Nov. 17, 1964 I. BENTOV 3,157,178

DRESSING

Filed Dec. 14, 1961

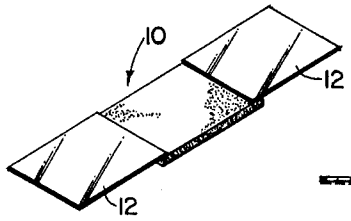


FIG. 1

FIG. 2

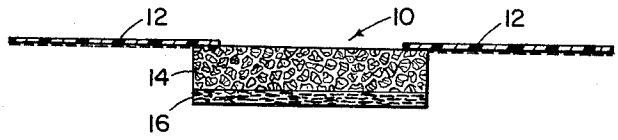
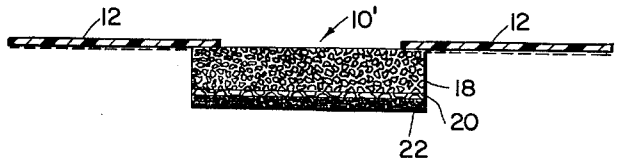


FIG. 3



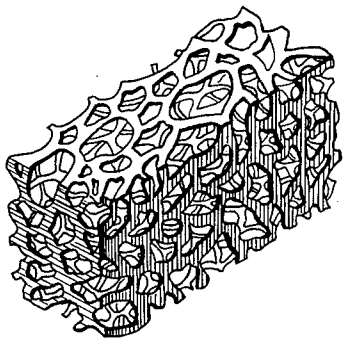


FIG. 4

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DRESSING

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This invention relates to dressings for wounds and the like, and more particularly, to a novel and improved elastic dressing.

One of the primary objects of the present invention is to provide a novel and improved dressing which will provide improved protection of a wound against impact, which will have improved porosity to provide essentially free exposure of the wound to the air, while at the same time will act as a filter to the passage of micro-organisms when treated with a bactericidal product, which will tend to remove fluids from the wound surface and encourage evaporation of these fluids, while at the same time will not cause the wound to become dry, and which will be elastic and have an improved conforming characteristic when applied to an irregular surface.

It is a further object of this invention to provide a novel and improved dressing of the type described which can be heat sterilized without losing its elasticity and conforming characteristic.

It is still another object of the present invention to provide a novel and improved dressing of the type described which is adapted to carry medication and particularly is adapted to carry a solid or semi-solid medicament such as metallic magnesium or magnesium treated clays.

Another object is to provide an elastic dressing having attaching members, in which the elasticity of the dressing is essentially unimpaired by the attaching members.

Other objects will be in part obvious, and in part pointed out more in detail hereinafter.

The invention accordingly consists in the features of construction, combination of elements and arrangement of parts which will be exemplified in the construction hereafter set forth and the scope of the application of which will be indicated in the appended claims.

In the drawing:

FIG. 1 is a perspective view of a dressing constructed in accordance with the present invention;

FIG. 2 is an enlarged cross sectional view of the dressing of FIG. 1;

FIG. 3 is a cross sectional view of an alternative embodiment of the invention; and

FIG. 4 is a greatly enlarged fragmentary perspective view of a portion of the dressing of FIG. 2.

With reference to the drawing and particularly FIGS. 1 and 2, an exemplary dressing incorporating the present invention comprises a body portion generally indicated at **10**. The body **10** is in the form of a flat, relatively thin rectangular sheet of elastic foam material. In the cross section of FIGS. 2 and 3, the thickness of the sheet has been somewhat exaggerated for easier identification of the components thereof. In the specific embodiment of FIGS. 1 and 2, attached to the body **10** are a pair of tape members **12** having a backing of pressure sensitive adhesive whereby the dressing may be secured to a body. As shown in the drawing, the tape **12** is secured to the body adjacent the ends of the body and does not extend across the body **10**. In this manner, the elasticity of the body **10** is utilized essentially to its fullest as compared to the case where the tape extends across the back of the body **10** and thus essentially prevents elongation of the body of the dressing.

With reference to FIG. 4, the body **10** of the dressing is fabricated from a skeletonized foam which may be as much as 97% void area. Specifically, I prefer to use

a polyester polyurethane foam or a polyether polyurethane foam. Such a foam is available commercially under the trademark Scottfoam. The embodiment of FIG. 2 represents a dressing in which the body **10** is approximately 3/16" in thickness and is comprised of a skeleton foam, such as illustrated in FIG. 4, having approximately 55 pores per linear inch. The reason for the term skeleton or skeletonized foam is believed apparent from a consideration of FIG. 4. Here it can be seen that such a term refers to something more than merely an open cellular structure. Rather, it refers to a cellular structure in which the material between the cells has been removed to a substantial extent thereby leaving a very porous open structure resembling a three-dimensional lattice of fine members.

In the embodiment of FIG. 2, the body **10** comprises two sections; namely, an upper or top pad section **14** and a lower or membrane portion **16**. In this embodiment, both sections of the body are fabricated from the same piece of 55 pore skeleton foam. The bottom or membrane section **16** is however permanently compressed, or shined, under pressure and heat to form a denser and smoother surface for the underside of the dressing. In a practical embodiment corresponding generally to FIG. 2, the upper pad had a slightly wool-like texture, while the surface of the membrane **16** had a very smooth texture. The foam may be compressed by the application of pressure alone, the simultaneous use of heat effects the desired permanent set of the material.

While the embodiment of FIG. 2 has been described in terms of fabricating both the portions **14** and **16** from the same block of foam, it will be understood that if desired the portion **16** could be a separate layer of either a foam having a greater pore per linear inch characteristic, or a separate layer of foam which has been shined, or both. The purpose of the denser membrane portion **16** is to provide a very smooth surface for contact with the wound and at the same time to provide a means for preventing solid medicaments carried by the top pad from passing through the dressing and directly contacting the wound. In this connection and as will be described more fully hereinafter, the dressing of this invention is particularly advantageous when the medication used therewith is of a solid or semi-solid material of fine particle size. Also, the dressing may be treated by the depositing of a film of medicated material on the dressing or by dipping the dressing into a solution of medication material and then drying the dressing.

In the embodiment of FIG. 3, the body **10'** of the dressing comprises an upper portion or top pad **18** of 90 pore skeletonized foam and a lower portion or pad **20** of 55 pore skeletonized foam having a shined wound contacting portion **22**. The pads **18** and **20** are adhered to each other by suitable adhesive. Where a solid medicament is used, it may be disposed at the interface of the layers **18** and **20** where it will be contacted by wound fluid drawn up through the bandage. As in the embodiment of FIG. 2, the tape sections **12** are attached adjacent the ends of the body portion with the tape section being spaced apart. In this manner, the elasticity of the foam is not decreased by the tape, and attendantly the improved conforming characteristic of the dressing is retained.

It is believed that other details of the structure of a dressing of this invention will be apparent from the following description of method of fabricating the dressing. As mentioned above, the body of the dressing is fabricated from a polyether polyurethane or polyester polyurethane foam. The foam is slit to the desired thickness, which in the case of the top pad may vary, for example, from 1/16 to 3/8" thick depending on the intended use of

the dressing. A 90 pore foam is preferably used as the top pad where the body is fabricated from two separate layers of foam. Also, in a two layer dressing either a 55 or 90 pore foam may be used as the bottom pad of the dressing. This bottom layer may, for example, be approximately 1/16" thick in its initial form. However, the bottom pad is compressed under heat and pressure to permanently compress the pad over substantially its entire thickness. The resulting membrane layer may be, for example, from .005"–.030" in thickness. Where the dressing is fabricated from a single piece of foam, either a 55 or 90 pore foam may be used, and of course foams of other pores per linear inch may be used. Variation in the pores per linear inch of the foam determines the absorbtive characteristics, the elasticity and conforming characteristics of the dressing, and as will be later seen, the manner in which a solid medicant such as metallic magnesium may be introduced into the dressing.

In the case of the thicker dressings, the top pad of the dressing is preferably scored in order to provide the dressing with greater flexibility and better configuration characteristics. Generally speaking, dressings of over approximately 1/4" of thickness should be cross scored. This may be done by means of a hot wire applied to the top pad. The scorings may be spaced approximately 1/2" apart and across both directions of the pad. Where the dressing is fabricated of two layers of foam, the depth of the scorings should not penetrate to the interface of the top and membrane pads.

While dressings according to the present invention may be fabricated singly, it is preferred particularly in the case of the smaller dressings to fabricate a plurality of dressings simultaneously by using for example rectangular layers of foam which are later cut into a plurality of smaller dressings. During initial cutting and sizing of the foam and prior to the packaging of the dressing, the foam should preferably be shielded against light as the foam tends to discolor from prolonged exposure to light. Additionally, it is important that the physical cleanliness of the foam be maintained.

As described above, the bottom wound contacting surface of the dressing is shined in order to provide a smooth surface to present to the wound. This is true regardless of the pore size of the foam. The permanent compression of the foam is obtained for example by placing the foam layer, having the surface to be presented to the wound, between two sheets of Teflon, for example .015" in thickness, and pressing one of the Teflon sheets lightly with a very hot iron. Where the dressing consists only of a single layer of foam, care should be taken to provide the desired smooth surface while at the same time retain a sufficient thickness of uncompressed pores at the top portion of the dressing. When using, for example, 90 cellsize foam, the compression should again be sufficient to provide the smooth surface desired but still leave enough pore structure to retain the desired elasticity of the foam.

Polyurethane foam is by nature hydrophobic. Because of this and because the compressed sheet is to act as a membrane to permit ion exchange between the wound and any solid medicant such as magnesium contained within the dressing, the foam must be made wettable. This may be accomplished by dipping the foam, and particularly the bottom layer **20** of the embodiment of FIG. 3, in a solution of a wetting agent. A satisfactory wetting agent has been found to be an ammonium salt of a sulphate ester of an alkylphenoxypoly (ethyleneoxy) ethanol sold under the trademark Alipal CO–436 by Antara Chemical Co. The foam is dipped in a 1% solution of this wetting agent and then is wrung out lightly and dried in an oven without vacuum at approximately 120° C.

Where the dressing does not include a medicant, the body of the dressing is completed simply by compressing the wound facing surface of the dressing and applying the wetting agent. Where a two layer dressing such as shown in FIG. 3 is utilized, the layers **18** and **20** may be adhered to each other by the use of a suitable adhesive which will retain its elasticity following sterilization of the bandage. This step will be described more in detail hereinafter. The bandages may then be packaged and sterilized and ready for use. Where the dressing is to be treated with a medicant by dipping or the like, the medicant will be applied prior to packaging.

Where the dressing is to be utilized with a solid medicant, the medicament such as metallic magnesium may be assembled into the bandage in two manners. Where the bottom layer **20** of the bandage such as shown in FIG. 3 is of a 55 cell size, magnesium powder of approximately 40 mesh size may be sprinkled uniformly over the top surface of the foam. By brushing the foam with the finger and at the same time lightly stretching the foam, the magnesium may be worked into the foam. This process is repeated as necessary until the foam has been filled with the desired amount of magnesium. The bottom or membrane portion is then ready for adhesion to the top pad. A preferred manner of applying the adhesive is by means of an applicator comprising a curved, stainless steel sheet. The adhesive is applied in a thin smooth layer to the convex side of the sheet over an area large enough to contact the entire surface of the top pad. When the adhesive has lost sufficient volatile material so as to be at least slightly sticky, the pad is placed on the surface and gently pressed to transfer adhesive. After the pad has been uniformly coated with adhesive, it is carefully removed and placed on the membrane. The pad is then gently pressed onto the membrane to adhere it thereto whereupon the dressing is dried under vacuum to remove the solvent from the adhesive. An adhesive for this use should be one which will remain flexible after drying so that it will not crack when the bandage is stretched. Also, it should be able to withstand the sterilization temperatures without destroying its elasticity. A preferred adhesive is modified Weldwood Contact Cement sold by U.S. Plywood Corp. The cement is modified by a 10% solution of a high molecular weight polyisobutylene polymer sold under the trademark Vistanex by the Enjay Company, Inc. The solution of Vistanex is prepared in toluol and 30% by weight of the solution is added to the Weldwood Contact Cement. The Vistanex increases the elasticity of the Weldwood Contact Cement with temperature so as to achieve the desired result.

Where the dressing is fabricated from a lower membrane portion of denser foam, for example, 90 pore size, the solid medicament such as magnesium must be adhered to the membrane rather than retained in the cells. The reason for this is that the magnesium particles are normally too large to be received within the smaller cells of a 90 cell foam. In this aspect of the invention, a dry layer of foam is engaged with a glue applicator, as described above, to transfer the adhesive to the side of the membrane opposite the shined side thereof. Care should be taken that the adhesive is not applied too thickly otherwise it may go through the membrane. After the membrane has been completely and uniformly coated with adhesive, magnesium powder may be sprinkled over the surface to which adhesive has been applied. Excess powder may then be shaken from the foam and the top pad attached in the same manner as described above. Following adhesion of the two layers of foam in either of the two aspects just described, the assembled dressings are placed in a vacuum oven at approximately 120° C. with a vacuum of about 25" of mercury for approximately 20 minutes. This will effect rapid removal of the toluol solvent.

Following drying, the dressing should be carefully cleaned and trimmed to the desired size. The bandages may be packed in any suitable manner. A preferred manner of packaging involves the use of a heavy duty

aluminum foil. For example, a rectangular sheet of foil may be folded along its lateral centerline with the open ends and fold portion being double folded and the top left open. The finished dressings are merely slipped into the packages and the open end folded over once. The package may then be placed in an oven at a temperature of about 120° C. for 20 minutes in order to sterilize the dressing. After sterilizing, the top of the foil package should be folded twice more to seal the package and complete the operation.

As can be seen, there has been provided a novel and improved surgical dressing which offers many distinct advantages. The attachment of the pressure sensitive tape to the dressing in two sections which are spaced apart and mounted adjacent the ends of the dressing assures that essentially the full elasticity of the dressing may be utilized. In this manner, the dressing will conform very well to irregular surfaces such as knuckles and the like and will remain in good contact with the wound during movement of the portion of the body to which the dressing is applied. The dressing of this invention is quite porous inasmuch as the foam from which it is fabricated may be as much as 97% void. Thus, the wound is essentially open to air. Where the dressing is treated with a bactericidal product, the dressing will act as a filter with respect to the wound thus maintaining the wound surface free of germs.

Further, the dressing of this invention offers the advantage of tending to remove the liquid from a wound which tends to exude a large amount of liquid. In this connection, the liquid will be drawn up through the dressing by capillary action with the top pad serving as a reservoir for excess exudate and permitting the same to evaporate. However, the use of a wetting agent together with the dense bottom layer on the dressing assures that the liquid will not penetrate the dressing too easily thus maintaining a layer of liquid under the bandage. This is important as it is not desired to have the wound area become dry but rather it is preferred that it be kept moist. This not only will tend to prevent the formation of a scab which can adversely affect the rate of healing but at the same time such a layer of liquid is necessary where metallic magnesium or the like is present in the dressing in order to assure that the action of the magnesium or the like will be maintained. On the other hand, the bandage provides good mechanical padding of the wound so as to protect it from impact and the like, and in this sense offers what advantages there may be to scabbing. Further, the dressing when applied to a wound which exudes a great amount of fluid may be easily dried in cases where the rate of evaporation is not sufficiently high. This may be accomplished without removing the dressing simply by pressing on the dressing with a soft absorbent article such as a towel.

Inasmuch as many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the language in the following claims is intended to cover all of the generic and specific features of the invention herein described and all statement of the scope of the invention which, as a matter of language might be said to fall therebetween.

I claim:

1. A dressing comprising a body of elastic skeletonized plastic foam, the portion of the body for positioning adjacent a wound area being compressed to provide a shined surface for contact with a wound, said portion being only a small proportion of the thickness of said body, and a pair of members for attaching the dressing, said members being secured to the body respectively adjacent opposite ends of the body and being spaced apart from each other.

2. A dressing as described in claim 1 in which said pair of members are a pair of strips of pressure sensitive tape, the end of the strips attached to the body being spaced apart a distance sufficient to preserve substantially the elasticity of the body.

References Cited in the file of this patent

UNITED STATES PATENTS

2,626,886	Scholl	Jan. 27, 1953
2,649,391	Alderfer	Aug. 18, 1953
2,858,830	Robins	Nov. 4, 1958
2,888,013	Levitt	May 26, 1959