

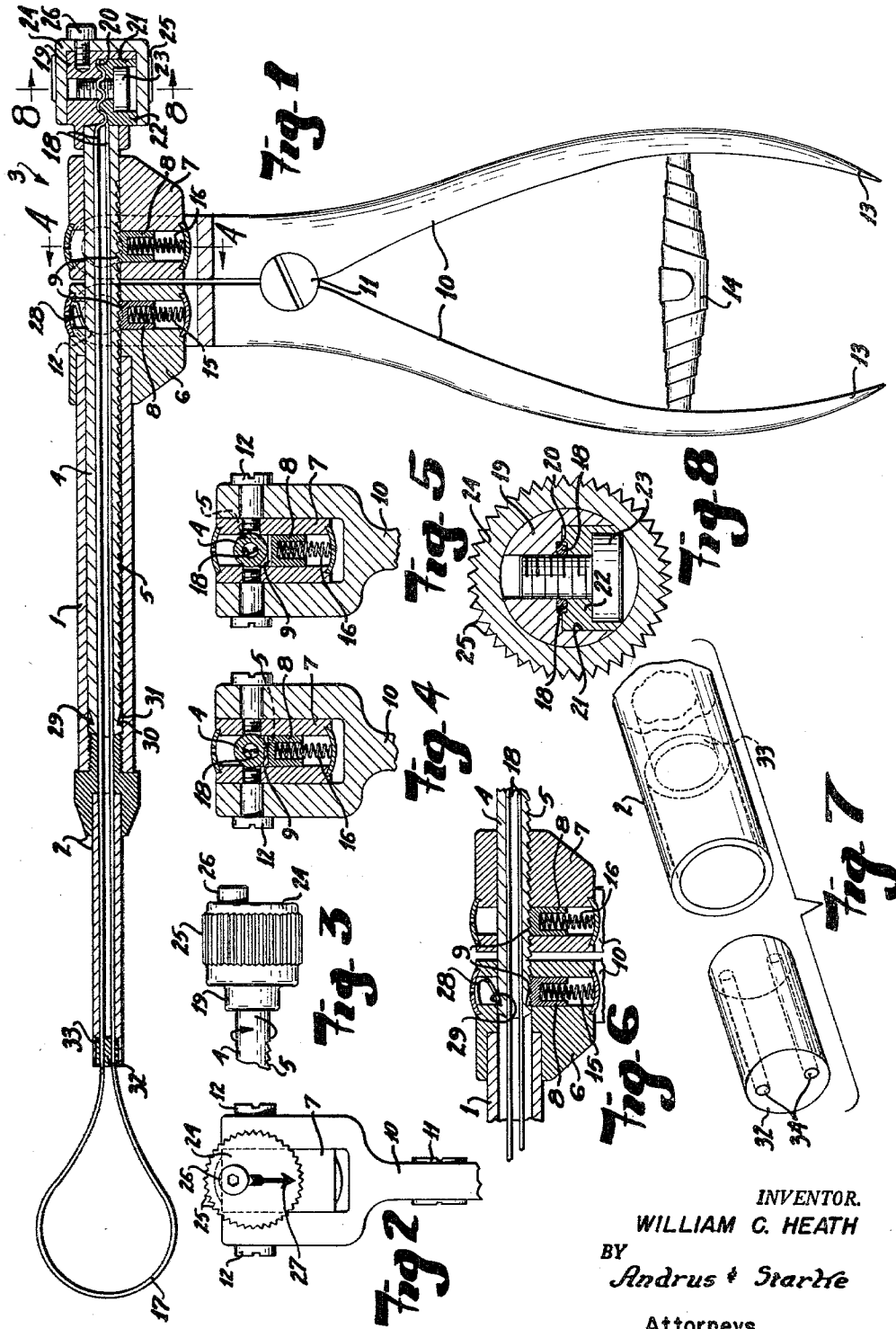
May 4, 1965

W. C. HEATH

3,181,533

SURGICAL SNARE

Filed Jan. 15, 1962



INVENTOR.
WILLIAM C. HEATH
BY
Andrus & Starcke
Attorneys

1

2

3,181,533

SURGICAL SNARE

William C. Heath, 1121 N. Waverly Place,
Milwaukee, Wis.

Filed Jan. 15, 1962, Ser. No. 166,198

5 Claims. (Cl. 128—320)

This invention relates to a surgical snare used by surgeons for cutting cartilage and various parts of the anatomy in the performance of operations.

In the performance of operations time is an important factor, and where a snare is to be employed there must be certainty of its functioning. Various ways have been employed in making up snares from surgical wire and in many instances these have been very crude.

The present invention provides a ratchet type surgical snare with improved features facilitating its assembly and actuation and protecting against errors in assembly and in actuation.

The loop of the snare is always made of a given maximum size and by actuation of the ratchet device it can be gradually reduced in size to zero thereby serving to cut or to take hold of any object of the anatomy during an operation. The reduction in size of the loop is accomplished always by pulling both sides of the loop into a nozzle, so that there is no tendency to turn or twist the object that is gripped or being cut by the loop.

The surgical wire forming the loop has its ends crimped in situ and secured in a plunger which draws the wire through the nozzle in reducing the loop.

The nozzle may have a plug in its mouth to guide the two sides of the loop as they enter the nozzle and prevent any kinking of the wire in the nozzle or plunger upon shock movements as when a cartilage is cut through.

The plunger has ratchet teeth along one side only and is adapted to be turned to disengage the teeth from the ratchet actuating pawls so that the plunger can be rapidly returned to starting position for a new operation. A lock is provided to prevent accidental removal of the plunger from the actuating mechanism, which then might delay assembly for a pending operation.

The invention will be better understood by reference to the accompanying drawing which shows an embodiment thereof with the several features stated above.

In the drawing:

FIGURE 1 is a side elevation of the snare with the actuating mechanism sectioned axially of the plunger and nozzle;

FIGURE 2 is an end view of the device;

FIGURE 3 is a detail side elevation of the outer end of the plunger;

FIGURE 4 is a schematic illustration taken as a section on line 4—4 of FIG. 1;

FIG. 5 is a view similar to FIG. 4 with the plunger turned 90° from its position in FIG. 4 for release of the ratchet teeth from the pawls and providing a rapid return of the plunger to starting position;

FIG. 6 is a detail view similar in sectioning to FIGURE 1 showing the plunger pulled to its outermost position and the lock engaged;

FIG. 7 is a detail perspective view showing the end of the nozzle with plug prior to insertion; and

FIG. 8 is an enlarged detail section taken on line 8—8 of FIGURE 1.

The surgical snare illustrated has a tubular body 1, carrying a removable nozzle 2 threaded thereto at one end, and a ratchet actuating device 3 at the other end.

A tubular plunger 4 is disposed axially within the tubular body 1 and extends outwardly through the actuating device 3 for axial movement relative to body 1. The plunger 4 is cylindrical and fits within a cylindrical bore

in body 1 to slide freely therein and to be turnable therein.

Ratchet teeth 5 are cut into the surface of the plunger along one side only and have their perpendicular sides facing axially toward the nozzle 2.

The actuating device 3 comprises two relatively movable heads or blocks 6 and 7, each carrying a spring pressed pawl 8 which has teeth 9 complementary to teeth 5 and normally in engagement therewith. Block 6 is secured to the end of body member 1 in fixed relation thereto while the block 7 is movably carried by the body member 1 by means of the pivotal arms 10 hereinafter described. The blocks 6 and 7 have aligned bores there-through serving as extensions of the bore of body 1 to receive the plunger 4.

A pair of laterally extending arms 10 are pivotally secured together at 11 intermediate the ends thereof, and have one end of each arm pivoted as at 12 to a corresponding block, and the other ends 13 of the arms serving as handles or a hand grip actuator. The handles 13 are similar to the handles of a pair of pliers and can be gripped in one hand of the operator and pivoted inwardly toward each other against a spring 14 which biases the arms 10 to a normal position where blocks 6 and 7 are closely adjacent. In operation, when handles 13 are squeezed toward each other against spring 14 block 7 will be moved axially away from block 6 and the ratchet pawl 8 in block 7 will pull the plunger 4 outwardly to the right from body 1. During this movement of plunger 4 the ratchet pawl 8 in block 6 moves outwardly against its spring 15 to ride over the ratchet teeth 5 on plunger 4.

When the handles 13 are released, spring 14 will separate them and cause the return of block 7 toward block 6 during which time the pawl 8 in block 7 will move outwardly against its spring 16 and ride over the ratchet teeth 5 on plunger 4.

Alternate squeezing and release of the handles 13 effects a step by step movement of plunger 4 outwardly in a direction to reduce the loop 17 of the snare, and at all times when one pawl 8 is riding over ratchet teeth 5 the other pawl engages the ratchet teeth 5 to secure the plunger 4 against inward movement.

The loop 17 is formed of surgical wire and is made up new just prior to use in each instance from a single wire of predetermined length. In forming the loop the ends 18 of the wire are threaded through the nozzle 2 and plunger 4 until they both engage the clamp head 19 which is secured on the outer end of plunger 4 and which provides an abutment or stop means for locating the ends 18 of the wire during assembly and thereby determining the size of the loop 17. In this position and with plunger 4 moved all the way into body 1, the loop 17 will be of maximum size.

The ends 18 are secured tightly within clamp head 19 by individually crimping the same between the corrugated inner surface 20 of a recess 21 in the head and a complementary corrugated surface of a clamp member 22 inserted in the recess 21 and secured in clamping position by a screw 23. For best clamping action one of the wire ends 18 extends on one side of screw 23 and the other wire end extends on the opposite side of screw 23 so that the latter enters clamp head 19 between the wire ends. The plunger 4 and the head 19 fixed thereto and clamping the ends 18 of the wire, together with the actuating mechanism for the plunger constitute pull means for pulling the wire of the loop 17 into and through the nozzle 2 of body 1, thereby reducing the size of the loop.

A cap 24 slides over clamp head 19 and protects clamp 22 from accidental loosening. Cap 24 has a knurled outer cylindrical surface 25 to facilitate turning and is secured on the clamp head 19 by a screw 26. An arrow

27, or other indicia is marked on the outer end of cap 24 to indicate to the operator the rotational position of plunger 4 so that he knows when the ratchet teeth 9 and 5 are and are not engaged.

After a given operation in which the plunger 4 is ratcheted outwardly it is desired to move it back to starting position. For this purpose, a turn of the clamp head 19 and with it the plunger 4 by about 90° to release the ratchet teeth as shown in FIG. 5 will permit manual pushing of the plunger inwardly to starting position, after which it may be turned back to engage the ratchet teeth 9 and 5.

In order to prevent accidental removal of the plunger by pulling it out of the bore in body 1 and in blocks 6 and 7, a spring detent 28 is disposed in block 6 to bear against the plunger 4 on the side opposite to pawl 8. A circumferential groove 29 is provided encircling the inner end of plunger 4 with an outwardly facing perpendicular wall 30 to engage spring detent 28 and stop further outward movement of the plunger, as shown in FIG. 6. The opposite wall 31 of groove 29 is slanting to serve as a cam for moving the detent spring 28 outwardly when plunger 4 is pushed inwardly.

Should it become desirable to remove the plunger 4 from body 1, the spring lock 28 may be removed from the body 1 and then the plunger may be pulled out all the way.

When a cartilage or other member is cut through there may be a considerable shock on the snare and the wire may tend to kink in the nozzle 2 or plunger 4. In order to prevent this a plug 32 is inserted in the end of the nozzle against a shoulder 33 in the bore of the nozzle, and provides two openings 34 for receiving the corresponding wires forming the opposite sides of loop 17. The openings 34 may be either drilled in plug 32 or they may be formed as separate slots in the outer surface of the plug.

Upon completion of an operation the loop 17 will be removed and replaced by a new loop. For this purpose it is only necessary to turn and push the plunger 4 inwardly, remove cap 24, loosen clamp 22 and pull on the loop 17 to withdraw ends 18 from the device. A new surgical wire is then inserted as previously described to form a new loop 17 and is clamped by member 22, after which cap 24 is replaced.

The invention provides a surgical snare that is quick and powerful to operate, with no danger of the loop loosening or breaking, and that can be assembled and disassembled easily.

Various modes of carrying out the invention are contemplated as being within the scope of the following claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention.

I claim:

1. In a surgical snare employing a surgical wire, a body having a nozzle through which the free ends of the surgical wire forming a loop are threaded, and pull means carried by said body securing said free ends to pull the loop into the nozzle in operation by pulling both ends simultaneously relative to the nozzle, said pull means comprising a cylindrical tubular plunger axially movable in said body and having ratchet teeth on one side thereof,

ratchet actuating means carried by said body and including pawl means engageable with said teeth, and means to actuate said pawl means relative to said ratchet teeth to effect movement of said plunger in a direction to pull said wire, and said plunger being rotatable in said body to disengage said ratchet teeth from said pawl means and thereby release said plunger for rapid return in a direction opposite to said wire pull direction.

2. A surgical snare employing a replaceable loop of surgical wire having free ends, comprising a tubular nozzle for receiving the free ends of the surgical wire and having a head fixed to the end thereof opposite the loop, a tubular plunger axially movable within said nozzle and extending outwardly through said fixed head, clamp means on the outer end of said plunger for securing the free ends of the surgical wire thereto, a movable head slidable on said plunger and disposed adjacent said fixed head, a series of ratchet teeth on one side of said plunger, spring pressed pawl means carried by each of said heads and adapted to engage said ratchet teeth, and lever means pivotally secured to said heads and disposed for manual alternate relative reciprocation of said heads toward and away from each other to effect step movement of said plunger outwardly of said nozzle to contract the wire loop.

3. The construction of claim 2 in which said lever means comprises a pair of plier-like lever arms pivotally connected intermediate their ends to provide a handle end and an operating end, a pivotal connection between the operating end of each said lever arm and a corresponding head to effect relative reciprocation of said heads by successive actuation of said lever arms, and spring means biasing said lever arms in a direction to effect separation of the handle ends thereof and relative movement of said heads toward each other.

4. The construction of claim 2 in which said clamp means comprises separable clamp elements adapted to crimp the portions of the wire in clamping the same, and abutment means for locating the ends of the wire therein to effect initial formation of a given sized loop with a given length of wire.

5. The construction of claim 2 in which said plunger is rotatable in said nozzle to present a smooth surface toward said ratchet means for free return of said plunger inwardly of said nozzle, and means on said plunger indicating the rotational position thereof.

References Cited by the Examiner

UNITED STATES PATENTS

50	668,647	2/01	Jaenicke	128—320
	798,839	9/05	Stowe	128—320
	1,606,497	11/26	Berger	128—320
	1,609,238	11/26	Beck	128—320
	1,772,352	8/30	Huber	128—320
55	2,054,149	9/36	Wappler	128—320
	2,154,929	4/39	Edwards	74—502

FOREIGN PATENTS

60	724,776	1/32	France.	
	RICHARD A. GAUDET, <i>Primary Examiner</i> .			
	JORDAN FRANKLIN, <i>Examiner</i> .			