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(54) IMPROVEMENTS IN WINDING CABLES AND THE LIKE ON TO STORAGE DRUMS

(71) We, SOCIETE ANONYME FRANCAISE DU FERODO, a French Body Corporate, of 64, Avenue de la Grande-Armée, 75, Paris, France, 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 cables and other elongated and pliable elements such as electric conductors and flexible pipes, which will hereinafter be called cables, and concerns their winding on to drums such as the drums of winches, winders or storage drums. It applies especially to winches for dredging, towing, hoisting, hauling, drilling and oceanographic winches, but can also apply to pliable pipes serving for the supply of oil under pressure to hydraulic devices for marine petroleum drilling, and for example to the coaxial cables of suspended submarine television cameras or to pipes for supplying public works tools from a hydraulic power centre.

In conventional winding systems the adjacent turns of each cable layer wound on a drum are not exactly contiguous, so that the turns of successive layers tend to insert themselves into the intervals existing between the turns of the immediately subjacent layers. This can result in jamming prejudicial to the durability of the cables. In particular in installations working at sea, cables of very great length, for example 1,000 metres, and thus of very high price are currently in use. When the cable is subjected to slight forces at low speeds or has to carry out an operation without particular constraint, it is strictly possible to wind the cable on to a drum without taking special precautions, and the operation is convenient. On the other hand for greater forces, that is when the cable has for

example to carry out a hoisting or hauling function or to support a tool in addition to its own weight when the cable is wound, the cable turns of the successive layers tend to insert themselves into the intervals existing between the turns of the layers immediately subjacent to them. This results in cable jamming which can be irreversible and necessitate the freeing of the cable by cutting with a blow torch in the jammed zone or can at least lead to a deterioration of the cable in the long term by successive jamming. This risk also exists for cables subjected to slight forces but the high cost of which necessitates perfect winding; this is the case especially with the winding of coaxial cables of suspended submarine television cameras.

The present invention aims to avoid these drawbacks by ensuring an orderly setting of the cable on the drum in such manner that the turns remain perfectly contiguous over all the layers of the winding.

According to the invention there is provided a device for winding a cable on to a drum, comprising a cable guide member and means of control consisting of a guide cylinder bearing peripheral guide grooves having portions of circular arcs joined by short oblique portions to shift the cable guide member step by step along the drum as it rotates, so as to keep the guide member stationary during the greater part of each revolution of the drum, and to shift the guide member axially of the guide cylinder and drum by one step over a distance equal to the diameter of the cable whilst the drum completes its revolution.

In one embodiment of the circular portions of the turns forming the two ends of each layer of the winding are placed respectively against the adjacent side members of the drum, by reason of the fact that for the winding of the last turn of each

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layer the cable guide member remains stationary for a supplementary revolution before moving by one step in the direction taking it away from the side member adjacent to this last turn. This can be realised by causing the grooved cylinder which rotates in synchronism with the drum to rotate at a speed reduced in the ratio 1:2.

In this embodiment each turn of the successive layers must rest on an immediately subjacent turn. In another embodiment, to prevent the risk that a turn in the course of winding may slip or roll on the subjacent turn and drop into the groove formed between the latter and the adjacent turn, the turns of the successive layers are caused to rest in the grooves formed by the immediately subjacent layer. To this end the spacing between the two side members of the drum is equal to an odd number of cable half diameters, and an end turn of the first layer is supported by an abutment element at a distance from the adjacent side member equal to a half diameter of the cable.

The abutment member is for example interposed between the first turn and the adjacent side member. The cable portion wound directly on to the drum thus forms a first layer of contiguous turns between this abutment and the other side member. The turns of the second layer rest in the grooves included either between the turns of the first layer or between the first of these turns and the adjacent side member, and so on. For the winding of the last turn of this layer the cable guide member will remain stationary only during the major part of one single revolution of the drum and then will move by a half step in the direction away from the side member adjacent to this last turn. In the case where the cable guide member is controlled in position by a feeler following a guide track traced on a rotating cylinder, this cylinder can rotate at the same speed as the drum.

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

Figure 1 is a plan view of an apparatus according to the invention.

Figure 2 is an elevation seen in the direction of the arrow II in Figure 1;

Figure 3 is a sectional view along the line III—III in Figure 1;

Figure 4 is a sectional view along the line IV—IV in Figure 3;

Figure 5 is a developed view of the cylinder carrying the track for guiding the feeler which controls the cable guide member;

Figures 6 and 7 are views analogous respectively to Figures 2 and 3, showing another embodiment;

Figure 8 is a plan view of a cable in the course of winding on to an apparatus according to another embodiment of the invention;

Figure 9 is a sectional view along the line IX—IX in Figure 8, the cable being assumed to be removed;

Figure 10 is a partial enlarged elevation of the cylinder showing the track for guiding the feeler controlling the cable guide member;

Figure 11 is a sectional view along the line XI—XI in Figure 10;

Figure 12 is a partial longitudinal half-sectional view on a larger scale along the line XII—XII in Figure 9, showing the drum on to which several layers of turns are wound.

In Figures 1 to 3 there is seen a cable 1 in the course of winding on to a drum 2 equipped with two side members 3, 4 and driven in rotation in the direction of the arrow 5 by means not represented. In a well known manner the end of the cable 1 passes through a window 6 in the side member 3 and is fixed at A to the outer face of the latter.

Thus the cable arrives obliquely on to this drum. The cable is incurved at D and set in orderly manner against the inner face of the side member 3 so that the winding of the first turn 7 takes place against this side member during a little less than one revolution, between the point D and a point E situated opposite to the window 6. The oblique portion BD of the cable 1 (B being the point where the axis of the cable passes through the window 6) is thus followed by a circular portion DE of the first turn 7, this circular portion being placed in a plane parallel with the side members and perpendicular to the axis of rotation of the drum. At the point E the cable is diverted laterally to F towards the left in Figure 1, by a step equal to its diameter, and then set orderly against the portion DE of the first turn 7, as far as E', where it is again diverted by a step equal to its diameter as far as F', and so forth.

The trajectory EF very substantially matches the trajectory BD and the gap between the portions BD and EF is very small and practically negligible. The first turn 7 comprises the circular portion DE which extends over the major part of its circumference and is connected by the short oblique portion EF to the second turn 8. The latter comprises the circular portion FE' which extends over the major part of its circumference and is connected to the subsequent turn by the short oblique portion E'F'. Each of the turns following the first turn comprises a circular portion set in orderly manner against the circular portion of the preceding turn, and an

oblique portion set against the oblique portion of the preceding turn. Thus there is no gap between the turns in which the turns of the layer situated above can be jammed; nor are they in danger of jamming into the very narrow space existing between the portions BD and EF.

The oblique portion of the penultimate turn 9 of the first layer terminates at F'' against the side member 4 and the last turn 10 is set over its entire circumference against this side member 4. This last turn 10 comprises a circular portion followed by a radially diverted portion which terminates above the point F''. As the drum continues to rotate the cable commences the first turn 11 of the second layer, which again comprises a circular portion set in orderly manner against the side member 4 and a portion GH diverted laterally by a step equal to the diameter of the cable, but this time towards the right in Figure 1. This first turn 11 is followed by a second turn 12 comprising a circular portion HG' parallel with the side member 4 and an oblique portion G'H', and so forth, all the turns of the second layer being set in orderly manner against one another like those of the first layer.

The winding of the second layer continues as far as the side member 3, where the reversal procedure described above for the arrival of the cable in contact with the side member 4 is reproduced. The cable commences and continues the winding of a third layer towards the side member 4, and so forth. Thus as many layers as necessary may be wound, without any interval existing between the turns in which there is risk of jamming of the turns placed thereabove.

The winding as described above is realised with the aid of the device represented in Figures 1 to 5, which comprises essentially a cable guide member 13 and means for its step-by-step displacement along the drum 2 in synchronism with the rotation of the latter. The cable guide member 13 is constituted by a pair of vertical rollers 14, 15 mounted on a carriage 16 comprising a bearing 17 which can slide along a cylindrical shaft 18 parallel with the drum, and a nut 19 engaged on a threaded shaft 20 parallel with the shaft 18 and the drum 2. The distance between the vertical rollers 14, 15 is equal to the diameter of the cable 1 and the carriage 16 further supports a horizontal roller 21 at the level of the base of these vertical rollers.

The cylindrical shaft 18 is driven in rotation by a chain transmission 22 at a speed equal to half the speed of rotation of the drum 2. In the periphery of this

cylindrical shaft 18 a groove 23 is cut in which there is engaged a feeler 24 which controls the position of the carriage 16 by means which will be described hereinafter. In view of the fact that the cylindrical shaft 18 rotates at half the speed of the drum 2, the groove 23 defines the path which the cable 1 must follow to effect the winding as described above and represented in Figure 1. To this end, as shown by the developed view in Figure 5, the groove comprises, starting from the point D of origin of the first turn 7, a section D₁E₁ of circular arc form which extends over a little less than half a circle and corresponds to the portion DE of the first turn, an oblique section E₁F₁ corresponding to the short portion EF of this first turn, a second section F₁E₁' of circular arc form and a second oblique section E₁'F₁' corresponding to the second turn 8, and so forth.

To the point F'' of the penultimate turn 9, Figure 1, of the first layer there corresponds a point F'', Figure 5, forming the extremity of a last section diverted to the left in Figure 5. From this point F'', there starts a groove section F''G₁ which extends over a little less than the circumference of the cylindrical shaft 18 and corresponds to the turns 10 and 11. The section G₁H₁ is diverted to the right in the figure and corresponds to the portion GH of the turn 11, the sections H₁G₁' and G₁'H₁' correspond to the turn 12, and so forth. To the last turn of the second layer and to the first turn of the third layer, which must be set in order against the side member 3, there corresponds a circular section of the groove extending over a little less than the circumference of the shaft 18 and terminating at the point E₁.

In the form of embodiment as represented the feeler 24 is the feeler of the reading head 25 of a power operated reader 26. In the form of embodiment as represented the reader 26 is a hydraulic reader which effects the control of the carriage 16 through the intermediary of a hydraulic motor 27 and the threaded shaft 20. The hydraulic reader 26 is of a well known type used currently in reproduction apparatuses with which machine tools are equipped. For this reason it does not appear necessary to describe it in detail. The hydraulic reader 26 and its reading head 25 are supported by the carriage 16. The reader actuates a distributor (not shown) which controls the hydraulic energy supplied to the motor 27 by a pump (not shown). The motor 27 drives the threaded shaft 20 in rotation through a chain transmission 28. The nut 19 is immobilised in rotation in the carriage 16 so that the rotation of the threaded shaft 20 causes a translation movement of the carriage

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parallel with this threaded shaft and the drum.

When the feeler 24 travels a circular section such as D_1E_1 or H_1G_1 of the groove 23, the reading head 26 keeps the distributor (not shown) closed controlling the supply of the motor 27. Thus the carriage 16 remains stationary so that the cable 1 winds on to the drum 2 over a circular turn portion such as DE or HG' . When the feeler 24 travels an oblique section such as E_1F_1 or G_1H_1 , the reading head 26 controls the distributor (not shown) so as to feed the motor 27 so that the latter may rotate in the direction, at the speed and for the time required to advance the carriage 16 by a step corresponding to an oblique turn portion, such as EF or GH. During the stopping periods of the carriage, that is to say when the reading head 6 keeps the distributor closed, the pump (not shown) charges a hydraulic accumulator (not shown); the latter liberates the hydraulic fluid which it contains during the active periods of the carriage, that is to say when the carriage is advancing by one step.

Figures 6 and 7, in which the elements play the same part as in the previous figures are designated by the same references, shown an embodiment which differs from the preceding only by the device for controlling the movement of the carriage 16. The threaded shaft 20 and the nut 19 of the preceding figures are replaced by a slideway 20a on which there slides a bearing 19a of the carriage and by double-acting jack 27a supplied directly by the distributor (not shown) which is controlled by the reading head 26. The hydraulic motor 27 is eliminated. The device operates in the manner already described, the reading head 26 controlling the step-by-step movements of the carriage 16 through the intermediary of the jack 27a, instead of controlling them through the intermediary of the motor 27 and the threaded shaft 20.

In the embodiment according to Figures 8 to 12 the elements playing the same part as in the preceding figures are designated by the same reference numerals, increased by 100 units.

In Figure 8 there is seen the cable 101 in the course of winding on the drum 102 equipped with the two side members 103 and 104 and driven in rotation by means not shown. As in the preceding figures the cable 101 passes into the window 106 through the side member 103; it is fixed at A to the outer face of the latter, arrives obliquely on the drum 102, is incurved at D and winds on to the drum in a first turn 107 during a little less than one revolution. However instead of being set in order immediately against the side member 103,

the first turn 107 is here set in order against a packing piece 30.

As may be seen from Figures 8, 9 and 12, the packing piece 30 has a thickness e equal to half the diameter of the cable 101 and a height h between 65 and 75% of this diameter, and has the form of a ring interrupted at 31 and engaged on the drum 102 against the side member 103. The edges of the interruption 31 are cut on the slant at 32 and 33, starting from the window 106, so as to serve as supports for the portion BD of the cable 101 (B being the point where the axis of the cable passes through the window 106).

As in the preceding figures, the winding of the first turn 107 thus takes place, over a little less than one revolution, between the point D and a point E situated opposite to the window 106. Thus the portion BD of the cable 101 is followed by a circular portion DE of the first turn 107, this circular portion being placed in a plane parallel with the side members and perpendicular to the axis of rotation of the drum. At the point E the cable is diverted laterally to F towards the left in Figure 1, by a step equal to its diameter, then set in order against the portion DE of the first turn 107, as far as E' , where it is again diverted by a step equal to its diameter as far as F' , and so forth.

The length L of the drum 102 between the side members 103 and 104 is equal to an odd number of half diameters (61 half diameters, or 30 diameters and a half in the form of embodiment as represented), so that the circular portion $F''E'''$ of the last turn 110 (the thirtieth) of the first layer is set in order against the side member 104, all the turns of this first layer being set in order against one another. Starting from the point E''' , the end of the circular portion of the last turn 110, as the drum continues to rotate the cable describes a portion $E'''G$ diverted laterally by a half step (that is half of the diameter of the cable) which passes over the oblique portion $E''F''$ of the penultimate turn 109, then forms the circular portion GH of the first turn 111 of the second layer, which comes to rest in the circular groove 34 formed between the circular portions of the turns 109 and 110 of the first layer. The cable then describes the portion HG' diverted by one step to the right, then comes to rest in a groove formed between the subjacent circular portions of the turns of the first layer, as so forth.

The winding of the second layer continues as far as the side member 103, the circular portion of the last turn of the second layer coming to rest in the grooves 35 formed between the side member and the turn 107 (see Figure 12), that is to say above the packing piece 30, then the

procedure for reversals as described above on the arrival of the cable into contact with the side member 104 is reproduced, the cable first forming a portion diverted by a half step to the left and continuing the winding of a third layer towards the side member 104 and so forth. Thus it is possible to wind as many layers of turns as necessary, without the existence of any interval between the contiguous turns where the turns placed thereabove might jam, and without the risk that the turns in the course of winding may drop outside the grooves such as 34 and 35.

The winding as described above is carried out with the aid of the device as represented in Figures 8, 10 and 11, which differs from that described with reference to the preceding figures only in the design of the groove 123 and in the transmission ratio of the transmission system comprising the chain 122, which ratio is here 1:1 so that the cylindrical shaft 118 rotates at the same speed as the drum 102. It will be recalled only that the winding of the cable 101 on the drum 102 is guided by the cable guide member 113 supported by the carriage 116 which can slide parallel with the axis of the drum 102 and is controlled in position by a feeler engaged in the groove 123 cut in the cylindrical shaft 118.

The groove 123 defines the trajectory which the cable 101 must follow to effect the winding as described above and represented in Figures 8 and 12. To this end, as shown by Figures 10 and 11, in order to effect the winding from a point D (Figure 8) of origin of the first turn 107, the groove 123 comprises a section D_1E_1 of circular arc form which extends over a little less than the circumference of the shaft 118 and corresponds to the portion DE of the first turn, a section E_1F_1 diverted by one step to the left which corresponds to the short portion EF of this first turn, a second section $F_1E'_1$ of circular arc form and a second diverted section $E'_1F'_1$ corresponding to the second turn 108, and so forth.

To the point F'' of the penultimate turn 109 of the first layer there corresponds a point F'' , forming the end of a first section $E''_1F''_1$ diverted to the left in Figure 10. From this point F'' , there starts a last groove section $F''_1E'''_1$ which extends over a little less than the circumference of the cylindrical shaft 118 and corresponds to the circular portion $F''E'''$ of the last turn 110. The section E'''_1G_1 is diverted by a half step to the right of the figure and corresponds to the portion $E'''G$ of the turn 110, the section G_1H_1 and $H_1G'_1$ (diverted by one step to the right) correspond respectively to the circular portion GH and the oblique portion HG' of the turn 112, and so forth.

The last section diverted by one step to the right L'_1K_1 terminates at a half step further to the right than the point D_1 and is followed by a section K_1L_1 of circular arc form which corresponds to the circular portion of the last turn of the second row. From the point L_1 there starts a section L_1D_1 diverted by a half step to the left which corresponds to the oblique portion of the last turn of the second row. This oblique section L_1D_1 terminates in the section D_1E_1 of circular arc form which ensures the winding of the circular portion of the first turn of the third row, thus recommencing the winding cycle.

In the case where the diameter of the cable is not absolutely constant over its entire length, the diameter which will serve to determine the distance between side members and the winding pitch will of course be the maximum diameter of the cable. In this case slipping of the turns of the first layer could occur, which would create spaces between certain of these turns where there would be risk of jamming of the turns of the second layer, and so forth. In order to avoid this risk the drum 102 is advantageously provided with guides of circular arc form interrupted in the zones where the turns are diverted and spaced by one step (equal to the maximum diameter of the cable), between which the circular portions of the turns of the first layer are placed. In the embodiment represented (Figure 12) these guides are constituted by round iron lengths 36 curved into circular arcs and welded on to the drum 102.

Of course the embodiments described are only examples and they could be modified, especially by substitution of equivalent technical means, without thereby departing from the scope of the invention as defined in the claims. In particular the movement of the carriage could be obtained by a means other than a screw or a jack, for example by a step-by-step motor. The hydraulic reader could be replaced by a reader of another type, for example magnetic or photoelectric. Instead of interposing the abutment element according to Figures 8 to 12 between the first turn and the adjacent side member, it could be interposed between the last turn of the first row and the adjacent side member. In the latter case the abutment member could be an annular uninterrupted packing piece. The abutment member could be part of the adjacent side member.

WHAT WE CLAIM IS:-

1. A device for winding a cable on to a drum, comprising a cable guide member and means of control consisting of a guide cylinder bearing peripheral guide grooves having portions of circular arcs joined by

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procedure for reversals as described above on the arrival of the cable into contact with the side member 104 is reproduced, the cable first forming a portion diverted by a half step to the left and continuing the winding of a third layer towards the side member 104 and so forth. Thus it is possible to wind as many layers of turns as necessary, without the existence of any interval between the contiguous turns where the turns placed thereabove might jam, and without the risk that the turns in the course of winding may drop outside the grooves such as 34 and 35.

The winding as described above is carried out with the aid of the device as represented in Figures 8, 10 and 11, which differs from that described with reference to the preceding figures only in the design of the groove 123 and in the transmission ratio of the transmission system comprising the chain 122, which ratio is here 1:1 so that the cylindrical shaft 118 rotates at the same speed as the drum 102. It will be recalled only that the winding of the cable 101 on the drum 102 is guided by the cable guide member 113 supported by the carriage 116 which can slide parallel with the axis of the drum 102 and is controlled in position by a feeler engaged in the groove 123 cut in the cylindrical shaft 118.

The groove 123 defines the trajectory which the cable 101 must follow to effect the winding as described above and represented in Figures 8 and 12. To this end, as shown by Figures 10 and 11, in order to effect the winding from a point D (Figure 8) of origin of the first turn 107, the groove 123 comprises a section D_1E_1 of circular arc form which extends over a little less than the circumference of the shaft 118 and corresponds to the portion DE of the first turn, a section E_1F_1 diverted by one step to the left which corresponds to the short portion EF of this first turn, a second section $F_1E'_1$ of circular arc form and a second diverted section $E'_1F'_1$ corresponding to the second turn 108, and so forth.

To the point F'' of the penultimate turn 109 of the first layer there corresponds a point F''_1 forming the end of a first section $E''_1F''_1$ diverted to the left in Figure 10. From this point F''_1 there starts a last groove section $F''_1E'''_1$ which extends over a little less than the circumference of the cylindrical shaft 118 and corresponds to the circular portion $F''E'''$ of the last turn 110. The section E'''_1G_1 is diverted by a half step to the right of the figure and corresponds to the portion $E'''G$ of the turn 110, the section G_1H_1 and $H_1G'_1$ (diverted by one step to the right) correspond respectively to the circular portion GH and the oblique portion HG' of the turn 112, and so forth.

The last section diverted by one step to the right L'_1K_1 terminates at a half step further to the right than the point D_1 and is followed by a section K_1L_1 of circular arc form which corresponds to the circular portion of the last turn of the second row. From the point L_1 there starts a section L_1D_1 diverted by a half step to the left which corresponds to the oblique portion of the last turn of the second row. This oblique section L_1D_1 terminates in the section D_1E_1 of circular arc form which ensures the winding of the circular portion of the first turn of the third row, thus recommencing the winding cycle.

In the case where the diameter of the cable is not absolutely constant over its entire length, the diameter which will serve to determine the distance between side members and the winding pitch will of course be the maximum diameter of the cable. In this case slipping of the turns of the first layer could occur, which would create spaces between certain of these turns where there would be risk of jamming of the turns of the second layer, and so forth. In order to avoid this risk the drum 102 is advantageously provided with guides of circular arc form interrupted in the zones where the turns are diverted and spaced by one step (equal to the maximum diameter of the cable), between which the circular portions of the turns of the first layer are placed. In the embodiment represented (Figure 12) these guides are constituted by round iron lengths 36 curved into circular arcs and welded on to the drum 102.

Of course the embodiments described are only examples and they could be modified, especially by substitution of equivalent technical means, without thereby departing from the scope of the invention as defined in the claims. In particular the movement of the carriage could be obtained by a means other than a screw or a jack, for example by a step-by-step motor. The hydraulic reader could be replaced by a reader of another type, for example magnetic or photoelectric. Instead of interposing the abutment element according to Figures 8 to 12 between the first turn and the adjacent side member, it could be interposed between the last turn of the first row and the adjacent side member. In the latter case the abutment member could be an annular uninterrupted packing piece. The abutment member could be part of the adjacent side member.

WHAT WE CLAIM IS:—

1. A device for winding a cable on to a drum, comprising a cable guide member and means of control consisting of a guide cylinder bearing peripheral guide grooves having portions of circular arcs joined by

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- short oblique portions to shift the cable guide member step by step along the drum as it rotates, so as to keep the guide member stationary during the greater part of each revolution of the drum, and to shift the guide member axially of the guide cylinder and drum by one step over a distance equal to the diameter of the cable whilst the drum completes its revolution.
2. A device according to claim 1, wherein the guide cylinder is rotated at a speed proportional to the rotational speed of the drum, and a feeler which follows the guide grooves directs the cable guide member through the medium of a servo-control.
3. A device according to claim 2, in which the feeler forms part of an hydraulic, magnetic or photo-electric reading head which ensures the controlling of the cable guide member through the medium of a drive device for that member.
4. A device according to claim 3, wherein the drive device consists of a motor actuating a threaded shaft engaged in a nut integral with the cable guide member.
5. A device according to claim 3, in which the drive device comprises a jack.
6. A device according to claim 2, in which the guide grooves form a cam on which the feeler, integral with the cable guide member, rests to drive the member directly.
7. A device according to any of the preceding claims, wherein for the winding of the last turn of each layer the cable guide member is held stationary during a supplementary revolution of the drum then displaced by one step in the direction away from a side member adjacent this last turn.
8. A device according to claim 7, wherein the speed of rotation of the guide cylinder is half the speed of rotation of the drum.
9. A device according to any one of the claims 1 to 6, in which the distance between

side members of the drum is equal to an odd number of half-diameters of the cable.

10. A device according to claim 9, in which the circular portion of an end turn of a first layer of cable on the drum is retained by an abutment element at a distance from the adjacent side member of the drum equal to half the diameter of the cable.

11. A device according to claim 9 or claim 10, wherein after winding the circular portion of the last turn of each layer, the cable guide member is displaced by half a step.

12. A device according to claim 10 or claim 11, for the winding of a cable which passes through a window in the side member adjacent the abutment element, wherein the abutment element is an interrupted ring having a thickness equal to half the diameter of the cable, the edges of the interruption being cut on the slant so as to serve as a support for the oblique portion of the cable included between the window and the circular portion of the turn adjacent the said ring.

13. A device according to any of the claims 10 to 12, in which the cylinder rotates at the same speed as the drum.

14. A device for winding a cable on to a drum substantially as hereinbefore described with reference to Figures 1 to 5, or Figures 6 and 7, or Figures 8 to 12 of the accompanying drawings.

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