transfer a predetermined amount of the liquid sample **340** from the upper receptacle **320** to the lower receptacle **324**. Furthermore, it is recognized that, after the portion **342** of the liquid sample has been transferred from the upper receptacle **320** to the lower receptacle **324**, the remainder of the liquid sample **340** in the upper receptacle **320** could be discarded and a different material (e.g., a diluent, a buffer, a liquid and/or powder reagent) can be placed into the upper receptacle **320** and a predetermined amount could subsequently be transferred to the lower receptacle **324** using the valve **370** (not shown).

[0113] In the illustrated embodiment of FIG. **3**, the means for isolating the upper receptacle **320** and lower receptacle **324** of the housing includes the valve **370**. In the illustrated embodiment of FIG. **3**, the means for transferring the cell concentration agent **330** from the upper receptacle **320** to the lower receptacle **324** includes the passageway **316** and the valve **370**.

[0114] FIG. **4**A shows a side view of a plunger **450** and a cross-sectional view of a housing **410**, both of which are components of a detection device **400** according to the present disclosure. The plunger comprises a shaft **451**, optional O-ring **455**, and piercing end **459**. The O-ring can be made of a conformable material (e.g., butyl rubber) to provide a liquid-tight seal with the housing **410**. The housing **410** can be constructed as described above with an upper part **412** and a lower part **414**. The optional cap **478** can be constructed as described above. Frangible seals **460** divide the housing **410** into three receptacles, an upper receptacle **420**, lower receptacle **424**, and third receptacle **426**. In this illustration, frangible seals **460** are located at the end of the upper receptacle **420** that is proximate the lower receptacle **424**. The space between the frangible seals **460** defines a third receptacle **426**. Located in the third receptacle **426** is a hydrogel **462** comprising a cell extractant. An alternative construction (not shown) may have only one frangible seal **460** proximate the lower receptacle **424**, with the hydrogel **462** located in the lower receptacle **424**, as shown in FIG. **3**C.

[0115] Located in the upper receptacle **420** proximate frangible seals **460** is a drain valve **480** with the valve gate **482**, which is shown in the closed position. Also located in the upper receptacle **420** is the liquid sample **440** and the optional cell concentration agent **430**. An optional detection reagent **465** is shown in the lower receptacle **424**.

[0116] FIG. **4**B shows a cross-sectional view of an assembled detection device **400** comprising the housing **410** and plunger **450** of FIG. **4**A. The cell concentration agent **430** is settled to the bottom of the upper receptacle **420**. The valve gate **482** of the drain valve **480** is in the open position and, as force is applied (e.g., by pressure from finger or hand) in the direction shown by the arrow, the clarified liquid sample **445** is expelled out of the drain valve **480**. Also shown in FIG. **4**B is detection reagent **465** coated on the wall of the lower receptacle **424**.

[0117] FIG. **4**C shows a cross-sectional view of the detection device **400** of FIG. **4**B. In this view, the O-ring **455** and piercing end **459** of the plunger **450** are inserted in the housing **410** on the side of the drain valve **480** proximate the nearest frangible seal **460**. In this position, the plunger **450** traps a portion **442** of the liquid sample comprising the cell concentration agent **430** between the plunger **450** and the nearest frangible seal **460**.

[0118] FIG. **4**D shows a cross-sectional view of the detection device **400** of FIG. **4**C. In this view, the piercing end **459** of the plunger **450** has punctured both frangible seals **460** and the portion **442** of the liquid sample has transferred to the lower receptacle **424**, where it has dissolved the detection reagent (shown in FIG. **4**C) and the portion **442** is in contact with the hydrogel **462** comprising a cell extractant.

[0119] FIG. **5**A shows a cross-sectional view of a plunger **550** and a housing **510**, both of which are components of a detection device **500**. The plunger **550** comprises a shaft **551** with an optional handle **552** and a tip **590**. In any embodiment, the handle **552** further may comprise an optional O-ring **555**.

[0120] The housing **510** can be constructed as described above, with an upper part **512** and a lower part **514**. Frangible seals **560***a* and **560***b* divide the housing **510** into three receptacles, an upper receptacle **520**, lower receptacle **524**, and third receptacle **526**. In this illustration, frangible seals **560***a* and **560***b* are located at the end of the upper receptacle **520** that is proximate the lower receptacle **524**. The space between the frangible seals **560***a* and **560***b* defines the third receptacle **526**. Located in the third receptacle **526** is hydrogel **562**, which comprises a cell extractant as described herein. In the illustrated embodiment, the lower receptacle **524** comprises an optional detection reagent **565**. An alternative construction (not shown) may have only one frangible seal proximate the lower receptacle, with the hydrogel located in the lower receptacle, as shown in FIG. **3**C.

[0121] The handle **552** can be made, using processes well known in the art, from a variety of materials including, for example, plastic, wood, metal, and combinations thereof. The optional O-ring **555** is disposed in a notch **554** in the handle **552**. The handle **552** may be shaped and dimensioned such that at least a portion of the handle **552** can be inserted into the housing **510** when the plunger **550** is fully inserted in the housing **510**. In one embodiment, the handle **552** further includes a rim **554** that engages the opening of the housing **510** to prevent the handle **552** from being fully inserted into the housing **510**.

[0122] The shaft **551** of the plunger **550** can be made from a variety of materials including, for example, plastic, wood, metal, and combinations thereof. One end of the shaft **551** is coupled to the handle **552** by press-fitting into a recessed portion (as shown in FIG. **5**), by ultrasonic welding, or by using an adhesive, for example. The other end of the shaft **551** is coupled to the tip **590** by press-fitting, by ultrasonic welding, or by using an adhesive, for example.

[0123] Detail of the tip **590** of the plunger **550** is shown in FIGS. **6**A and **6**B.

[0124] FIG. **6**A shows a partially exploded side view, partially in section, of the tip **590** of FIG. **5**A. The tip **690** comprises a body **691**, a one-way valve **697**, and a filter **696**.

[0125] The body **691** includes a first end **691***a*, a second end **691***b*, and a conduit **692** running through the body **691** from the first end **691***a* to the second end **691***b*. At the first end **691***a*, the conduit **692** is sealed by the shaft **651** of the plunger. At the second end **691***b*, the conduit **692** opens into a recessed opening **694**. Two drain channels **695** run from the first end **691***a* of the body **691** to the conduit **692**. Thus, the drain channels are fluidically connected to the conduit **692** and the recessed opening **694**. In one embodiment (not shown), the tip **690** may comprise only one drain channel **695**. Advantageously, a plurality of drain channels **695** may provide less back-pressure and, thus, a higher rate of fluid transport through the tip **690**.