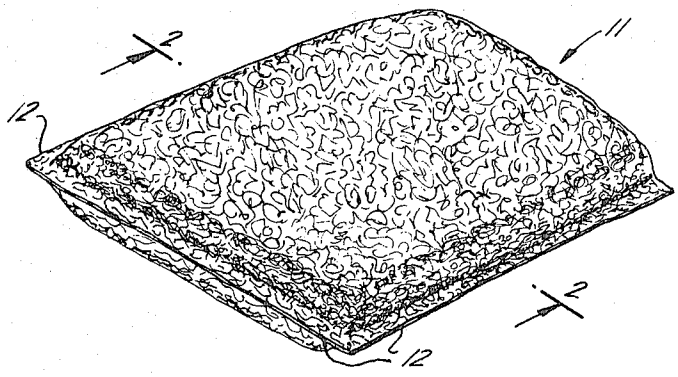
June 13, 1967 G. H. FULLER ETAL 3,324,500

SCOURING PAD

Filed Nov. 24, 1964

FIG. 1



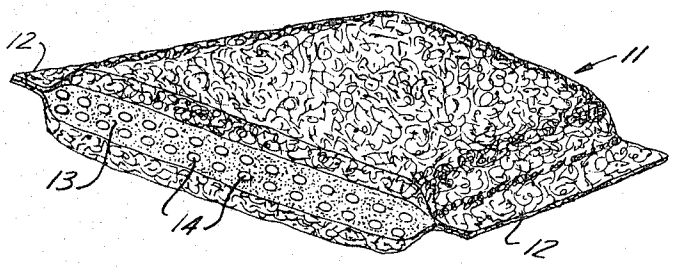


FIG. 2

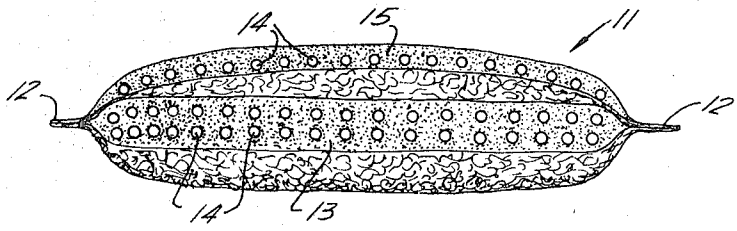


FIG. 3

INVENTORS
GEORGE HERBERT FULLER
WERNER OTTO TUNDERMANN

BY Thomas J. Corun
ATTORNEY

United States Patent Office

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SCOURING PAD

George Herbert Fuller and Werner Otto Tundermann, Colonia, N.J., assignors to Colgate-Palmolive Company, New York, N.Y., a corporation of Delaware

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The present invention relates to an improved scouring pad capable of releasing ammonia upon use. More particularly, it relates to a scouring pad which retains its capability of releasing ammonia upon re-use.

Scouring articles such as steel wool pads are widely used as household scouring agents for the cleansing of soiled cooking utensils and the like. In conjunction with this scouring, it has been found desirable to have an ammonia containing product present to provide an ammoniacal odor when the scouring pad is contacted with water and to aid in the removal of grease. Heretofore, ammonia-containing detergent compositions have been available for use with scouring pads. Unfortunately, when such compositions are used in an aqueous solution, the water rapidly dissolves the ammonium salt to release the ammonia prior to the end of the useful life of the product.

It has now been discovered that a scouring pad having water-soluble ammonium salt particles coated with a water-insoluble rupturable film provides an ammoniacal odor when the film is abraded or ruptured by using the pad in a scouring operation and thereafter provides a sustained release of ammonia vapor. Accordingly, the ammoniacal odor is available during substantially all of the time that the product is in use and, additionally, ammonia is available to aid in the removal of oily types of soil and grime from many surfaces. The scouring pad of the present invention comprises a body of fibrous scouring material containing a plurality of water-soluble ammonium salt particles having a water insoluble rupturable outer coating.

It has also been found that the coated ammonium salt particles can be combined with an aqueous-containing detergent medium which normally tends to decompose the ammonium salts and release ammonia. In accordance with the present invention coated ammonium salt particles can be combined with an aqueous-containing detergent medium and used as an integral part of a scouring pad without any release of ammonia vapor until the film on the ammonium salt particles has been ruptured or abraded by the scouring action. Additionally, in this embodiment of the invention the coated ammonia salt particles and aqueous-containing detergent medium are intimately mixed in the scouring pad. Since the ammonia is gradually released, it serves as a signaling device to indicate loss of detergent power. As the aqueous-containing detergent medium will not cause release of ammonia and the two are concurrently depleted during use, it is apparent that when ammonia is no longer being released, both the detergent and ammonium salts have been completely used and the pad should be discarded.

The fibrous scouring materials useful in the present invention are any of those commonly used for scouring pads such as the metallic fibers and synthetic organic fibers well known in the art. Typical metallic fibers are steel wool, stainless steel fibers, copper fibers and copper alloy fibers, e.g. bronze and brass. Preferably, steel wool and stainless steel fibers are employed since the ammonia released could possibly cause corrosion by reaction with copper or copper alloys. Typical synthetic organic fibers that may be used include nylon, polyester fibers such as "Dacron," acrylic fibers such as "Acrilan," rayon and other well known materials of similar types.

The water-soluble ammonium salts to be employed in the present invention for producing a sustained release of ammonia vapor are the crystalline ammonium compounds which are characterized by their solubility in water and the release of ammonia in an alkaline solution. A particularly suitable water-soluble ammonium salt is ammonium carbonate since in the presence of water, ammonia vapor is readily released. As used herein the term ammonium carbonate refers to the ammonium carbonate of commerce which is a mixture of ammonium bicarbonate and ammonium carbamate (e.g. see Merck Index, Seventh Edition). Other ammonium salts which may be employed are the ammonium salts of strong acids such as ammonium chloride, ammonium sulfate, ammonium phosphate and the ammonium salts of weak acids such as ammonium acetate and ammonium bicarbonate. Since the ammonia vapor is released in an alkaline solution, the ammonium salts which are acid in solution such as the ammonium salts of strong acids and some ammonium salts of weak acids, e.g. ammonium acetate, require the presence of an alkaline buffer salt to provide sufficient alkalinity for the release of the ammonia. Of course, an alkaline buffer salt is not necessary where ammonium salts which are alkaline in solution, e.g. commercial ammonium carbonate and ammonium bicarbonate, are employed nor where an ammonium acid salt is used in conjunction with an alkaline system such as in combination with some detergent systems as described hereinafter. Examples of typical alkaline buffer salts are inorganic alkaline buffer salts such as sodium carbonate, potassium carbonate, sodium acetate, potassium acetate, sodium citrate and potassium citrate, and organic alkaline buffer salts such as sodium succinate.

While the particle size of the crystalline ammonium salts is not critical by itself, it can influence the rate of release of ammonia, the sustained release of ammonia and the arrangement of the particles in scouring pads. Generally the particle size of the ammonium salts will range from about 20 to 30 mils in diameter to about 120 to 130 mls, although coarser or finer material may be used. The finer particles will release ammonia quickly whereas the larger particles will provide a more sustained release of ammonia.

In addition to the provision of an ammoniacal odor during use, the water-soluble ammonium salt component of the present invention provides ammonia to aid in the removal of grease and grime during each scouring operation.

The water insoluble coating materials used to coat all surfaces of the ammonium salt particles are water insoluble substances which form a film over the ammonium salt particles. The film is characterized in that it is readily ruptured or abraded by scouring and is impermeable or substantially impermeable to water and prevents transmission of moisture to the ammonium salt particles prior to rupture, thus preventing or inhibiting the premature release of ammonia by any moisture in the scouring pad prior to usage. The water insoluble films that have been found to be most useful are those provided by film forming solutions of plastics. Since the ammonium salts will release ammonia in the presence of water as well as at elevated temperatures, the plastic solutions should not contain water nor should heat be required for drying to form the water-insoluble films. After the ammonium salt particles are coated with the plastic solution, room temperature curing should be sufficient for the film formation.

Suitable water-insoluble coating materials for use in coating the water-soluble ammonium salt particles of the present invention are vinyls such as polyvinyl chlorides ("Geon 151," "Geon 251,", "Geon 351," "Pliovic Latex 300." and Exon 700 XR59), vinylidene chloride-vinyl

chloride copolymers (Saran), and vinyl chloride-vinyl acetate copolymers ("Vinylite VMCH," "Vinylite VYHH" and "Geon 200 x 20"). These materials provide films which have chemical resistance to alkalies and have negligible water absorption, i.e. the films are substantially impermeable to water. Other suitable materials are alkyd resins having alkali resistance and water absorption of less than 0.5% after 24 hour immersion at 25° C. such as made from anhydrides and a polybasic alcohol ("Glyptal 2468"); polystyrene having alkali resistance and water absorption of from about 0.04 to 0.06% after 24 hour immersion at 25° C.; and polymethyl methacrylates having alkali resistance and water absorption of from about 0.3 to 0.4% after 24 hour immersion at 25° C. The films of these materials are considered to be substantially impermeable to water. Cellulosic plastics such as cellulose acetate and cellulose nitrate have rather high moisture absorption capacities but are useful in certain applications. It has been unexpectedly found that paints containing cellulosic plastics provide a very satisfactory film for the ammonium salt particles, e.g. Krylon Royal Blue No. 1901 Spray Enamel, Krylon, Inc., Philadelphia, Pa. according to the following composition:

	Percent
Pigment	2.60
Titanium dioxide ---------percent--	58.70
Iron Blue ----------do----	40.30
Lithol Maroon ----------do----	1.00
Non-volatile	
Cellulose nitrate	11.80
Coconut oil modified alkyd.	
Dioctyl phthalate.	
Volatile Ketones, esters, alcohols, aromatic hydrocarbons, aliphatic hydrocarbons	45.60
Propellant Halogenated hydrocarbon	40.00
	100.00

Phenolics, such as phenol formaldehyde form a film having a low moisture absorption, i.e. about 0.1 to 0.2% after 24 hour immersion at 25° C. and are particularly useful in detergent-free systems since some types of detergent may weaken the coating. A suitable phenolic coating is the following phenol formaldehyde base for paints:

	Parts
Mineral spirit	28.12
Varnish oil	17.15
Para phenyl phenol-formaldehyde resin	16.65
China-wood oil	25.98
Dipentene	4.67
Ethylene glycol monoethyl ether	3.84
Toluol	2.38
High flash naphtha	1.21

A water insoluble adhesive may be employed to hold the coated ammonium salt particles to the fibrous scouring material. Any suitable adhesive composition which does not react with the water insoluble coating material or the ammonium salt and can withstand repeated wettings can be used. Typical suitable cements are synthetic polymer based emulsion binders such as polyvinyl acetate emulsions ("Elvacet," "Vinac") which form water insoluble bonds after water has evaporated from the emulsion. Other suitable emulsion binders are ethyl acrylate emulsions ("Rhoplex B–15") and vinyl pyrrolidone-ethyl acrylate emulsions ("Pelectron 130"). Non-solvent containing adhesives which are set by specific catalysts, e.g., epoxy resins cured with polyamines are also useful. Of course, the choice of adhesive will be somewhat dependent on the nature of the fibrous scouring material and the water insoluble coating material used and should usually be selected for the greatest degree of adhesion under the conditions of use.

It is preferred to employ a detergent or detergent composition in the present invention in order to provide cleansing and polishing properties. The detergents which may be used are selected from the group consisting of anionic and non-ionic detergents. Suitable anionic detergents are well known and include alkali metal and alkaline earth salts of various organic sulfates and sulfonates such as the higher alkyl aryl sulfonates, e.g., the sulfonates of alkylated benzene, toluene, cresol, naphthalene and the like in which the alkyl group contains from about 10 to 18 carbon atoms, typified by sodium pentadecyl benzene sulfonate and sodium tetrapropylene benzene sulfonate; higher fatty alcohol sulfates such as potassium lauryl sulfate and the lithium salt of sulfated alcohols derived from coconut oil by reduction; sulfated higher fatty acid monoglycerides such as the sodium or magnesium salts of monosulfated glyceryl monomyristate; higher fatty acid N-substituted taurates such as sodium N-methyl N-oleoyl taurate; and alkali metal, ammonium and triethanolamine soaps of higher fatty acids having about 12 to 18 carbon atoms such as sodium oleate, sodium stearate, potassium oleate, potassium stearate, potassium soap of mixed oleic and coconut oil fatty acids, ammonium sterate, ammonium oleate, ammonium laurate, triethanolamine oleate, and triethanolamine stearate. Suitable non-ionic detergents include the water-soluble ethyl oxide condensates of water insoluble (molecular weight 900 to 3,400) polypropylene glycols (Pluronics); higher fatty acid alkanolamides such as lauric mono- and diethanolamide; and the ethylene oxide condensates of alkyl phenols such as nonyl phenol condensed with from 6 to 16 mols of ethylene oxide. If desired, inorganic builder salts such as pentasodium tripolyphosphate, tetrasodium pyrophosphate and the like may be employed to supplement or replace the anionic or non-ionic detergents but it is preferred to utilize some detergent too.

In addition to its customary foaming and detergent action to provide cleansing and polishing during use of the scouring pad, the detergent composition can serve as an alkaninity adjusting agent for those ammonium salt particles which are acid in solution. Thus, when ammonium acid salts are employed in conjunction with anionic detergent salts or non-ionic detergents and inorgaic builder salts it is not necessary to employ alkaline buffer salts if the detergent system is characterized by a pH of from about 8 to about 12.

In addition to the components of the improved article described above, one may employ adjuvants which are known in the detergent art. Perfumes, coloring agents, fluorescent brighteners, bleaches, foam enhancing additives, antibacterial and fungicidal compounds and rust preventing materials may be employed. If stable they may be formulated with the detergent or may be separately added, as desired. It is to be understood that the adjuvants employed will not materially affect the water insoluble coating on the ammonium salts.

The water insoluble coating material solutions may be applied to the ammonium salt particles in any manner suitable for coating particles. One method by which the water-soluble ammonium salt particles may be cated with the water insoluble coating material solutions is by first placing the ammonium salt particles on a vibrating feeder. While the particles are bouncing on the feeder they are coated with the plasticized solution at room temperature. If desired, the plasticized solution may contain some pigment so that one can visually determine when the particles have been completely coated. The resulting coated particles are dried at ambient temperature and a water insoluble film encapsulates the water-soluble ammonium salt particles. Additionally, the water-soluble ammonium salt particles may be coated with the water-insoluble coating material by dipping the particles into a plastic film forming solution. For example, the water-soluble ammonium salt particles are immersed or dipped in the film forming solution and then placed on a vibrating screen to drain, dry and set the coating. Also, the coating material may be applied by various other methods useful

for coating particles such as a fluidized coating bed where the ammonium salt particles are placed in a coating unit chamber and coated with steams of coating solution while suspended in the chamber by air currents. The water insoluble film encapsulating the ammonium salt particles should be thin enough to be ruptured by scouring action but not so thick that normal scouring would not abrade or rupture the film. In general, the coated ammonium salt particles may have a water insoluble film in thickness of from about 0.5 to 10 mils and preferably about 4 to 6 mils. Additionally, the individual ammonium salt particles may have film coatings of different thicknesses. Thus, both the particle size of the ammonium salts and the film thickness can vary and influence the sustained release of ammonia. Where the ammonium acid salts are used in combination with alkaline buffer salts, the alkaline buffer salts are preferably separately coated with the same water insoluble coating materials.

The scouring pads of the present invention can have any desired shape and form. It will be apparent to those skilled in the art that these articles may be prepared by any typical method such as by coating one face of a fibrous scouring material strip with a water insoluble adhesive and coated ammonium salt particles or coating one face with a detergent paste containing the coated ammonium salt particles and rolling up the strip with the coated face on the inside and compressing to impart a desired shape and form. Additionally, the strip may be loaded with the adhesive and coated ammonium salt particles, rolled and pressed to form a pad and coat one or both faces of the pad with the detergent paste and coated ammonium salt particles. It has been found that the scouring articles have a slight ammonia odor after formation of the pads, and when used in conjunction with dishwater in the course of scouring, the desired ammoniacal odor is released during each use as the water insoluble film is abraded or ruptured by the fibrous material such as steel wool.

Suitable scouring pads of the present invention are illustrated in the accompanying drawings in which: FIG. 1 shows a pad which has been compressed to make a form-retaining pad of pillow-shape in which a narrow strip along each edge is permanently crimped while the center portion remains relatively fluffy; FIG. 2 is a fragmentary sectional view drawn to a larger scale along the line 2—2 of FIG. 1; and FIG. 3 shows an end view of the pad coated on a face.

Referring to the drawings, the pad **11** has a narrow crimped border **12** around its edges, thus enabling the pad to maintain its shape.

As shown in FIG. 2, the pad **11** is formed with a water insoluble adhesive coating **13** containing coated ammonium salt particles **14** inside the pad. As shown in FIG. 3, the pad **11** may have one or both faces of the pad coated with a detergent paste **15** containing coated ammonium salt particles **14**.

The instant coated ammonium salt particles are employed in a small but effective amount sufficient to provide an ammoniacal odor during scouring in the presence of an aqueous medium. The exact minimum amount necessary to such action, as well as the aid in grease cutting action, is dependent upon the fibrous scouring material employed, the size of the particles, the thickness of the coating film, arrangement of the particles and the types and amount of other constituents in the pad. Thus in the case of steel wool per se, very small amounts may suffice, e.g. as little as 0.01% by weight of the steel wool, whereas in the case of scouring pads containing a detergent system increased proportions may be required. Preferably, the coated ammonium salt particles in a scouring pad will vary in particle size and film thickness and be distributed through out the pad with the majority of the larger particles or thicker coated particles being in the core of the pad. Suitable proportions will be illustrated by the examples hereinafter set forth.

The following examples are given to illustrate the nature of the invention and it will be understood that the invention is not limited thereto. All parts and percentages are by weight unless otherwise specified.

Example I

Commercial ammonium carbonate lumps are reduced to particles which passed through a No. 10 U.S. standard mesh sieve but remained on a No. 20 sieve. The particles are then placed on a vibrating feeder. While bouncing on the vibrating feeder, the ammonium carbonate particles are sprayed and thoroughly coated with Krylon Royal Blue No. 1901 Spray Enamel. An aqeuous solution (32% solids) of a mixture of potassium and sodium soaps is partially dried to provide a soap paste containing about 40% moisture. The soap is a 50:50 coco:tallow soap in which the saponifying alkali metal is a 9:1 mixture of potassium and sodium.

In preparing a soap charged scouring pad, 2.5 grams of the above soap paste and 0.5 gram of coated ammonium carbonate particles are intimately mixed and the mixture is spread along one face of a strip of 0 gauge steep wool weighing 27 grams. The strip is rolled up with the paste-carrying face on the inside, and the pad is then compressed to impart a desired shape and form.

When used to scour solid cooking utensils, the pads release ammonia vapor during use in the wash water. After drying-out, the pads provide the same results in subsequent usages.

In storage, prior to use and between each use, the coated ammonium carbonate particles do not release ammonia although they are carried in a soap system containing moisture which would normally tend to cause the ammonia vapor to be released.

Example II

Spherical commercial ammonium carbonate particles having a particle size from about 30 to 50 mils in diameter are placed on a vibrating feeder. The ammonium carbonate particles are thoroughly coated by spraying with Krylon Royal Blue No. 1901 Spray Enamel to provide coated ammonium carbonate particles encapsulated in a film having a thickness of about 4 to 6 mils after drying at room temperature. An aqueous solution (40% solids) of a blend of 69% sodium soap (20% coconut oil:80% tallow) and 31% sodium N-methyl N-oleoyl taurate is partially dried to provide a detergent paste containing about 25% moisture.

In preparing detergent charged scouring pads, 10 grams of the detergent paste is spread along one face of a strip of stainless steel fibers weighing 30 grams. The detergent coated strip is passed under a hopper containing the coated ammonium salt particles. The nozzle of the hopper is adapted so that the opening of the nozzle can be varied and as the strip passes beneath the nozzles the opening is varied and 5 grams of particles ranging from 30 to 50 mils in diameter are spread along the surface of the detergent paste. The strip is rolled up with the paste carrying face on the inside, and the pad is pressed to impart a desired shape and form.

When used to scour cooking vessels and kitchen utensils, the pads release ammonia vapor during use in the wash water. The pads also release ammonia during subsequent usage.

Example III

Spherical commercial ammonium carbonate particles having a particle size of about 50 mils in diameter are separated into two batches. Each batch is separately placed on a vibrating feeder and thoroughly coated by spraying with Krylon Royal Blue No. 1901 Spray Enamel. One batch of ammonium salt particles are coated until they are encapsulated in a film having a thickness of about 2 to 3 mils and the other batch of ammonium salt particles are coated until they are encapsulated in a film having a thickness of about 5 to 7 mils.

In preparing loaded scouring pads 8 grams of the soap paste of Example I and 4 grams of each batch of coated ammonium salt particles are intimately mixed and spread along one face of a steel wool strip of designated weight (e.g. 25 or 27 grams) and rolled as set forth in Example I. These scouring pads exhibit the same ammonia releasing ability as those of Examples I and II.

Example IV

Ammonium chloride particles having a particle size of about 50 mils in diameter are immersed in a vinylidene chloridevinyl chloride copolymer (Saran) coating solution and then placed on a vibrating screen to drain and dry at room temperature. The film on the dry particles has a thickness of about 5 or 6 mils. Sodium carbonate particles of about 50 mils in diameter are coated as set forth above to provide them with a film having a thickness of about 3 or 4 mils.

In preparing scouring pads, 1 gram of coated ammonium chloride particles and 1 gram of coated sodium carbonate particles are distributed along one face of a steel wool strip weighing 10 grams. One gram of a polyvinyl acetate emulsion (Elvacet) is spread along this face of the steel wool strip over the particles and an additional 1 gram of coated ammonium chloride particles and 1 gram of coated sodium carbonate particles are distributed over the adhesive. The coated strip is rolled and pressed as set forth in Example I.

When these pads are used to scour cooking vessels, a detectable ammoniacal odor is present during each use.

Example V

Ammonium acetate particles having a particle size from about 30 to 50 mils in diameter are spray coated with Krylon Royal Blue No. 1901 Spray Enamel as set forth in Example I. Twenty-five parts of coated ammonium acetate particles are intimately mixed in a detergent paste consisting of 25 parts of sodium dodecyl benzene sulfonate, 25 parts of the diethanolamide of coconut oil fatty acids, 43 parts of pentasodium tripolyphosphate and 7 parts of sodium meta silicate.

In preparing detergent charged scouring pads, about 10 grams of the mixture of detergent paste and coated ammonium acetate particles are spread over one entire face of a steel wool strip 2¾ inches wide and of sufficient length to weigh about 5 to 7 grams and the strip folded to form a pad 2¾ inches by 2¾ inches.

These pads also release ammonia vapor when used with water to scour articles.

Although the present invention has been described with reference to particular embodiments and examples, it will be apparent to those skilled in the art that variation and modification of this invention can be made and that equivalents can be substituted therefor without departing from the principles and true spirit of the invention as defined in the appended claims.

What is claimed is:

1. A scouring pad which during successive scouring operations in the presence of water is adapted to controllably release ammonia comprising a body of fibrous scouring material containing a plurality of water-soluble ammonium salt particles, the particle sizes of which are distributed throughout the range from about 20 mils to about 130 mils, said water-soluble ammonium salt particles having a water insoluble rupturable outer coating providing a film substantially impermeable to water absorption, said film being from about 0.5 mil to about 10 mils thick, the coated ammonium salt particles being at least about 0.01% by weight of the fibrous scouring material and distributed throughout the scouring pad, said coated ammonium salt particles being adapted to release ammonia in the presence of water when the outer coating is ruptured during a scouring operation, and said coated ammonium salt particles being present in variant particle sizes and coating thicknesses so that ammonia is controllably released during sucessive scouring operations.

2. A scouring pad according to claim 1 including a plurality of water-soluble alkaline buffer salt particles having a water insoluble rupturable outer coating, and a water insoluble adhesive composition adherent to a surface of the fibrous scouring material and the water insoluble outer coating, thereby holding the coated water-soluble ammonium salt particles and the coated alkaline buffer salt particles to the fibrous scouring material until the outer coatings of said particles are ruptured during a scouring operation whereby ammonia is released in the presence of water.

3. A scouring pad according to claim 1 wherein the water-soluble ammonium salt particles are commercial ammonium carbonate particles having a particle size from about 30 mils to about 50 mils, encapsulated in a water insoluble rupturable outer coating providing a film from about 4 mils to about 6 mils thick, and including a water-soluble aqueous soap paste, said soap paste being a mixture of potassium and sodium soaps in which the soap is a 50 coconut:50 tallow soap and the saponifying alkali metal is a 9:1 mixture of potassium to sodium, the ratio of said soap paste to the encapsulated ammonia carbonate particles being about 5:1 by weight.

4. A scouring pad which during successive scouring operations in the presence of water is adapted to controllably release ammonia comprising a body of fibrous scouring material containing a water soluble aqueous detergent paste and a plurality of water soluble ammonium salt particles, the particles size of which are distributed throughout the range from about 30 mils to about 50 mils, said water-soluble ammonium salt particles having a water insoluble rupturable outer coating providing a film being from about 2 mils to about 8 mils thick, the coated ammonium salt particles being at least about 0.01% by weight of the fibrous scouring material and distributed throughout the scouring pad, said coated ammonium salt particles being adapted to release ammonia in the presence of water only when the outer coating is ruptured during a scouring operation and said coated ammonium salt particles being present in variant particle sizes and coating thicknesses so that ammonia is controllably released during successive scouring operations.

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CHARLES A. WILLMUTH, *Primary Examiner.*

R. L. BLEUTGE, *Assistant Examiner.*