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Peterson et al.

[11] **3,928,885**

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[54] **PIPE CLEANING MACHINE AND CABLE RETRIEVING MECHANISM THEREFOR**

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[73] Assignee: **Roto Rooter Corporation,** West Des Moines, Iowa

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[52] **U.S. Cl.** ..... **15/104.3 SN;** 226/143; 242/54

[51] **Int. Cl.²** **B08B 9/02**

[58] **Field of Search** ..... 15/104.3 R, 104.3 SN; 242/54; 254/134.3; 226/143

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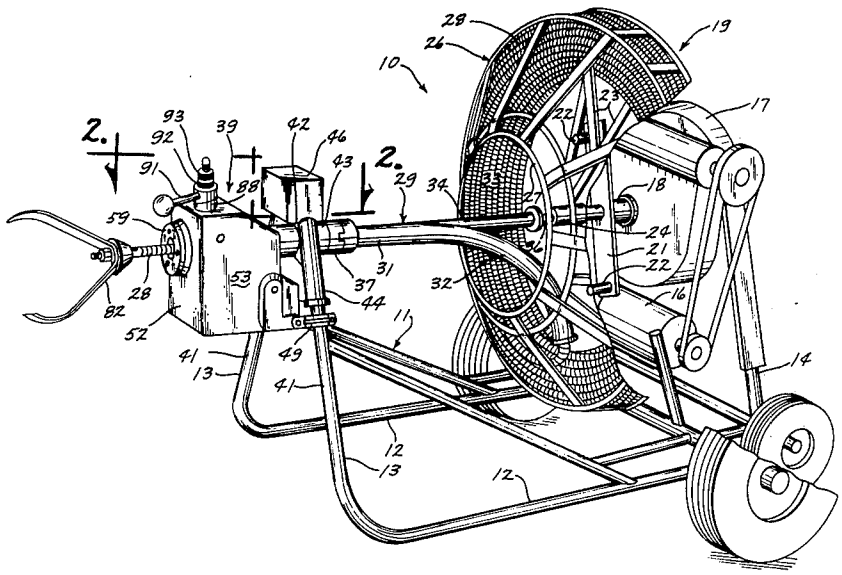
Attorney, Agent, or Firm—Rudolph L. Lowell

[57] **ABSTRACT**

The pipe cleaning machine includes a cable retrieving mechanism which derives its power from the rotational movement of the cable reel and has a cable feed means which is manually actuated into engagement with the cable for retrieving purposes. When the feed means is disengaged, the cable is manually movable into or out of a pipe being cleaned. On completion of a pipe cleaning job the feed means, on being engaged with the cable, automatically retrieves the cable for coiled reception within the cable reel.

6 Claims, 6 Drawing Figures



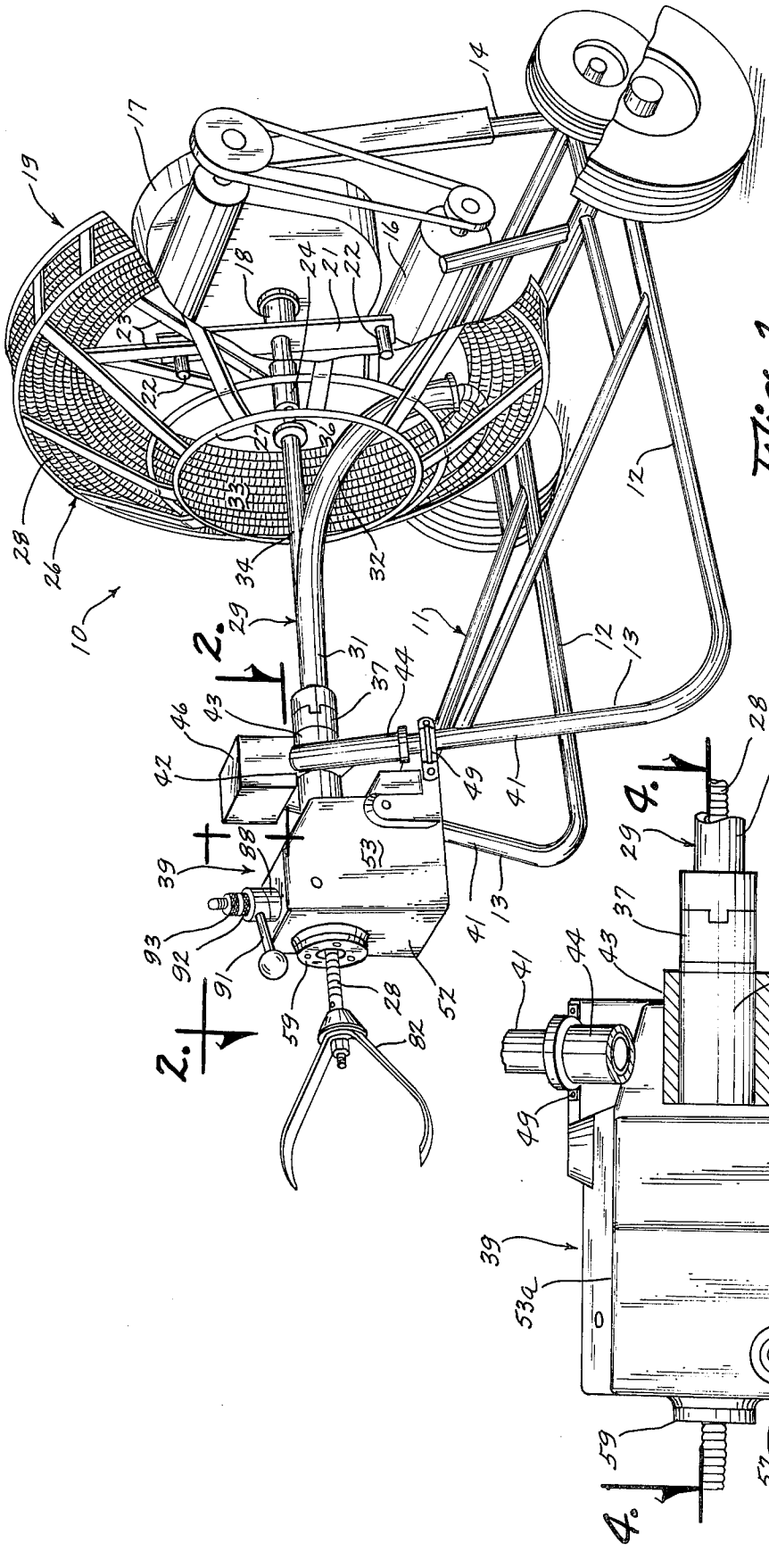

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Fig. 1

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Fig. 2

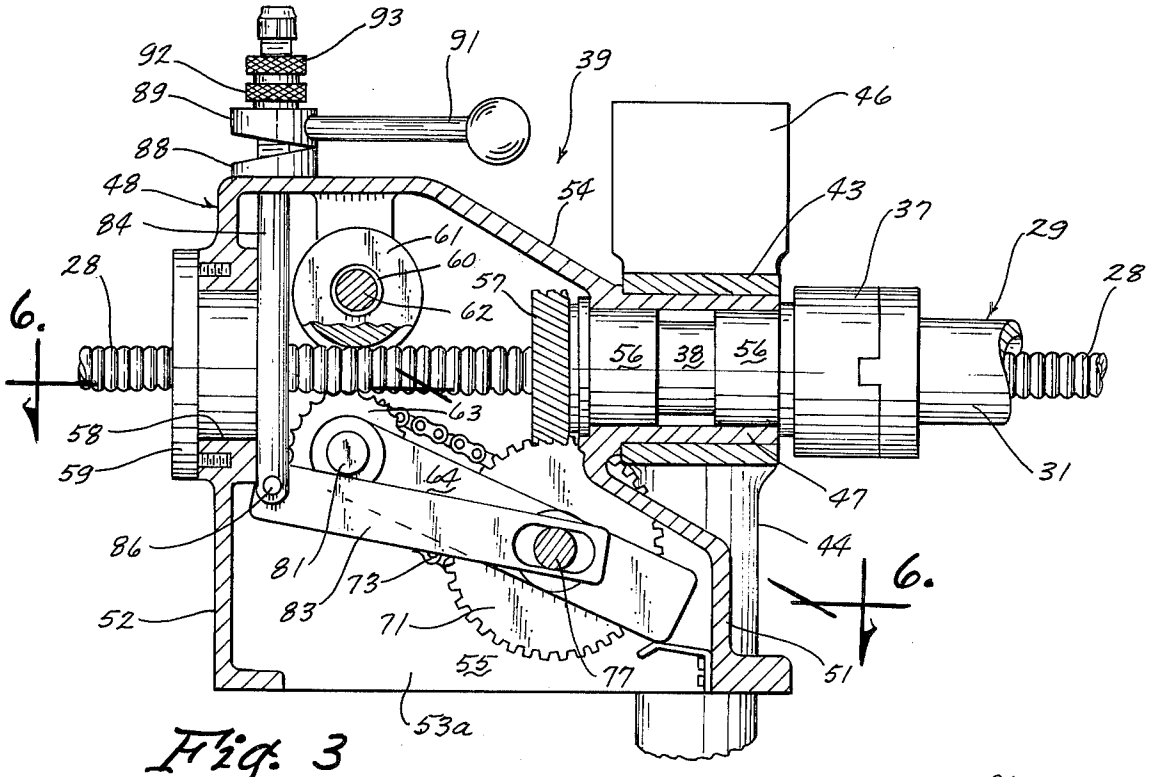
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Fig. 3

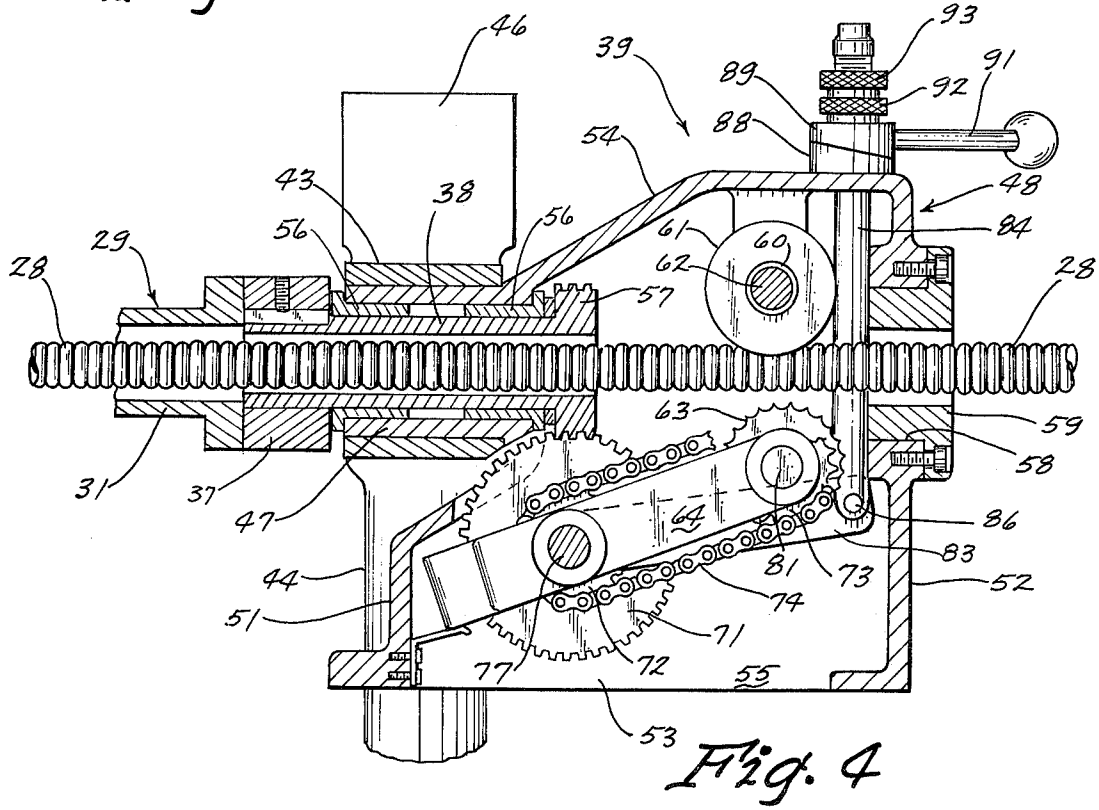
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Fig. 4

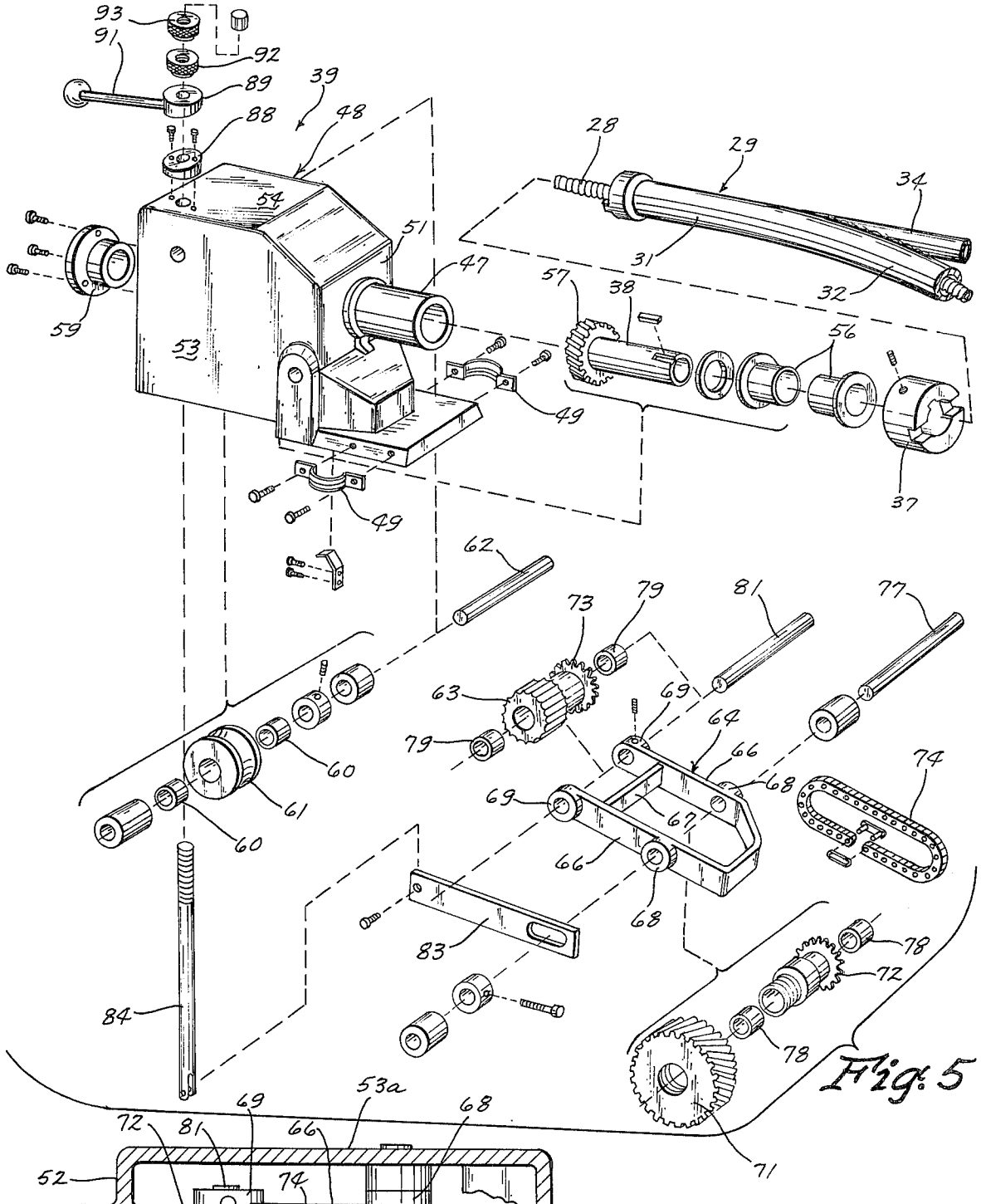
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Fig. 5

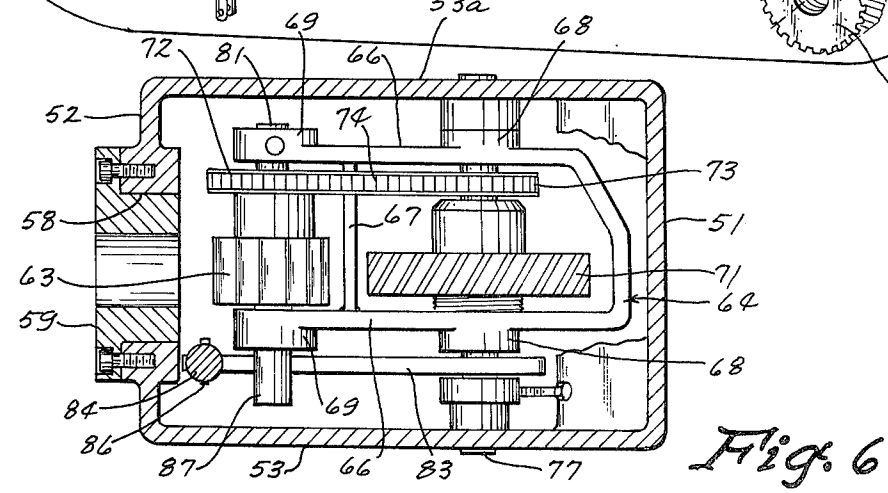
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Fig. 6

PIPE CLEANING MACHINE AND CABLE RETRIEVING MECHANISM THEREFOR

SUMMARY OF THE INVENTION

The cable retrieving mechanism is of a simple and rugged construction capable of operating over a long service life with a minimum of maintenance attention; and efficient in operation to quickly retrieve cable lengths of one hundred feet or more from within cleaned pipes. The mechanism is compact and readily assembled on many different types of pipe cleaning machines without impairing the appearance or ease of portability of such machines. The manual actuator for the mechanism and the switch control for the cable reel driving motor are located in close proximity to each other for convenient accessibility by the machine operator at all times during a pipe cleaning operation.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a pipe cleaning machine showing the cable retrieving mechanism of this invention in assembly relation therewith, with parts of the cleaning machine being broken away for the purpose of clarity;

FIG. 2 is an enlarged sectional view of the retrieving mechanism taken on line 2—2 in FIG. 1;

FIGS. 3 and 4 are enlarged sectional views as seen on the lines 3—3 and 4—4, respectively, in FIG. 2;

FIG. 5 is an exploded perspective view of the cable retrieving mechanism; and

FIG. 6 is a sectional view on the line 6—6 in FIG. 3.

DETAILED DESCRIPTION OF THE INVENTION

Referring to FIG. 1 of the drawings, there is illustrated a pipe cleaning machine 10 having a frame 11 formed with a base 12 and upright end sections 13 and 14, hereinafter to be referred to as front and rear end sections, respectively. The rear end section 14 carries an electric motor 16 in operative association with a speed reduction unit 17 equipped with a power take-off shaft 18, which is in driving connection with a cable reel 19. This connection is accomplished by means of a drive arm 21 mounted transversely of the shaft 18 and provided with laterally extended pins 22 for engaging certain ones of the reel spokes 23.

The reel 19 (FIG. 1) includes a hub 24 that is rotatably mounted on the shaft 18 forwardly of the drive arm 21 and includes the radially extended spokes 23 and circular struts 27 to form a storage chamber for a flexible cable 28 of a coiled spring construction. A cable guide tube 29 has a front linear section 31 and an arcuate rear section 32 that projects through a front central opening 33 in the reel cage 26. The guide tube 29 extends from a point on the forwardly extended center axis of the reel 19 to a point within the reel located near the outer peripheral surface of the reel.

A rear shaft extension 34 on the front linear extension 31 has a spring biased bearing member 36 at its rear end rotatably supported in the reel hub 24. It is thus seen that the linear front section 31, the shaft extension 34 therefor, the reel hub 24 and the power take-off shaft 18 are in axial alignment longitudinally of the machine frame 11. The forward end of the front linear section 31 of the guide tube 29 is coupled, as indicated at 37, to the rear end of a tubular shaft 38 that forms part of the cable retrieving mechanism 39 of this invention (FIGS. 2 and 4). The front end 13 of the

machine frame 11 (FIG. 1) terminates in a pair of upwardly converging members 41 of a tubular construction.

A mounting bracket 42, for the mechanism 39, includes a hub 43 that has a pair of transversely opposite diverging members 44 of a tubular construction of a size to slidably receive therein the lower ends of the upper portions of the corresponding ones of the tubular members 41 (FIGS. 1 and 2). A switch unit 46 for controlling the operation of the reel driving motor 16 is mounted on the upper side of the mounting bracket hub 43 with connecting electrical wires (not shown) to the motor 16 being carried in the tubular constructed frame 11.

The mounting bracket hub 43 is of a size to snugly receive therein a front tubular extension 47 (FIGS. 3 and 4) formed as an integral part of a housing 48 for the cable retrieving mechanism 39. The housing 48 is rigidly secured to the front end 13 of the machine frame 11 by clip members 49 connected to the tubular members 41 (FIGS. 1 and 2). As best appears in FIGS. 3 and 4, the housing 48 has front and rear end walls 51 and 52, respectively, side walls 53 and 53*a*, a top wall 54 and an open bottom 55.

The housing front tubular extension 47 (FIGS. 4 and 5) is provided with bearing members 56 for rotatably supporting therein the tubular shaft 38. Integrally formed at the rear end of the tubular shaft 38 and located within the housing 48 is a worm gear 57. As thus far described, it is seen that the tubular shaft 38, and in turn the gear 57, are rotatable as a unit with the cable guide 29 about a common axis. The rear housing wall 52 is formed with an opening 58 that has inserted therein a cable guide sleeve 59 in axial alignment with the tubular shaft 38. The cable 28, therefore, (FIGS. 3 and 4) is linearly extendible longitudinally through the housing 48 from the guide tube 29.

To withdraw the cable 28 from a pipe (not shown) that has been cleaned, the retrieving mechanism 39 is provided with a cable feed means comprised of an idler roller 61 (FIGS. 3 and 4) rotatably supported on bearings 60 carried on a shaft 62 having its ends in the housing side walls 53 and 53*a* such that the idler roller 61 is adjacent the rear housing wall 52 with its lower side opposite the opening in the cable guide insert 59. The roller 61 has a concave peripheral surface for engaging the top side of the cable 28 as it travels through the housing 48. Arranged below and opposite the idler roller 61 is a cable feed gear 63 that has a concave peripheral surface of a contour for contact meshed engagement with the lower side of the cable 28.

The feed gear 63 is movable into and out of engagement with the lower side of the cable 28 by means including a pivoted frame structure 64 (FIGS. 5 and 6). This frame is of a generally U-shape having side legs 66 connected adjacent their free ends by a brace member 67 and formed with transversely opposite longitudinally spaced pairs of hub members 68 and 69. Mounted on the pivoted frame 64 is a gear train that is comprised of a drive gear 71 and power transmission gears 72 and 73 connected together by a sprocket chain 74.

The frame 64 has what will be referred to as its forward end pivoted on a shaft 77 for up and down pivotal movement of the rear end thereof. The shaft 77 extends through the front hubs 68 with its opposite ends carried in the housing side walls 53 and 53*a*. Bearing members 78 on the shaft 77 rotatably support the drive gear 71

and front transmission gear **72** at positions between the legs **66** of the pivoted frame **64** such that the drive gear is in a continuous meshed engagement with the power gear **57** on the tubular shaft **38.** The cable feed gear **63** and rear transmission gear **73** are also located between the side legs **66** and are rotatably supported on bearings **79** mounted on a shaft **81** carried in the rear hubs **69.**

Thus, on an up and down pivotal movement of the rear end of the frame **64** the feed gear **63** is moved into and out of a meshed engagement with the lower side of the cable **28.** In the engaged position, therefore, the cable **28** has opposite sides thereof in engagement with the idler gear **61** and feed gear **63,** for retrieving movement forwardly through the housing **48** and the guide tube **29** for a coiled reception within the reel **19.** When the feed gear **63** is disengaged from the cable **28,** by a downward pivotal movement of the rear end of the frame **64,** the cable **28** is freely manually movable in either direction through the housing **48** in engagement with only the idler gear **61** to either retrieve the cable or to feed the cable into a pipe to be cleaned. In this respect, and as shown in FIG. **1,** the terminal end of the cable **28** is equipped with a cutting unit **82** which is rotated in a single direction within a pipe in response to the unirotational movement of the guide tube **29** through its cable connection with the reel **19.**

The frame **64** is pivotally moved by an actuating assembly (FIGS. **3** and **5**) that includes a first link **83** extended longitudinally of the housing **48** adjacent the side wall **53** and a second vertical link **84** projected through the housing top wall **54** at a position adjacent the rear wall **52** and side wall **53** with its lower end pivotally connected at **86** with the rear end of the longitudinal link **83.** The front end of the longitudinal link **83** is formed with a longitudinally extended slot for slidably receiving therethrough the shaft **77.** With its forward end thus slidably supported on the shaft **77,** the longitudinal link **83** is arranged to one side of the pivoted frame **64** with its rear end located below and in bearing engagement with a projected end **87** of the shaft **81** (FIG. **6**). It is seen, therefore, that in response to a vertical movement of the vertical link **84** and resultant pivotal movement of the rear end of the pivoted frame **64,** the feed gear **63** is moved into and out of feeding engagement with the cable **28.**

To vertically move the link **84,** the projected upper end thereof is extended in axial alignment through a circular cam member **88** secured to the upper surface of the housing top wall **54** (FIGS. **3, 4** and **5**). A coacting cam member **89** mounted on the projected end of the vertical link **84** has a radially extended actuator arm **91.** The adjacent cam surfaces of the cams **88** and **89** are of a like contour formed with corresponding high and low sides. When these cam surfaces are in flush mating engagement, as shown in FIG. **4,** the pivoted frame **64** is in its lowermost pivotally moved position wherein the feed gear **63** is out of engagement with the cable **28.** On movement of the actuator arm **91** to move the corresponding high and low cam sides of the cam surfaces to positions opposite each other, as shown in FIG. **3,** the pivoted frame **64** is in its uppermost pivotally moved position wherein the feed gear **63** is in meshed engagement with the coiled spring cable **28.** These moved positions of the pivoted frame **64** are determined by adjustment of an adjusting nut **92** threadable on the vertical link **84** for engagement with the top side of the cam member **89.** Adjustment of the nut **92** is maintained by an associated locking nut **93.**

When the machine **10** is to be used for a pipe cleaning operation, the parts of the retrieving mechanism **39** are in the positions of FIG. **4** wherein the cable **28** is in contact only with the idler roller **61.** On operation of the reel driving motor **16,** therefor, the guide tube **29,** tubular shaft **38** and the gear train on the pivoted frame **64** are continuously rotated. With the reel **19** and guide tube **29** rotating in the same direction the cable **28** is manually movable outwardly from the housing **48** for feeding into a pipe to be cleaned. As is well-known, the unidirectional movement of the reel and guide tube additionally provides for a like rotational movement of the cable **28** to rotate the cutter **82** at its terminal end. On completion of the pipe cleaning operation the manual actuator arm **91** is manipulated to move the cam members **88** and **89** from their positions of FIG. **4** to their positions of FIG. **3.** Since the feed gear **63** is in continuous operation, the cable **28** is retrieved immediately on being engaged by the feed gear.

Although the invention has been described with respect to a preferred embodiment thereof, it is to be understood that it is not to be so limited since changes and modifications can be made therein which are within the full intended scope of this invention as defined by the appended claims.

We claim:

1. In a pipe cleaning machine having a frame, a reel for a coiled spring cable rotatable on said frame, power means on said frame for rotating said reel in one direction, and a cable guide tube rotatable on said frame having one end portion coaxial with the axis of said reel and an opposite end portion extended within and terminating adjacent the outer peripheral surface of the reel; a cable retrieving mechanism comprising:

a. a housing fixed on said frame adjacent the one end portion of said guide tube having a pair of oppositely arranged end walls,

b. a tubular shaft rotatably supported on and extended through one of said end walls in a coaxial relation with said reel, said other end wall having a cable receiving opening in axial alignment with said shaft with the length of cable within said opposite end portion of the guide tube and coiled within said reel providing for the rotation of the guide tube with said reel,

c. means coupling said tubular shaft with the one end portion of the guide tube for rotation with said guide tube,

d. a cable feed means in said housing movable into and out of engagement with a cable to move the cable in only one direction through said end wall opening into said housing and axially through said tubular shaft into said guide tube for coiled reception within said reel, and

e. means connecting said tubular shaft in continuous driving engagement with said cable feed means.

2. The pipe cleaning machine according to claim **1** wherein:

a. said cable feed means includes an idler roller within said housing having a concave peripheral surface in continuous engagement with one side of said cable, and a feed gear having a serrated concave peripheral surface engageable with the opposite side of said cable, and

b. said connecting means includes a drive gear rotatably supported within said housing for continuous engagement with said tubular shaft,

c. pivoted means within said housing supporting said feed gear for pivotal movement about the axis of said drive gear into and out of engagement with said opposite side of the cable, and

d. means on said pivoted means connecting said drive gear with said feed gear.

3. The pipe cleaning machine according to claim **2,** including:

a. manually actuated means for pivoted moving said pivoted means to move said feed gear into and out of engagement with said opposite side of the cable having an actuator located exteriorly of said housing.

4. The pipe cleaning machine according to claim **1,** wherein:

a. said cable feed means includes an idler roller rotatably supported in said housing for continuous rolling engagement with one side of said cable and a feed gear arranged opposite said idler roller for engagement with the opposite side of said cable, and

b. said connecting means includes a pivoted frame structure within said housing,

c. pivot means pivotally supporting one end of said frame structure on said housing adjacent said one end wall thereof for pivotal movement of the other end wall thereof toward and away from the idler roller about an axis normal to the axis of said tubular shaft,

d. means rotatably supporting said feed gear on the other end of said frame structure,

e. a drive gear rotatably supported on said pivot means,

f. a power gear on said tubular shaft located within said housing in continuous meshed engagement with said drive gear,

g. means on said frame structure connecting said drive gear in a driving relation with said feed member, and

h. means for pivotally moving said frame structure including a manual actuator member arranged exteriorly of said housing.

5. The pipe cleaning machine according to claim **4,** wherein:

a. said feed gear, in one pivotally moved position of said frame structure, in one pivotally moved position of said frame structure, is in driving engagement with said cable, and in a second pivotally moved position of said frame structure is disengaged from said cable whereby in said one position of the frame structure the cable is movable in one direction into said reel by the coaction of said idler roller and feed gear, and in the second position of the frame structure the cable is manually movable in either direction.

6. The pipe cleaning machine according to claim **4,** wherein:

a. said housing has a top wall, and

b. said means for pivotally moving the frame structure includes additionally a first link member slidably extended through said top wall with the lower end thereof positioned within said housing;

c. a second link member within said housing arranged longitudinally of said frame structure having one end movably supported on said pivot means and an opposite end in bearing engagement with the underside of the opposite end of the frame structure,

d. means pivotally connecting the lower end of said first link member with the opposite end of said second link member, and

e. coacting means on said first link member and housing for linearly moving said first link member in response to an actuation of said actuator member.

* * * * *