

UNITED STATES PATENT OFFICE.

THOMAS TARVIN GRAY, OF ELIZABETH, WALTER L. FAUST, OF SUMMIT, NEW JERSEY, AND MALVIN R. MANDELBAUM, OF BROOKLYN, NEW YORK, ASSIGNORS TO WHITLOCK CORDAGE COMPANY, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW JERSEY.

WATER-RESISTING IMPREGNATING COMPOUND FOR CORDAGE.

No Drawing.

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Our invention relates to water-resisting impregnating compounds for cordage, and particularly to compounds for treating ropes, hawsers, and the like, which are intended to be used where they may be exposed to rain, sea water, and other forms of dampness.

A particular object of our invention is to provide a compound which is readily assimilated by rope fibres and acts as a lubricant thereof and which is so water repellent when applied to rope, hawser, and other cordage as to make the same practically water proof, so that despite such exposure the rope will retain its full share of lubricant and will accordingly remain strong, flexible and easy to handle.

The stiffness and inflexibility of wet rope has heretofore presented great difficulty and danger when in use. When ordinary lubricated rope is exposed to dampness the moisture penetrates into and distends the cells of which the fiber is formed, thereby swelling the rope and making it stiff and unmanageable and at the same time driving out a part of the natural waxes of the fiber and of the artificial lubricant as well. As the natural waxes and artificial lubricants are driven out the fibers become brittle and tend to disintegrate in drying out so that the life of the rope as well as its strength and serviceability are substantially diminished by such exposure. By providing a lubricating and water-resisting compound which is capable of impregnating the cells of the rope fiber so as to make the rope substantially water proof we retain the natural and artificial lubricants in the fiber and overcome the difficulties heretofore met and provide a rope which is longer lived and superior to any now known.

Other advantages of our invention will be apparent from the following description and claims.

Broadly, the compound consists of a non-volatile solvent, having the viscosity of lubricating oil, a mineral wax and a non-mineral wax or wax-like substance mixed in such portions as to be semi solid or solid at ordinary temperatures (i. e. below 100° Fahrenheit) and to be a free flowing liquid

at about 140 to 180 degrees Fahrenheit. The compound as a whole has the capacity of penetrating the walls of the fiber cells and filling the cells and thus impregnating the fiber. It then functions both as a lubricant for the fiber and as an agent to resist the entrance of any dampness or water into the cellular structure of the fiber.

The non-volatile solvent may consist of any mineral oil such as cylinder oil, red oil, spindle oil, paraffin oil, neutral oil, petrolatum or the like. It is employed primarily as a vehicle for conveying the remaining constituents into the fiber cells and preferably does not exceed 60% of the compound by volume, but in any event should be sufficient to give plasticity to the particular wax or waxes employed. By the term non-volatile solvent we mean those solvents of the materials used which do not evaporate appreciably under ordinary conditions of temperature or pressure and particularly lubricating oils of the character described.

Any mineral wax may be employed such as ceresine, ozokerite, Montan wax, lignite wax, paraffin, shale wax, or the like. Its function is to penetrate the cells of the fiber and lubricate them and make them substantially water proof. It preferably constitutes about 30% of the volume of the compound.

The non-mineral wax may be beeswax, carnauba wax, palmwax, wool wax, insect or China wax, Japan wax, spermacetti, stearin, or similar substances or esters having similar physical properties. It has the function of a binder to make the compound more adhesive and more water repellant so that it is retained in more intimate contact with the fibers of the rope and resists abrasion. It preferably constitutes about 10% of the compound by volume.

In addition a small quantity of essential oil may be employed for the purpose of giving a pleasant odor to the compound and to the rope with which it is treated. Examples of such oils are mirbane, anis-rosemary, citronella, sassafras, wintergreen, lemon oil, etc. The lemon oil has the additional advantages of bleaching the fiber somewhat to give it a more desirable color.

As a particular illustration of our lubricating compound we recommend the following mixture.

- 125 pounds of spindle oil.
- 95 pounds of paraffin wax.
- 25 pounds of Japan wax.
- 1 pound of citronella and lemon oil mixed equally.

The paraffin wax and Japan wax are preferably melted and brought to a temperature of about 150 degrees and then mixed with the spindle oil which has been previously raised to about the same temperature. The ingredients are then thoroughly stirred together and may be applied to the cordage at once in the ordinary manner in which cordage oil is applied, namely, by sprinkling the same on the fiber at the breakers. If it is not desired for immediate use it may be poured into suitable containers and allowed to cool. At normal temperatures it is a semisolid or solid and may be stored in containers. To prepare it for use it should be gently warmed until it has melted and the mixture has come to a temperature in the neighborhood of 150 to 180 degrees Fahrenheit.

We are aware that petroleum oil has long been used as a lubricant for cordage and that it is commonly mixed with wool grease which has the capacity of penetrating the fiber and making it softer and smoother, but wool grease is unstable and the combination of the same with petroleum oils is emulsifiable in water, the emulsion being in a short time washed out by the water whereby the lubricant is driven off and the rope left subject to rapid deterioration. Furthermore the emulsion operates to release dilute fatty acids which are likely to attack the fiber and produce further emulsification of any remaining lubricant. Such rope, furthermore, becomes discolored with age so that it cannot be sold as new rope after storage.

We are also aware that water resisting coating compounds have heretofore been suggested employing waxes and a vehicle for depositing them on the fabric and in the mesh of the fabric. In certain of these prior compounds the vehicle employed for the waxes consists of a light solvent or solvents volatile at ordinary temperature and pressure. In others the vehicle consists of water with additional agents for emulsifying the waxes.

When such compounds are applied to cordage fiber the vehicle alone is capable of penetrating into the cells of the fiber for the waxes are filtered out and excluded by the cell walls thus preventing impregnation of the fiber by the compound as a whole and leaving only a solid and relatively inflexible film of the waxes on the exterior of the fiber, which film would in the case of cordage soon

be fractured and worn off in use. On evaporation of the vehicle contained in any one of the compounds of the prior art after its application to cordage fiber, the coils of the fiber would become partially empty and therefore capable of absorbing moisture on subsequent exposure. The presence of moisture in the cells will ultimately drive out the natural waxes and will always prevent the ingress of the artificial waxes and so prevent impregnation of the cells by the compound as a whole.

In none of the compounds heretofore suggested, so far as we know, is the compound as a whole capable of impregnating the cells of the fiber nor is it so constituted as to be at once stable, water-resisting and effective as a permanent lubricant for the fiber.

We have found that when suitable waxes are dissolved in a non-volatile solvent of the character and viscosity described herein the compound as a whole including the waxes is capable of penetrating the cell walls into the interior of the fiber cells. And when cordage fiber is treated with our compound we find that the vehicle not only carries the waxes into the fiber cells so that the cells are fully impregnated with the compound, but being non-volatile and stable the vehicle remains with the waxes in a semisolid state in the cells and so cooperates with the waxes to prevent the entrance of any moisture. By providing a compound which not only fully impregnates the cells of the fiber but permanently fills them with stable, water-resisting, lubricating material, we are able to produce a rope which during its life is not only substantially waterproof but permanently lubricated. There is a novel cooperation between the constituents of our compound not found in prior compounds, for, on the one hand the solvent acts as a vehicle for conveying the waxes into the interior of the fiber cells, and, on the other hand, through their resistance to the entrance of any moisture, the waxes serve to permanently retain the solvent as a part of the lubricating compound in the cells of the fiber.

By our invention we provide a stable lubricant which supplements the natural waxes of the fiber to produce extremely high water resistance and effective lubrication. The water resisting quality of rope fiber impregnated with our compound results in the lubricant being retained in the rope for a very much longer period so that the life of the rope and its maximum utility and strength are very materially prolonged. The compound has no harmful effect upon the fiber and does not cause discoloration with age. It is stable for the life of the rope structure and adds to the resistance against the action of acids on the rope. By the use of our lubricating compound we

have made rope having two to five times the durability in marine use of the best lubricated rope heretofore known besides important advantages, such as continued softness and flexibility despite prolonged exposure to rain or sea water, avoidance of the necessity of hanging the rope out to dry, etc.

In defining our impregnating compound herein as "stable" we mean that it is of such character as to remain a homogeneous composition substantially unchanged by exposure to the elements at normal temperature and during ordinary use of the fibrous material to which it may be applied. By "plastic" we means that the compound is a non-brittle substance which at normal temperature is semi-solid and freely conforms to changes in shape of surfaces with which it may be in contact. Our impregnating compound is both stable and plastic. Its stability prevents loss in volume, prevents appreciable oxidation during the life of the material to which it is applied and prevents chemical reaction between the compound and such material. Its plasticity prevents interference with the natural flexibility of the material and permits the compound to pass in and out of the fiber cells so that it acts both as an internal and external lubricant and waterproofing agent for the fibers.

It will, of course, be understood that the foregoing description of our invention is illustrative only and that the invention is not intended to be limited except as defined in the appended claims.

What we claim and desire to secure by Letters Patent of the United States is:

1. A stable and plastic water-resisting impregnating composition for cellular fibrous material consisting essentially of a waterproofing wax and a non-volatile plasticizing agent for the wax.

2. A stable and plastic water-resisting impregnating composition for cellular fibrous material consisting essentially of a waterproofing wax and a non-volatile solvent for the wax in quantity sufficient to plasticize the same.

3. A stable and plastic water-resisting impregnating composition for cellular fibrous material consisting essentially of a waterproofing wax, a binder and a plasticizing agent for the same in quantity sufficient to plasticize the composition.

4. A stable and plastic water-resisting impregnating composition for cellular fibrous material consisting essentially of a mineral wax, a non-mineral wax and a liquid non-volatile solvent for the same in quantity sufficient to produce plasticity of the composition.

5. A stable and plastic water-resisting impregnating composition for cellular fibrous material consisting essentially of a waterproofing wax, a binder and a plasticizing agent for the same, the quantity of wax exceeding that of the binder and being less than that of the said agent.

6. A stable and plastic water-resisting impregnating composition for cellular fibrous material consisting essentially of a waterproofing wax comprising not less than 30% of the composition, a binder and a plasticizing agent in quantity sufficient to plasticize the composition.

7. A stable and plastic water-resisting impregnating composition for cellular fibrous material consisting essentially of a waterproofing wax, a binder and a non-volatile solvent for the same, the wax and binder constituting more than 30% and the solvent less than 60% of the composition by volume, the quantity of solvent being sufficient to plasticize the composition.

8. A stable and plastic water-resisting impregnating composition for cellular fibrous material consisting essentially of paraffine wax and a non-volatile lubricating oil in quantity sufficient to plasticize the wax.

9. A stable and plastic water-resisting impregnating composition for cellular fibrous material consisting essentially of paraffine wax, a wax-like binder and non-volatile lubricating oil in quantity sufficient to plasticize the composition.

10. A stable and plastic water-resisting impregnating composition for cellular fibrous material consisting essentially of a waterproofing wax, a binder and a plasticizing agent for the same, the said agent constituting more than half of the composition by volume and being of such viscosity as to render the composition plastic.

In testimony whereof, we have signed our names to this specification.

THOMAS TARVIN GRAY.
WALTER L. FAUST.
MALVIN R. MANDELBAUM.