Nov. 26, 1968 S. SIMON 3,412,732

CUTTING INSTRUMENT FOR USE IN SKIN GRAFTING

Filed March 21, 1966 2 Sheets-Sheet 1

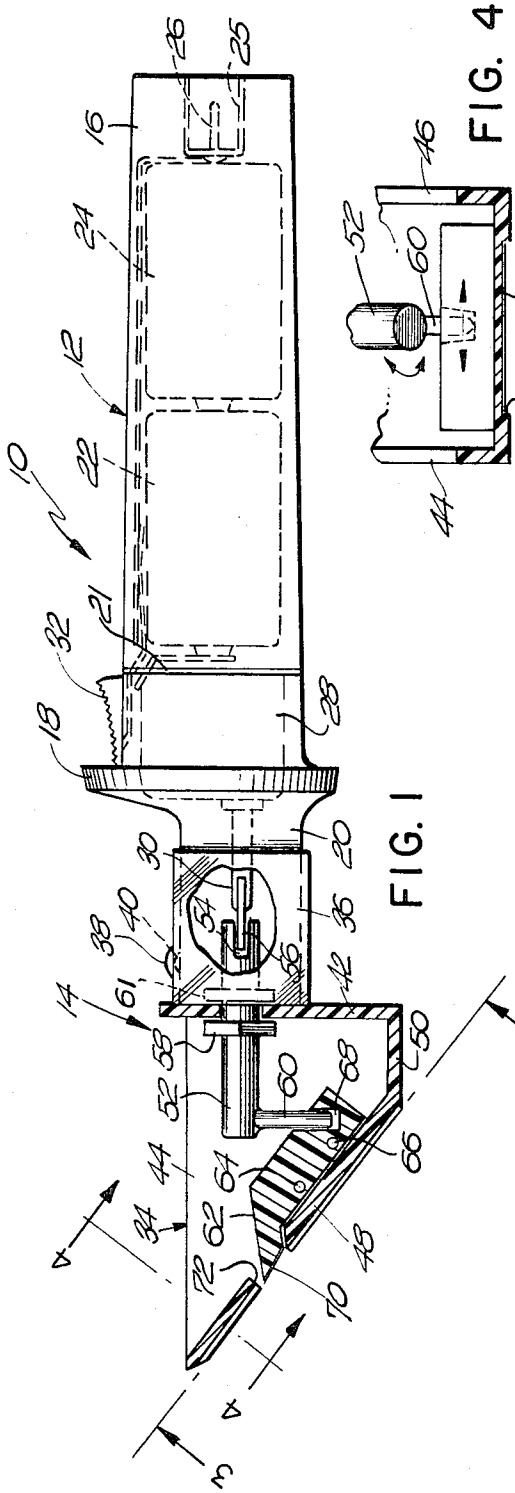


FIG. 1

FIG. 4

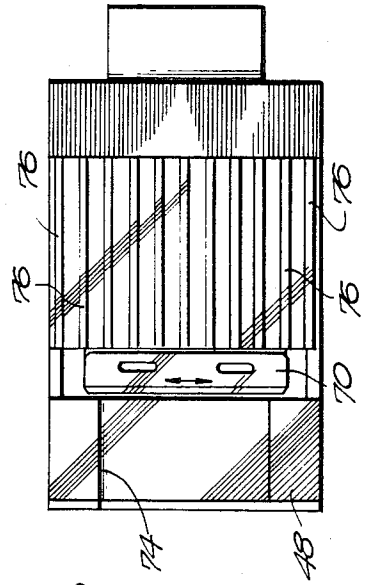


FIG. 3

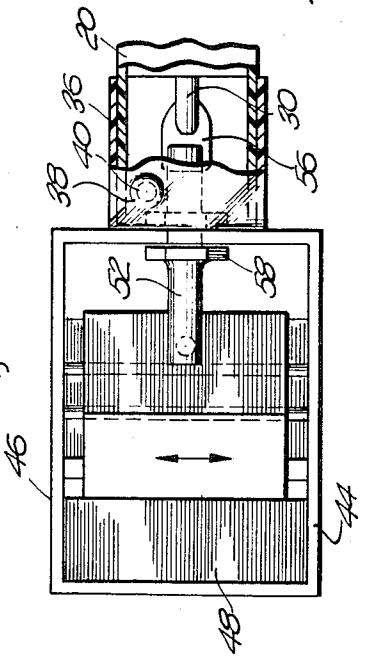


FIG. 2

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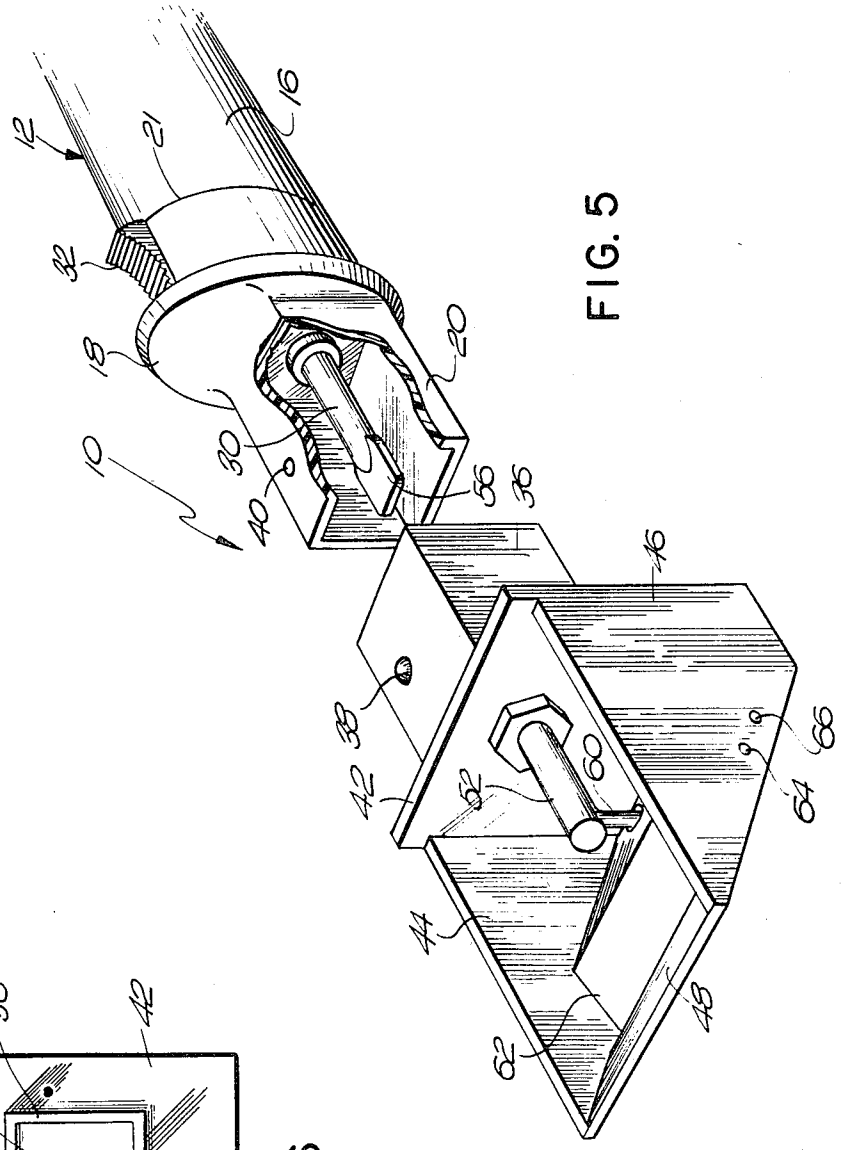


FIG. 5

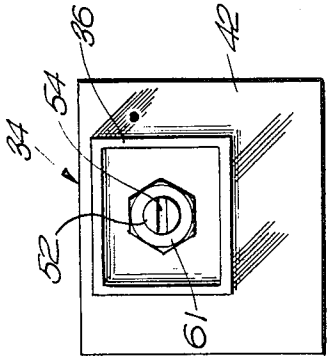


FIG. 6

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United States Patent Office 3,412,732 Patented Nov. 26, 1968

3,412,732

CUTTING INSTRUMENT FOR USE IN SKIN GRAFTING

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Filed Mar. 21, 1966, Ser. No. 535,861
10 Claims. (Cl. 128—305)

The present invention relates to a surgical device for use in skin grafting. More particularly, the present invention relates to a surgical instrument that is adapted for use in the removal of a skin graft, the instrument including a disposable head member that may be conveniently removed from the instrument and disposed of after the skin grafting procedure.

The surgical instrument employed for removing a skin graft in a grafting procedure is called a dermatome and is used by surgeons for removing a thin layer of skin of predetermined thickness and width from a patient in the grafting procedure. Heretofore the dermatome machine has normally consisted of a frame formed of a metallic material and in which an oscillating knife was mounted. The oscillating knife was driven by a flexible shaft that was interconnected to an externally located motor, the motor being selectively energized by a foot control switch and operating the device to cause a reciprocating movement of the knife. Although these prior known machines performed in the manner required they were objectionable since they were limited in movement by the interconnection of the knife frame to the motor through the flexible shaft. Moreover, the knife frame necessarily required sterilization after each use thereof, which then required proper positioning and placement of the knife in the frame for the next graft. Furthermore, these prior machines were relatively expensive due to the large number of parts required for the operation thereof.

The present invention defines a unique dermatome machine that differs from the previously known devices in that it is completely portable in use, and further in that it includes a disposable head member that contains the cutting member therein, the head member being easily replaceable after each use of the device.

In carrying out the concept of the present invention, the dermatome machine embodied herein includes a handle that is hollow in construction and that defines a housing for a battery pack. Also mounted in the handle is a motor that is selectively energized by the current from the battery pack and that is adapted to oscillate a shaft through a suitable translating device. Releasably mounted on the handle is a head member that is defined by a forward portion in which a blade carrier is mounted and into which a shaft interconnected to the handle shaft extends. The blade carrier has a blade mounted thereon, the blade carrier and blade being interconnected to the shaft in the forward portion and being reciprocated thereby upon oscillation of the shaft driven by the motor. Since the head member as provided in the present invention is esentially formed of plastic materials, with the exception of the blade and other retaining elements, the head member may be inexpensively manufactured and thus may be disposed of after each skin grafting procedure. The interconnection of the head member to the handle is accomplished in a relatively simple manner but is sufficiently positive to provide the required reciprocating movement of the blade for the skin grafting operation.

Accordingly, it is an object of the present invention to provide a dermatome for use in skin grafting that includes a self-contained battery-operated unit.

Another object of the invention is to provide a surgical machine for use in skin grafting that includes a disposable head member in which a reciprocating blade is mounted,

the blade being located in predetermined relation, and the construction of the head member further providing for a predetermined width of cut during a skin graft operation.

Still another object is to provide a dermatome that includes a handle in which a battery pack and motor energized thereby are mounted, and a disposable head member that is releasably joined to the handle, the head member having a blade carrier and blade attached thereto that are interconnected to the motor and are driven in reciprocating relation thereby.

Other objects, features and advantages of the invention will become apparent as the description thereof proceeds when considered in connection with the accompanying illustrative drawings.

In the drawings which illustrate the best mode presently contemplated for carrying out the present invention:

FIG. 1 is a side elevational view of the dermatome embodied in the present invention with portions broken away and shown in section;

FIG. 2 is a top plan view of the disposable head member with portions broken away and shown in section;

FIG. 3 is a plan view of the head member as viewed in the directions of lines **3—3** in FIG. 1;

FIG. 4 is a sectional view taken along lines **4—4** in FIG. 1;

FIG. 5 is an exploded perspective view, with portions shown in section, of the disposable head member and a portion of the handle to which the head member is adapted to be releasably joined; and

FIG. 6 is a rear elevational view of the disposable head member.

Referring now to the drawings and particularly to FIG. 1, the skin grafting machine or dermatome embodied in the present invention is illustrated and is generally indicated at **10**. The dermatome is defined by two basic units, one being a handle generally indicated at **12** and the other being a disposable head member generally indicated at **14** that is releasably connected to the handle **12**, as will hereinafter be described. The handle **12** includes a generally cylindrical housing **16** that is preferably formed of a high impact plastic material and that terminates at the forward end thereof in a flange **18**. Joined to the flange **18** and extending forwardly with respect thereto is a reduced neck portion **20**, which, as seen in FIG. 5, has a square configuration when viewed in cross section. The housing **16** may be separated along the line **21** which may be a screw threaded connection, it being understood that separation of the housing **16** provides for insertion of a battery pack therein indicated by the batteries **22** and **24**. The battery pack is preferably of the recharge type and for this purpose the rear of the housing has a recess **25** formed therein into which conductors **26** extend. The conductors **26** may be electrically interconnected in any suitable manner to a source of AC current for recharging the batteries **22**, **24** when required. Located in electrical communication with the battery pack and disposed within the housing **16** at the forward end thereof is a motor **28** of any conventional design and to which suitable gearing and linkage are interconnected for translating the rotary movement of the motor shaft to an oscillating movement of a shaft **30** that is interconnected to the translating means driven by the motor **28**. A thumb switch **32** is mounted on the housing **16** and is mechanically interconnected to switch contacts disposed within the housing and is movable by the user of the device for selectively energizing the motor **28** upon electrical interconnection thereof to the battery pack. In this connection, it is understood that slidable movement of the thumb switch **32** will electrically connect the battery pack to the motor **28** for producing the required operation thereof. The motor **28** is preferably of the explosion-proof variety, i.e., it emits

no sparks during use, since it is well known that certain anesthetics are explosively combustible.

As previously mentioned, the head member **14** is adapted to be releasably secured to the handle **12**, and it is contemplated that the head member **14** may be removed from engagement with the handle **12** for the disposal thereof after its use. As illustrated in FIGS. 1, 2 and 5, the head member **14** includes a forward portion generally indicated at **34** and a rear collar portion indicated at **36** that is integrally joined to the forward portion **34**. As shown in FIGS. 2 and 5, the configuration of the collar portion **36** as seen in cross section is similar to that of the neck portion **20**. Since the head member **14** is designed to be releasably secured to the handle **12**, the neck portion **20** is constructed such that it is adapted to be frictionally engaged with the collar **36** in telescoping relation. This may be accomplished by slightly tapering either the neck portion **20** or the inside of the collar portion **36**. However, as illustrated herein, engagement of the collar portion **36** on the neck portion **20** is accomplished by forming a detent **38** on the undersurface of the upper wall of the collar portion **36**, the detent **38** being engageable with a projection **40** that is formed on the upper surface of a corresponding portion of the upper wall of the neck portion **20**. Thus when the collar portion **36** is mounted on the neck portion **20**, the detent **38** will receive the projection **40** therein to releasably lock the head member **14** on the handle **12**.

As shown more clearly in FIGS. 1 and 5, the forward portion **34** of the disposable head member **14** includes a rear wall **42** to which the collar portion **36** is joined. Secured to the ends of the rear wall **42** and extending forwardly with respect thereto are trapezoidal-shaped side walls **44** and **46**. The forward edges of the side walls **44** and **46** are disposed obliquely with respect to the longitudinal axis of the head member and the handle, and conform to the configuration of a front wall **48** that is joined thereto. A bottom wall **50** is joined to the front wall **48** and the rear wall **42** and encloses the bottom of the chamber that is defined by the walls of the forward portion **34** as just described. As shown in the drawings, the uppermost end of the chamber in the forward portion is exposed, thus permitting ready access to the skin graft as it is being cut.

Extending through an opening in the rear wall **42** suitably provided therefor, is a shaft **52**, the innermost end thereof having a slot **54** formed therein. As shown in FIG. **1**, the slot **54** is adapted to receive a flattened portion **56** that is formed on the outermost end of the shaft **30**. The shafts **30** and **52** are thus coupled together when the head member **14** is mounted on the handle **12**, wherein the oscillating movement of the shaft **30** is adapted to be transferred to the shaft **52**. As further illustrated in FIG. **1**, the shaft **52** is effectively retained in position in the opening in the rear wall **42** by retainers **58** and **61** that are fixed to the shaft **52** and are located on opposite sides of the rear wall **42** of the head member. In this connection, assembly of the head member **14** may be effected by forming the head member in longitudinal halves. With the shaft **52** disposed in the grooves that define the opening in the rear wall **42**, the longitudinal halves of the head member may then be secured together by any appropriate adhesive means to define the complete head member unit, thereby capturing the shaft **52** in the opening formed in the rear wall **42**. By locating the retainers **58** and **61** as indicated, longitudinal movement of the shaft **52** will then be prevented.

Joined to the shaft **52** adjacent to the outermost end thereof and projecting downwardly with respect thereto is a lug **60**. As will be described, the lug **60** is adapted to translate the oscillating movement of the shaft **52** into reciprocating movement of a carrier located in the chamber of the head member and indicated at **62**. The carrier **62** is mounted for reciprocating movement on a pair of rods **64** and **66** that are fixed in the side walls **44** and **46** of the forward portion **34**. A slot **68** is formed in the carrier **62** and receives the lug **60** therein, the slot **68** being somewhat larger than the lug **60**, as illustrated in FIG. 4, so that oscillating movement of the lug **60** will cause the carrier to move in a reciprocating manner on the rods **64** and **66**. Fixed to a front face of the carrier **62** is a blade **70**, the cutting edge of which extends through a slot **72** that is formed in the front wall **48** of the forward portion **34**.

Referring now to FIGS. 3 and 4, a groove **74** is shown being formed in a forward portion of the obliquely directed front wall **48**. The groove **74** communicates with the slot **72** and has a lateral dimension that is somewhat less than the length of the blade **70**, the extreme edges of the blade extending beyond the ends of the groove **74**. Thus, as will be described, when the blade **70** is reciprocated with the carrier **62**, the ends of the blade will not be exposed during a skin graft operation. Referring again to FIG. 3, the lower portion of the obliquely directed front wall **48** is shown being formed with a plurality of longitudinally extending ribs **76**, the ribs **76** being adapted to contact the skin of the patient on whom the skin graft is being performed, and thus acting to reduce frictional drag of the wall **48** as it is moved forwardly during the cutting of skin in the grafting procedure.

In use of the device, the surgeon performing the grafting operation grasps the handle **12** and moves the switch **32** to the "on" position, thereby energizing the motor **28** and producing an oscillating movement of the shaft **30**. Since the shaft **30** is coupled to the shaft **52**, the shaft **52** will also be oscillated, which then results in a reciprocating movement of the blade carrier **62**. As the blade **70** that is secured to the carrier **62** is reciprocated, the surgeon positions the dermatome such that the front wall **48** is in flush contact with the skin of the patient. In this position, the longitudinal axis of the device is generally inclined with respect to the surface of the skin being cut. The surgeon then moves the dermatome in a forwardly direction, the reciprocating action of the blade **70** performing the required cut. The width of cut is determined by the lateral dimension of the groove **74** in the front wall **48**, the portions of the front wall **48** located adjacent to the groove **74** acting as guide surfaces during the cutting operation.

When the skin grafting procedure is completed, the head member **14** is then removed from engagement with the handle **12** by pulling outwardly on the forward portion **34** so that the collar portion **36** is removed from engagement with the neck portion **20**. Since the head member **14** is relatively inexpensive and essentially formed of plastic materials, it may be disposed of after use. When it is required to again use the dermatome, a new head member contained in a sterilized package will be inserted in place by locating the collar thereof on the neck portion **20** of the handle **12**. It is understood that the depth of cut of the blade **70** may be varied in accordance with the grafting procedure, and, similarly, the width of cut may be varied by preforming the groove **74** in the front wall **48** of the head member to the required specifications.

Since the dermatome **10** is free of external wiring, it is not confined to a particular location and may be moved around at will. Only a simple thumb switch is required to energize the motor of the dermatome, and external switches normally employed heretofore for the prior known devices are avoided. It is understood that the battery pack may be rejuvenated at any time after a period of use by electrically connecting the prongs **26** to an electrical outlet.

While there is shown and described herein certain specific structure embodying the invention, it will be manifest to those skilled in the art that various modifications and rearrangements of the parts may be made without departing from the spirit and scope of the underlying inventive concept and that the same is not limited to the particular forms herein shown and described except insofar as indicated by the scope of the appended claims.

What is claimed is:

1. In a dermatome for use in skin grafting, an elongated handle, a shaft carried by said handle, drive means mounted in said handle and responsive to a source of power for oscillating said shaft, a disposable head member releasably mounted on said handle and including a shaft that is releasably coupled to said oscillating shaft for oscillation thereby, said head member further including a blade carrier that is interconnected to the shaft of the head member for reciprocation thereby, and a blade mounted on said carrier for reciprocating movement therewith and in a direction that is transverse to the axis of said head member and handle, wherein a cutting action is produced during the skin grafting procedure.

2. In a dermatome as set forth in claim 1, said handle defining a housing in which a battery pack is located, a motor mounted in said housing and being electrically interconnected to said battery pack for being selectively energized thereby, and means located in said housiag and coupled to said motor and to the shaft in said handle for translating the rotating motion of the motor to the oscillating movement of the handle shaft.

3. In a dermatome as set forth in claim 2, said housing including a neck portion into which the shaft drivingly connected to said translating means extends, said head member including a collar that is releasably connected to said neck portion in telescoping relation for mounting said head member on said handle.

4. In a dermatome as set forth in claim 1, said head member including a front wall, the plane of which is inclined with respect to the longitudinal axis of the head member and handle, said front wall having a groove which communicates with said blade, the length of said groove being less than the length of said blade, wherein the blade ends extend beyond both ends of said groove and are protected from contact with the graft being removed.

5. In a dermatome as set forth in claim 2, said head member including a rear wall, spaced side walls, a bottom wall and an inclined front wall, said walls cooperating to define a chamber in which said blade carrier is located, rod elements mounted in said side walls and extending transversely with respect to the longitudinal axis of said head member and handle, said blade carrier being mounted on said rods for reciprocating movement, a slot formed in said front wall, said blade extending into said slot for contact with the patient's skin wherein the outer surface

of said front wall is disposed in flush engagement with the graft being removed.

6. In a dermatome as set forth in claim 5, the oscillating shaft located in said head member extending through an opening in said rear wall and terminating in said chamber and a lug joined to said shaft in said chamber and projecting into contact with said carrier for translating the rotary oscillating movement of said oscillating shaft in said head member to lateral reciprocating movement of said carrier.

7. In a dermatome as set forth in claim 6, said housing including a forward neck portion into which the shaft drivingly connected to said translating means extends said head member including a collar that is joined to the rear wall of said head member and that is releasably connected to said neck portion in telescoping relation for mounting said head member on said handle.

8. In a dermatome as set forth in claim 5, said inclined front wall including a groove located forwardly of said slot and that communicates therewith, the width of said groove determining width of cut to be taken by said blade.

9. In a dermatome as set forth in claim 1, said head member including an inclined front wall in which a laterally extending slot is formed, said blade extending into said slot, and a groove formed in the forward portion of said front wall and communicating with said slot, the lateral dimension of said groove determining the width of cut to be taken by said blade.

10. In a dermatome as set forth in claim 9, the portion of said front wall located rearwardly of said slot having a plurality of longitudinally extending ribs formed therein that act to reduce frictional drag of said front wall with respect to the portion of the patient's skin it contacts during the skin grafting operation.

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