

1 343 650

- (21) Application No. 14014/71 (22) Filed 10 May 1971
(31) Convention Application No. 38 414 (32) Filed 18 May 1970 in
(33) United States of America (US)
(44) Complete Specification published 16 Jan. 1974
(51) International Classification D07B 3/12//B65H 49/02 59/06
(52) Index at acceptance
D1T 1K 1M 2B10 2B1A1 2B2 2B7 2BX2
D1J E



(54) HIGH SPEED STRANDER

(71) We, SOUTHWIRE COMPANY, a corporation organized and existing under the laws of the State of Georgia, United States of America, of Carrollton, Georgia 30117, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

When manufacturing cable from a plurality of wires, a core wire is usually passed along a path and cable wire is wrapped around the core wire as the core wire moves along its path. This function is usually carried out by relatively high speed machinery which usually includes a rotatable strander frame or housing and a plurality of wire carrying bobbins located within the frame. The core wire is usually taken from a bobbin mounted outside the frame and passed through the frame, and the wires from the bobbins mounted inside the frame pay off the bobbins and are rotated with the frame about the core wire.

In the past, the wire carrying bobbins mounted on the frame of a strander have usually been mounted so that the bobbins were required to rotate along their own longitudinal axes in order to pay out their wire. This arrangement usually requires some control of the rotation of the bobbins, such as a brake mechanism for each bobbin, so that the bobbins will not continue to rotate when the frame of the strander has stopped its rotation.

The braking devices cause the tension in the wire extending from the bobbins to vary during the operation of the strander since the braking force required for a full bobbin is significantly more than that required for a partially depleted bobbin. While the initial braking force may be sufficient only to control the bobbins, the

[Price 25p]

same braking force applied to a bobbin with a partially depleted wire supply is frequently sufficient to draw out or stretch the wire to a smaller gauge, which causes the cable formed by the strander to be malformed. Also, because of the braking forces being applied to each bobbin before the initial start-up of the strander, there is also a tendency for the wire paying off the bobbins to be drawn before the strander reaches its normal operational speed, and the unnecessary braking of the bobbins during initial start-up of the strander requires more work to operate the strander. Because of the frequent malfunction of the brakes of the stranders, the wire from the bobbins within the frame of the strander occasionally continues to pay out after the operation of the strander has been terminated, and because of the different brake forces applied to different ones of the bobbins, and because of the different tension created in the wire paying out from the bobbins due to the varying effects of the brake forces and supply of wire on the bobbins of the strander, the cable formed by the stranders frequently has one or more cable wires loosely wrapped about the core wire with the remaining wires more tightly wrapped.

Briefly described, the present invention comprises a strander for forming cable at high speeds substantially without the hazard of forming a cable with loose or drawn wire strands. Wire carrying bobbins are mounted in a rotatable frame, which may rotate at several hundred revolutions per minute, with their longitudinal axes extending approximately parallel to the axis of rotation of the frame and the wire is pulled off the bobbins along a path intersecting the longitudinal axes of the bobbins without requiring the bobbins to rotate about their axes. The wires drawn from the bobbins in this manner usually

price 35p

can be withdrawn with approximately the same wire tension throughout the entire pay off from the bobbin without requiring a braking device. In the situations where it is desirable to positively control the tension in the wire being drawn from the bobbins a simplified control means is positioned adjacent each bobbin which usually does not require adjustment and which is reliable to impart uniform tension on each wire from each bobbin. The arrangement is such that when the rotation of the frame of the strander is terminated there is no tendency for the wire to pay out from any of the bobbins within the frame and when the rotation of the frame is begun there is virtually no static brake friction to overcome.

Thus, it is an object of this invention to provide a high speed strander for forming cable wherein the cable wires are withdrawn from bobbins without requiring the bobbins to rotate.

Another object of this invention is to provide a high speed strander that is reliable, inexpensive, easy to maintain and tends to form a cable having cable wires each wrapped about a core wire with approximately the same wrapping tension.

Another object of this invention is to provide a high speed strander with a small number of moving parts, which is easy to load with wire.

According to the invention there is provided a strander for forming cable comprising an elongated frame having an inlet end and an outlet end and an axis of rotation extending longitudinally between them, wire guide means at each of said inlet and outlet ends positioned along said axis of rotation for guiding a core wire through said frame, at least one bobbin support means carried by said frame for rotatably supporting at least one wire-carrying bobbin relative to said frame with the longitudinal axis of the bobbin extending substantially parallel to the axis of rotation of the frame, and means for facilitating withdrawal of wire from said at least one bobbin without requiring rotation of the bobbin about its longitudinal axis including wire feed out guide means mounted adjacent the bobbin and freely rotatable thereabout so that wire may be withdrawn substantially axially from the bobbin independently of rotation of said frame, and stranded with said core wire as said frame rotates.

The invention extends to a method of stranding cable using the apparatus described above, and to the product of the method.

The invention will now be further described, by way of example, with reference to the accompanying drawings, in which:

Fig. 1 is a side view, with parts broken

away, of a high speed strander having its bobbins positioned in alignment with each other along the frame of the strander.

Fig. 2 is a partial side view of a high speed strander, similar to the Fig. 1, but showing a modified wire tension control device and cage structure.

Fig. 3 is a partial side view of a high speed strander with the bobbins positioned about the axis of rotation of the frame.

Fig. 4 is a schematic perspective view of a high speed strander showing a plurality of supports mounted along the length of the frame and with the bobbins displaced from the axis of rotation of the frame.

Fig. 5 is a schematic illustration of the wire shown as a tape to show the twisting of the wire as it pays off a bobbin.

Referring now in more detail to the drawing, in which like numerals indicate like parts throughout the several views, Fig. 1 shows a high speed strander 10 which includes a frame or barrel 11 mounted on a plurality of roller bearings 12 so that it rotates on its longitudinal axis 14. Frame 11 is divided along its length by support partitions 15 and wire guide partitions 16. Each support partition 15 includes a bearing structure 18, and a bobbin support means 19 is carried by the bearing structure. Each bobbin support means includes a hub 20 and a bobbin support stem 21 pivotally connected to each hub 20 by means of pivot pin 22. Stems 21 and hubs 20 extend along the axis of rotation 14 of frame 11, and stems 21 are pivotal to a position normal to axis 14 about pivot pins 22. Hubs 20 are formed with a counterweight 24 so that each hub and its stem will normally remain stationary, and rotate in bearing structure 18, with respect to frame 11 when the frame is rotated. A wire carrying bobbin 25 is mounted on each stem 21 by pivoting the stem to an upright attitude, extending a bobbin through an opening 23 of frame 11, and pivoting the bobbin and stem back into alignment with the axis of rotation 14 of the frame. A light-weight tension control means such as rotatable guide 26 is mounted on the end of each stem and remains attached thereto by cap 28. The arrangement is such that the longitudinal axis 29 of each bobbin extends along the axis of rotation 14 of frame 11. Each rotatable guide 26 includes a support arm 30 which extends out beyond the periphery of its bobbin 25 and a tubular guide 31 is connected to the remote end of arm 30. Each guide 31 is arranged to lift the wire from its bobbin 25 without causing the wire to engage the end flanges of the bobbin. Guides 31 are arranged to rotate freely about the axis 29 of its hub 20, stem 21 and bobbin 25 so that when its bobbin is full the guide will rotate relatively

ing its
h each
r.
a high
1, but 70
contr

speed
about

view
turality
gth of
placed
me. 80
of the
wisting

to the
ndicate 85
views,
which
ted on
that it
Frame 90
support
ms 16.
bear-
support
ucture. 95

ides a
m 21
20 by
d hubs
ion 14 100
otal to
pivot
ounter-
s stem
rotate 105

ect to
ed. A
n each
in up-
through 110
ivoting
ment
frame.

s such
on the
tached
is such
bobbin
14 of
cludes 120

beyond
ubular
le end
ged to
without 125
flanges
ged to
ts hub
hen its
atively 130

slowly, and when its bobbin is substantially depleted of wire the guide will rotate at a higher angular velocity.

The wires paying off bobbins 25 are threaded through openings 32 of the wire guide partitions 16 which are aligned with the axis of rotation 14 of the frame, so that the wire from each bobbin 25 is withdrawn substantially axially from the bobbin along a path intersecting the longitudinal axis of the bobbin. Thus, the bobbins are not required to rotate to allow the wire to pay out.

The wires passing through openings 32 of wire guide partitions 16 pass through openings 34 of support partitions 15 toward guide pulleys 35 mounted on frame 11. The wires then move toward the winding end 36 of the frame, where they are received by second pulleys 38 and then guided to a guide plate 39. Core wire 40 pays off a bobbin 41 mounted outside frame 11 and enters the frame through a rear opening 42. Core wire 40 is guided through aligned openings 44 in the support partitions 15 and wire guide partitions 16 along the length of frame 11 until it reaches the winding end of the frame, whereupon it passes about guide pulleys 45 and 46 to return the core wire to the axis of rotation of the frame. The core wire pays out through the winding end of the frame, and the cable wires are wound about the core wire.

As is illustrated in Fig. 2, another form of the invention comprises a frame 48 that has smaller distances between its support partitions 49 and guide partitions 50 and includes bearing mounted bobbin holders 51 that have clamps 52 spaced thereabout for clamping an end flange of a bobbin. The bobbins are inserted down through the openings 54 in frame 48 and placed in abutment with bobbin holders 51 with clamps 52 maintaining the bobbin in this position. The bobbins may be of the type having sloped inner surfaces 55 on their end flanges 56 to assist the pay off wire from the bobbin, and the bobbins are counterweighted (not shown) to prevent their rotation with frame 48. The tension control means for each bobbin is in the form of brush control 58 that comprises a series of bristles 59 extending radially outwardly from a sleeve 60 mounted on the end of spindle 61. Spindle 61 is connected at its end to flange 62, and flange 62 is clamped onto the end flange of the bobbin. In order to prevent the wire paying off a bobbin from engaging the end flange of the bobbin, a rotatable cover 62 is mounted on sleeve 60 and arranged to rotate freely about the end flange of the bobbin. With this arrangement, as the wire pays off its bobbin it initially engages the curved ends of cover

62 and tends to rotate the cover so as to form a circumferentially friction-free engagement with the end of the bobbin assembly. When the wire passes through bristles 59 of brush control 58, the bristles will sequentially engage the wire as the wire is spun off the end of its bobbin and the bristles will tend to create a substantially uniform tension in the wire without regard to the amount of wire remaining on the bobbin.

As is illustrated in Figs. 3 and 4, the bobbins of a strander can be spaced from the axis of rotation of the frame without losing the pay off characteristics illustrated in Figs. 1 and 2. The frame 65 is rotated and core wire 66 pays off its bobbin 68 and passes along the axis of rotation of the frame. The bobbins 69 are mounted so that they are not required to rotate. They are positioned with their longitudinal axes parallel to the axis of rotation of frame 65 and the cable wires are withdrawn substantially axially from bobbins 69 along parts intersecting the longitudinal axes of the bobbins and passed through a guide plate 70 which rotates in unison with and forms a part of frame 65. The cable wires 71 are wrapped around core wire 66 as the frame rotates, and the tension control means used to control the tension of the cable wires 71 can be either similar to that shown in Fig. 1 or in Fig. 2. Of course, a plurality of bobbins will be mounted on frame 65 and normally will be placed in a circular arrangement. Moreover, while only a single circle of bobbins is illustrated, it will be understood that concentric circles of bobbins can be placed on frame 65 if desired.

As is illustrated in Fig. 4, a series of support disks 75 are mounted on tubular axle 76 and core wire 78 passes through the axle. Each support disk supports a plurality of bobbins, mounted so that they are not required to rotate, and arranged in a circle about the axle, and the bobbins of support disk 75a are offset circumferentially from the bobbins of support disk 75b. The bobbins on support disks 75c and 75d are displaced radially outwardly of the bobbins mounted on support disks 75a and 75b, while the bobbins of support disk 75d are offset circumferentially from the bobbins on support disk 75c. With this arrangement, the wire from each bobbin pays out through aligned openings in each support disk ahead of it toward the winding end of the frame without having to bend around another bobbin. For instance, the wire paying off bobbin 79a will pass through aligned openings 80b, 80c, 80d, and 80e. This allows the cable wires to be drawn substantially axially off each bobbin along a path intersecting the longitudinal axis of the bobbin

and to continue its path of movement without being bent so as to reduce the hazard of work hardening the wire before it is wound or twisted about the core wire. As with the form of the invention shown in Fig. 3, the tension control means utilized to impart the proper tension in the wire being pulled from the bobbins can be either the brush control illustrated in Fig. 2 or the rotatable guide illustrated in Fig. 1.

It should be noted that in all forms of the invention illustrated, the wire pays substantially axially off the bobbins along paths intersecting the longitudinal axes of the bobbins without requiring the bobbins to rotate, and virtually no variable tension is experienced in the wire in spite of the varying supply of wire present on the bobbin. The result is that the cable formed by the wire is more likely to have uniform tension in its wound wires, and virtually no drawing of the wound wires will be experienced. Moreover, as is illustrated in Fig. 5 where the cable wire is illustrated as a tape, the cable wire is twisted along its length as it pays off a bobbin 25, and a full 360° twist is applied to the cable wire upon each withdrawal of the wire from about the supply of wire on the bobbin. The cable wire maintains this twist or torsion after it has been wound upon the core wire 40. If the bobbin 25 has been mounted in housing 11 so that its cable wire unwinds in a direction about the axis of the bobbin which is opposite to the direction of the rotation of frame 11, the twist or torsion in the cable wire will tend to maintain the cable wire in its wound configuration about the core wire. Thus, the twist in the cable wire has a tightening effect with respect to the cable formed by the wires, and this torsion and tightening effect prevents the cable from "bird caging" or becoming unwound. Thus, the mounting of the bobbins within the housing with the axis of the bobbin extending parallel to the axis of rotation of the housing functions to cause the cable manufactured to be more tightly wound.

WHAT WE CLAIM IS:—

1. A strander for forming cable comprising an elongated frame having an inlet end and an outlet end and an axis of rotation extending longitudinally between them, wire guide means at each of said inlet and outlet ends positioned along said axis of rotation for guiding a core wire through said frame, at least one bobbin support means carried by said frame for rotatably supporting at least one wire-carrying bobbin relative to said frame with the longitudinal axis of the bobbin extending substantially parallel to the axis of rotation, of the frame, and means for facilitating with-

drawal of wire from said at least one bobbin without requiring rotation of the bobbin about its longitudinal axis including wire feed out guide means mounted adjacent the bobbin and freely rotatable thereabout so that wire may be withdrawn substantially axially from the bobbin independently of rotation of said frame, and stranded with said core wire as said frame rotates.

2. A strander according to claim 1 wherein said bobbin support means is rotatably supported by said frame and includes a counterweight for maintaining said bobbin support means and the bobbin supported thereby in a substantially fixed position while permitting said frame to rotate about said bobbin support means and its bobbin.

3. A strander according to claim 1 further comprising a brush member mounted adjacent one end of the bobbin and including bristles extending radially outwardly beyond the periphery of the bobbin into the normal path of travel of the wire being pulled from the bobbin.

4. A strander according to claim 1 wherein said wire feed out guide means includes a guide member defining a guide opening beyond the periphery of the bobbin for receiving and guiding the wire pulled from the bobbin.

5. A strander according to claim 1 wherein said bobbin support means is constructed and arranged to pivot its bobbin to a position where the longitudinal axis of the bobbin extends substantially normal to the axis of rotation of said frame.

6. A strander according to claim 1 wherein said at least one bobbin support means comprises a plurality of bobbin support means spaced from the axis of rotation of said frame.

7. A strander according to claim 1 wherein said at least one bobbin support means comprises a plurality of bobbin support means spaced along the axis of rotation of said frame.

8. A strander according to claim 1 wherein said bobbin comprises a spool including a generally cylindrical body and end flanges extending substantially radially outwardly from the ends of said cylindrical body with at least one of said end flanges defining a substantially conically-shaped surface sloped outwardly away from said cylindrical body.

9. A method of stranding cable from a plurality of wires comprising using a strander as claimed in Claim 1.

10. A cable made by the method of Claim 9.

11. A strander for forming cable substantially as herein described with reference to Figure 1 of the accompanying drawings.

and to continue its path of movement without being bent so as to reduce the hazard of work hardening the wire before it is wound or twisted about the core wire. As with the form of the invention shown in Fig. 3, the tension control means utilized to impart the proper tension in the wire being pulled from the bobbins can be either the brush control illustrated in Fig. 2 or the rotatable guide illustrated in Fig. 1.

It should be noted that in all forms of the invention illustrated, the wire pays substantially axially off the bobbins along paths intersecting the longitudinal axes of the bobbins without requiring the bobbins to rotate, and virtually no variable tension is experienced in the wire in spite of the varying supply of wire present on the bobbin. The result is that the cable formed by the wire is more likely to have uniform tension in its wound wires, and virtually no drawing of the wound wires will be experienced. Moreover, as is illustrated in Fig. 5 where the cable wire is illustrated as a tape, the cable wire is twisted along its length as it pays off a bobbin 25, and a full 360° twist is applied to the cable wire upon each withdrawal of the wire from about the supply of wire on the bobbin. The cable wire maintains this twist or torsion after it has been wound upon the core wire 40. If the bobbin 25 has been mounted in housing 11 so that its cable wire unwinds in a direction about the axis of the bobbin which is opposite to the direction of the rotation of frame 11, the twist or torsion in the cable wire will tend to maintain the cable wire in its wound configuration about the core wire. Thus, the twist in the cable wire has a tightening effect with respect to the cable formed by the wires, and this torsion and tightening effect prevents the cable from "bird caging" or becoming unwound. Thus, the mounting of the bobbins within the housing with the axis of the bobbin extending parallel to the axis of rotation of the housing functions to cause the cable manufactured to be more tightly wound.

WHAT WE CLAIM IS:—

1. A strander for forming cable comprising an elongated frame having an inlet end and an outlet end and an axis of rotation extending longitudinally between them, wire guide means at each of said inlet and outlet ends positioned along said axis of rotation for guiding a core wire through said frame, at least one bobbin support means carried by said frame for rotatably supporting at least one wire-carrying bobbin relative to said frame with the longitudinal axis of the bobbin extending substantially parallel to the axis of rotation, of the frame, and means for facilitating with-

drawal of wire from said at least one bobbin without requiring rotation of the bobbin about its longitudinal axis including wire feed out guide means mounted adjacent the bobbin and freely rotatable thereabout so that wire may be withdrawn substantially axially from the bobbin independently of rotation of said frame, and stranded with said core wire as said frame rotates.

2. A strander according to claim 1 wherein said bobbin support means is rotatably supported by said frame and includes a counterweight for maintaining said bobbin support means and the bobbin supported thereby in a substantially fixed position while permitting said frame to rotate about said bobbin support means and its bobbin.

3. A strander according to claim 1 further comprising a brush member mounted adjacent one end of the bobbin and including bristles extending radially outwardly beyond the periphery of the bobbin into the normal path of travel of the wire being pulled from the bobbin.

4. A strander according to claim 1 wherein said wire feed out guide means includes a guide member defining a guide opening beyond the periphery of the bobbin for receiving and guiding the wire pulled from the bobbin.

5. A strander according to claim 1 wherein said bobbin support means is constructed and arranged to pivot its bobbin to a position where the longitudinal axis of the bobbin extends substantially normal to the axis of rotation of said frame.

6. A strander according to claim 1 wherein said at least one bobbin support means comprises a plurality of bobbin support means spaced from the axis of rotation of said frame.

7. A strander according to claim 1 wherein said at least one bobbin support means comprises a plurality of bobbin support means spaced along the axis of rotation of said frame.

8. A strander according to claim 1 wherein said bobbin comprises a spool including a generally cylindrical body and end flanges extending substantially radially outwardly from the ends of said cylindrical body with at least one of said end flanges defining a substantially conically-shaped surface sloped outwardly away from said cylindrical body.

9. A method of stranding cable from a plurality of wires comprising using a strander as claimed in Claim 1.

10. A cable made by the method of Claim 9.

11. A strander for forming cable substantially as herein described with reference to Figure 1 of the accompanying drawings.



12. A strander for forming cable substantially as herein described with reference to Figure 2 of the accompanying drawings.
13. A strander for forming cable substantially as herein described with reference to Figure 3 of the accompanying drawings.
14. A strander for forming cable substantially as hereinbefore described and illustrated in Figure 4 of the accompanying drawings.
15. A cable according to Claim 10 and substantially as hereinbefore described with reference to any one of the accompanying figures.
16. A method of stranding cable substantially as hereinbefore described with reference to and as shown in Figure 1 of

the accompanying drawings.

17. A method of stranding cable substantially as hereinbefore described with reference to and as shown in Figure 2 of the accompanying drawings.

18. A method of stranding cable substantially as hereinbefore described with reference to and as shown in figure 3 of the accompanying drawings.

19. A method of stranding cable substantially as hereinbefore described with reference to and as shown in Figure 4 of the accompanying drawings.

30

MARKS & CLERK.

Agents for the Applicants.

Printed for Her Majesty's Stationery Office by The Tweeddale Press Ltd., Berwick-upon-Tweed, 1973.
Published at the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.



* C L M S *