

Disposable Processing Bag with Alignment Feature

Cross-Reference Related Applications

This application claims the benefit of U.S. Provisional Patent Application No. 60/927,598, filed on May 4, 2007, the entire contents of which are incorporated by reference herein.

The present invention relates to a bag for use in a holder, such as a vat or carboy, and arranging the bag in a proper alignment within the holder via an alignment feature attached to the bag. More particularly, it relates to a disposable bag for use in a holder, such as a vat or carboy, with the bag having one or ports and an alignment feature attached to the bag adjacent the one or more ports to properly orient the bag in its holder.

Background of the invention

Traditionally, products such as pharmaceuticals, biopharmaceuticals, enzymes, neutraceuticals and the like were processed in stainless steel containers. After use the steel containers had to be cleaned and sterilized. This often required the use of steam and/or caustics to accomplish this task.

Additionally, for regulated products such as pharmaceuticals, the sterilization process had to be validated to show that it could sterilize the device and could so time after time.

Both the cleaning process and the validation are time consuming and expensive and can't be varied without a new validation.

This has led to the use of single use, disposable plastic bags to store and process many of these products. These bags are provided sterile (generally gamma irradiated), do not require cleaning as they are disposed of after use and reduces the validation required by the user and/or shifts the validation to the bag supplier.

These bags contain one or more ports through which liquids, additives, product and the like are added or removed from the bag during processing.

These bags are generally placed into a holder such as steel plastic, fiberglass, graphite or other composite vat, tote or carboy to help hold the weight of the liquid and to protect the bag from rupture due to contact with other items on the manufacturing floor. These holders have an opening in their bottom portion through which the ports extend. As the port arrangements differ by bag type, manufacturer or customer requirement, the bottom of the holders generally have large rectangular

or circular opening and a matching plate that has several openings in it through which the ports are arranged while supporting the bag bottom by the remainder of the plate.

The ports are generally unmarked and indistinguishable from each other. However their arrangement is critical to the use of the bag due the arrangement of inlets and outlets from the holder. Often, the bag is inserted wrongly (backward for example) and is only discovered when the bag is at least partially filled. This requires the removal of the liquid and either rearrangement of the bag in the holder so that the ports are properly aligned or the use of a new bag.

What is needed is a better means for properly arranging a bag in its holder.

Summary of the Invention

The present invention is an alignment device for a bag containing one or more ports wherein the alignment device is attached to either the one or more ports such as by wire ties, clamps or cable ties or to the bag adjacent the one or more ports via adhesives or welding or molding such as overmolding. The plate has either an indicator or an unique outer edge shape that is designed to fit into a corresponding unique opening in a bag holder such as a carboy or tote to ensure proper alignment of the bag and its port(s) in the holder.

In one embodiment the plate formed of plastic has a series of holes equal to and in alignment with the one or more ports of the bag and the port(s) are extended through the holes of the plate and the plate is attached to the bag by retainers on the port(s) below the plate. Such retainers can be plastic cable ties, wire ties, tube clamps and the like.

Alternatively, the plate may be fitted over the port(s) and attached to the bag such as by thermal bonding or welding.

In another embodiment, the plate is overmolded to the bag or the bag is formed and molded to the plate.

The plate may have any unique design that ensures that the alignment of the bag in the holder is correct and cannot be reversed or incorrectly aligned. Such designs use a plate that is affixed to the bag or its port(s) in such a way that it cannot be realigned or moved out of register.

Such designs include but are not limited to plates having a permanent graphical representation as to the alignment or an asymmetrical design which corresponds to a similar opening in the holder.

In another embodiment, the plate has two parts, an inner asymmetric portion and symmetric outer portion selectively attachable to the inner asymmetric plate portion and is of a configuration to fit into a standard opening in a holder.

Brief Description of the Drawings

Figure 1 shows a first embodiment of the present invention in cross-sectional view.

Figure 2 shows a second embodiment of the present invention in planar, bottom view.

Figure 3 shows a third embodiment of the present invention in planar view.

Figure 4 shows a fourth embodiment of the present invention in cross-sectional view.

Figures 5 A and B shows fifth embodiment of the present invention in planar view.

Figures 6 A-H show different shapes useful in the embodiments of the present invention in planar view.

Figures 7A and B show another embodiment in planar bottom up view.

Figure 8 shows a further embodiment in planar bottom up view.

Figure 9 shows a knockout plug according to an embodiment of the present invention in cross-sectional view.

Detailed Description of the Invention

In Figure 1 is shown a first embodiment of the present invention in cross-sectional view. A bag 2 is held within a holder 4 such as a carboy or a tote and has one or more ports 6 extending out at least of its lowermost portion 8. An alignment plate 10 is attached to either the bag 2 or its one or more ports 6 as will be discussed below. The plate 10 also provides support for the bottom of the bag while in use in the holder 4 by fitting into and aligning with a hole or opening 12 in the lowermost portion 8 of the holder 4. As can be seen, the port(s) 6 extend through the plate 10 so they may be connected to inlets, outlets, pumps, storage bags, tubing, etc (not shown) as is needed in the process. In this embodiment the plate 10 is attached to the ports 6 of the bag 2 by an attachment device 14 such as a cable tie or a wire wrap or similar device.

To the extent the same elements are used in later Figures, their reference numbers remain the same.

As shown in Figure 2, one surface 16 of the plate 10 may be adhered or welded or molded to the bag 2 during assembly so that its orientation remains the same.

As shown in Figure 3 is an embodiment of the plate containing a graphic design 18 as to the orientation or alignment of the bag 2 when it is inserted into the holder 4 such that the operator will know which way to orient the bag 2 as it is being inserted into the holder 4 and attached to the various other elements such as pumps, filters, inlet hoses, outlet hoses, etc, (not shown). The graphical design 18 may be anything such as an arrow as shown pointing in a given direction to indicate the bag's alignment to the holder 4. It may also include words 19 providing an indication of the direction of the bag or which port is which such as inlet, outlet, etc so an operator may properly align the bag in the holder. Alternatively, the graphic design 18 could be a hash mark, the arrow mentioned above or other symbol that is designed to align with a similar feature on the holder 4 itself (not shown).

As shown in Figure 4 is an embodiment in which the bag 2 has one port 6. In this embodiment the bag 2 also has an alignment device 20 in this case in the form of a nub that extends outwardly from the bag 2 and the alignment plate 10 contains both an opening for the port 6 but also for the alignment device 20 such that the plate 10 is always properly aligned to the bag and not allowed to rotate relative to it. The plate 10 may be attached to the port 6 in this instance by an attachment device 14 again in this instance a ratcheted cable tie. Other alignment devices include but are not limited to twist ties such as plastic coated wire ties, steel or plastic clamps and the like.

Bags 2 containing two or more ports 6 that extend through the plate 10 do not necessarily need a separate alignment device 20 but may have one if desired.

While the plate 10 in the above embodiments is shown as being a rectangle, the shape of the plate 10 and its corresponding hole 12 is not limited to such. It may be any symmetric or asymmetric shape or design that is desired, such as any polygon including but not limited to triangles, squares, pentagons, hexagons, heptagons, octagons and the like. They may also be circular or oval. They may also be combinations of the different shapes such as two circles of different sizes or two polygons of different sizes or different shapes.

Multiple plates 10 may also be used, with each one associated either with at least one port 6 or an alignment device 20.

Any of the embodiments discussed above may if desired contain the graphical design 18 discussed above.

In Figure 5A is shown a plate 10 the design of which is asymmetrical in shape and which corresponds to and sized to fit an asymmetrical opening 12 in the holder 4 as shown in Figure 5B. In this instance, the plate 10 and opening 12 are in the shape of a four sided polygon having opposite first and second sides 22 A, B parallel to each other and a third and fourth sides 22 C,D parallel to each other and intersecting the first and second sides 22 A, B at an angle of greater than 0 degree and less than 180 degree. In this way once the plate 10 is secured to the bag 2 such that it can not rotate either by attaching the plate 10 to the bag 2 itself or through the use of various multiple ports or the use of an alignment device 16 as discussed above, the bag 2 will only fit into the opening 12 in one orientation. As can be seen the opening 12 has corresponding sides 23 A and B and 23 C and D to those respectively of sides 22A and B and 22 C and D.

In Figures 6A-H are shown just a representative sampling of the possible asymmetrical plate 10 and corresponding opening 12 designs that can be used. Others will be well known and obvious to one of ordinary skill in the art and are meant to be included in the appended claims. Figure 6A shows a polygon 24 having opposite first and second sides 25 A, B which are parallel to each other and a third and fourth sides 25 C,D which are not parallel to each other and each of which intersect the first and second sides 25 A, B at an angle of greater than 0 degree and less than 180 degree. Figure 6B shows a triangle 26 with at least one side 27A longer than the others 27 B,C. Essentially any triangle other than an isosceles triangle may be used. Figure 6C, shows an asymmetrical pentagon 28 with at least side 29A being of a different length. Other asymmetrical polygonal shapes can also be used. Figure 6D shows the use of two dissimilar circles 30 A, B attached at their adjacent surfaces. As shown in Figure 6E the circles 30 A, B may only be partial. In Figure 6F, the use of dissimilar shapes, in this instance a rectangle 32 coupled to a circle 34 is used. In Figure 6G, the use of dissimilar ovals 36 A, B are used. Figure 6H simple knocks one corner 39 off a rectangle 37 to form a notch or key.

In some embodiments, as shown in Figure 7A, it may be desirable to have a first plate portion 10A having a symmetrical outer shape that corresponds to the symmetrical shape of the opening 12 of the holder 4 (not shown) and an opening 38 of an asymmetrical shape such as any of those discussed above in the first plate portion 10A. A second plate portion 10B in Figure 7B fits into the asymmetrical opening 38 of the first plate portion 10. In this manner a universal design can be made that allows for the orientation of the bag 2 in the plate 10 in the holder 4.

As shown in Figure 8 any of the plates 10 may also have a series of preformed holes 40 or holes containing knock out plugs 42 arranged in the most common positions in the plate 10 so that one plate may be used with a variety of bag/port designs. Additionally, channels 44 from the edge of the plate 10 to the holes 40 or knockout plugs 42 may be included with this or any other embodiment to allow one to squeeze the tubing adjacent the port(s) so as to allow one to fit the plate onto an existing bag.

Figure 9 shows a cross-sectional view of knock out plug 42 in the plate 10 taken along lines 8-8.

The alignment plate can be made of various materials, such as plastic (thermoplastic or thermoset) composites (such as graphite composites or fiberglass composites), metal (such as stainless steel or aluminum) or wood (such as pine, cedar or wood composites or plywood).

One preferred material is stainless steel in that even when relatively thin it is still strong, is well known and widely used in the industry and is compatible with the bags and holder.

Another is a thermoplastic such as polyethylene, polypropylene, PVDF, PES, and the like. One embodiment is to use a high density polyethylene. Another is a linear low density polyethylene.

Thermosets such as urethanes or epoxies may be used to form the plate. Composites such as fiberglass or graphite composites are also useful.

Wood is relatively inexpensive and light weight and can be used in the present invention as well. Rot resistant woods such as cedar or various pines are useful. Plywood, chip board, wood laminates and the like are also useful, although they may need a protective coating if they are to be subjected to a wet environment.

In a further alternative embodiment of this invention, one can coat the steel, plastic or wood layer with a thermoplastic layer, a thermoelastomeric layer such as a thermoplastic elastomer (TPE) or an elastomeric layer such as a silicone layer. In one example of this embodiment, the rigid plate is made of steel, preferably stainless steel, which is coated on at least one side and preferably encapsulated in a plastic such as polyethylene or polypropylene, a TPE or a silicone. In another embodiment, the plate is made of a plastic to which silicone adheres such as polysulfones or polyethersulfones. In a further embodiment, the plastic plate can be coated or encapsulated or laminated with another plastic layer or TPE layer. In the same way, a wood plate can also be coated or encapsulated with one of these layers.

The coated layers may provide additional cleanliness to the plate or act as a bonding layer between the plate and the bag to which it is attached if such bonding is desired. It also reduces the potential for flash or rough surfaces on the plate to pierce the adjacent bag.

The plate may in the case of plastics, composites and metals either formed from a blank sheet of material or molded as the finished plate. Wood can be formed from a blank and shaped into the desired configuration and port arrangement.

Additionally, wireless tracking devices such as RFID chips, Zigbee® or Bluetooth® devices may also be included on the plate to provide manufacturing data about the plate, the bag to which it is attached and with devices having read/write capabilities to track the use of the bag at the user's facility. There information relating to a trackable event such as entry into inventory, use, the material made or stored in the bag, etc can added by the user to the tag. Such a tag 100 is shown in Figure 5A.

What is Claimed

1. A system comprising a holder having an opening in its lowermost portion, the opening having an outer edge that is asymmetrical shaped and a disposable processing bag formed of one or more pieces of plastic sealed to form a closed container, one or more ports formed in the bag to provide access to an interior of the bag for the introduction and/or removal of materials to the bag and an alignment plate attached to the bag adjacent the one or more ports and wherein the plate has one or more openings aligned to match the one or more ports of the bag, the plate has an outer edge that is asymmetrical shaped and corresponding to that of the opening of the holder, wherein the opening and the plate are both in the shape of a four-sided polygon having opposite first and second sides parallel to each other and a third and fourth sides converging relative to each other and intersecting the first and second sides at an angle of greater than 0 degree and less than 180 degree and the plate fits into and aligns with the opening in the holder in only one orientation for proper alignment of the bag within the holder.
2. The system of claim 1 wherein the plate is attached to the one or more ports by one or more cable ties.
3. The system of claim 1 wherein the plate is welded to surface of the bag adjacent the one or more ports.
4. The system of claim 1 wherein the plate is molded to an adjacent surface of the bag.
5. The bag of claim 1 wherein the plate has one or more openings aligned to match the one or more ports of the bag and the plate is overmolded to an adjacent surface of the bag.
6. A system comprising a holder having an opening in its lowermost portion with an outer edge that is an unique shape and a disposable processing bag formed of one or more pieces of plastic sealed to form a closed container, one or more ports formed in a bottom of the bag to provide access to an interior of the bag for the introduction and/or removal of materials to the bag and an alignment plate attached to a device selected from the group consisting of the

bag and the one or more ports of the bag and wherein the plate has one or more openings aligned to match the one or more ports of the bottom of the bag, the plate has a uniquely shaped outer edge corresponding to that of the opening of the holder such that the plate fits into and aligns with the opening in the holder in only one orientation for proper alignment of the bag within the holder.

7. The system of claim 6 wherein the plate is in the form selected from the group consisting of uneven polygons, partial polygon/partial circular designs and two or more rectangular or circular designs of different sizes.
8. The system of claim 6, wherein the plate is attached to the one or more ports by one or more cable ties.
9. The system of claim 6, wherein the plate is welded to surface of the bag adjacent the one or more ports.
10. The system of claim 6, wherein the plate is molded to an adjacent surface of the bag.
11. The bag of claim 6, wherein the plate has one or more openings aligned to match the one or more ports of the bag and the plate is overmolded to an adjacent surface of the bag.
12. A system comprising:
 - a holder;
 - a disposable processing bag containing one or more ports, the bag formed of one or more pieces of plastic sealed to form a closed container; and
 - an alignment plate with one or more holes that align with one or more ports,wherein the plate is affixed to the bag or one or more ports such that the plate cannot be realigned or moved out of register, the holder comprising an opening in its lowermost portion, the opening having an outer edge shape that corresponds to an outer edge shape of the plate such that the bag with the affixed plate will fit into the opening in a single orientation.
13. The system of claim 12, wherein the plate is in the form selected from the group

consisting of uneven polygons, partial polygon/partial circular designs and two or more rectangular or circular designs of different sizes.

14. The system of claim 12, wherein the plate is attached to the one or more ports by one or more cable ties.

15. The system of claim 12, wherein the plate is welded to surface of the bag adjacent the one or more ports.

16. The system of claim 12, wherein the plate is molded to an adjacent surface of the bag.

17. The bag of claim 12, wherein the plate has one or more openings aligned to match the one or more ports of the bag and the plate is overmolded to an adjacent surface of the bag.