March 16, 1965 W. E. KNAPP ETAL 3,173,272

CABLE LAYERS

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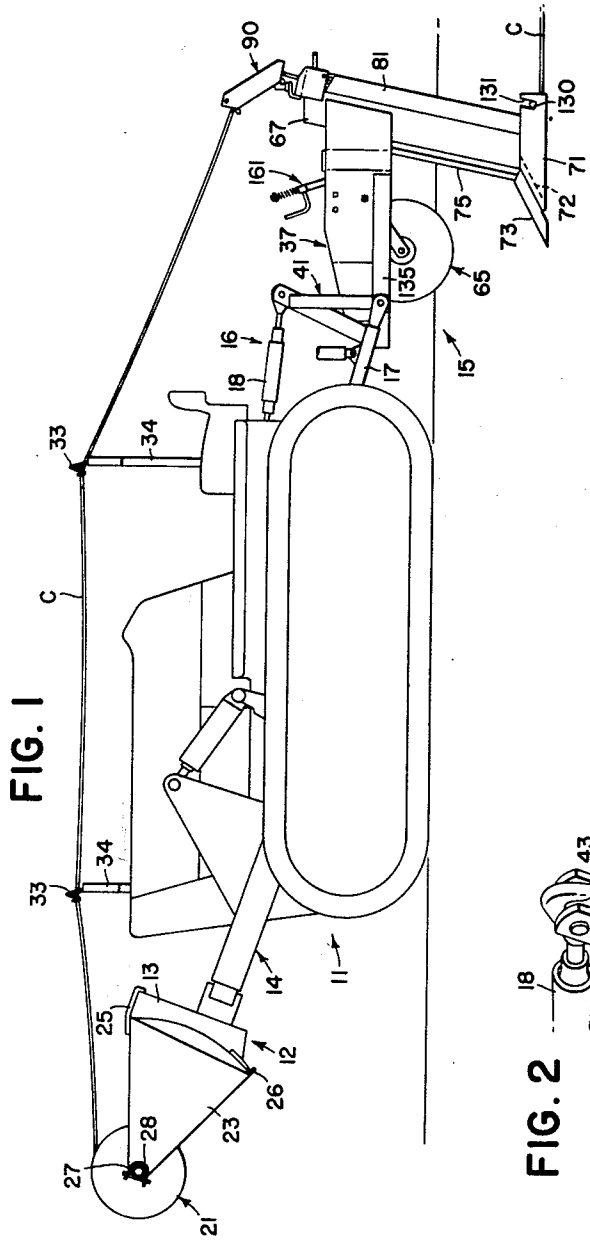


FIG. 1

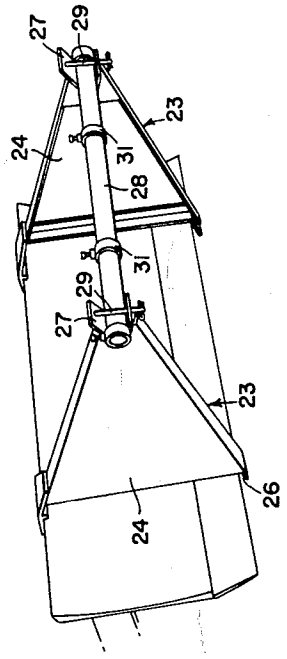


FIG. 3

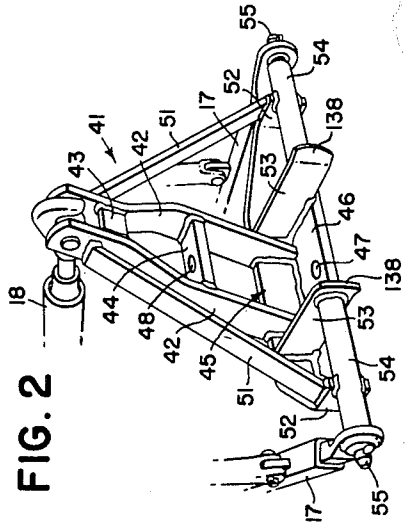


FIG. 2

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CABLE LAYERS

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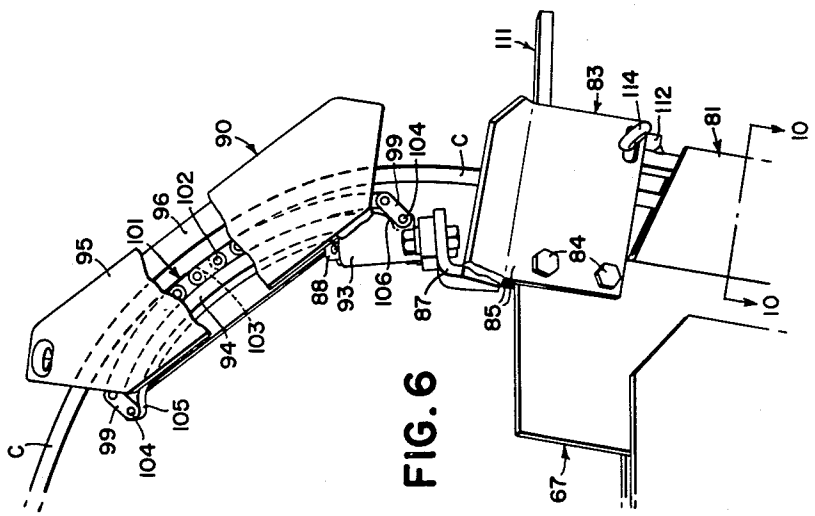


FIG. 6

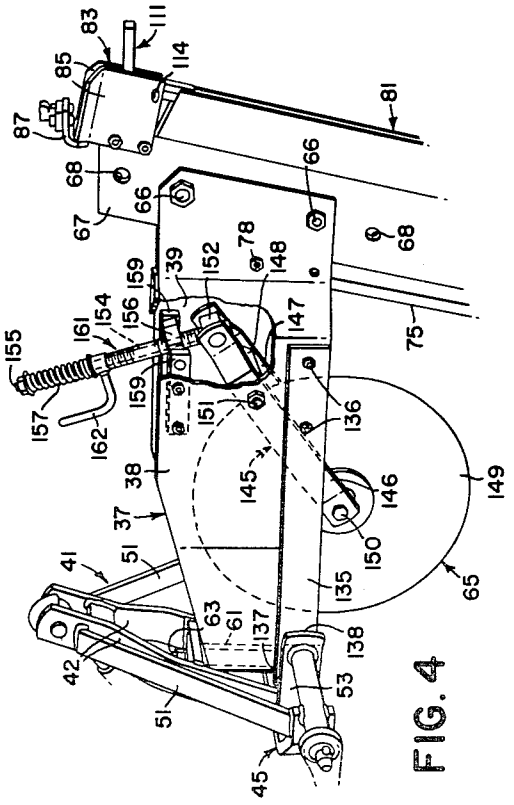


FIG. 4

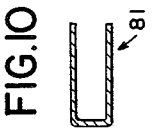


FIG. 10

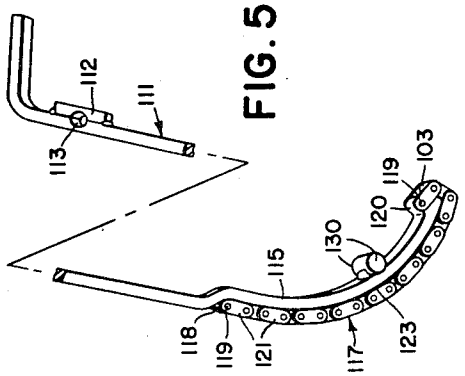


FIG. 5

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CABLE LAYERS

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FIG. 7

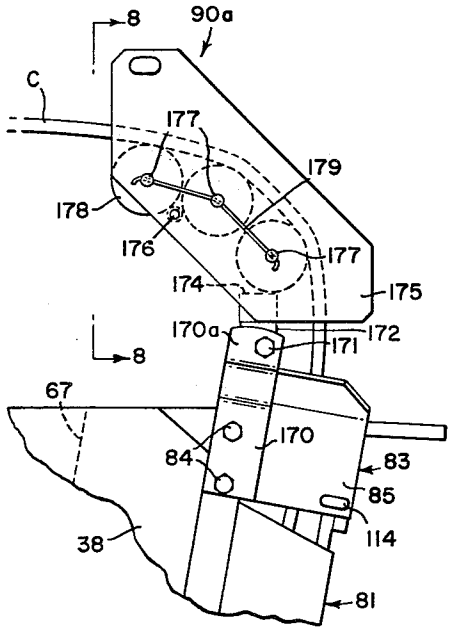


FIG. 8

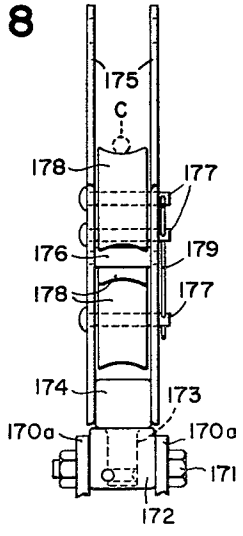
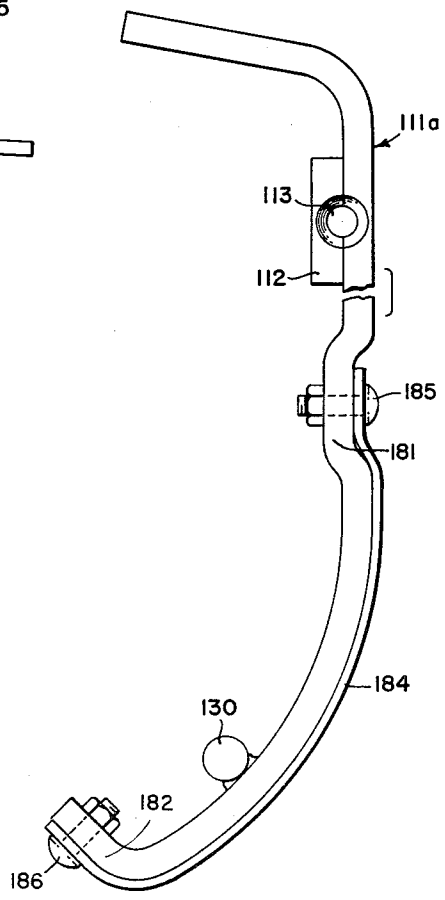


FIG. 9



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3,173,272

CABLE LAYERS

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Filed Mar. 29, 1961, Ser. No. 99,314
13 Claims. (Cl. 61—72.6)

This application is a continuation-in-part of our co-pending application, Ser. No. 862,853 filed December 30, 1959, for Cable Layers, now U.S. Patent 3,037,357, issued June 5, 1962.

This invention relates generally to cable or wire laying machines and more particularly to implements of this type that are particularly adapted to be connected to tractors having 3-point hitch linkage.

The object and general nature of this invention is the provision of a cable layer having new and improved cable guide means. More specifically, one feature of this invention is the provision of cable guide means provided with anti-friction cable-engaging means for guiding the cable downwardly without sharp bends into the shoe that opens a furrow or slit in the soil to receive the cable. Further, it is a feature of this invention to provide cable guide means in the form of relatively short sections of conventional roller chain, the rollers of the chain being disposed above the associated cable guide supporting surface so that the cable is guided by virtue of contact with the freely rotatable rollers of the chain section or sections.

It is another feature of this invention to provide a swiveled upper cable guide and a lower smooth lower cable guide bolted to the lower end of the removable guide bar or gate closing the channel.

A further feature of this invention is the provision of a cable plow or cable layer constructed and arranged to be attached to the 3-point linkage of a farm or industrial tractor and including a plow frame connected to a hitch frame for generally lateral swinging movement relative thereto about a generally vertical axis, whereby turning when the standard is in the ground is facilitated.

More specifically, it is a feature of this invention to provide a plow frame including laterally spaced plow frame plates between which a vertically adjustable and spring biased coulter is disposed, the coulter being arranged generally in the vertical fore-and-aft extending plane of the ground opening plow. Further, the coulter is spring loaded so as to cut trash or sod and still be adapted to rise over a hidden or buried obstacle without lifting the standard frame up and thereby vary the depth of the buried cable.

Still further, a feature of this invention is the provision of spring means acting against the laterally swingable plow frame for holding the latter in a centered position, particularly when raised for transport, but which is also adapted to yield, such as when the tractor departs from the straight forward line of travel, or in the case the plow and/or coulter should strike a submerged object.

These and other objects and advantages of the present invention will be apparent to those skilled in the art after a consideration of the following detailed description, taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a side view of the tractor-carried cable laying outfit in which the principles of this invention have been incorporated.

FIG. 2 is a fragmentary perspective view showing the hitch frame, with a portion of the tractor 3-point hitch linkage shown diagrammatically.

FIG. 3 is a perspective view of the reel mounting.

FIG. 4 is a fragmentary perspective view showing the pivotal connection of the plow frame with the hitch frame and other associated parts and the spring biased adjustable coulter mounting.

FIG. 5 is an enlarged elevation of the lower portion of the plow standard and the associated cable guide channel closure gate, with cable-receiving roller chain section.

FIG. 6 is a side view of the upper cable guide and swivel mounting carried at the upper end of the plow standard.

FIG. 7 is a view similar to FIG. 6, showing a modified form of upper cable guide and swivel mounting.

FIG. 8 is a fragmentary section taken along the line 8—8 of FIG. 7.

FIG. 9 is a view similar to FIG. 5, showing a modified form of lower cable guide and the associated guide bar.

FIG. 10 is a section taken along the line 10—10 of FIG. 6, showing the guide for the cable.

Referring first to FIG. 1, the cable laying outfit in which the principles of the present invention have been incorporated is illustrated as comprising a track-laying tractor 11 of generally conventional construction and provided with a bulldozer 12 carried at the forward end of the tractor and including a transverse blade 13 and a push frame 14, and a cable-laying plow implement 15 in which certain novel features of this invention have been embodied.

The implement unit 15 is connected with the rear portion of the tractor 11 by means of a 3-point linkage 16 that includes a pair of lower draft links 17 and an upper link 18, the links 17 and 18 being connected with the tractor for generally universal movement and the rear ends of the links 17 and 18 being connected with the cable-laying plow unit by universal joint connections that per se are of generally conventional construction. The outfit shown in FIG. 1 is particularly designed for laying insulated cable underground along roadways, through open fields, or the like. An outfit of this type is admirably adapted for use in laying telephone cables, which may be one inch or more in outside diameter and normally carried on a cable reel 21.

According to this invention, the cable reel 21 is supported at the front of the tractor 11 through a pair of triangular reel carriers 23, best shown in FIG. 3. Each reel carrier 23 includes a flanged plate 24 disposed in generally vertical longitudinally extending plane and each being provided at its rear end with the hook section 25 adapted to be engaged over the upper edge of the bulldozer blade 23. An extension 26 at the lower rear portion of each of the reel carrier plates 24 engages with the lower cutting edge of the blade and serves to hold the reel carriers in position. The reel carriers are provided with suitable sockets 27 in which a reel axle 28 is disposed, being held in position by suitable retainers, such as detachable pins 29. The cable reel 21 is carried on the reel axle 28 and held in position laterally by set screw collars 31 or other suitable means. A cable C extends rearwardly from the reel 21 through "pig tail" cable guides 33 supported on standards 34 carried in any suitable way by the tractor.

Referring now to FIGS. 1, 2 and 4, the cable-laying plow 15 of the present invention includes a plow frame 37 made up of right and left hand plow frame plates 38 and 39 and associated parts and a generally vertical hitch frame 41. The latter includes a pair of generally vertically disposed bars 42 suitably interconnected in laterally spaced apart relation by cross bars 43 and 44 and, at the lower end of the bars 42 by generally U-shaped horizontal member 45. Secured to the latter is a lower horizontal plate 46 that is apertured, as at 47, in line with an upper aperture 48 formed in the generally central portion of the cross bar 44. The apertures just mentioned form means receiving a generally vertical pivot 63 by which the plates 38 and 39 are connected with the hitch frame 41 for laterally swingable move-

ment, as will be described in detail below. The hitch frame **41** also includes downwardly and laterally outwardly diverging reenforcing bars **51** that are secured at their upper ends, as by welding, to the upper portions of the bars **42** and at their lower ends to the rear and laterally outwardly disposed portions **52** of the U-shaped bar **45**. Extending rearwardly from the generally central portion of the bar **45** is a pair of rearwardly extending bars **53** that at their rear ends are disposed laterally inwardly of the rear ends **52** of the U-shaped bar **45**. The latter ends **52**, and the ends of the rearwardly extending bars **53**, are welded to axially spaced apart cross shaft sections **54**, the outer ends of which are reduced as at **55**, to form means receiving the rear ends of the associated lower draft links **17**. The rearwardly extending bars **53** are also welded or otherwise fixed to the lower horizontal plate **46**.

As mentioned above, the plow frame plates **38** and **39** are connected with the hitch frame **41** for laterally swinging movement about the generally vertical pivot **63**. The forward end portions of the plow frame plates **38** and **39** are formed so as to converge forwardly and are welded to a vertical sleeve **61** that receives the generally vertical pivot structure **63** that is rigidly secured to the apertured members **44** and **46** of the hitch frame **41**. The pivot means just described is of sufficient vertical extent that the plow frame plates **38** and **39** are rigid in a generally vertical direction with respect to the hitch frame structure **41**.

The generally central portions of the hitch frame plates **38** and **39** are spaced apart to receive a coulter **65** therebetween (FIG. 4), and the rear ends of the plates **38** and **39** are shaped to extend toward one another and are apertured to receive a pair of bolts **66** by which the plates are rigidly secured in vertically adjusted position to a generally vertical standard **67**. The latter has a plurality of openings **68** to selectively receive the bolts **66**. The lower end of the standard **67** (FIG. 1) is welded to a pair of laterally spaced apart foot plates **71**. The rear ends of the plates **71** extend rearwardly of the standard **67** and the forward ends of the plates **71** extend forwardly of the standard **67** and are welded to an angled apertured bar **72** to which a rounded furrow forming point **73** is connected, as by a pair of bolts or the like. The point **73** is rounded at its upper side to minimize lifting or heaving of the ground. A sharpened shin **75** is fixed in front of the forward edge of the standard **67** and is apertured at its upper end to receive a bolt **78** (FIG. 4) that connects the upper end of the shin **75** to the rear portions of the frame plates **38** and **39**. The shin **75** is also apertured at its lower ends so that the shin **75** may be reversed end for end, which has the effect of providing a new sharp edge for soil engagement. It will be seen from FIG. 4 that the standard **67** is provided with two sets of openings, whereby the standard may be connected to the plates **38** and **39** in either of two optional vertical positions, thereby providing for a short position or a long position, the latter being provided for placing the cable at a greater depth.

A standard guide member **81**, U-shaped in cross section, as best shown in FIG. 10, is bolted to the rear edge of the standard **67** and forms a channel for receiving the cable C as the latter passes behind the standard **67** and into the space between the rear portions of the foot plates **71**. A cable guide **83** is bolted, as at **84**, to the upper end of the standard **67** and includes a pair of side plates **85** extending laterally outwardly and upwardly and serves to support, by means of an angled bracket **87**, a generally vertical post **88**. This post forms the pivot support for a swivelled cable guide **90** that receives the cable from the rear loop **33**.

The upper swivelled cable guide **90** is of particular construction. As will best be seen in FIG. 6, the swivelled cable guide **90** comprises a lower vertical sleeve **93** secured, as by welding, to an upwardly and forwardly carried chain-receiving member **94** to which a pair of side plates **95** and **96** are secured, as by welding. The member **94** is apertured at its ends to receive the side links **99** at the ends of a roller chain section **101** as will best be seen in FIG. 6. The roller chain section **101** is of conventional roller chain construction, embodying, in addition to the side links **99**, pivot means **102** interconnecting the side links **99** and serving as journal means receiving the rollers **103** (FIG. 5). The side links **99** have a width that exceeds the diameter of the associated rollers **103**, so that when the chain section **101** is disposed in position, as shown in FIG. 6, the rollers **103** are supported for relatively free rotation above and out of contact with the curved surface or upper face of the roller chain supporting member **94**. Thus, when the cable is fed down through the unit **90** and in between the side plates **95**, the cable is supported by a plurality of closely spaced antifriction means in the form of the chain rollers **103**.

The roller chain section **101** is held in place by pins **104** extending to the inside links and through associated apertured bosses **105** and **106** carried at the ends of the arcuate member **94**. As will best be seen from FIG. 6, the cable guide unit **90** is so constructed and mounted that the cable C feeds downwardly from the unit **90** into the channel formed by the standard guide member **81**.

The rear opening of the channel member **81** is closed by a vertical guide or gate bar **111**. This bar is similar to corresponding parts shown in U.S. Patent 2,441,153, issued May 11, 1948 to R. J. Kent but is provided with certain improvements that form a part of this invention. First, the upper end of the cable guide **111** is provided with a short block **112** (FIG. 5) that is welded to the adjacent face of the guide or gate **111**. After the parts are welded together, an opening **113** is drilled therein to receive an attaching quick detachable pin **114**. Secondly, the lower end portion of the channel-closing guide or gate **111** is provided with a curved offset portion **115** (FIG. 5) that receives a short section **117** of roller chain, that may be identical or substantially so with the chain section **101** described above. The lower portion of the guide or gate **111** is provided with an upper apertured lug **118** receiving a pin **119** by which the side links **121** of the chain section **117** are connected to the gate **111**. The rearwardmost portion of the gate **111** is provided with a second apertured lug **120** that is adapted to receive a second pin **119** that fixes the lower end of the chain section **117** in position, with the side links **121** of the chain resting on the lower downwardly and rearwardly curved face **123** of the lower gate portion, which supports the associated chain rollers in an arcuate series that lies out of contact with the curved surface **123**, whereby the rollers are freely rotatable and serve as free running antifriction means guiding the lowermost portion of the cable into the furrow opened by the plow point **73**. Experience has shown that by the use of upper and lower chain sections, the force required to pull the cable from the reel in the arrangement constructed according to this invention is many times smaller than the force required to pull the cable over relatively fixed guides, such as those shown in the Kent patent. The closure guide or gate **111** is mounted for ready detachability in the channel member **81**. To this end, the lower portion of the gate member **111** carries a pair of opposed laterally outwardly extending studs **130** that are adapted to be disposed in notches **131** formed in the rear portion of the foot plates **71**. The upper end of the gate **111** is apertured, as described above, so that simply by removing the pin **114** the gate **111** may simply and easily be lifted out from the channel member **81**, thus freeing the cable for disconnection from the plow **15**. It will be seen that the cable need not be severed to connect and disconnect the same from the plow **15**.

Since the roller chain sections **101** and **117** are of conventional construction and are commercially available,

the cost of the roller chain sections is many times less than the cost of special journal supports and anti-friction rollers that would have to be made special for the upper and lower cable guides of the type shown in the Sjogren et al. patent.

As mentioned above, the plow frame is connected with the hitch frame for lateral swinging about the vertical pivot 63. However, when the plow is raised for transport, it is desirable to hold the plow unit in a centered position. To this end, we provide a pair of leaf springs 135 that are bolted, as at 136, to the associated side plates 38 and 39, well toward the rear of the plow frame. Each spring member 135 is so formed that the forward end 137 extends or lies laterally outwardly away from the associated plow frame plate. The ends 137 are disposed between the rear portions of the bars 53 and are curved or bent at their forward ends to cooperate with the rear curved or bent portions, indicated at 138, of the rear ends of the bars 53. The action of the springs 135 is to hold the plow frame in generally centered position, but if the direction of travel of the tractor changes, the plow frame is free to swing laterally to accommodate such change, one or the other of the springs 135 yielding to accommodate such movement. In transport, the springs 135 hold the plow against lateral swinging.

The coulter construction 65 is best shown in FIG. 4 and includes a coulter support lever 145 that comprises two lever arms 146 and 147 rigidly interconnected by a cross sleeve 148 welded thereto. A coulter blade 149 is journaled as at 150 between the lower forward ends of the arms 146 and 147 and a pivot bolt 151 swingably mounts the support lever 145 on the frame plates 38 and 39. The ends of the lever arms 146 and 147 opposite the coulter journal 150 are apertured to receive a trunnion block 152 that is apertured to receive the head end of a long bolt 154 the upper end of which is threaded to receive an adjusting nut 155. A biasing spring 157 is disposed between the nut 155 and an elongated exteriorly threaded member 161 trunnioned in a nut member 156 carried by a pair of support bars 159 bolted to the inside faces of the adjacent portions of the frame plates 38 and 39. The adjusting member 161 carries a handle 162 so that by turning the member 161 the coulter blade 149 may be raised or lowered, as desired, but in any position the yielding of the spring 157 permits the coulter to raise and pass over obstructions without raising the cable furrow-opening shoe.

The lower bolt 66 (FIG. 4) may take the form of a shear pin so that the standard 67 may swing upwardly and rearwardly if the lower shoe should hook under a rock or other obstacle. In that case, the cable guide 90 is provided with a horizontal pivot so that if an interference is encountered between the top guide 90 and the coulter adjusting crank, the top guide will pivot rearward relative to the standard when the shear bolt fails, resulting in forward movement of the top guide 90.

Under some conditions, such as where excessive sharp turns are required, the presence of the side links 121 of the roller chain in the upper and lower cable guides may be undesirable, and in that event, a different upper cable guide means 90*a* shown in FIGS. 7–9 may be provided.

Referring first to FIG. 7, the angled bracket 87 (FIG. 6) may be omitted from the cable guide 83 and, instead, right and left hand strap brackets 170 fastened to the cable guide 83 by the bolts 84. The brackets 170 extend above the cable guide 83, as indicated at 170*a*, and are apertured to receive a pivot bolt 171 on which a bearing block 172 is pivotally mounted. The bearing block 172 is apertured vertically, alongside the opening receiving the pivot bolt 171, to receive the depending pivot stud 173 of a block 174 that is fixed to the lower portions of a pair of guide plates 175 that are rigidly interconnected by the block 174 and also by a spacer pin 176. The guide plates 175 are also apertured at adjacent portions to receive bearing pins 177 on which a plurality of sheaves 178 are mounted. The bearing pins 177 are arranged so that the sheaves 177 are disposed in a curve leading downwardly toward the cable guide 83. A retainer wire 179 holds the pins 177 in position. The upper cable guide 90*a* may swivel laterally about the stud 173 as a pivot axis and also the cable guide 90*a* may swing about a transverse axis as defined by the trunnions pivot bolt 171.

Also, in this form of the invention as shown in FIG. 9, the vertical guide bar 111*a* is provided with an offset portion 181 and a lower end 182 bent to form a right angle portion. The latter and the offset portion are apertured. A guide shoe 184 is apertured at its upper end to receive a bolt 185 that secures the upper end of the shoe 184 to the offset portion 181, and similarly, a lower bolt 186 secures the lower end of the shoe 184, which is shaped to conform to the shape of the lower end 182 of guide 111*a*, as will be seen from FIG. 9. The guide shoe 184 is formed of stainless steel and forms a hard smooth surface against which the cable passes, without excessive friction at this point. The lower end of the guide or gate bar 111*a* is shaped similarly to the lower end 115 of the guide bar 111 described above.

While we have shown and described above the preferred structure in which the principles of the present invention have been incorporated, it is to be understood that our invention is not to be limited to the particular details, shown and described above, but that, in fact, widely different means may be employed in the practice of the broader aspects of our invention.

What is claimed is:

1. A cable plow adapted to be mounted on a tractor, said plow comprising a frame adapted to be connected for lateral swinging movement with respect to the tractor, the plow having a generally vertical standard fixed to a rear portion of said frame, cable guide means including a generally vertical cable-receiving channel on the rear of said standard, a generally vertical gate closing said channel and including a lower end portion, cable-receiving anti-friction means extending around said lower end portion and fixed in a position to receive said cable, and an upper guide member mounted on the upper end portion of said standard for movement about a generally vertical axis disposed forwardly of said channel, said member serving to guide into the upper portion of said channel a cable received from guide means mounted on the tractor.

2. The invention set forth in claim 1 in which said anti-friction means is a section of roller chain fixed at its ends to the lower end portion of said gate and in a position disposing the rollers of said chain section so as to receive said cable.

3. The invention set forth in claim 1 in which said upper guide member includes an upwardly and forwardly curved part serving to guide the cable into the upper portion of said channel, a section of roller chain fixed at its ends to the upwardly and forwardly curved part in a position disposing the rollers of said roller chain so as to receive said cable in said channel.

4. The invention set forth in claim 1, further characterized by said upper guide member being mounted on the upper portion of said vertical standard for movement about a generally transverse axis.

5. A cable guide for a cable-laying implement having a generally vertical standard, said guide comprising means forming a generally vertical cable-receiving channel at the rear of said standard, a removable generally vertical gate closing said channel and including a lower rearwardly curved end portion, a section of roller chain extending around said curved end portion, said chain section having upper and lower ends, means fixing the upper end of said roller chain section to said gate generally at the upper portion of said curved gate portion, and means fixing the lower end of said roller chain section generally at the lower portion of said curved gate portion, thereby disposing the rollers of said chain section so as to rotate about fixed generally parallel axes and shiftably receive said cable.

6. In a cable guide, a part having a face over which a cable is adapted to pass, anti-friction means to facilitate movement of the cable, comprising a section of roller chain, said chain including side links dimensioned so that the links engage said face and dispose the rollers out of contact with said face, and means fixing said chain to said part in a position so that the rollers of said chain section overlie said face out of contact therewith and directly receive said cable.

7. In a cable guide, a part having a face over which a cable is adapted to pass, anti-friction means to facilitate movement of the cable, comprising a section of roller chain, said chain including articulated side links, pivots interconnecting said links and rollers rotatably mounted on said pivots, and means fixing said chain to said part in a position so that the links of said chain lie against said face, the links being dimensioned to support said rollers out of contact with said face, said links being spaced apart so that said cable contacts and rests directly on the rollers as the cable passes over said chain, and means connecting the end links of said chain section to said part for holding said chain in fixed position over said face.

8. In a cable guide, a part having a face over which a cable is adapted to pass and a pair of side plates at opposite sides of said face, the latter being curved, a pair of apertured lugs fixed to said part generally at opposite ends of said face, and a section of roller chain connected at its ends to said lugs, respectively, said chain section including end links apertured and spaced apart to receive the associated fixed lug, and connecting pins extending through the apertures in said end links and said lugs for fixing said chain section in place against said curved face.

9. A cable plow adapted to be mounted on a tractor, said plow comprising a frame adapted to be connected for lateral swinging movement with respect to the tractor, and the plow having a generally vertical standard fixed to the rear portion of said frame, a generally vertical cable-receiving channel at the rear of said standard, an upwardly extending post fixed to the upper end of said standard, and a cable guiding means mounted on said post, comprising an upwardly and forwardly curved part, a sleeve fixed to the lower end of said curved part and disposable over said post, a pair of plates fixed to the sides of said curved part, a section of roller chain disposed between said side plates and including side links lying against said curved part, cable-receiving rollers carried by said side links, and means connecting the end links of said chain section to the end portions of said curved part, said cable guiding means serving to guide into the upper portion of said channel a cable received from guide means mounted on the tractor.

10. The combination with a tractor having three-point hitch linkage at its rear end, of a cable layer comprising a cable laying plow connected for lateral swinging movement with said three-point linkage and including cable guide means, the latter comprising a generally vertical standard having a channel and laterally oscillatable arcuate cable-receiving guide mounted for laterally swinging on said standard for directing cable into said channel in any position of said cable laying plow relative to said hitch linkage, a reel carrier mounted on and supported on the tractor, and cable guides carried by the tractor for guiding the movement of the cable from said reel over the tractor to said laterally oscillatable cable-receiving guide.

11. The invention set forth in claim 10, further characterized by overload release means connecting the standard with the plow, and means pivoting the cable receiving guide to the standard for rearward swinging movement about a horizontal axis.

12. A cable plow adapted to be mounted on a tractor, said plow comprising a frame adapted to be connected for lateral swinging movement with respect to the tractor, the plow having a generally vertical standard fixed to a rear portion of said frame, cable guide means including a generally vertical cable-receiving channel on the rear of said standard, a generally vertical gate closing said channel, a generally vertical post fixed at its lower end to the upper portion of said standard, said post defining a generally vertical axis disposed forwardly of said channel, an upper guide member mounted for movement about said generally vertical post as an axis, said member serving to guide into the upper portion of said channel a cable received from guide means mounted on the tractor.

13. A cable plow adapted to be mounted on a tractor, said plow comprising a frame adapted to be connected for lateral swinging movement with respect to the tractor, and the plow having a generally vertical standard fixed to the rear portion of said frame, a generally vertical cable-receiving channel at the rear of said standard, an upwardly extending post fixed to the upper end of said standard, and a cable guiding means mounted on said post, comprising an upwardly and forwardly curved part, a sleeve fixed to the lower end of said curved part and disposable over said post, said cable guiding means serving to guide into the upper portion of said channel a cable received from guide means mounted on the tractor.

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