Oct. 25, 1966

R. S. COPELAND

3,280,517

CLEANING PAD

Filed Jan. 2, 1964

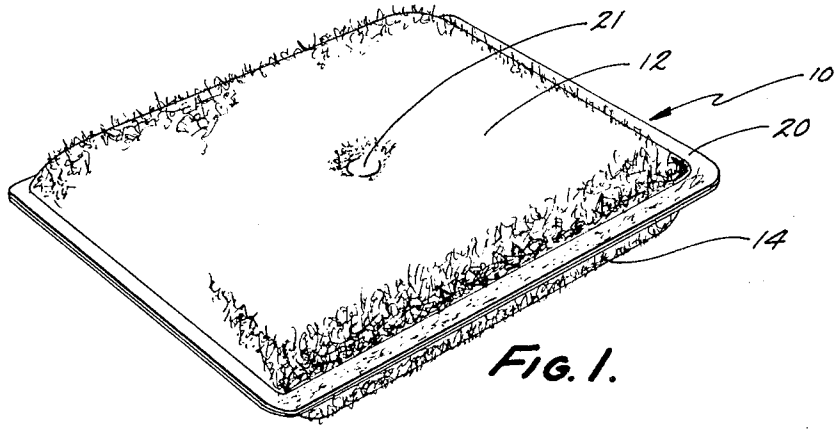

FIG. 1.

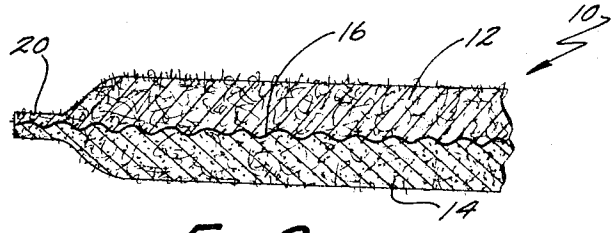

FIG. 2.

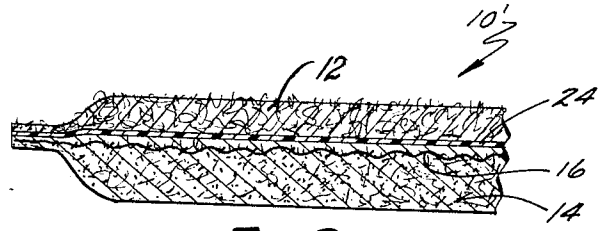

FIG. 3.

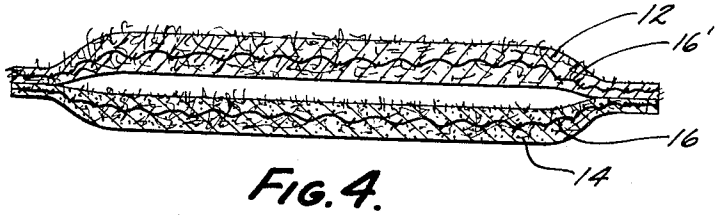

FIG. 4.

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CLEANING PAD

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1 Claim. (Cl. 51—400)

This invention relates to cleaning pads, and more particularly to laminated, abrasive, fibrous cleaning pads.

Presently available cleaning pads have an abrasive action, but often cause abrasion of the user's hand as well as articles to be cleaned, especially if the hand slips over the surface of the pad when scrubbing. This is true with pads of non-metallic fibers as well as metallic fibers.

This abrading irritation is even greater when employing strong chemical reagents such as oven-cleaning alkali. Consequently, rubber or plastic gloves ordinarily are necessary.

It is therefore an object of this invention to provide a cleaning pad not only having excellent abrading characteristics for cleaning, but which also has protection against hand abrasion. It further exhibits excellent gripping characteristics for the fingers, yet without employing expensive pad construction.

It is another object of this invention to provide a laminated abrasive cleaning pad having integral interconnection.

It is another object of this invention to provide an abrasive cleaning pad allowing items such as ovens to be cleaned with strong chemical cleansing reagents, yet without requiring rubber gloves to be worn by the user, and with complete protection and comfort to the hand of the user.

These and several other objects of this invention will become apparent upon studying the following specification in conjunction with the drawings in which:

FIG. 1 is a perspective view of a pad;

FIG. 2 is a sectional view of one non-elected form of the pad;

FIG. 3 is a sectional view of the elected form of the pad;

FIG. 4 is a sectional view of a non-elected modification of the pad.

Referring now specifically to the drawings, the pad **10** shown in FIG. 1 is a laminate of the simplest form of those taught. The first layer **12** is an abrasive fibrous layer, the second layer **14** is a non-abrasive fibrous layer, and the woven anchor sheet **16** (FIG. 2) extends between layers **12** and **14**. The laminate is bonded together around its peripheral edge, and preferably in the center **21** also, by heat sealing of the thermoplastic materials.

Both layers **12** and **14** are formed of a great number of randomly-dispersed, tough, resilient fibers, preferably of nylon such as nylon 6 or nylon 66. Other tough, flexible, resilient fibers could conceivably be used, e.g. polyesters such as Dacron or polypropylene. Other synthetic fibers may be mixed with these fibers, providing that they do not become soft in water or under scrubbing action. These additional fibers could be of any one or more of the following: Thermoplastic fibers or filaments as those of cellulose esters and ethers or mixed esters, such as cellulose acetate propionate or cellulose acetate butyrate, preferably in plasticized condition and treated for high wet strength; also, resins, either permanently thermoplastic or thermosetting but in the thermoplastic state, formed by the polymerization or condensation of various organic compounds such as coumarone, indene, or related hydrocarbons, vinyl compounds, styrene, sterols, phenol-aldehyde resins either unmodified or modified with oils, urea-aldehyde resins, sulfonamide-aldehyde resins, polyhydric alcohol-polybasic acid resins, drying oil-modified alkyd

resins, resins formed from acrylic acid, its homologues and their derivatives, sulfur-olefine resins, resins formed from dicarboxylic acids and diamines (nylon type); synthetic rubbers and rubber substitutes, herein called "resins," such for example as polymerized butadiene, olefine polysulfides, iso-butylene polymers, chloroprene polymers; and fibers formed from a resin comprising the product of copolymerizing two or more resins, such as copolymers of vinyl halide and vinyl acetate, copolymers of vinyl halide and an acrylic acid derivative; and also a mixture of resins, such as a mixture of vinyl resins and acrylic acid resins or methacrylic acid resins, a mixture of polyolefin resins and phenol-aldehyde resins, or a mixture of two or more resins from the different classes just named.

The amount of soft fibers such as vinyl should not be greater than about 25% in the abrasive layer **14** since the fibers are not sufficiently tough to withstand the rugged treatment imparted to the pad.

A frictional amount of natural fibers can be mixed in these also. These fibers are originally randomly positioned at various angles with respect to each other in three dimensions to form a lofty, uncompacted, loosely-assembled layer.

Into each of the highly porous layers is sprayed a resin binder material to bond the fibers at their junctures. The binder material is of a resin which will harden to a stable condition around the fibers. The preferred binder is a mixture of melamine formaldehyde and a cross linking acrylic polymer such as polymethyl methacrylate, roughly in a 50–50 ratio. Other possible binders include phenol aldehyde resins such as phenol formalydehyde, butylated urea aldehyde resins, polyepoxy resins such as those formed of epichlorohydrin and bisphenol A, and/or polyester resins such as the condensation product of maleic and phthalic anhydrides and propylene glycol. The binder is sprayed into the layer in the form of a viscous uncured liquid. Small globules attach to the fibers at their junctures. These are cured to a hardened condition. The binder may be cured at room or elevated temperatures depending upon its nature.

Particulate abrasive material creates the abrasive action in layer **14**. The particles are added to layer **14** with the binder. The abrasive may be of any suitable material depending upon the hardness desired, for example silicon carbide, boron carbide, fused aluminum oxide, flint, pumice, carborundum, emory, rouge, and similar materials. The size of the abrasive particles may vary from the finest polishing or buffing powder to the coarser grit sizes.

Layer **12** lends body to the pad. It also provides an excellent gripping surface for the hand during use of the pad to conform to the contour of the fingers of the hand, and yet to be free of any abrading characteristics on the skin. The binder of this layer is purposely low in cross linking acrylics to assure a soft feel to the surface. No abrasive particles are permitted in this layer. The particles do not contact the user's hand, even when extreme scrubbing pressure is applied to the pad. The woven anchor sheet and stabilizing layer (to be described) completely prevents such contact. Layer **12** is formed of like fibers as in layer **14** with variations in mixtures being possible. Randomly disposed, three dimensional fibers are bonded in a manner to form a porous web.

Layer **14** is created as a separate independent layer of layer **12**. The fibers of layer **14** are needled to a woven scrim sheet **16**. Needling pushes fibers through the woven cloth to cause these fibers to collectively create a layer portion on the opposite side of the woven cloth sheet. In FIGS. 2 and 3, only one scrim layer is employed to anchor the abrasive layer. As explained hereinafter, often a second scrim is employed for the backing fibrous layer **12** also. Each serves as a good anchor for

the three dimensional fibers. Each scrim also helps prevent "growing" of the pad in hot water to distort the pad. They further comprise a guard means or particle barrier preventing abrasive particles in layer **14** from contacting the user's hand.

The layers are integrally interbonded by compressing the edges **20** together with heated dies or with dielectric dies. The edges are fused to bind the assembly into a unitary laminate by fusion of the thermoplastic binders **15** and **15'** on the inner surfaces of at least one of layers **12** and **14**. If desired, the center **21** may have a fused area also for more secure bonding of the layers. Each layer performs its functions while cooperating with the adjacent layers to form an integral sturdy pad.

The specific steps of formation therefore are: (1) forming layer **14** of randomly disposed three dimensionally oriented fibers in a lofty, uncompacted, loosely assembled condition, (2) placing this layer upon a woven, thin, flexible cloth sheet coextensive with the fibrous layer, (3) needling the fibrous layer extensively to push and hook fibers on the opposite side of the cloth scrim, (4) spraying a mixture of binder and abrasive particles into the first layer, (5) forming and needling a second layer of three dimensional fibers, (6) spraying a binder material into the second layer, (7) curing the binder materials, and (8) applying a thermoplastic binder to the inner surfaces of the layers and fusing the edges of the layers together.

It should be noted that the main body of the pad should not be compressed and fused as in the edge since this would destroy its lofty, resilient characteristics.

THE PREFERRED FORM OF THE INVENTION

Referring to FIG. 3, the preferred form of the invention especially suitable for cleaning ovens and the like with strong chemical reagents is disclosed.

This laminate **10'** is composed of an abrasive fibrous layer **14**, a woven cloth scrim **16** needled to layer **14**, a non-abrasive fibrous layer **12**, and a special non-pervious barrier film **24**.

The layers **12**, **14** and **16** are made in the same manner as that described previously. That is, the fibers are randomly disposed in three dimensions to form the lofty, uncompacted, loosely assembled layers. These fibers again may include at least about 10% of a fusible thermoplastic material such as polyvinyl chloride, polyvinyl acetate, polyvinyl-vinylidene chloride and co-polymers thereof. A flexible barrier film **24** of non-pervious thermoplastic material such as polyvinyl chloride is inserted between layers **12** and **14**, co-extensively therewith. It is capable of fusion upon being heated with hot dies or dielectrically.

The barrier sheet is secured by fusion to the fusible fibers of layers **12** and **14** when the edges of the pad is pressed. The sheet completely prevents passage of strong chemical reagents in the abrasive layer from passing into the layer **12** in contact with the hand. Therefore, even when cleaning ovens and the like, no rubber gloves need be employed. The peripheral edge of this pad is then fused. The barrier film **24** serves to help bond the layers into an integral construction. This joins the pad into an integral construction having excellent abrading qualities on one side, good gripping qualities on the other, hand protective qualities, free of abrasive action on the hand and free of contact of chemicals on the hand. Pressure of the fingers on the lofty pad causes the pad to conform to the fingers, thereby providing good gripping action. Even if the fingers should slip across the surface, no abrasion of them occurs since the abrading material is confined to the opposite side. Each of the layers in the laminate thereby performs at least one, and usually two different functions. Layer **14** provides resilient body to the pad, and provides abrasive characteristics. The cloth sheet **16** forms a barrier for the abrasive particles, retains dimensional stability by preventing the pad from "growing" in hot water, and provides an excellent anchor material for the fibrous layer. The moisture impervious barrier layer **24** prevents passage of harmful chemicals from the cleaning side of the pad to the hand gripping side, and serves to bond the layers together when they are dielectrically fused. The layer **12** provides body, provides excellent hand support with soft feel and finger conformation, and provides finger gripping surface.

The novel pad can be mass-produced from rolls of the layer materials, so that the resulting pad is relatively inexpensive to purchase by the public. The pads are disposable after use, but can be reused several times merely by rinsing and wringing them out as with a rag. The pad can be readily crumpled, folded, or twisted and resumes its normal condition upon the removal of the force. The cloth scrim retains it from disintegration when so doing. It maintains its particular shape, configuration, and porosity in spite of this treatment.

It has been found that a pad can withstand more abuse and has a longer life if a scrim sheet is employed with each fibrous layer. Thus, as shown in FIG. 4, not only layer **14** is needled to a woven flexible sheet **16**, but also layer **12** is needled to a like scrim sheet **16'**. This anchors the fibers more effectively. Whether or not this second sheet is employed, the fibers of layer **12** are needled to intertangle them into an integrated layer.

Various additional advantages of the construction taught will be apparent to those in the art upon studying the foregoing forms illustrated. It is conceivable that certain minor structural modifications can be made in the construction, without departing from the inventive principles taught. Consequently, this invention is not to be limited merely to the illustrated forms depicted, but only by the scope of the appended claim and the reasonably equivalent structures to those defined therein.

I claim:

A cleaning pad comprising: a first layer of randomly disposed, tough, resilient, polymeric fibers bonded at their junctures by a bonding material, and forming a highly porous structure; said layer having abrasive particles dispersed throughout and bonded to said fibers by said bonding material; a second layer coextensive with said first layer and comprising a plurality of randomly disposed, tough, resilient, polymeric fibers bonded at their junctures by a bonding material and free of abrasive particles; a sheet of woven cloth between said first and second layers and needled to one of said layers to anchor said layers and control the dimensions thereof; and a barrier sheet of resilient, flexible, moisture-impervious thermoplastic material between said layers; said thermoplastic sheet having its edges fused to fibers of said layers at the periphery thereof enabling said first layer to be employed with a cleaning reagent for scrubbing and said second layer to be in contact with the hand while the hand is protected from the cleaning reagent.

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