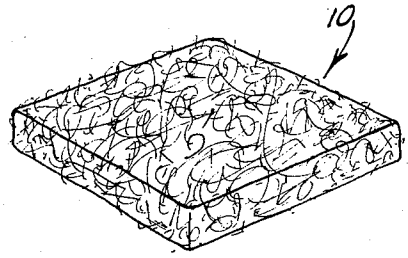
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CLEANING AND SCOURING PADS

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CLEANING AND SCOURING PADS

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The present invention relates to improvements in fibrous articles for cleaning and scouring purposes and more particularly is concerned with fibrous abrasive pads impregnated with suitable cleaning and scouring compositions.

Conventional cleaning and scouring devices hitherto have normally consisted of a fibrous matted pad of steel wool, aluminum wool, or the like, with or without soaps or detergents incorporated therein. Such pads have met with considerable success in the industry but have certain disadvantages which have prevented their more widespread use and universal acceptance. These disadvantages are more marked in the cleaning and scouring of copper surfaces and it is to this field that the present invention will be more particularly described, although such is for illustrative purposes and is not to be construed as limitative of the broader aspects of the present inventive concept.

Some of these prior art cleaning pads have not been completely satisfactory inasmuch as they have failed to give the high luster and mirror-like finish preferred on cooking utensils, decorative articles, and the like, particularly on copper surfaces. Other prior art cleaning pads were capable of forming a relatively good luster and sheen on the metallic surface but such a finish dulled considerably during the rinsing, draining and drying of the surface, due most likely to the oxidation of the metal during that time.

In other cases, the abrasive action was too severe and was such as to produce scouring marks and coarse scratches on the surface being cleaned which, of course, detracted considerably from its appearance and provided crevices wherein foreign materials would lodge and be more difficult to remove at the next cleaning.

Additionally, in order to give the user sufficient bulk of fiber for gripping and holding during scouring, it was necessary to use larger pads having a weight of up to as much as 10 grams. Such a size, however, was too expensive just to use once and then to throw away and necessitated re-using the pad several times for economical reasons. Unfortunately, the oxidation and rust formation between such uses, as well as the concomitant disintegration and decay of the pad and dirt particles therein, rendered such reuse objectionable and unsanitary. Furthermore, the breaking of the fibers into shorter lengths and the possibility of their becoming embedded in the skin during reuse not only caused discomfort and distress to the user but created undesirable health hazards.

It is therefore a principal purpose of the present invention to provide a cleaning and scouring pad capable of yielding the high luster and mirror-like finish preferred on cooking utensils, decorative articles, and the like, particularly on copper surfaces.

It is a further principal purpose of the present invention to provide a cleaning and scouring pad capable of yielding a high luster and mirror-like finish on metallic surfaces, which finish will not dull or lose its sheen during rinsing, draining and drying thereof.

It is a still further principal purpose of the present invention to provide a cleaning and scouring pad having an excellent abrasive action which will be thorough and efficient but which will not show any marked tendency towards producing scour marks or coarse scratches on surfaces being cleaned.

It is another principal purpose of the present invention

to provide a cleaning and scouring pad having a small size and being of a disposable nature whereby it can be efficiently used and then be economically discarded.

It has been discovered that these purposes and other objects which will become clear hereinafter may be accomplished by providing a randomly-matted mass of selected fibers in the form of a cleaning and scouring pad and incorporating therein the proper type of a chemical scouring agent capable of producing a high luster, mirror-like finish, in combination with a material capable of producing a hydrophobic, non-rewettable film on the cleaned surface which will permit the rinsing, draining and drying theerof without the formation of any staining, discoloration or oxidation during that time.

The cleaning and scouring pad **10** of the present invention is illustrated in the figure of the drawing but such size and shape is illustrative of the invention and is not to be construed as limitative thereof.

The fibers which are selected for the formation of the cleaning and scouring pad must possess a hardness at least as great as and preferably greater than that of the metallic surface being cleaned. With particular reference to copper surfaces, it is appreciated that steel wool, glass wool, glass fibers, quartz fibers and aluminum fibers of sufficient hardness are acceptable. In the case of steel wool and like metallic fibers, a fiber size ranging from No. 0000 to No. 1 is acceptable.

In the case of glass fibers, they should fall within a diameter size of from about 1 to about 15 microns. Glass fibers having a smaller diameter than 1 micron do not possess the desired abrasive action whereas fibers having a larger diameter than 15 microns show an undesirable tendency toward excessive abrasive action and the formation of scour marks and coarse scratches. Within the more commercial aspects of the present invention, it has been found that a range of from about 2 to about 5 microns and an average of about 3 microns is most satisfactory. The length of such fibers, whether glass or metallic, should be at least ½" and preferably at least 2" up to several inches and even a foot or more.

The fibers are intermatted to form sheets or webs of the desired thickness and then preferably impregnated or coated with a suitable resin or bonding agent to form a coherent fibrous mass. The binder may be any thermosetting resin such as phenol-formaldehyde, urea-formaldehyde, melamine - formaldehyde, resorcinol - formaldehyde, resorcinol-furfural, polyester elastomers, etc., or any thermoplastic resin such as nylon, vinylidene chloride, cellulose acetate, etc., provided its softening point is above about 140–160° F., the normal temperature range of cleaning and scouring solutions wherein abrasive pads are used.

The chemical scouring agent which is incorporated in the fibrous mass normally exists in a dry powdered, crystalline form at room temperatures and readily dissolves in water to yield acidic aqueous solutions having a pH of less than 5 for a one percent concentration. It should also be noted that the ions released during the formation of these acidic aqueous solutions should not interfere with the "copper stearate" reaction to be described more fully hereinafter. Illustrative of such acidic materials are inorganic acids such as sulfamic acid, dicarboxylic acids such as oxalic acid, tricarboxylic acids such as citric acid, hydroxy-substituted carboxylic acids such as tartaric acid, or acidic salts such as alkali metal bisulfates and the like which are capable of providing the necessary pH conditions and meeting the other requirements, as defined above.

The acidic material is the active constituent of the cleaning and scouring composition and reacts upon and dissolves away the metallic oxides staining and discoloring the surface of the article being cleaned. The greater

the concentration and the acidity of the active constituent, the greater and more rapid will be the cleaning action. In order for the cleaning pad to possess an efficient cleaning action, the acidic material and the other ingredients of the cleaning composition must be ready to dissolve rapidly in water so as to provide the desired pH conditions quickly.

An inorganic, water-soluble salt such as an alkali metal chloride should be present in the cleaning composition to cooperate with the acidic material to increase the solubility of the metal oxides in the cleaning solution and to accelerate the rate at which these oxides are removed by the acidic material. Sodium chloride, due to its high water solubility, ready availability and inexpensive nature, has been found to be excellent in this use.

The scouring ability of the acidic material and the salt, when combined with the abrasive action of the fibers, is capable of producing the high luster and mirror-like finish on the metallic surface but it is desirable that such a finish be maintained over as long a period as possible. Such permanency of finish is supplied to the cleaning and scouring composition by the addition of a higher fatty acid having from about 12 to about 22 carbon atoms. Such higher fatty acids are available in a dry form and can be used as such but, in the interests of economy, are preferably used as mixtures sold commercially as single pressed "stearic acid," double pressed "stearic acid," and triple pressed "stearic acid" or hydrogenated tallow fatty acids, hydrogenated vegetable fatty acids and hydrogenated fish oil fatty acids wherein a mixture of higher fatty acids from 12 to 22 carbon atoms is present. These mixtures sometimes contain small amounts of fatty acids as low as eight and ten carbon atoms and even these mixtures are utilizable.

The exact mechanism of the reaction whereby the high luster, mirror-like finish is maintained is not completely or precisely understood. However, without being bound to the following concept, it may be stated that it is believed that the fatty acid radical reacts with the cleaned, exposed metallic surface to form a metal-organic salt (the so-called "copper stearate" reaction referred to hereinabove) which acts as a protective film to prevent further oxidation of the metal. As a consequence, the bright surface sheen is maintained during rinsing, draining and drying and for a considerable period thereafter.

It is usually advantageous to include a detergent in the scouring and cleaning composition. In view of the acidic nature of the solution formed during cleaning, soap or related cleaning agents which are unstable in acid solutions cannot be used. The surface active agents of particular application are the non-ionic surface active agents such as the polyoxyethylene ethers of alkyl phenols, the polyoxyethylene ethers of higher fatty alcohols, etc. Anionic and cationic surface active agents are also applicable provided they are stable in acid solutions and do not interfere with the previously described "copper stearate" reaction.

The ingredients of the cleaning nad scouring composition are incorporated in a dry form in the fibrous mass preferably when it is in web or sheet form prior to the formation of the pad in the desired or required size and shape although incorporation in individual pads is possible.

A very convenient size and shape for a disposable pad is a 2" x 2" square such as illustrated in the figure of the drawing and is cut from a ¼" thick web having a bulk density between 0.3 and 5 pounds per cubic foot, and preferably from about 0.5 to about 2 pounds per cubic foot. Other sizes and thicknesses are, of course, possible, depending to a great extent on the intended use of the pad. The optimum weight ratio of fiber to binder in such a pad depends to a large extent upon the specific type of binder used and normally falls in the range of from about 14 to 1 to about 1 to 2 and preferably from about 6 to 1 to about 2 to 1.

The acidic scouring material may be incorporated in such a size pad (which happens to have a volume of 1 cubic inch) in an amount of from about 0.05 to about 5 grams and preferably from about 0.2 to about 0.8 gram. The salt is normally present in an amount of from about 0.05 to about 5 grams and preferably from about 0.2 to about 0.8 gram per pad. The higher fatty acid is incorporated in an amount of from about 0.02 to about 2 grams and preferably 0.05 to 0.5 gram per pad. The detergent is included in an amount of from about 0.005 to about 0.5 gram and preferably from about 0.01 to about 0.05 gram per pad. As noted above, these materials are included in a dry form in the bonded fiber pad and do not tend to react in any way with the fibers or binder of the pad, whereby packaging of the pad is simplified and its "shelf life" considerably enhanced. Dryness as used herein is intended to mean substantially dry or dry to the feel and does not only include completely dry or anhydrous.

The invention will be further described by reference to the following examples but it is to be noted that such is primarily for illustrative purposes and that the invention is not to be construed as limited to the specific ingredients or their weights, sizes or concentrations set forth therein.

Example 1

A ¼" thick steel wool fiber web was formed from steel wool, size No. 00 by matting the fibers in unoriented random fashion. The weight of the resulting web was approximately 210 grams per square yard. 2" x 2" pads were cut from the web; each pad weighing about 0.65 gram. Each pad was then impregnated with 0.3 gram of sulfamic acid; 0.3 gram of sodium chloride; 0.2 gram of a commercially available single pressed stearic acid; and 0.025 gram of Triton X–100, a non-ionic polyethylene glycol alkyl aryl ether. The pad was used to clean an oxidized, stained and wetted copper surface with excellent results, leaving a high luster, mirror-like finish which was hydrophobic and non-rewettable and which rinsed, drained and quickly dried without restraining or oxidizing. Brass surfaces were also cleaned with similarly satisfactory finishes. The pad was used to clean a surface equivalent to several pots and pans and was then discarded.

Example 2

A ¼" thick fiber web was formed from steel wool fibers (No. 000 size) by matting the fibers in unoriented random fashion. The weight of the resulting web was approximately 205 grams per square yard. 2" x 2" pads were cut from the web; each pad weighing about 0.63 gram. Each pad was then impregnated with 0.8 gram of citric acid; 0.7 gram of sodium chloride; 0.15 gram of a commercially available triple pressed stearic acid; and 0.025 gram of Triton X–100, a non-ionic polyethylene glycol alkyl aryl ether. The pad was used to clean an oxidized, stained and wetted copper surface with excellent results, leaving a high luster, mirror-like finish which was hydrophobic and non-rewettable and which rinsed, drained and quickly dried without restaining or oxidizing. The pad was used to clean a copper surface equivalent to several pots and pans and was then discarded.

Example 3

A ¼" thick glass fiber web was formed from glass fibers having a diameter between 1 and 5 microns with an average of about 3 microns and a fiber length from about 1½ to about 8 inches by matting the fibers in unoriented random fashion. The weight of the resulting web was approximately 63.7 grams per square yard. A binder of a thermosetting phenol-formaldehyde resin was used to bond the fibers. The resulting bonded web had a weight of 84.9 grams per square yard. 2" x 2" pads were cut from the web; each pad weighing about 0.26 gram. Each pad was then impregnated with 0.5 gram of

sulfamic acid; 0.5 gram of sodium chloride; 0.1 gram of a commercially available stearic acid; and 0.025 gram of Triton X–100, a non-ionic polyethylene glycol alkyl aryl ether (the isooctyl phenyl ether of polyethylene glycol). The pad was used to clean an oxidized, stained and wetted copper surface with excellent results, leaving a high luster, mirror-like finish which was hydrophobic and non-rewettable and which rinsed, drained and quickly dried without restaining or oxidizing. The pad was used to clean a copper surface equivalent to several pots and pans and was then discarded.

Example 4

A ¼" thick glass fiber web was formed from glass fibers having a diameter between 1 and 5 microns with an average of about 3 microns and a fiber length ranging from 2 to 10 inches by matting the fibers in unoriented random fashion. The weight of the resulting web was approximately 63.7 grams per square yard. A binder of a thermosetting phenol-formaldehyde resin was used to bond the fibers. The resulting bonded web had a weight of 84.9 grams per square yard. 2" x 2" pads were cut from the web; each pad weighing about 0.26 gram. Each pad was then impregnated with 0.4 gram of citric acid; 0.4 gram of sodium chloride; 0.1 gram of a commercially available double pressed stearic acid; and 0.025 gram of Neutronyx 600, a non-ionic polyethylene glycol alkyl aryl ether (the nonyl phenyl ether of polyethylene glycol). The pad was used to clean an oxidized, stained and wetted copper surface with excellent results, leaving a high luster, mirror-like finish which was hydrophobic and non-rewettable and which rinsed, drained and quickly dried without restaining or oxidizing. The pad was used to clean a copper surface equivalent to several pots and pans and was then discarded.

It is to be appreciated that other specific constituents and other sizes, weights, and concentrations could be used in these examples within the scope of the present invention as defined by the appended claims.

While I have shown and described what is believed to be a preferred embodiment of my invention in the matter of simplicity and durability of construction, ease of utilization, etc., it will be apparent that the details of such construction may be more or less modified within the scope of the claims without departure from the principles of construction or material sacrifice of the advantages of the preferred design.

I claim:

1. An article of manufacture comprising a mass of fibers randomly matted and bonded in the form of a cleaning and scouring pad containing a solid acidic material capable of yielding a pH below 5 in a one percent aqueous solution in an amount of from about 0.05 to about 5 grams per cubic inch of pad, from about 0.05 to about 5 grams of an alkali metal chloride per cubic inch of pad, from about 0.02 to about 2 grams of a member of the group consisting of higher fatty acids having from 12 to 22 carbon atoms and mixtures thereof per cubic inch of pad.

2. An article as defined in claim 1 wherein the acidic material is sulfamic acid.

3. An article as defined in claim 1 wherein the acidic material is citric acid.

4. An article as defined in claim 1 wherein the fibers are glass fibers.

5. An article as defined in claim 1 wherein the fibers are steel fibers.

6. An article of manufacture comprising a mass of glass fibers having diameters of from about 1 to about 15 microns, said fibers being randomly matted and bonded in the form of a cleaning and scouring pad containing a solid acidic material capable of yelding a pH below 5 in a one percent aqueous solution in an amount of from about 0.05 to about 5 grams per cubic inch of pad, from about 0.05 to about 5 grams of an alkali metal chloride per cubic inch of pad, from about 0.02 to about 2 grams of a member of the group consisting of higher fatty acids having from 12 to 22 carbon atoms and mixtures thereof per cubic inch of pad.

7. An article of manufacture comprising a mass of glass fibers having diameters of from about 2 to about 5 microns, said fibers being randomly matted and bonded in the form of a cleaning and scouring pad containing a solid acidic material capable of yielding a pH below 5 in a one percent aqueous solution in an amount of from about 0.2 to about 0.8 gram per cubic inch of pad, from about 0.2 to about 0.8 gram of an alkali metal chloride per cubic inch of pad, from about 0.05 to about 0.5 gram of a member of the group consisting of higher fatty acids having from 12 to 22 carbon atoms and mixtures thereof per cubic inch of pad.

8. An article of manufacture comprising a mass of glass fibers having diameters of from about 1 to about 15 microns, said fibers being randomly matted and bonded in the form of a cleaning and scouring pad containing a solid acidic material capable of yielding a pH below 5 in a one percent aqueous solution in an amount of from about 0.05 to about 5 grams per cubic inch of pad, from about 0.05 to about 5 grams of an alkali metal chloride per cubic inch of pad, from about 0.02 to about 2 grams of a member of the group consisting of higher fatty acids having from 12 to 22 carbon atoms and mixtures thereof per cubic inch of pad, and from about 0.005 to about 0.5 gram per cubic inch of pad of a detergent stable in an acidic aqueous medium.

9. An article of manufacture comprising a mass of glass fibers having diameters of from about 1 to about 15 microns, said fibers being randomly matted and bonded in the form of a cleaning and scouring pad containing a solid acidic material capable of yielding a pH below 5 in a one percent aqueous solution in an amount of from about 0.2 to about 0.8 gram per cubic inch of pad, from about 0.2 to about 0.8 gram of an alkali metal chloride per cubic inch of pad, from about 0.05 to about 0.5 gram of a member of the group consisting of higher fatty acids having from 12 to 22 carbon atoms and mixture thereof per cubic inch of pad, and from about 0.01 to about 0.05 gram per cubic inch of pad of a detergent stable in an acidic aqueous medium.

10. An article of manufacture comprising a mass of glass fibers having diameters of from about 1 to about 15 microns, said fibers being randomly matted and bonded in the form of a a cleaning and scouring pad containing a solid, inorganic acidic material capable of yielding a pH below 5 in a one percent aqueous solution in an amount of from about 0.05 to about 5 grams per cubic inch of pad, from about 0.05 to about 5 grams of a solid, inorganic water-soluble salt per cubic inch of pad, and from about 0.2 to about 2 grams of a member of the group consisting of higher fatty acids having from 12 to 22 carbon atoms and mixtures thereof per cubic inch of pad.

11. An article as defined in claim 1 wherein the acidic material is tartaric acid.

12. An article as defined in claim 1 wherein the acidic material is oxalic acid.

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CERTIFICATE OF CORRECTION

Patent No. 2,896,242 July 28, 1959

Allen R. Winch

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 3, line 58, for "nad" read -- and --; column 4, lines 40 and 41, for "restraining" read -- restaining --; column 6, line 42, for "mixture" read -- mixtures --; line 48, for "a a cleaning" read -- a cleaning --; line 54, for "about 0.2" read -- about 0.02 --.

Signed and sealed this 22nd day of December 1959.

(SEAL)
Attest:

KARL H. AXLINE
Attesting Officer

ROBERT C. WATSON
Commissioner of Patents