[0126] The body **691** may be fabricated from plastic (e.g., polypropylene, polyethylene, polytetrafluoroethylene) by molding, for example. The body **691** is shaped and dimensioned to fit in a housing (e.g., housing **510** of FIG. **5**A). In any embodiment, the body **691** or the O-ring **686** can form a substantially liquid-tight seal with the walls of a housing when the body **691** is inserted into the housing. In any embodiment that includes an O-ring, **686**, the O-ring **686** may function both to form a liquid-tight seal and to wipe particulate material (e.g., cell concentration agents) off the wall of the housing as the O-ring **686** is moved in relation to the wall of the housing. The shaft **651** may be coupled to the conduit **692** by means that are known in the art (e.g., by an adhesive, by press-fit). The optional O-ring **686** is disposed in a notch **689** in the body **691**.

[0127] The tip **690** further comprises a filter **696**. The filter **696** is coupled to the body **691**. In the illustrated embodiment, the filter **696** is formed from a porous material, which can be press-fit and/or adhesively coupled to the recessed opening **694**. In some embodiments, the porous material can be semi-rigid porous material (e.g., POREX filtration medium sold under the part number X6854 by Porex Corporation, Fairburn, Ga.). The filter **696** may be configured with a relatively angular or pointed end, such that the end can facilitate the penetration of a frangible seal. In alternative embodiments (not shown), the filter may comprise a membrane filter that is coupled to the body. When coupled to the body, the membrane filter is part of a fluid path that includes the conduit and a drain channel.

[0128] In some embodiments, the porosity of the filter **696** may be selected such that the filter **696** prevents only the passage of relatively large particles (e.g., >1 μm, >5 μm, or >10 μm,) through it. Relatively large particles may include, for example, cell concentration agents as described herein. In these embodiments, microorganisms such as bacteria, yeast, and/or filamentous fungi (mold) may pass through the filter **696**.

[0129] In some embodiments, the porosity of the filter **696** may be selected such that the filter **696** prevents only the passage of relatively small particles (e.g., <1 μm, <0.45 μm, <0.2 μm,) through it. In these embodiments, microorganisms such as bacteria, yeast, and/or filamentous fungi (mold) may be retained by the filter **696**.

[0130] The tip **690** further comprises a one-way valve **697** disposed in the recessed opening **694** between the filter **696** and the conduit **692**. Also shown is an optional retaining washer **698** that serves to hold the one-way valve **697** in position. The one-way valve **697** may be constructed from plastic (e.g., polypropylene, polyethylene, polyester) or rubber, for example, and may be configured as a duck-bill valve, for example. In use, the one-way valve **697** substantially prevents the flow of liquid that has passed through the filter **696** from returning through the filter **696** in the opposite direction.

[0131] FIG. **6**B shows a side view, partially in section of the assembled tip **690** of FIG. **6**A. The one-way valve **697**, optional retaining washer **698**, and filter **696** are disposed in the recessed opening and are in fluidic connection with the conduit **692** and the drain channels **695**. The shaft **651** is coupled to the body **691** of the tip **690**.

[0132] Referring back to FIG. **5**A, the detection device **500** comprising the housing **510** and plunger **550** is used in a method to detect microorganisms and, in particular, live microorganisms.

[0133] In use, a liquid sample is transferred into the upper receptacle **520** of the housing **510**, where it is allowed to contact a cell concentration agent **530**. After adding the liquid sample **540** to the housing **510**, the tip of the plunger **550** is inserted into the housing **510** and urged (e.g., manually or mechanically) toward the lower receptacle **524** of the housing **510**, as shown in FIG. **5**B. As the tip **591** of the plunger **550** contacts the liquid sample **540**, the liquid passes through the tip **590** and back into the housing **510**, as shown in FIG. **5**B. This process retains the cell concentration agent **530** and, in some embodiments, free microorganisms in a portion **542** of the liquid sample proximate the third receptacle **526**.

[0134] As the tip **590** of the plunger **550** penetrates the frangible seal **560***a*, not shown, the portion **542** of the liquid sample containing the cell concentration agent **530** contacts the hydrogel **562**. Further movement of the plunger **550** (as shown in FIG. **5**D) causes penetration of the frangible seal **560***b*, which causes the portion **542** of the liquid sample and the hydrogel **562** to transfer to the lower receptacle **524**, where they contact the detection reagent **565**.

[0135] FIG. **7**A shows a cross-sectional side view of another embodiment of a detection device **700** according to the present disclosure. The detection device **700** comprises a plunger **750** and a housing **610**.

[0136] The housing **710** can be constructed as described above with an upper part **712** and a lower part **714**. Frangible seals **760***a* and **760***b* divide the housing **710** into three receptacles, an upper receptacle **720**, lower receptacle **724**, and third receptacle **726**. In this illustration, frangible seals **760***a* and **760***b* are located at the end of the upper receptacle **720** that is proximate the lower receptacle **724**. The space between the frangible seals **760***a* and **760***b* defines a third receptacle **726**. Located in the third receptacle **726** is a hydrogel **762** comprising a cell extractant. In the illustrated embodiment, the lower receptacle **724** comprises an optional detection reagent **765**. An alternative construction (not shown) may have only one frangible seal **760** proximate the lower receptacle **724**, with the hydrogel **762** located in the lower receptacle **724**, as shown in FIG. **3**C.

[0137] The plunger **750** comprises a shaft **751** coupled to a handle **752** and a tip **790**. In this embodiment, the shaft **751** is hollow and the handle comprises a vent **748** to equalize the pressure between the interior and exterior of the shaft **751**. The plunger further comprises an optional drain tube **753**. The drain tube **753** receives liquid filtrate from the tip **790** and distributes the filtrate to the interior of the shaft **751**. By functioning as an overflow valve, the drain tube **753** also reduces the volume of filtrate that can flow back through the tip **790** in the reverse direction.

[0138] Detail of the tip **790** of the plunger **750** is shown in FIG. **8**.

[0139] FIG. **8**A shows a partially exploded side view, partially in section, of the tip **790** of FIG. **7**A. The tip **890** comprises a body **891**, an optional one-way valve **897**, and a filter **896**. Also show in FIG. **8**A is a portion of the plunger **850** comprising a hollow shaft **851** and a drain tube **853**.

[0140] The body **891** includes a first end **891***a*, a second end **891***b*, and a conduit **892** running through the body **891** from the first end **891***a* to the second end **891***b*. At the first end **891***a*, the conduit **892** is coupled (e.g., by press-fit, and adhesive, or by a threaded connection) to the drain tube **853** of the plunger. At the second end **891***b*, the conduit **892** opens into a