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SURGICAL APPARATUS

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Fig. 1.

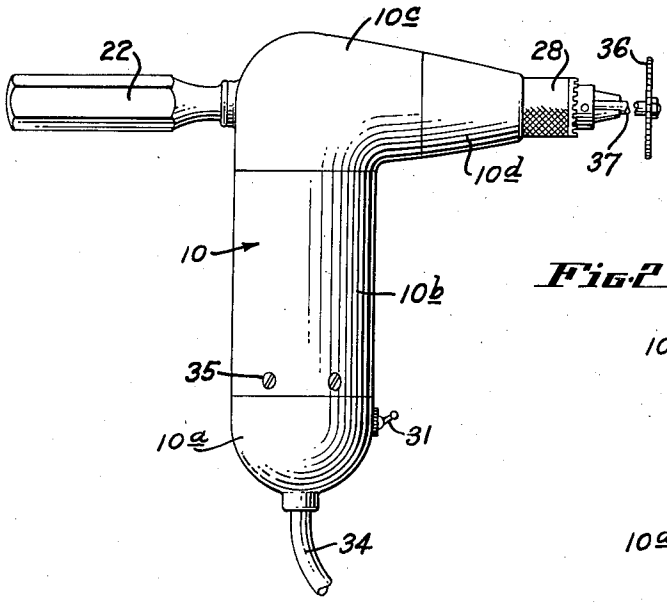


Fig. 2.

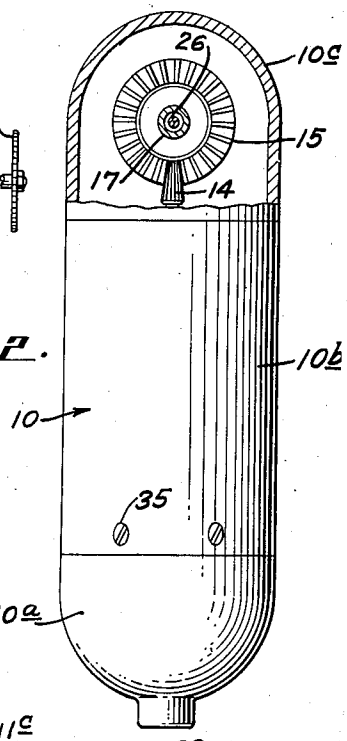
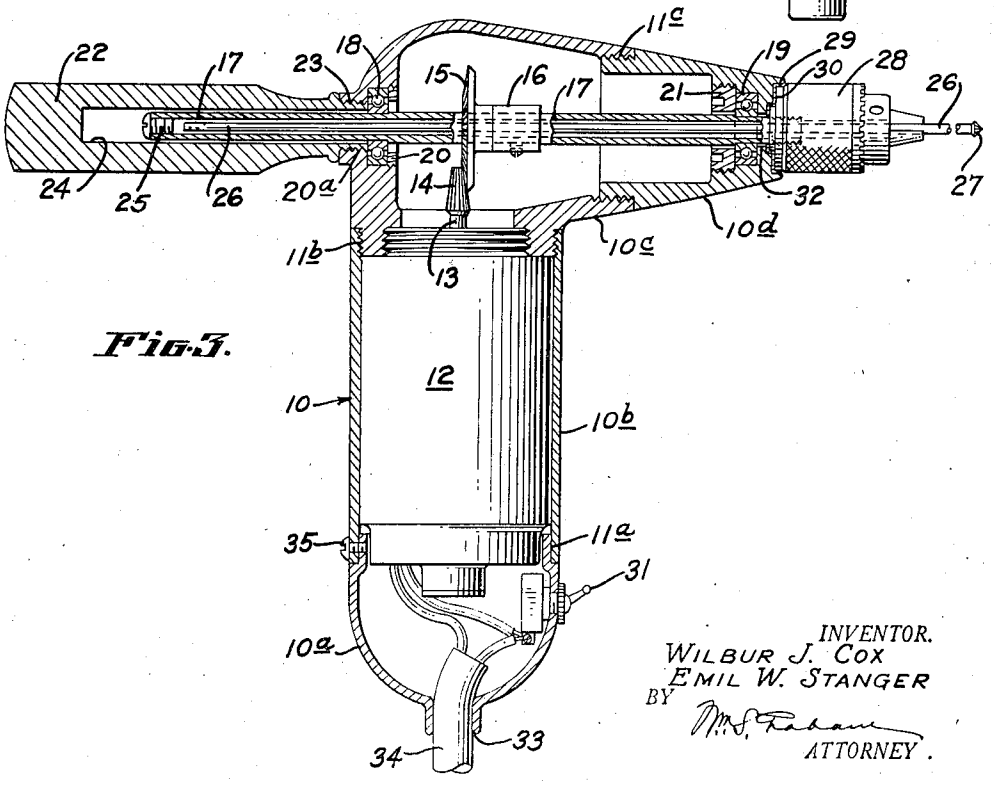


Fig. 3.



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SURGICAL APPARATUS

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3 Claims. (Cl. 128—310)

This invention relates to improvements in surgical apparatus and more particularly to a surgical drill instrument. In surgery it is well recognized that aseptic conditions must be maintained to the highest possible degree at the instant immediately preceding a surgical operation, and it is therefore highly desirable that instruments for performing surgical operations should be subjected to asepsis immediately prior to use and not require assembly after sterilization. Therefore, it is of great importance that an instrument of the character described herein should be capable of sterilization as an entirety in an autoclave, including the drill mechanism and the motor for rotation thereof. It is further highly desirable that the motor be encased within the instrument itself so as to procure the advantages of accuracy and power of direct drive between motor and drill mechanism; it is further important that instant control of the rotation of the drill be convenient to the hand of the operator.

It is one object of this invention to provide a surgical drill apparatus of various surgical uses which can be readily sterilized in an autoclave just prior to its use or even at intermittent periods during its use, and not require assembly after bein asepticized. A further object is to provide a surgical drill apparatus which may be manually manipulated so as to be guided by either hand or both hands of the operator and which may be manually directed in movement forwardly or rearwardly, as well as laterally. Another object is to provide a surgical drill apparatus which may be operated for sawing bone and the like in which the plane of the saw blade is parallel to normal forward or backward movement of the hand of the operator and simultaneously to provide a means by which support may be afforded to the drill instrument and the saw blade for accuracy in operation. A still further object is to provide a surgical drill apparatus adaptable for operation with a saw blade, a surgical drill bit, or a Kirschner wire, the latter being a name known to the medical profession for an elongated metal wire having a drill point, usually a diamond drill head, and employed for drilling through bone which is deeply embedded in tissue, such as in the thigh or arm and leaving the drill wire within the incision for traction purposes in setting and further treatment of fractures.

With the foregoing and other objects in view, all of which will be more apparent as this description proceeds, the invention is exemplified in one form in the novel construction and combination of parts hereinafter described, illustrated in the accompanying drawing, and pointed out in the claims hereto appended, it being understood that various changes in the form, proportion, size and details of construction of the apparatus may be resorted to within the scope of the appended claims without departing from the spirit or sacrificing any of the advantages of the invention.

To more clearly comprehend the invention, reference is directed to the accompanying drawing wherein—

Fig. 1 is a side elevation of the invention.

Fig. 2 is an end view of Fig. 1, from the left-hand side of the drawing, with the upper portion in section to show detail of mechanism.

Fig. 3 is a vertical transverse view partially in section with portions shown in side elevation.

In Fig. 1 the apparatus is illustrated as employing a circular rotatable saw blade mounted on the drill bit, whereas in Fig. 3 the apparatus is illustrated as employing a Kirschner wire.

Referring to the drawing, in which like characters of reference indicate corresponding parts in the several views, 10 indicates generally a hollow casing having a substantially smooth exterior and preferably formed of four parts comprising a cup-like base 10^a, a cylinder body 10^b, a head 10^c, and a cap portion 10^d. The head 10^c and cap 10^d preferably form a conical frustrum body. The base, cylinder body, head and cap are tightly fitted at their respective joints 11^a, 11^b, 11^c, so that said joints are substantially impervious to moisture. In our preferred embodiment of the invention, the axes of the cup-like base 10^a and cylinder body 10^b are substantially at right angles, or perpendicular to the axes of the head 10^c and cap 10^d. A motor 12 of any suitable type is snugly mounted within the cylinder body 10^b. Since the motor 12 is of any conventional, well-known type, it is believed unnecessary to describe its mechanism in detail other than to state that it has a rotatable shaft 13 on which is mounted a suitable driving gear 14, illustrated as a conical bevel drive which meshes with a plate bevelled gear 15, the latter being fixedly mounted by a sleeve 16 on a rotatable arbor or drill shaft 17, which is journaled at respective opposite end portions in anti-friction bearings 18, 19, for rotation axially of the head 10^c and cap 10^d. The bearing 18 is maintained in position by threaded plug 20 and the bearing 19 is likewise maintained in position by threaded plug 21. It will be noted that the joint 11^c of the casing is at a position relative to the conical portion thereof so that when the casing is opened at joint 11^c the width of the opening permits the complete withdrawal of the drill

shaft with the conical head 10d, for which purpose the plate bevelled gear 15 is of smaller diameter than the opening at joint 11c, the bevelled plate gear being mounted so that it meshes with drive gear 14 at the side thereof which is between the axis of gear 14 and the joint 11c. This permits ready repair or replacement of parts of the drill, and also makes the antifriction bearings 18, 19 accessible from the interior of the hollow portions of the casing and permits sealing within the casing of lubrication of said bearings wherein the lubricating oil cannot come into contaminating contact with the drill point nor be dissolved by the sterilizing immersion of the drill in steam or water, nor can the bearings collect any infectious matter from operations.

At the rear end of the head 10c is mounted a handle 22, one end of which is threadedly connected as at 23, to the head 10c. The handle 22 serves for manipulation purposes to direct the drill and is also canalized as at canal 24 to receive an elongated extension of the drill shaft 17, the latter extending rearwardly beyond the confines of head 10c through an opening 20a. The drill shaft 17 is also tubular, and is capped at its rear end by a threaded plug 25 to prevent entry within the shaft of any grease or foreign matter. This elongation of the shaft or arbor 17 permits the employment of the elongated Kirschner wire 26 which is illustrated as being employed in the drill in Fig. 3, the wire 26 having a diamond drill point 27. A chuck 28 of any usual well-known type is mounted at the forward end of the shaft 17 so as to rotate therewith. The forward end opening of the cap portion 10d closely fits circumferentially adjacent to the chuck 28, as at 29, and a suitable packing gland 30 may be also employed between the cap and chuck to provide a seal therebetween and prevent moisture from entering within the body 10.

In order to facilitate the operation of the drill, a switch mechanism 31 for the motor 12 is carried by the cup base 10a at which point it is readily accessible to operation by a finger of the operator's hand which grasps the cylinder body, while the other hand of the operator may grasp the handle 22 for more efficient and dexterous manual manipulation of the device.

Since one of the objects of the invention is to permit sterilization in an autoclave of the entire apparatus while it is assembled, it will be obvious that the joints 11a, 11b, 11c and 23 are tightly fitting and impervious to entry of moisture and that the opening 32 in the cap portion through which the shaft 17 is mounted as well as the opening 33 which receives the electrical conduit 34 are likewise made impervious to entry of moisture. While we have shown the joints 11b, 11c, and 23 as being threaded connections, other suitable connections may be employed, such as at the joint 11a where a tight frictional fit is employed and the joined parts secured against separation by a screw 35 passing through the abutting walls of the members.

In Fig. 1 the apparatus is illustrated as employing a rotary blade saw 36 mounted on the drill bit 37. Manifestly, the bit could be used as an ordinary drill without the saw being mounted thereon if the surgical operation being performed should require such use.

We claim:

1. A surgical apparatus comprising a hollow casing sealed against entry of moisture and composed of a plurality of tightly joined body parts, a drill mechanism in said casing having a tubular rotatable drill shaft which extends free beyond the sealed portion of the casing and is adapted for mounting a chuck at its free end, and a packing gland at the free end of the drill shaft for preventing entry of moisture into the casing around the drill shaft, relatively spaced anti-friction bearings within the sealed casing for rotatively supporting the drill shaft, a motor in the casing having a rotatable drive shaft for rotating the drill shaft, and a handle mounted at the rearward portion of the casing substantially coaxial with the drill shaft, said handle being canalized for receiving an end portion of the drill shaft, the portions of the casing housing the motor and drill shafts, respectively, being relatively perpendicular and the portion of the casing housing the drill shaft, being conical and having a joint intermediate its ends whereby the head of the conical casing, the chuck assembly and the drill shaft may be removed from the casing as a unit and the anti-friction bearings made accessible from the interior of the conical portion of the casing.

2. A surgical apparatus comprising a hollow casing sealed against entry of moisture and composed of a plurality of tightly joined body parts relatively disposed so that one portion of the casing is perpendicular to another portion thereof, a drill mechanism in said casing having a tubular rotatable drill shaft which extends free beyond the sealed portion of the casing and is adapted for mounting a chuck at its free end, and a packing gland at the free end of the drill shaft for preventing entry of moisture into the casing around the drill shaft, a closure for one end of the tubular shaft, relatively spaced anti-friction bearings within the sealed casing for rotatively supporting the drill shaft, a motor in the casing having a rotatable drive shaft for rotating the drill shaft, said respective motor and drill shafts being substantially perpendicular relatively, and a handle mounted at the rearward portion of the casing substantially coaxial with the drill shaft, said handle being canalized for receiving an end portion of the drill shaft, and the portion of the casing housing the drill shaft being conical and having a joint intermediate its ends at a longitudinal position of the conical casing whereby the head of the conical casing, the chuck assembly and the drill shaft may be removed from the casing as a unit and the anti-friction bearings made accessible from the interior of the conical portion of the casing.

3. A surgical apparatus comprising a hollow casing sealed against entry of moisture and composed of a plurality of tightly joined body parts, a drill mechanism in said casing having a tubular rotatable drill shaft closed at one end and having at its opposite end beyond the sealed portion of the casing a chuck which is adapted to receive the stem of a drill tool, antifriction bearing means within the sealed casing for rotatably supporting the tubular drill shaft, a motor in the casing for rotating the tubular drill shaft, said casing being sufficiently sealed at its joints and through its body to prevent entry of moisture thereinto and the tubular drill shaft having its tube sealed against communication with other portions of the interior of the hollow casing.

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