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ELASTICALLY STRETCHABLE CORDAGE

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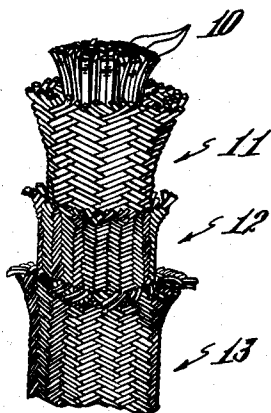


FIG. 1

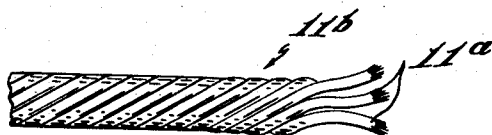


FIG. 2

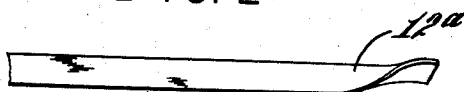


FIG. 3

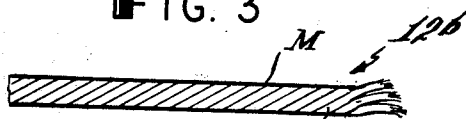


FIG. 4

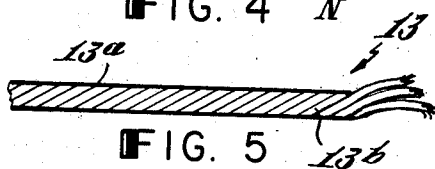


FIG. 5

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ELASTICALLY STRETCHABLE CORDAGE

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This invention pertains to cordage, more especially to elastically stretchable cords of the type wherein a rubber-elastic core, consisting, for instance, of a bundle of parallel rubber-elastic threads, is housed within an outer jacket of a character such as to confine the bundle of elastic threads and which is capable of elongation (but not elastically, as the rubber core elongates. Usually, this outer jacket consists of one or more tubular braids, for example, of textile threads or yarns concatenated about the elastic core as the latter is fed through a conventional braiding machine. While a core comprising a bundle of elastomeric threads is preferable, it is contemplated that a solid elastomeric core might be used for certain purposes.

Such cords are of wide utility, for example, but without limitation, in substitution for some of the more usual inelastic ropes, so many of which are employed for marine purposes; as binder ropes for material piled upon trucks or other conveyances, or for holding truck covers in place; as tent-guy ropes by campers; as supports for trampolines securing binding cords for holding boats on trailers or car tops; for aeronautical and missile use, either civilian or military; and as parachute shrouds thereby to relieve the astronaut or astronaut of excess shock when the parachute canopy opens. In these and other uses such cords are often exposed for long periods to sunlight, heat, moisture, or subjected to off-repeated elongation and contraction and to the abrasive action of external objects in contact with the cord.

However, a thread of rubber-elastic, as well as of certain of the elastomers, whether the thread be cut, extruded or spun, is subject to deterioration, particularly when exposed to radiant energy, such as heat or light—the actinic rays of sunlight being particularly harmful—causing the elastomer to lose its strength and elasticity. Moreover, the outer jacket, usually of conventional textile yarns, is subject to rot, mildew, or other bacterial effects when exposed to moisture, particularly when confined in a storage space in which there is little circulation of air and especially when in a warm climate.

The object of the present invention is to provide an elastic cord which is resistant to the deteriorating agents above referred to, so that its useful life is greatly in excess of usual elastic cords under such conditions of use as above referred to, and so that it is dependable for its intended purpose for a much longer period than the ordinary elastic cords, whereby the necessity for frequent replacement is substantially reduced.

In the attainment of the above object, the present invention contemplates the provision of an elastic core of generally conventional type, that is to say, consisting of a bundle of parallel rubber-elastic threads, but wherein the confining jacket which houses the core is of a construction and material such as to reduce danger of mechanical abrasion of the rubber core; to oppose attack by bacterial action, such, for example, as mold or mildew; to reduce the injurious effects of sunlight, in particular, ultra violet and infrared rays; and wherein the jacket comprises yarns or threads which are stronger than the customary threads employed for the purpose, thus providing a cord of unusually great ultimate strength. Other objects and advantages of the invention will be

pointed out in the following more detailed description and by reference to the accompanying drawings wherein:

FIG. 1 is a fragmentary elevation of a short length of cord, according to the present invention, showing the end of the rubber-elastic core, and a jacket comprising three concentric tubular braids;

FIG. 2 is an enlarged elevation showing a short length of plied yarn such, for example, as is useful in the braiding of the inner tube of the jacket;

FIG. 3 is an enlarged elevation showing a short length of metal yarn such as may be incorporated in braiding the intermediate tube of the jacket;

FIG. 4 is a longitudinal section illustrating another type of yarn which may be used in braiding an intermediate tube of the jacket; and

FIG. 5 is a view similar to FIG. 4, illustrating a yarn useful in forming the outer tube of the jacket.

Referring to the drawings, the numeral 10 designates rubber-elastic strands or threads such as are customarily made by cutting sheet rubber along parallel lines. However, it is to be understood that threads of other elastomers than rubber may be useful, and that extruded threads may be substituted for cut threads if desired. Merely by way of example, the individual rubber threads may be of the order of $\frac{1}{32}$ of an inch in square, but this dimension may be varied as desired and in accordance with the character of the rubber and the desired size of the core. Conveniently, these threads may be such as are initially furnished in pairs, wherein individual threads slightly adhere to one another. It is obvious that enough of these individual rubber threads will be assembled so that, in the aggregate, they will provide ample strength to support the greatest shock load to which they are subjected. For example, when this bundle of rubber threads is compacted by the enveloping jacket, it may form a substantially solid circular core of the order of $\frac{1}{2}$ inch in diameter.

The first or inner braided tube 11 should be of a material which will not abrade the rubber core strands as the constituent yarns of this tube 11 move relatively to the rubber strands in response to the stretching and contraction of the cord. Desirably, soft, unglazed cotton yarns, either single ply or multi-ply, are employed. Merely by way of example, the thread 11b, shown in FIG. 2, comprises three strands 11a twisted together with a low twist to form a soft three-ply thread. Such soft threads are used in the braiding machine in braiding the tube 11. Cotton is desirable for these threads because of its softness, but, instead of cotton, certain of the synthetic yarns, in particular spun or bulked yarns, might be employed—the synthetic fibers being desirable because they are resistant to mildew.

The intermediate tube 12 is desirably made from a material which reflects sunlight and thus protects the rubber core from injury by actinic or infrared rays. Thus, for example, this tube 12 may be braided wholly from metal yarn, such as the yarn 12a, illustrated in FIG. 3, or such yarns reinforced with textile yarns. However, it is preferable to employ a metalized organic yarn 12b (FIG. 4), such, for example, as "Mylar" yarn N, vacuum-coated with metal M, or a yarn made of "Mylar" and sheet metal laminated together and slit to form yarn. Composite yarns (except those wherein the organic strand is cellulosic) are mildewproof.

The outer tube 13 is preferably braided from nylon yarn 13b (FIG. 5) coated with vinyl 13a. The vinyl coating protects the nylon, being resistant to abrasion, while the nylon provides great tensile strength. Other synthetics may be employed (in particular, in continuous monofilament ribbons, or in multifilament form, providing high tensile strength), which are characterized by high resistance to the effects of radiation, coupled with

abrasion resistance, as, for example, polypropylene, and when strands of this type are tightly twisted and the resultant yarns braided, as illustrated in FIG. 1, a cord of great strength and long useful life results.

The cord thus provided has all the desired resilient strength, with respect to supporting a shock load to which it may be exposed, while the inner tube 11 protects the rubber core from abrasion and, if of nylon or other non-cellulosic material, provides mildew-proofing. The mid-tube 12 provides the desired protection against deterioration of the elastomer by reason of the action of light rays, including ultra violet and infrared; provides a further protection against mildew; and gives added strength. The outer tube 13 provides protection against abrasion from contact with external objects and gives additional tensile strength to the composite braided jacket to sustain the stresses to which it is subjected as the core is extended in response to shock load.

While the construction herein specifically disclosed is desirable, it is contemplated that some of the desired results may be attained, although a lesser number of concentric tubes were employed; for example, much of the desired effect would be obtainable without the external tube 13, although, as above noted, that tube has a very useful function in protecting the cord from mechanical abrasion, as well as adding to the tensile strength and protection from radiation. On the other hand, by the use of additional intermediate tubes, intensified effects may be obtained, and it will be understood that any modifications of structure or materials employed, which fall within the terms of the appended claims, are to be considered as within the scope of the invention.

I claim:

1. An elastically stretchable cord comprising a core consisting of parallel elastomeric threads, and a jacket comprising a plurality of concentric tubular braids, the innermost of said braids being soft and non-abrasive and consisting of bulked synthetic yarn which is resistant to mildew, at least one of said braids being resistant to the passage of actinic rays from the exterior of the cord to the core.

2. An elastically stretchable cord comprising a rubber-elastic core, and a jacket comprising a plurality of concentric tubular braids, the innermost of said braids being non-abrasive and consisting of soft three-ply threads of unglazed cotton yarn, one at least of the braids compris-

ing light-reflecting material operative to deflect actinic rays of sunlight away from the rubber core.

3. An elastically stretchable cord, according to claim 2, wherein the jacket comprises three concentric tubular braids, and the outer braid is of a material which resists mechanical abrasion.

4. An elastically stretchable cord, according to claim 2, wherein the outermost braid consists of nylon yarns coated with vinyl.

5. An elastically stretchable cord, comprising a core consisting of rubber-elastic threads and a jacket which houses the core and which comprises at least three concentric tubular braids, the inner tubular braid being of a soft material incapable of injuriously abraiding the rubber cord in response to relative motion of the core and said inner braid, and another of said tubular braids comprising strands of light-reflecting material.

6. An elastically stretchable cord comprising a core, including parallel rubber-elastic threads, and a jacket which houses the core and which comprises a plurality of tubular concentric braids, the inner braid consisting of textile material which is nonabrasive as respects contact with the rubber core, another of said concentric braids comprising metal so disposed within the substance of the braid as to prevent infrared rays from being transmitted to the core, and the outermost braid comprising strands which are resistant to mechanical injury.

7. An elastically stretchable cord having a core, comprising parallel rubber-elastic threads, and a jacket which houses the core, said jacket comprising a plurality of concentric tubular braids, the inner of said braids being of soft material incapable of injuriously abraiding the rubber core, an intermediate braid comprising metalized synthetic fiber strands capable of reflecting actinic rays thereby opposing the passage of infrared rays inwardly toward the rubber core, and the outermost tubular braid comprising vinyl-coated nylon strands.

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