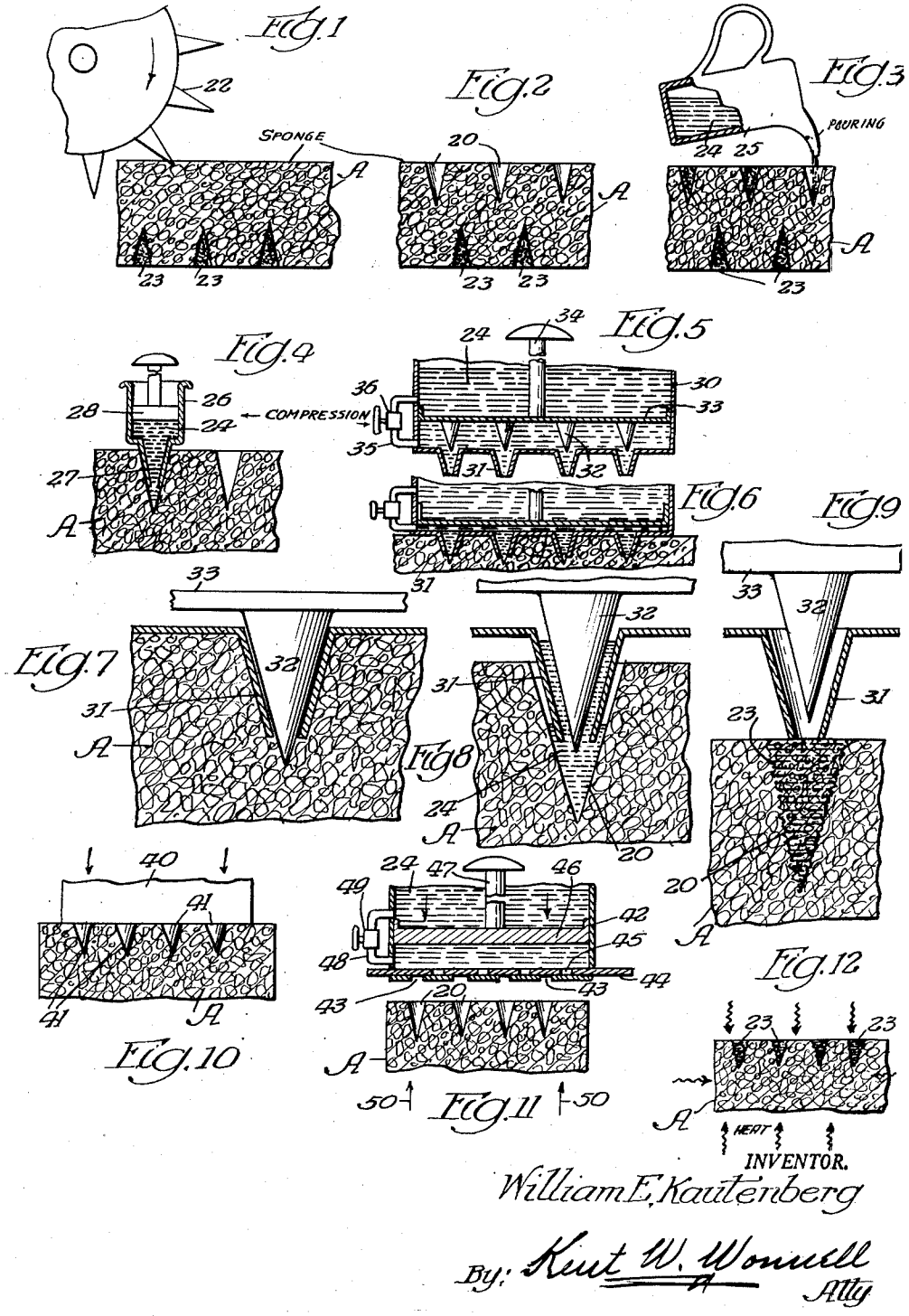
May 13, 1952 W. E. KAUTENBERG 2,596,565

REINFORCED SPONGE AND METHOD OF REINFORCING IT

Filed Sept. 23, 1946



INVENTOR.

William E. Kautenberg

By: Kent W. Wonnell

Atty

Patented May 13, 1952

2,596,565

UNITED STATES PATENT OFFICE

2,596,565

REINFORCED SPONGE AND METHOD OF REINFORCING IT

William E. Kautenberg, Freeport, Ill.

Application September 23, 1946, Serial No. 698,735

4 Claims. (Cl. 15—244)

1

This invention relates in general to the method of reinforcing a block or mass of cellular material by inserting or engaging a number of particles of tougher but somewhat similar flexible material therein, and to the article produced thereby. The invention is described as applied to a cellulose sponge which is relatively weak if continuously used and applied and requires reinforcement to increase its wearing qualities and to prevent the tearing of the sponge when it is put to a severe strain such as in mopping a floor or shampooing a rug.

An important object of the invention is to provide a cellulose type of sponge with reinforcements of material which is both flexible and yielding, and which adds a definite strengthening material to the original sponge.

A further object of the invention is to provide means for introducing an interengaging and reinforcing material into a cellulose sponge.

A further object of the invention is to provide means for injecting a reinforcing flexible resilient material into an open or cellulose sponge and under compression or pressure.

Still a further object of the invention is to provide means for introducing or forcing a resilient heat responsive material into pores or openings made from the surface of a sponge so that the new material interengages with the material of the sponge and in heat treating the reinforcing material to harden, set, or vulcanize it in place.

Other objects of the invention will appear in the specification and will be apparent from the accompanying drawings in which,

Fig. 1 illustrates somewhat diagrammatically a means for making perforations in sponge material in accordance with this invention; Fig. 2 is a sectional view of the sponge material after the perforations are made; Fig. 3 shows the method of filling the perforations with a plastic hardening material; Fig. 4 illustrates means for applying a hardening material under compression to perforations in a spongy material; Fig. 5 is a sectional view of an apparatus for applying plastic material to the perforations of a spongy material in accordance with this invention; Fig. 6 illustrates the apparatus of Fig. 5 in forming perforations in a spongy material; Figs. 7, 8 and 9 are enlarged views illustrating somewhat diagrammatically, and in succession, the making of a perforation in spongy material, the partial withdrawal of the perforating means and partial entry of the reinforcing material into the opening, and the complete withdrawal of the apparatus and the filling of an aperture with the reinforcing material;

Fig. 10 is a sectional view illustrating the making of a plurality of openings in a spongy material;

2

Fig. 11 is a sectional view illustrating an apparatus in section for applying a reinforcing material under pressure to the perforations of a spongy material which is ready for application to the apparatus; and

Fig. 12 is a sectional view of a piece of spongy material with reinforcing material filling the perforations thereof and to which heat is applied for vulcanizing or setting the reinforcing material.

When a block of cellulose sponge is used in a floor mop or for cleaning a rug, the pull or drag on this sponge material is of considerable strength, and it tends to strain the sponge material so that in a short time it will tear apart or break open, and will rapidly disintegrate.

The present invention has for its object to provide a reinforcement for a material of this kind which consists generally in making a number of holes in the surface of the cellulose sponge and in pouring reinforcing material, or forcing it under pressure into each individual hole. This may be done by providing an awl shape tool to make the openings and then pouring, filling, or injecting material into the opening; or the awl itself may be hollow with means for expelling the reinforcing material from the end of the hollow awl as it is withdrawn; or a number of openings, preferably conical shaped, may be made in the surface of the material to be reinforced, and then the reinforcing material may be applied by compression to the openings, filling up the formed openings in the material and also causing the reinforcing material to spread through the interior of the sponge material adjacent the openings because of the voids and natural pores and fissures of the sponge itself.

Referring now more particularly to the drawings, a block A of sponge material either comprising an ordinary sponge or more particularly a block of cellulose sponge, has a plurality of openings 20 formed in and from its surface or surfaces preferably conical in shape which may be made with a single awl-like instrument or by means of a roller 21 having a number of awl-like projections 22 therefrom.

Into these openings 20, blocks 23 of reinforcing material, usualy flexible, resilient and adherent to the sponge, such as rubber latex 24, is introduced as by pouring it from a suitable container or vessel 25. The block of material thus treated is set aside until the reinforcing material 23 sets or hardens. Since the reinforcing material is liquid, it will flow readily into the natural pores, voids and fissures which are intersected by the openings 20. If desired, the openings 20 may be filled by a compression device as shown by Fig. 4 having a casing 26 with a hollow conical stem 27 into which the reinforcing material is placed and from which it is expelled by

a plunger 28 in the casing. By forcing it under pressure from the casing, it tends to spread throughout the pores and openings adjacent to the formed hole and to reinforce it in this manner.

To provide a multiple machine for accomplishing a similar result, a casing 30 as shown in Figs. 5 and 6 has a plurality of hollow conical projections 31 open at their extremities into which similar conical points 32 are inserted, the extremities of the points projecting beyond the hollow projections 31. These points 32 are mounted upon a plunger 33 movable somewhat closely in the container and operated by an upwardly projecting plunger bar 34. Adjacent the bottom at one side of the container is a by-pass 35 having a valve 36 therein, the by-pass to extend around the plunger in a lowered position to admit a quantity of the reinforcing material 24 from the upper or main portion of the container to the space below the plunger 33. The operation of this apparatus will be more clearly understood from Figs. 7, 8 and 9 in which Fig. 7 represents the making of the holes with the projections 31 and the pointed extremities 32 together; Fig. 8 shows the conical projection 31 partially withdrawn from the hole and the reinforcing material 24 passing between the conical projection 31 and the pointed extremities 32 which are partially spaced therefrom; and Fig. 9 showing the conical projection 31 and the pointed extremity entirely removed from the sponge A, the hole 20 filled with the reinforcing material and hardened into a conical plug of reinforcing material which extends into the adjacent pores and fissures of the sponge A.

To introduce the reinforcing material into the sponge under pressure other than of the weight of the reinforcing material, the method illustrated by Figs. 10 and 11 may be utilized. To a block of sponge material A, a multiple awl device 40 is applied having pointed projections 41 for making multiple openings in any surface of the sponge material. After the openings are formed, the multiple awl is removed, and applied to the surface of the sponge containing the openings is a container 42 having bottom openings 43 corresponding in size and position to the openings in the material A produced by the multiple awl 40. Inside of the container but preferably movable from the outside thereof is a multiple valve plate 44 for closing the openings which also has a plurality of openings 45 movable to register with the openings 43. Within the container 42 is a plunger 46 having means such as a plunger rod 47 for operating it to compress reinforcing material 24 from the container through the openings 45 and 43 from the bottom thereof.

A by-pass 48 with a valve 49 admits any measured quantity of the reinforcing liquid from above the plunger 46 to the lower side thereof so that when the perforated block A is pressed upwardly against the bottom of the receptacle 42, the valve 44 moved to uncover the openings 43, the reinforced material 24 is expelled under pressure into the proper openings 20 of the block.

For some materials such as rubber latex and other heat responsive plastics, it may be desirable or necessary to subject the block A thus filled with reinforcements 23 to the action of heat for setting or curing the reinforcements in place.

With this construction and method of reinforcing, the reinforcing plugs or masses of material may be inserted from one side or from all sides of the block or sponge to be reinforced; they may be as shallow or deep as desired; and they may be spaced closely or more remotely depending upon the service to be performed. The reinforcing material may flow in place; it may be pressed into the several openings, or it may be forced under compression into the openings and allowed to harden or set, or even to be heat treated and vulcanized in place.

Although these several methods of reinforcing have been illustrated and described in some detail, these constructions should be regarded by way of illustration and example and not as a limitation of the invention.

Various changes in the construction, combination and arrangement of the parts may be made without departing from the spirit and scope of the invention.

I claim:

1. The method of reinforcing preformed cellulose sponge with latex which comprises forcing separate and independent smaller masses of latex into the sponge and extending into the adjacent communicating pores and fissures, and allowing the latex to harden or set in place.

2. The method of reinforcing preformed cellular sponge with latex which comprises, punching separate openings into the sponge from the surface and removing the punches, filling the openings with latex, and applying pressure to the latex in the openings causing it to flow into the natural sponge pores and fissures in communication with the openings to form independent reinforcing masses.

3. The method of reinforcing a relatively fragile preformed cellulose sponge material with a relatively stronger heat responsive material which comprises, producing separate openings in the sponge extending inwardly from the surface but not through the material, filling the openings with the heat responsive material, applying pressure to the heat responsive material to force it into the natural pores and fissures of the sponge which communicate with the openings, and heating the heat responsive material in place causing it to harden or set in independent masses and adhere more firmly to the sponge material.

4. A new article of manufacture comprising a block of cellulose sponge material having openings extending from the outer surface inwardly intersecting and communicating with the internal sponge pores and fissures, and a reinforcing filler of hardening latex inserted into the openings in separate and independent masses for each opening and extending into the pores and fissures and adhering to the inner material of the sponge.

WILLIAM E. KAUTENBERG.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,180,516	McIndoe	Apr. 25, 1916
1,348,259	Wilber	Aug. 3, 1920
1,447,708	Caffrey	Mar. 6, 1923
1,978,620	Brewster	Oct. 30, 1934
2,186,050	Vaughn	Jan. 9, 1940
2,210,967	Vaughn	Aug. 13, 1940
2,232,389	Jurkat	Feb. 18, 1941
2,268,403	Kingman	Dec. 30, 1941
2,380,762	Jackson	July 31, 1945