

LIQUID FLOWRATE GAUGE

Technical Field

[0001] Various embodiments generally relate to a liquid flowrate gauge. In particular,
5 various embodiments generally relate to a liquid flowrate gauge for serving as a “go and no-go” gauge to determine whether a liquid flowrate has met a minimum threshold flowrate.

Background

[0002] Lower urinary tract symptoms (LUTS) represent one of the most common
10 urological complaints and reasons for referral to an urologist in Singapore. Benign prostate enlargement (BPE) is the main chronic urological disease that gives rise to LUTS in men. The clinical evaluation of males with BPE requires detailed history taking and physical examination. Urinary peak flow rate (PFR) is one of the common parameter used to detect obstruction in clinical evaluation. The current method of performing uroflometry requires
15 the patient to be at the hospital or clinic for measuring the urine flow using an uroflometer. While there are machines which incorporate the uroflometry into the toilet bowl, but the costs are prohibitive and involve the removal of existing toilets and installation of new ones, which is a barrier to its adoption by the patient.

[0003] Accordingly, there is a need for an improved liquid flowrate gauge for serving as
20 a point-of-care device which the patient may conduct self-monitoring of urine flow at the comfort of their home.

Summary

[0004] According to various embodiments, there is provided a liquid flowrate gauge. The
25 liquid flowrate gauge including a receptacle structure having a surrounding wall around a central axis, wherein an outlet port is disposed at a base side of the receptacle structure and an inflow opening disposed at a topside of the receptacle structure. The base side and the topside are two opposite sides of the receptacle structure along the central axis. The liquid flowrate gauge further including a floatable member loosely sitting within the receptacle
30 structure in a manner so as to define at least one gap between the floatable member and the receptacle structure to maintain a flow path from the inflow opening to the outlet port. The

- outlet port is dimensioned to achieve a liquid flowrate through the outlet port equal to or above a threshold outlet flowrate and the floatable member is configured to be floated in a manner so as to be free from contact with the receptacle structure when a liquid level of a liquid accumulated in the receptacle structure is equal to or higher than a predetermined
- 5 height measured along the central axis from the outlet port as the liquid flows into the receptacle structure via the inflow opening and out of the receptacle structure via the outlet port. The floatable member being floated by the liquid accumulated in the receptacle structure serve as an indication that a rate of inflow of the liquid into the receptacle structure is equal to or above the threshold outlet flowrate.
- 10 **[0005]** According to various embodiments, there is provided a kit for a liquid flowrate gauge. The kit including a receptacle structure having a surrounding wall around a central axis, wherein an outlet port is disposed at a base side of the receptacle structure and an inflow opening disposed at a topside of the receptacle structure. The base side and the topside are two opposite sides of the receptacle structure along the central axis. The kit
- 15 further including a floatable member capable of loosely sitting within the receptacle structure in a manner so as to define at least one gap between the floatable member and the receptacle structure to maintain a flow path from the inflow opening to the outlet port. The outlet port is dimensioned to achieve a liquid flowrate through the outlet port equal to or above a threshold outlet flowrate and the floatable member is configured to be floated in a
- 20 manner so as to be free from contact with the receptacle structure when the floatable member is loosely sitting within the receptacle structure and a liquid level of a liquid accumulated in the receptacle structure is equal to or higher than a predetermined height measured along the central axis from the outlet port as the liquid flows into the receptacle structure via the inflow opening and out of the receptacle structure via the outlet port. The floatable member
- 25 being floated by the liquid accumulated in the receptacle structure serve as an indication that a rate of inflow of the liquid into the receptacle structure is equal to or above the threshold outlet flowrate.

Brief description of the drawings

- 30 **[0006]** In the drawings, like reference characters generally refer to the same parts throughout the different views. The drawings are not necessarily to scale, emphasis instead generally being placed upon illustrating the principles of the invention. In the following

description, various embodiments are described with reference to the following drawings, in which:

FIG. 1A shows a schematic diagram of a liquid flowrate gauge according to various embodiments;

5 FIG. 1B shows a schematic diagram of the liquid flowrate gauge of FIG. 1A under predetermined operational conditions according to various embodiments;

FIG. 2 shows a schematic diagram of a liquid flowrate gauge according to various embodiments;

10 FIG. 3A and FIG. 3B show an examples of an inflow guide member of the liquid flowrate gauge of FIG. 2 according to various embodiments;

FIG. 4 shows an example of a backsplash screen of the liquid flowrate gauge of FIG. 2 according to various embodiments;

FIG. 5A to FIG. 5G show an example of a nozzle assembly according to various embodiments;

15 FIG. 6A to FIG. 6D show an example of a floatable member according to various embodiments;

FIG. 7 shows a schematic side view of a variation of the liquid flowrate gauge of FIG. 1A to FIG. 2 according to various embodiments;

20 FIG. 8A shows a handle which is a variant of the handle of the liquid flowrate gauge of FIG. 7 according to various embodiments;

FIG. 8B shows a side view of the handle of FIG. 8A according to various embodiments;

FIG. 9A shows a handle which is a variant of the handle of the liquid flowrate gauge of FIG. 7 according to various embodiments;

25 FIG. 9B shows a bottom perspective view of the handle of FIG. 9A according to various embodiments;

FIG. 9C shows a side view of the handle of FIG. 9A according to various embodiments;

FIG. 10A shows a handle which is a variant of the handle of the liquid flowrate gauge of FIG. 7 according to various embodiments;

FIG. 10B shows a side view of the handle of FIG. 10A according to various embodiments;

5 FIG. 11 shows a schematic diagram of another variation of the liquid flowrate gauge of FIG. 1A to FIG. 2 according to various embodiments;

FIG. 12 shows a schematic diagram of yet another variation of the liquid flowrate gauge of FIG. 1A to FIG. 2 according to various embodiments;

10 FIG. 13 shows a schematic diagram of another variation of the liquid flowrate gauge of FIG. 1A to FIG. 2 according to various embodiments;

FIG. 14A shows a floatable member which is a variant of the floatable member of FIG. 6A according to various embodiments;

FIG. 14B shows a perspective view of the floatable member of FIG. 14A according to various embodiments;

15 FIG. 14C shows an exploded view of the floatable member of FIG. 14A according to various embodiments;

FIG. 14D shows a perspective exploded view of the floatable member of FIG. 14A according to various embodiments;

20 FIG. 14E shows another perspective exploded view of the floatable member of FIG. 14A according to various embodiments;

FIG. 15A shows a side view of a variant of a receptacle structure of the liquid flowrate gauge of FIG. 1A to FIG. 2, together with a backsplash screen, according to various embodiments;

25 FIG. 15B shows a perspective view of FIG. 15A according to various embodiments; and

FIG. 15C shows another perspective view of FIG. 15A according to various embodiments.

Detailed description

[0007] Embodiments described below in the context of the apparatus are analogously valid for the respective methods, and vice versa. Furthermore, it will be understood that the embodiments described below may be combined, for example, a part of one embodiment
5 may be combined with a part of another embodiment.

[0008] It should be understood that the terms “on”, “over”, “top”, “bottom”, “down”, “side”, “back”, “left”, “right”, “front”, “lateral”, “side”, “up”, “down” etc., when used in the following description are used for convenience and to aid understanding of relative positions or directions, and not intended to limit the orientation of any device, or structure or any part
10 of any device or structure. In addition, the singular terms “a”, “an”, and “the” include plural references unless context clearly indicates otherwise. Similarly, the word “or” is intended to include “and” unless the context clearly indicates otherwise.

[0009] Various embodiments generally relate to a liquid flowrate gauge. In particular, various embodiments generally relate to a liquid flowrate gauge for serving as a “go and no-go” gauge to determine whether a liquid flowrate has met a minimum threshold flowrate.
15 According to various embodiments, the liquid flowrate gauge being a “go and no-go” gauge may provide a simple to use and hassle-free device for the user to determine whether the liquid flowrate of a liquid is below the threshold flowrate, or is equal to or above the threshold flowrate. According to various embodiments, the liquid flowrate gauge may
20 include an indicator which may be in a first state when the liquid flowrate is below the threshold flowrate, and may be in a second state when the liquid flowrate is equal to or above the threshold flowrate. Accordingly, the indicator in the first state would serve as a “no-go” indication and the indicator in the second state would serve as a “go” indication. Hence, the liquid flowrate gauge may provide a binary output, i.e. go or no-go, and may be
25 used as a pass/fail test for checking whether the liquid flowrate has met a minimum threshold flowrate.

[00010] According to various embodiments, the liquid flowrate gauge being simple to use and hassle-free may be suitable for serving as a point-of-care device which the patient may conduct self-monitoring of urine flow at the comfort of their home. Further, the liquid
30 flowrate gauge may be configured to be portable and low-cost such that it may be easily accessible and adopted by patient for self-monitoring at home. According to various embodiments, the patient may pass urine into the liquid flowrate gauge and the liquid

flowrate gauge may provide an indication whether the rate of flow of the urine has met the minimum threshold flowrate. The simple “go” or “no-go” indication provided by the liquid flowrate gauge may provide the patient with a primary screening tool, which is simple to use without training, for home-use or telemedicine consultation before the patient makes a trip to the hospital or clinic for a more thorough investigation.

5 [00011] According to various embodiments, the liquid flowrate gauge may include a receptacle structure (for example, a funnel-shaped structure) having an inlet and an outlet. According to various embodiments, the liquid flowrate gauge may include a floatable member (for example, a floatation ball) within the receptacle structure, which will float
10 when a predetermined amount of liquid accumulates within the receptacle structure. According to various embodiments, the floatable member may allow liquid to flow pass such that liquid may flow from the inlet to the outlet when the floatable member is loosely sitting within the receptacle structure. At a base (or an end) of the receptacle structure, there may be a flow limiter or flow restrictor configured to restrict the flowrate at the outlet to a
15 predetermined threshold flowrate for the liquid flowrate gauge under predetermined operational conditions.

[00012] According to various embodiments, the liquid flowrate gauge may include an inflow guide member (for example, in the form of a flap) at the inlet of the receptacle structure. According to various embodiments, the inflow guide member may guide liquid
20 into the receptacle structure. Accordingly, when a liquid flow is directed into the liquid flowrate gauge for determining whether the liquid flow met the minimum threshold flowrate, the inflow guide member at the top of the receptacle structure may channel the liquid to an aperture that lead into the receptacle structure. If the liquid flow has a flowrate that is equal to or above the predetermined threshold flowrate, the flow limiter or flow restrictor may
25 cause the liquid to accumulate within the receptacle structure to a level which may result in the floatable member being floated. Accordingly, floating of the floatable member may be an indicator that the liquid flow has a flowrate equal to or above the predetermined threshold flowrate. If the liquid flow has a flowrate less than the predetermined threshold flowrate, the liquid may not accumulate within the receptacle structure or the accumulation of liquid
30 within the receptacle structure may not be sufficient to float the floatable member.

[00013] According to various embodiments, the floatable member may be configured to rotate when a level of the liquid accumulated within the receptacle structure is sufficient to float the floatable member as the liquid flow is continuously directed into the liquid flowrate

gauge and the liquid exits the receptacle structure via the outlet at a flowrate that is equal or higher than the predetermined threshold flowrate.

[00014] According to various embodiments, the liquid flowrate gauge may serve as a “go and no-go” gauge for pass/fail test of urinary flow. Patient may use it at home or clinics with a simple instruction without training. It may provide the primary screening for patient to determine if their urine flow is abnormal (i.e. lower than standard urine flow). It may also be used with other accessory at different location (e.g. hospital, clinics).

[00015] According to various embodiments, the liquid flowrate gauge may include a sensor. The sensor may be configured to detect and analyze the accumulation of liquid within the receptacle structure. The sensor may be connected to a processor (for example, a microprocessor or the like). When in use, the accumulation of liquid may be dependent on the liquid flow directed into the liquid flowrate gauge which may send a signal to the processor. Information relating to the time of start, peak and total flow may be detected and analysed. The result may be provided to a local display. These analyzed information may also be transmitted to a wireless device. The receiving devices may include, but not limited to, mobile phone, database server, printer...etc.

[00016] According to various embodiments, the liquid flowrate gauge may be configured to be portable, non-invasive, cost-effective, simple to use, reliable and hassle-free for measuring liquid flow. According to various embodiments, the liquid flowrate gauge may serve as a mobile uroflometry device for providing a common platform in which patients diagnosed with BPE may be monitored safely at the primary care setting. The measured flow may be electronically transmitted to a mobile application which may electronically log and plot the uroflometry trends of the patients. At periodic intervals, the log diary may be shared with respective patient appointed family physicians, general practitioners, nurse practitioners, specialists such as urologists, geriatric physicians, uro-gynaecologists, telemedicine care providers. These care providers may have a better insight of the conditions of patient by using the liquid flowrate gauge of the various embodiments. According to various embodiments, the liquid flowrate gauge may be configured to include full flow tracing capabilities.

[00017] Various embodiments may provide a kit that may be assembled into the liquid flowrate gauge of the various embodiments. The kit may include parts of the liquid flowrate gauge of the various embodiments as separate components which may be assembled together by the user to form the liquid flowrate gauge.

[00018] The following examples pertain to various embodiments.

[00019] Example 1 is a liquid flowrate gauge including:

a receptacle structure having a surrounding wall around a central axis, wherein an outlet port is disposed at a base side of the receptacle structure and an inflow opening
5 disposed at a topside of the receptacle structure, the base side and the topside being two opposite sides of the receptacle structure along the central axis;

a floatable member loosely sitting within the receptacle structure in a manner so as to define at least one gap between the floatable member and the receptacle structure to maintain a flow path from the inflow opening to the outlet port,

10 wherein the outlet port is dimensioned to achieve a liquid flowrate through the outlet port equal to or above a threshold outlet flowrate and the floatable member is configured to be floated in a manner so as to be free from contact with the receptacle structure when a liquid level of a liquid accumulated in the receptacle structure is equal to or higher than a predetermined height measured along the central axis from the outlet port as the liquid flows
15 into the receptacle structure via the inflow opening and out of the receptacle structure via the outlet port, wherein the floatable member being floated by the liquid accumulated in the receptacle structure serve as an indication that a rate of inflow of the liquid into the receptacle structure is equal to or above the threshold outlet flowrate.

[00020] In Example 2, the subject matter of Example 1 may optionally include that the
20 threshold outlet flowrate may be within a range from 10ml/s to 15 ml/s, or is within a range from 11ml/s to 13ml/s, or is about 12 ml/s.

[00021] In Example 3, the subject matter of Example 1 or 2 may optionally include that the floatable member may include a shape and density to create a buoyancy force greater than a weight of the floatable member by a volume of the floatable member immersed in the
25 liquid accumulated in the receptacle structure when the liquid level is equal to or higher than the predetermined height.

[00022] In Example 4, the subject matter of any one of Examples 1 to 3 may optionally include that the floatable member may include an inverted frustoconical shape or a spherical shape or a cylindrical shape or a hemispherical shape.

30 [00023] In Example 5, the subject matter of any one of Examples 1 to 4 may optionally include that the floatable member may be of a solid structure or a hollow structure or an inflatable structure, wherein the floatable member may be made of polystyrene, wood, foam

material, sponge material, high density polyethylene (HDPE), low density polyethylene (LDPE), or polypropylene (PP).

5 [00024] In Example 6, the subject matter of any one of Examples 1 to 5 may optionally include that the floatable member may include a weight member coupled to a base of the floatable member for lowering a center of gravity of the floatable member to stabilize the floatable member when floated by the liquid accumulated in the receptacle structure.

[00025] In Example 7, the subject matter of any one of Examples 1 to 6 may optionally include that the floatable member may include a plurality of grooves distributed around the floatable member.

10 [00026] In Example 8, the subject matter of Example 7 may optionally include that the plurality of grooves may be parallel to each other.

[00027] In Example 9, the subject matter of Example 7 or 8 may optionally include that the plurality of grooves may be diagonal grooves, helical grooves, or spiral grooves.

15 [00028] In Example 10, the subject matter of any one of Examples 1 to 9 may optionally include that the receptacle structure may include a base portion at the base side of the receptacle structure, the base portion adjoining a corresponding edge of the surrounding wall of the receptacle structure, wherein the outlet port may be in the base portion of the receptacle structure.

[00029] In Example 11, the subject matter of Example 10 may optionally include that the 20 base portion may include a nozzle assembly, wherein the nozzle assembly may include a first part including a ring-shaped attachment and a second part including a flanged insert, wherein the flanged insert may include an insert portion, a flanged annular plate at an end of the insert portion, and a through-hole extending through the flanged insert along a center axis of the flanged insert,

25 wherein the flanged insert may be coupled to the ring-shaped attachment with the insert portion of the flanged insert fitted into a central cavity of the ring-shaped attachment, wherein the through-hole of the flanged insert may form the outlet port.

[00030] In Example 12, the subject matter of Example 11 may optionally include that the ring-shaped attachment may include a raised annular wall along a perimeter thereof, 30 wherein the flanged insert may be coupled to the ring-shaped attachment with the flanged annular plate of the flanged insert abutting the ring-shaped attachment and the raised annular wall of the ring-shaped attachment surrounding a circumferential edge of the flanged annular plate of the flanged insert.

[00031] In Example 13, the subject matter of any one of Examples 1 to 12 may optionally include an inflow guide member extending across the inflow opening.

[00032] In Example 14, the subject matter of Example 13 may optionally include that the inflow guide member may include a lune shape defined by two intersecting circles with a distance between the centres of the two intersecting circles greater than respective radius of the two intersecting circle, or a shape corresponding to a major segment of a circle.

[00033] In Example 15, the subject matter of any one of Examples 1 to 14 may optionally include that the inflow opening may be defined by an edge of the surrounding wall of the receptacle structure towards the topside of the receptacle structure.

[00034] In Example 16, the subject matter of any one of Examples 1 to 15 may optionally include a backslash screen coupled to a boundary of the inflow opening in an erected manner with respect to the inflow opening.

[00035] In Example 17, the subject matter of any one of Examples 1 to 16 may optionally include a dipstick attached to an inner surface of the surrounding wall of the receptacle structure.

[00036] In Example 18, the subject matter of Example 17 may optionally include that a first end of the dipstick may be directed towards the base side of the receptacle structure and a second end of the dipstick may be directed towards the topside of the receptacle structure.

[00037] In Example 19, the subject matter of any one of Examples 1 to 18 may optionally include that the receptacle structure may be foldable.

[00038] In Example 20, the subject matter of any one of Examples 1 to 19 may optionally include a sensor attached to the floatable member.

[00039] Example 21 is a kit for a liquid flowrate gauge including:

a receptacle structure having a surrounding wall around a central axis, wherein an outlet port is disposed at a base side of the receptacle structure and an inflow opening disposed at a topside of the receptacle structure, the base side and the topside being two opposite sides of the receptacle structure along the central axis;

a floatable member capable of loosely sitting within the receptacle structure in a manner so as to define at least one gap between the floatable member and the receptacle structure to maintain a flow path from the inflow opening to the outlet port,

wherein the outlet port is dimensioned to achieve a liquid flowrate through the outlet port equal to or above a threshold outlet flowrate and the floatable member is configured to be floated in a manner so as to be free from contact with the receptacle structure when the

floatable member is loosely sitting within the receptacle structure and a liquid level of a liquid accumulated in the receptacle structure is equal to or higher than a predetermined height measured along the central axis from the outlet port as the liquid flows into the receptacle structure via the inflow opening and out of the receptacle structure via the outlet port, wherein the floatable member being floated by the liquid accumulated in the receptacle structure serve as an indication that a rate of inflow of the liquid into the receptacle structure is equal to or above the threshold outlet flowrate.

[00040] FIG. 1A shows a schematic diagram of a liquid flowrate gauge 100 according to various embodiments. FIG. 1B shows a schematic diagram of the liquid flowrate gauge 100 under predetermined operational conditions according to various embodiments. According to various embodiments, the liquid flowrate gauge 100 may be configured to determine whether a flowrate of a flowing liquid (or rate of inflow of a liquid) has met a minimum threshold flowrate. According to various embodiments, the liquid flowrate gauge 100 may be configured for the flowing liquid to flow therethrough such that the liquid flowrate gauge 100 may determine whether the flowrate of the flowing liquid (or rate of inflow of the liquid) has met a minimum threshold flowrate.

[00041] According to various embodiments, the liquid flowrate gauge 100 may include a receptacle structure 110. According to various embodiments, the receptacle structure 110 may be configured for the flowing liquid to flow therethrough. According to various embodiments, the receptacle structure 110 may include a surrounding wall 112 around a central axis 114. According to various embodiments, the central axis 114 may be a straight axis. Accordingly, the surrounding wall 112 may be a continuously endless wall encircling the central axis 114. Hence, the surrounding wall 112 may define a conduit or a passage or a channel for the flowing liquid to flow therethrough. According to various embodiments, the surrounding wall 112 may include, but not limited, to a funnel-shaped wall, an inverted-conical wall, an inverted-frustoconical wall, an inverted-hemispherical wall, a bowl-shaped wall, an annular wall, a cylindrical wall arrangement, a circular wall arrangement, an oval wall arrangement, an elliptical wall arrangement, side walls arrangement enclosing a square, side walls arrangement enclosing a rectangular, side walls arrangement enclosing a polygonal, or any wall arrangements that surrounds the central axis 114.

[00042] According to various embodiments, the liquid flowrate gauge 100 may include an outlet port 120. According to various embodiments, the outlet port 120 may be a hole for liquid to flow out of the receptacle structure 110 of the liquid flowrate gauge 100. According

to various embodiments, the outlet port 120 may be disposed at a base side 116 of the receptacle structure 110. According to various embodiments, the liquid flowrate gauge 100 may include an inflow opening 130. According to various embodiments, the inflow opening 130 may be a hole or a mouth or an inlet for liquid to be directed or introduced or flowed
5 into the receptacle structure 110 of the liquid flowrate gauge 100. According to various embodiments, the inflow opening 130 may be disposed at a topside 118 of the receptacle structure 110. According to various embodiments, the base side 116 of the receptacle structure 110 and the topside 118 of the receptacle structure 110 may be two opposite sides of the receptacle structure 110 along the central axis 114. Accordingly, the outlet port 120
10 and the inflow opening 130 may be a two opposite sides of the liquid flowrate gauge 100 along the central axis 114 of the receptacle structure 110. Hence, the flowing liquid may flow through the liquid flowrate gauge 100 by entering the liquid flowrate gauge via the inflow opening 130 and exiting the liquid flowrate gauge via the outlet port 120. Thus, the flowing liquid may be directed or introduced or flowed into the liquid flowrate gauge 100
15 from the top and exit from the liquid flowrate gauge 100 via the base or bottom. According to various embodiments, a direction of flow is to enter from the inflow opening 130, flow through the conduit or the passage or the channel defined by the surrounding wall 112 of the receptacle structure 110, and exit via the outlet port 120.

[00043] According to various embodiments, the liquid flowrate gauge 100 may include a
20 floatable member 140. According to various embodiments, the floatable member 140 may include a float, a floatation object, a buoyant object, or any other suitable object capable of floating in liquid. According to various embodiments, the floatable member 140 may be loosely sitting within the receptacle structure 110. Accordingly, the floatable member 140 may be touching or in contact or loosely abutting the receptacle structure 110 without being
25 attached or fixed or secured or joined to the receptacle structure 110. Hence, the floatable member 140 may be easily moved away or set apart from the receptacle structure 110 such that the floatable member 140 may no longer be touching or in contact or abutting the receptacle structure 110. According to various embodiments, the floatable member 140 may be loosely sitting in a manner so as to define at least one gap between the floatable member
30 140 and the receptacle structure 110. Accordingly, when the floatable member 140 is loosely sitting within the receptacle structure 110, the floatable member 140 may not fully seal or close off or block the conduit or the passage or the channel defined by the surrounding wall 112 of the receptacle structure 110. Rather, when the floatable member 140 is loosely sitting

within the receptacle structure 110, the floatable member 140 may only partially touch or contact or abut the receptacle structure 110 along an inner circumferential surface 110a around the central axis 114. Hence, the floatable member 140 may only be touching or contacting or abutting along some segments or sectors of the inner circumferential surface 110a of the receptacle structure 110 around the central axis 114 such that at least a gap or break or chasm may be formed along at least one other segment or sector of the inner circumferential surface 110a of the receptacle structure 110.

[00044] According to various embodiments, the at least one gap between the floatable member 140 and the receptacle structure 110 may be formed by having grooves, corrugation, undulation, uneven surface, indentation, dent, depression, dimple, crease, cut, chamfer, or other similar elements to create a gap or a break or a chasm on the floatable member 140 and/or the receptacle structure 110. According to various embodiments, the floatable member 140 and the receptacle structure 110 may be configured or shaped with respect to each other so as to create the at least one gap between the floatable member 140 and the receptacle structure 110 when the floatable member 140 is loosely sitting within the receptacle structure 110. According to various embodiments, the at least one gap between the floatable member 140 and the receptacle structure 110 may also be formed by differences in dimension, size, shape, configuration, orientation, profile, and/or outline between the floatable member 140 and the receptacle structure 110 with respect to each other.

[00045] According to various embodiments, the at least one gap between the floatable member 140 and the receptacle structure 110 may maintain a flow path from the inflow opening 130 to the outlet port 120. Accordingly, the at least one gap may allow liquid to flow from the inflow opening 130, through the at least one gap, and to the outlet port 120 for exiting the liquid flowrate gauge 100. Therefore, when the flowing liquid is directed or introduced or flowed into the liquid flowrate gauge 100 via the inflow opening 130, the liquid may always flow through the liquid flowrate gauge 100 via flowing from the inflow opening 130, through the at least one gap, and exit from the outlet port 120. Thus, the at least one gap between the floatable member 140 and the receptacle structure 110 may ensure that the flow path is always open for the flowing liquid to flow through the liquid flowrate gauge 100 regardless of whether the flowrate of the flowing liquid has met the minimum threshold flowrate.

[00046] Referring to FIG. 1A and FIG. 1B, when the flowing liquid is directed or introduced or flowed into the liquid flowrate gauge 100 via the inflow opening 130, the liquid may always exit from the outlet port 120. However, depending on the dimension or size of the outlet port 120, when an instantaneous flowrate of the flowing liquid (or instantaneous rate of inflow of the flowing liquid) directed or introduced or flowed into the liquid flowrate gauge 100 is higher than a liquid flowrate of the liquid exiting from the outlet port 120, the liquid may start to accumulate within the receptacle structure 110 of the liquid flowrate gauge 100. According to various embodiments, a liquid level of the liquid accumulated within the receptacle structure 110 of the liquid flowrate gauge 100 may continue to increase as long as the instantaneous flowrate of the flowing liquid directed or introduced or flowed into the liquid flowrate gauge 100 is higher than the liquid flowrate of the liquid exiting from the outlet port 120. According to various embodiments, the liquid level of the liquid accumulated within the receptacle structure 110 of the liquid flowrate gauge 100 may be maintained when the instantaneous flowrate of the flowing liquid directed or introduced or flowed into the liquid flowrate gauge 100 is equal to the liquid flowrate of the liquid exiting from the outlet port 120 (i.e. the instantaneous flowrate of the flowing liquid directed or introduced or flowed into the liquid flowrate gauge 100 is in equilibrium with the resultant flowrate of the liquid exiting from the outlet port 120). According to various embodiments, the liquid level of the liquid accumulated within the receptacle structure 110 of the liquid flowrate gauge 100 may decrease when the instantaneous flowrate of the flowing liquid directed or introduced or flowed into the liquid flowrate gauge 100 drops below the liquid flowrate of the liquid exiting from the outlet port 120.

[00047] Assuming that the liquid is incompressible, Bernoulli's principle for incompressible flow may be applied. According to Bernoulli's equation, the following is valid at any arbitrary point along a streamline or pathline or flow path (i.e. field lines in a fluid flow).

$$\frac{v^2}{2} + gz + \frac{p}{\rho} = \text{constant} \quad (1)$$

v is fluid flow speed;
 g is acceleration due to gravity;
 z is the elevation of the point above a reference plane;
 p is the pressure at the chosen point; and

ρ is the density of the fluid at all points in the fluid.

[00048] Referring to FIG. 1B, assuming a streamline between point A and point B, whereby point A is at the surface of the liquid level of the liquid accumulated within the receptacle structure 110 and point P is at the outlet port 120, the Bernoulli's equation may
5 be represented as follows.

$$\frac{v_A^2}{2} + gz_A + \frac{p_A}{\rho_A} = \frac{v_B^2}{2} + gz_B + \frac{p_B}{\rho_B} \quad (2)$$

v_A is fluid flow speed at point A;
 g is acceleration due to gravity;
 10 z_A is the elevation of the point A above a reference plane;
 p_A is the pressure at the point A;
 ρ_A is the density of the fluid at point A;
 v_B is fluid flow speed at point B;
 z_B is the elevation of the point B above a reference plane;
 15 p_B is the pressure at the point B; and
 ρ_B is the density of the fluid at point B.

[00049] Considering the scenario of the liquid level of the liquid accumulated within the receptacle structure 110 of the liquid flowrate gauge 100 being maintained when the instantaneous flowrate of the flowing liquid directed or introduced or flowed into the liquid
 20 flowrate gauge 100 is equal to the liquid flowrate of the liquid exiting from the outlet port 120 (i.e. the instantaneous flowrate of the flowing liquid directed or introduced or flowed into the liquid flowrate gauge 100 is in equilibrium with the resultant flowrate of the liquid exiting from the outlet port 120), the amount of liquid entering the liquid flowrate gauge 100 is the same as the amount of liquid exiting the liquid flowrate gauge 100 resulting in
 25 the liquid level of the liquid accumulated within the receptacle structure 110 of the liquid flowrate gauge 100 being maintained. Since the liquid level is maintained, it may be assumed that the liquid level is not changing or moving. Hence, the fluid flow speed, v_A , at point A may be assumed to be zero. Further, taking point B to be the reference plane, z_B may be assumed to be zero, and, thus, z_A may be Δh (height of liquid level measured along
 30 the central axis 114 from the outlet port 120). In addition, since point A is exposed to atmospheric pressure and point B is also exposed to atmospheric pressure, $p_A = p_B =$

atmospheric pressure. Furthermore, since density of the liquid is assumed to be the same throughout, $p_A = p_B$. Accordingly, equation (2) above may be simplified to the following.

$$g\Delta h = \frac{v_B^2}{2}$$

$$v_B = \sqrt{2g\Delta h}$$

5 (3)

[00050] From equation (3), the liquid flowrate (or volumetric flowrate) through the outlet port 120 is equal to:

$$Q = Area \times v_B$$

$$Q = \pi r^2 \times \sqrt{2g\Delta h}$$

10 (4)

Q is liquid flowrate through the outlet port 120;

r is radius of the outlet port 120; and

Δh is the height of liquid level of the liquid accumulated within the receptacle structure 110 measured from the outlet port 120.

15 **[00051]** From equation (4), the liquid flowrate, Q , through the outlet port 120 is dependent on the radius, r , of the outlet port 120 (or the dimension of the outlet port 120) and the height, Δh , of liquid level of the liquid accumulated within the receptacle structure 110 measured from the outlet port 120. Accordingly, for a given radius, r , of the outlet port 120, the liquid flowrate, Q , through the outlet port 120 may vary accordingly depending on the height, Δh ,
20 of liquid level of the liquid accumulated within the receptacle structure 110 measured from the outlet port 120.

[00052] According to various embodiments, since the liquid flowrate gauge 100 is to be used to measure whether the flowrate of the flowing liquid (or rate of inflow of the liquid) directed or introduced or flowed into the liquid flowrate gauge 100 has met the minimum
25 threshold flowrate, the liquid flowrate gauge 100 may be configured by taking a threshold outlet flowrate at the outlet port 120 to be a value equal to a desired minimum threshold flowrate of the flowing liquid directed or introduced or flowed into the liquid flowrate gauge 100. Accordingly, the liquid flowrate gauge 100 may be configured according to the scenario whereby when the liquid level of the liquid accumulated within the receptacle
30 structure 110 of the liquid flowrate gauge 100 is maintained at a predetermined height, the instantaneous flowrate of the flowing liquid directed or introduced or flowed into the liquid flowrate gauge 100 is at the desired minimum threshold flowrate and the liquid flowrate of

the liquid exiting from the outlet port 120 is at the threshold outlet flowrate, wherein the desired minimum threshold flowrate is equal to the threshold outlet flowrate (i.e. the instantaneous flowrate of the flowing liquid directed or introduced or flowed into the liquid flowrate gauge 100, which is the desired minimum threshold flowrate, is in equilibrium with the resultant flowrate of the liquid exiting from the outlet port 120, which is the threshold outlet flowrate). In this manner, whether the liquid level of the liquid accumulated within the receptacle structure 110 reaches or surpass the predetermined height measured from the outlet port 120 may be taken as a measure of whether the flowrate of the flowing liquid directed or introduced or flowed into the liquid flowrate gauge 100 has met the desired minimum threshold flowrate. Accordingly, the outlet port 120 may be dimensioned to achieve a liquid flowrate through the outlet port 120 equal to or above (or, equal to or higher than) the threshold outlet flowrate when the liquid level of the liquid accumulated within the receptacle structure 110 is equal to or higher than the predetermined height measured from the outlet port 120. According to various embodiments, depending on the desired minimum threshold flowrate to be measured, suitable dimension of the outlet port 120 and a reasonable predetermined height may be selected accordingly such that the liquid level of the liquid accumulated within the receptacle structure 110 may be monitored or sensed to determine whether the liquid level of the liquid accumulated within the receptacle structure 110 has reached or surpassed the predetermined height measured from the outlet port 120 for determining whether the flowrate of the flowing liquid directed or introduced or flowed into the liquid flowrate gauge 100 has met the minimum threshold flowrate.

[00053] According to various embodiments, when the instantaneous flowrate of the flowing liquid directed or introduced or flowed into the liquid flowrate gauge 100 is equal to the minimum threshold flowrate, the instantaneous flowrate of the flowing liquid may be higher than the liquid flowrate of the liquid exiting from the outlet port 120 before the liquid is accumulated to the predetermined height within the receptacle structure 110 of the liquid flowrate gauge 100. Hence, the liquid level of the liquid may continue to increase as the liquid accumulates within the receptacle structure 110 of the liquid flowrate gauge 100. When the liquid accumulated within the receptacle structure 110 of the liquid flowrate gauge 100 reaches a liquid level equal to the predetermined height measured from the outlet port 120, the liquid may be maintained at the predetermined height because the amount of liquid entering the liquid flowrate gauge 100 (i.e. the instantaneous flowrate of the flowing liquid which is at the minimum threshold flowrate) is the same as the amount of liquid exiting the

liquid flowrate gauge 100 (i.e. the flowrate of the liquid exiting the outlet port 120 which is at the threshold outlet flowrate). When the flowing liquid stops or the instantaneous flowrate of the flowing liquid drops below the minimum threshold flowrate, the liquid accumulated within the receptacle structure 110 of the liquid flowrate gauge 100 may drain from the outlet port 120 and the liquid level may decrease accordingly.

[00054] According to various embodiments, when the instantaneous flowrate of the flowing liquid directed or introduced or flowed into the liquid flowrate gauge 100 is higher than the minimum threshold flowrate, the instantaneous flowrate of the flowing liquid may be higher than the liquid flowrate of the liquid exiting from the outlet port 120 initially before the liquid is accumulated to the predetermined height within the receptacle structure 110 of the liquid flowrate gauge 100. Since the instantaneous flowrate of the flowing liquid directed or introduced or flowed into the liquid flowrate gauge 100 is higher than the minimum threshold flowrate, the liquid may continue to accumulate within the receptacle structure 110 even after reaching a liquid level equal to the predetermined height measured from the outlet port 120. Accordingly, the liquid accumulated within the receptacle structure 110 may reach a liquid level higher than the predetermined height measured from the outlet port 120. Eventually, the liquid accumulated within the receptacle structure 110 may be maintained at the liquid level higher than the predetermined height when the amount of liquid entering the liquid flowrate gauge 100 (i.e. the instantaneous flowrate of the flowing liquid) is the same as the amount of liquid exiting the liquid flowrate gauge 100 (i.e. the flowrate of the liquid exiting the outlet port 120). Subsequently, when the flowing liquid stops or the instantaneous flowrate of the flowing liquid drops, the liquid accumulated within the receptacle structure 110 of the liquid flowrate gauge 100 may drain from the outlet port 120 and the liquid level may decrease accordingly.

[00055] According to various embodiments, when the instantaneous flowrate of the flowing liquid directed or introduced or flowed into the liquid flowrate gauge 100 is below the minimum threshold flowrate, the flowing liquid may directly exiting from the outlet port 120 without accumulating any liquid within the receptacle structure 110 of the liquid flowrate gauge 100, or may accumulate some liquid within the receptacle structure 110 of the liquid flowrate gauge 100 but the liquid level of the liquid accumulated within the receptacle structure 110 of the liquid flowrate gauge 100 may not reach the predetermined height.

[00056] According to various embodiments, the floatable member 140 may be configured to serve as an indicator whether the liquid level of the liquid accumulated within the receptacle structure 110 of the liquid flowrate gauge 100 has reached the predetermined height as a measure of whether the flowrate of the flowing liquid (or rate of inflow of the liquid) directed or introduced or flowed into the liquid flowrate gauge 100 has met the minimum threshold flowrate. According to various embodiments, the floatable member 140 may be configured to be floated when the liquid level of the liquid accumulated within the receptacle structure 110 of the liquid flowrate gauge 100 is equal to or higher than the predetermined height. Accordingly, the floatable member 140 may be configured to achieve positive buoyancy when the liquid level of the liquid accumulated within the receptacle structure 110 of the liquid flowrate gauge 100 is equal to or higher than the predetermined height. Hence, when the liquid level of the liquid accumulated within the receptacle structure 110 of the liquid flowrate gauge 100 is equal to or higher than the predetermined height, a volume of the floatable member 140 immersed in the liquid to displace the liquid may produce a buoyant force greater than a weight of the floatable member 140 so as to float the floatable member 140. In other words, as the level of the liquid accumulated within the receptacle structure 110 of the liquid flowrate gauge 100 increases, the liquid may increasing cover the floatable member 140 until the volume of the floatable member 140 covered by the liquid may produce the positive buoyancy required to float the floatable member 140, and the point at which the floatable member 140 may be floated is when the liquid level of the liquid accumulated within the receptacle structure 110 of the liquid flowrate gauge 100 is at least at the predetermined height. According to various embodiments, when the floatable member 140 is floated by the liquid accumulated within the receptacle structure 110 of the liquid flowrate gauge 100, the floatable member 140 may be lifted or moved away or set apart from the receptacle structure 110 of the liquid flowrate gauge 100 such that the floatable member 140 may be free from contact with or free from touching or abutting the receptacle structure 110 of the liquid flowrate gauge 100. Hence, the floatable member 140 may no longer be sitting within the receptacle structure 110 of the liquid flowrate gauge 100. Rather, the floatable member 140 may be suspended inside the receptacle structure 110 of the liquid flowrate gauge 100 by the liquid accumulated within the receptacle structure 110 of the liquid flowrate gauge 100.

[00057] According to various embodiments, in the liquid flowrate gauge 100, the outlet port 120 may be dimensioned to achieve a liquid flowrate through the outlet port 120 equal

to or above the threshold outlet flowrate and the floatable member 140 may be configured to be floated when a liquid level of the liquid accumulated in the receptacle structure 110 of the liquid flowrate gauge 100 is equal to or higher than the predetermined height measured along the central axis 114 from the outlet port 120. Accordingly, to configure the liquid

5 flowrate gauge 100 for determining whether the flowrate of the flowing liquid (or rate of inflow of the liquid) directed or introduced or flowed into the liquid flowrate gauge 100 has met the minimum threshold flowrate, both the outlet port 120 and the floatable member 140 have to be dimensioned and configured respectively so as to work in a cooperative manner such that, when the liquid level of the liquid accumulated in the receptacle structure 110 of

10 the liquid flowrate gauge 100 is equal to or higher than the predetermined height measured along the central axis 114 from the outlet port 120, the liquid flowrate through the outlet port 120 is equal to or above the threshold outlet flowrate and the floatable member 140 is floated by the liquid accumulated in the receptacle structure 110 of the liquid flowrate gauge 100. In this manner, whether the floatable member 140 is floated may be taken as a measure

15 of whether the flowrate of the flowing liquid directed or introduced or flowed into the liquid flowrate gauge 100 has met the minimum threshold flowrate.

[00058] According to various embodiments, for the purpose of configuring the the liquid flowrate gauge 100 to serve as a point-of-care device which the patient may conduct self-monitoring of urine flow, the minimum threshold flowrate for passing or failing the urine

20 flow test may be within a range from 10ml/s to 15 ml/s, or may be within a range from 11ml/s to 13ml/s, or may be about 12 ml/s. Accordingly, the liquid flowrate gauge 100 may be configured based on the threshold outlet flowrate being within a range from 10ml/s to 15 ml/s, or being within a range from 11ml/s to 13ml/s, or being about 12 ml/s.

[00059] FIG. 2 shows a schematic diagram of a liquid flowrate gauge 200 according to various embodiments. According to various embodiments, the liquid flowrate gauge 200 includes all the features of the liquid flowrate gauge 100 as described with reference to FIG. 1A and FIG. 1B. Accordingly, all features, changes, modifications, and variations that are applicable to the liquid flowrate gauge 100 of FIG. 1A and FIG. 1B are also applicable to the liquid flowrate gauge 200 of FIG. 2.

30 **[00060]** According to various embodiments, the liquid flowrate gauge 200 may, similar to the liquid flowrate gauge 100 of FIG. 1A and FIG. 1B, include the receptacle structure 110. According to various embodiments, the receptacle structure 110 of the liquid flowrate gauge 200 may, similar to the liquid flowrate gauge 100 of FIG. 1A and FIG. 1B, include

the surrounding wall 112 around the central axis 114. According to various embodiments, the liquid flowrate gauge 200 may, similar to the liquid flowrate gauge 100 of FIG. 1A and FIG. 1B, include the outlet port 120 and the inflow opening 130. Similar to the liquid flowrate gauge 100 of FIG. 1A and FIG. 1B, the outlet port 120 of the liquid flowrate gauge
5 200 may be disposed at the base side 116 of the receptacle structure 110 and the inflow opening 130 of the liquid flowrate gauge 200 may be disposed at the topside 118 of the receptacle structure 110.

[00061] According to various embodiments, the liquid flowrate gauge 200 may, similar to the liquid flowrate gauge 100 of FIG. 1A and FIG. 1B, include the floatable member 140.

10 Similar to the liquid flowrate gauge 100 of FIG. 1A and FIG. 1B, the floatable member 140 of the liquid flowrate gauge 200 may be loosely sitting within the receptacle structure 110 in a manner so as to define at least one gap between the floatable member 140 and the receptacle structure 110 to maintain the flow path from the inflow opening 130 to the outlet port 120.

15 **[00062]** According to various embodiments, similar to the liquid flowrate gauge 100 of FIG. 1A and FIG. 1B, the outlet port 120 of the liquid flowrate gauge 200 may be dimensioned to achieve a liquid flowrate through the outlet port 120 equal to or above the threshold outlet flowrate and the floatable member 140 may be configured to be floated in a manner so as to be free from contact with the receptacle structure when the liquid level of
20 the liquid accumulated in the receptacle structure 110 of the liquid flowrate gauge 200 is equal to or higher than the predetermined height measured along the central axis 114 from the outlet port 120 as the liquid flows into the receptacle structure 110 via the inflow opening 130 and out of the receptacle structure 110 via the outlet port 120. Accordingly, similar to the liquid flowrate gauge 100 of FIG. 1A and FIG. 1B, the floatable member 140 of the
25 liquid flowrate gauge 200 being floated by the liquid accumulated in the receptacle structure 110 may serve as an indication that a rate of inflow of the liquid into the receptacle structure 110 is equal to or above the threshold outlet flowrate. Hence, similar to the liquid flowrate gauge 100 of FIG. 1A and FIG. 1B, whether the floatable member 140 of the liquid flowrate gauge 200 is floated may be taken as a measure of whether the rate of inflow of the liquid
30 into the liquid flowrate gauge 100 has met the minimum threshold flowrate.

[00063] According to various embodiments, the liquid flowrate gauge 200 may further include the following additional features and/or limitations.

[00064] According to various embodiments, the liquid flowrate gauge 200 may further include an inflow guide member 250. According to various embodiments, the inflow guide member 250 may be disposed near or at the inflow opening 130 of the liquid flowrate gauge 200. According to various embodiments, the inflow guide member 250 may extend across
5 the inflow opening 130 so as to partially cover the inflow opening 130 of the liquid flowrate gauge 200. Accordingly, the inflow guide member 250 may extend partially across the inflow opening 130. According to various embodiments, the inflow guide member 250 may be configured to guide or direct the liquid entering the inflow opening 130 of the liquid flowrate gauge 200 towards the surrounding wall 112 of the receptacle structure 110 for
10 flowing along the surrounding wall 112 towards the outlet port 120 such that the liquid entering the inflow opening 130 of the liquid flowrate gauge 200 may not (or may be prevented) from directly impinging or hitting or impacting the floatable member 140 loosely sitting within the receptacle structure 110. According to various embodiments, the inflow guide member 250 may have a lune shape defined by two intersecting circles with a distance
15 between the centres of the two intersecting circles greater than respective radius of the two intersecting circles (for example see FIG. 3A), or a shape corresponding to a major segment of a circle (for example, see FIG. 3B), or any suitable shape that stretches over the floatable member 140. FIG. 3A shows an example of the inflow guide member 250 having a lune shape according to various embodiments. FIG. 3B shows an example of the inflow guide
20 member 250 having a shape corresponding to a major segment of a circle according to various embodiments.

[00065] According to various embodiments, the inflow opening 130 may be defined by an edge 112a (for example, see FIG. 1A to FIG. 2) of the surrounding wall 112 of the receptacle structure 110 towards the topside 118 of the receptacle structure 110.
25 Accordingly, the edge 112a of the surrounding wall 112 of the receptacle structure 110 may be an upper edge or a rim of the surrounding wall 112 of the receptacle structure 110 at the topside 118 of the receptacle structure 110. According to various embodiments, in the liquid flowrate gauge 200, the inflow guide member 250 may extend from a segment of the edge 112a (or the upper edge or the rim) of the surrounding wall 112 of the receptacle structure
30 110 or extend from a segment of a portion immediately below the edge 112a (or the upper edge or the rim) of the surrounding wall 112 of the receptacle structure 110.

[00066] According to various embodiments, the liquid flowrate gauge 200 may further include a backsplash screen 260. According to various embodiments, the backsplash screen

260 may be configured to block or catch splatter from fluid entering the liquid flowrate gauge 200. For example, when the liquid flowrate gauge 200 is used for urine flow test, the backsplash screen 260 may block or catch urine splatter. According to various embodiments, the backsplash screen 260 may be coupled to a boundary of the inflow opening 130.

5 Accordingly, the backsplash screen may be coupled to the edge 112a (or the upper edge or the rim) of the surrounding wall 112 of the receptacle structure 110. According to various embodiments, the backsplash screen 260 may be coupled in an erected manner with respect to the inflow opening 130. Accordingly, the backsplash screen 260 may be set in a raised manner, or directed generally upwards, or set in an upright or vertical or diagonal or slanted

10 manner with respect to a plane of the inflow opening 130. FIG. 4 shows an example of the backsplash screen 260 according to various embodiments.

[00067] Referring to FIG. 1A to FIG. 2, according to various embodiments, the receptacle structure 110 may include a base portion 111. According to various embodiments, the base portion 111 may be at the base side 116 of the receptacle structure 110. Accordingly, the

15 base portion 111 may be a bottom of the receptacle structure 110 opposite the inflow opening 130. According to various embodiments, the base portion 111 may be adjoining a corresponding edge 112b of the surrounding wall 112 of the receptacle structure 110. The corresponding edge 112b of the surrounding wall 112 of the receptacle structure 110 may be a base edge or a bottom edge of the surrounding wall 112 of the receptacle structure 110.

20 According to various embodiments, a perimeter of the base portion 111 may be fully adjoining the corresponding edge 112b of the surrounding wall 112 of the receptacle structure 110 all around. According to various embodiments, the outlet port 120 may be in the base portion 111 of the receptacle structure 110. Accordingly, the outlet port 120 may be a through-hole extending completely through the base portion 111.

25 [00068] According to various embodiments, the base portion 111 of the receptacle structure 110 may include a nozzle assembly 511. FIG. 5A shows an assembled side view of the nozzle assembly 511 according to various embodiments. FIG. 5B shows a disassembled side view of the nozzle assembly 511 according to various embodiments. FIG. 5C shows a top view of a first part 570 of the nozzle assembly 511 according to various

30 embodiments. FIG. 5D shows a side view of the first part 570 of the nozzle assembly 511 according to various embodiments. FIG. 5E shows a top view of a second part 580 of the nozzle assembly 511 according to various embodiments. FIG. 5F shows a side view of the second part 580 of the nozzle assembly 511 according to various embodiments. FIG. 5G

shows a bottom view of the second part 580 of the nozzle assembly 511 according to various embodiments. According to various embodiments, the nozzle assembly 511 may be coupled to the corresponding edge 112b of the surrounding wall 112 of the receptacle structure 110 such that the nozzle assembly 511 forms the base portion 111 of the receptacle structure 110.

- 5 [00069] According to various embodiments, the nozzle assembly 511 may include the first part 570 and the second part 580. According to various embodiments, the first part 570 may include a ring-shaped attachment 572. Accordingly, the ring-shaped attachment 572 may be of a ring shape having a central cavity 574. According to various embodiments, the second part 580 may include a flanged insert 582. According to various embodiments, the flanged insert 582 may include an insert portion 584. According to various embodiments, the flanged insert 582 may include a flanged annular plate 586 at an end 584a of the insert port 584. As shown in FIG. 5A and FIG. 5B, according to various embodiments, the first part 570 and the second part 580 may be assembled together by fitting the insert portion 584 of the flanged insert 582 into the central cavity 574 of the ring-shaped attachment 572.
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- 15 [00070] Referring to FIG. 5C as an example, according to various embodiments, the ring-shaped attachment 572 may be circular in shape and the central cavity 574 may be a circular central cavity. Referring to FIG. 5E and FIG. 5G as an example, according to various embodiments, the insert portion 584 of the flanged insert 582 may be a cylindrical insert portion and the flanged annular plate 586 may also be circular. It is understood that the shapes of the ring-shaped attachment 572 and the flanged annular plate 586 of the flanged insert 582 may be of any suitable shape, including but not limited to circular or oval or elliptical or square or rectangular or polygonal, depending on a corresponding shape formed by the corresponding edge 112b (or base edge or bottom edge) of the surrounding wall 112 of the receptacle structure 110. It is also understood that the shape of the central cavity 574
- 20
- 25 of the ring-shaped attachment 572 and the shape of the insert portion 584 of the flanged insert 582 may be complementary to each other such that they may be fitted together. Accordingly, a cross-sectional profile of the insert portion 584 of the flanged insert 582 and a corresponding cross-sectional profile of the central cavity 574 of the ring-shaped attachment 572 may respectively have a shape, including, but not limited to, a circular shape, an oval shape, an elliptical shape, a square shape, a rectangular shape, or a polygonal shape.
- 30 [00071] According to various embodiments, the flanged insert 582 may include a through-hole 588 extending through the flanged insert 582 along a center axis 589 (or centerline) of the flanged insert 582. According to various embodiments, the center axis 589 (or the

- centerline) may extend through a center of the flanged annular plate 586 and a center of the insert portion 584. Accordingly, a hole-axis (or a centerline) of the through-hole 588 may coincide with the center axis 589 (or the centerline) of the flanged insert 582. Hence, the through-hole 588 may extend through the center of the flanged annular plate 586 and the center of the insert portion 584. According to various embodiments, when the insert portion 584 is of a cylindrical shape as shown in FIG. 5F and FIG. 5G, the center axis 589 of the flanged insert 582 may coincide with a cylindrical axis of the cylindrical insert portion 584. Accordingly, the through-hole 588 may extend through the flanged insert 582 along the cylindrical axis of the cylindrical insert portion 584.
- 5
- 10 **[00072]** According to various embodiments, the through-hole 588 of the flanged insert 582 may be the only through-hole extending through the nozzle assembly 511 when the flanged insert 582 and the ring-shaped attachment 572 are assembled together. Accordingly, the through-hole 588 of the flanged insert 582 may form the outlet port 120 when the nozzle assembly 511 is coupled to the corresponding edge 112b (or base edge or bottom edge) of the surrounding wall 112 of the receptacle structure 110.
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- [00073]** According to various embodiments, the ring-shaped attachment 572 may include a raised annular wall 576 along a perimeter of the ring-shaped attachment 572. According to various embodiments, the flanged insert 582 may be coupled to the ring-shaped attachment 572 on a side of the ring-shaped attachment 572 from which the raised annular wall 576 may be protruding. Accordingly, the flanged insert 582 and the ring-shaped attachment 572 may be assembled by directing a side of the flanged insert 582 having the insert portion 584 towards the side of the ring-shaped attachment 572 having the raised annular wall 576. According to various embodiments, the flanged insert 582 may be coupled to the ring-shaped attachment 572 with the insert portion 584 of the flanged insert 582 fitted into the central cavity 574 of the ring-shaped attachment 572, the flanged annular plate 586 of the flanged insert 582 abutting the ring-shaped attachment 572, and the raised annular wall 576 of the ring-shaped attachment 572 surrounding a circumferential edge 586a of the flanged annular plate 586 of the flanged insert 582.
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- 25
- [00074]** According to various embodiments, the flanged insert 582 and the ring-shaped attachment 572 may be coupled together in a manner so as to form a liquid-proof or leak-proof nozzle assembly 511, except for the through-hole 588 of the flanged insert 582. According to various embodiments, the nozzle assembly 511 may be coupled to the
- 30

corresponding edge 112b (or base edge or bottom edge) of the surrounding wall 112 of the receptacle structure 110 in a liquid-proof or leak-proof manner.

[00075] Referring to FIG. 2, according to various embodiments, the floatable member 140 may include a plurality of grooves 242. According to various embodiments, the plurality of grooves 242 may be distributed around the floatable member 140. According to various embodiments, the plurality of grooves 242 may be distributed along a circumferential surface or side surface(s) of the floatable member 140. According to various embodiments, the plurality of grooves 242 may provide the at least one gap between the floatable member 140 and the receptacle structure 110 for maintaining the flow path from the inflow opening 130 to the outlet port 120. According to various embodiments, the plurality of grooves 242 may be parallel to each other.

[00076] According to various embodiments, the plurality of grooves 242 of the floatable member 140 may be configured such that the floatable member 140 may rotate when the floatable member 140 is floated by the liquid accumulated within the receptacle structure 110 of the liquid flowrate gauge 100, 200. According to various embodiments, the plurality of grooves 242 may include, but not limited to, diagonal grooves, helical grooves, or spiral grooves. According to various embodiments, the plurality of grooves 242 may be extending in a same direction. According to various embodiments, the plurality of grooves 242 may provide unidirectional rotation for the floatable member 140.

[00077] FIG. 6A shows a top view of an example of the floatable member 140 according to various embodiments. FIG. 6B shows a side view of the example of the floatable member 140 of FIG. 6A according to various embodiments. FIG. 6C shows a bottom view of the example of the floatable member 140 of FIG. 6A according to various embodiments. FIG. 6D shows a disassembled view of the example of the floatable member 140 of FIG. 6A according to various embodiments.

[00078] According to various embodiments, the floatable member 140 may have a shape and density to create a buoyancy force greater than a weight of the floatable member 140 by a volume of the floatable member 140 that may be immersed in the liquid accumulated in the receptacle structure 110 when the liquid level is equal to or higher than the predetermined height. According to various embodiments, the floatable member 140 may also have a shape suitable for rotating about itself when floated by the liquid accumulated in the receptacle structure 110. According to various embodiments, for example, the floatable member 140 may be of a shape including, but not limited to, an inverted

frustoconical shape (for example see FIG. 6B), a spherical shape, a cylindrical shape, or a hemispherical shape.

[00079] According to various embodiments, the floatable member 140 may be made of material having density suitable for creating the buoyancy force. According to various
5 embodiments, for example, the floatable member 140 may be made of material including, but not limited to, polystyrene, wood, foam material, sponge material, high density polyethylene (HDPE), low density polyethylene (LDPE), or polypropylene (PP). According to various embodiments, the floatable member 140 may be of a solid structure. According to various embodiments, the floatable member 140 may also be of a hollow structure or an
10 inflatable structure such that the floatable member 140 may create the buoyancy force as required.

[00080] Referring to FIG. 6C and FIG. 6D, according to various embodiments, the floatable member 140 may include a weight member 644. According to various embodiments, the weight member 644 may be coupled to a base 646 of the floatable member
15 140. According to various embodiments, the weight member 644 may be configured to lower a center of gravity of the floatable member 140 so as to provide stability to the floatable member 140 when the floatable member 140 is floated by the liquid accumulated in the receptacle structure 110. According to various embodiments, the weight member 644 may include, but not limited, to a screw or a bolt screwed into a center of the base 646 of
20 the floatable member 140.

[00081] FIG. 7 shows a schematic side view of a variation of the liquid flowrate gauge 100, 200 according to various embodiments. According to various embodiments, the liquid flowrate gauge 100, 200 may further include a handle 790 coupled to the receptacle structure 110. Accordingly, the handle 790 may allow the user to easily handle the liquid flowrate
25 gauge 100, 200 for directing or introducing or flowing liquid into the liquid flowrate gauge 100, 200. According to various embodiments, the handle 790 may be integrally formed with the receptacle structure 110 or may be a separate piece that may be coupled or attached or fitted with the receptacle structure 110.

[00082] FIG. 8A shows a handle 790a which is a variant of the handle 790 of FIG. 7 according to various embodiments. FIG. 8B shows a side view of the handle 790a. According to various embodiments, the handle 790a of FIG. 8A is shown as a separate piece that may be coupled or attached or fitted with the receptacle structure 110 of the liquid
30 flowrate gauge 100, 200. As shown, the handle 790a may include a receptacle holder portion

792a and a grip portion 794a. According to various embodiments, the receptacle holder portion 792a may be of a ring shape, which the receptacle structure 110 may be seated or fitted therein. Further, the grip portion 794a may extend radially outwards from the receptacle holder portion 792a. For example, the grip portion 794a may be in the form of a bar or a rod extending from the receptacle holder portion 792a, i.e. similar to a radial handle extending from a ring. According to various embodiments, the grip portion 794a may be arched with a curvature. Hence, the grip portion 794a may extend upwards from the receptacle holder portion 792a before extending radially outwards in a gradual and continuous manner so as to form the curvature (i.e. the arch). According to various embodiments, the grip portion 794a may have a contour that follows a curvature of user's palm and fingers to enhance comfortability and stability when gripping. According to various embodiments, the handle 790a may minimize and/or eliminate a tilting of the receptacle structure 110 when held by the user.

[00083] FIG. 9A shows a handle 790b which is a variant of the handle 790 of FIG. 7 according to various embodiments. FIG. 9B shows a bottom perspective view of the handle 790b. FIG. 9C shows a side view of the handle 790b. According to various embodiments, the handle 790b of FIG. 9A is shown as a separate piece that may be coupled or attached or fitted with the receptacle structure 110 of the liquid flowrate gauge 100, 200. As shown, the handle 790b may include a receptacle holder portion 792b and a grip portion 794b. According to various embodiments, the receptacle holder portion 792b may be of a ring shape, which the receptacle structure 110 may be seated or fitted therein. Further, the grip portion 794a may be along an outer side of an arc segment of the receptacle holder portion 792b forming an annular sector extension. Accordingly, the annular sector extension may be running alongside the outer side of the arc segment of the receptacle holder portion 792b. Hence, the grip portion 794b may widen the arc segment of the receptacle holder portion 792b. Thus, the grip portion 794b may provide a wider area along the arc segment of the receptacle holder portion 792b for user to grip. For example, the grip portion 794b may be a flat and wider border-like extension along the arc segment of the receptacle holder portion 792b. Hence, the grip portion 794a may provide a flat and wide surface allowing a bigger surface area for user to grip so as to enhance user's grip stability. According to various embodiments, an underside 795 of the grip portion 794b may be hollow or recessed or may include grooves which may accommodate or receive fingers of the user to enhance user's

grip comfortability. Further, the underside 795 of the grip portion 794b may be profiled based on curvature of the fingers.

[00084] FIG. 10A shows a handle 790c which is a variant of the handle 790 of FIG. 7 according to various embodiments. FIG. 10B shows a side view of the handle 790c.

5 According to various embodiments, the handle 790c of FIG. 10C is shown as a separate piece that may be coupled or attached or fitted with the receptacle structure 110 of the liquid flowrate gauge 100, 200. As shown, the handle 790c may include a receptacle holder portion 792c and a grip portion 794c. According to various embodiments, the receptacle holder portion 792c may be of a ring shape, which the receptacle structure 110 may be seated or
10 fitted therein. Further, the grip portion 794c may be a thicken section along an arc segment of the receptacle holder portion 792c. Accordingly, the grip portion 794c may be a segment of the receptacle holder portion 792c having a larger thickness than the rest of the receptacle holder portion 792c. Thus, the grip portion 794c may provide a thicker gripping region along the arc segment of the receptacle holder portion 792c for user to grip. For example, the grip
15 portion 794c may protrude from a top surface 793 along the arc segment of the receptacle holder portion 792c. The grip portion 794c may protrude in a gradual and continuous manner. According to various embodiments, the grip portion 794c may be profiled according to the user's palm in a manner so as to accommodate the gripping profile of the palm which may in turn increase user's grip stability and comfortability.

20 **[00085]** FIG. 11 shows a schematic diagram of another variation of the liquid flowrate gauge 100, 200 according to various embodiments. According to various embodiments, the liquid flowrate gauge 100, 200 may further include a dipstick 896 attached to the inner surface 110a of the surrounding wall 112 of the receptacle structure 110. According to various embodiments, when the liquid flowrate gauge 100, 200 is configured to serve as a
25 point-of-care device which the patient may conduct self-monitoring of urine flow, the dipstick 896 may include, but not limited to, a urine test strip for detecting blood, infection, protein, and/or glucose in the urine.

[00086] According to various embodiments, the dipstick 896 may be attached to the inner surface 110a of the surrounding wall 112 of the receptacle structure 110 in a manner such
30 that a first end of the dipstick 896 may be directed towards the base side 116 of the receptacle structure 110 and a second end of the dipstick 896 may be directed towards the topside 118 of the receptacle structure 110.

[00087] According to yet another variation of the liquid flowrate gauge 100, 200 of the various embodiments, the liquid flowrate gauge 100, 200 may be foldable. According to various embodiments, the receptacle structure 110 of the liquid flowrate gauge 100, 200 may be made of foldable material or may be shaped so as to be foldable. According to various
5 embodiments, being foldable may allow ease of production, transportation, and/or stowage. According to various embodiments, the foldable liquid flowrate gauge 100, 200 may be folded for packing and stowing. According to various embodiments, when the foldable liquid flowrate gauge 100, 200 is to be used, the foldable liquid flowrate gauge 100, 200 may be unfolded or spread out into the liquid flowrate gauge 100, 200 as shown in FIG. 1A
10 to FIG. 2 for use and work in the same manner.

[00088] FIG. 12 shows a schematic diagram of another variation of the liquid flowrate gauge 100, 200 according to various embodiments. According to various embodiments, the liquid flowrate gauge 100, 200 may further include a sensor 997. According to various embodiments, the sensor 997 may be attached to the floatable member 140 (for example,
15 see FIG. 9) and/or to the receptacle structure 110. According to various embodiments, the sensor 997 may be configured to sense or detect the accumulation of liquid in the receptacle structure 110. For example, when the sensor 997 is attached to the floatable member 140, the sensor 997 may sense or detect a displacement or a motion of the floatable member 140 as a measure that the floatable member 140 is floated by the liquid accumulated within the
20 receptacle structure 110. As another example, when the sensor 997 is attached to the receptacle structure 110, the sensor 997 may sense or detect the liquid level or the displacement or motion of the floatable member 140 as a measure that the floatable member 140 is floated by the liquid accumulated within the receptacle structure 110. According to various embodiments, the sensor 997 may be in communication with a processor 998.
25 Accordingly, the sensor 997 may send a signal to the processor 998. According to various embodiments, the processor 998 may process the signal and analyze the information for storing, displaying, transmitting, tabulating, etc. in an electronic device. According to various embodiments, the electronic device may include but not limited to a mobile phone, a smart phone, a smart watch, a tablet, a notepad, a laptop, a computer, a server, a printer,
30 etc.

[00089] In various embodiments, a "processor" may be understood as any kind of a logic implementing entity, which may be special purpose circuitry or a processor executing software stored in a memory, firmware, or any combination thereof. Thus, in an

embodiment, a "processor" may be a hard-wired logic circuit or a programmable logic circuit such as a programmable processor, e.g. a microprocessor (e.g. a Complex Instruction Set Computer (CISC) processor or a Reduced Instruction Set Computer (RISC) processor). A "processor" may also be a processor executing software, e.g. any kind of computer
5 program, e.g. a computer program using a virtual machine code such as e.g. Java. Any other kind of implementation of the respective functions which will be described in more detail below may also be understood as a "processor" in accordance with various embodiments. In various embodiments, the processor may be part of a computing system or a controller or a microcontroller or any other system providing a processing capability. According to
10 various embodiments, such systems may include a memory which is for example used in the processing carried out by the device or system. A memory used in the embodiments may be a volatile memory, for example a DRAM (Dynamic Random Access Memory) or a non-volatile memory, for example a PROM (Programmable Read Only Memory), an EPROM (Erasable PROM), EEPROM (Electrically Erasable PROM), or a flash memory, e.g., a
15 floating gate memory, a charge trapping memory, an MRAM (Magnetoresistive Random Access Memory) or a PCRAM (Phase Change Random Access Memory).

[00090] FIG. 13 shows a schematic diagram of another variation of the liquid flowrate gauge 100, 200 according to various embodiments. According to various embodiments, the liquid flowrate gauge 100, 200 may further include a collector adapter 1399. The collector
20 adapter 1399 may be at the base side 116 of the receptacle structure 110 of the liquid flowrate gauge 100, 200. According to various embodiments, the collector adapter 1399 may be configured to couple a liquid collector 1308 to the liquid flowrate gauge 100, 200 in a manner such that the flowing liquid may flow through the outlet port 120 of the liquid flowrate gauge 100, 200 into the liquid collector 1308. According to various embodiments,
25 the liquid collector 1308 may include, but not limited to, a bottle, a container, or a vessel. According to various embodiments, the collector adapter 1399 may include an adapter wall arrangement extending from the base side 116 of the receptacle structure 110 in a direction away from the topside 118 of the receptacle structure 110 (or away from the inflow opening 130 of the liquid flowrate gauge 100, 200). The adapter wall arrangement may include an
30 engagement element for coupling with a corresponding engagement element of the liquid collector 1308. Hence, the liquid collector 1308 may be coupled to the liquid flowrate gauge 100, 200 by coupling the engagement element of the adapter wall arrangement of the collector adapter 1399 to the corresponding engagement element of the liquid collector 1308.

[00091] For example, the adapter wall arrangement of the collector adapter 1399 may include an annular wall or a series of walls extending from the base portion 111 of the receptacle structure 110 of the liquid flowrate gauge 100, 200 in a manner so as to surround or enclose the outlet port 120 of the liquid flowrate gauge 100, 200. Accordingly, the outlet
5 port 120 of the liquid flowrate gauge 100, 200 may be within the adapter wall arrangement of the collector adapter 1399 (or a center of the adapter wall arrangement of the collector adapter 1399). Further, the engagement element of the adapter wall arrangement of the collector adapter 1399 may be on an inner wall surface of the adapter wall arrangement of the collector adapter 1399. In such an example, the liquid collector 1308 may be a
10 PolyEthylene Terephthalate (PET) bottle. Accordingly, a neck finish of the PET bottle may be coupled to the collector adapter 1399. Thus, the engagement element of the adapter wall arrangement of the collector adapter 1399 may be internal screw threading and the neck finish of the PET bottle may be external screw threading. Therefore, the PET bottle may be coupled to the liquid flowrate gauge 100, 200 via screwing the neck finish of the PET bottle
15 to the collector adapter 1399 of the liquid flowrate gauge 100, 200. While the collector adapter 1399 and the liquid collector 1308 are described based on the PET bottle as an example, it is understood that other suitable collector adapter 1399 and the liquid collector 1308 may be possible, such as collector adapter with external threading and liquid collector with internal threading, or collector adapter and liquid collector with snap-fit arrangements,
20 etc. Further, the liquid collector 1308 may also include suitable venting arrangement such as air holes or vent for air to escape the liquid collector 1308 as the flowing liquid is filling up the liquid collector 1308.

[00092] FIG. 14A shows a floatable member 140a which is a variant of the floatable member 140 according to various embodiments. FIG. 14B shows a perspective view of the
25 floatable member 140a of FIG. 14A. FIG. 14C shows an exploded view of the floatable member 140a of FIG. 14A. FIG. 14D shows a perspective exploded view of the floatable member 140a of FIG. 14A. FIG. 14E shows another perspective exploded view of the floatable member 140a of FIG. 14A.

[00093] As shown, the floatable member 140a of FIG. 14A may have an inverted
30 hemispherical shape. Further, the floatable member 140a may include the plurality of grooves 242. The plurality of grooves 242 may be distributed around the floatable member 140a. The plurality of grooves 242 may also be parallel to each other. For example, the plurality of grooves 242 of the floatable member 140a may include, but not limited to,

diagonal grooves, helical grooves, or spiral grooves. According to various embodiments, the plurality of grooves 242 of the floatable member 140a may be extending in a same direction. According to various embodiments, the plurality of grooves 242 may provide unidirectional rotation for the floatable member 140a.

5 [00094] As also shown, the floatable member 140a may be of a hollow structure (for example, see FIG. 14D) such that the floatable member 140a may create the buoyancy force as required. Accordingly, the floatable member 140a may include a hollow body structure 1447 and a cover 1448. The hollow body structure 1447 may be of a bowl shape or an inverted hollow hemispherical shape. The cover 1448 may be a flat structure or a lid or a
10 panel to cover the mouth (or the largest opening) of the hollow body structure 1447. The cover 1448 may include a central shaft 1449 extending from a center of the cover 1448. When the cover 1448 is fitted to the hollow body structure 1447, the central shaft 1449 may extend to the base 646 of the hollow body structure 1447 that is at a center of the hollow body structure 1447 (or a center of the bowl shape or an apex of the inverted hollow
15 hemispherical shape). The base 646 of the hollow body structure 1447 may include a hole. According to various embodiments, the floatable member 140a may include the weight member 644. The weight member 644 may be coupled to the base 646 of the floatable member 140a. According to various embodiments, the weight member 644 may be in the form of a screw-like element. Accordingly, the weight member 644 may be inserted through
20 the hole in the base 646 of the hollow body structure 1447 so as to be coupled to the central shaft 1449 of the cover 1448. In this manner, the hollow body structure 1447 and the cover 1448 may be coupled tightly in a leak-proof member with the weight member 644 located at the base 646 of the floatable member 140a. According to various embodiments, the weight member 644 may lower a center of gravity of the floatable member 140a so as to provide
25 stability to the floatable member 140 when the floatable member 140 is floated by the liquid accumulated in the receptacle structure 110, and also serve as the coupling element for coupling the hollow body structure 1447 and the cover 1448. According to various embodiments, the weight member 644 may include, but not limited, to a screw or a bolt screwed into a center of the base 646 of the floatable member 140a. According to various
30 embodiments, the hollow body structure 1447 and the cover 1448 may include snap-fit arrangement around respective edges so as to be capable of being snap fitted to each other.
[00095] FIG. 15A shows a side view of a variant of the receptacle structure 110 of the liquid flowrate gauge 100, 200 of FIG. 1A to FIG. 2, together with the backsplash screen

260, according to various embodiments. FIG. 15B shows a perspective view of FIG. 15A according to various embodiments. FIG. 15C shows another perspective view of FIG. 15A according to various embodiments. As shown, the liquid flowrate gauge 100, 200 may include the receptacle structure 110 that may be integral with a handle 790d. The handle 790d may be configured in a manner similar to the handle 790a of FIG. 8A and FIG. 8B, except that the handle 790d may be integrally formed with the receptacle structure 110. According to various other embodiments (not shown), the handle 790d may be configured to be similar to the handle 790b of FIG. 9A to FIG. 9C or the handle 790c of FIG. 10A and FIG. 10B, except that the handle 790d may be integrally formed with the receptacle structure 110. Further, the liquid flowrate gauge 100, 200 may further include the backsplash screen 260 coupled to the receptacle structure 110 with the integral handle 790d. According to various embodiments, the backsplash screen 260 may be coupled to the boundary of the inflow opening 130 of the receptacle structure 110, i.e the edge 112a (or the upper edge or the rim) of the surrounding wall 112 of the receptacle structure 110. Furthermore, the liquid flowrate gauge 100, 200 may include the collector adapter 1399 at the base side 116 of the receptacle structure 110. The collector adapter 1399 may be integral with the receptacle structure 110 and may extend, in the form of an annular wall 1399a, from the base portion 111 of the receptacle structure 110 of the liquid flowrate gauge 100, 200 in a manner so as to surround or enclose the outlet port 120 of the liquid flowrate gauge 100, 200. Furthermore, the outlet port 120 may be in the form of an outlet tube 120a extending from the base portion 111 of the receptacle structure 110 of the liquid flowrate gauge 100, 200. The outlet tube 120b may be concentric with the annular wall 1399a of the collector adapter 1399, and the annular wall 1399a of the collector adapter 1399 may surround the outlet tube 120a. Hence, when the liquid collector 1308 is coupled to the collector adapter 1399, the outlet tube 120a may extend into the liquid collector 1308 (for example, into a space enclosed by a neck of a PET bottle).

[00096] FIG. 15A to FIG. 15C have provided a possible combination of various features as described earlier. It is understood that FIG. 15A to FIG. 15C are provided as examples and does not serve to limit the various permutations and combinations of the various features as described earlier. Hence, further combinations and permutations of the various features are envisaged for the liquid flowrate gauge 100, 200 of the various embodiments.

[00097] According to various embodiments, the liquid flowrate gauge 100, 200 of the various embodiments may be provided as a kit. For example, the kit may include the

receptacle structure 110 (as described in the various embodiments and variants) and the floatable member 140 (as described in the various embodiments and variants) as separate components. Accordingly, the user may simply place the floatable member 140 into the receptacle structure 110 so as to assemble the kit into the liquid flowrate gauge 100, 200 of the various embodiments. Further, the kit may also include the inflow guide member 250, the backsplash screen 260, and/or the nozzle assembly 511 as separate components from the receptacle structure 110. Hence, the user may respectively fit the inflow guide member 250, the backsplash screen 260, and/or the nozzle assembly 511 to the receptacle structure 110 for assembling the kit into the liquid flowrate gauge 100, 200 of the various embodiments.

When the handle 790 is a separate piece from the receptacle structure 110, such as the handle 790a, 790b, 790c as shown in FIG. 8A to 10B, the kit may include the handle 790 as a separate component from the receptacle structure 110. Thus, the user may fit the handle 790 to the receptacle structure 110 for assembling the kit into the liquid flowrate gauge 100, 200 of the various embodiments. When the receptacle structure 110 includes the collector adapter 1399, the kit may also include the liquid collector 1308 as a separate component.

[00098] According to various embodiments, when the liquid flowrate gauge 100, 200 of the various embodiments is configured to serve as a point-of-care device which the patient may conduct self-monitoring of urine flow, the liquid flowrate gauge 100, 200 may be configured according to the following.

[00099] According to various embodiments, the surrounding wall 112 of the receptacle structure 110 may be of a funnel shape. According to various embodiments, the funnel shaped surrounding wall 122 may include a rim with a diameter from 120mm to 126mm, or from 122mm to 125mm, or about 123.6mm. According to various embodiments, the funnel shaped surrounding wall 122 may include a base with a diameter from 16mm to 20mm, or from 17mm to 19mm, or about 18mm. According to various embodiments, the funnel shaped surrounding wall 122 may have a height from 70mm to 80mm, or from 72mm to 78mm, or about 75mm. According to various embodiments, the surrounding wall 122 may be made of polypropylene.

[000100] According to various embodiments, the output port 120 may have a diameter from 4.9 to 5.1mm, or about 5.0mm.

[000101] According to various embodiments, the floatable member 140 may be of a frustoconical shape having a height from 24mm to 28mm, or about 26mm. According to various embodiments, a wider end surface of the frustoconical shaped floatable member 140

may have a diameter from 30mm to 34mm, or about 32mm. According to various embodiments, a smaller end surface of the frustoconical shaped floatable member 140 may have a diameter from 17mm to 21mm, or about 19mm. According to various embodiments, the floatable member 140 may be made of polystyrene.

5 [000102] According to various embodiments, the weight member 644 of the floatable member 140 may be a DIN 912 M5 x 12 screw made of 304 stainless steel.

[000103] According to various embodiments, the inflow guide member 250 may be in the form of a sheet or a flap having a lune shape. According to various embodiments, the inflow guide member 150 may have a diameter from 109mm to 111mm, or about 110mm.

10 According to various embodiments, the inflow guide member 250 may be made of polyvinyl chloride.

[000104] According to various embodiments, the backplash screen 260 may have a length from 189mm to 191mm, or about 190mm. According to various embodiments, the backplash screen 260 may have a height from 69mm to 71mm, or about 70mm. According

15 to various embodiments, the backplash screen may be made of polyvinyl chloride.

[000105] According to various embodiments, the ring-shaped attachment 572 of the nozzle assembly 511 may be made of vinyl chloride resin. According to various embodiments, the flanged insert 582 of the nozzle assembly 511 may be made of aluminum alloy.

20 [000106] Various embodiments have provided a liquid flowrate gauge capable of serving as a “go and no-go” gauge to determine whether a liquid flowrate has met a minimum threshold flowrate. Various embodiments have also provided a liquid flowrate gauge capable of serving as a point-of-care device which the patient may conduct self-monitoring of urine flow at the comfort of their home. Various embodiments have also provided a kit
25 for a liquid flowrate gauge which the user may assemble into the liquid flowrate gauge of the various embodiments.

[000107] While the invention has been particularly shown and described with reference to specific embodiments, it should be understood by those skilled in the art that various changes, modification, variation in form and detail may be made therein without departing
30 from the scope of the invention as defined by the appended claims. The scope of the invention is thus indicated by the appended claims and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced.

Claims

1. A liquid flowrate gauge comprising:
a receptacle structure having a surrounding wall around a central axis, wherein an outlet port is disposed at a base side of the receptacle structure and an inflow opening disposed at a topside of the receptacle structure, the base side and the topside being two opposite sides of the receptacle structure along the central axis;
a floatable member loosely sitting within the receptacle structure in a manner so as to define at least one gap between the floatable member and the receptacle structure to maintain a flow path from the inflow opening to the outlet port,
wherein the outlet port is dimensioned to achieve a liquid flowrate through the outlet port equal to or above a threshold outlet flowrate and the floatable member is configured to be floated in a manner so as to be free from contact with the receptacle structure when a liquid level of a liquid accumulated in the receptacle structure is equal to or higher than a predetermined height measured along the central axis from the outlet port as the liquid flows into the receptacle structure via the inflow opening and out of the receptacle structure via the outlet port, wherein the floatable member being floated by the liquid accumulated in the receptacle structure serve as an indication that a rate of inflow of the liquid into the receptacle structure is equal to or above the threshold outlet flowrate.
2. The liquid flowrate gauge according to claim 1, wherein the threshold outlet flowrate is within a range from 10ml/s to 15 ml/s, or is within a range from 11ml/s to 13ml/s, or is about 12 ml/s.
3. The liquid flowrate gauge according to claim 1 or 2, wherein the floatable member has a shape and density to create a buoyancy force greater than a weight of the floatable member by a volume of the floatable member immersed in the liquid accumulated in the receptacle structure when the liquid level is equal to or higher than the predetermined height.
4. The liquid flowrate gauge according to any one of claims 1 to 3, wherein the floatable member has an inverted frustoconical shape or a spherical shape or a cylindrical shape or a hemispherical shape.

5. The liquid flowrate gauge according to any one of claims 1 to 4, wherein the floatable member is of a solid structure or a hollow structure or an inflatable structure, wherein the floatable member is made of polystyrene, wood, foam material, sponge material, high density polyethylene (HDPE), low density polyethylene (LDPE), or polypropylene (PP).
6. The liquid flowrate gauge according to any one of claims 1 to 5, wherein the floatable member comprises a weight member coupled to a base of the floatable member for lowering a center of gravity of the floatable member to stabilize the floatable member when floated by the liquid accumulated in the receptacle structure.
7. The liquid flowrate gauge according to any one of claims 1 to 6, wherein the floatable member comprises a plurality of grooves distributed around the floatable member.
8. The liquid flowrate gauge according to claim 7, wherein the plurality of grooves are parallel to each other.
9. The liquid flowrate gauge according to claim 7 or 8, wherein the plurality of grooves are diagonal grooves, helical grooves, or spiral grooves.
10. The liquid flowrate gauge according to any one of claims 1 to 9, wherein the receptacle structure comprises a base portion at the base side of the receptacle structure, the base portion adjoining a corresponding edge of the surrounding wall of the receptacle structure, wherein the outlet port is in the base portion of the receptacle structure.
11. The liquid flowrate gauge according to claim 10, wherein the base portion comprises a nozzle assembly, wherein the nozzle assembly comprises a first part comprising a ring-shaped attachment and a second part comprising a flanged insert, wherein the flanged insert comprises an insert portion, a flanged annular plate at an end of the insert portion, and a through-hole extending through the flanged insert along a center axis of the flanged insert,

wherein the flanged insert is coupled to the ring-shaped attachment with the insert portion of the flanged insert fitted into a central cavity of the ring-shaped attachment, wherein the through-hole of the flanged insert forms the outlet port.

12. The liquid flowrate gauge according to claim 11, wherein the ring-shaped attachment comprises a raised annular wall along a perimeter thereof,

wherein the flanged insert is coupled to the ring-shaped attachment with the flanged annular plate of the flanged insert abutting the ring-shaped attachment and the raised annular wall of the ring-shaped attachment surrounding a circumferential edge of the flanged annular plate of the flanged insert.

13. The liquid flowrate gauge according to any one of claims 1 to 12 further comprising an inflow guide member extending across the inflow opening.

14. The liquid flowrate gauge according to claim 13, wherein the inflow guide member has a lune shape defined by two intersecting circles with a distance between the centres of the two intersecting circles greater than respective radius of the two intersecting circle, or a shape corresponding to a major segment of a circle.

15. The liquid flowrate gauge according to any one of claims 1 to 14 wherein the inflow opening is defined by an edge of the surrounding wall of the receptacle structure towards the topside of the receptacle structure.

16. The liquid flowrate gauge according to any one of claims 1 to 15, further comprising a backsplash screen coupled to a boundary of the inflow opening in an erected manner with respect to the inflow opening.

17. The liquid flowrate gauge according to any one of claims 1 to 16, further comprising a dipstick attached to an inner surface of the surrounding wall of the receptacle structure, wherein a first end of the dipstick is directed towards the base side of the receptacle structure and a second end of the dipstick is directed towards the topside of the receptacle structure.

18. The liquid flowrate gauge according to any one of claims 1 to 17, wherein the receptacle structure is foldable.

19. The liquid flowrate gauge according to any one of claims 1 to 18, further comprising a sensor attached to the floatable member.

20. A kit for a liquid flowrate gauge comprising:

a receptacle structure having a surrounding wall around a central axis, wherein an outlet port is disposed at a base side of the receptacle structure and an inflow opening disposed at a topside of the receptacle structure, the base side and the topside being two opposite sides of the receptacle structure along the central axis;

a floatable member capable of loosely sitting within the receptacle structure in a manner so as to define at least one gap between the floatable member and the receptacle structure to maintain a flow path from the inflow opening to the outlet port,

wherein the outlet port is dimensioned to achieve a liquid flowrate through the outlet port equal to or above a threshold outlet flowrate and the floatable member is configured to be floated in a manner so as to be free from contact with the receptacle structure when the floatable member is loosely sitting within the receptacle structure and a liquid level of a liquid accumulated in the receptacle structure is equal to or higher than a predetermined height measured along the central axis from the outlet port as the liquid flows into the receptacle structure via the inflow opening and out of the receptacle structure via the outlet port, wherein the floatable member being floated by the liquid accumulated in the receptacle structure serve as an indication that a rate of inflow of the liquid into the receptacle structure is equal to or above the threshold outlet flowrate.