United States Patent Office 2,702,780
Patented Feb. 22, 1955

2,702,780

MEASURING DISPENSING SHEET FOR GERMICIDES AND PROCESS OF FORMING SAME

Louis L. Lerner, Chicago, Ill., assignor to Phil Kalech, Jack I. Le Vant, and Nat Kalech, a copartnership, doing business as Phil Kalech Company, Chicago, Ill.

No Drawing. Application October 10, 1950, Serial No. 189,486

6 Claims. (Cl. 167—84)

The present invention relates to dispensing measured quantities of germicidal agents in preparing germicidal solutions, and in particular it also relates to a measuring germicide dispenser suitable additionally as an applicator for a germicidal solution produced therefrom.

Germicidal solutions are required to be used by health authorities in many places, for example, in dairies, restaurants, hotels and other industries, particularly those dealing with food. For such uses, the authorities specify solutions of minimum germicidal potency. This is particularly true in dairies and restaurants. One important use in dairies besides treating containers and other equipment, is the use of such solutions to wash the flanks and udders of milk cows.

It is well known that many of the quaternary ammonium salts (hereinafter referred to as "quaternaries" or as a "quaternary") are water-dispersible and at moderately low concentrations are highly germicidal in action, and relatively harmless to the human organism. Among the micro-organisms against which it has been reported that the quaternaries are effective are:

Eberthella typhosa; staphylococcus aureus; staphylococcus albus; escherichia coli; streptococcus hemolyticus; (streptococcus pyogenes); streptococcus viridans (streptococcus salivarius); streptococcus agalactiae; streptococcus salivarius (strep. viridans); streptococcus pyogenes (strep. hemolyticus); manilia albicans; microsporon lanosum; microsporon audouini; tricophyton interdigitale; pseudomonas aeruginosa; achorion schoenleini; proteus vulgaris; bacillus subtilis; epidermophyton inguinale; sarcina lutea; actinomyces gedanensis; and saccharomyces cerevisiae.

In those places where public health inspection is common, the inspector usually checks upon the kind of germicide used, the germicidal potency of the solutions used, the potency being determined by the concentration of the germicide if other agents are not present. Standards are so set that maintenance of the specified minimum of concentration of material consisting of the germicide assures the result sought. Usually in such places it is the hired help which is obligated to prepare and use the sterilizing solution in the sanitizing practices. To assure adequate compliance with such duty, it is very important to make it simple and easy, as well as a desirable act, to do the expected work properly. It is one of the objectives of the present invention to provide an instrumentality leading to simple and easy performance of the tasks and inviting proper conduct thereof in a manner to satisfy inspection authorities.

It is not sufficiently practicable to provide a concentrated supply of quaternary material with instructions for measuring and dispersing it into a prescribed quantity of water to prepare it for proper use. The present invention overcomes these practical problems and offers new advantages as well.

The present invention is based upon finding that certain kinds of sheet material may be treated with a quaternary solution under controlled conditions, so that equal areas of the sheet will yield to water like amounts of the quaternary. It is also based upon finding that the quaternary is held by surface adsorption or substantivity on sheets with a smooth face, and by like action plus capillarity in certain other sheets. In sheets lacking capillarity, the amount held is small and controllable, whereas in sheets having capillarity the amount held is

correspondingly increased. In the present invention, where sheets with capillarity are preferred, a sheet of controlled structure is employed whereby the capillarity is substantially uniform and subject to control for regulating the uniformity of content of quaternary.

It is therefore the general object of the present invention to provide an adequate carrier sheet, and to treat the sheet with water-dispersible germicidal quaternary compound for uniformity of content with respect to pieces having the same area.

It is an object of the invention to provide such a carrying sheet with strength-giving fibers to impart capillarity.

It is another object of the invention to provide such a carrying sheet having an appreciable wet strength whereby it may be used as an applicator in using the solution prepared therefrom.

Various other and ancillary objects and advantages of the invention will appear from the following description and explanation of the invention and its advantages.

Taking the dairy industry as an example, it may be stated that it is a "must" that a milk cow be washed before milking, and in that matter the practice is so well established that hired help does not neglect it. However, if left to his own devices, the dairy helper may neglect to prepare any or a proper germicidal solution for such washing, and thus endanger the sanitary quality of the milk. In washing, a cloth or the like must be used, and naturally a fresh and clean cloth is more likely to be selected by the helper than an old and used one. Also, it is easier to discard the cloth after milking than to take the trouble to prepare and preserve it for use again at the following milking. By taking advantage of these natural human tendencies, the present invention practically assures the proper attention to duty by the dairy worker for legal compliance in the washing of milk cows. The same factors apply in other industries, as will be readily appreciated.

Accordingly, by providing a sheet cut to size for adding to a predetermined volume of water, one may readily prepare a proper sterilizing solution and at the same time, in the preferred practice of the present invention, the dispensing medium becomes an applicator or wash cloth, where such is desired, in applying the solution, as for example, in washing the flanks and udders of the cow.

At first blush it appears logical to impregnate a piece of ordinary absorbent paper to provide a carrier sheet of quaternary, to be subdivided as suggested for immersion in water in preparing a sterilizing solution. Also, where an applicator sheet or "wash cloth" is desired for using the solution, it appears logical to impregnate and dry a woven cloth as the carrier sheet. But in doing this, it has been found that impregnation is not uniform, and one unit-area piece of the impregnated paper or cloth differs in available content of quaternary from another and like unit-area piece.

There is in commerce a well-known non-woven cloth made in continuous sheet form and well controlled as to uniformity in structure, consisting of combed cotton or other fibers extending generally in one direction and coated, and bonded and connected into a wet-strength sheet by regenerated cellulose. In making such a non-woven fabric, a continuous web of combed cotton or other fibers extending generally in the same direction is subjected to contact by wet roll or by immersion with a solution of cellulose xanthate (otherwise known as viscose) so as to wet the fibers therewith and to load inter-fiber spaces with the thick viscose solution. The wetted web is then subjected to the action of a regenerating bath, usually acidic in character, to convert the cellulose xanthate content thereof back to cellulose in the form of a water-insoluble hydrophilic gel as a coat on fibers, as an inter-fiber bond, and as thin webs connecting parts of some fibers to parts of other fibers. The residual chemical is then washed out and the sheet is dried to provide a finished article. Such sheet material is made in various weights and thicknesses which are standard articles of commerce. They are made with variable content and ratio of fiber to regenerated cellulose. In addition to being made from cellulose in solution form as cellulose

xanthate, a solution of cuprammonium cellulose may be applied and regenerated in a well known manner.

I have discovered that such a cellulose bonded and treated cotton fiber sheet either in its initial wet or in its dry state may be passed through an aqueous bath of germicidal quaternary, to adsorb and carry away a controlled quantity of such solution after first draining away or squeezing out excess liquid in a controlled procedure. The drained sheet, dried or not, is uniformly over its area a carrier of the quaternary compound.

A study of various sheet materials passed through or immersed in a strong solution of quaternary, drained and dried, has revealed why some sheets are non-uniform carriers and why others are uniform carriers. Uniformity is a practical necessity. If the public is provided with a sheet size X suitable for two gallons of water, the public will at one time or another use half of that sheet for one gallon of water. It is therefore essential that any given area contain the same quantity.

It is known that the surfaces of most materials are so charged electrically that cationic surface active materials, of which the subject quaternaries are examples, are electrostatically deposited thereon in oriented molecular arrangement such as to provide a new surface which is that of the adsorbed cationic agent. This is a molecular film strongly held against dissolution in water, even though the quaternary is soluble in water. Fabrics are presently made water-resistant by treatment to deposit such a molecular film of cationic material.

In the present invention this surface-deposition occurs as soon as any sheet material is subjected to a quaternary solution. Thus, in immersing in a quaternary bath, a material having non-capillary faces, metal foils and organic films, for example, aluminum foil or cellophane, it is immaterial what the body is composed of. Only the surface is active, and immediately the surfaces, whether of aluminum foil or cellophane, become identical in being the surface of oriented molecules of the quaternary. In removing such films from the bath and draining, there is a residual adhering film of the bath which on drying leaves its solid content on the sheet, uniformly distributed where the draining procedure is uniformly conducted. The stronger the bath, the more the residue.

This is demonstrated by using films of impervious greaseproof glassine paper, having different thicknesses, and hence proportional capacities to absorb water. Pieces of the same size immersed in the same bath absorb internally weights of water proportional to thickness, but carry equal quantities of residual liquid at the surfaces when drained uniformly; and when dried, have the same carried amount of residual quaternary. The quaternary stops at the surface, but the water of the bath does not. Such glassine sheets have no capillary spaces of size to accept the quaternary molecule. The carrying capacity for quaternary is dependent on the surface, which is primarily in a dried glassine sheet the dried residue of hydrated cellulose, or cellulose gel, formed in beating the stock to provide conventional "greaseproof" or glassine paper.

Table I shows the results of immersing commercial glassine paper sheets of 4 x 5 inches in a 20% solution by weight in water of alkyl dimethyl benzyl ammonium chloride wherein the alkyl group varies from 8 to 18 carbon atoms, predominating in the lauryl radical ($-C_{12}H_{25}$.), which quaternary is hereinafter referred to as ADBAC, draining them substantially uniformly by simple laboratory technique, and drying.

Table I

Thickness of glassine in inches	Gain in Weight by added Quaternary
.0045	.1198
.0045	.1135
.0075	.1038
.0075	.1135
.0095	.1165
.0095	.1114
.0130	.0957
.0130	.1015
Average	.1094

The thickness of the sheet is not a factor, demonstrating that the surface, which is devoid of capillary space, is the controlling factor.

Cellophane sheets, aluminum foil and like non-capillary smooth-faced sheets act likewise, and may be used as carrier sheets for dispensing quaternaries in accordance with the present invention. However, the quantity so available is small relative to practical sizes of the material, and the preferred carrier is one having more capacity, not primarily of smooth surface, but of special capillarity at the surface. In a sheet having such capillarity, the amount of solution held against drainage is greater, and hence the retained material is greater. However, the capillarity must be substantially uniform, and not "wild."

Examples of "wild" capillarity are sponge materials, papers and ordinary woven cloth. By "ordinary" paper is herein meant a paper sheet which when examined under a microscope has voids or capillaries and exhibits a "brush-heap" appearance. Glassine paper lacks this character, being a film of dried gel reinforced with the remnants of fibers beaten to provide the gel. Woven cloth has not only capillaries between the threads, but also within the threads, resulting from twisting so-called smooth-faced or cylindrical fibers, such as cotton, silk, rayon, nylon, into thread form. The capillary capacity is variable over such sheets not only in structure when static, but by physical manipulation of the sheet, especially when wet. Witness a well-drained wet cloth. Squeeze it at one portion, and liquid is lost. In such materials there is too much capillary volume to control it for uniformity with respect to area.

The preferred carrier sheet of the present invention is a compromise between the described non-capillary foils and films and sheets having uncontrollable capillarity, such as ordinary paper and woven cloth. It is exemplified by the non-woven fabric above described, whether its fibers are cotton, rayon, silk, nylon, sisal, flax or other fibers. Even twisted thread of multiple fibers may be used, provided, of course, that the thread is sealed to close its capillarity and give it a closed surface. The non-woven fabric described, or made in a similar way from other fibers, may be considered as a sheet of fibers each presenting a closed gel surface of regenerated cellulose, bound fiber to fiber by regenerated cellulose, and in many locations interconnected by thin webs or films of regenerated cellulose. Thus, such sheet offers more surface for adherence of liquid, and also provides limited and controllable capillary volume. It has been found that the increase in weight or gauge of such sheets made of cotten fibers, having a fixed proportion of regenerated cellulose to cotton, increases the capacity for carried quaternary. Compared to the glassine sheets, of which the thickness is immaterial, it shows that the sheet does not act as a flat closed membrane. However, by increasing the proportion of regenerated cellulose, the capillarity is lessened, and the sheet approaches and may become a flat closed sheet of cellophane reinforced with imbedded fibers. Such a closed sheet is useful as an applicator cloth for quaternary carried by it, but because of its lower capacity, relative to a similar type having more capillary volume, it is practically not as useful, or of as much commercial value, as the preferred kind.

The invention contemplates the production of the non-woven fabrics as described, with control of capillarity by control of manufacturing process. Commercially, this is already a well developed procedure for providing standard gauge fabrics as to fiber content and regenerated cellulose content.

The following Table II shows how two non-woven cotton fabrics having from 3% to 4½% regenerated cellulose content and x gauge (x=grains total weight per square yard) carry quaternary in proportion to the strength of bath used, containing in one case ADBAC, and in the other case a quaternary which is herein designated as T. T is alkyl (C_8H_{17} to $C_{18}H_{37}$) dimethyl 3, 4 dichloro benzyl ammonium chlorides and alkenyl (C_{16} to C_{20}) dimethyl ethyl ammonium bromides, in the ratio of 5 to 1, respectively. In each instance pieces of different size, the weight thereof being proportional to the area, were immersed in the bath, drained in the same way, and dried. The gain in weight is the quaternary material, and is reported as "retention" in Table II.

Table II

	Quaternary=T Gauge=45			Quaternary=ADBAC Gauge=35		
Percent Solution	10	12½	15	20	25	30
Retention	159	169	179	206	238	265

The relationship is substantially linear in each case as to retention and concentration of quaternary, showing that the amount of liquid retained by the sheet in each case is constant, and indicating constancy of surface and capillarity over any selected area, and hence the solids retention is proportional to the strength of solution.

In production, the non-woven fabric having regenerated cellulose is wet before the conventional drying. It may, and preferably should have, for the present invention, some residual washing alkali (dilute caustic soda suffices) to give it a pH of 9 or over when containing the quaternary of the present invention. The latter is more effective at pH of 9 or over. The sheet, either with its wet undried coagulated and washed regenerated cellulose of the sheet, or the same sheet dried, with or without retained alkali, may be run into the quaternary bath. The dried sheet so used retains somewhat more quaternary than the wet sheet. This is believed to be due to the fact that the rewet or rehydrated regenerated cellulose, having been first dried, does not swell back to the volume it has before the initial drying. This is believed to result in somewhat more capillary space in the sheets once dried before contact with the quaternary bath.

The following results show the constancy of retention in two large scale runs, wherein a cotton-web is impregnated with a controlled amount of viscose, then regenerated and washed, and dried, and then run through a bath of ADBAC of 21½% strength in Case A and 17% in Case B. Gel content (dry) is 4%.

Case A.—The web of 45 gauge (±2 gauge as manufacturing tolerance) was cut into 2000 pieces each 12 x 12 inches. At random 300 of such sheets were selected, and divided into 12 groups of 25 sheets each. Each group was weighed as a group with results in grams given in Table III as follows:

Table III

136.57
139.80
133.20
134.50
133.64
136.38
134.38
134.80
135.40
137.80
134.00
135.90

Average 135.50 per group

Maximum + deviation	4.3
Minimum — deviation	2.3
Average per sheet	5.42

Case B.—The web of 45 gauge (±2 gauge tolerance) was cut into 1000 sheets each 12 x 18 inches. At random 180 of such sheets were selected, and divided into 3 groups of 38 and 2 groups of 33 sheets each. Each group was weighed as a group with results in grams given in Table IV as follows:

Table IV

Groups of 38		Groups of 33
265.00		228.35
267.55		228.70
267.30		
266.60	Average per group	228.52
7.	Average per sheet	6.9
4.66	Average per sq. ft.	4.6

Case B averages 4.63 grams per sq. ft.

Discussion of Case A and Case B.—Considering the different strengths of bath used, namely 21½% and 17%, and Case A as standard, the content of 5.42 grams per sq. ft. would indicate that Case B should have 4.3 grams per sq. ft. for a linear relationship. Actually, 4.66 grams was found. Considering the sheet gauge tolerance of ±2 in 45, the fabric may vary as much as 4 gauge from maximum to minimum. This is more than the deviation between contents 4.3 and 4.66.

The invention is not limited to baths containing dispersed material consisting of quaternary Other materials may be present. It is beneficial to have present also a compatible wetting agent, that is, one which must be either nonionic or cationic, and hence generically referred to hereinafter as nonanionic. A nonionic wetting agent is preferred because it is not substantive to the surface of the sheet and does not compete with the quaternary for adhesion to the surface of the sheet. A cationic wetting agent does compete and it has been found that in general a cationic wetting agent should not be present above a ratio of 1 part by weight to two parts of the quaternary. Hence, nonionic wetting agents are the preferred ones, and among them are those commercial ones known as Neutronyx 600, Triton X–100, Ninol 979, and Ethofat 242/20. Others are available.

"Ninols" are trade-marked products of Ninol Laboratories, Chicago, Illinois, made in accordance with Kritchevsky U. S. Patent No. 2,089,212. They are condensation products of one mole of aliphatic monocarboxylic acid with at least two moles of alkylolamine. The compounds are readily dispersible or soluble in water, are stable in mildly acid and alkaline media, and are effective in the presence of calcium and magnesium ions. They are surface-active agents, functioning as detergents, and as agents for dispersing and emulsifying solids and liquids in water.

The higher fatty acids (six or more carbon atoms) are preferred for the aliphatic radical. One such compound is "Ninol 979." It is a 100% active, nonionic, pale amber liquid with a specific gravity of 1.00, corresponding to the product of condensing lauric acid with diethanolamine.

The properties of the "Ninols" change in degree as the composition varies, and with different ones the amounts required vary for any predetermined extent of function. Hence, where an amount is specified in a formula herein, the particular member of the family is specified.

"Ethofats" are trade-marked products of Armour and Company, Chemical Division, Chicago, Illinois. They are a family of fat-derived nonionic surface-active agents. They are polyoxyethylene-glycol esters of fatty acids, having the general formula:

They vary from fluid liquids to soft pastes depending upon length and saturation of the fatty chain and the relative proportion of the polyethylene glycol residue, which factors also control the solubilities. As the value of x increases in a given formula, the material becomes more soluble in water and correspondingly less soluble in nonpolar organic compounds. All of the "Ethofats" are water-soluble or water-dispersible.

The "Ethofats" are resistant to hydrolysis and therefore, stable to mildly acid and alkaline conditions. They are unaffected by calcium, magnesium or other hard water ions. They are compatible with nearly all types of surface-active agents, and function as detergents and as dispersing and emulsifying agents.

The polyethylene glycol employed for the material may have a molecular weight from 220 to 2200, which determines the value of x in the formula. The radical R in the formula is a fatty acid radical, saturated or unsaturated, or mixed radicals of the acids caprylic, capric, lauric, myristic, palmitic, stearic, oleic, linoleic, linolenic, and rosin acids.

"Ethofat 242" is one in which the radical R, taken as 100%, consists of 15% of oleyl radical, 15% of linoleyl radical, and 70% of the radicals of rosin acids.

Since the value of x in the general formula may vary and in the commercially available "Ethofats" varies from 5 to 50, the constitution and hence the solubility are indicated in the commercial identification, thus:

"Ethofat 242/(x+10)"

"Ethofat 242/60" is thus a mono-ester of mixed organic acids R (as specified above) with polyoxyethylene glycol addition having an average molecular weight of 2200, corresponding to $x=50$. Likewise, "Ethofat 242/20" involves instead a polyoxyethylene glycol having an average molecular weight of 440, corresponding to $x=10$.

The foregoing information is found in bulletins by the manufacturer, and in part has been abstracted from Chemical and Engineering News, vol. 27, No. 39, September 26, 1949, page 2756.

The compounds "Neutronyx" are a family of trade-marked materials made by Onyx Oil Chemical Company, Jersey City 2, New Jersey. They are nonionic surface-active agents, functioning as detergents, emulsifiers and dispersants. They vary from liquids to low-melting wax-like solids, all dispersible in water. Being nonionic they are compatible with cationic and other nonionic compounds, such as quaternary ammonium compounds. They are stable in mildly acid and alkaline solutions.

Chemically, they are ethers, the various kinds being designated commercially by a number:

No. 330—polyalkylether condensate of fatty acids
No. 600—aromatic polyglycol ether, and specifically alkyl phenyl ether with polyethylene glycol
No. 834—polyalkyl ether condensate of fatty acids

"Neutronyx 600" is miscible in all proportions in water, has a specific gravity of about 1, and in a 1% solution in water a pH of 7.3.

The "Tritons" are trade-marked materials of Rohm & Haas, Philadelphia 5, Pa. They are surface active agents functioning as detergents, and as agents for dispersing and emulsifying. They vary from nonionic, to cationic and anionic activity, and are stable in strong acid and alkaline solutions.

The nonionic ones are commercially designated and identified as follows:

	Percent Solids	pH	Type
X-30	30	7.5–10	Alkylated aryl polyether alcohol.
X-100	100	7.5–10	Do.

The above compounds are soluble in cold water in all proportions. They are compatible with both cationic and anionic active materials. Activity is not affected by hard water.

A suitable cationic wetting agent for the purpose is one sold as "Alkaterge O" by Commercial Solvents Corporation. It is the oxazoline from oleic acid and 2-amino-2-methyl-1,3-pentanediol.

When wetting agent is used, any amount upwardly from zero is effective, but in the case of cationic ones not over about one part to two parts of quaternary.

The invention is not limited to drying the sheet, although drying is preferred for what may be termed domestic uses. It is possible to immerse the sheets and to leave them well drained but wet, and so to package the wet sheets in a water-proof pack, for a soldier's or a camping kit, as emergency swabs for wounds. In such use, the dry sheets are not adequate when water to wet them is lacking. In such wet-pack sheets of non-woven fabric as described, it has been found that the presence of non-anionic wetting agent in addition to the germicidal quaternary, applied to wounds increases the germicidal action of the quaternary by action which is believed to be one of easing penetration of the quaternary into minute spaces. A successful formula for such a wet-pack sheet is as follows:

Wet-pack sheet.—The following is an assay of a wet-pack sheet of 45 gauge non-woven cotton fabric, which is non-draining:

	Grams
The 45 gauge sheet	3.25
ADBAC	2.13
Neutronyx 600	.50
Water	10.00

The same sheet may be dried and then immersed in a limited amount of water, or rewetted for application as a sterilizing swab.

The number of germicidal quaternary compounds known is vast, and a great many of them are available commercially as germicides and sanitizing agents. Choice of one over another may depend on many factors, especially costs. The following are but a few in addition to those already given.

1. "Emulsept" (The Emulsol Corporation, Chicago, Illinois) N(higher acyl esters of colormino formyl-methyl) pyridinium chloride.
2. "Hyamine 1622" and "Hyamine 10–X" (Rohm & Haas Co., Philadelphia, Pa.) being respectively:
   Di-isobutyl phenoxy ethyl dimethyl benzyl ammonium chloride, monohydrate, and
   Di-isobutyl cresoxy ethoxy ethyl dimethyl benzyl ammonium chloride, monohydrate.
3. "Arquad 2C" and "Arquad 2HT" (Armour & Co., Chicago, Illinois), being respectively:
   Dialkyl dimethyl ammonium chloride wherein the alkyl groups are distributed as follows:

Alkyl	Carbon Chain	2C	2HT
		Percent	*Percent*
Octyl	8	8	----------
Decyl	10	9	----------
Dodecyl	12	47	----------
Tetradecyl	14	18	----------
Hexadecyl	16	8	30
Octadecyl	18	10	70

4. p-Tert.-octyl phenoxy ethoxyethyl dimethyl benzyl ammonium chloride

The present invention therefore involves the production of sheets of controlled character in combination with carried germicidal quaternary compounds, with or without non-anionic wetting agents, and preferably in dried form, except that in the case of sheets having controlled available capillarity as described, the sheets may be maintained wet or dry as articles for use or in commerce.

Practically all of the carried quaternary is available and releasable to water, and that which is not, is the adsorbed substantive layer. The releasable quantity is substantially uniform for any given area of the prepared sheet, and from the potency of the quaternary, and the required usage, one may readily prescribe the maximum amount of water into which a given size of carrying-sheet may be placed to produce a sterilizing solution of at least the requisite strength.

In the case of ADBAC as the only agent carried by a sheet, a common regulated standard is 200 parts per million for dairy use. The present invention provides in Cases A and B above, sheet materials, the described sizes of which may be placed in a three-gallon pail containing about 2¾ gallons of water for use on a moderate sized herd of milk cows, or in a restaurant, and elsewhere.

Because cellulosic surface tends to bind the germicidal quaternary material to it, a germicidal solution of it at near the critical concentration is subject to depletion of germicidal content upon immersing therein, for example, a clean cellulosic applicator, having power to remove germicidal content from solution and bind it to the cellulosic surface. By so doing, the power of the remaining solution is weakened. It is a great advantage of the present invention that such depletion is not possible with respect to the applicator-carrier sheet hereof. Such sheet yields some germicide to the water, rather than taking it from the water, and the resulting applicator has its surface satiated with the germicide.

It is to be understood that the invention is not limited to the proportions or the materials particularly described for the purpose of illustrating and explaining the invention, and that numerous variations are contemplated as falling within the scope of the appended claims.

I claim:

1. A germicide-measuring dispenser consisting in addition to any content of water, essentially and substantially entirely of (*a*) a water-insoluble water-absorbent carrier sheet of material having average uniformity of structure, the microscopic surface of the sheet being entirely the surface of hydrophilic water-insoluble cellulosic gel, and (*b*) water-soluble substance consisting essentially of non-anionic surface-active material carried in substantially uniform distribution per unit area of sheet by and on said surface, essentially including germicidal cationic quaternary ammonium salt only in part substantively attached to said surface by that character of orientation effected in water solution, said germicidal salt being present in quantity of at least two-thirds of all the cationic surface-active material present, the excess of said germicidal salt over

that portion of it which is substantively held by said surface being releasable on immersion of the sheet in water, whereby a given unit area of sheet may be immersed in a predetermined volume of water to provide a germicidal solution, and the carrier sheet may be used as an applicator of said solution without reduction of the germicidal concentration.

2. A germicide-measuring dispenser consisting in addition to any content of water, essentially and substantially entirely of (*a*) a water-insoluble water absorbent sheet comprising fibers fixed in generally side-by-side relationship and coated and bonded to sheet form in relatively fixed positions with respect to each other by thin coats and connecting webs of regenerated cellulose, said sheet being characterized over its area by substantial uniformity of distribution of its regenerated cellulose surface and substantial uniformity of distribution and volume of resulting fiber-formed capillary space, and (*b*) water-soluble substance consisting essentially of non-anionic surface-active material carried in substantially uniform distribution per unit area of sheet by and on said surface, essentially including germicidal cationic quaternary ammonium salt only in part substantively attached to said surface by that character of orientation effected in water solution, said germicidal salt being present in quantity of at least two-thirds of all the cationic surface-active material present, the excess of said germicidal salt over that portion of it which is substantively held by said surface being releasable on immersion of the sheet in water, whereby a given unit area of sheet may be immersed in a predetermined volume of water to provide a germicidal solution, and the carrier sheet may be used as an applicator of said solution without reduction of the germicidal concentration.

3. A dry sheet according to claim 2.

4. A germicide-measuring dispenser consisting in addition to any content of water, essentially and substantially entirely of (*a*) a water-insoluble water absorbent sheet comprising fibers fixed in generally side-by-side relationship and coated and bonded to sheet form in relatively fixed positions with respect to each other by thin coats and connecting webs of regenerated cellulose, said sheet being characterized over its area by substantial uniformity of distribution of its regenerated cellulose surface and substantial uniformity of distribution and volume of resulting fiber-formed capillary space, and (*b*) in substantially uniform distribution per unit area of sheet water-soluble substance consisting essentially of nonionic surface-active agent and germicidal cationic quaternary ammonium salt, the latter being only in part substantively attached to the surface of the regenerated cellulose by that character of orientation effected in water solution, and the remaining part being releasable on immersion of the sheet in water, whereby a given unit area of sheet may be immersed in a predetermined volume of water to provide a germicidal solution containing said nonionic surface-active agent, and the carrier sheet may be used as an applicator of said solution without reduction of the germicidal concentration.

5. A dry sheet according to claim 4.

6. In the process of forming a non-woven fabric which comprises forming a web of combed fibers, wetting said web with a solution of dissolved cellulose capable of treatment to regenerate cellulose, regenerating said cellulose as a coating and bonding agent for said fibers in situ in the web, and washing out the residual soluble material in the regenerated cellulose with water, the step of applying to said wet washed sheet prior to drying an aqueous dispersion consisting of water and non-anionic surface-active material essentially including germicidal cationic quaternary ammonium salt, said germicidal salt being present in said solution in quantity of at least two-thirds of all the cationic surface-active content and at a heavy concentration of the order of 10% to 30% by weight of said solution, whereby to cause substantive attachment of one portion of the cationic material of said solution to the regenerated cellulose surface and to wet the sheet with a substantially uniform content per unit area of said solution and thereby provide said remainder of the germicidal cationic material as a portion releasable into water to provide a germicidal solution on immersing a given unit area of sheet in a predetermined quantity of water, and whereby the immersed piece of sheet may be used as an applicator of said solution without reduction of the germicidal concentration.

References Cited in the file of this patent

UNITED STATES PATENTS

1,353,954	Henry	Sept. 28, 1920
2,063,218	Zisserman	Dec. 8, 1936
2,255,694	Beale	Sept. 9, 1941
2,346,632	Wolfert	Apr. 11, 1944
2,349,152	Feinstone	May 18, 1944
2,390,235	Barnard	Dec. 4, 1945
2,436,673	Shelton	Feb. 24, 1948
2,474,306	Doub	June 28, 1949
2,542,909	DeWet	Feb. 20, 1951

FOREIGN PATENTS

236,877	Switzerland	Mar. 15, 1945
23,237	Switzerland	Jan. 14, 1901

OTHER REFERENCES

"Hyamines; 1622 and 10-X." Rohm & Haas Co., Philadelphia, Pa., 1947, 16 pages.

Pharmaceutical Formulas, vol. 1, The Chemist and Druggist, London, 1944, pages 45, 46.