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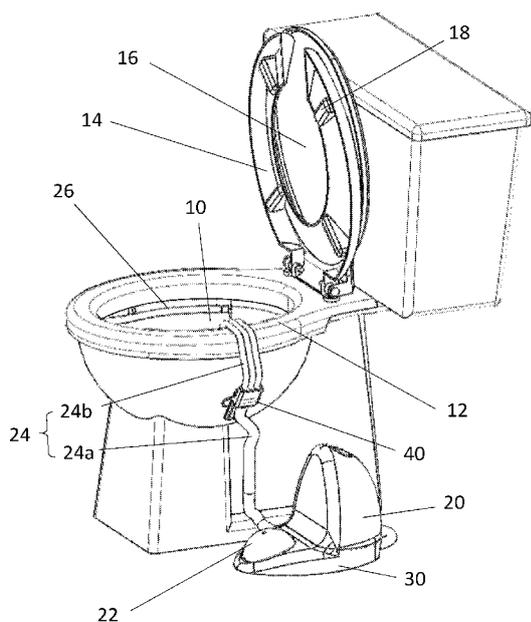


FIGURE 1

(57) Abstract: An apparatus for dispensing cleaning fluid into a toilet bowl (10) comprises a fluid reservoir (20) for storing a supply of cleaning fluid and an actuator (22) operatively associated with the fluid reservoir (20). The apparatus further comprises a dispensing arrangement (26) comprising an arrangement of tubing that is configured to fit inside the toilet below the rim (12) of the toilet and to extend circumferentially around the toilet bowl (10), the arrangement of tubing having one or more apertures (28) that are arranged to dispense cleaning fluid into the toilet bowl (10) in response to a user actuating the actuator (22).



## TOILET CLEANING FLUID DISPENSER

TECHNICAL FIELD

5           The present invention relates generally to an apparatus for dispensing cleaning fluid into a toilet, and in particular to such apparatus that can be retrofitted for use with existing toilets of a standard design to provide improved cleaning.

BACKGROUND

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The problem of toilet surfaces harbouring germs, showing soiled marks and creating unpleasant odours is well known. Toilets therefore need regular cleaning, often with chemicals, such as bleach and other toilet gels that are manually poured into the toilet. Manual cleaning requires significant time and effort and this can be expensive, especially for commercial or industrial premises, or schools, for example, where there may be a relatively larger number of toilets and/or toilet users, such that more frequent cleaning is desirable. Even for individual households, the time and effort involved means that cleaning is often not performed as regularly as it should be. These problems may be exaggerated for elderly or infirm users who may struggle to manually clean their own toilet.

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To mitigate this, it is known to use toilet rim block type devices, which are usually provided with a small holder that is attached over the rim of a toilet bowl such that the holder hangs down into the bowl. A toilet 'block' composed of suitable detergent and/or deodorizer materials is then placed in the holder and slowly dissolves over time with use of the toilet to thereby provide a cleaning effect. Such toilet blocks, however, provide limited cleaning effect. Further, there is a problem that the toilet block may fall into the toilet, causing blockages which then require further time and effort to fix.

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Other solutions involve providing liquid material directly into the toilet bowl. For example, such arrangements are disclosed in GB-1250561 and GB-1304577, both assigned to Westinghouse Brake and Signal Company Limited. However, these solutions are relatively complex to implement and install, potentially requiring significant modification of the toilet, and have not found much commercial use.

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It is therefore desired to provide an improved apparatus for maintaining the cleanliness of toilets.

## SUMMARY

According to a first aspect there is provided an apparatus for dispensing cleaning fluid into a toilet, the toilet having a toilet bowl and a rim defining an opening to the toilet bowl, the apparatus comprising:

- a fluid reservoir for storing a supply of cleaning fluid;
- an actuator operatively associated with the fluid reservoir; and
- a dispensing arrangement comprising an arrangement of tubing that is configured to fit inside the toilet below the rim of the toilet and to extend circumferentially around the toilet bowl, the arrangement of tubing having one or more apertures that are arranged to dispense cleaning fluid into the toilet bowl in response to a user actuating the actuator, wherein actuation of the actuator causes fluid to move from the fluid reservoir to the dispensing arrangement, and causes fluid that has passed from the fluid reservoir to the dispensing arrangement to then move out through the one or more apertures of the arrangement of tubing into the toilet bowl.

The present invention relates to apparatus for dispensing cleaning fluid into a toilet, e.g., in order to provide a cleaning effect. In particular, the apparatus of the present invention according to its various aspects and embodiments is designed to be easily retrofitted onto existing toilets of standard design. In that respect, it will be appreciated that a standard toilet will comprise a toilet bowl, which is the part that is connected to the system for flushing away waste. The toilet also comprises a rim that defines the opening to the toilet bowl. The present invention is, however, also envisaged to be used in plumbing features other than toilets, such as, e.g., a bidet, a single unit (e.g. wall-mounted) urinal, or a sink. That is, the apparatus of the present invention may be used for dispensing cleaning fluid into any suitable and desired plumbing fixture, e.g. provided the plumbing feature comprises a bowl or basin (e.g., a drainage bowl or basin) and a rim that defines the opening to the bowl or basin so that the apparatus can be suitably mounted thereto.

Compared to other possible approaches, the apparatus of the present invention may be capable of dispensing a larger volume of cleaning fluid, over a relatively larger area of the toilet bowl, thus preferably providing a more effective cleaning action. For instance, at least in preferred embodiments when the apparatus is used to dispense sanitising fluid such as a neat chemical such as neat bleach, the apparatus of the present invention may provide a more effective cleaning action (e.g. compared to existing toilet rim blocks that typically dispense sanitising material from a single, static point without attempting to

provide the sanitising material around the full circumference of the toilet bowl and only offering a diluted chemical - i.e. mixed with water as the toilet is flushed - and not neat chemical), whilst maintaining an overall relatively simpler assembly and installation.

5 Thus, the present invention may provide various benefits compared to other approaches.

By actuating the actuator, the cleaning fluid is dispensed into the toilet bowl through the one or more apertures of the arrangement of tubing, thereby cleaning the toilet bowl. It will be appreciated that by using the arrangement of tubing as will be described further below, the apparatus may be easily retrofitted onto toilets having different toilet bowl sizes  
10 without requiring complex installation. That is, the apparatus may be relatively easy to install, e.g. by a layperson, and, in embodiments, without requiring any tools.

The arrangement of the apertures can be selected as desired. It may for example comprise a single opening that extends along the length of the tubing, and hence around the circumference of the toilet bowl, in use. Preferably however there are plural apertures  
15 spaced apart around the tubing. This has been found to provide a more effective dispensing mechanism to ensure more uniform dispensing.

The sizing and/or spacing of apertures may, and preferably does, vary along the length of the arrangement of tubing (and hence vary around the circumference of the toilet bowl when the apparatus is installed). That is, the sizing and/or spacing of apertures may  
20 vary along length of the arrangement of tubing from an inlet opening to the arrangement of tubing (i.e. the inlet opening through which the arrangement of tubing is connected to the fluid reservoir and at which point the fluid pressure is highest), e.g., and preferably, so as to increase the sizing (and/or reduce the spacing of apertures) along the length of the arrangement of tubing from the inlet opening moving around the circumference of toilet  
25 bowl. For example, preferably the apertures increase in size (e.g. length) along the length of the arrangement of tubing when moving away from the inlet opening, e.g. such that the largest sized (or longest) apertures are furthest away from the inlet opening. In that case the spacing between apertures may be, and in some embodiments is, the same. However, the spacing between apertures could also vary. For example, the spacing of the apertures  
30 may decrease along the length of the arrangement of tubing when moving away from the inlet opening, e.g. such that the apertures furthest away from the inlet opening are relatively closer spaced than the apertures that are nearer to the inlet opening.

It will be appreciated that varying the sizing and/or spacing of apertures along the length of the arrangement of tubing may help facilitate more uniform dispensing by

positioning the smallest aperture closest towards the position of highest fluid pressure of the fluid flow through the dispensing arrangement and the largest aperture towards the position of lowest fluid pressure of the fluid flow through the dispensing arrangement so as to ensure more uniform dispensing. Thus, in embodiments, the dispensing arrangement  
5 includes an inlet opening through which fluid from the fluid reservoir enters the arrangement of tubing and the apertures increase in size moving away from the inlet opening to provide a more uniform dispensing of fluid.

The cleaning fluid may comprise any suitable and desired cleaning fluid or cleaning agent. In an embodiment, the cleaning fluid may simply comprise water. In that case, the  
10 water may be dispensed onto the walls of the toilet bowl in order to dislodge debris. For instance, in use, one or more of the apertures may be orientated so as to dispense or spray water onto the wall of the toilet bowl adjacent to that aperture and/or one or more of the apertures may be orientated so as to dispense or spray water onto the opposite wall of the toilet bowl to that aperture. In preferred embodiments, the cleaning fluid comprises a  
15 sanitising fluid such as bleach. However, in general, the cleaning fluid may comprise any suitable detergent and/or deodorizer material that a user may wish to dispense into their toilet, as desired. Thus, it will be appreciated that the cleaning fluid need not solely provide a cleaning effect, but may also have a pleasant fragrance and colour, e.g. to help increase the perception of cleanliness.

The cleaning fluid is held in a suitable fluid reservoir. The fluid reservoir can be  
20 mounted or positioned in any suitable location relative to the toilet, so long as there is a suitable fluid connection between the reservoir and the dispensing arrangement. The volume of the fluid reservoir may be selected as desired, e.g. depending on the desired refill rate. As an example, a fluid reservoir according to a preferred embodiment may have  
25 a volume of between about 1L to 2L. For a dispense rate of about 40ml per actuation this then provides up to about 50 uses before the fluid reservoir should be re-filled. Accordingly, the dispensing arrangement may be configured to dispense at least about 40ml of cleaning fluid with a single actuation of the actuator. It has been found that  
dispensing at least about 40ml of fluid may result in an optimal cleaning performance whilst  
30 maximising the number of actuations available before it is required to re-fill the fluid reservoir.

However, these numbers are of course only exemplary, relating to one preferred embodiment, and other examples would of course be possible. That is, the apparatus may of course be configured to dispense any amount of cleaning fluid, as desired.

As mentioned above, the fluid reservoir is fluidly connected to the dispensing arrangement such that the cleaning fluid can be moved from the fluid reservoir into the dispensing arrangement (and then dispensed out from the dispensing arrangement into the toilet bowl). Preferably, there is flexible tubing provided that extends between and  
5 connects the fluid reservoir and the dispensing arrangement. The flexible tubing interconnecting the fluid reservoir and dispensing arrangement is preferably designed (and sized) so as to fit underneath the toilet seat cover and loop over the toilet rim to connect to the dispensing arrangement, as will be explained further below.

The dispensing arrangement in a preferred embodiment comprises one or more  
10 tube(s) that extend in a circumferential direction around the toilet bowl. It will be appreciated that as used herein a "tube" may be generally cylindrical but does not need to be strictly cylindrical and as used herein is intended to cover any suitably tubular element that can extend circumferentially around a toilet bowl to transfer cleaning fluid for dispensing in the manner described herein. As will be explained further below, these tubes  
15 may house a strong flexible rod (e.g. a rod comprising carbon fiber or titanium, and which is able to be bent into a loop without breaking) that may help to keep the tubes firmly held against the wall of the toilet and prevent it from falling downwards over time and when the toilet is flushed repeatedly and water hits the tubing at force. The rod may be housed freely within the tube, or may be integrated into the material of the tube. The rod may be  
20 much smaller in diameter than the diameter of the tube. For instance the diameter of the rod may be between about 0.1 mm and 2.5 mm. In some embodiments, the diameter of the rod may be between about 1.0mm and 2.0 mm, such as about 1.5 mm. On the other hand, the tube may have a diameter of between 3 mm and 10 mm, such that the diameter of the tube is larger than the rod (such that the rod can easily fit inside the tube without  
25 impeding fluid flow). Various arrangements are of course possible in this regard.

The dispensing arrangement (tube(s)) may thus be designed to fit inside a toilet bowl. Generally, the dispensing arrangement is designed to fit underneath the toilet rim.

The dispensing arrangement (tube(s)) preferably extend in a circumferential direction, around the toilet bowl.

30 The dispensing arrangement preferably extends around a significant portion of the toilet bowl, e.g. compared to traditional toilet rim blocks that are typically installed only at a single point. Preferably, the dispensing arrangement is configured to extend around substantially the entire, preferably the entire, circumference of the toilet bowl. That is, the arrangement of tubing may extend around substantially the entire circumference of the

toilet bowl. Preferably, the arrangement of tubing is therefore adjustable to fit to different sizes of toilet bowls, as will be explained further below. It will be appreciated that, by having the dispensing arrangement extending around substantially the entire circumference of the toilet bowl, cleaning fluid may be dispensed about substantially the entire circumference of the toilet bowl such that the associated cleaning is preferably applied about substantially the entire circumference of the toilet bowl.

In an embodiment the dispensing arrangement defines a single loop of tubing that is preferably configured to extend substantially the whole way, and in a particularly preferred embodiment the whole way, around the toilet bowl circumference. In preferred embodiments, as will be explained further below, the loop is formed by two overlapping pieces of tubing (with the degree of overlap being adjustable in order to re-size the loop to fit different sizes of toilet bowl). Other arrangements would however be possible.

The tube(s) of the dispensing arrangement are preferably made of a flexible material so that it can flex into position.

The dispensing arrangement may be mounted to the toilet using a specially designed bracket. For instance, the bracket may be designed to hang over the toilet rim and provide a support for the dispensing arrangement (tube(s)). In some preferred embodiments however the arrangement of tubing is instead held into place by an interference fit, as will be explained further below.

The fluid reservoir is also operatively associated with an actuator that is configured to cause fluid to move from the fluid reservoir to the dispensing arrangement responsive to a user actuating the actuator. Preferably, the same actuation event (or repeated instances of the same actuation action) also causes the dispensing arrangement to dispense cleaning fluid into the toilet bowl. Thus, in response to a user actuating the actuator, fluid is caused to move from the fluid reservoir to the dispensing arrangement such that it can then be dispensed accordingly into the toilet bowl.

For example, in preferred arrangement, an initial actuation of the actuator causes fluid to start moving through apparatus towards dispensing arrangement. Preferably the initial actuation causes some fluid to be dispensed. However, it may be necessary, depending on the configuration of the apparatus, that one or more initial actuations are needed in order to 'prime' the apparatus. For instance, after some time, the apparatus including the dispensing arrangement and the flexible tubing interconnecting the dispensing arrangement and fluid reservoir may be substantially filled with cleaning fluid,

such that any further actuations will cause some of the cleaning fluid to be dispensed, and replaced with cleaning fluid from the fluid reservoir.

To allow the dispensing arrangement to dispense cleaning fluid in response to a user actuating the apparatus, the dispensing arrangement in a preferred embodiment  
5 comprises one or more slits, openings or valves that are configured to open or dispense under fluid pressure generated by the actuator. That is, in embodiments, in response to the user actuating the actuator, to cause fluid to move through the apparatus, the resulting fluid pressure is sufficient to cause (and causes) the one or more slits or openings or valves of the dispensing arrangement to open such that cleaning fluid seeps out into the  
10 toilet bowl. It will be appreciated that by providing one or more slits or openings or valves that are configured to open under fluid pressure to dispense cleaning fluid into the toilet bowl, fluid may substantially not leak or “weep” from the arrangement of tubing when the actuator is not actuated. Moreover, by configuring the slit(s) or valve(s) to open only beyond a minimum fluid pressure threshold, a uniform dispensing and associated cleaning  
15 action may be achieved.

In a particularly preferred embodiment, the dispensing arrangement comprises small slits which have been laser cut into the dispensing arrangement. However various other suitable arrangements are contemplated as desired.

As mentioned above, the sizing of the slits, openings or valves may, and preferably  
20 does, vary along the length of the dispensing arrangement to provide an improved, e.g. more uniform, dispensing of cleaning fluid. In embodiments, the spacing of the slits, openings or valves may also vary.

The actuator may take any suitable and desired form. The actuator may comprise any suitable actuation mechanism, as desired. For example, in embodiments, the actuator  
25 could be connected to the toilet flush to provide an automatic cleaning action. However, preferably, the actuation mechanism (and the actuator itself) is separate to the toilet flushing mechanism. This then allows more effective cleaning action as the cleaning fluid is not overly diluted by the the water from the flushing action. This also facilitates retrofitting the apparatus to existing toilets, without requiring any special tools to install the  
30 apparatus, and regardless of the flush mechanism that is present on the toilet.

In embodiments, the actuator may comprise a hand pump, or any other manual pumping suitable arrangement, e.g. depending on the relative arrangement of the fluid reservoir and toilet. It is also contemplated that rather than a manual actuator, the actuator

may comprise a battery pump, for example, that can be actuated by a user pushing a button that then causes some other element to actuate the apparatus.

In a particularly preferred embodiment, however, the actuator comprises a (manual) foot pump. In that case, the user actuating the foot pump directly provides the actuation  
5 force to move fluid from the fluid reservoir and out of the dispensing arrangement. This has been found to provide sufficient actuation force to cause the fluid to move through the apparatus and out of the dispensing arrangement. This also beneficially avoids a user having to touch the actuator with their hands, and thus avoids the risk of the actuator harbouring germs that can transfer from user to user. As will be appreciated, providing  
10 actuation through a foot pump may simplify operation of the apparatus for a user, e.g., as a user would not need to sit, kneel or bend down to clean the toilet bowl. This may be particularly advantageous for users having mobility impairments, such as elderly users, who may otherwise find it difficult to clean a toilet bowl and/or achieve substantially uniform application of a cleaning fluid to a toilet bowl.

In a particularly preferred embodiment, the foot pump actuator and fluid reservoir  
15 are mounted on a single (common) structure, e.g. base plate. This reduces part count and hence facilitates installation. This may also allow a more direct transfer of pressure from the foot pump to the reservoir. That is, the apparatus may comprise a housing or base plate, wherein the a fluid reservoir and the foot pump may be provided together by the  
20 housing or base plate. Accordingly, in use, the fluid reservoir may be adjacent to the foot pump on the floor so as to be below the dispensing arrangement which is fit inside the toilet (e.g. under the toilet rim). Other arrangements would however be possible.

As will be appreciated, by providing the fluid reservoir below the dispensing  
arrangement and in particular below the one of more apertures, the majority or  
25 substantially all of the fluid which remains in the dispensing arrangement after an actuation of the foot pump (i.e. fluid which has not been dispensed) will preferentially flow under gravity back towards the fluid reservoir, which may reduce or prevent undesired leaking of the fluid out through the one or apertures between actuations when dispensation is not desired. Moreover, the housing may thus be conveniently positioned on the floor adjacent  
30 the toilet without requiring complex installation. On the one hand, as will also be appreciated, by providing the fluid reservoir below the dispensing arrangement in use, a greater pressure is required to be applied to the fluid so as to overcome the gravitational potential as compared to if the reservoir were provided above the dispensing arrangement (wherein action under gravity would facilitate movement of the fluid from the fluid reservoir

to the dispensing arrangement). On the other hand, however, the present inventors have recognised that by advantageously providing the actuator in the form of a foot pump together with the fluid reservoir, a user is more easily able to achieve the required pressure such that fluid passes from the fluid reservoir to the dispensing arrangement to then out  
5 through the one or more apertures into the toilet bowl, as a foot pump requires less the effort needed while actuating because as user is able to apply their weight to the foot pump when actuating, e.g. whilst standing on it with to apply a substantial portion of the user's bodyweight.

As will be explained further below, the apparatus preferably further comprises one  
10 or more internal valves to prevent fluid and/or air being sucked in through the dispensing arrangement to the fluid reservoir.

It is believed that this actuator arrangement is novel and inventive in its own right, e.g., and in particular, independently of the configuration of the dispensing arrangement.

According to a second aspect there is provided an apparatus for dispensing  
15 cleaning fluid into a toilet, the toilet having a toilet bowl and a rim defining an opening to the toilet bowl, the apparatus comprising:

a fluid reservoir for storing a supply of cleaning fluid;  
an actuator operatively associated with the fluid reservoir; and  
a dispensing arrangement configured to fit inside the toilet and dispense cleaning  
20 fluid into the toilet bowl in response to a user actuating the actuator, wherein actuation of the actuator causes fluid to move from the fluid reservoir to the dispensing arrangement, and out from the dispensing arrangement into the toilet bowl,  
wherein the actuator comprises a foot pump.

As will be appreciated by those skilled in the art, the apparatus according to the  
25 second aspect of the present invention can, and preferably does, comprise any one or more or all of the preferred and optional features of the first aspect of the present invention described herein, as appropriate.

The apparatus as described above, according to either the first or second aspects, can thus be installed onto a toilet. In response to a user actuating the actuator (e.g. pump),  
30 a pressure increase is preferably then generated that causes the cleaning fluid to move from the fluid reservoir to the dispensing arrangement and which pressure causes the dispensing arrangement to open to dispense cleaning fluid. For example, as mentioned above, the dispensing arrangement parts preferably include slits or valves that are designed to open under pressure to dispense the cleaning fluid.

The arrangements described above can therefore act to dispense relatively larger amounts of cleaning fluid, over larger areas of the toilet bowl, e.g. by suitable positioning of the dispensing arrangement. For example, the apparatus in preferred embodiments is capable of dispensing between 5ml and 100ml of cleaning fluid in a single actuation event, such as between 10ml and 70ml, or between 20ml and 60ml. In preferred embodiments, the apparatus is capable of dispensing at least 40ml of cleaning fluid in a single actuation event. That is, the effect of the preferred embodiments is to dispense at least 40ml of cleaning fluid in a single actuation event.

Thus, according to a third aspect, there is provided an apparatus for dispensing cleaning fluid into a toilet, the toilet having a toilet bowl and a rim defining an opening to the toilet bowl, the apparatus comprising:

- a fluid reservoir for storing a supply of cleaning fluid;
- an actuator operatively associated with the fluid reservoir; and
- a dispensing arrangement comprising an arrangement of tubing that is configured to fit inside the toilet below the rim of the toilet and to extend circumferentially around the toilet bowl, wherein the dispensing arrangement is configured to, in response to a user actuating the actuator, dispense at least 40ml of cleaning fluid into the toilet bowl. As will be appreciated by those skilled in the art, the apparatus according to the third aspect of the present invention can, and preferably does, comprise any one or more or all of the preferred and optional features of the first and second aspects of the present invention described herein, as appropriate.

The apparatus according to the second or third aspects the dispensing arrangement may, e.g., and preferably does, comprise an arrangement of tubing, e.g. similarly to the first aspect described above.

In that case, according to the apparatus of any of the first, second or third aspects, the arrangement of tubing is preferably configured such that the arrangement of tubing holds itself against the wall of the toilet in use. To facilitate this, as will be explained further below, a flexible and resilient element, e.g. a 'rod', may be included within the arrangement of tubing that helps the arrangement of tubing maintain its desired shape and biases the arrangement of tubing towards the wall of the toilet to hold the arrangement of tubing in position. Alternatively, it is also contemplated that the material properties of the tubing itself may facilitate the tubing holding itself against the wall of the toilet in use. Other arrangements would however be possible. For example, the arrangement of tubing may be held in place by a separate bracket or other mounting means.

According to the apparatus of any of the first, second or third aspects, when the dispensing arrangement comprises an arrangement of tubing, there is preferably provided means for adjusting the size of the arrangement of tubing to fit different sizes of toilet bowls. For example, the arrangement of tubing or dispensing arrangement may, and preferably does, comprise a re-sizable loop of tubing, wherein the loop is preferably defined by first and second overlapping tube portions, each tube portion having a respective first end that is connected to an inlet opening through which fluid from the fluid reservoir enters the arrangement of tubing and a respective second, free end that overlaps with the other of the tube portions to define the loop, wherein the first and second tube portions extend away from the inlet opening in opposite circumferential directions, and wherein the degree of overlap between the first and second tube portions can be adjusted in order to control the size of the loop of tubing.

The re-sizable loop may thus comprise an inlet opening for receiving fluid from the fluid reservoir into the loop, and wherein the re-sizable loop may be configured to: (i) reduce the loop size so as to be smaller than the rim of the toilet; and (ii) increase the loop size so as to be held against the wall of the toilet bowl underneath the rim of the toilet. That is, a user may reduce the size of the loop such that the loop is smaller than the rim of the toilet so that the loop may be laid loosely into the toilet bowl. A user may then increase the size of the loop whilst it is in the toilet bowl until the loop held against the wall of the toilet bowl by an interference fit, preferably just underneath the rim of the toilet. Advantageously, this may enable easy installation of the arrangement of tubing into a variety of different toilets having toilet bowls of different shapes and sizes.

The loop of tubing may comprise flexible and resilient tubing configured to be biased in outwards direction in response to an inwards force acting on the loop, such that the loop size is configured to be increased so as to be biased against the wall of the toilet bowl underneath the rim of the toilet such that the loop holds itself against the wall of the toilet. As will be understood, by providing the loop of tubing that may comprise or be formed from flexible and resilient tubing, the loop may be increased in size to such an extent as it is biased against the wall of the toilet bowl and holds itself in position under the action of its own bias arising from the flexible and resilient tubing. The present inventors have discovered that such an arrangement may enable the dispensing arrangement to be discretely positioned under the rim of a toilet preferably without the need for additional mounting brackets and still remain held against the toilet bowl during conventional flushing of the toilet bowl.

The loop of tubing may comprise a strong and flexible rod as described above, e.g. such as a carbon rod, on the interior thereof. The strong and flexible rod may help to keep the tubes firmly in place and prevent the loop of tubing from falling down further into the toilet bowl.

5           The loop of tubing may be formed from a carbon-fibre re-inforced material, e.g. such as a carbon-fibre reinforced polymer, which may also provide the required mechanical properties (e.g. being flexible but providing resilience) so as to help to keep the tubes firmly in place and prevent the loop of tubing from falling down further into the toilet bowl.

10           The arrangement of tubing may comprise: a first dispensing tube portion and a second dispensing tube portion, each of the first and second tube portions having an end for receiving fluid from the fluid reservoir and a free end, and wherein the arrangement of tubing is configured such that, when fitted inside the toilet, the first tube portion extends in a first circumferential direction around the toilet bowl and the second tube portion extends in a second circumferential direction around the toilet bowl opposite to the first  
15 circumferential direction; and a tube end connecting arrangement which may be configured to: (i) hold the free end of the second tube portion adjacent to the first tube portion so as to form the loop of tubing from the first and second tube portions; and (ii) enable the free end of the first tube portion to be slid along the second tube portion in the first circumferential direction to reduce the size of the loop, or in the second circumferential direction to  
20 increase the size of the loop. That is, the first dispensing tube portion, second dispensing tube portion, and tube end connecting arrangement together form the loop of tubing. The free end of the first tube portion can be slid along the second tube portion in the first circumferential direction to reduce the size of the loop such that the loop may be laid loosely into the toilet basin. A user can then slide the free end of the first tube portion  
25 along the second tube portion in the second circumferential direction to increase the size of the loop such that the loop is held or biased against the wall of the toilet bowl underneath the rim of the toilet, as described above.

30           Of course, providing the first dispensing tube portion, second dispensing tube portion, and tube end connecting arrangement together form the loop of tubing is only exemplary, relating to one preferred embodiment, and other examples would of course be possible. For example, rather than the tube end connecting arrangement described above, wherein the first and second tube portions are held adjacent to each other, it may also be possible for the first and second tube portions to mate with each other, e.g. in a telescopic arrangement, to define the re-sizable loop of tubing. Alternatively, a loop of tubing may be

provided by a single tube (although in this case it may not be possible to easily adjust the size of the loop). In that case, the ends for receiving fluid of the first and second receiving portions may be an aperture of the single tube. The ends for receiving fluid of the first and second receiving portions may then be provided by the same aperture of the single tube.

5           The free end of the first and/or second tube portions may be a closed end, such that fluid is not dispensed through the free end. For example, a stopper may be inserted into the free end to close the tube appropriately. The stopper may also be used to indicate correct orientation of the apparatus. For example, and in a preferred embodiment, the stopper may have some directionality, e.g. it may look like an arrow or pointer, which in  
10          turn indicates that the arrangement of tubing is facing the correct way to ensure optimised dispensing of cleaning fluid.

            More generally, the dispensing arrangement may comprise any suitable one or more indicators for indicating the orientation of the dispensing arrangement with respect to the toilet bowl such that the dispensing fluid is dispensed downwards into the toilet bowl  
15          during use. Thus, in embodiments wherein the dispensing arrangement comprises a first dispensing tube portion and a second dispensing tube portion, each of the first and second tube portions having a free end, the indicators may be solid pointers positioned substantially at or integral with the free ends. However, various other arrangements are contemplated in this regard.

20          As will be understood, the inlet opening for receiving fluid from the fluid reservoir of the re-sizable loop comprises the ends for receiving fluid from the fluid reservoir of the first and second dispensing tube portions.

            The inlet opening for receiving fluid from the fluid reservoir may comprise a rigid under-rim connector or may be in fluid communication with a rigid under-rim connector. As  
25          will be understood, the rigid under-rim connector may provide further mechanical support to the re-sizable loop. Moreover, the rigid under-rim connector may help to hide the re-sizable loop under the rim when the loop size has been increased so as to be held against the wall of the toilet bowl underneath the rim of the toilet (e.g. so that the loop is substantially out-of-view of a user of the toilet). Further, the rigid under-rim connector may  
30          help guide a user during installation for positioning of the loop within the toilet bowl relative to the rim.

            The apparatus may comprise a connection arrangement (i.e. transfer tubing) for fluidly connecting the fluid reservoir to the dispensing arrangement, wherein the connection arrangement (transfer tubing) may comprise: a primary connection tube; and a plurality of

secondary connection tubes fluidly connected to the primary connection tube, wherein each of the secondary connection tubes has a smaller diameter than the primary connection tube; wherein the primary connection tube is fluidly connected between the plurality of secondary connection tubes and the fluid reservoir and/or actuator, and plurality of secondary connection tubes are fluidly connected to the dispensing arrangement such that actuation of the actuator causes fluid to move from the fluid reservoir, through the primary connection tube, through the plurality of secondary connection tubes, to the dispensing arrangement, and out through the one or more apertures of the dispensing arrangement into the toilet bowl.

As will be understood, in situations where the toilet may have a toilet seat, by providing a primary connection tube fluidly connected to a plurality of secondary connection tubes of which each has a smaller diameter than the primary connection tube may enable the connection arrangement to fluidly connect the fluid reservoir to the dispensing arrangement without impeding the position of the toilet seat in the “down” position on the toilet rim. For instance, the toilet seat may have a number of toilet seat feet for supporting the seat platform of the toilet seat at a certain clearance above the toilet rim in the “down” position. The smaller diameter of the secondary connection tubes may enable the secondary connection tubes to fit under the toilet seat in the “down” position (i.e. within the clearance provided by the toilet seat feet), and as there are a plurality of secondary connection tubes, the total flow volume per unit of fluid through the smaller secondary connection tubes together may be similar or substantially the same as the flow volume per unit of fluid through the primary connection tube, such that the flow volume may remain substantially constant throughout the connection arrangement.

In a preferred embodiment, the plurality of secondary connection tubes may consist of two or more, and preferably three or more secondary connection tubes (in a particularly preferred embodiment there are three secondary connection tubes).

In embodiments comprising a rigid under-rim connector as described above, the plurality of secondary connection tubes may be fluidly connected to the dispensing arrangement by the rigid under-rim connector.

The apparatus may comprise a connection hub between primary connection tube and secondary connection tubes so as to fluidly connect the primary connection tube with the plurality of secondary connection tubes.

Other suitable arrangements would be possible in this regard. For instance, rather than having a primary connection tube connecting to a plurality of smaller secondary

connection tubes, the primary connection tube may connect into a secondary connection tube having a different, e.g. flatter, cross-sectional shape that is able to fit underneath of the toilet seat whilst still ensuring adequate flow volume. Or, the entire connecting tube may have the same cross-sectional shape that is able to fit underneath of the toilet seat.

5 Various other arrangements would of course be possible.

The connection hub may further comprise releasable attachable means configured to releasably attach the connection hub to the toilet. Providing the releasable attachable means as part of, or integral with, the connection hub may mechanically strengthen the connection between the primary connection tube and the secondary connection tubes and  
10 may protect the connection during manipulation by a user and use, which may accordingly help reduce leaks. Of course, in alternative embodiments herein, the releasable attachable means need not be provided with or at the connection hub. For instance, the releasable attachable means may be provided along the primary connection tube so as to releasably attach the primary connection tube to the toilet, and/or along one or more of the plurality of  
15 secondary connection tubes so as to releasably attach said one or more of the plurality of secondary connection tubes to the toilet.

In embodiments, the connection hub and/or primary connection tube and/or one or more of the plurality of secondary connection tubes may comprise securable means configured to fixedly secure the connection hub and/or primary connection tube and/or said  
20 one or more of the plurality of secondary connection tubes to the toilet.

The releasable attachable means may comprise: an anchor comprising adhesive pads configured adhere the anchor to the toilet; and a fixation means configured to releasably attach to the anchor.

The anchor may comprise a protuberance, and the fixation means may comprise a  
25 strap, the strap including one or more apertures therethrough, wherein the protuberance is configured to penetrate through an aperture of the one or more apertures so as to releasably attach the strap to the anchor.

The fluid reservoir may comprise an opening for receiving fluid and cap for closing the opening.

30 The cap may comprise a valve configured to prevent fluid and/or gas from leaking out of the reservoir through the opening when the cap closes the opening whilst also enabling actuation of the actuator to cause fluid to move from the fluid reservoir to the dispensing arrangement. That is, the reservoir preferably has a one way valve which may be configured to prevent fluid leaking out of reservoir whilst enabling exterior air to enter

the fluid reservoir to equilibrate pressure between the fluid reservoir and the exterior during actuation of the actuator (i.e. to re-prime the actuator and fluid reservoir). As such, this may enable the use or provision of relatively stronger cleaning fluids (e.g., such as neat cleaning product or chemical such as bleach, that bleach which is non-diluted with water) without the associated risk of such stronger cleaning fluids or gases released therefrom leaking out of the fluid reservoir. As will be appreciated, the inventors have recognised that providing an apparatus having the dispensing arrangement combined with the described valve that may be advantageously deliver smaller quantities of stronger cleaning fluid at a greater frequency without the risk associated for a user to apply the stronger cleaning fluid to the toilet bowl manually.

Of course, the valve need not be placed in the cap per se, but may instead be positioned in alternative positions of the fluid reservoir and still function in the manner described.

The fluid reservoir may comprise an opening for receiving fluid and cap for closing the opening, wherein the cap comprises a child-proof lock. As will be appreciated, this may prevent the fluid within the fluid reservoir from being easily accessible to children, which is particularly important in situations wherein the apparatus is used with e.g. cleaning fluid or strong cleaning fluid. In some embodiments the cap may additionally or alternatively comprise a one-way valve. Again, this can provide an important safety feature, as this prevents cleaning fluid leaking out if the apparatus were picked up by a child and turned upside down. The one-way valve may take any suitable and desired form. Preferably, it comprises a flexible, and preferably resilient, material that is operable and configured to seal against itself, in normal use, to cover the opening to the fluid reservoir (and hence the valve itself defines a 'cap' for the fluid reservoir). In that case, in order to re-fill the fluid reservoir, a suitable funnel may be used that can be inserted into the opening and pushed through the one-way valve in order to allow fluid to be introduced through the funnel into the body of the fluid reservoir.

Preferably, further internal valves are provided to prevent fluid and/or air being sucked in through the dispensing arrangement to the fluid reservoir. Various arrangements are contemplated in this regard. For instance, in some embodiments the form of apertures in the tubing arrangement may provide such function. However, it would also be possible to provide one or more additional internal valves for this purpose, and in preferred embodiments this is done. Thus, in preferred embodiments, the apparatus further includes internal valves for controlling the flow of fluid through the apparatus. Preferably, a first

internal valve is provided along the fluid path between the fluid reservoir and the actuator to prevent fluid (and/or air) having been moved or pumped from the fluid reservoir by the actuator returning into the fluid reservoir. A second internal valve is preferably provided to prevent fluid and/or air from being sucked back into the actuator from the dispensing arrangement. Any suitable arrangement of valves or other mechanism for ensuring effective actuation may be used as desired.

Preferably, these internal valves are associated with the fluid reservoir and are provided in the primary connection tube. Preferably, when the foot pump and fluid reservoir are mounted on a single structure, e.g. base plate, the internal valves (and connections to the primary connection tube) are provided within the footprint of the structure. This can therefore again provide a more compact apparatus and avoid risk of the connection arrangement being disturbed in use as it can be protected by the structure or housing that mounts the foot pump and fluid reservoir.

Thus, in preferred embodiments, transfer tubing for transferring fluid from the fluid reservoir to the dispensing arrangement is provided (e.g. the primary connection tube), the transfer tubing being connected to the fluid reservoir via one or more internal valves to prevent backflow of fluid and/or air into the fluid reservoir. In that case, the internal valves are preferably provided within the footprint of single structure on which the foot pump and fluid reservoir are mounted. Various other arrangements would of course be possible in this regard.

At least a portion of the fluid reservoir may be formed from a transparent or partly transparent material. As will be appreciated, by forming at least a portion of the fluid reservoir from a transparent or partly transparent material, a user may be able to see how much fluid remains within the fluid reservoir, which may enable judgement of whether the fluid reservoir should be re-filled without having to open the cap or reveal the opening through which fluid is to poured. This may be particularly useful if the apparatus is to be used with e.g. stronger cleaning fluid such that potentially harmful gas may be released therefrom, such that it may be desirable to minimise the amount of times a user is required to open the fluid reservoir.

Subject to the particular requirements of the present invention, the apparatus may generally be made of any suitable and desired materials that are able to achieve the function described above. For example, the housing of the fluid reservoir may comprise a hard plastics material, whereas the various tubing (including in the dispensing arrangement where that comprises an arrangement of tubing) may comprise flexible materials which is

preferable highly resistant to chemical corrosion, such as a suitable polymer-based material, preferably reinforced with one or more strong rod(s) as described above. The materials selected should, and therefore preferably are, selected as being capable of safely holding the cleaning fluid, whatever that is. Various suitable materials are known in this regard and various arrangements would be possible.

The apparatus may generally be provided as a kit of parts for installing onto a toilet seat. That is, as mentioned above, the apparatus may be retrofitted onto existing toilets. In some cases, a toilet seat may not have toilet seat feet for supporting the seat platform of the toilet seat at a certain clearance above the toilet rim in the “down” position. In that case, the apparatus may be provided together with one or more feet that can be added to the toilet seat (or alternatively provided together with a suitable toilet seat).

According to a further aspect of the present invention, there is accordingly provided a kit for a toilet, the toilet having a toilet bowl, a rim defining an opening to the toilet bowl, and a toilet seat. The kit comprises: the apparatus described above (according to any of the embodiments or aspects described above); and one or more feet configured to be attached to the toilet seat so as to provide a clearance between the toilet seat and the rim when the toilet seat is in the down position, or one or more feet extensions configured to be attached to feet of the toilet seat so as to increase the clearance between the toilet seat and the rim when the toilet seat is in the down position. The kit of parts may comprise any other suitable and desired components that may be provided.

The present invention also extends to methods of using such apparatus or kit. According to a further aspect of the present invention, there is accordingly provided a method of using the apparatus described above (according to any of the embodiments or aspects described above) or the kit described above, the method comprising: a user actuating the actuator to cause cleaning fluid to move from the fluid reservoir to the dispensing arrangement for dispensing the cleaning fluid into the toilet bowl.

The present invention also extends to a method of installing such apparatus (according to any of the embodiments or aspects described above) or kit onto a toilet. The method comprises installing the dispensing arrangement within the toilet bowl. Either the dispensing arrangement is installed in connection with the fluid reservoir or the method may comprise a further step of connecting the dispensing arrangement to the fluid reservoir.

As well as standard, e.g. ‘sit-down’, toilet designs, the apparatus may also be configured for use with other similar systems, such as bidets, urinals, and the like.

Various other arrangements would of course be possible.

#### BRIEF DESCRIPTION OF THE DRAWINGS

5            Various embodiments will now be described, by way of example only, and with reference to the accompanying drawings in which:

Figure 1 shows an apparatus installed onto a toilet for dispensing cleaning fluid into the toilet according to an embodiment;

10           Figure 2A shows a top-down view of the apparatus initially placed in the toilet bowl of a toilet according to an embodiment;

Figure 2B shows a top-down view of the apparatus of Figure 2A installed in the toilet bowl of the toilet ;

Figure 3A shows a perspective view of a portion of the apparatus installed onto a toilet;

15           Figure 3B shows a different perspective view than that of Figure 3A of another portion of the apparatus installed onto a toilet according to an embodiment;

Figure 4A shows a side-on view of a portion of the apparatus releasably attached to an outer surface of the toilet, according to an embodiment;

20           Figure 4B shows a perspective view of the apparatus of Figure 4A with a portion of the apparatus released from the outer surface of the toilet;

Figure 5A shows another anchor configuration for releasably attaching a portion of the apparatus to an outer surface of the toilet;

Figure 5B shows the anchor configuration of Figure 5A in use;

25           Figure 6A shows a bottom-up view a portion of the apparatus according to an embodiment;

Figure 6B shows a perspective view of a portion of the apparatus according to an embodiment;

Figure 6C shows a bottom-up view a portion of the apparatus according to another embodiment;

30           Figure 6D shows a perspective view of a portion of the apparatus according to an embodiment;

Figure 7A shows a funnel arrangement for use with the apparatus according to an embodiment; and

Figure 7B shows a cross-sectional view of the funnel arrangement.

## DETAILED DESCRIPTION

The present embodiments relate to an apparatus for dispensing cleaning fluid into a toilet. In particular, the present embodiments relate to an apparatus that is designed to dispense a relatively larger volume of cleaning fluid (such as 40ml or more in a single actuation event), over a larger area of the toilet.

Figure 1 shows an apparatus installed onto a toilet for dispensing cleaning fluid into the toilet according to an embodiment. As shown in Figure 1, the apparatus can be installed onto a standard toilet. The toilet comprises a toilet bowl 10 that is filled with water and connected to the sewage system. The toilet further comprises a rim 12 that defines the opening into the toilet bowl 10. In the normal way, the toilet also comprises a toilet seat cover 14 that sits on top of the rim 12 in use and a toilet seat lid 16 that can be used to close the toilet. As is usually the case, the toilet seat cover 14 and lid 16 are hingedly connected to the toilet, such that they can be opened/closed, as desired. The toilet seat cover 14 has a set of four toilet seat feet 18 for supporting the seat platform of the toilet seat cover 14 at a certain clearance above the toilet rim 12 in the “down” position.

The apparatus, as shown in Figure 1, includes a fluid reservoir 20 for storing cleaning fluid. The cleaning fluid may be bleach, for example, but in general may comprise any other suitable disinfectant and/or deodorizer, as desired. In Figure 1, the fluid reservoir 20 is arranged to be positioned on the floor, adjacent to the toilet. The fluid reservoir 20 is also associated with an actuator in the form of foot pump 22. When a user depresses the foot pump 22, this then generates a pressure that forces the cleaning fluid to move from the fluid reservoir 20 through the connection tubing 24 to a dispensing arrangement 26 installed within the toilet bowl, as will be described further below. As will be appreciated, the wall constituting the fluid reservoir 20 may be transparent or partly transparent such that a user is able to see into the fluid reservoir to see how much cleaning fluid remains. The foot pump 22 and the fluid reservoir 20 are mounted on a single base plate structure 30 such that the foot pump 22 and fluid reservoir 20 are provided as a single unit close to together, wherein the structure 30 as shown in Figure 1 constitutes the base of the single unit for placement on the floor.

The dispensing arrangement 26 is shown in more detail in Figures 2A-2B and 3A-3B and comprises an arrangement of flexible tubing that is designed to extend circumferentially around a significant portion, e.g. the entire circumference in Figures 2A-

2B and 3A-3B, of the toilet bowl, and that comprises one or more apertures 28 such as slits or openings or valves that are spaced around the arrangement of tubing and that are configured to open under pressure to dispense the cleaning fluid into the toilet bowl in response to a user actuating the actuator such that fluid is made to move from the fluid reservoir 20 to the dispensing arrangement 26. As shown in Figures 3A and 3B, the apertures 28 are slits 28 configured such that they extend in a direction perpendicular to the direction in which the tubing generally extends (i.e., the slits 28 extend circumferentially around the tubing for a part of the circumference). Of course, the slits 28 may be provided in an alternative arrangement, such as to extend parallel to the direction in which the tubing generally extends (i.e. the slits 28 extend longitudinally along the tubing for a small distance) as in the embodiment of Figure 1 (wherein the slits face downwards into the toilet bowl and are thus not visible). Although not visible, the slits 28 on the tube in Figure 1 increase in size as you move along the tube (i.e. they start small closest towards where fluid from the fluid reservoir 20 enters the dispensing arrangement 26 and increase in size along the dispensing arrangement 26). This is due to fluid dynamics and is a way to ensure that the first opening dispenses the same amount as the last opening (so as to avoid the scenario where a majority of the fluid would come out of the early openings and very little out of the openings further down the dispensing arrangement 26).

In Figures 2A and 2B, the dispensing arrangement 26 is formed of a resizable loop of tubing 32 and an under-rim connector 34, wherein the under-rim connector 34 receives fluid from the fluid reservoir 20 and passes it into the re-sizable loop 32, as will be discussed in more detail below. As shown in Figure 2A, the re-sizable loop 32 can be reduced in size so as to be smaller than the rim 12 such that the loop 32 can be laid loosely into the toilet bowl 10. As shown in Figure 2B, the re-sizable loop 32 can be increased in size so as to be held against the wall of the toilet bowl 10, preferably just underneath the rim 12 of the toilet such that the loop 32 is substantially out of view of a user of the toilet (e.g., as shown in the top-down view of the apparatus in the toilet in Figure 2B, the majority of the loop 32 is hidden by the rim 12). As shown in Figures 1 and 3A-3B, the loop 32 is biased against the wall of the toilet underneath the rim 12 such that loop holds itself against the wall of the toilet, e.g. without additional mountings required. This can be achieved by the re-sizable loop is formed from flexible and resilient tubing so that an outwards biasing force is exerted by the loop in response to an inwards force acting on the loop such as the contact force from the wall of the toilet when the loop 32 has been expanded in size.

Referring in particular to Figures 3A-3B, the loop 32 is formed from a first dispensing tube portion 32a and a second dispensing tube portion 32b which each extend in opposing circumferential directions around the toilet bowl, as indicated by the dashed arrows. Each of the first 32a and second 32b tube portions having an end for receiving fluid from the under-rim connector 34 (as shown in Figure 3B) and a free end 36a, 36b respectively (as shown in Figure 3A). The loop 32 also includes a tube end connecting arrangement 38 which holds the free end 36b of the second tube portion 32b adjacent to the first tube portion 32a whilst enabling the first tube portion 32a to be slid relative to the second tube portion 32b. If the first tube portion 32a is slid in the direction in which the first tube portion 32a extends (i.e. the upper of the two dashed arrows in Figure 3A), then the size of the loop 32 decreases. If the first tube portion 32a is slid in the direction in which the second tube portion 32b extends (i.e. the lower of the two dashed arrows in Figure 3A), then the size of the loop 32 increases. That is, the extent that the first 32a and second 32b tube portions overlap each other in around the circumference of the toilet bowl can be increased or decreased, whilst maintaining the loop structure via the tube end connecting arrangement 38 holding the free end 36b of the second tube portion 32b next to the first tube portion 32a. The dispensing arrangement 26 has one or more indicators 40 for indicating the orientation of the dispensing arrangement 26 with respect to the toilet bowl such that the dispensing fluid is dispensed downwards into the toilet bowl during use. The indicators 40 are shown as solid pointers at the free ends 36a,36b.

Referring back to Figure 1, the connection tubing 24, which fluidly connects the fluid reservoir 20 to the dispensing arrangement 26 (e.g. to the re-sizable loop 32 as shown in Figure 3B), is formed of a primary connection tube 24a and three secondary connection tubes 24b. That is, the primary connection tube 24a is fluidly connected to the reservoir 20, whereas the secondary connection tubes 24b are fluidly connected to the primary connection tube 24a and the dispensing arrangement 26. Each of the three secondary connection tubes 24b has a smaller diameter than the primary connection tube 24a such that the secondary connection tubes 24b can fit underneath the toilet seat 14 when it is in the "down" position without having the seat 14 cut off or impede fluid flow through the secondary connection tubes 24b to the fluid dispensing arrangement 26. That is, the secondary connection tubes 24b fit within the clearance between the rim and the seat 14 provided by the toilet feet 18. Moreover, by providing a plurality of secondary connection tubes 24b, e.g. three of them, the total flow volume per unit of fluid through the smaller secondary connection tubes 24b taken together may be similar or substantially the same

as the flow volume per unit of fluid through the primary connection tube, such that the flow volume may remain substantially constant throughout the connection arrangement. As shown in Figure 3B, a rigid under-rim connector 34 fluidly connects the secondary connection tubes 24b to the dispensing arrangement 26 (e.g., to the first 32a and second 32b tube portions in Figure 3B). The primary connection tube 24a is fluidly connected to the secondary connection tubes 24b at a connection hub 40.

Figures 4A and 4B show releasable attachable means 42 which is configured to releasably attach to the toilet. In particular, Figure 4A shows the releasable attachable means 42 as part of the connection hub 40 and attached to an outer surface of the toilet such that the primary connection tube 24a and secondary connection tubes 24b are substantially fixed in position relative to the toilet. As shown in Figure 4B, the releasable attachable means 42 comprises an anchor 44 and a fixation means 46 to releasably attach to the anchor 44, wherein the anchor 44 is adhered to the outside surface of the toilet by adhesive pads. In particular, the anchor 44 has a protuberance 48 and the fixation means 46 is a strap 46 including a number of apertures 50 therethrough. The protuberance 48 has a recess 48a about its circumference such that penetration of the protuberance 48 through one of the apertures 50 of the strap 46 attaches the strap 46 to the anchor 44 via positioning of the inner surface of the aperture 50 about the recess 48a. The protuberance 48 is also able to be pulled out of the aperture 50 (or rather, the user would pull the strap 46 away from the protuberance 48) when it is desired to remove e.g. the dispensing arrangement 26 from the toilet. By providing a plurality of such apertures 50 in the strap 46, the strap 46 may be attached to the anchor in a variety of orientations (e.g. at different angles with respect to the outer surface of the toilet, or at different relative vertical and/or horizontal positions) such that the apparatus is able to be conveniently fitted to toilets of a variety of different shapes and sizes.

Various other arrangements would be possible in this regard. For example, Figure 5A shows another possible form for a releasable attachable means 42' in which the connection hub 40' can be directly attached to a strap 46' that is designed to be mounted to the side of the toilet (as shown in Figure 5B). Thus, as shown in Figure 5A, the strap 46' includes a plurality of recesses 49a designed to receive a corresponding protrusion 49 provided on the connection hub 40'. Figure 5B then shows the in-use configuration in this example.

Referring again to Figures 1 and 2A-2B, the fluid reservoir 20 is shown with a cap 52 positioned within the opening of the reservoir for receiving fluid (i.e. the opening through

which a user may fill up the reservoir with fluid when empty). Whilst not essential, in this example the cap 52 comprises a one-way valve 54 which is configured to cover the opening to the reservoir 20 (i.e. such that the one-way valve 54 itself defines the cap covering the opening to the reservoir) and prevent fluid and/or gas released therefrom from leaking out of the reservoir 20 through the opening whilst also enabling actuation of the foot pump 22 to cause fluid to move from the fluid reservoir 20 to the dispensing arrangement 26 (i.e., lower pressure, which may induced within the fluid reservoir 20 in response to fluid being moved or pumped out of the fluid reservoir 20 to the dispensing arrangement 26, is released by action of the valve 54 enabling exterior air to then enter the reservoir to equilibrate the pressure between the reservoir 20 and the exterior). The valve 54 may generally take any suitable and desired form. For example, the valve 54 may comprise a flexible material that is designed to seal against itself. This can then prevent liquid leaking out, e.g. if the fluid reservoir 20 is turned upside down, and therefore provides an important safety feature. In some examples, instead of, or in addition to the one-way valve 54 covering the opening to the reservoir, a child-proof lock 56 may be provided which prevents or impedes a child (e.g. such as a relatively young child, such as a small child, such as a toddler or younger) from easily accessing the reservoir 20 or pushing anything through the one-way valve 54.

Figure 6A shows a bottom-up view of the single base plate structure 30 which provides the foot pump 22 and fluid reservoir 20 as a single unit close to together, and Figure 6B shows a perspective view of the foot pump 22 and associated tubing in isolation. As shown, the apparatus further includes one or more internal valves 58, 60 (e.g. one-way valves) for controlling the flow of fluid through the apparatus. In particular, a first internal valve 58 is located along the fluid path between the fluid reservoir 20 and the foot pump 22 so as to prevent fluid (and/or air) having been moved or pumped from the fluid reservoir 20 by the foot pump 22 from returning back into the fluid reservoir 20. In this example a second internal valve 60 is located downstream of the foot pump 22 so as to prevent fluid and/or air from being sucked back into the foot pump 22 from the dispensing arrangement 26. For instance, the second internal valve 60 is shown positioned between the foot pump 22 and the primary connection tube 24a. This can provide an improved operation. However, in some examples the second internal valve 60 may be omitted and this can still work well. Figure 6C shows an example that is similar to Figure 6A but wherein the second internal valve 60 is omitted. Figure 6D shows the corresponding foot pump and associated

tubing arrangement in isolation in this example. Various arrangements would be possible in this regard.

The valves 58, 60 (where provided) may alternatively be incorporated into the pump 22 itself (e.g. at respective inlet/outlets to the internal cavity defined with the pump 22).

5 As will be appreciated, the provision of such valves 58, 60 may enable or improve the pumping efficiency of the apparatus (i.e. the efficiency in moving fluid from the fluid reservoir 22 to and subsequently out from the dispensing arrangement 26 in response to actuation of the foot pump 22). As will also be appreciated, the valves 58,60 may be provided in embodiments comprising an alternative actuator (e.g. an actuator other than  
10 the foot pump 22). The valves may take many different forms (e.g. ball valve design, duck bill valve design, etc.).

The apparatus is preferably designed to be retrofitted onto an existing toilet. Thus, the apparatus may be provided as a kit of parts comprising the dispensing arrangement, the mounting bracket, the foot pump/fluid reservoir that can then be installed onto a toilet  
15 as described above. The kit of parts may also include cleaning fluid, such that the fluid reservoir can be re-filled over time. The kit of parts may also include toilet seat feet when the toilet seat does not have any feet to provide the required clearance (as described above), or toilet seat feet extensions (when the toilet seat does include feet) so as to increase the clearance between the toilet seat and the rim such that the dispensing  
20 arrangement 26 is able to be accommodated and fluidly connected to the reservoir 20 regardless of the form of the toilet seat of the toilet, e.g., such that the secondary connection tubes can fit within the clearance as described above. However, typically, the apparatus is sized and designed such that it can be used with the vast majority of toilet seats without modification.

25 The kit of parts may further comprise a funnel for introducing cleaning fluid into the reservoir. An example of this is shown in Figure 7A in which a funnel 70 is provided that is configured to push through the one-way valve 54 (i.e. the valve 54 that defines the cap 52 covering the opening of the fluid reservoir 20) to allow cleaning fluid to be introduced into the fluid reservoir 20 (e.g. when it is necessary to refill the apparatus). This is shown in  
30 more detail in Figure 7B which shows how the funnel 70 may be inserted through the one-way valve 54 to allow cleaning fluid to be introduced into the reservoir 20. For instance, as mentioned above, the one-way valve 54 generally comprises a flexible and resilient material that in normal use will seal against itself to cover the opening of the reservoir 20. However, as shown in Figure 7B, the funnel 70 is designed so that it can push through and

open the one-way valve 54 in order to allow the reservoir 20 to be refilled. As shown in Figure 7B, the funnel 70 also includes an air conduit 71 that allows air to escape the fluid reservoir 20 when cleaning fluid is being introduced via the funnel 70 (thus acting like a “snorkel”). This can then allow the user to more quickly and continuously fill the reservoir 20 (e.g. since without this air conduit 71 air cannot escape the reservoir 20 as cleaning fluid is introduced and so the reservoir 20 will not fill up, and so the cleaning fluid will remain trapped in the funnel 70).

In the examples above the dispensing arrangement comprises a flexible loop of tubing that extends around the entire circumference of the toilet bowl. In preferred embodiments, as shown best in Figure 3A and Figure 3B, this loop is defined by two overlapping tube portions (i.e. separate pieces of tubing that together define a re-sizable dispensing arrangement that extends around the entire circumference of the toilet bowl). Other arrangements would however be possible. For example, the dispensing arrangement may generally comprise a ‘C’ or ‘U’ arrangement of tubing, e.g. such that there may be a gap where no cleaning fluid is dispensed, but wherein the dispensing part still provides a more even distribution of cleaning fluid around the toilet bowl.

Thus, although the present invention has been described with reference to various embodiments, it will be understood by those skilled in the art that various changes in form and detail may be made without departing from the scope of the invention as set forth in the accompanying claims.

## Claims;

1. An apparatus for dispensing cleaning fluid into a toilet, the toilet having a toilet bowl and a rim defining an opening to the toilet bowl, the apparatus comprising:
- 5 a fluid reservoir for storing a supply of cleaning fluid;  
an actuator operatively associated with the fluid reservoir; and  
a dispensing arrangement comprising an arrangement of tubing that is configured to fit inside the toilet below the rim of the toilet and to extend circumferentially around the toilet bowl, the arrangement of tubing having one or more apertures that are arranged to
- 10 dispense cleaning fluid into the toilet bowl in response to a user actuating the actuator, wherein actuation of the actuator causes fluid to move from the fluid reservoir to the dispensing arrangement, and causes fluid that has passed from the fluid reservoir to the dispensing arrangement to then move out through the one or more apertures of the arrangement of tubing into the toilet bowl.
- 15
2. The apparatus of claim 1, wherein the sizing and/or spacing of apertures varies along the length of the arrangement of tubing.
3. The apparatus of claim 1 or 2, wherein the dispensing arrangement includes an
- 20 inlet opening through which fluid from the fluid reservoir enters the arrangement of tubing and wherein the apertures increase in size moving away from the inlet opening to provide a more uniform dispensing of fluid.
4. The apparatus of any of claims 1, 2 or 3, wherein the dispensing arrangement
- 25 extends around substantially the entire circumference of the toilet bowl.
5. The apparatus of any of claims 1-4, wherein the one or more apertures of the arrangement of tubing comprise slits or valves that are configured to open under fluid pressure to dispense cleaning fluid into the toilet bowl.
- 30
6. The apparatus of any preceding claim, wherein the actuator comprises a foot pump.
7. An apparatus for dispensing cleaning fluid into a toilet, the toilet having a toilet bowl and a rim defining an opening to the toilet bowl, the apparatus comprising:

a fluid reservoir for storing a supply of cleaning fluid;  
an actuator operatively associated with the fluid reservoir; and  
a dispensing arrangement configured to fit inside the toilet and dispense cleaning  
fluid into the toilet bowl in response to a user actuating the actuator, wherein actuation of  
5 the actuator causes fluid to move from the fluid reservoir to the dispensing arrangement,  
and out from the dispensing arrangement into the toilet bowl,  
wherein the actuator comprises a foot pump.

8. The apparatus of claim 6 or 7, wherein the foot pump and the fluid reservoir are  
10 mounted on a single structure.

9. The apparatus of claim 8, wherein transfer tubing for transferring fluid from the fluid  
reservoir to the dispensing arrangement is provided, the transfer tubing being connected to  
the fluid reservoir via one or more internal valves to prevent backflow of fluid and/or air into  
15 the fluid reservoir, and wherein the internal valves are provided within the footprint of the  
single structure on which the foot pump and fluid reservoir are mounted.

10. The apparatus of any preceding claim, wherein the arrangement of tubing is  
configured to hold itself against the wall of the toilet, preferably wherein a rod of flexible  
20 and resilient material is included inside the arrangement of tubing to bias the arrangement  
of tubing against the wall of the toilet bowl.

11. The apparatus of any preceding claim, wherein the arrangement of tubing  
comprises a re-sizable loop of tubing, wherein the loop is defined by first and second  
25 overlapping tube portions, each tube portion having a respective first end that is connected  
to an inlet opening through which fluid from the fluid reservoir enters the arrangement of  
tubing and a respective second, free end that overlaps with the other of the tube portions to  
define the loop, wherein the first and second tube portions extend away from the inlet  
opening in opposite circumferential directions, and wherein the degree of overlap between  
30 the first and second tube portions can be adjusted in order to control the size of the loop of  
tubing.

12. The apparatus of claim 11, wherein the first tube portion extends in a first  
circumferential direction around the toilet bowl and the second tube portion extends in a

second circumferential direction around the toilet bowl opposite to the first circumferential direction; and the arrangement of tubing further comprising a tube end connecting arrangement configured to:

- 5 (i) hold the respective second end of the second tube portion adjacent to the first tube portion so as to form the loop of tubing; and
- (ii) enable the free end of the first tube portion to be slid along the second tube portion in the first circumferential direction to reduce the size of the loop, or in the second circumferential direction to increase the size of the loop.

10 13. The apparatus of claim 11 or 12, wherein the inlet opening for receiving fluid from the fluid reservoir comprises a rigid under-rim connector.

14. The apparatus of any preceding claim, wherein the apparatus comprises a connection arrangement for fluidly connecting the fluid reservoir to the dispensing  
15 arrangement, wherein the connection arrangement comprises:

a primary connection tube; and

a plurality of secondary connection tubes fluidly connected to the primary connection tube, wherein each of the secondary connection tubes has a smaller diameter than the primary connection tube;

20 wherein the primary connection tube is fluidly connected between the plurality of secondary connection tubes and the fluid reservoir and/or actuator, and wherein the plurality of secondary connection tubes are fluidly connected to the dispensing arrangement such that actuation of the actuator causes fluid to move from the fluid reservoir, through the primary connection tube, through the plurality of secondary  
25 connection tubes, to the dispensing arrangement, and out through the one or more apertures of the dispensing arrangement into the toilet bowl.

15. The apparatus of claim 14, wherein the apparatus comprises a connection hub between primary connection tube and secondary connection tubes so as to fluidly connect  
30 the primary connection tube with the plurality of secondary connection tubes.

16. The apparatus of claim 15, wherein the connection hub further comprises releasable attachable means configured to releasably attach the connection hub to the toilet.

17. The apparatus of claim 16, wherein the releasable attachable means comprises:  
an anchor comprising adhesive pads configured adhere the anchor to the  
toilet; and  
5 a fixation means configured to releasably attach to the anchor.
18. The apparatus of claim 17, wherein the anchor comprises a protuberance, and the  
fixation means comprises a strap, the strap including one or more apertures therethrough,  
wherein the protuberance is configured to penetrate through an aperture of the one or  
10 more apertures so as to releasably attach the strap to the anchor.
19. The apparatus of any preceding claim, wherein the cleaning fluid comprises a  
detergent and/or deodorizer.
- 15 20. The apparatus of any preceding claim, wherein the fluid reservoir comprises an  
opening for receiving fluid and cap for closing the opening, the cap comprising a valve  
configured to prevent fluid and/or gas from leaking out of the reservoir through the opening  
when the cap closes the opening whilst also enabling actuation of the actuator to cause  
fluid to move from the fluid reservoir to the dispensing arrangement.  
20
21. The apparatus of any preceding claim, wherein the fluid reservoir comprises an  
opening for receiving fluid and cap for closing the opening, wherein the cap comprises a  
child-proof lock and/or a one-way valve.
- 25 22. The apparatus of any preceding claim, wherein at least a portion of the fluid  
reservoir is formed from a transparent or partly transparent material.
23. The apparatus of any preceding claim, wherein the dispensing arrangement is  
configured to dispense at least 40ml of cleaning fluid with a single actuation of the actuator.  
30
24. A method of using the apparatus of claims 1- 23, comprising a user actuating the  
actuator to cause fluid to move through the apparatus and dispense into the toilet bowl.

25. A method of installing the apparatus of claims 1- 23 onto a toilet comprising mounting the dispensing arrangement into the toilet bowl.

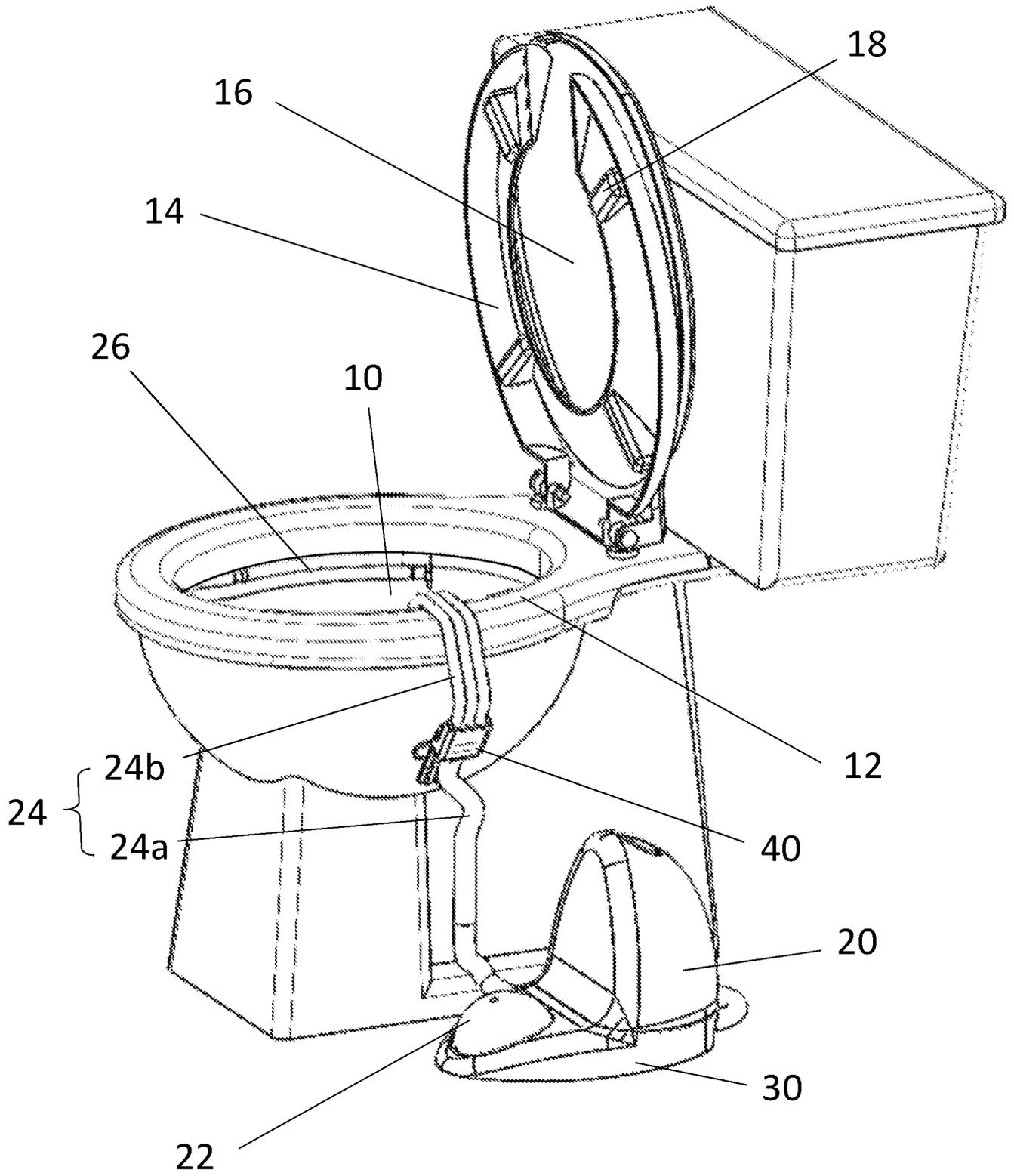


FIGURE 1

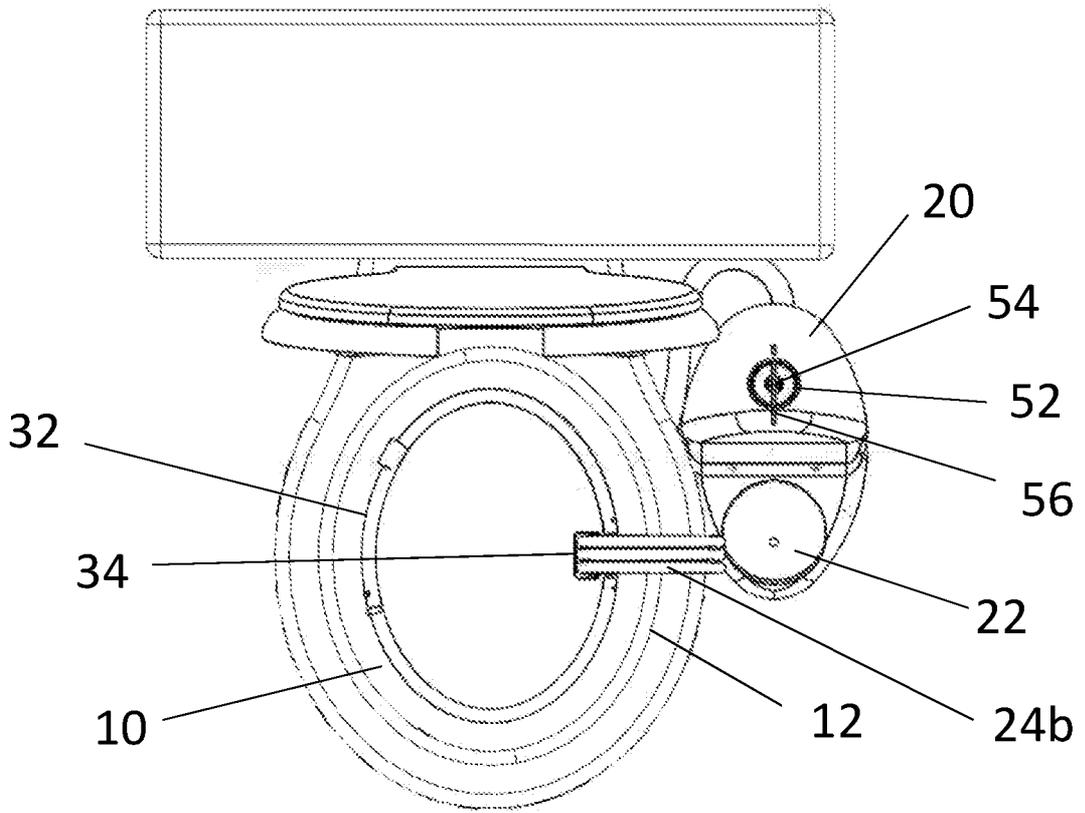


FIGURE 2A

22

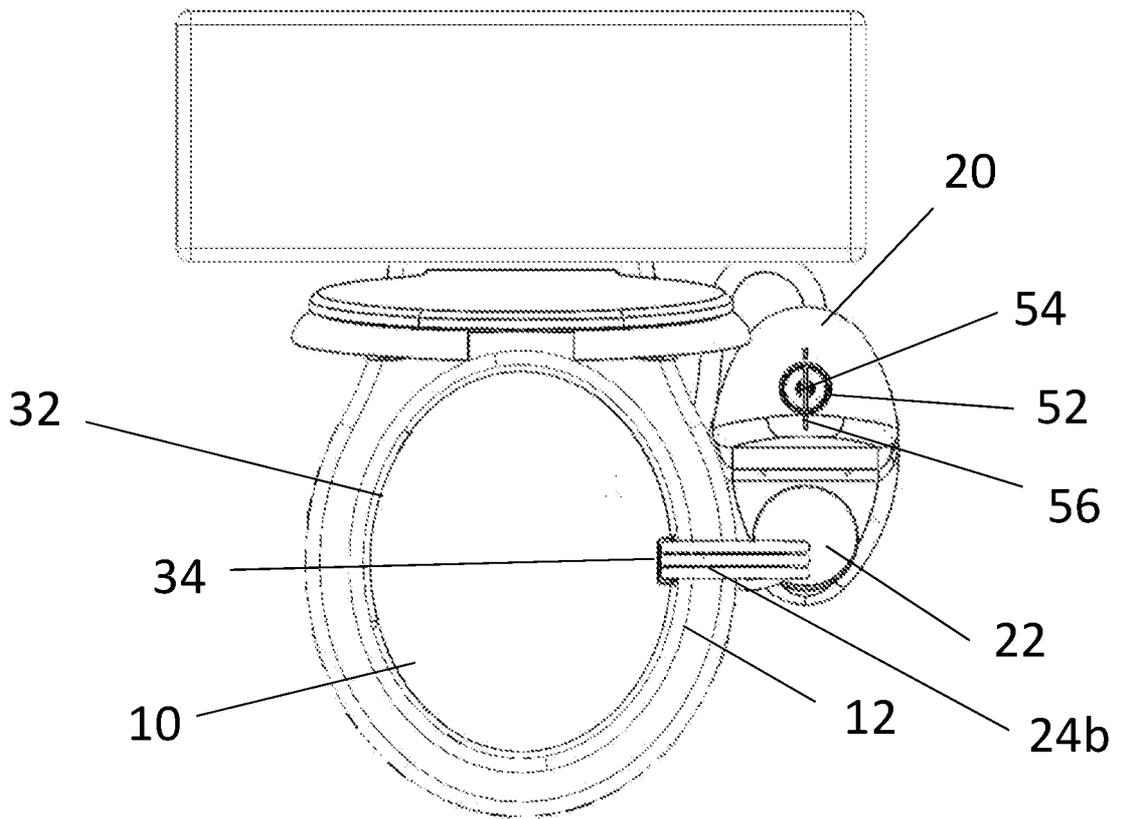


FIGURE 2B

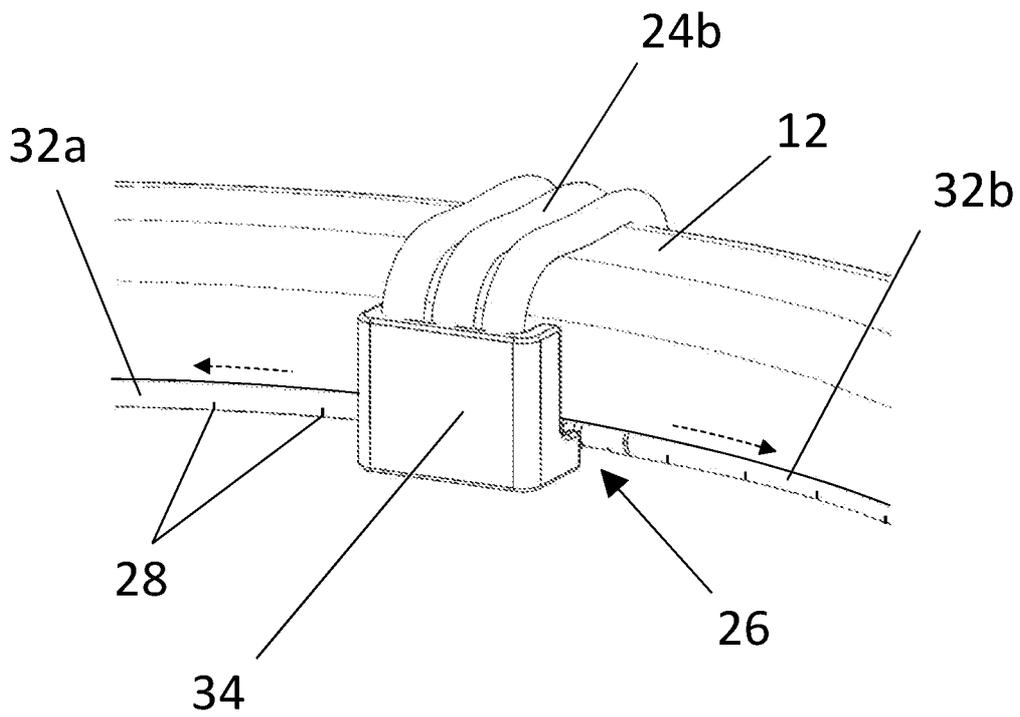
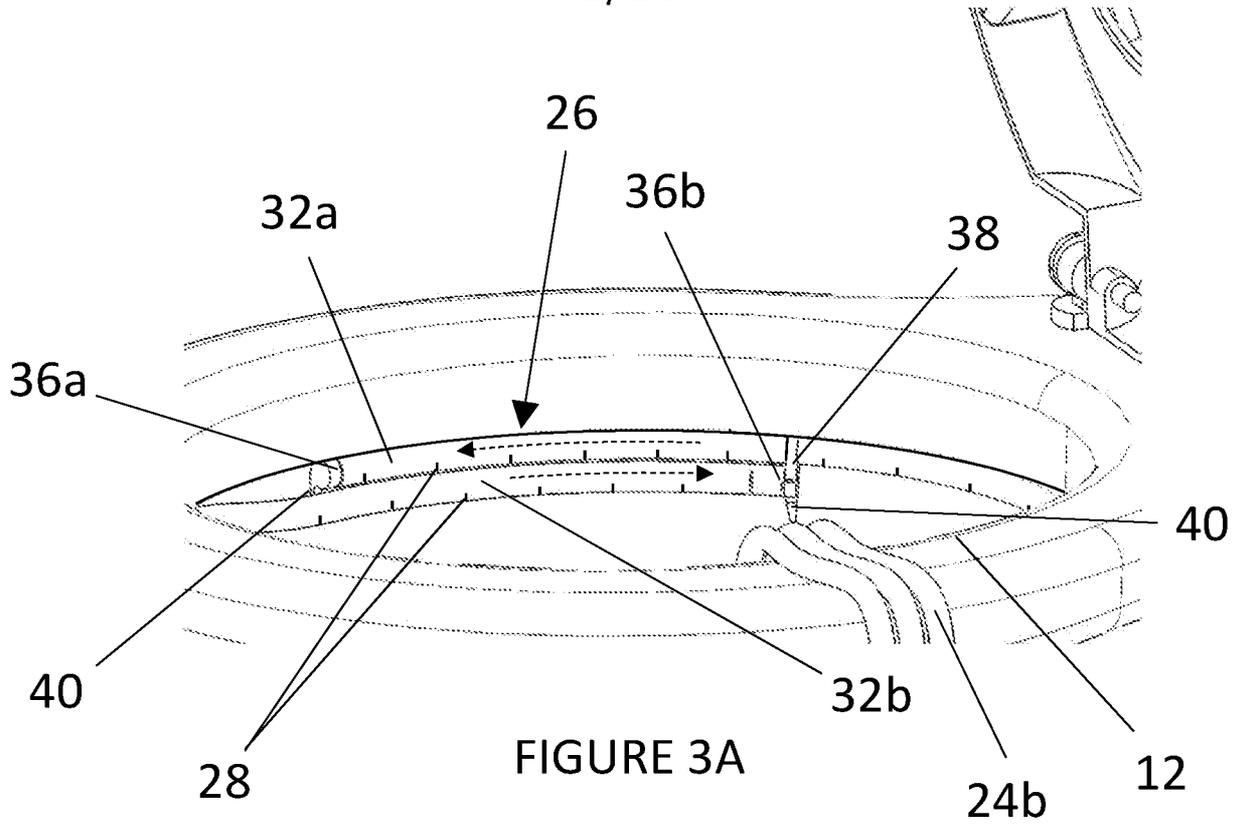
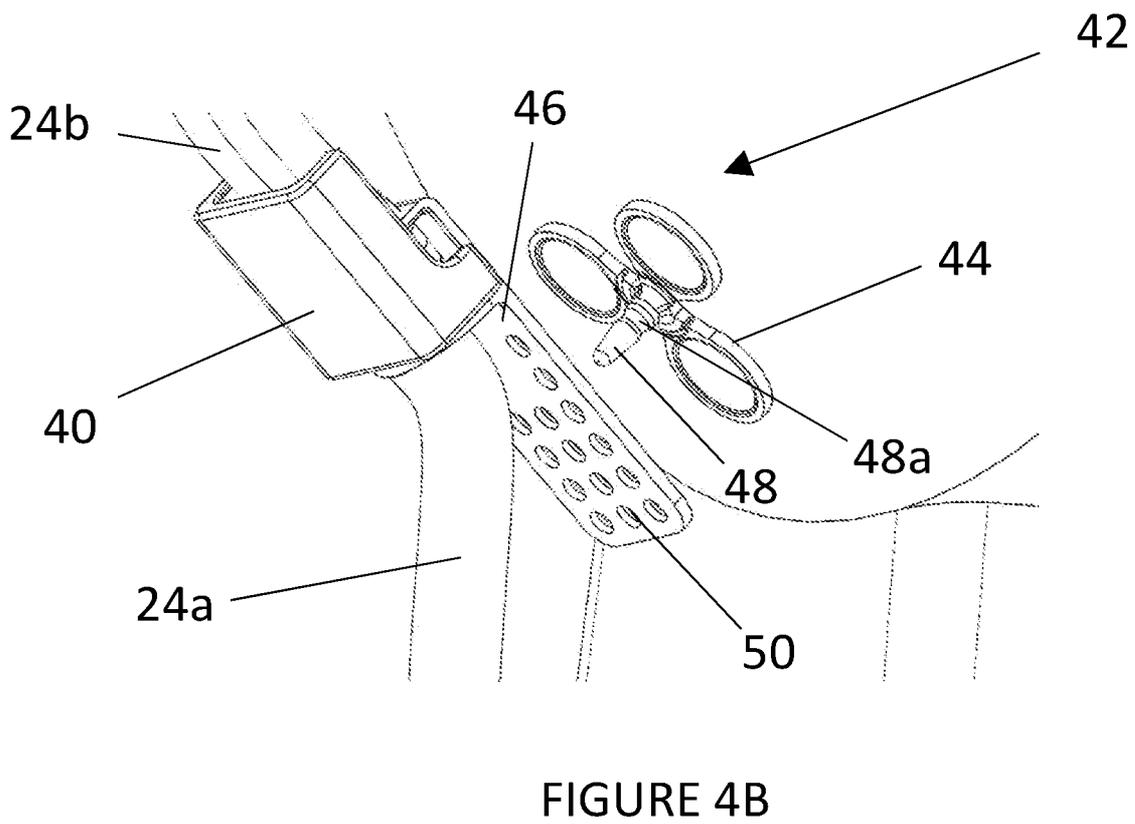
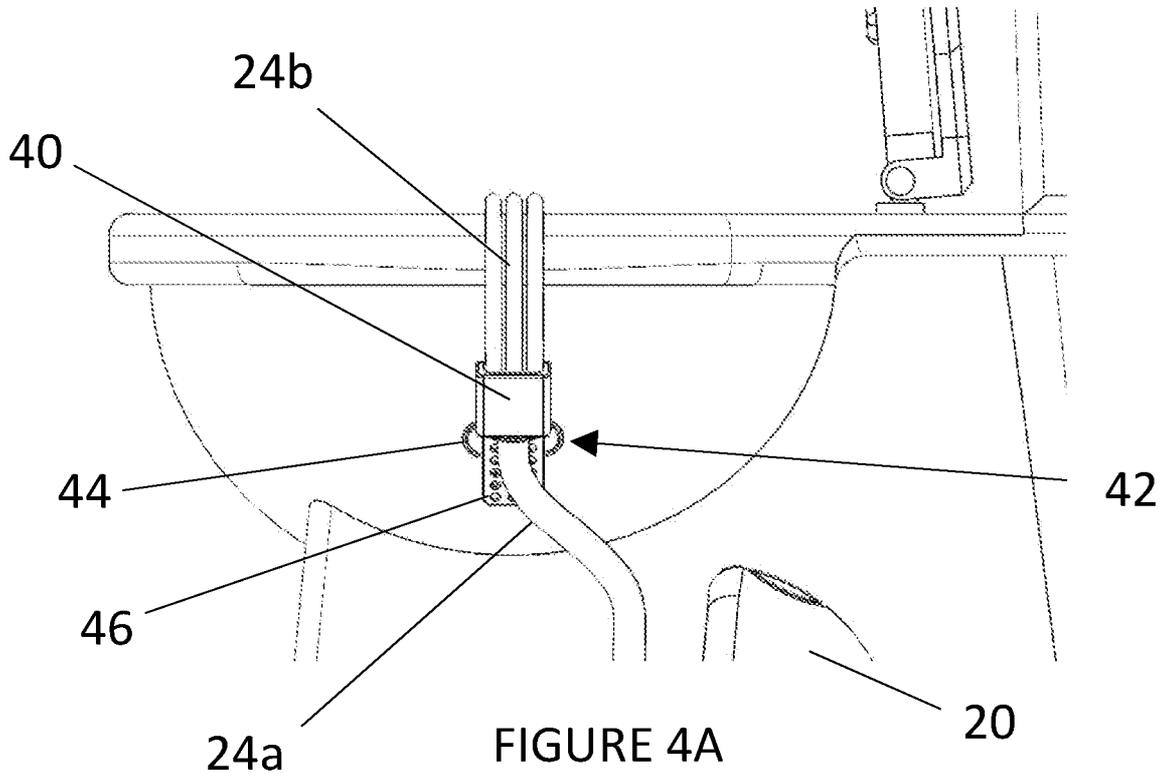


FIGURE 3B



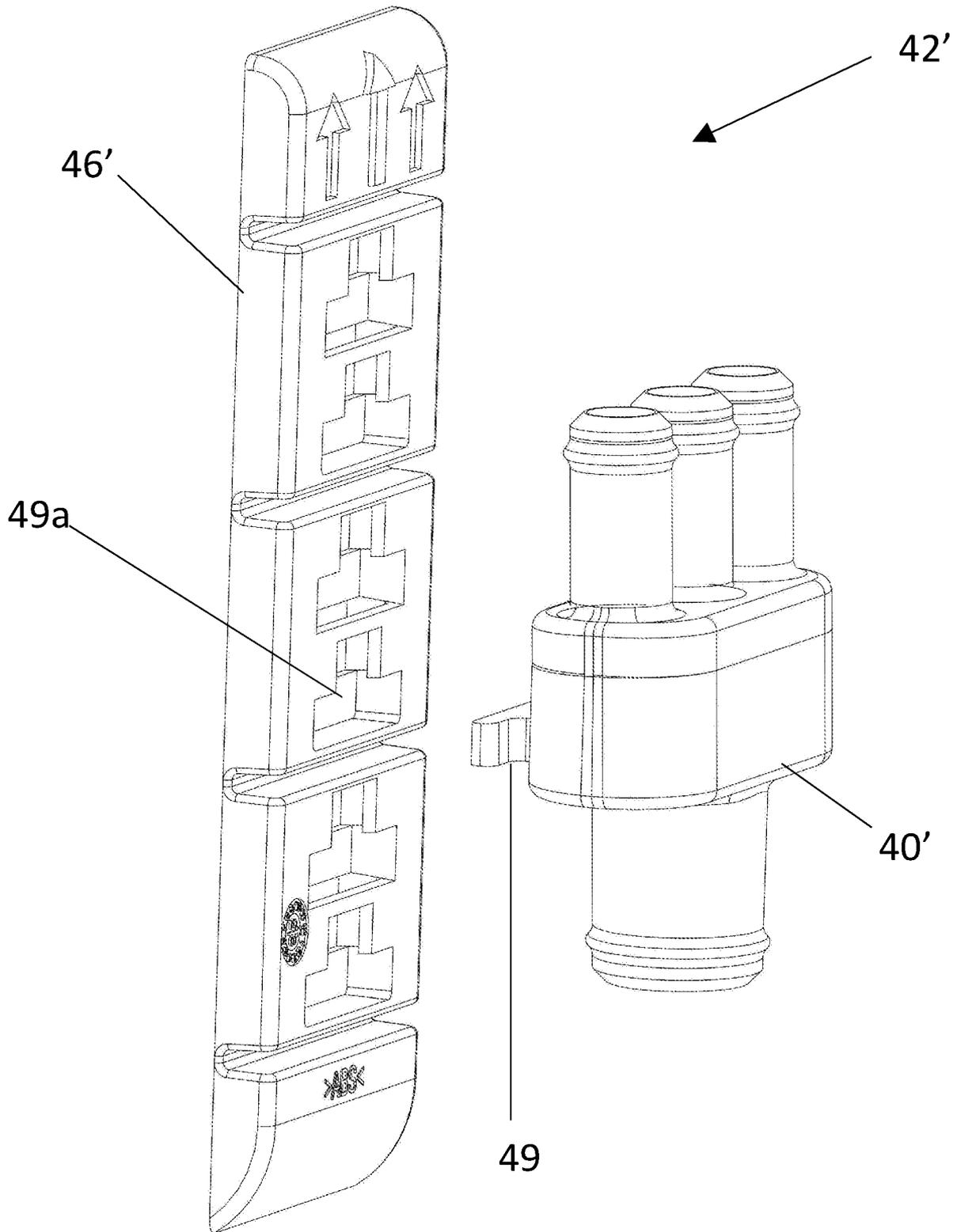


FIGURE 5A

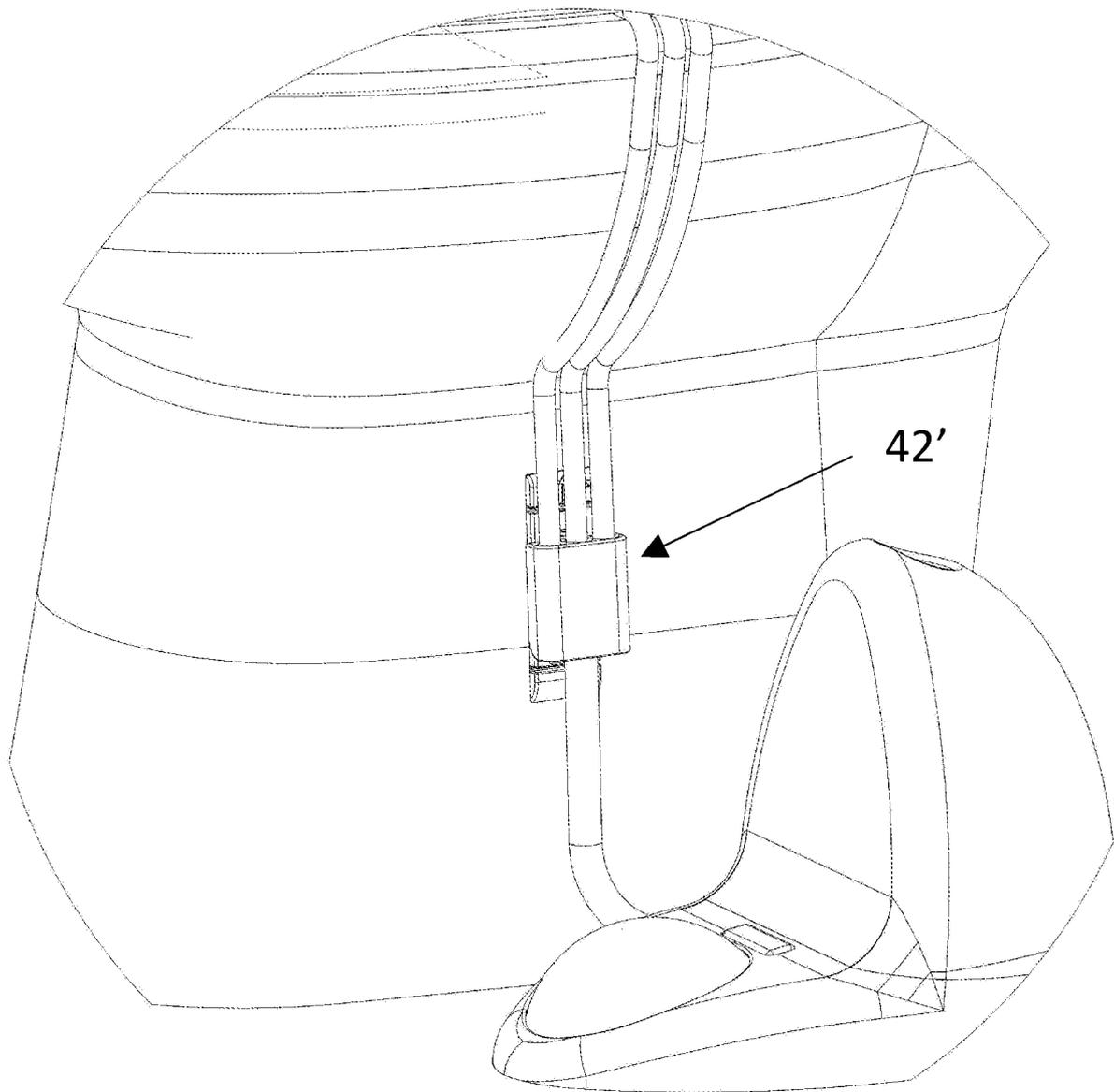


FIGURE 5B

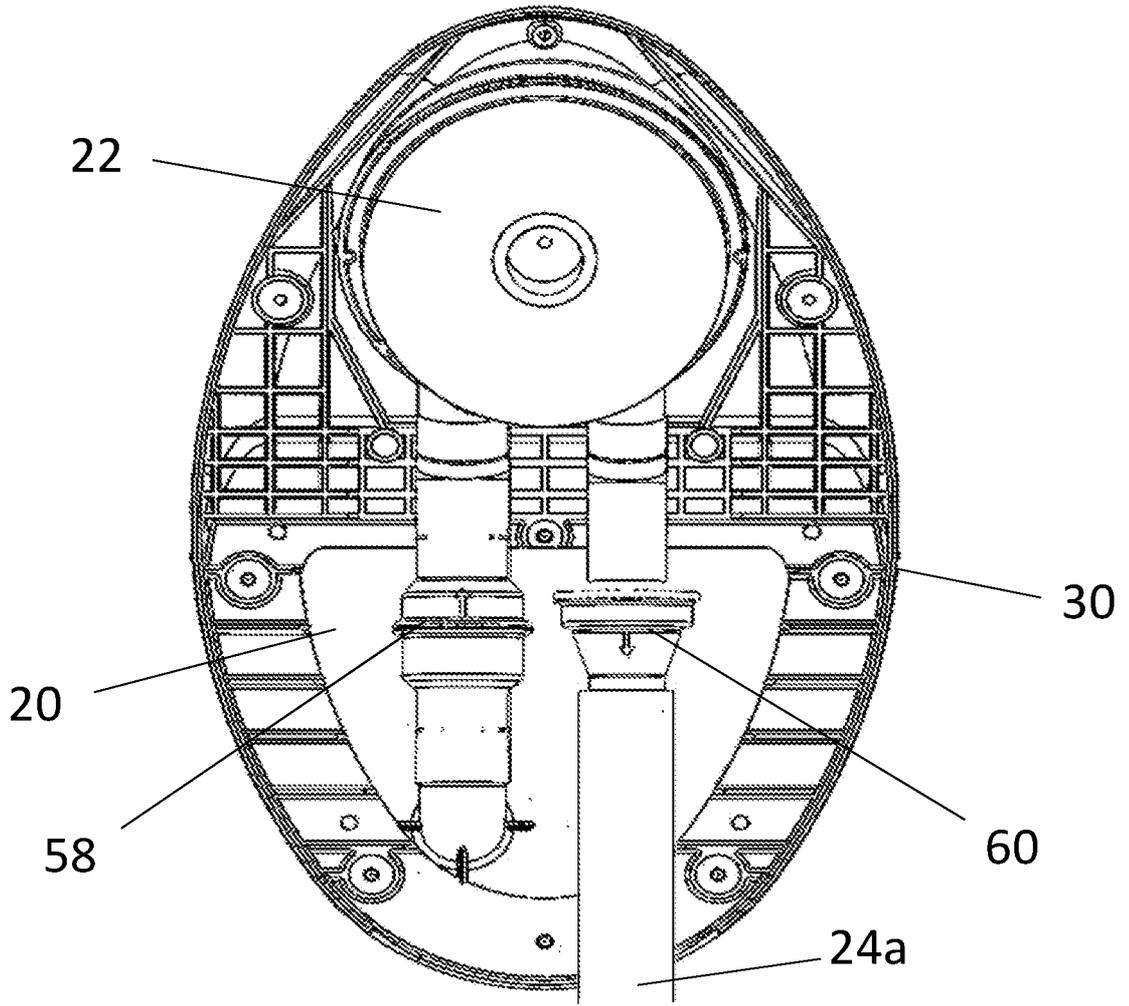


FIGURE 6A

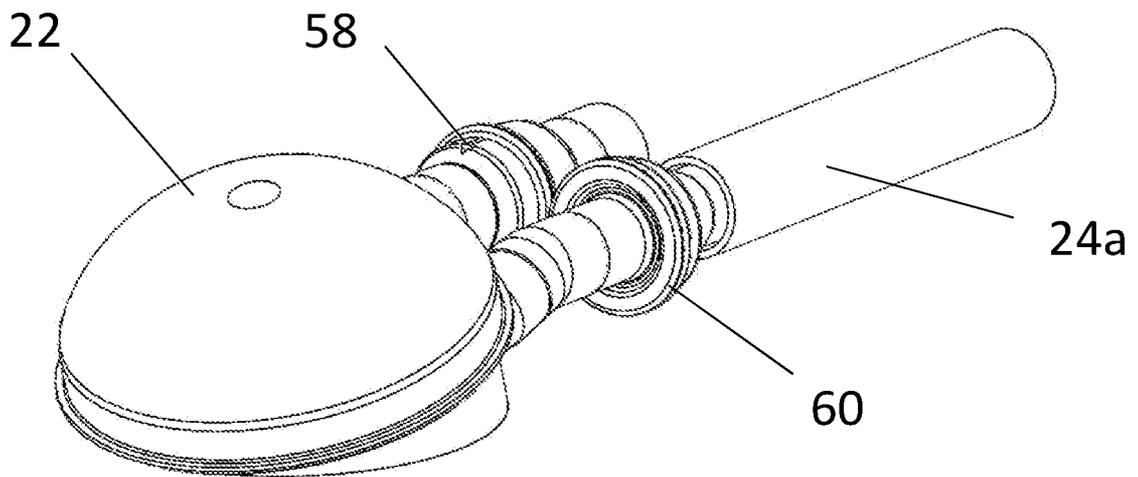


FIGURE 6B

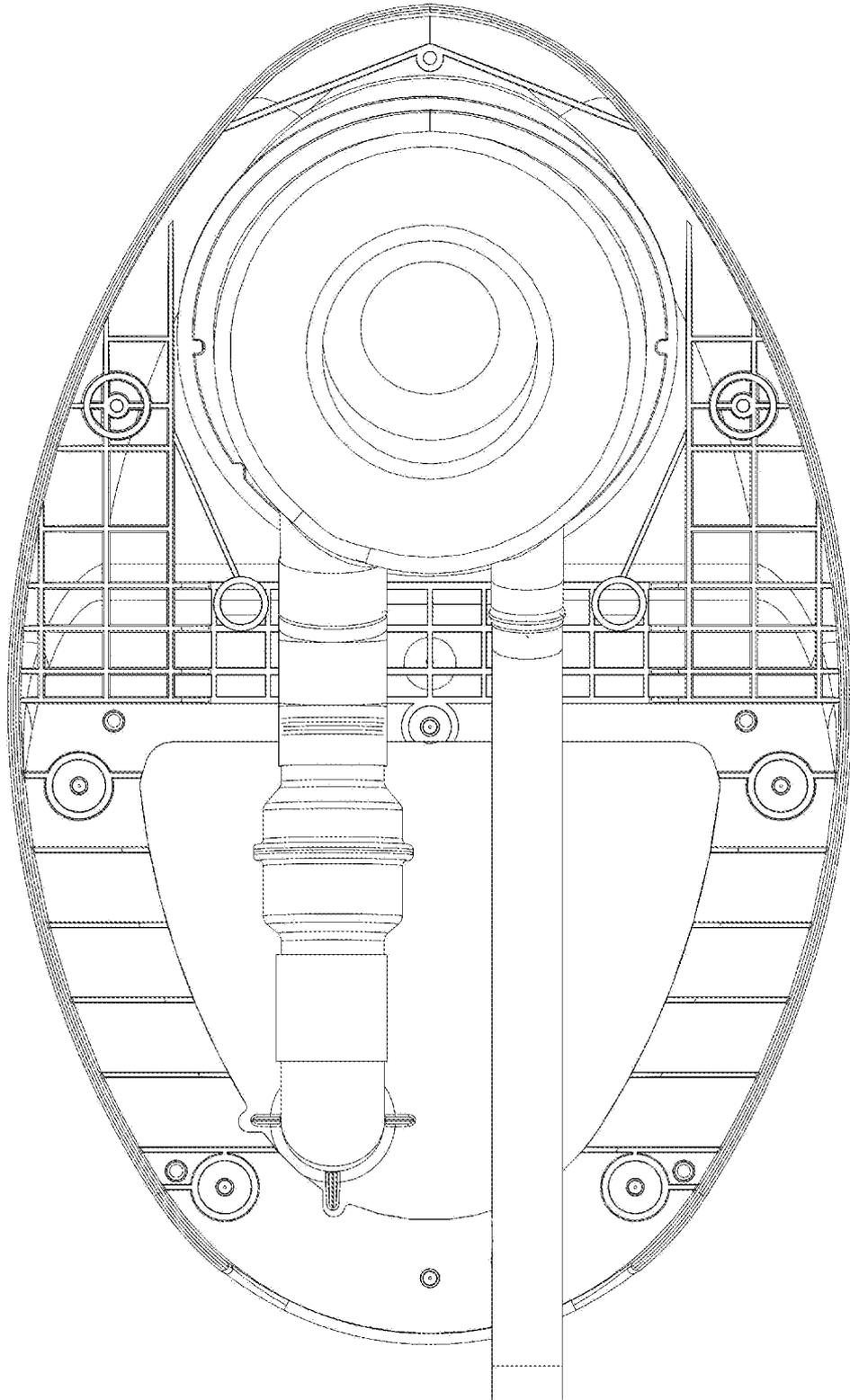


FIGURE 6C

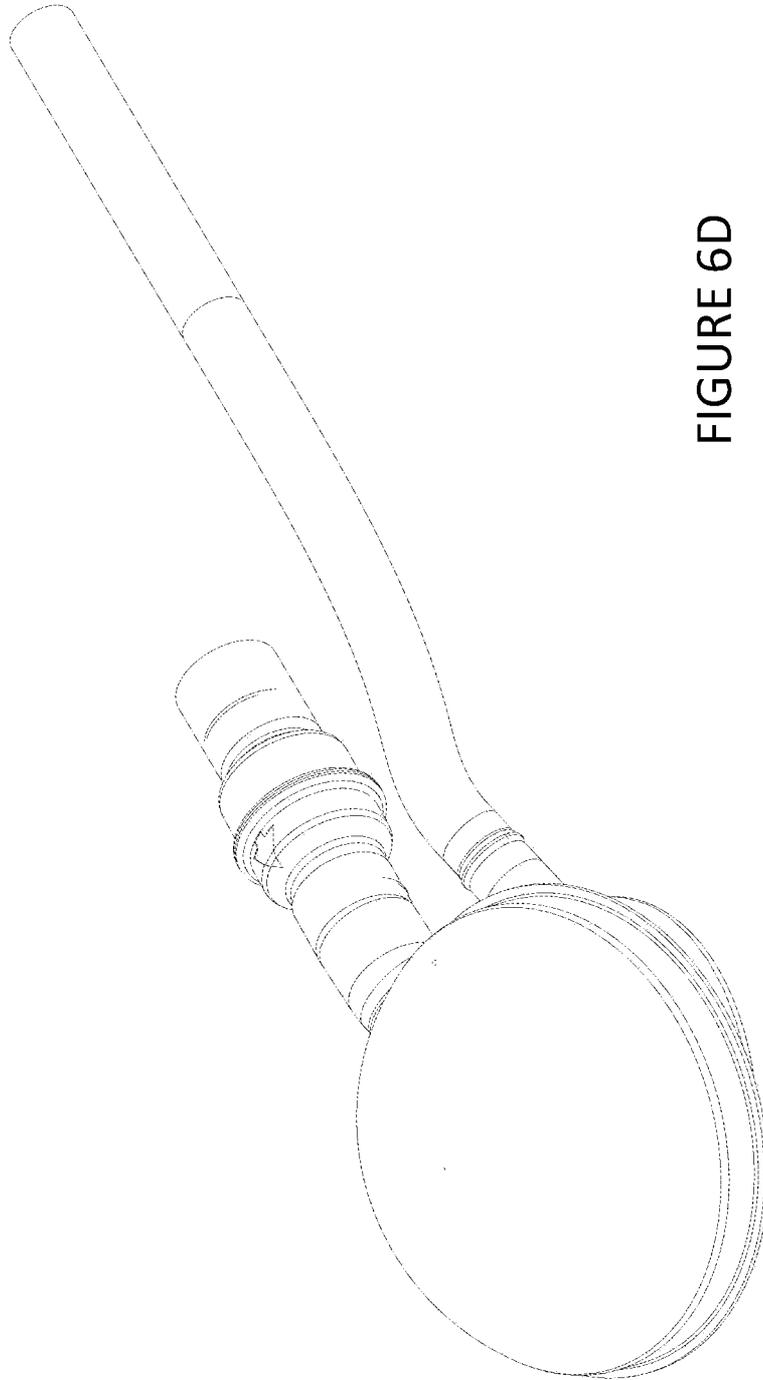


FIGURE 6D

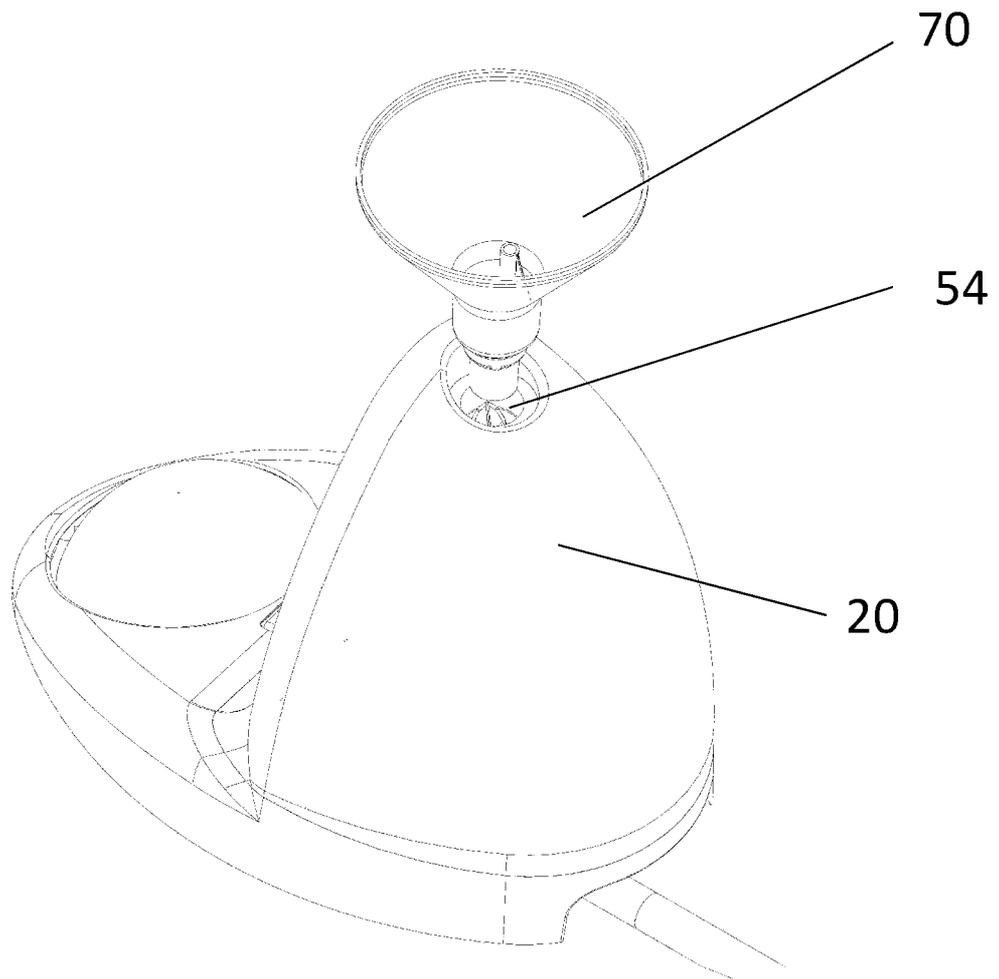


FIGURE 7A

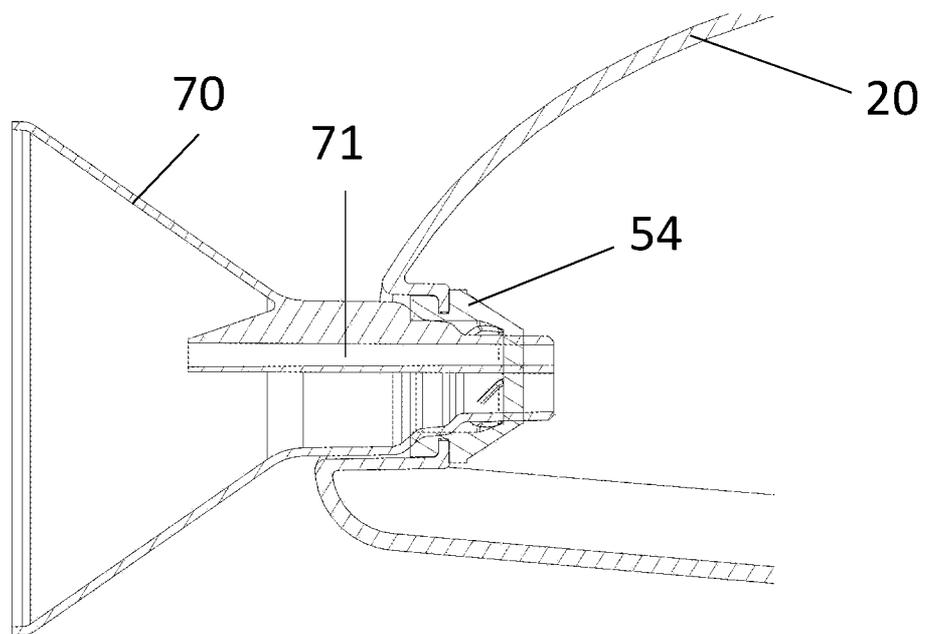


FIGURE 7B

# INTERNATIONAL SEARCH REPORT

International application No  
**PCT/GB2023/053289**

<b>A. CLASSIFICATION OF SUBJECT MATTER</b> <b>INV. E03D9/00</b> <b>ADD.</b>		
According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b>		
Minimum documentation searched (classification system followed by classification symbols) <b>E03D</b>		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) <b>EPO-Internal</b>		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
<b>X</b>	<b>GB 2 606 420 A (MICHAEL NICHOLS [GB])</b> <b>9 November 2022 (2022-11-09)</b>	<b>1, 2,</b> <b>4-10,</b> <b>19-25</b>
<b>Y</b>	<b>page 5 - page 9; figures 1-3</b>	<b>6-8</b>
<b>A</b>	-----	<b>3, 11-18</b>
<b>X</b>	<b>US 6 772 450 B1 (SAYLOR TOM [US] ET AL)</b> <b>10 August 2004 (2004-08-10)</b>	<b>1, 2, 4, 6,</b> <b>7, 9, 10,</b> <b>19-25</b>
<b>Y</b>	<b>the whole document</b>	<b>7, 8</b>
<b>X</b>	<b>CN 113 026 880 A (CHEN XUEQIN)</b> <b>25 June 2021 (2021-06-25)</b>	<b>1, 4, 10,</b> <b>19, 24, 25</b>
<b>Y</b>	<b>the whole document</b>	<b>6-9</b>
<b>Y</b>	<b>US 2022/381022 A1 (LESPERANCE JEFFERY</b> <b>BARON [US]) 1 December 2022 (2022-12-01)</b> <b>the whole document</b>	<b>6, 7, 9</b>
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<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <span style="margin-left: 200px;"><input checked="" type="checkbox"/> See patent family annex.</span>		
* Special categories of cited documents :		
"A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family	
Date of the actual completion of the international search	Date of mailing of the international search report	
<b>26 February 2024</b>	<b>28/03/2024</b>	
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer  <b>Horst, Werner</b>	

# INTERNATIONAL SEARCH REPORT

International application No

PCT/GB2023/053289

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	<b>GB 2 125 462 A (WHITING FRANK)</b> <b>7 March 1984 (1984-03-07)</b> <b>the whole document</b> -----	<b>8</b>

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

**PCT/GB2023/053289**

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
<b>GB 2606420</b>	<b>A</b>	<b>09-11-2022</b>	<b>NONE</b>
<b>US 6772450</b>	<b>B1</b>	<b>10-08-2004</b>	<b>NONE</b>
<b>CN 113026880</b>	<b>A</b>	<b>25-06-2021</b>	<b>NONE</b>
<b>US 2022381022</b>	<b>A1</b>	<b>01-12-2022</b>	<b>NONE</b>
<b>GB 2125462</b>	<b>A</b>	<b>07-03-1984</b>	<b>NONE</b>