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METHOD OF MAKING SCOURING ARTICLES

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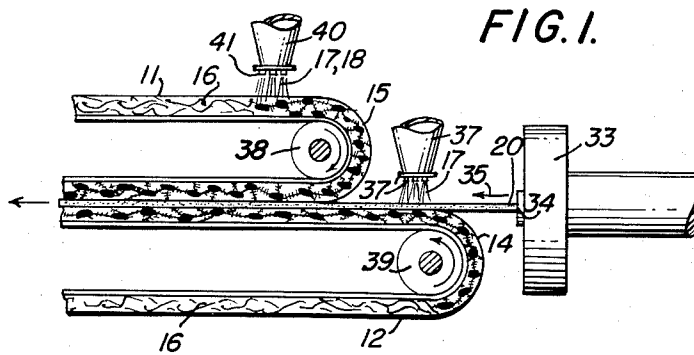


FIG. 1.

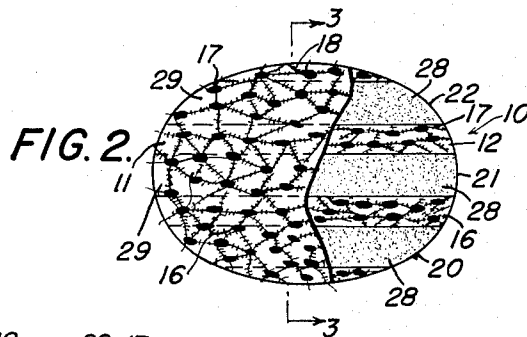


FIG. 2.

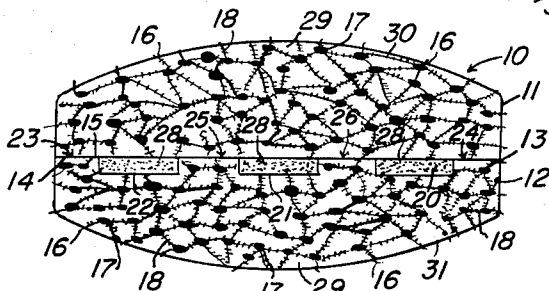


FIG. 3.

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METHOD OF MAKING SCOURING ARTICLES

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Original application Oct. 9, 1961, Ser. No. 143,914, now Patent No. 3,192,679, dated July 6, 1965. Divided and this application Sept. 11, 1964, Ser. No. 400,968
3 Claims. (Cl. 51-293)

This application is filed as a continuation-in-part of my copending applications identified by Serial No. 35,626, filed June 13, 1960, now abandoned, for "Impregnated Scouring Article and Method and Apparatus for Making Same," and Serial No. 131,663, filed August 15, 1961, now Patent No. 3,112,584 for "Scouring Article and Method for Making Same."

This application is also a division of Serial No. 143,914 filed October 9, 1961, now U.S. Patent 3,192,679.

This invention relates to scouring devices of the type used in the home and in various industrial areas. More particularly, the invention concerns a scouring article formed from tough, flexible filaments and capable of replacing soap and/or detergent-impregnated metal wool pads.

Scouring pads in commercial use at the present time may generally be categorized as metal wool pads and pads formed from intermingled organic fibers. Disadvantages of metal wool, for example, so-called steel wool, are well known. Metal wool itself is harsh and unpleasant to the touch. Unightly rusting may occur after several submergings of a pad in water. However, metal wool pads have been impregnated with soap or other detergent, and in such form have found wide use, both in household and industrial areas.

Scouring pads which are not formed from metal wool but are made of tough, flexible, organic fibers are also in use. These pads do not suffer from many of the undesirable characteristics inherent in the use of metal wool, e.g., splintering or rusting. However, scouring articles formed from organic fibers have not yet been impregnated with a detergent or otherwise formed to incorporate a detergent therewithin on a commercial scale.

Since metal wool scouring articles impregnated with detergent material have achieved wide commercial success, it will be apparent that such success has been achieved despite the many disadvantages which are present in such a pad. Many of these disadvantages would also be present in a pad formed from organic fibers if that pad were impregnated in the same manner as a metal wool scouring pad. Perhaps the most prominent of these disadvantages is the fact that, under the forces applied to an impregnated scouring article during use thereof and particularly when the article is utilized while immersed in water or other solvent, the supply of detergent within the pad is soon exhausted. In fact, the detergent is dissolved from the pad long before the filaments from which the pad is formed have outlived their usefulness. Nevertheless, the detergent-exhausted metal-wool pad is ordinarily discarded, since it cannot then perform its dual functions of cleaning as well as scouring, and the lack of detergent in the pad results in a decrease in lubricity when the pad contacts a work surface.

It is, therefore, a primary object of the present invention to provide a scouring article in which a quantity of detergent is present and which retains its detergent over longer periods of use than conventional scouring articles.

It is another object of the present invention to provide a scouring article in which detergent within the article is metered therefrom during use of the article.

It is still another object of the present invention to pro-

vide a scouring article in which detergent is concentrated therein in such form and at such location that immersion in water or other solvent will not tend to dissolve quickly a large percentage of the detergent and carry same from the scouring article.

It is a further object of the present invention to provide a scouring article in which a detergent is incorporated and in which such detergent serves as a carrier for abrasive media.

It is still a further object of the present invention to provide a novel and useful method for making a scouring article having the characteristics set forth hereinbefore.

According to the present invention, a three-dimensional article which is adapted to serve as a scouring pad is formed so that a strip of detergent material having a thickness which is substantially less than the thickness of the pad is positioned against one of the surfaces of the pad. The pad has a network of voids extending therethrough. The strip is sufficiently cohesive to permit it to retain its shape when dry, but is activatable in the presence of a solvent to pass detergent through the network of voids to a surface of the pad which can be disposed to contact work to be scoured.

As employed in this specification and the appended claims, the term, detergent, is intended to include synthetic detergents, soaps and other saponaceous materials of varying degrees of surface activity commonly employed in the cleansing art.

In a preferred embodiment of the present invention the strip of detergent material is adhered to a section of pad material, and another pad or batt section underlies the strip of detergent and is adhered both to the detergent and to the surface of the first pad section with which it is contiguous. Generally, a plurality of strips of detergent will be supplied, such strips being spaced from one another so that contiguous surfaces of the two pad sections will directly contact one another. If the pad sections are formed from filaments which may be secured to each other by means of a resin or other adhesive binder, these contiguous surfaces will permit the two batt sections to be securely joined at those areas where they are in direct contact, the zone of juncture of the sections being that location at which the sections are most subject to disengagement. As the detergent strips are dissolved due to solvent action, the supply of detergent material in those strips will be depleted and finally exhausted, thereby creating areas where the batt sections will not be joined to each other. Since it is desirable that the scouring article, although completely exhausted of its supply of detergent, will be amenable to some use, the scouring article should still be able to maintain its shape after the detergent has been dissolved. The surface-to-surface contact of the batt sections enables those sections to remain bonded together after dissolving of the detergent. It has been found particularly advantageous for the detergent strips to extend in the longitudinal direction of the scouring article, the strips being spaced transversely across the pad to provide longitudinal areas of surface-to-surface contact between the batt sections.

The two batt sections, at least one of which and preferably both of which are composed of a plurality of flexible, tough, organic fibers, such as nylon, are utilized to form a preferred scouring article according to my invention. These organic fibers are intermingled and disposed in random arrangement to form a network of intercommunicating voids extending through the sections, the fibers being bonded together at spaced locations where they cross and contact one another to unite each of the batt sections into an integral resilient structure throughout its dimensions. Such a batt structure provides easy

access of solvent to one or more strips located at a central zone with respect to the thickness of the batt and likewise enables detergent dissolved and foamed by the solvent to escape from its central location to one or more work contacting surfaces of the batt and to the work, itself. In a preferred form, particles of abrasive material are distributed at least along the working surfaces of the batt. These particles are bonded to the fibers of the batt and are stationed on the working surfaces in position to contact and scour work to which these surfaces are applied.

The detergent material which is utilized to form the one or more strips which comprise an important part of a scouring article according to my invention is such that it will retain its strip form when dry but will dissolve when contacted by a suitable solvent. In order for the detergent to dissolve slowly, a metering composition may be added to the detergent, such composition being, for example, carboxymethylcellulose, which is slightly soluble, or Fuller's earth, which is substantially insoluble. If such slightly soluble or insoluble compositions are distributed throughout the more soluble detergent material, they will tend to retard dissolution of the detergent.

Another additive which can be incorporated into the detergent composition from which the one or more strips are formed is a finely divided silica powder such as one varying between 80 and 200 mesh. The silica powder will be carried by the dissolved and foamed detergent through the network of voids of the batt to a working surface thereof. At such surface the finely divided silica or other similar abrasive will exert a mild scouring action on the work being treated. This mild action assists the more immediate scouring action of abrasive particles stationed at the working surface and bonded to fibers of the batt, the latter abrasive particles being comparatively large in relation to the abrasive powder which is incorporated in the detergent strips.

The concentration of detergent at a central portion of a scouring article and initial omission of detergent from those areas of the article near the work-contacting surfaces of the article provides important advantages. For example, it permits the detergent to be metered out in useful quantities without undue dissipation of detergent in amounts in excess of those necessary to cleanse a piece of work effectively. When detergent is concentrated near the surface of a scouring article, it is rapidly solubilized upon contact with solvent and flows from the scouring article in amounts in excess of those actually required. Pieces of solid detergent may be dislodged by the sudden solubilization of detergent surrounding them and fall from the article. Consequently, such detergent has been found to be wasted when a scouring article is completely filled with detergent. The metering effect produced by the concentration of detergent at the center of the scouring article avoids this loss of cleansing power and provides substantially longer scouring pad life per quantity of detergent therein. This metering effect is accentuated when the detergent is in the strip form disclosed herein, for the compact strips have relatively little of their detergent exposed at solvent-accessible surface areas.

A scouring article according to the present invention may preferably be embodied in a form which has a relatively high voids volume, i.e., the total volume of the batt occupied by the void spaces within the batt is large with respect to the batt volume occupied by the fibers, themselves. The void volume may, e.g., be 80% of the total volume of a batt from which the scouring article is to be formed. As will be apparent, a batt of wettable, synthetic fibers and a high voids volume is elastic and resilient; it will tend to reassume its initial form after it has been compressed and the compression released. The outer, unfilled portions of the scouring article will, therefore, be resilient and elastic.

The resilience and elasticity of sections of the present scouring article produce a second important advantage

over a pad completely filled with detergent. Compression of these resilient portions presses the air from the voids of those portions. Upon release of the compressive force, the resilient portions reassume their original shape, sucking air into their voids as they do so. As they suck in air, they likewise draw in any detergent in contact with their surfaces and thereby tend to reconcentrate detergent near the center of the scouring pad and to hold some already expended detergent within the pad so that it may be utilized in subsequent scouring operations.

Batt sections which have a relatively high voids volume and will be useful in the production of a scouring article according to a preferred embodiment of the present invention may be produced in accordance with the disclosure of United States Patent No. 2,958,593 to Hoover et al. This patent reveals a scouring article which does not have any detergent incorporated therein, but which is formed from intermingled, randomly arranged filaments of synthetic organic composition. The filaments are bonded together by binders, such as synthetic resins, and abrasive grits, advantageously incorporated in the liquid binder, may be sprayed on the surface of a batt, whereby the grits will be stationed on surface filaments of the batt in work-contacting position.

When a scouring article according to the present disclosure is formed from a plurality of batt sections, those sections may be joined together by adhesives which are similar to those used to unite the individual filaments of each batt section. Many types of adhesives will be found suitable; however, in selecting an adhesive binder, the conditions under which the binder is to be used must be taken into consideration. For example, where the batt containing the adhesive is to be subjected to water or other fluids at high temperatures, the adhesive binder should be of a type which does not become viscous or pasty at high temperatures, nor should the binder be one which is soluble to any substantial degree in water or the solvent applied to the batt. Then, too, if the adhesive binder dries to a brittle composition, the friction engendered in the use of the final pad may serve to crumble the frangible adhesive and so disrupt the integral structure of the pad.

Among those binders which have been found suitable for use for the purposes of the present scouring article are synthetic resins, e.g., phenolaldehyde resins, butylated urea aldehyde resins, epoxy resins and polyester resins, and modified natural or synthetic rubber, such as latex compositions which have been blended with a filler so that they do not become pasty at high temperatures. Commercial sources of adhesive binders which are suitable for use are Shell Chemical Company's Epon 828, which is a liquid epoxy resin, and Hycar Latex 1561, a butadiene-acrylonitrile copolymer latex marketed by B. F. Goodrich Company.

Detergents which can be used with a batt having the abrasive characteristics outlined hereinbefore may be selected from any natural or synthetic detergent which is non-toxic, non-irritating, not rapidly soluble, and has a melting point substantially above room temperature. The detergent should be non-toxic and non-irritating so that if any detergent film remains on a pot, pan or other article after a scouring operation, that detergent film will be neither poisonous nor irritating when inverted with food in a subsequent use of the article. In addition, it should be non-irritating so that the hands of the user are not affected adversely during and after a scouring action employing the pad. Extreme solubility is not a desirable characteristic because it leads to excessive consumption of detergent. If the detergent has a melting point at or below room temperature, it is likely to melt in transit or on the retailer's shelf and thus flow from the batt.

Furthermore, a detergent which can be advantageously utilized as the impregnant of a scouring pad according to the present invention is one which is physically and

chemically compatible with other detergents with which it is likely to come into contact. It is common, for example, for a scouring pad to be used during or immediately after a dish-washing operation, in which case the detergent in the scouring pad should be compatible with detergents normally used as dish-washing compositions. Consequently, since most dish-washing compositions that are now employed include anionic synthetic detergents, use of a soap or cationic detergent in the pad will not be compatible with the dish-washing detergent and will act adversely on the foam of the dish-washing detergent and destroy a large part of its cleansing power. It is, therefore, preferred that a non-ionic, anionic or amphoteric synthetic detergent be incorporated into the batt to form the present scouring pad.

Among those anionic synthetic detergents which have been found effective in this use are alkylaryl sulfonates and lauryl sulfate. A composition commercially available is a sodium salt of alkylaryl sulfonates marketed by Stepan Chemical Company under the trademark DS-60. Another commercial source of alkylaryl sulfonates is Ultrawet 60-K, produced by Atlantic Refining Company.

Among the non-ionic synthetic detergents which are suitable for use in the present scouring pad are ethoxylated alcohols, acids, phenols, and esters which contain OH groups, in addition to amines, amides, ethoxylated amines and ethoxylated amides. Also desirable are condensation products of an alkylolamine and a member of the group consisting of higher fatty acids and their trylycerides, esters, amides and anhydrides. Among such compositions commercially available is a lauryl diethanol amide made by Stepan Chemical Company under the trademark P616.

It should be noted, however, that a wide variety of natural and synthetic detergent materials will be found suitable for use in the present invention, and such materials will readily be determinable by those skilled in the art. Those compositions which have been named hereinbefore as being most advantageous for such use have been selected on the basis of their compatibility with materials with which they may come in contact in the course of household uses. In particular industrial uses it may well be that these detergents will be found more advantageous because they are compatible with other substances with which they are brought in contact in that particular use. Therefore, the selection of a detergent is governed to a large extent by the use to which the batt incorporating it is to be put, the degree of lubricity required, and the cleansing action which must necessarily be obtained.

According to a preferred embodiment of the method of the present invention, a scouring article having at least one strip of detergent material located at a central portion thereof is formed by adhering together two separate batt sections. Prior to such adherence a strip of detergent material is disposed on one surface of a batt section and the other batt section is then positioned over that surface and the strip and adhered to that surface. The composite structure is then subdivided into units each of which contains at least one strip of detergent material at a central location thereof. Advantageously, a spray of adhesive binder is applied to the surface of one batt section which carries the strip of detergent material. Then, when the other batt section is applied thereto, the contiguous surfaces will be united.

In order to dispose at least one strip of detergent material on a batt section, it has been found preferable to extrude the strip directly onto the surface of the batt section, that surface underlying the strip and retaining the strip by means of gravity. If the strip is extruded in a hot, fusible state, cooling the strip in contact with the batt surface will cause the strip to adhere to that surface. In practice, it has been found desirable to extrude simultaneously a plurality of relatively thin strips of detergent material, the strips extending longitudinally of the batt section on which they are extruded and being spaced later-

ally from each other. In such position the strips provide areas therebetween to which resin or other adhesive binder may be applied so that, on subsequent superposition of another batt section on the surface carrying the strips, there will be surface portions of each section which are contiguous and which will be firmly bonded by the binder. The detergent strips, themselves, are not firmly bondable to fibers by means of an adhesive binder.

These and other objects, features, and advantages of the present invention will become more apparent when considered in connection with the following detailed description of a preferred embodiment of the invention and the illustration of that embodiment in the accompanying drawing, which forms a part hereof, and in which:

FIG. 1 is a side elevational view illustrating a method of forming scouring articles according to the present invention.

FIG. 2 is a top plan view, partly broken away, of the scouring article so formed, and

FIG. 3 is a transverse, vertical sectional view along the line 3-3 of FIG. 2.

Referring now to the drawing, and in particular to FIGS. 2 and 3 thereof, a scouring pad of the present invention is identified by the reference numeral 10. In top plan view the pad is substantially oval, while in end elevation both the top and bottom surfaces of the pad 10 are convex.

In the illustrated, preferred embodiment, the pad 10 is formed from upper and lower pad sections 11 and 12, respectively, which are bonded together at a zone 13 at which the pad sections 11 and 12 are contiguous. At zone 13 upper surface 14 of batt section 12 is in direct contact with the lower surface 15 of batt section 11.

Each of batt sections 11 and 12 is formed from a plurality of synthetic, non-metallic fibers 16, which are disposed throughout each section in a random, three-dimensional arrangement. The fibers 16 are preferably $\frac{1}{4}$ to 2 inches long. Each of the individual fibers 16 is fixed to other fibers 16 at locations where the fibers cross and contact one another. To maintain such unity a quantity of adhesive binder illustrated in the form of globules 17 has been sprayed or otherwise applied to the fibers 16 of each batt section.

Globules 17 encase at least two fibers 16 at points where they contact each other or are immediately adjacent. Abrasive particles 18 have been incorporated into batt sections 11 and 12 by being stationed along the lengths of fibers 16 by means of adhesive bonding. Since these abrasive particles may be applied to the batt sections by spraying in the adhesive binder, the abrasive particles are often embedded in a globule 17 of binder and so are stationed in the globules as well as along the lengths of the fibers 16.

The illustrated embodiment shows detergent material positioned centrally over the thickness of a scouring pad in the form of three strips 20, 21 and 22. These strips are spaced laterally from each other and from the periphery of the pad so that areas are provided at which surfaces 14 and 15 of batt sections 12 and 11, respectively, are contiguous to each other without the interposition of detergent strips. Thus, contiguous areas 23 and 24 are provided at the margins of the pad as well as intermediate contiguous areas 25 and 26 at inner locations of the pad. At areas 23 to 26 fibers 16 of both upper batt section 11 and lower batt section 12 are disposed against each other so that, by means of adhesive binder, they and the two batt sections will be bonded together. As best seen in FIG. 3, strips 20 to 22 of detergent material have been almost completely included within the volume of the section 12, such inclusion having occurred if the strips were extruded on that batt section in a pliable, plastic condition such that they flowed within the section prior to solidifying.

Also seen in FIG. 3 as well as FIG. 2 are abrasive grits 28 located within the strips of detergent material.

These abrasive particles are finely divided silica, for example, and are quite small with respect to the size of abrasive particles 18 stationed on the fibers 16 of each of the batt sections. Abrasive grits 28 provide a finer scouring action in comparison with the somewhat coarser action of particles 18.

The scouring pad structure of FIGS. 2 and 3 has a network of voids 29 which are formed when fibers 16 are intermingled in random arrangement and then bonded together. Voids 29 permit detergent material from the strips 20 to 22 to pass through the intercommunicating voids 29 to working surfaces 30 and 31 of the scouring article when the strips have been partially dissolved by means of solvent.

A preferred method of forming the scouring pad illustrated in FIGS. 2 and 3 is shown in FIG. 1 of the drawing. An extrusion head 33 having an orifice 34 extrudes a strip 20 of detergent material in the direction of arrow 35. Identical strips 21 and 22 extruded through other orifices cannot be seen in this figure. Strip 20 is cohesive and passes to the upper surface 14 of lower batt section 12. Once the strip is on surface 14, that surface is sprayed with an adhesive binder 17 by means of a spray head 37 having nozzles 37'. Subsequently the upper batt section 11 is superposed on the lower batt section 12 by means of counter-rotating drive wheels 33 and 39 so that exposed surface areas of 14 and 15 of the batt sections are continuously disposed in contiguous relationship. The adhesive binder alone may be sufficient to firmly bond the two batt sections together at their common zone 13, or heat and/or pressure means (not shown) may be employed to unite the sections firmly.

Each of batt sections 11 and 12 has been formed into a cohesive structure prior to the bonding together of those sections. Thus upper batt section 11 has been formed from intermingled filaments bonded together at locations where they cross and contact one another by binder 17 applied to batt section 11 from a spray head 40 through nozzles 41. As illustrated, abrasive particles 18 have been incorporated in the adhesive binder 17 sprayed from head 40 so that those particles are stationed on filaments 16 of upper batt section 11. In a similar manner lower batt section 12 is formed from filaments 16, binder 17 and abrasive particle 18 prior to the joining together of sections 11 and 12. After a composite structure has been constructed, that structure is subdivided by cutting or other suitable means to form individual scouring pads 10.

It has been found preferable that the detergent strips be extruded in a pliable form; this may be accomplished through heating in the extruder, so that as the strips lie on the upper surface 14 of lower batt section 12, they flow somewhat into the body of that batt section. Upon cooling, the detergent material is firmly adhered to those fibers 16 about which it solidifies. Such a method step

provides a convenient manner of securing the several detergent strips in spaced location on the surface of one batt section.

While the present invention has been described with particular reference to a specific embodiment of a scouring article and a method for the manufacture of that article, it will be understood that the invention is not to be limited to the embodiments illustrated and described, but the scope of the invention is to be determined only by reference to the following, appended claims.

What is claimed is:

1. A method of forming an abrasive, detergent-containing scouring pad which comprises extruding a continuous strip of flowable detergent material on one surface of a porous batt section of organic fibers having abrasive particles bonded to the fibers of said batt so that said strip enters the voids in said batt section to an extent wherein the strip is substantially included within the volume of said batt, superposing on said surface a further batt section, bonding said batt sections and subdividing the adhered sections into individual pads each of which has detergent strips disposed at the adhering surface thereof over a portion which is less than the entirety of said surface.

2. A method of forming an abrasive, detergent-containing scouring pad from two porous batt sections of organic fibers, at least one of said batts having abrasive particles bonded to the fibers of said batt, said particles being distributed at least along the working surface of said batt, which comprises extruding a plurality of continuous strips of flowable detergent material on one surface of said batt sections so that the strips are spaced laterally from each other and enter the voids in said batt to an extent that the strips are substantially included within the volume of the batt section, applying an adhesive to said surface, superposing on said surface a further batt section, bonding said batt sections and subdividing the adhered sections into individual scouring pads each of which has detergent disposed at the adhering surface of said batts over less than the entirety of said surface.

3. A method of claim 2 wherein the strips of detergent material are made flowable by heating to a fusible state and then cooling said strips after the strips have entered the voids in said batt section.

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