

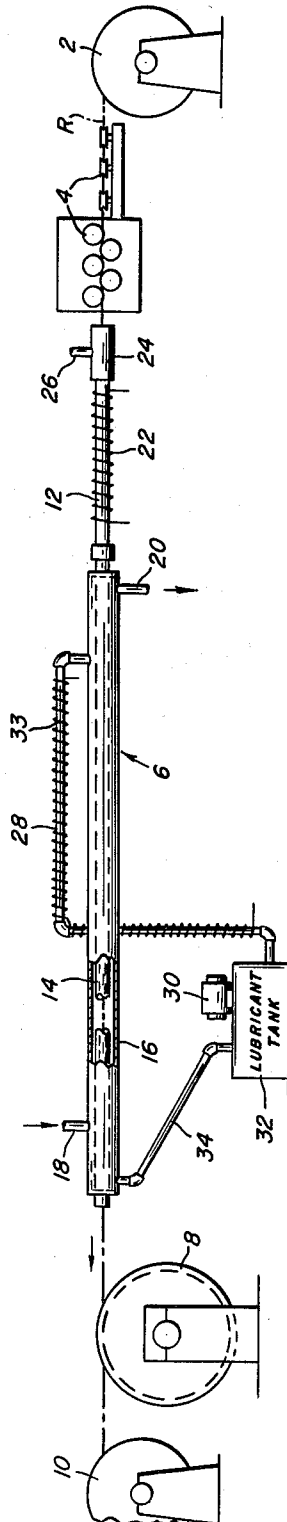
Oct. 27, 1964

J. J. GRIMES, JR., ETAL

3,154,440

METHOD FOR TREATMENT OF LUBRICATED STRANDED WIRE STRUCTURES

Filed Aug. 15, 1961



INVENTORS
JOHN J. GRIMES, Jr. and
WILBERT A. LUCHT
By *Donald L. Dalton*
Attorney

1

2

METHOD FOR TREATMENT OF LUBRICATED STRANDED WIRE STRUCTURES

John J. Grimes, Jr., Hamden, and Wilbert A. Lucht, Orange, Conn., assignors to United States Steel Corporation, a corporation of New Jersey

Filed Aug. 15, 1961, Ser. No. 131,514

4 Claims. (Cl. 148—16)

This invention relates to a method of and apparatus for making stranded wire structures. We have found that the breaking strength of stranded wire structures, particularly wire rope made of ordinary steel or alloy steel will be improved if stress relieved at temperatures of between 600 and 1100° F. However, most wire ropes have a lubricant thereon and such lubricants are desirable for protecting the rope and permitting freedom of movement of the individual wires in the rope. Wire rope lubricants are well known in the wire rope art and are manufactured and sold by many suppliers. In general these lubricants have an asphaltic or petroleum type base. The lubricant must be thin enough to reach the inner wires of the rope and yet have the ability to cling to the wires. The lubricants are not ordinarily soluble in water but are soluble in kerosene or any of the other lighter hydro-carbons. The lubricants must not break down in the presence of acid fumes, but must be acid-free so as to not corrode the rope. While the flash point may vary somewhat it is generally between 400 and 500° F. The Saybolt Furol viscosity of typical lubricants at 210° F. may be a maximum of 600 to 800 and at 250° F. a maximum of between 100 and 150. Suitable lubricants used by the American Steel and Wire Division of United States Steel Corporation are marketed by such companies as Cities Service Oil Company and The Texas Company. Their trade names for these lubricants are Cities Service 150-X and Texaco "C." Because of the presence of lubricants in wire rope we have found that the wire rope cannot be stress relieved in the ordinary manner because the lubricant will burn off. If no lubricant is present, damage to the rope may occur. Some types of wire rope use fiber cores and with such rope the fiber core will be burnt out. Even though the rope is stress relieved without damage it will not be suitable for use without further lubrication, this being an additional expense. In a few cases it is not desired to have any lubricant on the rope, but ordinary stress relieving will leave the rope in a discolored condition.

It is therefore an object of our invention to provide an improved method of stress relieving stranded wire structure, such as a wire rope.

Another object is to provide such a method in which the wire rope is lubricated as it is stress relieved.

A further object is to provide a method of making an improved lubricated stranded wire structure.

Still another object is to provide a method of simultaneously cleaning and stress relieving a stranded wire structure.

A still further object is to provide an apparatus suitable for carrying out our methods.

These and other objects will be more apparent after referring to the following specification and attached drawing, in which the single figure is a schematic view of the apparatus of our invention.

Referring more particularly to the drawing, reference numeral 2 indicates a payoff reel for wire rope R. The wire rope passes from payoff reel 2 through a roll straightener 4 and a conduit 6 and then around a power driven capstan 8 to a take-up reel 10. The conduit 6 includes a glass tube 12 adjacent the entry end thereof. In place of glass any electrical insulating material may be used. The conduit 6 also includes a steel tube 14

surrounded by a water jacket 16 having a water inlet 18 and a water outlet 20 at opposite ends thereof. An induction coil 22 surrounds the glass tube 12 and is powered from a suitable source, not shown. A tube 24 may be connected to the glass tube 12 at the entry end thereof with a seal, not shown, being provided adjacent the roll straightener 4. Nitrogen or other suitable neutral or deoxidizing gas such as argon, carbon monoxide or the like may be introduced into tube 24 through a pipe 26. A wire rope lubricant is delivered to the conduit 6 through a pipe 28 by means of a pump 30 mounted on lubricant tank 32. Heat may be supplied to the pipe 28 by means of a resistant coil 33. A lubricant return line 34 is connected to the exit end of conduit 6.

In carrying out our invention a wire rope to be treated is threaded from the reel 2 through roll straightener 4 and the conduit 6 to the capstan 8. In order to purge the conduit 6 of air, nitrogen or other suitable gas may be introduced through the pipe 26. However, this purging may be omitted in the practice of our invention. The lubricant, which may be heated by any suitable means if necessary, is delivered to the conduit 6 through the line 28 and will fill the conduit. Preferably the conduit 6 will slant slightly downwardly toward reel 2 when used in this manner. Heat is applied by means of the induction coil 22 and the rope is continuously pulled by means of the capstan 8 through the conduit 6. Sufficient tension is applied to the rope R to at least keep it taut. The induction coil 22 heats the wires of the wire rope R to a temperature of between 600° and 1100° F., this temperature varying somewhat depending upon the type of steel making up the rope. As the wire rope R passes from the induction coil 22 through the conduit 6 it will gradually cool to a temperature below the flash point of the wire rope lubricant while still surrounded by the lubricant. Further cooling of the wire rope takes place in the air when the wire rope leaves the conduit 6. If desired other means may be provided for cooling the wire rope after it leaves the conduit 6. Other apparatus may be used for carrying out our method, it only being necessary that the wire rope pass through a container containing the lubricant with the wire rope being heated to its stress relieving temperature while in the lubricant, and subsequently being cooled in the lubricant below the flash point of the lubricant. We have found that our method in addition to increasing the breaking strength of the cable will not damage the cable, nor burn up a fiber core when present. At the same time the rope is thoroughly lubricated throughout.

In some instances, particularly when only a small amount of lubrication need be provided on the rope, a lubricated rope can be stress relieved by passing through an atmosphere of nitrogen or other suitable gas without the lubricant being added in conduit 6.

Also, it is possible to use this apparatus for cleaning and stress relieving wire rope when lubricant is not desired on the rope. In doing this the conduit 6 is preferably slanted slightly upwardly toward the reel 2 and water instead of lubricant is delivered through conduit 28 to conduit 6. The flow of water to conduit 6 is so regulated that it turns to steam when it comes in contact with the hot rope with the steam very effectively cleaning the rope of lubricant and other materials. Nitrogen or other suitable gas is preferably introduced through pipe 26 in this operation. Before reaching the air the temperature of the rope is preferably below 500° F. A one inch 6 x 25 Independent Wire Rope Core made of Type 304 Stainless Steel has been successfully cleaned and stress relieved at a temperature of 1000-1050° F. in this manner.

While several embodiments of our invention have been shown and described, it will be apparent that other adapta-

3

tions and modifications may be made without departing from the scope of the following claims.

We claim:

1. The method of making a lubricated stranded ferrous base wire structure comprising passing the stranded wire structure continuously through a wire rope lubricant, heating the stranded wire structure while surrounded by said lubricant by induction heating to a temperature of between 600° and 1100° F., and cooling said stranded wire structure while surrounded by said lubricant to a temperature below the flash point of said lubricant with the stranded wire structure retaining its lubrication following the stress relieving.

2. The method of stress relieving and lubricating ferrous base wire rope comprising passing the rope continuously through a wire rope lubricant, heating the rope while surrounded by said lubricant by induction heating to a temperature of between 600° and 1100° F., cooling said wire rope while surrounded by said lubricant to a temperature below the flash point of said lubricant with the stranded wire structure retaining its lubrication following the stress relieving, passing said rope from said lubricant, and then further cooling said rope.

3. The method of making a lubricated stranded ferrous base wire structure comprising passing the stranded wire structure with wire rope lubricant thereon continuously through a non-oxidizing medium, heating the stranded wire structure by induction heating to a temperature of between 600° and 1100° F. while in said

4

medium, and cooling said stranded wire structure while in a non-oxidizing medium to a temperature below the flash point of said lubricant with the stranded wire structure retaining its lubrication following the stress relieving.

4. The method of making a lubricated stranded ferrous base wire structure comprising passing the stranded wire structure with wire rope lubricant thereon continuously through a non-oxidizing medium, heating the stranded wire structure by induction heating to a temperature of between 600° and 1100° F. while in said medium, and cooling said stranded wire structure while surrounded by wire rope lubricant to a temperature below the flash point of said lubricant with the stranded wire structure retaining its lubrication following the stress relieving.

References Cited in the file of this patent

UNITED STATES PATENTS

2,463,412	Nachtman	Mar. 1, 1949
2,549,666	Cope et al.	Apr. 17, 1951
2,625,495	Cone et al.	Jan. 13, 1953
2,880,739	Popp	Apr. 7, 1959
2,930,724	Rudd	Mar. 29, 1960
2,932,502	Rudd et al.	Apr. 12, 1960
2,979,321	Peterson	Apr. 11, 1961

OTHER REFERENCES

Metals Handbook, 1948 edition (pp. 237-243 relied upon).