June 22, 1954 DE MONT G. MILLER 2,681,793

WIRE LINE GUIDE

Filed Nov. 13, 1948

3 Sheets-Sheet 1

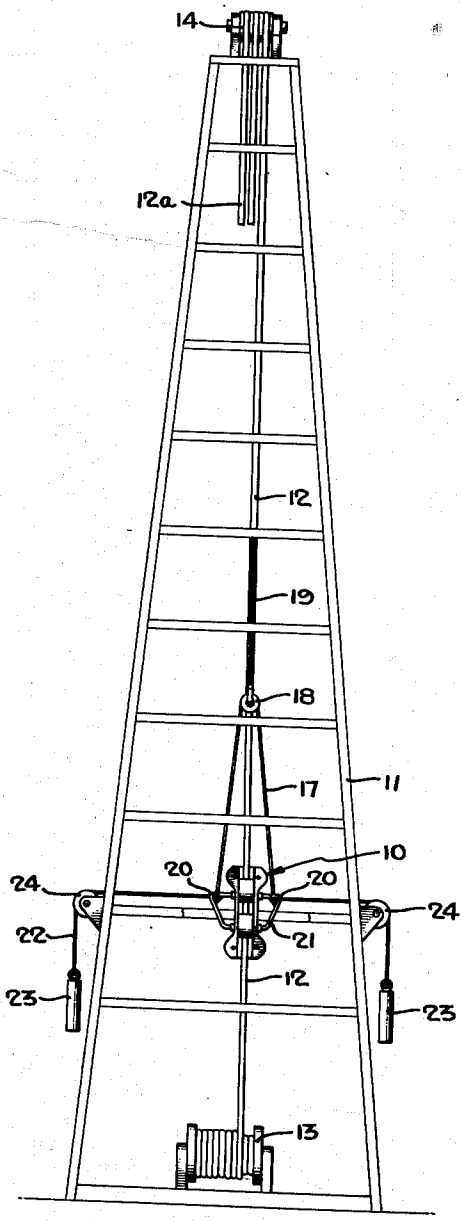


Fig. 1.

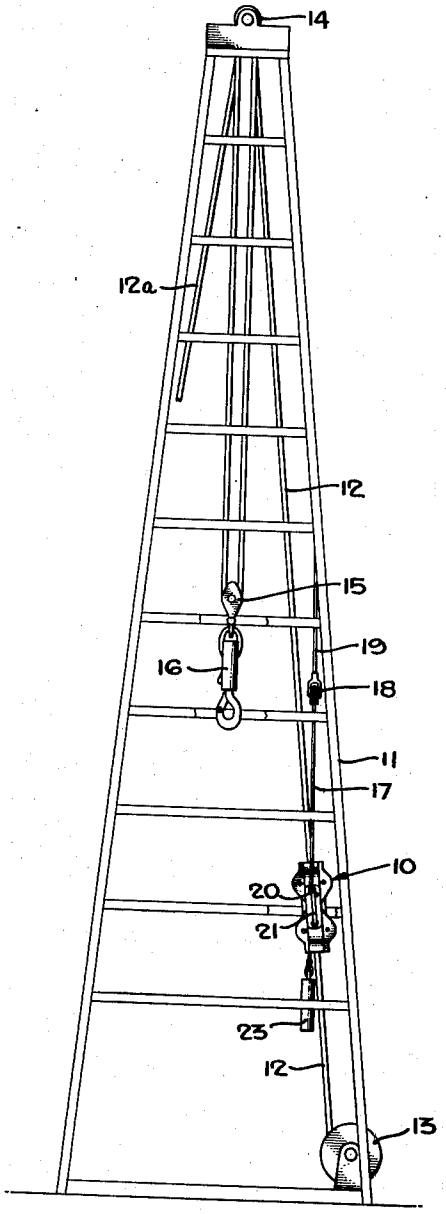


Fig. 2.

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3 Sheets-Sheet 2

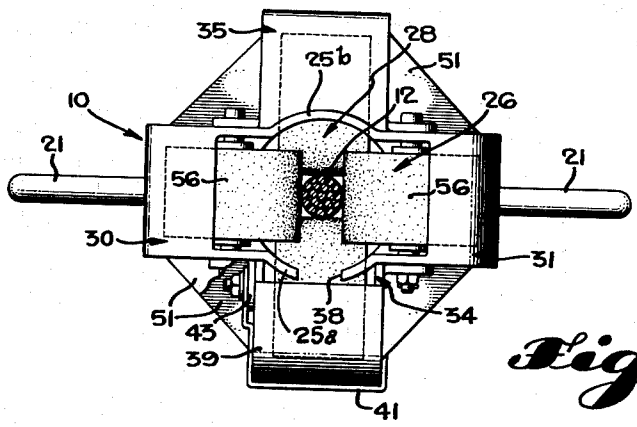


Fig. 4.

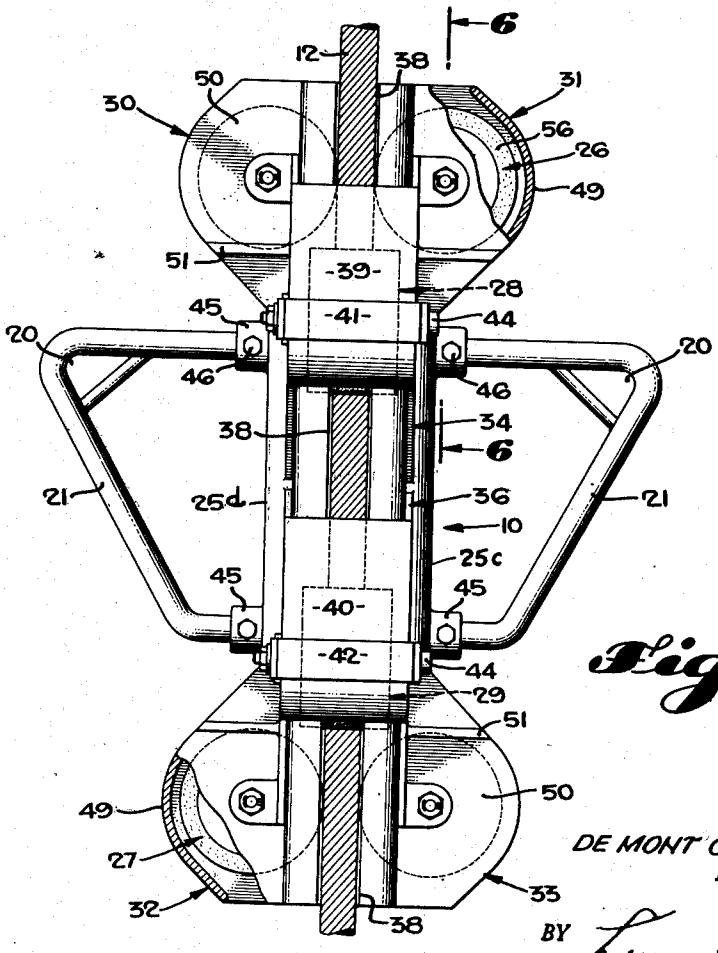


Fig. 3.

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Fig. 5.

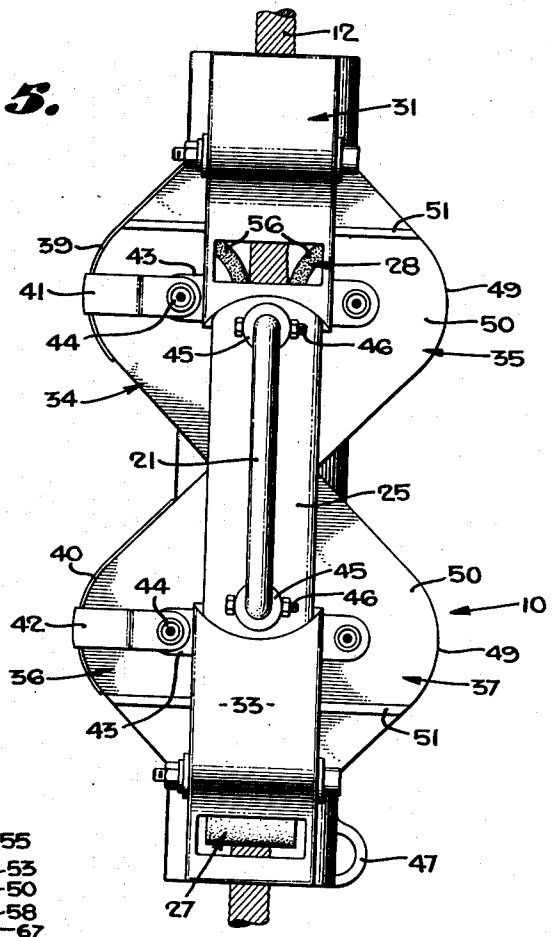
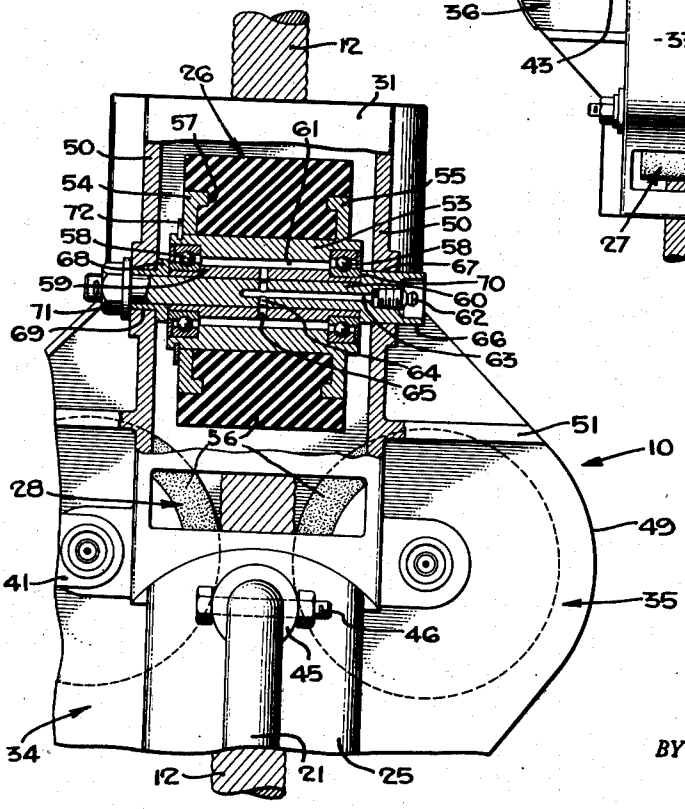


Fig. 6.



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UNITED STATES PATENT OFFICE

2,681,793

WIRE LINE GUIDE

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13 Claims. (Cl. 254—190)

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This invention relates to the spooling of wire line. It is particularly directed to an improved wire line guide for insuring proper spooling of a drilling line or cable as employed in a well drilling derrick assembly.

The principal object of this invention is to provide an improved wire line guide which may be quickly and easily applied laterally to the drilling line and which will efficiently damp excessive whipping motion of the line, in order that it may spool uniformly on the spooling drum.

Another object is to provide an improved wire line guide which employs a plurality of pairs of wire contacting rolls spaced longitudinally of the line and positioned in different planes for effectively dampening lateral oscillations or whipping of the line while offering minimum resistance to vertical movement of the line.

Another object is to provide a wire line guide of this type which may be installed laterally on the drilling line with a minimum of dismantling of the device.

Another object is to provide a wire line guide having novel roller assemblies carried on a frame in such a manner that, though securely anchored in operative position, a worn roller assembly may be quickly and easily replaced without dismantling the roller assembly.

A further object is to provide a wire line guide having an enclosing frame which protects the rollers and their mountings from damage during service, transportation or use.

Other objects and advantages will appear hereinafter.

In the drawings:

Figure 1 is a front elevation showing diagrammatically a well drilling derrick assembly and illustrating a wire line guide in position to dampen transverse whipping motion of the drilling line.

Figure 2 is a side elevation thereof.

Figure 3 is a front elevation partly broken away showing a preferred embodiment of my invention.

Figure 4 is a top plan view thereof.

Figure 5 is a side elevation.

Figure 6 is a sectional view partly broken away taken substantially on the lines 6—6 as shown in Figure 3.

Referring to the drawings, the wire line guide generally designated 10 is supported in a derrick assembly 11 and functions to prevent transverse whipping motion of the drilling line 12. This drilling line is wound on a spooling drum 13 and passes over a crown block 14 and travelling block 15 in the conventional manner to support a rotary hook assembly 16. The dead end 12a of the line 12 may extend downwardly from the crown block 14 to any suitable tie down device, not shown. A drill string (not shown) may be suspended from the hook 16. Power means (not shown) are provided for rotating the drum 13 for spooling and unspooling the drilling line 12. Ordinarily the drilling line is fastened at one end to the spooling drum 13 and the first layer of line is spooled directly on the drum. The required travel of the travelling block 15 and the number of line parts extending between the crown and travelling blocks 14 and 15 are such as to require that a relatively large amount of line be spooled upon the drum. Therefore, more than one layer of line is present on the drum when the travelling block 15 is hoisted to the top of its path of travel.

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The first layer of line which is spooled directly on the drum has a uniform helical lay, but the second layer and all subsequent layers do not. This is true because the lay of the second layer is opposite to that of the first layer. If the first layer has a right-hand lay the second layer must have a left-hand lay, and therefore the second layer spools partly in the right-hand grooves between adjacent loops on the first layer and partly in left-hand lay as it cranes over loops in the first layer. Therefore, the cable in the second layer spools with a nonuniform motion and proceeds with a series of jerks as the drum is turned. The lay of the third layer is the same as that of the first, but since the lay of the second layer is nonuniform so is the third. This nonuniform lateral movement of the line while spooling each of the layers subsequent to the first sets up vibrations and whipping motion of the moving line in a plane parallel to the axis of rotation of the spooling drum. This whipping motion is not damped out may interfere with spooling of the line, especially at high rotary speeds of the drum, and fouling and resultant damage to the line may thus occur.

The wire line guide 10 is supported in the derrick and constructed in a manner for effectively dampening such vibrations and whipping motion of the drilling line 12. The device 10 is installed in the derrick at a substantial height above the spooling drum 13, preferably by means of a bridle line 17 hanging from the support pulley 18. A stationary hanging line 19 carries the support pulley 18 at its lower end and the upper end of the line 19 is secured to the derrick assembly 11. The ends of the bridle line 17 are fixed to the eyes 20

formed at the outer ends of laterally extending support arms 21 provided on the guide 10. Equalizing cables 22 have their inner ends also secured to the eyes 20 and their outer ends fastened to counterweights 23. These equalizing cables pass over pulley assemblies 24 mounted on the derrick assembly 11.

The wire line guide 10 includes a main body portion 25 adapted to support upper and lower pairs of wire contacting roller assemblies 26 and 27. Intermediate spaced pairs of roller assemblies 28 and 29 are also carried on the main body 25, the axes of the roller assemblies 26 and 27 being positioned at right angles to the axes of the intermediate roller assemblies 28 and 29. The roller assemblies 26 and 27 are spaced apart to contact the cable at widely separated points to achieve effective dampening of "waves" in the cable which exist in a plane parallel to the drum axis. When the wire line 12 is in position within the guide assembly 10, the roller assemblies contact it on four sides as shown clearly in Figure 4.

The body 25 may comprise an elongated cylindrical casing having a pair of integral roller housings 30 and 31 extending laterally from the upper end of the casing and a similar pair of roller housings 32 and 33 extending laterally from the lower end of the cylindrical casing. The upper housings 30 and 31 enclose the upper roller assemblies 26, while the lower housings 32 and 33 enclose the lower roller assemblies 27. Positioned intermediate the end housings just described and mounted on the body 25 are intermediate housings 34 and 35 for the roller assemblies 28. Similar housings 36 and 37 are provided on the body 25 for the roller assemblies 27. From this description it will be understood that the housings 30, 31, 32 and 33 extend laterally in a plane parallel to the axis of rotation of the drum 13, while the housings 34, 35, 36 and 37 extend in a transverse plane at right angles thereto. It will be noted that the body 25 is of integral construction and that likewise the roller housings 30 to 37 are integral with said body. Thus, whereas a built-up body held together by bolts, nuts, or the like, and subjected to the severe vibration common in spooling operations might shake apart and injure personnel of the drilling crew, due to the integral construction of the body 25 this cannot happen with the instant invention. Likewise since the housings are integral with said body, such housings not only serve to protect the rollers from damage but also serve to prevent the rollers themselves from dropping onto the floor in the event they should be torn from their mountings. Additionally, of course, the integration of housing and body similarly prevents any dropping of housing portions.

The elongated integral cylindrical body 25 which is adapted to extend axially of and receive therein the cable 12, may be considered as formed of opposed pairs of side members. Referring to Figure 4 the front and rear side members are indicated by the numerals 25*a* and 25*b* respectively, the front 25*a* being provided with the slot 38 for permitting transverse application of the device to the cable 12. The right and left side members are indicated by the numerals 25*c* and 25*d* respectively in Figure 3. To these latter side members the arms 20 are secured to extend outwardly therefrom in a plane normal thereto which plane is intermediately parallel to the planes of the front and rear side members 25*a* and 25*b*.

Extending for the full length of the body 25 is a vertical slot 38 which permits the wire line guide 10 to be applied laterally to the line. The housings 34 and 36 are each provided with removable covers 39 and 40 so that in the absence of one of the roller assemblies 28 and 33 within the housings 34 and 36 the device 10 may be applied to the wire line through the open slot 38. These covers 39 and 40 are provided with mounting brackets 41 and 42 which are secured to ears 43 on the body 25 by means of suitable roller pins 44 which also support one of each pair of roller assemblies 28 and 29 in position within the housings 34 and 36.

The arms 21 may be attached to the body 25 in any convenient manner, and as shown in the drawings bosses 45 provide sockets into which the ends of the arms 21 may extend. Bolt assemblies 46 extend through the bosses and inner ends of the arms to secure the arms 21 relative to the body 25. An eye 47 may be provided on the lower portion of the body 25 for attachment to a safety line (not shown) which limits upward travel of the guide assembly 10 in the event that the wire line 12 should bind in the roller assemblies.

Each of the roller housings is preferably formed integrally with the body 25 and each includes an arcuate wall 49 spaced from and conforming generally to the contour of the outer peripheries of the roller assemblies enclosed therein. The sides of the housings are defined by parallel side walls 50 extending perpendicular to the axes of the roller assemblies. Reenforcing ribs 51 may be provided to interconnect adjacent roller housings to impart strength and rigidity to the assembly.

It is essential that the roller assemblies turn freely within their housings at all times regardless of adverse weather or severe operating conditions. It is also important that the roller assemblies be capable of replacement in service in order that drilling operations shall not be delayed. Accordingly, I provide a novel form of roller assembly which provides for both trouble-free roller rotation and also for ready replacement when necessary or desirable. All of the individual roller assemblies are substantially duplicates, and accordingly, description of one will suffice. As shown clearly in Figure 6 of the drawings each roller assembly comprises a two-piece core member including a central hub 53 and a separable end flange 54 at one end thereof. At the other end is provided an integral flange 55. A cylindrical roller body 56 of resilient material such as, for example, natural or synthetic rubber or rubber composition, is confined between the end flanges 54 and 55. These flanges may be provided with inwardly directed rims 57 at their outer peripheries which interlock with annular grooves in the roller body 56. Axially spaced bearings 58 support the hub 53 on a sleeve 59 which has a sliding fit on the support pin 60. The bearings 58 are preferably of the lubricant retaining type and a lubricant reservoir is thus provided within the annular space 61 between the bearings 58. Lubricant may be injected into this reservoir through the fitting 62 by way of the longitudinal passage 63 in the pin 60 and the transverse aligned ports 64 and 65 in the pin and sleeve 59 respectively. The enlarged head 66 on one end of the pin 60 has a sliding fit in a bore 67 provided in one side wall 50 of the housing, the other end of the pin 60 passing through a bushing 68 pressed into the bore 69 in the other side wall 50.

The shoulder 70 formed at the juncture of the head portion 66 and the central portion of the pin

engages the inner race of one of the bearings 58. The inner race of the other bearing 58 engages the bushing 68. It will be understood from this description that upon tightening of the nut 71 which is threaded to the end of the pin 60, the sleeve 59 and two bearings 58 are clamped between the shoulder 70 and the bushing 68.

An important feature of the construction just described resides in the fact that the head 66 on the pin 60 is freely slidable in the wall of the housing, and consequently the tightening of the nut 71 has no tendency to draw the opposed walls 50 toward each other. Hence, it is impossible to subject the supporting body structure to distortion or bending stresses through the action of tightening the nuts which hold the various roller assemblies in position. A further advantage is present in the construction just described in that the sleeve 59 and hub 53 constitute a unitized lubricant packed assembly which need not be dismantled when replacing any of the rollers or when removing one of each pair of the rollers 28 and 29 for installing the wire line guide in position on the cable. To remove a roller assembly it is only necessary to unscrew the retaining nut 71 and then slide the pin 60 to the right as viewed in Figure 6, the bushing 68 remaining in the wall by reason of its press fit. The pin 60 may be withdrawn laterally through the bore 67 and the roller assembly including the sleeve 59 may then be withdrawn as a unit. It will be understood, of course, that the device must be detached from the drilling line 12 before removing the rollers 26 and 27 and before removing one of each pair of the rollers 28 and 29 that lie on the side of the body opposite from the location of the longitudinal slot 38. As shown in Figure 3 the right-hand roller assembly 26 may be removed from its housing after withdrawal of its mounting pin by upward movement in an inclined direction so that it passes between the upper end of the curved wall of its housing and between the other roller assembly 26. During this operation the device is removed from the wire line 12.

After removal of a roller from the body, replacement of a worn or damaged resilient roller body 56 may be quickly and easily effected simply by removing the retainer ring 72 and the detachable end flange 54, whereupon the roller body 56 may be withdrawn from the hub 53. Since the resilient roller body 56 is the only element of the assembly which is subject to severe abrasion and consequent wear in service, the nonresilient parts of the assembly may be utilized again and again, it being only necessary to replace the wearing part 56. The easy replacement of the relatively inexpensive resilient roller body 56 results in low maintenance cost for the device and also minimizes the time spent in making repairs.

Having fully described my invention, it is to be understood that I do not wish to be limited to the details herein described, but my invention is of the full scope of the appended claims.

I claim:

1. A cable guide for use with a cable spooled upon a winding drum, comprising in combination a body; a plurality of angularly related cable-contacting unitary roller assemblies mounted upon the body, each of said unitary assemblies including a sleeve; axially spaced bearings on said sleeve; a hub carried on the bearings and having an integral flange at one end; a removable flange secured to the other end of the hub; and a resilient roller body encircling the hub and confined between the flanges, the resilient roller body being axially insertable on the hub in the absence of the removable flange.

2. A roller assembly for a cable guide of the class described, comprising in combination a sleeve; axially spaced bearings on said sleeve; a hub carried on the bearings and having an integral flange at one end; a removable flange secured to the other end of the hub; a resilient roller body encircling the hub and confined between the flanges, the resilient roller body being axially insertable on the hub in the absence of the removable flange.

3. A roller assembly for a cable guide of the class described, comprising in combination a sleeve; axially spaced bearings on said sleeve; a hub carried on the bearings and cooperating with the sleeve to define a lubricant reservoir between the bearings; port means in the sleeve for injection of lubricant into the reservoir, the hub having an integral flange at one end; a removable flange secured to the other end of the hub; and a resilient roller body encircling the hub and confined between the flanges, the resilient roller body being axially insertable on the hub in the absence of the removable flange.

4. In a cable guide for the spooling drum of a rotary drilling rig; an integral body defining an elongated cylindrical casing adapted to extend axially of and receive therein a cable to be spooled upon said drum; a pair of outwardly extending roller enclosure housings formed integrally with said body and spaced longitudinally thereof on each of two opposite sides of said body; a unitary roller assembly mounted within each of said housings, and means mounting each unitary roller assembly for removal from its housing as a unit.

5. In a cable guide for the spooling drum of a rotary drilling rig; an integral body defining an elongated cylindrical casing adapted to extend axially of and receive therein a cable to be spooled upon said drum including spaced parallel side members; two pairs of outwardly extending integrally formed roller enclosure housings joining said side members, said pairs being spaced longitudinally thereof; oppositely extending supporting arms formed rigidly on said body projecting therefrom in a plane intermediately parallel to the planes of said side members; a unitary roller assembly mounted within each of said housings on an axis normal to the plane of said side members and said supporting arms; and means mounting each unitary roller assembly for removal from its housing as a unit.

6. In a cable guide for the spooling drum of a rotary drilling rig; an integral body adapted to extend axially of a cable to be spooled upon said drum including spaced parallel side members; a pair of outwardly extending integrally formed roller enclosure housings joining said side members and spaced longitudinally thereof, and; a unitary roller assembly mounted within each of said housings, each of said unitary assemblies including a sleeve, axially spaced bearings on said sleeve, a hub carried on the bearings and having an integral flange at one end, a removable flange secured to the other end of the hub, a roller body encircling the hub and confined between the flanges to be axially insertable on the hub in the absence of the removable flange, said assembly being removable from its housing as a unit.

7. In a cable guide for the spooling drum of a rotary drilling rig; an integral body adapted to

extend axially of a cable to be spooled upon said drum including spaced parallel side members; a pair of outwardly extending integrally formed roller enclosure housings joining said side members and spaced longitudinally thereof; oppositely extending supporting arms formed rigidly on said body projecting therefrom in a plane intermediately parallel to the planes of said side members, and; a unitary roller assembly mounted within each of said housings on an axis normal to the plane of said side members and said supporting arms; each of said unitary assemblies including a sleeve, axially spaced bearings on said sleeve, a hub carried on the bearings and having an integral flange at one end, a removable flange secured to the other end of the hub, a roller body encircling the hub and confined between the flanges to be axially insertable on the hub in the absence of the removable flange, said assembly being removable from its housing as a unit.

8. In a cable guide for the spooling drum of a rotary drilling rig; an integral body adapted to extend axially of a cable to be spooled upon said drum, including contiguous pairs of spaced parallel side members forming an elongated cylindrical cable enclosure having a longitudinal cable receiving passage; pairs of opposed outwardly extending integrally formed roller enclosure housings joining one pair of said side members and spaced longitudinally thereof; a unitary roller assembly mounted within each of said housings the roller thereof extending into said longitudinal passage, and means mounting each unitary roller assembly for removal from its housing as a unit.

9. In a cable guide for the spooling drum of a rotary drilling rig; an integral body adapted to extend axially of a cable to be spooled upon said drum, including contiguous pairs of spaced parallel side members forming an elongated cylindrical cable enclosure having a longitudinal cable receiving passage; a longitudinally extending slot defined by adjacent edges of one of said side members to enable the body to be applied laterally of a cable to enclose a portion thereof within the longitudinal passage; pairs of opposed outwardly extending integrally formed roller enclosure housings joining one pair of said side members and spaced longitudinally thereof; a unitary roller assembly mounted within each of said housings the roller thereof extending into said longitudinal passage, and means mounting each unitary roller assembly for removal from its housing as a unit.

10. In a cable guide for the spooling drum of a rotary drilling rig; an integral body adapted to extend axially of a cable to be spooled upon said drum, including contiguous pairs of spaced parallel side members forming an elongated cylindrical cable enclosure having a longitudinal cable receiving passage; pairs of opposed outwardly extending integrally formed roller enclosure housings joining one pair of said side members and spaced longitudinally thereof, pairs of opposed outwardly extending roller enclosure housings extending in a direction normal to the direction of said first mentioned pairs of housings; a unitary roller assembly mounted within each of said housings the roller thereof extending into said longitudinal passage with the axis of the rollers of one set of opposed pairs of housings right angularly related to the axis of the rollers of another set of opposed pairs of housings, and means mounting each unitary roller assembly for removal from its housing as a unit.

11. In a cable guide for the spooling drum of a rotary drilling rig; an integral body adapted to extend axially of a cable to be spooled upon said drum, including contiguous pairs of spaced parallel side members forming an elongated cylindrical cable enclosure having a longitudinal cable receiving passage; oppositely extending supporting arms formed rigidly on one pair of said side members projecting therefrom in a plane intermediately parallel to the planes of the other pair of side members; pairs of opposed outwardly extending integrally formed roller enclosure housings joining one pair of said side members and spaced longitudinally thereof; opposed pairs of outwardly extending roller enclosure housings extending from the other pair of said side members; a unitary roller assembly mounted within each of said housings the roller thereof extending into said longitudinal passage, the rollers of one set of pairs of opposed enclosure housings having axes normal to the planes of one pair of side members and said supporting arms, the rollers of the other set of pairs having axes normal to the rollers of the first mentioned set of pairs, and means for mounting each unitary roller assembly for removal from its housing as a unit.

12. In a cable guide for the spooling drum of a rotary drilling rig; an integral body adapted to extend axially of a cable to be spooled upon said drum, including contiguous pairs of spaced parallel side members forming an elongated cylindrical cable enclosure having a longitudinal cable receiving passage; a longitudinally extending slot defined by adjacent edges of one of said side members to enable the body to be applied laterally of a cable to enclose a portion thereof within the longitudinal passage; oppositely extending supporting arms formed rigidly on one pair of said side members projecting therefrom in a plane intermediately parallel to the planes of the other pair of side members; pairs of opposed outwardly extending integrally formed roller enclosure housings joining one pair of said side members and spaced longitudinally thereof; opposed pairs of outwardly extending roller enclosure housings extending from the other pair of side members, said pairs of roller enclosure housings including parallel upper and lower pairs of housings and intermediate parallel pairs of housings extending in a direction normal to the direction of the upper and lower pairs of housings and to the direction of extension of said supporting arms; a unitary roller assembly mounted wtihin each of said housings the roller thereof extending into said longitudinal passage, and means mounting each unitary roller assembly for removal from its housing as a unit.

13. In a cable guide for the spooling drum of a rotary drilling rig; an integral body adapted to extend axially of a cable to be spooled upon said drum, including contiguous pairs of spaced parallel side members forming an elongated cylindrical cable enclosure having a longitudinal cable receiving passage; a longitudinally extending slot defined by adjacent edges of one of said side members to enable the body to be applied laterally of a cable to enclose a portion thereof within the longitudinal passage; oppositely extending supporting arms formed rigidly on one pair of said side members projecting therefrom in a plane intermediately parallel to the planes of the other pair of side members; pairs of opposed outwardly extending integrally formed roller enclosure housings joining one pair of said side members and spaced longitudinally thereof; opposed pairs

of roller enclosure housings extending outwardly from the other pair of side members, one of said pairs being integral with the side members and the other pair being removable said pairs of roller enclosure housings including parallel upper and lower pairs of housings and two intermediate parallel pairs of housings extending in a direction normal to the direction of the upper and lower pairs of housings and to the direction of extension of said supporting arms; a unitary roller assembly mounted within each of said housings the roller thereof extending into said longitudinal passage, each unitary roller assembly including a sleeve, axially spaced bearings on said sleeve, a hub carried on the bearings and having an integral flange at one end, a removable flange secured to the other end of the hub said resilient roller body encircling the hub and confined between the flanges to be axially insertable on the

hub in the absence of the removable flange, and; means mounting each unitary roller assembly for removal from its housing as a unit.

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