

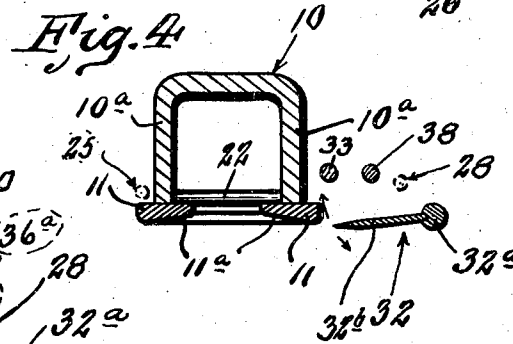
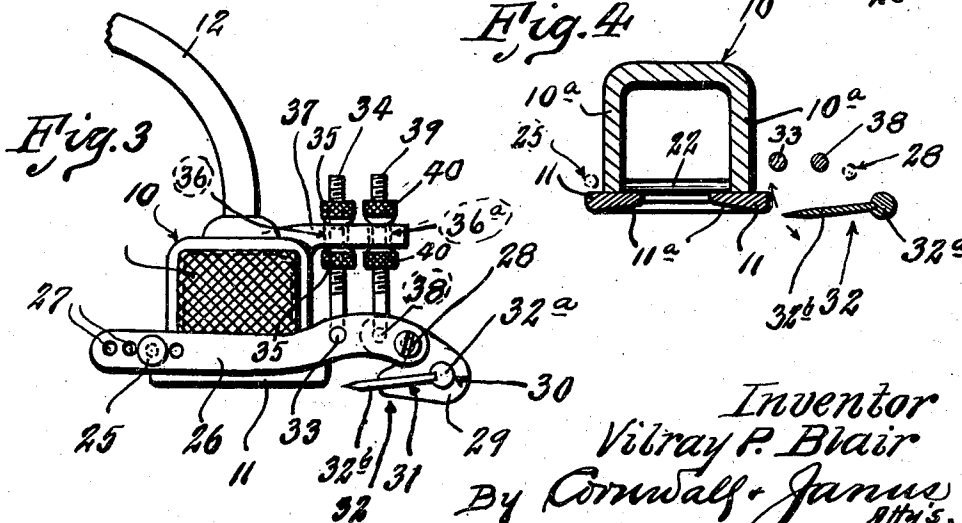
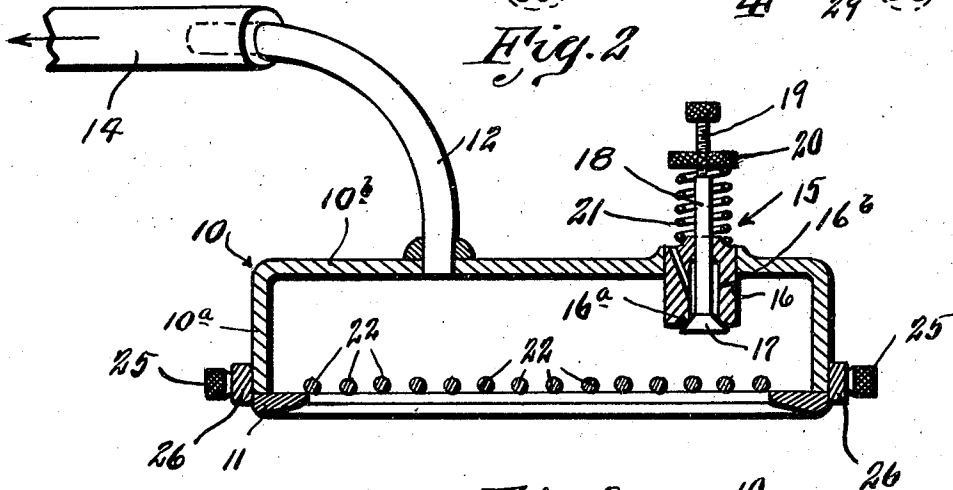
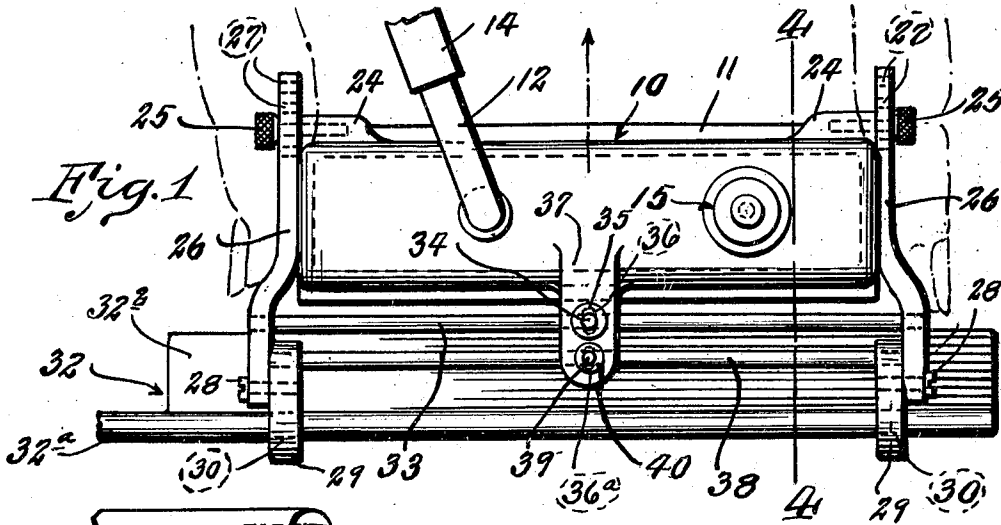
Nov. 19, 1929.

V. P. BLAIR

1,736,246

SKIN GRAFT SURGICAL INSTRUMENT

Filed Feb. 25, 1929



Inventor
Vilray P. Blair
By Cornwall & Janus
Attys.

UNITED STATES PATENT OFFICE

VILRAY P. BLAIR, OF ST. LOUIS, MISSOURI

SKIN-GRAFT SURGICAL INSTRUMENT

Application filed February 25, 1929. Serial No. 342,343.

This invention relates to surgical instruments and more particularly to instruments for severing skin to be used in skin-graft operations. Heretofore the skin was cut by a knife manually operated without the use of any guides except a pair of boards spaced apart from each other and pressed against the skin to hold it taut. No means were provided to guide the operator to form a straight cut or to obtain skin of predetermined uniform thickness.

The primary objects of the present invention are to provide an instrument for severing the skin to be used in skin graft operations, which instrument can be easily manipulated and is so constructed that it can be readily sterilized.

Further objects of the invention are to provide an instrument of the class described having a suction box for displacing or drawing up a portion of the skin to be severed and having a holder for receiving a reciprocable knife in a definite relation with said suction box whereby such displaced skin can be severed by said knife along predetermined lines.

Still further objects of the invention are to provide means for adjusting said holder relatively to said box so as to adjust the knife with respect to the skin displaced by the suction box, thereby regulating the thickness of the severed skin.

Other objects of the invention are to provide a suction box with automatic relief valve which automatically opens said box to the atmosphere in case undue suction is produced within the box, said valve being adjustable to regulate the degree of suction to be produced in said box.

With these and other objects in view, my invention consists in certain novel features of construction and arrangement of parts, hereinafter more fully described and claimed, and illustrated in the accompanying drawings, in which—

Figure 1 is a top plan view of the instrument.

Figure 2 is a longitudinal cross section through the same.

Figure 3 is an end elevational view of the instrument.

Figure 4 is a cross section taken on line 4—4 of Figure 1.

My invention contemplates the use of a suction box having an open bottom which is placed on the skin to be grafted. A suction is produced within the box by means of a suitable vacuum machine (not shown) connected to the box, preferably by a flexible tubing. The knife used to sever the skin is reciprocally mounted to one side of the box and longitudinally thereof in suitable spaced relation therewith. Thus, as the knife is operated it severs the skin raised or displaced by the suction produced in the box. In this manner only that portion of the skin acted upon by the suction is affected by the knife and thus the width of the severed portion is determined by the width of the box.

In using the instrument, the box is moved forward while the knife is reciprocated and the extent of movement of the instrument is determined by the length of the strip desired to be used. The box is comparatively narrow in cross section and its length is such that it may be conveniently grasped between the forefinger and thumb of one hand. The knife can be operated either manually or by suitable mechanism, which latter may be actuated electrically or by the vacuum pump used in connection with the suction box.

The instrument is so constructed that it may be readily sterilized and the knife is removably mounted in the holder so that said knife can be readily removed therefrom.

Referring by numerals to the accompanying drawings, 10 indicates a box having an open bottom. This box is comparatively narrow in cross section and is of suitable length to permit manual manipulation thereof. The bottom of box 10 has secured thereto a frame 11 which extends inwardly a suitable distance beyond the edges of the vertical walls 10^a of box 10. The underside of this frame is preferably tapered inwardly as indicated at 11^a and the edges of said frame are rounded. Leading from the top wall 10^b of box 10 and fixed thereto is one end of a curved metal tube 12, the opposite end of which is adapted to re-

ceive one end of a flexible connection 14, the opposite end of which is connected to a suitable vacuum pump mechanism (not shown).

A relief valve 15 is disposed in top wall 10^b to one side of connection 12. This relief valve comprises a valve seat member 16 disposed within the box and engaged by a valve 17 which latter is carried by the lower end of a stem 18. Valve stem 18 has threaded in its upper end a screw 19 and screw-seated on the latter and preferably in spaced relation with the upper end of stem 18 is a collar 20. A coiled spring 21 is interposed between collar 20 and the upper end of valve seat member 16. Thus the spring tends to hold the valve 17 against its seat in member 16 and the tension of this spring can be adjusted by manipulating screw 19 and collar 20. Valve seat member 16 is secured at its upper end in the top wall 10^b and is provided with an enlarged bore 16^b which communicates with the atmosphere and is normally closed at its lower end by a valve 17.

When the suction in box 10 passes beyond the degree for which the valve is adjusted, the suction in the box overcomes the tension of the coiled spring and allows valve 17 to be displaced, thereby admitting atmospheric air into the box.

The open end of the box is provided with a series of transversely disposed short rods 22 which are arranged immediately above the frame member 11 and are secured at their ends to the parallel side walls of the box. These rods are spaced a suitable distance from each other and serve to maintain uniform displacement of the skin as they limit the inward suction of the skin beyond a predetermined distance.

The forward side wall of member 10 is formed with integral extensions 24 having horizontally disposed threaded openings in which are screw-seated screws 25. These screws form mountings for a pair of arms 26 which are disposed on each end of member 10 and extend rearwardly thereof a suitable distance. The forward ends of arms 26 are preferably provided with a series of apertures 27 for engaging screws 25. These apertures are spaced longitudinally of said arms whereby by selecting the proper apertures the rear ends of said arms can be adjusted relatively to the rear side of member 10. The rear end of each arm 26 is provided with a horizontally disposed aperture 27 in which is loosely mounted a screw 28. This screw has its threaded end screw-seated in a threaded aperture in a holder 29 disposed on the inner side of each arm 26, while the head of the screw is disposed on the outer side of the arm.

Each holder 29 is provided in its lower end with an aperture 30 and a forwardly presented slot 31, the latter opening into said aperture. The apertures 30 are coaxially disposed and receive the rigid back 32^a of a

knife element 32, the blade 32^b thereof being slidably arranged in slots 31. The width of the blade is greater than the lengths of the slots 31 and consequently the cutting edge of the blade projects forwardly a suitable distance from holders 29. Thus apertures 30 and slots 31 form bearings for the knife element 32 so that the latter can be reciprocally operated therein and held in proper alignment with the suction member 12.

In order to raise or lower the rear ends of arms 26 and thereby position the knife element 32 relatively to the skin so as to regulate the thickness thereof, arms 26 are connected together by a horizontally disposed rod 33 at a point spaced rearwardly from member 10 and substantially above the cutting edge of knife 32. Rod 33 is carried by arms 26 in any suitable manner, preferably by having its ends secured therein. Extending upwardly from rod 33 at a point equidistant from arms 26 is a threaded member 34 and threaded on said member is a pair of lock nuts 35. Screw 34 passes through an elongated aperture 36 formed in an extension 37 which latter is carried by and projects rearwardly from member 10. Lock nuts 35 are disposed on each side of extension 37 and serve to hold screw 34 and arms 26 in position. By turning lock nuts 35 in proper directions, arms 26 can be so actuated on their pivots or mountings 25 as to raise or lower the knife element 32.

The pivotal arms 26 permit adjustment in a vertical plane of the knife 32. The holders 29, being pivotally mounted by means of screws 29, provide means for adjusting the knife 32 angularly. This adjustment is accomplished in a manner similar to the adjustment of arms 26.

The upper ends of holders 29 receive the ends of a horizontally disposed rod 38, which is parallel with and spaced from rod 33. The lower end of a screw 39 is secured to rod 33 and the upper end of said screw passes through an elongated opening 36^a formed in extension 37 rearwardly of aperture 36. A pair of lock nuts 40 is used to raise and lower screw 39.

As both rods 33 and 38 are spaced sufficient distance above the bottom of box 10 and knife 32, they in nowise interfere with the cutting operation or with the positioning of the severed skin on the knife.

By using both adjustments the knife can be accurately adjusted to assure correct positioning of the knife and efficient operation of the device.

The ends of member 10 are preferably knurled as indicated at 41 and provide suitable holds so that the instrument may be grasped between the forefinger and thumb of one hand and moved slowly forwardly in the direction indicated by dotted arrow, while the knife 32 receives reciprocating motion.

The entire instrument is made of rust-proof metal so that it is not affected by corrosion and can be sterilized. The knife 30 is removable from arms 26 so that it may be removed from the device during sterilizing or when not in use.

In using the instrument, suction member 10 is placed in position with the suction opening placed over the skin which is to be used in skin graft and which has been previously prepared for the operation. The arms 26 are adjusted and knife 32 is then placed in position. The suction box is placed through its connection under the desired degree of vacuum and is then moved forwardly on the skin while the knife 32 is actuated. In order to facilitate the movement of the suction member 10 over the skin, the latter is preferably greased before the instrument is placed in position. The knife can be operated either manually or automatically.

While I have shown and described the preferred form of my invention, it is obvious that various changes in the construction and arrangement of parts of my device can be made and substituted for those herein disclosed, without departing from the spirit of my invention.

I claim:

1. A skin graft surgical instrument comprising a suction box having an opening to draw up the skin, and a knife element operable in correlation with said box for severing the skin thus displaced by said box.

2. A skin graft surgical instrument comprising a suction box adapted to be placed on the skin to displace the same, and a knife holder mounted on said box and adapted to receive a reciprocal knife for severing the displaced skin.

3. A skin graft surgical instrument comprising a suction member having a suction opening adapted to be placed on the skin, a knife holder mounted on said member and adapted to receive a reciprocable knife for severing the skin displaced by said suction member, said holder being adjustable to adjust said knife in a vertical plane relatively to said skin so as to vary the thickness of the severed skin.

4. A surgical instrument of the class described comprising a suction member having an open bottom for engaging the skin to be severed, and a knife disposed longitudinally of said box in spaced relation therewith, said knife being operable to sever the skin along a line adjacent to said suction box.

5. A surgical instrument of the class described comprising a hollow suction member having a rectangular suction opening for engaging the skin to be operated upon, and a reciprocable knife mounted on said member in correlation with said opening for severing the skin acted upon by said suction member.

6. A surgical instrument of the class de-

scribed comprising a hollow suction member having a rectangular suction opening for engaging the skin to be operated upon, a reciprocable knife mounted on said member in correlation with said opening for severing the skin acted upon by said suction member, and means for adjusting said knife in a vertical plane relatively to the skin for regulating the thickness of the graft.

7. A surgical instrument of the class described comprising a hollow suction member having a rectangular suction opening for engaging the skin to be operated upon, a reciprocable knife mounted on said member in correlation with said opening for severing the skin acted upon by said suction member, and a flexible conduit leading from said suction member and adapted to be connected to a suitable vacuum apparatus for creating suction within said member.

8. A surgical instrument of the class described comprising a hollow suction member having a rectangular suction opening for engaging the skin to be operated upon, a reciprocable knife mounted on said member in correlation with said opening for severing the skin acted upon by said suction member, a flexible conduit leading from said suction member and adapted to be connected to a suitable vacuum apparatus for creating suction within said member, and a relief valve on said member for connecting the interior thereof with atmosphere when the suction in said member passes beyond a predetermined degree.

9. A surgical instrument of the class described comprising a hollow suction member having a rectangular suction opening for engaging the skin to be operated upon, a reciprocable knife mounted on said member in correlation with said opening for severing the skin acted upon by said suction member, a flexible conduit leading from said suction member and adapted to be connected to a suitable vacuum apparatus for creating suction within said member, and an adjustable relief valve for automatically establishing communication between said suction member and the atmosphere when the suction in said member passes beyond a predetermined degree, said valve being adjustable to change the degree of vacuum in said member.

10. A surgical instrument of the class described comprising a hollow suction member having a rectangular suction opening for engaging the skin to be grafted, a reciprocable knife mounted on said member in correlation with said opening for severing the skin along a predetermined line, means for adjusting said knife relatively to the skin, a relief valve for automatically establishing communication between said suction member and the atmosphere, and means for adjusting said valve to regulate the degree of vacuum in said suction member.

11. A surgical instrument of the class described comprising a hollow suction member having a rectangular suction opening for engaging the skin to be grafted, a pair of arms carried in spaced relation by said member and extending rearwardly thereof, and a knife reciprocally mounted in the rear ends of said arms in spaced relation with said suction opening for severing the skin along a line defined by said suction opening.

12. A surgical instrument of the class described comprising a hollow suction member having a rectangular suction opening for engaging the skin to be grafted, a pair of arms carried in spaced relation by said member and extending rearwardly thereof, a knife reciprocally mounted in the rear ends of said arms in spaced relation with said suction opening for severing the skin along a line defined by said suction opening, and means for adjusting said arms to regulate the position of said knife relatively to said skin.

13. A device of the class described comprising a hollow suction member having a downwardly presented suction opening for engaging the skin to be grafted, a pair of arms carried by said member in spaced relation with each other and extending rearwardly thereof, a reciprocable knife removably mounted in the rear ends of said arms in spaced relation with said suction opening for severing the skin acted upon by the suction along a predetermined line relatively to said suction opening, and means for adjusting the vacuum within said hollow member.

14. A device of the class described comprising a hollow suction member having a downwardly presented suction opening for engaging the skin to be grafted, a pair of arms carried by said member in spaced relation with each other and extending rearwardly thereof, a reciprocable knife removably mounted in the rear ends of said arms in spaced relation with said suction opening for severing the skin acted upon by the suction along a predetermined line relatively to said suction opening, means for adjusting the vacuum within said hollow member, and a manually adjustable member fixed to said arms for adjusting said knife relatively to the skin.

In testimony whereof I hereunto affix my signature this 31st day of January, 1929.

VILRAY P. BLAIR.