

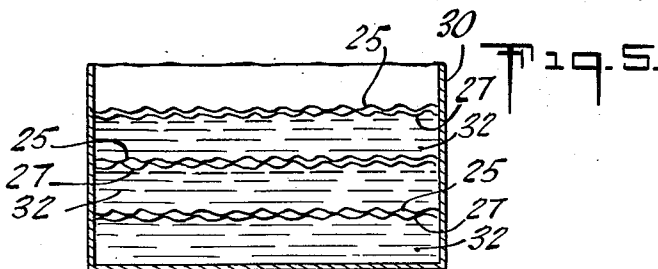
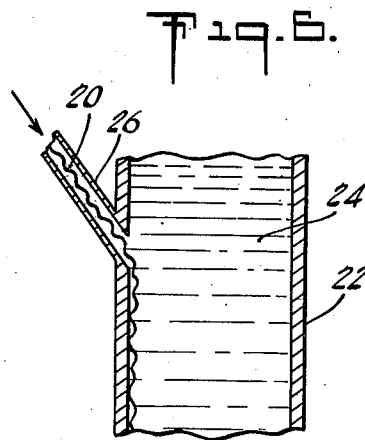
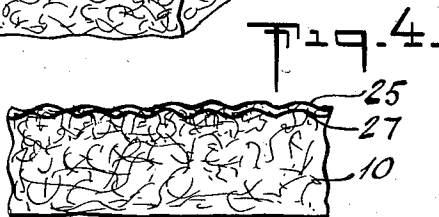
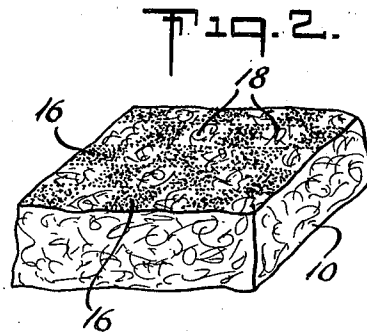
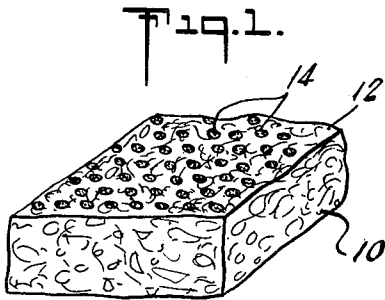
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A. POLITZER ET AL

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ABRASIVE ARTICLE

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INVENTORS
ALFRED POLITZER
LAWRENCE U. STOLL
BY *Melvin H. Gross*
ATTORNEY

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ABRASIVE ARTICLE

Alfred Politzer, Cleveland, Ohio, and Lawrence J. Stoll,
Larchmont, N. Y.

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The present invention relates in general to abrasive devices for use in cleaning, polishing, scouring and in similar applications both of a domestic and industrial nature and to a method of producing the same, and it relates more particularly to an improved abrasive device capable of delivering a liquid to the area of application.

In the cleaning and scouring of kitchen utensils, dishes, enamel and porcelain ware, walls, floors and like surfaces, it has been conventional to employ an abrasive material such as steel wool, copper, stainless steel or other metallic shavings or the relatively softer plastic fibrous masses, or to employ a powdered abrasive or gritty material by means of a wet cloth or sponge. These methods possess numerous disadvantages and drawbacks and leave much to be desired.

Where the steel wool or like material is employed, the inability of the steel wool to carry adequate amounts of water or a detergent solution necessitates the frequent dipping of the steel wool with its attendant inconveniences and time consumption. The use of a powdered abrasive or grit with a wet cloth or sponge, on the other hand, results in a deposit of the grit or powdered abrasive on the scoured surface which must be subsequently removed by washing. Furthermore, where a powdered abrasive or grit is employed, it must be continuously replenished. It has been previously proposed to uniformly imbed in the sponge material a finely divided abrasive such as sand, powdered emery or the like but this has proven to be of little effect since the exposed abrasive is shortly lost and the device no longer serves its designed purpose.

It is thus a principal object of the present invention to provide an improved abrasive device for use in cleaning, scouring, polishing, abrading and similar operations.

Another object of the present invention is to provide an improved device for the cleaning and scouring of kitchen utensils, dishes, porcelain and enamel ware, floors, walls and other surfaces.

Still another object of the present invention is to provide an improved scouring and cleaning device capable of holding large quantities of water or detergent solution and possessing abrasive properties.

Still a further object of the present invention is to provide an improved, highly pliable, scouring and cleaning device capable of absorbing and delivering large quantities of water or other liquids or solutions and characterized by the high retention of the abrasive material.

The above and other objects of the present invention will become apparent from a reading of the following description taken in conjunction with the accompanying drawing wherein

Figure 1 is a perspective view of an improved abrasive device embodying the present invention;

Figure 2 is a perspective view of another embodiment of the present invention;

Figure 3 is a perspective view of still another embodiment of the present invention;

Figure 4 is a transverse sectional view of another embodiment of the present invention;

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Figure 5 is a transverse sectional view, partially broken away, of a filled mold, employed in the improved method for producing the devices illustrated in Figures 3 and 4; and

5 Figure 6 is a vertical sectional view of an apparatus which may be employed in producing the embodiment of the invention illustrated in Figure 3 of the drawing.

Referring now to Figure 1 of the drawing which illustrates a preferred embodiment of the present invention, 10 the numeral 10 generally designates a shallow block or body member of sponge material comprising porous regenerated cellulose. The body member 10 is of a size permitting its convenient manual use and has a rectangular upper face 12. Spaced circular areas 14 located on the 15 sponge body member upper face 12, are coated with a layer of flexible abrasive supporting or containing material. The abrasive may be any suitable finely divided substance such as powdered or ground pumice, sand, emery, Carborundum or similar materials, the particle size and 20 material constituting the abrasive being determined by the use to which the device is to be applied. Thus for the cleaning and scouring of dishes, pans and pots a finely powdered pumice would be preferred, since the released pumice is easily washed from the dishes or pans. The 25 vehicle carrying the abrasive as a coating should preferably be flexible and may comprise any suitable flexible adhesive such as a properly plasticized plastic or rubber cement or any flexible coating material as is well-known in the art which will adhere to the sponge surface. The 30 finely divided abrasive may be admixed with the adhesive vehicle and applied to the face of the sponge at the selected spaced areas in any suitable manner, such as for example by means of a brush through a correspondingly apertured stencil. The abrasive may also be applied to 35 the sponge face by coating the selected areas of the sponge face with a flexible adhesive in the aforesaid manner and dusting the powdered abrasive over the tacky unset coating to which it will adhere.

While the areas coated by the adhesive carrying coating 40 are illustrated in Figure 1 as being circular and regularly arranged, these areas may assume various shapes and arrangements which are preferably regular but may be of random distribution. Thus the configuration of the abrasive coated areas and their arrangement as illustrated in 45 Figure 2 of the drawing is checkered. The areas covered by the abrasive carrying flexible coating is designated by the numeral 16 and alternate with the free uncoated areas 18.

Since the body member 10 may be formed of a coarse 50 pored sponge material it is highly advantageous to form the body member 10 with a face 12 constituted by a permeable skin having pores therein of substantially smaller cross section than the pores in the main body of the sponge. This skin is formed on the sponge incidental 55 to the manufacture thereof, as will be hereinafter described and has heretofore been trimmed from the sponge and either discarded or sold at a nominal price. Large economies and efficiencies are thus realized by employing the skin containing portion of the sponge for producing 60 the improved device and an improved product is achieved.

An example of the preferred method by means of which the sponge may be produced includes the step of steeping sheets of cellulose containing between 36 and 42 pounds 65 cellulose, for example, 39 pounds cellulose in an approximately 18½% sodium hydroxide solution for a time sufficient to alkalinize the cellulose. The excess sodium hydroxide solution is then expressed from the resulting alkali cellulose in the conventional manner and the unaged alkali cellulose is admixed with between 15.6 and 19.5 pounds 70 of carbon bisulphide, for example, approximately 17.5 pounds of carbon bisulphide, and the resulting mixture if tumbled in a suitable drum until cellulose xanthate is

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produced in accordance with the general practice. The resulting cellulose xanthate is dissolved in a weak sodium hydroxide solution in an amount to produce approximately 600 pounds of viscose having an analysis of between 5% and 7% cellulose, for example 6½% cellulose, 5% to 6% of total alkalinity and between 2.3% and 2.6% total sulphur.

To the 600 pounds of viscose in a green unripened condition is then added from 12 to 18 pounds, for example 15 pounds of thoroughly opened hemp fibers or other suitable reinforcing fibers having an average staple length of approximately ¾ inch to ½ inch and thorough mixing is effected, preferably by means of a double delta blade mixing machine while maintaining the mass at a temperature not exceeding 15° C. This initial mixing period is approximately 20 minutes. To the resulting mass is added between 1000 and 1500 pounds, for example 1250 pounds sodium sulphate decahydrate crystals having an average particle size in accordance with desired pore size of the finished device. For example, an average particle size of about 10 millimeters will produce a relatively coarse pore device, whereas an average particle size of about 2 millimeters will produce a relatively fine pore device. The mixing is continued for approximately an additional 10 minutes while maintaining the temperature at about 15° C. or less.

The mass is then deposited into molds or forms of any desirable configuration, preferably rectilinear, and the viscose coagulated and the cellulose regenerated. This may be done by steeping the closed forms into boiling water or into a boiling sodium sulfate solution for the required time, by subjecting them to an atmosphere of high pressure steam in an autoclave, or by raising the temperature of the mass by passing a heavy electrical current therethrough, preferably an alternating current. During the coagulation process, the sodium sulphate decahydrate crystals liquify and a good part of its flows from the mass leaving the corresponding pores. The coagulated blocks are then washed in hot water to remove the remaining sodium sulphate decahydrate and most of the contaminants and the washed blocks are then bleached with a water solution containing about 0.5 gas per liter chlorine in the form of sodium hypochlorite. The bleached blocks are then treated with a hot oxalic acid solution concentration, approximately 2 grams per liter, and again washed to remove all traces of acid. The blocks are then impregnated with a suitable humectant such as glycerin, polyethylene glycol, propylene glycol, urea or mixtures thereof and dried to the desired moisture content.

The finished blocks of sponge are then cut into the desired shapes in any well-known manner, and those sponges including the outer surface of the finished sponge block are advantageously employed in producing the above improved devices described above. This outer sponge surface which is in contact with the mold walls during the coagulation and regeneration process are in the form of a permeable skin containing pores of substantially smaller cross section than the pores of the main body of the sponge and possess many advantages when employed as the base face for the abrasive carrying coating. The skinless sponges may also be satisfactorily employed in producing the improved device described above.

In Figure 3 of the drawing there is illustrated another embodiment of the present invention wherein the numeral 10 designates a regenerated cellulose sponge body member, as in the previous embodiments. A mesh 20 formed of bands, strands, cords, yarns or the like of an abrasive material such as any suitable organic plastic of the desired stiffness, and hardness, many types of which are widely available, is partially imbedded throughout its full area in the upper portion of the sponge body member 10 so that a substantial portion thereof is disposed above the upper face of the sponge body member 10. The mesh 20 may be woven, knitted or otherwise formed. For example,

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the mesh 20 may be knitted thick extruded bands of nylon or a copolymer of vinyl chloride and vinyl acetate approximately 1 mm. wide having approximately six stitches and six courses to the inch.

It has been found that a highly superior product is achieved by employing two superimposed layers of the abrasive mesh and anchoring them to a surface of the sponge by partially embedding them therein. Thus as illustrated in Figure 5 of the drawing, the upper surface of the sponge body 10 carries the superimposed meshes 25 and 27 respectively of abrasive material, the layers 25 and 27 being partially embedded in the sponge 10 and firmly anchored thereto. The mesh layers 25 and 27 may be formed of the same material and be of the same construction as the mesh 20 or may be formed of different materials and may be of different constructions.

A preferred method of producing the improved devices illustrated in Figures 3 and 4 of the drawing is shown in Figure 5 of the drawing. The numeral 30 designates a mold of rectangular cross section formed of metal or an insulating material in accordance with the type of coagulation employed. A layer 32 of the sponge forming mass consisting of viscose, sodium sulphate decahydrate crystals and reinforcing fibers is deposited in the bottom of the mold 10 and upon the upper surface thereof are laid one or two layers of the abrasive mesh in accordance with whether it is desired to produce the articles of Figure 3 or Figure 4 of the drawing. Successive alternate layers 32 of sponge mass and of one or two layers of abrasive mesh are deposited in the mold 30 until the same is filled whereupon the mold is closed in the conventional fashion and the coagulation of the viscose is effected. Thereafter, the coagulated sponge block is washed, purified, treated and dried in the manner above set forth. The sponge layers carrying the layers of embedded abrasive mesh are then separated and cut to the desired sizes. The thickness of the layers 32 of viscose mass are in accordance with the desired corresponding dimension of the end product.

Another convenient and simple method of producing the improved device illustrated in Figure 3 of the drawing is to line the interior faces of the coagulating molds with the abrasive mesh material in one or two layers and thereafter fill the molds with the viscose mass containing the sodium sulphate decahydrate crystals and the reinforcing fibers. The coagulated and regenerated sponge block will have the mesh 20 partially imbedded in its outer faces, the mesh 20 being exposed and anchored to the sponge body along its full extent. The sponge block is then treated, dried and cut as earlier described, those sponges being cut from the surface of the block forming the improved devices.

The devices illustrated in Figures 3 and 4 may be produced in a continuous manner by employing an extrusion die 22 shown in Figure 4 of the drawing the die 22 being preferably of rectangular cross section. The die 22 has its feed end connected to a metered source of the viscose sponge mass 24 containing the sodium decahydrate crystals and reinforcing fibers the mass 24 being extruded through the die by means of a screw press or the like. The discharge end of the die 22 is immersed in a coagulation and regenerating bath as previously described which may be an acid solution or a hot sodium sulphate solution. A downwardly inclined guide channel 26 communicates with the die interior through a side wall thereof and a continuous band of the abrasive mesh 20 in one or more layers is fed through the channel 26 at the same rate of advance as the viscose mass 24. The mesh thus is partially imbedded in the viscose mass which is coagulated as it is exposed to the coagulating bath and is then regenerated. The abrasive mesh carrying sponge is produced as a band of indefinite length which may be continuously treated and dried in the manner previously described and thence cut into the desired lengths.

While there has been described and illustrated pre-

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ferred embodiments of the present invention it is apparent that numerous alterations and omissions may be made without departing from the spirit thereof. For example, whereas the devices are illustrated as of rectilinear configuration they may assume any desired shape. Moreover, the abrasive material may be applied to one or more faces of the device.

What is claimed is:

1. An abrasive device of the character described comprising a body member formed of porous regenerated cellulose sponge material and a mesh of an abrasive material partially imbedded in a face of said body member along substantially the full extent of said mesh at least a portion of said mesh projecting above said face of said body member.

2. An abrasive device of the character described comprising a body member formed of porous sponge material and a mesh of an abrasive material partially embedded in a face of said body member along substantially

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the full extent of said mesh, at least a portion of said mesh projecting above the surface of said sponge member.

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