SPRING FEED DEVICE

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3,224,024 12/1965 Hunt ......................... 15/104.3 SN
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ABSTRACT

A feed control apparatus for use in conjunction with a plumbing tool of the type used for cleaning and removing obstructions from drain pipes in which an elongated coiled spring wire, or plumber's snake, is advanced through the pipe and rotated. The feed control apparatus includes a novel combination snake feed and chucking device which supports the rotating snake at all times and automatically controls the rate of feed of the snake through the pipe in accordance with the resistance encountered. Upon the snake encountering a blockage in the pipe which results in torque buildup in the snake, the rate of feed will be automatically slowed to permit the snake to work its way past the obstruction. If the blockage cannot be penetrated so as to permit further advance of the snake, the rate of feed will automatically be reduced to zero, thereby preventing damage to the equipment or possible injury to the operator.

16 Claims, 8 Drawing Figures
SPRING FEED DEVICE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention has to do generally with plumbers tools used for cleaning and removing obstructions from drain pipes and utilizing an elongated member in the form of a coiled spring wire, known as a plumbaspring, which is advanced through the pipe and rotated. More particularly, the invention relates to the provision of a novel, automatic feed device which will accommodate springs or snakes of various diameters, will accommodate distortions in the spring and will automatically vary the rate of axial feed of the spring relative to the impedance encountered by the spring as it advances through the pipe.

2. Discussion of the Prior Art

Spring-type plumbers snakes are ordinarily housed in a drum or container having a conoidal wall through which the spring or snake is fed and retracted axially of itself as the container is rotated to cause rotation of the spring. In conventional tools having power-operated spring advancing and retracting means, the feed mechanism typically includes a jaw in the form of a segmented nut, or the like, through which the spring is fed by rotating it so that, in effect, the spring is threaded through the jaw. Since the jaw is stationary, the rate of feed of the spring or snake is entirely dependent upon its speed of rotation. Further, the stationary jaw cannot accommodate irregularities in the spring such as kinks, couplings and the like and if such irregularities are encountered, serious damage to the equipment can result. Also, should the spring or snake encounter a restriction within the pipe which it cannot penetrate, the driving torque will build up against the stationary jaw causing the snake to kink and frequently break, thereby creating a significant safety hazard.

Various attempts have been made in the past to design a snake feed device which would permit the operator to quickly stop the feed should a blockage be encountered within the pipe. Among the most successful of these prior art devices are the devices invented by Hunt, et al., and described in U.S. Pat. Nos. 2,769,191, 3,224,024 and 3,499,782. These devices, while clearly superior to similar units on the market, nevertheless have the drawback that the feed jaws cannot accommodate any appreciable distortion in the spring and the feed of the spring is controlled entirely by the operator. Unless the operator is continuously alert to any indication of impedance to forward feed of the spring within the pipe, and quickly responds by stopping the feed, the buildup of driving torque can cause serious damage to the equipment and possibly injure the operator as well.

The novel construction of the device of the present invention solves the aforementioned problems by providing a novel spring loaded combination chucking and feed mechanism which can readily accommodate distortions or couplings in the spring and additionally automatically regulates the rate of feed of the snake from zero to approximately 12 feet per minute depending upon the impedance encountered by the snake. For example, upon encountering a blockage in the pipe which results in a torque buildup in the snake and an impedance to further forward feed, the rate of feed will be automatically slowed to permit the snake to work its way past the obstruction. If the blockage is such that the snake cannot penetrate it, the impedance to forward movement of the snake is immediately sensed by the feed device and the rate of feed is instantly reduced to zero without any corrective action being required by the operator. This way, the safety of the operator is assured and damage to the snake or to other parts of the equipment is prevented.

In addition to the patents to Hunt, et al., previously identified, applicant is aware of the prior art patent to Turnbaugh, U.S. Pat. No. 2,600,707, which is clearly distinguishable from the present invention.

SUMMARY OF THE INVENTION

It is a primary object of the present invention to provide a plumbing tool of the type which uses an elongated coiled spring wire, or snake which is rotated and fed into drain pipes and the like, in which there is provided a novel spring loaded combination chucking and snake feed mechanism which continuously supports the rotating snake and which, during the feed mode, automatically controls the rate of feed of the snake into the pipe in accordance with the degree of impedance encountered by the snake as it is fed into the pipe.

It is another object of the present invention to provide a device of the aforementioned character in which the feed mechanism automatically adjusts to various coiled spring, or snake, diameters and to widely varying conditions of snake distortion.

It is another object of the present invention to provide a tool of the class described in which the feed mechanism can function as a chucking device to rotatably support the snake during a dwelling mode, i.e., at zero feed, and can be expeditiously activated to a feed mode whereby the snake can be controllably fed in a forward or reverse axial direction relative to the feed mechanism.

It is still another object of the invention to provide a device of the aforementioned character in which the feed mechanism includes snake engaging elements moveable into and out of driving engagement with the snake and further includes a biasing mechanism for yieldingly urging the snake engaging elements into driving engagement with the snake which is so constructed and arranged as to permit the elements to move out of driving engagement with the snake in response to forces opposing feeding of the snake axially of itself.

It is a further object of the invention to provide a device as described in the preceding paragraph in which the biasing mechanism is adjustable so that the force exerted thereby to hold the snake engaging elements in driving engagement with the snake may be controllably varied.

More particularly, it is an object of the invention to provide a novel feed mechanism embodying a plurality of arcuate spaced radially movable rotating feed rollers which can be moved into and out of driving engagement with the rotating snake. The mechanism is constructed so that when the feed rollers are in driving engagement with the snake, the entire assembly can function as a chucking device and rotate with the snake. Alternatively, the rotation of the mechanism can be stopped, thereby causing the feed rollers to rotate in an opposite direction relative to the rotation of the snake. Because the feed rollers rotate relative to the snake and because they are constructed with specially configured helical grooves about their periphery, the snake will be fed at a significantly advanced rate of speed as compared with a standard stationary jaw type device.
It is still another object of the invention to provide a device as described in the preceding paragraph in which the feed rollers of the feed mechanism are movably radially outwardly relative to the snake against the urging of a biasing means operatively coupled with the feed mechanism and adapted to normally urge the rollers into engagement with the snake. This unique construction permits the feed mechanism to automatically sense and effectively accommodate torque buildup and distortions of the snake.

It is a further object of the invention to provide a novel, low-cost, lightweight, continuous chucking, automatic feed apparatus which is relatively simple in design, can be readily attached to tools presently on the market, and is extremely durable and reliable in operation.

In summary, these and other objects of the invention can be accomplished by a feed control apparatus for use with plumbing tools of the type having an elongated coiled spring wire or plumbers snake and a mechanism for rotating the snake about its longitudinal axis comprising a snake engaging subassembly movable into and out of driving engagement with the snake, an operating subassembly operably coupled with a snake engaging subassembly for moving the snake engaging subassembly into driving engagement with the snake, and a biasing subassembly operably coupled with the operating subassembly for yieldably urging the operating subassembly into driving engagement with the snake. The biasing subassembly is so constructed and arranged as to permit the snake engaging subassembly to move out of driving engagement with the snake in response to forces opposing feeding of the snake axially of itself.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of the plumbing tool of the invention including the automatic plumbers snake feed control device.

FIG. 2 is a slightly enlarged view taken along lines 2—2 of FIG. 1 showing the plumbers snake feed control device of the invention.

FIG. 3, taken along lines 3—3 of FIG. 2, is a greatly enlarged cross-sectional view of the feed control device of the invention as it appears at rest.

FIG. 4 is a cross-sectional view taken along lines 4—4 of FIG. 3 partly broken away to show internal construction. The phantom lines in FIG. 4 illustrate the position of the control lever of the feed control device when the device has been actuated.

FIG. 5 is a cross-sectional view similar to FIG. 3, but showing the appearance of the part of the device after it has been actuated to bring the feed rollers thereof into operable engagement with the rotating snake.

FIG. 6 is a cross-sectional view taken along lines 6—6 of FIG. 5.

FIG. 7 is a cross-sectional view taken along lines 7—7 of FIG. 5, but shown with the stop lever in its actuated, or downward, position.

FIG. 8 is a cross-sectional view taken along lines 8—8 of FIG. 6.

DESCRIPTION OF ONE EMBODIMENT OF THE INVENTION

Referring to the drawings, FIG. 1 shows the plumbing tool of the invention generally designated by the numeral 12. The tool includes a snake housing 14 in which may be coiled a plumbers snake 16, shown as a tightly coiled spring wire or cable. The housing 14 has mounted thereon a reversible electric motor 18 which is used for rotating the housing and the coiled spring or snake encased therein, either in a clockwise or counterclockwise direction. The housing and the motor are mounted on a wheeled cart 20 for ease of transport and are interconnected in a conventional manner to permit controlled rotation of the housing. Snake housing 14 is provided with an opening 22 which is concentric with the axis of rotation of the housing and through which the rotating coiled spring 16 may be fed.

The automatic feed control apparatus of the invention, generally indicated by the numeral 24, is located forwardly of the snake housing and, as shown in FIG. 2, is affixed to a bracket 26 on cart 20 by means of threaded studs 28.

Turning now particularly to FIGS. 2, 3 and 4, the feed control apparatus of the invention can be seen to include a transmission housing 30 having a forward cover plate 32. The housing and cover plate, which are removably interconnected by threaded connectors or the like, may be constructed of a durable metal or plastic material and are provided with an axial passageway 34 coaxially disposed with respect to opening 22 in the snake housing 14.

A first means, which functions as a combination chucking and feed mechanism, is generally designated by the numeral 36. First means 36 is rotatably carried by housing 30 and is adapted to supportably engage the rotating snake 16. In the embodiment of the invention illustrated in the drawings, means 36 comprises a snake engaging means movable into and out of operable engagement with the snake for supporting the rotating snake during the dwell mode and for controllably feeding the snake in an axial direction during the feed mode, and support means for carrying the snake engaging means rotatably within housing 30. The snake engaging means is provided with an axial passageway 38 concentric with passageway 34 for reception of the snake 16 and includes a plurality of areately spaced radially movable segments 40 disposed in slidable engagement with a rear, generally circular shaped, support plate 42 which plate forms a portion of the support means of first means 36.

As best seen by referring to FIGS. 3 and 6, each segment 40 of the snake engaging means is provided with a concave cavity portion 44 adapted to accommodate a snake driving means depicted here in the form of specially configured feed rollers 46. Each feed roller is generally cylindrical in shape and has a plurality of helical grooves formed on its outer periphery which are adapted to matably engage the coils of the coiled spring wire or snake. As shown in FIG. 3, each feed roller 46 is provided with bushings 47 and is rotatably mounted on an axle member 48 which, in turn, is rotatably supported in coaxial bores 50 formed in each segment 40. Axle member 48 has an enlarged diameter head 52 at one end and a keeper ring 53 near its opposite end. Keeper ring 53 serves to locate the axle longitudinally of the segment 40.

Each segment 40 along with its rotatably mounted feed roller 46 is supported within housing 30 by a support means shown here as comprising, in addition to the previously mentioned rear support plate 42, a generally circular forward support plate 54 carried by a rotating spindle member 56 and a generally circular intermediate or spacer plate 58. Spacer plate 58 is provided.
with a plurality of radially outwardly extending slots 59, the purpose of which will be discussed shortly. Provided within bearing ways 60 formed in cover plate 32 are roller bearings 62 adapted to rotatably support the spindle member 56. Spindle member 56 has an inside diameter slightly larger than snake 16, an outside diameter slightly smaller than the axial passegeway 64 formed in cover plate 32 and is held in position within passegeway 64 by a ring member 66. Plates 42, 54 and 58 are suitably interconnected together by rivets or the like and cooperate to operatively support segments 40 so that the entire assembly thereby can rotate freely about the longitudinal axis of housing 32.

As shown in FIG. 3, when the feed means is assembled together, the enlarged diameter head portion 52 of each axle member 48 is disposed between forward support plate 54 and the rearward support plate 42 and within slots 59 formed in the spacer plate 58.

Referring to FIG. 7, which is a view more clearly illustrating the configuration of support plate 42, it can be seen that each axle member 48 of the feed means protrudes through a guide slot 68 formed in support plate 42. The guide slots 68 in plate 42 extend outwardly from the longitudinal axis of the assembly in the same manner as the slots 59 formed in spacer plate 58, but have a width only slightly larger than the diameter of the axle 48 and somewhat smaller than the diameter of the head portion 52. With this construction it can be seen that when keeper rings 53 are in place on axles 48, the radially extending forward faces of segments 40 are held in slidable engagement with the rearwardly facing surface of support plate 42. Because of the spacing between the support plates and due to the configuration of the slots 68, which act as guides to the axles 48, each segment 40 is free to move radially inwardly and outwardly relative to the snake 16. In this way, the feed rollers 46 carried by segments 40, may be selectively moved into and out of operative engagement with the snake 16.

Referring now to FIG. 6, it can be seen that the snake engaging means also includes a first biasing means, shown here in the form of coil springs 70, disposed between segments 40, which biasing means is provided for yieldably resisting inward radial movement of segments 40 so as to normally hold the feed rollers 46 out of engagement with the snake in the manner shown in FIG. 3. To bring the feed rollers 46 into operative engagement with the snake 16, it is necessary to move segments 40 radially inwardly against the urging of the first biasing means. This is accomplished by a second or operating means generally designated by the numeral 74. Second means 74, which is operatively coupled with first means 30, comprises interengaging means 76 rotatably carried within housing 30 and movable into mating engagement with first means 36 for moving the snake engaging means of the first means into operative engagement with the snake 16. As best seen in FIG. 4, second means 74 also includes a control means 77 cooperatively associated with housing 30 for operating interengaging means 76.

In the form of the invention shown in the drawings, interengaging means 76 includes a generally conical shaped member 78 (FIG. 3) which is rotatably carried within housing 30 by a rotating spindle member 80. Provided within a ring shaped loading member 82 which is carried within housing 30 and which forms a part of control means 77 are bearing ways 84 adapted to carry roller bearings 86 which function to rotatably support spindle member 80. As illustrated in FIG. 5, loading ring 82 is movable longitudinally of housing 30 by means of a control rod assembly 88 which, in this embodiment of the invention, also forms a part of control means 77.

Referring to FIGS. 2 and 4, control rod assembly 88 can be seen to comprise a control rod 90 threadably connected to loading ring 82 and extending radially outwardly from housing 30. Control rod 90 is movable with respect to housing 30 along a prescribed arcuate path defined by a cam slot 92 (FIG. 2) formed in housing 30. Because of the shape of slot 92, movement of control rod 90 within slot 92 results in the movement of loading ring 82 forwardly and rearwardly within housing 30. Control rod assembly 88 also includes a sleeve member 94 (FIG. 4), a biasing spring 96 and a spherically shaped handle element 98 affixed to control rod 90. When the control rod assembly is in the locked position, as shown by the solid lines in FIG. 4, the lower end of sleeve 94 is closely received within a cylindrically shaped opening 93 which is formed in housing 30 at one extremity of slot 92. To enable the control rod to be moved into the position shown by the phantom lines in FIG. 4, a threaded slot 99 in turn moves the loading ring 82 forwardly of housing 30, the sleeve 94 must be raised against the urging of spring 96 until it clears spring 93. A threaded set screw 97 is threadably connected to loading ring 82 at a location diametrically opposed to rod 90. Set screw 97 is adapted to move within a second slot 99 formed in housing 30 and serves to hold the control assembly in proper alignment so as to prevent cocking and possible binding of control rod 90 in slot 92.

As illustrated in FIGS. 3 and 5, segments 40 of first means 36 cooperate to form a generally frustoconical shape having inwardly sloping sides 100 adapted to mate with the inner surfaces of members 78 of second means 74. With this construction, when the control rod assembly is released from its locked position and loading ring 82 is moved forwardly or to the left of housing 30 to the position shown in FIG. 5, segments 40 will in turn be moved radially inwardly due to the camming action of member 78. As shown in FIG. 5, this will result in rollers 46 moving into operative engagement with the snake or coil spring 16. With the device in the configuration shown in FIG. 5, and with the snake 16 rotating about its longitudinal axis, interengaging means 76, along with first or chucking means 36, will rotate freely about the longitudinal axis of housing 30. In this mode of operation, called the dwell mode, the snake 16 is held in a chucking relationship and will move neither forwardly nor rearwardly with respect to housing 30.

An important feature of the present invention is the provision of a second biasing means cooperatively coupled with the first and second means 36 and 74 for normally holding the snake engaging means in driving or feeding engagement with the snake. In the form of the invention shown in the drawings, the second biasing means comprises a conically shaped coil spring 102. As will presently become clear, the second biasing means is responsive to forces resisting feeding of the snake so as to permit the snake engaging means to move out of normal driving engagement with the snake in response to such forces. As illustrated in FIGS. 3 and 5, the second biasing means or spring 102 is constructed and arranged so as to continuously urge conical member 78
of second means 74 into operable engagement with segments 40 of first means 36. In this way, the rollers 46 of the snake engaging means are continuously, but yieldingly, urged into frictional driving engagement with snake 16.

The second biasing means of the invention also includes an adjustment means for adjusting the loading of the second biasing means or spring 102. As shown in FIG. 3, in this form of the invention the adjustment means includes an adjusting ring 104 which is slidable received within the axial passageway 34 formed in housing 14. Ring 104 has a shank portion 105 end a radially extending flange portion 106 at its left or forward extremity which normally engages the end wall 108 of housing 30. This flange portion is provided with a plurality of accurately spaced holes 110 adapted to receive a locking pin member 112 carried by end wall 108 and extending a short distance into housing 30. As shown in FIG. 3, one extremity of spring 102 is connected to loading ring 82 and the other end is connected to adjusting ring 104. The shank portion 105 of ring 104 extends rearwardly from housing 30 and is provided with a plurality of openings 114 adapted to receive a tool such as a spanner wrench or the like for turning ring 104. To adjust the torque load on spring 102, ring 104 is forced inwardly into the housing a sufficient distance to clear the end of pin 112 and it is then turned so as to either coil or uncoil spring 102. When the desired spring loading is achieved, inward pressure on ring 104 is relieved and the ring is turned slightly until the end of pin 112 falls into the nearest opening 110 formed in flange 106 of ring 104. It is to be understood that the greater the loading on the spring, the greater will be the resistance to rearward movement of interengaging means within housing 30. Stated another way, the greater the loading on spring 102, the greater will be the camming pressure exerted by cone member 78 against segments 40 and the greater will be the resultant gripping pressure exerted by rollers 46 against the coiled spring or snake 16.

Referring now to FIGS. 6 and 7, the stop means or feed control means of the invention is generally designated by the numeral 116. The purpose of the stop means is to permit the operator to stop the rotation of first means 36, and thereby cause the snake 16 to be fed forwardly or rearwardly of the housing depending upon the direction of rotation of the motor 18. As best seen in FIG. 7, in this form of the invention the stop means 116 comprises a lever arm 118 pivotally connected to housing 30 by means of a pivot pin 120. A piston 122 is connected to lever arm 118 and is adapted to be moved within a bore 124 formed in housing 30 and cover plate 32 into and out of braking engagement with first means 36 upon corresponding upward and downward movement of lever arm 118. A spring 126 is interposed between arm 118 and housing 30 to normally hold the lower arm in an upward position.

When the lever arm is in its normal upward position, as shown in FIG. 6, and the feed rollers 46 are in engagement with the rotating snake 16, first means 36, along with interengaging means 76, are free to rotate within housing 30. The tool is now in the dwell or chucking mode. When the lever arm 118 is moved downwardly into the position shown in FIG. 7, piston 122 is moved into frictional engagement with the support ring assembly of first means 36 causing the first means to stop rotating within housing 30. This will cause the feed rollers 46 to start to rotate in a direction opposite the direction of rotation of the snake and, due to the novel configuration of the helically grooved rollers, will cause the snake to be fed axially of itself at a rate proportional to the speed of rotation of the snake.

Turning to FIG. 8, it can be seen that the rollers 46 are mounted within segments 40 at a slight angle of an order of 7° relative to the longitudinal axis of the snake. As is fully described in U.S. Pat. No. 3,224,024, issued to Hunt, this novel configuration, along with the unique design of the helical grooves or channels formed around the periphery of the rollers, causes the snake to be fed at a rate several times faster than is possible with conventional tools embodying stationary feeding jaws.

**OPERATION**

With the apparatus of the invention assembled as shown in FIGS. 1, 2 and 3, and with the end of the coiled spring or snake 16 inserted into the pipe to be cleaned, cleanout operations can be commenced. By activating motor 18, snake housing 14 along with snake 16 can be caused to rotate in a clockwise direction. To move the snake engaging means of first means 36 into chucking engagement with the snake, the control rod assembly 88 of control means 77 is moved from the position illustrated by the solid lines of FIG. 4 into the position shown by the phantom lines. This is done by lifting up on sleeve 94 against the urging of spring 96 until the lower end of the sleeve clears opening 93 formed in housing 30. Once the lower end of sleeve 94 clears opening 93, the second biasing means or spring 102, which is coiled as shown in FIG. 3, will urge loading ring 82 forwardly of housing 30 into the position shown in FIG. 5. This, in turn, causes the control rod 90 which is threadably connected to ring 82 to move forwardly of housing 30 within slot 92. Forward movement of ring 82 also causes conically shaped element 78 of interengaging means 76 to move forwardly of housing 30 in operative engagement with the sloping walls 100 of segments 40 of first means 36, thereby camming the segments 40 inwardly against the urging of the first biasing springs or springs 70 (FIG. 6). When the components of the drive control mechanism reach the position shown in FIGS. 5 and 6 of the drawings, rollers 46 of the snake engaging means will be urged into gripping engagement with the rotating snake 16 and the entire assembly comprising first means 36 and interengaging means 76 of second means 74 will be caused to rotate on roller bearings 62 and 86 about the longitudinal axis of housing 30. The unit is now in the dwell mode with snake 16 being supported in a chucking relationship by rollers 46.

To move the unit into a feed mode so as to feed the coiled spring or snake axially of itself into the pipe to be cleaned, the stop or feed control means of the invention must be activated. This is accomplished by the operator pushing down on feed control lever 118 so as to cause piston 122 to move into engagement with the support means or supporting rings 42, 54 and 58, as shown in FIG. 7, with sufficient force to stop the rotation of first means 36 and interengaging means 76. When the rotation of these subassemblies is stopped, the rotation of snake 16 will cause rollers 46 to rotate relative to segments 40 about axes 48 in a direction opposite to the direction of rotation of the snake. As previously discussed, due to the novel design of the helical grooves formed about the periphery of the rollers 46,
the snake will be fed forwardly of housing 30 at a rate of speed proportional to the speed of rotation of the snake.

So long as the feed control lever is held down so as to preclude rotation of the chucking assembly or first means 36 and so long as the snake can move forwardly within the pipe without encountering significant impedance to such forward movement, the snake will feed into the pipe at a generally uniform rate of speed. Because of the novel design of the mechanism, the feed control apparatus can accommodate deformations in the snake such as kinks or couplings without endangering either the equipment or the operator. Referring to FIG. 5 and assuming piston 122 is depressed so as to place the device in the feed mode, it can be seen that any kink, coupling or other deformation in the snake encountered by the feed rollers 46 will generate a force vector tending to move the rollers radially outwardly. This force vector, in turn, is transmitted to the sloping inner walls of conically shaped element 78 of interengaging means 76 where it will be translated into a force vector tending to move loading ring 82 axially rearwardly of housing 30 against the urging of the second biasing means or spring 102. When this force vector reaches sufficient magnitude to overcome the resistance of spring 102, the entire second means 74 will be moved rearwardly of housing 30. The control rod assembly 88 will move in a counterclockwise direction, as viewed in FIG. 4, and the snake engaging means will move toward the configuration shown in FIG. 3. This separation of the rollers 46 will, of course, permit the deformation in the spring to pass. Once the deformation has passed, the second biasing means or spring 102 will again urge the interengaging means rearwardly of the housing, thereby camming the rollers 46 into gripping engagement with the coiled spring and causing the spring to be threaded forwardly relative to the rollers.

The ability of the snake engaging means to automatically move into and out of engagement with the snake against the urging of the second biasing means in the manner just discussed also constitutes an important safety feature of the invention. For example, in the eventuality that the snake encounters a blockage in the pipe which impedes its forward movement, unless the forward speed of the snake can be instantaneously slowed, or in some instances completely stopped, the equipment can be seriously damaged and the operator exposed to risk of significant injury. Because of the novel and unique arrangement of the feed control device of the present invention, however, the rate of feed of the snake in such eventualities is automatically controlled and the possibility of damage to the equipment or injury to the operator is effectively eliminated.

Again referring to FIG. 5, and assuming the device has been placed into the feed mode by depressing piston 122, it can be seen that spring 102 imparts an axial force to conically shaped member 78 through ring 82. This force is translated into a radial force vector causing inward movement of segments 40 and, in turn, causing rollers 46 to move into gripping engagement with snake 16. When the snake is feeding normally at a rate of on the order of 12 feet per minute, the rollers are held in normal frictional driving engagement with the rotating snake by the urging of spring 102. However, when the snake encounters an impedance to forward movement, such impedance is instantaneously sensed by the snake engaging means in the form of a force vector opposing forward feed of the snake. Because of the novel design of the helically-grooved rollers, this force vector is translated into a radial force vector tending to move the rollers radially outwardly in opposition to the force exerted by spring 102. This radial force vector causes the rollers to grip the snake with less force and, therefore, permits slippage between the rollers and the snake, which in turn, results in a decreased rate of feed of the snake proportional to the impedance encountered. If the blockage within the pipe is so severe that the snake cannot work its way past the obstruction and further forward, feed of the snake becomes impossible. The resultant rearwardly directed force vector will simply cause the rollers to automatically move radially outwardly in a repetitive ratcheting-like manner with the helical grooves, in effect, jumping over the coils formed in the spring. In this way the forward feed of the snake is immediately and automatically reduced to zero. The operator can then reverse the motor so that the snake can be safely withdrawn from the pipe by the resultant reversed rotation of the rollers 46.

A further safeguard is also inherent in the construction of the stop means itself. For example, if torque conditions become extreme, a slippage between the piston 122 and surfaces 54, 58 and 42 will result permitting the assemble to rotate within the housing thereby reducing the feed rate. Additionally, the operator can, of course, at any time release the feed lever 118 at any visual sign of extreme torque conditions, thus instantly returning the feed rate to zero and returning the grooved rollers to a grip action on the coiled spring.

If slippage of the rollers relative to the snake is greater than desired, the loading on spring 102 can be increased by means of the loading adjusting mechanism in the manner previously described. Increased loading on the spring will, of course, cause the rollers 46 to be urged against the snake with greater force and the opposing vertical force vector generated by impedance to forward movement of the snake must be of greater magnitude to affect radially outward movement of the rollers and concomitant slippage between the rollers and the snake.

By automatically controlling the feed of the snake in proportion to the impedance encountered by the snake within the pipe, the cleaning efficiency of the tool is significantly enhanced, damage to the snake due to excessive torque buildup within the snake is avoided, and, most importantly, the operator is fully protected from serious injuries which can be caused by the highly dangerous whipping action of broken or overstressed coil spring snakes.

I claim:

1. A plumbing tool for use in cleaning out drains, conduits and the like comprising:
   a. an elongated coiled spring plumbers snake,
   b. means for rotating said plumbcrs snake about its longitudinal axis;
   c. first means including snake engaging means movable into and out of operable engagement with said plumbers snake for feeding said snake in an axial direction, said first means also including first biasing means for yieldably holding said snake engaging means normally out of engagement with said snake;
d. second means movable into operable engagement with said first means for moving said snake engaging means into engagement with said snake against the urging of said first biasing means; and
e. second biasing means for yieldably urging said second means into operable engagement with said first means, said second biasing means being responsive to forces opposing axial feeding of said snake so that said snake engaging means will automatically move out of engagement with said snake in response to such forces.

2. The plumbing tool as defined in claim 1 in which said snake engaging means is rotatable with respect to said plumbers snake and comprises:
a. a plurality of arcutely spaced supporting segments radially movable toward said plumbers snake against the urging of said first biasing means; and
b. snake driving means rotatably carried by said supporting segments for driving said snake axially of itself upon relative rotation between said snake driving means and said snake.

3. The plumbing tool as defined in claim 2 in which said second means comprises interengaging means rotatable with respect to said plumbers snake and movable into operable engagement with said supporting segments for moving said segments radially toward said snake against the urging of said first biasing means.

4. The plumbing tool as defined in claim 3 in which said snake driving means comprises a plurality of feed rollers rotatably carried by said supporting segments, each said feed roller having peripheral grooves adapted to drivably engage said snake.

5. The plumbing tool as defined in claim 3 in which said first means further includes stop means for stopping the rotation of said snake engaging means with respect to said snake.

6. A plumbing tool of the type used for cleaning drains, conduits and the like and characterized by having a plumbers snake housing in which an elongated plumbers snake can be coiled, said snake housing having an opening for passage of the snake and including means for rotatably driving the housing relative to the feed device, comprising:
a. a housing having an axial passageway adapted to accommodate passage of said snake;
b. first means rotatably carried within said housing for cooperative engagement with said snake, said first means comprising snake engaging means for feeding said snake in an axial direction relative to said housing, said snake engaging means being movable into and out of engagement with said snake and including a first biasing means for yieldably holding said snake engaging means normally out of engagement with said snake;
c. second means for cooperative engagement with said first means comprising interengaging means rotatably carried within said housing and movable into mating engagement with said first means for moving said snake engaging means into operative engagement with said snake against the urging of said first biasing means;
d. second biasing means cooperatively associated with said second means for yieldably urging said interengaging means into engagement with said first means; and
e. said first means further including stop means carried by said housing for stopping the rotation of said first means relative to said housing.

7. The apparatus as defined in claim 6 including control means carried by said housing for moving said interengaging means of said second means out of operative engagement with said first means against the urging of said second biasing means.

8. The apparatus as defined in claim 6 in which said feed means comprises a plurality of feed rollers rotatably relative to said snake and having peripheral grooves adapted to engage said snake so as to urge axial movement thereof relative to said feed rollers.

9. The apparatus as defined in claim 6 in which said feed means comprises:
a. a plurality of arcutely spaced, radially movable segments; and
b. a plurality of snake engaging driving means carried by said segments.

10. The apparatus as defined in claim 9 in which said segments of said feed means in combination form a conically shaped assembly and in which said interengaging means of said second means is in the form of a recessed cone movable axially within said housing and constructed and arranged to mate with said segments in a manner as to urge them radially inwardly against the urging of said first biasing means.

11. A plumbing tool comprising:
a. an elongated plumbers snake;
b. means for rotating said plumbers snake about its longitudinal axis;
c. a housing having an axial passageway for accommodation passage of the snake;
d. first means rotatably carried by said housing for cooperative engagement with the snake, said first means having an axial passageway for reception of the snake and including:
1. a plurality of arcutely spaced, radially movable segments;
2. a plurality of feed rollers rotatably carried by said segments proximate the axial passageway, said feed rollers being constructed and arranged as to be movable into releasable engagement with the snake upon inwardly radial movement of said segments and each having peripheral grooves adapted to drivably engage the snake; and
3. first biasing means for yieldably resisting inward radial movement of said segments;
e. second means cooperatively associated with said first means for operating said first means comprising:
1. interengaging means rotatably carried within said housing and movable into operable engagement with said segments of said first means for moving said segments radially inward against the urging of said biasing means;
2. second biasing means for urging said interengaging means into engagement with said segments; and
3. control means for moving said interengaging means out of operable engagement with said segments; and
f. stop means carried by said housing for preventing rotation of said first means within said housing.

12. A feed control apparatus for use with plumbing tools of the type having an elongated coiled spring wire
or plumbers snake and means for rotating the snake about its longitudinal axis, comprising:

a. snake engaging means movable into and out of driving engagement with the snake for feeding the snake axially of itself; and

b. means operably coupled with said snake engaging means for moving said snake engaging means into driving engagement with the snake, including biasing means for yieldably urging said snake engaging means into driving engagement with the snake, said biasing means being responsive to forces opposing axial feeding of the snake so that said snake engaging means will automatically move out of driving engagement with the snake in response to such forces.

13. The feed control apparatus as defined in claim 12 in which said snake engaging means comprises:

a. a plurality of arcuately spaced segments radially movable toward and away from the snake and rotatable with respect thereto;

b. a plurality of feed rollers rotatably carried by said segments each said roller having snake engaging surfaces adapted to operably engage the snake so as to urge axial movement thereof relative to said feed rollers; and

c. first biasing means operably associated with said segments for yieldably resisting radial movement thereof toward the snake.

14. The feed control apparatus as defined in claim 12 in which said means for moving said snake engaging means into driving engagement with the snake includes interengaging means rotatable relative to the snake and movable into operable engagement with said segments for moving said segments radially toward the snake against the urging of said first biasing means.

15. The feed control apparatus as defined in claim 14 in which said snake engaging means includes stop means for stopping the rotation of said segments with respect to the snake.

16. The feed control apparatus as defined in claim 14 including adjustment means for adjusting said biasing means so as to vary the force with which said biasing means urges said engaging means into driving engagement with said snake.