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J. W. BAYMILLER ETAL

3,196,478

APPLIERS

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Fig. 1

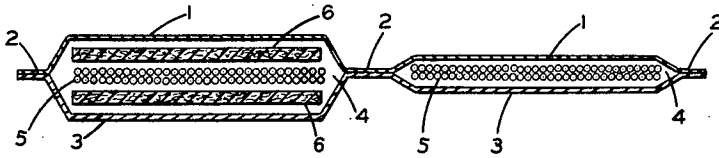


Fig. 2

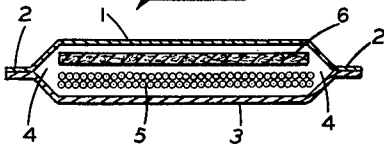


Fig. 3

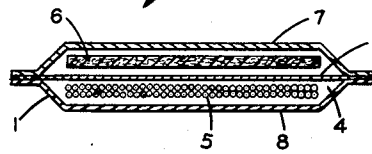


Fig. 4

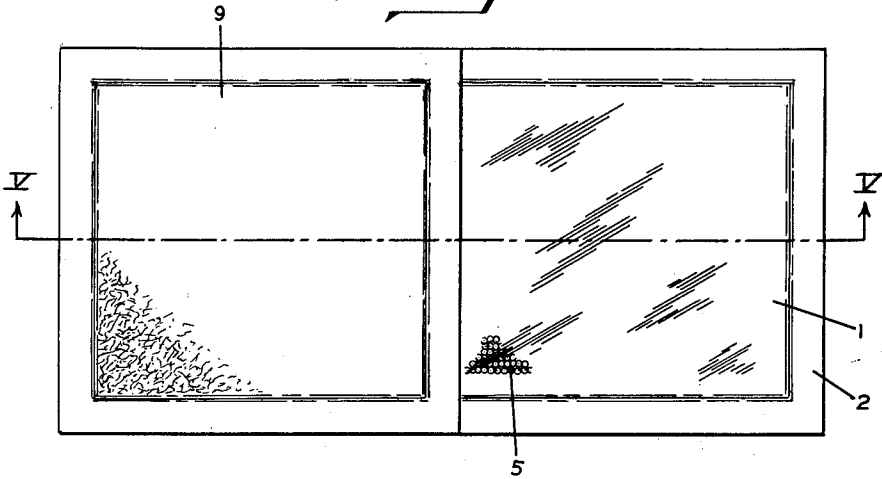
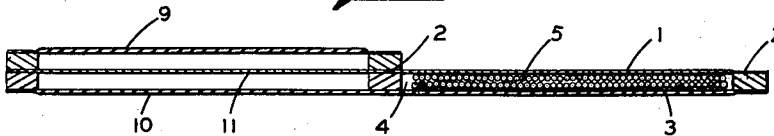


Fig. 5



INVENTOR.

JOHN W. BAYMILLER

WILLIAM A. MOGGIO

BY

Theodore L. Thomas

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3,196,478
APPLIER

John W. Baymiller, Manheim Township, Lancaster County, and William A. Moggio, Millersville, Pa., assignors to Armstrong Cork Company, Lancaster, Pa., a corporation of Pennsylvania

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13 Claims. (Cl. 15—534)

This invention relates generally to an article for applying liquids to surfaces. More particularly the invention relates to an applicator adapted to supply a controlled amount of liquid to a surface to be treated. Still more particularly, the invention relates to an applicator which remains dry during storage and which on gentle pressure produces a controlled amount of liquid.

There is a need for an article which can conveniently store a wide variety of liquids normally used for treating various surfaces, and conveniently deliver the liquid to the surface when needed. Such liquids have been stored in the past in bottles, cans, dispensers, and other containers. Such containers normally hold much larger amounts of the liquid to be used than is needed for a single application. Thus in spot removers for clothing, rug and upholstery cleaners, nail polish remover, leather cleaners, adhesives, and many more articles, it is customary to use the liquid repetitively from the same container each time the need for the liquid arises. There is a need for the added convenience of an applicator adapted for a single application which may be thrown away after use if desired, but which may, until use, be stored in dry form without fear of spillage, evaporation, or hardening as may be encountered when the liquids are stored in the more usual containers.

It is the primary object of the present invention to supply such an applicator. It is another object of the present invention to supply an applicator which can deliver a controlled amount of liquid to a surface to be treated. It is still another object of the present invention to present a disposable applicator which may be conveniently and economically thrown away after a single use.

These objects are achieved in a surprisingly straightforward and effective manner. The invention contemplates an applicator comprising at least two flexible opposing sheets. These sheets are circumferentially sealed together over a portion of their opposing faces to define an enclosed pouch between the two sheets, the pouch being encompassed by the sealed area. Positioned inside the pouch are a plurality of pressure-rupturable capsules containing the liquid to be applied to a surface. One of the two sheets defining the pouch is impermeable to the liquid, while the other of the two sheets defining the pouch is porous and adapted to allow passage of the liquid from the pouch to the surface to be treated when at least a portion of the capsules in the pouch are ruptured.

The basic design of the applicator of the present invention contemplates a plurality of capsules containing an encapsulated material sandwiched between two sheets to form a capsule pad such that when the facing side of the pad is placed on a surface, and moderate hand pressure is applied against the back of the pad, the capsules will rupture and release their contents through the porous pad facing.

Encapsulated liquids lie at the heart of the present invention. The applicator may properly be referred to as a capsule pad. A wide variety of liquids may be encapsulated and utilized in the applicator of the present invention. These liquids may be fully encapsulated by the process set forth in U.S. Patent No. 2,766,478—Raley et al., the disclosure of which is hereby incorporated herein by reference. This patent describes the processes that may be used for encapsulating a wide variety of liquids in a wide variety of

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capsules. The apparatus of U.S. 3,015,128—Somerville may be used. The resulting capsules are pressure-rupturable and may be produced in a variety of sizes. For the purposes of the present invention, however, it is preferred that capsules no smaller than about 500 microns be used. With smaller capsules, the proportion of contained liquid to wall material becomes sufficiently small as to be inefficient in the applicator. Additionally, capsules which are smaller than the stated minimum may lodge in corners of the pouch in which they are carried or rest between fibers and thus escape rupturing from finger pressure with the attendant loss or nonavailability of the encapsulated liquid. The maximum size of capsules for the present use will be about 3,000 microns. Capsules larger than this maximum deprive the applicator of the feature of controlled release of the liquid in that pressure of the fingers will rupture the few large capsules contained in the pouch, thus releasing most of the available liquid all at once. Additionally, capsules larger than the stated maximum produce a bulky capsule pad, one which occupies more room in storage in a box or the like than is warranted. The preferred range of size of these capsules in the applicator of the present invention is in the range of about 1,500–2,500 microns. For many users the preferred size is 2,500 microns.

It will be seen that the number of capsules in the pouch will vary to some extent, depending on the exact size of the individual capsules. In order to achieve the controlled release of the liquid, the pouch will contain at least 50 capsules, and preferably about 200 capsules. No more than about 1,000 capsules should be present in the pouch because the capsule size will then be sufficiently small to be objectionable as described above.

A wide variety of liquids may be encapsulated. Any liquid may be encapsulated in a shell provided that the liquid does not react with or dissolve the material used for the shell. Aqueous and nonaqueous liquids, solutions, suspensions, and emulsions, may be used. The exact nature of the encapsulated liquid will be determined by the ultimate end use of the capsule pad. If the applicator is to serve as a spot remover for clothing, or a rug and upholstery cleaner, or a clean-up pad for use after painting, or an auto tar remover, or a hand cleaner, then the encapsulated liquid may be carbon tetrachloride or naphtha. If the applicator is to be used as a nail polish remover, the liquid will be primarily an ester such as amyl acetate. A shoe polish cloth will utilize, for example, a naphtha solvent, a black dye, and dissolved wax or resin; most of the liquid shoe polishes now on the market may be encapsulated and used in the applicator of the present invention. A furniture polish cloth made according to the present invention will have a liquid furniture polish comprising for example a solvent such as naphtha, a wax, and a silicone. A furniture scratch remover will incorporate a liquid stain in the capsules. Black mark remover for removing the black heel marks from resilient and wood floors and the like will contain for example a naphtha-based solution of a wax. An applicator for an insect repellent will contain any of the known liquid repellents such as the large molecule liquid alcohols, for example hexane diol, or the dialkyl phthalates such as dimethyl phthalate. Metal cleaners such as silver cleaner and copper cleaner may contain, respectively, a solution of urea and a solution of ammonium sulfamate. An applicator for placing a layer of an anti-fog liquid on a windshield of an automobile may contain glycerin or a glycol. Applicators for placing a layer of oil on sporting equipment such as guns, baseball gloves, outboard motors, and the like will contain simply encapsulated oil of the desired viscosity. Special purpose liquids such as odorless mineral spirits and 1,1,2-trichloroethane have been encapsulated as have various mixtures of compounds such as mixtures of ketones with hydrocar-

bons to be used as nail polish removers. Wetting agents and silicones in liquid form have also been encapsulated.

The material used to form the shell or wall of the capsule will be selected on the basis of nonreaction with the encapsulated liquid and an ease of capsule formation. Several such materials are described in the above-mentioned Raley et al. patent, provided the conditions there described are met. Alginic acid is a useful encapsulating medium, as is a mixture of alginic acid with poly(vinyl alcohol) and a gelatin. A mixture of these three ingredients in the ratio of 3.5:7.0:1.0 makes a good all-around encapsulating material for the encapsulation of hydrophobic materials. Aqueous systems may be encapsulated in a mixture of chlorinated polyethylene and ethylene-vinyl acetate copolymer dissolved in a suitable solvent such as benzene or toluene.

The capsules are contained in a pouch formed by circumferentially sealing two opposing sheets around the circumference of the area defined by the pouch. One of the two sheets must be substantially impermeable and impenetrable by the liquid contained in the capsules. The other of the two sheets must be porous so that the liquid will pass through to the surface to be treated once the capsules are ruptured. Both sheets will be flexible and deformable so that the pressure of the fingers can rupture the capsules through the backing or impermeable sheet. The porous or facing sheet will have sufficient strength to withstand the conditions of application. In some instances these conditions may not be very stringent as when an insectifuge is patted onto the human skin. In other applications as where a paint remover is released to remove a spot of paint from a wall, window, or other object, the porous sheet will have to possess sufficient strength to withstand the requisite amount of rubbing.

As examples of the impermeable or backing sheet, there may be mentioned polyethylene, cellophane, polypropylene, poly(vinylidene chloride), polycarbonates, and the various polyester films. Additionally, there may be used metallic foils such as aluminum foil. Sheets or films of acrylics and acrylates may be used. Polyurethane sheets and any of the synthetic rubbers may be used in sheet or film form, as may natural rubber. A variety of flexible papers may be used provided the paper is impermeable to the liquid to be released from the capsule. Papers may be rendered impermeable by being coated with a wide variety of resins or rubbers, or by being prepared by any of the known beater saturation processes which coat at least a portion of the individual fibers with a suitable binder material prior to formation of the web. These impermeable sheets are sufficiently impermeable not to stain the fingers or otherwise allow an annoying amount of the liquid to penetrate once the capsules are ruptured.

The flexible porous or face material may be the same material used for the impermeable backing material, providing holes, slits, or other openings have been made in the impermeable sheet in order to allow the transmission of liquid therethrough. The porous sheet may be a textile or textile-like material, a felt, or any of the nonwoven sheets. Additionally the face material may be an open-celled foam as for example poly(vinyl chloride), polyurethane, foamed rubber, or other foamed resin. These materials must all be open-celled in order to allow the transmission of the liquid therethrough. Thin sheets of such open-celled foams may be particularly suitable for use where the liquid is to be patted or otherwise applied to human skin. Textiles, felts, and other nonwoven fabrics and materials may carry distributed through the fibers which make up the sheet abrasive grits or particles as an aid in removing spots or other coatings when the applicator of the present invention is used. Screens and meshes of wire or other strands may be advantageously used.

Both sheets may be attractively colored as desired and they may bear printing in the nature of directions, deco-

rations, and advertising. The circumferential seal defining the pouch may also be achieved by sewing the opposing faces of the sheets together. Both the package and the pouch may be of any desired shape, such as square, rectangular, hexagonal, triangular, round, oval, or non-geometric. Pouches and pads having the shape of letters or other symbols may be used.

If desired, the pouch may contain a layer of an absorbent material such as a felt which will act as a reservoir for the encapsulated liquid once it has been released from the capsules by rupturing the capsules. Such a layer of absorbent material may be positioned in any convenient place on the applicator of the present invention depending on the particular role to be served. For example, the layer of absorbent material may be positioned outside of the pouch on the back of the impermeable layer and used to soak up any excess of the liquid applied to the surface to be treated. A series of layers of absorbent material may be used in any one applicator, each layer to serve the desired purpose.

In the drawings,

FIG. 1 is a simplified sketch of a dual pouch,

FIG. 2 is a simplified drawing of a pouch containing absorbent material on one side of the capsules,

FIG. 3 shows an alternate combination pouch,

FIG. 4 shows a pouch in combination with a rub-up portion, and

FIG. 5 is a view of the applicator of FIG. 4 taken along the lines 5-5.

Like elements in the drawings have the same numbers.

Referring particularly to FIG. 1, the backing sheet 1 is adhered at 2 to the porous facing sheet 3 to form the pouch 4. The capsules 5 contain the liquid to be released and deposited or spread on a surface to be treated. The capsules are ruptured simply by pressing with the fingers or other object on the impenetrable backing sheet 1 with sufficient force to rupture the capsules 5. The liquid in the capsules 5 will then pass through the porous facing sheet 3 to the surface to be treated. The absorbent material 6 serves to absorb some of the liquid from the capsules 5 after rupturing. In FIG. 1, the left-hand pouch shows the capsules 5 surrounded by the absorbent material 6. In FIG. 2, the capsules are backed by the absorbent material 6. It is apparent that the absorbent material could also be placed between the capsules and the porous facing sheet 3.

With the arrangement illustrated in FIG. 3, pressure on the upper facing sheet 7 will rupture the capsules 5 and allow the liquid to flow through the lower porous facing sheet 8. This applicator may then be turned over and the upper facing sheet 7 brought in contact with the liquid just deposited on the surface to be treated. Under such circumstances the porous material 6 will absorb any of the excess liquid.

In FIG. 4 and FIG. 5, the right-hand pouch contains the impenetrable film 1, the seal 2, the pouch 4, and the porous facing sheet 3, all enclosing the capsules 5. A buffer forms an integral part of the applicator illustrated in FIGS. 4 and 5. An upper buffing surface 9 and a lower buffing surface 10 separated by an impenetrable layer 11 may be used to buff or polish the encapsulated liquid inside the capsules 5. This arrangement is particularly good for depositing buffable solutions and is an excellent applicator for use as a black mark remover for floors, walls, and the like, where it is desirable to leave a buffed, shiny surface.

The two flexible opposing sheets may be sealed or adhered to one another to form the enclosed pouch by any convenient manner. If the impenetrable film is a thermoplastic film, as is preferred, then heat sealing may be accomplished to form the circumferential seal between the impenetrable backing film and the porous facing sheet. Adhesives of the activatable contact type may be used to form the pouch where the nature of the facing sheet and the backing sheet renders such use convenient.

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We claim:

1. An applicator for applying a controlled amount of liquid to a surface to be treated with said liquid, said applicator comprising at least two flexible opposing sheets circumferentially sealed together over a portion of their opposing faces to define an enclosed pouch therebetween, a plurality of 50-1,000 pressure-rupturable capsules having a size range of about 1,500-2,500 microns positioned inside said pouch, said capsules containing the liquid to be applied to a surface, one of said two sheets being impermeable to said liquid, the other of said two sheets being porous and adapted to allow passage of said liquid from said pouch to the surface being treated when at least a portion of said capsules are ruptured.

2. An applicator according to claim 1 wherein at least one of said two opposing sheets is a thermoplastic film.

3. An applicator according to claim 1 wherein said two flexible opposing sheets comprise polyethylene and a cellulosic felt.

4. An applicator according to claim 1 wherein said circumferential seal is a heat seal.

5. An applicator according to claim 1 wherein said circumferential seal is an adhesive seal.

6. An applicator according to claim 1 wherein said flexible opposing sheets are sealed over a plurality of portions of their opposing faces to form a plurality of pouches.

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7. An applicator according to claim 1 containing an absorbent material positioned inside said pouch.

8. An applicator according to claim 1 wherein said capsules are a size of about 2,500 microns.

5 9. An applicator according to claim 1 having, in addition to said two flexible opposing sheets, a sheet affixed thereto adapted for buffing a surface.

10. An applicator according to claim 1 containing in said pouch a plurality of layers of absorbent material.

10 11. An applicator according to claim 1 wherein said liquid comprises a hydrocarbon.

12. An applicator according to claim 1 wherein said liquid comprises an aqueous system.

15 13. An applicator according to claim 1 wherein said liquid comprises a solvent and a wax adapted to remove black marks from floors and leave a wax coating thereon.

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25 CHARLES A. WILLMUTH, *Primary Examiner*.