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(54) **DITCH DIGGING AND DITCH CLEANING APPARATUS**

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(71) Applicant: **DITCH DOCTOR ATLANTIC LIMITED**, Glenholme, Nova Scotia (CA)

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(72) Inventor: **Adam FISHER**, Glenholme, Nova Scotia (CA)

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(57) **ABSTRACT**

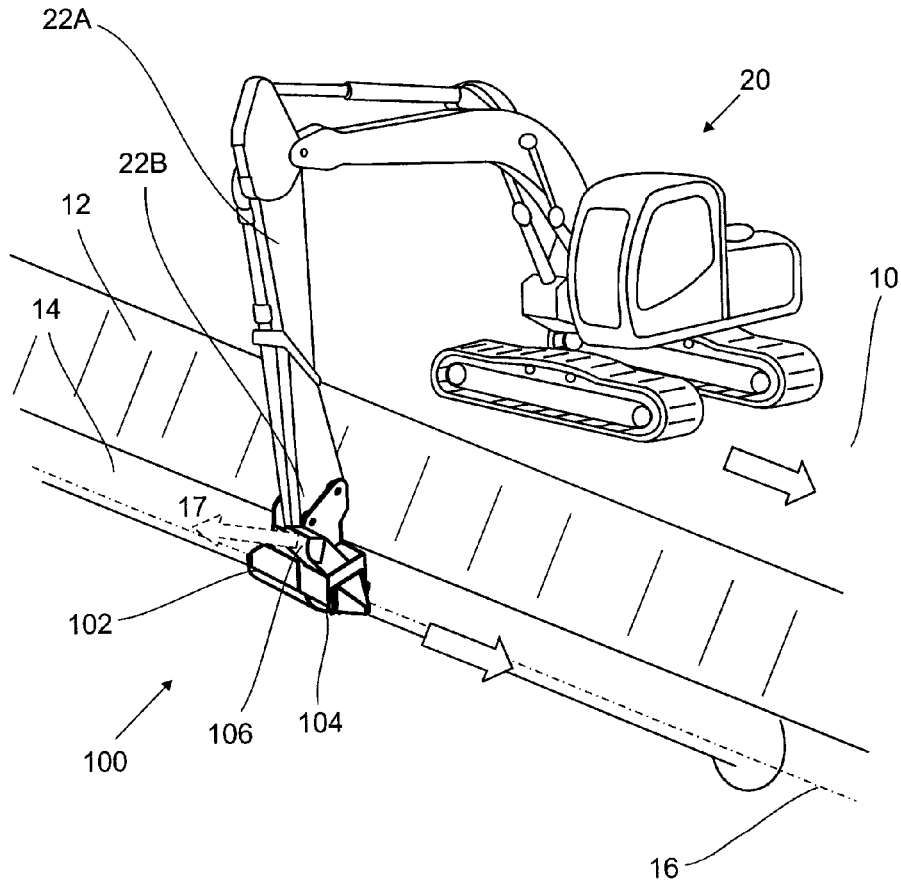
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A ditch digging and cleaning apparatus comprising a housing adapted for being moved along a longitudinal axis of the ditch. The housing has an inlet opening at a bottom front portion thereof for transmitting therethrough debris disposed in the ditch and an outlet opening at an upper portion thereof. An impeller is disposed in the housing and rotatably movable mounted thereto. The impeller receives the debris from the inlet opening and propels the same through the outlet opening. A drive is connected to the impeller for driving the same, the drive has a power of at least 30 hp.

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Feb. 2, 2015 (CA) ..... 2,880,947



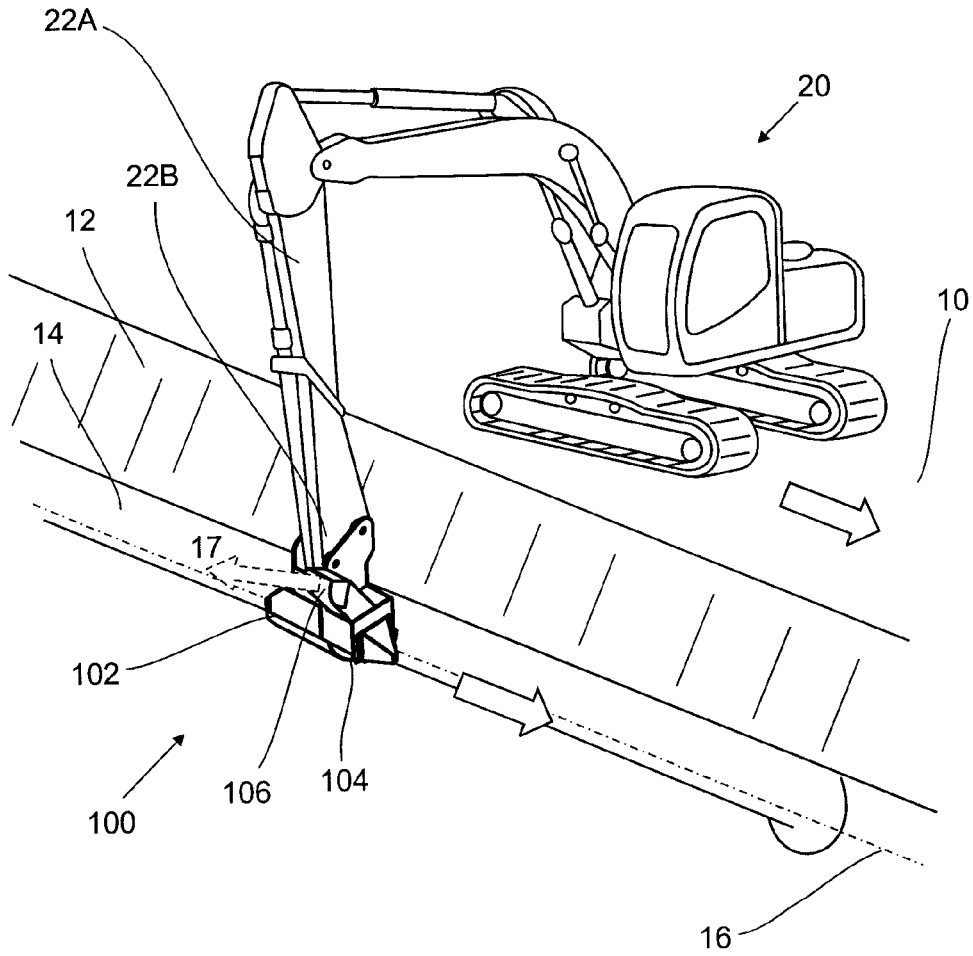


Figure 1

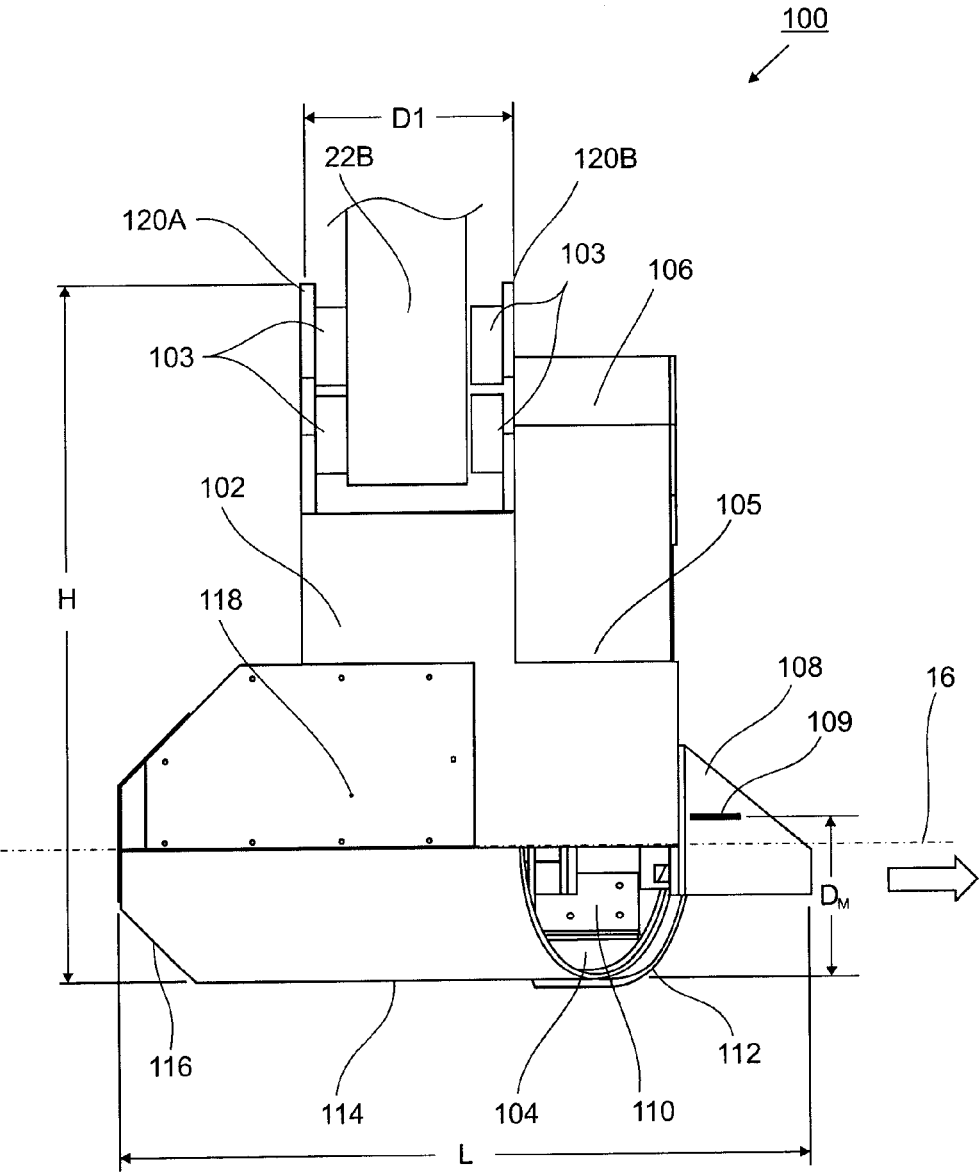


Figure 2a

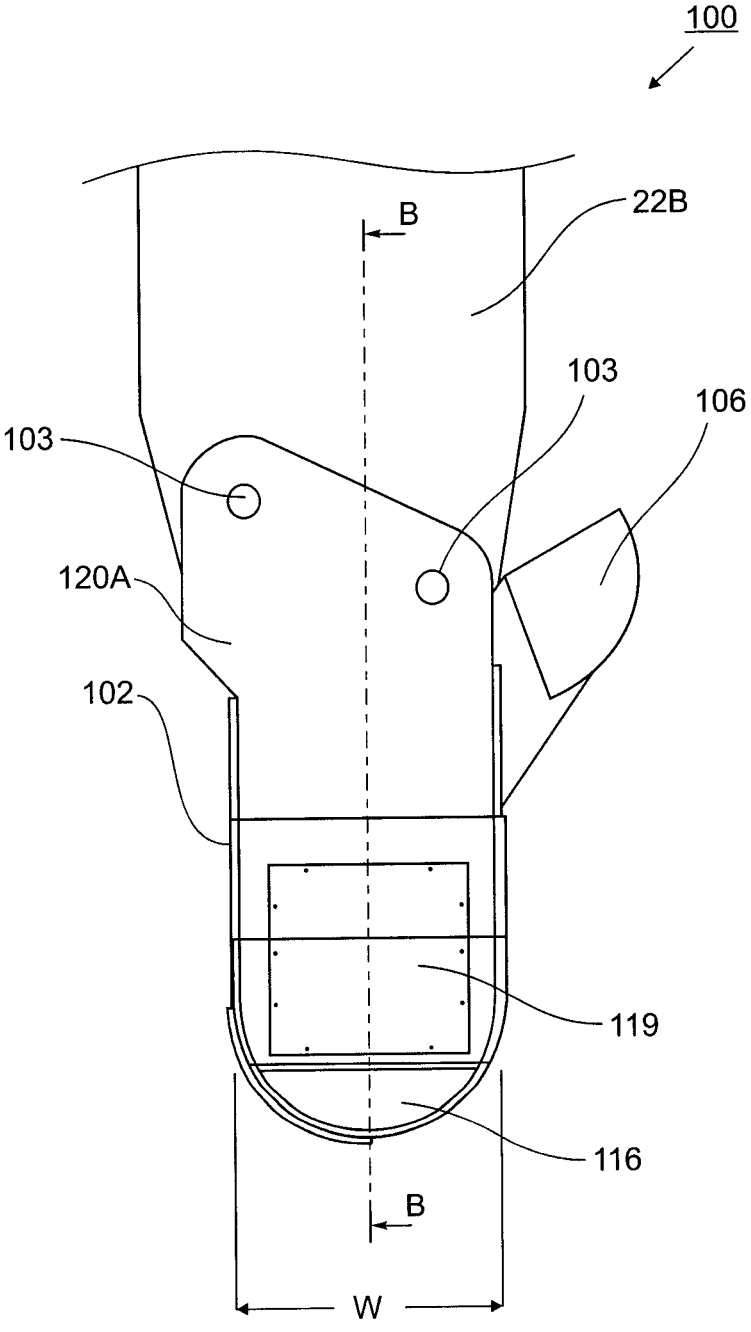


Figure 2b

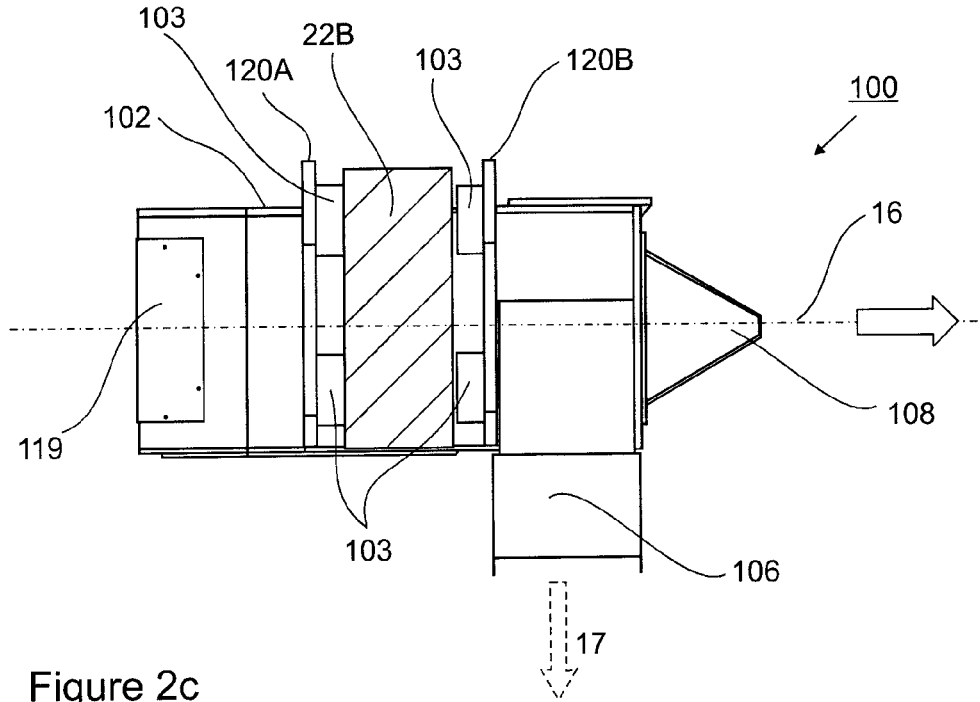


Figure 2c

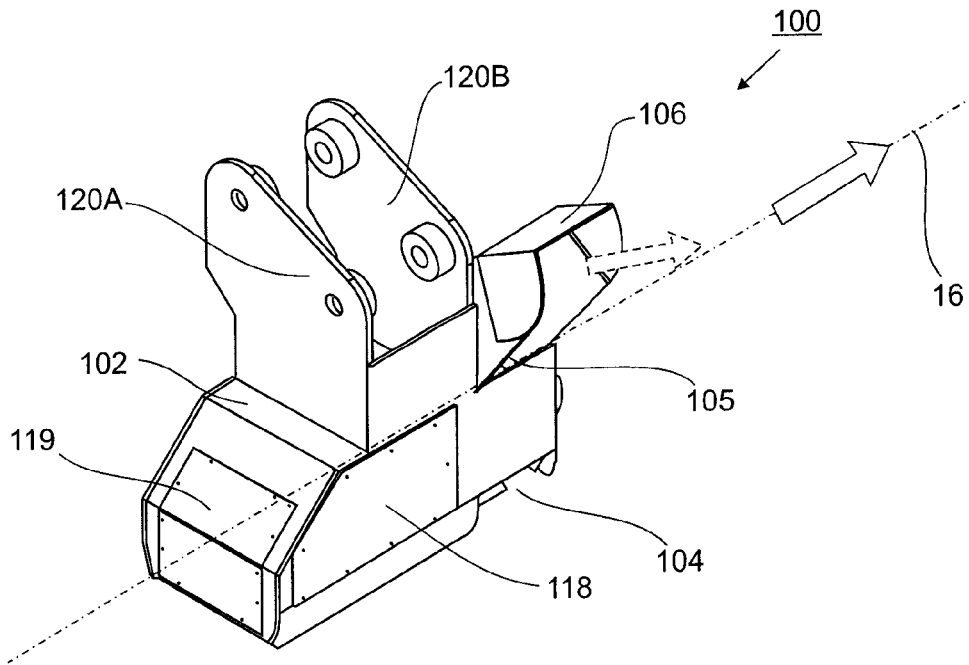


Figure 2d

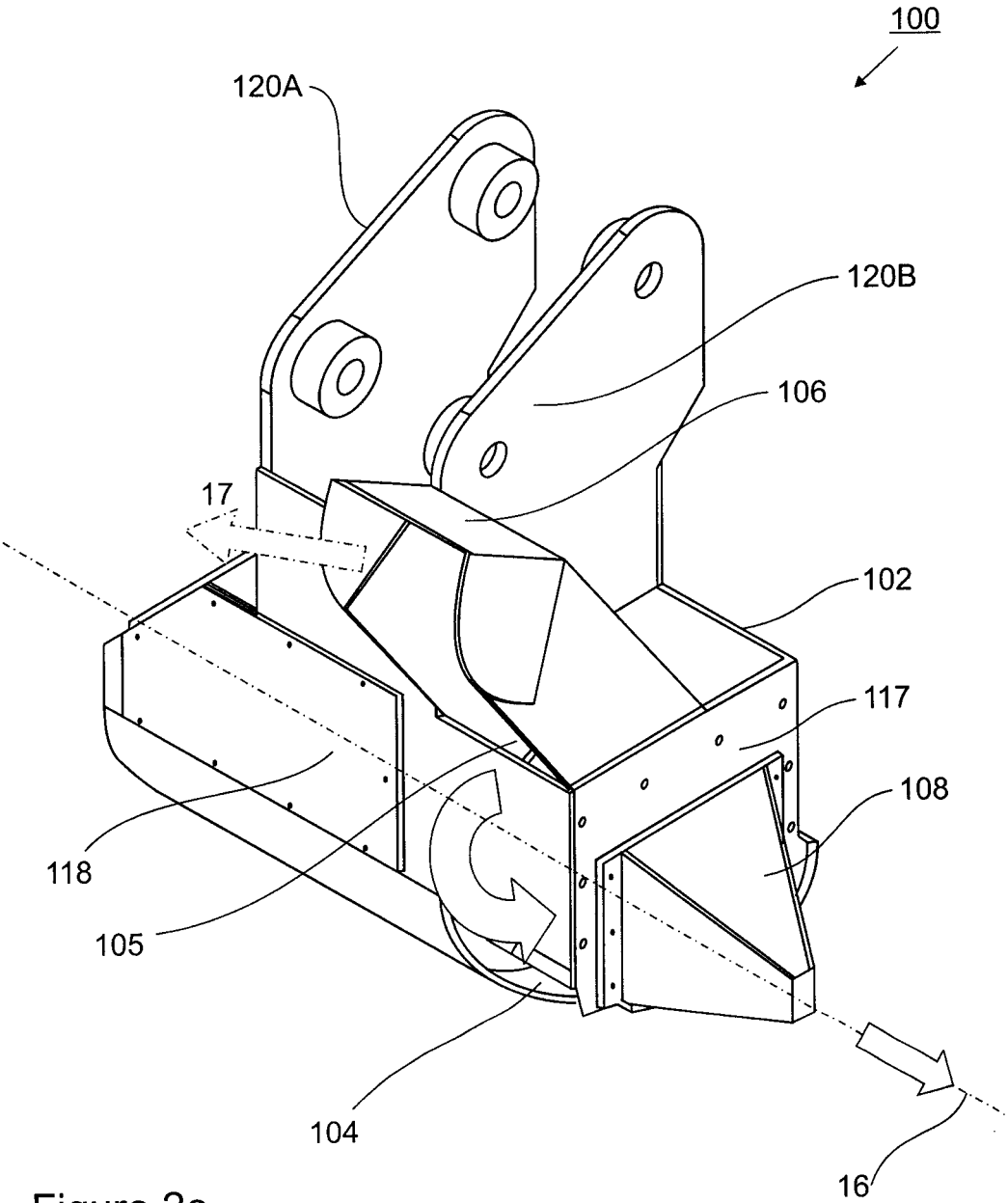


Figure 2e

Section B-B

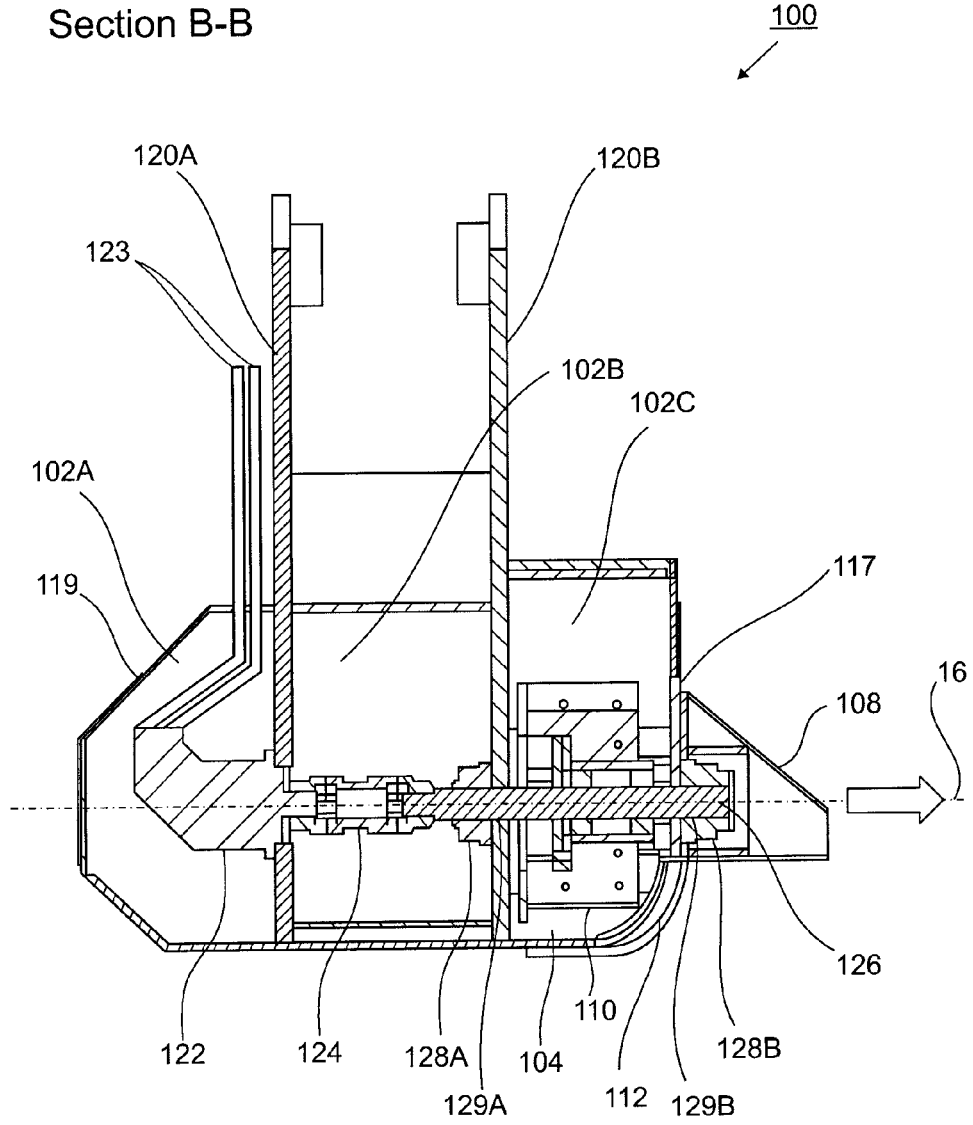


Figure 2f

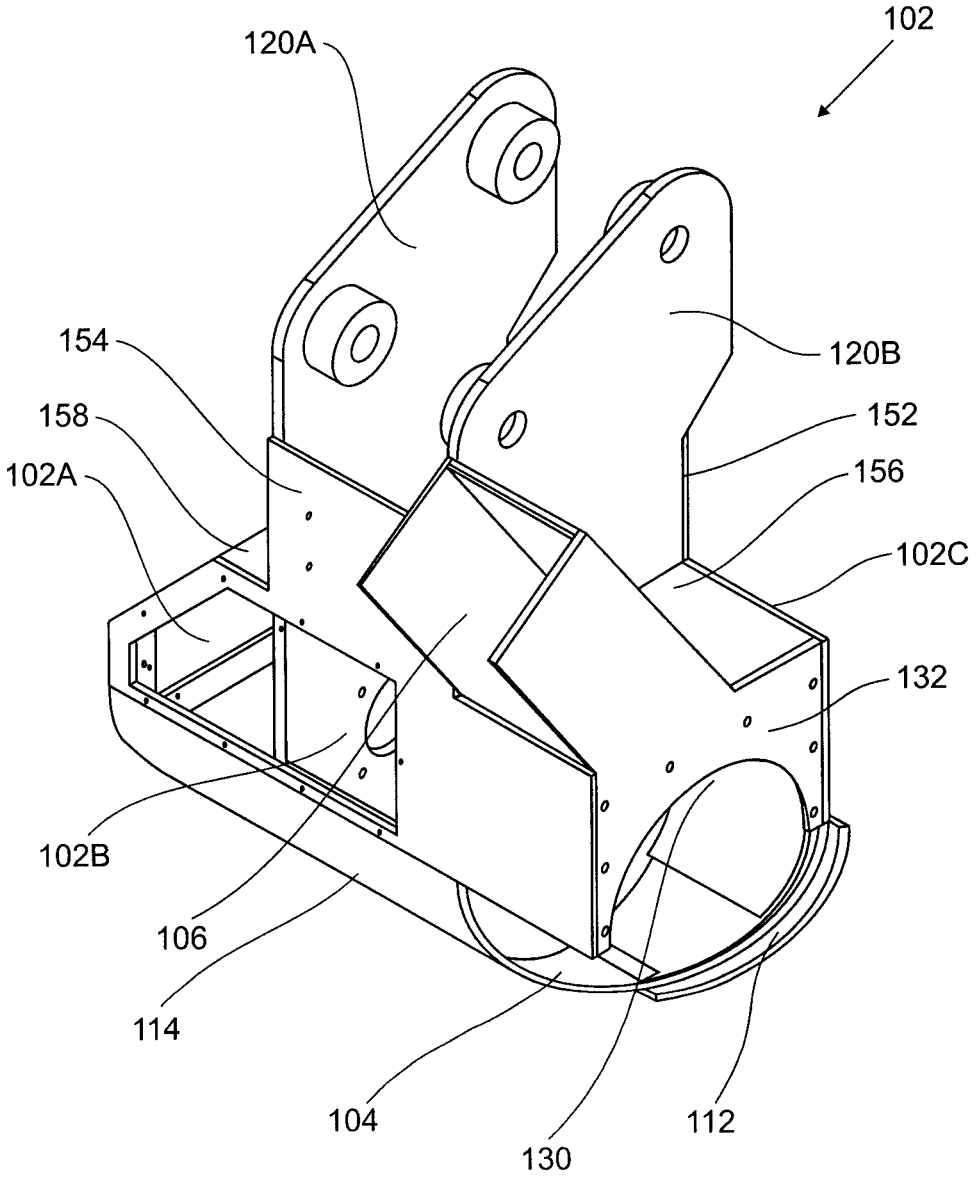


Figure 3a



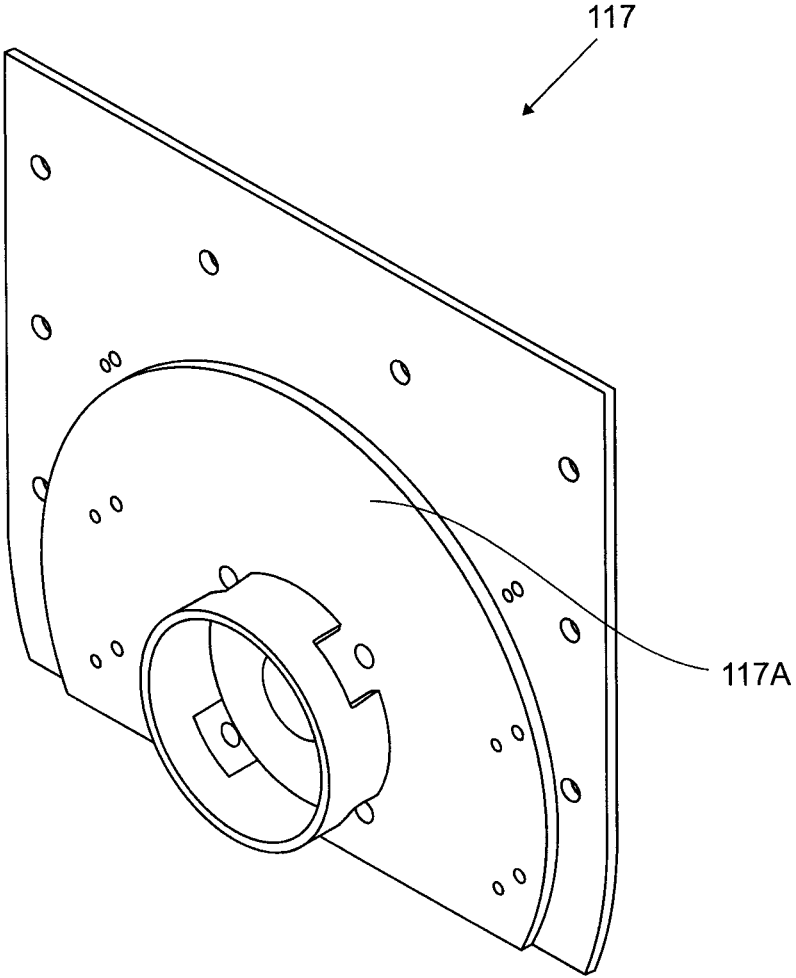


Figure 3b

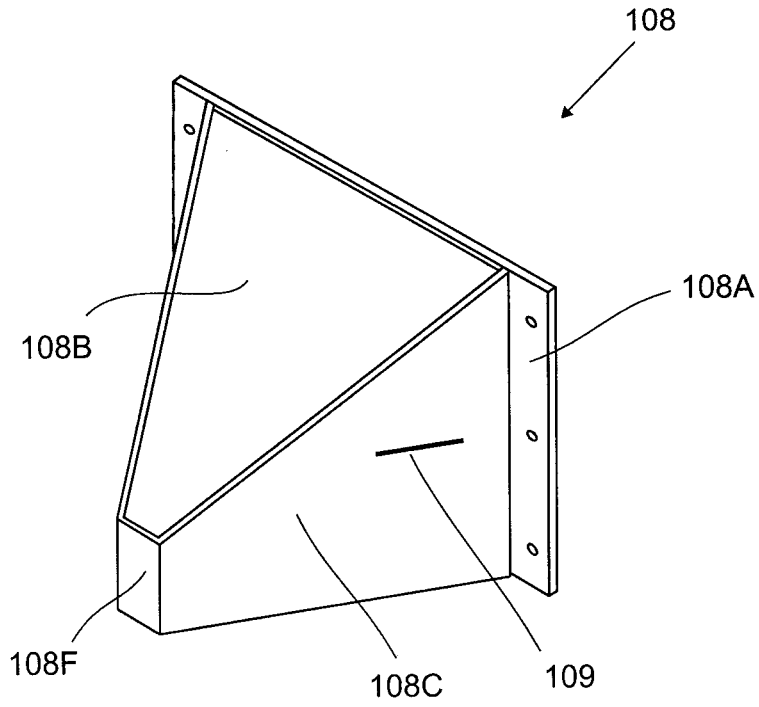


Figure 3c

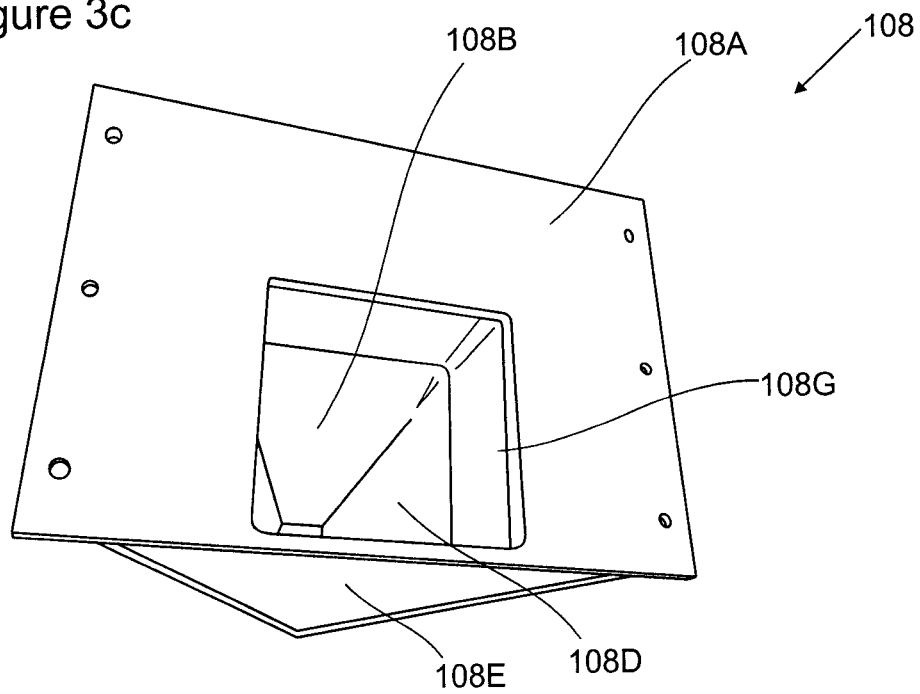


Figure 3d

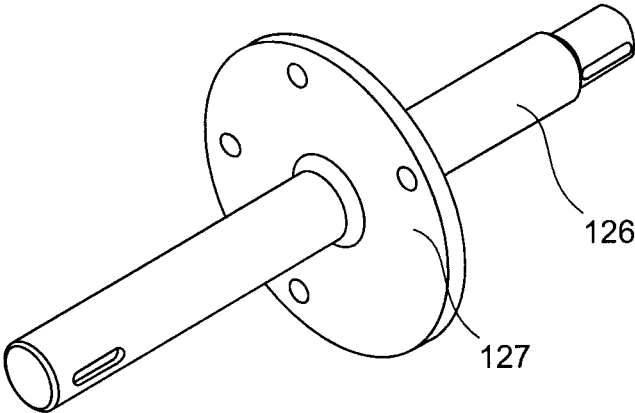


Figure 3e

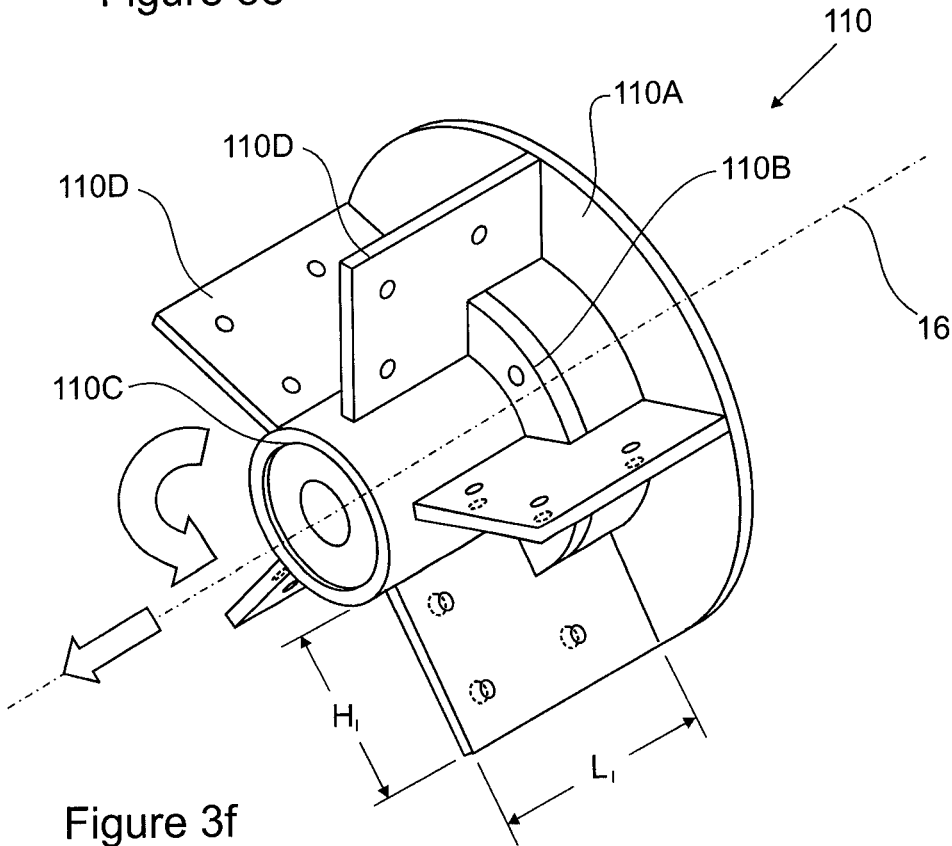


Figure 3f

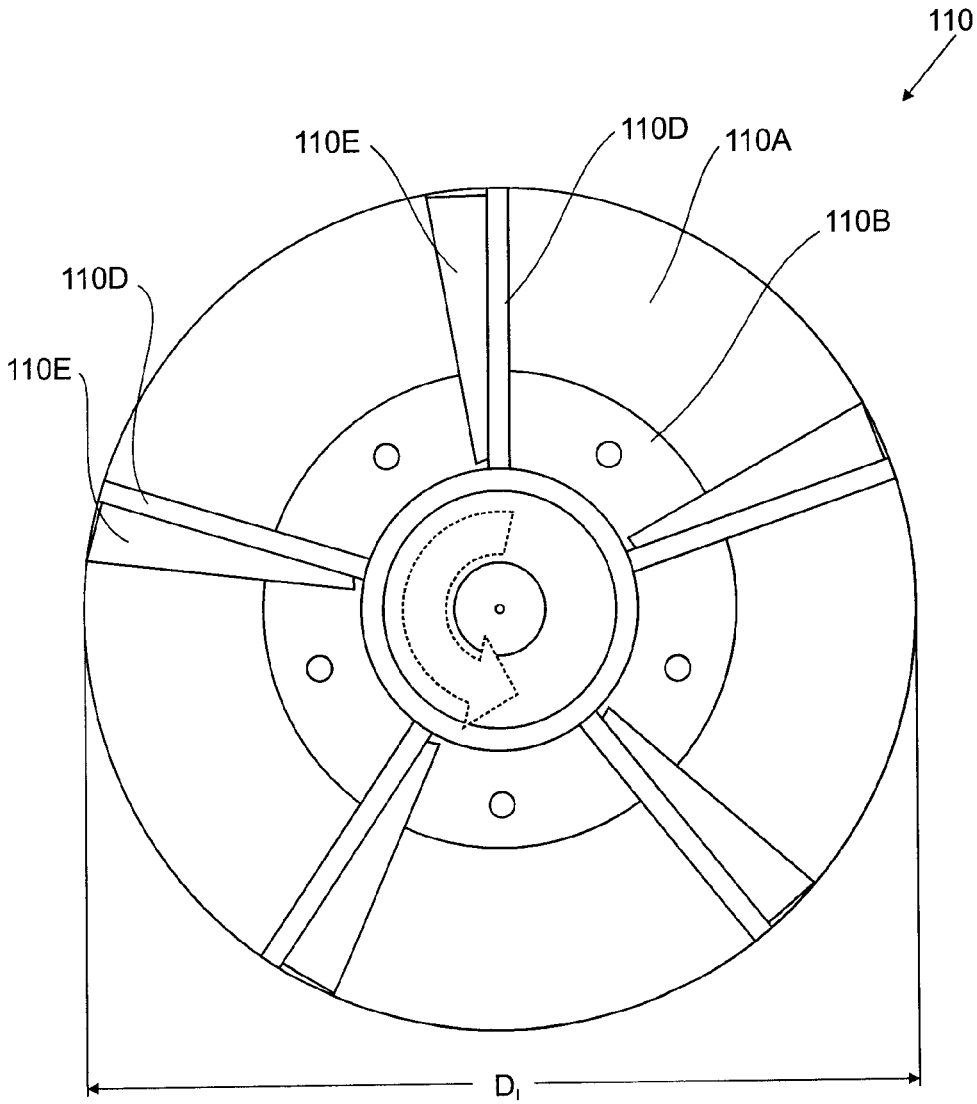


Figure 3g

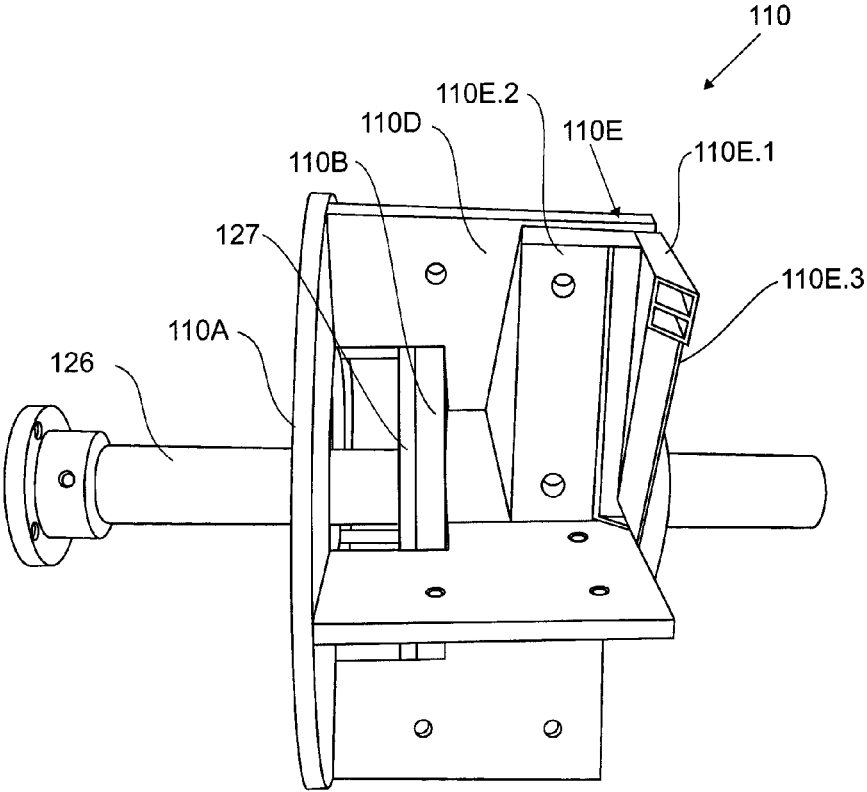


Figure 3h

## DITCH DIGGING AND DITCH CLEANING APPARATUS

### CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claim priority to, and is a national stage filing of, International Patent Application No. PCT/CA2016/000012 (Publication No. WO 2016/123690) entitled DITCH DIGGING AND DITCH CLEANING APPARATUS filed on Jan. 18, 2016, which in turn claims priority to Canadian Patent Application No. 2,880,947, filed on Feb. 2, 2015. The entire contents of both of these applications are incorporated by reference herein.

### FIELD

[0002] The present disclosure relates to equipment for digging and cleaning ditches, and more particularly, to a ditch digging and cleaning apparatus for being mounted as an attachment to an excavator, loader, or other boom.

### BACKGROUND

[0003] Typically, roadways are designed with ditches along the sides thereof for collecting run-off water from the road, as well as water flowing towards the road from a hill or mountain or surrounding area, and directing the same away from the road. Over time, debris such as, for example, sediment from erosion—sand, soil, rocks, etc.—and organic material—tree branches, shrubs, vegetation overgrowth, etc.—accumulate in the ditches and can block the same, posing a serious risk of wash-outs often damaging or destroying significant portions of a roadway during a heavy rain fall.

[0004] Therefore, the drainage ditches require periodic cleaning to maintain their ability for collecting and directing the water away from the roadway. Generally, the cleaning of drainage ditches is done using a ditch bucket mounted to a wheel excavator or track excavator. Unfortunately, great care and maneuvering are required from the operator to accomplish the cleaning and dumping of the debris in order to avoid the ditch being damaged or even destroyed, resulting in a very time consuming process.

[0005] It may be desirable to provide a ditch digging and cleaning apparatus for being mounted as an attachment to an excavator or other boom that enables substantially simple and fast digging and cleaning of ditches and dumping of the debris.

[0006] It also may be desirable to provide a ditch digging and cleaning apparatus for being mounted as an attachment to an excavator or other boom that is operable under water.

[0007] It also may be desirable to provide a ditch digging and cleaning apparatus for being mounted as an attachment to an excavator or other boom that is easy to maintain.

[0008] It also may be desirable to provide a ditch digging and cleaning apparatus for being mounted as an attachment to an excavator or other boom that is capable of quickly moving a substantial amount of debris.

### SUMMARY

[0009] Accordingly, one object of the disclosed system is to provide a ditch digging and cleaning apparatus for being mounted as an attachment to an excavator or other boom that enables substantially simple and fast cleaning of ditches and dumping of the debris.

[0010] Another object of the disclosed system is to provide a ditch digging and cleaning apparatus for being mounted as an attachment to an excavator or other boom that is operable under water.

[0011] Another object of the disclosed system is to provide a ditch digging and cleaning apparatus for being mounted as an attachment to an excavator or other boom that is easy to maintain.

[0012] Another object of the disclosed system is to provide a ditch digging and cleaning apparatus for being mounted as an attachment to an excavator or other boom that is capable of quickly moving a substantial amount of debris.

[0013] According to one aspect, there is provided a ditch digging and cleaning apparatus. The apparatus comprises a housing adapted for being moved along a longitudinal axis of the ditch. The housing has an inlet opening at a bottom front portion thereof for transmitting therethrough debris disposed in the ditch and an outlet opening at an upper portion thereof. An impeller is disposed in the housing and rotatably movable mounted thereto. The impeller receives the debris from the inlet opening and propels the same through the outlet opening. A drive is connected to the impeller for driving the same, the drive has a power of at least 30 hp.

[0014] According to another aspect, there is provided a ditch digging and cleaning apparatus. The apparatus comprises a housing adapted for being moved along a longitudinal axis of the ditch. The housing has an inlet opening at a bottom front portion thereof for transmitting therethrough debris disposed in the ditch and an outlet opening at an upper portion thereof. An impeller is disposed in the housing and rotatably movable mounted thereto via a shaft and at least a bearing. The impeller receives the debris from the inlet opening and propels the same through the outlet opening. A drive is disposed in the housing and connected to the shaft for driving the same. The housing is adapted for enclosing the drive, a portion of the shaft, and the at least a bearing in a water sealed fashion.

[0015] According to another aspect, there is provided a ditch digging and cleaning apparatus. A housing is adapted for being moved along the ditch. The housing has a front portion, a middle portion, and a rear portion. The front portion of the housing has an inlet opening at a bottom front portion thereof for transmitting therethrough debris disposed in the ditch and an outlet opening at an upper portion thereof. A front structural support plate separates the front portion from the middle portion of the housing and a rear structural support plate separates the middle portion from the rear portion of the housing. The front and the rear structural support plate are adapted for being coupled to a coupling structure of heavy equipment such that the same is accommodated therebetween. An impeller is disposed in the front portion of the housing and rotatably movable mounted to the front structural support plate via a shaft. The impeller receives the debris from the inlet opening and propels the same through the outlet opening. A drive is disposed in the rear portion of the housing and connected to the shaft for driving the same. The drive is mounted to the rear structural support plate.

[0016] One advantage of the disclosed system is that it provides a ditch digging and cleaning apparatus for being mounted as an attachment to an excavator or other boom that enables substantially simple and fast cleaning of ditches and dumping of the debris.

[0017] A further advantage of the disclosed system is that it provides a ditch digging and cleaning apparatus for being mounted as an attachment to an excavator or other boom that is operable under water.

[0018] A further advantage of the disclosed system is that it provides a ditch digging and cleaning apparatus for being mounted as an attachment to an excavator or other boom that is easy to maintain.

[0019] A further advantage of the disclosed system is that it provides a ditch digging and cleaning apparatus for being mounted as an attachment to an excavator or other boom that is capable of quickly moving a substantial amount of debris.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0020] An embodiment of the present invention is described below with reference to the accompanying drawings, in which:

[0021] FIG. 1 is a simplified block diagram illustrating in a perspective view operation of a ditch digging and cleaning apparatus according to one embodiment of the invention;

[0022] FIGS. 2a to 2f are simplified block diagrams illustrating a side view, a rear view, a top view, a perspective top rear view, a perspective top front view, and a cross sectional view, respectively, of the ditch digging and cleaning apparatus according to an embodiment of the invention;

[0023] FIG. 3a is a simplified block diagram illustrating a perspective top front view of the housing of the ditch digging and cleaning apparatus according to an embodiment of the invention;

[0024] FIG. 3b is a simplified block diagram illustrating a perspective view of the front cover plate of the ditch digging and cleaning apparatus according to an embodiment of the invention;

[0025] FIGS. 3c and 3d are simplified block diagrams illustrating a perspective front view and a perspective rear view, respectively, of the front cover of the ditch digging and cleaning apparatus according to an embodiment of the invention;

[0026] FIG. 3e is a simplified block diagram illustrating a perspective view of the shaft of the ditch digging and cleaning apparatus according to an embodiment of the invention; and

[0027] FIGS. 3f to 3h are simplified block diagrams illustrating a perspective top front view, a front view, and a side view, respectively, of the impeller of the ditch digging and cleaning apparatus according to an embodiment of the invention.

#### DETAILED DESCRIPTION

[0028] Unless defined otherwise, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which the invention belongs. Although any methods and materials similar or equivalent to those described herein can be used in the practice or testing of the present invention, certain methods and materials are now described.

[0029] While the description of certain embodiments hereinbelow is with reference to an excavator boom for digging or cleaning a roadside ditch, it will become evident to those skilled in the art that the embodiments of the invention are not limited thereto, but are also adaptable for use with various other pieces of heavy equipment such as, for example, a wheel loader as well as for cleaning various other

types of ditches such as, for example, ditches along railway lines or ditches employed in agriculture. Furthermore, the ditch digging and cleaning apparatus may also be used for digging new ditches.

[0030] FIG. 1 illustrates operation of a ditch digging and cleaning apparatus 100 according to an embodiment for cleaning ditch 14 along roadway 10 having embankment 12. The ditch digging and cleaning apparatus 100 can be mounted to boom 22A of excavator 20. For example, housing 102 of the ditch digging and cleaning apparatus 100 can be adapted for being mounted to a conventional coupling structure 22B of the boom 22A. Since the coupling structure 22B is not standardized, an adapting coupler may be interposed between the housing 102 and the coupling structure 22B. Optionally, the coupling structure 22B or the adapting coupler is adapted for rotating the ditch digging and cleaning apparatus 100 about an approximately vertically oriented axis in order to facilitate movement of the ditch digging and cleaning apparatus 100 when the ditch 14 comprises curves and/or corners. The ditch digging and cleaning apparatus 100 can be connected to the hydraulic system of the excavator 20—with present day heavy equipment typically providing hydraulic oil at pressure in the range of 4000 psi to 5000 psi—in a conventional manner for driving the same, as will be described in more detail hereinbelow.

[0031] As illustrated in FIG. 1, the ditch digging and cleaning apparatus 100 is moved along longitudinal axis 16 of the ditch 14 using the excavator 20 placed on the road 10 or its shoulder and moved along the same, as indicated by the block arrows. As the ditch digging and cleaning apparatus 100 is moved forward, the debris—typically accumulated in the bottom portion of the ditch 14 in the form of a slurry comprising sediment, solid organic material and sometimes water—is transmitted through inlet opening 104, propelled, and expelled through chute 106 at a speed sufficient for throwing the same a sufficient distance 17 from the ditch 14, as indicated by the dashed block arrow. The chute 106 can be adapted for expelling the debris in a direction oriented approximately perpendicular to the longitudinal axis 16 of the ditch 14. Optionally, the chute 106 is replaced by a rotatably directable chute or a coupling element adapted for being coupled in a conventional manner to a pipe or hose for loading the expelled debris onto a truck such as, for example, a vacuum truck.

[0032] It is noted that the ditch digging and cleaning apparatus 100 is employable under various conditions such as: under water when the ditch is, for example, flooded; or, in absence of water such as, for example, when digging ditches.

[0033] Referring to FIGS. 2a to 2f and 3a to 3h, the ditch digging and cleaning apparatus 100 according to an embodiment of the invention is provided. The housing 102—being adapted for being moved along the longitudinal axis 16 of the ditch 14—has, in one case, a semi cylindrically shaped straight bottom portion 114 of sufficient length for guiding the housing 102 along the ditch 14. The housing 102 has an inlet opening 104 at a bottom front portion thereof for transmitting therethrough debris disposed in the ditch 14 and an outlet opening 105 at an upper portion thereof. Impeller 110 is disposed in the housing 102 and rotatably movable mounted thereto for receiving the debris from the inlet opening 104 and propelling the same through the outlet opening 105. The inlet opening 104 is, in one case, shaped

such that a bottom portion of the impeller 110 is exposed with the bottom portion of the housing 102 forming a substantially forward facing edge such that the inlet opening 104 is narrowing in a direction of rotation—indicated in FIG. 2e—of the impeller 110. A portion of the forward facing edge can be tapered in a substantially forward direction for facilitating the forward movement of the housing 102, for example, by providing edge plate 112 welded to the housing 102. Optionally, the complete forward facing edge is tapered.

[0034] A front cover 108 of the housing 102 can be tapered in a substantially forward direction for facilitating movement of the ditch digging and cleaning apparatus 100 through vegetation overgrowth by separating the same, while bottom rear portion 116 of the housing 102 is angled upwardly for facilitating movement of the ditch digging and cleaning apparatus 100 around tight curves and corners of the ditch.

[0035] A marker 109 can be disposed on the housing 102—for example, on the front cover 108—indicating a distance  $D_M$  therefrom to the bottom end 114 of the housing 102 for assisting the operator, for example, when lowering the ditch digging and cleaning apparatus 100 into the ditch 14. Optionally, a plurality of markers are provided indicating different distances to the bottom end 114. Further optionally, one or more markers are provided a predetermined distance above the housing 102—for example, disposed on the boom 22A or a vertical extension mounted to the housing 102—for assisting the operator when the ditch digging and cleaning apparatus 100 is operated under water.

[0036] The housing 102 can comprise a front portion 102C, a middle portion 102B, and a rear portion 102A with a front structural support plate 120B separating the front portion 102C from the middle portion 102B of the housing 102 and a rear structural support plate 120A separating the middle portion 102B from the rear portion 102A of the housing 102. The front structural support plate 120B and the rear structural support plate 120A comprise coupling elements 103, disposed in an upper portion thereof, for being coupled in a conventional manner to coupling structure 22B of excavator 20 such that the same is accommodated therebetween using, for example, bolts accommodated in respective bores disposed in the coupling structure 22B and the coupling elements 103. The impeller 110 is disposed in the front portion 102C of the housing 102 and rotatably movable mounted to the front structural support plate 120B via a shaft 126. The front portion 102C of the housing 102 comprises a front cover plate 117 disposed a predetermined distance to the front structural support plate 120B for accommodating the impeller 110 therebetween. The front cover plate 117 can be removably mounted using, for example, bolts, to front side 132 of the front portion 102C, illustrated in FIG. 3a, such that fitting section 117A of the front cover plate 117, illustrated in FIG. 3b, is in snug contact with inside opening 130 of front side 132 to ensure proper placement thereof. The shaft 126 is rotatably movable mounted to the front structural support plate 120B and the front plate 117 in a conventional manner, using off-the-shelf bearings 128A and 128B. The impeller 110 is driven using drive 122 disposed in the rear portion 102A of the housing 102 and mounted to the rear structural support plate 120A. An off-the shelf drive coupler 124 can be interposed between the drive 122 and the shaft 126 and is adapted such that the same can be removed while the drive 122 and the

shaft 126 remain in place, thus enabling maintenance or replacement of the bearing 128A without removing the drive 122 or the shaft 126. The drive 122 is, for example, an off-the-shelf hydraulic drive connected to the hydraulic system of the excavator 20 via hydraulic lines 123 in a conventional manner.

[0037] Furthermore, the impeller 110 is removably mounted to the shaft 126, as will be described in more detail hereinbelow, and can be removed therefrom while the shaft 126 remains mounted to the front structural support plate 120B by removing the front cover 108, the bearing 128B, and the front cover plate 117.

[0038] The rear portion 102A, the middle portion 102B, and the front cover 108 can be adapted for enclosing the drive 122, the drive coupler 124, and the bearings 128A and 128B in a water sealed fashion using off-the-shelf seals such as, for example, O-ring seals disposed between the shaft 126 and the respective bores 129A and 129B disposed in the front structural support plate 120B and the front cover plate 117. Access to the drive 122, the coupler 124, and the bearings 128A and 128B is provided via cover plates 118, 119 and front cover 108, which are mounted in conventional water sealed fashion to the housing 102 using, for example, a seal placed between the cover and the housing and screw fasteners. Use of conventional seals enables operation of the ditch digging and cleaning apparatus 100 under water to a depth of approximately 3 feet.

[0039] Sufficient strength and rigidity of the housing 102 for: employing a drive having a power of at least 30 hp; to withstand a vertical impact when dropped accidentally into the ditch; and, to be strong enough for being pushed into debris and vegetation overgrowth during forward movement, is provided by the front structural support plate 120A and the rear structural support plate 120B which are made of, for example, steel sheet material having sufficient thickness—for example, 1 inch thickness—and extend from the top, where they are coupled to the coupling structure 22B, downwardly to the bottom of the housing 102. The substantially semi-circular bottom portion 114 of the housing 102—made of, for example, 0.25 inch thick steel sheet material and formed in a conventional manner using a press—is welded to the bottom portion of the front structural support plate 120B and the rear structural support plate 120A, as illustrated in FIG. 3a. The remaining flat walls and covers are also made of, for example, 0.25 inch thick steel sheet material. The side walls 152 and 154 are welded to the front structural support plate 120B and the rear structural support plate 120A and are extended upwardly between the structural support plates 120A and 120B to further increase rigidity. The front top wall 156 and the rear top wall 158 are also welded to the front structural support plate 120B and the rear structural support plate 120A, respectively.

[0040] The front cover 108 is made of a base plate 108A having top plate 108B, bottom plate 108E, and side plates 108C, 108D welded thereto, as illustrated in FIGS. 3c and 3d. Front edges of the top plate 108B, the bottom plate 108E, and the side plates 108C, 108D are welded to front plate 108F to form an enclosure for protecting the bearing 128B disposed therein through an opening in the base plate 108A. Ring structure 108G surrounding the opening is welded to the base plate 108A for further protecting the bearing 128B from impact when the ditch digging and cleaning apparatus 100 is pushed forward.



[0041] Referring to FIGS. 3e to 3h, a configuration of the impeller 110 is provided. The impeller 110 comprises impeller cylinder 110C having impeller mounting plate 110B welded thereto. The impeller cylinder 110C has a bore for accommodating the shaft 126 therein. The impeller mounting plate 110B is removably mounted to shaft mounting plate 127—which is welded to the shaft 126—in a conventional manner using, for example, screw bolts. Impeller blades 110D are welded to the impeller cylinder 110C, the impeller mounting plate 110B and rear impeller ring 110A for providing sufficient strength and rigidity as well as enabling removal of the impeller 110 with the shaft 126 remaining mounted to the front structural support plate 120B and connected to the drive 122, substantially facilitating replacement of the impeller 110 in case of damage or if it is desired to use an impeller having a different number of blades 110D and/or differently shaped blades 110D for propelling different types of debris. The impeller blades 110D are made, for example, of flat steel sheet material having a thickness of approximately 0.5 inch. Cutting teeth 110E can be removably mounted to the forward edge of the blades 110D in a conventional manner using, for example, screw bolts. The cutting teeth 110E comprise a mounting plate 110E.2 for being in contact with the impeller blade 110D when mounted thereto and a cutting plate 110E.1 oriented perpendicular to the mounting plate 110E.2 with a cutting edge 110E.3 being disposed at a radially outwardly increasing distance to the mounting plate 110E.2. Removably mounting of the cutting teeth 110E facilitates replacement of the cutting teeth 110E in case of wear-out/damage or if it is desired to use cutting teeth 110E having a different shape, for example, for cutting through different types of debris.

[0042] In an implementation of the ditch digging and cleaning apparatus 100 for employing a hydraulic drive operated at a hydraulic pressure of 4400 psi and having a power of 30 hp, the housing 102 has an overall length L of approximately 4.5 feet, an overall height H of approximately 2 feet, width W of approximately 1.5 feet. The structural support plates 120A, 120B are spaced a distance D1 of approximately 1.25 feet. The impeller 110 has a diameter  $D_I$  of approximately 17.5 inches. The impeller blades 110D have a length  $L_I$  of approximately 8.5 inches and a height  $H_I$  of approximately 5.75 inches. The impeller 110 driven at a speed of approximately 1500 rpm is capable of propelling debris at a rate of approximately 1 m<sup>3</sup>/min.

[0043] The present invention has been described herein with regard to certain embodiments. However, it will be obvious to persons skilled in the art that a number of variations and modifications can be made without departing from the scope of the invention as described herein.

What is claimed is:

1. A ditch digging and cleaning apparatus comprising:
  - a housing adapted for being moved along a longitudinal axis of the ditch, the housing having an inlet opening at a bottom front portion thereof for transmitting there-through debris disposed in the ditch and an outlet opening at an upper portion thereof;
  - an impeller disposed in the housing and rotatably movable mounted thereto, the impeller for receiving the debris from the inlet opening and propelling the same through the outlet opening; and
  - a drive connected to the impeller for driving the same, the drive having a power of at least 30 hp.

2. The ditch digging and cleaning apparatus according to claim 1 wherein the inlet opening is shaped such that a bottom portion of the impeller is exposed.

3. The ditch digging and cleaning apparatus according to claim 2 wherein a bottom portion of the housing forms a forward facing edge of the inlet opening and wherein at least a portion of the forward facing edge is tapered in a substantially forward direction.

4. The ditch digging and cleaning apparatus according to claim 1 wherein a front portion of the housing is tapered in a substantially forward direction.

5. The ditch digging and cleaning apparatus according to claim 1 wherein a bottom rear portion of the housing is angled upwardly.

6. The ditch digging and cleaning apparatus according to claim 1 comprising a marker disposed on the housing, the marker being indicative of a distance therefrom to a bottom end of the housing.

7. A ditch digging and cleaning apparatus comprising:

- a housing adapted for being moved along a longitudinal axis of the ditch, the housing having an inlet opening at a bottom front portion thereof for transmitting there-through debris disposed in the ditch and an outlet opening at an upper portion thereof;

- an impeller disposed in the housing and rotatably movable mounted thereto via a shaft and at least a bearing, the impeller for receiving the debris from the inlet opening and propelling the same through the outlet opening; and

- a drive disposed in the housing and connected to the shaft for driving the same, wherein the housing is adapted for enclosing the drive, a portion of the shaft, and the at least a bearing in a water sealed fashion.

8. The ditch digging and cleaning apparatus according to claim 7 wherein the inlet opening is shaped such that a bottom portion of the impeller is exposed.

9. The ditch digging and cleaning apparatus according to claim 8 wherein a bottom portion of the housing forms a forward facing edge of the inlet opening and wherein at least a portion of the forward facing edge is tapered in a substantially forward direction.

10. The ditch digging and cleaning apparatus according to claim 7 wherein a front portion of the housing is tapered in a substantially forward direction.

11. The ditch digging and cleaning apparatus according to claim 7 wherein a bottom rear portion of the housing is angled upwardly.

12. The ditch digging and cleaning apparatus according to claim 7 comprising a marker disposed on the housing, the marker being indicative of a distance therefrom to a bottom end of the housing.

13. The ditch digging and cleaning apparatus according to claim 7 wherein the housing is adapted for being operated under water to a depth of approximately 3 feet.

14. A ditch digging and cleaning apparatus comprising:
  - a housing adapted for being moved along the ditch, the housing having a front portion, a middle portion, and a rear portion;

- the front portion of the housing having an inlet opening at a bottom front portion thereof for transmitting there-through debris disposed in the ditch and an outlet opening at an upper portion thereof;

- a front structural support plate separating the front portion from the middle portion of the housing and a rear

structural support plate separating the middle portion from the rear portion of the housing, the front and the rear structural support plate being adapted for being coupled to a coupling structure of heavy equipment such that the same is accommodated therebetween;

an impeller disposed in the front portion of the housing and rotatably movable mounted to the front structural support plate via a shaft, the impeller for receiving the debris from the inlet opening and propelling the same through the outlet opening; and,

a drive disposed in the rear portion of the housing and connected to the shaft for driving the same, the drive being mounted to the rear structural support plate.

**15.** The ditch digging and cleaning apparatus according to claim **14** comprising a drive coupler interposed between the drive and the shaft, the drive coupler being adapted for removal of the same with the drive and the shaft remaining mounted.

**16.** The ditch digging and cleaning apparatus according to claim **14** wherein the front portion of the housing comprises a front cover plate disposed a predetermined distance to the front structural support plate for accommodating the impeller therebetween and wherein the shaft is rotatably movable mounted to the front structural support plate and the front plate.

**17.** The ditch digging and cleaning apparatus according to claim **16** wherein the front cover plate is removably mounted to the front portion of the housing and wherein the impeller is removably mounted to the shaft.

**18.** The ditch digging and cleaning apparatus according to claim **14** wherein the front structural support plate and the rear structural support plate each comprise coupling elements disposed in a top portion thereof for coupling the same to the coupling structure and extend downwardly to a bottom of the housing.

\* \* \* \* \*