July 10, 1962 H. A. HOOD 3,043,086

ROPE

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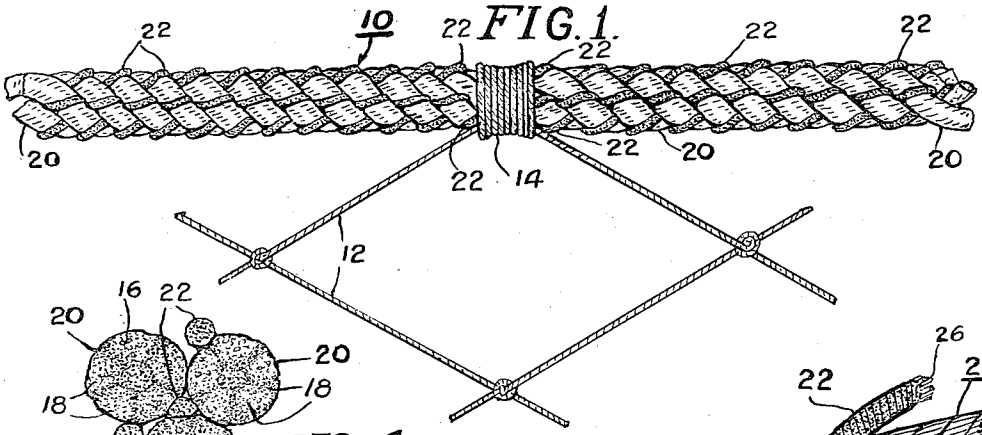


FIG. 1.

FIG. 4.

FIG. 2.

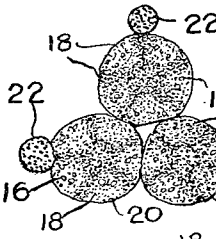


FIG. 3.

FIG. 5.

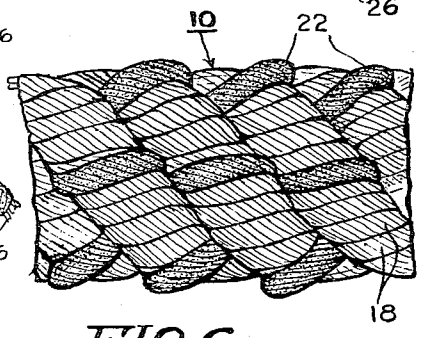


FIG. 6.

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This invention relates to cordage, especially to rope, and more particularly to rope provided with a rough surface texture although made of smooth-textured material.

Ropes made of various synthetic materials are now in common use. These are preferred to ropes made of natural fibers, especially when strength, durability, and resistance to rotting or chemical attack are required properties. Of the synthetic materials currently employed in the making of rope, thermoplastic materials are most widely used, especially nylon, polyester fiber, polyethylene and polypropylene; however, the invention is not limited to cordage made of these fibers.

Some synthetic materials, notably polyethylene and polypropylene, have a slippery or unctuous surface texture. Ropes made ofthese materials are not entirely satisfactory because knots have been known to become undone, and lashings or gangings secured to the rope are susceptible to sliding along the length thereof. Additionally, ropes having a relatively slippery surface cannot be held scurely by the hand.

It is the principal object of the present invention to provide rope made of synthetic material constructed so as to minimize the slippage of lashings secured thereto and/or to possess a rougher surface texture than prior art ropes of this kind.

Cordage constructed according to the present invention comprises a plurality of filaments twisted in a first direction into rope yarns, there being a number of these rope yarns twisted together in a direction opposite to the first direction to form a rope strand. It is to be understood, however, that the invention is applicable to rope having yarn made in one or more operations. Coiled about each strand in the same direction as the strand is twisted is an extra yarn which lies on the surface of the strand. The requisite number of strands, usually three, with the extra yarn coiled about each, are laid up into rope in a direction opposite to the direction in which the strands are twisted. In one form of the invention, the extra yarn coiled about each strand comprises filaments which are twisted in a direction opposite to the direction in which the filaments of the rope yarns are twisted; but in another form of the invention the filaments of the extra yarn and the filaments of the rope yarns are twisted in the same direction.

The invention contemplates still further modifications wherein the number of wraps or turns per unit length of the extra yarn about the strand does not correspond to the number of turns or twists per unit length of the rope strand. For example, when there are more turns per unit strand length of the extra yarn than the turns of the strand, the helix angle of the extra yarn to the strand axis will be greater than if they had the same number of turns per unit length.

The extra yarns appear at closely spaced intervals along the length of the rope, so that the girth of the rope alternately increases and decreases along the length thereof with great frequency. Because of this provision lashings, tightly wrapped about rope portions of reduced girth are secured against axial movement by adjacent rope portions of increased girth.

Furthermore, the twisting of the filaments of the extra yarns opposite to the direction in which the filaments of the rope yarns are twisted disposes the exposed lengths of filaments of the extra yarn more nearly at right angles to the longitudinal axis of the rope than lengthwise thereof. This provision produces, at the exposed outermost portions of the rope, where the extra yarn protrudes, an axially spaced series of minute protuberances which give the rope a rough texture.

When the number of turns per unit length of the extra yarn about its associated strand differs from the number of turns per unit length of each outermost rope yarn, there is little or no tendency for the extra yarn to lie in the depressions of helical formation disposed between adjacent rope yarns, with the result that a full measure of increased girth is achieved from a given extra yarn.

Various other objects, features and advantages of the invention will appear from the following detailed description, taken in connection with the accompanying drawing, forming a part of this application, in which:

FIG. 1 is a elevational view of rope embodying the invention used as a hanging line for fish netting;

FIG. 2 is an enlarged view of a fragment of the rope of FIG. 1;

FIG. 3 is a cross-sectional view of the rope of FIGS. 1 and 2, taken along line III—III of FIG. 2;

FIG. 4 is a view similar to FIG. 3, taken along line IV—IV of FIG. 2;

FIG. 5 is a view similar to FIG. 2, showing the invention in modified form; and

FIG. 6 is a view similar to FIG. 2, showing the invention in another modified form.

For the sake of illustration, and without the intention of limiting the invention, right hand laid rope **10** embodying the invention is shown in FIG. 1 as a hanging line supporting a fish net **12**. The latter is lashed to the rope **10** by gangings **14** tightly wrapped or secured thereabout.

The rope **10** is made of thermoplastic material, or other synthetic material capable of extrusion in great lengths into continuous filaments and having in the range of between .005 to .015 inch cross-sectional diameter. These, commonly termed monofilaments, give rope a smoother surface texture than filaments which are more finely spun. Nylon, polyester fiber, polyethylene, and polypropylene are among the synthetic materials preferred for rope making.

The filaments **16**, preferably of polyethylene material, are successively twisted, in one or more operations, into rope yarns **18**, twisted into strands **20**, and, after coiling an additional or extra yarn **22** about each strand **20**, finally laid up into rope **10**.

As shown in FIGS. 2, 5 and 6, a multiplicity of filaments **16** are Z-twisted, or twisted right-handedly, into rope yarns **18**. A number of rope yarns **18**, six for example, are S-twisted, that is, twisted left-handedly to form each strand **20**. The extra yarns **22** are coiled about their associated strands **20**, as will be explained in detail hereinafter. The strands **20**, with their coiled extra yarns **22**, are Z-laid, or laid up right-handed into rope. Three strands **20** are preferred for rope.

Rope made in this fashion has slight helical depressions between successive, adjacent rope yarns **18** in each strand **20**, but the depressions afford virtually no security against slippage of the gangings **14** along the length of the rope. And the slippery surface texture of materials such as polyethylene makes this condition even more difficult to correct.

In the embodiment of the invention shown in FIG. 2, the filaments **26** of the extra yarn **22** are S-twisted, and preferably they are made of polypropylene material. It will be noted that these filaments **26** are twisted opposite to the direction in which the filaments **16** of the rope yarn **18** are twisted. One extra yarn **22** is coiled left-handedly about the rope yarns **18** comprising each strand **20** after the yarns **18** are S-twisted together into strand form, whereby the extra yarn **22** is given an extra left hand twist as the strand is formed. It will be noted in FIG. 2 that, because of the way in which the extra yarn **22** is

incorporated in the rope, the exposed portions of its filaments **26** are disposed more nearly at right angles to the longitudinal axis of the rope than lengthwise thereof. The exposed portions of the filaments **26** provide the rope with an axially spaced series of small ridges or teeth, thus giving the rope a rough surface.

The rope **10** not only has a rough surface, but its girth alternately increases and decreases with great frequency along the length thereof, thereby enabling a hand to grip the rope more securely. To this end, it will be appreciated that the positional relationship of the extra yarns **22** to each other affect the girth of the rope, the greatest girth being obtained when the extra yarns are all disposed at maximum distance from the rope axis, as shown in FIG. 3. A rope portion of small girth is shown in FIG. 4. With this arrangement, gangings **14** and the like are held against axial slippage along the length of the rope because one or more turns wrapped tightly about a rope portion of small girth will be secured between adjacent rope portions of larger girth. Furthermore, knots are less likely to become undone in ropes made according to the invention.

Modified forms of the invention are shown in FIGS. 5 and 6. In these views like reference numerals are used to designate parts similar to those of the embodiment describe previously.

In the embodiment of the invention shown in FIG. 6, the filaments **26** of the extra yarn **22** are twisted in the same direction as the filaments **16** of the rope yarns **18**; however, the rope alternately increases and decreases in girth along its length as set forth previously without imparting a rough surface to the rope. The absence of surface roughness is desirable for some applications.

The embodiment of FIG. 5 differs from the embodiment of FIG. 2 primarily in the angular disposition of the axis of the coiled extra yarn **22** with the depressions between the rope yarns **18**. The exposed portions of the extra yarn **22** have incremental lengths thereof extending at a small acute angle to the exposed, adjacent depressions of the yarns **18**. This ensures that decreases in girth will not be brought about by nesting of the extra yarns **22** in the depressions. It will be noted that in the embodiment of FIG. 5 more turns of the extra yarn **22** are coiled about its strand **20** for a given length thereof than in the embodiment of FIG. 2. And although not illustrated, the angular disposition of the extra yarns **22** to the depressions adjacent them can be shifted to similar advantage in the opposite direction if fewer turns of the extra yarn are coiled about the same given length of strand **20**.

In all embodiments of the invention, the filaments **26** can be made of any synthetic material suitable for rope. Therefore, it can be made of the same material as the strand **20**, or it can be made of different material, depending upon the requirements of the rope.

From the foregoing it can be appreciated that improved rope has been provided which not only is inexpensive, strong, rugged and dependable, but which is also capable of resisting rotting and chemical attack, and has the desired degree of elasticity and surface roughness; and this can be accomplished even if the filaments from which the rope is made are themselves slippery.

While the invention has been shown in but several forms, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modifications without departing from the spirit thereof.

What is claimed is:

1. Cordage comprising a plurality of strands twisted in a first direction and twined together, each of said strands including a plurality of first yarns each comprising a multiplicity of continuous filaments, and a plurality of second yarns, one of said second yarns being coiled in said first direction about each strand, said second yarns comprising a multiplicity of continuous, twisted filaments, said yarns being positioned relative to each other so as to provide portions of alternately large and small girth along the length of said cordage.

2. Cordage according to claim 1 wherein the filaments of the second yarn are twisted in first direction.

3. Cordage according to claim 1 wherein the filaments of the second yarn are twisted in a direction opposite to first direction.

4. Rope comprising a plurality of strands twisted in a first direction and twined together, each of said strands comprising a plurality of first yarns twisted in a direction opposite to said first direction, and a second yarn for each strand coiled thereabout in said first direction, said second yarn comprising a multiplicity of continuous filaments which are twisted in said first direction.

5. Cordage comprising a multiplicity of continuous filaments which are successively twisted in a first direction into yarns, twisted opposite to said first direction into a plurality of strands, and laid in said first direction into rope; and an additional yarn coiled about at least one of said strands in a direction opposite to said first direction, said additional yarn comprising continuous filaments twisted in a direction opposite to said first direction.

6. Cordage according to claim 5 wherein the filaments have an unctuous surface texture.

7. Cordage comprising a plurality of strands each twisted in one direction, each of said strands comprising yarns which are twisted opposite to said one direction, said yarns comprising a multiplicity of continuous filaments which are twisted in said one direction, and an extra yarn coiled about each of said strands, said extra yarn comprising a multiplicity of continuous filaments which are twisted in said one direction.

8. Cordage according to claim 7 wherein the extra yarns are positioned relative to each other so as to provide the cordage with portions of large and small girth alternately along the length thereof.

9. Cordage according to claim 7 wherein the filaments have a cross-sectional diameter in the range of between .005 inch and .015 inch.

10. Cordage including a plurality of twined strands each comprising a plurality of first yarns twisted together in a first direction, each of said first yarns being made up of continuous thermoplastic filaments which are twisted opposite to said first direction, and a second yarn for each strand coiled snugly thereabout in said first direction, said second yarn comprising continuous thermoplastic filaments twisted in said first direction.

11. Cordage according to claim 10 wherein said second yarn and each of said first yarns differ in the number of turns they make in a given length of strand.

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