

REPLACED SHEETS		SG
☒ Description	: paged 1 to paged 5	
☒ Claim(s)	: paged 6 to paged 7	
☒ Drawing(s)	: paged 1 to paged 8	
☒ Abstract	: paged 8 to paged -	

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- 1 -

CABLE GUIDE ROLLER APPARATUS

The present invention relates to a mounting system for cable guide roller apparatus. Cable guide roller apparatuses find use in the installation of electric cables and the present invention provides a mounting system which permits the cable guide roller apparatuses to be conveniently mounted along the intended route of the cable installation.

Background Art

Cable guide roller arrangements generally take the form of a square frame with one roller arranged along each side of the frame. Thus, the rollers are formed into a hollow square through which the cable passes during its installation.

Where a number of cables are to be laid within the same trench, it is highly desirable that the cables be laid in a predetermined position avoiding undesirable crossovers so that the electric and/or capacitive of properties of the laid cables are as intended by the engineer who designed the cable system. Since such cables are typically kilometres in length, have a cable weight of approximately 40 kg/meter and a cable diameter of approximately 150 mm, substantial forces are involved in the drawing of the cable through the trench and in the positioning of the cable into its final position once drawn through the trench.

It is the object of the present invention to improve the ease with which the cables may be placed in their final position once drawn through the trench.

Summary of the Invention

According to the first aspect of the present invention there is disclosed a mounting system for a cable guide roller apparatus comprising a frame having at least one roller therein, the roller or rollers being mounted for rotation relative to said frame, and said frame and roller, rollers substantially encompassing the cable in use, said system comprising a slide member arranged to be substantially co-planar with said frame and at least one coupler slidably connecting said frame to said slide member, said slide member being mounted transversely to the intended direction of cable installation and permitting said frame to reciprocally slide there along in response to net forces applied to said cable during its movement along its direction of installation.

According to the second aspect of the present invention, there is provided a cable guide apparatus comprising a frame having at least one roller and at least one skid plate therein, the roller or rollers being mounted for rotation relative to the frame and the frame, roller or rollers and skid plate or plates being positioned along a path which encompasses the cable in use.

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According to a third aspect of the present invention there is disclosed an installation system for trench-laid cables, said installation system comprising a plurality of the mounting systems according to the first or aspect of the invention or cable guide apparatus according to the second aspect of the invention, each located at spaced intervals along the trench.

Brief Description of Drawings

Embodiments of the present invention will now be described with reference to the drawings in which:

Fig. 1 is a perspective view of a mounting system in accordance with a first embodiment of the invention in use during installation of a cable in a trench;

Fig. 2 is an exploded perspective view of the mounting system of Fig. 1;

Fig. 3 is a transverse cross-sectional view through the trench and illustrating the positioning of cables into their final position;

Fig. 4 is a view similar to Fig. 3 but illustrating a second embodiment of the invention;

Fig. 5 is a schematic side elevational view of the winch system used to draw a cable through the trench from a truck mounted reel;

Fig. 6 is a plan view of the winch system of Fig. 5;

Fig. 7 is a front view of a mounting system in accordance with a third embodiment of the invention;

Fig. 8 is an exploded perspective view of the cable guide apparatus in accordance with a fourth embodiment of the invention;

Fig. 9 is a perspective view of the cable guide apparatus shown in Fig. 8 in use during installation of a cable in a trench;

Fig. 10 is a transverse cross-sectional view through the trench and illustrating the positioning of cables into their final position;

Fig. 11 is a plan view of the trench shown in Fig. 10; and

Fig. 12 is a front view of a fifth embodiment of the invention.

Detailed Description

As seen in Fig. 1, the trench 1 in which the cable 2 is to be laid is formed from reinforced concrete and has opposed sides 3 and a base 4. Typically the trench 1 is of U-shaped configuration as illustrated in Fig. 1, however, other configurations such as V or W configurations are also possible. The cable 2 passes through a large number of cable guide roller arrangements 6 according to a first embodiment of the invention. Each cable guide roller arrangement 6 has a square frame 7 and four rollers 8.

As best seen in Fig. 2, each of the frames 7 is provided with a pair of sliding couplers 9 which are slidably mounted on a slide 10. The slide 10 preferably takes the



form of a well known ACROW (Trade Mark) jack which has a hollow cylinder 12 (which forms the slide itself), an internally threaded nut 13 and an externally threaded rod 14 which extends into the hollow interior of the cylinder 12. Both the cylinder 12 and threaded rod 14 are provided with end flanges 15 which are bolted to short lengths of I-beam 16.

As will be appreciated from Fig. 1, the nut 13 can be rotated in order to adjust the overall length of the slide 10 and the I-beams 16 conveniently mate with the upper edge of the sides 3 of the trench 1. In this way the cable guide roller arrangements 6 each with their corresponding slide 10 are able to be easily and quickly positioned at spaced intervals along the length of the trench.

As indicated schematically in Figs. 5 and 6, a leader wire 20 is passed from a winch 22 through all the rollers 8 and connected to the cable 2 located in a truck mounted reel 21. The reel 21 and winch 22 are located at opposite ends of the trench 1. The leader wire 20 is then winched onto the drum of the winch 22 in order to pull the cable 2 from the reel 21 and along the trench 1. Since the trench 1 is not normally a straight line, as the cable 2 snakes along the trench 1, the cable guide roller arrangements 6 are free to slide reciprocally along the slide 10 and thereby accommodate transverse forces applied to the rollers 8 by the cable 2.

Furthermore, once the cable 2 has been extended along the length of the trench 1, each of the cable guide roller arrangements 6 is able to be moved into a final position from which the cable 2 is dropped from the roller guide arrangements 6. This drop release is as indicated in Fig. 3 and is brought about by removal of the lowermost one of the four portions making up the square frame 7. As indicated in Fig. 3, where a plurality of cables 2A, 2B, 2C, etc. are to be laid within the same trench 1, then the cable guide roller arrangements 6 is able to be slid into a suitable position prior to the drop so that cable 2C can be easily dropped into its final position. This prevents unintended tangling of the cables 2A, 2B, 2C, etc. within the trench 1 and ensures that the electrical and capacitive properties for all the cables laid within the trench 1 are as they were designed to be. Furthermore, because of the weight of the cables, the easy sliding ability of the cable guide roller arrangements 6 relative to the slides 10 means that this final positioning is easily achieved without having to adjust the cable.

In some circumstances where the trench 1 does not extend substantially horizontally, for example where the cable is required to cross under a culvert or some other obstacle, substantial vertical forces can be applied to the cable guide roller arrangements. Under these circumstances in order to overcome these additional forces, a second slide 30 is provided as in the second embodiment of the invention shown in Fig. 4. This can be tightly wedged between the sides 3 of the trench 1 by means of operation of the nut 13. The two slides 10 and 30 therefore form a pair of rails between which the cable guide roller arrangement 6 is free to reciprocally slide. This



arrangement is also particularly useful at bends in the trench since at these locations extra forces on the rollers 8 are also exerted.

Fig. 7 shows a third embodiment of the invention which is essentially a simplified version of the first embodiment but having only three rollers. Like reference numerals are used to designate like features. It will be understood that a fourth roller can be added to this simplified version.

Referring to Figs. 8 and 9, there is shown a fourth embodiment of the invention in the form of cable guide apparatus 110 for use in installing a cable 112 into a trench 113 having a floor 114 and sidewall 115. The apparatus 110 has a frame 116 comprising three roller frame members 118, 120 and 122, which each include an inwardly facing roller 123, and at least one skid plate frame member 124, which includes an inwardly facing skid plate surface 126.

An upper support beam 128 transverses the width of the trench to which the frame 116 is slidably attached by couplers 130. Similar couplers 132 are provided at the bottom of the frame through which pass a lower beam support 134. Right angled couplers 136 connect a support upright 138 to both the upper and lower support beams.

As best shown in Fig. 8, the cable guide frame 116 is able to be dismantled into three roller frame members 118, 120 and 122, which each include one of the rollers 123, and skid plate frame member 124, which includes the skid plate 126. The ends of the upper and lower frames 118 and 122 are each provided with connecting formations in the form of cylindrical sections 142 which can be axially aligned with corresponding cylindrical sections 144 connected to the skid plate. Connecting members 146 are passed through the aligned cylindrical sections 142 and 144 and secured in place by cotter pins 148 to connect the skid plate frame member to the adjacent roller frame members. The vertical roller frame member 120 includes a pair of horizontal cylindrical sections 150 which can be axially aligned with the cylindrical sections 152 provided on the other end of the upper and lower frame members. Pins 154 are placed through the aligned cylindrical sections to connect the vertical roller frame member to the upper and lower frame members.

Fig. 12 shows a fifth embodiment of the invention which is essentially a simplified version of the fourth embodiment but having two skid plates and a single lower roller.

As best shown in Figs. 10, 11 and 12, the skid plate frame member 124 and its associated skid plate 126, when viewed in the intended direction of cable travel, are relatively thin when compared to a roller and its associated frame member. This allows the cable guide apparatus according to the fourth and fifth embodiments of the invention to be positioned closer to the side wall 114 of trench 113 than existing devices. Upon dismantling of the lower frame member 122, the cable can be dropped

to the position shown in phantom and thereby positioned nearby the wall without necessitating further manual handling.

Industrial Applicability

All embodiments of the invention find particular application in the laying of electric power cables by power utilities. Since such cables are particularly heavy, it is particularly advantageous to combine the threading and laying operations in a single operation so that after threading, the cable is discharged from the cable guide roller arrangement into its final position and therefore does not require any subsequent handling or manipulation.

The fourth and fifth embodiments of the present invention find particular application in the laying of power cables in subterranean trenches with the relatively thin skid plate(s) assembly allowing the cables to be positioned close to the trench wall without necessitating extra manual handling. This is also advantageous when cables are being passed around bends in a trench as the close spacing of the cable relative to the outer trench wall enables a bend radius larger than that provided by existing equipment. The increase in the bend radius reduces the mechanical stress on the cable, and reduces the transverse forces applied to adjacent leading and trailing cable guide apparatus.

The foregoing describes only five embodiments of the present invention and modifications, obvious to those skilled in the cable laying arts, can be made thereto without departing from the scope of the present invention. For example, the I-beams 16 can be replaced by inverted U-channels if desired.





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- 6 -

CLAIMS:

1. A mounting system for a cable guide roller arrangement comprising a frame having at least one roller therein, the roller or rollers being mountable for rotation relative to said frame, said frame and roller or rollers substantially encompassing the cable in use, said system comprising a slide member arranged to be substantially co-planar with said frame and at least one coupler slidably connecting said frame to said slide member, said slide member being mounted transversely to the intended direction of cable installation and permitting said frame to reciprocally slide there along in response to net forces applied thereto by said cable during its movement along its direction of installation.
2. A mounting system as claimed in claim 1, wherein the frame has a plurality of rollers positioned along a path which encompasses the cable in use.
3. A mounting system as claimed in claim 1 or 2, wherein said cable is to be installed in a generally U or V-shaped trench and the ends of said slide member are each provided with a connector to connect to said trench.
4. A mounting system as claimed in claim 3, wherein said trench is formed from a concrete channel and has side walls of predetermined configuration, and said connectors each comprise a shaped adaptor having a bight which mates with the upper edge of said side walls.
5. A mounting system as claimed in claim 4, wherein each said adaptor comprises a portion of an I-shaped beam.
6. A mounting system as claimed in claims 3 to 5, wherein said slide member is longitudinally adjustable.
7. A mounting system as claimed in claim 6, wherein said slide member is substantially hollow, has a portion which is internally threaded, and is threadably engaged with an externally threaded extension arm which protrudes from the interior of said hollow slide member.
8. A mounting system as claimed in any one of claims 1 to 7, wherein said slide member is coupled to the upper edge of said frame and a further slide member is coupled to a lower edge of said frame, said slide members being substantially parallel and forming rails along which said frame reciprocates whilst resisting forces applied to said frame having a component which is substantially perpendicular to said slide members and substantially co-planar therewith.
9. An installation system for trench-laid cables, said installation system comprising a plurality of said mounting systems as claimed in any one of claims 1 to 8 and located at spaced intervals along a trench.
10. A cable guide roller apparatus comprising a frame having at least one of roller and at least one skid plate therein, the roller or rollers being mounted for



rotation relative to the frame and the frame, roller, rollers and skid plate or plates being positioned along a path which encompasses the cable in use.

11. An apparatus as claimed in claim 10, wherein said cable is to be installed in a generally U or V shaped trench and the skid plate is aligned substantially parallel with a wall of the trench to permit positioning of the frame in close proximity to the trench wall.

12. An apparatus as claimed in claim 10 or 11, wherein the thickness of the skid plate in the intended direction of cable installation is relatively thin when compared to the thickness of the rollers.

13. An apparatus as claimed in claims 10 to 12, wherein the skid plate includes a smooth flat surface substantially parallel to the intended direction of cable installation.

14. An apparatus as claimed in claim 13, wherein the flat surface is disposed substantially vertically.

15. An apparatus as claimed in claims 10 to 14, wherein the frame comprises of a plurality of roller frame members each including one of the rollers and at least one skid plate frame member including the skid plate, whereby said members are adapted to be releasably connected together to form said frame.

16. An apparatus as claimed in claim 15, wherein the at least one skid plate frame member and the two adjacent roller frame members each include connecting formations adapted to each receive a releasable connecting member adapted to provide a releasable connection between the skid plate frame member and the adjacent roller frame members.

17. An apparatus as claimed in claim 16, wherein at least one of the roller frame members and two adjacent roller members include connecting formations adapted to receive a releasable connecting member adapted to provide a releasable connection between the three frame members.

18. An apparatus as claimed in claims 12 to 17, wherein at least one of the frame members includes at least one coupler adapted to slidably connect the frame member to a support beam transversing the width of the trench.

19. An installation system for trench laid cables, said system comprising a plurality of the cable guide apparatus as claimed in claims 10 to 18, each said cable guide apparatus located at spaced intervals along the trench.

