April 6, 1965 P. L. CIACCIO ETAL 3,176,335

SEWER ROD DRIVING AND ROTATING REEL WITH DUAL VARIABLE HYDRAULIC DRIVE

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FIG. 1.

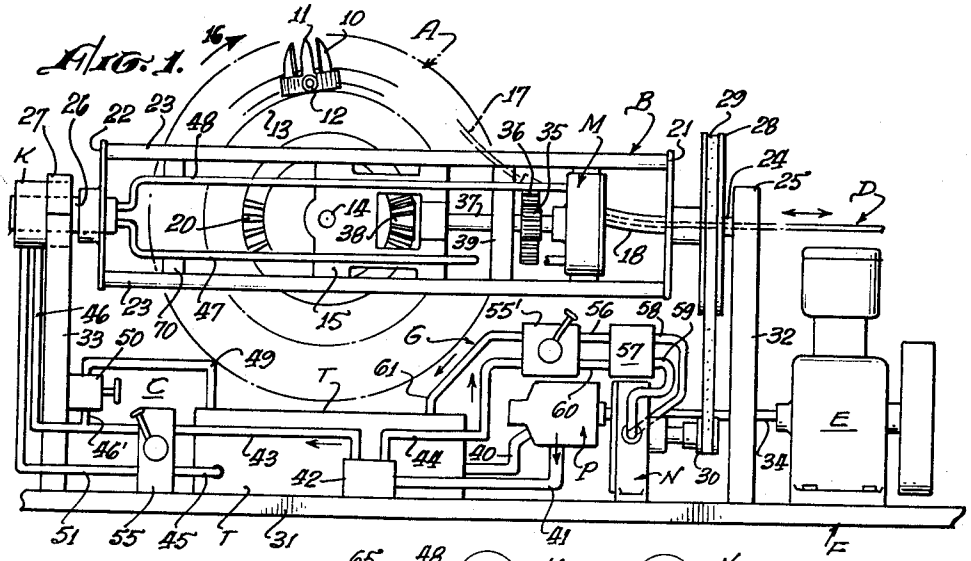


FIG. 2.

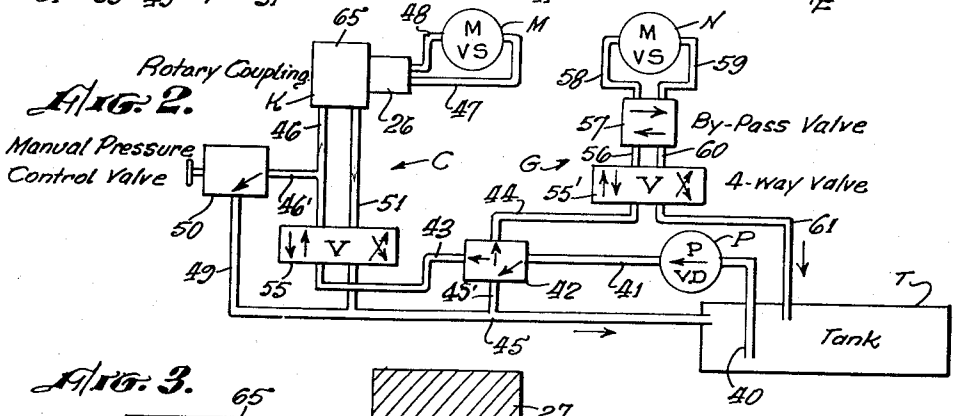
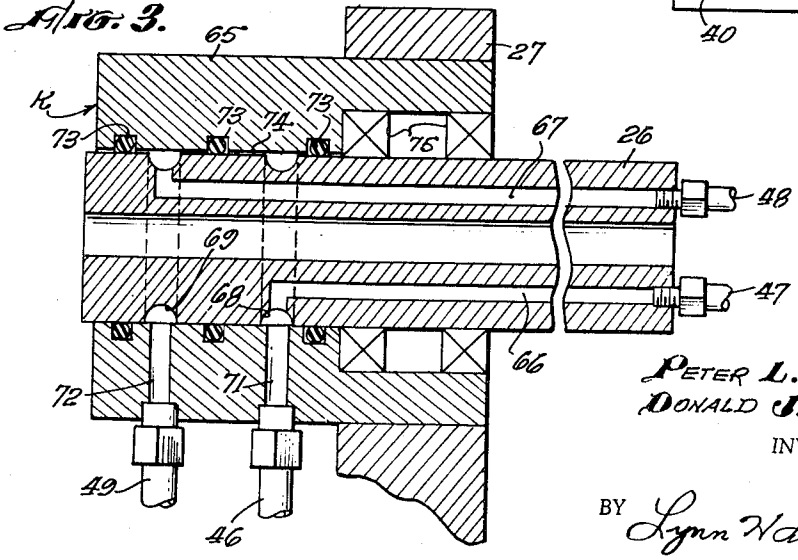


FIG. 3.



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Fig. 7.

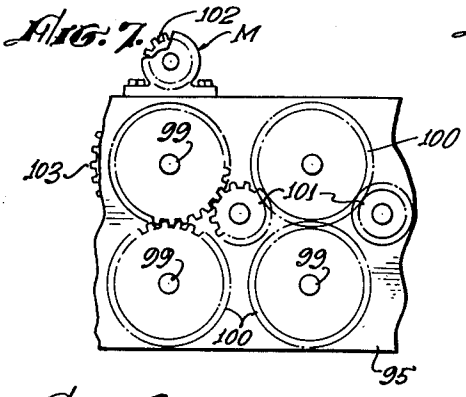


Fig. 6.

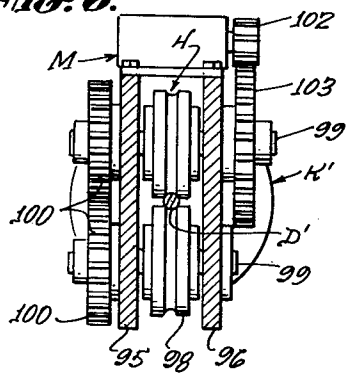


Fig. 8.

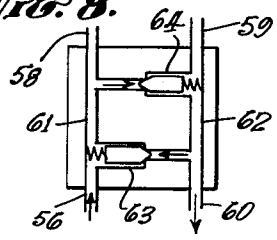


Fig. 4.

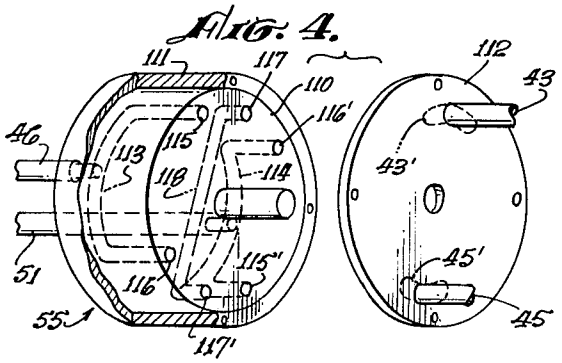
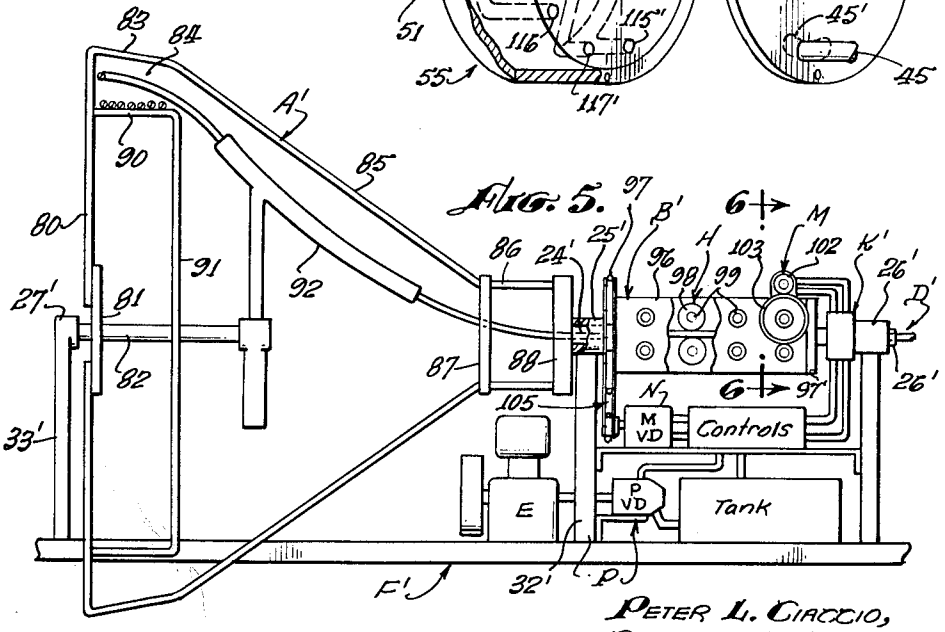


Fig. 5.



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United States Patent Office 3,176,335 Patented Apr. 6, 1965

3,176,335

SEWER ROD DRIVING AND ROTATING REEL WITH DUAL VARIABLE HYDRAULIC DRIVE

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Filed Jan. 10, 1964, Ser. No. 336,900
14 Claims. (Cl. 15—104.3)

This invention relates to apparatus for feeding sewer tool drive rod longitudinally into and out of a sewer while simultaneously transmitting rotary drive thereto for rotating the cleaning tool within the sewer. Such apparatus customarily provides mechanism for separately controlling the longitudinal feed and the rotary drive of the sewer rod to meet the varying conditions encountered in a sewer cleaning operation. For example, when initially feeding the drive rod into a sewer it may be desirable to feed the rod rapidly while rotating it either slowly or not at all. When the tool commences a cleaning operation it may be desirable to rotate the rod while simultaneously feeding it into the sewer at a selected ratio of rotation to forward feed. If the tool encounters increased congestion in the material clogging the sewer, the normal procedure is to slow down the forward feed or to stop it entirely while continuing the rotary drive. When the tool is to be withdrawn from the sewer, the longitudinal feed of the sewer rod is reversed. When this is done it may be desirable to continue the forward rotary drive of the rod. Under other circumstances it may become necessary to reverse the direction of rotation (e.g. in the event a cork-screw type tool becomes stuck in the congestive material in the sewer).

In the past it has been the usual practice to utilize mechanical drives with clutches, reversing gears, and the like for driving and separately controlling the rod reeling mechanism in its rotary drive and longitudinal feeding functions. Such drive mechanisms have been characterized by a limited number of drive speeds with step-shifts from one speed to another.

The present invention contemplates a sewer rod feed and drive and reeling mechanism providing an infinitely variable speed change for both the feed and the rotary drive, together with means for reversing both the feed and the rotary drive. With this general object in mind, the invention embraces, as specific objects thereof, to provide an improved rod reeling, feeding and rotating mechanism wherein:

(1) Rotary drive is transmitted to the drive rod by mechanism mounted in a carriage which is turned about the rod feed axis by one infinitely variable hydraulic motor, and longitudinal feed is imparted to the rod by mechanism driven by a separate, independently controlled variable-speed hydraulic motor.

(2) Both such hydraulic motors are powered by pressurized hydraulic liquid delivered from a common pump; and the two hydraulic motors are disposed in separate control circuits and thereby independently controlled both as to direction of rotation and speed.

(3) The reel may be one which is rotatable about its own axis for feeding the rod while being carried and turned by a carriage on the rod-feed axis (which is disposed at right angles to its rotational axis) for transmitting rotary drive to the rod, feeding of the rod longitudinally along the feed axis being effected by rotating the reel on its own rotational axis.

(4) Alternatively, the reel may be of a conical type having a throat at its apex through which the rod is fed along the feed axis (the major axis of the reel) on which it is rotatable for transmitting rotary drive to the rod, the rod being fed along this axis by one or more pairs of feed rolls rotating tangentially with respect to the feed axis while being turned bodily around said axis by a carriage in which they are mounted, said carriage turning with the reel about the feed axis.

(5) One of the hydraulic motors is carried by the carriage or frame that turns about the feed axis and executes a planetary motion around that axis while simultaneously transmitting drive to the feed reel or the group of feed rolls carried by the turning carriage, hydraulic liquid for driving this motor being conveyed to it through a rotary hydraulic coupling gland. The other hydraulic motor, for executing the turning movement about the feed axis, is fixedly mounted in the fixed frame of the apparatus.

(6) A combined directional and flow control valve is provided in each of two independent fluid-conducting and control circuits whereby the two motors can be separately controlled both as to speed and direction.

(7) The control circuit for the motor which effects the turning movement about the feed axis is provided with an additional control element which makes it possible for the reel or the reel carriage to overrun its drive when the latter is reduced in speed or shut off.

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

FIG. 1 is a side elevational view, partially schematic, of a rod feed and drive apparatus embodying my invention;

FIG. 2 is a schematic flow diagram of the hydraulic circuits;

FIG. 3 is a detail axial sectional view of the rotary coupling gland;

FIG. 4 is an exploded perspective view of a rotary valve schematically illustrating the broad features of the four-way valve component of the apparatus;

FIG. 5 is a schematic side elevational view of a rod feeding and rotating apparatus of a type embodying a conical reel and a roll-feed at the apex thereof, with the invention embodied therein;

FIG. 6 is a detail transverse sectional view of the roll-feed unit of the apparatus of FIG. 5 taken on the line 6—6 thereof;

FIG. 7 is a fragmentary back side view of the feed roll unit of FIG. 5; and

FIG. 8 is a detail schematic illustration of the bypass valve component of the apparatus.

Referring now to the drawings in detail, and in particular to FIGS. 1–3, we have shown therein, as an example of one form in which the invention may be embodied, an apparatus embodying a reel and a reel-mounting carriage of a type disclosed in Patent No. 2,199,651, issued May 7, 1940, to R. T. Quick, such apparatus comprising, in general, a reel A, a reel carriage B, and a fixed frame F in which the carriage B is mounted for turning movement on a rod-feed axis along which a sewer tool drive rod D is fed into and withdrawn from a sewer.

The present invention provides, in combination with such reel, carriage and mounting, a suitable motor or engine E (e.g. a gasoline engine); a hydraulic pump P

(e.g. a gear pump or vane pump) driven by the motor E; a hydraulic motor M for rotating the reel A in a manner to feed or retract the drive rod D as indicated by the double arrow in FIG. 1; a motor N for turning the carriage B; a fluid-conducting and control circuit C (FIG. 2) for controlling the motor M; a fluid-conducting and control circuit G for controlling the motor N; and a rotary hydraulic coupling gland K included in the circuit C.

The reel A embodies suitable means for containing and controlling the egress and ingress of drive rod D through an open periphery thereof. Such means may include radial lugs **10** disposed at respective sides of the reel in opposed pairs and retainer fingers **11** having transverse swinging movements controlled by rollers **12** riding upon a cam track **13**, all as disclosed in detail in the aforesaid Quick patent. Reel A rotates on an axle **14** mounted in suitable brackets **15** on respective sides of frame B (one side being shown). Rotation of reel A to feed the drive rod D outwardly into a sewer is indicated by arrow **16**. Retraction of the rod is effected by rotation of the reel in the opposite direction. The drive rod D leaves the periphery of reel A at **17** and is guided through an arcuate guide tube **18** forming part of the carriage B. Reel A is driven through a crown gear **20** secured on its axle **14**.

Carriage B, which likewise may embody a construction shown in the aforesaid Quick patent, comprises, in general, respective end plates **21** and **22**, two pairs of rails **23** extending longitudinally between and attached to the end plates **21** and **22**, a tubular trunnion **24** journalled in a suitable pillow block bearing **25** of frame F, and a combined hydraulic gland core and trunnion **26** journalled in a pillow block bearing **27** of frame F, the trunnions **24** and **26** supporting the carriage B for turning movement about the feed axis of drive rod D, and the trunnion **24** functioning also as a guide throat through which the drive rod D is fed.

The carriage B is provided with a drive pulley **28** suitably attached to the carriage end plate **21** as indicated, and receiving drive from the hydraulic motor N for turning the carriage B.

Pulley **28** may be driven by a belt **29** which in turn may be driven by a drive pulley **30** on the shaft of motor N.

Drive rod D may be of the continuous type or the jointed type, the reel A being adapted for handling either type of drive rod.

Frame F is shown only fragmentarily, including a suitable horizontal chassis or floor structure **31** and suitable upright supports **32** and **33** for supporting the respective ends of the carriage B and the pillow blocks **25** and **27**. It is to be understood that the frame F will in most instances include suitable wheeled supports for transportation of the apparatus to and from a job and may also support a suitable housing structure for covering the mechanism and shielding it from the weather, dust, etc.

Motor or engine E can be of a combustion type as schematically indicated in FIG. 1 or in some instances may be an electric motor. It has a suitable drive connection to the pump P which normally will be a belt end pulley or chain and sprocket drive but which, for the purpose of illustration herein, is shown schematically as a shaft **34** extending to the pump P.

Motor M is mounted on the carriage B and swings in a planetary orbit around the feed axis as the carriage B turns. Motor M has a suitable drive connecting it to the crown gear **20** of reel A, which drive may comprise a pinion **35** driven by the shaft of motor M and driving a spur gear **36** on a shaft **37** carrying a bevel pinion **38** which meshes with the crown gear. Shaft **37** may be suitably journalled in bearings carried by the bracket **15** and by a bracket **39** of carriage B. Other equivalent means for transmitting drive from motor M to reel A can be employed.

Motor N is fixedly mounted on frame F as indicated in FIG. 1.

Motor N (and likewise motor M) may be of any conventional type of fluid motor (e.g. a gear type or a vane type or swash plate type) having respective inlet and outlet ports the functions of which may be reversed upon reversal of fluid flow, whereby these motors will turn in either direction as determined by the direction of flow.

Pump P is a constant-displacement hydraulic pump, preferably of vane or gear type. It may be a pressure-compensated pump which may, for example, be of the swash-plate type such as that shown in Patent No. 2,982,-218, issued May 2, 1961, to R. Lucien. It has an intake port connected by an intake conduit **40** to a hydraulic fluid storage tank T and a discharge port connected by a pressure conduit **41** which in turn is connected through a flow divider **42** to a pair of branch pressure conduits **43** and **44** leading to the control circuits C and G respectively.

Flow divider **42** is of a priority type operable to deliver fluid at a selected rate of flow, to the circuit G as a primary circuit, and the balance to the circuit C as a secondary circuit. Its outlet to conduit **44** is such as to determine the selected rate of flow to circuit G. Its outlet to conduit **43** is restricted by a pressure responsive valve which exerts sufficient resistance to maintain the selected rate of delivery to conduit **44** and yields to the excess over such selected rate at a pressure slightly higher than the back pressure in the outlet to conduit **44**. It has a pressure relief valve return connection **45'** which returns to tank T any excess over the combined deliveries to both lines **43** and **44**, at a pressure still higher than the pressure at which fluid is released to conduit **43**.

The control circuit C comprises the pressure line **43** leading to a four way flow-direction and volume control valve **55** having separate means for effecting control over the rate of flow and for reversing the direction of flow; a return line **45** leading from valve **55** back to tank T; a fluid line **46** leading from valve **55** to rotary coupling K, communicating with the pressure line **43** when the valve **55** is set for forward drive, and having a branch connection **46'** to a manual pressure control valve **50**; delivery and return lines **47** and **48** carried by and turning with carriage B, leading from the inner end of coupling K to the hydraulic motor M and returning therefrom to the coupling gland K; a return line **51** leading from the gland K back to the four way valve **55** and communicating with the return line **45** when the valve **44** is set in the forward drive position; and a relief line **49** leading from the valve **50** to the return line **45**.

The normal flow through valve **55** is indicated by the parallel arrows at the leftward side of the block diagram which indicates the valve, the upwardly pointing arrow indicating the flow from line **43** to line **46** and the downwardly pointing arrow indicating the flow from line **51** to return line **45**. When the valve **55** is actuated to the reverse position, the flows between lines **43** and **45** on the one hand and lines **51** and **46** on the other hand are crossed or reversed as indicated by the crossed arrows at the rightward end of the diagram of valve **55**.

The four way control valves **55**, **55'** in each instance may be of a rotary shear type adapted to shunt the flow from the pump directly back to the tank when in a neutral position, and in respective second and third positions, directing forward and reverse flows respectively to the motors M and N. Merely by way of schematic illustration of a possible construction for such a pump, but without limiting the invention thereto, FIG. 4 illustrates a rotary valve comprising a rotor **110** rotatable in a housing **111** having a cover **112**, inlet and tank return lines **43** and **45** communicating with one end face of rotor **110** through respective ports **43'** and **45'** (e.g. in cover **112**) and the delivery and return lines **46** and **51**

communicating witih the opposite end of the housing and with respective branching passages 113 and 114 which may be provided in that end of the housing or in the corresponding end of rotor 110. The rotor 110 may further be provided with a pair of through ports 115, 116 communicating with the branch passage 113, and with a corresponding pair of through ports 115', 116' communicating with the branch passage 114. A pair of diametrically opposed ports 117, 117', connected by a shunt passage 118 in rotor 110 can be registered with the ports of cover 112 at the ends of fluid lines 43, 45, for shunting the flow from the pumy back to the tank. The pair of ports 115, 115', likewise diametrically opposed, can be registered with the lines 43, 45 in a second position of the valve, at one side of the neutral position, to convey the flow from line 43 to line 46 and from line 51 back to line 45. A third pair of diametrically opposed ports 116, 116' can be registered with lines 43, 45 in a third position of the valve, for conveying reverse flows from line 43 to line 51 and from line 46 back to line 45.

The relationship between the areas of ports 43' and 45' and the spacings between rotor ports 117, 117' and the adjacent ports 115, 116' and 115', 116, is such that the ports 43', 45' can have simultaneous partial communication with return ports 117, 117' and ports 115, 115' or 116, 116', so that it is possible to adjust the valve to various positions in which the output of pump P is divided, in varying proportions, between return flow and delivery to motors M and N. This relationship between port areas and spacings is illustrated schematically by circumferential extension of ports 43', 45'.

Valve 50 is a pressure reducing valve (basically a pressure relief valve) which may incorporate a spring-loaded piston applying pressure to the fluid in the delivery line 46, together with suitable manually operable means (e.g. a hand-screw) for varying the loading of the spring. Varying the hydraulic pressure in this circuit is utilized to vary the amount of torque developed by the motor M, thus varying the pressure applied to the drive rod D by the reel A, and thereby protecting and giving "feel" to the rod (e.g., as it is being pushed into a sewer against the resistance of obstructing matter therein).

Control circuit G comprises the pressure line 44 delivering hydraulic liquid from pump P through flow divider 42 to a four-way valve 55' which may be of the same type as valve 55; a delivery line 56 communicating with the line 44' when valve 55' is in the forward drive position and delivering the pressure fluid to a cushion valve 57; a delivery line 58 leading from valve 57 to motor N; a return line 59 leading from motor N back to the cushion valve 57; a return line 60 leading from valve 57 back to valve 55'; and a return line 61 communicating with return line 60 when the valve 55' is in the forward drive position and leading from the valve 55' back to the tank T.

Flow volume control is a function of balanced pressure and discharge port area in the flow divider 42 which is effective in both forward and reverse positions of the valves 55, 55'. The rate of transmission of drive fluid to the motor M or motor N is varied in order to vary the speed of drive of the motor, by adjusting the respective valve 55 or 55' so as to direct part of the fluid to the respective motor while allowing the excess fluid to return to the tank through shunt passage 118.

Bypass valve 57 is a dual check valve which, as illustrated schematically in FIG. 8, has a passage 61 connecting the lines 56 and 58, a passage 62 connecting the lines 59 and 60, a check valve 63 providing a unidirectional shunting connection from passage 62 to passage 61 for shunt or bypass flow from line 59 to line 58 for forward drive over-run as described hereinafter, and a check valve 64 providing a shunting connection from passage 61 to passage 62 for shunt flow from line 58 to line 59 for reverse drive overrun. The excess pressure which opens one check valve for shunt flow will effectively maintain the other check valve in closed position.

In the operation of the circuit just described, the motor N will be driven in the forward drive direction in order to turn the carriage B in the forward direction for normal rotation of the drive rod D in a cleaning operation. If, during such an operation the volume of flow is reduced or cut off by actuation of the volume control function of valve 55', the carriage B will be permitted to coast or over-run the driving flow from valve 55', the flow bypassing from the return line 59 back to the inlet line 58 through the valve 57.

When the valve 55' is actuated to reverse position, the connections from line 56 to line 58 and from line 59 to 60 will be reversed, line 56 being connected to line 59 and line 58 being connected to line 60, thereby effecting reverse drive in motor N.

Rotary coupling gland K (FIG. 2) may comprise a casing 65 suitably mounted in pillow block 27; the gland core 26 (a cylindrical body having axially extending, radially spaced passages 66 and 67 therein and having respective annular passages 68 and 69 communicating respectively with the passages 66 and 67 near the outer end thereof; and having suitable connections between its inner end and the respective lines 47 and 48. The lines 47 and 48 are suitably attached to and carried by the frame B (as at 70) in fixed relation thereto. The inner end of gland core 26 may be secured in the hub of end plate 22 of carriage B, and thus the core 26 and the lines 47 and 48 will turn with the carriage B in fixed relation thereto, while hydraulic fluid is transmitted to the passages 66 and 67 through radial ports 71 and 72 which provide communication between the respective lines 46 and 49 and the respective annular passages 68 and 69. The cylindrical periphery of core 26 is hydraulically sealed by means of suitable gaskets 73 (e.g., O-rings) to the interior of casing 65 which has a bore 74 within which the core 26 is freely rotatable. Suitable bearings 75, within the pillow block 27 or within a counterbore in the casing 65 as shown may be utilized to support the core 26 for relatively frictionless turning within the pillow block.

In FIGS. 5 and 6, the invention utilizes a reel A' mounted in frame F' for turning movement about the axis of feed of the drive rod D', a carriage B' also mounted in the frame F' for turning movement about the feed-axis; feed roll mechanism H mounted in the carriage B' for effecting the longitudinal feed of the rod D along the feed axis; a prime mover (motor or engine) E driving a hydraulic pump P; a hydraulic motor M mounted on the carriage B' and driving the roll-feed mechanism H; a motor N for turning the carriage B' and the reel A' about the feed-axis; and control mechanism C' (including the control circuits C and G of FIG. 2) for controlling the motors M and N in the same manner as in FIGS. 1–3.

The reel mechanism A' embodies a conical cage which may be the same as the outer cage disclosed in the application of Peter L. Ciaccio, Serial No. 295,124, filed July 15, 1963, for Reel Mechanism for Feeding Sewer Cleaning Tool Drive Rod, or as disclosed in somewhat different specific form in my Patent No. 3,071,794, issued January 8, 1963, for Reel Feed Mechanism for Feeding and Rotating Sewer Cleaning Tool Drive Rod.

In general, it comprises a back member 80 consisting of a plurality of spokes of rod material secured to and radiating from a hub 81 which has an axle 82 journalled in a pillow block bearing 27' on an upright support member 33' constituting part of the frame F'. The spokes of back member 80 are continued forwardly to provide a plurality of circumferentially spaced peripheral bars 83 defining the periphery of a reel chamber 84 in which the drive rod D is stored; and the rod members 83 are continued forwardly and inwardly in a conical array of circumferentially spaced converging bars 85 which are then bent forwardly, parallel to the feed-axis in a plurality of parallel bars 86 in cylindrical array, secured by axially spaced spider or discs 87 and 88, the latter functioning as a brake drum. A tubular trunnion 24', secured

to the brake drum **88**, projects forwardly through a pillow block bearing **25'** carried at the top of an upright member **32'** of the frame F', and cooperates with the axle **82** in supporting the reel A' for turning movement about the feed axis. The inner side of reel chamber **84** is defined by a series of shoulder bars **90** in circumferentially spaced cylindrical array, secured at their rear ends to respective spokes **80** and supported at their forward ends by a series of spokes **91** secured to and radiating from the axle **82**. Rotatably mounted on the forward end of axle **82** is a rod guide unit **92** which may be similar to that disclosed in the aforesaid Ciaccio application Serial No. 295,124.

It is to be understood that FIG. 5 of the drawings herein is schematic in its showing of the parts described above, and reference is made to the aforesaid Ciaccio application and my aforesaid Patent No. 2,071,794, for a more detailed disclosure of this reel cage structure and the free-wheeling guide unit **92**.

The carriage B' may comprise generally a pair of parallel, laterally spaced side plates **95** and **96** secured at one end to a drive sprocket **97** which in turn is secured to the forward end of the tubular trunnion **24'**, whereby the sprocket **97'** may simultaneously transmit turning movement both to the reel A' and to the carriage B'. The forward ends of side plates **95, 96** are secured to a suitable end disc **97** which in turn is secured to the rotatable core **26'** of the hydraulic coupling gland K'.

Between the side plates **95, 96** are several pairs of feed rolls **98** having respective shafts **99** journalled in and extending through the plates **95, 96**. On one side of the carriage B', the shafts **99** are coupled by meshing spur gears **100** connected in a train by pinions **101**.

Hydraulic motor M is mounted on the side plates **95** and **96** and its shaft carries a pinion **102** which transmits drive to a gear **103** on one of the shafts **99**, from which drive is transmitted to the other shaft **99** through the chain of gears **100, 101**. Motor M turns bodily with the carriage B', in a planetary orbit.

Motor N has a driving connection to the sprocket **97** consisting of a sprocket pinion on its output shaft and a chain connecting this pinion to the sprocket **97**, the pinion and chain being designated collectively **105**.

We claim:

1. Sewer rod feeding apparatus comprising: rotatable means for feeding sewer tool drive rod longitudinally along a feed axis; a carriage in which said feeding means is mounted for feeding rotation; means for turning said carriage about said feed axis so as to transmit rotary drive to the drive rod being fed along said axis; an hydraulic motor mounted on said carriage and turning bodily therewith; means for transmitting drive from said motor to said rod-feeding means for effecting rod-feeding rotation thereof; pumping means; conduit means for circulating hydraulic fluid under pressure from said pumping means to said hydraulic motor and back to said pumping means for driving said motor; and control means for controlling the operation of said hydraulic motor by controlling the hydraulic fluid flowing in said conduit means.

2. Sewer rod feeding and rotating means as defined in claim 1, including support means in which said carriage is mounted for said turning movement about said feed axis and on which said pumping means is mounted in a fixed position; said conduit means including a rotatable hydraulic coupling gland forming a portion of said conduit means, the latter including fixed portions extending between said pumping means and said gland, and including fluid lines extending between said gland and said motor and turning bodily witih said carriage.

3. Apparatus as defined in claim 2, wherein said control means is interposed in said fixed portions of said conduit means.

4. Apparatus as defined in claim 1, wherein said control means includes a control device operable to vary the flow rate of hydraulic fluid to said motor and thereby to effect infinitely variable control of the rate of rod-feeding rotation of said feeding means.

5. Apparatus as defined in claim 1, wherein said control means includes a control device operable to variably control the pressure of hydraulic fluid in said conduit means so as to vary the intensity of feeding drive applied to said drive rod.

6. Apparatus as defined in claim 1, wherein said control means includes a valve for reversing the connections between the pressure lines and return lines between said pumping means and said motor, whereby to effect reversal of drive in said motor.

7. Apparatus as defined in claim 1, wherein said means for turning said carriage comprises an hydraulic motor having a drive connection to said carriage; and an hydraulic circuit for delivering pressure fluid to said carriage-turning motor from said pumping means and returning it thereto; and means for controlling the flow in said hydraulic circuit for controlling said carriage turning motor.

8. Apparatus as defined in claim 7, wherein said conduit means and said hydraulic circuit constitutes separate parallel circuits between said pumping means and the respective hydraulic motors; and wherein each of said parallel circuits includes therein a reversing valve for reversing the connections between the pumping means and the respective motor whereby to reverse the drive in the respective motor.

9. Apparatus as defined in claim 1, wherein said feeding means comprises a reel mounted on said carriage for rotation about a reel axis at right angles to said feed axis and operable by said rotation to effect said longitudinal feeding of the drive rod, said means for transmitting drive comprising a direct driving connection between said motor and said reel.

10. Apparatus as defined in claim 1, including a reel mounted coaxially with said carriage for turning movement about said feed axis and operable to store the drive rod in coiled condition therein; and wherein said feeding means comprising opposed feed elements carried by said carriage and engageable with opposite sides of said drive rod for transmitting longitudinal movement thereto.

11. Apparatus as defined in claim 1, including a reel mounted coaxially with said carriage for turning movement about said feed axis and operable to store the drive rod in coiled condition therein and wherein said feeding means comprises a pair of feed rolls mounted in said carriage in opposed relation with said drive rod engaged tangentially between them, and wherein said means for transmitting drive comprises driving connections between said hydraulic motor and said feed rolls for rotating them in opposite directions, said hydraulic motor being mounted eccentrically on said carriage and executing an orbiting movement in response to the turning of said carriage.

12. Sewer rod feeding and rotating apparatus comprising: means for feeding sewer tool drive rod longitudinally along a feed axis; a carriage in which said feeding means is mounted; a frame mounting said carriage for turning movements about said feed axis; a first hydraulic motor mounted on said frame; means for transmitting drive from said motor to said carriage for effecting said turning movements; a second hydraulic motor carried by said carriage and bodily turning therewith; means for transmitting drive from said second motor to said feeding means; means for pumping hydraulic fluid under pressure; and conduit means for conducting said fluid between said pumping means and both said motors, said conduit means providing two parallel circuits each comprising delivery and return fluid lines connected at one end to said motor, one of said circuits including hydraulic lines carried by said carriage and bodily turning therewith, a rotary coupling gland including a part fixed with reference to said frame and a coupled rotary part turning with said carriage, said hydraulic lines at their other end being connected to said rotary part, and fluid delivery and

return lines extending between said pumping means and said fixed gland part.

13. Apparatus as defined in claim 12, including a valve in the hydraulic circuit for enabling said carriage to overrun the hydraulic drive from said pump when the latter is shut off or restricted.

14. Apparatus as defined in claim 12, including reversing valves in each of said parallel circuits, operable to reverse the connections between the pump and said delivery and return fluid lines of each of said circuits, whereby to effect reversal of the drives in the respective motors.

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