This invention relates to a new composition matter in general, and particularly to a new abrasive composition and the method of producing the same.

Abrasive compounds of different types are known. The present invention deals especially with a relatively soft, spongy abrasive compound, adapted for roughening and cleansing of various articles and materials, and for the application of cleansing, polishing, and coloring liquids.

Certain materials, such as wool fabrics, cotton fabrics, camel hair fabrics, felt, suede, either artificial or natural, and other rough-surface finish materials, perform the function of combing the roughened surface to their original desired state.

In the production of my spongy abrasive composition, I have further discovered that by a judicious combination of cellulose and mineral fibres, I was able to reinforce the usually brittle mineral fibres, thus preventing them from breaking and separating from the composition, and that I also reinforce the wall structure of the pores, and therefore strengthen the entire body of my composition.

I have further discovered that certain natural vegetable fibres contain certain mineral salts, such as silicates and oxalates, which in themselves are mild abrasives. Such salts may be found, for instance, in sisal hemp, aloë fibres, straw, etc.

I have further discovered that it is essential that a major portion of the different types of fibres used must be so disposed that their ends assume a position at right angles to the abrading surface of my composition, or approximately thereto, and I prefer to so arrange either the mineral fibres alone or the mixture of mineral and vegetable fibres to maintain such position within my composition, whereby the useful life of the latter is considerably enhanced. In other words, when the vegetable fibres are properly combined with the mineral fibres and are arranged so that their ends always form an essential portion of the abrading surface of my composition, I actually reinforce the body of the sponge and retard its wear to a marked extent. It is to be noted that all of the fibres, both mineral and vegetable, must be securely anchored in the non-porous walls of the sponge, so that they may not separate from the spongy body during operation.

Such disadvantage is very evident in heretofore produced abrasive compositions, where powdered or crushed glass, or glass in splinters, powdered carborundum, and milder abrasives of relatively short body length are employed. They usually produce an excessive roughening for short time periods, and when the abrasives fall out from their holding mass, a lack of abrasive action follows.

From the above it is quite evident that only long fibred abrasives or more or less elongated fibre particles are ideal for the purpose intended. However, I have found that still better results are obtained by properly combining and mixing my abrasive fibres, both mineral and cellulose, prior to their introduction into the spongy body.

To accomplish this, I preferably produce fibre twists in the form of cords, or braids in the form of strips, or simply form bundles from a combination of substantially parallelly arranged.
mixed mineral and vegetable fibres, to which I preferably add a rubber composition to be partially vulcanized or pre-vulcanized, whereby the grouped fibres are held sufficiently together to permit their introduction into the mass, from which my sponge rubber abrasive composition is made.

It is to be noted that due to the addition of mineral fibres or strands, the specific weight of my composition is considerably increased, and that I have a sufficient percentage of gassing or forming agents to produce the required pores in my sponge device. These pores are essential, especially for the purpose of absorbing cleansing, polishing or coloring material in liquid form, which is applied to the surface to be roughened during the roughening operation. Incidentally, such procedure more readily facilitates the introduction of such liquid matter, and especially of coloring, due to the fact that the roughening operation so-to-speak opens the pores of the material to be treated, and permits the ready introduction of liquid matter into the open pores, whereby a perfect result is obtained.

My composition may be produced in different ways, and I shall describe several of the major processes employed. In all of the processes I use as major ingredients natural rubber, such as Kongo or Peru rubber, to which I add artificial or substitute rubber, such as vulcanized oils known as factice. I preferably use white factice. Furthermore, I add a rather heavy percentage of a mineral filler, such as chalk or barium, also what I term mineral wax, such as paraffin, ceresin, or both, a vulcanizing agent, such as sulphur, and various types of gas-forming agents, such as ammonium carbonate, oil of turpentine, a mixture of flour, alcohol or chloroform, or a mixture of ceresin and amylacetate. To the above composition I add a certain percentage of a mixture of mineral and vegetable or cellulose fibres in elongated form.

One of the processes employed consists of the following steps: 25 to 40 parts of natural rubber, such as Kongo or Peru, as a plastic, whereupon is added 8 to 12 parts of white factice, 25 to 40 parts of chalk and 8 to 12 parts of spun glass fibres and 5 to 9 parts of vegetable or cellulose fibres. The rolling is continued until all of the above ingredients are thoroughly mixed, whereupon I add 1.5 to 3 parts of ceresin, 1.5 to 3 parts of oil of turpentine, and 1.5 to 2.5 parts of sulphur. These added ingredients are now well intermixed with the previously rolled compound and the mixture is repeatedly re-rolled and finally rolled to a desired thickness, placed into forms and vulcanized. The forms are preferably rectangular in shape and, depending upon their depth, smaller or larger pores are produced during vulcanization. When the forms are shallow, the pores are relatively small, whereas in a deeper mold, the pores grow correspondingly larger. Due to the fact that all abrasive fibres, both glass and cellulose, are elongated, and are introduced in a certain pre-arranged manner, the rolling operation preceding vulcanization causes the fibres to assume a so-to-speak one-directional position relative to the body of the mixture, whereby all non-porous walls of the cells or pores of the finished spongy product carry imbedded longitudinal abrasive fibres, which, due to their one-directional arrangement, present an effective surface when the finished material is cut at substantially right angles to the direction of the fibres.

A variation of the aforesaid process is as follows: All the aforesaid ingredients, with the exception of the glass fibre, are employed and are dealt with in the manner outlined, except that some of the vegetable or cellulose fibres are retained for later use, and one percentage of cellulose fibres are mixed with the rubber composition. Before the mixture is ready to be vulcanized, the vegetable or cellulose fibres and the glass fibres are grouped into parallel relations and preferably are intermixed with a rubber compound, and subjected to a short period of pre-vulcanization.

The above indicated rubber composition is then rolled out into thin sheets which are cut to uniform sizes, whereupon I arrange several courses of superimposed layers, starting with a sheet of rubber composition, whereupon I place a layer of the mixed, pre-vulcanized cellulose and glass fibres, then another rubber composition sheet, another fibre layer, etc., until the top layer of a composition rubber sheet finishes the column. Thereupon I copurses all the superimposed courses so that the rubber composition of the sheets absorbs the layers of the combination cellulose and glass fibres. After this compression, the whole body is placed into forms and vulcanized. The finished product is then cut at substantially right angles to the longitudinal fibres, whereby pads are produced which may be provided with a suitable reinforcing backing for immediate use.

A slight modification of the immediately preceding method consists in the introduction of the combined cellulose and glass fibres in the form of twists, cords or braids, which are preferably vulcanized, and formed into layers, prior to the final vulcanization of the stock-up courses of rubber composition and abrasive fibres.

While the above described rubber composition produces a very good sponge rubber body, I have found that the following mixture may be employed with equally good success: I use 25 to 40 parts of Peru rubber, 10 to 25 parts of white factice, 1 to 2 parts of paraffin, 10 to 20 parts of barium, 8 to 12 parts of chalk, and 6 to 9 parts of sulphur. The gas-forming agent in this composition consists of a mixture of 8 to 12 parts of flour, 6 to 8 parts of alcohol, and 2 to 12 parts of chloroform. With this gas-forming agent, I may employ a composition containing 1 to 2 parts of ceresin with 8 to 12 parts of amylacetate. With either of the gas-forming agents I use 12 to 14 parts of glass fibres or strands mixed with 3 to 4 parts of vegetable or cellulose fibres. The procedure of forming alternate courses or layers of rubber composition and combination glass and vegetable fibres is the same as described above.

It is to be noted that in both compositions stated herein the quantities or parts referred to indicate weights; that by cellulose fibres I understand fibres of vegetable origin, which however may be in spun form. Nevertheless, I prefer the use of natural vegetable fibres, such as mentioned herein before, since those fibres are more particularly combining what may be termed miniature brushes which produce a combing action. This brush formation is due to the natural structure of the fibres which consists of a great number of very fine, hairy threads or filaments which spread out when subjected to friction, and more so when simultaneously exposed to moisture. In order to graphically illustrate my method of producing an abrasive composition, from which
handy abrasive pads may be made, I introduce the accompanying drawing, in which:

Figure 1 is a finished pad ready for use without a backing.

Fig. 2 is an enlarged partial perspective view of an abrasive pad showing relatively small pores. Fig. 3 is a partial enlarged perspective view of an abrasive pad with relatively large pores. Fig. 4 is a partial end view of alternate courses of rubber composition sheets and layers of abrasive fibers employed in my process prior to the final vulcanization step.

Figs. 5 and 6 illustrate similar end views, wherein, however, the abrasive fibers are grouped or combined differently.

Fig. 7, which is a plan view of a portion of a stack of layers with parts of the different layers exposed.

Fig. 8 shows one arrangement of parallelly grouping or bundling glass and vegetable fibers. Fig. 9 is a typical cross sectional view taken on line 3—3 of Fig. 8.

Fig. 10 illustrates a braided arrangement of vegetable and glass fibers.

Fig. 11 is a cross sectional view taken on line 11—11 of Fig. 10.

Fig. 12 illustrates a cord-like grouping of vegetable and glass fibers.

Fig. 13 is a cross sectional view taken on line 13—13 of Fig. 12.

Fig. 14 is an enlarged view of a portion of my finished abrasive material, prior to cutting it into pads and Fig. 15 is a microscopic enlargement of a portion of my abrasive pad produced by the aforesaid method.

Referring now specifically to the drawing, pad 16 of Fig. 1 is a typical illustration of a spongy abrasive pad produced by my method and cut off from body 11, shown in Fig. 14 of my finished composition. In Fig. 2 is indicated a portion of a pad 12, similar in all respects to pad 16 of Fig. 1, which, however, is provided with a backing 13 to reinforce the body of the pad. It will be observed that all the fibers which form the abrasive elements of the pad are arranged vertically, as clearly indicated at 14. In Fig. 12 it will be also seen that the pores of the spongy material are relatively small whereas in Fig. 3 the pores are considerably larger. From this figure it will be evident that pad 16, provided with a backing 16, also carries in the substantially non-porous walls of its pores elongated abrasive fibers 17, which are perpendicular to the abrading surface indicated at 18.

Referring to Fig. 4, there are illustrated alternately super-imposed courses of rubber composition 19 and fiber layers 20. These fiber layers consist of evenly intermixed loose mineral and cellulose fibers, arranged in parallel relationship with rubber and forming courses of uniform thickness. It will be observed that the bottom layer 19' and the top layer 19'' are made of rubber composition and that both these layers are shown of the same thickness as rubber layers 18. If prefer, however, to employ thicker layers for the top and bottom.

Similar arrangements of alternate courses of rubber composition sheets and abrasive fiber layers are illustrated in Figs. 5 and 6, wherein the rubber layers in Fig. 5 are indicated at 21, while the fiber layers are marked 22. Rubber layers 23 correspond to rubber layers 19 of Fig. 4, whereas the fiber layers are composed of groups of intimately combined glass and vegetable fiber strands, which are preferably pre-vulcanized and then uniformly placed between rubber layers 21. This grouping of fiber strands is preferably accomplished by either forming fiber cords such as illustrated in Figs. 12 and 13, or by a grouping of parallel loose strands of the type shown in Figs. 8 and 9.

Referring now to Fig. 6, there are again shown courses 23 of rubber composition, between which are arranged layers of grouped abrasive fibers, indicated at 24. These layers of abrasive fibers correspond to the braided form of fibers observed in Figs. 10 and 11. In all types of fiber groupings it is preferable to pre-vulcanize the fibers together before forming them into even layers between the rubber sheets.

Obviously, all of the fibers, no matter in what form, are preferably arranged substantially parallel to one another or when grouped fibers are used, they are also arranged in longitudinal fashion and in one direction only, as clearly illustrated in Fig. 7. When the alternate courses of rubber sheets and fiber layers are stacked up to a desired height, they are forcibly compressed and placed into forms to be vulcanized. The finished product shown at 11 in Fig. 14 is then cut perpendicularly to the direction of the abrasive fibers.

Fig. 15 clearly demonstrated that the finished product is composed of a spongy rubber mass in which the substantially non-porous walls of the pores or cavities 26 are uniformly studded with the ends of the combined, evenly distributed abrasive fibers which form part of the abrading surface of the finished product.

While the aforesaid processes, in conjunction with the accompanying drawing, and the ingredients mentioned represent the essential steps and arrangement to be followed in my method, and while I have stated certain proportions of the ingredients employed, and although I am aware of abrasive compositions using similar ingredients, I believe to be the first who introduces into a spongy rubber base a mixture or a combination of vegetable or cellulose fibers with mineral fibers, such as glass strands, whereby entirely new results are procured, in that the glass strands and the fiber strands cooperate with one another so that while the former are utilized for roughening the material to be abraded, the latter comb the worked-out fibers, and while the abrasive action is taking place, liquid matter, absorbed by the pores of the composition, may be conveniently and efficiently introduced into the newly abraded surface.

Furthermore, I believe to be the first who not only employs a combination of elongated mineral and cellulose fibers, but who, realizing the increased weight of the rubber composition due to the addition of heavy mineral fibers, incorporates new, efficient and sufficient gas-forming agents to provide, in spite of the increased weight of the body, a sufficient amount of pores in the finished product for effectively absorbing liquid agents to be introduced into the roughened surface of the material to be treated.

I also believe to be the first, who has developed an abrasive composition of a spongy nature, wherein the usually frail, non-porous walls of the cavities or pores are effectively reinforced by at least two types of elongated abrasive matter, and due to which wall-reinforcement of the cells the relatively infirm body of the whole structure is substantially strengthened, where
4. and wherein the base, proir to being cured, consists of a composition of natural rubber, a rubber substitute, mineral filler, mineral wax, sulphur and a gas-forming agent, and wherein the abrasive mineral fibres are spun glass.

5. As a new abrasive product, set forth in claim 4, and wherein the base, prior to being cured, consists of natural rubber, such as Perubber, rubber substitute, such as white factice; mineral filler, such as chalk; mineral wax, such as ceresin; a gas-forming agent, such as oil of turpentine; a rubber stabilizing agent, such as sulphur; and wherein the mineral fibres are spun glass strands, and wherein the cellulose fibres surround and reinforce said mineral fibres.

6. A new abrasive product, set forth in claim 4, and wherein the base, prior to being cured, is a sponge rubber composition consisting of 25 to 40 parts of natural rubber, 8 to 25 parts of rubber substitute, 18 to 40 parts of mineral filler, 1 to 3 parts of mineral wax, 1.5 to 24 parts of a gas-forming agent and 1.5 to 9 parts of a vulcanizing agent, and wherein the mineral abrasive fibres form 8 to 14 parts, and the cellulose fibres 3 to 9 parts of the finished product.

7. A new abrasive composition comprising a resilient vulcanized rubber sponge body, wherein the entire volume of the pores contains a base formed by a mixture of elongated spun mineral and natural vegetable fibres so disposed that the ends of the fibres always constitute a substantial portion of the abrading surface of the composition.

8. The process of producing a new abrasive composition, which comprises rolling to a smooth, flat body a quantity of natural rubber, adding thereto a rubber substitute, a mineral filler, elongated cellulose fibres, continuing the rolling operation until the ingredients are intermixed, thereupon adding mineral wax, sulphur and a gas forming agent, re-mixing by rolling all of the ingredients, rolling the mixture into thin sheets, forming alternate courses of such sheets and of layers of evenly distributed, substantially parallelly arranged, elongated mineral fibres, compressing the latter into the former, replacing the compressed mass and cutting the vulcanized product at right angles to the direction of the mineral fibres.

9. The process of producing a new abrasive composition which comprises, firstly, rolling to a smooth, flat body a quantity of natural rubber, and secondly, adding thereto white factice, a mineral filler and elongated cellulose fibres, thirdly, continuing the rolling operation until all of the above ingredients are thoroughly intermixed, fourthly, thereupon adding a mineral wax, gas producing agents and sulphur and continuing the rolling operation until all ingredients are well intermixed, then re-rolling the mixed rubber mass into thin sheets, forming long-fibred cellulose strands within and surrounding the sheets, vulcanizing the compressed courses and forming abrasive pads from the vulcanized product by cutting the latter at an angle to the direction of the combined strands.

10. The process of producing a new abrasive composition as set forth in claim 10, and wherein said cellulose and mineral strand are grouped, combined and mixed together with a rubber com-
position and are partially vulcanized, before being formed into layers.

12. The process of producing a new abrasive composition as set forth in claim 9, and wherein said cellulose and mineral strands are mixed by twisting them into cords or braids, adding a sufficient amount of rubber to the twisted strand mixture and setting the strands by partial vulcanization prior to being formed into layers, and wherein said set cords or braids are arranged, closely together and substantially parallel to one another when formed into layers, and wherein the cords or braids of all layers are disposed in one direction only throughout the several courses between the rubber mass sheets before their compression and before the final vulcanization step.

13. The process of producing a new abrasive compound, which consists of preparing a rubber mass adapted to be converted by vulcanization into a sponge rubber base of relatively high specific weight, forming sheets from the mass, placing between each two superimposed sheets layers of the mixed fibres in uniform thickness so that the fibres are arranged in one direction only, compressing the sheets and fibre layers, vulcanizing the laminated structure and cutting pads from the vulcanized product at an angle to the direction of the fibres.

14. The process of producing a new abrasive implement, which comprises forming a vulcanizable sponge rubber base, introducing thereinto a mixture of elongated cellulose and mineral fibres so that upon vulcanization they will be uniformly distributed throughout the base and their major portion is disposed in one direction only and is imbedded in and forms reinforcements of the substantially non-porous walls of the finished spongy product, and forming abrasive pads by cutting the product into strips at an angle to the direction of the fibres.

15. The process of producing a new abrasive implement, as set forth in claim 14, and securing a backing to said pads.

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