METHOD AND AN APPARATUS FOR THE CONTINUOUS PRODUCTION OF STRANDED WIRE

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FOREIGN PATENTS OR APPLICATIONS
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ABSTRACT
The present invention relates to a method and an apparatus for the continuous production of a twisted stranded wire by flattening a strand of wire, shearing it into a plurality of strands, and twisting the strands together.

4 Claims, 2 Drawing Figures
METHOD AND AN APPARATUS FOR THE CONTINUOUS PRODUCTION OF STRANDED WIRE

BACKGROUND

It is previously known to produce a twisted stranded wire by utilizing as a starting material a number of wires corresponding to the desired number of strands in the stranded wire, said wires being wound on reels. Those wires are passed through a guide or a so-called hole disc, which is provided with a number of grooves or holes, corresponding to the number of strands, through which the separate wires, each in its groove or hole, are passed to a nipple, wherein the strands are combined. The twisting of the strands is then caused by means of a relative rotary movement between the output stranded wire and the hole disc. This relative rotary movement is produced by rotating either all the wire reels supporting the starting material and the hole disc or else the collecting drum, wherein the output ready stranded wire is wound. Due to the large masses, which are present both in the reels supporting the starting material for the stranded wire and the drum, wherein the ready stranded wire is wound, the rotary speed of said devices must be kept low so as to avoid excess stresses on the devices during rotation. This rotary speed limits the production rate of the stranded wire in the determining manner and such a production method will therefore be relatively expensive, since the length of stranded wire produced per unit of time will be short. In addition to the low rate of production, the prior method of production has the disadvantage that the process must be interrupted each time all the wire on a wire reel has been consumed, so as to allow the mounting of a new wire reel and the connection thereof to the end of the preceding wire. This, of course, means an interruption of the production and causes additionally increased costs. Since normally a plurality of wire reels are used and the wire reels should not be replaced simultaneously, which would cause a weak point in the cable, a large number of such interruptions is caused.

The object of the present invention is to eliminate the last-mentioned disadvantage or both disadvantages of the prior method. This object is attained by providing the method and the apparatus according to the present invention with the features as defined in the claims.

The invention will now be described below with reference to the accompanying drawings, on which FIG. 1 shows schematically an embodiment of an apparatus according to the invention and FIG. 2 schematically an improved embodiment of an apparatus according to the invention.

The apparatus illustrated in FIG. 1 allows the continuous production of a twisted, stranded wire according to the invention. From a stationary wire supply 10 a wire 13 is continuously drawn via guide pulleys 11, 12, said wire first being caused to pass between a pair of abutting rollers 14, 15, which roll the wire to a band 16. This band is then caused to pass through a shearing device 17, 18, which follows immediately after the rollers 14, 15 and wherein the band is sheared into a number of strands 19, the number of which corresponds to the desired number of strands in the finished stranded wire. This shearing device may be of any known type, e.g., according to the Swedish patent specification No. 76 361, which discloses a method of producing wire from a band or sheet in one single shearing operation. The different strands 19, which already in the shearing device 17, 18 have been provided with substantially the desired shape, are then caused to pass through a hole disc 20, provided with one hole for each strand and from there to a nipple 21, wherein the strands are combined. The finished stranded wire 22 is then passed between a pair of rollers 23, 24, which may be forming and/or guiding and is then wound onto a collecting drum 25. In order to produce the twisting it is necessary to rotate either the drum 25, wherein the finished stranded wire is wound, and the rollers 23, 24 relative to the hole disc 20 or else the unit comprising the rollers 14, 15, the shearing device 17, 18 and the hole disc 20 relative to the collecting drum 25. The possibility of maintaining the collecting drum 25 stationary and instead rotate the rollers, the shearing device and the hole disc is provided by utilizing one single wire 13 as a starting material for the stranded wire, whereby the turning between the stationary starting supply 10 with the guide pulleys 11, 12 and the rollers 14, 15 is received by torsion in the wire. Thus, in this case it is not necessary to rotate the complete starting wire supply, which reduces the mass which must be put into rotation, but instead the rollers, the shearing members and the hole disc must be rotated. Totally the problems of the rotation are thus substantially the same as previously but the method provides the great advantage that the starting wire supply 10 can be replenished successively, since it is stationary, by means of welding a new wire to the end of a consumed wire supply, without the necessity of interrupting the production process from this reason. Since the joining point is then rolled by the rollers 14, 15, the weakness mentioned above of the finished stranded wire due to simultaneous joining of the strands is eliminated, in any case to a very great extent. The rollers 14, 15 and the shearing device 17, 18 are provided with an equipment 26, 27 and 28, 29, respectively, for driving the rolling and shearing devices. The principal production method for stranded wire according to the invention as described above and illustrated, viz. the utilization of one single wire as the starting material, the rolling of said wire to a band shape, the shearing of the band thus obtained into a plurality of strands and the twisting of the various strands to a stranded wire, consequently causes a substantial advantage relative to prior methods, since the production process can be made continuous and thereby will become more rapid and consequently more economic.

The production method of a stranded wire, as illustrated in FIG. 1, however, has an additional advantage, viz. that by a further development a substantial reduction is allowed of the masses which must be caused to rotate. FIG. 2 illustrates as an example a further development of the process illustrated in FIG. 1, wherein the rollers 14, 15, the shearing device 17, 18 and the hole disc 20 are arranged in a stationary cradle 26 and, consequently, take no part in the rotation. Instead only on loop of the starting wire 13 and one loop of the stranded wire 22 are rotated together with certain holding members for said loops, whereby the total mass being in rotation in substantially reduced, that the rotary speed can be maintained lower, which in turn allows an increased production rate for the stranded wire.

The embodiment of an apparatus according to the invention illustrated in FIG. 2 comprises a first and a second shaft 27, 28, which are arranged coaxially and
between which the cradle 26 is supported in such a manner that the shafts can be rotated without the cradle accompanying said rotation. In the cradle 26 the rollers 14, 15, the shearing device 17, 18 and the hole discs 20 are arranged. Consequently, the hole discs 20 is stationary and the nipple 21 is rotatable. The nipple 21, which combines the strands 19, is conveniently secured in or on the shaft 27 carrying the cradle. In order to guide the wire 13 in a loop around the cradle 26 there is provided on the first shaft 27 a first and a second pulley 29, 30 which are adapted to accompany the rotation of the shaft and of which the second pulley 30 is located more remote from the centre line of the shaft 27 than the first pulley 29. The second shaft 28 is provided with a third and a fourth pulley 31, 32 for the wire loop, which are similarly arranged to accompany the rotation of the shaft and of which the third pulley 31 is located more remote from the centre line of the shaft 28 than the fourth pulley 32. In a corresponding manner there are provided on both the first shaft 27 and the second shaft 28 pulleys 33-36 for guiding the stranded wire emerging from the cradle 26 in a loop around the cradle 26. By means of these pulleys 29-36 a wire loop as well as a stranded wire loop will consequently be guided half a revolution around the cradle spaced therefrom, which makes possible the simultaneous rotation of said loops and pulleys around the cradle and the devices located therein.

The shafts 27, 28 are provided at both ends thereof with axially extending central conduits 37, 38 and 39, 40 which at a distance from the ends are bent and open into the cylinder surface of the shafts.

As illustrated in FIG. 2 the output wire 13 is passed from the supply into the conduit 37 in the portion adjacent the supply of the first shaft 27 and passes axially through said part to the first pulley 29, where the wire leaves the shaft 27 and passes out to and around the second pulley 30 on the first shaft, and from there further to the third pulley 31, which is arranged on the second shaft 28, and thereafter inward to the fourth pulley 32 and there into the conduit 39 in the part of the second shaft 28 adjacent the cradle 26 and axially through said part into the cradle, where the wire passes between the rollers 14, 15, and after the rolling through the shearing device 17, 18, where the various strands 19 are formed. The strand 19 passes thereafter through the various holes in the hole disc 20 and thereafter to the nipple 21 combining the strands and from there in the form of a stranded wire out of the cradle and into the conduit 38 in the part of the first shaft 27 adjacent the cradle. The stranded wire 22 thereafter runs around the first pulley 33 in the stranded wire loop out of the shaft 27 around the second pulley 34, which is also arranged on the first shaft 27, and further to the third pulley 35, which is located on the second shaft 28, and down to the fourth pulley 36, which is likewise arranged on the second shaft 28, and at the last-mentioned pulley into the conduit 40 in the shaft and axially through the part thereof remote from the cradle out of the shaft and further to the drum collecting the stranded wire.

During the production of the stranded wire, as mentioned above the wire loop and the stranded wire loop are caused to rotate around the stationary cradle, whereby the turning occurring before the introduction of the wire into the cradle is received as torsion in the wire and the turning occurring after the exit of the strands from the nipple is utilized for the twisting of the strands. The turning of the wire occurs on one hand at the introduction of the wire into the rotating loop and on the other hand at the introduction of the wire into the stationary cradle, and the twisting of the strands of the stranded wire occurs on one hand at the introduction of the stranded wire into the rotating stranded wire loop and on the other hand at the introduction of the stranded wire loop into the stationary collecting device. The turning in the wire loop on both occasions occurs in the same direction and the twisting of the stranded wire on both occasions also has the same direction. Consequently, the turning direction in the wire loop and the stranded wire loop are mutually opposed.

The embodiments illustrated in FIG. 2 involve the advantage that the rotating masses will be very small and in any case substantially smaller than what has up to the present been achieved, whereby a higher production rate can be attained. If, namely, the finished stranded wire should have a certain number of twisting turns per unit of length, it is evident that the production rate can be increased proportionally to the number of turns. In addition, the device illustrated in FIG. 2 produces twice the twisting velocity since the twisting is performed at two points, namely both at the entrance into and the exit out of the rotating loop.

The embodiments illustrated can, of course, be modified substantially within the scope of the present invention. The pulleys can be replaced by other guide members, e.g., bent tubes, and the loops need not be arranged diametrically relative to each other. The diametral location, however, is advantageous from balancing reasons. The rollers for the finished stranded wire are convenient if the strands at the shearing are provided with a square cross section. However, if the strands are provided with a substantially round cross section already at the shearing, this operation can be eliminated. In addition, of course, other roller devices may be utilized for the rolling of the wire, e.g., a dual mill or an inner rolling mill. As an alternative other members than rollers may also be utilized so as to provide the necessary flattening of the wire. In order to enable said rolling mills to provide the maximum widening of the starting wire it might be necessary to introduce an additional rolling or shearing operation, since it is easier to obtain a higher percentage of widening of narrow bands than of wide bands. Within the scope of the present invention it is also possible to arrange a plurality of oppositely rotating loops of the wire and the stranded wire, whereby the twisting velocity can be made two, four, six times etc. of the initial rate.

Since the apparatus of the invention is continuous in its production of twisted stranded wire, it can easily be mounted in a production line after e.g., a wire drawing machine or the like, whereby the wire supply can be reduced or completely eliminated. A plastic coating machine can also be connected after the twisting operation, which allows that a finished, insulated cable can be obtained. This method gives a great possibility of rationalisation, since a plurality of intermediate stocks and the like can be eliminated.

The method is adapted for all ductile metals within a large range of dimensions, e.g., 1.5 to 15 mm diameter of the solid wire at the input side. The range of dimensions, however, depends only on the construction.
of the machine and large deviations from the range indicated above as an example are therefore possible.

I claim:

1. A method for the continuous production of a twisted, multiple strand wire including the steps of:
   a. feeding one strand wire of ductile material from a stationary supply into a rotatable unit along the axis of rotation;
   b. continuously rotating said rotatable unit, thus continuously twisting said one strand wire during the feeding;
   c. flattening said one strand wire in said rotating unit;
   d. dividing said flattened one strand wire into a plurality of spaced apart strands in said rotating unit;
   e. bringing said strands into close proximity with each other;
   f. feeding said strands out of said rotating unit along the axis of rotation, and through a common passageway, thus twisting said strands together; and
   g. collecting said twisted, multiple strand wire.

2. A method for the continuous production of a twisted, multiple strand wire including the steps of:
   a. feeding a one strand wire of ductile material from a stationary supply into a rotatable unit along the axis of rotation;
   b. guiding said one strand wire in said rotatable unit in a loop diverting from the axis of rotation and returning to said axis of rotation;
   c. feeding said one strand wire into a stationary unit in a direction diverted 180° to the original direction of feeding;
   d. flattening said one strand wire in said stationary unit;
   e. dividing said flattened one strand wire into a plurality of strands in said stationary unit;
   f. bringing said strands into close proximity with each other;
   g. feeding said strands out of said stationary unit into the rotatable unit along the axis of rotation;
   h. guiding said multiple strand wire in said rotatable unit in a loop diverting from the axis of rotation and returning to said axis of rotation;
   i. feeding said multiple strand wire out of said rotatable unit along the axis of rotation in the original feeding direction;
   j. continuously rotating said rotatable unit, thus continuously twisting said one strand wire during the feeding into and out of said rotatable unit and continuously twisting said multiple strands together during the feeding into and out of said rotatable unit; and
   k. collecting said twisted, multiple strand wire.

3. An apparatus for the continuous production of a twisted, multiple strand wire, comprising:
   a. stationary supply means for delivering a one strand wire;
   b. means for continuously flattening said one strand wire received from said stationary supply means;
   c. shearing means receiving said flattened one strand wire for shearing said wire into a plurality of strands;
   d. converging means for bringing said strands together in spaced apart relationship;
   e. stationary means for collecting said multiple strand wire;
   f. said flattening, shearing and guiding means being positioned in a unit rotatable in respect to said stationary supply and collecting means around an axis the direction of which coincides with the feed-in and feed-out direction of the wire.

4. An apparatus for the continuous production of a twisted, multiple strand wire, comprising:
   a. stationary supply means for delivering a one strand wire;
   b. means for continuously flattening said one strand wire received from said stationary supply means;
   c. shearing means receiving said flattened one strand wire for shearing said wire into a plurality of strands;
   d. converging means for bringing said strands together in a desired spatial relationship;
   e. said flattening, shearing and converging means being positioned in a stationary cradle;
   f. a rotatable unit surrounding said stationary cradle;
   g. means in said rotatable unit for receiving, along the axis of rotation, said one strand wire from said wire supply means and guiding said wire in a loop halfway around said stationary cradle and into said cradle along the axis of rotation in a direction diverted 180 degrees from the original direction of feeding into said rotatable unit;
   h. means in said stationary cradle for feeding said wire through said flattening and shearing means;
   i. means in said stationary cradle for feeding said multiple strand wire through said converging means;
   j. means in said rotatable unit for receiving, along the axis of rotation, said multiple strand wire and guiding said wire in a loop halfway around said stationary cradle and out of said rotatable unit along the axis of rotation in the original direction of feeding; and
   k. stationary means for collecting said multiple strand wire.

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