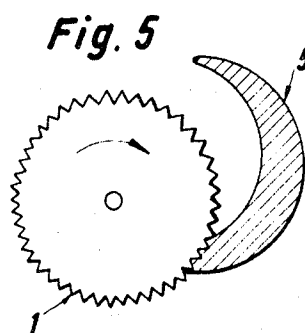
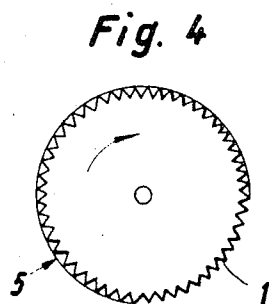
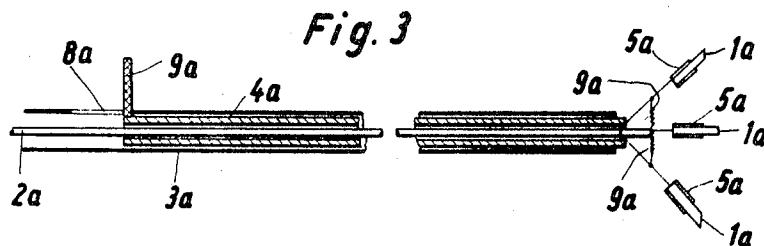
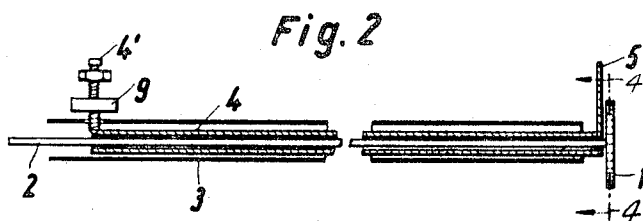
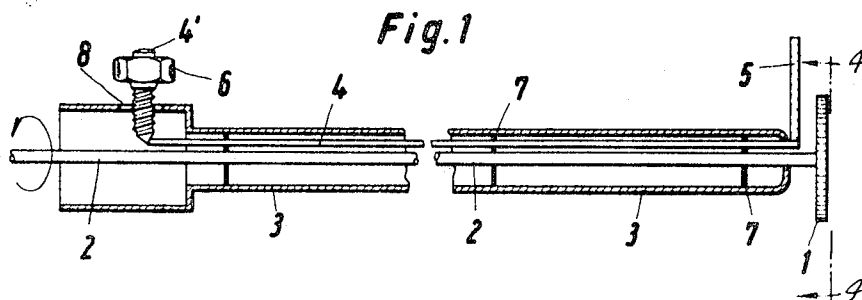


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3,468,312

METHOD AND INSTRUMENT FOR CUTTING OR SEVERING A
BONE FROM THE BONE'S INSIDE
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3,468,312

METHOD AND INSTRUMENT FOR CUTTING OR SEVERING A BONE FROM THE BONE'S INSIDE

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Claims priority, application Germany, Mar. 27, 1963, O 9,320

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U.S. Cl. 128—317

7 Claims

This application is a continuation of my abandoned application Ser. No. 348,406, filed Mar. 2, 1964.

The invention relates to a method and to an apparatus for cutting or severing bones from the inside of the bone.

Up to now, it has been common practice in surgery in case of need to saw or break through a bone from the outside thereof, which measure, however, did involve the danger of an infection, of a shock, of a high loss of blood, or of an injury of vessels, nerves or tendons.

In order to avoid this danger, the invention proposes an entirely different method, namely to cut or severe the bone not from its outside, but to insert a cutting tool through the marrow-cavity being drilled or otherwise provided with a central opening for this purpose, into the interior of the bone, and to apply the tool against the inner wall of the bone.

An embodiment of the invention relates to a method for sawing through a bone from the inside of the bone wherein a cutting tool such as a circular saw-like device, is inserted through an existing hole or through an opening drilled into the marrow-cavity in a manner known per se or formed therein by other known methods, and wherein the tool, at the location of the cut to be made, is laterally displaced from the central axis of the bone against the wall thereof, whereafter the wall of the bone is severed or cut through from the inside thereof by applying the tool against the bone's wall in said manner.

According to another embodiment of the invention, applying of the tool against the bone's wall may be performed by spreading outwardly the tool holder against the wall thereby forming an angle with respect to the central axis of the bone.

The internal saw may be inserted into the bone in the manner which is known for marrow spikes or nails, i.e. it is introduced into the marrow-cavity of the bone through a small skin puncture being spaced a sufficient distance from the location of the cut to be made. Similarly as in the case of driving in marrow spikes or nails, prior to insertion of the tool the marrow-cavity is enlarged by means of a long marrow-cavity drill to a diameter exceeding that of the saw disc of the internal saw by .04".

For carrying out said method, the invention provides an instrument for cutting or severing through a bone from the inside of the bone, wherein first and second elongated power-transmitting elements are arranged in parallel relation within a flexible tube, the first element having a cutting tool rigidly coupled to its end adjacent the end of the instrument to be inserted into the bone, and the corresponding end of the second element being provided with means for laterally displacing said tool out of the central axis of the bone and against the wall of the bone.

The invention is now described in detail with reference to these preferred embodiments of the invention and with reference to the accompanying drawings, wherein:

FIGURE 1 is a longitudinal sectional view through an embodiment of the instrument according to the invention, with the displacement means pivoted outwardly;

FIGURE 2 is a longitudinal sectional view through another embodiment of the instrument of the invention, with the displacement means pivoted outwardly;

FIGURE 3 is a longitudinal sectional view through a third embodiment of the instrument according to the invention, with the displacement means spread apart;

FIGURE 4 is an elevational view of the circular saw disc with the displacement means withdrawn (insertion position), and

FIGURE 5 is an elevational view of the circular saw disc with the displacement means expanded (operational position), in section along lines 4—4 in FIGURE 1.

In the drawings, the invention has been shown in a schematic form only since the exact constructional configuration will be obvious for an expert from the present disclosure.

The instrument of the invention mainly consists of a small cutting tool such as a circular saw disc 1, the diameter of which approximately corresponds to that of the marrow-cavity of the bone to be severed, and which is attached to the end of a robust elongated power-transmitting element 2 having a length of from about 12" to about 16". In the embodiment shown in FIG. 1, this element comprises a metal wire, preferably a steel wire, whereas in the embodiment shown in FIG. 2, a wire or a flexible shaft may be used for this purpose. The other end of this element 2 may be connected through a clutch (not illustrated and through a flexible drive shaft (not illustrated, either) to any one of the electric or pneumatic motors commonly used in an operating room.

The saw disc drive 2 extends into a flexible tube 3 which furthermore encloses a second elongated shaft element 4 of substantially the same length, the end of which element adjacent the saw disc being provided with a displacement means in the form of an approximately crescent-shaped lever 5 extending parallel to the saw disc. In the embodiment of the invention as shown in FIG. 1, element 4 and element 2 both consist of a metal wire, preferably a steel wire, while a flexible tube coaxially enclosing element 2 is used for this purpose in the embodiment shown in FIGS. 2 and 3.

Due to its eccentric mounting relative to the saw hub, lever 5 (which is almost completely covered by the saw disc in the sectional view of FIG. 4) may be moved a substantial distance out of the circular profile of the saw disc 1 by rotating shaft 4, as shown in FIG. 5, so that said lever presses the saw disc against the inner wall of the tubular bone whereby the bone may be severed at said location upon rotation of the saw disc. By rotating the entire instrument about its longitudinal axis, the tubular bone is cut through along its entire circumference.

Obviously, different cutting tools such as a milling tool, a grinding wheel, or one or more cutters may be used in a corresponding manner instead of the circular saw disc.

In order to allow the lever 5 of the embodiment shown in FIGS. 1, 2, 4 and 5 to be pivoted out of the tube 3 in a plane crossing the axis of the shaft element 4 and preferably normal to said axis, the wire of FIG. 1 is bent at 4' in a right angle at its end opposite to the displacing means, and passes out of the tube in radial direction through an elongated slot 8 extending e.g. about 180° of the periphery of the tube. In the construction of FIG. 2, the end of the outer shaft element 4 is provided with a pin 4' extending through said elongated slot. This angular portion or pin 4', respectively, may be provided with an external threading adapted to receive a nut 6 by means of which the element 4 may be secured against the tube 3 in any desired angular position.

Further, the embodiment of FIG. 1 includes one or several collars 7 or the like guide means disposed internally of the tube and adapted to guide wires 2, 4 within the tube 3 in parallel relationship with respect to the axis of the latter.

In the embodiment shown in FIG. 3, the cutting tool preferably comprises three cutting steel-like members 1a which are arranged respectively at the ends of three tool retainers or holders 5a adapted to be spread apart to form an angle with respect to the central axis of tube 3a and preferably to be spread apart in radial direction. In this modification, the power-transmitting element 4a is not pivoted about its longitudinal axis as in the embodiments of FIGS. 1 and 2 in order to move the displacing means out of the central axis of the bone towards the wall thereof, but is shifted in axial direction relative to the other power-transmitting element 2a to allow expansion of the tool holders 5a under the action of an expanding means 9a, e.g. in form of three springs. In this case, the elongated slot 8a must extend in direction of the tube axis.

I claim:

1. An instrument for cutting or severing a bone from inside the bone, comprising an elongated tube adapted to be inserted longitudinally into a prepared, generally axial cavity in the bone, first and second shafts extending lengthwise within said tube, spaced guide means in said tube for maintaining said shafts in parallel relation, a portion of said first shaft extending beyond the end of said tube and carrying a cutting tool, and radially displaceable means connected for positioned control by said second shaft for controllably urging said cutting tool against the internal bone surface to cut the same.

2. An instrument in accordance with claim 1, in which said radially displaceable means comprises a crescent-shaped lever adapted to lie in one position substantially within the profile of said cutting tool, and to project beyond said cutting tool in another position thereof.

3. An instrument in accordance with claim 1, in which said radially displaceable means comprises at least two additional cutting tools radially displaceable with respect to the first-mentioned cutting tool and with respect to each other.

4. An instrument in accordance with claim 1, in which said tube and said shafts are longitudinally flexible.

5. An instrument in accordance with claim 1, in which said shafts are coaxial.

6. The method of surgically severing a bone having a generally central axial cavity, by cutting the same from within the cavity along a circular path in a cutting plane generally perpendicular to the cavity axis, comprising introducing lengthwise into the cavity an elongated instrument having at least one cutting tool at its distal end, urging said cutting tool sidewise relative to the bone cavity to bring the cutting tool into cutting engagement with the inner wall of the bone cavity at one position, and thereafter rotating said instrument bodily about its own axis to advance the cutting tool around the desired circular path.

7. The method of surgically severing a bone having a generally central axial cavity, by cutting the same from within the cavity along a circular path in a cutting plane generally perpendicular to the cavity axis, comprising introducing lengthwise into the cavity an elongated instrument having at least one cutting tool at its distal end, urging said cutting tool sidewise relative to the bone cavity to bring the cutting tool into cutting engagement with the inner wall of the bone cavity at one position, and thereafter revolving said cutting tool bodily about the axis of said instrument to advance the cutting tool around the desired circular path.

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