

A VOLUME CALIBRATED DEVICE

5 TECHNICAL FIELD

The present disclosure relates broadly to a volume calibrated device for use with a fluid container, for example, for dispensing a fluid.

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BACKGROUND

Drugs or medication can come in concentrated form in vials or ampoules which require dilution prior to administration. Upon dilution, a syringe can contain more than a
15 required amount of drug / medication. In the haste of administration, a user may mistakenly administer the full contents of a syringe resulting in an overdose. This problem may happen especially when the drug is prepared and administered by different personnel.

20 For example, morphine comes in a 10mg/ml ampoule and would typically need to be diluted to 10mg/10mL before e.g. intravenous (IV) administration. The drug is usually given in titrated doses and the full 10mg dose is rarely given all at once. As such, upon dilution, a 10mL syringe contains more than the required amount of drug. In the haste of administration, a user may mistakenly administer the full contents of the
25 syringe resulting in an overdose. This is so especially when the drug is prepared and administered by different personnel.

Existing processes to safeguard administration errors include having a user to prepare his/her own drug, incorporating an independent double check, and/or
30 mandating excess drug to be discarded. The process may be made more tedious when a controlled drug (CD) such as morphine is involved as time will be taken to procure the controlled drug from a locked CD cupboard, purging excess drug and documenting in the CD register repeatedly.

Therefore, in view of the above problems, there exists a need for a volume calibrated device that seeks to address one or more of the problems above.

5 SUMMARY

In accordance with an aspect of the present disclosure, there is provided a volume calibrated device, the device comprising, a spine capable of attachment to a portion of a fluid container, the spine having one or more mating sections, each mating
10 section being spaced from one end of the spine at a corresponding calibrated distance corresponding to a predetermined fluid volume of the fluid container; at least one section member capable of being removably mated to said one or more mating sections, the at least one section member being capable of providing a mechanical barrier to an actuator of the fluid container; wherein a position of said at least one section member
15 when mated to said one or more mating sections provides a mechanical barrier to limit a distance movable by the actuator of the fluid container.

The at least one section member may be movable from a first position with respect to the spine.
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In use, the at least one section member may be mated to said one or more mating sections and the actuator of the fluid container may be allowed to move and the predetermined fluid volume corresponding to the corresponding calibrated distance of said one or more mating sections is allowed to be used.
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The spine may be capable of attachment to the actuator of the fluid container.

The spine may be coupled to a holding device that is capable of attachment to the actuator of the fluid container.
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The volume calibrated device may comprise a plurality of section members; wherein each section member is configured to be moved with respect to a remainder of the plurality of section members, and each movement of one section member allows the actuator of the fluid container to move the calibrated distance.
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The actuator of the fluid container may be allowed to move the calibrated distance until the mechanical barrier is provided by a next section member, and wherein the mechanical barrier provided by said next section member provides a tactile feedback to a user of the fluid container.

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The at least one section member may be provided integrally on the spine.

Movement of the at least one section member may comprise destructive removal of the section member from the spine.

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The at least one section member may be detachably plugged into said one or more mating sections.

The spine may be capable of attachment to a flange member of the fluid container, the flange member comprising a receiving portion of the actuator of the fluid container.

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In use, the at least one section member may be mated to said one or more mating sections and the actuator of the fluid container may be allowed to move until the actuator contacts the at least one section member and the predetermined fluid volume corresponding to the corresponding calibrated distance of said one or more mating sections is allowed to be used.

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The actuator of the fluid container may be allowed to move the calibrated distance until the mechanical barrier is provided by the at least one section member, and wherein the mechanical barrier provided by the at least one section member provides a tactile feedback to a user of the fluid container.

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The spine may comprise a tubular portion.

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The spine and the at least one section member may be capable of forming a substantially closed arc enclosure around a perimeter of the actuator.

In accordance with another aspect of the present disclosure, there is provided a volume calibrated device, the device comprising, a plurality of movable section

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members capable of attachment to a portion of a fluid container, each section member having a calibrated width corresponding to a predetermined fluid volume of the fluid container; wherein each section member is configured to be moved with respect to a remainder of the plurality of movable section members, and each movement of one
5 section member allows an actuator of the fluid container to move the calibrated width.

The each section member may be movable from a first position with respect to the actuator.

10 The movable section members may be capable of being mated directly to the actuator.

The volume calibrated device may further comprise a holding device that is capable of attachment to the actuator of the fluid container and at least one of the
15 section members is capable of coupling to the holding device using a keyhole mechanism.

For the keyhole mechanism, the holding device may comprise a first aperture disposed on a bottom surface of the holding device, and the at least one of the section
20 members may comprise a protruding mating member disposed on a top surface of the at least one of the section members and a second aperture disposed on a bottom surface of the at least one of the section members, the first aperture of the holding device being formed to receive the protruding mating member of the at least one of the section members.

25 The movable section members may be substantially identical to the at least one of the section members and the second aperture is formed to receive a corresponding protruding member of another movable section member.

30 The each movement of one section member may allow the actuator of the fluid container to move the calibrated width until a mechanical barrier is provided by another section member, and wherein the mechanical barrier provided by said another section member provides a tactile feedback to a user of the fluid container.

BRIEF DESCRIPTION OF THE DRAWINGS

Exemplary embodiments of the invention will be better understood and readily apparent to one of ordinary skill in the art from the following written description, by way of example only, and in conjunction with the drawings, in which:

FIG. 1A is a perspective view of a volume calibrated device in an exemplary embodiment being attached to a fluid container.

FIG. 1B is a perspective view of the volume calibrated device in the exemplary embodiment.

FIG. 1C is a top view of the volume calibrated device in the exemplary embodiment.

FIG. 1D is a side view of the volume calibrated device in the exemplary embodiment.

FIG. 2A is a schematic drawing of a volume calibrated device in an exemplary embodiment prior to attachment to a fluid container.

FIG. 2B is a schematic drawing of the volume calibrated device of FIG. 2A being attached to the fluid container with an actuator of the fluid container being at a first position.

FIG. 2C is a schematic drawing of the volume calibrated device of FIG. 2B with the actuator being at a second position.

FIG. 3A is a schematic drawing of a volume calibrated device in an exemplary embodiment with the volume calibrated device detached from a fluid container.

FIG. 3B is a schematic drawing of the volume calibrated device being attached to the fluid container with a section member of the volume calibrated device detached from a spine of the volume calibrated device.

FIG. 3C is a schematic drawing of the section member being mated to the spine of the volume calibrated device with an actuator of the fluid container being at a first position.

FIG. 3D is a schematic drawing of the volume calibrated device with the actuator of the fluid container in translation from the first position.

FIG. 3E is a schematic drawing of the volume calibrated device of FIG. 3D with the actuator being in a second position.

FIG. 4A is a perspective view of a volume calibrated device in an exemplary embodiment being attached to a fluid container.

FIG. 4B is a top view of a section member of the volume calibrated device.

FIG. 4C is a schematic drawing showing the volume calibrated device being detached from the fluid container.

FIG. 5A is a perspective view of a volume calibrated device in an exemplary embodiment being attached to a fluid container.

FIG. 5B is a side view of the volume calibrated device of FIG. 5A.

FIG. 5C is a perspective view of the volume calibrated device of FIG. 5A.

FIG. 5D is a schematic back perspective view of the volume calibrated device of FIG. 5C.

FIG. 5E is a schematic drawing showing the volume calibrated device being detached from the fluid container.

FIG. 5F is a perspective view of a section member in the exemplary embodiment.

DETAILED DESCRIPTION

FIG. 1A is a perspective view of a volume calibrated device in an exemplary embodiment being attached to a fluid container. FIG. 1B is a perspective view of the volume calibrated device in the exemplary embodiment. FIG. 1C is a top view of the volume

calibrated device in the exemplary embodiment. FIG. 1D is a side view of the volume calibrated device in the exemplary embodiment.

In FIG. 1A, the volume calibrated device 100 is shown attached to the fluid container 130. The fluid container 130 is in the form of, but is not limited to, a syringe having a plunger as an actuator. The fluid container 130 comprises an actuator 132, a flange member 134 and a barrel 136. The flange member 134 is located at one end of the barrel 136. A tip 138 is disposed / located at an opposing end of the barrel 136. The flange member 134 comprises a receiving portion of the actuator 132 i.e. to receive the actuator 132. The actuator 132 is adapted to be withdrawn from the barrel 136 for drawing fluid into the barrel 136 via the tip 138, for example by a force applied e.g. a pulling action on the actuator 132 in the Y direction. The actuator 132 is adapted to be received / inserted into the barrel 136 for dispensing fluid out of the barrel 136 via the tip 138, for example by another force applied e.g. a pushing action on the actuator 132 in the X direction. The actuator 132 may be withdrawn from the barrel 136 in the Y direction to draw a fluid e.g. liquid medication into the barrel 136 via the tip 138. The actuator 132 may be pushed / received into the barrel 136 in the X direction to dispense the fluid out of the barrel 136 via the tip 138. When a bottom surface of a holding device 104 abuts or contacts the flange member 134, this indicates to a user that all fluid is dispensed from the barrel 136.

In the exemplary embodiment as shown in FIGS. 1A to 1D, the volume calibrated device 100 comprises a spine 102 capable of attachment to a portion of the fluid container 130, e.g. a portion of the actuator 132 of the fluid container 130. The spine 102 comprises one or more mating sections 106. The spine 102 also comprises at least one section member 108.

In the exemplary embodiment, the spine 102 is capable of attachment to the actuator 132 of the fluid container 130. For example, referring to FIGS. 1B and 1C, the spine 102 comprises two elongated portions 102A, 102B, which are separated by an elongated opening 102C. The opening 102C is configured to enable the spine 102 to be securely attached to the actuator 132 of the fluid container 130. For example, the opening 102C may be slotted onto a raised portion of the actuator 132.

Further, the spine 102 may be coupled to the holding device 104 that is capable of attachment to the actuator 132 of the fluid container 130. In FIGS. 1A to 1D, the holding

device 104 is in the form of a cap but it will be appreciated that the holding device 104 is not limited as such and may take other forms. In other exemplary embodiments, the holding device 104 may be optional. For example, the holding device 104 comprises an aperture 140 as shown in FIGS. 1C and 1D. The aperture 140 is of a complementary shape and size to the actuating end (e.g. a protruding head (not shown)), of the actuator 132. The protruding head (not shown) of the actuator 132 may be slotted or inserted into the aperture 140 such that the holding device 104 is securely attached to the actuator 132 and the volume calibrated device 100 is thereby attached to the fluid container 130 via the actuator 132. In the exemplary embodiment, the opening 102C may extend from the distal end with respect to the holding device 104 until the aperture 140, when viewed from the underside of the volume calibrated device 100.

In the exemplary embodiment, each mating section 106 provides a connection / joint between the spine 102 and a corresponding section member 108. The position of each mating section 106 is calibrated to be spaced from one end of the spine 102 at a corresponding calibrated distance to correspond to a predetermined fluid volume of the fluid container 130.

In this exemplary embodiment, the at least one section member 108 is in the form of a tab. For example, a tab 108 is removably mated to a corresponding mating section 106 on the spine 102. In the exemplary embodiment, a tab 108 is movable from a first position, e.g. an initial position where the tab 108 is mated to the corresponding mating section 106, with respect to the spine 102. The tab 108 is capable of limiting the movement of the actuator 132 of the fluid container 130 while the tab 108 is mated to the corresponding mating section 106. Therefore, the position of the tab 108 when mated to the mating section 106 provides a mechanical barrier to the actuator 132 of the fluid container 130. For example, the tab 108 may abut or mechanically contact the flange member 134 of the fluid container 130 and cooperate with the spine 102 (due to its rigidity) in conjunction with the actuating end of the actuator 132 to mechanically limit / stop the movement or distance movable by the actuator 132.

The tab 108 may be of a width W so long as the width W is able to limit movement of the actuator 132 when the tab 108 abuts or contacts the flange member 134 of the fluid container 130. In the exemplary embodiment, the leading edge of each tab 108 towards the flange member 134 provides the mechanical barrier to limit the distance movable by the

actuator 132 of the fluid container 130. In this exemplary embodiment, the tab 108 may be provided integrally on the spine 102. Movement of the at least one section member, i.e. the tab 108, comprises destructive removal of the tab 108 from the spine 102.

5 The spine 102 further comprises a raised portion 110, for example a hump, adjacent or near the holding device 104. The raised portion 110 is used as an indication to a user that there is a remainder of the calibrated predetermined volume, for example 1 ml, of fluid in the fluid container 130.

10 As an example, the volume calibrated device 100 comprises nine tabs 108 as shown in FIGS. 1B and 1C. For identically sized and symmetrical tabs, the distance L between a first tab 112 mating section and a next second tab 114 mating section is calibrated to correspond to a predetermined fluid volume e.g. 1 ml of fluid e.g. for dispensing from the fluid container 130. Likewise, the distance between the second tab 114 mating section and a
15 next third tab 116 mating section, the distance between the third tab 116 mating section and a next fourth tab 118 mating section, the distance between the fourth tab 118 mating section and a next fifth tab 120 mating section, the distance between the fifth tab 120 mating section and a next sixth tab 122 mating section, the distance between the sixth tab 122 mating section and a next seventh tab 124 mating section, the distance between the seventh tab
20 124 mating section and a next eighth tab 126 mating section, and the distance between the eighth tab 126 mating section and the next ninth tab 128 mating section, are each calibrated to correspond to 1 ml of fluid for dispensing from the fluid container 130. Similarly, a distance L1 between e.g. the leading edge of the first tab 112 and the leading edge of the second tab 114, both leading edges towards the flange member 134, is calibrated to correspond to a
25 predetermined fluid volume. When all nine tabs are removed from their corresponding mating sections 106 and with the actuator 132 having translated into the barrel 136 until the raised portion 110 abuts or contacts the flange member 134 of the fluid container 130, it is an indication to a user that 9 ml of fluid has been dispensed from the fluid container. The distance between the ninth tab 128 and the raised portion 110 is calibrated to correspond to
30 1 ml of fluid for dispensing from the fluid container 130.

 In FIGS. 1A to 1D, the first tab 112, the third tab 116, the fifth tab 120, the seventh tab 124 and the ninth tab 128 are positioned on one side of the spine 102, for example on the elongated portion 102A. The second tab 114, the fourth tab 118, the sixth tab 122 and
35 the eighth tab 126 are positioned on an opposing side of the spine 102, for example on the

elongated portion 102B. The distance of the first tab 112, the third tab 116, the fifth tab 120, the seventh tab 124 and the ninth tab 128 from the end of the spine 102 are staggered from the distance of the second tab 114, the fourth tab 118, the sixth tab 122 and the eighth tab 126 from the end of the spine 102 respectively. It is to be appreciated that the arrangement of the section members is not limited as such. For example, the first tab 112, the second tab 114, the third tab 116, the fourth tab 118, the fifth tab 120, the sixth tab 122, the seventh tab 124, the eighth tab 126 and the ninth tab 128 may be on the same side of the spine 102.

When in use, the user attaches the volume calibrated device 100 to the actuator 132 of the fluid container 130 by inserting or slotting the protruding head (not shown) of the actuator 132 into the aperture 140 of the holding device 104. The holding device 104 is thereby attached to the end of the actuator 132. The opening 102C of the spine 102 is removably attached to a raised portion / rib of the actuator 132 such that the spine 102 rests on or contacts against the actuator 132. Movement of the actuator 132 thereby translates to a corresponding movement of the volume calibrated device 100. A movement (for example, but not limited to, a removal) of the section member 108 with respect to the actuator 132 allows freedom of movement of calibrated distance L or L1.

At a first position, the first tab 112 being mated to the corresponding mating section 106 provides a mechanical barrier to prevent the actuator 132 from moving e.g. via an abutment of the first tab 112 leading edge against the flange member 134 of the fluid container 130. After the user moves / removes the first tab 112 from the corresponding mating section 106 with respect to a remainder of the other tabs e.g. the second tab 114 and the third tab 116 etc, the user is able to move the actuator 132 via a pushing force on the protruding head of the actuator 132 to dispense the calibrated predetermined volume of fluid from the fluid container 130, for example 1 ml. The predetermined volume of fluid corresponds to the calibrated distance between the one or more mating sections 106. When the next section member or the second tab 114 leading edge abuts or contacts the flange member 134 of the fluid container 130, the actuator 132 is prevented from further movement. The next section member or the second tab 114 being mated to the corresponding mating section 106 provides a mechanical barrier to limit the distance movable by the actuator 132 of the fluid container 130. The mechanical barrier provided by the second tab 114 provides a tactile feedback to the user to indicate that the desired fluid volume is already dispensed.

As another example, if 2 ml of fluid is to be dispensed from the fluid container 130, the user moves / removes the first tab 112 and the second tab 114 with respect to the remainder of the other tabs. The user then pushes on the protruding head of the actuator 132 which causes the actuator 132 to move or translate into the barrel 136 and thereby, dispense fluid from the fluid container 130. When the next section member or the third tab 116 leading edge abuts or contacts the flange member 134 of the fluid container 130, the actuator 132 is prevented from movement. The next section member or the third tab 116 being mated to the corresponding mating section 106 provides a mechanical barrier to limit the distance movable by the actuator 132 of the fluid container 130. The mechanical barrier provided by the third tab 116 provides a tactile feedback to the user to indicate that the desired fluid volume is already dispensed.

When all nine tabs 112 to 128 are removed from their corresponding mating sections 106 and the raised portion 110 contacts the flange member 134 of the fluid container 130, the actuator 132 is limited by the raised portion 110. The raised portion 110 provides a mechanical barrier to limit the distance movable by the actuator 132 of the fluid container 130. The mechanical barrier provided by the raised portion 110 provides a tactile feedback to the user to indicate that the desired fluid volume is dispensed and a last predetermined volume, e.g. 1 ml, of fluid remains in the fluid container 130. To dispense the last 1 ml of fluid from the fluid container 130, the user applies a pushing force onto the protruding head of the actuator 132 to overcome the raised portion 110. The actuator 132 is thereby caused to translate in the X-direction into the barrel 136 to dispense the predetermined fluid volume.

In the exemplary embodiment, the volume calibrated device 100 may be formed of a plastic material e.g. suitable for use with sterile equipment. The volume calibrated device 100 may be formed using, but is not limited to, plastic molding.

In another exemplary embodiment, the volume calibrated device 100 may be modified to work without the holding device 104. For example, the volume calibrated device 100 may be attached to the fluid container 130 by slotting the opening 102C of the spine 102 onto a raised portion of the actuator 132 such that the spine 102 rests against on or contacts against the actuator 132 and with one end of the spine 102 abutting a bottom surface of the protruding head of the actuator 132.

In this exemplary embodiment, the volume calibrated device 100 may provide a clear visualization of the volume of fluid left in the fluid container 130 since the number of section members 108 remaining on the spine 102 is clearly visible to the user. Further, the user may not need to preload or assemble the sections members 108 to the mating sections 106 since the volume calibrated device 100 may be manufactured or produced with the sections members 108 being removably mated to the mating sections 106. Minimal time is therefore needed to assemble the volume calibrated device for use.

In the exemplary embodiment, the volume calibrated device 100 is an external device to be mounted on the actuator 132 e.g. a plunger of a syringe. It is recognized that the infection risk is no different from a user handling the actuator 132 with his or her hands. As an additional precaution to minimize any infection risk, the volume calibrated device 100 may be sterilised, individually packed and disposed after one use. A user may also be reminded not to pull back or withdraw the actuator 132 after drug administration as in all other sterile procedures.

FIG. 2A is a schematic drawing of a volume calibrated device in an exemplary embodiment prior to attachment to a fluid container. FIG. 2B is a schematic drawing of the volume calibrated device of FIG. 2A being attached to the fluid container with an actuator of the fluid container being at a first position. FIG. 2C is a schematic drawing of the volume calibrated device of FIG. 2B with the actuator being at a second position.

In FIGS. 2A to 2C, the fluid container 230 is substantially similar to the fluid container 130 as described in FIG. 1A. The components of the fluid container 230 are referred to using the same terminology.

In this exemplary embodiment, the volume calibrated device 200 comprises a spine 202 capable of attachment to a portion of the fluid container 230 e.g. a portion of a flange member 234 of the fluid container 230. The volume calibrated device 200 comprises at least one section member 208. The spine 202 comprises one or more mating sections 206. The at least one mating member 208 is capable of being removably mated to the one or more mating sections 206. The position of each mating section 206 is calibrated to be spaced from one end of the spine 202, e.g. the end closer to the flange member 234 of the fluid container 230 and/or the end further from the flange member 234, to correspond to a predetermined fluid volume of the fluid container 230.

When the at least one section member 208 is mated to the one or more mating sections 206, the at least one section member 208 is capable of providing a mechanical barrier to an actuator 232 of the fluid container 230. The distance movable by the actuator 232 is limited by the mechanical barrier provided by the position of the at least one section member 208 when mated to the at least one mating sections 206.

In the exemplary embodiment, each mating section 206 comprises two apertures (or a set of apertures) e.g. 207A, 207B separated by a longitudinal central portion of the spine 202. The at least one section member 208 may be detachably plugged or inserted into any one of these mating sections 206. The at least one section member 208 may be in the form of a disc having two prongs wherein the two prongs may be plugged or inserted correspondingly into the two apertures of each mating section 206. The spine 202 may be, but is not limited to, a L-shaped device (when viewed from its side). The at least one section member 208 may be, but is not limited to, a U-shaped plug/disc/device.

In the described exemplary embodiment, the calibrated measure or width of each set of apertures from an end of the spine may correspond to a predetermined fluid volume. For example, a first set of apertures may correspond to 1 ml and a second set of apertures may correspond to 2 ml. The width between one set of apertures to the next set of apertures (i.e. the difference in distance from the end of the spine) may correspond to 1 ml. In this manner, the calibrated width also corresponds to the distance between each adjacent set of apertures and in turn corresponds to a predetermined fluid volume. This allows a fluid volume to be pre-determined at larger volumes e.g. 3 ml or 2 ml without having to move the section members one at a time, e.g. by 1 ml each time.

The spine 202 further comprises a holding portion 204 which is capable of attachment to the flange member 234 of the fluid container 230. For example, the holding portion 204 may comprise an aperture 210 which is of a complementary shape and size to the flange member 234 of the fluid container 230. The flange member 234 may be slotted or inserted into the aperture 210 of the holding portion 204 such that the spine 202 is fitted onto or detachably attached to the flange member 234 in order to attach the volume calibrated device 200 to the fluid container 230.

In this exemplary embodiment, with each mating section 206 spaced from one end of the spine 202 at a corresponding calibrated distance that in turn corresponds to a predetermined fluid volume of the fluid container 230, the distance between each mating section 206 is also calibrated to correspond to a predetermined fluid volume of the fluid container 230. For example, the distance W between each mating section 206 may correspond to 1 ml of fluid volume. The section member 208 may be slotted or plugged into one of the mating sections 206 to interact with the protruding head 238 of the actuator 232 to stop further translation of the actuator 232 into the receiving portion of the flange member 234. That is, the section member 208 may provide a physical/mechanical barrier/stop to the actuator 232. In this exemplary embodiment, the at least one section member 208 and the spine 202 are disposed / placed on the same side of the actuator 232.

When in use, the user attaches the volume calibrated device 200 to the flange member 234 of the fluid container 230 by inserting or slotting the flange member 234 into the aperture 210 of the holding portion 204. In the exemplary embodiment, at a first position of the actuator 232 (see FIG. 2B), the actuator 232 is fully withdrawn with respect to a barrel 236 of the fluid container 230. Depending on the volume of fluid desired to be used, the user inserts or slots the at least one section member 208 into a mating section 206 corresponding to the fluid volume.

As an example, a volume calibrated device 200 may be provided which comprises ten mating sections 206 and the distance W between two adjacent mating sections 206 is calibrated to correspond to 1 ml of fluid of the fluid container 230, with the actuator 232 fully withdrawn with respect to the barrel 236 of the fluid container 230. If the user desires to dispense 6 ml of fluid from the fluid container 230, the user inserts or plugs the at least one section member 208 into a sixth mating section 206A (counted from the end of the spine 202 nearer to the protruding head 238 of the actuator 232). The user applies a pushing force on the protruding head 238 of the actuator 232 in the direction X (see FIG. 2B). The actuator 232 thereby translates in the direction X into the barrel 236 to dispense the fluid from the fluid container 230. When the protruding head 238 of the actuator 232 abuts or contacts the section member 208 which has been inserted or plugged into the mating section 206A, the actuator 232 having translated the calibrated distance (multiples of W) in the direction X causes the corresponding fluid volume, e.g. 6 ml, to be dispensed from the fluid container 230 (see FIG. 2C).

Referring to FIG. 2C, when the protruding head 238 of the actuator 232 abuts or contacts the section member 208 which is inserted into the mating section 206A, the section member 208 provides a mechanical barrier to the actuator 232 to limit the distance movable by the actuator 232. The actuator 232 is prevented from further movement. The mechanical
5 barrier provided by the section member 208 provides a tactile feedback to the user to indicate that the desired fluid volume has been used.

In the exemplary embodiment, the volume calibrated device 200 may be formed of a plastic material e.g. suitable for use with sterile equipment. The volume calibrated device
10 200 may be formed using, but is not limited to, plastic molding.

FIG. 3A is a schematic drawing of a volume calibrated device in an exemplary embodiment with the volume calibrated device detached from a fluid container. FIG. 3B is a schematic drawing of the volume calibrated device being attached to the fluid container with
15 a section member of the volume calibrated device detached from a spine of the volume calibrated device. FIG. 3C is a schematic drawing of the section member being mated to the spine of the volume calibrated device with an actuator of the fluid container being at a first position. FIG. 3D is a schematic drawing of the volume calibrated device with the actuator of the fluid container in translation from the first position. FIG. 3E is a schematic drawing of the
20 volume calibrated device of FIG. 3D with the actuator being in a second position.

In FIGS. 3A to 3E, the fluid container 330 is substantially similar to the fluid container 130 as described in FIG. 1A. The components of the fluid container 330 are referred to using the same terminology.
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In this exemplary embodiment, the volume calibrated device 300 comprises a spine 302 capable of attachment to a portion of the fluid container 330 e.g. a portion of a flange member 334 of the fluid container 330. The volume calibrated device 300 comprises at least one section member 308. The spine 302 comprises one or more mating sections 306. The at
30 least one mating member 308 is capable of being removably mated to the one or more mating sections 306. The position of each mating section 306 is calibrated to be spaced from one end of the spine 302, e.g. the end closer to the flange member 334 of the fluid container 330 and/or the end further from the flange member 334, to correspond to a predetermined fluid volume of the fluid container 330.

When the at least one section member 308 is mated to the one or more mating sections 306, the at least one section member 308 is capable of providing a mechanical barrier to an actuator 332 of the fluid container 330. The distance movable by the actuator 332 is limited by the mechanical barrier provided by the position of the at least one section member 308 when mated to the one or more mating sections 306.

In the exemplary embodiment, the spine 302 is tubular in shape and comprises an arc, for example there is a concave shape with a semi-circular profile when viewed from one end of the spine. Each mating section 306 comprises two apertures (or a set of apertures) e.g. 307A, 307B separated by a longitudinal central portion of the spine 302. The at least one section member 308 may be detachably plugged or inserted into any one of these mating sections 306. The at least one section member 308 may be in the form of a disc comprising two prongs and an arc. For example, the disc may be semi-circular in shape when viewed from a top view. The two prongs may be plugged or inserted correspondingly into the two apertures of each mating section 306. The spine 302 may be, but is not limited to, a U-shaped device (when viewed from one end of the spine). The at least one section member 308 may be, but is not limited to, a U-shaped plug/disc/device. In this exemplary embodiment, the two prongs of the at least one section member 308 are spaced apart to accommodate the actuator 332 in between the at least one section member 308 and the spine 302.

In the described exemplary embodiment, the calibrated measure or width of each set of apertures from an end of the spine may correspond to a predetermined fluid volume. For example, a first set of apertures may correspond to 1 ml and a second set of apertures may correspond to 2 ml. The width between one set of apertures to the next set of apertures (i.e. the difference in distance from the end of the spine) may correspond to 1 ml. In this manner, the calibrated width also corresponds to the distance between each adjacent set of apertures and in turn corresponds to a predetermined fluid volume. This allows a fluid volume to be pre-determined at larger volumes e.g. 3 ml or 2 ml without having to move the section members one at a time, e.g. by 1 ml each time.

The spine 302 further comprises a holding portion 304 which is capable of attachment to the flange member 334 of the fluid container 330. For example, the holding portion 304 may comprise an aperture 310 which is of a complementary shape and size to the flange member 334 of the fluid container 330. The flange member 334 may be slotted or

inserted into the aperture 310 of the holding portion 304 such that the spine 302 is fitted onto or detachably attached to the flange member 334 in order to attach the volume calibrated device 300 to the fluid container 330.

5 In this exemplary embodiment, each mating section 306 is spaced from one end of the spine 302 at a corresponding calibrated distance that in turn corresponds to a predetermined fluid volume of the fluid container 330. The distance between each mating section 306 is also calibrated to correspond to a predetermined fluid volume of the fluid container 330. For example, the distance W between each mating section 306 may
10 correspond to 1 ml of fluid volume. In the exemplary embodiment, the section member 308 may be slotted or plugged into one of the mating sections 306 to interact with a protruding head 338 of the actuator 332 to stop further translation of the actuator 332 into the receiving portion of the flange member 334. That is, the section member 308 may provide a physical/mechanical barrier/stop to the actuator 332.

15 In this exemplary embodiment, the at least one section member 308, e.g. the disc, and the spine 302 are placed on opposing sides, or at least different sides, of the actuator 332. The at least one section member 308 forms a substantially closed enclosure with the spine 302 around a perimeter of the actuator 332 body below its actuating end. Thus, the
20 protruding head 338 of the actuator 332 may contact the at least one section member 308 when the at least one section member 308 is mated to the mating section 306 of the spine 302. Upon mechanical contact with the section member 306, the protruding head 338 is then prevented from further translation/movement, thereby preventing fluid from being e.g. dispensed from the fluid container 330.

25 When in use, the user attaches the volume calibrated device 300 to the flange member 334 of the fluid container 330 by inserting or slotting the flange member 334 into the aperture 310 of the holding portion 304. The holding portion 304 is thereby attached to the flange member 334 of the fluid container 330. In the exemplary embodiment, at a first
30 position of the actuator 332 (see FIG. 3C), the actuator 332 is fully withdrawn with respect to a barrel 336 of the fluid container 330. Depending on the volume of fluid desired to be used, the user inserts or slots the at least one section member 308 into a mating section 306 corresponding to the fluid volume. The at least one section member 308 and the spine 302 are disposed on opposing sides, or at least different sides, of the actuator 332.

As an example, a volume calibrated device 300 may be provided which comprises ten mating sections 306 and the distance W between two adjacent mating sections 306 is calibrated to correspond to 1 ml of fluid of the fluid container 330, with the actuator 332 fully withdrawn with respect to the barrel 336 of the fluid container 330. If the user desires to dispense 6 ml of fluid from the fluid container 330, the user inserts the at least one section member 308 into a sixth mating section 306A (counted from the end of the spine 302 nearer to the protruding head 338 of the actuator 332). The user applies a pushing force on the protruding head 338 of the actuator 332 in the direction X (see FIG. 3D). The actuator 332 thereby translates in the direction X into the barrel 336 to dispense the fluid from the fluid container 330. When the protruding head 338 of the actuator 332 abuts or contacts the section member 308 which has been inserted or plugged into the mating section 306A, the actuator 332 having translated the calibrated distance (multiples of W) in the direction X causes the corresponding fluid volume, e.g. 6 ml, to be dispensed from the fluid container 330 (see FIG. 3E).

Referring to FIG. 3E, when the protruding head 338 of the actuator 332 abuts or contacts the section member 308 which is inserted into the mating section 306A, the section member 308 provides a mechanical barrier to the actuator 332 to limit the distance movable by the actuator 332. The actuator 332 is prevented from further movement. The mechanical barrier provided by the section member 308 provides a tactile feedback to the user to indicate that the desired fluid volume has been used.

In the exemplary embodiment, the volume calibrated device 300 may be formed of a plastic material e.g. suitable for use with sterile equipment. The volume calibrated device 300 may be formed using, but is not limited to, plastic molding.

FIG. 4A is a perspective view of a volume calibrated device in an exemplary embodiment being attached to a fluid container. FIG. 4B is a top view of a section member of the volume calibrated device. FIG. 4C is a schematic drawing showing the volume calibrated device being detached from the fluid container.

In FIGS. 4A and 4C, the fluid container 430 is substantially similar to the fluid container 130 as described in FIG. 1A. The components of the fluid container 430 are referred to using the same terminology.

In this exemplary embodiment, the volume calibrated device 400 comprises a holding device 404 and a plurality of movable section members 402 capable of attachment to a portion of a fluid container 430, e.g. an actuator 432 of the fluid container 430. Each movable section member 402 has a calibrated width W corresponding to a predetermined fluid volume of the fluid container 430. The width W is a distance in the direction X e.g. along an axis parallel to the actuator 432. Each movable section member 402 is configured to be moved with respect to a remainder of the plurality of movable section members. Each movement of one movable section member 402 allows the actuator 432 of the fluid container 430 to move the calibrated width W.

In the exemplary embodiment, each movable section member 402 may be capable of being mated directly to the actuator 432. Each movable section member 402 is movable from a first position with respect to the actuator, i.e. each movable section member 402 is movable from being coupled to the actuator 432 to being moved / removed from the actuator 432.

As shown in FIG. 4A, there may be provided ten movable section members 402 but it will be appreciated that the number of movable section members 402 is not limited as such. Each movable section member 402 may be in the form of, but is not limited to, a module block. In the exemplary embodiment, each movable section member 402 is a substantially circular device which is substantially resilient. With reference to FIG. 4B, each movable section 402 comprises an open-ended part 401 and a cross-shaped cut-out 403 near the middle portion. The open-ended part 401 allows the movable section member 402 to be parted and attached to the actuator 432. The cross-shaped cut-out 403 portion allows the movable section member 402 to accommodate the body or stem of the actuator 432. It will be appreciated that the shape of the movable section member 402 may take on other forms as well and may also be dependent on a shape of the actuator 432. Each movable section member 402 is configured to be disposed on the actuator 432 of the fluid container 430 and is capable of being mated directly to the actuator 432. The width W of each movable section member 402 is calibrated to correspond to a predetermined fluid volume of the fluid container 430, for example 1 ml of fluid of the fluid container 430. With reference to FIG. 4C, while the movable section members e.g. 402 are shown stacked one on top of each other, the exemplary embodiment uses the section members e.g. 402 individually and each is separate from the others.

The holding device 404 comprises an aperture 406 which is of a complementary shape and size to a protruding head 438 of the actuator 432. The protruding head 438 of the actuator 432 may be slotted or inserted into the aperture such that the holding device 404 is securely attached to the protruding head 438 and thereby to the actuator 432. In FIGS. 4A and 4C, the holding device 404 is in the form of a cap but it will be appreciated that the holding device 404 is not limited as such.

The holding device 404 serves as a reference point or guide for a first movable section member 402A to be positioned against an end of the holding device 404. The length L of the holding device 404 and the width or thickness W of each movable section member 402 are calibrated to correspond to a predetermined fluid volume of the fluid container 430. For example, the length L of the holding device 404 is calibrated such that when ten movable section members 402 are attached to the actuator 432, one end of the holding device 404 abuts or contacts, at its bottom surface, a topmost movable section member 402A while a flange member 434 of the fluid container 430 abuts or contacts a bottommost movable section member 402B, with the actuator 432 being fully drawn with respect to a barrel 436 of the fluid container 430. As an example, each movable section member 402 of width W corresponds to 1 ml fluid volume of the fluid container 430.

When in use, the user attaches the holding device 404 to a protruding head 438 of the fluid container 430 which has been filled with fluid, for example medicine, with the actuator 432 being withdrawn from the barrel 436. A first movable section member 402A is attached to the actuator 432 of the fluid container 430, at a position just below one end of the holding device 404. The first movable section member 402A therefore contacts or abuts the end or the bottom surface of the holding device 404. A remainder of a predetermined number of movable section members 402 are attached to the actuator 432 of the fluid container 430, below the first movable section member 402A. For example, ten movable section members 402 are attached to the actuator 432 of the fluid container 430. Each movable section members 402 is in frictional contact with its adjacent movable section member(s). A bottommost movable section member 402B with respect to the actuator 432 provides a mechanical barrier, in conjunction with the flange member 434, to prevent the actuator 432 from moving and thus, prevents the fluid from being used from the fluid container 430. It will be appreciated that the assembly process may also begin with the first movable section member being placed in contact with the flange member 434 and the

remainder of the movable section members 402 are attached along the actuator 432 to finally contact the holding device 404.

As an example, to dispense 1 ml of fluid from the fluid container 430, the user moves
5 / removes the bottommost movable section member 402B with respect to the remainder of the section members. The user pushes on the protruding head 438 of the actuator 432 in the direction X. A movement (for example, but not limited to, a removal) of the movable section member 402B with respect to the actuator 432 allows freedom of movement of calibrated width W. With the freed distance from the removal of the bottommost movable section
10 member 402B, the actuator 432 thereby translates in the direction X into the barrel 436 of the fluid container 430 to dispense the fluid from the fluid container 430. After the movable section member 402B is removed, another movable section member i.e. the next and adjacent movable section member 402C becomes the bottommost movable section member. When the currently bottommost movable section member 402C which is disposed
15 on and attached to the actuator 432 abuts or contacts the flange member 434 of the fluid container 430 due to movement of the actuator 432, the actuator 432 has translated for a distance of the width W of the movable section member 402B. The corresponding fluid volume, for example 1 ml, is thus dispensed from the fluid container 430. Thus, the currently bottommost movable section member 402C provides a mechanical barrier to the actuator
20 432 to limit the distance movable by the actuator 432. The actuator 432 is thereby prevented from further movement. The mechanical barrier provided by the currently bottommost movable section member 402C provides a tactile feedback to the user to indicate that the desired fluid volume is used.

As another example, if, for example, 2 ml of fluid is to be used, the user removes the
25 bottommost movable section member 402B and the second bottommost movable section member 402C. Another movable section member, i.e. the next and adjacent movable section member 402D being disposed on and attached to the actuator 432 provides a mechanical barrier when it abuts the flange member of the fluid container 430 to limit the
30 distance movable by the actuator 432 of the fluid container 430. The mechanical barrier provided by the next movable section member 402D provides a tactile feedback to the user to indicate that the desired fluid volume is used.

In this exemplary embodiment, the movable section members 402 may be made of a
35 foam or rubber or elastic material.

In this exemplary embodiment, the volume calibrated device 400 may provide flexibility to the user to easily make adjustments or changes to the desired fluid volume to be used. For example, if the user desires to use a higher volume of fluid from the fluid container 430, more movable section member(s) 402 may be moved / removed with respect to the remainder of the section members. Further, since each movable section member 402 in this exemplary embodiment is substantially the same as each other, the movable section members 402 may be interchangeably arranged or attached to one another i.e. there is no specific movable section member which may only be attached to another specific movable section member. Moreover, in this exemplary embodiment, the volume calibrated device 400 is suitable for use with sterile equipment since the volume calibrated device 400 is not in contact with the internal of the barrel 436 of the fluid container 430.

In the exemplary embodiment disclosed above, the bottommost movable section member and/or its next and adjacent movable section member (from the bottom-up direction in FIG. 4A i.e. from the flange member towards the actuating head or end of the actuator 432) is/are removed in order to allow the actuator to translate in the X direction. It will be appreciated that the exemplary embodiment is not limited as such. For example, the topmost movable section member and/or its next and adjacent movable section member (from the top-down direction in FIG. 4A i.e. from the actuating head or end of the actuator 432 towards the flange member) may be removed in order to allow the actuator to translate in the X direction to dispense the fluid from the fluid container.

In another exemplary embodiment, the volume calibrated device may be modified to be capable of being used without a holding device, e.g. by varying the width W of each section member to accommodate a length of the actuator.

FIG. 5A is a perspective view of a volume calibrated device in an exemplary embodiment being attached to a fluid container. FIG. 5B is a side view of the volume calibrated device of FIG. 5A. FIG. 5C is a perspective view of the volume calibrated device of FIG. 5A. FIG. 5D is a schematic back perspective view of the volume calibrated device of FIG. 5C. FIG. 5E is a schematic drawing showing the volume calibrated device being detached from the fluid container. FIG. 5F is a perspective view of a section member in the exemplary embodiment.

It will be appreciated that FIGS. 5B, 5C and 5D show an exaggerated arrangement of the volume calibrated device to illustrate how a plurality of movable section members may be attached to each other. In exemplary embodiments, the volume calibrated device appears substantially similar to FIG. 5A, e.g. with the movable section members arranged substantially along a straight line axis parallel to an actuator of a fluid container.

In FIG. 5A, the fluid container 530 is substantially similar to the fluid container 130 as described in FIG. 1A. The components of the fluid container 530 are referred to using the same terminology.

In this exemplary embodiment, the volume calibrated device 500 comprises a plurality of movable section members 502 capable of attachment to a portion of a fluid container 530, e.g. to an actuator 532 of the fluid container 530. Each movable section member 502 has a calibrated width W corresponding to a predetermined fluid volume of the fluid container 530. The width W is a distance in the direction X e.g. along an axis parallel to the actuator 532. Each movable section member 502 is configured to be moved with respect to a remainder of the plurality of movable section members. Each movement of one section member 502 allows the actuator 532 of the fluid container 530 to move the calibrated width W .

The volume calibrated device 500 further comprises a holding device 504 that is capable of attachment to the actuator 532 of the fluid container 530. At least one of the section members, for example 502A, is capable of coupling to the holding device 504 e.g. by a keyhole mechanism. It will be appreciated that other forms of coupling may also be used. The plurality of section members is also capable of coupling to each other using e.g. the keyhole mechanism.

As an example, for the keyhole mechanism in the exemplary embodiment, the holding device 504 comprises a first aperture 506 disposed on a bottom surface of the holding device 504. The at least one of the section members 502A comprises a protruding mating member 510 disposed on a top surface of the at least one of the section members 502A. The first aperture 506 of the holding device 504 is adapted and formed to receive the protruding member 510 of the at least one of the section members 502A. The at least one of the section members 502A further comprises a second aperture 512 disposed on a bottom surface of the at least one of the section members 502A. Another movable section member

having a protruding mating member e.g. 510, 514 may couple to the at least one of the section members 502A using the second aperture 512 of the at least one of the section members 502A.

5 The holding device 504 further comprises a third aperture 508. The third aperture is of a complementary shape and size to the protruding head 538 of the actuator 532. The protruding head 538 of the actuator 532 may be slotted or inserted into the third aperture such that the volume calibrated device 500 is attached to the fluid container 530. In FIGS. 5A to 5E, the holding device 504 is in the form of a cap but it will be appreciated that the
10 holding device 504 is not limited as such.

 The movable section members 502 are capable of coupling to one another by e.g. the keyhole mechanism. The movable section members 502 are substantially identical to the at least one of the section members 502A. That is, each movable section member 502
15 comprises a protruding mating member 510 disposed on a top surface of the movable section member 502 and a second aperture 512 disposed on a bottom surface of the movable section member 502. The second aperture of each movable section member 502 is adapted and formed to receive a corresponding protruding member of another movable section member. For example, the protruding mating member may comprise a T-shape while
20 the second aperture may be in the form of a corresponding T-shape to receive the protruding mating member. The protruding mating member is inserted into the second aperture in the direction Z shown in e.g. FIGS. 5B and 5C.

 In FIGs. 5A to 5E, there are provided ten movable section members 502 but it will be
25 appreciated that the number of movable section members 502 is not limited as such. Each movable section member 502 may be in the form of a module block but the form is not limited as such. The width W of each module block is calibrated to correspond to a predetermined fluid volume of the fluid container 530, for example 1 ml of fluid of the fluid container 530.

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 The length L of the holding device 504 and the width or thickness W of each movable section member 502 are calibrated to correspond to a predetermined fluid volume of the fluid container 530. The length L and width W are measured in the direction X. For example, the length L of the holding device 504 is calibrated such that when ten movable section
35 members 502 are coupled to the holding device 504 and thereafter attached to the actuator

532, a flange member 534 of the fluid container 530 abuts or contacts a bottommost movable section member, for example 502C, with the actuator 532 fully withdrawn from a barrel 536 of the fluid container 530.

5 When in use, the user couples the holding device 504 to one of the movable section members, for example 502A, via a keyhole mechanism. The first aperture of the holding device 504 receives the protruding mating member of the movable section member 502A. Another movable section member 502B is coupled to the section member 502A via a keyhole mechanism. The second aperture of the movable section member 502A receives
10 the protruding mating member of the movable section member 502B. Movable section members 502 are attached to one another until a predetermined number of movable section members 502 have been coupled to the holding device 504. The holding device 504 is attached to the protruding head 538 of the actuator 532 of the fluid container 530 which has been filled with a fluid, for example medicine, within the barrel 536. The plurality of movable
15 section members e.g. 502, 502A, 502B are disposed on or abut against the actuator 532 which has been withdrawn with respect to the barrel 536 of the fluid container 530.

For example, ten movable section members 502 are attached to the holding device 504 of the fluid container 530. Each movable section members 502 is coupled to its adjacent
20 movable section member(s). A bottommost movable section member 502C or the furthest with respect to the actuator 532 provides a mechanical barrier due to abutment with the flange member 534 of the fluid container 530 to prevent the actuator 532 from moving. Thus, fluid is prevented from being dispensed from the fluid container 530. For example, to dispense 1 ml of fluid from the fluid container 530, the user removes the bottommost
25 movable section member 502C and pushes on the protruding head 538 of the actuator 532 in the direction X. The actuator 532 thereby translates in the direction X into the barrel 536 of the fluid container 530 to dispense the fluid from the fluid container 530. A movement (for example, but not limited to, a removal) of the bottommost movable section member 502C with respect to the actuator 532 allows freedom of movement of calibrated width W. When
30 another or the next movable section member 502D which is adjacent to the moved bottommost movable section member 502C, and which is now the bottommost movable section member, abuts or contacts a flange member 534 of the fluid container 530, the actuator 532 has translated a calibrated distance of W and the corresponding predetermined fluid volume, for example 1 ml, is dispensed from the fluid container 530. When the now
35 bottommost movable section member 502D abuts or contacts the flange member 534 of the

fluid container 530, the movable section member 502D provides a mechanical barrier to the actuator 532 to limit the distance movable by the actuator 532. The actuator 532 is thereby prevented from further movement. The mechanical barrier provided by the next movable section member 502D provides a tactile feedback to the user to indicate that the desired fluid volume has been dispensed.

As another example, if, for example, 2 ml of fluid is to be dispensed, the user removes the bottommost movable section member 502C and the second bottommost movable section member 502D. Another or the next movable section member 502E which is adjacent to the moved second bottommost movable section member 502D provides a mechanical barrier when it abuts the flange member 534 of the fluid container 530 to limit the distance movable by the actuator 532 of the fluid container 530. The mechanical barrier provided by the next movable section member 502E provides a tactile feedback to the user to indicate that the desired fluid volume is used.

In this exemplary embodiment, the volume calibrated device 500 may be formed of a plastic material e.g. suitable for use with sterile equipment. The volume calibrated device 500 may be formed using, but is not limited to, plastic molding.

In this exemplary embodiment, the volume calibrated device 500 may provide flexibility to the user to easily make adjustments or changes to the desired fluid volume to be used. For example, if the user desires to use a higher volume of fluid from the fluid container 530, more movable section member(s) 502 may be moved / removed with respect to the remainder of the section members. Further, since each movable section member 502 in this exemplary embodiment is substantially the same as each other, the movable section members 502 may be interchangeably arranged or attached to one another i.e. there is no specific movable section member which may only be attached to another specific movable section member. Further, the volume calibrated device 500 may be preassembled in advance by e.g. another personnel other than the user. When needed, the user may simply slot or insert the protruding head 538 of the actuator 532 into the third aperture of the holding device, to attach the preassembled volume calibrated device 500 to the fluid container 530. Minimal time is therefore spent by the user to assemble the volume calibrated device for use.

The following recites some embodiments of the present disclosure.

SE1. A volume calibrated device, the device comprising, a plurality of movable section members capable of attachment to an actuator of a fluid container, each section member
5 having a calibrated measure or width corresponding to a predetermined fluid volume of the fluid container; wherein each section member is configured to be moved with respect to a remainder of the plurality of movable section members, and each movement of one section member allows the actuator of the fluid container to move the calibrated width to dispense or withdraw the predetermined fluid volume.

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SE2. The volume calibrated device according to SE 1, wherein the section member is movable from a default position with respect to the actuator.

SE3. The volume calibrated device according to any one of the preceding SEs, wherein
15 each section member is pivotally movable from the actuator while still being attached to the actuator. For example, each section member may pivot from the actuator e.g. like a ribcage.

SE4. The volume calibrated device according to any one of the preceding SEs, wherein each section member is removable from the actuator.

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SE5. The volume calibrated device according to any one of the preceding SEs, wherein the movable section members are capable of being mated to one another.

SE6. The volume calibrated device according to SE 5, wherein the movable section
25 members can be mated using a keyhole mechanism.

SE7. The volume calibrated device according to SE 6, wherein for the keyhole mechanism, each movable section member comprises a protruding mating member disposed on a top surface and an aperture disposed on a bottom surface, the aperture being formed to receive
30 a corresponding protruding mating member of another movable section member.

SE8. The volume calibrated device according to any one of the preceding SEs, further comprising a stem/spine configured to hold or comprise the plurality of movable section members.

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SE9. The volume calibrated device according to SE 8, wherein the stem/spine is capable of attachment to the actuator of the fluid container.

SE10. The volume calibrated device according to SEs 8 or 9, wherein the stem/spine is coupled, detachably or integrally, to a holding device, such as a cap, that is capable of attachment to the actuator of the fluid container.

SE11. The volume calibrated device according to SE 10, wherein the holding device, such as a cap, is capable of detachably attaching to the actuator of the fluid container.

SE12. The volume calibrated device according to any one of SEs 8 to 11, wherein the movable section members are provided as integrated tabs on the stem/spine.

SE13. The volume calibrated device according to any one of SEs 8 to 12, wherein movement of the movable section members comprises destructive removal of the movable section members from the stem/spine.

SE14. The volume calibrated device according to any one of SEs 8 to 13, wherein the moveable sections members are removably mated to the stem/spine.

SE15. The volume calibrated device according to SE 14, wherein the moveable sections members are plugged into the stem/spine.

SE16. The volume calibrated device according to any one of the preceding SEs, wherein the plurality of movable section members is integrally attached to the actuator.

SE17. The volume calibrated device according to any one of SEs 1 to 15, wherein the plurality of movable section members is detachably attached to the actuator.

SE18. The volume calibrated device according to any preceding SE, wherein the device is a disposable device or contraption, or wherein the device may be a non-disposable and optionally re-usable device or contraption.

SE19. The volume calibrated device according to any preceding SE, wherein the each movement of one section member allows the actuator of the fluid container to move the calibrated width until a physical stop/barrier is provided by a next section member.

- 5 SE20. The volume calibrated device according to SE 19, wherein the physical stop/barrier is provided by a next section member provides a mechanical/tactile feedback to a user of the fluid container.

- 10 SE21. The volume calibrated device according to any preceding SE, wherein the predetermined fluid volume is optionally about 1 millilitres (mL).

SE22. The volume calibrated device according to any preceding SE, wherein one or more movable section members can be moved depending on a needed volume of fluid, for example, depending on a drug dose contained in the fluid container.

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SE23. The volume calibrated device according to any preceding SE, wherein dose titration can be provided with the fluid container.

- 20 SE24. A volume calibrated device, the device comprising, a stem/spine capable of attachment to a fluid container, the stem/spine having one or more mating sections, each mating section being spaced from one end of the stem/spine with a corresponding calibrated measure or width that in turn corresponds to a predetermined fluid volume of the fluid container; at least one section member capable of mating to said one or more mating sections, the at least one section member being capable of providing a physical/mechanical
25 barrier/stop to an actuator of the fluid container.

- SE25. The volume calibrated device according to SE 24, wherein in use, the at least one section member is mated to said one or more mating sections and the actuator of the fluid container is allowed to move until the actuator interacts/contacts the at least one section
30 member and thereby the predetermined fluid volume corresponding to the corresponding calibrated width of said one or more mating sections is allowed to be dispensed or withdrawn.

SE26. The volume calibrated device according to any one of SEs 24 to 25, wherein the mating of the at least one section member to said one or more mating sections can be detachable/removable mating or integrated mating.

- 5 SE27. The volume calibrated device according to SE 26, wherein the at least one section member can be plugged into said one or more mating sections.

SE28. The volume calibrated device according to any one of SEs 24 to 27, wherein the stem/spine is configured to be detachably/removably attached or integrally attached to the
10 fluid container.

SE29. The volume calibrated device according to SE 28, wherein the stem/spine can be fitted onto or to a flange member of the fluid container.

- 15 SE30. The volume calibrated device according to any one of SEs 24 to 29, wherein the stem/spine is tubular.

SE31. The volume calibrated device according to any one of SEs 24 to 30, wherein the stem/spine and the at least one section member can form a substantially closed enclosure
20 around a perimeter of the actuator.

SE32. The volume calibrated device according to any one of SEs 24 to 31, wherein one, or both, of the stem/spine and the at least one section member is shaped to comprise an arc.

- 25 In the described exemplary embodiments, a volume calibrated device may be provided which may be conveniently attached or used together with e.g. a typical syringe to reduce the possibility of medication overdose and/or to allow minor/precise adjustment of the medication dosage. Furthermore, minimal time is taken to assemble the volume calibrated device for use. The volume calibrated device may also be user
30 friendly and easy to use. In addition, minimal cost may be incurred to produce the volume calibrated device.

In the described exemplary embodiments, the volume calibrated device provided may be suitable for use with sterile equipment. Therefore, use of the volume calibrated
35 device may not affect the sterility of the medication to be used i.e. the fluid in the fluid

container. In the described exemplary embodiments, the volume calibrated device may allow the user to accurately use or dispense a desired volume of fluid from the fluid container. For example, if desired, the volume calibrated device may be calibrated to allow the user to use or dispense 1.01 ml of fluid from the fluid container. The volume
5 calibrated device may be capable of adjustment of different fluid volumes. Further, the volume calibrated device may minimize the error in the volume or amount of fluid used from the fluid container.

In the described exemplary embodiments, minimal time may be needed to
10 assemble the volume calibrated device to the fluid container for use. Moreover, another personnel, other than the user, may first assemble the volume calibrated device. The user may then simply attach the volume calibrated device to the fluid container for use when needed. Time is thereby saved by the user since there is no need for the user to assemble the volume calibrated device by himself / herself. Moreover, if desired, a
15 larger fluid volume may be predetermined, e.g. 2 ml or 3 ml, without having to move the sections members one at a time, e.g. by 1 ml at a time. Again, time may be saved by the user. In the described exemplary embodiments, the volume calibrated device is user friendly since operation of the volume calibrated device is easy and comfortable. In the described exemplary embodiments, minimal cost may be incurred to produce the
20 volume calibrated device. The volume calibrated device may be used on different fluid containers and thereby, reduce the cost needed to manufacture specific volume calibrated devices for specific fluid containers.

In the described exemplary embodiments, the volume calibrated device may
25 cause a better tactile feedback to be provided to the user to indicate that the desired fluid volume is used / dispensed by providing a higher resistance feedback while the actuating head is being actuated/pushed by the user. The volume calibrated device may provide a hard stop for the user such that the actuator is prevented from being translated beyond a predetermined distance e.g. without disassembling or breaking the
30 volume calibrated device.

In the described exemplary embodiments, a section member functioning as a dosage flow restrictor may increase user confidence in e.g. morphine administration by preventing a wrong dose from being delivered through creating an intentional physical
35 barrier and feedback to a user.

As such, wrong dose administration arising from miscommunication when a drug is prepared and administered by different persons may also be averted. For example, a doctor may assume that a prepared syringe contains Morphine 1mg/10mL when an assistant / nurse had instead prepared 10mg/10mL, and the exemplary embodiments may create a hard stop to prevent the doctor from over-administering. By allowing the drug to be prepared by another person, this frees the doctor to attend to a patient's more pressing needs.

The described exemplary embodiments may also improve process efficiency by removing the need of mandatory purging of excess doses of drug / medication.

In addition, the described exemplary embodiments may promote patient safety by allowing a user to slowly titrate up the medication without feeling the pressure to initiate a patient on a higher morphine dose.

The terms "coupled" or "connected" as used in this description are intended to cover both directly connected or connected through one or more intermediate means, unless otherwise stated.

Additionally, when describing some embodiments, the disclosure may have disclosed a method and/or process as a particular sequence of steps. However, unless otherwise required, it will be appreciated the method or process should not be limited to the particular sequence of steps disclosed. Other sequences of steps may be possible. The particular order of the steps disclosed herein should not be construed as undue limitations. Unless otherwise required, a method and/or process disclosed herein should not be limited to the steps being carried out in the order written. The sequence of steps may be varied and still remain within the scope of the disclosure.

Further, in the description herein, the word "substantially" whenever used is understood to include, but not restricted to, "entirely" or "completely" and the like. In addition, terms such as "comprising", "comprise", and the like whenever used, are intended to be non-restricting descriptive language in that they broadly include elements/components recited after such terms, in addition to other components not explicitly recited. For an example, when "comprising" is used, reference to a "one" feature is also intended to be a reference to

“at least one” of that feature. Terms such as “consisting”, “consist”, and the like, may, in the appropriate context, be considered as a subset of terms such as “comprising”, “comprise”, and the like. Therefore, in embodiments disclosed herein using the terms such as “comprising”, “comprise”, and the like, it will be appreciated that these embodiments provide
5 teaching for corresponding embodiments using terms such as “consisting”, “consist”, and the like. Further, terms such as “about”, “approximately” and the like whenever used, typically means a reasonable variation, for example a variation of +/- 5% of the disclosed value, or a variance of 4% of the disclosed value, or a variance of 3% of the disclosed value, a variance of 2% of the disclosed value or a variance of 1% of the disclosed value.

10 Furthermore, in the description herein, certain values may be disclosed in a range. The values showing the end points of a range are intended to illustrate a preferred range. Whenever a range has been described, it is intended that the range covers and teaches all possible sub-ranges as well as individual numerical values within that range. That is, the end
15 points of a range should not be interpreted as inflexible limitations. For example, a description of a range of 1% to 5% is intended to have specifically disclosed sub-ranges 1% to 2%, 1% to 3%, 1% to 4%, 2% to 3% etc., as well as individually, values within that range such as 1%, 2%, 3%, 4% and 5%. The intention of the above specific disclosure is applicable to any depth/breadth of a range.

20 In the described exemplary embodiments, the volume calibrated device may be used with a fluid container in the form of a syringe. The syringe comprises an actuator or a plunger. The plunger has a protruding head at an end for contact with the user to perform the translation of the plunger. In addition, the syringe has a flange for the user to abut
25 against for performing the translation of the plunger to, for example, dispense fluid from the syringe. It will be appreciated that other fluid containers may also be used. For example, the volume calibrated device may also be attached to other fluid containers that use an actuator e.g. a plunger.

30 In the described exemplary embodiments, the volume calibrated device is used with a fluid container to dispense a fluid from the fluid container when the user pushes on the protruding head of the actuator but the use is not limited as such. For example, the volume calibrated device may be modified to assist in withdrawal of fluid via the fluid container. Thus, the term “use” in respect of fluid is intended to apply across the exemplary
35 embodiments to broadly cover both dispensing and withdrawal of fluid where applicable.

In the described exemplary embodiments, the section members of the volume calibrated device are moved sequentially but is the exemplary embodiments are not limited as such. For example, a movement of a section member which is placed in the middle of an assembly of section members may still allow freedom of movement of the calibrated distance.

In the described exemplary embodiments, the term “spine” refers to an elongated member with a function to allow mating with one or more section members when in use. The spine may also be in any other form as long as the function is fulfilled.

In the described exemplary embodiments, the volume calibrated device is described as being used by a “user” but the exemplary embodiments are not limited as such. There may be, for example, automated processes or apparatus which are used to actuate actuators of fluid containers. Tactile feedback may provide a force to work with e.g. force sensors of such equipment.

In the described exemplary embodiments, the word “aperture” is used to describe a fitting or accommodation for another component and the word is not limited to describing a through-hole. For example, the aperture may refer to a concave form or trough to accommodate a protruding portion or peak of e.g. a flange member.

It will be appreciated by a person skilled in the art that other variations and/or modifications may be made to the specific embodiments without departing from the scope of the invention as broadly described. For example, in the description herein, features of different exemplary embodiments may be mixed, combined, interchanged, incorporated, adopted, modified, included etc. or the like across different exemplary embodiments. The present embodiments are, therefore, to be considered in all respects to be illustrative and not restrictive.

CLAIMS

1. A volume calibrated device, the device comprising,
a spine capable of attachment to a portion of a fluid container, the spine
5 having one or more mating sections, each mating section being spaced from one end of
the spine at a corresponding calibrated distance corresponding to a predetermined fluid
volume of the fluid container;

at least one section member capable of being removably mated to said
one or more mating sections, the at least one section member being capable of
10 providing a mechanical barrier to an actuator of the fluid container;

wherein at a position of said at least one section member on the spine
when removably mated to said one or more mating sections, in use, the at least one
section member provides a mechanical barrier to limit a distance movable by the
actuator of the fluid container to move to dispense fluid from the fluid container, the
15 movable distance being based on the position of the at least one section member on the
spine and a position of the actuator.

2. The volume calibrated device according to claim 1, wherein the at least
one section member is movable from a first position with respect to the spine.

3. The volume calibrated device according to any preceding claims, wherein
in use, the at least one section member is mated to said one or more mating sections
and the actuator of the fluid container is allowed to move and the predetermined fluid
volume corresponding to the corresponding calibrated distance of said one or more
25 mating sections is allowed to be used.

4. The volume calibrated device according to any one of the preceding
claims, wherein the spine is capable of attachment to the actuator of the fluid container.

5. The volume calibrated device according to claim 4, wherein the spine is
coupled to a holding device that is capable of attachment to the actuator of the fluid
container.

6. The volume calibrated device according to any one of the preceding
35 claims, the device comprising a plurality of section members;

wherein each section member is configured to be moved with respect to a remainder of the plurality of section members, and each movement of one section member allows the actuator of the fluid container to move the calibrated distance.

5 7. The volume calibrated device according to claim 6, wherein the actuator of the fluid container is allowed to move the calibrated distance until the mechanical barrier is provided by a next section member, and

 wherein the mechanical barrier provided by said next section member provides a tactile feedback to a user of the fluid container.

10 8. The volume calibrated device according to any one of the preceding claims, wherein the at least one section member is provided integrally on the spine.

 9. The volume calibrated device according to claim 8, wherein movement of
15 the at least one section member comprises destructive removal of the section member from the spine.

 10. The volume calibrated device according to any one of claims 1 to 3, wherein the at least one section member is detachably plugged into said one or more
20 mating sections.

 11. The volume calibrated device according to claim 10, wherein the spine is capable of attachment to a flange member of the fluid container, the flange member comprising a receiving portion of the actuator of the fluid container.

25 12. The volume calibrated device according to any one of claims 10 to 11, wherein in use, the at least one section member is mated to said one or more mating sections and the actuator of the fluid container is allowed to move until the actuator contacts the at least one section member and the predetermined fluid volume
30 corresponding to the corresponding calibrated distance of said one or more mating sections is allowed to be used.

 13. The volume calibrated device according to claim 12, wherein the actuator of the fluid container is allowed to move the calibrated distance until the mechanical
35 barrier is provided by the at least one section member, and

 wherein the mechanical barrier provided by the at least one section member provides a tactile feedback to a user of the fluid container.

14. The volume calibrated device according to any one of claims 10 to 13, wherein the spine comprises a tubular portion.

5 15. The volume calibrated device according to any one of claims 10 to 14, wherein the spine and the at least one section member is capable of forming a substantially closed arc enclosure around a perimeter of the actuator.

16. A volume calibrated device, the device comprising,
a plurality of movable section members capable of attachment to a portion
10 of a fluid container, each section member having a calibrated width corresponding to a predetermined fluid volume of the fluid container; and

a holding device that is capable of attachment to an actuator of the fluid container, the holding device being capable of serving as a reference point for a first movable section member to be positioned against an end of the holding device and a
15 length L of the holding device and the width of the plurality of movable section members are calibrated to correspond to a second predetermined fluid volume of the fluid container;

wherein when attached to the fluid container, each section member is configured to be moved with respect to a remainder of the plurality of movable section
20 members attached to the fluid container, and each such movement of one section member allows the actuator of the fluid container to move the calibrated width.

17. The volume calibrated device according to claim 16, wherein the each section member is movable from a first position with respect to the actuator.

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18. The volume calibrated device according to any one of claims 16 to 17, wherein the movable section members are capable of being mated directly to the actuator.

30 19. The volume calibrated device according to any one of claims 16 to 18, wherein at least one of the section members is capable of coupling to the holding device using a keyhole mechanism.

20. The volume calibrated device according to claim 19, wherein for the keyhole mechanism, the holding device comprises a first aperture disposed on a bottom surface of the holding device, and

the at least one of the section members comprises a protruding mating member disposed on a top surface of the at least one of the section members and a second aperture disposed on a bottom surface of the at least one of the section members, the first aperture of the holding device being formed to receive the protruding mating member of the at least one of the section members.

21. The volume calibrated device according to claim 20, wherein the movable section members are substantially identical to the at least one of the section members and the second aperture is formed to receive a corresponding protruding member of another movable section member.

22. The volume calibrated device according to any one of claims 16 to 21, wherein the each movement of one section member allows the actuator of the fluid container to move the calibrated width until a mechanical barrier is provided by another section member, and

wherein the mechanical barrier provided by said another section member provides a tactile feedback to a user of the fluid container.