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REELING PREASSEMBLED PARALLEL WIRE STRANDS FOR
BRIDGES AND OTHER STRUCTURAL
APPLICATIONS
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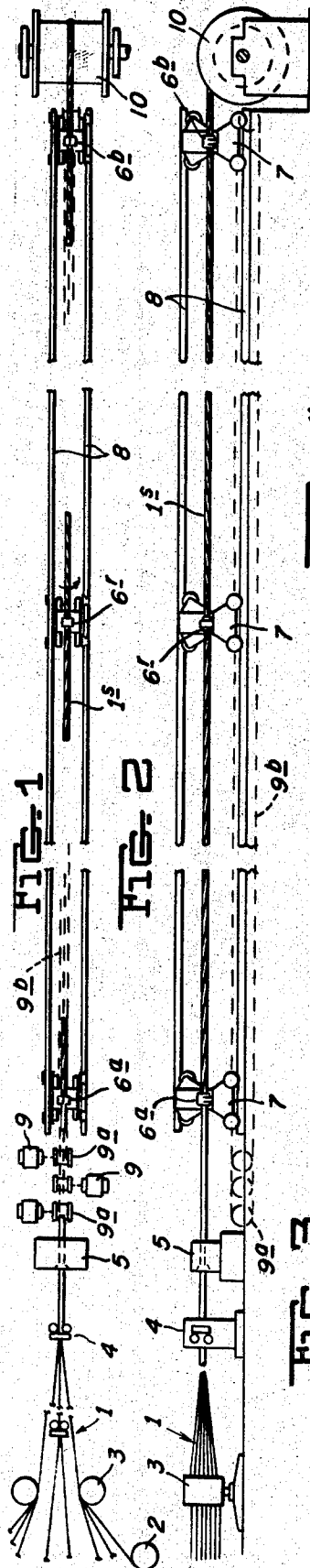


FIG. 1

FIG. 2

FIG. 3

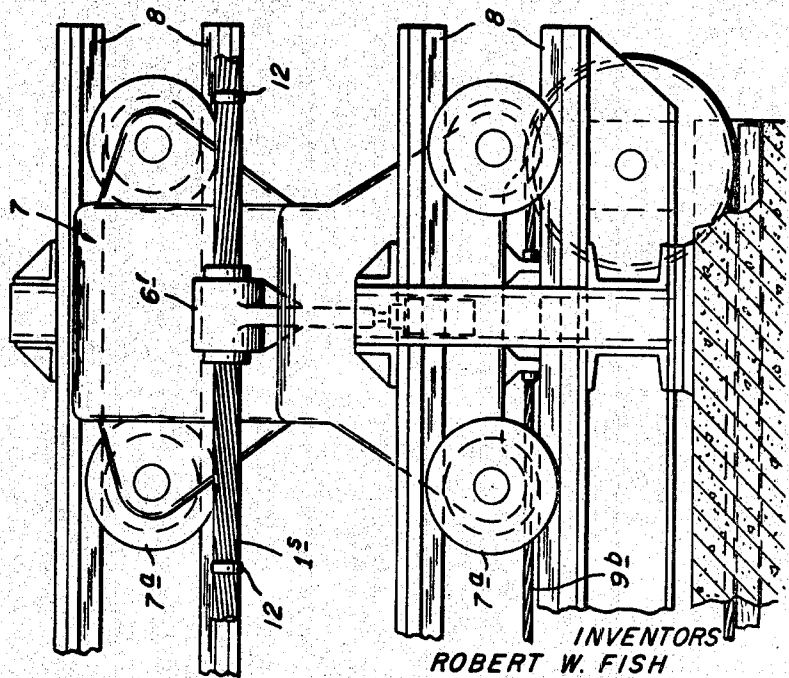


FIG. 3

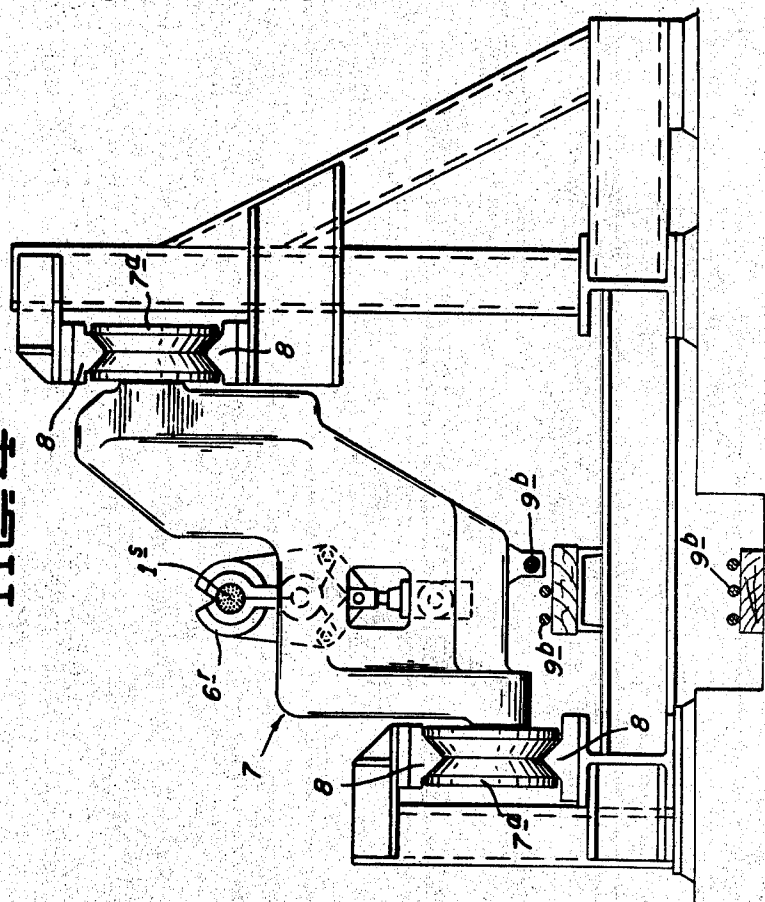


FIG. 4

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REELING PREASSEMBLED PARALLEL WIRE STRANDS FOR BRIDGES AND OTHER STRUCTURAL APPLICATIONS

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Continuation of application Ser. No. 662,163, Aug. 21, 1967. This application May 22, 1969, Ser. No. 828,438 Int. Cl. B65h 54/00, 59/10

U.S. Cl. 57—156

8 Claims

ABSTRACT OF THE DISCLOSURE

Compact reeling of long lengths of preassembled parallel steel wire strands for suspension construction, such as suspension bridges and roofs, for example, is permitted by imparting a periodic pattern of alternate right-lay and left-lay twists to the strands in preparation for reeling. This twisting is gauged to assure that equal lengths of individual wires are put onto the reel in spite of the varying radii of the individual wire loops created by the reeling, while at the same time not being so severe in deformation as to preclude ready return of the wires of the strand to their original parallel structure upon unreeling. Suitable seizings are employed about the strands to improve their manageability during reeling.

This application is a continuation of application Ser. No. 662,163, filed Aug. 21, 1967, now abandoned.

BACKGROUND OF THE INVENTION

The invention is particularly concerned with provision of compact and orderly reeling of preassembled parallel steel wire strand, with a view to its ready transportation from a point of manufacture to its point of use, and to minimizing its difficulty in installation.

The strands under consideration are approximately of circular cross section. Owing to the difference in radii between the inner and outer loops in the reeling process, compact reeling, in usual fashion, is precluded by excess slack in those individual wire loops with the shorter radii.

This invention relates to suspension cables formed of parallel wire strands, as distinguished from helical-wire-strand cables, for bridges, roofs and other structures. The invention relates, more particularly, to a method of reeling a strand of parallel wires and is directed to improvements which enable its being wound on a drum and removed therefrom without kinking or snarling of the individual wires in such strand. In a manner to be described, the improvements of this invention with respect to preventing kinking or snarling of the cable wires during reeling are obtained by applying a twist to the strand which is reeled on a drum, the amount of angular twist being such that undesirable slack does not develop in individual wires during the reeling operation.

The basic problem involved in packaging a parallel wire strand on a reel for transportation stems from the fact that the wires closest to the reel drum have a shorter path than the outer wires. For example, in reeling a parallel wire strand formed of 81 wires of .196" diameter on a 6' diameter drum, the inner wires develop about 13" of slack for each wrap around the reel drum. Unless formation of this slack can be prevented, it will build up into undesirable slack that may result in tangles and kinks that would prevent winding more than a few wraps on the reel without harmful effect on the strand.

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SUMMARY OF THE INVENTION

To achieve the objectives of relatively compact and orderly reeling of preassembled parallel steel wire strand, without overstressing any of the wires therein, with minimized difficulty of transportation, and improved facility in strand installation, the invention according to the preferred practice thereof encompasses the imparting of alternate hand, right-lay and left-lay twists, to the preassembled parallel wire strand, to assure that equal lengths of individual wires of the strand are put onto the reel in spite of the varying radii of the individual wire loops occasioned by reeling on conventional wire reels. These twists are of a somewhat superficial nature, in that, while they retain their form while the strand is in place upon the reel, the deformation in twisting is not sufficiently severe to preclude "self cancelling" action upon unreeling, which enables the strand to revert to its original parallel wire arrangement when unreeling.

Seizings are applied at intervals along the strand to improve manageability of the strand during reeling. The seizings are preferably applied after twisting, but may be applied before twisting if desired.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a schematic plan view of the strand twisting device;

FIG. 2 is a front elevation of FIG. 1;

FIG. 3 is an enlarged front elevation of one of the strand clamps, as well as the strand in twisted condition; and

FIG. 4 is a side view of FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In FIGS. 1 and 2, wires 1 are payed off from reels represented by 2, through tension brakes in the form of hold back drums 3 and guide rolls 4, to closing head 5 which has an approximately circular aperture. The strand 1s thence proceeds through clamps generally designated 6, and more particularly 6a, 6r and 6b, of which 6a and 6b are non-rotatable, while clamp 6r is rotatable. These clamps ride on carriages 7 having wheels 7a guided by tracks 8. Motive power for positioning of the clamp carriages may be provided by motors 9, through conventional means such as drums 9a and wire rope 9b connected therewith. The strand 1s is reeled onto rotatably driven reel 10, preferably in conventional fashion, such as employed for rope.

FIG. 3 schematically depicts a rotating clamp 6r, with detailed rotating operating mechanism deleted.

In FIG. 4, clamp element 6r emphasizes a characteristic of all three clamps 6, namely that of being capable of releasing the strand 1s at appropriate times during reeling.

All three clamps 6, as best shown in the case of the clamp 6r in FIG. 3, engage and apply a clamping action to the peripheral surface of the strand 1s which operates to hold the wires 1 therein in a tight bundle.

The particular arrangement of the supporting structure for the carriages 7 and clamps 6 is not a part of the present invention.

In initial operation, a leader (not shown) is fed, from left to right, through closing head 5 and prepositional clamps 6a, 6r and 6b, and thence secured to drum 10, to be followed by strand 1s, which is clamped, preferably in accurately measured relationship, by clamps 6a and 6b. The carriage of clamp 6b is then locked adjacently to reel 10, against movement along tracks 8, to prevent any unreeling of the strand, while the carriages of clamps 6a and 6r remain free to move therealong. At this point the strand twisting operation is effected by rotating clamp 6r.

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Conventional seizings 12, illustrated diagrammatically in FIG. 3, preferably in the form of tightly wound wire wrapping, are applied at appropriate intervals along the twisted strand, prior to winding on the drum 10, to secure the wires 1 in the strand 1s in a tight bundle against movement relative to each other and to obtain uniformity in reeling. The seizings 12 also contribute to the prevention of crossovers and kinks in the final unreeled strand.

After the strand has been twisted by rotation of clamp 6r, clamp 6b is released and reel 10 is rotated to take up the twisted strand, clamps 6r and 6a meanwhile preventing untwisting. Clamp 6r is released next when it is moved to a position adjacent the clamp 6b and reel 10. Similarly following clamp 6a is released when it approaches the clamp 6r and the reel 10. At this point clamp 6b is operated to clamp and hold the strands 1s, while the clamps 6r and 6a are returned to their initial positions for clamping and twisting another section of strand, and reeling, in similar fashion.

Although the invention may be practiced without clamp 6b, its use is preferred since it provides more accurate control of the length of wire being twisted by clamp 6r, and improved control of the twisting action.

Also, and while the use of the rotatable clamp 6r for twisting the strand at a midpoint between the clamps 6a and 6b produces a pair of alternate hand twists in a single operation, clamp 6a may be omitted, and the desired twists obtained by alternately reversing the direction of the rotatable twist inducing member, as exemplified by rotatable clamp 6r.

As indicated above, the clamp 6r is rotatable, and since the clamps 6 hold the wires 1 in the strand 1s in a tight bundle, it will be apparent that rotation of the clamp 6r operates to rotate the strand 1s about its axis, so that the outer wires of the strand are twisted into a spiral path about its central or inner wires. From this, it will be apparent that the central wire in the strand 1s will be torqued when the strand is rotated by the clamp 6r but will remain in its original position extending substantially along the axis of the strand 1s, while the wires radially outwardly with respect to the central wire will be twisted into a helical path about such central wire.

It should be emphasized that the twisting should not be sufficiently severe as to form a permanent set in the wires, as this may affect the tensile strength of the wire and may even preclude "self cancelling" and return to proper parallel wire strand condition upon unreeling.

In an example involving 0.196" diameter steel bridge wire, with 81 wires per strand, twisting was accomplished by rotation of the clamp 6r midway of about 160' strand lengths between the clamps 6a and 6b, utilizing about 5 rotations of the twisting element or clamp 6r per length. Seizings 12 were applied at about 5' intervals. A reel with about a 6' diameter drum having about a 5' length, and provided with about 15" flange depth, will accommodate about 5000' or more of the aforementioned strand.

With proper adjustments, individual wires in the strands may conveniently vary in size and number, depending upon the use of the strand.

From the foregoing it will be apparent that the method of this invention enables reeling of a preassembled parallel wire strand on a drum for transportation to a site where it is to be unreeled and assembled into a suspension cable for a bridge or other structural applications. In addition it will be noted this is accomplished without overstressing any of the wires to an extent that will result in permanent set or damage to any of the wires in the strand, and without slack and consequent kinks or snarls that would otherwise interfere with orderly reeling and unreeling of the strand. Attention is particularly directed to the fact that the advantages of the invention in these respects are obtained simply and conveniently by winding the parallel wire strand on a drum with a temporary twist therein which is sufficient to prevent the formation of slack in any of the wires during reeling and which disappears

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with a "self cancelling" action when the strand is unreeled. This "self cancelling" or untwisting action is inherent in the preferred practice of the invention as described above wherein successive sections of the strand are twisted in opposite directions. Although the preferred practice of the invention is effected by twisting two successive sections simultaneously by rotating the strand at a point centrally located between the two clamps 6a and 6b, it will be understood, as indicated above, that twisting of the wire in this respect may be modified. It will also be understood that other twisting procedures, which may perhaps not require twisting successive sections of the strand in opposite directions, may be used for the purposes of this invention with respect to reeling and unreeling parallel wire strand and are contemplated. The above and other adaptations and modifications may be made without departing from the scope of the following claims.

We claim:

1. In a method of reeling a suspension cable strand on a drum, said strand being in the form of a bundle of a large number of parallel and axially extending wires, the steps which comprise feeding said strand axially to said drum, fastening said strand to said drum, applying a clamp about the perimeter of said strand at a point spaced axially from said drum, rotating said drum and clamp relative to each other to rotate the portion of said strand therebetween about its axis and twist the outer wires in said strand into a helical path about the central wires therein, and winding said twisted portion of said strand on said drum, the twist imparted to said strand being retained during reeling on said drum, said twist being effective to eliminate the development of slack in the wires of said strand as it is wound on said drum, and to enable the wires in said strand to untwist and revert to their said axially extending and parallel arrangement relative to each other upon unreeling from said drum.

2. The method defined in claim 1 characterized by moving said clamp with said strand in an axial direction toward said drum as said twisted strand portion is wound thereon.

3. A method of reeling a suspension cable strand comprising a bundle of a large number of parallel and axially extending wires, which comprises the steps of feeding said strand axially to a drum, rotating said strand in advance of its movement to said drum to twist the outer wires in said strand into a helical path with respect to the central wires therein, said central wires extending centrally and axially with respect to said helically extending outer wires, and winding the strand on said drum, said twist being retained in the strand during reeling on said drum and being effective to eliminate the development of slack in the wires of the strand as it is wound on the drum, and to enable the wires in the said strand to revert to their said axially extending and parallel arrangement relative to each other upon unreeling from said drum.

4. The reeling method defined in claim 3 characterized by the step of applying seizings about said strand at spaced intervals along its length before it is fed to said drum.

5. The reeling method defined in claim 3 characterized by successive sections of said strand being twisted in opposite rotational directions.

6. The method of claim 5 wherein the said rotation of said strand is accomplished by rotating a rotatable strand clamp located between said drum and a remote non-rotatable clamp, moving said rotating and non-rotatable clamps axially toward said drum with the strand upon reeling, and successively releasing said clamps from the strand when advanced to a position adjacent said drum.

7. The method of claim 5 wherein twisting of said strand is effected by rotating a clamp engaged with said strand at a point spaced axially along its length with respect to said drum.

8. In a reel, the combination comprising a preassembled parallel wire strand for use in structural support cables,

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said strand comprising a bundle of a large number of parallel and axially extending wires, and a drum on which said cable strand is wound, successive sections of said strand being rotated about its axis to provide opposite hand twists therein, the inner wires in each of said strand sections extending centrally with respect to the outer wires therein and said outer wires extending in a spiral path about said inner wires, said opposite hand twists being respectively sufficient to provide for said strand being wound on said drum without the development of slack in individual wires, said twists being insufficient to impart permanent deformation to said wires to enable return of said strand to its initial parallel wire form upon unreeling.

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Disclaimer

3,545,194.—*Robert W. Fish*, South Russell Village, Ohio, and *Wallace F. Stack*, Middletown Township, Bucks County, and *Craig J. Welch*, Ross Township, Allegheny County, Pa. REELING PREASSEMBLED PARALLEL WIRE STRANDS FOR BRIDGES AND OTHER STRUCTURAL APPLICATIONS. Patent dated Dec. 8, 1970. Disclaimer filed Dec. 17, 1973, by the assignee, *United States Steel Corporation*.

Hereby enters this disclaimer to claims 3, 4, 5 and 8 of said patent.

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