The present invention relates to devices for producing bubbles. 

More particularly, the present invention relates to that type of device wherein the user immerses a ring in a solution from which bubbles are adapted to be formed when withdrawn from the solution, and the bubble forming device is capable of producing from each immersion a number of bubbles far in excess of the number which can be produced from conventional devices of the type referred to above.

Another object of the present invention is to provide a device for the above type which is exceedingly simple and inexpensive to manufacture.

A further object of the present invention is to provide in a bubble-producing device a container which cooperates with the device inserted into a solution in the container in such a way that practically all of the solution can be used in order to form bubbles. 

In view of the above objects, the invention includes, in a device for producing bubbles, a body which is adapted to be immersed in a solution from which bubbles are adapted to be formed, this body being formed with an opening across which a film of the solution extends when the body is withdrawn from the solution. Thus, the operator, upon blowing through the opening, will form a bubble from this film. In accordance with the invention, the body has an endless portion surrounding the opening thereof and having an inner periphery which defines this opening, and this endless portion is formed with a plurality of capillary passages which extend all the way up to the inner periphery of the endless portion so as to communicate with the opening of the body. Because of these capillary passages, additional solution is stored in these passages and will flow to the inner periphery of the endless portion as successive bubbles are formed, so that in this way it becomes possible to form many more bubbles than would be the case where the body was incapable of storing solution which would eventually flow to the inner periphery of the endless portion to form additional bubbles.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

FIG. 1 shows in elevation one possible construction of a device adapted to be used in the production of bubbles according to the present invention; 
FIG. 2 is a fragmentary illustration on an enlarged scale of part of the structure of FIG. 1; 
FIG. 3 is a sectional view taken along line III—III of FIG. 2 in the direction of the arrows; 
FIG. 4 is a fragmentary view on an enlarged scale of part of another embodiment of a device according to the present invention; 
FIG. 5 fragmentarily illustrates the manner in which the body of the invention is immersed into the interior of a container in a solution therein, FIG. 5 being a sectional view taken along line V—V of FIG. 6 in the direction of the arrows; 
FIG. 6 is a sectional plan view of the structure of FIG. 5 taken along line VI—VI of FIG. 5 in the direction of the arrows; 
FIG. 7 is a sectional elevation illustrating one form of container and bubble-producing device according to the present invention; 
FIG. 8 is a sectional elevation illustrating another embodiment of a container and bubble-forming device according to the present invention; 
FIG. 9 illustrates another variation of a bubble-forming device according to the invention; and 
FIG. 10 is a transverse section of still another embodiment of a bubble-forming device according to the present invention.

Referring now to FIGS. 1–3, there is shown therein an annular body 1 which is adapted to be immersed in a solution, such as a soap solution, from which bubbles are adapted to be formed, as is well-known. The body 1 is formed with an opening 2, and the size of the opening 2 and the nature of the solution into which the body 1 is immersed are such that when the body 1 is removed from the solution, there will extend across the opening 2, as a result of the surface tension of the liquid which forms the solution, a film of the solution so that the operator, upon blowing through the opening 2, will form a bubble from this film, as is well-known. The annular body 1 may be connected to a stem, shown at the lower part of FIG. 1, which enables the operator to manipulate the body 1, this stem forming a handle, as is also well-known. The annular body 1 forms an endless portion which surrounds the opening 2 and has an inner periphery which defines the opening 2. At its opposed faces the body 1 is formed with a plurality of radial grooves 4, and these grooves extend all the way up to the inner periphery 3 of the endless portion which surrounds the opening 2. The several grooves 4 on each of the opposed faces of the body 1 are of such a width, that they have a capillary action with respect to the solution, so that solution is stored in the several grooves 4. Thus, the several grooves 4 form passages which communicate with the opening 2 at the inner periphery 3 of the body 1. As the successive bubbles are formed the solution which is stored in the passages 4 will flow toward the inner periphery 3 of the body 1 so that in this way it is possible to form, after each immersion of the body 1 in the solution, a number of bubbles far in excess of that which could be formed if the exterior surface of the body 1 were smooth. The body 1 is also formed in each of its opposed faces with an annular groove 5 whose center coincides with the center of the circular opening 2, and this groove 5 extends across all of the radial grooves 4, so that in this way all of the grooves 4 communicate with each other, and the groove 5 thus contributes to the uniform delivery of the solution to the inner periphery 3 of the body 1 through
the several grooves 4. In addition, the body 1 is formed at its inner perimeter 3 with a plurality of axially extending and radial grooves 4 which are respectively aligned with the grooves 4 on the opposite face of the body 1, and the several notches 6 provide communication between the pairs of aligned grooves 4, as is particularly apparent from FIG. 3, so that in this way also a uniformity of the supply of solution to the inner perimeter 3 of the body 1 is ensured around the entire outer periphery of the body 1 so as to uniformly deliver a large number of bubbles through the opening 2 provided in the bottom of the container 10. However, the size and number of the grooves 4 and the openings 2 may be varied in accordance with the embodiment described above in connection with FIGS. 1-3, for example. The body 11 is fixed to one end of a stem 12 and the stem 12 is adapted to be closed by a cover 19. The body 11 is fixed to the cover 19 with the cover 19 being clamped thereto by a tensioning member 20.

As is apparent from FIG. 7, the cover 10 is formed with an inner flange which is annular and which surrounds the portion of the cover 10 to which the stem 12 is fixed, so that in this way a recess 15 is formed, and when the body 11 is removed from the container 9 and positioned so that it is located at a elevation higher than the recess 15, any excess solution will flow down along the stem 12 into the recess 15 to be received therein so that in this way none of the solution which fall from the body 11 will be received in the recess 15, the latter normally being located beneath the body 11 when the latter is used. According to the embodiment of the invention which is illustrated in FIG. 8, the annular body 16 also has the construction described above and as shown in FIGS. 1-3, for example. This body 16 is located at its underside against the inclined bottom wall 17 of a cylindrical container 18. The upper portion of the stem 21, which is fixed to the body 16, has an enlargement 20 received in a suitable recess of a portion of the cover 19 so as to be fixed to the cover 19, and the stem 12 may be fixed to the cover 10 in the same way, and it will be noted that in the embodiment shown in FIG. 8 the connection of the stem 21 to the cover 19 is eccentrically spaced from the center of the cover 19 which is used to close the container 18. It is apparent that with the embodiment of FIG. 8 also the body 16 will extend to the lowest part of the container so as to enable practically all of the solution to be received in the capillary grooves and thus to be capable of being used for forming bubbles.

Either the container for the solution or the bubble-forming body itself may be made with a flexible material so that in this way also it is possible to make use of the last bit of the solution in the container. If the materials used for the embodiments of FIGS. 7 and 8 are not flexible, then there will be located at the adjoining portions of the container and cover of the embodiment of FIG. 7 as well as that of FIG. 8 either a mechanical or optical arrangement indicating to the operator the proper alignment of the cover with respect to the container so that the body will properly be received in the container in the manner shown in FIGS. 7 and 8. Thus, the adjoining peripheries of the container and cover may respectively be provided with marks which need only be matched in order to provide the proper angular positioning of the cover with respect to the container, or one of these elements may be formed with a notch which receives a projection of the other element so as to mechanically guarantee that the parts are in proper angular alignment.

According to the embodiment of the invention which is illustrated in FIG. 7, the container 9 is also cylindrical and is adapted to be closed by a cover 10. The body 11 which is used to form the bubbles may have the
the precise center of the body. For example, FIG. 9 shows a body 22 formed with an opening 23 across which a film of the solution will extend so that the operator can form bubbles by blowing through the opening 23. The endless portion of the body 22 which surrounds the opening 23 and which has an inner periphery which defines the opening 23 is formed with capillary passages as described above in connection with FIGS. 1–3 or in connection with FIG. 4. As is apparent from FIG. 9, the outer periphery of the body 22 may have a configuration which represents a living creature such as an animal. This effect of representing a living creature may be enhanced by suitable additional markings provided on the body 22, as indicated in FIG. 9. This form of construction renders the device far more attractive to a child.

In the embodiment of the invention which is illustrated in FIG. 10, the structure is exactly the same as that described above and shown in FIGS. 1–3, the only difference being that in addition to the structure shown in FIGS. 1–3, the embodiment of FIG. 10 includes a pair of layers 20 of foam plastic which are fused to the exterior opposed side surfaces of the annular body 1, each of these layers 20 being in the form of a ring of plastic which extends only between the inner and outer peripheries of the body 1. The foam plastic is preferably flexible and of the open-cell type, so that all of the cells communicate with each other, and in this way it is possible to store in the foam plastic additional solution which will flow from the pores or cells of the foam plastic into the capillary passages and from the latter to the inner periphery of the body, as described above.

It should also be noted that in addition to being formed with notches 6 as indicated in FIGS. 2 and 3, the body 1 may also be formed with openings passing therethrough at the intersections of the grooves 4 and 5, and that in this way also the several grooves 4 at the opposed faces of the body 1 will be placed in communication with each other to further enhance the uniform supply of the solution to the inner periphery 3 of the body 1.

The use of plastic for the body 1 is preferred because it is inexpensive to manufacture and because it is resistant to corrosion, but it is also possible to use materials such as glass, metal, or the like that are non-porous.

In practice, it has been found that the grooves or passages 4 and 5 may have a width of from 0.5–3.0 mm, in order to provide the desired capillary action with respect to the fluid solution which is to be blown from the bubbles. Of course, these dimensions will vary with different solutions depending upon the surface tension of the liquid. With scopy solutions grooves having a width of 3 mm. have been used successfully. It is to be emphasized that these dimensions and ranges are of course only approximate. Moreover, the cross-sectional configuration of the grooves can vary. While grooves 4 and 5 of substantially-rectangular cross-section have been shown in FIGS. 2 and 3, the cross-section need not be rectangular or square, as shown, but it can also be wedge or trapezoidal-shaped in cross-section, or even circular in cross-section. The square cross-section is preferred because of the simplicity of its manufacture.

It should be noted that bubble-producing devices which are blown through by children in order to form bubbles often pass with so that there is the possibility of spreading germs undesirably with these devices, particularly in the cases of small children. The structure of the invention, because of the manner in which the inner periphery of the body 1 is broken up by the grooves 4 and the notches 6, or by the pins 7 in the case of FIG. 4, greatly reduces the possibility of transferring germs, so that there is an additional safety factor involved with the structure of the invention.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of bubble-producing devices differing from the types described above.

While the invention has been illustrated and described as embodied in bubble-producing rings and containers, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without consulting the present specification, since the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. For use in the production of bubbles, a body which is adapted to be immersed in a solution from which bubbles are adapted to be formed, said body being formed with an opening across which a film of the solution is adapted to extend so that the user, upon blowing through said opening, can form a bubble from said film, said body having and endless portion consisting of non-porous material surrounding said opening and having an inner periphery which defines said opening, said endless portion being formed with capillary grooves tapering toward said inner periphery of said endless portion for storing in said grooves solution which will flow toward said inner periphery as bubbles are successively formed, and said body being formed with at least one annular groove intersecting said tapering capillary grooves to provide communication between all of said grooves.

2. For use in the production of bubbles, a body adapted to be immersed in a solution from which bubbles are adapted to be formed, said body being formed with an opening across which a film of said solution is adapted to extend so that the user, upon blowing through said opening, can form a bubble from said film, said body having an endless portion consisting of non-porous material surrounding said opening and having an inner periphery which defines said opening, said endless portion of said body being formed with a plurality of capillary passages which respectively taper toward and communicate with said inner periphery and in which solution is stored to flow toward said inner periphery as successive bubbles are formed, and said body being formed with at least one annular groove intersecting said capillary passages to provide communication between all of said capillary passages.

3. For use in the production of bubbles, a body adapted to be immersed in a solution from which bubbles are adapted to be formed, said body being formed with an opening across which a film of said solution is adapted to extend so that the user, upon blowing through said opening, can form a bubble from said film, said body having an endless portion consisting of non-porous material surrounding said opening and having an inner periphery which defines said opening, said endless portion of said body being formed with a plurality of capillary passages which respectively taper toward and communicate with said inner periphery and in which solution is stored to flow toward said inner periphery as successive bubbles are formed, said passages becoming gradually narrower as they approach said inner periphery of said endless portion of said body, and said body being formed with an annular groove intersecting said capillary passages to provide communication between all of said capillary passages.

4. For use in the production of bubbles, a body adapted to be immersed in a solution from which bubbles are adapted to be formed, said body being formed with a substantially circular opening across which a film of the solu-
tion is adapted to extend so that the user, upon blowing through said opening, will form a bubble from said film, said body having an endless portion consisting of non-porous material surrounding said opening and having an inner periphery which defines said opening, said body being formed at said endless portion thereof with a plurality of radial grooves distributed about the center of said opening and tapering radially toward said center all the way up to said inner periphery of said endless portion so that solution is stored in said radial grooves to flow toward said inner periphery during the formation of successive bubbles, and said body being also formed with an annular groove interconnecting said radial grooves to provide communication between all of said radial grooves.

5. For use in the production of bubbles, a body adapted to be immersed in a solution from which bubbles are adapted to be formed, said body being formed with a substantially circular opening across which a film of the solution is adapted to extend so that the user, upon blowing through said opening, will form a bubble from said film, said body having an endless portion consisting of non-porous material surrounding said opening and having an inner periphery which defines said opening, said body being formed at said endless portion thereof with a plurality of radial grooves distributed about the center of said opening and tapering radially toward said center all the way up to said inner periphery of said endless portion so that solution is stored in said radial grooves to flow toward said inner periphery during the formation of successive bubbles, each of said radial grooves tapering toward said inner periphery so that by capillary action the solution in each groove is drawn toward said inner periphery, and said body being also formed with an annular groove interconnecting said radial grooves to provide communication between all of said radial grooves.

6. For use in the production of bubbles, a body adapted to be immersed in a solution from which bubbles are adapted to be formed, said body being formed with a substantially circular opening across which a film of the solution is adapted to extend so that the user, upon blowing through said opening, will form a bubble from said film, said body having an endless portion consisting of non-porous material surrounding said opening and having an inner periphery which defines said opening and said body being formed at said endless portion thereof with a plurality of radial grooves distributed about the center of said opening and tapering radially toward said center all the way up to said inner periphery of said endless portion so that solution is stored in said radial grooves to flow toward said inner periphery during the formation of successive bubbles, said body being formed with an annular groove whose center coincides with the center of said opening, spaced from said inner periphery of said endless portion, and extending along said endless portion across all of said radial grooves to provide communication between all of said radial grooves.

7. For use in the production of bubbles, a ring formed of non-porous material adapted to be immersed in a solution from which bubbles are adapted to be formed, so that a film of the solution will extend across the ring and so that the user, upon blowing through said ring, will form a bubble from said film, said ring having opposed faces each of which is formed with a plurality of grooves tapering toward and communicating with the inner periphery of said ring and adapted to store solution which flows toward the inner periphery of said ring during the formation of successive bubbles, and said ring also being formed with an annular package interconnecting said grooves to provide communication therewith.

8. For use in the production of bubbles, a ring adapted to be immersed in a solution from which bubbles are adapted to be formed, a film of said solution extending across said ring when the latter is withdrawn from the solution so that the user, upon blowing through said ring, will form a bubble from said film, said ring consisting of non-porous material and having an endless portion thereof extending over said opposed faces with a plurality of grooves respectively tapering toward and communicating with the inner periphery of said ring, and the grooves at one of said faces being respectively aligned with the grooves at the other of said faces, said ring being formed at its inner periphery with a plurality of notches which respectively provide communication between the grooves on one face and the grooves on the other face which are respectively aligned with said grooves on said one face, the size of said grooves being small enough for solution to be retained therein by capillary action so that solution will be stored in said grooves to flow toward said inner periphery of said ring as successive bubbles are formed, and said ring also being formed on each face with an annular passage interconnecting the grooves on its respective face to provide communication between said grooves.

9. For use in the production of bubbles, a ring adapted to be immersed in a solution from which bubbles are adapted to be formed, a film of the solution extending across the ring after the latter is withdrawn from the solution so that the user, upon blowing through the ring, will form a bubble from said film, said ring consisting of non-porous material and having opposed faces respectively formed with substantially radial grooves tapering toward and communicating with the inner periphery of said ring and said ring being formed in each of its faces with an annular groove providing communication between all of the radial grooves at one face of said ring, and said ring being formed at the intersections of said radial and annular grooves with openings passing through said ring to provide communication between the grooves at the opposed faces of said ring, the size of all of said grooves being small enough to retain solution therein by capillary action so that the solution will flow to the inner periphery of said ring as successive bubbles are formed.

10. For use in the production of bubbles, a body adapted to be immersed in a solution from which bubbles are adapted to be formed, said body being formed with an opening across which a film of the solution extends when the body is withdrawn from the solution, so that the user, when blowing through said opening, will form a bubble from said film, said body having an endless portion consisting of non-porous material surrounding said opening and having an inner periphery defining said opening, and said endless portion being formed with a plurality of passages which taper toward and communicate with the inner periphery of said endless portion, and said body carrying a layer of foam plastic along said endless portion thereof extending over said passages, the size of said passages being small enough to store solution therein by capillary action so that the solution will flow along said passages to the inner periphery of said endless portion as successive bubbles are formed, and the layer of foam plastic increasing the capacity for storing solution from which bubbles can be successively formed, and said endless portion being formed with an annular groove interconnecting said passages to provide communication therewith.

11. For use in the production of bubbles, in combination, a body adapted to be immersed in a solution from which bubbles are adapted to be formed, said body being formed with an opening across which a film of said solution extends when said body is withdrawn from said solution, and said body having an endless portion consisting of non-porous material surrounding said opening and having an inner periphery defining said opening, said endless portion being formed with a plurality of capillary grooves tapering toward and communicating with said opening to store solution which will flow toward said opening as successive bubbles are formed and said endless portion being formed with an annular groove
interconnecting said capillary grooves to provide communication therebetween; and a container for the solution, said container being large enough to receive in its interior the entire body so that the latter may be stored in said container when not in use.

12. For use in the production of bubbles, a body adapted to be immersed in a solution from which bubbles are adapted to be formed, said body being formed with an opening across which a film of said solution extends when said body is withdrawn from the solution, so that the user, upon blowing through said opening, will form a bubble from said film, said body having an endless portion consisting of non-porous material surrounding said opening and having an inner periphery which defines said opening and said body being formed at said endless portion thereof with a plurality of capillary passages tapering toward said inner periphery of said endless portion for storing solution which flows to said inner periphery as successive bubbles are formed, and said endless portion being formed with an annular groove interconnecting said capillary passages to provide communication therebetween; and a container adapted to contain a solution from which the bubbles are adapted to be formed, said container having a curved side wall and said body having a curvature which conforms to the curvature of said side wall so that said body can be located with one of its side faces engaging along the entire area of said side face said side wall at the interior of said container.

13. For use in the production of bubbles, in combination, a body adapted to be immersed in a solution in which bubbles are adapted to be formed, said body being formed with an opening across which a film of said solution extends when said body is withdrawn from the solution, so that the user, upon blowing through said opening, will form a bubble from said film, said body having an endless portion consisting of non-porous material surrounding said opening and having an inner periphery defining said opening and said body being formed at said endless portion thereof with a plurality of capillary passages tapering toward said inner periphery of said endless portion to communicate with said opening so that additional solution may be stored in said passages to flow toward said inner periphery as successive bubbles are formed, and said endless portion being formed with an annular groove interconnecting said capillary passages to provide communication therebetween; and a container adapted to contain said solution, said container having a lower portion formed with a recess into which said body fits with a relatively slight clearance whereby the last bit of said solution in said recess will be received by said body so that the solution can be used up in its entirety to form bubbles.

14. For use in the production of bubbles, in combination, a body adapted to be immersed in a solution from which bubbles are adapted to be formed, said body being formed with an opening across which a film of said solution extends when said body is withdrawn from the solution, so that the user, upon blowing through said opening, will form a bubble from said film, said body having an endless portion consisting of non-porous material surrounding said opening and having an inner periphery which defines said opening and said body being formed at said endless portion thereof with capillary passages tapering toward said inner periphery and communicating with said opening so that additional solution may be stored in said passages to flow toward said inner periphery as successive bubbles are formed, and said endless portion being formed with an annular groove interconnecting said capillary passages to provide communication therebetween; a container adapted to contain said solution, said container being large enough to house the entire body therein when the latter is not in use; a cover removably connected to said container for covering the same; and a stem fixed to and extending between said body and said cover so that when said cover is removed said body will be removed from said solution in said container.

15. For use in the production of bubbles, a body adapted to be immersed in a solution from which bubbles are adapted to be formed, said body being formed with an opening across which a film of said solution is adapted to extend so that the user, upon blowing through said opening, can form a bubble from said film, said body having an endless portion consisting of non-porous material surrounding said opening and having an inner periphery defining said opening and said body being formed at said endless portion thereof with a plurality of capillary passages tapering toward said inner periphery of said endless portion to communicate with said opening so that additional solution may be stored in said passages to flow toward said inner periphery as successive bubbles are formed, and said endless portion being formed with an annular groove interconnecting said capillary passages to provide communication therebetween, said body having at its outer periphery a configuration which is representative of a living creature.

References Cited in the file of this patent

UNITED STATES PATENTS

<table>
<thead>
<tr>
<th>Patent Number</th>
<th>Inventor</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,391,797</td>
<td>Raspet</td>
<td>Dec. 25, 1945</td>
</tr>
<tr>
<td>2,514,009</td>
<td>Raspet</td>
<td>July 4, 1950</td>
</tr>
<tr>
<td>2,618,886</td>
<td>Wagner</td>
<td>Nov. 25, 1952</td>
</tr>
<tr>
<td>2,711,051</td>
<td>Pick</td>
<td>June 21, 1955</td>
</tr>
</tbody>
</table>