June 24, 1969 H. K. McCLAIN 3,451,758

TRAPEZOIDAL SCOURING PAD OF NON-WOVEN FIBROUS MATERIAL

Filed May 11, 1966

Fig. 1

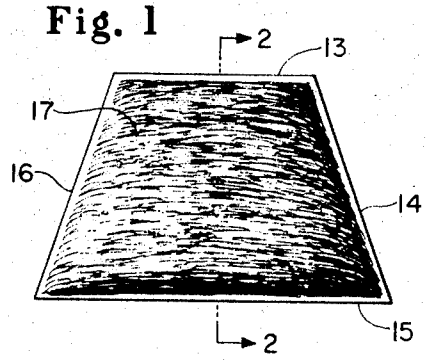


Fig. 2

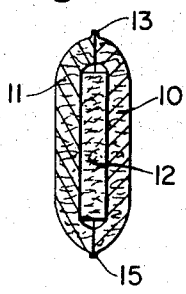


Fig. 3

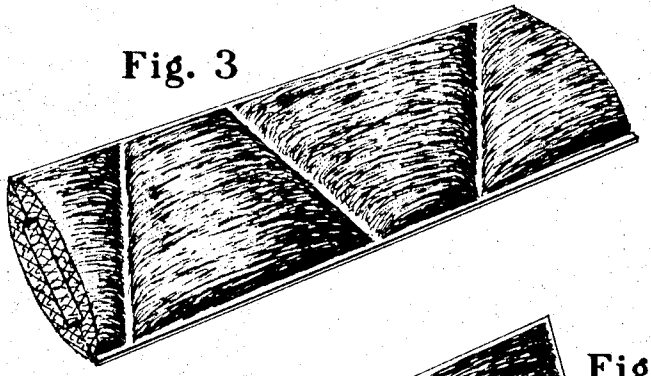
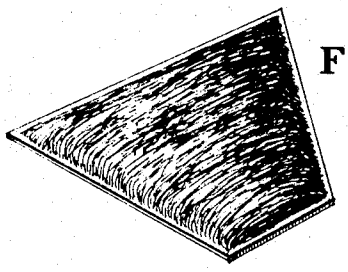


Fig. 4



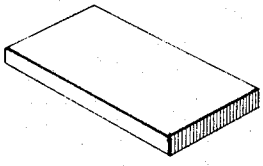


Fig. 5a

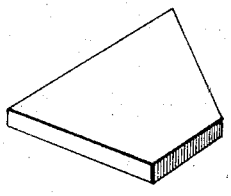


Fig. 5c

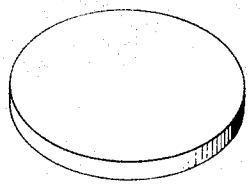


Fig. 5b

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TRAPEZOIDAL SCOURING PAD OF NON-WOVEN FIBROUS MATERIAL

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U.S. Cl. 401—201 7 Claims

ABSTRACT OF THE DISCLOSURE

A scouring pad comprising non-woven, non-absorbent fibers in three dimensional open arrangement having a plan view shape of a trapezoid. Preferably the pad is made of thermo-plastic synthetic fibers and contains a detergent cake.

This invention relates to a scouring pad made of non-woven fibrous material having a plan view shape of a trapezoid, whereby the use and manufacturing characteristics of the pad are improved.

Scouring pads of non-woven fibrous materials are old and have been widely used. Heretofore, however, they have generally been in circular, oval or rectangular shapes. Circular and oval shaped scouring pads have advantageous use characteristics in that their rounded edges facilitate the cleaning and scouring of the insides of conventional round cooking ware. Such rounded corners, however, are not very effective when scouring non-round articles. Moreover, scouring pads are sometimes used for cleaning floors and cupboards where the rounded edges are ineffective in corners. Circular and oval scouring pads have a further disadvantage in that their manufacture from sheet stock involves a substantial amount of waste. Rectangular scouring pads, however, can be manufactured from sheet stock without waste, but have square corners which have only mediocre effectiveness in scouring rounded cooking vessels and in reaching out-of-the-way areas on floors and in cabinets. Moreover, rectangular shaped scouring pads are undistinctive in appearance.

It is an object of this invention to provide a scouring pad which can be manufactured from sheet stock without waste, has a shape which is distinctive in appearance and provides effective scouring and cleaning in difficult to reach areas as well as the rounded insides of cooking vessels.

These and other objects are achieved with the scouring pad of this invention which comprises non-woven, non-absorbent fibers in three dimensional open arrangement and which has a plan view shape of a trapezoid. This trapezoidal scouring pad has two acute angles which are very effective in scouring and cleaning corners and out of the way places. It also has two obtuse angles which provide effective cleaning and scouring in rounded cooking vessels. The trapezoid is a distinctive shape and can also be cut from sheet stock without waste.

Preferably the trapezoid, which is the plan view shape of the scouring pad, has a base ranging from 3 to 5 inches in length, has interior angles between the base and sides ranging from 55° to 75° and has a height ranging from 2 to 2¾ inches. The angles between the base and sides which are employed within the above range are equal. According to the geometry of this shape, the base, height and the base angles fully designate all dimensions of the

trapezoid, with the top, sides and obtuse angles taking care of themselves. These preferred dimensions are such that the pad has superior handling and use characteristics for the average housewife, particularly with respect to the way it fits into a woman's hand and to the acute and obtuse angles for the desirable use characteristics described above. Preferably the pad has a base length of about 4 inches, a height of 2½ inches and interior angles between the base and sides of about 65–75°. In such a preferred pad the top is about 2¼ inches long, and the sides measure about 2½ inches.

While certain parallelograms have a pair of acute and a pair of obtuse angles, such shapes are not easy to handle. Moreover, they package inefficiently because of the extreme diagonal measurement.

While the specification concludes with claims particularly pointing out and distinctly claiming the subject matter regarded as forming the present invention, the invention will be better understood from the following description taken in connection with the accompanying drawings in which:

FIGURE 1 is a plan view of the scouring pad of this invention showing the trapezoidal shape as described above and having the preferred two-layer construction with peripheral seams as hereinafter described.

FIGURE 2 is a cross-section view taken on line 2—2 of FIGURE 1 showing another preferred aspect of the scouring pad, a detergent cake insert.

FIGURE 3 is a perspective view showing a series of joined preferred scouring pads prior to separation along the transverse seams to form individual scouring pads. This view also illustrates the lack of waste in and manufacture from sheet stock.

FIGURE 4 is a perspective view of an individual preferred scouring pad of the present invention.

FIGURES *5a*, *5b* and *5c* are perspective views of various shapes in which the detergent cake insert shown in FIGURE 2 can be employed.

The nonwoven fibrous material used in making the trapezoidal cleaning and scouring pads of this invention preferably comprises non-absorbent, non-matting fibers of various lengths which generally range from about one-half inch to about two inches. The fibers are in an open three-dimensional arrangement, preferably random arrangement. While FIGURES 1, 3 and 4 indicate an oriental structure as may be found in steel wool, they are also intended to represent a random arrangement. The three-dimensional arrangement of fibers provides many advantages in loft and resilience, but it will be understood that the nonwoven fibrous material used in the practice of the present invention can vary from such fiber arrangement so long as any other fiber arrangement has the advantages inherent from the use of the desired material possessing the preferred fiber arrangement. The fibrous material is in the form of a fibrous layer which can be used as a single thickness, ⅛″ to ½″ thick, or which can be used with another layer in dual layer construction, ¼″ to ¾″ thick, preferably with sealed peripheral seams. Thicker pads up to 1″ thick or more can also be formed.

The nonwoven fibrous material can comprise synthetic fibers, metallic fibers, or various animal or vegetable fibers, either alone or in various combinations. The metallic fibers that can be used, either alone or in combination with other fibers, include steel wool, brass wool and stainless steel fibers. Individual metallic fibers are usually

quite long when employed to make fibrous layers. Particularly preferred are the synthetic fibers which are shorter in length, e.g. ½"–2". The most satisfactory synthetic fibers are the thermoplastic synthetic fibers and include those made of nylon (e.g., polyhexamethyleneadipamide, polycaprolactam, and the like), polyethylene, polypropylene, polyester fibers (e.g., polyethyleneterephthalate, and the like, rayon, cellulose acetate, modacrylic fiber (a copolymer of vinyl chloride and acrylonitrile) commercially available under the trademark Dynel, acrylic fiber (formed from a polymer of acrylonitrile) such as commercially available under the trademarks Orlon and Acrilan, polyvinylidene chloride-polyvinyl chloride copolymer fibers, and the like fibers. The fibers can be curled, crimped and/or straight.

The denier of the fiber used can vary widely, i.e., from 6 to 1000, depending upon the results desired. For example, heavy denier nylon, e.g. 600 denier is preferred for use in making coarse pads for rough scouring jobs. For fine scouring jobs the nylon may be of lighter denier, e.g. 15 denier or can be mixed with various soft fibers.

While the above described fibrous material, in a fibrous layer, can be used for the pads of this invention per se, preferably at least the opposite side surfaces of the nonwoven fibrous material are lightly impregnated with adhesive, e.g., a resin. The amount of adhesive applied, e.g., sprayed, on either surface of the fibrous layer is sufficient to bond the fibers together so as to form a self-sustaining layer of material when it is cut into a suitable size. The amount of adhesive is preferably sufficient to cause concentration of the adhesive at the surface area of the layer rather than in the center or middle of the layer. This is achieved by employing an amount of resin which preferably avoids penetration of substantial amounts of adhesive to the center or middle of the layers. The bonding of the fibers prevents them from pulling out and thereby insures dimensional stability of the layer for a much longer period of time than is possible with unbonded fibers.

An adhesive can be used, if desired, which penetrates to the center or middle of the layer such that the layer is substantially uniformly coated throughout with the adhesive material. By way of example, a fibrous material in which the adhesive is substantially uniformly distributed is described in U.S. Patent 2,784,132 issued to Emanuel N. Maisel on Mar. 5, 1957. The disclosure of the Maisel patent is incorporated herein by reference with respect to its teachings on adhesive-bonded nonwoven fibrous materials.

The adhesive can comprise any fusible adhesive material, resinous or otherwise, which fuses under heat and coalesces to bind the fibrous material into unitary pad. Such resins can also be employed to form the heat seal areas in the preferred dual layer constructed pads. Examples of thermoplastic resinous adhesives which can be used are polyvinyl alcohol, polyvinyl chloride or polyvinyl acetate or the copolymers thereof, and natural resinous adhesive materials such as rosin, and the like. A rubbery adhesive binder composition can be used such as butadiene-acrylonitrile copolymer latex having about 60 parts butadiene to 40 parts acrylonitrile, sold commercially by B. F. Goodrich Company under the trade name Hycar Latex 1561 and cured to a stable resilient rubbery condition.

Both surfaces of the fibrous layer can be treated, e.g. sprayed, with the same adhesive, if desired. However, if increased scouring action is desired, the surface of the fibrous layer that eventually becomes the outer surface of a cleaning and/or scouring pad is preferably treated, e.g., sprayed, with an adhesive in which an abrasive particle is embedded.

A fibrous material of the type disclosed in U.S. Patent 2,958,593 issued to Howard L. Hoover et al., on Nov. 1, 1960 can be used in which abrasive particles are adhered and distributed uniformly throughout the fibrous material. The disclosure of the Hoover et al. patent is incorporated herein by reference with respect to its teachings on adhesive-bonded nonwoven fibrous material.

The scouring action of such a preferred pad depends upon the size of grit contained in the adhesive, the type of fiber, and the denier of fiber used. Silicon carbide (grit) and aluminum oxide (alumina) are examples of suitable abrasive particles. Other examples of suitable abrasive particles are silica (sand, quartz), ground glass (calcium silicate), pumice, ilmenite ($FeTiO_3$), CeO_2, Fe_2O_3 (hematite) ZrO_2, zirconium silicate, TiO_2 and topaz. The resinous abrasives described in U.S. Patents 3,070,510, 3,151,027 and 3,251,800 can also be used. Preferably such abrasives range in particle size from 1 to 50 microns.

In another preferred aspect of this invention the fibrous layer can be impregnated with detergent. Impregnation is preferably done with the detergent in a liquid form. The liquid form usually contains up to 35% detergent in an aqueous vehicle. Such a detergent can be any of the many detergents known in the art such as soap and anionic and nonionic synthetic detergents. They are preferably one or more of the active detergent compounds employed in the dilute liquid composition described in U.S. Patent 3,179,599 issued Apr. 20, 1965 to Stanley L. Eaton and Edmund F. Gebhardt. Preferably the amount of such detergent can range from ¼% to 2% by weight of the total fibrous material in the pad.

The preferred construction for the trapezoidal scouring and cleaning pads of this invention comprises two individual superposed layers of nonwoven fibrous materials seals, preferably by heat sealing, together at the side edges; at least one of the two superposed layers of nonwoven fibrous material has at least the surface of its fibers coated with a heat-sealable resin. The two layers are superposed with this coated fiber surface of the one layer being juxtaposed with a surface of the other layer. Heat is applied to the edges, e.g. by a hot gas passing through the superposed trapezoidal layers, at a temperature sufficient to fuse the heat-sealable resin in the trapezoidal peripheral sealing pattern. The sealing area of the juxtaposed layers is then compressed for a brief interval until the resin coalesces thereby joining the layers in the desired sealing pattern. The joined layers can thereafter be trimmed if desired.

The peripheral heat sealed superposed layers of the trapezoidal pad provides adequate interbonding of the fibers in the layer edges so as to avoid shredding of and distortion of the scouring pads.

Preferably, the preferred cleaning and scouring pads of this invention have a detergent cake interposed between two layers of nonwoven fibrous material. Such a cake is inserted before the layers are sealed together. In this preferred embodiment, the detergent cake is entirely surrounded and enclosed by the heat seal area of the sealing pattern so that the finished cleaning and scouring pad has the washing composition centrally located.

The cleaning and scouring pads of this invention can be of the type generally illustrated and described in U.S. Patent 3,175,331, issued on Mar. 30, 1965, to Joseph J. Klein, and can preferably be formed by the techniques described therein. Preferably, however, the preferred trapezoidal scouring pads of this invention are formed by the method and apparatus described in the copending patent application of Norman J. Franz, Ser. No. 525,947, filed Feb. 8, 1966.

Example I

Trapezoidal scouring pads were prepared as follows: Two fibrous layers were superposed. Each layer somprised non-woven, non-absorbent nylon batting 5/16 inch thick, made of 6 to 15 denier staple fibers 1 9/16" long, in 3-dimensional random arrangement. The batting had about 85–90% voids and weighed 4 oz. per square yard. The nylon fibers in the batting were bonded together with

a heat-sealable resin, green in color. The resin was a mixture of melamine formaldehyde resin and polyvinyl chloride resin. The resin not only bonded together the nylon fibers, but contained silica abrasive, the particle size of which ranged from 0.5 micron to 60 microns. The total composition of the batting was as follows:

	Percent
Nyon fibers	33.6
Melamine formaldehyde resin	15.65
Polyvinyl chloride resin	14.35
Silica	36.4

Between the superposed fibrous layers, prior to sealing, was placed a synthetic detergent cake having the following composition.

	Percent
Sodium linear dodecyl benzene sulfonate	27
Ethanolamide of coconut fatty acids	2
Sodium tripolyphosphate	17
Trisodium phosphate	7
Sodium sulfate	4.5
Sodium bicarbonate	35
H_2O	7.4
Perfume	0.1

The cake was rectangular in shape and had the following dimensions:

	Inches
Thickness	3/16
Height	1⅝
Length	1⅞

The cake was prepared according to the process described in U.S. Patent 3,178,370 issued Apr. 13, 1965 to Richard Henry Okenfuss.

As seen in FIGURE 2 the superposed fibrous layers, **10** and **11**, with the detergent cake **12** between, were then cut into equal trapezoidal shapes, then heat sealed around the edges **13**, **14**, **15** and **16** according to the process described in U.S. Patent 3,175,331, such that there was a continuous thin peripheral edge around the resulting pad **17**. The resulting sealed pad had the following dimensions:

Base	inches	4¼
Top	do	2¼
Sides	do	2½
Height	do	2¼
Interior angles between the base and sides	degrees	67
Thickness	inch	0.825

The trapezoidal scouring pad was easy to handle, had good scouring action, worked well in rounded cooking vessels as well as in hard-to-reach corners. The detergent cake in the interior provided good sudsing and detergency.

For additional detergency capacity, the surface of the scouring pad was sprayed with an aqueous solution containing 35% of a synthetic detergent mixture having the following composition on a dry basis:

	Percent
Sodium salt of the sulfated reaction product of 1 mole of coconut fatty alcohol and 3 moles of ethylene oxide	73.53
Sodium coconut alkyl glyceryl ether sulfonate	11.75
Dodecyl dimethyl amine oxide	14.71

This water in this synthetic detergent mixture was removed by drying.

The total composition of the pad was as follows:

	Percent
Batting (2 layers)	26.02
Detergent cake	73.12
Liquid synthetic detergent	0.86

The above trapezoidal scouring pad can also be made very effectively by the process of Norman J. Franz described in copending application Ser. No. 525,945 filed Feb. 8, 1966 wherein a log of connected trapezoidal pads with detergent cakes including therein are prepared as shown in FIGURE 3. These pads can then be cut apart to form the pad shown in FIGURE 4.

The composition and shape of the detergent cakes employed in the preferred embodiment which includes such cakes are not critical. Preferably, however, the detergent cakes are of compositions having good detergency and suds characteristics, such as soap or the synthetic detergent cakes described in U.S. Patent 3,178,370. Any of the detergent cake compositions described in copending application Ser. No. 500,324, filed Oct. 21, 1965, and now abandoned, by Richard Henry Okenfuss can be employed.

The shape of the detergent cake can be any which fits within the sealed superposed fibrous layers making up the scouring pad: preferably the cake ranges from ⅛ to ⅜" thick. The cake can be rectangular as shown in FIGURE 5*a* and as employed in the above example. This is the most practical shape when the cakes are formed by extrusion and cut in suitable lengths on high speed machinery. Desirably, the detergent cake is in the form of a trapezoid as shown in FIGURE 5*c*, corresponding in configuration but reduced in the dimensions corresponding to the scouring pad in which it is employed. This shape fills the maximum amount of available space in the pad. Disc-shaped cakes as shown in FIGURE 5*b* can also be employed.

Example II

No. 0 grade steel wool can be formed by stamping into a trapezoidal shape having a 4 inch base, a height of 2 inches and interior angles between the base and sides of 60°. The steel wool can be a non-woven, fibrous, 3-dimensional generally oriented construction with long individual steel fibers. The trapezoidal pad formed is about ¾" thick and easy to handle; its obtuse angles are effective for scouring the insides of round cooking vessels; its acute angles are effective for hard-to-reach corners.

Similar pads can be cut or formed from layers of non-woven fibrous material which is formed of metallic or synthetic fibers which are non-absorbent and arranged in a 3-dimensional open structure. Such material can be used alone or with a resinous bonding agent, with or without impregnated abrasive.

While the preferred aspects of this invention have been described in the joining of two separate layers of non-woven fibrous material, it is not so limited. For example, similar results can be achieved by folding over a single layer such that the fold forms one side edge of the pad and the other three sides of a series of pads are formed with heat seals.

The pads of this invention can also contain additives such as perfumes and dyes.

All percentages herein are by weight.

What is claimed as new is:

1. A cleaning and scouring pad for hand use comprising non-woven, non-absorbent fibers in three-dimensional open arrangement having a plan view shape and size of a trapezoid having a base ranging from 3 to 5 inches in length and having interior angles between the base and side which are equal and range from 55° to 75°.

2. The scouring pad of claim **1** wherein the trapezoid has a height ranging from 2 to 2¾ inches.

3. The scouring pad of claim **2** which comprises two superposed layers of said fibers, sealed together around the periphery of the pad.

4. The scouring pad of claim **3** in which the fibers are thermoplastic synthetic fibers at least partially impregnated with a heat-sealable resinous adhesive and the peripheral edges are heat sealed.

5. The scouring pad of claim **4** which contains, between the heat-sealed superposed fibrous layers, a detergent cake.

6. The scouring pad of claim **5** wherein the trapezoid has a base of about 4 inches, a height of about 2½ inches and equal interior angles ranging from 65° to 75°.

7. The scouring pad of claim 5 wherein the fibrous layers are impregnated with a detergent.

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