April 15, 1947. T. W. BRIEGEL 2,419,114

SKIN GRAFTING KNIFE

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Fig. 1.

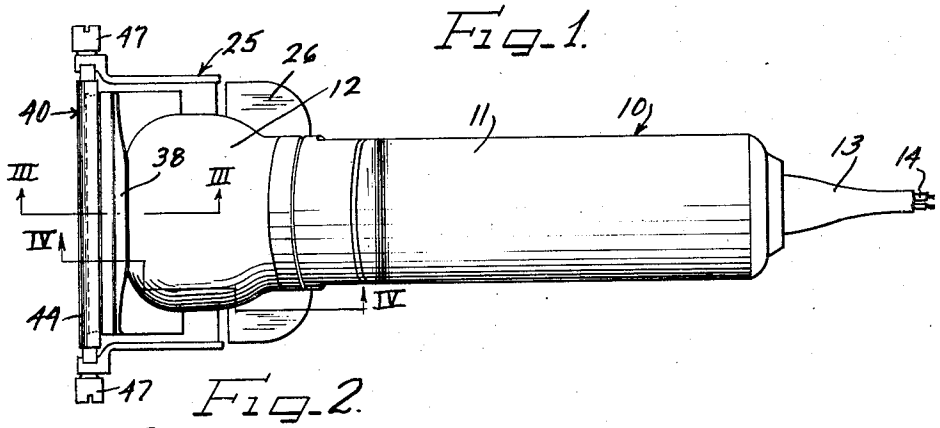

Fig. 2.

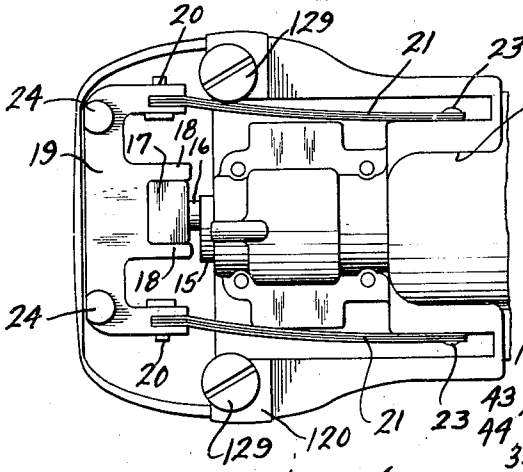

Fig. 3.

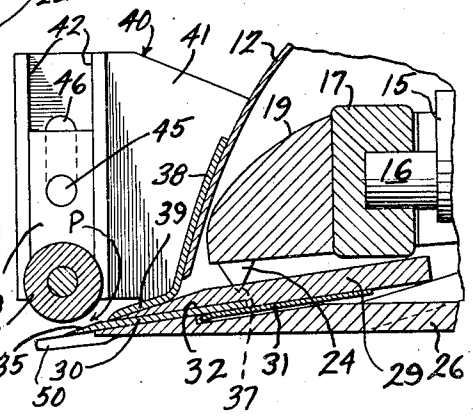

Fig. 4.

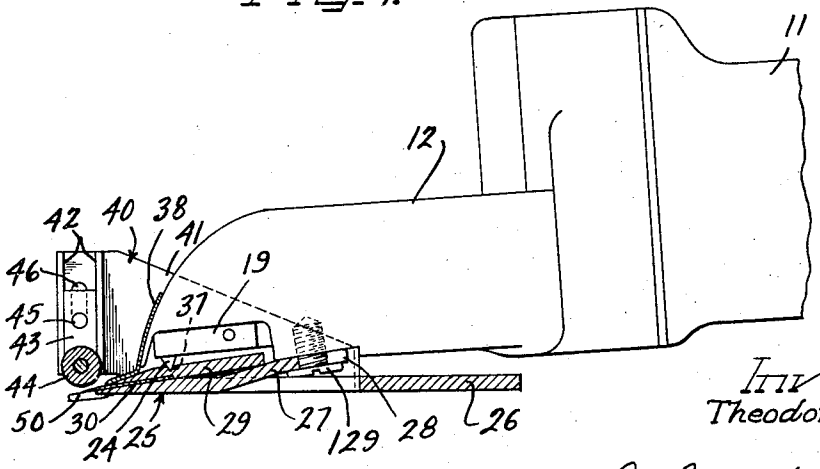

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Fig. 5.

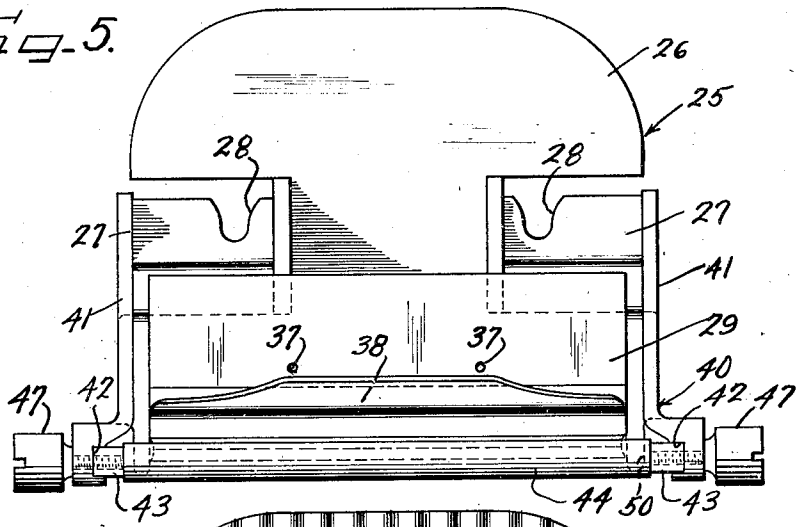


Fig. 6.

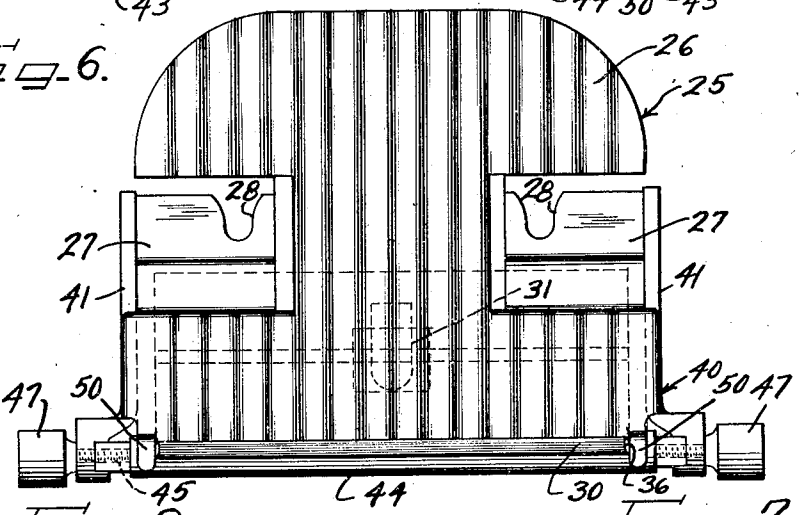


Fig. 8.

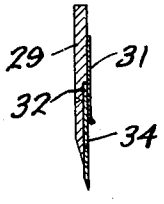
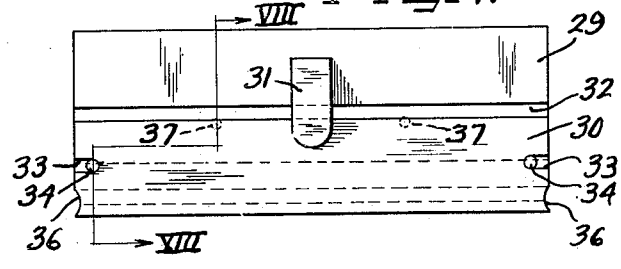


Fig. 7.



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SKIN GRAFTING KNIFE

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3 Claims. (Cl. 128—305)

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This invention relates to a skin grafting knife.

Heretofore, in the grafting of skin, the surgeon has had to rely very largely upon his own experience and skill and upon the assistance of a helper in the manual operation of cutting a strip of skin from a living person for grafting upon another portion of that person's body. Such a manual operation requires more than the usual skill of a surgeon, since the depth of the cut must be very carefully gauged, depending upon the needs of the patient upon whom the strip of skin is to be grafted. Furthermore, the manual operation as heretofore carried out has been a very laborious and tedious task, especially where long lengths of skin strips are required.

It is, therefore, an important object of this invention to adapt a power driven mechanism, similar to the power driven mechanism used in the shearing of sheep's wool and the like, to the operation of cutting strips of skin for skin grafting purposes. According to my present invention, a power driven shearing device of known construction is modified by the provision of means for gauging the width and depth of the cut of skin to be taken, and by the provision of means for guiding the severed strip of skin away from the cutting edge of the blade to a point where the strip may be readily grasped by the surgeon or his assistant.

In the preferred form of my invention, the means for gauging the depth of the cut of skin include a roller positioned adjacent the cutting edge of the blade and adjustable relative to said edge. Thus, with the roller traveling over the surface of the skin, the blade serves to sever a thickness of skin represented by the distance between the lower surface of the roller and the cutting edge of the blade. In order to insure the cutting of a strip of uniform width and having even side edges, the side edges of the blade are notched and sharpened in back of the leading cutting edge, and guide fingers are provided over which said blade oscillates. The sharpened notched side edges of the blade thus exert a shearing action in relation to the guide fingers that insures a clean, straight cut of skin. The skin after being severed is guided away from the blade by a forwardly and rearwardly sloping member that extends into contact with the blade immediately behind the cutting edge thereof.

It is therefore an important object of this invention to provide a skin grafting knife that is power driven and that embodies novel and improved features of construction enabling the severing of a strip of skin of the desired thickness, while requiring only a minimum of experience and skill on the part of the surgeon, or other operator.

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It is a further important object of this invention to provide a power driven skin grafting knife provided with means for adjustably varying the depth of the cut taken to thereby gauge the thickness of skin severed, and also provided with means for guiding the strip of severed skin away from the cutting edge of the knife into a position for easy handling by the operator, or his assistant.

Other and further important objects of this invention will be apparent from the disclosures in the specification and the accompanying drawings.

On the drawings:

Figure 1 is a top plan view of a power driven skin grafting knife embodying the principles of my invention.

Figure 2 is a fragmentary enlarged bottom plan view with the knife carrying mechanism removed.

Figure 3 is an enlarged fragmentary view taken substantially along the line III—III of Figure 1, with parts in elevation.

Figure 4 is an enlarged fragmentary sectional view taken substantially along the broken line IV—IV of Figure 1.

Figure 5 is an enlarged top plan view of the blade carrying mechanism.

Figure 6 is a bottom plan view of the blade carrying mechanism of Figure 5.

Figure 7 is a top plan view of the blade holder and blade.

Figure 8 is a sectional view taken substantially along the broken line VIII—VIII of Figure 7.

The reference numeral 10 indicates generally a power driven skin grafting knife embodying the principles of my invention. Said device 10 includes a tubular casing 11 having an enlarged head end 12 and provided at the other end with an insulated lead-in electrical connection 13 through which extend wires 14 for plugging into any suitable source of electrical current. As is customary in power operated shears and the like, the casing 11 houses a motor (not shown), the shaft 15 of which carries at its end an eccentric pin 16 that extends into a block 17 (Figures 2 and 3). Said block 17 is mounted for reciprocatory movement between guiding portions 18 of an oscillating head 19. As will be obvious, when the motor is being driven, the motor shaft 15 will revolve, causing the eccentric pin 16 also to revolve. Since the eccentric pin 16 is free to rotate within the block 17, said block will be held

against rotation within the guiding fingers 18 and cause the oscillating head 19 to oscillate in a horizontal plane while the block 17 moves up and down within the guiding portions 18. The oscillating head 19 is secured at its rear end, as at 20 to the forward ends of leaf springs 21, the rear ends of said springs being attached to the motor housing 22 as by means of screws 23.

The oscillating head 19 is provided with a pair of spaced downwardly projecting points 24 (Figures 2 to 4, inclusive), which are adapted to cooperate with a knife blade assembly, indicated generally by the reference numeral 25. Said knife blade assembly 25 comprises a lower plate 26, which has a lower ribbed surface for sliding movement over the surface of the skin from which a strip is to be severed. Said plate 26, as best shown in Figures 5 and 6, has laterally opposed portions 27 that are struck up from the plate and are provided along their rear edges with notches 28 for receiving screws 129 that attach said plate 26 securely to the thickened wall portions 120 of the casing 12.

A blade holder, indicated generally by the reference numeral 29 (Figures 3 to 8, inclusive) is adapted to cooperate with the plate 26 for the mounting of a blade proper 30 in the blade assembly 25. As best shown in Figure 7, the blade holder 29 carries intermediate its ends a spring finger 31, which is mounted upon the underside of said holder 29 and overlies a blade receiving recess 32 into which is adapted to be fitted the blade proper 30. Said blade 30 is provided with inwardly extending notches 33 for receiving pins 34. In inserting the blade 30 in the holder 29, the rear edge of the blade is slipped under the spring finger 31 until the notches 33 are in registration with the pins 34, whereupon the blade is allowed to seat under the pressure of the spring 31 with the pins 34 extending into said notches 33. The cutting edge of the blade 30 is beveled, as at 35 (Figure 3), to give a smoothly inclined upper face. The side edges of said blade are notched and sharpened adjacent the cutting edge, as at 36. The upper surface of the blade holder 29 is provided with conically shaped depressions 37 (Figures 3 to 5 and 7) into which project the points of the conically shaped projections 24. The oscillating head 19, therefore, transmits its oscillatory movement to the blade holder 29 to cause the blade 30 to have an oscillatory vibration relative to the lower plate 26.

A guiding plate 38 (Figures 3 to 5, inclusive) is secured to the forward edge of the blade holder 29, as by means of brazing, welding or the like. Said guiding plate 38 is formed with a lower forwardly extending sloping portion 39, the front edge of which directly overlies the blade 30 and serves to separate the strip of skin being severed from the upper surface of said blade 30. The guide plate 38 extends upwardly and rearwardly from said forward portion 39 and as shown in Figure 3, lies against the downwardly extending forward portion of the end casing 12. The strip of skin severed by the cutting knife 30 is thus caused to travel upwardly over the outer surface of the guide plate 38 into a position where it can be manually grasped by the operator, or his assistant.

In order to gauge the depth of the cut of skin made by the knife, I provide an attachment, indicated generally by the reference numeral 40 (Figures 1 and 3 to 6, inclusive), which comprises upwardly and forwardly extending side plates 41 secured to or integrally formed with the plate 26.

Said side plates 41 are provided at their forward edges with vertical guides 42, within which are slidably disposed blocks 43 that support the ends of the shaft of a roller 44. In order to provide adjustability as to height of the roller 44, the blocks 43 are provided with threaded apertures 45 and the side plates are provided with elongated slots 46 for the reception of adjusting screws 47. Said screws 47 may be loosened to adjust the slide blocks 43 in their guide ways 42 to adjust the height of the roller 44 to its desired position, after which the screws 47 are tightened to hold the roller 44 in its adjusted position. In that position, the tapered face 35 of the blade 30 is parallel to a tangent of said roller and closely spaced from the surface of said roller to provide a passage P (Figure 3) for the severed strip of skin to pass through.

As best shown in Figures 3 to 6, inclusive, the plate 26 has forwardly projecting, downwardly offset guiding fingers 50 that lie on either side of the lateral edges of the blade 30. Said blade 30 thus oscillates over the upper surfaces of said guide fingers 50, and, in so doing, the sharpened edges of the notches 36 cooperate with the adjacent edges of said guide fingers 50 to shear the skin therebetween.

In using the power operated skin grafting knife of my invention, the operating end of the device is moved toward the surface of the skin from which a strip is to be severed until the plate 26 rests upon the skin surface. As is customary in cutting skin for grafting purposes, the skin is held stretched ahead of the knife by the use of suction cups. The roller 44 is then adjusted, if necessary, to the height required for making the depth of cut desired by the surgeon. Sufficient pressure is next exerted upon the head end of the device to cause the knife edge 35 to bite into the roller 44 serving to gauge the depth of the cut.

When the device is connected to a source of power to energize the motor and start the knife blade 30 oscillating, the device is slowly moved forward. A strip of skin is severed by the cutting edge of the knife to a thickness that is gauged by the elevation of the roller 44. The surface skin so severed passes back over the upper surface of the knife 30 through the passage P until it reaches the forward edge of the lower guide plate portion 39, which serves to separate the skin from the knife blade. As the length of the surface skin increases, the surgeon, or his assistant, grasps the strip and when a strip of skin of the desired length has been obtained, the knife edge is pointed slightly upwardly to complete the severance of the strip.

It is possible through the use of the skin grafting knife of my invention to gauge much more accurately the thickness of skin to be severed, and also to accomplish the skin cutting operation much more quickly and with less effort on the part of the surgeon, or operator.

It will, of course, be understood that various details of construction may be varied through a wide range without departing from the principles of this invention and it is, therefore, not the purpose to limit the patent granted hereon otherwise than necessitated by the scope of the appended claims.

I claim as my invention:

1. In a skin grafting knife including a blade carrying member having a lower longitudinally corrugated surface for traveling over a skin surface, a blade oscillatably mounted on said mem-

ber and means for oscillating said blade, said blade having a beveled cutting edge, a member having a curved surface adapted to be positioned adjacent to and slightly above said cutting edge and means for adjusting the position of said curved surface to gauge the depth of cut made by said cutting edge.

2. In a skin grafting knife including a blade carrying member having a lower longitudinally corrugated surface for traveling over a skin surface, a blade oscillatably mounted on said member and means for oscillating said blade, said blade having a beveled cutting edge, a rotatably mounted roller adapted to be positioned adjacent to and slightly above said cutting edge and means for adjusting the position of said roller to gauge the depth of cut made by said cutting edge.

3. In a skin grafting knife, a blade carrying member having an under surface provided with corrugations extending in the direction of movement over the skin surface to prevent side motion and reduce the amount of friction in the direction of movement.

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