United States Patent

Harmon

[15] **3,670,731**

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[54] ABSORBENT PRODUCT CONTAINING A HYDROCOLLOIDAL COMPOSITION

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[73] Assignee: **Johnson & Johnson**

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[52] **U.S. Cl.** **128/284,** 117/136, 128/156, 260/88.1

[51] **Int. Cl.** **A61f 13/16**

[58] **Field of Search** 128/156, 284, 285, 287, 290, 128/296; 260/47, 77.5, 88.1; 117/136

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Primary Examiner—Charles F. Rosenbaum

Attorney—Alexander T. Kardos, Arnold S. Worfolk and John H. Tregoning

[57] **ABSTRACT**

An absorbent dressing having an absorbent layer defined by water soluble hydrocolloidal composition capable of absorbing of at least about fifteen times its weight of body exudate and retaining said exudate under pressure of up to about 2.5 p.s.i.

11 Claims, 13 Drawing Figures

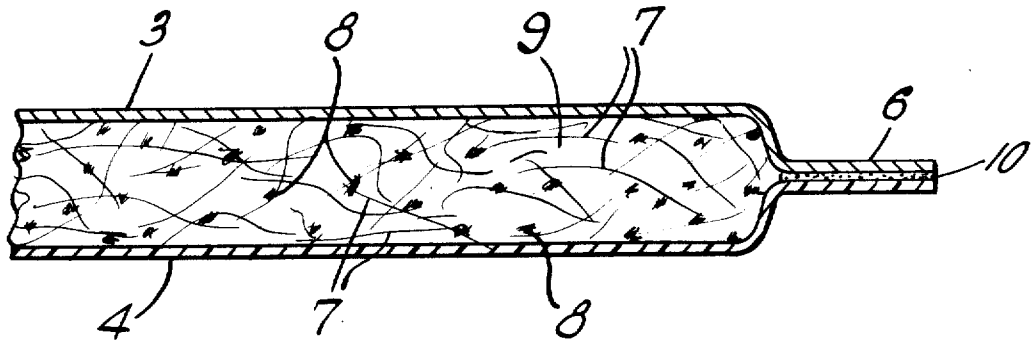

Fig. 1.

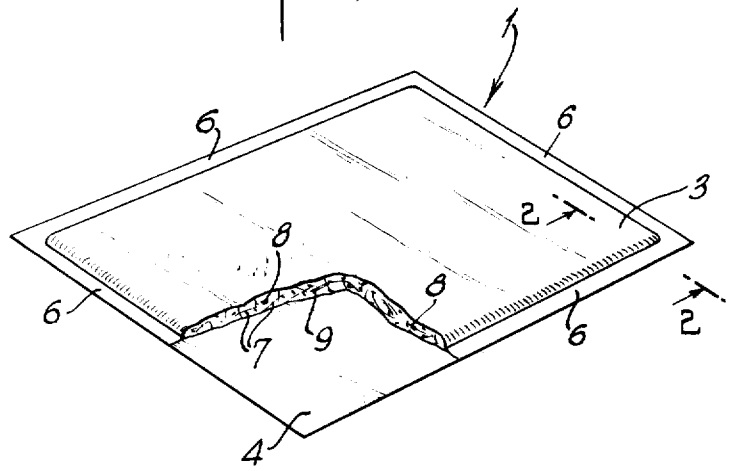

Fig. 2.

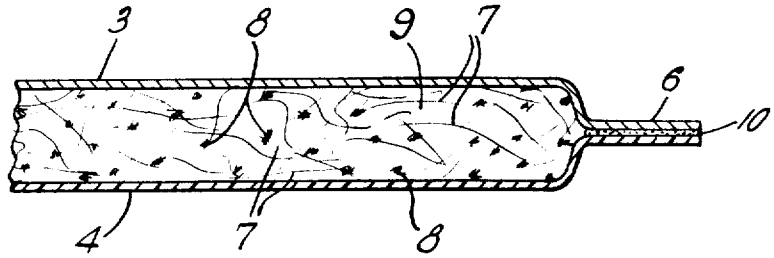

Fig. 3.

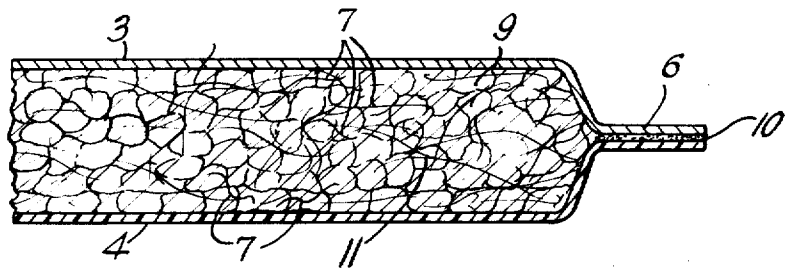

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Fig. 4.

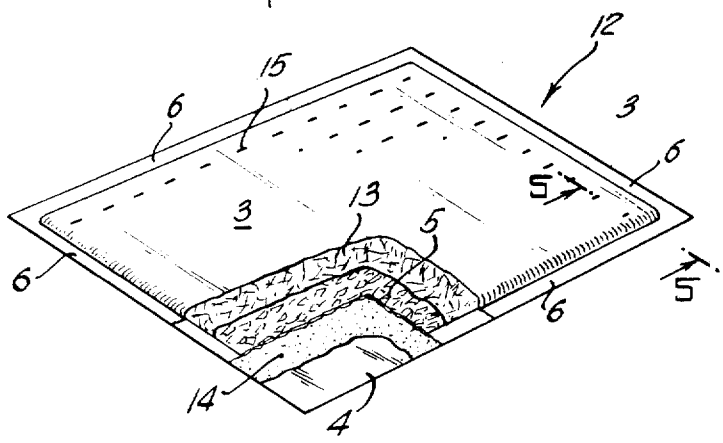

Fig. 5.

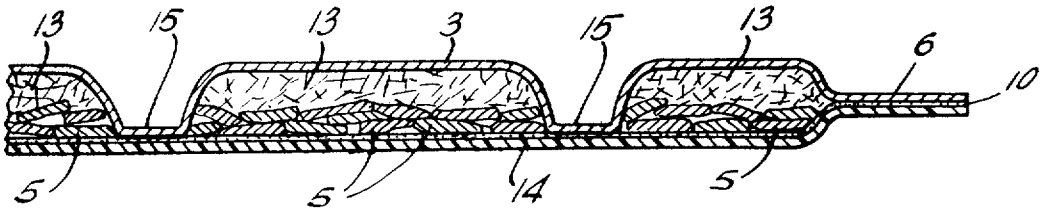

Fig. 6.

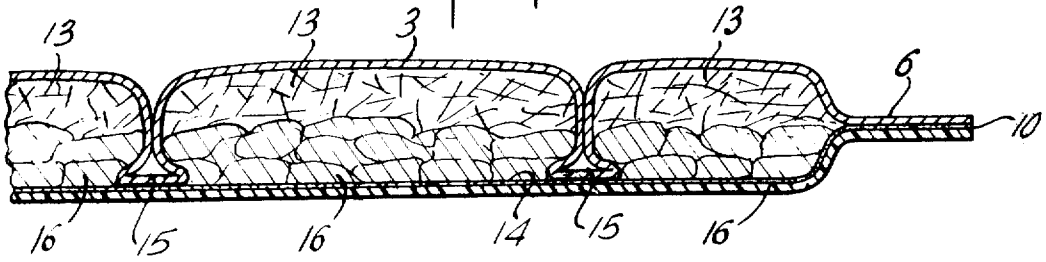

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Fig. 7.

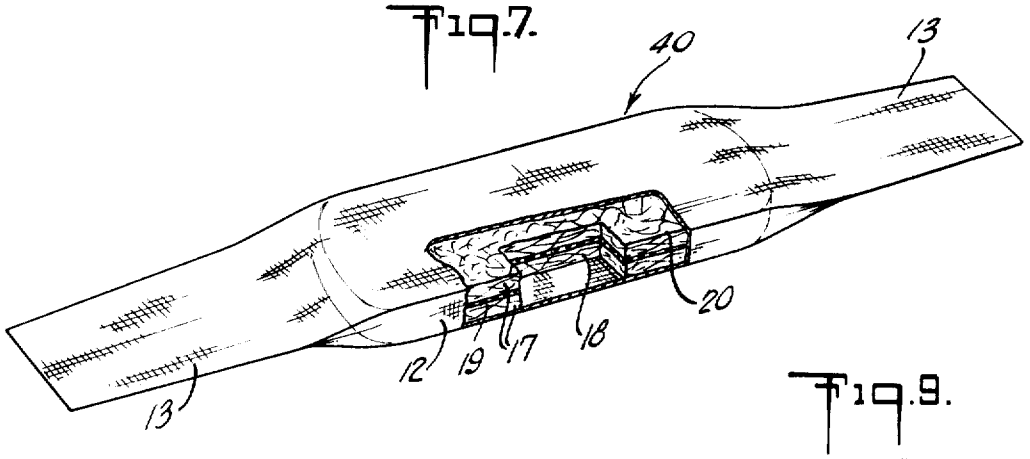

Fig. 9.

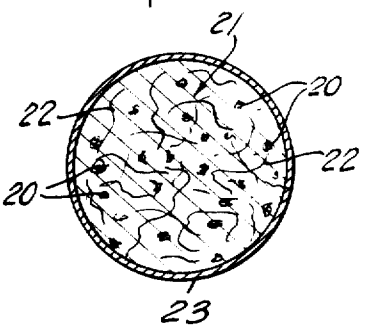

Fig. 8.

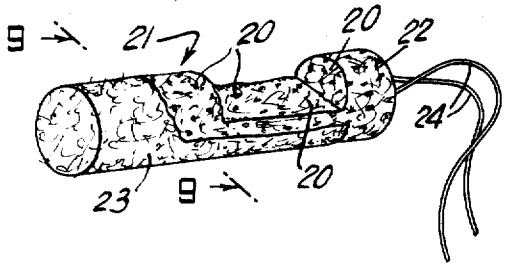

Fig. 10.

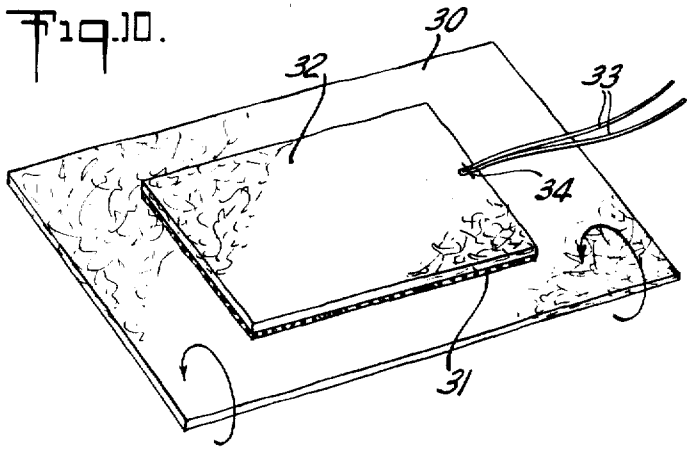

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Fig. 11.

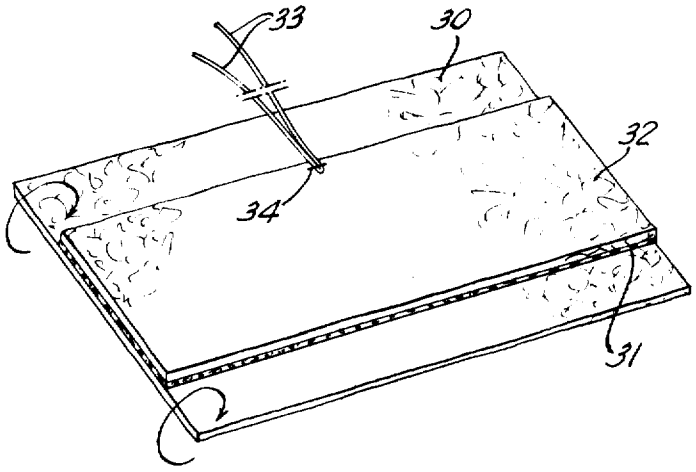


Fig. 12.

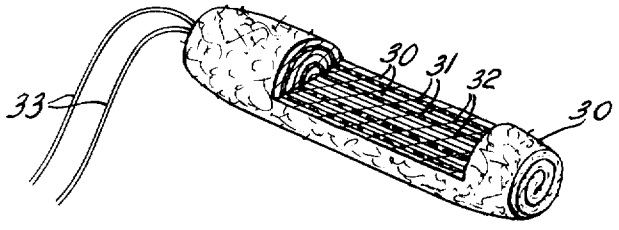
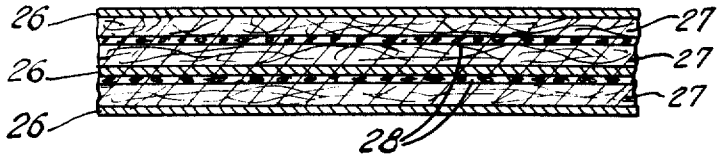


Fig. 13.



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ABSORBENT PRODUCT CONTAINING A HYDROCOLLOIDAL COMPOSITION

The present invention relates generally to absorbent dressings and, more particularly, to diapers, to sanitary napkins, to catamenial tampons, and to absorbent wound dressings, e.g., surgical dressings, which are characterized by the use therein as the main absorbent medium of a particulate hydrocolloidal composition which is substantially aqueous insoluble at ambient temperatures and is capable (1) of absorbing body exudates such as urine, menstrual discharge and wound exudates in amounts of from at least 15 times to about 70 times its weight, and (2) of holding these amounts of absorbed exudate against release during normal flex and pressure as a result of activity of the wearer, (3) while maintaining its particulate integrity, albeit swollen grossly because of its absorption and retention of body exudate.

As a result of the nature of the absorption of the body exudate by the particulate hydrocolloidal component used in the absorbent dressings of the invention, i.e., imbibing with concomitant swelling so that particulate body form is maintained, the surface of the wet dressing has a dry-to-the-touch feel. This coupled with the unusual retention of the absorbed liquid even during normal activity of the wearer makes the absorbent dressings of the invention of substantial importance for all the intended uses, and especially for diapers, particularly those of the so-called "throw-away" type, and for catamenial tampons, where the articles are relatively small with respect to the quantity of liquid body exudate, urine and menstrual fluid, respectively, they are called upon to handle.

Test results show in the case of a diaper in accordance with the invention, that it will "hold" absorbed liquid in amounts of 30 and more times the weight of the particulate hydrocolloidal component, under a pressure of up to 2.5 p.s.i.

It may be that during actual use of the diaper of the invention the movements of the child may be such as to apply a temporary extraordinary pressure here and there, sufficient to disgorge some absorbed urine from swollen particulates containing the same. Be that as it may, if some absorbent particulates in the diaper have absorbed their full capacity considering the pressure applied, other surrounding absorbent particulates which have not absorbed up to their capacities, are capable of absorbing additional urine, with the result that the diaper feels substantially dry to the touch at substantially all times during a normal time interval of use.

In use in an absorbent dressing in accordance with the invention, the substantially water-insoluble particulate hydrocolloid absorbent material, of a particle size suitably in the range of from about 1 micron to about 2 millimeters, is spread as uniformly as possible onto and/or into a carrier sheet commonly used in making an absorbent dressing, so that the carrier sheet and the applied particulate layer can be fashioned by conventional procedures into an absorbent dressing in accordance with the invention. Preferably, the particulate absorbent material is sandwiched between a pair of carrier sheets and then incorporated by conventional procedures into an absorbent dressing according to the invention, thus insuring that the desired discrete particulate hydrocolloid layer is maintained in the final structure. In the case of a catamenial tampon, this can be accomplished by first spreading the hydrocolloid particles as a layer over a conventional layer of absorbent fibers and then winding the latter on itself into the form of a roll so that the hydrocolloid particles are trapped between the windings.

The hydrocolloidal absorbent material used in accordance with this invention may be in solid form such as, for example, a fiber, thin film, or a cellular structure, all of which provide a large surface area; however, it is preferred that it be in particulate form such as a flake or granule, since these forms provide the largest surface area for absorption and insure that maximum surface area is available for absorbency. There should be at least about 5 percent by weight, preferably 10 to 15 percent by weight, of hydrocolloidal absorbent material based on the total weight of absorbent materials in the dressing. In the case of a diaper or wound dressing the total absorbent component may be the hereinabove described hydrocolloid absorbent material.

Depending upon the end absorbent dressing desired, the carrier sheet for the particulate hydrocolloid layer in the product may be an absorbent mass or pad of textile fibers, wood pulp fibers, cotton linters and mixtures of such fibers, one or more sheets of bonded textile fibers, either synthetic or natural fibers, or a mixture thereof. The term "carrier sheet" also includes a composite of layers of absorbent tissue, e.g., creped tissue, paper sheets and water impermeable films and fibrous sheets, perforated, if desired, to allow liquids to pass therethrough freely, if desired. As already indicated, the carrier sheets which may be used to make the absorbent dressing of the invention may be those which are commonly used in making absorbent dressings of conventional construction.

Water-insoluble particulate hydrocolloid compounds of the type herein contemplated are presently known materials, but their uses in the past have not been related to that herein contemplated, i.e., as an absorbent material in absorbent dressings, wherein the absorbent material maintains its particulate character as it imbibes and absorbs many times its weight of surrounding liquid, and in doing so swells. As previously indicated, the absorbent, water-insoluble particulate hydrocolloid contemplated herein is capable of absorbing from about 15 to 70 times its weight of water, urine and other body exudates. In doing so each individual absorbent particle swells or enlarges several hundred percent times its individual parameter without destruction of its initial particulate integrity. As the particulate, water-insoluble hydrocolloid accepts liquid it substantially immobilizes the same therein, and the resulting particulate, liquid-swollen structure is gelatinous.

The mass of swollen particulate water-insoluble hydrocolloid particles within the body of the sanitary dressing define an aciniform structure since each individual absorbent particle is a greatly enlarged particle, having become liquid-swollen or grape-like or acinus in form due to the water, urine or other liquid it has absorbed. The individual, swollen, hydrocolloid particles are tacky and hence within the absorbent dressing they are in a clustered mass of liquid-swollen particles. The particles remain in this aciniform state even in the presence of liquid in excess of their ability to absorb.

The liquid-swollen hydrocolloid particles bind their absorbed water tightly, as already indicated, but upon drying the particles are dehydrated and return more or less to their original size. At this time they can again operate more or less as before to absorb and bind liquids, and hence in the case of an emergency the diaper of the invention lends itself for reuse.

The water-insoluble hydrocolloid absorbent particles used in accordance with the present invention are presently known materials, generally being a hydrocolloid polymer material having from about 25 to 72 percent of its molecular structure composed of hydrophilic groups, and whose polymeric network has been crosslinked to introduce a limited water insolubility into the molecule. Suitable water-insoluble hydrocolloid absorbent material in accordance with the invention have a minimum average molecular weight per crosslinkage of about 13,000 and a maximum molecular weight per crosslinkage of about 276,000. In general, the extent of crosslinking is contained so that the polymeric network of the hydrocolloid is not soluble in water, urine and the like, yet remains flexible and swells as water and other liquid is absorbed within its structure. As the hydrocolloid swells it maintains the approximate shape and geometry it had before contact with liquid, but the dimensions thereof are greatly enlarged to provide for the binding of the liquid absorbed therein.

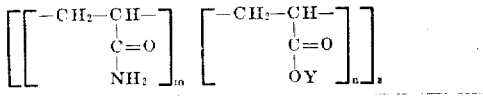
It is evident that absorbent dressings containing water-insoluble hydrocolloid absorbent particles in accordance with the invention are distinguishable from the prior art absorbent dressings which may have had incorporated in their structure natural and/or synthetic water soluble hydrocolloid materials to increase the viscosity of, i.e., to thicken, the liquid absorbed into the absorbent dressing structure.

For the present invention the crosslinked, water-insoluble particulate hydrocolloids of the invention are not the equivalent of known natural soluble hydrocolloids such as agar, karaya and the water-soluble gums (tragacanth, arabic, locust beam, and guar), or of synthetic hydrocolloids such as carboxymethyl cellulose and carboxyethyl cellulose. These soluble hydrocolloids serve only to increase viscosity of liquids and in the presence of an added liquid excess, lose their power to retain the viscosity they had previously achieved. In contrast as exemplified by diaper use, the crosslinked hydrocolloid absorbent material within the diaper of the invention swells upon absorption of liquid and retains the absorbed liquid so that it does not flow back on the child. The swollen hydrocolloid remains essentially locked in position within the diaper structure and does not penetrate the diaper facings. Liquid taken into the swollen structure is retained well under the pressures encountered in use. And with any excess of liquid the discrete, separate, liquid-swollen hydrocolloid entity maintains its maximum swollen form.

The water-insoluble hydrocolloid absorbent material which may be used in accordance with the present invention preferably is a crosslinked polyacrylamide or a crosslinked sulfonated polystyrene or a mixture of these acrylamides and polystyrenes.

The preferred hydrocolloid absorbent material is a hydrolyzed crosslinked polyacrylamide which has the following values for the variables identified in the general formula set forth immediately below: n=28, m=72, Z=19 and Y=Na. This preferred material is described in U.S. Pat. No. 3,229,769, patented Jan. 18, 1966.

The preferred hydrolyzed polyacrylamide hydrocolloid absorbent materials of the invention suitably are compounds having the following structural formula:



where

Y is a hydrogen, ammonium or an alkali metal ion,

m is a number from 1 to 100,

n is a number from 0 to 100 and defines the degree of hydrolysis,

m plus n is equal to 100, and

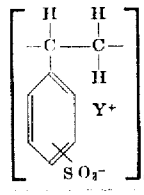
Z is a number from 1 to 30, where Z times 100 is equal to the number of mer units between crosslinks.

The crosslinked polyacrylamide hydrocolloid material of the invention may be prepared by known techniques, e.g., by crosslinking a linear polyacrylamide (or by copolymerizing an acrylamide) with a non-conjugated divinyl compound such as methylene bis acrylamide. In the latter case, the polymerization may be run by any of the standard methods including the use of peroxide catalysts, or by photo polymerization with riboflavin activator. The crosslinking compound may be present in an amount of from about 500 to about 5,000 parts per million of polymerizate.

Other examples of non-conjugated divinyl crosslinking compounds are 1,4-divinyl benzene; N,N-diallylacrylamide; diallylamine; diallylmethacrylamide; 2,5-dimethyl-1,7-octadiene; p,p'-diisopropenylbenzene; 2,8-dimethyl-1,8-nonadiene and diethylene glycol divinyl ether.

The preferred polyacrylamides are those in the above general formula that are hydrolyzed and wherein Y is sodium or potassium, n is equal to a number in the range of 10 to 70 and Z is a number in the range of 2 to 20. Most preferably, Y is sodium, n and Z are numbers within the ranges 20 to 40 and 4 to 15, respectively.

Crosslinked polystyrene sulfonate hydrocolloid absorbent materials which may be used in accordance with the invention preferably are those which have been crosslinked with non-conjugated divinyl compounds as above set forth. These polystyrene sulfonates are known materials and have the following general structural formula:



where

Z is a number from 100 to 3,000 and defines the number of mer units between cross links, and

Y is a hydrogen, ammonium or an alkali metal ion.

These crosslinked polystyrene sulfonates are prepared by known procedures, e.g., by copolymerizing styrene with a non-conjugated divinyl compound such as divinyl benzene in the presence of a polymerization catalyst such as benzoyl peroxide. It is customary to add a suspension stabilizer (such as gelatin or polyvinyl alcohol) so that small polymer beads in the range of from about 1 micron to about 2 millimeters will be formed during the polymerization. The resultant polymer is sulfonated, for example, by heating it in the presence of concentrated sulfuric acid at a temperature of about 100° C.

The mechanism whereby water or liquid is lead through the outer covering sheet or through the facing sheet of the absorbent dressing to the hydrocolloid absorbent medium incorporated into the structure of the dressing is generally termed "wicking". Wicking is effected generally by fibers either in the covering or facing sheet or within the absorbent medium. These fibers act as channels to direct the liquids deposited on the surface of the absorbent dressing into the contained hydrocolloid absorbent medium. In the present invention both means may be utilized simultaneously or individually depending upon the desired composition of the facing or covering sheet and whether the hydrocolloid is the sole absorbent medium or whether it is combined with a fibrous absorbent mass.

The hydrocolloid absorbent medium used in accordance with this invention may be constructed of a blend of the hydrocolloid with a mass or pad of fibers or a composite of layers of absorbent tissue, e.g., creped tissue.

The invention will be described in detail in connection with illustrative embodiments, e.g., a diaper, a surgical dressing, and catamenial devices, specifically a tampon and a sanitary napkin, in the accompanying drawings, wherein:

FIG. 1 is a perspective view of a diaper or surgical dressing of the invention with a portion thereof cut away;

FIG. 2 is a cross section taken along 2 — 2 of FIG. 1;

FIG. 3 is the same cross section as FIG. 2 after use and during which absorption of body exudates has taken place;

FIG. 4 is a perspective view of another embodiment of a diaper or surgical dressing of this invention, with portions thereof cut away;

FIG. 5 is a cross section taken along 5 — 5 of FIG. 4;

FIG. 6 is the same cross section as FIG. 5 after use and during which absorption has taken place;

FIG. 7 is a perspective view of a sanitary napkin embodying the invention, shown partially open to illustrate the same;

FIG. 8 is a perspective view of a catamenial tampon embodying the invention, shown partially open to illustrate the same;

FIG. 9 is a cross section taken along line 9 — 9 of FIG. 8,

FIGS. 10 and 11 are planar views of other embodiments of a tampon construction before the same are formed into tampons;

FIG. 12 is a view of a tampon constructed from the embodiment shown in FIG. 11, portions being broken away to show details; and

FIG. 13 is a cross section of an absorbent dressing used for testing to illustrate the efficiency of this invention.

With specific reference to FIG. 1 which depicts a disposable diaper 1, the facing sheet 3 is a porous non-woven fabric made of individualized fibers bonded together in a pattern of spaced binder areas. The backing sheet 4 is a moisture-resistant sheet, e.g., a thin gauge polyethylene film. The facing sheet 3 and the

backing sheet 4 are adhered together along common edges 6 by a selected adhesive. A fibrous layer 9 constructed of absorbent fibers 7, e.g., cellulosic, having incorporated therein, in random manner, the aforedefined hydrocolloidal absorbent composition 8, provides the absorptive medium of this diaper. The facing sheet 3 and the backing sheet 4 are the "carriers" in this diaper construction.

The facing sheet 3 may be a sheet of soft, absorbent paper, a lightweight intermittently bonded or overall impregnated nonwoven fabric, a thin perforated plastic film or any such material which will readily pass liquids therethrough and which present a smooth and soft surface for contacting the wearer's body.

It is preferred that the layer of absorbent material 9 have a backing sheet 4 constructed of a waterproof material such as a layer of waterproof paper, a thin water-repellent film, etc. The facing sheet 3 and the backing sheet 4 are secured to each other along their longitudinal edges to prevent movement of the layers with respect to each other. The sheets 3 and 4 may be secured by any method known in the art, such as by glue, embossing the edges, etc.

The hydrocolloidal absorbent composition 8, in particulate form, may be applied to the fibrous layer 9 by sprinkling or dusting the hydrocolloid absorbent into the absorbent pad.

Of course, the absorbent pad 9 may be constructed of a plurality of sheets of absorbent material, and in such a case the hydrocolloidal absorbent 8 may be adhesively secured to the surface of one or more of the sheets. In point of fact, the fibrous material composing the absorbent pad 9 may be constructed of any known absorbent material such as fluffed wood pulp, woven cloth, cotton linters, a plurality of plies of creped tissue, and the like.

Yet another means for securing the hydrocolloid in place with any diaper or absorbent dressing, is to emboss the surface of the absorbent pad 9 to provide cavities such as parallel ribbon-like channels, diamond patterns, etc., that will contain the absorbent hydrocolloid 8 to insure substantially uniform distribution.

FIG. 2 is a cross section taken along line 2 — 2 of FIG. 1 and shows the absorbent pad 9 constructed of absorbent fibers 7 and having particles of the hydrocolloid absorbent material 8 attached or secured to, or mechanically intermixed with the fibers. The facing sheet 3, which may be singular or plural, and the water-repellent backing sheet 4, engulf and entrap the absorbent pad 7. The sheets 3 and 4 are joined along their common edges 6 by an adhesive 10.

FIG. 3 shows the same cross section as is shown in FIG. 2 but after use, and thus after absorption has taken place. Note the swollen nature of the hydrocolloid absorbent which takes on an acinuous form 11 in that in the swollen state it retains its particulate integrity. The fibers 7 comprising the absorbent pad 9 aid in retaining the gelatinous mass of liquid-swollen hydrocolloid absorbent 11 in substantially uniform distribution throughout the length and width of the diaper. Of course, the need for the absorbent pad 9 can be obviated by techniques such as embosing whereby the substantially uniform positioning of the hydrocolloid absorbent is virtually insured. In that case the hydrocolloid of the aforegiven definition does form essentially the total of the absorbent medium, and in fact, will be the entire absorbent medium if absorbent carriers are not utilized.

Another absorbent dressing, and more specifically a second diaper 12, encompassing this invention, is shown via FIG. 4. The facing and backing sheets, 3 and 4 respectively, are as defined in FIG. 1; however, the absorbent medium is defined by a layer of hydrocolloid absorbent 5 in fine flake form in this instance. The absorbent flakes 5 are substantially uniformly dispersed along the inner face of the backing sheet 4 and kept in position by an adhesive layer 14, first applied to the inner surface of the backing sheet 4. In this instance a thin wood pulp underlay 13 is secured uniformly to the inner surface of the facing sheet 3 to provide wicking action in the diaper 12. The cross section of FIG. 5 taken along 5 — 5 of FIG. 4 defines the diaper more particularly. Note the bottom most layer of the hydrocolloidal absorbent composition 5 secured by adhesive 14 to the inner surface of the backing sheet 4. The pulp underlay 13 helps to keep the hydrocolloid absorbent in position to provide an absorbent core. The pulp underlay 13 is clearly seen secured to the inner surface of the facing sheet 3.

FIG. 6 depicts the same cross section as shown in FIG. 5 but after the diaper 12 has been used for its intended purpose and has had a quantity of body exudate absorbed in it. The hydrocolloidal absorbent 16 is liquid swollen and is of the characteristic gelatinous aciniform structure. The gelatinous mass 16, which is virtually a continuous layer spanning the length and the width of the diaper, is retained in a relatively flat position by depressed sites 15 (formed by embossing techniques) spaced through the diaper in a substantially uniform pattern. With the use of an adhesive 14 the backing sheet 4 and the facing sheet 3 become attached at these sites 15 to provide means by which a reasonable flatness is maintained, and the tendency of the gelatinous absorbent mass 16 to ball in the center of the pad is precluded. The pulp underlay also contributes substantially to maintain the position of the gelatinous mass such that substantial flatness of the diaper is maintained.

The diapers shown via FIGS. 1 – 6 could also represent surgical dressings or other absorbent patches or bandages. The size of the dressing need simply to be reduced accordingly since the dressing would continue to function to absorb and retain body exudate.

In FIG. 7, a sanitary napkin 40 incorporating the invention includes a relatively thick absorbent core 18 enclosed within a liquid pervious fibrous wrapper 12 whose ends extend beyond the ends of the absorbent core 18 to provide the usual attachment tab 13. The absorbent core 18 can be about 8 inches long, 2 ½ inches wide and one-fourth to one-half inch thick and in this instance consists of a layer of the aforedefined particulate hydrocolloidal absorbent composition 19 interposed between several layers of fibrous material 15 such as cotton webs, air-layered cellulosic fiber webs, non-woven or textile fibrous webs, wood pulp batts, tissue pulp or like materials which are highly absorbent. The entire core assembly is enclosed within the liquid pervious wrapper 12. As an alternative the hydrocolloidal absorbent 14 may be randomly interspersed throughout the absorbent core 18.

Referring to FIGS. 8 and 9, there is illustrated a catamenial tampon 21 incorporating the invention, and which includes the elongated cylindrical core 22 of densely packed absorbent fibers enclosed with a liquid pervious wrapper 23. Secured at one end of the tampon are a pair of withdrawal strings 24 by which the tampon can be withdrawn subsequent to use. The absorbent fibrous core has about 12 percent by weight, based on the total weight, of the aforedescribed hydrocolloidal absorbent composition 20 dispersed therein.

FIG. 9 is an enlarged cross section taken along line 9 — 9 of FIG. 8 and shows the particulate hydrocolloid 20 impregnated in the fibrous absorbent core 22 which is encased by the liquid pervious wrapper 23.

FIGS. 10 and 11 are planar views of other tampon constructions before the same are formed into tampons. In both Figures an absorbent covering sheet 30 forms the base for the layer 31 of the aforedefined hydrocolloidal absorbent and the absorbent positioning-sheet 32. Both sheets 30 and 32 are of nonwoven construction and are liquid permeable; however, other liquid absorbent mediums could be utilized, i.e., paper or woven textiles, etc., and it is conceivable that apertured or foraminous nonabsorbent sheets, e.g., apertured polyethylene film, could be substituted for one or the other.

The tampon construction of FIG. 10 is formed by turning either of the longitudinal edges over on itself and continuing to so roll the edge to provide a cylindrical tampon. The cylindrical tampon is then compressed and the free longitudinal edge adhesively secured. The same applies to the tampon of FIG. 11, and in each instance the arrows describe the method of forming. Each tampon has withdrawal strings 33 secured by stitching 34 or other suitable means to the composite.

A tampon formed of the embodiment shown in FIG. 11 is given in FIG. 12. The center portion of the tampon is cut away to show the distribution and positioning of materials.

The absorbent dressings of the instant invention exhibit greatly improved absorption and retention of liquids. To establish the improved absorbency and retention of liquids, sample dressings were prepared as follows: A plurality of 10 × 10 inch test absorbent dressings were constructed by superimposing in congruent relationship, layers of nonwoven fabric **26**, fluffed wood pulp **27** and a hydrocolloidal composition **28** as is shown in cross section in FIG. **13**. Each sheet of nonwoven fabric weighed 1 gram, each layer of pulp weighed 3.3 grams and each layer of hydrocolloidal absorbent composition weighted 0.5 grams. A control dressing similarly constructed contained no hydrocolloidal absorbent composition.

Each dressing or pad was saturated with 500 milliliters of deionized water. Each pad was inclined at an angle of about 45° for 3 minutes and the water that escaped from each pad or dressing was separately collected and measured.

After allowing 5 minutes for the escape of the water, a planar pressure of 1.25 psi was applied to each pad. The water forced from each pad or dressing by this pressure was separately collected and measured. The amount of absorption was determined by calculating the difference between the amount of water added and the amount of water collected under these conditions. The results are shown in Table I where the letters *n*, *Z* and *Y* are those utilized in defining the polyacrylamides of this invention and the crosslinking agent was methylene bis acrylamide.

TABLE I

Absorbent dressing sample	Absorbent compound m	n	Z	Y	Absorption in mil under 0 p.s.i. pressure	Absorption in mil under 1.25 p.s.i. pressure
1 (control)					197	87
2	1	99	(*)	K	325	192
3	54	46	5	K	383	237
4	72	28	10	Na	400	252
5	100	0	5		273	125
6	69	31	4	Na	365	222
Crosslinked sulfonated polystyrene				Na	228	120

*Radiation crosslinked.

The absorbent dressing of this invention also maintains a reduced, or minimal, surface wetness on the facing sheet, i.e., the sheet of textile or paper-like material positioned contiguous to the skin of the user, or in the alternative the sheet of the dressing exposed directly to the source of the liquid which the dressing is intended to absorb. This feature is dramatically established by the following test utilizing two diapers of identical construction. Each diaper measured 10 × 10 inches and the weight of the absorbent facing and backing sheets was 200 grains per square yard. Each diaper had a layer of fluffed wood pulp in an amount of 12 grams; however, only one diaper had 1.5 grams of a crosslinked hydrolyzed polyacrylamide dispersed within the absorbent fibrous layer. The values for *n*, *m*, *Z* and *Y* of this crosslinked hydrolyzed polyacrylamide were 28, 72, 10 and Na respectively (which apply to the structural formula on page 4) and the crosslinking agent was methylene bis acrylamide. 150 ml of deionized water was added to each of the horizontally positioned diapers. Diaper A contained the hydrocolloidal composition and diaper B did not.

In the first test, identical thin sheets of preweighed paper toweling were placed in facewise engagement with the facing sheets of both diapers and a thin flat metal plate weighing 13 pounds was placed upon each of these laminates. After 5 minutes the plate and the paper toweling were removed from each diaper and was re-weighed to determine the water pickup. The ratio of surface water pickup of the conventional diaper B without the absorbent compound, i.e., the crosslinked hydrolyzed polyacrylamide, to the diaper A containing the absorbent was 4 to 1.

In another test, the facing sheet of each diaper was carefully removed and weighed to determine its liquid content. The ratio of the wetness of the facing sheets of the conventional diaper B without the absorbent to that of the diaper A containing the hydrocolloidal absorbent, was 3 ½ to 1.

Another very important feature that is characteristic of the absorbent dressing of this invention is the reduced internal spread of absorbed liquid that it exhibits. To illustrate this feature, diapers constructed in accordance with FIG. 1 of this invention were prepared. Several contained the absorbent hydrocolloid defined herein (specifically in this instance the methylene bis acrylamide crosslinked hydrolyzed polyacrylamide bearing the values *n*=28, *m*=72, *Z*=10 and *Y*=Na) while several were prepared without this hydrocolloid. Fifty cubic centimeters (cc) of colored water was introduced onto the center of each of these diapers constructed in accordance with FIG. 1. The diapers contained either 0 percent, 16 percent or 31 percent by weight, based on the total weight of the diaper, of absorbent hydrocolloid. The results are expressed in terms of percent decrease of spread area based on the diaper that did not contain any of the absorbent hydrocolloid.

% Wt. Hydrocolloid in Pulp	Water Feed Rate (cc/sec.)	% Decrease in Spread Area from 0% Pulp
0	1.6	0
16	1.6	46
31	1.6	72
0	8.3	0
16	8.3	36
31	8.3	45

These results also show that at lower feed rates, the diaper of this invention has more of an opportunity to absorb the water before it flows past, thus decreasing the percent spread area.

In describing the present invention, certain embodiments have been used for purposes of illustration; however, other embodiments and modifications within the spirit and scope of the invention will readily occur to those skilled in the art after a reading of this disclosure. The invention is accordingly not to be limited to the specific embodiments illustrated but only in accordance with the appended claims.

I claim:

1. An absorbent dressing comprising an absorbent layer sandwiched between a liquid permeable facing sheet and a backing sheet, said absorbent layer containing at least about 5 percent by weight, based on the total weight of the dressing, of a hydrocolloidal polymer composition rendered substantially water insoluble by crosslinking, and having from about 25 to about 72 percent of its molecular structure composed of hydrophillic groups, said hydrocolloidal composition being further defined as providing a gelatinous agglomerate of liquid-swollen particulate members in the presence of a quantity of body exudate, as capable of absorbing at least about 15 times its weight in body exudate, as capable of retaining said absorbed exudate under a pressure of up to about 2.5 p.s.i., and as having a minimum average molecular weight per crosslinkage of about 13,000.

2. The dressing of claim 1 wherein said hydrocolloidal composition is incorporated within a fibrous mass to define said absorbent layer.

3. The dressing of claim 2 wherein said hydrocolloidal composition is selected from the group consisting of crosslinked polystyrene sulfonate and crosslinked polyacrylamide.

4. The absorbent dressing of claim 2 in the form of a catamenial device.

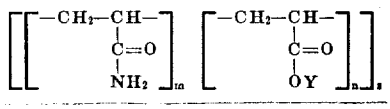
5. A disposable diaper comprising absorbent layers sandwiched between a liquid permeable facing sheet and a liquid permeable backing sheet, said absorbent layer containing at least about 5 percent by weight, based on the total weight of

the diaper, of a hydrocolloidal polymer composition rendered substantially water insoluble by crosslinking, and having from about 25 to about 72 percent of its molecular structure composed of hydrophillic groups, said hydrocolloidal composition being further defined as providing a gelatinous agglomerate of liquid-swollen particulate members in the presence of body exudate, as capable of absorbing at least about 15 times its own weight in body exudate, as capable of retaining said absorbed exudate under a pressure of up to about 2.5 p.s.i., and as having a minimum average molecular weight per crosslinkage of about 13,000.

6. The diaper of claim 5 wherein said hydrocolloidal composition is incorporated within a fibrous mass to define the absorbent layer.

7. The diaper of claim 5 wherein said hydrocolloidal is selected from the group consisting of

A.



where

Y is a member of the group selected from, ammonium or an alkali metal ion,

m is a number from 1 to 100,

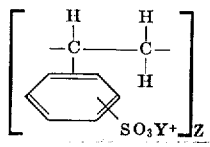
n is a number from 0 to 100, and defines the degree of hydrolysis,

m plus *n* is equal to 100, and

Z is a number from 1 to 30, and *Z* times 100 is equal to the number of mer units between crosslinks.

and,

B.



where

Z is a number from 100 to 3,000 and defines the number of mer units between crosslinks, and

Y is a member of the group consisting of hydrogen, ammonium, and an alkali metal ion.

8. The diaper of claim 6 wherein said hydrocolloidal composition is selected from the group consisting of crosslinked polystyrene sulfonate and crosslinked polyacrylamide.

9. As an article of manufacture, a flexible support adapted to be caused to conform to a surface of an animal body, said support confining a dry, solid, water-swellable, water-insoluble, physiologically unobjectionable polymeric sorbent so as to present said sorbent for the sorption of aqueous fluid elaborated by the animal to which said article is applied and said polymeric sorbent being a lightly crosslinked polymer and being selected from the group consisting of polystyrene-sulfonate, and alkali metal salts thereof as contain sulfonate or carboxylate groups.

10. An absorbent dressing comprising an absorbent layer sandwiched between a liquid permeable facing sheet and a backing sheet, said absorbent layer containing a hydrocolloidal polymer composition rendered substantially water-insoluble by crosslinking, and having from about 25 to about 72 percent of its molecular structure composed of hydrophilic groups, said hydrocolloidal compositions being further defined as providing a gelatinous agglomerate of liquid-swollen particulate members in the presence of a quantity of body exudate, as capable of absorbing at least about fifteen times its weight in body exudate, as capable of retaining said absorbed exudate when exposed to pressure sufficient to deform said agglomerate and as having a degree of cross-linking within the range of the degrees of crosslinking obtained by copolymerizing a mono-olefinic monomer with from about 0.05 to about 0.5 percent by weight of a divinyl compound.

11. The dressing of claim 10 wherein said hydrocolloidal composition is selected from the group consisting of polyacrylamide, alkali metal salts of hydrolyzed polyacrylamides and the free acid and alkali metal salts of polystyrene sulfonates.

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