United States Patent Office 3,191,392
Patented June 29, 1965

3,191,392

COOLING PACK COMPOSITION AND METHOD OF COOLING

William R. Donnelly, 903 Washington Ave., Piqua, Ohio

No Drawing. Filed May 15, 1963, Ser. No. 280,705
18 Claims. (Cl. 62—4)

This invention relates in general to a cooling package and to temperature stabilizing materials therefor. More particularly, the present invention relates to a unitary article and substantially dry charge therefor, for shelf storage which article is capable of being activated on desire to obtain extended periods of cooling.

In many instances, there is a substantial need for convenient means of cooling when one is at remote distances from a source of water or electricity. This is especially the case on hikes and picnics where individuals incur muscle or ligament strains or sprains, bruises, swelling, insect bites, heat exhaustion, etc. and an immediate need for a cold compress arises. In times of national or area disaster, when power lines are down, a particularly great need would exist for source of cooling without recourse to refrigeration or ice. Furthermore, a dry, convenient, cold pack not requiring preparation, refrigeration, or mixing, would be suitable for use as a compress for head aches, tooth aches, tooth extractions, or other similar discomforting ailments. It would also be a convenient aid in industrial, domestic, and athletic first aid kits. Due to its desirable properties, it can also be utilized during recreational activities, to cool fool or beverages.

Accordingly, it is an object of the present invention to provide a convenient unitary cooling package not requiring a source of electricity, refrigeration, or addition of water preparatory to its utilization.

A further object of the present invention is the provision of a cooling package and composition contained therein that is suitable as a cold compress wherever the same was previously utilized.

Yet another object of the present invention is the provision of a unitary, bi-segmented, cooling package that on mixing of the ingredients contained in the two compartments there is formed a semi-fluid gelatinous product that will conform to and absorb heat from any animate or inanimate body to which it is applied.

Still another object of the present invention is to provide a unitary convenient cooling package that is inert and capable of long shelf storage without deterioration but on the inter-mixing of the ingredients contained therein there is immediately initiated a mild cooling reaction so as to obviate shock on exposure thereto and which cooling progresses to a minimum temperature within a few minutes and maintains such for periods from one half hour to one and one half hours or longer.

A still further object of the present invention is the provision of a cooling package that on activation results in a semi-fluid gelatinous mass that conforms to the body to which it is applied, and which, on manipulation can be further activated to yield additional controlled cooling.

These and other objects of the present invention will be readily appreciated as the same becomes better understood by reference to the following detailed description wherein specific examples of the package, composition and manner of using are illustrated. Whenever possible, alternative chemicals and modes of operation are discussed, but it will be recognized that various additional modifications can be made without deviating from the scope of the invention.

The above objects are accomplished by dividing the ingredients of a suitable composition and incorporating each of the divided parts into compartments of a segmented plastic bag, filling the same, storing the composition in

this manner, and mixing the final composition immediately before a source of cooling is required.

A particularly suitable package for the present invention would be a plastic bag which is divided into equal non-connecting compartments by installing a bag closure across the middle of said bag. The bag closure disclosed by Vance and Donnelly in U.S. Patent 3,060,985 would be suitable for this function.

In Part I of said bag, a water donating mixture of a saturated solution of a hydrated salt, a wetting agent and optionally a small excess of water is placed. The water prevents agglomeration of the salt and acts to initiate the cooling reaction as will be explained hereinafter.

Part II of said bag contains a mixture of salts which successively undergo an endothermic reaction and which form a gelatinous mass on dissolution in water. Optionally an agent which prevents caking or agglomeration may be added to the mixture of Part II and an additional substance that gels on dissolution may be present.

In operation, the dividing closure of the bag is removed and the chemical contents of the separate parts are intermixed. On contact of the small excess of water with the preferentially soluble salt of Part II an endothermic reaction is initiated and the cooling process and gelling and thickening of the total mixture begins. This initial cooling causes the water donating salt of Part I to liberate some of its bound water of hydration, which water dissolves more salt of Part II which results in more cooling. This donating and accepting process continues incrementally to give continuous cooling. The temperatures obtainable are below those obtained when ice is utilized for the same purpose.

At a latter time, as the bag is manipulated, the second endothermic solution reaction is initiated by the dissolution of the second salt present in Part II of the bag. The conversion of the contents of the bag into a more fluid state contributes to the progress of the reaction, since it facilitates more intimate contact of the solvent with the remaining undissolved particles.

The solution reaction can be accelerated or retarded by the speed of contact of the solvent and the particles. Therefore, the rate of cooling can be effectively controlled by accelerating such contact by simply shaking the bag to more intimately mix the contents. Another desirable feature is the controlled positioning that can be obtained since the article is a gelled mass contained in a plastic bag and thus can be made to conform to a limb or joint of a human being or food or other products to be cooled.

A suitable water donating composition of Part I contains 125 to 175 parts by weight of a completely hydrated salt admixed with 5 to 10 parts by weight of water and 1 to 10 parts of a wetting agent such as diamyl sodium sulfosuccinate. Also present may be three parts to 100 parts by weight of the total mixture of a gelling agent such as carbohydrates extracted from seaweed kelp, sodium alginate or other commercial gels and thickeners.

A preferable salt would be sodium thiosulfate in the following mixture:

	Parts
$Na_2S_2O_3 \cdot 5H_2O$	150
Diamyl sodium sulfosuccinate	5
H_2O	8

Other hydrated salts such as particulate crystalline sodium carbonate, sodium sulfate, or sodium acetate will perform the same function and may be substituted for the sodium thiosulfate in the composition of Part I.

The water accepting composition of Part II contains as an essential component, 75 to 110 parts by weight of ammonium sulfamate plus 50 to 200 parts of a second salt and optionally 1 to 5 parts of Attapulgus clay or other suitable agents to prevent caking or agglomeration of

the mixture during storage. The reason the sulfamate is essential is that this salt is preferentially dissolved in relation to the other salts to be enumerated, thus giving the extended cooling advantage and it is this salt that becomes gelatinous on solution giving the controlled positioning property to the final mixture.

The secondary soluble salt is preferably ammonium nitrate. An even more advantageous extended cooling can be obtained by coating part of this second salt with a substance that resists the solubilizing effect of the water from Part I thus increasing the time delay in attack of this chemical. An example of a salt in this form would be prelled ammonium nitrate, 75% of which is coated with diatomaceous earth (infusorial white fossil flour). The coating is only physical in nature and can be composed of other substances such as rosin, paraffin, kaolin clay, tricalcium phosphate, etc.

The preferred composition for Part II would be:

	Parts by weight
Powdered ammonium sulfamate	90
Attapulgus clay	2
Prelled ammonium nitrate	150

Other salts that will secondarily enter into the endothermic solution reaction are: Ammonium thiocyanate, ammonium chloride, ammonium sulfate, potassium chloride, potassium iodide, and potassium nitrate. The following table illustrates several compositions of Part I and corresponding compositions of Part II which on admixture give a double endothermic cooling reaction to yield a gelled mass according to the present invention. These compositions all contain wetting agents in Part I and an agent to prevent caking in Part II as previously described.

Table

	Part I			Part II		
	Hydrated water donating salt		H_2O, p.b.w.	Ammonium sulfamate, p.b.w.	Secondary soluble salt	
	Salt	P.b.w.			Salt	P.b.w.
1	Sodium thiosulfate	150	8	90	Ammonium thiocyanate	175
2	do	150	8	90	Ammonium chloride	50
3	do	150	8	90	Ammonium sulfate	100
4	do	150	8	90	Potassium chloride	50
5	do	150	8	90	Potassium iodide	200
6	do	150	8	90	Potassium nitrate	100
7	Sodium carbonate	150	8	90	Ammonium thiocyanate	175
8	do	150	8	90	Ammonium nitrate	150
9	do	150	8	90	Ammonium chloride	50
10	Sodium sulfate	150	8	90	Ammonium thiocyanate	175
11	do	150	8	90	Ammonium nitrate	150
12	do	150	8	90	Ammonium chloride	50
13	Sodium acetate	150	8	90	Ammonium thiocyanate	175
14	do	150	8	90	Ammonium nitrate	150
15	do	150	8	90	Ammonium chloride	50

From the foregoing, it is understood that the compositions embodying the present invention are well suited to provide the following advantages:

Controlled cooling
Controlled positioning of gelled mass
Convenient package
Extended periods of cooling

Since many possible varied embodiments may be made of the various features of the present composition all without departing from the scope of the present invention it is to be understood that all matter hereinbefore set forth are to be interpreted as illustrative only and that in certain instances, certain features may be used without corresponding use of other features all without departing from the scope of the invention.

What is claimed is:

1. A method of cooling by effecting the endothermic solution reaction of a mixture of differentialy soluble salts

comprising the steps of mixing a water donating mixture containing as a source of water, a completely hydrated salt with a water accepting mixture of ammonium sulfamate and at least one other differentially soluble salt to initiate a mild controlled endothermic reaction between said mixtures so as to form a semi-fluid gelatinous mass and applying said total mixture to the object to be cooled.

2. The method according to claim **1** wherein the completely hydrated salt of the water donating mixture is selected from the group consisting of sodium thiosulfate, sodium carbonate, sodium sulfate, and sodium acetate.

3. A method according to claim **2** wherein the hydrated salt is sodium thiosulfate.

4. The method according to claim **2** wherein the water donating mixture contains a slight excess of water and a wetting agent.

5. The method according to claim **1** wherein the additional soluble salt is at least one member selected from the group consisting of ammonium nitrate, ammonium thiocyanate, ammonium chloride, ammonium, sulfate, potassium chloride, potassium iodide and potassium nitrate.

6. The method according to claim **5** wherein the additional soluble salt is ammonium nitrate.

7. A chemical cooling composition comprising a water donating mixture containing a completely hydrated salt and a water accepting mixture comprising ammonium sulfamate and at least one other differentially soluble salt whereby on admixing said mixtures, a mild controlled endothermic reaction is initiated to form a semi-fluid gelatinous mass.

8. The composition according to claim **7** wherein the completely hydrated salt is selected from the group consisting of sodium thiosulfate, sodium carbonate, sodium sulfate, and sodium acetate.

9. The composition of claim **7** wherein the water donating mixture contains a slight excess of water and a wetting agent.

10. The composition of claim **7** wherein the additional soluble salt of the water accepting mixture is selected from the group consisting of ammonium nitrate, ammonium thiocyanate, ammonium chloride, ammonium sulfate, potassium chloride, potassium iodide, and potassium nitrate.

11. The composition according to claim **10** wherein the additional soluble salt is ammonium nitrate.

12. The composition according to claim **7** wherein a portion of the additional soluble salt is coated.

13. The composition according to claim **11** wherein the water accepting composition contains an agent to prevent agglomeration of the salts.

14. A method according to claim **1** wherein the water donating mixture contains, in relative parts by weight, about 125–175 parts of a completely hydrated salt and a slight excess of water and the water accepting mixture

contains 75–100 parts of ammonium sulfamate and 50–200 parts of a second differentially soluble salt.

15. A composition according to claim **7** wherein the water donating mixture contains, in relative parts by weight, about 125–175 parts of a completely hydrated salt and a slight excess of water and the water accepting mixture contains 75–100 parts of ammonium sulfamate and 50–200 parts of a second differentially soluble salt.

16. A chemical cooling composition comprising, in relative parts by weight, a water donating portion containing a saturated solution of about 125–175 parts of hydrated sodium thiosulfate in a slight excess of water and a water accepting portion containing 75–110 parts of ammonium sulfamate and 50–200 parts of a second differentially soluble salt whereby on admixture of said portions, a mild controlled endothermic reaction is initiated to form a semi-fluid gelatinous mass.

17. A composition according to claim **16** wherein the second differentially soluble salt is ammonium nitrate, a portion of the particles of which are coated with a substance that resists the solubilizing effect of water.

18. A composition containing, in relative parts by weight, 150 parts of hydrate sodium thiosulfate in a slight excess of water and 90 parts of powdered ammonium sulfamate and 150 parts of prelled ammonium nitrate, 75% of the particles of which are coated with diatomaceous earth.

References Cited by the Examiner

UNITED STATES PATENTS

2,109,952	3/38	Wyler.	
2,882,692	4/59	Robbins	62—4
3,058,313	10/62	Robbins	62—4

OTHER REFERENCES

Handbook of Chemistry & Physics, thirty-ninth edition, p. 486 (copy in Scientific Library), Chem. Rubber Pub. Co.

NORMAN YUDKOFF, *Primary Examiner.*

JULIUS GREENWALD, *Examiner.*