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Fig. 1.

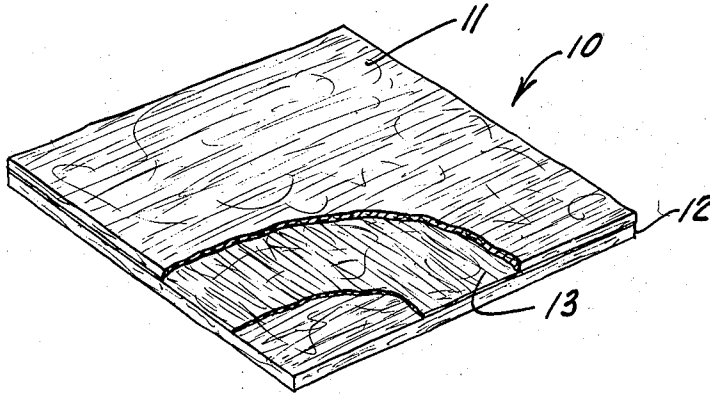
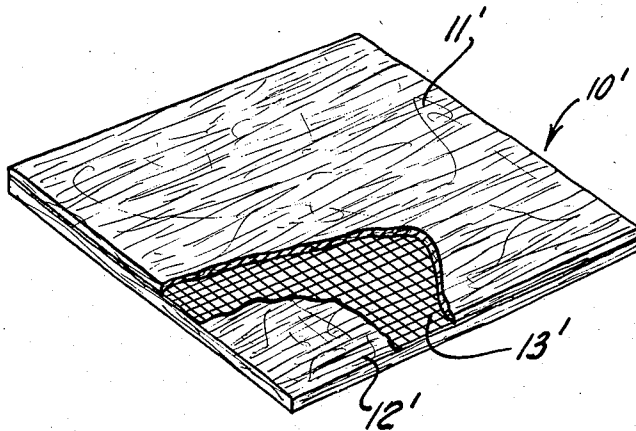


Fig. 2.



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6 Claims. (Cl. 15—209)

This invention relates to an improved cleaning and scouring pad and to a method of making the same and more particularly to a cleaning and scouring pad employing layers of steel wool fibers as an abrasive medium in a novel laminated structure.

Steel wool fibers have hitherto been used in pad-form for cleaning and scouring metallic surfaces of aluminum, copper, brass, steel, and the like but have had to be formed of a thickness of at least about $\frac{5}{8}$ to about $\frac{3}{4}$ inch or more in order to give body to the pad for holding and handling and to avoid the rolling and "pilling" of the steel fibers during use whereby the pad rapidly disintegrates.

Laminated structures of a slightly thinner construction containing steel wool fibers have also been used heretofore in which the various laminations have been held together by adhesive bonding materials. Such structures, although they are somewhat thinner, however, have not been completely satisfactory to the industry inasmuch as they are expensive, stiff and harsh, and are lacking in sufficient sudsing and foaming cleaning action when used with soaps and detergents.

Additionally, these cleaning pads, being at least about $\frac{5}{8}$ to about $\frac{3}{4}$ inch or greater in thickness, or of a more complex laminated construction almost that thick, are expensive to manufacture and their use can be justified economically only by their storage and reuse over extended periods of time. The storage of such a soggy mass as well as the health hazards involved in the reuse of a pad which has partially rusted and which contains malodorous, decomposed particles from previous uses is undesirable and objectionable. Efforts to make thinner and more inexpensive steel wool pads which could be of a single-use, disposable nature have not been too successful inasmuch as such thinner pads have proved to be too weak structurally and to roll and "pill" and fall apart rapidly unless an adhesive is used such as in a laminated structure.

It is therefore an object of the present invention to provide an improved cleaning and scouring pad which will be of a relatively thin but sturdy and durable construction, without necessitating the use of adhesive bonding agents; which will have a reduced tendency to roll and "pill"; and which will be inexpensive to manufacture whereby it can be used once satisfactorily and then be economically discarded.

It is a further object of the present invention to provide an improved cleaning and scouring pad which will not be stiff and harsh and which will be capable of providing sufficient sudsing and foaming cleaning action when used with soaps or detergents.

Other objects and purposes and the advantages and benefits of the present invention will become apparent from the accompanying drawing and following specification wherein there is illustrated and described a preferred design and construction of cleaning and scouring pad embodying the present invention. Such a design, however, should not be construed as limitative of the

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inventive concept but should be considered primarily as illustrative thereof and limited only by the scope of the appended claims.

In the drawing,

Fig. 1 represents a cutaway perspective view of one embodiment of the present invention, and

Fig. 2 represents a cutaway perspective view of another embodiment of the present invention.

In Fig. 1 of the drawing, there is represented one embodiment of an improved cleaning and scouring pad 10 comprising an upper surface layer 11 formed of abrasive steel wool fibers, the predominant portion of which fibers are in substantial parallelism; a lower surface layer 12 formed of abrasive steel wool fibers, the predominant portion of which fibers are in substantial parallelism to each other as well as to the fibers of the upper layer; and a unitary intermediate layer 13 fabricated from non-metallic fibers having an average length of at least about $\frac{1}{2}$ inch, and wherein about half or more of the fibers lie at an angle of from about 45° to about 90° , and preferably from about 60° to about 90° , to the direction of the substantial parallelism of the fibers in the upper and lower layers.

In Fig. 2 of the drawing, there is represented another embodiment of an improved cleaning and scouring pad 10' comprising an upper surface layer 11' and a lower surface layer 12' similar to layers 11 and 12 of Fig. 1. An intermediate layer 13' fabricated from non-metallic fibers having an average length of at least about $\frac{1}{2}$ inch is interposed between layers 11' and 12' and has the form of gauze or a similarly loosely woven fabric.

The upper surface and lower layers 11, 12 (11', 12') of the pad 10 (10') have a predominating portion of greater than 50% and preferably at least about 85% of the steel wool fibers lying in substantial parallelism. Such a pad may be constructed from steel wool fibers as fine as No. 0000 or may be less fine and range through No. 000 and 00 to No. 0. For more abrasive action, sizes No. 1, 2, 3 and coarser grades are applicable. It is not necessary that both the upper and lower layers be made of the same grade or fineness of fiber and it is within the scope of the present invention to use different grades and finenesses in each layer, as desired or required. The weight of each surface layer falls within a range of from about 0.1 pound per square yard to about 0.3 pound per square yard and preferably from about 0.15 to about 0.25 pound per square yard. The thickness of each layer normally ranges from about one-thirty second to about one-eighth of an inch and preferably from about one-sixteenth to about three-thirty seconds of an inch as measured under slight pressure of the hand.

The intermediate layer 13 (Fig. 1) of the pad 10 is fabricated from non-metallic fibers having an average length of at least about $\frac{1}{2}$ inch and takes the form, for example, of a carded cotton web; a sheet or web of continuous synthetic filaments such as obtained by expanding and spreading-out tow; a non-woven fabric; etc., wherein the fibers are in substantial parallelism to each other and wherein about half or more of the fibers lie at an angle of from about 45° to about 90° , and preferably from about 60° to about 90° , to the direction of the substantial parallelism of the fibers in the upper and lower layers.

The intermediate layer 13' (Fig. 2) takes the form of gauze or a similarly loosely woven fabric having a sufficient number of non-metallic fiber members or threads therein crossing and intermeshing with the steel fibers of the upper and lower layers at angles between about 45° and about 90° and preferably from about 60° to about 90° . Inasmuch as the gauze threads (warp and weft) of the intermediate layer extend in two directions, the fibers of the upper and lower layers, although they

are parallel to each other within each layer, may have their directions of substantial parallelism at angles to each other and may even be perpendicular to each other. In such a case, one set of parallel gauze threads (warp, for example) crosses the fibers of one steel fiber layer at the above indicated desired angles and the other set of parallel gauze threads (weft, for example) crosses the fibers of the other steel fiber layer for sufficient intermeshing.

The weight of the intermediate layer 13 (13') of the pad walls within a range of from about 0.015 to about 0.3 pound per square yard and preferably from about 0.025 to about 0.1 pound per square yard. The thickness of such a layer normally ranges from about one-two hundredth to about one-sixteenth of an inch and preferably from about one-one hundredth to about one-thirty second of an inch.

These layers are preferably separately formed in lengths and are brought together in a laminated structure by means will known in the industry. This structure is then run between pressure-applying means such as pressure rollers or belts whereby the fibers are pressed to become mechanically entangled or intermatted sufficiently as to form an integral structure. It is not understood completely or precisely how the presence of the thin intermediate layer cooperates in this coalescing operation but it has been established that its presence leads to a resulting laminated article having properties and characteristics of an synergistic nature not realized in structures not having such an intermediate layer. Following the formation of the integral structure, the particular size and shape of the cleaning and scouring pad is cut out therefrom preferably by a punching operation or by slitting and chopping.

These laminated structures possess surprisingly good wet strength, coherence and form and shape retentivity when used either in sheet form or in pad form for the scouring of metallic surfaces such as pots and pans. Any attempt to use a plurality of steel wool fiber layers of an equivalent thickness but without an intermediate layer results in rolling and "pilling" and in the rapid disintegration of the steel wool pad. For example, a laminated structure in which the steel wool fibers in one layer are aligned in substantial parallelism and are placed against a second layer of steel wool fibers aligned in substantial parallelism at approximately 90° to the fibers of the first layer disintegrates much more rapidly than a similar laminated structure having an intermediate layer of gauze as described in this specification.

It is believed that, although the steel fibers of one layer may tend to cling to the steel fibers of the other layer, the nature of the steel fibers is such that they cut and break through each other due primarily to their brittleness and lack of resilience and consequently the layers do not hold together too well. It has been surprisingly found that the insertion even of a very light gauze material, or of parallel fibers made from a non-metallic material such as cotton, or cellulosic or synthetic fibers and filaments, including nylon polyamide type, acrylic and other vinyl fibers, polyester fibers, protein fibers, etc., for example, between such layers provides some sort of a yielding but clinging resilient effect whereby the layers of steel fibers cling to the intermediate layer and to each other and provide a laminated structure which holds together remarkably well.

This intermediate layer need not necessarily have to possess any inherent or "built-in" wet strength or contain any bonding agents to prevent the separation of the layers of the pad. It is essential, however, that the intermediate layer fibers be relatively long fibers, that is, relatively long as compared to common paper fibers. These fibers should have an average length of at least 1/2 inch or more. Continuous filament tow of rayon (regenerated cellulose), cellulose acetate and other syn-

thetic resin filaments is ideally suited for the purposes of the present invention.

In such a laminated structure the steel fibers act as free fibers and achieve a line type of abrasion or a planing action rather than a particle or point type of abrasion or scratching action. Furthermore, the more pliable and softer nature of the laminated structure due to its relative thinness and the absence of bonding or adhesive materials permits better conformance of its surface to the surface being scoured whereby it is considerably easier to clean irregular surfaces particularly those with small radii of curvature. It is also to be noted that the omission of the adhesive bonding material considerably reduces the manufacturing cost of the pad whereby it is rendered economically disposable and consequently more desirable commercially.

If desired, various soaps, detergents, fillers, waxes, polishes, abrasives, or other cleaning and scouring materials, may be incorporated in the cleaning and scouring pad at any time during its manufacture. Approximately about 0.05 to about 0.5 pound of soap per square yard of fiber web or about 0.15 to about 1.5 grams of soap per scouring pad (3" x 3") or from about 0.015 to about 0.15 gram per square inch has been found sufficient.

The cleaning and scouring pads of the present invention are particularly well adapted for the scouring of metallic surfaces such as pots and pans but are also highly effective and economical in the scrubbing, cleaning, and the waxing of linoleum or plastic tile floors, wood floors, painted walls, etc. The pads are also very effective for many other related purposes such as for removing of paint and other surface coatings, finishing of wood, the preparing of surfaces for coatings, etc.

The invention will be described in greater detail by the following specific examples. It should be understood, however, that although these examples may set forth in particular detail some of the more specific features of the invention, they are given primarily for purposes of illustration and the invention in its broader aspects is not to be construed as limited thereto.

Example I

A cleaning and scouring pad was formed with an upper and lower layer of steel wool fiber web, grade No. 0, each layer having a weight of about 0.19 pound per square yard, and an intermediate layer having a weight of 0.1 pound per square yard of expanded cellulose acetate spread from a tow of crimped, 5 denier filaments having an average length greater than 1/2 inch. The layers were pressed together into an integral structure wherein the fibers of the upper and lower layers were all substantially parallel and the fibers in the intermediate layer substantially at right angles thereto. 3" x 3" cleaning pads were cut therefrom. These pads had a reduced tendency to roll and to "pill," were not stiff or harsh and were capable of providing sufficient sudsing and foaming cleaning action when used with soaps and detergents. The pads were used to clean several aluminum pots and pans and held together satisfactorily. The thickness of these pads ranged from 1/32 to 3/32 as measured with the pad compressed under a slight pressure such as exerted during use of the pad.

Example II

A cleaning and scouring pad was formed with an upper and lower layer of steel wool fiber web, grade No. 0, each layer having a weight of about 0.19 pound per square yard, and an intermediate layer having a weight of 0.1 pound per square yard of expanded cellulose acetate spread from a tow of crimped, 8 denier filaments (Y cross-section). The fibers of all the layers were parallel to each other within each layer. The layers were pressed together into an integral structure with the fibers of the upper and lower layers parallel and the intermediate layer fibers at about 90° thereto and 3" x 3" cleaning pads were cut therefrom. These pads had a reduced tendency

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to roll and to "pill," were not stiff or harsh and were capable of providing sufficient sudsing and foaming cleaning action when used with soaps and detergents. These pads were used to scour dirty and greasy porcelainized surfaces and held together very well. The thicknesses of these pads ranged from $\frac{1}{32}$ to about $\frac{3}{32}$ of an inch.

Example III

A cleaning and scouring pad was formed with an upper and lower layer of steel wool fiber web, grade No. 00, each layer having a weight of about 0.21 pound per square yard and an intermediate layer having a weight of 0.03 pound per square yard of carded cotton web having an average length greater than $\frac{1}{2}$ inch. The layers were pressed together into an integral structure as described in preceding example and 3" x 3" cleaning pads were cut therefrom. These pads had a reduced tendency to roll and to "pill," were not stiff or harsh and were capable of providing sufficient sudsing and foaming cleaning action when used with soaps and detergents. These pads had thicknesses of about $\frac{1}{32}$ to $\frac{3}{32}$ of an inch when held and slightly compressed by the fingers.

Example IV

A cleaning and scouring pad was formed with an upper and lower layer of steel wool fiber web, grade No. 0, each layer having a weight of about 0.19 pound per square yard, and an intermediate layer having a weight of 0.03 pound per square yard of 18 x 14 cotton gauze, basket weave. The layers were pressed together into an integral structure wherein the fibers of the upper and lower layers were parallel within each layer but with the directions of parallelism at about 90°. The gauze was so positioned that the warp threads were at about right angles to one layer and the weft threads were at about right angles to the other layer. 3" x 3" cleaning pads were cut therefrom. These pads had a reduced tendency to roll and to "pill," were not stiff or harsh and were capable of providing sufficient sudsing and foaming cleaning action when used with soaps and detergents. These pads had thicknesses ranging from $\frac{1}{32}$ to about $\frac{3}{32}$ of an inch as measured under slight applied pressure and could be used for cleaning surfaces having small crevices and sharp inside corners.

Example V

A cleaning and scouring pad was formed with an upper layer of steel wool fiber web, grade No. 000, having a weight of about 0.17 pound per square yard; a lower layer of steel wool fiber web, grade No. 0, having a weight of about 0.19 pound per square yard; and an intermediate layer having a weight of 0.10 pound per square yard of expanded cellulose acetate spread from a tow of crimped, 5 denier filaments. The layers were pressed together into an integral structure as described in Example IV and 2½" x 3" cleaning pads were cut therefrom. These pads had a reduced tendency to roll and to "pill," were not stiff or harsh and were capable of providing sufficient sudsing and foaming cleaning action when used with soaps and detergents.

Example VI

A cleaning and scouring pad was formed with an upper and lower layer of steel wool fiber web, grade No. 00, each layer having a weight of about 0.2 pound per square yard, and an intermediate layer having a weight of 0.02 pound per square yard of 10 x 10 cotton gauze, basket weave. The layers were pressed together into an integral structure as described in Example IV and 3" x 3" cleaning pads were cut therefrom. These pads had a reduced tendency to roll and to "pill," were not stiff or harsh and were capable of providing sufficient sudsing and foaming cleaning action when used with soaps and detergents. These pads had thicknesses ranging from $\frac{1}{32}$ to about $\frac{3}{32}$ of an inch as measured under slight applied pressure and could be used for cleaning surfaces having small crevices and sharp inside corners.

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Example VII

A cleaning and scouring pad was formed with an upper and lower layer of steel wool fiber web, grade No. 000, each layer having a weight of about 0.2 pound per square yard, and an intermediate layer having a weight of 0.04 pounds per square yard of 20 x 20 cotton gauze, basket weave. The layers were pressed together into an integral structure with the fibers in the upper and lower layers parallel within the layers and with the directions of parallelism also parallel. The warp threads of the gauze crossed the parallelized fibers at about right angles and the pads developed excellent cohesive properties and shape retentivity characteristics. 4" x 4" cleaning pads were cut therefrom. These pads had a reduced tendency to roll and to "pill," were not stiff or harsh and were capable of providing sufficient sudsing and foaming cleaning action when used with soaps and detergents. These pads had thicknesses ranging from $\frac{1}{32}$ to about $\frac{3}{32}$ of an inch as measured under slight applied pressure and could be used for cleaning surfaces having small crevices and sharp inside corners.

Example VIII

A cleaning and scouring pad was formed with an upper and lower layer of steel wool fiber web, grade No. 000, each layer having a weight of about 0.2 pound per square yard, and an intermediate layer having a weight of 0.03 pound per square yard of 12 x 24 cotton gauze, basket weave. The layers were pressed together into an integral structure as described in Example VII and 2" x 2½" cleaning pads were cut therefrom. These pads had a reduced tendency to roll and to "pill," were not stiff or harsh and were capable of providing sufficient sudsing and foaming cleaning action when used with soaps and detergents. These pads had thicknesses ranging from $\frac{1}{32}$ to about $\frac{3}{32}$ of an inch as measured under slight applied pressure and could be used for cleaning surfaces having small crevices and sharp inside corners.

Example IX

A cleaning and scouring pad was formed with an upper and lower layer of steel wool fiber web, grade No. 0, each layer having a weight of about 0.2 pound per square yard, and an intermediate layer having a weight of 0.03 pound per square yard of 8 x 8 cotton gauze, basket weave. The layers were pressed together into an integral structure as described in Example VII and 3" x 3" cleaning pads were cut therefrom. These pads had a reduced tendency to roll and to "pill," were not stiff or harsh and were capable of providing sufficient sudsing and foaming cleaning action when used with soaps and detergents. These pads had thicknesses ranging from $\frac{1}{32}$ to about $\frac{3}{32}$ of an inch as measured under slight applied pressure and could be used for cleaning surfaces having small crevices and sharp inside corners.

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

Variations and modifications may be made within the scope of this invention and portions of the improvements may be used without others.

I claim:

1. A cleaning pad comprising a steel wool upper surface layer having a weight of from about 0.1 to about 0.3 pound per square yard and having the predominant portion of its steel fibers substantially parallel; a steel wool lower surface layer having a weight of from about 0.1 to about 0.3 pound per square yard and having the predominant portion of its steel fibers substantially parallel; and a unitary intermediate layer contacting said upper

and lower layers and forming therewith an integral structure, said intermediate layer having a weight of from about 0.015 to about 0.3 pound per square yard and being fabricated from non-metallic fiber members having an average length of at least about $\frac{1}{2}$ inch, said steel wool fibers and said non-metallic fiber members being mechanically interlocked by at least about half of the non-metallic fiber members lying at an angle between about 45° to 90° to the direction of predominant parallelism of the steel fibers of the upper and lower layers.

2. A cleaning pad as defined in claim 1 wherein the intermediate layer is a carded cotton web.

3. A cleaning pad as defined in claim 1 wherein the intermediate layer is gauze.

4. A cleaning pad as defined in claim 1 wherein the intermediate layer is a sheet of substantially parallel continuous synthetic filaments.

5. A cleaning pad comprising a steel wool upper surface layer having a weight of from about 0.1 to about 0.3 pound per square yard and having the predominant portion of its steel fibers substantially parallel; a steel wool lower surface layer having a weight of from about 0.1 to about 0.3 pound per square yard and having the predominant portion of its steel fibers substantially parallel; and a unitary intermediate layer contacting said upper and lower layers and forming therewith an integral structure, said intermediate layer having a weight of from about 0.015 to about 0.3 pound per square yard and being fabricated from non-metallic fiber members having an average length of at least about $\frac{1}{2}$ inch, said steel wool fibers and said non-metallic fiber members being mechanically interlocked by at least about half of the non-metallic fiber members lying at an angle between about 60° and

90° to the direction of predominant parallelism of the steel fibers of the upper and lower layers.

6. A cleaning pad comprising a steel wool upper surface layer having a weight of from about 0.1 to about 0.3 pound per square yard and having the predominant portion of its steel fibers substantially parallel; a steel wool lower surface layer having a weight of from about 0.1 to about 0.3 pound per square yard and having the predominant portion of its steel fibers substantially parallel; and a unitary intermediate layer contacting said upper and lower layers and forming therewith an integral structure, said intermediate layer having a weight of from about 0.015 to about 0.3 pound per square yard and being fabricated from non-metallic fiber members having an average length of at least about $\frac{1}{2}$ inch, said steel wool fibers and said non-metallic fiber members being mechanically interlocked by at least about half of the non-metallic fiber members lying at an angle between about 45° and 90° to the direction of predominant parallelism of the steel fibers of the upper and lower layers, said pad having incorporated therein from about 0.015 to about 0.15 gram of soap per square inch.

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