Sept. 6, 1966 C. J. PRANGE 3,270,982

CABLE WINDING APPARATUS FOR CABLE DRUMS OF SEWER CLEANING MACHINES

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FIG. 3.

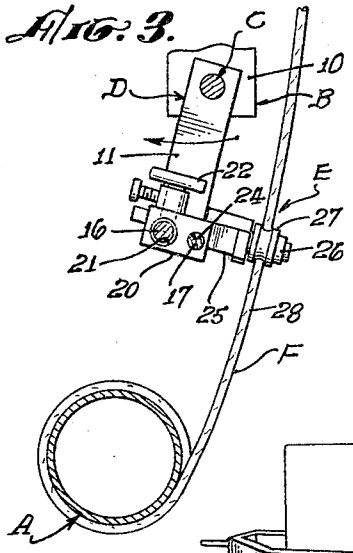


FIG. 1.

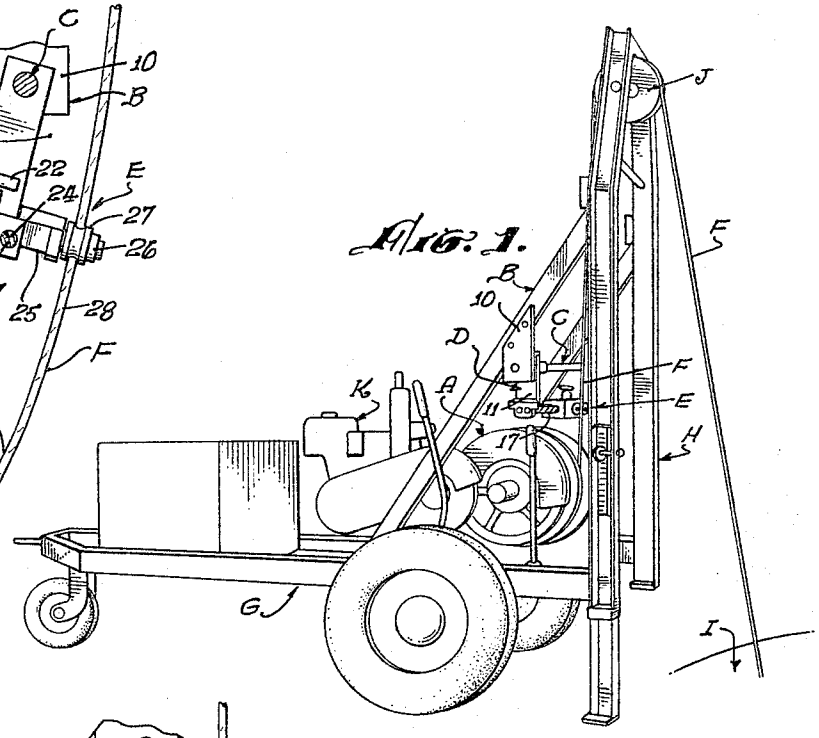


FIG. 2.

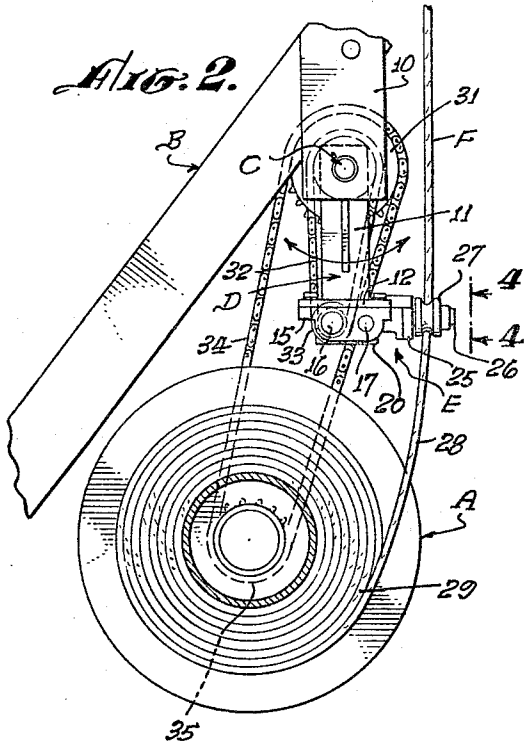
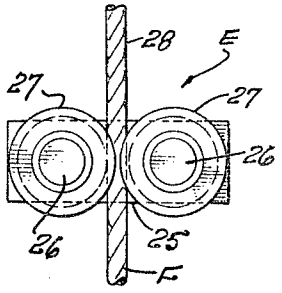


FIG. 4.



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CABLE WINDING APPARATUS FOR CABLE DRUMS OF SEWER CLEANING MACHINES

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FIG. 5.

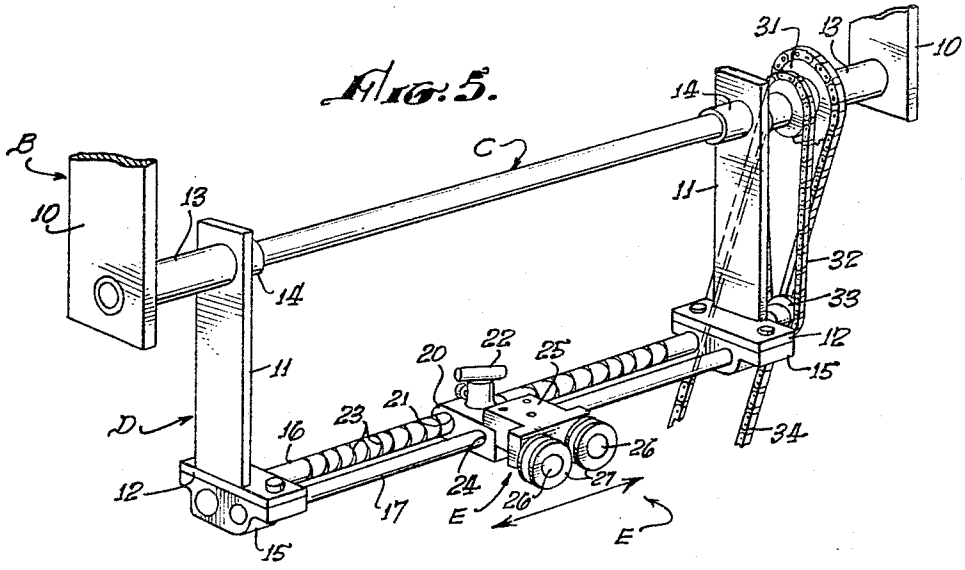


FIG. 6.

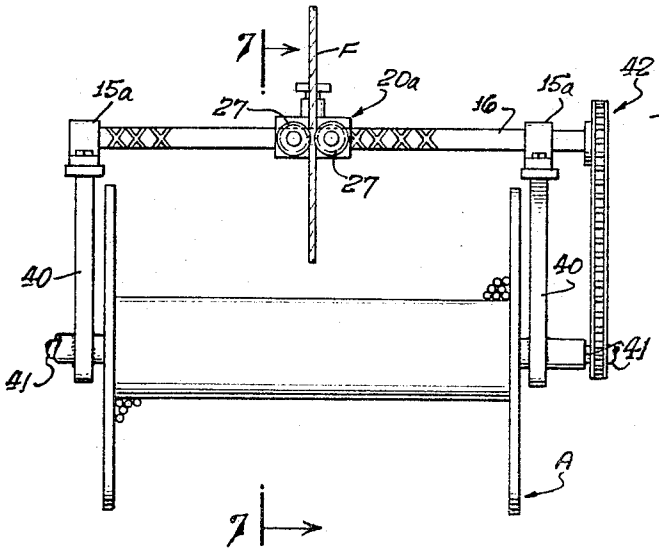
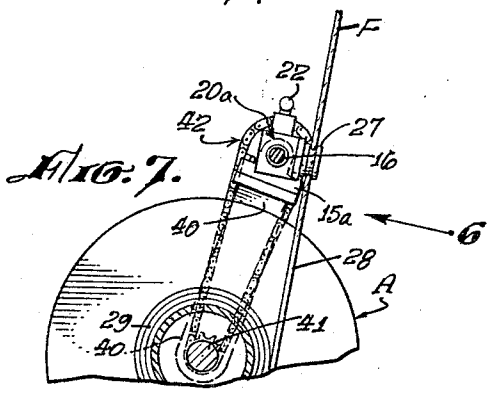


FIG. 7.



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3,270,982

CABLE WINDING APPARATUS FOR CABLE DRUMS OF SEWER CLEANING MACHINES

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9 Claims. (Cl. 242—158.3)

This invention relates generally to even-winding apparatus for cable drums, and in particular to cable winding apparatus as used in sewer cleaning machines for operating a drag bucket for removing accumulated debris from a sewer.

The general object of the invention is to provide a cable guide apparatus for even winding of the cable on its drum. With this general object in mind, the invention aims to provide such a cable guide apparatus wherein:

(1) The cable, in extending to the drum from a guide pulley, passes through a guide which is reciprocated in a path parallel to the axis of the drum, such as to guide the cable back and forth from one end of the drum to the other and return, at a rate of speed which is related to the rotation of the drum so as to lay the cable evenly in adjacent coils upon the drum.

(2) The guide preferably embodies a pair of flanged rollers between which the cable can travel with minimal resistance, and which embrace the cable to retain it captive while guiding it in successive traverses of the drum.

(3) The guide rollers are mounted on a carriage which includes a follower element geared to a double helix scroll shaft or worm which drives the carriage in reciprocating movements.

(4) The scroll shaft is driven by a geared connection to the drum so as to rotate in timed relation to the rotation of the drum.

(5) In one embodiment, the cable is jointly carried by the drive shaft and a guide rail parallel thereto, so as to maintain the guide properly oriented with respect to the cable while executing its traversing movements.

(6) In this embodiment, the scroll shaft and guide rail are carried by or suspended in a swing which permits the guide to follow the movements of the cable radially with respect to the drum as the diameter of the windings on the drum varies in accordance with the number of turns of cable that are wound on the drum. Also, in this embodiment, the swing is hung upon a countershaft through which the drive is transmitted from the drum to the scroll shaft.

(7) In another embodiment, the scroll shaft is mounted in a yoke which swings about the drum axis so that the guide may swing concentrically around the drum to follow the shifting of the cable as the turns are increased upon the drum; and the guide carriage is free to pivot around the scroll shaft so as to maintain the guide rollers in proper alignment with the cable.

(8) The guide apparatus is of relatively simple construction yet sturdy and positive in operation.

(9) The guide apparatus will completely eliminate fouling and uneven winding of the cable on the drum.

Other objects and advantages will become apparent in the ensuing specification and appended drawing in which:

FIG. 1 is a perspective view of a cable winding apparatus exemplifying one form of my invention as embodied in drag bucket machine;

FIG. 2 is a fragmentary side elevational view of the cable drum and winding guide portions thereof;

FIG. 3 is a vertical sectional view of the winding guide apparatus;

FIG. 4 is a front elevational view of the guide unit;

FIG. 5 is a perspective view of the winding guide apparatus;

FIG. 6 is a plan view of a modified form of the winding guide apparatus, viewed as indicated by the arrow 6 in FIG. 7; and

FIG. 7 is a side elevational view of the apparatus of FIG. 6 with a portion thereof broken away and shown in section.

Referring now to the drawings in detail, and in particular to FIGS. 1–5, I have shown therein, as an example of one form in which the invention may be embodied, a cable winding apparatus, comprising, in general, a drum A, a support B associated therewith, a countershaft C carried by the support B, a swing D mounted on the countershaft C, and a guide unit E carried by the swing D and cooperating with the cable F for guilding the same as it is wound upon the drum A.

The cable wind apparatus can be applied to various types of sewer cleaning machines including the drag bucket machine shown in FIG. 1, truck loaders such as that shown in my Reissue Patent No. 24,908, and other drag bucket machines. The bucket machine shown by way of Example in FIG. 1 may include a wheel mounted truck G, a derrick arch H having adjustable feet to stand adjacent a sewer I, the cable drum A for winding the cable F which is passed over a sheave J carried by the upper end of the derrick arm H and thence downwardly into the sewer I, and an engine and transmission unit K for driving and controlling the cable drum A. The supporting frame B in this instance may comprise a pair of laterally spaced brace bars extending diagonally between the truck G and the derrick arch H and secured thereto at their respective ends.

In this embodiment of the invention, the countershaft C has its respective ends journalled in brackets **10** secured to the respective brace bars B and depending therefrom. The swing D comprises a pair of hanger arms **11** each pivotally mounted at its upper end upon a respective end portion of countershaft C, depending therefrom and having at its lower end, a respective mounting flange **12**. Hanger arms **11** (FIG. 5) are spaced inwardly from brackets **10** and may be retained in position by spacer sleeves **13** on the respective ends of countershaft C, and by opposed retainer collars **14** secured on the shaft.

Attached to the mounting flanges **12** are pillow block bearings **15**. A double-helix scroll shaft or worm **16** has its respective ends journalled in the respective bearings **15**. A guide bar **17** likewise has its ends mounted in the pillow blocks **15** in spaced parallel relation to the scroll shaft **16**.

Guide unit E comprises a follower carriage **20** having a cylindrical bore **21** in which the scroll shaft **16** is rotatably received and having a follower pin **22** engaged in the double-helix worm groove **23** of the scroll shaft **16** for causing the carriage **20** to reciprocate axially upon the shaft **16** in response to rotation thereof. Carriage **20** has a second cylindrical bore **24**, spaced from the bore **21**, and slidably receiving the guide bar **17**. Thus, the carriage **20** is slidably mounted on and supported by the scroll shaft **23** and guide bar **17**, oriented in a plane substantially at right angles to the hanger arms **11**.

Mounted upon the carriage **20** is a roller bracket **25** which has a forward face generally parallel to the plane of arms **11** and carrying a pair of forwardly projecting trunnions **26** on which are rotatably mounted a pair of cable-guided grooved rollers **27**. A stretch of cable F, extending generally tangentially from cable drum A at **28**, passes between the rollers **27**, which are properly

spaced to embrace the cable with a retaining action such as to securely retain the cable guided between the rollers while permitting it to freely move axially as it is unrolled from and rerolled upon the cable drum A.

The swing D swings freely upon the countershaft C to accommodate shifting movements of the guide E transversely with reference to a radius of drum A so as to follow the lateral shifting of the cable stretch **28** in accordance with changes in the diameter of the cable windings **29** upon the drum A as the amount of cable wound thereon is increased or decreased.

Mounted upon the countershaft C between one of the hanger arms **11** and the opposed bracket **10** is a sprocket cluster **31** consisting of integrally connected sprockets one of which drives through a chain **32** to a sprocket **33** on one end of the scroll shaft **16**. The other sprocket of cluster **31** is driven by a chain **34** which in turn is driven by a sprocket **35** on one end of the cable drum A (FIG. 2).

The ratio of drive from the drum A to the scroll shaft **16** is so related to the pitch of the worm groove **23** of shaft **16**, the average diameter of the cable wound periphery of drum winding **29** and the thickness of the cable so that the guide unit E will travel axially with respect to the drum A at a rate such as to lay the cable in even turns upon the drum with the consecutive turns closely adjacent, the winding proceeding progressively from one end of the drum to the other and then back. As the diameter of the wound body **29** of the cable increases, the swing D will swing toward the right as viewed in FIG. 2, and as the cable is unwound and the diameter decreases, the swing will move leftwardly to follow the shifting movements of the cable stretch **28** as it remains tangent to the periphery of the wound body **29** throughout the changes in diameter thereof.

Referring now to FIGS. 6 and 7, there is shown therein a modified form of the invention in which a pair of mounting arms **40** are pivotally mounted upon the respective ends of shaft **41** of the drum A, and wherein a scroll shaft **16** is mounted in bearings **15***a* secured to the ends of the respective arms **40**. A follower carriage **20***a* is mounted upon the shaft **16** and is provided with a pair of cable guide rollers **27** between which the cable stretch **28** extends. Carriage **20***a* is free to rotate around the scroll shaft **16** except as restrained by the engagement of the cable stretch **28** between the rollers **27**. It will assume a position in which the axes of the roller trunnions **26** are disposed substantially normal to the cable stretch **28**, and as the angular position of the stretch **28** changes in accordance with variations in diameter of the cable wound periphery of the drum A, the carriage **20***a* will tilt slightly about the shaft **16** to maintain the normal relationship of its roller axes to the cable stretch **28**.

The scroll shaft **16** is driven directly from the drum A through a direct chain drive indicated generally at **42**.

I claim:

1. Sewer cleaning drag bucket hoist apparatus comprising: a cable-winding drum; a guide for receiving a stretch of cable extending tangentially from the drum; a double-helix scroll shaft on which said guide is mounted for reciprocating movement in response to rotation thereof; means supporting said scroll shaft in a position parallel to the axis of said drum, said supporting means being movable transversely with reference to a radius of said drum to effect shifting movements of said guide so as to follow movements of said cable stretch corresponding to changes in the radial distance from the axis of said drum to the point of tangency of said cable stretch with the cable-wound periphery of the drum in accordance with changes in the amount of cable wound upon the drum; and means transmitting rotary drive from the drum to said scroll shaft to rotate the same in timed relation to drum rotation, said scroll shaft supporting means being disposed above said drum and comprising a swing and fixed supporting pivot means from which said swing is free-hanging, depending toward the drum with its lower portion clearing the upper side of the drum, said scroll shaft being mounted in said lower portion of the swing.

2. Apparatus as defined in claim **1**, wherein said guide comprises a follower carriage geared to said scroll shaft and having a roller-mount projecting horizontally away from said scroll shaft and a pair of grooved rollers mounted on said roller-mount on substantially horizontal axes transverse to said scroll shaft, said rollers engaging between them the stretch of cable adjacent said drum; and guide means cooperating with said scroll shaft to support said follower carriage in a substantially horizontal position for travel along said scroll shaft when said swing is downwardly pendant.

3. Apparatus as defined in claim **2**, wherein said guide means comprises a smooth guide shaft mounted in said lower portion of the swing in parallel, adjacent, spaced relation to said scroll shaft, said scroll shaft and guide shaft both extending through said follower carriage.

4. Sewer cleaning drag bucket apparatus comprising: a frame; a cable-winding drum mounted thereon for rotation; a cable wound upon said drum and having a stretch thereof extending tangentially from the drum; a guide engaging said cable in guiding relation thereto; a double-helix scroll shaft geared to said guide for reciprocating it axially of said shaft so as to guide the cable in the winding thereof onto the drum; means mounting said scroll shaft and guide for rotation of said shaft and for reciprocation of the guide; means supporting said mounting means on said frame for free movement of said guide in a path generally transverse with reference to a radius of said drum to follow shifting movements of said cable stretch in accordance with changes in the radius of the cable-wound periphery of the drum; and means for transmitting rotary drive to the scroll shaft in timed relation to rotation of the drum, said supporting means comprising a countershaft supported on the frame above said drum and parallel to its axis, and hanger arms suspended from said countershaft and carrying said mounting means at their lower extremities for swinging movement above and adjacent to the periphery of the drum.

5. Cable winding apparatus as defined in claim **4**, wherein said drive transmitting means comprises a cluster of rotatable driving elements on said countershaft, means for transmitting drive from the drum to one of said cluster elements, and means for transmitting drive from the other cluster element to said scroll shaft.

6. Sewer cleaning drag bucket apparatus comprising: a frame; a cable-winding drum mounted thereon for rotation; a cable wound upon said drum and having a stretch thereof extending tangentially from the drum; a countershaft supported by said frame above said drum and parallel to its axis; a swing suspended from said countershaft, said swing including bearing means at its lower extremity; a double-helix scroll shaft journalled in said bearing means parallel to the axis of said drum and above the periphery thereof; a guide bar mounted in said swing in laterally-spaced, parallel relation to said scroll shaft; a guide carriage slidably mounted on said scroll shaft and said guide bar and having a drive-receiving connection with said scroll shaft such as to be reciprocated in response to rotation thereof; guide means on said carriage, in guiding engagement with said cable stretch; and means for transmitting rotary drive to said scroll shaft, such as to reciprocate said guide means so as to guide the cable back and forth from end to end of the drum as it is wound thereon; said swing being free for swinging movement on said countershaft, such as to effect movement of said guide transversely with reference to a radius of the drum, thereby to follow the shifting of said cable stretch in accordance with changes in diameter of the cable-wound periphery of the drum.

7. Apparatus as defined in claim 6, wherein said guide means comprises a pair of grooved rollers mounted on said guide carriage for free rotation and in embracing, guiding relation to said cable stretch.

8. Sewer cleaning drag bucket apparatus comprising: a frame; a cable-winding drum mounted thereon for rotation; a cable wound upon said drum and having a stretch thereof extending tangentially from the drum; a countershaft supported by said frame above said drum and parallel to its axis; a swing mounted on said countershaft for free-swinging movement, said swing extending toward said drum and having bearing means at its swinging end; a double-helix scroll shaft journalled in said bearing means parallel to the axis of said drum and in opposed relation to the periphery thereof; a guide bar mounted in said swing in laterally-spaced, parallel relation to said scroll shaft; a guide carriage slidably mounted on said scroll shaft and said guide bar and having a drive-receiving connection with said scroll shaft such as to be reciprocated in response to rotation thereof; guide means on said carriage, in guiding engagement with said cable stretch; and means for transmitting rotary drive to said scroll shaft, such as to reciprocate said guide means so as to guide the cable back and forth from end to end of the drum as it is wound thereon; said swing being free for swinging movement on said countershaft, such as to effect movement of said guide transversely with reference to a radius of the drum, thereby to follow the shifting of said cable stretch in accordance with changes in diameter of the cable-wound periphery of the drum.

9. Apparatus as defined in claim 8, wherein said drive-transmitting means comprises a cluster of rotatable driving elements on said countershaft, means for transmitting drive from the drum to one of said cluster elements, and means for transmitting drive from the other cluster element to said scroll shaft.

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