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R. M. HOEY ET AL

2,333,070

SURGICAL SWAB

Filed June 12, 1940

Fig-1

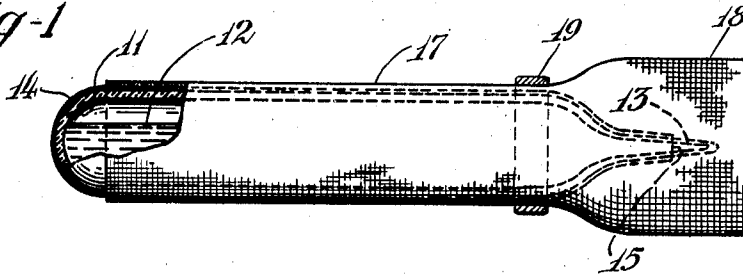


Fig-2

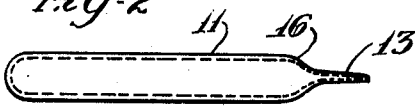


Fig-3

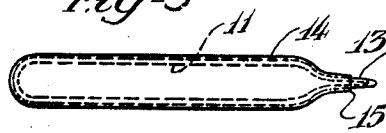


Fig-4

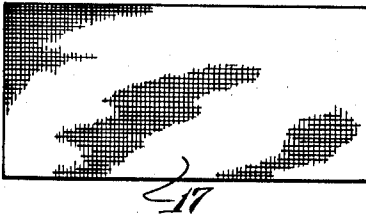


Fig-5

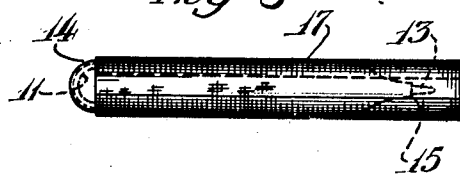


Fig-8

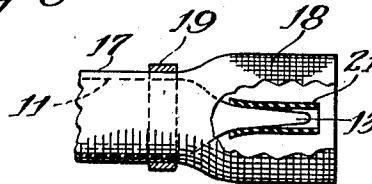


Fig-6

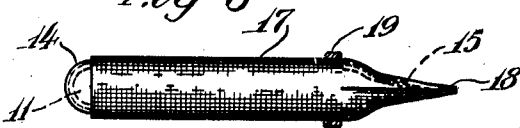
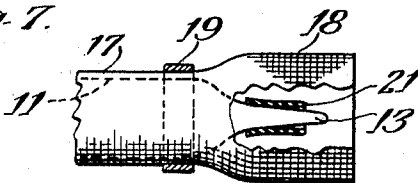


Fig-7



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SURGICAL SWAB

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9 Claims. (Cl. 128—269)

This invention relates to the type of surgical swab used for transporting small quantities of a cleansing, antiseptic, or healing liquid, which will make their application a simple and easy matter and at the same time will preserve these liquids in their original strength and efficacy prior to their actual use.

In the past, swabs have been made by encasing in an essentially absorbent fabric a glass vial drawn out to a suitable tip, the portion of the fabric beyond the tip being formed as a brush or applicator. The tip or brush end of the casing has in some instances been treated to render the fabric partially non-absorbent.

In order to secure the fabric around the tube and to prevent particles of the tip of the vial from becoming discharged with the liquid contents, it was necessary to tie or sew the fabric below the tip of the vial. Even with this method of securing the fabric, there has been some danger of discharging particles of glass into a wound from the portion above the point of tying or sewing. This closure has not only added to the cost of production, but in the use of the swab the tying or sewing has acted as a block to the flow of the liquid, making it in many cases difficult or impossible to get the liquid to flow past the closure to the extreme end of the brush.

Further, since the fabrics previously in common use were rather loosely woven, knitted, or braided, thus allowing a considerable slippage of the yarns, threads, or fibres relative to each other, it was difficult to prevent the tip of the vial from protruding through the fabric.

This weakness has caused considerable breakage, has involved the hazard of getting glass particles into a wound, and has generally lessened the utility of the swab.

The fact that many fabrics used have retained a degree of absorbency, even though treated, has meant that a relatively high percentage of the fluid has been absorbed by the fabric and has not been available for application. If the fabric used was treated to render it completely or substantially non-absorbent, the flow through it tended to be so rapid that the contents flowed out too rapidly for efficient application. This was due to the essentially liquid-repellent characteristics of the substance used for rendering the material non-absorbent.

For the reasons stated, it has been difficult to provide a brush with the satisfactory characteristics for good flow.

Another factor acting as an important influence on the rate of the flow has been the vari-

ation in the size of the orifice produced when the swab was broken. This has been due to the fact that there was little control over the actual point of breakage of the tapered tip, and, depending on how close to the shoulder the actual break was made, the orifice produced was of larger or smaller size. Thus, some swabs were broken so that it was extremely difficult to get the liquid to wet the brush, and others were broken so that the liquid drained from the vial too rapidly for satisfactory application.

With these faults of prior constructions in mind, the nature and importance of the improvement provided by the present invention will be understood from the following statement of objects and detailed specification.

One object of the invention is to provide a surgical swab in which the rate of flow may be definitely predetermined in accordance with the characteristics desired and will not be dependent upon the point of breakage of the tapered tip of the vial.

A further object is to provide a swab of the general type above indicated in which the brush or applicator portion is formed without tying or sewing.

Another object is the provision of a swab so constructed that its use involves little or no hazard of glass particles getting into the wound.

A further object is to provide a swab in which the danger of accidental breakage of the tip or other portions of the glass vial is greatly lessened.

Another object is the provision of a swab which is easier and more economical to manufacture than prior constructions.

Still another object is to produce a type of swab which, when the tip of the vial is broken, will wet the surface of the applicator and, at a predetermined rate, supply liquid to a surface being brushed thereby, but which will prevent any of the liquid from dripping off the applicator when the swab is held stationary with the brush suspended in the air, although permitting ready flow of drops of liquid from the applicator when the latter is shaken.

Other objects and advantages will become apparent from the following description and the accompanying drawing of a preferred embodiment of the invention.

In said drawing:

Fig. 1 is an elevational view, partly broken away and shown in section, of a completed swab constructed in accordance with our invention;

Fig. 2 is an elevational view of the vial which is the inner element of the swab and is adapted

to have the iodine or other solution sealed therein;

Fig. 3 is a similar view showing the film or coating of vulcanized latex or other suitable material applied to the vial and covering all but the extreme portion of the tip;

Fig. 4 is a plan view of the blank of impregnated fabric which is used to form the casing and brush portion of the swab;

Fig. 5 is an elevational view of the coated vial with the fabric wrapped thereon, the same being shown prior to the final formation of the brush or applicator;

Fig. 6 is a similar view of the completed swab viewed in a position at right angles to that shown in Fig. 1;

Fig. 7 is a fragmentary elevational and sectional view showing a modified form of the invention; and

Fig. 8 is a similar view showing a modification of the form of device illustrated in Fig. 7.

The swab shown in the drawing as an illustrative embodiment of the invention has as its inner element a vial 11 made of glass or other suitable material and containing a quantity of liquid 12, such as a solution of iodine or other antiseptics, which is sealed therein preferably by drawing the vial out to a point or tip 13. This tip may be readily broken by pressing the same against a table or other hard surface when it is desired to use the contents of the vial and is thus a convenient form of construction, but if for any reason the formation of a tip should not be desired, the vial may be formed with a weakened area at one end or the walls may be made sufficiently thin to break when pressure is applied.

In accordance with the form of our invention shown in Figs. 1-6 inclusive, a coating or jacket 14 is applied to the exterior of the vial, preferably covering the entire surface thereof with the exception of the extreme end portion of the tip 13. The point of termination of the coating on the tip is indicated at 15 in the drawing. A suitable coating material is a solution of latex, preferably vulcanized latex, which, when applied and allowed to dry, will remain intact and impervious even when the container is broken. The film may be applied by dipping the vial in the solution, or by any other suitable process. The size of the orifice in the coating at the point 15 may be determined by varying the point of termination of the film on the tip 13 or shoulder 16 on the tapered end of the vial, and it will be observed that this orifice remains the same after the breaking of the tip as it was before so that even if the point of breakage is within the film, it makes no difference so far as the rate of flow of the liquid is concerned. The uniformity thus provided is a highly desirable feature of the invention.

Other coating materials may be employed instead of latex if desired. Among them may be mentioned cellulose nitrate, cellulose acetate, ethyl cellulose, vinyl resins, acrylic resins, and various rubber derivatives. An artificial dispersion or solvent solution of natural rubber or synthetic rubber or rubber-like polymers could be used, but we have found vulcanized latex to be a very satisfactory material and it may be regarded as a preferred example of the type of materials suitable for this purpose.

After the coating 14 is applied, the vial, or a portion thereof, is wrapped with a piece of specially impregnated fabric shown in blank form in Fig. 4 of the drawing and identified therein, and in Figs. 1, 5 and 6, by the reference numeral 17.

A preferred material is gauze impregnated with a vulcanized latex solution, although other rubber-base solutions or such substances as cellulose esters and ethers, vinyl and acrylic resins, rubber derivatives or synthetic rubber-like polymers such as those known in the trade as neoprene, "Vis-tanex," "Perbunan" and "Thiokol"—all preferably from aqueous dispersion might be used as the impregnating material if desired. The fabric should be treated so as to be cohesive and essentially non-absorbent but yet porous and with a surface which is easily wettable by the solution from the vial when the friable portion of the latter is broken. The degree of impregnation is such that the surface portions of the fabric are coated but the interstices are not completely filled, so the fabric does not become impervious.

The fabric is self-adherent and is also adherent to the coating 14 on the vial. It may therefore be easily and quickly rolled onto the vial and will stay in place without the use of any other attaching means than the adhesive contained in the fabric. The fabric extends beyond the end of the tip 13 and the portions thereof beyond the shoulder 16 are pressed together to form a fan-like brush or applicator 18 suitable for use in applying the solution. The firm adherence of these portions of the fabric prevents escape of particles of the crushed tip of the container after it is broken, and the impregnated fabric is stiff enough when dry to afford substantial protection against accidental breakage of the tip.

The size of the orifice at the point 15 is preferably such that by the combined effect of atmospheric pressure and surface and/or interfacial tension the liquid will be prevented from dripping when the swab is held stationary with the applicator 18 suspended in the air, but will be caused to flow at desired rate when the swab is shaken or the applicator is brushed upon a surface to which it is desired to apply the liquid. Said orifice is of sufficiently small diameter and of sufficiently regular form to prevent the entrance of air therethrough into the vial unless the liquid in the vial is agitated by shaking or is drawn out by capillary action when the applicator is brushed upon the surface to be treated with the iodine or other liquid. In either of these events air will be allowed to enter the vial to replace the liquid which leaves the same through the action just described.

The rate of flow of the liquid to be dispensed may be varied, in accordance with the viscosity of the material, by varying the size of the opening at the end of the film of impervious material and/or the mesh or degree of impregnation of the fabric casing of the vial and the brush. We have found an opening of about $\frac{3}{4}$ ths inch diameter at the end of the film of impervious material to be suitable, and have found that for a $3\frac{1}{2}\%$ tincture of iodine solution in 50% alcohol and 50% water, a casing consisting of six layers of 44/40 gauze impregnated with about 36 grams of rubber per square yard gives good results, while with a liquid consisting of a $3\frac{1}{2}\%$ tincture of iodine solution in 93% alcohol and 7% water, a casing composed of nine layers of similarly impregnated gauze, at the brush end, is very satisfactory.

The rate of flow with solutions of different viscosities can also be regulated by using a fixed number of layers of treated fabric at the brush end and varying the quantity of coating or im-

pregnating material applied thereto, thus altering the size of the openings in the fabric mesh.

In the form of our invention shown in Figs. 7 and 8 of the drawing a piece of tubing 21 made of vulcanized rubber or other suitable material is applied to the tip 13 of the vial and the diameter of the outer end of this tubing determines the size of the outlet orifice. When such tubing is used it is not necessary to extend the coating 14 onto the tip or, in fact, to use it at all so far as the outlet opening is concerned, although it may nevertheless be desirable to apply such coating to all or a part of the body of the vial to assist in forming a bond between the latter and the fabric wrapping 17. The tubing 21, which, as well as the coating 14 in the first-described form of the invention, is intended to be embraced within the term "jacket" used in certain of the appended claims, may be positioned on the tip 13 so that the end of the latter protrudes beyond said tubing as shown in Fig. 7, or may extend beyond the end of the tip as shown in Fig. 8. In either event the outer end of the tubing should be unstretched so that an opening of predetermined diameter will be provided thereby when the tip is broken at a suitable point inwardly from such end of the tubing. The tubing should extend far enough inwardly on the tip to insure that the latter will not be broken at a point inwardly from said inner end of the tubing. The tubing being elastic, the inner portion thereof will grip the larger portion of the tip and will be held in place by such gripping action and by the self-adhesive fabric of the applicator 18. Furthermore, the inner end of the tubing does not necessarily have to be sealed air-tight to the vial because when the outer portion of the tip is broken the flow of liquid by capillarity will form a liquid seal between the tubing and the base portion of the tip.

An advantage of the modified form of the invention just described is that the tubing not only serves as an effective means of providing an outlet opening of fixed predetermined size, but, by reason of being flexible, facilitates the delivery of liquid when the swab is being used as a brush, since the pressure tends to deform the shape of the orifice thereby facilitating the entrance of air into the vial for the purpose of expelling the liquid. On the other hand the use of a coating extending from the body of the vial to a predetermined point on the tip is perhaps preferable from the standpoint of avoiding displacement in handling, although experience has indicated that neither form is subject to serious objection on this score.

Through the use of the type of impregnated fabric material described, it is possible to construct a swab without sewing or tying operations. The material is substantially non-absorbent, thus making practically the entire contents of the container available for application. The use of extra layers of fabric over the tip end of the vial also adds a greater measure of protection against breakage during handling, and further insures against the escape of broken particles of the vial.

The whole of the swab from the shoulder 16 to the end opposite the tip may be dipped in paraffin or other suitable material, or, as illustrated, a band 19 of such material may be applied just above said shoulder 16. The purpose of this treatment is to confine the liquid to the brush, and to thereby conserve the solution and prevent staining the fingers of the user.

Around the outside of the fabric 17, which may extend substantially the full length of the body of the container 11 or may extend only far enough onto the body thereof to form an effective bond therewith, there may be applied a suitable label describing the contents and use of the swab.

The ideal swab is of simple, easily fabricated construction, which will allow the liquid to flow until the brush is wet, but without allowing the swab to drip. The material used for the brush should be capable of retaining the particles of glass resulting when the swab tip is broken for use, and yet should absorb as small a percentage of the liquid as possible, thus making the maximum amount available for application. It should be possible to shake free drops of the liquid from the brush of the swab but, as above stated, it should not drip or run when held stationary. The rate of flow of the liquid to and through the brush should be subject to definite control and should be the same regardless of the particular point in the tip where the break may occur. From the preceding description it will be seen that these desirable characteristics are present to a very high degree in the swab which we have provided.

A preferred embodiment of the invention has been described for clearness of understanding only and no unnecessary limitations should be understood therefrom, but the appended claims should be construed as broadly as possible in view of the prior art.

We claim:

1. A surgical swab comprising a container having liquid therein for application by the swab when said liquid is released from the container, and a casing of cohesive, self-adherent material wrapped around said container and extending beyond an end thereof with opposed portions of the extension pressed together and adhering to each other to confine said end of the container within the casing and to provide an applicator for applying the liquid when it is released, said applicator being wettable and sufficiently porous to permit the liquid to pass therethrough upon appropriate manipulation of the swab but being substantially non-absorbent.

2. A surgical swab comprising a container having liquid therein for application by the swab and having a tapered tip portion at one end adapted to be broken to release the liquid for use, a film of impervious material on said container terminating at a predetermined point on said tip and thus providing an outlet opening of predetermined size when said tip is broken, said film being unbreakable in the ordinary use of the swab and a casing of cohesive, self-adherent material wrapped around said container and extending beyond said tip end thereof with opposed portions of the extension pressed together and adhering to each other to confine said end of the container within said casing and to provide an applicator for applying the liquid when it is released, said applicator being wettable and sufficiently porous to permit the liquid to pass therethrough upon appropriate manipulation of the swab but being substantially non-absorbent.

3. A surgical swab comprising a container having liquid therein for application by the swab when said liquid is released from the container, a casing of cohesive, self-adherent material wrapped around said container and extending beyond an end thereof with opposed portions of the extension pressed together and adhering to

each other to confine said end of the container within the casing and to provide an applicator for applying the liquid when it is released, said applicator being wettable and sufficiently porous to permit the liquid to pass therethrough upon appropriate manipulation of the swab but being substantially non-absorbent, and means on said casing for confining the flow of the liquid to said applicator portion of the casing material.

4. A surgical swab comprising a container having liquid therein for application by the swab when said liquid is released from the container, and a piece of cohesive and self-adherent, yet porous, material rolled upon said container and having a portion extending beyond an end thereof with opposed portions of the extension pressed together and adhering to each other to thereby enclose the end of the container and form a brush or applicator for applying the liquid, said applicator being of such texture and number of layers and being so treated as to provide predetermined porosity in accordance with the rate of flow desired during the application of the liquid thereby but being substantially non-absorbent.

5. A surgical swab comprising a container having liquid therein for application by the swab when said liquid is released from the container, a film of cohesive material coated onto said container, and a piece of cohesive and self-adherent, yet porous, material rolled upon said container and adhering to the film or coating thereon and having a portion extending beyond an end thereof with opposed portions of the extension pressed together and adhering to each other to thereby enclose the end of the container and form a brush or applicator for applying the liquid.

6. A surgical swab comprising a container having liquid therein for application by the swab and having a tip portion at one end adapted to be broken to release the liquid for use, and a piece of cohesive and self-adherent, yet porous, material rolled upon and adhering to said container and having a portion extending beyond said tipped end thereof with opposed portions of the extension pressed together and adhering to each other to thereby securely confine the tip therein after as well as before the same is broken and to form a brush or applicator for applying the liquid.

7. A surgical swab comprising a container having liquid therein for application by the swab and having a tip portion at one end adapted to be broken to release the liquid for use, a film of cohesive material on said container terminating at a predetermined point on said tip, and a piece of cohesive and self-adherent, yet porous, material wrapped upon said container, said material being adherent to said film and being thus secured to the container, a part of said material extending beyond the tipped end of the container with opposed portions of the extension pressed together and adhering to each other to thereby securely confine the tip therein after as well as before the same is broken and to form a brush or applicator for applying the liquid.

8. A surgical swab comprising a container having liquid therein for application by the swab and having a portion adapted to be broken to release the liquid for use, a piece of flexible, impervious tubing positioned on said container, one end of said tubing being unstretched and providing a discharge opening of predetermined size through which the liquid may pass when said portion of the container is broken, and a porous applicator extending from said container adjacent said outlet for applying liquid flowing thereto from the latter, said tubing extending beyond the portion of the container to which it is applied and being disposed within said applicator, the latter being made of self-adherent fabric with opposed portions thereof pressed together about said tubing and holding the latter in place on the container.

9. A surgical swab comprising a container having liquid therein for application by the swab when said liquid is released from the container, and a piece of cohesive and self-adherent, yet porous, material rolled upon said container and having a portion extending beyond an end thereof with opposed portions of the extension pressed together and adhering to each other to thereby enclose the end of the container and form a brush or applicator for applying the liquid, said applicator being fan-shaped with a narrow outer edge the material of said applicator being wettable but substantially non-absorbent.

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