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(19)

(54) ARMOURING PROCESS FOR APPLYING AN ELONGATE COVERING MATERIAL TO AN ELONGATE CORE MEMBER

(71) We, NORTHAMPTON MACHINERY COMPANY LIMITED, a British Company, of Balfour Road, Northampton, NN2 6JS, England, 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:—

This invention relates to an armouring process for applying an elongate covering material to protect an elongate core member.

It is known in the bunching or stranding of wires to form a core member of a plurality of wires and to effect the stranding operation with either single or double-twist twisting, stranding or bunching machines, but it has not been possible hitherto to produce from such machines successive layers of armouring wires or tapes about a single or multi-wire core to form substantially concentric strands of the core and the outer layers.

According to the present invention we provide an armouring process for applying an elongate covering material to protect an elongate core member comprising the steps of rotating the core member as it is drawn in a line of draw from a stationary rotatable supply device by passing it through a double twist flyer of a first twisting machine and a double twist flyer of a second twisting machine spaced apart on the said line of draw, applying to said rotating core member between said spaced apart flyers said elongate covering material that is drawn from a stationary rotatable supply device and rotating the covering material with the core member before it enters the flyer of the second twisting machine to wrap said covering material over said core member prior to winding said armoured core member onto a rotatable stationary take-up device.

The rotatable stationary supply devices and the rotatable stationary take-up device are generally drums or spools depending upon the mean diameter of the core member and the type of covering employed which decides the mean diameter of the covered core member.

The term 'stationary' as used herein means that the drum or spool has its axis of rotation fixed in relation to the line of draw of the moving core member, the drum or spool being able to be rotated about said axis of rotation.

In a preferred process, the process as described above employs a pair of rotational core member gripping devices spaced apart on the line of the draw, one of said gripping devices being placed after the exit of the core member from the first flyer and the other placed before the entry of the core member together with its applied covering material into the second flyer. Generally such core member gripping devices are double juxtaposed belt members that are geared to rotate *in toto* about the line of the draw of the core member as the belts move with the core member in the direction of the draw. Such gripping devices may conveniently be geared with the double twist flyer to give a speed of the core or the core and its armour covering that is twice that of the flyer.

The core member may consist of a number of metal wires, often bare copper wires or copper wires covered with a material providing an insulation against the passage of electricity between the juxtaposed wires of the core member. The elongate covering material may be one or more tapes of metal or plastics or paper or a plurality of metal wires, often steel wire generally smaller in diameter than the diameter of the wires of the core member to provide an armouring to said core member.

The use of double rotation of the core member obtained from the use of a double twist flyer gives a higher speed to the process of the invention than is possible with the single rotation of the core member obtained from the use of a single twist flyer.

The invention will be more fully understood from the following description given by way of example in relation to the figures of the accompanying drawings in which:—

Figure 1 is a schematic showing one apparatus for the armouring of a core mem-

ber from four stationary supply bobbins.

Figure 2 is a schematic showing another apparatus for the armouring of a core member with steel tape from two stationary supply reels.

Figure 3 is a schematic showing yet another apparatus for the formation of a core member of seven wires with an armouring layer of twelve wires supplied in all from nineteen separate stationary supply bobbins.

Figure 4 is a schematic showing a double twist flyer of a bunching machine.

Figure 5 is a view in oblique perspective of an alternative feed plate to those shown schematically in Figure 1.

Figure 6 is a view in oblique perspective of an alternative core gripping device for use, for example, in the apparatus of Figures 1, 2 and 3.

Referring now to Figure 1 a core member 10 having *n* strands (where *n* is any whole number) previously bunched or stranded and insulated if required is drawn from a stationary rotatable drum 11 and enter via mounted pulley 12_{1A} a double twist flyer 12_1 of a double-twist twisting machine and leaves it via mounted pulley 12_{1B}. The core member is held against rotation at end 10A and, as is well known, when the flyer 12_1 is rotating at a speed of N r.p.m. the core member at 10B rotates at a speed of 2N r.p.m. (explained in greater detail below in respect of Figure 4). The core member 10 at 10B rotating at speed 2N in the sense shown by the arrow 13 enters a first core member gripping device shown generally at 14_1 of known form comprising a pair of driven belts 14_{1A}, 14_{1B} that rotate *in toto* about the axis of draw D1 D2 in the sense shown by arrow 15 at a rotational speed of 2N r.p.m. The core 10 leaves the gripping device 14_1 at 10C and enters a stationary feed plate 16 through which pass four armouring wires 17A, 17B, 17C, 17D each supplied respectively from a separate stationary rotatable bobbin 18A, 18B, 18C, 18D. The armouring wires 17A-17D and the core member 10 enter a closing die 19 and then pass to a second 'core' gripping device shown generally at 14_2 similar in form to that at 14_1 and spaced apart from it axially of the line of draw D1-D2 by a distance *d*. Gripping device 14_2 is rotated at the same speed as gripping device 14_1 viz: 2 N r.p.m. and in the same sense as 14_1 as shown by arrows 15 and 20. The core member 10 and its wrapped armouring leave device 14_2 at 10D and enter a second double twist flyer 12_2 of a second double-twist twisting machine said flyer having mounted pulleys 12_{2A} and 12_{2B}, which flyer, rotating at speed N r.p.m., maintains the twist to the armouring to wrap it about the core member prior to the armoured core member being wound via guide pulley 22C onto the rotatable, stationary take-up drum 21 via a capstan 22A, 22B that supplies the main force for the draw. It is to be understood that there is no twist applied to the core member 10 *per se* in this process since its rotation between 10B and 10D is at a speed of 2N r.p.m.

Referring now to Figure 2 the process and the apparatus are similar to that of Figure 1 but the core member 10 is armoured from two stationary rotatable supply reels R1, R2 carrying steel tapes t_1 t_2.

Referring now to Figure 3 seven separate wires are drawn from seven separate supply bobbins 100A-100G and enter a closing die 101 where they are held stationary before entry into a double twist flyer 102_1 with mounted pulleys 102_{1A}, 102_{1B} of a double-twist twisting machine. The seven wires leave the flyer 102_1 at pulley 102_{1B} and are given a speed $2N_1$ r.p.m. in the sense of rotation shown by arrow 103 since the rotational speed of the flyer 102_1 is N_1 r.p.m. Core member 104 enters a first core gripping device shown generally at 105_1 (similar to the devices 14_1, 14_2 of Figure 1) rotating *in toto* about the axis of draw D1, D2 at a rotational speed of $2N_1$ r.p.m. and in the sense shown by arrow 109_1. The core member 104 now enters stationary die plate 106 which also receives twelve armouring wires each one drawn from a separate stationary yet rotatable supply bobbins 107A-107L. The seven wire core member 104 and the twelve outer wires enter closure die 108 and then pass to a second 'core' gripping device shown generally at 105_2 which device is rotating at a speed $2N_2$ r.p.m. which is different from the rotational speed $2N_1$ r.p.m. of device 105_1, but in the same sense as that of device 105_1 as shown by arrows 109_1 and 109_2. The twelve outer wires are wrapped about the core member and the complete cable core 110 now enters a second double twist flyer 102_2 rotating at N_2 r.p.m. of a second double-twist twisting machine via rotating pulley 102_{2A}. The stranded cable leaves the flyer via rotating pulley 102_{2B} to be wound via guide pulley 112C onto rotatable, stationary take-up drum 111 via a capstan 112A, 112B that supplies the main force of the draw. In view of the different rotational speeds $2N_1$ r.p.m. and $2N_2$ r.p.m. between 102_{2A}, 102_{1B} additional twist is imparted to the seven wires of the core member 104.

The core 104 and the outer layer may be twisted in the same, or opposite directions relative to each other, depending on the relative speeds of the flyer 102_1 and 102_2, and the associated gripping devices 105_1, 105_2 which normally run at twice the speeds of their associated flyers. As shown in Figure

3 the seven wire core member out of 105_1 has a left hand lay but the twelve outer wires have a right hand lay.

In the use of the term core gripping device for the second device 14_2 (Figure 1) 105_2 (Figure 3) it is to be understood that the belts grip the covering material together with the core member and that the core member *per se* is not contacted by the belts.

In Figure 4 the entry of a covered core 10D into the double twist flyer 12^{**}_2 of a double-twist twisting machine rotating at N r.p.m. will give a rotation of 2N r.p.m. to the covered core 10D. The core is held stationary about its axis at the end Y at the winding-on drum 21** and the flyer 12^{**}_2 rotated about axis D1 D2 at N r.p.m. as shown by arrow X produces at the free end of the core a rotation of twice the speed of the flyer viz: 2N r.p.m.

This is due to the fact that with one of its ends stationary the core rotates in the flyer with a speed of +N and a relative speed of −N. By the reversal caused by the curvature of the flyer the relative movement becomes positive and is added to the rotation of the flyer, the result being: +N+N=2N shown by arrow Z.

It will be clear that any number of bobbins may be used, whereas four only are described above in the example of Figure 1. Again various numbers of wires may be used to armour a core in place of the nineteen exemplified in Figure 3.

For example as shown in Figure 5 a nineteen wire unilay cable may be formed as shown using two lay plates or feed plates 201_A 201_B and two closing dies 202_A 202_B. A central core wire 203 of single or multistrand enters lay plate 201_A via the central hole and eighteen wires enter the lay plate 201_A via eighteen separately spaced hole formed in an inner ring of six holes and an outer concentric ring of twelve holes. Closing die 202_A closes seven wires that is to say the core 203 and the inner six which then receive the outer twelve armouring wires closing die 202_B to form a nineteen wire strand at 204 of the core wire 203 is a single wire.

The core gripping device 14_1, 14_2 of Figures 1 and 2 and 105_1, 105_2 of Figure 3 may each be constructed as shown in Figure 6 which provides means for pulling the core to decrease the tension in the apparatus. The longitudinal motion along line D1 D2 of Figures 1, 2 and 3 is now provided in part by the electric motor 301 which rotationally drives gripping rollers 302_1 302_{10} inclusive on their axes via suitable gearing not shown.

The gripping device may be provided with a pair of juxtaposed belts as shown for example in 14_1 and 14_2 of Figure 1.

WHAT WE CLAIM IS:—

1. An armouring process for applying an elongate covering material to protect an elongate core member comprising the steps of rotating the core member as it is drawn in a line of draw from a stationary rotatable supply device by passing it through a double twist flyer of a first twisting machine and a double twist flyer of a second twisting machine spaced apart on the said line of draw, applying to said rotating core member between said spaced apart flyers said elongate covering material that is drawn from a stationary rotatable supply device and rotating the covering material with the core member before it enters the flyer of the second twisting machine to wrap said covering material over said core member prior to winding said armoured core member onto a rotatable stationary take-up device.

2. The process according to claim 1 wherein the elongate covering material is applied between two gripping devices spaced apart on the line of the draw.

3. The process according to claim 2 wherein the gripping devices pull the core along the line of the draw.

4. The process according to any preceding claim wherein the core has a lay of one hand and the elongate covering material providing the armour has a lay of the same or the other hand.

5. The process according to any preceding claim wherein the elongate covering material is a metal tape.

6. An armouring process for applying an elongate covering material to an elongate core member substantially as described herewin and as shown in Figures 1, 2 or 3 of the accompanying drawings.

7. A process according to claim 6 when modified by the feed plate of Figure 5.

8. A process according to claim 6 or claim 7 when modified by the gripping device of Figure 6.

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1590130 COMPLETE SPECIFICATION
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Sheet 1

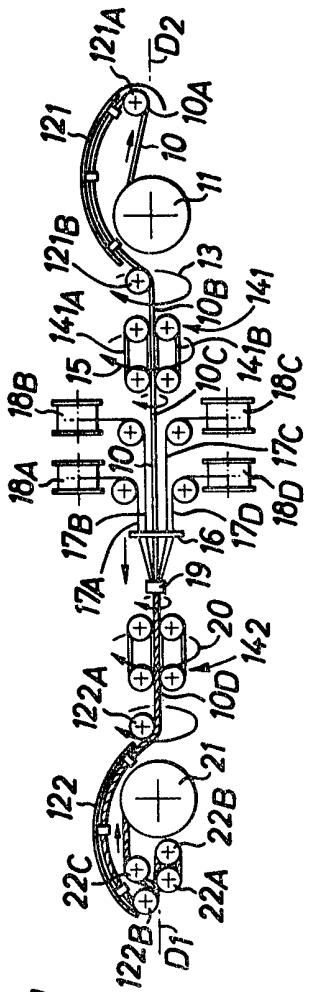

FIG.1

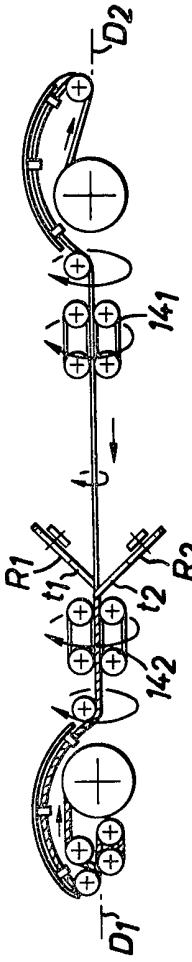

FIG.2

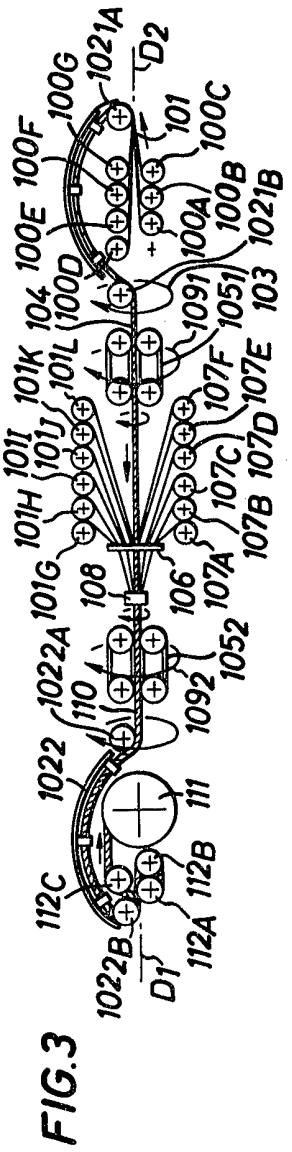

FIG.3

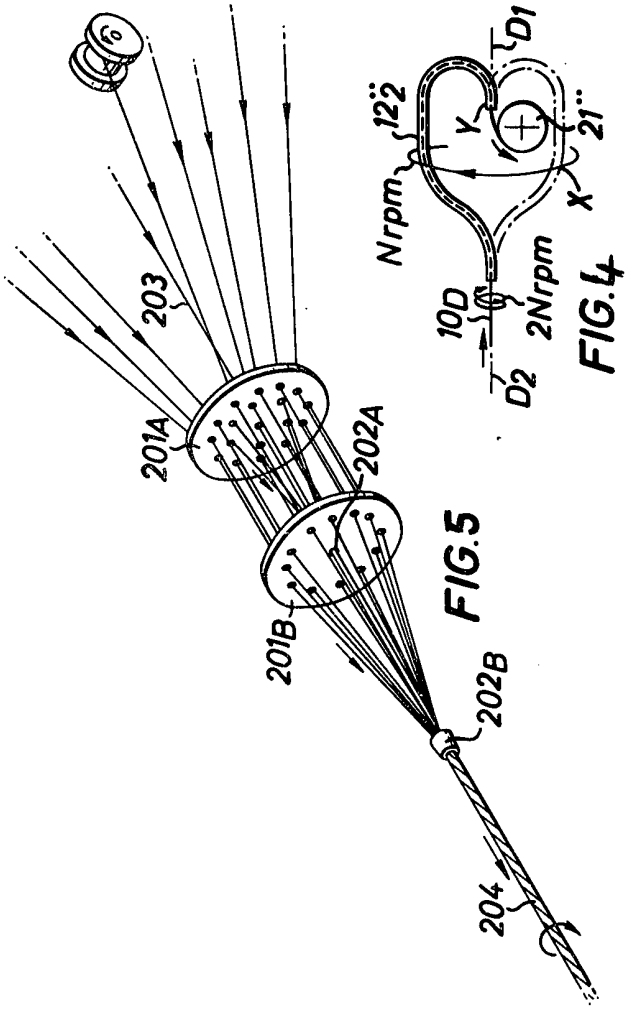

FIG.5

FIG.4

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3 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 3

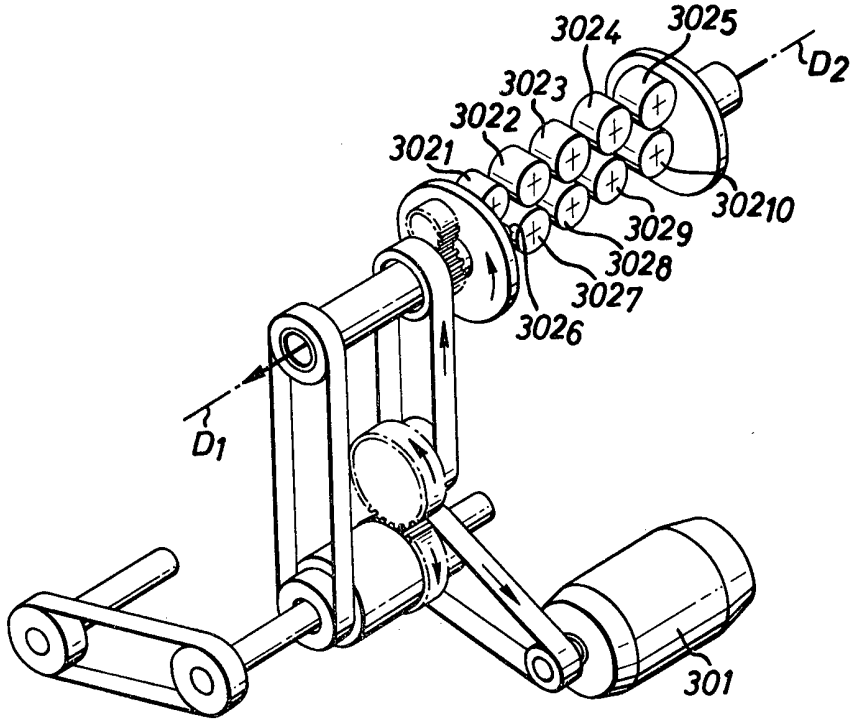

FIG.6