an angle to each other as discussed above in regard to the embodiments of Figures 7A and B.

[0055] The sheet or sheets 18 can be arranged around (such as in Figure 6) and /or above the the bottom of the bag 4 as needed to achieve the desired vortex breaking effect. Generally it has been found that the vortex breaker (sheet 18) should be arranged above the mixing element as the vortex tends to occur above the impellers of the mixer device. The distance above the mixer device is one of design choice for the most part however it needs to small enough to interpret and /or prevent the vortex from forming. Generally the sheet(s) 18 should be at a height at least 5% of the height of the vertical sides of the bag above the impellers on the mixing device. The overall height of the sheet (s) 18 is not critical so long as it is sufficient to break the vortex formation as desired in the given bag and is of a height that does not interfere with the mixing of the components.

[0056] The sheet(s) 18 should either be flexible and capable of being stretched so that as the bag is inflated the sheet(s) become somewhat tight or taut. Alternatively, they can be of a length essentially equal to the width of the bag when inflated so that as the bag 4 expands the sheet 18 unfolds and becomes somewhat tight or taut. By somewhat tight or taut it is meant that the sheet 18 does not need to rigid or stretched tightly across the bag 4 in all circumstances. It may have some slack and may move slightly in the bag 4 so long as it is capable of remaining in the zone of vortex formation in order to prevent the vortex from forming.

[0057] The bag 4 of all the embodiments comprises a flexible and collapsible bag-like bag 4 having an interior surface

and an exterior surface. Interior surface bounds a compartment or space into which liquid can be added. More specifically, bag 4 comprises a side wall 22 that, when bag 4 is unfolded, has a substantially circular or polygonal transverse cross section that extends between a first end and an opposing second end. First end terminates at a top end wall 16 while second end terminates at a bottom end wall 10.

[0058] Bag 4 is comprised of a flexible, water impermeable material such as polyethylene or other polymeric sheets having a thickness in a range between about 0.1 mm to about 5 mm with about 0.2 mm to about 2 mm being more common. Other thicknesses can also be used. The material can be comprised of a single ply material or can comprise two or more layers which are either sealed together or separated to form a double wall container. Where the layers are sealed together, the material can comprise a laminated or extruded material. The laminated material comprises two or more separately formed layers that are subsequently secured together by an adhesive.

[0059] The bag material comprises a single integral sheet which comprises two or more layer of different material separated by a contact layer that are either laminated together or all simultaneously co-extruded.

[0060] One example of an extruded material that can be used in the present invention is the Pureflex™ ~~flim~~ film and bags available from Millipore Corporation.

[0061] Another is the HyQ CX5-14 cast film available from HyClone Laboratories, Inc. This film comprises a polyester elastomer

[0068] It is appreciated that bag 4 can be manufactured to have virtually any desired size, shape, and configuration. For example, bag 4 can be formed to hold 50 liters, 100 liters, 200 liters, or other desired amounts. Although bag 4 can have a substantially box shaped configuration, bag 4, as depicted in the Figures, conforms to the configuration of the container 6 as it is filled with solution. In one embodiment, however, bag 4 can be specifically configured to be complementary or substantially complementary to the container 6.

[0069] In any embodiment, however, it is desirable that when bag 4 is received within the container 6 it is uniformly supported by floor and side walls of container 6. Having at least generally uniform support of bag 4 by container 6 helps to preclude failure of the bag 4 by hydraulic forces applied to the bag 4 when filled with a solution.

[0070] A device according to the invention can be made in many ways. In either a two dimensional or three dimensional bag, one simply incorporates and aligns each end of the vortex breaking sheet with a seam to be formed and uses the manufacturing effort of forming the seam such as by heat or glue to attach the end of the sheet into the seam of the bag. Other means such as attaching the ends after bag formation may also be used however they are not as convenient as including the sheet(s) during manufacture.

[0071] One can also simply create a tab on the desired seams that extends into the space of the bag 4 and attach the vortex breaking sheet(s) 18 to the tabs such as by welding, adhesives or mechanical fasteners such as rivets.

[0072] In use, the bag 4 is generally retained with a holder or carrier 6 such as a plastic or metal vat or tank. The bag 4 may be inflated with some air or gas before liquid is added if desired. As the bag 4 is filled the sheet 18 simply expands and conforms to the space with the movement of the bag 4. When the mixing device 8, be it a bottom mount or top mount design, is turned on, the sheet 18 occupies at least a portion of the space in which a vortex is normally formed thus disrupting its formation and allowing the mixer to mix without a vortex.

[0073] If needed, one can first make a bag 4 without the vortex breaking sheet 18 and determine where the vortex is forming. Then one can build a bag 4 with the vortex breaking sheet(s) 18 located at least partially within the zone of the vortex so as to disrupt the vortex formation for that type and size of bag 4.

Example

[0074] A single use mixer system, Mobius® mixer 100 system available from Millipore Corporation, was used in this example. The bag and the vortex breaking sheet were made of Pureflex™ film, available from Millipore Corporation. The mixer was a Levitronix magnetic mixer with a plastic impeller and magnetic element contained within the bag and a magnetic drive unit located outside the bag below the impeller and coupled to the impeller by magnetic forces to cause the impeller to rotate.

[0075] A first (Control) bag was used with no vortex breaker. The motor was run at 560 revolutions per minute (RPM) and a sustained vortex was formed above the impeller blades in about 3 seconds after starting the motor and remained until the motor power was shut off.

Claims

What we claim:

1. A disposable mixer comprising a plastic bag having a bottom, one or more side walls each having a lower portion attached to the bottom and a top connected an upper portion of the one or more side walls, the bag having an internal volume defined by the inner surfaces of the bottom, one or more side walls and top, a disposable mixing element contained within the internal volume of the bag and one or more vortex breakers formed of sheet of plastic material attached to a first surface selected from the group consisting of the bottom, a first side and the top of the bag and extending through at least a portion of the internal volume to a second surface which is different from the first surface and selected from the group consisting of the bottom, a second side and the top of the bag.

2. The mixer of claim 1 wherein the sheet extends from a first side of the bag to a second side of the bag.

3. The mixer of claim 1 wherein the sheet extends from a first side of the bag to a second side of the bag and the sheet contains one or more openings in the sheet.

4. The mixer of claim 1 wherein the sheet extends from the bottom of the bag to a side of the bag.

5. The mixer of claim 1 wherein the sheet extends from the bottom of the bag to a side of the bag and the sheet contains one or more openings in the sheet.

6. The mixer of claim 1 wherein the sheet extends from the bottom of the bag to the top of the bag.

7. The mixer of claim 1 wherein the sheet extends from the bottom of the bag to the top of the bag and the sheet contains one or more openings in the sheet.

8. The mixer of claim 1 wherein the mixing element is selected from the group consisting of magnetic sit bars, magnetically driven mixers and shaft driven mixers having the shaft extending into the interior volume of the bag form a surface selected from the top and the bottom.

9. The mixer of claim 1 wherein the mixing element is driven by a magnetically driver mixer located in the bottom of the bag.

10. The mixer of claim 1 further comprising a rigid support container for the bag.

~~10~~11. A disposable mixer comprising a plastic bag having a bottom, one or more substantially vertical sides each having a lower portion attached to the bottom and a top connected an upper portion of the one or more vertical sides, the bag having an internal volume defined by the inner surfaces of the bottom, one or more sides and top, a magnetically driven disposable mixer mounted to the bottom of the bag and contained within the internal volume of the bag and one or more vortex breakers formed of sheet of plastic material attached to a first side surface of the bag to a second side surface of the bag.

~~11~~12. The mixer of claim ~~10~~11 wherein the sheet extends from the first side surface to the second side surface ~~along a diameter of a cross section of the interior volume of the bag~~ in a substantially horizontal manner.

~~12~~13. The mixer of claim ~~10~~11 wherein the sheet extends from the first side surface to the second side surface along a diameter of a cross section of the interior volume of the bag.

~~13~~14. The mixer of claim ~~10~~11 wherein the sheet extends from the first side surface to the second side surface along a diameter of a cross section of the interior volume of the bag and the sheet contains one or more openings.

~~14~~15. The mixer of claim ~~10~~11 wherein the sheet extends from the first side surface to the second side surface in a substantially horizontal manner and the sheet contains one or more openings.

~~15~~16. The mixer of claim ~~10~~11 wherein there are two or more vertical sides and sheet extends from the first side surface to the second side surface in a substantially horizontal manner and the sheet contains one or more openings.

~~16~~17. The mixer of claim ~~10~~11 wherein there are two or more vertical sides and the two or more vertical sides are secured to each other along a series of vertical seams and wherein the sheet is secured to and extends from a seam of the first side to a seam of the second side surface in a substantially horizontal al manner and the sheet contains one or more openings.

~~17~~18. The mixer of claim ~~10~~11 wherein the sheet extends at least partially through the interior volume vertically.

~~18~~19. The mixer of claim ~~10~~11 further comprising a second sheet extending between two inner surfaces of the vertical side wall(s) and wherein the second sheet is at an angle to a plane of the first sheet ~~identified~~ defined as the direction from the first side surface to the second side surface of the bag.

~~19~~20. The mixer of claim ~~10~~11 wherein the mixer comprises a stirring rod with one or more paddles and the sheet has an opening formed in the sheet to allow the rod to extend through the sheet.

~~20~~21. The mixer of claim 11 further comprising a rigid support container for the bag.

~~21. The mixer of claim 10 further comprising a rigid support container for the bag.~~

22. A disposable mixer comprising a plastic bag having a bottom, one or more side walls each having a lower portion attached to the bottom and a top connected an upper portion of the one or more side walls, the bag having an internal volume defined by the inner surfaces of the bottom, one or more side

walls and top, a disposable mixing element contained within the internal volume of the bag and one or more vortex breakers formed of sheet of plastic material attached to a first surface selected from the group consisting of the bottom, a first side and the top of the bag and extending through at least a portion of the internal volume to a second surface which is different than the first surface, selected from the group consisting of the bottom, a second side and the top of the bag and wherein the sheet of plastic material has one or more openings.