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 DRAG BUCKET DREDGING AND DUMPING MECHANISM
 FOR CULVERTS AND THE LIKE
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3,022,908

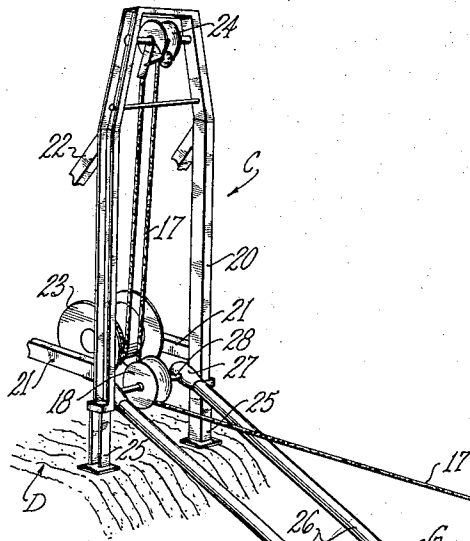


FIG. 1.

FIG. 3.

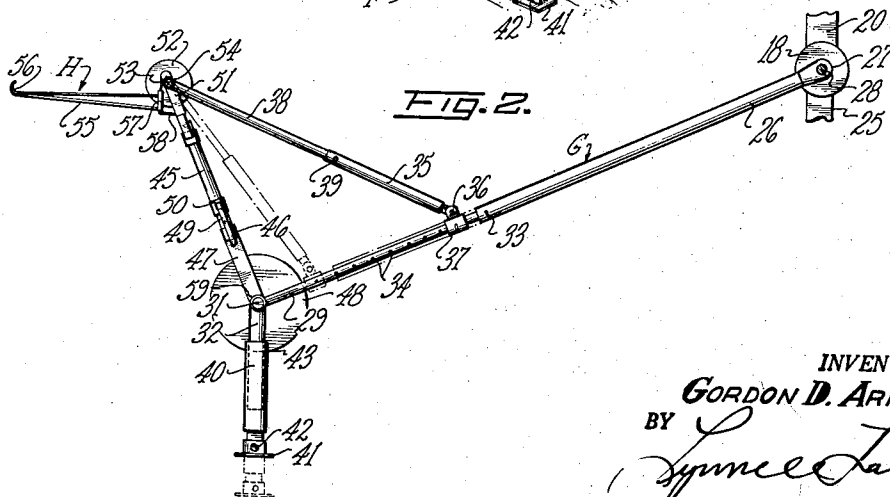
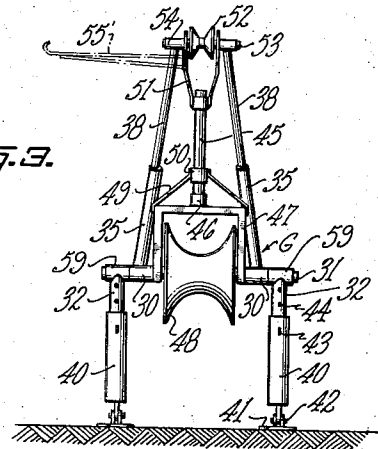


FIG. 2.

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1

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**DRAG BUCKET DREDGING AND DUMPING
MECHANISM FOR CULVERTS AND THE LIKE****Gordon D. Arnold, Dallas, Tex., assignor to Flexible
Sewertool Corporation, Lima, Ohio, a corporation of
Ohio****Filed Apr. 18, 1960, Ser. No. 30,514
6 Claims. (Cl. 214-92)**

This invention relates to drag bucket type apparatus for cleaning underground conduits such as sewers, culverts, etc. and has as its general object to provide a drag bucket mechanism particularly adapted for cleaning of culverts, storm drains and the like.

More specifically, the invention aims to provide an apparatus for moving a drag bucket back and forth through a culvert or drain conduit having respective open ends terminating in embankments along the respective sides of a roadway or other elevated ground area.

A particular object is to provide such an apparatus embodying a withdrawal and dumping unit adapted to bridge an embankment or a substantial portion thereof, with a discharge boom portion of the unit standing in a ditch at the base of the embankment and a cable-reeling winch portion adapted to stand on a road shoulder or the brow of the embankment and embodying a winch, operable at that elevated point, for reeling a cable which functions to move the drag bucket through the culvert.

A further object is to provide such an apparatus having improved means for dumping the drag bucket in the drainage ditch into which the culvert empties, at a sufficient distance from the discharge end of the culvert to assure the dumped material being carried away in the ditch and not re-entering the culvert.

A further object is to provide such an apparatus having means for adjusting the same to embankments and drainage ditches of varying depths and widths, with the winch portion of the apparatus mounted on the road shoulder at the top of the embankment, out of traffic and also out of the drainage ditch flanking the road, for maximum convenience and efficiency in the operation of the apparatus.

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

FIG. 1 is a perspective view of the bucket retracting and dumping unit of an apparatus embodying my invention;

FIG. 2 is a side view of the same looking at the far side of the apparatus as shown in FIG. 1; and

FIG. 3 is an end view of the unit.

Referring now to the drawings in detail, I have shown therein as an example of one form in which the invention may be embodied, one of a pair of drag bucket operating units adapted to be positioned at opposite ends of a culvert shown at A, which units are adapted to draw a drag bucket B back and forth in the culvert, one of a pair of units being operative to draw the bucket B into the culvert and to fill the bucket during such entering movement, and the other unit (the one shown in the drawing) being operative to withdraw the bucket from the culvert and to empty it across the road-flanking ditch into which the culvert empties. The dumping position is shown in FIG. 1, in full lines. The entry of the bucket B into the culvert and the commencement of the filling operation is indicated at broken lines in FIG. 1 at B'.

The withdrawing and dumping unit, shown in the drawing, includes, in general, a winch section C which is adapted to stand on the shoulder D of a roadway, a boom section E adapted to stand in the drainage ditch F into which the culvert empties, and a bridge section G joining

2

the boom section E to the winch section C and adapted to bridge an embankment I extending downwardly from road shoulder D and constituting the near side of ditch F. Bridge section G comprises, in general, a pair of extension arms and a pair of extension braces for adjustably positioning the boom section E at various distances from and various angles of inclination with respect to the winch section C to conform to drainage ditches of varying width and depth. The apparatus also includes a dumping crane arm H at the outer end of boom section E. By suitable adjustment of the several units in their relationship to one another, the apparatus can be set up with the winch section C on the road shoulder at the top of an embankment I, with the bridge section G slanting downwardly into the ditch F, and with the legs of boom section E resting in the bottom of the ditch.

Detailed Description

The bucket B is a conventional drag bucket of a type (such as is disclosed in Kuhlman Patent No. 1,185,686, issued June 6, 1916), including a tubular barrel 10 having a forward end adapted to be closed by a pair of clam shell lips 11 hinged thereto, having a constantly open rear end 12, having diametrically opposed longitudinally slidable actuator bars 13 linked to the clam shell lips 11 for opening and closing the same, having bails 14 and 15 linked to the respective ends of the actuator bars 13, and having respective sections of cable 16 and 17 secured to the respective bails 14 and 15. Cable 17 passes upwardly and around the forward end of boom section E, thence rearwardly to the winch section C, where it passes beneath a roller 18 and thence upwardly.

The winch section C is likewise largely of conventional construction, including a derrick arch 20, a frame 21 extending horizontally rearwardly therefrom and braced by suitable diagonal brace arms 22, a winch drum 23 mounted upon the frame 21 for rotation by a motor (not shown) and a pulley 24 mounted in the crown of the arch 20, around and from which the cable 17 may extend downwardly to the winch drum 23 for winding thereon. At its lower end, derrick arch 20 has feet 25 adapted to rest upon the road shoulder D. At the rear end of frame 21 is additional supporting means, not seen in the drawing. The winch section C is self-balancing upon such supporting means and its feet 25 during operation of the apparatus.

The bridge section G comprises a pair of extension arms each including a sleeve 26 having at its rear end a knuckle fitting 27 pivoted upon a respective end of a shaft 28 extending therethrough, with its respective ends thereof mounted in respective legs of derrick arch 20. A pair of extension arms 29 have their rear end portions telescoped into respective sleeves 26 and have at their forward ends respective transverse, aligned trunnion collars 30. Collars 30 are pivotally connected, upon a transverse shaft 31, to extension legs 32 of the boom section E. Thus the angle of inclination of the bridge section G with respect to the extension legs 32 can be varied in accordance with varying profile conditions in the drainage ditch and the embankment I.

The extension arms 29 are adapted to be extended from and retracted into sleeves 26 for adjusting the distance between the sections C and E, and to be secured in adjusted positions by pins or bolts 33 extended through opposed openings in the forward ends of sleeves 26 and through any selected one of a series of pairs of openings 34 in extension arms 29 to secure the adjustment.

The bridge section G further includes a pair of extensible braces each including a tube 35 having at its rear

3

end an eye connected by a pivot 36 to an integral ear on a collar 37 which encircles and is adjustable along a respective extension arm 29 and adapted to be pinned or bolted therethrough, using a pair of the openings 34 for that purpose.

The braces further include extension rods 38 telescoped into respective tubes 35 and adapted to be secured in selected positions of extension by set screws 39 threaded through the respective tubes 35 and engaging the respective rods 38.

The boom section E comprises the extension legs 32, respective boots 40 into which the legs 32 are telescoped, supporting feet 41 pivoted at 42 to eyes on the lower ends of boots 40, and locking pins 43 adapted to be extended through respective pairs of openings in the upper ends of boots 40 and through selected pairs of openings 44 in extension legs 32. Adjustment of the legs 32, 40 of boom unit E in their angular relationship to extension arms 29 so that the legs may stand vertically, is provided for by pivotal connections between tubular cross heads 59 on the upper end of the respective leg sections 32 and the shaft 31, the ends of which extend into these cross heads 59. The boom section E further includes a boom 45 having a lower end mounted in a socket 46 on the cross web of a rectangular yoke 47 having side arms the ends of which are pivoted upon the shaft 31. Embraced within the yoke 47 and rotatably mounted upon the shaft 31 is a large guide roller 48 having a width such as to span or to substantially span the width of bucket B. A forked brace 49, including a collar 40 through which the boom 45 extends, braces and rigidifies the boom 45 to the yoke 47.

At its upper end, boom 45 has a harp 51 in which is mounted a relatively small pulley 52. Pulley 52 is mounted on a shaft 53 extending through the ends of the arms of harp 51 and mounted in collars 54 secured to the forward ends of extension brace rods 38.

With bucket B in its B' position within culvert A, cable 17 will extend from the mouth of the culvert beneath roller 48, upwardly around this roller to pulley 52, thence rearwardly and beneath pulley 18, thence upwardly over crown pulley 24, and thence downwardly to winch drum 23, around which it is wrapped.

Crane arm H includes an arm 55 of cantilevered truss construction, fabricated from a pair of rods converging and joined at the outer end of the arm with one of the rods terminating in a hook 56, and a bearing sleeve 57 to which the spread rear ends of the rods are secured at substantially right angles, the bearing sleeve 57 being pivoted in a clevis-type bracket 58 secured to one of the arms of harp 51 and projecting forwardly therefrom. This provides a vertical pivot upon which the arm 55 can swing laterally from a position projecting forwardly as shown in full lines in FIG. 1 to a position projecting sidewise as indicated in broken lines at 55' in FIG. 3.

Bucket B is provided with a short length of chain 57 linked to its open end 12 and adapted to be hooked over the hook 56 when the bucket has been elevated by the cable 17.

Setting Up

In setting up the apparatus of FIG. 1 for a cleaning operation on a culvert such as the culvert A disclosed, the apparatus is placed over the embankment I, the winch section C being positioned on the road shoulder D with the feet 25 at the brow of the embankment, and the boom section E is placed in the bottom of the drainage ditch F with the bridge section G extending downwardly and laterally over the embankment I and over the mouth of the culvert A. The inclination of the bridge section G may be adjusted to meet the embankment and ditch contour conditions existing at the job, the knuckle fittings 27 pivoting on the shaft 28 to provide any required variation in inclination of the bridge section G with respect to the derrick section C. Adjustment for distance between the

4

brow of the embankment and the bottom of the ditch is provided for by adjusting the extension arms 29 with respect to sleeves 26. Adjustment of the angular relationship between boom 45 and bridge unit G so as to maintain crane arm H in a horizontally projecting position, is provided for by varying the extension of brace arms 38 in brace tubes 35.

Operation

In the operation of the apparatus, the withdrawal dumping unit of FIG. 1 is set up at one end of the culvert A and a generally similar unit (which need not have the crane arm H) is set up on the opposite side of the road over the other end of culvert. The cable 16 is attached to the winch of this remote unit, being extended thereto through the culvert from the bucket B. Upon operating the remote unit to wind up the cable 16 on its winch, the bucket B (with its chain 57 unhooked from crane arm H) will be drawn into the culvert as indicated at B', its clam shell lips 11 being spread apart so that the entering end of the bucket will be open and will gather sediment into the bucket. While the bucket is being drawn into the culvert, the winch drum 23 of the dumping unit is released for free unreeling movement to pay out the cable 17 as it is drawn around the pulleys 24, 28 and 52. When the bucket is filled, the operation of the remote unit is arrested, its winch drum is released for free unreeling movement, and the winch drum 23 of the dumping unit is driven to reel in the cable 17. The pull of cable 17 through bail 15 against actuator bars 13 will move the clam shell lips 11 to closed positions so as to retain the sediment in the bucket as it is withdrawn from the culvert. As the bucket leaves the culvert the pull of the cable, passing beneath and around roller 48, will draw the bucket between the legs 32, 40 and will then tilt its open end 12 upwardly, the near side of the bucket engaging the pulley 48 and being cradled between the flanges thereof and thereby supported out of contact with the yoke 47 as it is elevated toward the pulley 52. When the bail 15 has been drawn close to the pulley 52, a workman standing on the opposite side of the ditch from the culvert grasps the bucket, draws it toward the free end of crane arm H and hooks the chain 57 over the hook 56. The cable 17 is then relaxed so that the bucket will be suspended on the crane arm H, which may be swung laterally to any selected position for dumping. Simultaneously, the workman adjacent the bucket will grasp the bail 14 by a suitable draw bar 60 so that he may, as desired, swing the bottom of the bucket toward him and shake the bucket as necessary in order to dislodge its contents. The pull on the bail 14 also operates to open the clam shell lips 11 so that the contents may be discharged through the bottom of the bucket.

It will now be seen that the invention provides an apparatus including means for positioning the wide roller 48 substantially in alignment with the mouth of the culvert and spaced away from the same a selected distance, together with the overhanging boom 45 and its pulley 52 which functions to draw the bucket beneath the roller 48 and thence upwardly and away from the culvert to a position where it can be transferred to the swinging crane arm H for final positioning over a dumping site, far enough removed from the culvert so as to avoid the likelihood of the dumped material flowing back into the culvert. The invention also provides for convenient dumping of the material in the drainage ditch into which the culvert empties, on the side of the ditch away from the culvert so that the flow of water in the ditch may carry away the material that has been taken from the culvert.

I claim:

1. A drag bucket apparatus for removing sediment from an underground conduit having a horizontally projecting open end, said apparatus comprising: a winch section including a support adapted to stand upon the brow of the embankment and a winch drum mounted on said support; a bridge section having a rear end attached to said

5

6

support and a forward portion adapted to extend downwardly and forwardly over the embankment; a boom section including supporting means adapted to stand at the foot of the embankment, a bucket straddling roller mounted for rotation of said supporting means, a boom having at its lower end a yoke with side arms straddling said roller and pivotally attaching the end of said boom to said supporting means on the axis of said roller, with the boom projecting upwardly from said roller, and a pulley mounted on the upper end of said boom.

2. A drag bucket apparatus for removing sediment from a culvert having an end projecting from an embankment, said apparatus comprising: a winch section including a support adapted to stand upon the brow of the embankment and a winch drum mounted on said support; a bridge section having a rear end attached to said support and a forward portion adapted to extend downwardly and forwardly over the embankment; a boom section including supporting means adapted to stand at the foot of the embankment, a bucket straddling roller mounted for rotation on said supporting means, a boom, a yoke secured to the lower end of said boom, straddling said roller, and pivotally attached to said supporting means at the axis of said roller, said yoke straddling said roller, said boom projecting upwardly and forwardly therefrom, and a pulley mounted on the upper end of said boom; a drag bucket; a cable attached to the rear end of the bucket and extending over said pulley and thence to said winch unit; and a second cable attached to the forward end of the bucket and adapted to be extended into a culvert for drawing the bucket downwardly around said bucket straddling roller and thence into the culvert.

3. A drag bucket apparatus for removing sediment from a roadway-piercing culvert having an end projecting into a road-flanking ditch, said apparatus comprising: a winch section including a support adapted to stand upon the shoulder of the roadway and a winch drum mounted on said support; a bridge section having a rear end pivotally attached to said support and a forward portion adapted to extend downwardly and forwardly into said ditch; a boom section including laterally spaced supporting feet adapted to stand in the bottom of the ditch, a bucket straddling roller mounted for rotation between said supporting feet, a boom having at its lower end a yoke straddling said roller and pivotally attached to and disposed between said supporting feet at the axis of said roller and projecting upwardly and forwardly therefrom, and a pulley mounted on the upper end of boom; a drag bucket having clam shell lips defining the forward end thereof, having longitudinally movable actuator means for opening and closing said lips, and having respective bails attached to said actuator means adjacent the respective ends of the bucket; a cable attached to said actuator means adjacent the rear end of the bucket and extending over said pulley and thence to said winch unit; a second cable attached to the bail at the forward end of the bucket and adapted to be extended into a culvert for drawing the bucket downwardly around said bucket straddling roller and thence into the culvert for filling the bucket; and a crane arm pivoted to the upper end of said boom on a normally vertical axis and projecting forwardly for supporting the bucket for lateral swinging movement to position it over a selected dumping site.

4. A drag bucket apparatus for removing sediment from a culvert having an end projecting from an embankment, said apparatus comprising: a winch section including a derrick having feet adapted to stand upon the brow of the embankment, a horizontal frame secured to said derrick and projecting rearwardly therefrom, a winch drum mounted for rotation in said horizontal frame, a lower pulley, a shaft on which said lower pulley is mounted for rotation in said derrick adjacent said feet, and an upper pulley mounted in the crown of said derrick above said lower pulley; a bridge section comprising a pair of extensible arms including respec-

tive rearward arm members pivoted at their rear ends upon said shaft, thereby pivotally attaching said bridge unit to said derrick for projecting downwardly over said embankment at varying selected angles of downward inclination, and said extensible arms further including respective forward arm members extensibly connected to said rearward arm members, and a pair of extensible braces having rear ends pivotally attached to said forward arm members; a boom section including supporting legs adapted to stand at the foot of said embankment, means including a transverse roller shaft pivotally connecting the upper ends of said legs to the forward ends of said forward extension arm sections, a bucket-straddling roller rotatably mounted on said roller shaft between said legs, a boom having at its lower end a yoke with side arms straddling said roller, pivotally mounted upon said shaft and thereby pivoted to the forward ends of the forward extension arm members, said boom extending upwardly and forwardly, a pulley pivotally mounted on the upper end of said boom in a common vertical plane with said roller and said lower pulley of the derrick unit, the forward ends of said extensible braces being attached to the upper end of said boom, whereby the angle of forward inclination of said boom can be adjusted by adjustment of said braces; a drag bucket; a cable attached to the rear end of the bucket and extending over said pulley and thence to said winch unit; and a second cable attached to the forward end of the bucket and adapted to be extended into a culvert for drawing the bucket downwardly around said bucket straddling roller and thence into the culvert.

5. A drag bucket apparatus for removing sediment from a culvert having an end projecting from an embankment, said apparatus comprising: a winch section including a frame adapted to stand upon the brow of the embankment, and a winch drum mounted for rotation in said frame; a bridge unit comprising a pair of extensible arms including respective rearward arm members pivoted at their rear ends on a horizontal axis to said frame for projecting therefrom downwardly over said embankment at varying selected angles of downward inclination, and said extensible arms further including respective forward arm members extensibly connected to said rearward arm members, and a pair of extensible braces having rear ends attached to said extensible arms; a boom unit including supporting means adapted to stand at the foot of said embankment, a bucket-straddling roller rotatably mounted in said supporting means; means pivotally connecting the upper end of said supporting means to the forward ends of said forward extension arm members, a boom including at its lower end a yoke having side arms straddling said roller and pivoted to the forward ends of said forward extension arm sections, said boom extending upwardly and forwardly, and a pulley pivotally mounted on the upper end of said boom, the forward ends of said extensible braces being attached to the upper end of said boom, whereby the angle of forward inclination of said boom can be adjusted by adjustment of said braces; a drag bucket; a cable attached to the rear end of the bucket and extending over said pulley and thence to said winch unit; and a second cable attached to the forward end of the bucket and adapted to be extended into a culvert for drawing the bucket downwardly around said bucket straddling roller and thence into the culvert.

6. A drag bucket apparatus for removing sediment from an underground conduit having a horizontally projecting open end, said apparatus comprising: a winch section including a derrick adapted to stand upon the brow of the embankment, a horizontal frame secured to said derrick and projecting rearwardly therefrom, a winch drum mounted for rotation in said horizontal frame, a lower pulley mounted for rotation in said derrick, and an upper pulley mounted in the crown of said derrick above said lower pulley; a bridge unit comprising a pair

7

of extensible arms including respective sleeves pivoted at their rear ends to said derrick adjacent said lower pulley, thereby attaching said bridge unit to said derrick for projecting downwardly over said embankment at varying selected angles of downward inclination, and said 5 extensible arms further including respective extension rods telescoped in said sleeves, and a pair of extensible braces having rear ends pivotally attached to said extension rods; a boom unit including a support adapted to stand at the foot of said embankment, means including 10 a transverse roller shaft pivotally connecting the upper end of said support to the forward ends of said extension rods, a bucket-straddling roller rotatably mounted on said shaft, a boom including at its lower end a yoke having side arms straddling said roller, pivotally mounted 15 upon said shaft, and thereby pivoted to the forward ends of said extension rods, said boom extending upwardly and forwardly, a pulley pivotally mounted on the upper end of said boom, the forward ends of said extensible

8

braces being attached to the upper end of said boom, whereby the angle of forward inclination of said boom can be adjusted by adjustment of said braces; a drag bucket; a cable attached to the rear end of the bucket and extending over said pulley and thence to said winch unit; and a second cable attached to the forward end of the bucket and adapted to be extended into a culvert for drawing the bucket downwardly around said bucket straddling roller and thence into the culvert; and a crane arm pivoted to the upper end of said boom on a normally vertical axis and projecting forwardly for supporting the bucket for lateral swinging movement to position it over a selected dumping site.

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