** and **26** of white mantle yarns. The rope has a continuous core, e.g., FIGS. 1–4, of white yarns, and the mantle at the middle segment **27** is made up of a short length, e.g., one meter of red or other colored yarn for ready identification of the middle of the rope. The red and white mantle segments are joined by co-braiding the white and colored threads for about 0.5–1 meter at segments **28** and **29**.

The instant invention provides several important advantages in mountaineering rope construction such as means to easily locate the exact middle of the rope and/or to measure length of rope played out without the presence of enlargements along the rope mantle and a way of more easily recognizing yarn breaks in the mantle of the rope.

The invention is hereby claimed as follows:

1. A mountaineering rope having a core of white yarns and a mantle of colored yarns braided into at least two segments of contrasting colors which also contrast with

white, whereby breaks in the mantle yarns are made visible by the appearance of the white yarns of the core, the braided yarns of one color in a segment of said mantle being co-braided for a short distance at the color change boundary with the yarns of a contrasting color in the adjacent segment of the mantle.

2. A mountaineering rope having a core of white yarns and a mantle of colored yarns braided into at least two segments of contrasting colors which also contrast with white, whereby breaks in the mantle yarns are made visible by the appearance of the white yarns of the core, the braided yarns of one color in a segment of said mantle being co-braided for a distance of about 0.5–1 meter at the color change boundary with the yarns of a contrasting color in the adjacent segment of the mantle.

3. A mountaineering rope having a core of yarns and a mantle of yarns braided about said core, said mantle being subdivided into at least two longitudinally disposed, adjacent sections of contrasting colors by the braiding of said mantle with yarns of one color for at least one section and with different yarns of another, contrasting color for an adjacent section, the different yarns of adjacent

sections being co-braided for a distance of about 0.5–1.0 meter to provide a co-braided section between said longitudinally disposed sections of contrasting color.

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