

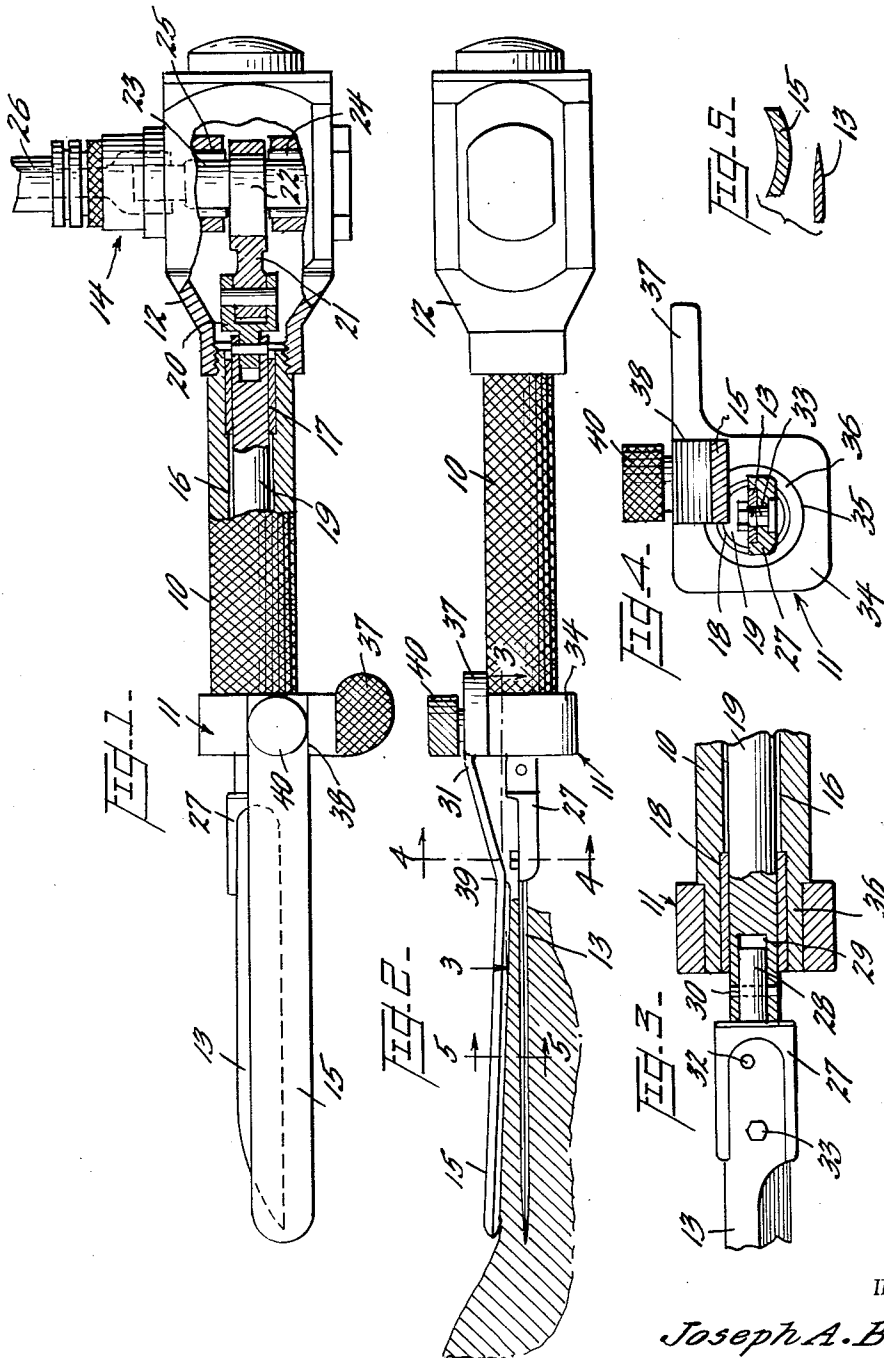
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POWER DRIVEN SURGICAL KNIFE

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POWER DRIVEN SURGICAL KNIFE

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This invention relates to surgical instruments, and more particularly to a power driven surgical knife primarily intended for certain specialized uses.

Notwithstanding the wide variety of tasks which the surgeon is required to perform, the conventional scalpel or surgical knife has undergone little development over the years, and this conventional instrument is still employed in a great variety of operating procedures, for some of which it is not ideally suited. Thus, in performing certain operations, of which mastectomy is a notable example, the surgeon is required to lay open a considerable area of the patient's body by forming skin "flaps" which are turned back to expose the tissues which lie beneath. In the formation of such skin flaps certain factors are of great importance, including the conservation of time, which minimizes loss of blood and reduces the total time required for the operation, to the benefit of the patient. Another important factor is accuracy. Use of the conventional scalpel in the formation of skin flaps, even by the most competent surgeons, results in some variation in thickness of the flap from point to point, and occasionally areas of fat will be left on the flap which are thicker near the edge and without adequate blood supply. This factor of devitalized fat contributes appreciably to the development of post-operative wound complications such as fluid collection, wound infection, delayed healing and skin necrosis.

Again, in forming the aforesaid skin flaps it is desirable that the thickness of the flap increase uniformly from the edge toward the base of the flap, to insure adequate blood supply for all areas of the skin. With the conventional scalpel it is difficult to insure such uniform variation in thickness. In mastectomy operations, for example, it is desirable that the skin flaps be approximately 2 mm. thick at their edges, and increase uniformly toward their bases to an ultimate thickness of 6 mm. to 8 mm.

Use of a power driven scalpel would, in itself, expedite formation of the aforesaid skin flaps, but would not necessarily be of assistance in obtaining the required accuracy and resultant uniformity mentioned above. Accordingly, it is the general object of the invention to provide a power driven surgical knife equipped with guide means enabling the surgeon to perform surgical procedures of the type in question both expeditiously and with great accuracy and uniformity of result. The knife blade is caused to reciprocate rapidly in the direction of its length, and the guide means consists of a member extending in substantial parallelism with the knife blade to a point approximately opposite the distal end of the blade when at the extremity of its outward reciprocation. The guide member rests upon the outer surface of the skin during the cutting of the skin flap, and thus determines the depth of the knife in the underlying tissue while, at the same time, the tip of the guide member indicates accurately the location of the tip of the knife blade.

More specifically, it is an object of the invention to provide a surgical instrument for cutting tissues to a controlled thickness, for example in the formation of skin flaps of a definite and uniformity increasing thickness from edge to base of the flap, such instrument comprising a power driven knife blade and a guide bar extending generally parallel to the blade and adapted to rest on the skin surface to control the depth and angle of the

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blade, and indicate its location. Such an instrument may comprise a handle, a member mounted in the handle for reciprocatory motion relative thereto, a knife blade connected to one end of said member for reciprocation therewith in the direction of the length of the blade, a guide bar rigidly secured to the handle and extending generally parallel to the blade in laterally spaced relation thereto, and means operatively connected to the other end of said member for impairing reciprocatory motion thereto.

For use in forming skin flaps such as mentioned above, the guide bar preferably diverges gradually and uniformly from the blade in the direction of the distal end of the latter. The guide bar is spaced from the blade in the direction of the thickness of the blade, said guide bar being preferably provided, on the side facing toward the blade, with a surface which is convexly curved in the direction of its width.

Other and further objects, features and advantages will be apparent from the description which follows, read in connection with the accompanying drawings in which

FIGURE 1 is a view, partly in plan and partly in section, of an instrument constructed according to the invention;

FIGURE 2 is a side elevational view of the instrument;

FIGURE 3 is a longitudinal section on line 3—3 of FIGURE 2; and

FIGURES 4 and 5 are transverse sectional views on lines 4—4 and 5—5, respectively, of FIGURE 2.

In order to facilitate an understanding of the invention, reference is made to the embodiment thereof shown in the accompanying drawings and detailed descriptive language is employed. It will nevertheless be understood that no limitation of the invention is thereby intended and that various changes and alterations are contemplated such as would ordinarily occur to one skilled in the art to which the invention relates.

The illustrated embodiment of the invention comprises generally a handle 10 provided with a thumb-piece assembly 11 at one end and a transmission housing 12 at the other end, a knife blade 13 operatively connected, in a manner to be described, to a power means 14, and a guide bar 15 laterally spaced from and extending generally parallel to the blade 13. The power means 14 may take the form of any suitable flexible cable drive such as those used for various surgical and dental instruments, its details being of no consequences to the present invention.

The handle 10 is tubular and preferably cylindrical, and may be roughened on its exterior surface to facilitate handling. Within the tubular bore 16 of the handle there are provided cylindrical bushings 17 and 18 at either end, in which a reciprocating member 19 is slidably mounted. A yoke 20 is articulated to the rearward end of the member 19, the yoke 20 being pivotally connected, in turn, to a connecting rod 21 journaled on an eccentric 22. The latter is rigid with a shaft 23 journaled in bearings 24 and 25 carried by the housing 12, and is operatively connected to the flexible cable 26 from which it derives rotary motion.

To the opposite or outer end of the reciprocatory member 19 there is secured a blade holder 27, the latter having a projection 28 telescoped within a bore 29 provided in the outer end of the member 19, and secured therein by means of a pin 30. The blade 13 is rigidly secured to the blade holder 27 by means of a dowel 32 and screw 33, or in any other suitable fashion. The blade 13 may be of a conventional shape as illustrated, and is sharpened along its straight edge, from the vicinity of its connection with the blade holder to its outer extremity.

The thumb-piece assembly 11 is seen in end elevation

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in FIGURE 4, and comprises a generally rectangular body 34 centrally bored as at 35 to engage with a press fit upon a reduced portion 36 at the outer end of handle 10. The body 34 is provided with a lateral extension 37 which serves as a thumb rest, and which is preferably roughened on its upper surface. The body 34 is provided with a slot 38 to receive one end of the guide bar 15, the latter being secured to the body 34 by means of a knurled screw 40 which extends through an aperture in the guide bar and into threaded engagement with a tapped hole in the body 34.

The guide bar 15 is provided with a downward bend 31 adjacent the thumb-piece assembly and an upwardly bend 39 adjacent the inner end of the sharpened edge of blade 13 so that the lateral spacing between the guide bar and the inner end of the blade edge approximates 2 mm. From this point outwardly the guide bar preferably diverges uniformly from the blade so that the outer ends of these two members are from 6 mm. to 8 mm. apart. It is contemplated that several guide bars, of varying angularity, may be provided with each instrument so that the surgeon may choose a guide bar which will enable him to form skin flaps of the desired edge and base thickness, depending upon circumstances.

In using an instrument according to the invention, the surgeon inserts the knife under the skin, through a previously made linear incision, the guide bar 15 resting upon the outer surface of the skin and, after applying power, moves the instrument laterally in the direction of the sharpened edge of the knife, this motion being to the left in the case of the illustrated embodiment. By keeping the skin taut, with the use of clamps, and maintaining the guide bar 15 in constant light engagement with the skin surface during this movement, the depth and angle of the blade may be controlled so that an accurate, uniform cut is made and the result is a properly tapered flap of definite and predetermined thickness and taper.

Having thus described the invention, what is claimed

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as new and desired to be secured by Letters Patent is:

1. A surgical instrument comprising a handle, a member mounted in said handle for reciprocatory motion relative thereto, a knife blade operatively connected to one end of said member for reciprocatory motion therewith in the direction of the length of said blade, said blade being relatively wide and thin, and having a laterally presented rectilinear cutting edge extending in the direction of its length and a free distal end, a guide bar rigidly secured to said handle and extending generally parallel to said blade in laterally spaced relation thereto, said guide bar being spaced from said blade in the direction of the thickness of said blade, and diverging gradually from said blade in the direction of the distal end thereof, said guide bar having a free end detached from said blade and extending to a point substantially opposite the outer end of the reciprocatory travel of the free distal end of said blade, said free ends being relatively spaced to provide an opening for the passage of a flap of severed material therebetween and means operatively connected to the other end of said member for imparting reciprocatory motion thereto.

2. A device as defined in claim 1, said guide bar being spaced about 2 mm. from said blade at the inner end of the latter, said spacing increasing uniformly to about 6 to 8 mm. at the distal end of the blade.

3. A device as defined in claim 1, the surface of said guide bar facing toward said blade being convexly curved in the direction of its width.

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