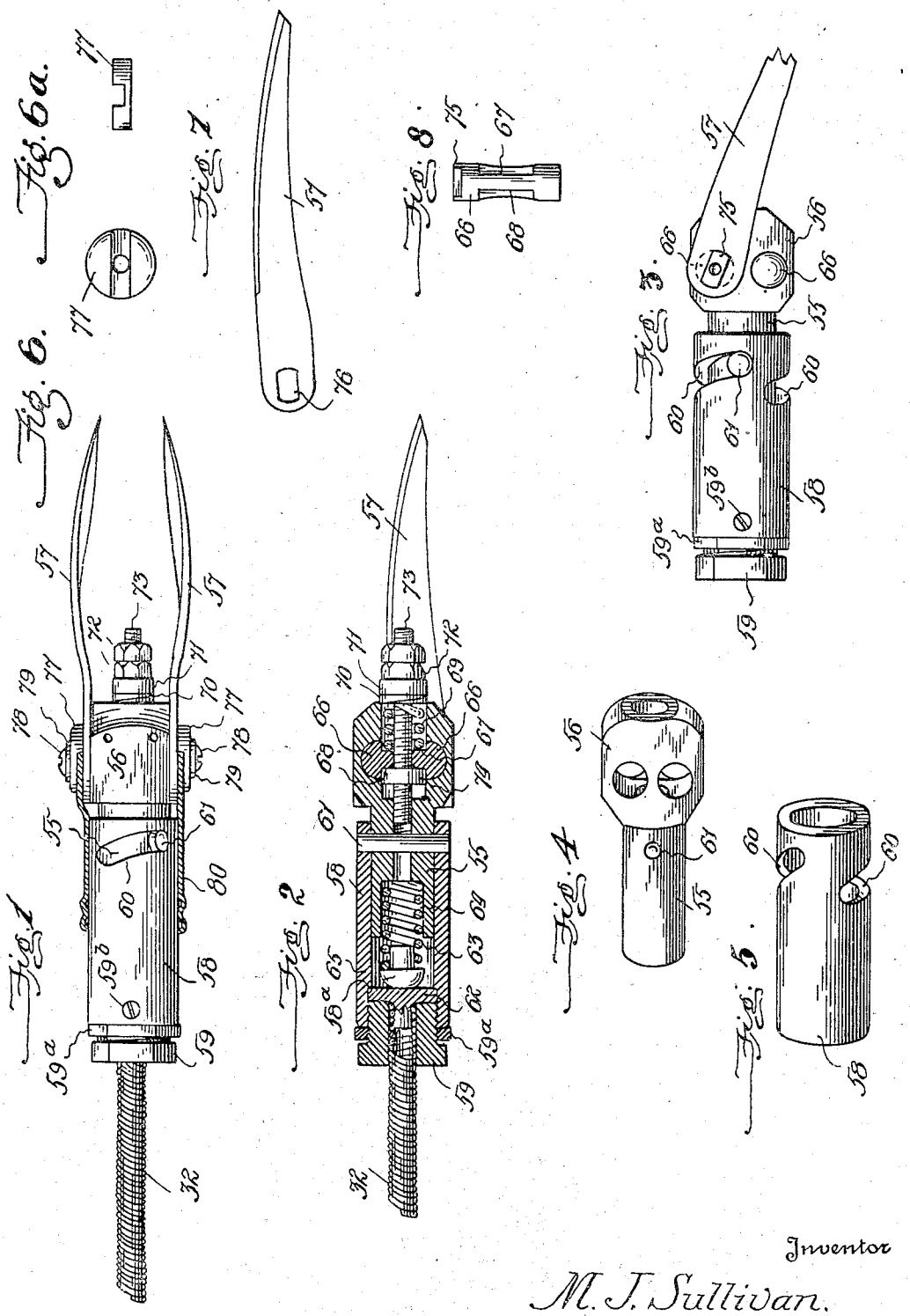
Aug. 15, 1939 M. J. SULLIVAN 2,169,543

ROTARY CLEANER FOR SEWERS AND FLUES

Filed Oct. 13, 1938



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Patented Aug. 15, 1939 2,169,543

UNITED STATES PATENT OFFICE

2,169,543

ROTARY CLEANER FOR SEWERS AND FLUES

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Application October 13, 1938, Serial No. 234,856

7 Claims. (Cl. 15—104.30)

My invention relates to apparatus for cleaning obstructions from sewer pipes and flues, and has particular reference to the provision of a rotary cutting tool used in connection with a flexible shaft forming part of an apparatus of this kind.

The principal object of my invention is to provide a rotary cutting tool in which the knives are adjustable with respect to the internal diameter of the pipe or flue and are movable towards each other to facilitate the operation of cutting through obstructions and for the purpose of entering a smaller pipe, in association with a slip clutch between the tool and flexible shaft for regulating the rotation of the tool under varying conditions of operation.

A further object of my invention is to provide a rotary cutting tool in which the connection between the flexible shaft and associated parts of the tool is such that a reciprocating motion in line with the axis is effected to produce a jabbing movement of the knives in addition to the rotary motion imparted by the flexible shaft to more effectively operate the knives in cutting through obstructions such as root growths in sewer pipes or incrustations formed on the inner walls of flues.

Other objects and advantages of my invention will be apparent from the following specifications, and what I particularly claim as new and desire to protect by Letters Patent is more specifically set forth in the appended claims.

In the drawing:

Fig. 1 is an enlarged detail plan view of the rotary cutter.

Fig. 2 is a vertical longitudinal sectional view through the same.

Fig. 3 is a view showing the connection of the cutting blades to the cutter head.

Figs. 4 and 5 are detail perspective views of parts of the rotary cutter.

Figs. 6 and 6*a* include a bottom plan and side view of the grooved washer for clamping the knife blades to the head of the cutter.

Fig. 7 is a detail view of one of the cutter blades, and

Fig. 8 is a detail view of one of the pivot pins to which the cutter blades are attached.

The main purpose of my present invention is to provide a cutting tool usable in connection with a flexible shaft **32**, operated by any preferred form of drive organization for imparting a rotary motion to the shaft and to the tool connected to the outer end of said shaft, the construction of the rotary cutting tool being such as to provide for adjustment of the knife blades in respect to the size of pipe in which the tool is to operate, as well as relieving the strain on the drive organization when difficulty is experienced in cutting away obstructions by the inclusion of a slip clutch between the shaft and tool in association with a yielding connection incorporated in the construction of the tool itself, as set forth in the following description.

Referring to the drawing, **55** designates the body portion of the tool having a head **56** to which the knife blades **57, 57** are attached, and connected to said body portion, in the manner hereinafter described, is a sleeve **58** to which the flexible shaft **32** is connected by a nipple **59** threaded into the outer end thereof. The flexible shaft extends loosely through the nipple, and to the inner end thereof is welded a disk **62** seated in the outer end portion of the sleeve, said disk being clamped between the inner end of the nipple and a shoulder **58***a* on the turnable sleeve, whereby to connect the flexible shaft to the sleeve by frictional engagement according to the adjustment of the nipple; that is, the pressure exerted by the nipple in clamping the disk between said nipple and shoulder will control the operation of the tool, after the manner of a friction clutch, for the reason should the knives get caught in the sewer the disk carried by the rotatable shaft will overcome the friction and rotate in the cutter, thus stopping the operation of the knives to prevent injury to the same. The connection of the disk to the flexible shaft is by means of a stem extending from the disk into the shaft to which it is welded. Adjustment of the nipple, in respect to the clamping action against the disk, is secured either by a clamping nut **59***a*, or set screw **59***b*.

The connection of the rotatable sleeve to the cutter head carrying the knives is such as to provide for an axial movement of the cutter head and knives carried thereby. For this purpose the body portion of the cutter head which extends into the sleeve is provided with a transverse pin **61** working in slots **60, 60** inclined to the longitudinal axis of the body portion and at opposite sides of the sleeve, and to project the cutter head normally forward there is a spring **63** seated in a recess **64** at the inner end of the body portion **55** with a contact piece **65** at the inner end of the spring bearing against the aforementioned disk **62**. By this arrangement, or connection of the sleeve to the cutter head, any resistance offered to the cutting of the knives will result in the turning of the sleeve on the body portion **55** against the action of spring **63**, to withdraw the

knives to the extent of the inclination and length of the slots 60, and said spring will again project the cutter head and knives, resulting in an axial movement of the cutter head and jabbing movement of the knives that will not only assist in making the knives cut faster but will also permit them to push their way through the obstruction in the sewer.

The cutting knives are connected to the head of the tool for a further yielding of said knives in the event they meet a stubborn obstruction, and also for an adjustment of said knives laterally so as to work in pipes or flues of different internal diameters. For this purpose the knife blades, at opposite sides of the head 56, are each attached to the outer end of a pin 66 extending through and turnable within said head with the intermediate portion of the pin cut away at opposite sides (Fig. 8) to provide shoulders 67, 68, one of which engages a compression spring 69 interposed between the shoulder and outer end of the tool or a member in fixed relation thereto. In this instance the fixed member against which the spring bears, for adjusting the tension of the spring, is in the form of a lock washer 70 against which bears a collar 71 and nuts 72, 72, the latter being threaded on the outer end of a rod 73 extending into the head between the pins to which the knives are attached and threaded at its inner end into a recess in the body portion of the tool adjoining the head. This rod, in connection with a collar 74 integral therewith, provides for the adjustment of the knife blades towards and away from each other in disposing the same according to the internal diameter of the pipe or flue to be cleaned or cleared of obstructions, for the reason that the collar bears against the shoulders 68 on the pins 66 opposite those with which the spring 69 engages, and by turning the threaded rod the collar can be adjusted to set the knives as desired. Ordinary pressure on the knife blades, or resiliency of the same in cutting, will be taken up by the spring 63 through the intervention of the sleeve turning on the body portion of the tool against the action of said spring, to thereby produce an axial movement or reciprocating motion of the cutter head and knives in removing obstructions. On the other hand should the knife blades be subject to extraordinary pressure, or should they get caught in the pipe, they will automatically close or come closer together against the action of spring 69 which keeps them normally separated by pressure of said spring against the shoulders 67 on the pins to which the knives are attached, the opposite shoulders 68 engaging the collar 74 to limit the separation of the knives for adjustment thereof to the internal diameter of the pipe.

The attachment of each knife blade to the outer end of the pin by which it is connected to the head of the tool is effected by reducing the outer end of the pin to provide a squared portion 75 fitting within a corresponding slot 76 in the knife blade, in connection with a grooved washer 77 fitting on the end of the pin, so that the blade can be clamped to the pin by screw 78 and interposed washer 79 for turning of the blade therewith.

For protecting the slots 60 in the sleeve, and the joint between said sleeve and body of the tool, a metal sleeve 80 incloses this part of the tool, being secured in place by screws threaded into the head 56, and I may supplement this protecting cover by a rubber sleeve (not shown) placed over the same.

The operation of the rotary cutting tool will be readily understood from the foregoing description in connection with the accompanying drawing, for the blades are first adjusted to correspond to the internal diameter of the pipe from which the obstructions are to be removed, and in cutting away obstructions revolving of the flexible shaft will rotate the cutting tool so that the knives will operate against the inner side of the pipe, and, as heretofore explained, when the knives meet resistance hard to overcome, a reciprocating motion will be imparted thereto to accomplish a more effective operation; that is, this reciprocating motion or axial movement will more quickly cut away roots that have grown into the pipe. Should the cutting of the tool meet with extraordinary resistance the operation thereof will cease, or said tool remain stationary, by reason of the slip clutch or friction disk by which the flexible shaft is connected to the sleeve turning within said sleeve, and by reason of the yielding connection of the knives with the head they will automatically close, or come closer together, in cutting away the obstructions. This automatic closing of the knives will also provide for their passage from a larger pipe into a smaller pipe, as well as pass through a clean-out plug which is usually installed in house sewers; in the latter instance a six inch sewer line being usually provided with a plug having a four inch opening through the same, and as the knives will readily pass through it prevents the cutting edges thereof from injury. The yielding connection of the knives to the cutter head also relieves the cutting edges from wear in scraping against the inner sides of the pipes, as would occur if the knife blades were rigidly connected to the cutter head.

The flexible shaft may be turned in either direction, according to its operation by the drive organization in connection with which the cutting tool is employed, and said shaft is pushed into the pipe as the tool cuts away the obstructions, the shape of the outer ends of the knife blades determining the direction in which the tool is rotated.

It will be understood that I have shown and described the preferred form of construction of rotary cutting tool in accordance with my invention, and that modifications or changes may be made in respect thereto, as well as any preferred type of drive organization employed to turn the shaft to which the tool is connected for operation thereof.

I claim:

1. A rotary cutting tool for use in connection with the flexible shaft of an apparatus for dislodging obstructions in pipes and other conduits, comprising a head and body portion rigidly connected together, knife blades attached to the head, a sleeve in which the body portion is slidable, a spring operatively interposed between the sleeve and body portion, and a slip clutch connecting the end of the flexible shaft to the sleeve.

2. A rotary cutting tool for use in connection with the flexible shaft of an apparatus for dislodging obstructions in pipes and other conduits, comprising a head and body portion rigidly connected together, knife blades attached to the head, a sleeve in which the body portion is slidable, a spring operatively interposed between the sleeve and body portion, and means for connecting the flexible shaft to the sleeve including a nipple threaded in the outer end of the sleeve, and an element rigidly secured to the flexible shaft and interposed between the nipple and

sleeve for frictional engagement of the parts to control the operation of the cutting tool.

3. A rotary cutting tool for use in connection with the flexible shaft of an apparatus for dislodging obstructions in pipes and other conduits, comprising a head and body portion rigidly connected together, knife blades attached to the head, and a spring for yieldably urging said blades away from each other; together with a sleeve operatively associated with the aforementioned body portion, one having a slot inclined to the longitudinal axis of the body portion and the other having a pin extending into said slot, a spring operatively interposed between the sleeve and body portion, and means for connecting the end of the flexible shaft to the sleeve.

4. A rotary cutting tool for use in connection with the flexible shaft of an apparatus for dislodging obstructions in pipes and other conduits, comprising a head and body portion rigidly connected together, knife blades attached to the head of the tool, a sleeve connected to and projecting beyond the end of the body portion opposite the head, a nipple threaded on the sleeve and through which the flexible shaft passes, and a disk rigidly secured to the flexible shaft and adapted to be clamped between the nipple and sleeve for controlling the operation of the rotary cutting tool under varying conditions.

5. A rotary cutting tool for use in connection with the flexible shaft of an apparatus for dislodging obstructions in pipes and other conduits, comprising a head and body portion rigidly connected together, knife blades attached to the head, a sleeve connected to and projecting beyond the end of the body portion opposite the head and having an internal shoulder near the outer end thereof, a nipple threaded in the sleeve and through which the flexible shaft passes, and a disk rigidly secured to the end of the flexible shaft and adapted to be clamped between the nipple and shoulder for controlling the operation of the rotary cutting tool under varying conditions.

6. A rotary cutting tool for use in connection with an apparatus for dislodging obstructions in pipes and conduits, comprising a body portion having a cutter head, knife blades pivoted to the cutter head by pins fixed to said blades and rotatably journaled in said head, shoulders formed on opposite sides of the pins, an adjustable collar bearing against the shoulder at one side of each pivot pin for limiting the outward movement of the knife blades with respect to each other, and a spring bearing against the shoulder at the other side of each pivot pin for yieldably urging said blades away from each other.

7. A rotary cutting tool for use in connection with an apparatus for dislodging obstructions in pipes and conduits, comprising a body portion having a cutter head, knife blades pivoted to the cutter head by pins fixed to said blades and rotatably journaled in said head, shoulders formed on opposite sides of the pins, an adjustable collar bearing against the shoulder at one side of each pivot pin for limiting the outward movement of the knife blades with respect to each other, and a spring bearing against the shoulder at the other side of each pivot pin for yieldably urging said blades away from each other; together with a sleeve operatively associated with the aforementioned body portion, one having a slot inclined to the longitudinal axis of the body portion and the other having a pin extending into said slot, a spring operatively interposed between the sleeve and body portion, and means for connecting the end of the flexible shaft to the sleeve.

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