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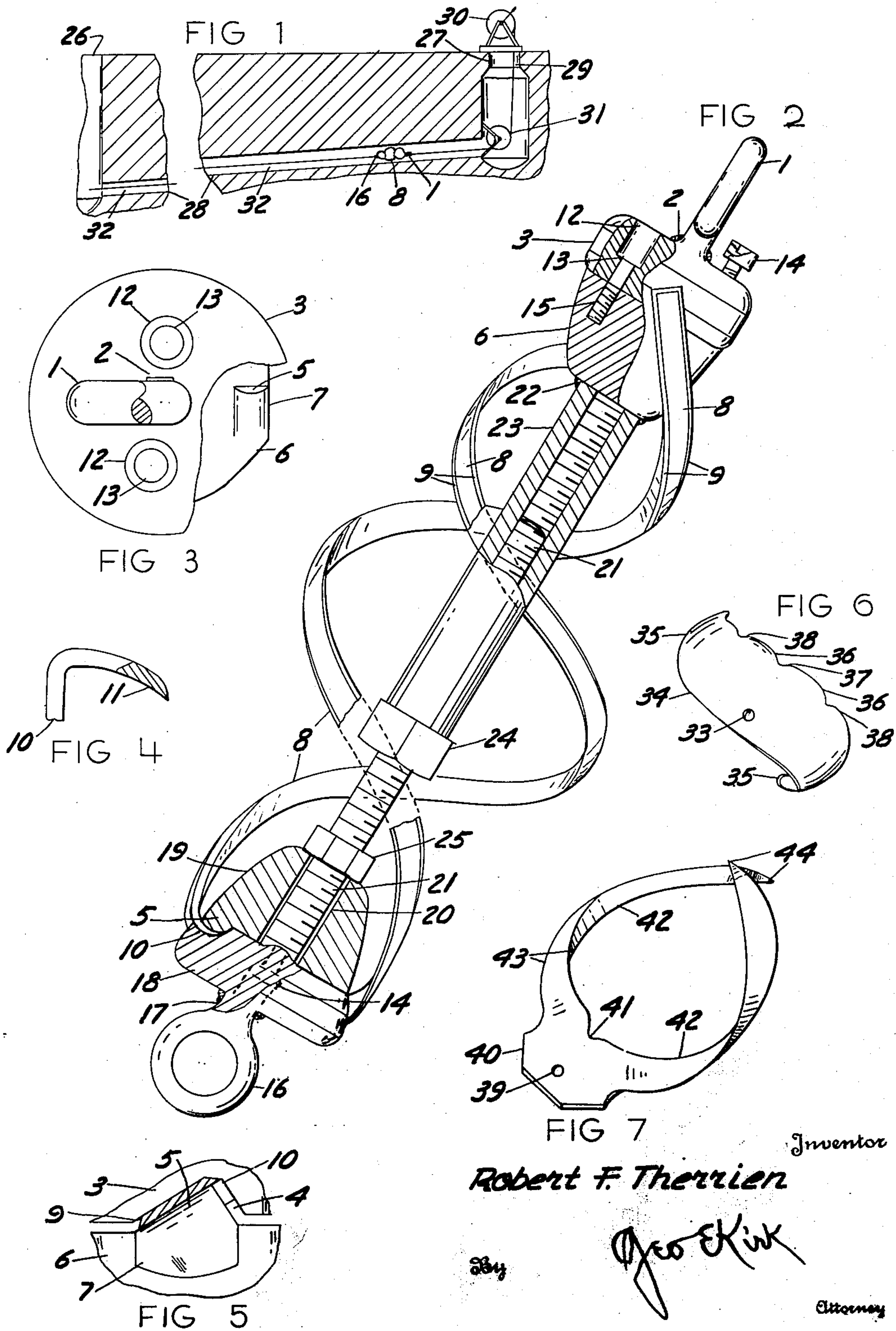
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2,628,380

EXPANSIBLE PIPE CLEANING KNIFE

Filed Nov. 22, 1946

2 SHEETS—SHEET 1



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2 SHEETS—SHEET 2

FIG 9

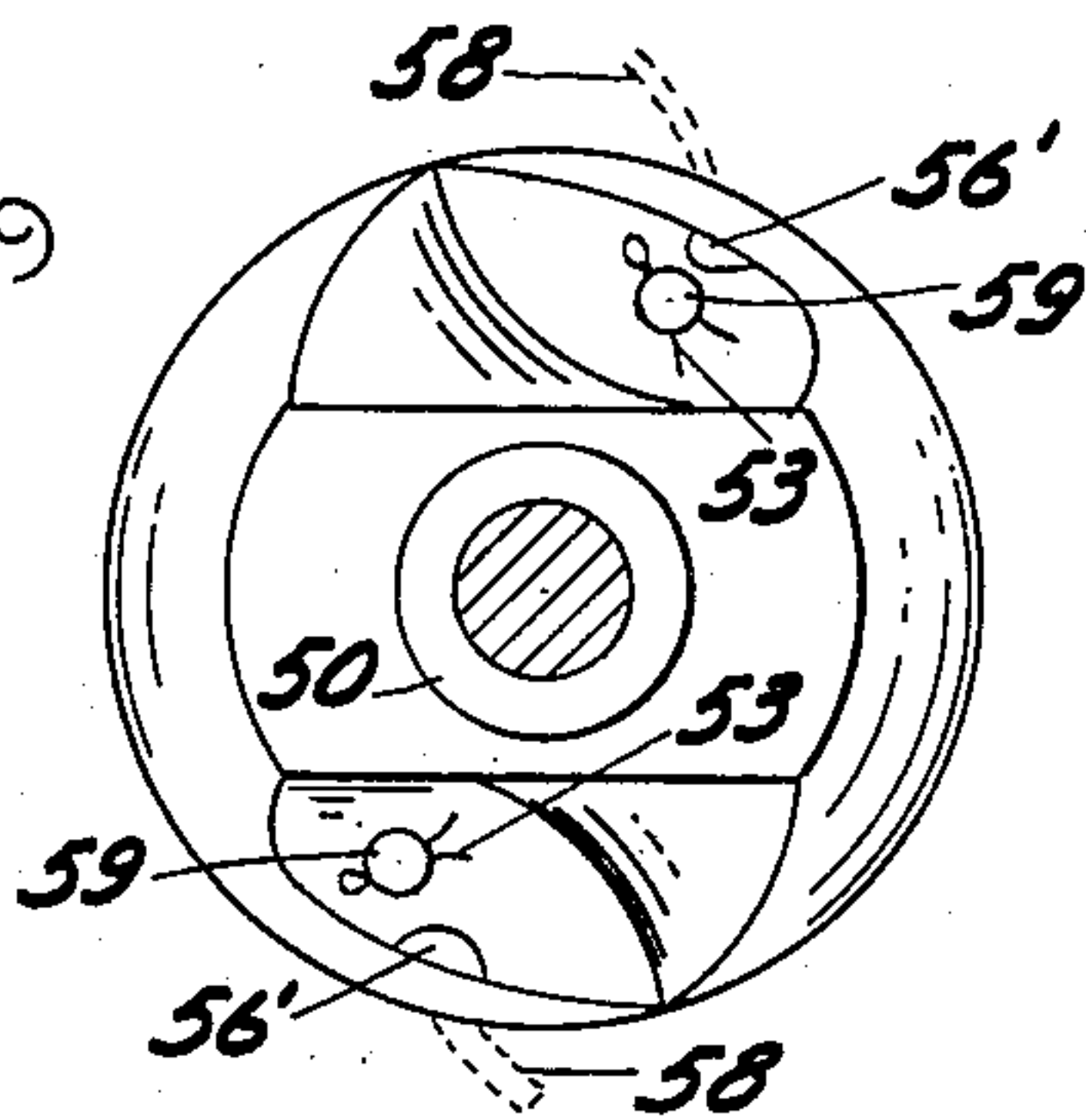


FIG 8

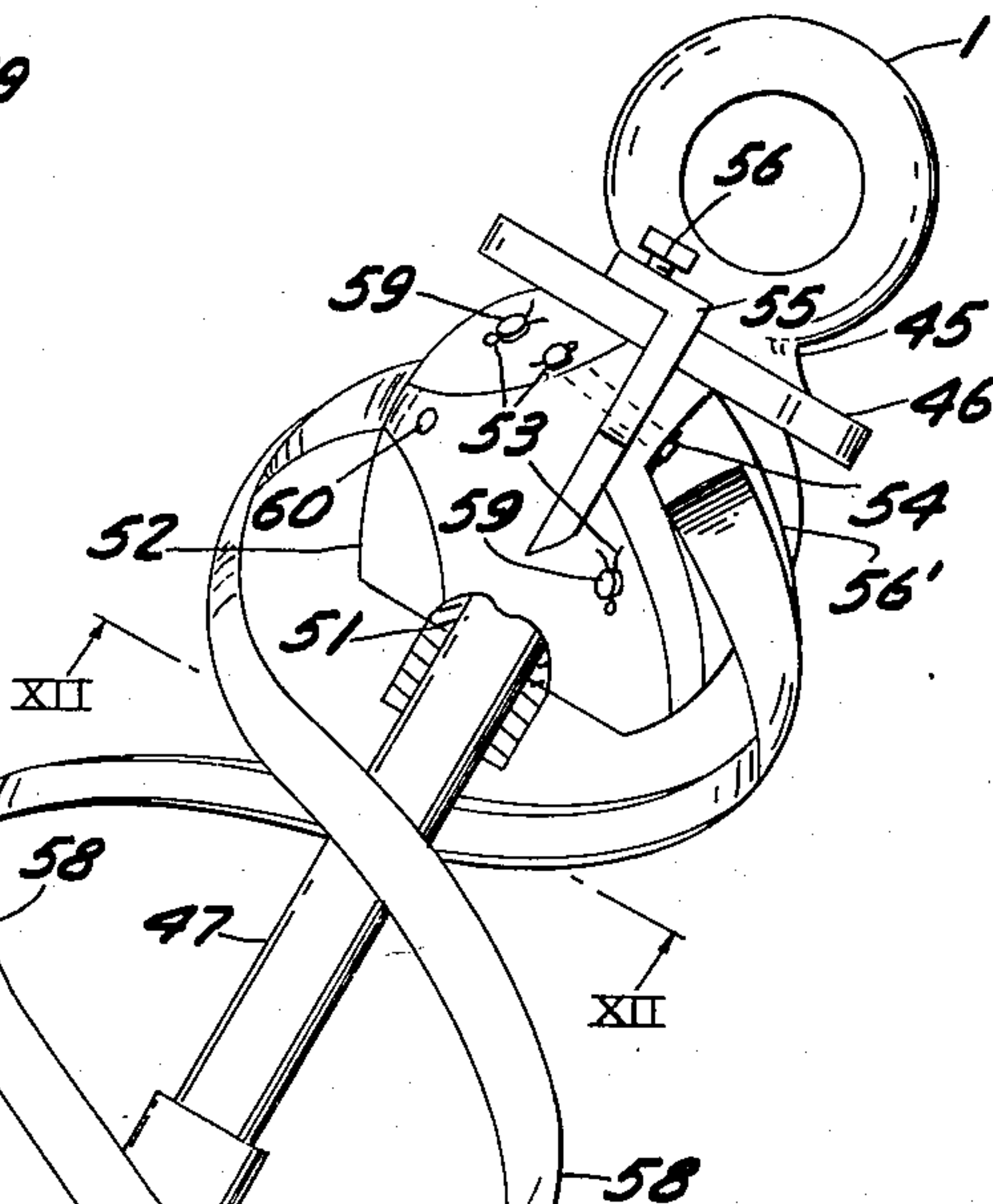


FIG. 10

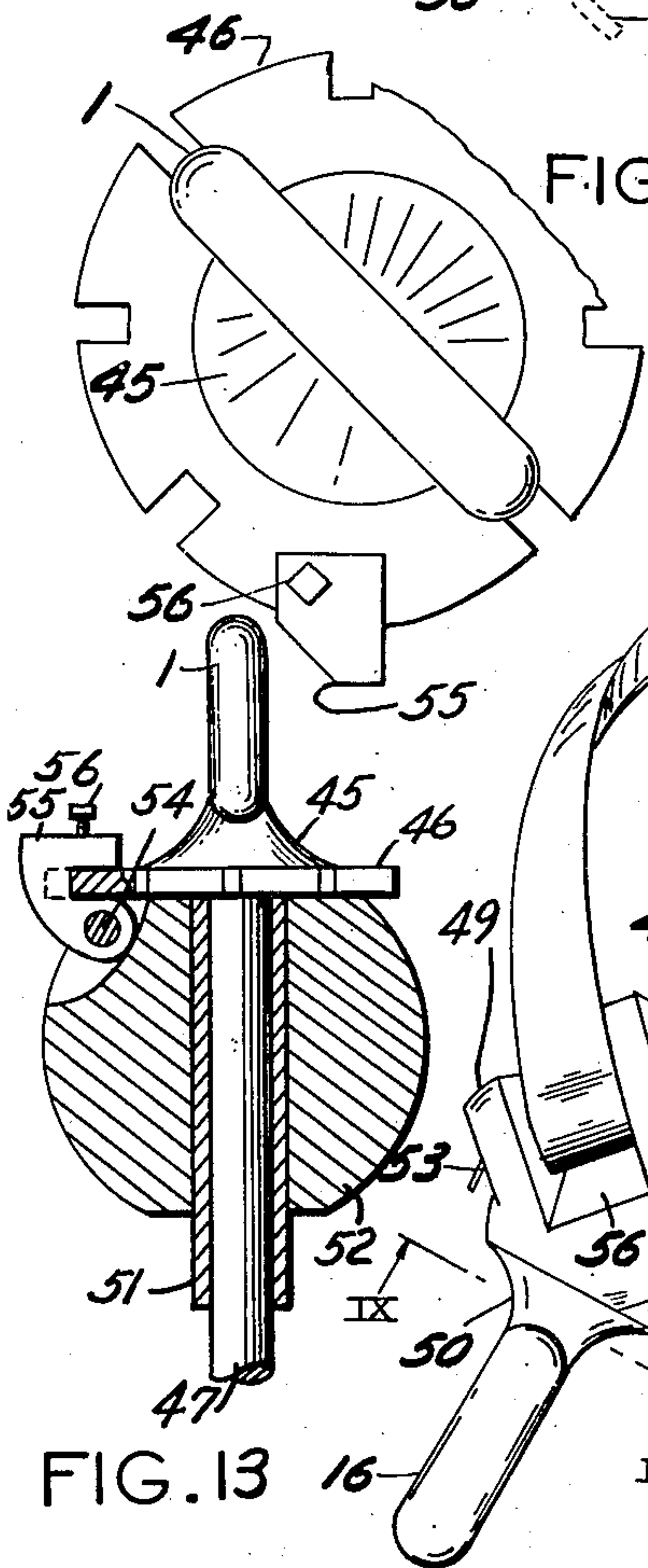


FIG. 13

FIG II

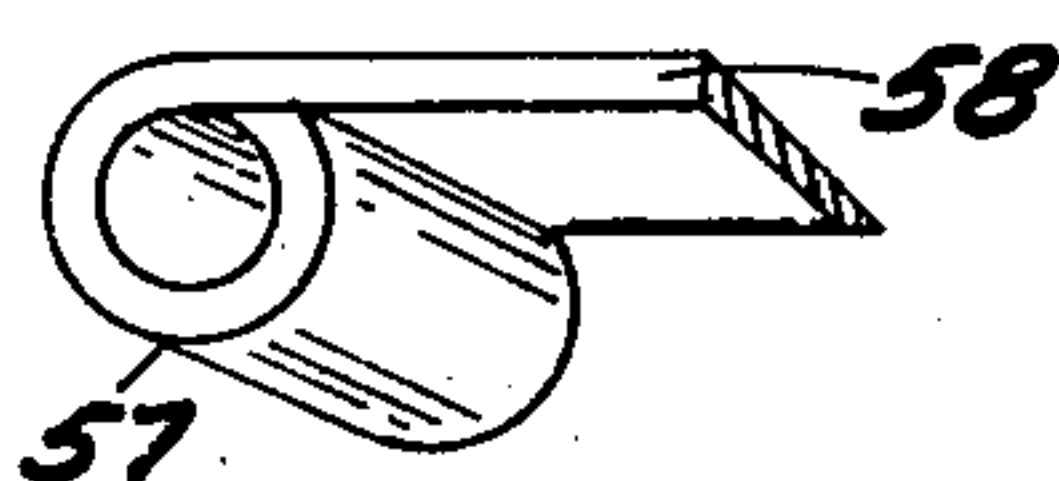
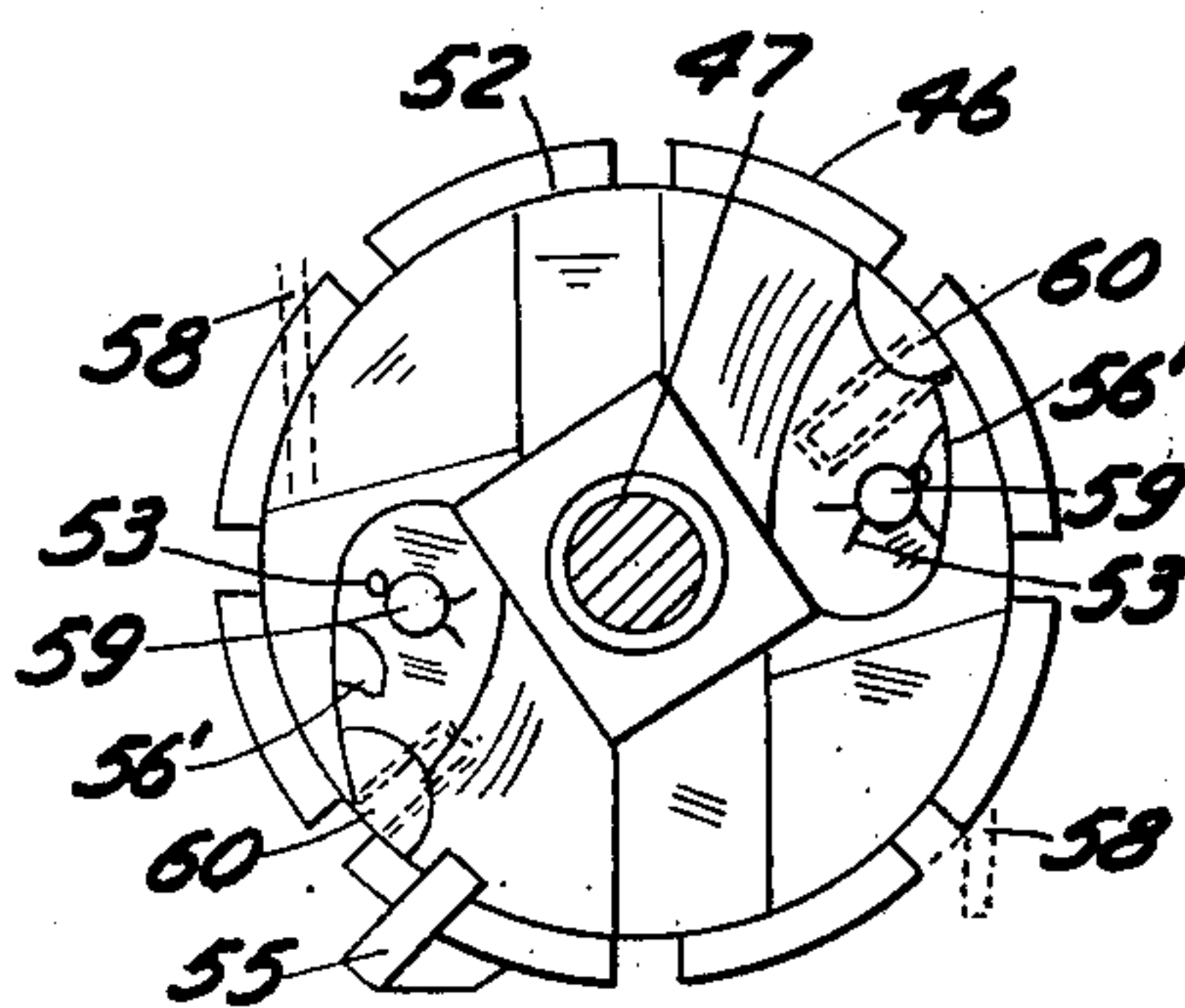


FIG 12



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UNITED STATES PATENT OFFICE

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EXPANSIBLE PIPE-CLEANING KNIFE

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3 Claims. (Cl. 15—104.3)

1

This invention relates to clearing passages or ducts to allow free flow therethrough.

This invention has utility when incorporated for cutting loose detritus, clogging materials, or even growths, in sewers, waste take-off passages, tile, pipe and the like.

Referring to the drawings:

Fig. 1 is a side elevation of an in-use position for an embodiment of the invention in transit thru a sewer from one manhole to another;

Fig. 2 is a side elevation, on a considerably enlarged scale, and with parts in section, of the cutter unit of Fig. 1;

Fig. 3 is an end view of a cap portion on the cutter unit, partially broken away to expose a portion of the unit head embraced by the cap;

Fig. 4 is a detail view of the anchoring end of a helical knife or double-edged blade of the unit, being the knife portion clamped between the cap and head;

Fig. 5 is a fragmentary detail from the right of Fig. 3, showing the gripping of the angled end of the knife between the cap and head and over the head lug;

Fig. 6 is a perspective view of another embodiment or modification of a knife or cutter with re-entrant free ends, pitched for either direction of rotation or drive to effect cutting progress;

Fig. 7 is a double bladed helical knife two-edged unit, a further modification, also adapted for cutting in either direction of rotation, the blades here being somewhat like a shortened region of the knives of Fig. 2 than the more short axially extent knife of Fig. 6;

Fig. 8 is a side elevation, with parts broken away, somewhat along the lines of Fig. 2, but comprising a different modification in adjustment, and adaptable for release, when with the tool in a duct entrance, it may automatically conform to the internal diameter of such duct or sewer;

Fig. 9 is a section on the line IX—IX, Fig. 8, looking in the direction of the arrow, and showing the follower rigid end ball or head of the tool for anchoring one end of the blades or knives;

Fig. 10 is a partial plan or end view looking toward the tool from the opposite end to the showing in Fig. 9;

Fig. 11 is a perspective detail view of a knife end eye;

Fig. 12 is a section on the line XII—XII, Fig. 8, looking in the direction of the arrow, and showing the opposite side of the adjustable head to the showing in Fig. 10; and

Fig. 13 is a view of the dog looking theretoward

2

from the upper right of Fig. 8, showing a fragment of the mounting therefor.

An eye 1 has a weld joint 2 in providing a rigid unit with a cap 3. Diametrically disposed in the underside of the cap 3 are re-entrant or V-shaped seats or recesses 4 of about 90° angle for the bottom thereof as parallel to a tangent to the cylindrical side portion of the cap 3. The seats 4 are complementary to are topped taper lugs 5 of a head 6. The head 6 has a flat face 7 from the lug 5.

Of spring metal and adapted to have adjustable pitch, helical knife blades 8, with opposite cutting edges 9, have abrupt terminal offsets 10. These offsets 10 are adapted to be hooked over the lugs 5 for knife blade inner face 11 to be adjacent the face 7 in taking a pitch direction angle therefrom as determined by the taper side of the lug 5 toward the longer face of the seat 4. In the layout here provided, this direction of pitch is about 30° as to the axis of the unit.

Diametrically of the cap 3 and 90° away from the seats 4, openings 12 with shoulders 13 therein, have socket headed bolts 14 protrude therefrom to extend from the seats or openings 12 through the bearing surface of the disk or cap 3 in contact with the bearing surface on the head section 6 for clamp assembly against relative angular shifting when the bolts 14 are inserted to engage threaded recesses 15 in the head 6. Wrench ends in the heads of the socket head of the bolts 14 may set the bolts in the recesses 15 to draw the cap 3 toward the head 6, and thereby clamp the knife ends 10 on the lugs 5 at the recesses 4. The two double edged helical blades 8 are thus firmly locked with the unit end 3, 4.

The opposite end of the cutter unit is provided with an eye 16 with a weld joint 17 to a cap 18 adapted to be assembled with a head 19 by bolts 14 for clamping the ends of the knives 8 remote from the head 6.

The head 19 has an opening 20 axially there-through for an externally threaded stem 21 integral with the eye 16. A weld joint 22 assembles an internally threaded sleeve 23 to extend axially from the head 6 to be entered by the stem 21. This overall length adjustment to determine the outward bow or central maximum cutting diameter for the knives 8 is done with the head 19 loose, even as to the cap 18.

With a unit in the range of slightly over three feet length, and the caps 3, 18, about five inches in diameter, the helical knives may cut from slightly over five inches in diameter, and by the overall length shortening, the central bow in-

creased to nearly twelve inches. In this shortening, the general length is determined by threading the stem 21 into the sleeve 23. As a desired length for cut diameter be determined, a nut 24 on the stem 21 may be set to lock with the end of the sleeve 23 toward the head 19. An additional locking is effected by a lock nut 25 on the stem 21 against the head 19. Upon effecting this adjustment setting, the bolts 14 may clamp the ends 10 of the knives 8 between the cap 13 and the head 19. In this operation, the bolts 14 are run into the openings 12 to be not protruding to have sewer or other waste matter accumulate or be gathered thereby.

Extreme clogging of sewers has been handled by working rod sections through from a manhole 26 to a manhole 27 in a sewer 28. After having the rod sections run thru, a cable 29 may be paid out from the manhole 26 to the manhole 27. A windlass or winch 30 may be located conveniently at the manhole 27 with the cable 29 attached thereto. The cable as emerging from the sewer 28 may be directed by a guide pulley 31 toward the winch 30. At the manhole 26, the eye 1 of the cutter unit is connected to the cable 29 and directed into the sewer 28, with a cable 32 from the eye 16, as a safeguard in the instance there may be a break in the cable 29. Also in the preferred practice hereunder, even tho the sewer 28 may be flushed with water, a reverse or pull back operation is advantageously had thru the cable 32, say as drawn back through the operation of a winch.

For a smaller unit cutter, or a quite massive flexible cable or rotary snake, there may be power rotation imparted thereto. The two-edge knives 8 care for efficient cutting in either direction of rotation, and whether thrust or pulled.

According to the severity of the clogging, or in the instances where a feed-through be not first effected, instead of clamping to an eye 1 or 16, the rotating driven means may engage an eye 33 in a knife or blade 34 (Fig. 6) having reverse curved or arced free ends 35 between which on the forward end of this knife 34 is a cutting edge 36. A central notch 37 may to some extent hold a medial portion of the debris for the radial edge portions therefrom to act. Outward therefrom, are notches 38 for the return bend or V-shaped knife or cutting ends. These sections between the knife portions, under the experience therewith, have advantage in getting into roots and packed matter, for severing and subdividing, so that the remnants may be readily flushed to clear the duct.

An eye 39 of a two-bladed sheet metal knife has a mounting portion 40 for connecting a snake (Fig. 7). From a centering notch 41, is a pair of helically pitched blades 42, each with opposite cutting edges 43 from the portion 40 to tips or points 44. The blades 42 are semicylindrical in extent to the prongs or tips 44.

The knife-blades 34, 42, may be thrust or pulled. However, the blade 34 (Fig. 6) is not so well adapted to pull as is the blade 42. The free ends in helical extent have considerable advantage in attacking a clogged pipe, tile, waste line, or sewer. The knife 40, 42 (Fig. 7), may be of various dimensions for different diameter ducts in which to be used. However, there is some flexibility in the forward pitch of the blades. Accordingly, in operation, the blades may effect snug cutting close to the inner wall of the passage.

This application is a continuation-in-part of

applicant's Patent 2,431,089, November 18, 1949, Duct Interior Cleaning Means.

A pull type of cutting tool for sewer clog removal, having a draft eye 1 (Fig. 8), has a weld connection 45 to a peripherally notched disk 46 and an axially extending stem 47. The stem 47 provides assembly means thru a weld connection 48 with a head 49. A weld 50 assembles follower eye 16, remote from the eye 1, with the head 49. This rigid unit portion of the tool has a bearing 51 on the stem 47 adjacent the disk 46, for relatively rotatable head 52, complementary to the head 49. Split keys 53 hold pivot pin 54 in the head 52 for rockably mounting a catch or dog 55 in a seat in the head 52. The dog 55 may be swung on its pivot pin 54 to engage a desired notch in the disk 46, and be there locked by a set screw 56 adjusted to frictionally engage the top of the disk 46. This is a means for positively fixing the angular position of the head 52 as to the rigid unit including the other head 49.

The head 49 has a pair of diametrically disposed angularly pitched seats 56'. An eye 57 of a helically extending blade or double edged knife 58 is located in each of these seats 56'. An anchoring pin 59 thru the eye 57 and spanning the seat 56' is held against shifting out of the head 49 by split keys 53.

The head 52 has complementarily located similar seats 56' with split key held pins 59 for anchoring the other end eyes of the respective helical knives 58. The knives 58 in their helical extent are radially spaced clear of the stem 47 and in their outward range determine the maximum cutting diameter. The stem 47 fixes the tool overall length. The winding turning of the head 52 relatively to the head 49 to such extent shortens the helical pitch for reducing the cutting tool radius. Inasmuch as the tool is adapted to be set at a reduced diameter for placing in a duct and then released by clearing the dog 55 from the disk 46, there is automatic unwinding expansion of the spring steel knives 58 to take the duct internal diameter.

While reference has been made to the draft eye 1 and the follower eye 16, as having to do with the showing in Fig. 8, the preferred practice is to have the working or initial hauling or pulling of the tool through a duct to be cleared of clogging accumulation therein, by a cable connected to the eye 16. This insures that the rigid unit with the head 49 is undergoing the penetration strains. The relatively adjustable head 52 may not initially be exposed to such severe action. However, as the tool has made its one direction pass, the return course may be traversed without reversing the tool end for end. That is, the hauling back may be upon the eye 1.

By taking out the split keys 53 for the pins 59, the eyes 57 may be released. These eyes 57 may be bent ends of the blades 58. For an overall length in the range of some thirty inches and the heads about 5" in diameter, substitutive pairs of knives or blades 58 may be readily installed. As an instance a pair of blades for one full turn or 360° arc extent for each thereof as diametrical, may describe a cutting circle of 26" diameter. By releasing the dog 55 clear of the notched disk 46, with one holding bar thru the eye 16, a second bar may be thrust as to an end in a radial seat 60 in the head 52, and the pitch of the blades 58 brought down say to the range of 18" with the blades now wrapping close to 480°. As so adjusted the dog 55 may be set and locked by the set screw 56.

5

With the single rigid unit, substitute blades may be available to have extensive working range. For instance, a second set of blades for 360° at placing may describe a circle of 16'' to 26'' diameter and by winding down get to 10'' to 16''. A third set may step its cutting circle from 10'' and 12'' down to 6''.

What is claimed and it is desired to secure by Letters Patent is:

1. A pull type of cutting tool having terminal 10 eyes, a seat-providing head fixed to one eye, a peripherally-notched disk fixed with the other eye, a stem fixed to and connecting the eyes and providing a bearing adjacent the disk, a second head journaled on the stem at the bearing and 15 having a manually controllable catch to engage the disk in locking against angular shifting, and helical knives secured to the head seats adjusted by said locking.

2. A pull type of cutting tool having terminal 20 eyes, a head unit anchored to each eye, a stem connecting the head units, one of said head units comprising a disk fixed with the eye for such unit, said disk having a bearing surface and a plurality of seats, said one unit having a stem- 25 connecting head section with a bearing surface in contact with the disk bearing surface, said sec-

6

tion having a recess angularly alignable with a selected disk seat, manually actuatable means adapted to coact between a disk seat and the section recess, and helical knives secured to the head units and secured in adjustment by the manually actuatable means.

3. A tool according to claim 2 wherein said manually actuatable means comprises a bolt.

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