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REVERSE TWIST STRANDER, STRANDING METHOD, AND STRAND

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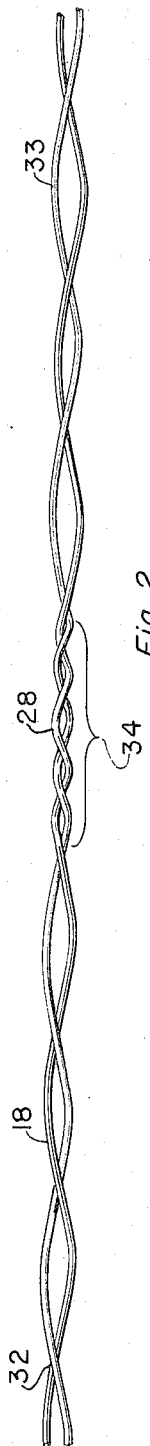


Fig. 2

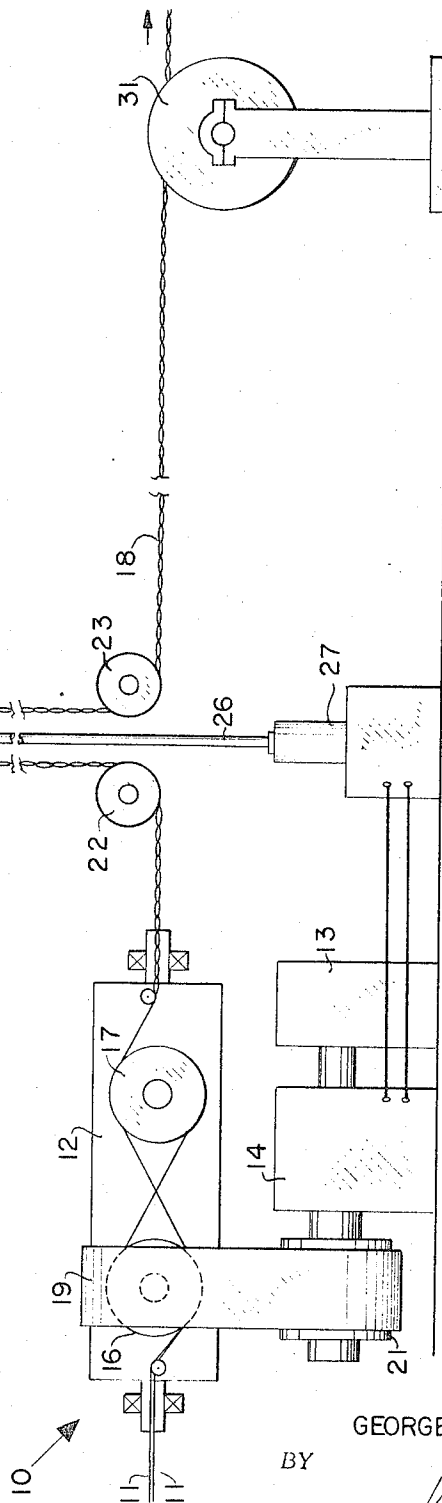


Fig. 1

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HIS AGENT

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REVERSE TWIST STRANDER, STRANDING METHOD, AND STRAND

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9 Claims. (Cl. 57—34)

My invention relates to twisted strands and particularly to strands having a reversing twist lay.

It has been suggested in Patent 3,169,360, issued Feb. 16, 1965, and assigned to the assignee of the present invention, to form a strand having a false twist by means of an oscillating apparatus that continuously accumulates and pays off a supply of the strand. Each time the apparatus reverses its direction of rotation it reverses the direction of twist imparted to the strand. If tension is applied to the strand it may tend to unwind at the reversal points and it is suggested in the aforementioned patent that this tendency may be overcome by binding the filaments together at reversal points with adhesive or tape.

One of the advantages of reverse twist stranding is that the operation can proceed continuously at high speed, and this advantage is reduced by any requirement for binding the strand periodically along its length.

I have now discovered that binding the strand at reversal points is not necessary if the twist lay is substantially reduced at such points.

My invention has the advantage that the special binding equipment is eliminated.

It has the further advantage that there is no interruption of the passage of strand through any operations on line with the stranding operation.

It has the further advantage that the cost of tapes or adhesives and the requirement periodically to replenish the supply of these materials are eliminated.

Where the strands comprise telephone conductors my invention has the advantage that foreign materials that might affect electrical properties are not introduced into the telephone cable.

I have invented a twisted strand comprising a plurality of filaments comprising periodic twist reversal points, with the twist lay at these reversal points substantially shorter than the twist lay at other points of the strand. My invention has particular utility when the filaments comprise insulated conductors and when the strands comprise twisted pairs, so that I have invented an electric cable comprising a plurality of twisted pairs of insulated conductors, each of which pairs comprise periodic twist reversal points, with the twist lay of the pairs at reversal points substantially shorter than the twist lay at other points in the length of the pairs.

I have invented the method of twisting a plurality of filaments into a strand comprising continuously twisting the filaments in a left-hand lay with a selected minimal lay length, reversing the direction of twist and then continuously twisting the filaments in a right-hand lay, also with a selected minimal lay length. I then again reverse the direction of twist of the filaments and alternately repeat the left-hand and right-hand twisting while reducing the twist lay at reversings substantially below the minimal lay lengths. My invention includes the method where the lay lengths between the reduced twist lays at reversings is substantially constant.

I have further invented the method of twisting a plurality of filaments into a strand comprising continuously advancing the filaments through a twisting zone at a speed not less than a selected minimal speed, simultaneously twisting the filaments passing through said zone in a left-hand lay, reversing the direction of twist of said filaments entering the twisting zone and continuously advancing the

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filaments into the zone in a right-hand lay at a speed not less than a selected minimal speed. I again reverse the direction of twist and alternately repeat the left-hand and right-hand twisting, during the reversing substantially reducing the speed of advancing of the filaments through the zone. Preferably the twisting is continued in each direction for a plurality of revolutions.

I have invented apparatus for practicing the method of my invention comprising a rotating guide means for strand being twisted, means for rotating said guide means in a first direction and means for reversing so as to rotate said guide means in a reverse direction. The reversing occurs in a short, finite period of time. There are means for advancing the strand through the rotating means and means for accumulating the strand between the rotating means and the advancing means. My apparatus also comprises means for reducing the speed of strand passing through the guide means during the short time of reversing.

A more thorough understanding of my invention may be gained from a study of the appended drawing.

In the drawing:

FIGURE 1 shows a diagrammatic side view of the apparatus and method of my invention.

FIGURE 2 shows a strand made in accordance with my invention.

In the apparatus indicated generally by the numeral 10 a plurality of filaments 11—11 are paid into the apparatus from a source, not shown, which may be a reel rack or some processing apparatus such as one or more wire insulation extruders. My apparatus has particular utility when the filaments 11 comprise a pair of insulated telephone conductors. The filaments 11 pass continuously into a rotating collector 12 which is caused to rotate first in one direction and then in the other by a motor 13 and reversing clutch 14 such as the clutch described in application Ser. No. 480,832 assigned to the assignee of the present invention. Means for reversing the rotation of the collector 12 do not constitute a patentable feature of the present application and other means may be used within the scope of my invention. On entering the collector 12 the filaments 11 are twisted with either a left-hand or right-hand twist lay depending on the direction of rotation at the time of entry. The collector 12, which functions as rotating guide means for the strand, comprises two multi-grooved rolls 16, 17 which collect a supply of the strand being twisted. The frequency of reversal of rotation of the collector 12 will depend on the speed at which the strand is advanced and the length of strand that is held in the collector at any time, reversal taking place each time a length equal to the collected length enters the unit 12. On leaving the collector 12 the strand receives an additional twist, since by the time any point of strand leaves, the collector is rotating in a direction opposite to the direction it had at the time that same point entered. This additional twist causes a shortening of the effective twist lay. The completed strand, indicated by the numeral 18, passes through an accumulator 20 to a take-up mechanism which will usually take up the strand at constant speed. This is particularly true if the strand 18 is passed through some other processing apparatus, such as an extruder, before it is taken up. While the strand 18 may be urged to advance solely by the final take-up mechanism it will be understood that it may be desirable to introduce capstans or caterpillars at intermediate points so as to reduce the strand tension, and this can be done within the scope of my invention. The motor 13 acting through the clutch 14 drives the collector 12 by means of a broad timing belt 19 immediately driven by a timing pulley 21. This arrangement allows for very rapid braking and reversal of the rotation of the collector 12, but there is still a finite time required for such reversal. For example if

strand is advancing at 1200 feet per minute through the collector and is receiving a 1 foot twist lay the collector is rotating 600 r.p.m. or 10 r.p.s. (bear in mind that each rotation imparts two twists). If a complete reversal requires $\frac{1}{2}$ second, 4 feet of strand will pass from the collector 12 during the period of reversal. This same length of strand would also have entered the collector during a reversal period so that there will be a long length of parallel, untwisted strand at each reversal. To prevent the occurrence of such parallel lengths and even to substitute tight twists at reversal points to keep the strands from unwinding I use the accumulator 20 to slow the advance of the strand 18 during reversals. As shown diagrammatically in the drawing the accumulator 20 comprises two fixed sheaves 22, 23 and a movable sheave 24 mounted on the plunger of a solenoid 27. Immediately prior to a reversal of the collector 12 the plunger 26 is fully extended so that there is a maximum accumulation of strand in the accumulator 20. When the clutch 14 is actuated to reverse the rotation of the collector 12 the solenoid plunger 26 is released so that the strand 18 may continue to pay out at the same speed to any downstream apparatus, but will pass through the unit 12 at greatly reduced speed. The motion of the plunger 26 may be adjusted to compensate exactly for the deceleration of the rotating unit 12, with the result that the lay length will remain constant through the reversal point, but I prefer to slow the passage of strand through the collector 12 to such an extent during reversals that a tight twist of the order of a fraction of an inch is applied for at least one turn at either side of the actual point of reversal of twist 28 (FIGURE 2). Electrical means for controlling the motion of the plunger 26 in synchronization with the clutch 14 can be selected from types that are known and are within the ability of persons skilled in electromechanical arts. Although I have shown the sheave 24 controlled by a solenoid it will be understood that it might, within the scope of my invention, also be moved by an air cylinder or other mechanical means and the latter might be controlled by suitable camming of types that are known. Although I prefer to slow the passage of the strand 18 through the collector 12 during reversals by means of the accumulator 20 as hereinabove described, it will be realized that the reduction in speed might also be accomplished by changing the speed of a take-up capstan 31, within the scope of my invention.

The strand 18 produced in my apparatus can best be visualized by reference to FIGURE 2. At the left of the figure the strand is seen to have a plurality of turns 32 twisted in a left-hand lay and in the right of the figure to have a plurality of turns 33 twisted in a right-hand lay. The turns are even and uniform in length extending beyond the figure both left and right but in a reversal zone 34 that includes the reversal point 28 the twist is substantially tighter. According to the manner in which the plunger 26 is selected to be moved during reversals, the length of lay of the twists may be progressively shorter as they approach the reversal point 28 or the twists within the zone 34 may all be the same length but much shorter than the lay at other points in the strand. The strand 18 will then have the usual advantages of reverse lay strands and be free from any special adhesive or binder at the reversal points. To prepare the accumulator 20 so that it can pay out strand during reversals I automatically raise the plunger 26 at a relatively slow but constant speed during the period between reversals.

I have invented a new and useful strand and apparatus and method for making the same for which I desire an award of Letters Patent.

I claim:

1. A twisted strand comprising a plurality of filaments comprising periodic twist reversal points, the twist lay at reversal points being substantially shorter than the twist lay at other points in said strand.

2. The strand of claim 1 wherein said filaments comprise insulated conductors.

3. The strand of claim 2 wherein said strand comprises a twisted pair.

4. An electric cable comprising a plurality of twisted pairs of insulated conductors, each of said pairs comprising periodic twist reversal points, the twist lay of said pairs at reversal points being substantially shorter than the twist lay at other points in the length of said pairs.

5. The method of twisting a plurality of filaments into a strand comprising:

(A) continuously twisting said filaments in a left-hand lay having a selected minimal lay length,

(B) reversing the direction of twist of said filaments,

(C) continuously twisting said filaments in a right-hand lay having a selected minimal lay length,

(D) again reversing the direction of twist of said filaments and alternately repeating said left-hand and said right-hand twisting, and

(E) at said reversings, reducing the twist lay substantially below said minimal lay lengths.

6. The method of claim 5 wherein the lay lengths between the reduced twist lays at reversings is substantially constant.

7. The method of twisting a plurality of filaments into a strand comprising:

(A) continuously advancing said filaments through a twisting zone at a speed not less than a selected minimal speed,

(B) simultaneously twisting said filaments passing through said zone in a left-hand lay,

(C) reversing the direction of twist of said filaments entering said zone,

(D) continuously advancing said filaments into said zone in a right-hand lay at a speed not less than a selected minimal speed,

(B) again reversing the direction of twist of said filaments and alternately repeating said left-hand and right-hand twisting, and

(F) during said reversing substantially reducing the speed of advancing of said filaments through said zone.

8. The method of claim 7 wherein said twisting is continued in each direction for a plurality of revolutions.

9. Apparatus for applying a reversing twist to an advancing strand comprising:

(A) rotating guide means for said strand,

(B) means for rotating said guide means in a first direction,

(C) means for reversing the rotation of said guide means, said reversing occurring in a short, finite length of time,

(D) means for advancing said strand through said rotating means,

(E) means for accumulating said strand between said rotating means and said advancing means, and

(F) means for reducing the speed of strand passing through said guide means within said finite length of time.

References Cited

UNITED STATES PATENTS

2,869,316	1/1959	Lilly	57—156 XR
2,961,010	11/1960	Berry	57—156 XR
2,986,867	6/1961	Berry	57—156
3,025,656	3/1962	Cook	57—34
3,052,079	9/1962	Henning	57—34
3,169,360	2/1965	Corrall et al.	57—156 XR
3,225,533	12/1965	Henshaw	57—34
3,283,494	11/1966	Lucht et al.	57—166

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