

[54] **LIQUID DISPENSING DEVICE**
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[22] Filed: **June 4, 1973**
[21] Appl. No.: **366,469**
[52] U.S. Cl. **128/269**, 15/244, 128/2 W,
128/276, 401/244
[51] Int. Cl. **A61m 35/00**
[58] Field of Search 128/2 W, 276, 269;
401/132; 15/244

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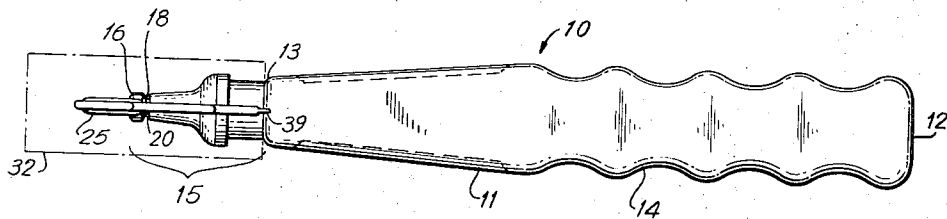
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Primary Examiner—Aldrich F. Medbery
Attorney, Agent, or Firm—Alfred L. Michaelsen

[57] **ABSTRACT**
Disclosed is a device useful for antiseptically cleansing a surface, for example an area of a patient prior to an operation. The device includes a sponge mounted on a nozzle which extends from a hollow handle which contains an antiseptic solution. The antiseptic solution within the handle is dispensed into the sponge when a rupturable joint in the nozzle is broken.

11 Claims, 5 Drawing Figures



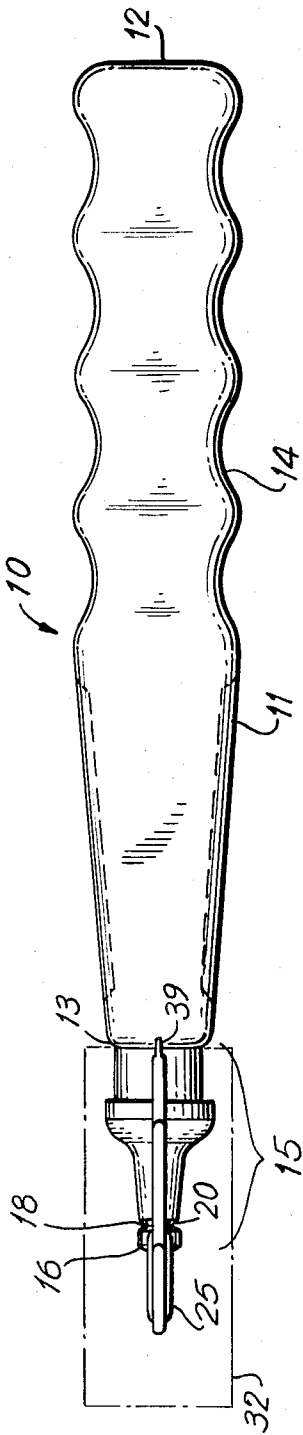


FIG. 1

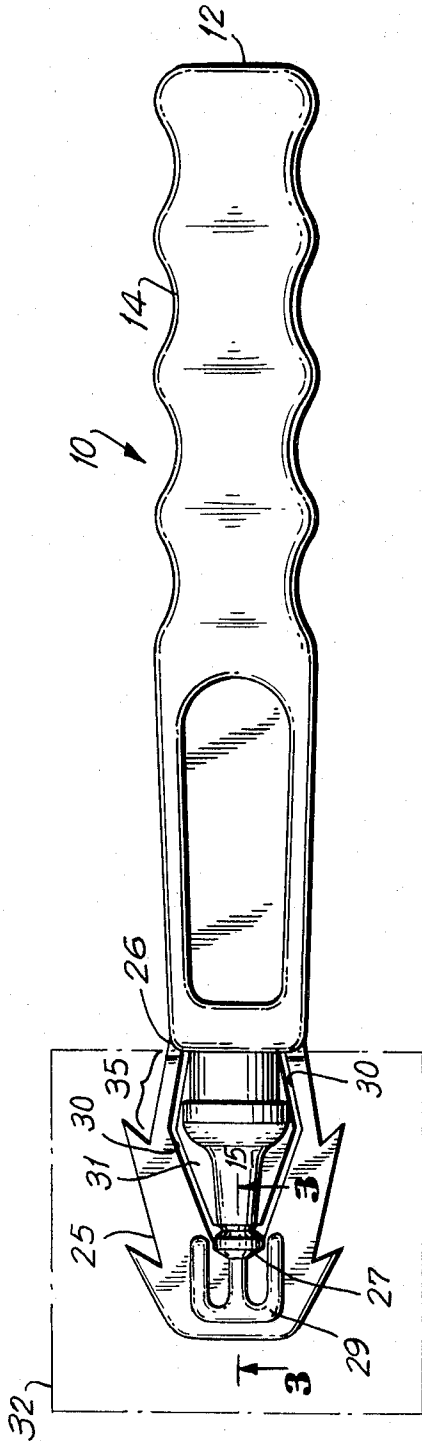


FIG. 2

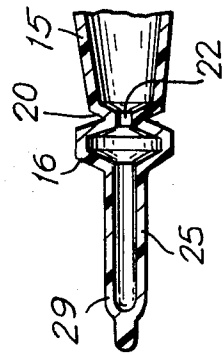


FIG. 3

FIG. 4

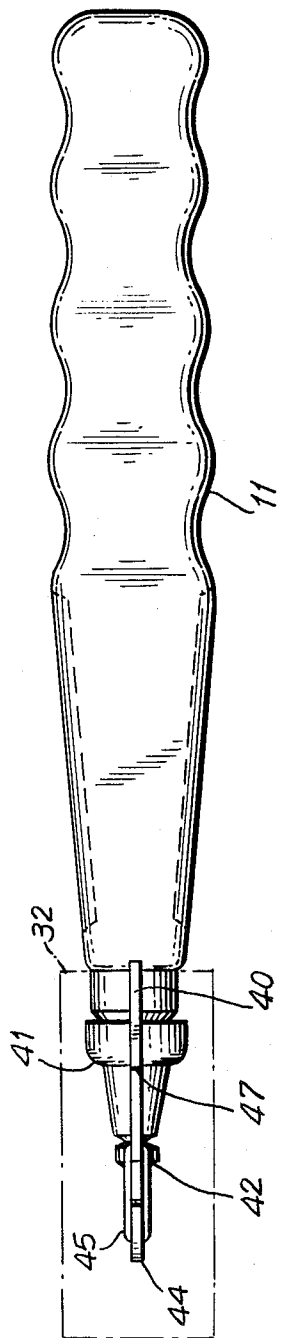
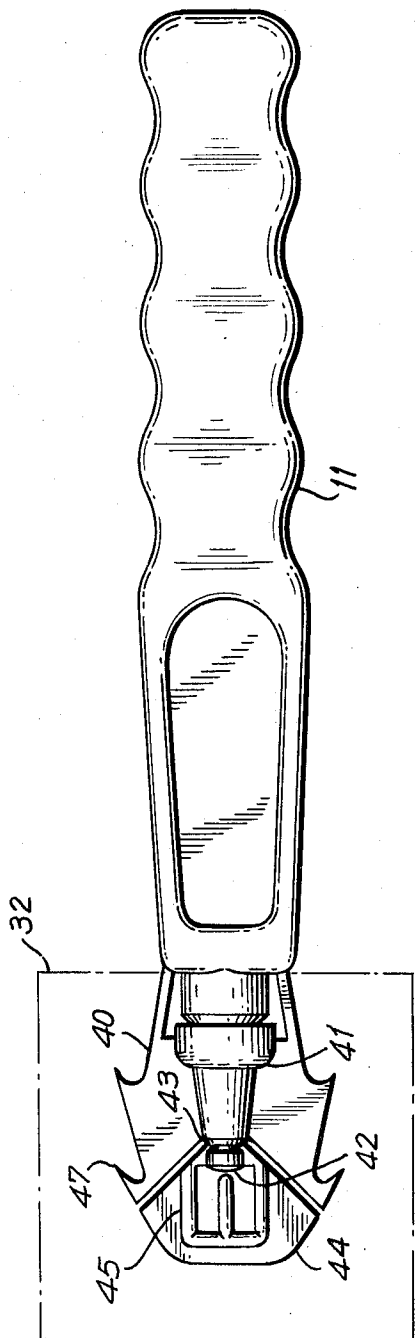


FIG. 5



LIQUID DISPENSING DEVICE

BACKGROUND OF THE INVENTION

In preparation for conducting many medical procedures, for example a surgical operation, it is often necessary to antiseptically cleanse the area of the patient which is to be operated upon. Since the requirement for antiseptically cleansing the surface of a patient has long existed, numerous techniques and devices have been developed to accomplish the desired objective. For example, a primitive approach involves the use of gauze patches which are held by forceps. After the patches have been saturated with an antiseptic solution, the appropriate area is wiped with the wetted gauze. Since such an approach is time consuming and requires a number of separate articles, surgical preping devices were developed which comprised a sponge or gauze fixedly or removably mounted upon a handle. As the art developed, it was recognized that the antiseptic to be applied might advantageously be included within the handle. Of course, such a construction then presented the problem of delivering, at the proper time and in the proper quantity, the antiseptic from the handle to the sponge. To solve this problem, the prior art contrived a number of rather complicated constructions. For example, surgical preping devices were proposed which included a plunger slidably mounted within the handle and which, in combination with different valve arrangements, might function so as to deliver the antiseptic when required. Exemplary of the constructions resorted to by the prior art are those shown in U.S. Pat. Nos. 1,221,231, 1,221,227, 3,394,702, 3,324,855 and 3,508,547.

Although, in general, the devices disclosed by the prior art were an improvement over the primitive method of using gauze patches and forceps, there were nevertheless certain disadvantages which attended either the use or manufacture of these devices. For example, in many of these devices, the construction thereof results in a rather substantial manufacturing cost. The significance of a high manufacturing cost is particularly apparent when it is realized that many of these devices are used only once and then discarded.

From a functional point of view, a number of prior art devices were difficult to use. For example, recognizing that the objective of using such a device is to antiseptically cleanse a particular surface, it will be appreciated that only the antiseptically wetted sponge should contact the surface. Thus, the handle of the device or the hand of the person using the device should not contact the surface to be cleaned. Because prior art devices of this type have generally been provided with a handle which extends from the sponge and lies in a plane defined by the sponge, there has been a distinct tendency for the handle or the hand of the operator to contact the surface to be cleaned. The tendency for this undesirable result to occur is apparent when it is noted that the user of the device will, in order to save time, endeavor to maintain the face of the sponge against the surface to be cleansed. Therefore, in prior art devices wherein the handle and the sponge were in the same plane, any effort by the operator to fully employ the entire face of the sponge increased the probability that a non-antiseptic surface would contact the surface to be cleaned.

As distinguished from prior art surgical preping devices, the invention disclosed herein employs a construction which is particularly amenable to a high speed, low cost manufacturing techniques. Additionally, the structure of the device of this invention provides superior utility and the use of the device may generally be conducted without the risk of frustrating the object of the cleansing procedure.

SUMMARY OF THE INVENTION

A hollow handle is provided which is relatively longitudinally rigid and transversely flexible so that the handle may be compressed by only a moderate hand pressure. Mounted on one end of the handle is a nozzle which is in fluid communication with the handle. The end of the nozzle which is remote from the handle is sealed. Near the seal, the nozzle is provided with a stress raiser so that the end portion of the nozzle may be ruptured when the nozzle is subjected to bending or twisting.

Disposed about the nozzle is a web which is preferably, generally flat or planar. The web extends beyond the end of the nozzle and may be attached to the sealed end of the nozzle. Additionally, the web is attached to either the end of the handle, a portion of the nozzle which is remote from the rupturable joint or both the handle and the nozzle in the aforementioned area. Preferably, the handle, the nozzle and the web are of a one piece, unitary construction.

When the device described above is manufactured, the handle is filled with an antiseptic solution and the end of the handle remote from the nozzle is then sealed. Subsequently, a sponge is positioned over the nozzle and the web. To facilitate this positioning, the sponge may be provided with an appropriately dimensioned slot. Similarly, to promote the retention of the sponge upon the web, the web may be provided with rearwardly extending barbs which engage the sponge. To promote this engagement, the width of the slot may be less than the width of the web. If desired, an adhesive may be used to secure the web to the sponge.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side view of one embodiment of the instant invention.

FIG. 2 is a top view of the embodiment shown in FIG. 1.

FIG. 3 is a fragmentary, sectional view taken along the section line 3—3 of FIG. 2.

FIG. 4 is a side view of another embodiment of the invention.

FIG. 5 is a top view of the embodiment shown in FIG. 4.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGS. 1 and 2, there is shown a preferred embodiment of the instant invention. More specifically, the surgical preping device 10 includes a handle 11 having a proximal end 12 and a distal end 13. A portion of the handle 11 near the proximal end 12 may be provided with undulations 14 to facilitate a gripping thereof by the user. The device 10 shown in FIGS. 1 and 2 is approximately the actual size of the device.

At the distal end 13 of the handle 11, there is provided a nozzle 15. The interior of the nozzle 15 and the interior of the handle 11 are in fluid communication.

The distal end of the nozzle is sealed as at 16. Additionally, adjacent the sealed end 16, it may be noted that the nozzle has been peripherally crimped such that the exterior of the nozzle at 18 forms a "V" shape in cross section. The purpose of this peripheral crimp will be explained in detail hereinafter.

As shown in FIGS. 1 and 2, a web 25 is secured to the distal end of the handle 11 as at 26. The web 25 extends distally from the handle 11 and extends beyond the end of the nozzle 15. The sealed end 16 of the nozzle 15 is secured to the web 25 as at 27.

As may be noted from a close inspection of FIG. 2, in this embodiment of the invention the web 25 is connected to the nozzle 15 only at the sealed end 16. Thus, there is provided a space 30 between the web 25 and a small, second web 31 which is attached to and integral with the nozzle 15. As will be apparent from the description of the manner in which this invention is used, the second web 31 may be omitted. However, irrespective of whether or not the small or second web 31 is omitted, it is critical to the construction of this embodiment of the invention that the web 25 is not connected to the nozzle 15 in the area of the nozzle which is proximally adjacent to the peripheral crimp 18.

When the device 10 shown in FIGS. 1 and 2 is to be used, the handle 11 would be filled with an antiseptic solution. Preferably, the handle 11 is filled with an appropriate solution when the device is manufactured and, immediately thereafter, the proximal end 12 is sealed. Additionally, preferably at the time the device is manufactured, a sponge 32 is disposed upon the web 25 such that the proximal edge of the sponge 32 substantially abuts the distal end 13 of the handle 11. Assuming the handle has been prefilled and sealed, it will be appreciated that the handle and the nozzle are sealed, i.e. the handle is sealed at the proximal end 12 and the nozzle is sealed at the distal end 16. To use the device, the operator would grasp the handle 11 and place one of the faces of the sponge 32 against the surface to be cleansed. Thereafter, the user of the device would exert a downward force on the handle which force would be resisted by the sponge and the web 25 within the sponge 32. Thus, it will be seen that since the nozzle is attached to both the web 25 and the handle 11, the nozzle is subjected to both a bending moment and a shear force. Therefore, corresponding bending and shear stresses will arise in the nozzle 15 and the peripheral crimp or groove 18 will function as a stress raiser and a stress concentration will occur within the groove 18. As a result, the lower portion of the groove 18, viz. that portion of the groove 18 which is tensilely stressed, will fail. Once such a local failure occurs, the failure will immediately propagate around the groove 18 and the sealed end 16 of the nozzle 15 will immediately break away. Thereafter, the antiseptic solution within the handle 11 may flow into the sponge 32. In this connection, the space 30 may advantageously function to promote the distribution of the antiseptic solution throughout the sponge 32.

Recognizing that the rupturable nature of the end of the nozzle 15 is critical to the construction and use of this invention, reference is made to FIG. 3 which shows a fragmentary, cross sectional view of the distal end of the nozzle 15. Referring to FIG. 3, the peripheral, V shaped groove which functions as a stress raiser may clearly be seen. Those skilled in the art will recognize

that although the "V" shaped configuration shown in FIG. 3 will function as a stress raiser and will cause a stress concentration at the bottom 20 of the V when the nozzle is subjected to a bending moment, still other configurations may be employed which will function in an equivalent manner. However, a number of reasons appear to suggest that the "V" shape shown in FIG. 3 is preferable. For example, the sharpness of a V crimp provides a maximum stress concentration. Maximizing the stress concentration is desirable because, as a result, the wall thickness of the nozzle in the region of the crimp may then remain constant, i.e. a break or rupture of the nozzle will occur at the crimp because of the high stress concentration and therefore there is no need to reduce the wall thickness in this area. As a result, manufacturing of the nozzle is facilitated. Another factor which suggests the preferability of employing a V shaped crimp is the configuration of the nozzle after the break or rupture. Thus, in general, a nozzle having a V shaped crimp as shown in FIG. 3 will usually fail at the apex of the V and therefore the portion of the nozzle which remains will essentially define an orifice 22. By adjusting the depth of the V shaped crimp, the diameter of this orifice may be substantially predetermined. Hence, when the end portion of the nozzle fails or ruptures, the entire quantity of antiseptic solution within the handle will not immediately discharge into the sponge. Rather, because of the presence of the constricted orifice remaining after the failure of the tip of the nozzle, the antiseptic solution will discharge, in a somewhat metered fashion, into the sponge.

To further promote the metered or controlled discharge of the antiseptic solution into the sponge, the handle 11 is preferably made of a material which is sufficiently flexible that it can be squeezed with only a moderate hand pressure. Thus, the use of a transversely flexible handle and the orifice defined at the end of the nozzle after a failure thereof, will permit the operator to control the discharge of the antiseptic into the sponge 32. Of course, it will be appreciated that since the handle 11 is subjected to a bending stress by the operator and since it is desired that the effect of the bending stress will be to cause a failure of the distal portion of the nozzle, therefore, the handle 11 should be relatively, longitudinally rigid. Similarly, it will also be appreciated that the portion of the web 25 which extends beyond the sealed end 27 of the nozzle 15 should be relatively rigid, i.e. when the nozzle 15 is subjected to a bending stress, it is desirable that the end of the web is subjected to only a relatively small amount of bending. Stated otherwise, if the portion of the web 25 which extends past the sealed end of the nozzle 15 were to substantially bend, the bending moment experienced by the nozzle would be reduced and, therefore, it would become more difficult to cause a failure of that portion of the nozzle which contained the stress raiser. In view of these factors, it is preferable to provide some form of strengthening or rigidifying means on that portion of the web 25 which extends past the closed end of the nozzle 15. In the embodiment of this invention shown in FIG. 2, the strengthening means employed is a "M" shaped rib 29, i.e. the thickness of the web 25 is increased so as to define the M shaped rib 29.

As previously indicated, the embodiment of this invention shown in FIGS. 1 and 2 contemplates that the web 25 will be secured to the handle 11 as at 26. Such a construction is believed to be preferable because of

certain operational advantages which result. For example, referring to FIG. 2, it will be appreciated that after the end of the nozzle 15 fails during the initial bending, the web 25 will then be attached only to the handle 11. Moreover, it may be noted that the portion of the web 25 adjacent to the handle 11, e.g. the portion 35, is relatively narrow. Therefore, after the end of the nozzle 15 has failed, the web 25 may be bent or flexed through a considerable angle, for example 45°. As a result, a user of the preping device shown in FIGS. 1 and 2 may bend the handle upward by pressing down on the sponge and, as a result, the handle 11 and the hand of the user of the device may be kept remote from the surface to be cleaned. Such a position of the handle with respect to the sponge is not only more natural from the point of view of the user but, additionally, avoids the problem of prior art constructions, viz. the risk that the area to be cleaned might be contaminated by either the handle or the hand of the user.

With general regard to the functioning of the web 25 and the flexing thereof to promote the use of the device, a number of other factors may be noted. For example, the presence of the web 25 within the sponge 32 will insure that when the sponge 32 is pressed against the surface to be cleaned, a maximum portion of the sponge will stay in contact with the surface to be cleaned. In other words, the web 25, when positioned within the sponge 32, will act as a bearing surface to transmit the force exerted by the user of the device over a maximum area of the sponge. With specific regard to the bending or flexing of the web 25, it may be advantageous to provide a reduced thickness portion of the web 25 adjacent to the point at which it is secured to the handle 11, for example as shown at 39 in FIG. 1. Depending upon the specific material selected for the web 25, the thickness thereof at the point at which it is secured to the handle 11 may be adjusted accordingly.

Returning to a consideration of the manner in which the invention functions when the device is being used, the significance of a number of construction alternatives may be appreciated. For example, as previously indicated, the nozzle 15 may be supplied with a second, smaller web 31. While the presence of the smaller web 31 will have no particular effect upon the breaking of the end of the nozzle 15, it may act as a supplemental bearing surface to assist the main web 25 in distributing forces over a maximum area of the sponge 32. Referring to the web 25 as shown in FIG. 2, it may be noted that a number of rearwardly extending barbs 39 are provided. The barbs 39 will assist in maintaining the sponge on the web 25. For example, the sponge 32 is preferably provided with a slit having a depth approximately equal to the length of the web 25 and a width which is slightly less than the width of the web as measured from one barb to another. Thus, the web may be forced into the slit of the sponge and the rearwardly extending barbs will assist in maintaining the sponge on the web. As an alternative to the use of the barbs 39 or in combination therewith, an adhesive may be deposited upon the web 25 prior to insertion into the sponge 32.

Considering, in a more general sense, the construction of the device shown in FIGS. 1 and 2, it will be recalled that the web 25 is attached to the handle 11 as at 26. Although this construction is acceptable, an alternative construction may be employed. Thus, rather

than securing the web 25 to the distal end 13 of the handle 11, the web may be secured to the nozzle 15 at points which are proximally distant from the V shaped crimp 18. For example, the web 25 may be attached to the nozzle 15 in the region 35. The extent to which the web is attached to the nozzle will, of course, be dependent upon a number of factors such as the thickness of the web, the wall thickness of the nozzle, the particular form of stress raiser which is employed, the length of the nozzle and the overall length of the web. Thus, all of these factors will have to be considered in terms of the bending stress to which the end of the nozzle 15 is subjected. However, recognizing the principle of the operation of this embodiment, it will be appreciated that if the web is attached to the nozzle or both to the nozzle and the handle, the points of attachment to the nozzle must be proximally distant from the peripherally crimped portion 18 so as to insure that this portion is subjected to a bending moment.

The construction hereinbefore described represents the preferred embodiment of this invention, i.e. a construction wherein the sealed end of the nozzle is attached to the end portion of the web in order to facilitate the breaking of the nozzle. Another construction which is functionally acceptable resides in employing the same combination of elements hereinbefore described but omitting the attachment between the sealed end of the nozzle and the web. When using a device constructed in this manner, the sealed end of the nozzle would be broken by the user, e.g. by feeling for the end of the nozzle through the sponge and then breaking off the end of the nozzle. Thereafter, the device would be used as described above.

A construction which is intermediate the construction described above and the preferred embodiment described earlier is shown in FIGS. 4 and 5. Referring to FIGS. 4 and 5, it will be seen that the overall construction is similar to the preferred embodiment shown in FIGS. 1-3. Thus, a hollow handle 11 is provided with a web 40 and a nozzle 41 extending from and integral with the distal end of the handle 11. Additionally, the distal end of the nozzle is sealed as at 42 and the nozzle includes a break-away zone or stress raiser as at 43. However, differing from the preferred embodiment, the web 40 is integral with the nozzle between the handle and the break-away portion although the web 40 extends distally beyond the break-away zone 43. Thus, the web 40 will provide an adequate bearing surface to distribute applied forces over the face of the sponge.

To facilitate the breaking of the end of the nozzle, a second web 44 is provided and is secured to and preferably integral with the sealed end of the nozzle. To rigidify the web 44, an M shaped rib 45 may be provided.

When used, a sponge 32 is disposed over the webs 40 and 44. In order to actuate the device, the user will grasp the web 44 within the sponge and, while holding the handle 11, the web 11 will be bent thus breaking the nozzle at the break-away zone 43.

As was the case with the preferred embodiment, the embodiment of FIGS. 4 and 5 is preferably of a unitary construction, manufactured through the use of blow molding techniques and constructed of polyethylene. Additionally, the web 40 is preferably provided with rearwardly extending barbs 47 which promote the retention of the sponge.

While the article of manufacture disclosed herein has been described mainly in terms of a surgical preping device, it will be appreciated that the same device may be used for a number of other purposes, e.g. as a dish-washing device wherein a detergent is contained within the handle.

With respect to materials which are useful in the construction of this invention, the entire device, except the sponge, may be advantageously constructed of low, medium or high density polyethylene. Indeed, a particularly advantageous construction, which results in a minimum manufacturing cost, is a one piece construction wherein the handle is blow molded from extruded polyethylene stock and the distal portion of the nozzle and the web are formed by clamping between molding jaws.

Although a number of materials may be used for a sponge, it has been found that polyurethane foam having non-reticulated pores is a particularly acceptable material. A typical dimension for a sponge to be used in combination with this invention is a rectangular sponge which is two and one half inches square and is provided with a slit 1 inch wide and 2 inches deep.

Although a preferred embodiment of this invention and certain variations thereof have hereinbefore been described, it will be appreciated that other variations will occur to those skilled in the art without departure from the scope of this invention as defined by the claims appended hereto.

We claim:

1. A liquid dispensing device which comprises:

- a. a hollow handle having a sealed proximal end and a distal end and containing a liquid;
- b. a nozzle mounted on the distal end of said handle and in fluid communication with the interior of said handle, the distal end of said nozzle being sealed, said nozzle including a stress raiser adjacent the sealed end thereof, said stress raiser being defined by a stress concentrating discontinuity in the cross section of said nozzle;
- c. a web secured to said device and extending distally from the point of securement, said web having a substantial planar area for bearing against the inte-

rior surface of a sponge mounted thereon;

d. a sponge disposed upon and substantially surrounding said nozzle and said web; and

e. means for maintaining said sponge on said web.

2. The device of claim 1 wherein said web is flexibly mounted on said handle.

3. The device of claim 1 wherein the distal portion of said web includes rigidifying ribs.

4. The device of claim 1 wherein the end portion of said web is affixed to the sealed end of said nozzle.

5. The device of claim 4 wherein said web is flexibly mounted on said handle.

6. The device of claim 5 wherein the distal portion of said web includes rigidifying ribs.

7. A liquid dispensing device which comprises:

a. a hollow handle having a sealed proximal end and a distal end and containing a liquid;

b. a nozzle mounted on the distal end of said handle and in fluid communication with the interior of said handle, the distal end of said nozzle being sealed, said nozzle including a stress raiser adjacent the sealed end thereof, said stress raiser being defined by a stress concentrating discontinuity in the cross section of said nozzle;

c. a web secured to the sealed end of said nozzle at points proximally distant from said stress raiser, said web extending distally beyond the sealed end of said nozzle, said web having a substantial planar area for bearing against the interior surface of a sponge mounted thereon;

d. a sponge disposed upon and substantially surrounding said nozzle and said web; and

e. means for maintaining said source on said web.

8. The device of claim 7 wherein said web is flexibly mounted on said handle.

9. The device of claim 7 wherein the distal portion of said web includes rigidifying ribs.

10. The device of claim 7 wherein the end portion of said web is affixed to the sealed end of said nozzle.

11. The device of claim 10 wherein said web is flexibly mounted on said handle.

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