Sept. 17, 1957 H. J. MARTIN 2,806,380

SHEAVE BLOCK FOR STRINGING ALUMINUM CABLE

Filed Oct. 24, 1955 2 Sheets-Sheet 1

Fig. 1.

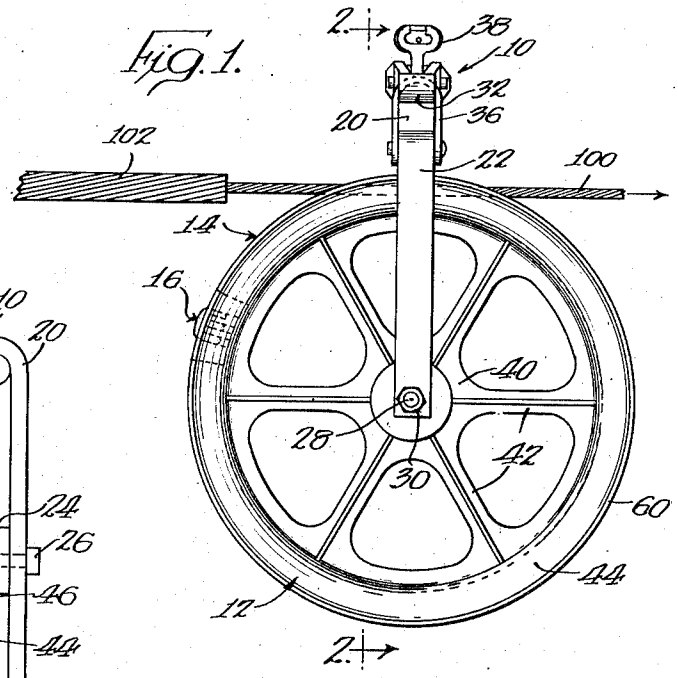


Fig. 2.

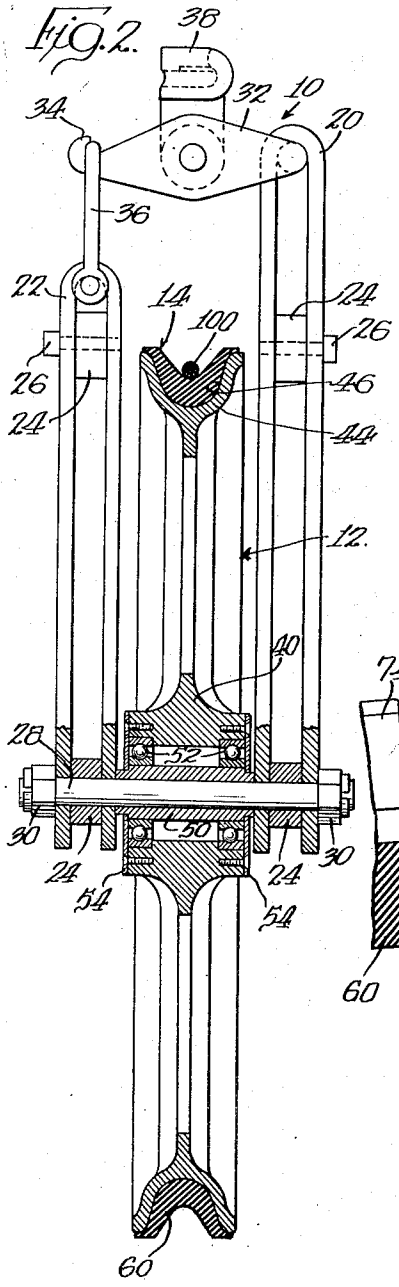
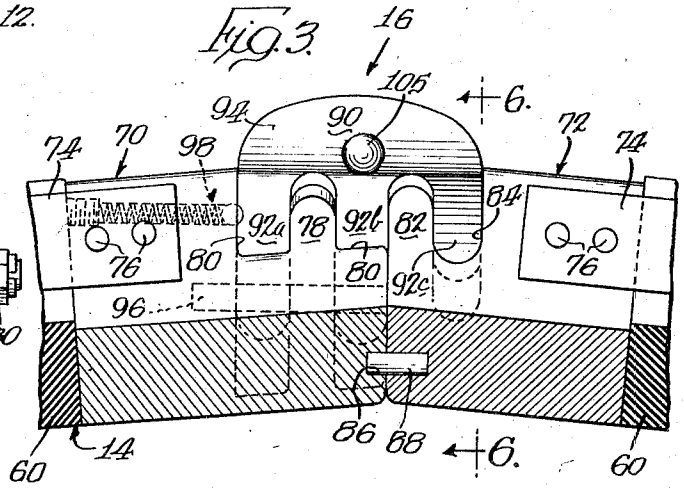


Fig. 3.



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Fig. 4.

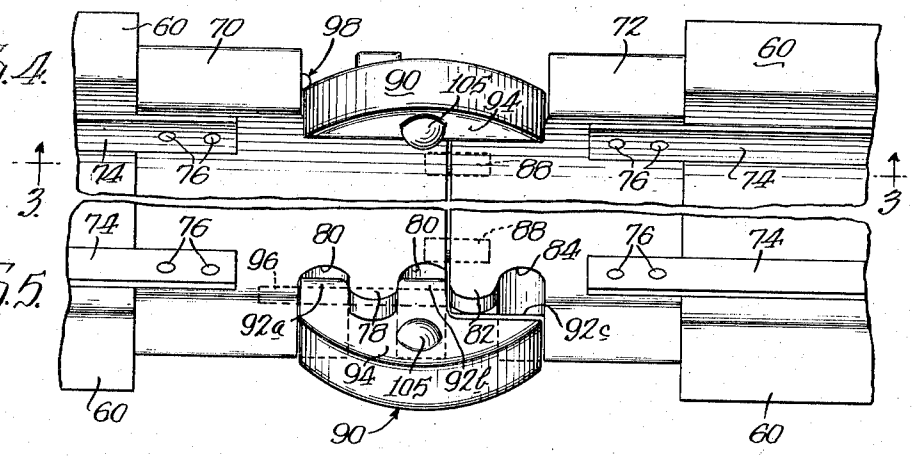


Fig. 5.

Fig. 6.

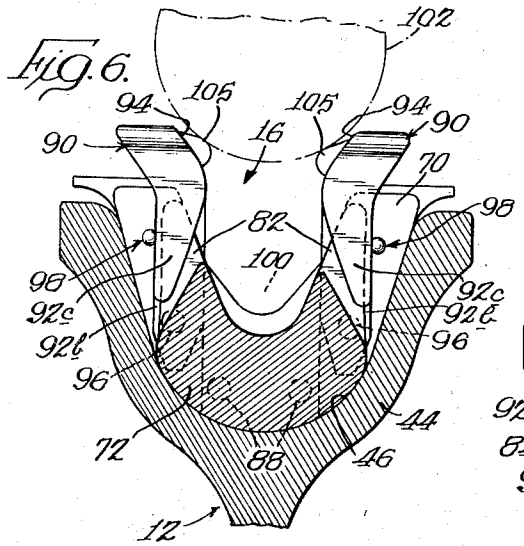
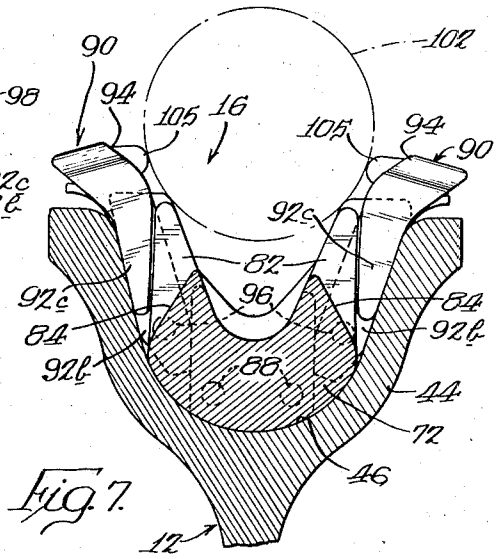


Fig. 7.



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SHEAVE BLOCK FOR STRINGING ALUMINUM CABLE

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Application October 24, 1955, Serial No. 542,319

7 Claims. (Cl. 74—230.7)

The present invention relates to sheave blocks, and particularly, to an improved sheave block especially adapted for use in stringing aluminum and like soft metal cables.

The invention is particularly applicable to use in conjunction with the erection of high tension electrical power transmission cables or conductors. High tension conductors are normally strung between towers of approximately 100–150 feet in height which are spaced several hundred feet apart, an individual length of conductor spanning between several towers. In the erection or stringing of the conductor, a winch or pulling device is located several towers away from the supply spool of cable to be erected, and a pulling line or rope is run from the winch through several towers, in the path in which the cable is to be erected, to the supply spool. The pull rope is attached to the cable and the winch is then actuated to pull the cable into position on the towers. Thereafter, the ends of the cables are tied off and a proper sag adjustment is made. To guide the pull rope and the conductor cable during erection of the cable, guide sheaves are suspended from the cross arms of the towers and the pull rope is reaved over these sheaves to pull the conductor cable over the sheaves into position. When the cable is tied to the cross arms of the tower, by suitable insulator strings, the guide sheaves are individually detached and lowered to the ground.

In erecting large diameter stranded aluminum conductor cable for high tension transmission systems, it has been found that every precaution must be taken to avoid scratching of the highly polished surface of the stranded cable, for if the cable becomes scratched, a strong corona effect is created upon energization of the cable, which results in interference with communication networks and renders the system unsuited for commercial use. For this reason, the sheaves for guiding the relatively soft conductor cable are formed of the same material or metal as, or of a material or metal similar to, the cable and are formed of a large diameter and with a smooth cable receiving surface to mitigate against scratching of the cable. However, the pull rope used for pulling the cable into place on the towers is a small diameter stranded steel rope, which can be handled with relatively great facility to accommodate stringing of the pull rope through the towers in the first instance. If the steel pull rope were permitted to engage the aluminum sheave for guiding the aluminum conductor cable, the sheave would be abraded, and the cable receiving surface thereof would be rendered rough and worn out in a very short period of time. Obviously then, the steel rope cannot be permitted to engage the aluminum sheave. Furthermore, the steel pull rope is normally permitted to drag along the ground during initial stringing thereof, so that the same is relatively dirty, and it is therefore necessary to shield the aluminum sheave, not only from direct contact with the pull rope, but from particles of dirt that may fall off of the same, and subsequently scratch the cable and its supporting sheave. Thus, in a sheave block

for stringing aluminum and like soft metal cables, it is necessary to employ a special guide sheave for the soft metal cable, preferably formed of the same metal as or a metal similar to the cable, and means for shielding the soft metal sheave from the pull rope and from dirt that may fall off of the pull rope.

In my copending application, Serial No. 456,409, filed September 16, 1954, now Patent No. 2,765,154, I have disclosed one sheave block means meeting the stated objectives and affording, in commercial use, a practical assembly which does not scratch the soft metal conductor cable. This sheave block comprises, briefly, a cable guide sheave, a pair of pull rope sheaves which are normally disposed above the cable sheave so that the pull rope supported thereby passes above and does not contact the cable sheave, linkage means for lowering the pull rope sheaves below the upper surface of the cable sheave, and a movable guide plate disposed over the upper surface of the cable sheave when the pull rope sheaves are in their upper positions. In use of the sheave block, the pull rope sheaves are initially disposed in their upper positions and the pull rope is reaved thereover, so that the pull rope does not engage the cable sheave and the guide plate shields the cable sheave from dirt and the like that may fall off of the pull rope. The steel pull rope is attached to the soft aluminum conductor and the winch is actuated to pull the conductor cable into position. As the leading end of the conductor cable approaches each guide sheave block, the leading end is pulled into position above the aluminum cable sheave. A worker on the tower structure, equipped with a long pole, then pulls on a chain associated with the sheave block which results, first, in releasing the guide plate to expose the upper surface of the cable sheave, and second, in tripping the supporting linkage for the pull rope sheaves whereupon the pull rope sheaves are lowered to lower the conductor cable onto the clean cable sheave. Thereafter, of course, the conductor cable runs on the cable sheave and does not engage the pull rope sheaves, whereby the cable is protected against scratching and scuffing. The sheave block is equipped with a detachable suspending yoke, so that when the cable is tied to the tower, upon completion of the stringing operation, the sheave block may be lowered away from the strung cable for use at another location. While this sheave block has proven highly successful in use, it is to be appreciated that the same is necessarily formed of a large number of parts, which renders the same relatively expensive, quite heavy and somewhat cumbersome, and that the device suffers the disadvantage of requiring manual actuation.

It is an object of the present invention to provide an improved sheave block for the purposes stated, which performs the general functions and affords the advantages of the sheave block above described, and which is of highly simplified, economical and lightweight construction and is actuated automatically.

Another object of the invention is to provide an improved sheave block for the purposes stated comprising, simply, a suspending yoke or frame, a sheave generally of the same material as the cable to be erected, and protective means for the sheave, which means guides the pull rope and prevents engagement of the pull rope with the sheave, and which is automatically released from the sheave when the conductor cable approaches the sheave to expose the sheave for supporting and guiding the conductor cable.

A further object of the invention is the provision of an improved sheave block for the purposes stated including a cable sheave, a protective liner or covering for the sheave, and releasable means for attaching the liner or covering on the sheave and for releasing the liner or covering from the sheave, the releasable means being

actuated as a function of the difference in diameter between the pull rope and the conductor cable.

More specifically, it is an object of the invention to provide an improved sheave block for the purposes stated comprising a frame, a cable sheave journaled on the frame, and a detachable liner on the sheave, the liner comprising an elongate flexible member of a length equal substantially to the circumference of the sheave and connector members at each end thereof, said liner being normally wrapped about the circumference of the sheave and connected at its ends by said members to retain the liner on the sheave, one of said members including radial tabs movable transversely of the sheave in an outward direction to disconnect said members, said tabs in the inner closed positions thereof being spaced apart transversely of the sheave by a distance greater than the diameter of the pull rope and less than the diameter of the cable, the pull rope being reaved over the liner and in its passage over the liner passing freely between said tabs so that the sheave is not contacted by the rope and the sheave surface is shielded from dirt or the like on the rope, the cable as it is pulled into position over the sheave on the liner spreading said tabs apart to disconnect said connector members, whereby, as the cable continues to move over and rotate the sheave, the liner is released and falls off of the sheave so that the cable is supported and guided directly by the sheave.

Accordingly, it is to be appreciated that the present invention provides improved guide sheave means meeting the stated objectives of protecting the soft metal conductor cable and its guide sheave, and of exposing the sheave to support the cable only when the cable is in position over the sheave, and at the same time affording the distinct advantages of simplicity, economy, compactness, lightweight and automatic operation.

Other objects and advantages of the present invention will become apparent in the following detailed description of a preferred embodiment of the invention.

Now, in order to acquaint those skilled in the art with the manner of making and using the improved sheave block of the invention, I shall describe, in connection with the accompanying drawings, a preferred embodiment of my invention and a preferred manner of making and using the same.

In the drawings:

Figure 1 is a side elevation of the improved sheave block means of the invention, showing a pull rope passing over the sheave means and pulling a conductor cable toward the sheave;

Figure 2 is a vertical cross section of the sheave block, on an enlarged scale, the view being taken substantially on line 2—2 of Figure 1;

Figure 3 is a fragmentary longitudinal sectional view of the sheave liner showing the connector members thereof, the view being taken substantially on line 3—3 of Figure 4;

Figure 4 is a fragmentary plan view of the sheave liner, the view comprising a plan of one longitudinal half of the connector members and showing one of the tabs in its inner closed position;

Figure 5 is a plan view similar to Figure 4 showing the other longitudinal half of the connector members, and showing the other tab in its outer open position;

Figure 6 is a fragmentary cross sectional view, on a still further enlarged scale, of the sheave and connector members, the view being taken substantially on line 6—6 of Figure 3 and showing the tabs of the connector members closed as the cable, shown in dotted lines, initially engages the same; and

Figure 7 is a view similar to Figure 6 showing the connector tabs in open position as the result of the cable having moved the same apart.

Referring now to the drawings, and particularly to Figures 1 and 2, the improved sheave block of the present invention is shown as comprising, generally, a frame or supporting yoke **10**, a large diameter sheave **12** journaled on the frame, and a liner **14** for the sheave including a connector **16**.

The frame **10** may be of any suitable form, but I prefer to adopt a sheave supporting yoke of elongated, inverted U-shape, one arm **20** of which is appreciably longer than the other arm **22**. Each of the arms **20** and **22** may suitably comprise a strap bent to invert U-shape, the legs of which are spaced but interconnected by means of spacers **24** and bolts **26**. At their lower ends, the arms **20** and **22** support the opposite ends of an axle **28**, the axle passing through the lower spacers **24** and being secured to the arms by castellated nuts **30**. A hook **32** is pivoted at one end in the loop at the upper end of the long arm **20**, and at its other end is provided with a curved bill **34** which engages in the bight portion of a clevis **36** pivoted in the loop at the upper end of the shorter arm **22**. A hook carrier **38** is attached to the hook **32** at the midpoint thereof to accommodate suspension of the frame **10** from the cross arm of a cable supporting tower.

The sheave **12** is of generally conventional form including a hub **40**, radial spokes **42** and a continuous peripheral rim **44** having a recess or groove **46** therein for reception of a cable to be erected. For the reasons set forth hereinbefore, the sheave, or at least the grooved rim portion thereof, is formed of the same material or metal as, or of a material or metal similar to, the cable to be erected. In a specific problem I have encountered, stranded aluminum cable, having a stranded steel core for structural strength, is utilized as the conductor in a 330 kv. electric power transmission system. This cable is 1¾ inches in diameter and is to be erected in lengths to span between several supporting towers, as has been previously described. For use in erecting such cable, I prefer to utilize an integral aluminum sheave approximately 2¼ feet in diameter, including a rim approximately 3¼ inches wide having a cable receiving groove approximately 1¾ inches deep complementary to the cable at its bottom portion and tapering outwardly and upwardly. Specifications for other specific problems will be obvious to those skilled in the art.

The sheave **12** is rotatably mounted within the supporting yoke or frame **10** on the axle **28** by means of a bearing assembly disposed within the hub **40** of the sheave and comprising a bushing **50** on the axle, a pair of ball bearings **52** between the bushing and the sheave hub, and annular end plates **54** attached to opposite sides of the hub to shield the bearings.

The sheave liner **14** preferably comprises an elongate flexible member **60** of a length slightly less than the circumferential dimension of the sheave **12** and the connector **16**, the member **60** and connector **16** together being of a length substantially equal to the circumference of the sheave. The member **60** is preferably a hard rubber extrusion having an inner surface complementary to the groove **46** in the rim of the sheave and a grooved outer surface for the reception of a rope of smaller diameter than the cable to be erected.

The connector **16** comprises two separable members or elements **70** and **72** both formed, preferably, of the same metal or material as the sheave **12**. Each member or element, in reference to the sheave and the flexible member **60**, has an inner surface complementary to the groove in the sheave rim and an outer surface the same as the outer surface of the member **60**, so that the elements are generally U-shaped in cross section. The elements **70** and **72** are secured to the opposite ends of the flexible member **60**, two straps **74** being fixed to each leg of each element and extending rearwardly therefrom to receive therebetween the corresponding legs of the member **60**, rivets **76** being passed through the straps and the legs of the elements and flexible member to effect secure attachment of the connector elements to the ends of the

flexible member. The connector element 70 is slightly longer than the element 72 and comprises a latch carrier having adjacent its free end a tooth 78 and two tooth recesses 80 to opposite sides of the tooth 78 formed in each leg thereof, a tooth recess 80 being provided at the end of the member. The element 72 comprises a latch anchor and is provided in each leg thereof with a somewhat similar tooth 82 at its free end and a single tooth recess 84 inwardly of the tooth. At the engaging faces of the two members or elements, the element 70 is provided with a pair of recesses 86 and the element 72 is provided with a pair of longitudinally extending pins 88 which are enterable into the recesses 86 for purposes of aligning the two sections when the same are brought together in end-to-end relation. When thus aligned, the elements 70 and 72, in each leg thereof, present two teeth and three tooth recesses.

To couple the two elements 70 and 72 in the described position, thus to connect the ends of the sheave liner, a tab or latch 90 is pivotally mounted on each leg of the latch carrier 70. Each tab or latch 90 comprises three longitudinally spaced radially inwardly extending teeth 92 complementary to the teeth 78 and 82 on the elements 70 and 72, and radially outwardly extending bridge portions 94. Two of the teeth of each latch are received within the tooth recesses 80 in the latch carrier 70 and the latches are pivotally mounted on the carrier 70 for movement transversely of the liner and sheave by means of pivot pins 96 extending through the teeth 92 and 78 and threaded into the body of the carrier. The teeth 92*a* and 92*b* of the latch fit within the tooth recesses 80 in the carrier 70 and interlock with the tooth 78 in all positions of the latch, the side surfaces of the latch teeth 92 cooperating with the body of the carrier to define two positions of the latch, as is shown in Figures 6 and 7, wherein the sides of the outer end portion of the carrier body is indicated by the vertical dotted lines. To retain the latches in either of the two positions shown, the carrier 70 is preferably provided in each leg thereof with a ball and spring type detent 98 engaging the rearward tooth 92*a* of the respective latch. In the inner position of the latches or tabs 90, as shown in Figure 6, the tabs are spaced apart by a distance greater than the diameter of the pull rope to be employed and less than the diameter of the cable to be erected.

The outermost tooth 92*c* on each latch is preferably of slightly different form than the teeth 92*a* and 92*b*, being shorter and tapered at the radially inward end portion thereof. The tooth 82 on each leg of the latch member 72 is also of different form than the teeth 78 on the carrier 70, the teeth 82 being of reduced thickness transversely of the liner and the sheave to afford clearance at the outer side thereof for the teeth 92*c*, so that when the latches or tabs are in their inner position, as shown in Figure 6, the teeth 82 and 92*c* are meshed or interlocked, and so that when the tabs are moved into their transversely outward position, as shown in Figure 7, the teeth 82 and 92*c* are unmeshed to accommodate separation of the elements 70 and 72 circumferentially of the sheave.

By forming the flexible member 60 and the connector members 70 and 72 of a total length slightly less than the circumference of the sheave, the resilient rubber member 60 is stressed when the liner is mounted on the sheave so that a resilient separating force is afforded when the teeth 82 and 92*c* are unmeshed to assist in releasing the liner from the sheave.

In use, the liner 14 is wrapped about the sheave 12 in the manner indicated and the locking elements of the connector 16 are intermeshed to connect the ends of the liner and to mount the same on the sheave. The frame or sheave supporting yoke 10 of the assembly is then suspended from a cable supporting tower, suitably by clipping the hook carrier 38 onto a complementary fitting at the end of an insulator string, not shown, connected to a cross arm of the tower. A small diameter steel pull rope, indicated at 100 in Figures 1, 2 and 6, is reaved over the sheave liner, conducted to a supply spool of aluminum or other relatively soft cable to be erected and attached to the leading end of the cable 102, as is shown diagrammatically in Figure 1. The rope 100 is then pulled in, by a winch or the like, to pull the cable 102 into position on the tower in the direction indicated by the arrow in Figure 1. As the pull rope 100 passes over and rotates the sheave and liner by which it is supported, the liner 14, which covers the entire cable receiving surface or groove of the sheave 12, supports and guides the rope and protects the sheave from contact with the rope and any dirt or the like accumulated on or falling off of the rope. During such movement, the pull rope, being of a diameter less than the spacing between the tabs or latches 90, and the bridge portions 94 thereof, passes freely between the tabs to be supported by the liner 14 and connector 16, as is indicated in Figure 6.

As the relatively soft surfaced cable to be erected approaches the sheave 12, a short length thereof may be received on the liner 14 until the tabs or latches 90 are rotated around to the upper surface of the sheave. As the tabs are rotated into such position, the bridge portions 94 of the tabs are engaged by the cable 102, which is of a diameter greater than the spacing between the tabs, and the cable, due to its weight, forces the tabs apart to pivot the tabs or latches to their outer positions. To facilitate such action, the latch bridges 94 are preferably inclined transversely outward and provided with projections 105 to be engaged by the cable. As the tabs or latches are moved to their outer positions, the connector elements 70 and 72 are released and the ends of the liner disconnected, whereupon, as the sheave continues to rotate due to passage of the cable 102 thereover, the liner is released and falls away from the sheave to leave the sheave freely exposed directly to support and guide the cable 102 within the groove 46 thereof.

From the foregoing, it is to be appreciated that the sheave block of the invention protects the cable against scratching and scuffing and provides an optimum supporting and guiding surface which will not scratch or mar the cable. The supporting surface is fully protected against abrading and such other wear as might result ultimately in scratching of the cable, and the means for protecting the sheave surface is automatically removed when the cable comes into position to be supported by the sheave. In addition, the sheave block of the invention is formed of a minimum number of parts, is as compact as it can be, is not particularly heavy, is not cumbersome and is highly economical in manufacture and assembly.

When the cable 102 is pulled into position, it is tied off at its ends and a proper sag adjustment is made, and the cable is then tied individually to the supporting towers. To free the cable from the sheave means, it is only necessary for the workmen doing the tying off to release the clevis 36 from the hook 32, whereupon the cable may be extracted from the yoke 10, and the disassociate the carrier 38 from the insulator string and lower the sheave to the ground, whereafter the sheave may be put to use in stringing another length of cable.

While I have shown and described what I regard to be a preferred embodiment of my invention, it will be appreciated that various changes, rearrangements and modifications may be made therein without departing from the scope of the invention, as defined by the appended claims.

I claim:

1. A sheave block for stringing cables comprising a sheave, a detachable liner for said sheave, and a connector releasably mounting said liner on said sheave, said connector including means engageable by a cable for releasing said connector automatically to accommodate detachment of said liner from said sheave.

2. A sheave block for stringing cables comprising a

rotatable sheave, a detachable liner for said sheave of a length equal substantially to the circumference of said sheave, and a connector releasably connecting the ends of said liner to mount said liner on said sheave, said connector including means engageable by a cable for disconnecting the ends of said liner, said liner, when disconnected at its ends, upon rotation of said sheave due to passage of the cable thereover, automatically becoming detached from said sheave.

3. A sheave block for stringing cables comprising a sheave for supporting and guiding the cable, a liner for said sheave, and a connector releasably mounting said liner on said sheave, said connector including tab means spaced laterally of said sheave for releasing said liner from said sheave, said tab means when said liner is mounted on said sheave being spaced apart by a predetermined distance less than the diameter of the cable to be erected, the cable, as it is pulled over said liner and sheave, engaging said tab means and forcing the same apart to release said liner and thereby expose said sheave for directly supporting and guiding the cable.

4. A sheave block for use in stringing soft metal cables and the like wherein the cable is pulled into position by a pull rope of smaller diameter than the cable, comprising a sheave for supporting and guiding the cable, a liner for said sheave of a length equal substantially to the circumference of said sheave, and a connector for detachably connecting the ends of said liner to mount said liner on said sheave, said connector including interlocking elements on the opposite ends of said liner and tab means spaced laterally of said sheave for actuating said elements, said tab means in the interlocked position of said elements being spaced apart by a distance greater than the diameter of the pull rope and less than the diameter of the cable, the pull rope in passing over said liner and sheave passing freely between said tab means, said liner protecting and shielding said sheave from the pull rope, the cable, as it is pulled over said liner and sheave, engaging said tab means and forcing the same apart to unlock said elements and release said liner to expose said sheave for directly supporting and guiding the cable.

5. A sheave block for use in stringing soft metal cables and the like wherein the cable is pulled into position by a pull rope of smaller diameter than the cable, comprising a sheave for supporting and guiding the cable, a liner for said sheave of a length equal substantially to the circumference of said sheave, and a connector for detachably connecting the ends of said liner to mount said liner on said sheave, said connector comprising a pair of members secured respectively to the ends of said liner and a pair of tabs pivotally mounted on one of said members for movement transversely of said liner and said sheave, at least the other of said members having teeth thereon and said tabs having teeth thereon complementary to the teeth on said other member, the teeth on said tabs in the transversely inward position of said tabs meshing with the teeth on said other member to connect said members and the ends of said liner together, the teeth on said tabs in the transversely outward position of said tabs being unmeshed with respect to the teeth on said other member, the distance between said tabs transversely of said liner and said sheave in the inward position thereof being greater than the diameter of the pull rope and less than the diameter of the cable, the pull rope in passing over said liner and sheave passing freely between said tab means, said liner protecting and shielding said sheave from the pull rope, the cable, as it is pulled over said liner and sheave, engaging said tab means and forcing the same apart to the transversely outward position thereof to release said members and disconnect the ends of said liner, whereupon said liner falls off of said sheave to expose said sheave for directly supporting and guiding the cable.

6. A sheave block for use in stringing soft metal cables and the like wherein the cable is pulled into position by a pull rope of smaller diameter than the cable, comprising a sheave having a peripheral groove therein for supporting and guiding the cable, and a liner fitting into and covering the full surface of said groove in said sheave, the exterior surface of said liner having a groove therein for supporting and guiding the pull rope, said liner comprising a flexible member of a length slightly less than the circumferential dimension of said sheave and a connector detachably connecting the ends of said member to mount said liner in said groove on said sheave, said connector comprising a pair of elements secured respectively to the ends of said flexible member and a pair of tabs pivotally mounted on one of said elements for movement transversely of said liner and said sheave, both of said elements having teeth thereon and said tabs having teeth thereon complementary to the teeth on said elements, the teeth on said tabs in the transversely inward position of said tabs meshing with the teeth on said elements to connect said elements and the ends of said flexible member together, the teeth on said tabs in the transversely outward position of said tabs being unmeshed with respect to the teeth on at least the other of said elements, the distance between said tabs transversely of said liner and said sheave in the inward position thereof being greater than the diameter of the pull rope and less than the diameter of the cable, the pull rope in passing over said liner and sheave passing freely between said tabs, said liner protecting and shielding said sheave from the pull rope, the cable, as it is pulled over said liner and sheave, engaging said tabs and forcing the same apart to their transversely outward position thereof to release said elements and disconnect the ends of said flexible member, whereupon said liner falls off of said sheave to expose said sheave for directly supporting and guiding the cable in said groove therein.

7. Apparatus for stringing electrically conductive cable on cable supporting towers and the like wherein the cable is pulled into position on the towers by a pull rope, comprising a sheave to be mounted on the tower for rotation about a horizontal axis for receiving and supporting the cable on the upper surface thereof to guide the cable with respect to the tower and to prevent scratching of the cable during stringing, pull rope guard means associated with said sheave and normally overlying said sheave when the pull rope is positioned above said sheave to prevent engagement between the pull rope and said sheave and to protect said sheave and ultimately the cable from the abrasive action of dirt and the like falling from the pull rope, and means for releasing said guard means to expose the upper surface of said sheave for reception and support of the cable when the cable has been pulled into position over said sheave by the pull rope.

References Cited in the file of this patent

UNITED STATES PATENTS

1,778,086	Palm et al.	Oct. 14, 1930
2,533,456	Harrison	Dec. 12, 1950
2,707,403	Thomson et al.	May 3, 1955