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WINDING DEVICE OR WINCH

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This invention relates generally to winding or spooling devices for cable or the like, the invention having particular application to winches, windlasses, hoists and analogous mechanisms for winding cable on drums or spools especially in connection with operations in which a heavy object is attached to one end of the cable is to be pulled, hauled or hoisted from one locality to another.

An object of the invention is to provide an improved winding or spooling device having means for controlling the convolutions of the cable as it is wound on the drum or the like so that the convolutions or windings will lie snugly together and uniformly across the effective width of the drum.

A further object of the invention is to guide the cable to the drum, as the latter revolves, in such manner that each winding or convolution of the cable will form in uniform manner closely contiguous to the previously formed winding across the effective width of the drum and further in which the windings will automatically form in uniform level layers or courses as the winding operation proceeds.

Still a further object of the invention is to provide a winding device, winch or the like having an improved travelling guide or spooling device comprising a carriage and a guide pulley mounted thereon and over which the cable or rope is led to the drum, the guide device being constructed and movable in such manner, as the windings form across the drum, as to maintain the lead portion of the cable running from the guide to the drum substantially perpendicular to the drum axis at all times, and the guide pulley being pivotally mounted on the carriage in such manner as to automatically position itself in proper engaging relation to the cable in any position of the carriage, thereby preventing damage to the cable and ensuring smooth and free operation of the spooling device.

Another object of the invention is to provide improved means for guiding the cable or rope to the winding drum in a direction constantly at substantially right angles to a plane passing through the drum axis, as a result of which each convolution is forced by the previous convolution or winding into place snugly thereagainst which action proceeds uniformly back and forth across the drum enabling any desired number of layers or courses to be formed smoothly upon the drum. By virtue of the invention, therefore, the full winding capacity of the drum may be availed of and without any danger or the disadvantage of the cable bunching up or winding irregularly on the drum.

The present invention is especially advanta-
Fig. 1 is a side elevation illustrating a motor driven truck having a winch, constructed in accordance with one embodiment of the present invention, installed thereon.

Fig. 2 is a front elevation of the winch mechanism illustrated in Fig. 1.

Fig. 3 is an enlarged fragmentary side elevation of a portion of the structure shown in Fig. 1 and showing an end elevation of the winch mechanism.

Fig. 4 is an end elevation of another embodiment of winch mechanism.

Fig. 5 is a fragmentary front elevation illustrating particularly a modified form of travelling guide.

Fig. 6 is a section taken substantially through lines 2—6 of Fig. 5 looking in the direction of the arrows.

Fig. 7 is an enlarged side elevation, partly in section, showing a modified form of fixed guide for the cable.

Fig. 8 is a section taken substantially through lines 3—3 of Fig. 7 looking in the direction of the arrows.

Fig. 9 is a fragmentary plan view showing a further embodiment of the invention.

Fig. 10 is a plan view illustrating still a further embodiment.

Fig. 11 is a perspective view of another embodiment of the invention.

Fig. 12 is a schematic view illustrating one method of developing a formula which may be used in determining the curve or contour of the track for the travelling cable guide.

Before explaining in detail the present invention it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also it is to be understood that the phrasing or terminology employed herein is for the purpose of description and not of limitation.

In the drawings I have illustrated by way of example, several embodiments of the invention as applied to a winch or winding mechanism of any suitable type which is provided with a drum or spool preferably power driven for the purpose of conveying the cable or the like thereon. In these embodiments the guiding mechanism for the cable, by means of which the cable windings on the drum are controlled, comprises a guide pulley at one side of the drum supported to travel on a track in a curvilinear path in the general direction of the drum axis and a second guide over which the cable passes to the travelling guide pulley and which is supported at a fixed point or locality in spaced relation both to the drum and the travelling guide pulley. The contour of the track and location of the fixed guide are preferably such that the lead-in line from the travelling pulley to the drum is maintained substantially perpendicular to a plane passing through the drum axis and in any given position of the travelling pulley on its track, the pull or tension forces exerted on the travelling pulley by the two lines of cable running to and from the travelling pulley will substantially balance. Hence, during the winding operation the cable as it is wrapped around the drum will be forced or thrust laterally by the preceding convolution so as to lie contiguous thereto, and this lateral shift of the cable on the drum will exert a force in the same lateral direction shifting the travelling pulley on its track so as to automatically position the lead-in line substantially perpendicular to a plane passing through the drum axis.

Thus, it will be noted that the cable at the locality where it is tangent to the winding surface on the drum is progressively forced or pushed laterally by the adjacent convolution through what is skid action to a camming action and at the same time the travelling pulley is progressively shifted in the same direction on its track into successive positions tending to bring into balance the pulling forces exerted on the pulley by the lines leading from the fixed guide to the travelling guide pulley and thence to the drum.

It will also be noted in the various embodiments that the lead-in line from the travelling guide pulley is constantly maintained at substantially the same angle to the drum, i.e., normal to a plane passing through the axis thereof or approximately so, whereas the secondary lead-in line extending from the fixed guide to the travelling pulley progressively changes its angle of direction. Moreover, the curved profile of the track for best results is preferably such that in all positions of the travelling guide pulley, the length of cable extending from the fixed guide over the travelling pulley to the drum is at all times substantially a constant.

Inasmuch as the winch or winding device embodying the present invention may be used for a variety of purposes it will be understood that it may be supported either on a stationary or a moving structure depending upon the use of the device and the nature of the work to be performed. Motor driven trucks or tractors are frequently equipped with winches and hence for convenience in illustrating one embodiment of the invention, without however limiting the scope or use of the invention, there is illustrated in Figs. 1 to 3 inclusive a motor driven truck equipped with a winch constructed in accordance with such embodiment. This truck is of conventional type having a restricted or relatively narrow space 21 between the cab 22 and the cargo receptacle 23 thereof. Mounted within the space 21 is a winch or winding device, generally indicated at 24, which is constructed in such manner as to permit its use within the relatively narrow space 21. The winch or winding device comprises suitable transversely spaced upright side frames 25 each of which may be made in two parts bolted together to form spaced bearings 26 for a transverse rotatable drum shaft 27 to which is secured a drum or winding spool 28 provided with a cylindrical portion 28a between the end flanges thereof upon which the cable is to be wound. The drum shaft and hence the drum 28 is preferably rotated at the desired speed by suitable power driven mechanism such as by an electric motor and reduction gear unit 19.

Spanning the upper ends of the uprights or stanchions 25 are two spaced rails 29 which are rigidly secured, as by means of bolts, to the upper ends of the side frames 25. The upper surfaces of the rails 29 are correspondingly curved to provide curved tracks or tracking surfaces 29a extending generally in the direction of the drum axis and preferably somewhat beyond the opposite ends of the drum. The preferred manner in which the curve of the tracks 29a is determined is hereinafter set forth. Mounted to travel along the tracks of the spaced rails 29 is a cable guide unit which for convenience may be referred to or termed a travelling guide. In the embodiment shown in Figs. 1 to 3 the trav-
eiling guide comprises a carriage including a base frame 30 of any suitable construction upon which is mounted a set of four flanged rollers or wheels 31, these wheels being arranged in two pairs spaced longitudinally of the rails. Secured to the carriage frame 33 is a bifurcated pulley support or yoke 32 between the ends of which is mounted a rotatable guide pulley 33 secured to a shaft 34 which is revolu-ably supported by the yoke or support 32. Secured to opposite ends of the shaft 34 and to the guide pulley 33, are upright stop members 25b adapted to fit between the guide rails 29 so as to limit the travel of the carriage when it reaches one end or the other of the tracks.

Bolted to the floor or platform of the truck beneath the drum 28 but in the present instance a short distance to the front thereof is a bifurcated bracket 33 between the ends of which is located a yoke 36. This yoke is mounted for transverse pivotal motion upon a shaft or pivot pin 37 carried by the bracket 33. A guide pulley 35 for the cable 25 is rotatably mounted between the sides of the yoke 36 by means of a pivot pin or shaft 40 carried by the bracket 33 in the particular installation shown in this embodiment the end of the cable 25 is attached in any customary manner to one end of the drum 28 and from the drum the cable passes over the pulley 33, thence forwardly and downwardly over the pulley 35 and thence rearwardly beneath the bracket 33, the cable passing through guide rollers 41 beyond the rear of the truck and terminating in a coupling or any other suitable device by means of which the cable may be connected to an object to be hauled or drawn toward the truck by winding the cable upon the drum.

From the foregoing it will be seen that the guide mechanism for controlling the windings or convolutions of the cable on the drum comprises a guide pulley 35 which, although pivoted to permit lateral swinging thereof in order to line up the groove of the pulley with the cable leading therefrom, is mounted at a fixed point or location 37 and hence this guide is herein termed the fixed guide since it is supported at a fixed point with respect to the drum 28. In this embodiment the pivot 37 in the particular installation shown is provided for the guide pulley 35 which supports the cable 25 is located at a point on a line extending perpendicularly to the drum axis and passing through substantially the longitudinal center of the drum. From the pulley 35 the cable is led past the drum over the travelling pulley 33, the portion of cable extending between these pulleys being termed for convenience the secondary lead-in line. From the pulley 33 the cable passes to the drum 28 for winding upon the cylindrical drum surface 28a and the portion of cable extending from the pulley 33 to the drum may be termed for convenience the primary lead-in line. The angularity of the secondary lead-in line 29b with respect to the drum axis varies as the winding of the cable proceeds but the primary lead-in line 38a is at all times substantially perpendicular to a horizontal plane passing through the pulley axis. Thus, as the cable is wound upon the drum the carriage upon which the pulley 33 is mounted will travel along the curved tracks 29a so as to maintain the lead-in line 38a substantially perpendicular to the horizontal plane passing through the drum axis. As a result, each convolution or winding will be formed contiguous to the preceding convolution and the cable will be wound evenly back and forth over the drum.

The embodiment of the invention illustrated in Fig. 4 is the same as that illustrated in Figs. 1 to 3 inclusive excepting as to the relative arrangement of the guide pulley 38, the travelling pulley 33 and the drum 28. In this instance the fixed guide pulley 35 is mounted below and to the rear of the drum 28 and the travelling guide pulley 33 together with its carriage and the guide rails 29 is mounted above but somewhat to the rear of the drum. This embodiment may be suitable in some instances where space requirements necessitate a different location of the cable guiding mechanism. In the embodiment illustrated in Figs. 1 to 3 inclusive, inasmuch as the operation of the mechanism shown in Fig. 4 is the same as that previously described, this embodiment further illustrates the flexibility of the invention in regard to the relative location of the fixed guide, travelling guide and drum.

In Figs. 5 and 6 there is illustrated a somewhat modified construction in respect to the travelling guide mechanism by which construction may be used in lieu of that illustrated in Figs. 1 to 4 inclusive or in connection with any other embodiments of the invention. In this instance the travelling guide mechanism comprises a carriage 42 of diverging frame members at the outer ends of which are revolu-ably supported two pairs of flanged wheels or rollers 43. Between these wheels is arranged a supporting yoke 44 on the outer end of which is journaled a shaft 45 to which is secured a grooved pulley 46. The frame members of the carriage 42 terminate centrally in a hub 42a bored to receive a swivel or rotatable shaft 47 having a bearing within the hub and to which the yoke 44 is secured. The lower reduced end of the swivel shaft 47 passes through a retainer strip or bar 48 which spans the lower edges of the rails 29 and the shaft is held in position by a nut 48. The retainer bar 48 is incorporated in the structure for the purpose of preventing the travelling guide and its carriage from becoming disconnected from the guide rails 29. At each end of the rails 29 at a point therebetween is a stop 50 which may take the form of an adjustable set screw adapted to be engaged by a stop 51 on the carriage 42 at each limit of its travel. The stop 50 may be adjusted toward and from the carriage in order to limit its travel to the desired point at the end of one row of windings on the drum so as to cause the direction of winding of the cable to be reversed at the end of the drum at the proper point.

In the embodiment illustrated in Figs. 7 and 8 there is illustrated a modified form of fixed guide pulley over or from which the cable 39 is fed to the travelling pulley. The construction shown in Figs. 7 and 8 may be substituted for the corresponding fixed guide structure illustrated in Figs. 1 to 4 inclusive or may be incorporated in any of the embodiments of the invention. In this instance the fixed guide structure comprises spaced base or supporting members 52 between which is disposed a ring or other shaped yoke 53 journaled at opposite supporting members 52 as by means of aligned pivots 54. Arranged within the yoke 53 and free to turn therein is a center ring or other shaped yoke 55 which is journaled at opposite sides in the outer yoke 53 as by means of aligned pivots 56. The pivotal axis passing through the pivots 56 intersects the pivotal axis passing through the supporting members 52 and is normal thereto. The center yoke 55 is centrally bored at 55a to receive a swivel shaft 57 which is journaled therein and to which is se-
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Cured an outwardly projecting pulley yoke 58. The fixed guide pulley 38 is secured to a shaft 59 journalled in the outer end of the yoke 58. The lower end of the swivel shaft 57 is threaded to receive a retaining nut 57a which engages a bearing washer interposed between the nut and the bottom of the yoke 55.

By virtue of this construction the pulley 38 is mounted for limited universal movement and, hence, permits the cable line 39 leading away from the pulley to extend therefrom in various angular directions either horizontally or vertically. For example, the drag or hauling line may be led to the pulley 38 in a direction both inclined to the horizontal and also from the side of the drum, such as illustrated in Fig. 11. In such instance the pulley will swivel in order to dispose the groove of the pulley in a plane lined up with the incoming cable and at the same time the supporting yokes 53 and 55 will tilt sufficiently to accommodate the inclination and the angle of the incoming line. In this embodiment, however, it will be noted that the pulley 38 is supported at a fixed point or locality by means of the pivots 51 journalled in the fixed support 50 and, hence, for convenience in description this pulley 38 is termed a fixed guide since it is basically supported at a predetermined fixed point or location.

The embodiment illustrated in Fig. 9 is in most particulars substantially the same as that previously illustrated and described and will be further described in connection with Fig. 10. This embodiment illustrates the application of the invention to a construction where the fixed guide is not located in line with the longitudinal center of the drum but, for example, beyond one end thereof. A construction as shown in Fig. 9 may be desirable in some instances in order to suit space requirements of the installation. In the embodiment of Fig. 9 the curved track is formed by spaced rails 60 which support the travelling guide comprising carriage 62, flanged wheels 43, swivel pulley yoke 44, and guide pulley 46. The construction of the travelling guide is preferably similar to that illustrated in Figs. 5 and 6. The fixed guide comprises spaced grooved guide rollers 61 between which the cable 39 passes. These guide rollers are journalled at fixed points 61a and are guided to the guide rollers in pairs through a pair of vertically spaced guide rollers 62. The power driven winding drum construction may be substantially the same as that previously described. The curvature or curved profile of the track is determined by a plane passing through a point centrally between the pivots 61a and perpendicular to the axis of the drum 28. The portion of the complete symmetrical track profile needed for the travel of the carriage 42 is determined by the width of the drum 28.

The embodiment illustrated in Fig. 10 is very much similar to that shown in Fig. 9. In both instances the track guide for the travelling pulley is located at the opposite side of the winding drum from the fixed guide. The construction in Fig. 10 differs from Fig. 9 in that a full symmetrical curve is provided to indicate that the fixed guide is located centrally of the drum instead of toward one end thereof as in Fig. 9. In this construction the spaced guide rails 63 are suitably supported at opposite ends through the medium of stanchions or other supporting members 64. On the carriage 65 are revolu-bly supported two spaced pairs of flanged wheels or rollers 66 adapted to travel upon the outer curved tracking surfaces of the rails 63, this construction being substantially the same as that previously shown and described. Arranged between the winding drum 28 and the rails 63 is a pulley yoke 57 swivelled at 68 within a bore in the hub of the carriage 55. The swivel shaft 68 has a bearing in this hub in much the same manner as the construction shown in Fig. 5 and the carriage and yoke are held in position against disconnection from the rails by means of a transverse retainer bar 70 spanning the rails and a nut 69 threaded onto the end of the shaft 68.

A grooved pulley 71 is journalled in the bifurcated ends of the yoke 67, and since the yoke is swivelled the pulley may turn relatively to the carriage to suit the angularity of the lead-in lines. The fixed guide over which the incoming line passes is the same as that shown in Fig. 9 and comprises spaced grooved pulleys 61 between which the cable passes and a pair of vertical guide rollers 62 arranged immediately in rear of the pulleys 61. As distinguished from the embodiment shown in Fig. 9, a vertical plane passing through a point lying centrally between the pivots 61a will bisect the winding surface of the drum 28 and will pass through the symmetrical center of the curved tracks 65. In view of the construction shown in Fig. 9 it will be seen, however, that the fixed guide may not only be located in front or in rear of the winding drum but may be located at various locations on one side or the other of a plane passing through the center of the drum.

The embodiment of the invention shown in Fig. 11 shows an application of the invention using a travelling guide of the swivel type shown in Figs. 5 and 6 mounted to travel along a curved track 23 in substantially the same manner as shown in the embodiment of Figs. 1 to 3 inclusive. Moreover, in Fig. 11 the fixed guide is of the type shown in Figs. 7 and 8 which is mounted below and to the rear of the winding drum 23, somewhat in the same manner as shown in Figs. 1 to 3 inclusive.

It will be understood that the track proper may be of any conventional type, either power driven as previously described or operated in any suitable manner to wind the cable 33 upon the drum. The fixed guide in the embodiment of Fig. 11 functions in the same manner as described in connection with Figs. 7 and 8, the pulley 38 not only being swivelled to turn to the desired angle to accommodate the angular direction of the incoming line but also mounted for limited universal movement in transverse directions.

As previously stated, for best results the curvilinear contour or profile of the track for the travelling pulley is such that in all positions of the pulley the lead-in line to the drum will remain in a plane substantially perpendicular to the axis of the drum and the length of cable extending from the fixed guide to the pulley to the drum will be substantially a constant. It is my belief that in order to achieve most efficient operation of the winding device the track curve or profile will vary somewhat from a true arc, and in my opinion the following method may be followed in developing a formula which may be used in fitting the form in laying out the desired curve for the track.

Referring to Fig. 12 the point O is predetermined and represents a fixed point through which
or from which the cable is drawn before passing over the trolley pulley and being wound on the drum. In Fig. 10 the fixed point is between the pulleys 61. In Fig. 11 the fixed point is approximately at the intersection of the extended axis of the cable 35b and the axis of the journal bearings 54 of member 53. Point O is the point of intersection of the cable line 35b with the pivot 57 in Fig. 2 or the pivot 54 in Fig. 7. It will be seen that the fixed point O lies on a line 100 perpendicular to a plane passing through the axis 101 and this line lies in a plane bisecting the drum. The track curve T to be developed is symmetrical about the center point C of this curve which also lies on the line 100. The position of the travelling pulley and its distance from the drum are also initially determined, it being noted from the drawings and the previous description that this pulley and the track may be located above or at either the front or rear of the drum.

In the schematic illustration in Fig. 12 a predetermined position of the travelling pulley 33 is shown as also the related position of the swiveled pulley 46 or 11. The point P represents the intersection of the angularly related primary and secondary lead-in lines 33a and 33b of the cable 39 which pass over the fixed guide at point O and over the non-swiveled pulley 33c. Where a swiveled pulley 45 or 11 is used the point P represents the intersection of the projected lines 33a and 33b passing over this pulley. Point P lies on the curve T to be determined and its distance from the drum axis will of course vary as the pulley 33, 45 or 11 travels along the track. It will be noted that the primary lead-in line 33a is perpendicular to the drum axis 101, or to a plane passing therethrough, and its point of intersection with this axis or plane is indicated at A. Base line 102 is a perpendicular to line 100 passing through point O. The distance between base line 102 and the drum axis 101 is designated as d; the variable distance between the drum axis and point P on the perpendicular line 33a is designated AP; and the variable distance between points O and P is designated OP.

In the following formulae X represents the variable distance from point P to line 102 and Y represents the variable distance from point P to line 100. As previously stated the sum of the distance OP and AP is a constant and it will be noted that the distance d is also a constant.

Based upon the foregoing factors the following formulas are developed by which all points P on the curve T may be found:

\[ O\text{P} + A\text{P} = \text{constant} = N \]

\[ O\text{P} = \sqrt{X^2 + Y^2} \]

\[ A\text{P} = X - d \]

\[ \sqrt{X^2 + Y^2} + X - D = N \]

\[ \sqrt{X^2 + Y^2} + X = N + d \]

\[ d \text{ is a constant. Let } N + d = N_1 \]

\[ \sqrt{X^2 + Y^2} + X = N_1 - X \]

\[ \sqrt{X^2 + Y^2} = N_1 - X \]

\[ X^2 + Y^2 = N_1^2 - 2N_1X + X^2 \]

\[ Y^2 = N_1^2 - 2N_1X + X^2 \]

\[ 2N_1X = N_1^2 - Y^2 \]

\[ X = \frac{N_1^2 - Y^2}{2N_1} \]

Example:

Let \( d = 2 \) ft.

Let \( N = 6 \) ft.

\[ N_1 = 8 \text{ ft.} \]

\[ X = \frac{N_1^2 - Y^2}{2N_1} \]

Solve for \( X \) with various values of \( Y \).

Example: Let \( X = 2 \) ft.

\[ X = \frac{64 - 4}{16} = 3 \frac{1}{2} \text{ ft.} \]

Using the foregoing example as an illustration it will be seen that when point P is 2 feet from the line 100 it will lie 3 1/2 feet from the base line 102. Any desired number of points P may be plotted in corresponding manner and a line passing through these points will produce the track curve T.

I claim:

1. In a cable control device for a winding drum or the like, track means comprising a pair of spaced curved parallel rails supported at one side of the drum, a carriage adapted to travel along said rails and including two pairs of rollers, each pair having rolling engagement with a rail, a pulley support mounted on the carriage between the pairs of rollers and pivotally mounted on the carriage to turn about an axis fixed with relation to the carriage and extending between the rails transversely thereof, a guide pulley rotatably mounted on said support and adapted to swing laterally with said support about said axis during travel of the carriage along the rails, and a cable guide mounted at one side of the drum for guiding the cable to the guide pulley and thence to the drum.

2. In a cable control device for a winding drum or the like, track means comprising a pair of spaced curved parallel rails supported at one side of the drum, a carriage adapted to travel along said rails and including two pairs of rollers, each pair having rolling engagement with a rail and change means resisting sidewise displacement of the carriage on the rail, a pulley support mounted on the carriage between the pairs of rollers and pivotally mounted on the carriage to turn about an axis fixed with relation to the carriage and extending centrally between the rails transversely thereof, a guide pulley rotatably mounted on said support and adapted to swing laterally with said support about said axis during travel of the carriage along the rails, and a cable guide mounted at a fixed position at one side of the drum for guiding the cable to the guide pulley and thence to the drum.

3. In a winding or spooling device for a cable to be wound on a drum or the like, a curved track supported at one side of the drum, a carriage adapted to travel along the track and including rollers having rolling engagement therewith, a pulley support mounted on the carriage and pivotally mounted on the carriage to turn about an axis fixed with relation to the carriage extending substantially perpendicular to the tangent to said track at every position of the carriage thereon, and a guide pulley rotatably mounted on said support and adapted to swing laterally with said support about said axis during travel of the carriage along the track.

4. In a winding or spooling device for a cable to be wound on a drum or the like, a curved track supported at one side of the drum, a carriage...
adapted to travel along the track and including rollers having rolling engagement therewith, a pulley support mounted on the carriage and pivotally mounted on the carriage to turn about an axis fixed with relation to the carriage extending substantially perpendicular to the tangent to said track at every position of the carriage thereon, and a guide pulley rotatably mounted on said support and adapted to swing laterally with said support about said axis during travel of the carriage along the track, the axis of rotation of the guide pulley extending in a plane substantially parallel to said tangent at every position of the carriage.

5. In a cable control device for a winding drum or the like, track means comprising a pair of spaced curved parallel rails supported at one side of the drum, a carriage adapted to travel along said rails and including two pairs of rollers having rolling engagement with said rails, a pulley support mounted on the carriage between the pairs of rollers and pivotally mounted on the carriage to turn about an axis fixed with relation to the carriage and extending substantially perpendicular to a plane tangent to said rails at every position of the carriage thereon, and a guide pulley mounted on said support to rotate about an axis fixed with relation to the support and adapted to swing laterally with said support about the axis of turning of the latter during travel of the carriage along the rails.

6. In a cable control device for a winding drum or the like, track means comprising a pair of spaced curved parallel rails supported at one side of the drum, a carriage adapted to travel along said rails and including two pairs of rollers having rolling engagement with said rails, a pulley support mounted on the carriage between the pairs of rollers and pivotally mounted on the carriage to turn about an axis fixed with relation to the carriage and extending substantially perpendicular to a plane tangent to said rails at every position of the carriage thereon, and a guide pulley mounted on said support to rotate about an axis fixed with relation to the support and adapted to swing laterally with said support about the axis of turning of the latter during travel of the carriage along the rails, a guide pulley extending in a plane substantially parallel to said tangent at every position of the carriage.

7. In a cable control device for a winding drum or the like, track means comprising a pair of spaced curved parallel rails supported at one side of the drum, a carriage adapted to travel along said rails and including two pairs of rollers having rolling engagement with said rails, a pulley support mounted on the carriage between the pairs of rollers and pivotally mounted on the carriage to turn about an axis fixed with relation to the carriage and extending substantially perpendicular to a plane tangent to said rails at every position of the carriage thereon, a guide pulley mounted on said support to rotate about an axis fixed with relation to the support and adapted to swing laterally with said support about the axis of turning of the latter during travel of the carriage along the rails, and a cable guide mounted at a fixed position at one side of the drum for guiding the cable to the guide pulley and thence to the drum.

In a cable control device for a winding drum or the like, track means comprising a pair of spaced curved parallel rails supported at one side of the drum, a carriage adapted to travel along said rails and including two pairs of rollers having rolling engagement with said rails, a pulley support mounted on the carriage between the pairs of rollers and pivotally mounted on the carriage to turn about an axis fixed with relation to the carriage and extending substantially perpendicular to a plane tangent to said rails at every position of the carriage thereon, said axis extending substantially centrally between said rails and said rollers, and a guide pulley mounted on said support to rotate about an axis fixed with relation to the support and adapted to swing laterally with said support about the axis of turning of the latter during travel of the carriage along the rails.

9. In a cable control device for a winding drum or the like, track means comprising a pair of spaced curved parallel rails supported at one side of the drum, a carriage adapted to travel along said rails and including two pairs of rollers having rolling engagement with said rails, a pulley support mounted on the carriage between the pairs of rollers and pivotally mounted on the carriage to turn about an axis fixed with relation to the carriage and extending substantially perpendicular to a plane tangent to said rails at every position of the carriage thereon, a guide pulley mounted on said support to rotate about an axis fixed with relation to the support and adapted to swing laterally with said support about the axis of turning of the latter during travel of the carriage along the rails.

10. In a winding device for a cable including a winding drum or the like, a curved track supported at one side of the drum, a carriage having rollers adapted to travel along said track, a rotatable guide pulley mounted on the carriage to turn about an axis fixed with relation to the carriage and extending substantially perpendicular to the tangent to said track at every position of the carriage thereon, a cable guide mounted at one side of the drum for guiding the cable to the guide pulley and thence to the drum, and adjustable stop means for limiting the travel of the carriage on the track at a point to reverse the direction of winding of the cable on the drum at a predetermined point.

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