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Trenchard

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[54] **SURGICAL PAD METHOD FOR DECUBITUS ULCER MANAGEMENT**

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[52] **U.S. Cl.**.....**128/24 R,** 128/68, 5/348

[51] **Int. Cl.**.....**A61h 1/00**

[58] **Field of Search**.....128/24, 68, 149, 400, 153, 128/132, 594; 5/348, 361

[56] **References Cited**

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[57] **ABSTRACT**

Method and surgical system for decubitus ulcer management, in which the surgical devices in the system each comprise a flexible, fluid-impervious bladder containing a gel or jelly formed as a colloidal system from water and a water-soluble resin which is a carboxy vinyl polymer of extremely high molecular weight and capable of displacement or flow within the bladder distributing the weight of the body of the user supported thereon. The mucilage or jelly has some form of elasticity and has yield value, both of which are controllable and variable and is capable of distributing pressure over an entire portion of the body resting on the bladder and avoids excessive pressure points thereon.

9 Claims, 4 Drawing Figures

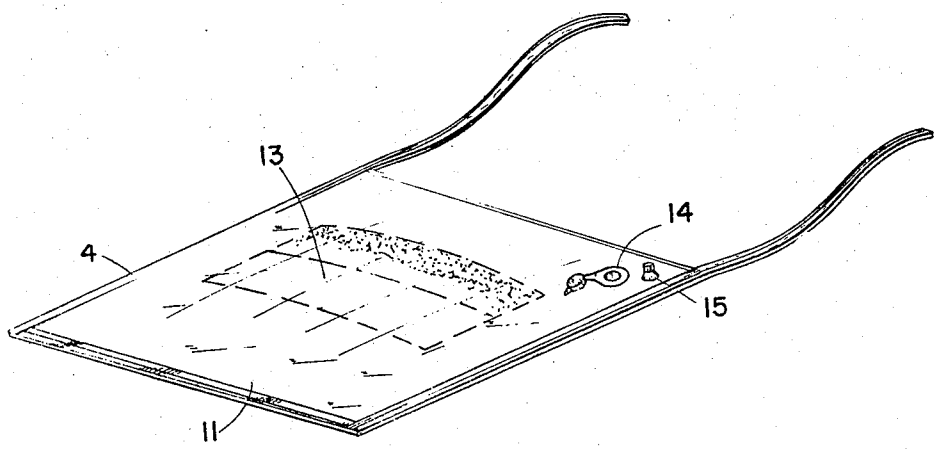
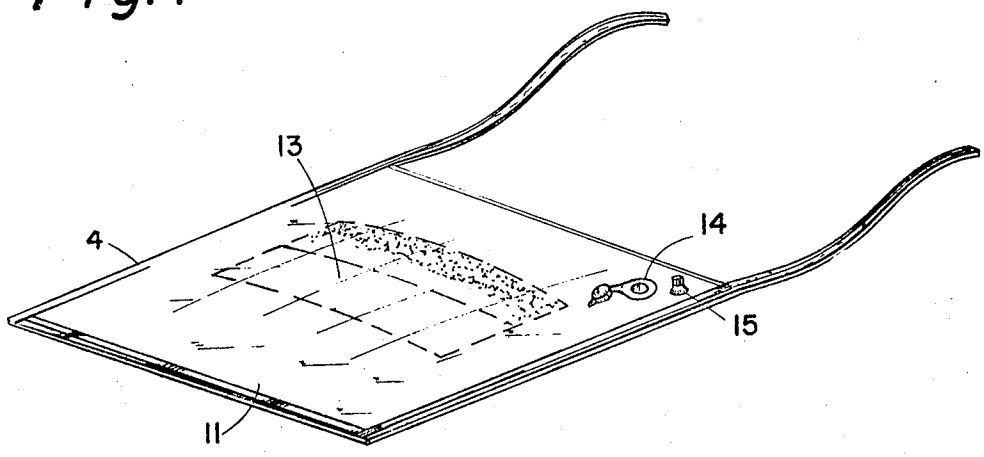


Fig. 1



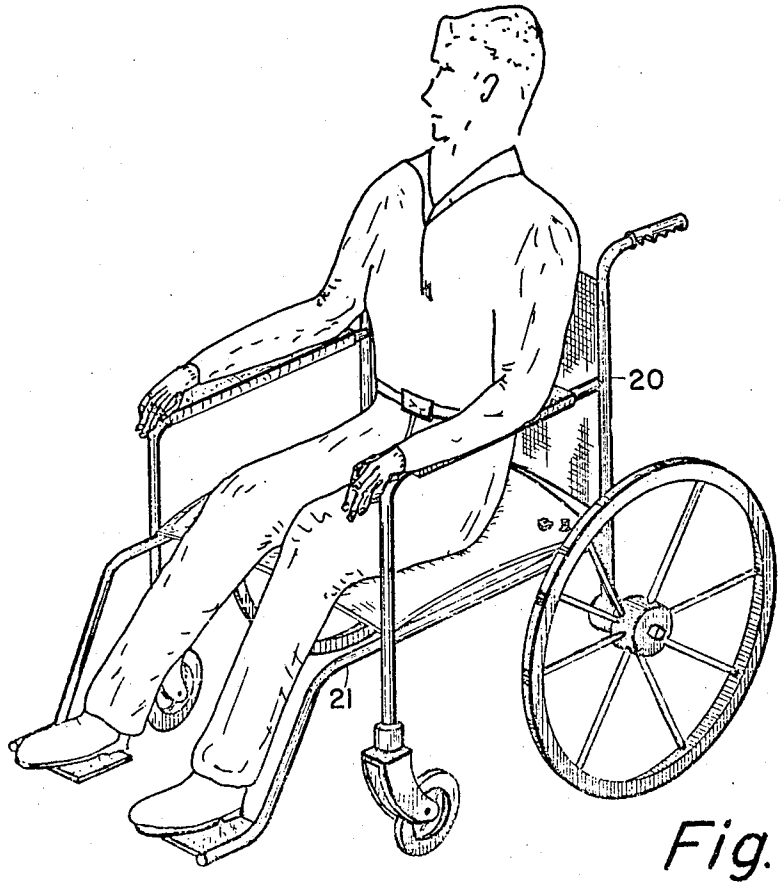


Fig. 3

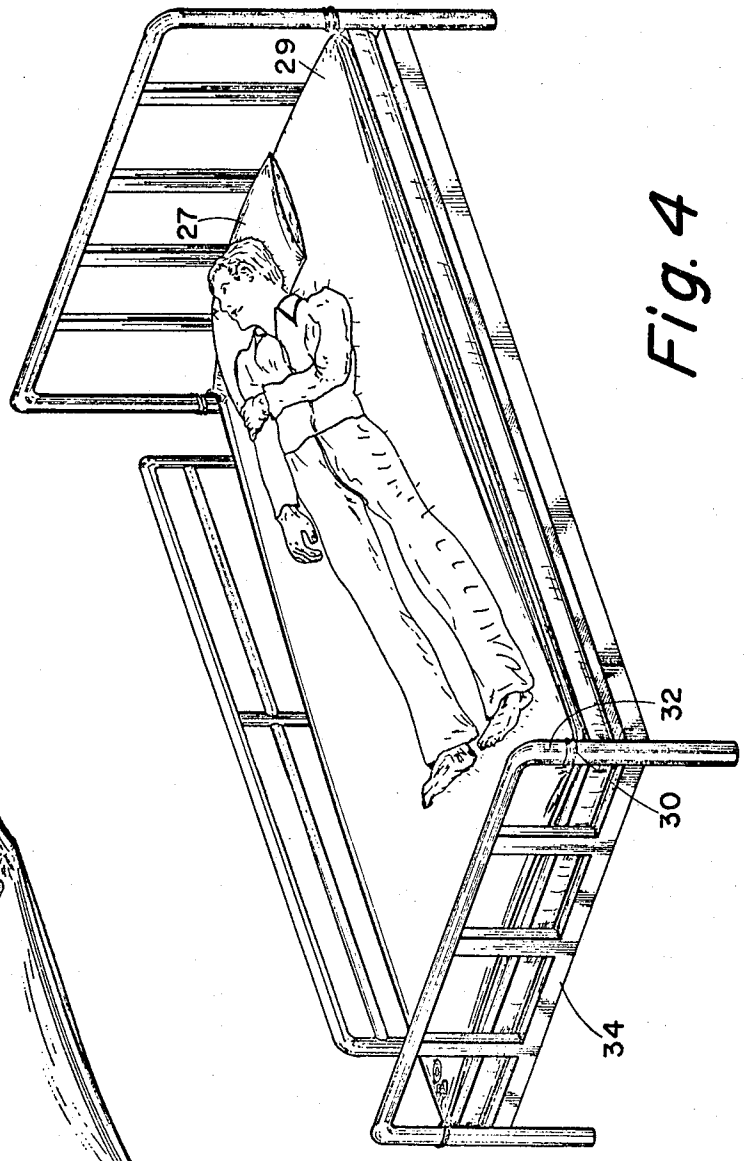


Fig. 4

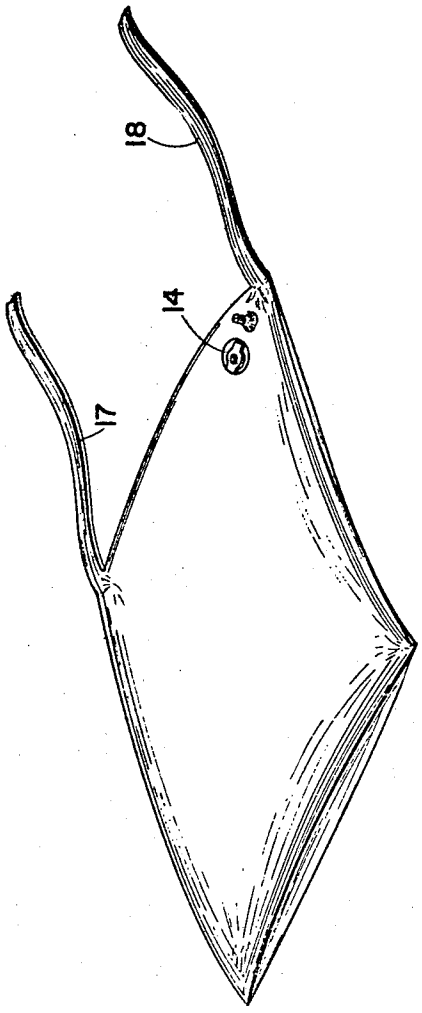


Fig. 2

SURGICAL PAD METHOD FOR DECUBITUS ULCER MANAGEMENT

This invention relates generally to the prevention and treatment of decubitus ulcers and more particularly to a surgical pad, pillow and mattress for bed-ridden patients to preclude decubitus ulcers from forming and for their treatment.

It is known that decubitus ulcers form when the body weight is supported chiefly by bony protuberances such as at the heels, hips, base of the spine and shoulders. Circulation at these points is compromised so that the surrounding tissue is not properly nourished by blood and local necrosis occurs. Patients confined to a conventional bed are subject to the formation of such ulcers. On conventional mattresses steps taken to relieve pressure on decubitus ulcer sites will only transfer pressure to other sites where additional decubitus ulcers could and will form. The patients are moved and massaged to attempt to relieve the formation of such ulcers.

Decubitus ulcer management has presented a considerable problem and attempts have been made to preclude the formation of such ulcers. Thus, patients have been made to "float" on water-filled bladders which will make some patients seasick. The bladder will tend to mold, within substantially very restricted limits, to the patient's body thereby making more body surface available for weight-bearing. Use has been made of pads made of self-contained, stable, chemically inert "gel" covered with a thin elastic membrane which acts to protect the gel but does not constrict or inhibit the properties of the gel which itself has restricted deformation capabilities. Because of their compression limitations, i.e., water is not compressible and the self-contained gel has limited internal displacement, these known devices are not as effective as they might be. They are often too small for large persons and too expensive.

It is a principal object of the present invention to provide a novel method and system for supporting the human body for prolonged periods of time without excessive external pressure on localized areas of tissue over rigid bony structures of the body.

In accordance with the invention a flexible, jelly-containing bladder either in the form of a pad, for a seat, a pillow or a mattress is provided. A weight-bearing colloidal solution, such as a weight-bearing jelly, is contained in the bladder and has a controllable viscosity, greater than that of water. The jelly has some form elasticity and is capable of accurately conforming to a surface of the body supported thereon effectively distributing the weight of the body of the user so that pressure is distributed over the entire surface of the portion of the body resting on the bladder to avoid excessive pressure points.

A feature of the surgical devices in accordance with the invention is that the jelly fill of the bladder will displace internally and has flow characteristics such that nurses can readily place their hands under the body of a patient on a mattress according to the invention for rotating or moving him.

Other features and advantages of the surgical pad, pillow and mattress and apparatus and system in accordance with the present invention will be better understood as described in the following specification and

appended claims, in conjunction with the following drawings in which:

FIG. 1, is a perspective view of a surgical pad made according to the principles of the invention;

FIG. 2, is a perspective view of the pad in FIG. 1 in a filled condition;

FIG. 3, is an elevation view of a patient on a wheelchair illustrating the use of the pad in FIGS. 1 and 2;

FIG. 4, is a perspective view of a hospital bed provided with a mattress made according to the invention.

A surgical pad made according to the invention is illustrated in FIGS. 1–3 inclusive and comprises a bladder 11 made of a fluid impervious material, for example a virgin polyvinyl chloride so that it has a skin-like texture. The bladder has its peripheral edges heat-sealed so that it can act as a fluid-tight jelly-filled container for supporting a patient thereon as hereinafter described. The bladder 11 is constructed with a water-soluble bag 13 disposed therein containing a chemical compound in powder form, for forming a deformable colloidal solution within the bladder 11 by the addition of water through a closable plug 14. The body of the bladder is provided with an air valve 15 for venting of the bladder when filling with water in making the colloidal system and to allow testing of the bladder by application of air pressure and submersion in water, with the plug 14 in place, before filling thereof.

When the pad 11 is to be used a volume of water, suitable to the volume of chemical compound in the bag 13 is applied through the plug 14 and the colloidal system will be formed and expand or swell the bladder 11 to form a jelly-filled pad as illustrated in FIG. 2. The bladder is provided with ties 17, 18 heat-sealed along the edges of the bladder for tieing the pad to a back 20 of a wheelchair 21 so that a patient can comfortably sit thereon as illustrated in FIG. 3.

For purposes of illustrating the invention, the bladder 111 is assumed to be a 22 inch × 22 inch square in which is contained the bag 13 containing three ounces of the powdered chemical compound "-Carbopol 960" which is the ammonium salt of "Carbopol 934" — or "carboxypolymethylene." The chemical compound is a water-soluble resin. The resin is a carboxy vinyl polymer of extremely high molecular weight made by B. F. Goodrich Company and described in the company's Service Bulletin GC–36 Revised and Bulletin GC–42. When water is added to the bladder 11, the bag 13 is dissolved and the water and chemical create a homogeneous jelly. As an example, it has been found that gel contents with a viscosity of approximately 58,000 cps, (Brookfield at 20 rpm) can be formed in bladder 13 by the three ounces of the chemical compound and the application of 1½ gallons of water. This jelly or paste has a controllable form elasticity and yield value so that the surface of the portion of the body of a patient resting on the pad has the pressure distributed over its entire area and excessive pressure points thereon are avoided, thereby avoiding the major cause of pressure sores. The jelly distributes the weight of the body of the patient to effect the pressure distribution so that the patient is without possibility of formation of pressure sores or decubitus ulcers on his buttocks because of the pattern of weight distribution over the patient's buttocks.

The invention is equally applicable to the construction of a head pillow **27** and a mattress **29** constructed in the manner above described as to the seat pad. The mattress is constructed with four corner ties **30** for securing the four corners thereof to posts **32** of a bed **34** as illustrated in FIG. **4**. The jelly-filled pillow and/or mattress and the pad heretofore described may have the viscosity of the jelly uniform or varied by controlling the amount of water applied to the powdered chemical or by addition of water in local areas as described hereinafter. The bladders from which the various devices are made can have the jelly within different portions or volumes of the bladder vary. Thus, some of the contents can be withdrawn or added and more water added to lower the viscosity in certain portions of the device or some of the resin can be added to increase viscosity, and the devices, for example the mattress, can be compartmented so that the compartments thereof can have the different viscosities of the jelly therein. The change in viscosity will change the form elasticity and yield value. Yield value is defined as an initial resistance to flow under applied stress. The jelly offers low resistance to manipulation. A practical significance of yield value is that it prevents phase separation, i.e. breaking of solids settling from the dispersion.

In one mattress constructed having beneficial results in the treatment of decubitus ulcers it was found that an average viscosity of 18,000 cps was recommendable. In that case the mattress was made as 40 inches × 40 inches square pads in which 8½ ounces of the chemical powder were contained in a plastic water soluble bag and about 17 gallons of water were added thereto to obtain the desired viscosity. With such constructions, two pads can be used as a mattress or one pad used on the upper or lower part of the body of the patent.

Moreover, the mattresses can be made with ribs sealed every six inches across the mattress top half with separate filling plugs, not shown, between each rib and thus, the bed may be raised without a corresponding shift of contents to the lower part of the mattress.

It has been found that paraplegics and their physicians usually prefer a low viscosity jelly in the surgical devices used by them so that greater movement is transmitted throughout the contents. Thus, when the patients arms are moved it creates internal movement through the contents of the mattress and this applies a massaging effect on the patient which also tends to cut down on the need for regular turning. Furthermore, the low viscosity makes it possible for a nurse to insert her hands under the patient's body to move him or roll him over without bruising the patient's skin.

The use of the pads and mattresses containing the gelatinous contents has indicated alleviation of decubitus ulcers and curing thereof due to the avoidance of pressure spots. If the surgical devices are used from the beginning of confinement in bed or in a wheelchair decubitus ulcers will not be formed. Furthermore, it has been found that the surgical devices are easily washed and cleaned with a detergent, alcohol or suitable antiseptic so that they can readily be kept sanitary.

It is known that in Newtonian systems flow is directly proportional to applied stress. Pseudoplastic solutions flow more readily as shear stress is increased. The water-soluble resin solution is of this type. Solutions exhibiting plastic flow do not flow until the applied shear stress exceeds a certain minimum value. This minimum is known as yield value. The chemical powder, heretofore described, forms a plastic flow solution with a yield value determined by the measure of viscosity of the solution with a Brookfield RVT Viscosimeter (Brookfield; 20 rpm). Thus, the "thickness" of the formulation is variable and controllable. The jelly is non-toxic, essentially inert in contact with the body and stable to bacterial attack.

The chemical heretofore described is preferred for making the gelatinous contents because it is a salt and does not require neutralizing. Moreover, if lumps are formed when water is applied, the lumps of soluble ammonium salt will solvate and swell. After the lumps have swollen a slight working of the material as the mattresses is readied for use on a chair or bed will produce a smooth homogeneous gel.

The makers of Carbopol water-soluble resin make other usable water-soluble resins such as "Carbopol resin 961" which is the ammonium salt of "Carbopol resin 941." Water-soluble acid "Carbopol resins 934, 940, 941" have the same properties of Carbopol resins 960 and 961 when neutralized to the identical pH, of the salt resins, with ammonium hydroxide. Viscosity and neutralization data of Carbopol water-soluble resins formulations made with water is provided by the service bulletins of the manufacturer heretofore mentioned so that the recipe for the desired thickness of the formulation can be readily determined.

While preferred embodiments of the invention have been shown and described it would be understood that many modifications and changes can be made within the true spirit and scope of the invention.

What I claim and desire to be secured by Letters Patent is:

1. A surgical device for supporting at least a part of the body of a user comprising, a liquid-impervious flexible bladder having a selected configuration, a mucilage or jelly of selectively adjustable viscosity contained in and at least partially filling said bladder, said mucilage having a viscosity greater than water and being capable of viscous flow displacement within said bladder to thereby enable the latter to conform to and support the part of the body of the user supported on said bladder and being effective to cause pressure distribution over the entire portion of the body of the user resting on said bladder, whereby excessive pressure points on the supported portion of the body are avoided.

2. Surgical device for supporting at least a part of the body of the user according to claim **1**, in which said jelly has a viscosity in the range between about 18,000 centipoise and 58,000 centipoise.

3. Surgical device for supporting at least a part of the body of the user according to claim **1**, in which said mucilage comprises a carboxy vinyl polymer of extremely high molecular weight.

4. Surgical device for supporting at least a part of the body of the user according to claim **1**, in which said mucilage comprises water and a water-soluble dry resin.

5. Surgical device for supporting at least a part of the body of the user according to claim **4**, in which said resin comprises a carboxy vinyl polymer of extremely high molecular weight.

6. A surgical device according to claim 1 wherein said mucilage comprises a solid constituent dispersed in and physically bonded to a liquid constituent, the physical bond being breakable by applied shear stress to permit plastic flow and being then re-established.

7. A surgical device according to claim 6 wherein the viscosity of said mucilage is variable as desired and precisely controllable by controlling the ratio of the solid to the liquid constituent.

8. A method of supporting a human body comprising, mixing water and a polymer of extremely high molecular weight in a confined volume to form a deformable colloidal system characterized by plastic flow having a viscosity greater than the viscosity of water and having form elasticity and a selected yield value, and continuing confinement of said colloidal system while supporting a human body on said confined volume, whereby pressure is distributed over an entire portion of the human body resting thereon and excessive pressure points on said portion of the body are avoided.

9. A surgical device for supporting at least a part of the body of a user comprising, a liquid-impervious flexible bladder having a selected configuration, a predetermined quantity of a dry resin contained in said bladder, said resin when having a liquid added thereto forming a mucilage or jelly of selectively adjustable viscosity which at least partially fills said bladder, said mucilage when formed having a viscosity greater than water and being capable of viscous flow displacement within said bladder to thereby enable the latter to conform to and support the part of the body of the user supported on said bladder and being effective to cause pressure distribution over the entire portion of the body of the user resting on said bladder, whereby excessive pressure points on the supported portion of the body are avoided.

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