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[54] **VISCOSITY CONTROL ADDITIVE FOR WATER BEDS AND OTHER AQUEOUS-FILLED FURNITURE**

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[51] **Int. Cl.** **A47c 27/08**

[58] **Field of Search** ..... 5/348–350, 5/348 WB; 106/197 R; 219/217

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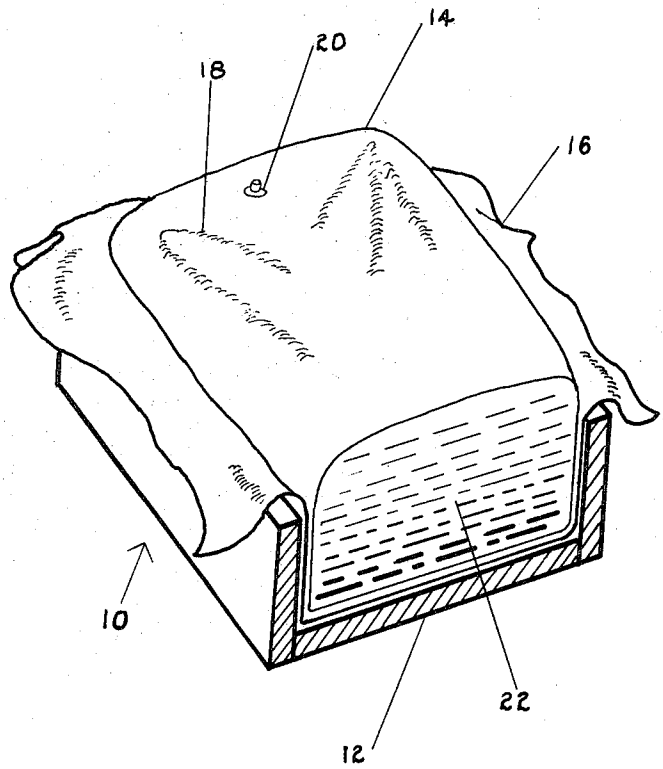
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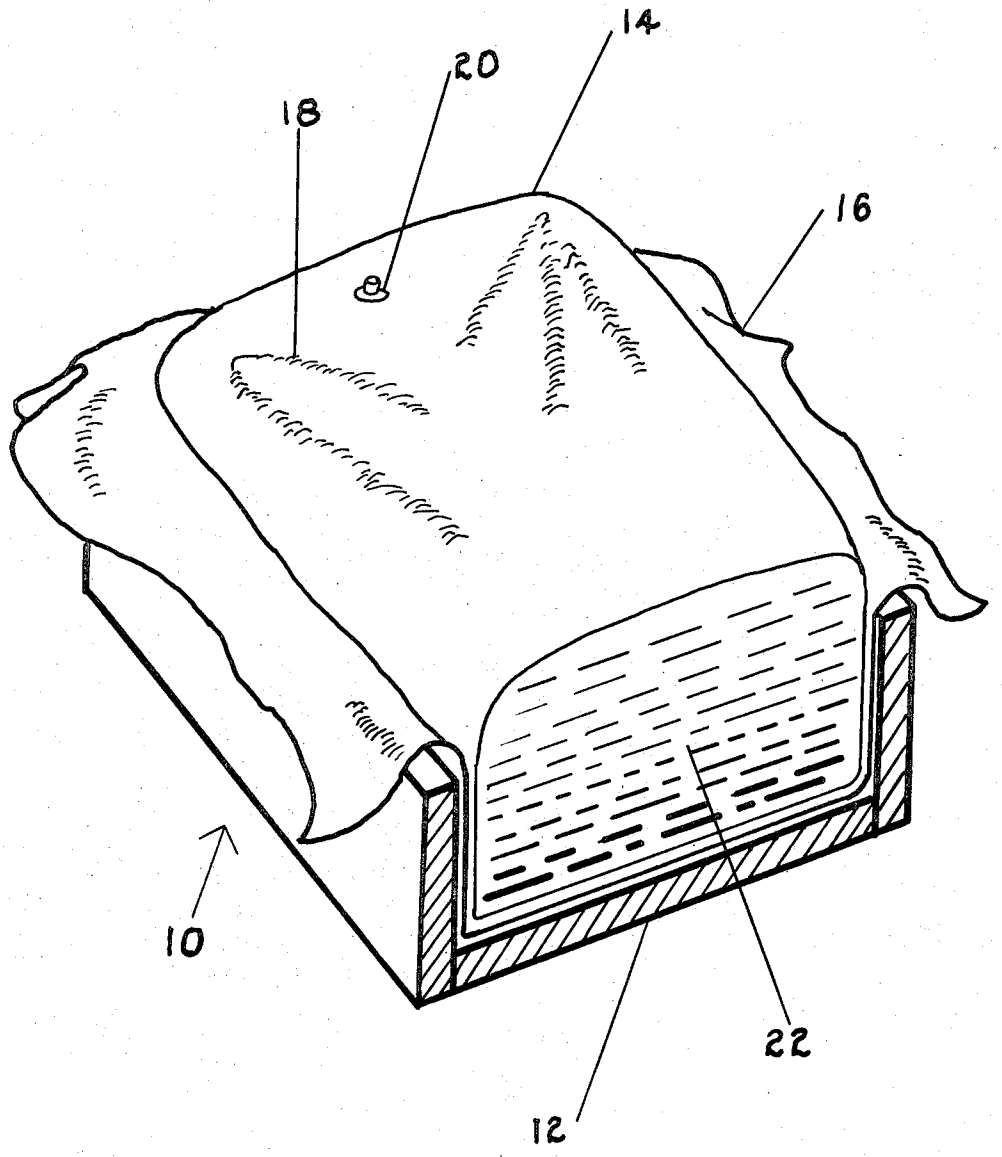
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[57] **ABSTRACT**

Unpleasant bouncing or other oscillations resulting from movements upon aqueous filled furniture or other apparatus, e.g., a water bed, is inhibited by filling the furniture with aqueous fluid and additionally a water soluble viscosity increasing agent. Other additives such as preservatives or algicides are preferably incorporated into the aqueous fluid. This increased viscosity imparts a dampening effect to water movement within the furniture for comfort of the user(s) and yet provides the uniform cushioned buoyancy attributable to conventional water filled furniture.

2 Claims, 1 Drawing Figure




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VISCOSITY CONTROL ADDITIVE FOR WATER BEDS AND OTHER AQUEOUS-FILLED FURNITURE

BACKGROUND OF THE INVENTION

This invention concerns furniture and apparatus such as household beds, therapeutic flotation apparatus, or sofas filled with an aqueous medium for support of the user; more particularly the invention relates to such aqueous filled apparatus incorporating water soluble additives for improved comfort. Relevant prior art references, exemplified by U. S. Pat. No. 3,308,491 to Spence and U.S. Pat. No. 3,456,270 to Weinstein, et al. may be found in U.S. Pat. Office Classifications Class 5, Subclass 348 through 350.

Water filled hospital beds and other aqueous filled apparatus have long been recognized for their therapeutic value in the treatment of patients who are confined to extended sieges in beds and who would otherwise be prone to developing bedsores (decubitus ulcers) when using conventional mattresses. These bedsores are evidenced by ugly and dangerous wounds than often harbor infections and develop when tissue dies after blood is squeezed out by body weight acting on such pressure points as the sacral area. The water filled apparatus prevents occurrence of such bedsores and in general enables greater freedom of movement and improves the overall comfort realized by the user. This is due in part to uniform buoyancy or support of the user's weight over the entire contact surface of the apparatus, acting in effect like a natural cushion to inhibit shear effect due to user movement.

The advantages of the water filled hospital bed have been extended and made available recently to the general public in the form of the popular "water bed." The water bed generally consists of a sealed liquid container or a bladder of a polymeric material, such as vinyl, filled with water and optionally supported upon a base provided with a protective liner, and usually including a foam rubber pad for positioning upon the bladder element. The base may include a seal element of polyurethane foam, fiberglass or other substantially rigid material having a cavity in which the water-filled bladder rests. Comfortable sleeping temperatures may be insured by providing a heating element and thermostat control.

While such water beds and other flotation apparatus have represented a significant improvement over conventional apparatus, such as the box springs mattress, they have unfortunately suffered from annoying drawbacks. The principal drawback has been due to the inherent sloshiness of the water buoyant, which, when disturbed by user movement creates unpleasant bouncing, jiggling, or other oscillations as the water and bladder are displaced in response to the movement. This problem is particularly annoying to multiple users of the bed, each of whom are subjected to the "waves" generated by another. Another drawback has been the chaos created when the bladder develops a leak due to a puncture or seam failure, for instance. The flow character of the water usually precludes stopping the leak before substantial drainage damage has occurred.

It is a primary object of the invention to overcome the drawbacks of the prior art and to provide aqueous filled furniture incorporating one or more additives for incorporation with the buoyant to improve its flow characteristics for improved comfort and safety.

SUMMARY OF THE INVENTION

Briefly described, the invention includes aqueous filled furniture in which the bladder element has been more or less filled with a buoyant of an aqueous medium containing preferably a water-soluble viscosity increasing agent in an amount sufficient to substantially dampen "waves" created by displacement of the buoyant due to a force impulse from the user. In a preferred embodiment a preservative or other additive is incorporated into the buoyant, inter alia, for maintenance of the desired viscosity over extended periods of time. Control of viscosity is obtained by the character and concentration of the viscosity increasing agent introduced. Draining of the bladder is effected by introducing a polymeric breaker which may cleave the molecules of the viscosity increasing agent or cause them to lose water of hydration to render them mobile enough for removal.

BRIEF DESCRIPTION OF THE DRAWING

The invention will be described in conjunction with the single FIGURE which depicts a perspective cutaway view of a water bed according to the invention.

PREFERRED EMBODIMENTS OF THE INVENTION

While the invention has general application to aqueous filled apparatus, for ease of clarity and conciseness, the description will be directed only to the use of water beds.

Although not essential, the water bed **10** will generally consist of a rigid frame **12** or base of a sufficient length and breadth to receive the user. Within the frame is seated the bladder element **14** usually consisting of an impervious container of a polymeric natural or synthetic material such as vinyl which is preferably of a thickness suitable to resist appreciable stretching. Twenty mil thick vinyl sheet has been found to be satisfactory. For maximum protection a liner **16** is inserted between the bladder and contiguous frame member to minimize the chance of puncturing the bladder. This liner may be of any suitable construction, such as polymeric sheet or foam material.

It is preferred that the bladder is not secured to the frame (if used), especially along the upper marginal surface of the bladder to insure preservation of even buoyancy and prevention of a shear-producing hammocking effect. For this purpose the upper surface of the bladder may carry some slack such as provided by a plurality of pleats **18.** Additionally, a foam rubber or other elastic pad may be floatably positioned on the upper bladder surface for added comfort or temperature compensation (not shown).

The bladder element will be provided with appropriate inlet and exit ports **20** (which may be one in the same) for introduction and drainage of the buoyant material **22.** This buoyant will typically comprise a major proportion of an aqueous medium such as hot or cold tap water supplied by a nearby faucet. The presence of dissolved ions in the water will usually be quite acceptable and often enhance the stability of the polymeric viscosity enhancing agent, e.g., calcium ions will inhibit cleavage of partially hydrolyzed polyacrylamides. While varying substantially with the character of the viscosity enhancing agent employed, the buoyant

material will preferably comprise proportionally from about 20 to 99.99, and more preferably from about 70 to 99.5 percent by weight of the aqueous medium component. The reason for the upper limits of the percentage of aqueous medium being so high is that very small amounts of viscosity increasing agent are capable of greatly increasing the viscosity of the buoyant.

The aqueous medium may be injected through the inlet port into the impervious bladder prior to or after addition of the viscosity imparting agent together with other desired additives, preferably making sure that injection is accomplished while the fluid is still of low viscosity, and high mobility. Where thorough mixing or agitation is required to disperse the additives throughout the aqueous medium prior to occurrence of the viscosity increasing phenomenon, a nozzle can be employed for metering the additive into the injecting aqueous medium. However, it is generally sufficient to merely incorporate separately the additives into the filled or unfilled bladder in the form of a powder, solution, gel, suspension, etc., with or without additional mixing once incorporated with the aqueous medium. As an alternative, however, the buoyant can be supplied in the form of an emulsion, preferably of the water or oil external stable microemulsion type carrying the desired viscosity increasing agent. The emulsion alone may be designed so as to provide an apparent viscosity increase.

According to the invention, the buoyant fluid 22 additionally contains a viscosity increasing agent, preferably of the water-soluble polymeric type, including both natural and synthetic materials. Illustrative but nonlimitative examples of suitable natural water-soluble polymers include exudates from vegatation exemplified by gum arabic, gum karaya, and gum tragacanth; seed extractives exemplified by guar gum, locust bean gum, starch and its derivatives, and proteins; seaweed products exemplified by agar-agar, alginates, and Irish moss; and animal origin materials exemplified by casein and gelatin. Preferred illustrative examples of suitable synthetic water-soluble polymers include cellulose derivatives exemplified by cellulose ether, ethyl hydroxyethylcellulose, ethyl methylcellulose, hydroxyethylcellulose, hydroxyethyl methylcellulose, hydroxypropyl methylcellulose, methylcellulose, and alkali metal salts of carboxymethylcellulose, carboxymethyl hydroxyethylcellulose and cellulose sulfate; acrylates exemplified by polyacrylic acid salts, polyacrylamides, and acrylamide copolymers; and miscellaneous polymers exemplified by carboxyvinyl polymer, polyethylene glycols, polyethylene oxides, polyvinyl alcohol, polyvinyl methyl ether, polyvinylpyrrolidone, and compatible mixtures of any of the foregoing.

Particularly effective and preferred viscosity increasing agents include those materials which are biodegradable, exhibit a wide viscosity range at low shear values, which are easily preserved, readily cleaved for removal when desired, and which increase the viscosity of the aqueous medium when added in relatively low concentrations. Examples of such materials include the aforementioned hydroxyalkyl substituted and unsubstituted celluloses, guar gum, alginates, and compatible mixtures thereof.

Another important consideration is the amount of time required for the buoyant medium to experience the viscosity increase phenomenon (a hydration mechanism) once the viscosity increasing agent has contacted the aqueous medium. Conventional water thickeners set up quite fast as the polymer thickener undergoes hydration rapidly and viscosity thereby increases. The invention preferably contemplates the use of a viscosity increasing agent which sets up slowly, i.e., provides a finite residence period, to allow complete dispersion and mixing of the aqueous and viscosity increasing media prior to thickening; this in turn is advantageous in providing ease of injection into the bladder element to produce a buoyant fluid of uniform viscosity. One example of such a preferred type of viscosity increasing agent is manufactured by the Hercules Chemical Company under the name Natrosol (a registered trademark), grade 250 HH-R (a hydroxyethylcellulose), which provides a residence time of about 20 minutes when using a desired concentration.

The amount of viscosity enhancing agent required will vary greatly among the various agents utilized, but in general is that amount which is sufficient to substantially dampen "waves" produced by the user. Preferably this amount will be effective to raise the apparent viscosity of the buoyant solution to at least five, more preferably to at least about 25 and most preferably in the range from about 60 to about 2 million centipoises as measured by a Brooksfield viscosimeter. In general, preferably from about 0.01 to about 10.0 and more preferably from about 0.25 to about 2. weight percent (based on the aqueous medium) of the viscosity increasing agent is added to the aqueous medium, although greater or lesser amounts may be utilized depending on the character of the additives and aqueous medium utilized.

For prolonged stabilization of the viscosity increasing agent, it is preferred to incorporated a preservative, e.g., an antioxidant, into the buoyant medium. Those skilled in the art will readily appreciate that the particular type of preservative required will vary substantially in each case and generally will be tailored to each individual viscosity increasing agent, so a lengthy listing of preservatives will be omitted for conciseness. Merely by way of illustration, alkali metal aromatic esters such as sodium benzoate or aldehydes such as formaldehyde have been found to suitably preserve hydroxyalkyl methylcelluloses, one particular example of a viscosity increasing agent. An effective stabilizing amount of the preservative should be added, preferably less than about 0.1 weight percent of the total buoyant medium.

The invention also contemplates the optional incorporation of other useful additives into the buoyant. Examples of typical useful additives include bactericides and algicides (e.g., copper sulfate), which in minor amounts will be effective in combating the offensive growth and propagation of small organisms and plant life. It should be kept in mind the primary requirement that any such additive should be compatible with the other components of the buoyant medium and surrounding bladder.

In filling the bladder with the buoyant medium, the proper fill level will generally depend on the individual desires of the user as well as the number of users. Usually, although not always, the bladder is filled to a degree somewhat less than totally full (even to the point of providing definite slacking) to allow for user positioning and movement with minimum or no apparent shear effect. After the viscosity increasing agent has had sufficient residence time to increase the viscosity

of the buoyant medium to its obtainable level, the user(s) should test the "ride" of the bed for individual taste, adding additional viscosity increasing agent as needed to increase its concentration. If the bed appears to be too viscous, water or alternatively a polymer breaker may be introduced in quantity sufficient to reduce the viscosity to the desired level. Temperature and other parameters, e.g., pH, may also be utilized for viscosity adjustment.

The polymer breaker may be also used in draining the bed, as desired, acting to reduce the viscosity of the buoyant medium by what is oftentimes a mechanism whereby the polymers present are cleaved to reduce their chain size (thus a reduction in apparent viscosity) and molecular weight. Often the level of hydration is also reduced to give a concomitant reduction in apparent viscosity. Selection of a particular polymer breaker will, of course, depend on the nature of the polymer desired to be cleaved. Those skilled in the art will be able to readily indentify suitable breakers in each case. As an example, cellulase enzyme has been found suitable as a breaker or anti-polymerizer for the cellulose viscosity-increasing agents.

In actual experiments comparing water beds carrying conventional water buoyant and water beds having viscous buoyants according to the invention, users have reported the increasing dampening effect and concomitant substantial reduction in bouncing and other undesirable oscillation and attributes such as "bottoming-out" characteristic of the conventional water-filled bed. At the same time, there is no apparent compromising of uniform buoyancy.

It should be understood that the invention is capable of a variety of modification and variations which will be made apparent to those skilled in the art by a reading of this specification and which are to be included within the spirit and scope of the claims appended hereto. For instance, one such modification as applied to a water bed would be to provide a cavity of molded polystyrene foam or other material for receiving the bladder to reduce the size of the bladder required and hence the amount of water and thickener needed.

What is claimed is:

1. In water filled furniture comprising a bladder element for receiving an aqueous fluid buoyant and for support of a person(s), the improvement comprising a water-soluble additive in combination therewith and to be incorporated into said bladder element, said additive selected from the group consisting of cellulosic derivatives, gums and alginates and present in the amount of from about 0.01 to about 10 weight percent of the aqueous fluid buoyant and effective to raise the apparent viscosity of the fluid buoyant to a level sufficient to substantially dampen "waves" generated by said person(s) causing internal displacement of the fluid buoyant by body movement acting upon the bladder.

2. A water bed according to claim **1** wherein the resultant apparent viscosity of the fluid buoyant is from about 60 centipoises to about 2 million centipoises.

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