United States Patent

Naeve

[15] **3,703,015**

[45] **Nov. 21, 1972**

[54] CONDUIT CLEANING APPARATUS

[72] Inventor: **Lester H. Naeve,** 3504 Parker Road, Fort Worth, Tex. 76117

[22] Filed: **Aug. 25, 1971**

[21] Appl. No.: **174,812**

[52] **U.S. Cl.** .....**15/104.3 SN**
[51] **Int. Cl.** **B08b 9/02**
[58] **Field of Search** ....15/104.3 R, 104.3 SN; 242/54

[56] **References Cited**

UNITED STATES PATENTS

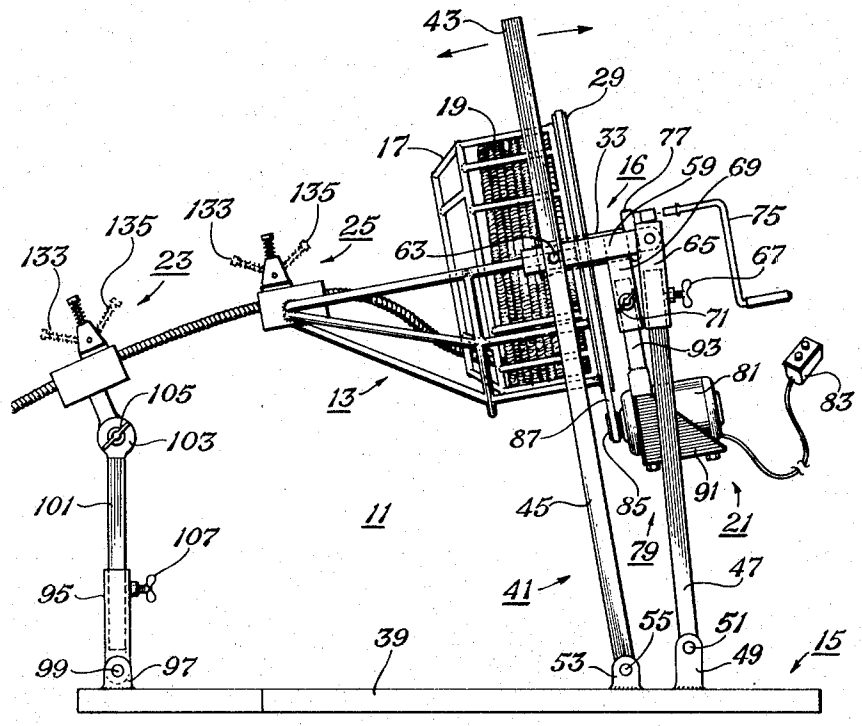
2,272,387	2/1942	Therrien	15/104.3 SN
2,355,733	8/1944	Johnson et al.	15/104.3 SN
2,603,495	7/1952	Hermanson	15/104.3 SN X
3,534,423	10/1970	Ratliff	15/104.3 SN

Primary Examiner—Edward L. Roberts
Attorney—Wm. T. Wofford et al.

[57] **ABSTRACT**

Conduit cleaning apparatus characterized by a cage containing a demountable reel of cable; a support frame comprising a base member; a support means carried by the base member for effecting reciprocal movement of the cage; first and second ratchet gripping means for either advancing the cable from the reel into the conduit to be cleaned or from the conduit and into the reel when the cage is moved reciprocally via the support means. The cage may be rotated by either manual or power drive means. The apparatus is designed to be broken down into four subassemblies so that one worker may easily transport, assemble, use and disassemble the apparatus without requiring a helper. Also disclosed are specific structural features that are employed in preferred embodiments.

11 Claims, 5 Drawing Figures



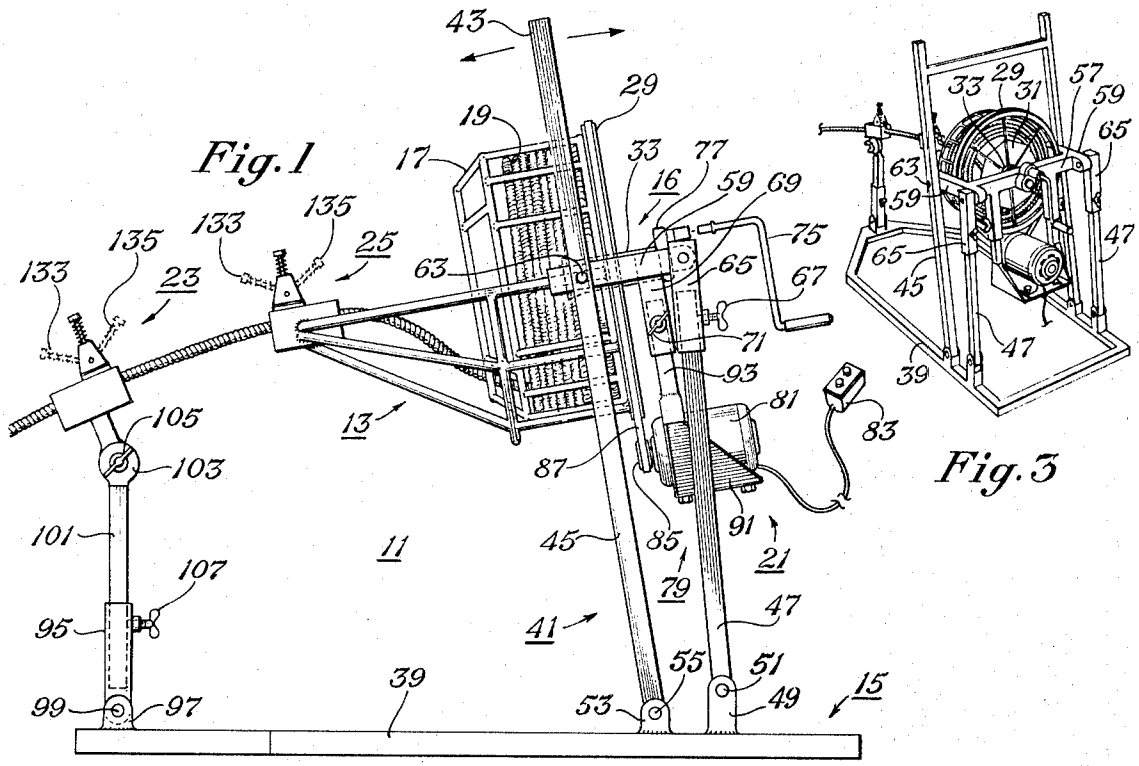


Fig. 1

Fig. 3

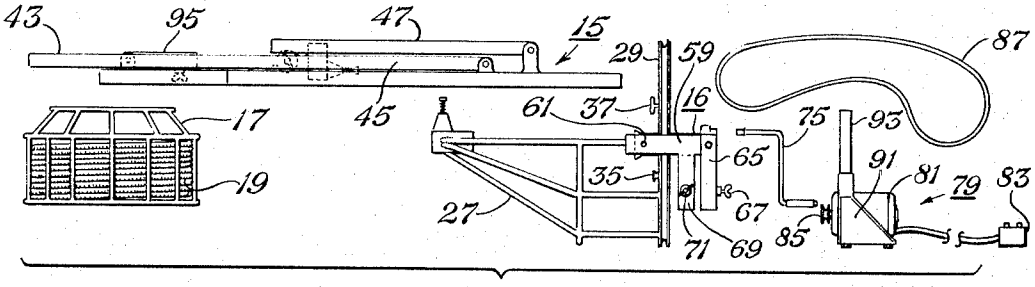


Fig. 2

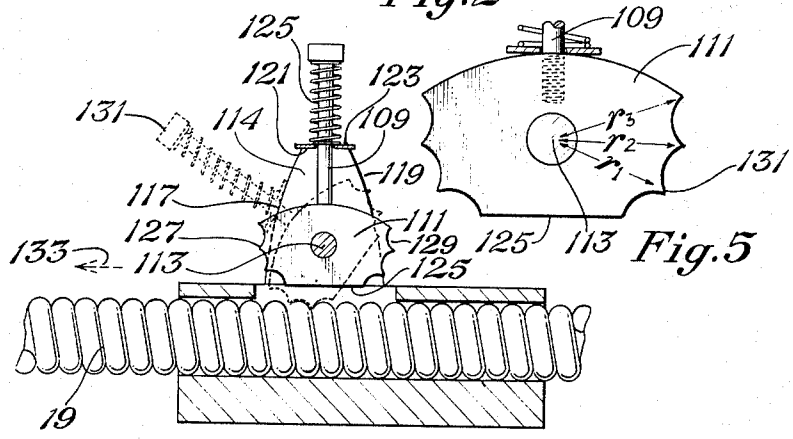


Fig. 4

Fig. 5

INVENTOR
Lester H. Naeve
BY
Wofford, Fleischman & Fails
ATTORNEYS

CONDUIT CLEANING APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to conduit cleaning apparatus. More particularly, it relates to apparatus for supporting and using a rotary cable-carrying reel which contains a flexible cable of the type used for cleaning sewer and drain pipes.

2. Description of the Prior Art

The prior art has seen the excellent development of rotary cable-carrying reels for cleaning out conduits such as sewers, drain pipes, and the like. Such apparata are typified by U.S. Pat. Nos. Re 22,113, reissued 1942; 2,355,733, patented 1944; and 3,534,423, patented 1970. The above-referenced U.S. Pat. No. 3,534,423 contains an excellent description of the ordinary practice of cleaning conduit.

I have been in the business of selling the conduit cleaning apparatus of the type known to the prior art, and insofar as I am aware, the prior art apparatus has suffered from two major disadvantages. Firstly, the prior art apparatus did not afford a convenient way to effect advancement of the cable containing the cutter, or cleaning apparatus, on its end, into the conduit; or easily effect retraction of the cable from the conduit into the cable reel. Secondly, the prior art apparatus did not break down into subassemblies that could be readily transported by a single worker; some of the subassemblies weighing in excess of 100 pounds; for example, up to 250 pounds; and accordingly required two workers to operate satisfactorily, particularly where it was necessary to transport the apparatus to a roof or the like to go through a vent pipe for satisfactory cleaning of the conduit.

Accordingly, it is an object of this invention to obviate the disadvantages of the prior art apparatus and provide apparatus which facilitates either advancement of the cable into the conduit, or retraction of the cable from the conduit.

It is also an object of this invention to provide sewer cleaning apparatus that obviates the disadvantages of the prior art in that it may be readily disassembled into subassemblies that are easily transportable by only one worker and that may be readily reassembled and used.

Other objects will become apparent from the accompanying drawings and the descriptive matter hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of one embodiment of this invention.

FIG. 2 is a disassembled view of the embodiment of FIG. 1 illustrating the readily transportable subassemblies thereof.

FIG. 3 is an isometric view of the embodiment of FIG. 1.

FIG. 4 is a partial side elevational view, partly cutaway and sectional, illustrating a ratchet gripping means of the embodiment of FIG. 1.

FIG. 5 illustrates a partial side elevational view of the handle and holding means of the ratchet gripping means of FIG. 4.

DESCRIPTION OF PREFERRED EMBODIMENTS

Referring to FIG. 1, the conduit cleaning apparatus **11** comprises the major subassemblies or elements of cage means **13** for containing a reel of cable, support frame **15**, mounting means **16** for rotatably connecting the cage means with the support means, reel **17** containing cable **19**, rotating means **21** for rotating the cage means, and first and second ratchet gripping means **23** and **25** for allowing a predetermined relative movement and blocking against other predetermined relative movement between the cable and the ratchet gripping means.

As can be seen in FIGS. **1–3**, the cage means **13** includes an outer cage structure **27** including a driving rim **29**, a back plate **31** and a hub and shaft assembly **33**. The outer cage structure **27** is shaped to facilitate insertion of the reel **17**. The reel **17** is readily mounted and demounted by insertion upon the hub and shaft assembly **33** and about two lower keepers **35** and an upper keeper **37**, FIG. **2**. The upper keeper **37** has a pivotal latch that may be pivoted in alignment with the base shaft for insertion of the reel and pivoted to retain the reel in place thereafter. Accordingly, the reel is frictionally held in place so that it rotates as the cage means **13** is rotated. Driving rim **29** is adapted to fit the particular element employed in the driving assembly. For example, it may be a gear if a gear drive is employed; a sprocket if a chain drive is employed; or a belt receiving rim if a belt drive is employed, as illustrated. The hub and shaft assembly **33** are journalled via conventional bearing means for rotational movement in the mounting means **16**. As illustrated, the cage means **13** has its central longitudinal axis, as defined by the hub and shaft assembly **33**, aligned with the apex of the converging members of the outer cage structure **27** such that the second ratchet gripping means **25** may be emplaced at this region of convergence and a cable **19** will feed readily from the reel **17** therethrough, as will be described in more detail hereinafter.

The support frame **15** comprises a base member **39** carrying a support means **41** for effecting reciprocal movement of the cage means with respect to the base member **39**. As illustrated, the support means **41** comprises an upright support means that is pivotally carried by the base member **39** so as to allow reciprocal movement of the cage means by reciprocal movement of the top **43** of the support means. The upright support means **41** comprises first and second upright support members **45** and **47** that are pivotally mounted on the base member **39**. The mounting brackets **49** and mounting shafts **51** for second upright support members **47** are respectively longer and higher than the mounting brackets **53** and mounting shafts **55** for first upright support member **45** in order that they will fold via pivotal movement to the flat position, as illustrated in FIG. **2**, and form a flat, readily transportable base subassembly.

The mounting means **16** has, as indicated, the hub and shaft assembly **33** journalled therein by conventional bearing means and supported by a laterally extending member **57**. As illustrated, the ends of the laterally extending member **57** are welded to longitudinal members **59**. The longitudinal members **59** are adjustably connectable with one of the support members and pivotally connectable with the other such that

the central longitudinal axis of the cage means **13** can be positioned at different angles with respect to the base member **39**. As illustrated, each longitudinal member **59** has an aperture **61** for receiving a conventional spring biased snap-in bolt **63** to facilitate pivotal installation of the cage means **13** within first upright support member **45**. Additionally, the longitudinal member **59** has a vertically disposed, pivotally mounted bracket **65** for slidably receiving the respective second upright support members **47**. A suitable tightening means such as nut with bolt and wing tightening means **67**, is provided for tightening the bracket **65** onto the upright member **47** once the desired angle has been attained. As can be seen in FIG. **3**, the respective mounting bracket **65** and upright support members **47** are pivotally mounted on each side for stability, yet allowing the desired reciprocal movement of the cage means **13**. The mounting means **16** also has a second vertically disposed mounting bracket **69** for slidably receiving members of a power drive unit. The second mounting bracket **69** also has suitable nut with a bolt and a wing tightening means **71** for affixing it with the member of the power drive unit, once the desired drive arrangement has been attained.

Thus, it can be seen that the mounting means **16** may be readily snapped into position via snap-in bolt **63** being received in aperture **61**, the upright support members **47** received in respective mounting brackets **65**, and the wing tightening means **67** tightened to attain the desired angle of the central axis of the cage means **13** with respect to the base member **39**. The base member **39**, the upright support members **45** and **47** and the longitudinal member **59** of the mounting means **16** form a quadrilateral figure having pivot connections at each practical corner of the figure such that a desired angle of the central axis of the cage means may be maintained during reciprocal movement of the top **43** and of the cage means **13**, even though there is an arcuate movement of the respective snap-in bolt **63**.

The reel **17** and cable **19** are of the form that is conventional. For ease of carrying the subassemblies herein, however, the reel is designed to carry only **50** feet of cable instead of the 100–150 feet that have been conventional heretofore. Experience has indicated that the 100–150 feet reels are too heavy for one worker to safely carry. The ends of the modern cables in the reel may be connected together easily so this invention uses smaller reels containing less cable. The cable may take any of the conventional forms, one of which is the closely wound helix of tempered steel similar to that illustrated in FIGS. **1** and **4**. Since the reel and cable are conventional and are not being claimed, per se, there is no need for further detailed description herein.

The rotating means may comprise a simple hand crank **75** that is connectable via gear box **77** with the shaft of the hub and shaft assembly **33** for manually rotating the cage means **13**. On the other hand, the rotating means may comprise a power drive assembly **79** that is drivingly connectable with the cage means **13**. As illustrated, the power drive assembly **79** comprises an electric motor **81** that may be connected via suitable extension cord (not shown) with a source of electric power, switch **83** for controlling the motor, and suitable drive comprising pulley **85** an endless member such as a belt **87**. As illustrated, the electric motor **81** is mounted on suitable mounting pad **91** having upright members **93** for being received within the second vertically disposed mounting bracket **69** on mounting means **16**. Specifically, the belt **87** may be emplaced about rim **29** and pulley **85** and the desired tension effected by sliding the upright members **93** in second mounting bracket **69**. Thereafter, the wing tightening means **71** is tightened to retain the power drive assembly **79** is place. For disassembly, the wing tightening means **71** may be readily loosened, the pulley **85** removed from the belt **87**, and the members **91** slid downwardly out of brackets **69**.

The first ratchet means **23** is carried so as to be stationary with respect to the base member **39**. It has means for adjusting its height and angle to accommodate the cable **19** that is fed therethrough at a predetermined angle without increasing the tendency of the cable to bend as it is forced into the conduit (not shown). As illustrated, the first ratchet gripping means **23** is carried by a third upright member **95** that is pivotally mounted on the base member **39** by conventional mounting bracket **97** and mounting shaft **99**. The third upright member **95** is adapted to slidingly receive member **101** having angle clamp **103** connecting it with the first ratchet gripping means **23**. The angle is adjusted by loosening the wing nut **105**, setting the desired angle and re-tightening the wing nut **105** onto its bolt. As is known, the angle clamp **103** may have serrated teeth on both halves to facilitate holding the set angle. As described with respect to the mounting bracket **65**, the upright member **95** has suitable nut with bolt and wing tightening means **107** for retaining the set height by being screwed inwardly against member **101**. The third upright member **95** may be pivoted down into a horizontal plane, as illustrated in FIG. **2**, to form a flat, readily transportable base subassembly. The third upright member **95** may be retained in its upright position during operation by frictionally tightening a nut (not shown) on mounting shaft **99**. The force retaining the upright member **95** in its upright position may be increased by the use of serrated teeth on its edge adjacent mounting bracket **97** and on mounting bracket **97** such that when the nut is tightened, the teeth inter-engage and hold the first ratchet gripping means stationary. If desired, the upright member **95** may be permanently welded to a region adjacent the forward end of the base member **39**, but kept short so as not to interfere with easy transportation of the base subassembly.

The second ratchet gripping means **25** is carried so as to be stationary with respect to the cage means **13** and movable with respect to the base; or, more importantly, movable with respect to the first ratchet means **23**; in order to effect the desired playing out or retraction of the cable **19**. As illustrated, the second ratchet gripping means **25** is welded to the converging rod members of the outer cage structure **27**.

Each of the first and second ratchet gripping means has, as illustrated in FIGS. **4** and **5**, handle **109** and holding means **111** for determining whether or not the respective ratchet gripping means will grip and hold the cable and in what direction of relative movement against which the respective ratchet gripping means will hold. The handle **109** and holding means **111** are mounted for pivotal movement about a mounting shaft

113. The mounting bracket **114**, illustrated with the front side cut away, serves as a cam surface having two respective side surfaces **117** and **119**, and top surface **121** that co-act with a biased cam follower means **123** for maintaining the handle and holding means in a set position. Specifically, the cam follower means **123** may comprise a washer that is biased by suitable spring **125** to retain the handle **109** and holding means **111** in a set position; that is, on either side, or at the neutral, or upright, position. The holding means **111** has a neutral portion, illustrated as flat bottom portion **125**; and, on either side of the neutral portion, respective ratchet portions **127** and **129**. As illustrated clearly in FIG. **5**, each ratchet portion has respective ratchet pawls **131** that have respectively increasing radii r_1, r_2, and r_3 that increase as the distance of the pawl from the neutral portion increases. Expressed otherwise, the radius r_3 is larger than the radius r_2 which is also greater than radius r_1 such that the ratchet portion will grip the cable when the cable tries to move in one direction with respect to the ratchet gripping means. For example, it can be seen in FIG. **4** that, with the handle moved to the left, as illustrated by dashed lines **131**, the ratchet gripping means will allow the cable to move to the left, as indicated by the dashed arrow **133** but will grip the cable and prevent its movement to the right. Conversely, if the handle is moved to the right in FIG. **4**, the cable will be allowed to move to the right but will be gripped when it is attempted to be moved to the left. In the center position, however, as illustrated, it can be seen that the flat bottom surface **125** does not contact the cable and allows free rotation of the cable, as for cutting roots or the like in a drain or sewer line.

In operation, the apparatus **11** is assembled by joining the respective subassemblies as described hereinbefore at the site where the conduit is to be cleaned. The cleaning attachment (not shown) is attached to the leading end of the cable **19** after the cable has been threaded through the first and second ratchet gripping means **23** and **25**. The cable is fed into the conduit to be cleaned and the cage means **13** is rotated. The respective handles of the first and second ratchet gripping means **23** and **25** are moved to the forward position, illustrated by dashed lines **133**. The top **43** is pushed forwardly to advance the cage means **13**, and consequently, the reel **17** and cable **19**. Since the tendency for relative movement is for the second ratchet gripping means **25** to move to the left, its holding means **111** grips the cable and pushes the cable forwardly as the top **43** is pushed forwardly. On the other hand, the first ratchet gripping means **23** allows the cable to move to the left without gripping it. After the desired forward movement of the reel has been affected, the top **43** is moved rearwardly. During this movement, the respective relative motions are reversed; the cable **19**, FIG. **4**, tending to move to the right with respect to the first ratchet gripping means **23**. The first ratchet gripping means **23** therefore holds the cable and prevents it moving to the right. On the other hand, the second ratchet gripping means **25** now perceives the relative motion as a movement of the cable to its left as it is moved to the right, or rearwardly of the base member **39**; consequently, it releases the cable and allows itself to be moved over the cable without gripping the cable. After the movement on the right, or rearwardly, is terminated and the forward movement again begun, simultaneously with rotation of the cage means **13** and the reel **17** and cable **19**, if desired, the respective relative motions are again reversed, as described on the forward stroke hereinbefore. Consequently, the cable is gripped by the second hatchet gripping means **25** and forced through the first ratchet gripping means **23**. Thus, by the respective reciprocating motion of the cage means **13** through the reciprocating motion of the top **43** of first upright support member **45**, the rotating cable, with its cleaning device on its forward end, is advanced into the conduit to be cleaned. When an obstruction is encountered, the ratchet gripping means may be moved to the center to allow free rotation; or they may be left in position and the rotation tends to advance the cable into the conduit incrementally as the obstacle is cut away, or cleaned from the conduit. Thus, a conduit may be cleaned for a desired distance. If the entire amount of cable is used from one reel, it is joined rapidly and easily with the end of the cable in the next reel, the empty reel removed, and the next reel emplaced and the operation continued.

After the conduit has been cleaned for the desired distance, the cable is rewound into the reel by movement of the ratchet gripping means to the right, as indicated by dashed lines **135**. Again, the top **43** is moved reciprocally to effect the rewinding of the cable. In the rewinding operation, however, the operation of the respective ratchet gripping means is reversed. Specifically, the ratchet portion **129** is emplaced adjacent the cable **19**. Consequently, during a forward movement, or movement to the left in FIG. **1**, the first ratchet gripping means **23** will grip the cable and prevent its movement, whereas the second ratchet gripping means **25** will slip over the cable. On the reverse stroke, or movement to the right, however, the first ratchet gripping means **23** will allow the cable to move to the right therethrough, whereas the second gripping means **25** will grip the cable, and pull the cable to the right as the cage means **13** is moved to the right. After the termination of the movement to the right, and during the movement to the left, the cable is coiled into reel **17** and the respective ratchet gripping actions reversed, as described with respect to the first movement to the left during retraction, or rewinding, of the cable **19**.

After the cable has been emplaced within the reel, the respective subassemblies are readily disassembled by one worker and, by design, transported by one worker to the truck without any danger of causing a hernia or otherwise straining the worker.

The materials that are ordinarily employed in this art may be employed herein and no exotic new materials are necessary.

From the foregoing descriptive matter, it can be seen that this invention provides apparatus that accomplishes the objects delineated hereinbefore and obviates the disadvantages of the prior art structure. Specifically, this invention provides apparatus in which the cable may be easily advanced into the conduit to be cleaned, with safety to the operator. Moreover, this invention provides a conduit cleaning apparatus that may be easily disassembled into four easily portable subassemblies, readily reassembled, and used on the site by only one operator without requiring a helper or without endangering the health of the operator.

Although the invention has been described with a certain degree of particularity, it is understood that the present disclosure has been made only by way of example and that numerous changes in the details of construction and the combination and arrangement of parts may be resorted to without departing from the spirit and the scope of the invention. Moreover, obvious equivalents may be substituted for the specific elements and mechanical devices described.

What is claimed is:

1. Conduit cleaning apparatus comprising:
a. cage means for containing a reel of cable;
b. a support frame comprising a base member carrying a support means for effecting reciprocal movement of said cage means;
c. mounting means for rotatably connecting said cage means with said support means;
d. reel readily removably connected to said cage means and containing cable for extending a cleaning device into said conduit;
e. rotating means for rotating said cage means and consequently said reel and cable;
f. first and second ratchet gripping means, said first ratchet gripping means being carried so as to be stationary with respect to said base member, and said second ratchet gripping means being carried so as to be stationary with respect to said cage means and said reel and movable with respect to said base member; said first and second ratchet gripping means having movable holding means for determining whether or not said ratchet gripping means will grip and hold said cable and in what direction of relative movement against which they will hold such that said cage means on said support means may be moved reciprocally and effect advance of said cable from said reel and into said conduit when said first and second ratchet gripping means are in a first position and effect return of said cable from said conduit and into said reel when said first and second ratchet gripping means are in a second position.

2. The apparatus of claim 1 wherein said support means comprises an upright support means that is pivotally carried by said base member so as to allow reciprocal movement of said cage means and said mounting means also pivotally connects said cage means with said upright support means for properly carrying said cage means during pivotal reciprocal movement of said upright support means.

3. The apparatus of claim 2 wherein said upright support means comprises first and second upright support members that are pivotally mounted on said base member; said mounting means is adjustably connectable with one of said support members such that the central longitudinal axis of said cage means can be positioned at different angles with respect to said base member; and wherein said upright support members, said mounting means, and said base member form a multilateral figure with four pivotal connections from a side view for properly carrying said cage means during said reciprocal movement.

4. The apparatus of claim 3 wherein said mounting means is pivotally connected with said first upright support member and is connectable at a desired height with said second upright support member.

5. The apparatus of claim 3 wherein said first ratchet gripping means has means for adjusting its height and angle to accommodate said cable fed at a predetermined angle without increasing the tendency of the cable to bend as it is forced into said conduit.

6. The apparatus of claim 3 wherein said first ratchet gripping means is carried by a third upright member mounted on said base member, said cage means is readily disconnectable from said two upright support members, said rotating means is readily disconnectable, and said two upright support members can be folded flat with said base member to form a substantially flat, readily transportable subassembly; said cage means is a readily transportable subassembly; said reel and cable form a readily transportable subassembly; and said rotating means is a readily transportable subassembly; such that one worker can easily transport, assemble, use and disassemble said apparatus.

7. The apparatus of claim 6 wherein said third upright member is also pivotally mounted on said base member so as to be folded flat.

8. The apparatus of claim 1 wherein each said ratchet gripping means comprises a handle and holding means mounted for pivotal movement about a mounting shaft, a cam surface having surfaces for maintaining at least three positions of said handle and holding means, biased cam follower means for maintaining said handle and holding means in a set position; said holding means comprises a neutral portion allowing free rotation of said cable when said first and second ratchet gripping means are in a third position; and having on each side of said neutral portion a ratchet portion having respective ratchet pawls that have respective radii with respect to said mounting shaft that increase as the distance of said pawl from said neutral portion increases.

9. The apparatus of claim 1 wherein said rotating means comprises a power drive assembly that is drivingly connectable with said cage means.

10. The apparatus of claim 9 wherein said power drive assembly is adjustably and readily connectable with and disconnectable from said mounting means for easy assembly and disassembly.

11. Conduit cleaning apparatus comprising:
a. first ratchet gripping means; and
b. support means carrying the elements of:
i. a cage means for containing a reel of cable;
ii. a reel readily removably connected to said cage means and containing cable for extending a cleaning device into said conduit;
iii. rotating means for rotating said cage means and consequently said reel and cable; and
iv. second ratchet gripping means; said support means being adapted for effecting reciprocal movement of said elements with respect to said first ratchet gripping means and said first and second ratchet gripping means having movable holding means for determining whether or not said ratchet gripping means will grip and hold said cable and in what direction of relative movement against which they will hold such that said cage means on said support means may be moved reciprocally and effect advance of said cable from said reel and into said conduit when said first and second ratchet gripping means are

in a first position and effect return of said cable from said conduit and into said reel when said first and second ratchet gripping means are in a second position.

* * * * *