June 30, 1925.

1,543,847

J. A. HEIDBRINK

ELECTRICALLY OPERATED SURGICAL BONE CUTTING DEVICE

Filed April 21, 1921

FIG-1.

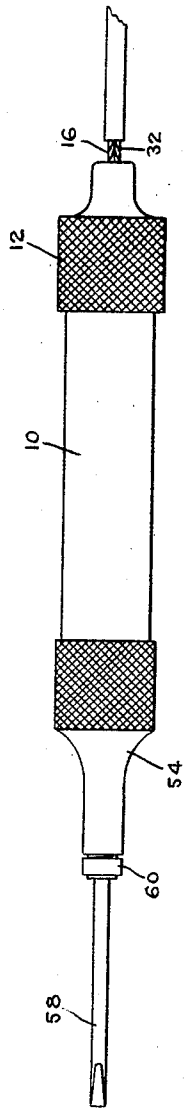


FIG-2.

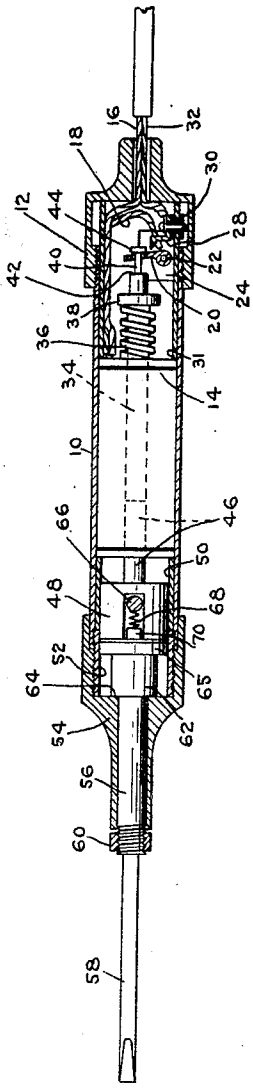


FIG-3.

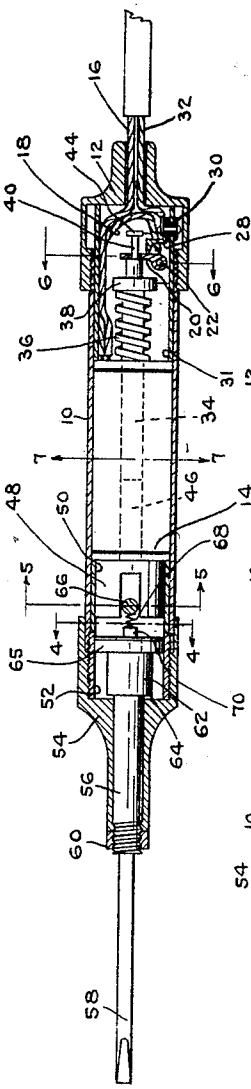


FIG-7

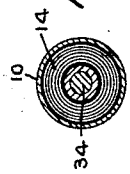


FIG-6

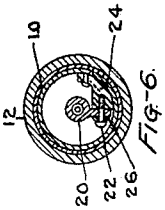


FIG-5.

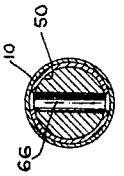
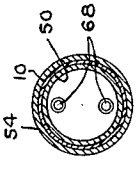


FIG-4.



INVENTOR:
JAY A. HEIDBRINK.
BY Whiteley and Ruckman
ATTORNEYS.

Patented June 30, 1925. 1,543,847

UNITED STATES PATENT OFFICE.

JAY A. HEIDBRINK, OF MINNEAPOLIS, MINNESOTA.

ELECTRICALLY-OPERATED SURGICAL BONE-CUTTING DEVICE.

Application filed April 21, 1921. Serial No. 463,422.

To all whom it may concern:

Be it known that I, JAY A. HEIDBRINK, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Electrically-Operated Surgical Bone-Cutting Devices, of which the following is a specification.

My invention relates to electrically operated surgical bone-cutting devices, and an object is to provide a device in which an electric current is employed to cause a rapid succession of blows to be delivered upon a cutting tool which is in engagement with the bone which is being operated upon. My device may be employed in performing surgical operations upon bones in various parts of the body. A particular instance where it may be employed to advantage is in oral surgery in cases of impacted teeth. Heretofore in treating such cases it has been customary to drill into the jawbone with a drill of the kind used by dentists. Such practice is open to the objections that fine particles which are drilled out get into the tissues and this is apt to have injurious results particularly if the bone is diseased. An object of my invention is to eliminate this objection by providing a cutter which cuts into the bone without producing fine particles.

The full objects and advantages of my invention will appear in connection with the detailed description, and the novel features embodied in my inventive idea will be particularly pointed out in the claims.

In the accompanying drawings which illustrate an application of my invention, Fig. 1 is a side elevational view of my device. Fig. 2 is a view mostly in central longitudinal section. Fig. 3 is a view similar to Fig. 2 but showing the device operated to bring the parts into a different position. Fig. 4 is a view in cross-section on the line 4—4 of Fig. 3. Fig. 5 is a view in cross-section on the line 5—5 of Fig. 3. Fig. 6 is a view in cross section on the line 6—6 of Fig. 3. Fig. 7 is a view in cross-section on the line 7—7 of Fig. 3.

Referring to the construction shown in the drawings, the numeral 10 designates a cylindrical member which, at its rear end, is provided with external screw-threads for receiving a cap 12. Mounted within the cylindrical member 10 is a solenoid 14 the coils of which are formed by a wire 16 which comes in through an opening in the cap 12. After forming the coils of the solenoid, the end portion 18 of this wire is secured to a contact member 20 pivoted on a screw 22 screwed into a piece of insulating material 24 secured inside of the cylinder. A spring washer 26 placed between the head of the screw and the shank of the pivoted contact member holds this member frictionally. This contact member normally engages a fixed contact member 28 mounted on a piece of insulating material 30 secured to a sleeve 31. A return wire 32 is connected to the fixed contact member. The core of the solenoid consists of a steel rod 34, the rear portion of which is surrounded by a coiled spring 36 placed between the rear end of the solenoid and an enlargement 38 carried by the rod. The extreme rear portion of the rod consists of a reduced stem 40 which extends through a hole in the pivoted contact member 20, the stem having limiting shoulders 42 and 44. To the forward end of the steel rod 34 is secured a brass rod 46, the forward end of which is enlarged into a head 48 which is slidable within a sleeve 50 fitting within the cylinder 10 and lying between the front end of the solenoid and a shoulder formed by cylindrical section 52 threaded into the forward end of the cylinder 10. Threaded upon the section 52 is a member 54 which has a bore for slidably receiving the reduced portion 56 of a holder for holding a chisel or cutting tool 58. The forward end of the tool holder is threaded for receiving an adjustable stop-ring 60. The rear portion of the tool holder has an enlarged portion 62 which forms a stop-shoulder 64 for engagement with the reduced portion of the member 54. The tool holder at the rear of the enlarged portion 62 has a still further enlarged portion 65 which has a sliding fit in the section 52. A pin 66 secured at its ends to the sleeve 50 extends through a slot in the head 48. This pin is engaged by the rear ends of a pair of springs 68, the forward ends of which are fastened in lugs 70 carried by the member 65. The springs 68 normally hold the tool 58 forwardly as shown in Fig. 2 but when it is pressed against a bone the tool is pushed back slightly as shown in Fig. 3 so that it may be operated by forward movement of the head 48.

The operation and advantages of my in-

vention will be readily understood from the foregoing description. The tool 58 is pressed against the bone which is to be operated upon and this causes the tool and the enlarged portion 65 to be slightly retracted as shown in Fig. 3. The solenoid core is normally held rearward by the spring 36 as shown in Fig. 3. When current is turned on its passage through the coils of the solenoid causes the steel rod 34 to be quickly drawn forwardly and the head 48 is caused to strike a blow on the enlarged portion 65 of the tool holder which is transmitted to the tool. The stem 40 slides through the pivoted member 20 until the shoulder 44 engages and pulls this member forwardly and breaks its contact with the fixed member 28. This causes the solenoid to be de-energized and the spring 36 quickly retracts the core so that the shoulder 42 causes the member 20 to again engage the member 28 and complete the circuit. This operation causes a rapid succession of blows to be delivered upon the cutting tool. In this manner, the bone is subjected to a cutting operation which is speedily accomplished without the formation of fine particles which are produced when a drill or saw is employed. The movement of the member 62 and of the cutting tool may be regulated by adjusting the stop ring 60 and also by screwing the section 52 in or out.

It is obvious that since the tool holder is backed up resiliently, the force of the blow delivered thereon by the hammer is determined by the degree of pressure with which the tool is pressed against the bone.

I claim:

1. An electrically operated bone-cutting device comprising a holder for a cutting tool, a tubular member in which said holder is slidably mounted, a solenoid mounted in said tubular member, a core for said solenoid, means for retracting said core in rearward direction when said solenoid is de-energized, a pivoted contact member insulatively mounted in said tubular member, a fixed contact member insulatively mounted in said tubular member and which is engaged by said pivoted contact member when the latter is in rearward position whereby a circuit is completed through the coils of said solenoid, means for operating said pivoted contact member to cause the circuit to be broken when said core reaches its forward position and to cause the circuit to be completed when said core is retracted, and a hammer carried by the forward portion of said core for delivering a succession of blows upon said tool holder.

2. An electrically operated bone-cutting device comprising a holder for a cutting tool, a tubular member in which said holder is adapted to have a limited sliding movement, resilient means which normally urges said holder forwardly with relation to said tubular member and which permits said holder to be pushed rearwardly when it is pressed against the bone to be cut, a solenoid mounted in said tubular member, a steel rod constituting a core for said solenoid, means for retracting said core in rearward direction when said solenoid is de-energized, a pivoted contact member insulatively mounted in said tubular member, a fixed contact member insulatively mounted in said tubular member and which is engaged by said pivoted contact member when the latter is in rearward position whereby a circuit is completed through the coils of said solenoid, means for operating said pivoted contact member to cause the circuit to be broken when said core reaches its forward position and to cause the circuit to be completed when said core is retracted, and a hammer carried by the forward portion of said core for delivering a succession of blows upon said tool holder.

3. An electrically operated bone-cutting device comprising a holder for a cutting tool, a tubular member which receives an enlarged portion of said holder, a head secured to the forward end of said tubular member and having a bore through which a reduced portion of said holder extends slidably, a stop on the forward end of said holder which by engagement with said head limits rearward movement of said holder, a solenoid mounted in said tubular member, a steel rod constituting a core for said solenoid, a coiled spring interposed between the rear of said solenoid and an enlargement on the rearward portion of said rod, a stem having limiting shoulders and extending from the rearward portion of said rod, a pivoted contact member insulatively mounted in said tubular member, said stem extending through a hole in said member, a fixed contact member insulatively mounted in said tubular member and which is engaged by said pivoted contact member when the latter is in rearward position whereby a circuit is completed through the coils of said solenoid, a brass rod secured to the forward end of said steel rod, a hammer on the forward end of said brass rod for delivering a succession of blows on said tool holder, a fixed pin extending through a slot in said hammer head, and resilient means interposed between said pin and the rear of said tool holder.

In testimony whereof I hereunto affix my signature.

JAY A. HEIDBRINK.