



US 20090151102A1

(19) **United States**

(12) **Patent Application Publication**  
**Donovan**

(10) **Pub. No.: US 2009/0151102 A1**

(43) **Pub. Date: Jun. 18, 2009**

(54) **WASH CLOTH**

**Publication Classification**

(76) Inventor: **James A. Donovan**, Tarpon  
Springs, FL (US)

(51) **Int. Cl.**  
**A47K 7/02** (2006.01)

(52) **U.S. Cl.** ..... **15/208**

(57) **ABSTRACT**

Correspondence Address:

**KINNEY & LANGE, P.A.**  
**THE KINNEY & LANGE BUILDING, 312**  
**SOUTH THIRD STREET**  
**MINNEAPOLIS, MN 55415-1002 (US)**

A washcloth or other personal hygiene cloth having an adjustable temperature when used. A first ply of fabric has a dry temperature changing chemical embedded on it to form an embedded surface and at least one additional ply of fabric is placed to cover the embedded surface. The addition of water to the device causes the dry temperature changing chemical to change the temperature of the washcloth device. The temperature changing chemical can be one that heats or one that cools the washcloth. More plies may be added to increase the thickness of the device.

(21) Appl. No.: **12/001,916**

(22) Filed: **Dec. 13, 2007**

## WASH CLOTH

### BACKGROUND

[0001] This invention relates to a washcloth such as those used to cleanse various parts of the body as well as to other cloths that are used to clean surfaces. More particularly, the invention relates to a cloth that is temperature controlled to give increased comfort and utility.

[0002] Washcloths and other personal hygiene items are often used by persons when they take care of their personal hygiene and that of persons for whom they are caring. Washcloths are often used when a person takes a shower or bath, and are quickly able to reach the temperature of the water being used. At other times, washcloths are also used when the part of the person that is to be cleaned is small, and a shower or bath consumes too much time. Washcloths would also be used when a person does not have access to warm or hot water.

[0003] In order to be most effective, however, personal washcloths need to be warmed or heated in order to more effectively clean the hands or other parts of the user's anatomy. At the present time, warm washcloths are only attainable by the use of an external source of hot water, or by inserting the cloths into a microwave or other heating device. This presents a danger as the degree of heating may vary, and it is possible to have excessive heat applied to the skin. For that reason it is desirable to find a safe way to warm, or cool, washcloths and other personal hygiene items.

[0004] It has been suggested that some form of exothermic reaction could be used to generate heat in these products. One such suggestion is to employ a supercooled liquid in a container that can be disturbed by the user at the appropriate time, thus causing an exothermic reaction as the liquid crystallizes. However, because washcloths may be subject to forces that are not anticipated, early crystallization of the supercooled liquid causes the wipes to be hot at a time when that is not needed.

[0005] Another major drawback of the use of an exothermic reaction to generate heat upon demand is that the various components have to be kept totally separated from each other until they are combined, and when combined need to react quickly and over a reasonable surface area. If the reaction only takes place at one location, excessive heat will be generated. If the reaction components are spread out, there has not been any way to combine them from the dispersed locations to generate uniform exothermic reaction.

[0006] In other instances, washcloths and other personal hygiene items are used to cool the skin of a person, such as one who has fainted or has a fever. This requires access to ice or cold water, when such access may not be readily available. Of course, washcloths and other cloths can be used to clean any surface, and often a heated cloth is more effective than one at room temperature.

[0007] It would be a great advantage if a way of heating washcloths and other items could be developed that has a controlled release of heat that is well within acceptable safety limits.

[0008] Yet another advantage would be to provide a way for cooling washcloths and other items without the need for a source of ice or cold water, particularly so that the cooling remains in the items for a useful period of time.

[0009] Another advantage would be to provide a way of heating and/or cooling cloths that is controlled and requires a

specific action by the user such that the action is not one experienced by the wipes when carried about prior to use.

### SUMMARY

[0010] The present invention is for a washcloth device that contains a temperature changing chemical in the fabric of the washcloth that reacts with water when the chemical comes in contact with water, thus generating heat or cooling, depending on the chemicals used.

[0011] In its simplest form, the present invention includes a first ply of fabric on which a dry temperature changing chemical has been embedded. By the term "embedded" is meant the application of the chemical on a surface of the fabric using sufficient force to cause the chemical to remain in the fabric. This surface is then covered by at least one additional ply of the same or different fabric. In one embodiment, the second fabric is applied before the force is applied, thus causing the chemical to be embedded in both plies. In another embodiment, the force is applied prior to adding the second fabric. One easy method for applying the chemical to the fabric is by the use of a calendaring device, which comprises passing the fabric with the chemical on the surface between two rollers or cylinders such that the pressure between the rollers is sufficient to cause the chemical to remain in the fabric.

[0012] In some embodiments, more than one ply can be used, as long as the chemical embedded ply remains accessible when the device is contacted with water. Also, depending upon the length of time the temperature changing agent is to function, a reaction delaying material may be coated on the temperature changing chemical to slow down the ability of water to contact the chemical. One such reaction delaying material is polyethylene glycol.

[0013] To use the device of this invention, all that is needed is to contact the washcloth or other personal hygiene item with water. Because the amount of dry temperature changing material is controlled when it is applied to the first ply of fabric, the amount of heating or cooling is controlled to give the desired change in temperature without any risk of unpleasant affects on the user's skin.

### DETAILED DESCRIPTION

[0014] As noted above, the present invention is a washcloth or other personal hygiene items that is treated with a temperature changing compound that changes the temperature of the device when contacted with water.

[0015] For the purposes of this invention, the term "washcloth" includes any item that is used by persons to wash or clean some object. It is not intended that the application be limited to cleansing personal bodies. Typical fabrics for this invention are those that are normally used to make washcloths and other cleansing cloths or related items. By way of example and not as a limitation, fabrics include cotton, blended fiber fabrics, and some forms of cellulose fibers such as paper. One example of paper is the heavy paper used in paper towels, particularly those that are more absorbent. Other fabrics are known as nonwoven fabrics. One example of a nonwoven fabric is, of course, paper, but other fibers are also contemplated by this invention without limitation. The invention is not limited by the choice of fabric as long as the fabric is capable of receiving dry temperature changing compounds and retaining them for reaction when water is brought in contact with the compound. Since the device of this invention is normally used once, when water contacts the embed-

ded temperature changing compound to produce heating or cooling, the less expensive fabrics are more economically desirable. Often the device is discarded after that single use, though it may still function as a useful cloth other than being self-heating or cooling.

**[0016]** The preferred heat generating material is a crystal formed from several components that, when free from moisture, are stable for up to three to five years or more, and which react when moisture is present to generate heat. The preferred crystal is made from a crystalline mixture of calcium oxide. Calcium oxide is commercially available from a number of sources, one of which being Calcium Oxide Fisher Scientific S79946. For efficient integration of this component into the fabric, the calcium oxide is ground into small particles or crystals and a sieve is used to insure uniform particle size.

**[0017]** In some instances it is also desirable to add citric acid that functions as a heat sink to regulated the rate of reaction and to react with the hydrated calcium oxide. The citric acid is also commercially available from a number of sources. One source of citric acid is Sigma Aldrich 201-069-1.

**[0018]** In the most preferred mixture of the heat generating material is a mixture of calcium oxide with a zeolite powder. More than 150 zeolite types have been synthesized and 48 naturally occurring zeolites are known. They are basically hydrated aluminosilicate minerals with an "open" structure that can accommodate a wide variety of positive ions, such as  $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{Ca}^{2+}$ ,  $\text{Mg}^{2+}$  and others. These positive ions are rather loosely held and can readily be exchanged for others in a contact solution. Some of the more common mineral zeolites are: analcime, chabazite, heulandite, natrolite, phillipsite, and stilbite. An example mineral formula is:  $\text{Na}_2\text{Al}_2\text{Si}_3\text{O}_{10}\cdot 16\text{H}_2\text{O}$ .

**[0019]** Preferred is a ratio of calcium oxide to powdered zeolite of from about 14 to 20 for calcium oxide and from about 7 to 10 for powdered zeolite. Most preferred is a ratio of calcium oxide to powdered zeolite is 17:8.5.

**[0020]** The heat generation material most preferred, using the above components includes a calcined calcium oxide. This material is available as a small article size, with a diameter less than about 0.2 mm, and as a particle of somewhere between 0.2 and 0.8 mm. Larger particles are ground and smaller ones sieved, and the calcium oxide is then calcined. It has been found to be effective to calcine for at least 60 to 120 minutes, and preferably about 90 minutes, at temperatures above  $500^\circ\text{C}$ ., and most preferably at about  $550^\circ\text{C}$ . for that period of time. The calcined calcium oxide is, of course, desiccated to prevent any contamination by moisture. Laboratory grade citric acid and powdered zeolite are mixed with the calcium oxide in moisture free conditions, in an appropriate reaction ratio to provide the exothermic reaction upon contact by the activating agent water.

**[0021]** In a preferred embodiment, the heat generation material also includes a small quantity of polyalkyl glycol such as polyethylene glycol or similar materials which are used to coat the calcium oxide prior to initiating the exothermic reaction. This small coating, of 1% to 7% polyethylene glycol by weight in the total composition slows down the reaction with water to prolong the heat for over two hours. A preferred weight percent of polyethylene glycol is from 3% to 4%. Tests have been made that kept a container of one liter of water at a temperature of  $140^\circ\text{F}$ . to  $165^\circ\text{F}$ . for more than two hours. While this is a long time for a wash cloth to remain hot,

extending the reaction time at least for as long as needed to complete personal hygiene practices is of considerable value.

**[0022]** It is also an embodiment of the present invention to employ a temperature changing chemical that causes a drop in temperature when contacted by water, creating an endothermic reaction. The solid materials may, for example, include materials such as sodium sulfate\* $10\text{H}_2\text{O}$ ; sodium bicarbonate, ammonium nitrate, ammonium chloride, urea, ammonium dichromate, citric acid, potassium perchlorate, potassium sulfate, potassium chloride, calcium nitrate, and vanillin. These solid compounds react with water in an endothermic fashion to impart cooling. Reactions can be with water based mixtures as well as other liquid systems.

**[0023]** Again these materials should be small in size so the crystals can be embedded into the fabric on which they are deposited.

**[0024]** The process of embedding the temperature changing chemical simply involves placing the desired amount of chemical on a ply of the fabric and pressing the chemical into the fibers of the fabric. The embedded surface is then covered by at least one additional ply of the fabric. When the embedding is done with a calendar device, the fabric containing the chemical on its surface can pass through the rollers directly. Alternatively, a second ply (or more) can be placed on the surface with the chemicals, either embedding the crystals into both plies, or into the first ply if the second ply surface is less penetrable.

**[0025]** Although the present invention has been described with reference to preferred embodiments, workers skilled in the art will recognize that changes may be made in form and detail without departing from the spirit and scope of the invention.

1. A washcloth device having an adjustable temperature when used, comprising:

- a first ply of fabric;
- a dry temperature changing chemical embedded on the first ply to form an embedded surface; and
- at least one additional ply of fabric covering the embedded surface;

whereby the addition of water to the device causes the dry temperature changing chemical to change the temperature of the washcloth device.

2. The device of claim 1, wherein the device includes at least one additional fabric ply.

3. The device of claim 1, wherein the fabric is comprised of cellulose fibers.

4. The device of claim 1, wherein the dry temperature changing chemical is a heat generating chemical.

5. The device of claim 6, wherein the heat generating chemical is a crystalline material embedded in the first ply of fabric.

6. The device of claim 5, wherein the crystalline material is calcium oxide.

7. The device of claim 6, wherein the calcium oxide is calcined prior to forming the crystalline mixture and the crystalline material further includes a zeolite in a ratio of calcium oxide to powdered zeolite of from about 14 to 20 for calcium oxide and from about 7 to 10 for powdered zeolite.

8. The device of claim 7, which further includes a quantity of exotherm delaying material coating the heat source to slow down the penetration of the actuation agent.

9. The device of claim 8, wherein the exotherm delaying material is a polyalkyl glycol.

**10.** The device of claim **1**, wherein the dry temperature changing chemical is a temperature lowering material.

**11.** The device of claim **10**, wherein the temperature lowering material is selected from the group consisting of sodium sulfate\*10H<sub>2</sub>O; sodium bicarbonate, ammonium nitrate, ammonium chloride, urea, ammonium dichromate, citric acid, potassium perchlorate, potassium sulfate, potassium chloride, calcium nitrate, vanillin.

**12.** A method of making a washcloth device having an adjustable temperature when used, comprising the steps of:

providing a first ply of fabric;

embedding a dry temperature changing chemical on the first ply to form an embedded surface; and

placing at least one additional ply of fabric covering the embedded surface;

whereby the addition of water to the device causes the dry temperature changing chemical to change the temperature of the washcloth device.

**13.** The method of claim **12**, wherein the fabric is comprised of cellulose fibers.

**14.** The method of claim **12**, wherein the dry temperature changing chemical is a heat generating chemical.

**15.** The method of claim **14**, wherein the heat generating chemical is a crystalline material embedded in the first ply of fabric.

**16.** The method of claim **15**, wherein the crystalline material is calcium oxide.

**17.** The method of claim **16**, wherein the calcium oxide is calcined prior to forming the crystalline mixture and the crystalline material further includes a zeolite in a ratio of calcium oxide to powdered zeolite of from about 14 to 20 for calcium oxide and from about 7 to 10 for powdered zeolite.

**18.** The device of claim **17**, which further includes a quantity of exotherm delaying material coating the heat source to slow down the penetration of the actuation agent.

**19.** The device of claim **18**, wherein the exotherm delaying material is a polyalkyl glycol.

**20.** The method of claim **12**, wherein the dry temperature changing chemical is a temperature lowering material.

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