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[54] **SURGICAL INSTRUMENT FOR PLACEMENT OF BONE PINS AND HOLES THEREFOR**

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[52] **U.S. Cl.**.....**128/92 EB**, 128/305

[51] **Int. Cl.**.....**A61b 17/16**, A61b 17/18

[58] **Field of Search**..128/305, 310, 347, 348, 349 R, 128/350 R, 83, 92 EB

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Primary Examiner—Channing L. Pace
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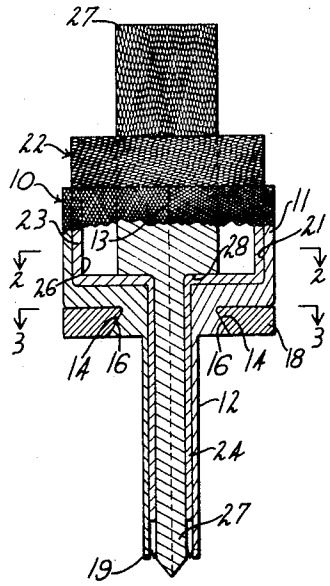
[57] **ABSTRACT**

A surgical instrument for placement of bone pins and holes therefor having an outer cannula telescopically receiving an inner cannula which in turn telescopically receives a stylus. The outer cannula has symmetrically separable components and one end thereof engages a bone in which a hole is drilled. A tool is detachably connected to the outer cannula for retaining the outer cannula assembly. An inner cannula terminates inwardly of said one end of the outer cannula and a stylus extends to a point adjacent said one end of the outer cannula.

10 Claims, 4 Drawing Figures



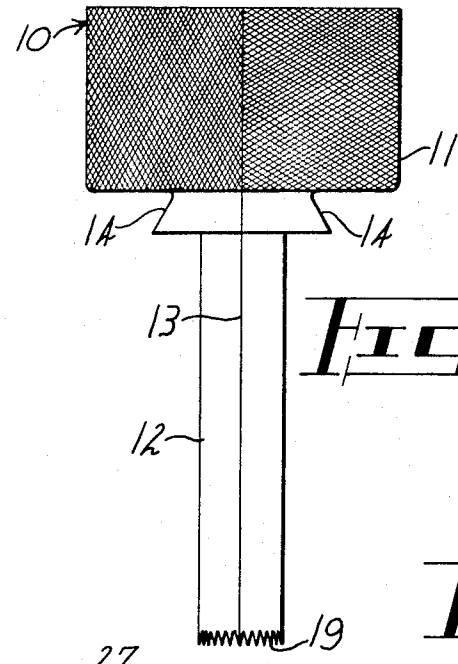


FIG 4.

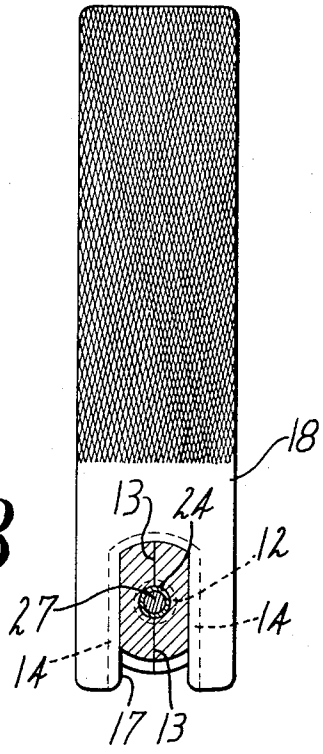


FIG 3

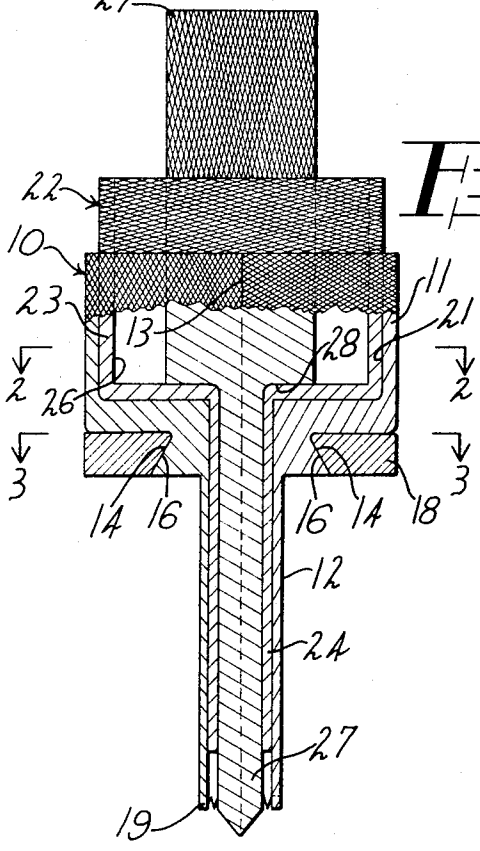
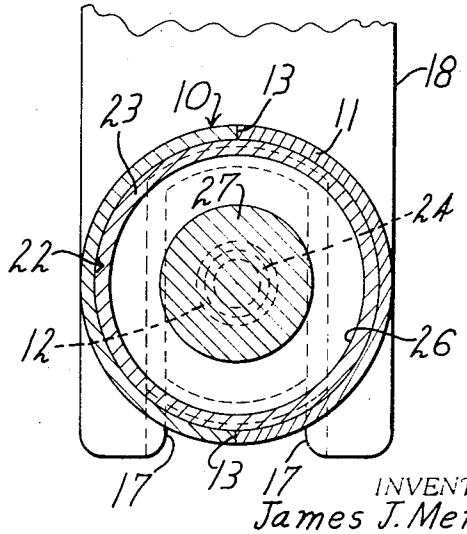


FIG 1.

FIG 2.



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SURGICAL INSTRUMENT FOR PLACEMENT OF BONE PINS AND HOLES THEREFOR

The invention described herein was made in part in the course of, or under, a grant from the U.S. Public Health Service, Department of Health, Education and Welfare.

BACKGROUND OF THE INVENTION

This invention relates to a surgical instrument and more particularly to an instrument for the placement of bone pins and holes therefor, such as where external pin fixation techniques are employed.

Heretofore in the art to which my invention relates, difficulties have been encountered in drilling holes into bones at precise locations without damage to surrounding soft tissues. Also, difficulties have been encountered in the insertion of the pin or screw into the drilled hole without damage to the surrounding soft tissue. Furthermore, visualization of pre-placed bur holes is difficult, thus requiring tactile manipulation of the pin into the bur hole. With prior art methods, the surrounding soft tissue is often contaminated with debris due to the difficulty in drilling the hole at the proper location and the difficulty in manipulating the pin whereby it enters the drilled hole. This is especially true in view of the fact that relatively large incisions are often required in the external soft tissue in order to position the drill bur and the bone pin.

BRIEF SUMMARY OF THE INVENTION

In accordance with my invention, I provide an instrument for the placement of bone pins and holes therefor wherein an inner cannula serves as a guide for the placement of the bur hole in the bone and an outer cannula serves as a guide for the placement of the bone pin within the hole. A stylus telescopes into the inner cannula to prevent entrapment of soft tissue when directing the apparatus to a bone. The outer cannula is divided longitudinally of its length to provide symmetrically separable sections which are held in assembled position by a tool which is detachably connected to the outer cannula and also serves as a handle member for the outer cannula and the components carried thereby whereby the bone pins may be placed at selected inclinations.

A surgical instrument embodying features of my invention is illustrated in the accompanying drawing, forming a part of this application, in which:

FIG. 1 is a side elevational view, partly broken away and in section, showing the instrument assembled;

FIG. 2 is a sectional view taken generally along the line 2—2 of FIG. 1;

FIG. 3 is a view taken along line 3—3 of FIG. 1, drawn to a smaller scale; and

FIG. 4 is a side elevational view showing the outer cannula with the sections thereof in assembled position.

Referring now to the drawing for a better understanding of my invention, I show an outer cannula 10 having, when assembled, a cylindrical end portion 11 which is formed integrally with a reduced diameter cylindrical portion 12. As shown in FIG. 4, the outer cannula 10 is divided along a centrally disposed line 13 to provide symmetrical and identical halves or sections at each side of the line 13 which are separable from each other.

To retain the separate halves or sections of the outer cannula in assembled relationship to each other, as shown in FIG. 1, I provide an outwardly opening locking groove 14 in the lower portion of the outer cannula 10 which corresponds to and slidably engagescontact surfaces 16 which define the sides of an outwardly opening slot 17 in an elongated handle 18. Preferably, the handle 18 is relatively flat whereby it requires a minimum of space to manipulate the tool. Accordingly, the recesses 14 are of a dove-tail shape which receive corresponding, inclined surfaces 16 defined along the sides of the U-shaped slot 17 in the handle 18. The handle 18 thus serves as a wrench to hold the outer cannula at selected inclinations and at the same time retains the separate halves of the outer cannula in assembled relation until the tool is separated from the outer cannula.

As shown in FIGS. 1 and 4, the end of the outer cannula opposite the enlarged diameter end 11 is serrated as at 19 to facilitate stabilization of the apparatus on the cortical bone and prevent movement of the apparatus while placing and drilling the bur hole and during the installation of the bone pin. The enlarged diameter portion of the outer cannula defines a cup-like receptacle 21 which is adapted to receive a conventional type wrench for seating the bone pin in a manner well understood in the art to which my invention relates.

Telescoping into the outer cannula 10 is an inner cannula 22 having an enlarged diameter portion 23 which slidably engages the inner surface of the cup-like receptacle 21 of the outer cannula 10. The enlarged diameter, cylindrical portion 23 of the inner cannula 22 is formed integrally with a reduced diameter cylindrical portion 24 which terminates inwardly of the end of the cylindrical member 12 carrying the serrations 19. Preferably, the cylindrical, reduced diameter portion 24 of the inner cannula 22 terminates approximately five millimeters inwardly of the end of the outer cannula 10 carrying the serrations 19 to provide a space for receiving water for coolant while the bur is in motion. This space also allows the serrations 19 of the outer cannula 10 to engage the cortical bone without difficulty and also prevents contact of the cutting edge of the bur with the adjacent inner surface of the inner cannula 22. The inner cannula 22 thus serves as a guide for the bur drill for placement of the bur hole in the bone. The inner surface of the enlarged diameter portion 23 of the inner cannula 22 defines a cup-like receptacle 26 which will accommodate conventional bur-shafts and conventional hand pieces.

Telescoping into the reduced diameter, cylindrical portion 24 of the inner cannula 22 is a central, solid stylus 27 which extends to a position adjacent the serrations 19 on the outer cannula 10. Preferably, the stylus extends to a position slightly outwardly of the serrations 19 on the outer cannula to prevent the entrapment of soft tissue in the outer cannula 10 when directing the apparatus to a bone. As shown in FIG. 1, the portion of the stylus 27 within the confines of the cup-like receptacle 26 is enlarged in diameter to provide an annular shoulder 28 which limits movement of the stylus inwardly of the inner cannula 22.

From the foregoing description, the operation of my improved surgical instrument will be readily understood. A small incision is made through the skin and

subcutaneous tissue over the proposed bone-pin site. The dimension of the incision should be approximately the same as the outer diameter of the cylindrical portion 12 of the outer cannula 10. A blunt dissection is performed to periosteum. With the incision thus made, the apparatus is directed to the bone with the stylus 27 in place and the outer cannula held in assembled position by the tool 18. When bony contact is established, the stylus 27 is removed and the serrations 19 of the outer cannula 10 are stabilized in the cortical bone. The bore of the inner cannula 22 is filled with sterile water for cooling purposes. The shaft of the bur drill is then inserted through the inner cannula 22 and following bony contact of the cutting portion of the bur drill, a hole is drilled in the bone through one or both cortices. Since the lower end of the cylindrical portion 24 of the inner cannula 22 is spaced from the adjacent end of the outer cannula carrying the serrations 19, sufficient room is provided for rotation of the cutting aspect of the drill bur without engaging the inner surface of the cylindrical portion 24.

After the hole is drilled, the inner cannula 22 is removed and water is aspirated into and from the outer cannula to remove water and any possible debris. Preferably, sterile water irrigations are employed. The pin or screw, not shown, is then inserted into the cylindrical portion 12 of the outer cannula 10 whereby the pin automatically moves into the proper alignment with the opening drilled in the bone. With the bone pin in engagement with the bur hole, the pin is rotated by conventional means to completely or partially secure the pin to the bone with the outer cannula still in place. The large diameter cup-like receptacle 21 in the outer cannula 10 permits insertion of a suitable tool into the outer cannula for rotation of the bone pin or screw. After the bone pin or screw has been anchored to the bone, the tool 18 is disengaged from the grooved surface 14 of the outer cannula 10, thus permitting separation of the outer cannula in two parts along the separation line 13. With the two sections of the outer cannula 10 thus separated, the outer cannula is removed from the soft tissue with the bone pin or screw remaining in place. The bone pin or screw is then completely secured in the bone if it was only partially secured prior to removal of the outer cannula.

From the foregoing, it will be seen that I have devised an improved surgical instrument for use in the placement of bone pins and drilled holes therefor. By providing means for guiding the shaft of the bur drill and the bone pin into proper engagement with the bone and preventing movement of the bur drill during the drilling operation, there is no damage to surrounding soft tissues since the bur drill and bone pin are manipulated within the confines of the apparatus. Also, surrounding soft tissue is not contaminated with debris due to the fact that debris is contained within the bore of the outer cannula 10 and any possible debris within the outer cannula is irrigated and aspirated prior to placement of the bone pin. Also, the entire procedure for placement of the bone pin is performed without the necessity of visualization of the pre-placed bur hole for tactile manipulation of the pin in the bur hole. Furthermore, my improved apparatus requires a minimal external soft tissue incision to obtain bony contact and placement of the bone pin and at the same time the apparatus is easily manuvered for placement of the bone pins at various inclinations. Furthermore, my improved instrument is simple of construction, economical of manufacture, durable and may be subjected to conventional methods of sterilization or may be disposable.

While I have shown my invention in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various other changes and modifications without departing from the spirit thereof.

What I claim is:

1. A surgical instrument for use in the placement of bone pins and drilled holes therefor;
   a. an outer cannula having separable components with one end of said outer cannula being adapted to be maintained in engagement with a bone in which a hole is to be drilled,
   b. a tool engagable with said separable components of said outer cannula holding said components together in assembled position while said tool is in one position relative to said components and releasing said components upon movement of said tool to another position,
   c. an inner cannula telescoping into said outer cannula with one end of said inner cannula terminating inwardly of said one end of said outer cannula, and
   d. a stylus telescoping into said inner cannula and extending to a point adjacent said one end of said outer cannula restraining the entrapment of soft tissue in said outer cannula.

2. A surgical instrument as defined in claim 1 in which said one end of said outer cannula is serrated.

3. A surgical instrument as defined in claim 1 in which the end of said stylus adjacent said one end of said outer cannula is tapered.

4. A surgical instrument as defined in claim 1 in which the end of said outer cannula opposite said one end is enlarged and said inner cannula has an enlarged end portion fitting said one enlarged end of said outer cannula.

5. A surgical instrument as defined in claim 4 in which said enlarged end portions of said outer and inner cannulae are concentric, cylindrical members which communicate with reduced diameter, concentric, cylindrical portions, respectively, of said cannulae.

6. A surgical instrument as defined in claim 5 in which said stylus is provided with an outer surface which corresponds to and slidably engages a portion of the inner surface of said inner cannula.

7. A surgical instrument as defined in claim 6 in which said enlarged end portion of said inner cannula extends axially outwardly of said outer cannula and the adjacent end of said stylus extends axially outwardly of said inner cannula.

8. A surgical instrument as defined in claim 1 in which said outer cannula is divided longitudinally into separate, matching sections with outwardly opening locking grooves in said sections and said tool is provided with contact surfaces along the edges of an outwardly opening recess therein which engage said locking grooves with a sliding fit to retain said sections in assembled position.

9. A surgical instrument as defined in claim 8 in which each locking groove is provided with an inner surface which flares outwardly toward said one end of

said outer cannula and said contact surfaces on said tool correspond to and slidably engage the adjacent inner surfaces of said locking groove.

10. A surgical instrument as defined in claim **8** in which said tool is provided with an elongated handle which projects outwardly of said outer cannula and supports said outer cannula while said outer cannula is in assembled position.

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