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Falabella

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[54] **APPARATUS AND METHODS FOR OBTAINING AND MAKING SKIN GRAFTS**

[76] Inventor: **Rafael Falabella,** Calle 46 Norte No. 5 AN-60, Cali, Colombia

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[51] **Int. Cl.** **A61b 17/32**

[58] **Field of Search** 128/276–278, 128/299, 300, 302, 305, 305.5

[56] **References Cited**

UNITED STATES PATENTS

2,012,363	8/1935	Vogel	128/276
2,583,341	1/1952	Reese	128/305.5
2,590,299	3/1952	Douglas	128/305.5
3,224,434	12/1965	Molomut et al.	128/276
3,315,665	4/1967	MacLeod	128/299
3,302,636	2/1967	Clemetson	128/300

OTHER PUBLICATIONS

"The Lancet," Vol. I/64, No. 7348; June 27, 1964, pp. 1444–1445.

Primary Examiner—Charles F. Rosenbaum
Attorney—Buell, Blenko & Ziesenheim

[57] **ABSTRACT**

An apparatus and method are provided for obtaining skin grafts and making skin grafts by subjecting a donor site to vacuum to produce blistering of the epidermal layer and removing and transferring the blister to the recipient site.

7 Claims, 5 Drawing Figures

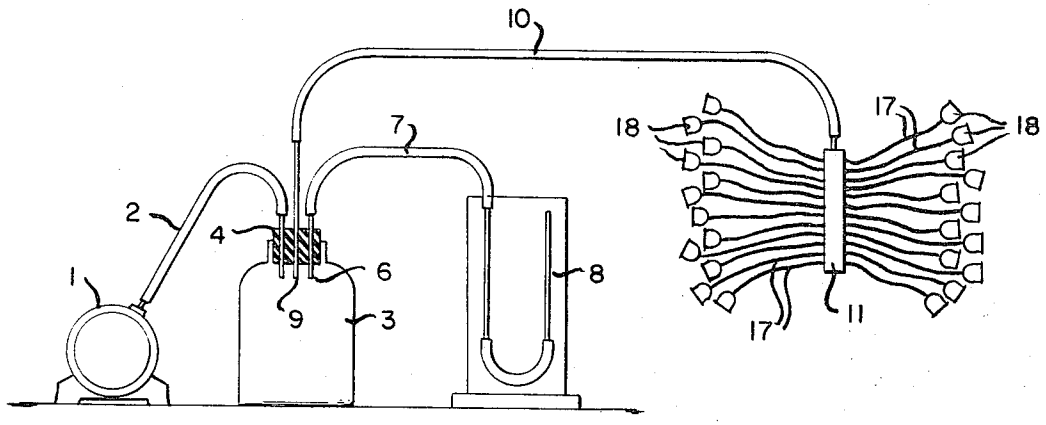


Fig. 1.

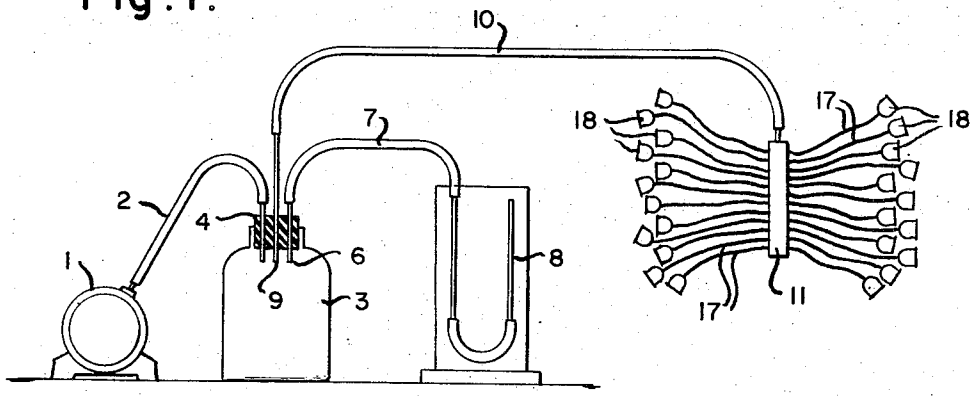


Fig. 2.

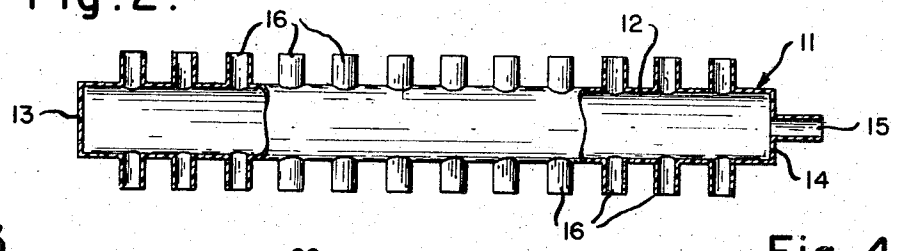


Fig. 3.

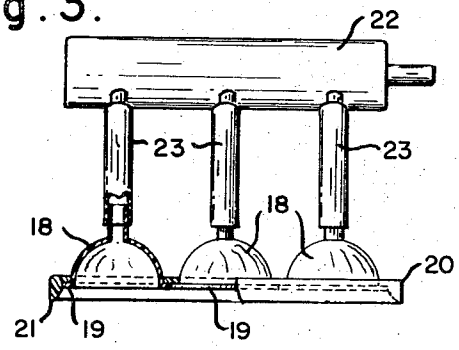


Fig. 4.

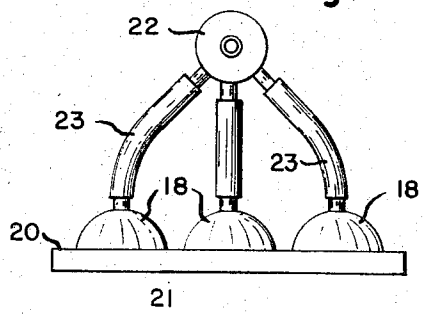
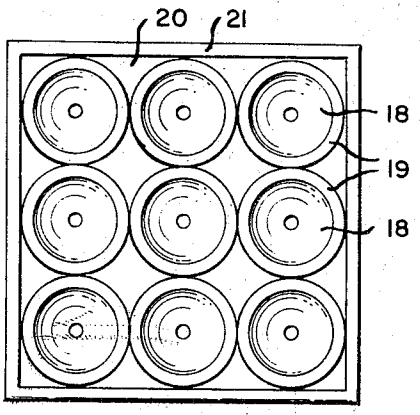


Fig. 5.



APPARATUS AND METHODS FOR OBTAINING AND MAKING SKIN GRAFTS

This invention relates to apparatus and methods for obtaining and making skin grafts and particularly to an apparatus for obtaining from a donor area skin grafts by suction and to a method of obtaining skin grafts from a donor area and implanting them to a receptor area.

The problem of obtaining skin grafts and applying them is an old and well recognized one. Normally skin grafts are obtained by incising a portion of donor skin with the patient under local or general anaesthesia and moving the same to the receptor area. Such grafts included a substantial thickness of both epidermal and dermal tissue. They are painful, they frequently scar or at least seriously discolor the donor area and they include an anaesthetic risk in many patients.

There are many situations where achromic lesions and granulating areas of the skin which could be corrected are simply ignored because of the fact that skin grafting techniques presently available are too complex, expensive and painful to warrant their correction. This is particularly true in those areas of the world with large numbers of dark-skinned individuals where achromic lesions are particularly noticeable. Heretofore therapy has been difficult and discouraging and no means has been available for obtaining and applying pigment bearing grafts to cover achromic lesions in a simple, inexpensive and relatively painless way. Typical of such problems are achromic nevi, achromic areas in healed ulcers of thermal burns.

The present invention provides a means and method for obtaining skin grafts and applying them without the problems attendant with ordinary skin grafting techniques. By the present invention it is possible to obtain epidermal grafts without damaging the dermal tissue, thereby avoiding scarring and disfigurement of the donor area, without anaesthetic risk and with little pain to the patient.

It is accordingly an object of the present invention to provide an apparatus which makes possible the obtaining of epidermal grafts with minimum discomfort and without anaesthetic risk.

It is another object of this invention to provide an apparatus for obtaining epidermal grafts by suction blistering.

A further object of the invention consists in providing a method for obtaining skin grafts and transferring the same to a receptor area.

The apparatus of this invention makes it possible to obtain practically a complete separation of the epidermis including the basic layer, in a non-traumatic form, by means of negative pressure. This is accomplished by applying an inverted cup-shaped vessel over the epidermal area and leaving it in position, under suction or negative pressure, for a more or less prolonged period of time to produce a blister or bulla, which consists exclusively of epidermis without producing any traumatism in the dermis.

Blistering techniques have heretofore been used for treating various skin problems. For example it has been known for many years that blisters could be produced by chemical means. More recently suction techniques have been used for blister production. However such techniques have not been designed for production of skin grafts and the apparatus used in such early blister techniques caused excessive traumatization of areas surrounding the blisters and utilized excessive sealing areas so that the production of blister areas was inefficient and not completely satisfactory for most effective production of skin grafts.

Essentially, the apparatus of the invention is composed of a means producing a vacuum greater than 200 mm. of H_g connected to a central vacuum unit from which goes a flexible tube which extends the central vacuum unit hydraulically with a central suction unit which consists of a hollow cylinder of plastic material having a sealed end while at the other end it is connected to the central vacuum unit and carries on its lateral surface a plurality of plastic tubes each one of which is connected at its end to a cup or capsule, preferably round provided with an edge of flange, by means of which a greater hermetic seal is obtained and it is avoided that the skin slides inside the cup during the suction.

So in the event that an appreciable quantity of tissue is necessary it is possible to join the cups or capsules in one unit in which their edges are joined on a plate of flexible material provided with a perimetrical edge which has the same function as the flange of the aforementioned cup or capsule. Through the condition of flexibility of the plate, it is obtained that the plate adapts to the form of the area of the skin which is the donor site so that the skin can adhere readily when the suction is applied.

In the preferred practice of the method of this invention, both the donor and receptor sites are cleansed, the donor area is blistered, the blisters are cut around their periphery and transferred to a smooth transfer surface with the external surface in contact with the transfer surface and the dermal face exposed, the blister is transferred to the receptor area on the transfer surface, an edge of the blister is held against the receptor site while the transfer surface is removed, leaving the blister on the receptor area and the blister or graft is smoothed over the receptor area. The transfer surface is preferably a glass microscope slide.

So that the invention may be understood easily and can be readily put in practice it has been represented in its preferred working form in the accompanying drawings in which:

FIG. 1 represents the apparatus diagramatically annd in one of its preferred working forms;

FIG. 2 is a longitudinal cross-section view of the central suction unit or manifold;

FIG. 3 is a lateral elevational view of one of the preferred alternate forms of achieving the suction cups or capsules;

FIG. 4 is a front view of FIG. 3; and

FIG. 5 is a plan view of the form shown in FIG. 3.

A vacuum producing apparatus is shown in all the figures with the same reference numerals applied to corresponding parts of the invention. It is illustrated as a vacuum pump actuated by an electric motor. The vacuum pump is indicated by reference **1**, its suction end is connected by a flexible hose **2** with a central vacuum unit **3** which preferably has the form of a flask or bottle of more or less a liter capacity and is provided with a rubber stopper **4** through which the connecting tube penetrates with the hose **2**. Through this rubber stopper **4** passes a tube **6** which by means of a flexible hose **7** communicates with a vacuum manometer **8**, while by means of a tube **9** and hose **10** the inside of **3** is con-

nected with a central suction manifold unit or manifold **11** represented in detail in FIG. **2** and composed of a walled chamber **12,** base end **13** and opposite end **14** provided with the spout **15** connecting with the hose **10.**

The lateral walls **12** are provided with spouts **16** on each one of which are attached corresponding flexible hoses **17** which through suitable connections are joined to suction cups or capsules **18.**

Preferably, these suction capsules or cups are composed of a hollow hemi-spherical body whose edge is provided with a flange **19** whose function is to obtain a better vacuum seal and prevent the skin from sliding inside the capsule during suction.

In another of the preferred working forms of the invention, the suction capsules or cups **18** are supported over a flexible plate **20** provided with a perimetrical edge **21** which constitutes a flange or projection anchoring the plate **20** to the skin.

The inside of each of the suction capsules or cups **18** communicates, by means of small short flexible hoses **23,** with a manifold **22** to which is connected the flexible hose **10** actuating the manifold **22** as central suction unit.

The suction capsules or cups **18** are preferably constructed of transparent or semi-transparent plastic material so that their interior can be seen.

The process for using the device of the invention consists in first cleaning the donor area with soap and later alcohol; tincture of benzoin is applied to insure better adherence of the suction capsules to the skin. Then one by one the capsules are placed, each of which has a pressure clamp or pincer on the connecting hose which is released on being applied to the skin; the negative pressure is first set at 200 mm. H_g and is not changed with application of the capsules. The donor area should preferably be the inside face of the thigh, although other areas can be used. Approximately 3 hours later the blister or bullas have appeared as the final product of coalescence of small vesicles or blisters which appear gradually during the suction period. They can be observed through semi-transparent plastic of the capsules. The pressure is then brought to zero and the capsules are removed from the skin.

At this moment the blisters can be considered ready to be grafted. The blisters are cut off with iris type scissors for dermatological use at the level of their implantation. The epidermal sheet thus obtained is manipulated with a hypodermic needle to place it on a microscopic glass slide with the external face in direct contact with the glass and the internal or dermic face to be applied directly on the surface and exposed ready to be grafted. The glass slide is moved immediately with adherence of the epidermic sheet so that it is put in contact with the receiving area; an edge of the epidermic fragment is held with a hypodermic needle and the glass plate is lifted slowly until it is completely removed. Then the graft is positioned finally with the two hypodermic needles and is located according to the size and shape of the area to be grafted.

In the foregoing specification I have set out certain preferred embodiments and practices of my invention, however it will be understood that this invention may be otherwise embodied within the scope of the following claims.

I claim:

1. An apparatus for obtaining epidermic grafts comprising a vacuum source, an hermetic vessel connected to said vacuum source and placed under vacuum thereby, a plurality of hemispherical cup shaped suction capsules connected to said hermetic vessel and adapted to be placed on an epidermal layer to be collected and transverse flange means surrounding the edge of said cup shaped capsule engaging and forming a seal with said epidermal layer to prevent relative movement of the epidermal and flange.

2. An apparatus for obtaining epidermic grafts as claimed in claim **1** having a manifold connected to said hermetic vessel and a plurality of said hemispherical cup shaped suction capsules connected to said manifold whereby said cups are under uniform vacuum.

3. An apparatus for obtaining epidermic grafts as claimed in claim **1** having vacuum measuring means connected to said hermetic vessel.

4. An apparatus as claimed in claim **2** wherein the edges of said plurality of suction capsules are connected to one another by a flexible sheet having a sealing projection around its periphery.

5. A method of epidermal grafting comprising the steps of:

a. forming a blister of the epidermal layer of a donor skin site;
b. removing said blister from the donor site by cutting around its periphery;
c. transferring the blister from the donor site to the recipient site with the dermal face exposed;
d. attaching the dermal face of said blister to the recipient site; and
e. smoothing said blister onto the contour of the recipient site.

6. The method as claimed in claim **5** wherein the blister is transferred by placing the external surface thereof onto a smooth plate and applied by pressing said plate and blister with the dermal face onto the recipient site and removing said plate.

7. The method as claimed in claim **5** wherein the blister is formed by subjecting the donor site to a vacuum of about 200 mm. of mercury.

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