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(56) Documents Cited:
WO 2010/147646 A1
FR 002779629 A1
US 4141524 A
US 20060255169 A1
FR 002889807 A1
US 5816457 A
US 20070012733 A1
US 20020115961 A1

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Other: **EPODOC, WPI.**

(54) Title of the Invention: **Hydration system**
Abstract Title: **A hand grip for the tube of a hydration system**

(57) A hydration system for providing fluid to a subject is provided, the system comprising a flexible tube **8** for extending between a reservoir of a liquid **4** and the mouth of the subject **12** and having a first end **10** for immersion in the reservoir of liquid and a second end **14**; a holder **16** releasably attached to a portion of the tube **8** between the first and second ends of the tube; and a mouthpiece connected to the second end of the tube and arranged to be held in the mouth of the subject when the subject is receiving liquid from the reservoir through the tube. The reservoir **4** may be a rigid container or a flexible bag or pouch. The holder **16** may have a hook portion **118** and a grip portion **104.**

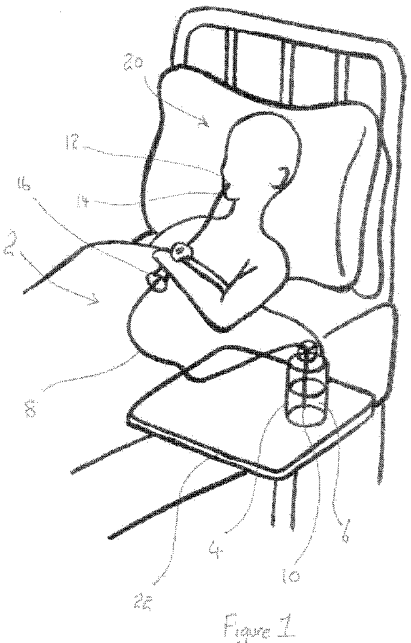

Figure 1

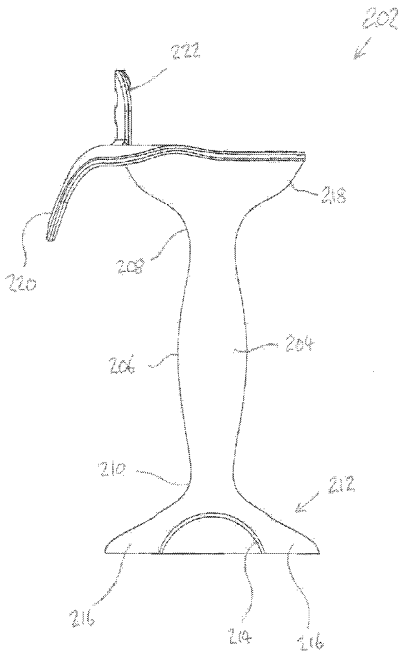

Figure 4

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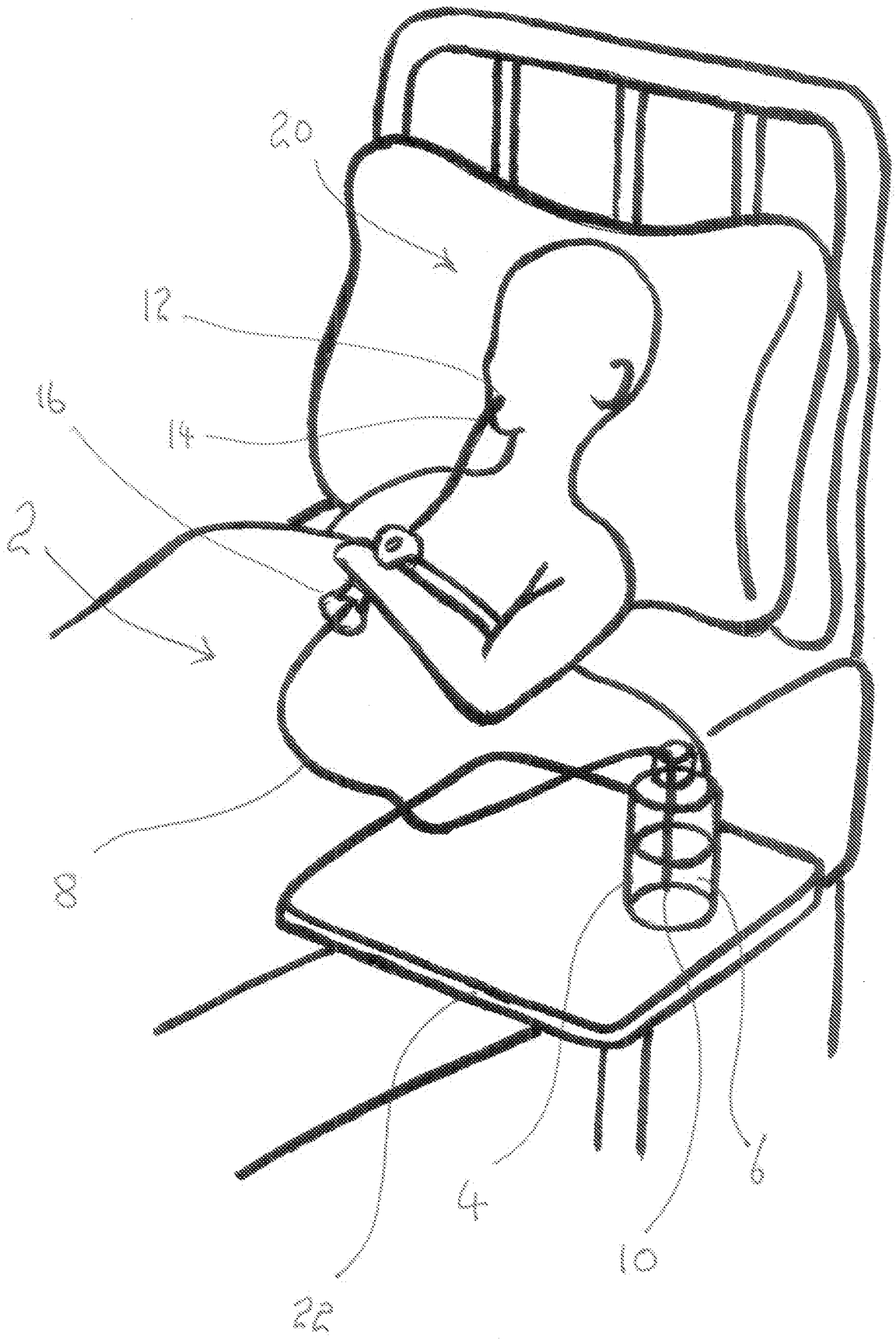


Figure 1

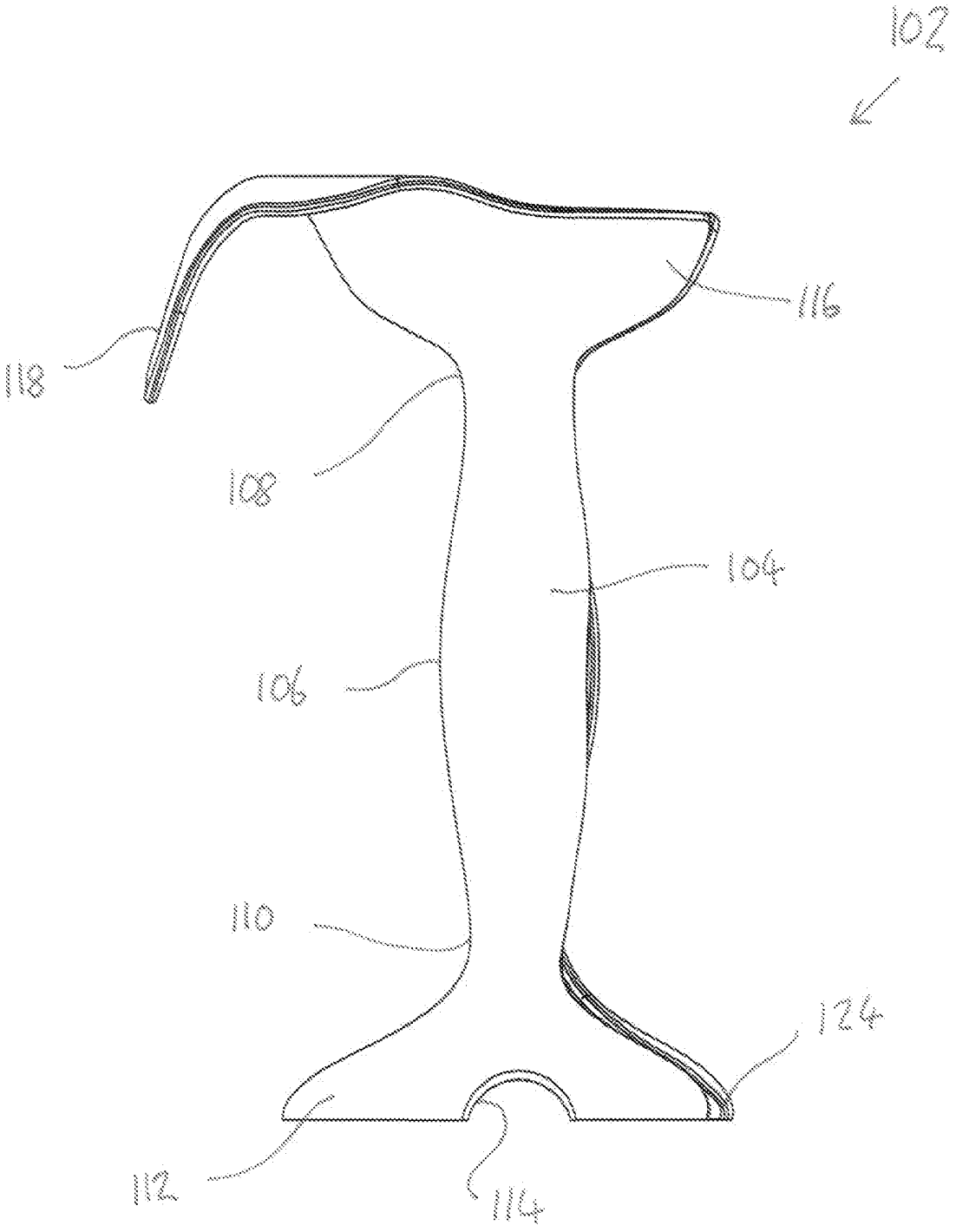
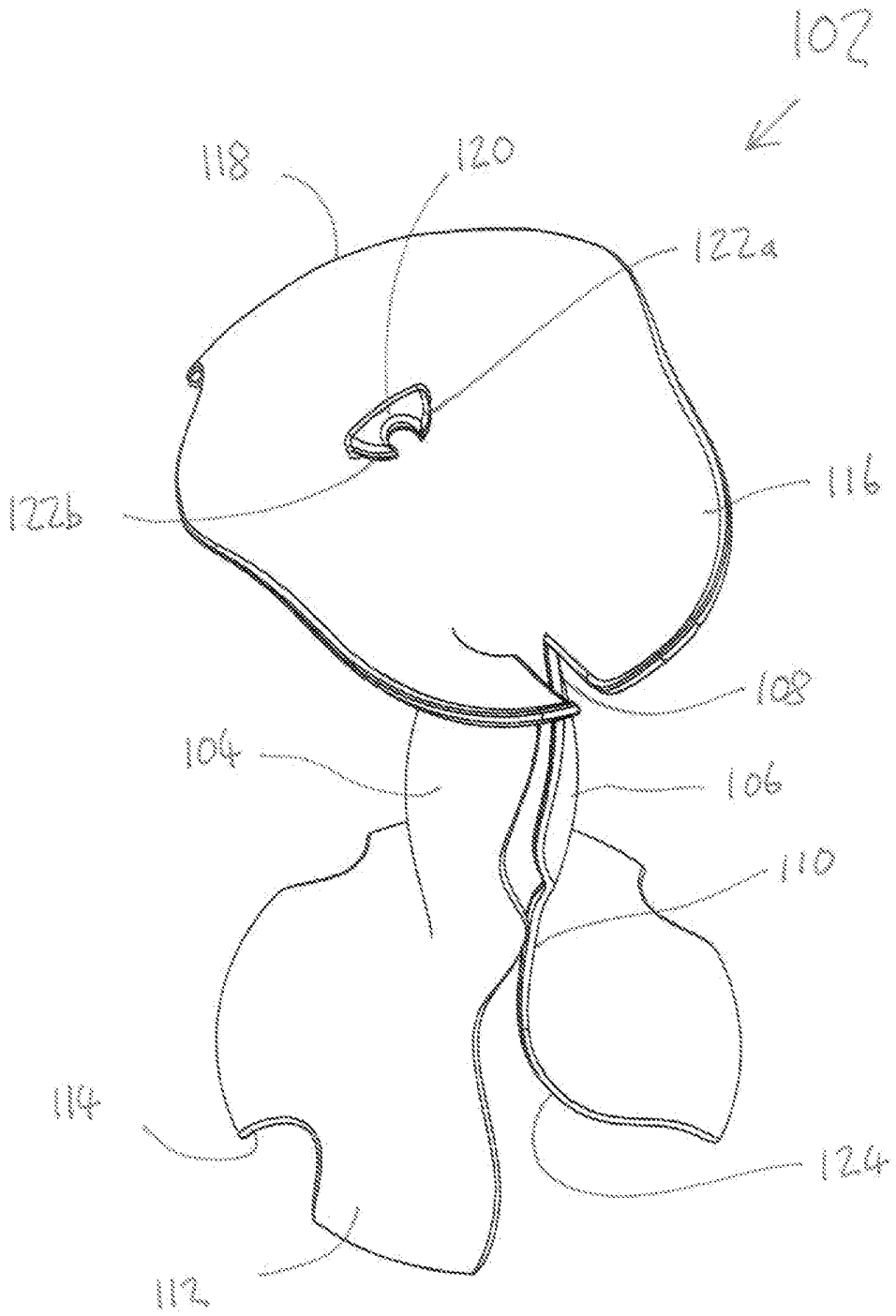


Figure 2



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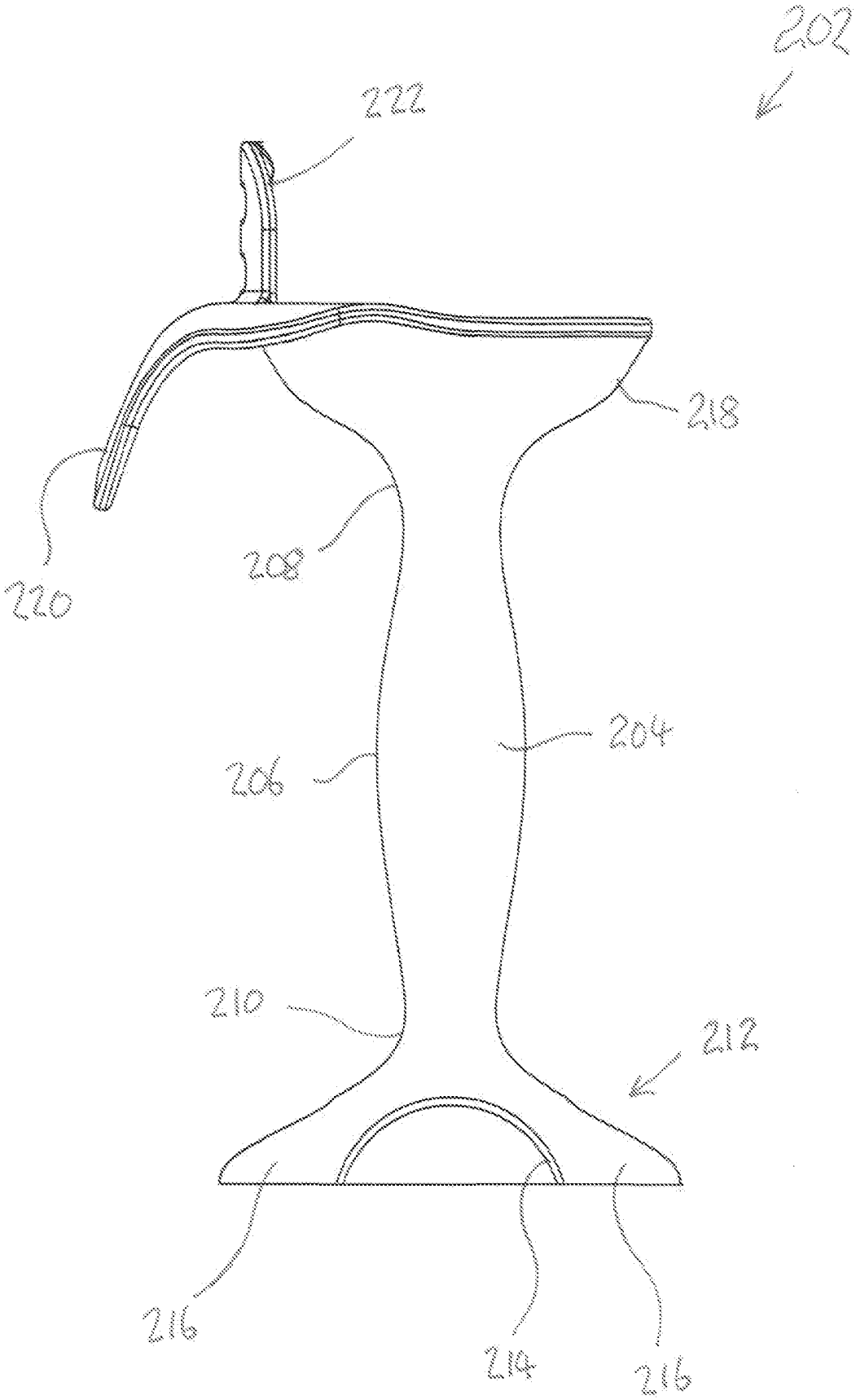

Figure 4

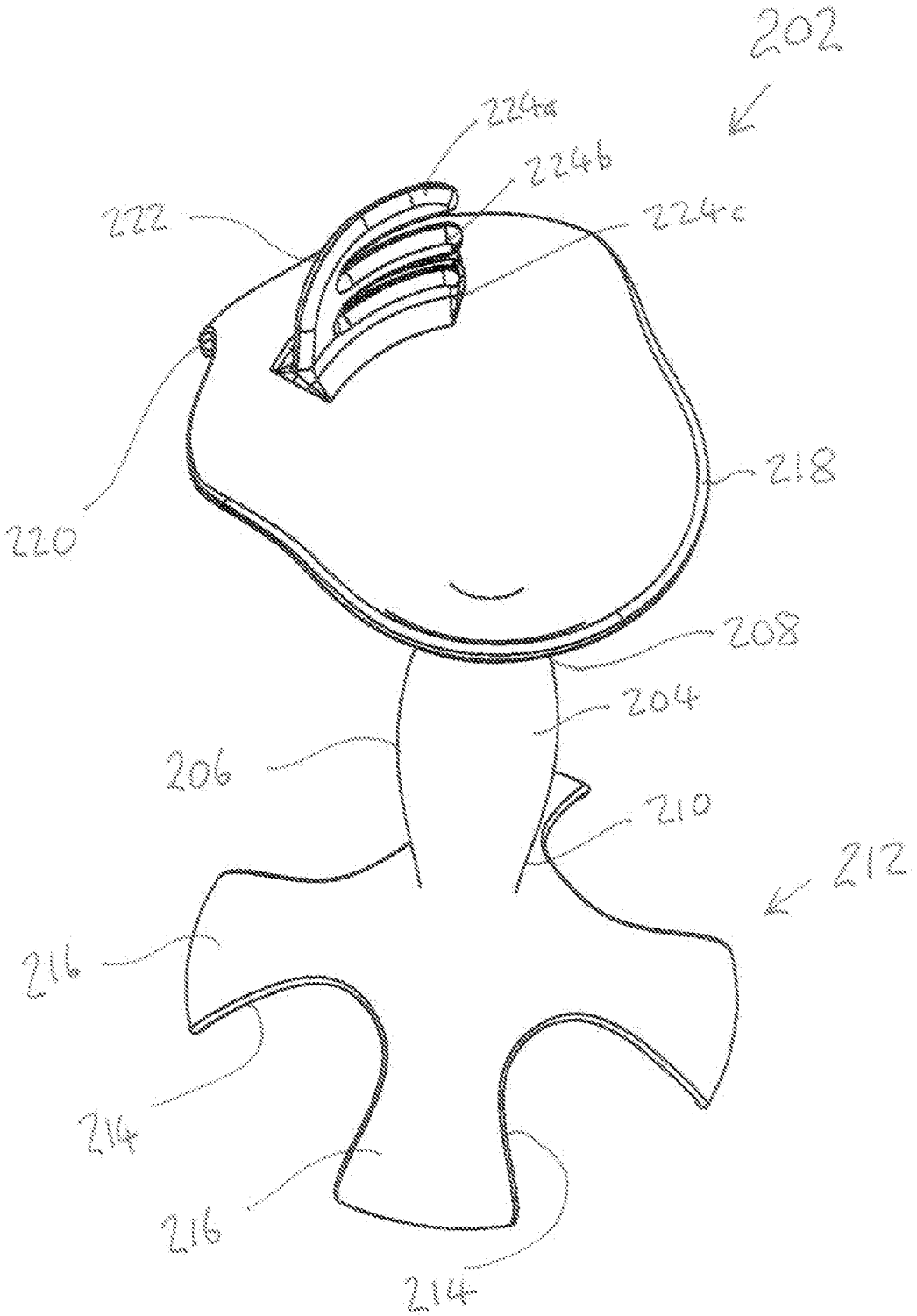
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Figure 5

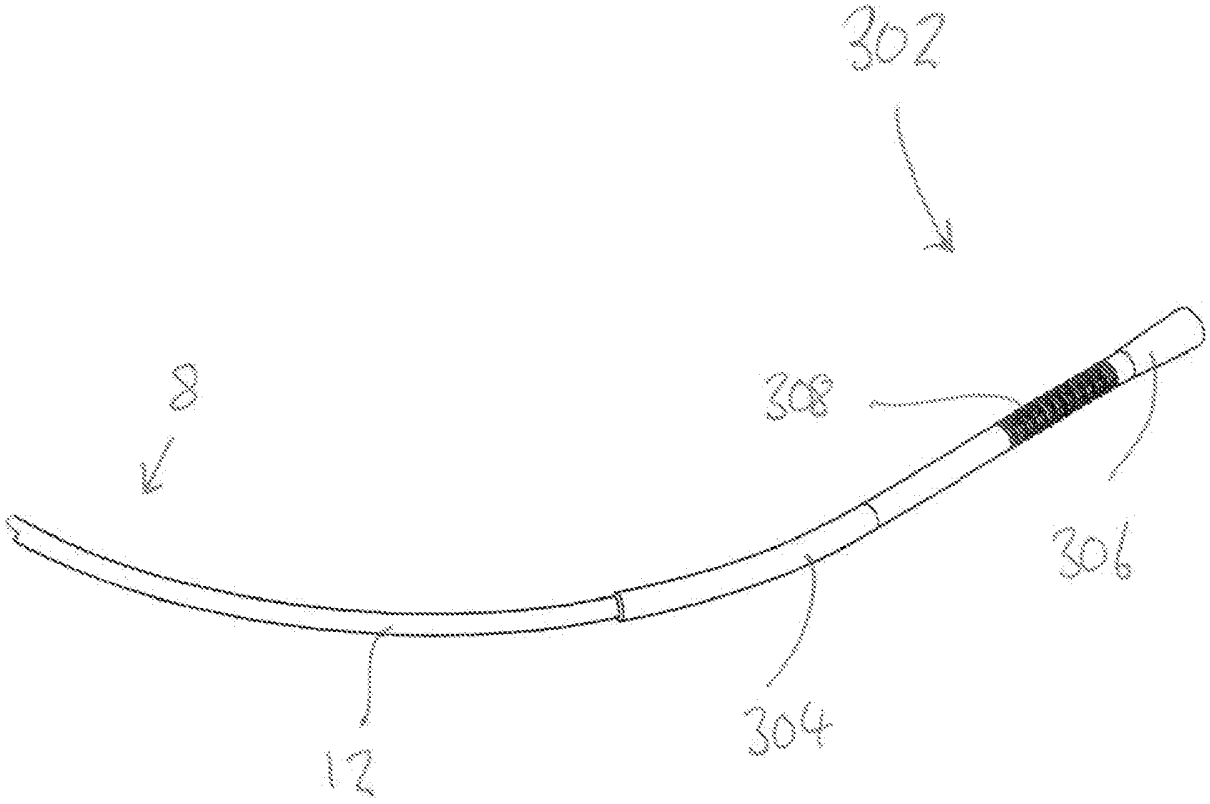

Figure 6

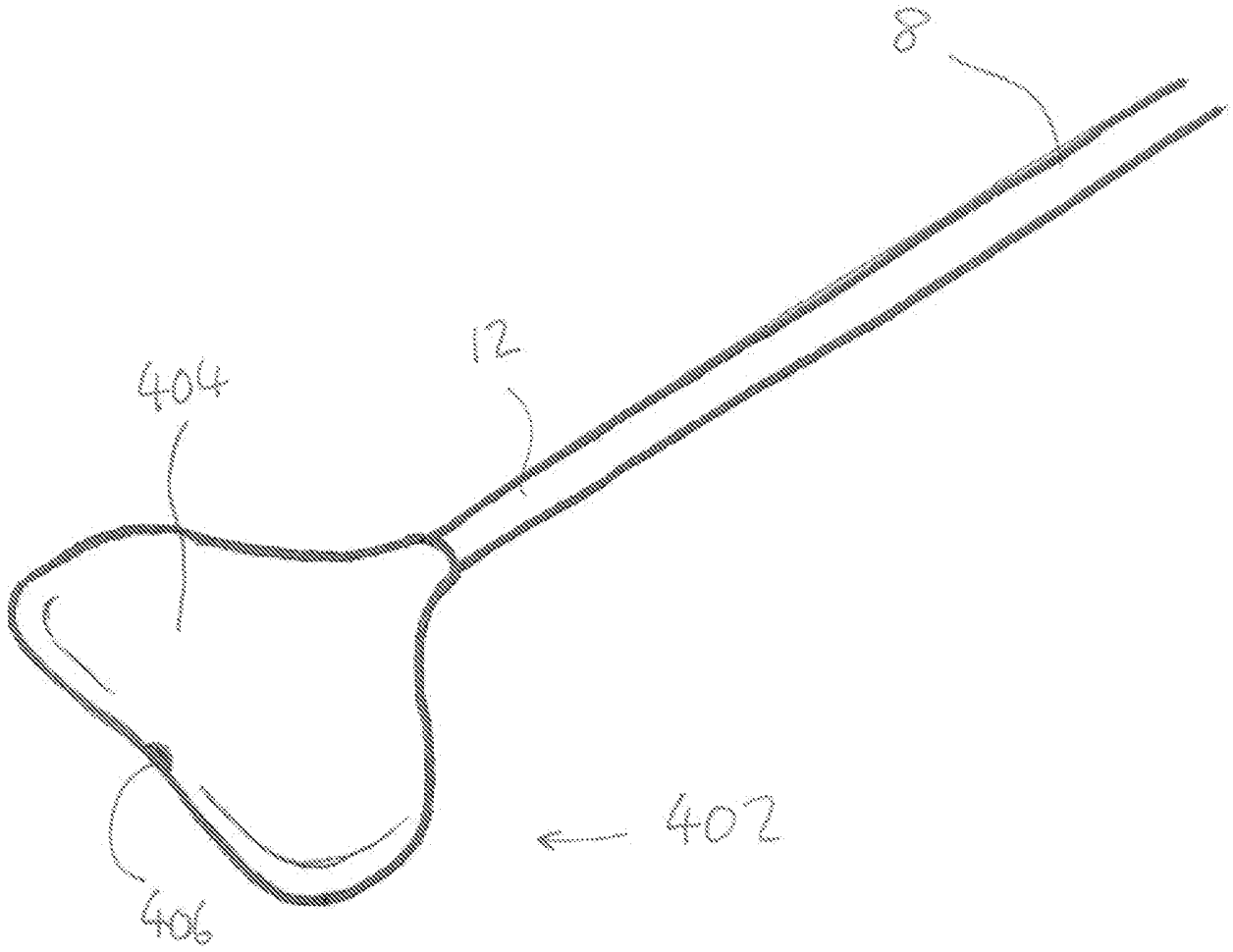

Figure 7

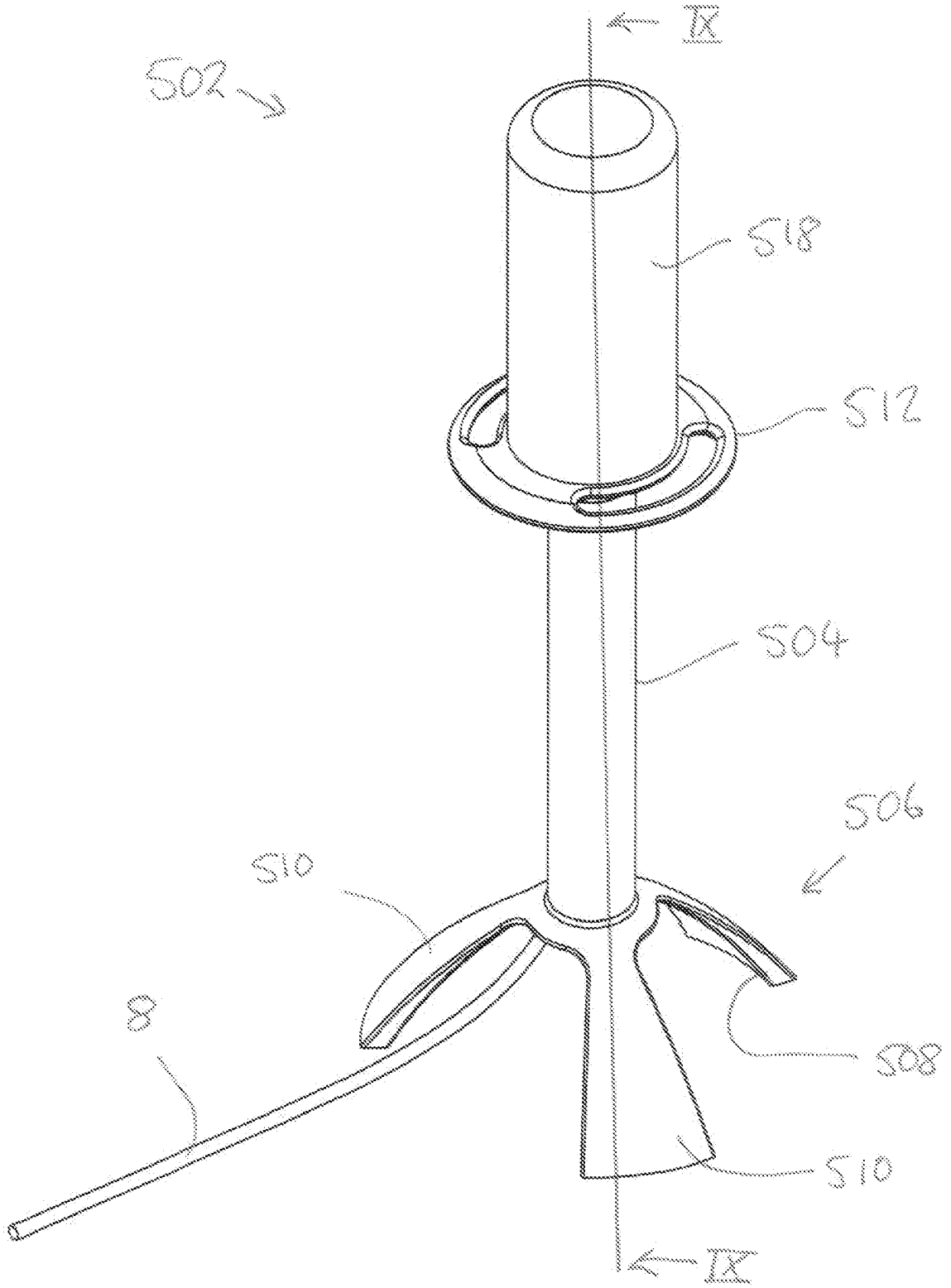

Figure 8

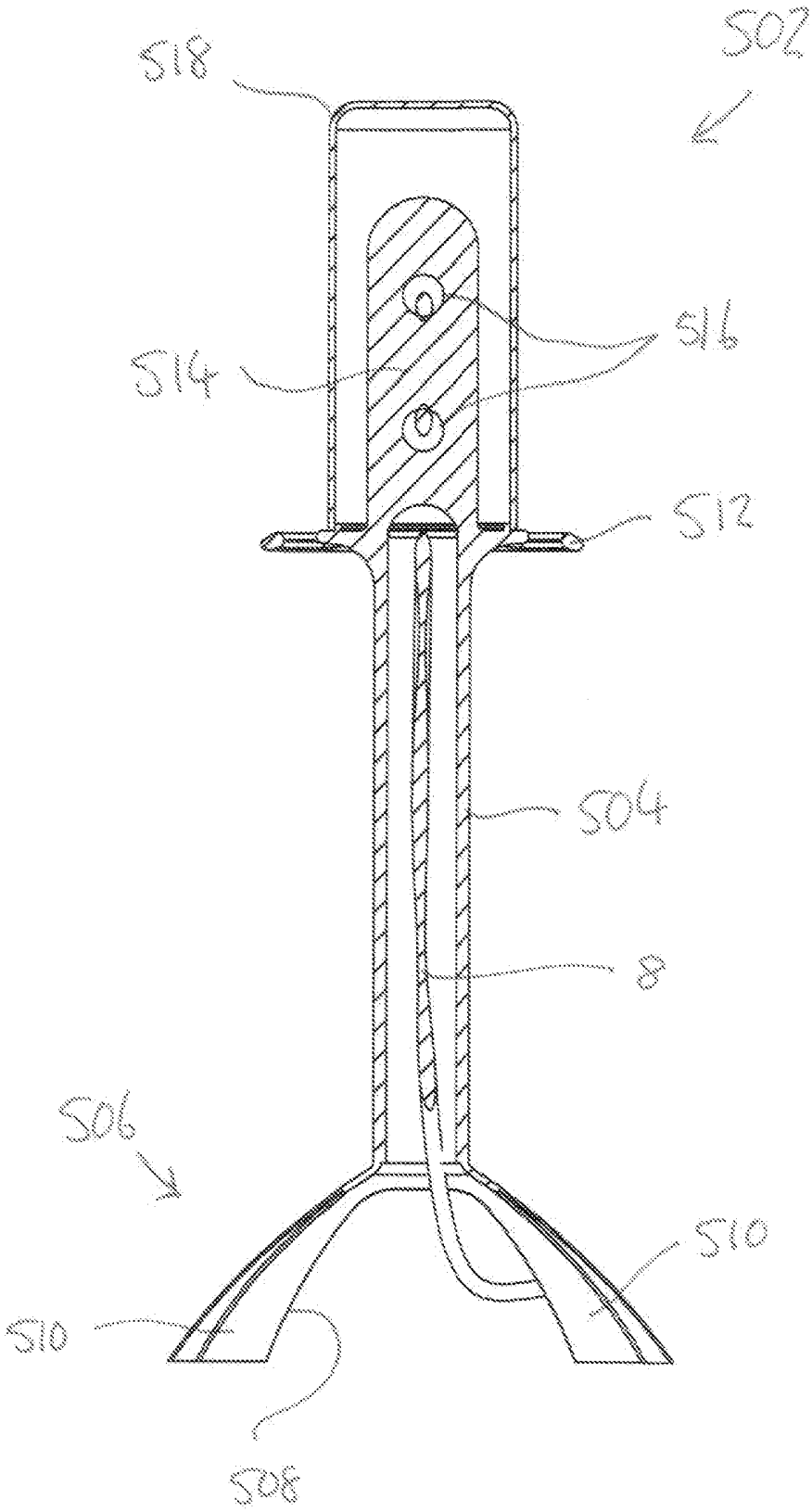

Figure 9

HYDRATION SYSTEM

The present invention relates to a system for hydrating a subject, in particular for hydrating a subject orally and the general provision of liquid to the mouth of a subject. The system finds particular use for subjects that are frail and/or bedridden.

The proper hydration of a subject is an essential aspect of good health. It is generally recognised that a person who is ill or infirm requires a minimum daily fluid intake of 1500 ml to prevent deterioration. However, subjects who are ill or infirm can have difficulties in consuming sufficient quantities of liquids to remain properly hydrated. A particular issue is the administering of liquids, in particular water and thickened liquids, to patients in hospital. There is currently a number of initiatives to improve the hydration of patients in hospitals, care homes and clinics.

Severely ill or infirm patients, including both children and adults, in hospital may be provided with liquids intravenously. In this way, the volume of liquid administered to the patient may be strictly controlled. Systems for the intravenous administering of liquids are well known in the art and are available commercially. More generally, patients are each provided with a container of water, with the intention that the patient takes regular drinks themselves to remain hydrated. Alternatively, the patient relies upon a carer or healthcare professional to assist them. This task requires significant time and physical effort from both the patient and the carer. Semi-dependent patients are particularly at risk of having an inadequate fluid intake. Patients with a reduced swallow function, in particular subjects having suffered a stroke, are provided with thickened liquids, to reduce the risk of aspiration.

It would be advantageous if an improved system could be provided for providing liquids to patients more easily. In particular, it would be advantageous

if the system could provide liquids to subjects who are in a prone, semi-prone or semi-recumbant position, such a bedridden subjects.

US 7,837,667 is concerned with a patient hydration system. The system administers hydration fluids to a patient intravenously by means of an infusion device, such as a peristaltic pump. The system further comprises means to monitor the volume of urine output by the patient. By monitoring the volume of hydration fluids administered to the patient and the volume of urine produced, the system monitors the level of hydration of the patient. The system may detect abnormal hydration patterns, indicated for example by the excessive production of urine. The system of US 7,837,667 is particularly complex and would appear to be appropriate for use by only the most vulnerable of patients. There is a need for a simpler system for the general provision of hydration liquids to patients in hospitals, clinics and the like.

US 2002/0092858 is concerned with a human hydration system. The system comprises a rigid container for holding fluid for human consumption. A fluid tube and an air vent tube extend from the container and terminate in a valve. A flexible tube extends within the container and connects with the fluid tube, allowing fluid to be removed from the container. The system is illustrated in use with the container secured to the belt of a person. The system is an example of many that are intended for use by persons involved in an activity, such as a sporting activity or the like. The application of such a system to the hydration of ill or infirm people, in particular in a sterile hospital environment is limited.

US 4,813,933 discloses an oral feeding appliance. The appliance comprises a container for holding liquid. The container is typically supported on a stand or the like in an elevated position above the patient. Liquid from the container is delivered to the patient by a tube provided with a nipple on its distal end. The nipple is constructed to be opened by the action of the patient sucking on the nipple or by the application of pressure, thereby allowing liquid to flow from the container. The nipple is provided with a mouthpiece that can be held by the patient in their mouth. While relatively simple in its design, the device of US

4,813,933 is limited in its application, requiring the container to be held in the elevated position, to allow liquid to be fed to the patient under the action of gravity. There is thus a risk of the patient receiving too much liquid, with an especial danger in the case of particularly weak patients with a decreased swallow function.

A hydration system for the disabled is disclosed in US 2002/0115961. The system comprises a container having a hose extending therefrom. The hose terminates in a dispenser for controlling the flow of fluid from the container to a patient. The dispenser is provided with a strap for securing the dispenser to a hand of the patient. A hanger assembly is required to support the container, which is shown as being suspended from the hanger assembly over the bed of the patient, when in use. Again, although relatively simple, the system of US 2002/0115961 is limited in its use as it requires securing to a support, such as a bed frame. Again, there is thus a risk of the patient receiving too much liquid, with an especial danger in the case of particularly weak patients with a decreased swallow function.

Perhaps most recently, WO 2010/147646 discloses a patient hydration system. The system comprises a bladder, from which extends a flexible tube terminating in a safety guard and a mouthpiece. The bladder is generally adapted for being suspended fro a suitable support. The safety guard provides a handle for holding or gripping by the patient and prevents the mouthpiece from being inadvertently swallowed by the patient. The safety guard also protects the mouthpiece from contamination if the mouthpiece is placed on a surface, such as a table or the like. The flexible tube is provided with a valve to regulate the flow of liquid from the bladder.

There is a need for an improved system for hydrating patients, particularly those that are bed ridden, have limited mobility or reduced dexterity. There is a particular need for a system that can be used safely by patients that are weakened and with a decreased swallow function, so as to avoid the patient receiving excessive volumes of liquid.

In general, the present invention provides a system for use in providing liquid to the mouth of a subject from a reservoir of liquid and comprising a tube for extending between the reservoir and the mouth of the subject; a holder attached to the tube having a portion that may be gripped and held by the subject; and a mouthpiece attached to one end of the tube for placing in the mouth of the subject for receiving liquid.

The hydration system of the present invention comprises various aspects, as described in both general and specific terms hereinafter.

In a first aspect, the present invention provides a hydration system for providing fluid to a subject, the system comprising:

a flexible tube for extending between a reservoir of a liquid and the mouth of the subject and having a first end for immersion in the reservoir of liquid and a second end;

a holder releasably attached to a portion of the tube between the first and second ends of the tube; and

a mouthpiece connected to the second end of the tube and arranged to be held in the mouth of the subject when the subject is receiving liquid from the reservoir through the tube.

The hydration system comprises a tube through which liquid may be passed from a reservoir of liquid to the mouth of the subject. The liquid may be caused to pass through the tube in any suitable manner. For example, the liquid my be caused to pass along the tube under the action of gravity, with the reservoir being at a position above the mouth of the subject. More preferably, the system is employed with the reservoir of liquid at a level below the level of the mouth of the subject.

More preferably, the tube is of a size that allows the subject to draw liquid from the reservoir by means of suction. In this way, the position of the reservoir relative to the mouth of the subject is not limited. Furthermore, this arrangement

allows the reservoir to be placed below the level of the mouth of the subject, thus reducing the risk that liquid will be caused to pass along the tube by the action of a siphon inadvertently created by the subject in use. This is particularly important in the case of hydration of the elderly or infirm. Further, by requiring the subject to suck on the system to receive liquid, the subject remains in total control of the amount of liquid they receive and can thus easily prevent receiving excessive and unwanted volumes of liquid in their mouth. This is particularly important in the case of infirm or frail subjects with a reduced swallow function, as such persons are vulnerable to aspiration and even drowning in severe cases.

The tube may have any suitable dimensions. In particular, the tube may have any suitable internal diameter. For the steady and regular hydration of subjects that are ill or infirm, relatively large internal diameters are preferably avoided. In this way, the subject is comfortable receiving a regular intake of liquid at an acceptable flowrate. For example, the tube may have an internal diameter of up to 5 mm, more preferably no more than 4 mm, still more preferably no greater than 3 mm. Tubes having an internal diameter of less than 2 mm are preferable for many embodiments for the hydration of subjects who are ill or infirm.

It follows that the internal diameter of the tube should be large to allow the subject to receive sufficient liquid to maintain the required level of hydration without undue effort on the part of the subject. Accordingly, the inner diameter of the tube is preferably at least 0.5 mm, more preferably at least 0.75 mm, still more preferably 1.0 mm.

A particularly preferred tube has an internal diameter in the range of from 0.5 to 3.0 mm, more preferably from 0.75 to 2.0 mm, still more preferably from 1.0 to 2.0 mm. One particularly preferred internal diameter for the tube is from 1.2 to 1.8 mm, more preferably between 1.5 to 1.7 mm, especially about 1.6 mm.

It has been found that a tube having an internal diameter of from 1.0 to 2.0 mm is very suitable for use in the system, as it allows a subject to draw liquid

from the reservoir over an extended distance, in particular up to several metres, at a comfortable rate of flow merely by sucking on the mouthpiece.

It is preferred that the tube is disposable, with the tube in use being replaced from one to three times a day, or as deemed clinically appropriate for the subject. Accordingly, the system should provide for easy and quick replacement of a used tube with fresh tubing.

Depending upon the internal diameter of the tube and the characteristics of the liquid being dispensed, the delivery of liquid to the subject may be assisted by capillary action.

The tube may have any suitable wall thickness and outside diameter. However, the tube of the hydration system of the present invention is flexible. Preferably, the tube is selected to have a wall thickness and outside diameter that prevent the tube from being crushed during normal use. This is particularly important when the system is being used to hydrate an ill or infirm subject, such as a patient in a hospital, clinic or the like, where movement of the patient could inadvertently crush and block the tube. The wall thickness required to prevent the tube from being crushed and blocked in normal circumstances will depend upon the material of construction of the tube. It is also preferred that the tube is resistant to crushing as a result of biting by the subject.

Preferably, the tube has a wall thickness of up to 5 mm, more preferably no more than 4 mm, still more preferably no greater than 3 mm. Tubes having a wall thickness of less than 2 mm are preferable for many embodiments for the hydration of subjects who are ill or infirm. A particularly preferred tube has a wall thickness in the range of from 0.5 to 3.0 mm, more preferably from 0.75 to 2.0 mm, still more preferably from 1.0 to 2.0 mm. One particularly preferred wall thickness for the tube is from 1.2 to 1.8 mm, more preferably between 1.5 to 1.7 mm, especially about 1.6 mm.

In one preferred embodiment, the tube has a wall thickness substantially the same as the internal diameter.

The tube may be formed from any suitable material. Suitable materials include polymers, in particular elastomeric polymers. Examples of suitable materials include polyolefins, including polyethylene, polypropylene and polybutylene, polyvinylchloride, silicone polymers, polyurethanes, fluoropolymers and mixtures thereof. The tube material is most preferably a food standard material and is preferably free of phthalates and other components that are potentially hazardous if ingested by the subject.

The tube may have any suitable elongation properties, so as to enable it to function in the hydration system without damage. Preferably, the tube has an elongation at break of from 200 to 3000%, more preferably from 300 to 2000%, still more preferably from 40 to 1750%.

As the subject may place a portion of the tube within their mouth, the material and construction of the tube should provide sufficient resistance to a bite from the subject. Accordingly, the hardness of the tube material should be selected accordingly. Preferred Shore A hardnesses are up to 80.0, more preferably up to 75.0, still more preferably up to 65.0. The minimum Shore A hardness of the tube is preferably 30.0, more preferably at least 40.0, still more preferably at least 50.0. One preferred tube has a minimum Shore A hardness of 55.0.

The system of the present invention may be used to provide any liquids that may be administered to a subject orally. Most commonly, the liquid being supplied to the subject will be water or an aqueous solution or composition. However, the system may be used for dispensing a wide range of other compositions and beverages, including cold beverages, such as milk, fruit juices and squashes, and warmed beverages, including soup, tea and coffee. The system is further useful in the provision of thickened liquids, as provided to frail subjects with a reduced swallow reflex. In addition, the system may be used to

administer food based or nutritional liquids to the subject. Further, the system may be used to administer medication orally in liquid form, such as aqueous solutions thereof.

As noted above, in use, the tube extends from the reservoir of liquid to the mouth of the subject. In many embodiments, it is preferred that the tube enters the body of the liquid from above, for example by entering the top of a container holding the liquid. In this case, it is preferred that the tube has a density of greater than that of the liquid, ensuring that the portion of the tube extending into the body of liquid sinks within the liquid. With the predominant use of the system being for providing a subject with water or a water-based composition or beverage, the tube material preferably has a specific gravity in excess of 1.0. More preferably, the material has a specific gravity of at least 1.05, still more preferably at least 1.1, in particular at least 1.13. The specific gravity is preferably no greater than 3.0, more preferably no greater than 2.75, still more preferably no greater than 2.5. A maximum specific gravity of about 2.37 has been found suitable in many embodiments.

If the density of the material of the tube is not greater than that of the liquid being delivered from the reservoir to the subject, the tube is preferably provided with a portion of increased density, that is having a specific gravity of greater than 1.0 at its first end or first end portion, so as to cause the first end of the tube to sink in the liquid in the reservoir. This increased density portion may be provided by means of a weighted member incorporated into or attached to the tube at or close to the first end. Alternatively, the tube may be fastened to the container holding the reservoir, such as a rim or the like, for example using a balanced weight.

The tube may be of any suitable length. Preferably, the tube is no longer than 5.0 m, more preferably less than 4.0 m, still more preferably less than 3.0 m. The tube is preferably at least 0.5 m in length, more preferably at least 1.0 m in length. A tube length of from 1.0 m to 1.5 m, in particular about 1.2 m, has been

found to be particularly suitable for many applications, including subjects that are bed ridden.

Suitable tubes having the properties as set out hereinbefore are known and are commercially available, for example ex. Watson Marlow Limited, Falmouth, England.

The system of the present invention further comprises a holder. The holder is releasably attached to the tube between the first and second ends. In this way, the holder may be released from the tube, which may be disposed of. The holder may then be cleaned and/or sterilised as required and reused for the same or a different subject.

The holder may be attached to the tube at any suitable position along the length of the tube. Typically, this is in the region of the second end of the tube and the mouthpiece, preferably spaced from the mouthpiece.

The holder provides a means to be gripped by the subject. This is particularly important for subjects who are elderly or infirm and suffering from conditions with reduced sensation and/or reduced or limited mobility in the joints of the wrist, arm and hands. Accordingly, the holder should comprise a grip portion that may be gripped and held by the subject, so as to move the mouthpiece and the tube to and from their mouth. The holder also allows a healthcare professional, such as a nurse, or carer to provide the mouthpiece and tube to the subject using the holder with a reduced risk of cross-infection or contamination of the subject.

The holder may comprise any suitable shape and form that allows it to be gripped, held and manipulated by the subject and/or carer. In one embodiment, the holder comprises a generally elongate grip portion, preferably generally tubular in form and surrounding the tube. The grip portion may be shaped to be more easily gripped and held by the subject, in particular by having a mid-portion of increased diameter relative to its two end portions.

In a preferred embodiment, the generally elongate grip portion is provided with a flange member at one end thereof, more preferably a flange member at each end thereof. The flange member allows the subject to grasp the grip portion, while preventing the holder from easily slipping from the grip of the subject. The flange member may extend partially or wholly around the end of the grip portion. Preferably, the or each flange member is generally circular.

In one embodiment, one or both of the flange members also serves as a base, on which the holder may be allowed to stand with the grip portion upright, thereby holding the tube clear of any surfaces and reducing the risk of contamination of the tube, in particular in the region of the second end and the mouthpiece. The subject may also find it easier to grasp the holder from this upright position. If forming a base, the or each flange member is preferably provided with one or more openings therein through which the tube may pass. The flange members are preferably sufficient in diameter to hold the grip portion clear of a surface on which the holder is lying, thereby allowing the subject to pass their fingers easily around the grip portion and grasp the holder.

The holder is preferably provided with a hook member. The hook member may be provided at one or both ends of the grip portion, for example on a respective flange member. The hook member is preferably of a size and form to allow it to hook onto the fingers or hand of a subject, thereby making it easier to hold and move the holder. The hook member may also be used to hang the holder from a suitable support, such as a bar or other member of a bed or the like.

The holder may be provided with one or more openings or holes, allowing it to hang from a suitable support, such as a hook, handle or the like. The opening or hole is most conveniently formed in the hook member.

The holder is releasably attached to the tube. Preferably, the holder is releasably attached to the tube such that its position along the tube may be

releasably fixed. Accordingly, the holder comprises one or more couplings for releasably holding the tube. Suitable releasable couplings for holding the tube include one or more cleats, clamps or the like. The releasable coupling may be provided at any suitable position on the holder. In one embodiment, a releasable coupling is provided at one end of the holder, more preferably on a respective flange member.

As noted, one preferred form for the holder is elongate and hollow, that is having a generally longitudinally extending central bore therethrough. Preferably the holder is generally tubular. In this case, the tube may be passed through the central bore of the holder, with the grip portion of the holder surrounding the tube. This has been found to be a particularly convenient form for the holder and tube. In one embodiment the hollow interior of the holder may be arranged to accommodate the second end portion and mouthpiece of the tube when the system is not in use, thus protecting the mouthpiece from contamination.

In a preferred embodiment, the holder is hollow and is provided with an elongate sllit, thereby allowing it to be applied around the tube more easily. The slit may be have any suitable form. For example, the slit may be straight or extend along a curved or arcuate path along the body of the holder. The slit may have any suitable width, provided the holder remains extending around the tube. In one embodiment, the slit has a width substantially the same as or slightly less than the outer diameter of the tube. In this way, the tube may only pass through the slit by compression of the tube material and/or by opening of the slit. In this case, the holder is preferably formed to resiliently bias the slit to resist opening, for example by means of inherent resilience in the material of the holder and/or a resilient shape of the holder body.

Further, a hollow holder is preferred, as the interior of the holder may provide space to store excess tube, when the full length of the tube is not required and the tube not fully extended.

The holder is preferably formed to be able to accommodate the tube when the system is not in use. In this way, the holder may be used to hold the tube, for example by having the tube wrapped around the holder, such as around the grip portion and between the two end flanges in embodiments provided with such. Alternatively, the tube may be accommodated partly or wholly within the hollow holder.

The holder may be formed from any suitable material. Most preferably, the holder is formed from a material that is easily cleaned and sterilised. Plastics, in particular medical grade plastics, are preferred. The material is preferably resilient. Suitable materials are known and include polyolefins, such as polyethylene and polypropylene, polyvinylchloride, polyurethanes and silicones. The material of the holder may be a foam, such as a polyurethane foam. The holder may be formed by any suitable technique, with moulding, such as injection or vacuum moulding being particularly preferred.

Preferably, the holder is formed from a pliable or pliant material and/or with a pliant form, so as to allow the holder to deform under the weight of a subject, for example if the subject inadvertently lies on the holder during use.

The holder may be provided with a cover, such as a lid or cap, to protect the tube and/or the mouthpiece, when not in use. In one embodiment, the holder is hollow or comprises a hollow portion, which may be used to house part or all of the tube when not in use. The holder is provided with a releasable cover extending over the hollow portion, further protecting the tube and mouthpiece from contamination.

In use, the holder is attached to the tube at any suitable location. Preferably, the holder is attached to the tube in the region of the second end, more preferably with a minor end portion of the tube extending between the holder and the second end, thereby allowing the holder to support the tube from a suitable distance from the mouth of the user. By having the holder releasably attached the tube, the subject and/or their carer may adjust the position of the

holder relative to the first and second ends of the tubes as appropriate to facilitate use of the system. Further, the position of the holder may be varied between a first position when the system is in use and liquid is being dispensed to the subject and a second position, in which part or all of the tube and/or the mouthpiece are stored around or within the holder.

In a further aspect, the present invention provides a holder as hereinbefore described for applying to a tube to form a hydration system. In this regard, it is recognised that the holder, while an integral part of the hydration system of the present invention, may be provided as a separate component, to be used in conjunction with a range of tubes and, as required, mouthpieces.

The hydration system of the present invention further comprises a mouthpiece at the second end of the tube. The mouthpiece is provided to improve the comfort of the subject and ease of manipulating the tube to and in the mouth of the subject. The mouthpiece may be formed on the second end of the tube or permanently applied thereto. The mouthpiece may be removably attached to the second end of the tube, allowing it to be reused after appropriate cleaning and/or sterilisation. More preferably, the mouthpiece is formed integrally with the tube or permanently applied to the second end thereof, so as to prevent the mouthpiece from separating from the tube and causing a choking hazard.

The mouthpiece is generally provided with an outer diameter that is larger than that of the tube, such that is may be easily held in the mouth of the subject. Further, the larger size of the mouthpiece reduces the hazard of the subject choking on the tube.

The mouthpiece is provided with at least one bore therethrough, communicating with the bore in the tube for the delivery of liquid into the mouth of the subject.

The mouthpiece may comprise a valve to regulate the flow of liquid to the subject, for example a bite valve that is opened by the action of the subject biting

on the mouthpiece. Such bite valves are known in the art. Preferably, the mouthpiece is open and allows the subject to draw liquid from the tube merely by gentle sucking. In this way, the effort involved in taking liquid is kept to a minimum. This is particularly advantageous when hydrating the elderly and/or infirm.

In one embodiment, the mouthpiece is formed by providing the second end portion of the tube with an increased wall thickness and outer diameter. In this embodiment, the mouthpiece may extend 10 mm, more preferably at least 20 mm, still more preferably at least 30 mm from the end of the tube. Alternatively, the mouthpiece is formed as a generally tubular component, having an internal bore that is an interference fit around the outer diameter of the tube. The mouthpiece may be formed with a grip portion to assist the subject in placing the mouthpiece in their mouth.

The mouthpiece may be formed from any suitable material, such as those materials described hereinbefore in respect of the tube. As with the tube, the mouthpiece should be of a material having a sufficient Shore hardness to provide the mouthpiece with a bite resistance.

As noted, the hydration system is used in conjunction with a reservoir of liquid. The reservoir may be held in any suitable container. The hydration system preferably further comprises a container for holding a reservoir of liquid, into which the first end of the tube extends. Any suitable container may be employed and suitable containers are known in the art, such as a cup, a beaker, a jug or a bottle. The system may be employed with an existing container. Alternatively, the system may be provided with a container.

The container may be attached to a suitable support, such as a stand or a bed frame. However, the hydration system of the present invention does not require the container to be elevated above the mouth of the subject. Rather, it is preferred that the container is at a level below the mouth of the subject, to reduce or prevent the risk of liquid being siphoned from the container. For example, for a

bed-ridden subject, the container may be disposed on the floor beside or under the bed.

In one embodiment, the hydration system of the present invention is provided with a pre-filled container, such as a flexible bag or pouch, having a predetermined, known volume of liquid therein. When empty, the container is discarded and a new pre-filled container is used in its place. In this way, the liquid intake of the subject may be easily measured and monitored. Further, such flexible bags or pouches act to segregate the liquid from the surrounding air, reducing the risk of contamination of the liquid from air borne agents. Such an arrangement is of particular use when the supply of fresh drinking water is limited, such as a disaster zone or the like. The system of this embodiment is also of use when hydrating subjects that are being moved or transported. Finally, this embodiment finds particular use for subjects who are ill, infirm or otherwise generally prone to spillages when using conventional drinking vessels.

In a further aspect, the present invention provides the use of a tube as hereinbefore described in a hydration system for subject, more particularly for the delivery of a liquid from a reservoir to a subject for the hydration of the subject.

Embodiments of the present invention will now be described, by way of example only, having reference to the accompanying drawings, in which:

Figure 1 is a general representation of a hydration system according to one embodiment of the present invention being used by a bed-ridden subject;

Figure 2 is a side view of a holder of one embodiment of the present invention;

Figure 3 is a perspective view from above of the holder of Figure 2;

Figure 4 is a side view of a holder of a second embodiment of the present invention;

Figure 5 is a perspective view from above of the holder of Figure 4;

Figure 6 is a view of the tube and a mouthpiece of one embodiment of the present invention;

Figure 7 is a view of the tube and a mouthpiece of a second embodiment of the present invention;

Figure 8 is a perspective view of a holder of a third embodiment of the present invention; and

Figure 9 is a vertical cross sectional view through the holder of Figure 6 along the line IX – IX.

Referring to Figure 1, there is shown a hydration system according to the present invention, generally indicated as 2. The system comprises a container 4 holding a body 6 of a liquid, such as water, for delivery to a subject, such as a patient in a hospital or clinic. A tube 8 has a first end 10 extending into the body 6 of liquid in the container 4 and a second end 12 having a mouthpiece 14 permanently attached thereto. A holder 16 is releasably attached to the tube in the region of the second end 12, but spaced apart from the second end 12 and the mouthpiece 14, as shown in the figure. The system 2 is shown in Figure 1 in use by a subject 20 lying in a bed. In particular, the subject 20 is shown holding the holder 16 in one hand, with the mouthpiece 14 in their mouth. The container 4 is shown standing on a table 22. However, it is to be understood that the container may be disposed in other positions, such as secured to the frame of the bed, a drip stand, or stood on the floor beside or beneath the bed.

Turning to Figure 2, a holder, generally indicated as 102, is shown in side view. The holder 102 is shown in perspective view in Figure 3. The holder 102

comprises a generally tubular grip portion 104 having a central portion 106 of a first diameter and end portions 108 and 110 of a second diameter. The first diameter is greater than the second diameter as shown, to allow the grip portion to be easily grasped and held by a subject.

The holder 102 is provided with a first flange member 112 at the end portion 110, which acts as a base on which the holder may be stood. The first flange member 112 is generally circular in cross-section and extends radially outwards from the grip portion 104 a sufficient distance to hold the grip portion clear of a surface if the holder is laying on its side. The first flange member 112 is provided with openings 114 in its outer edge, which may accommodate the tube 8, when the holder is standing on a surface.

The holder 102 further comprises a second flange member 116 at the end portion 108. The second flange member 116 is generally circular in cross-section and extends radially outwards from the grip portion 104 a sufficient distance to hold the grip portion clear of a surface if the holder is laying on its side.

In addition, the first and second flange members 112, 116, in use, bear on the fingers and hand of the subject when grasping the grip portion, preventing the holder from falling or being pulled from the hand of the subject.

The holder 102 is further provided with a hook member 118 extending from the outer rim of the second flange member 116, as shown in Figure 2. The hook member 118 may extend over the fingers or hand of a subject, allowing the holder to be held without needing to fully grasp the grip portion. In addition, the hook member 118 may be used to support the holder 102 and tube 8, for example by hanging from a stand, frame member of a bed or the like.

The hook member 118 is provided with a hole therethrough, by which the holder may be hung from a suitable support, such as a hook, handle or the like.

The holder 102 is provided with a cleat 120 for gripping the outer surface of the tube 8. As visible in Figure 3, the cleat 120 is located on the inner surface of the second flange member 116 and comprises opposing resilient jaws 122a and 122b between which the tube 8 is held. The tube may be removed and replaced in the cleat 120 as required, so as to locate the holder on the tube.

To allow the holder 102 to be easily secured to and removed from the tube 8, the holder 102 is provided with an elongate slit 124 extending along its length, allowing the holder to be placed around the tube and the tube engaged with the cleat 120 at the required position.

The hollow body of the holder 102 provides space for storing portions of the tube 8, if the tube is not required to be fully extended. Alternatively, or in addition, the tube may be wound around the central portion 106 of the holder, between the flange members 112, 116, as a way of storing the tube, when not in use. Preferably, the second end of the tube and the mouthpiece are held within the hollow body of the holder, for example by attaching the tube to the cleat at or close to the second end and the mouthpiece.

Turning to Figure 4, there is shown a side view of a second embodiment of a holder, generally indicated as 202. The holder 202 is shown in perspective view in Figure 5. The holder 202 comprises a generally tubular grip portion 204 having a central portion 206 of a first diameter and end portions 208 and 210 of a second diameter. The first diameter is greater than the second diameter as shown, to allow the grip portion to be easily grasped and held by a subject.

The holder 202 is provided with a first flange member 212 at the end portion 210, which acts as a base on which the holder may be stood. The first flange member 212 is generally circular in cross-section and extends radially outwards from the grip portion 204 a sufficient distance to hold the grip portion clear of a surface if the holder is laying on its side. The first flange member 212 is provided with openings 214 in its outer edge, in turn providing the holder with a

plurality of legs 216, which may accommodate the tube 8, when the holder is standing on a surface.

The holder 202 further comprises a second flange member 218 at the end portion 208. The second flange member 218 is generally circular in cross-section and extends radially outwards from the grip portion 204 a sufficient distance to hold the grip portion clear of a surface if the holder is laying on its side.

In addition, the first and second flange members 212, 218, in use, bear on the fingers and hand of the subject when grasping the grip portion, preventing the holder from falling or being pulled from the hand of the subject.

The holder 202 is further provided with a hook member 220 extending from the outer rim of the second flange member 218, as shown in Figure 4. The hook member 220 may extend over the fingers or hand of a subject, allowing the holder to be held without needing to fully grasp the grip portion. In addition, the hook member 220 may be used to support the holder 202 and tube 8, for example by hanging from a stand, frame member of a bed or the like.

The hook member 220 is provided with a hole therethrough, by which the holder may be hung from a suitable support, such as a hook, handle or the like.

The holder 202 is provided with a cleat assembly 222 for gripping the outer surface of the tube 8. As visible in Figure 5, the cleat assembly 222 is located on the inner surface of the second flange member 218 adjacent the hook member 220. The clear assembly comprises opposing resilient fingers 224a, 224b, 224c between which the tube 8 is held. The tube may be removed and replaced in the cleat assembly 222 as required, so as to locate the holder on the tube.

Again, the hollow body of the holder 202 provides space for storing portions of the tube 8, if the tube is not required to be fully extended.

Turning to Figure 6, there is shown the second end portion 12 of the tube 8 with one embodiment of a mouthpiece, generally indicated as 302. The mouthpiece 302 is generally tubular and comprises a sleeve 304 having an internal diameter suitable to accommodate the tube 8 by way of an interference fit, to hold the mouthpiece onto the tube. At its distal end, the sleeve 304 is provided with a frusto-conical distal end portion 306 for the subject to hold in their mouth. The distal end portion 306 is provided with a larger outer diameter than the tube 8 and the sleeve 304, and is formed to be comfortable for the subject to hold and retain in their mouth. The sleeve 304 is provided with a grip portion 308 along a portion of its outer surface, which may be held by the subject or a carer to finely adjust the position of the distal end portion in the mouth of the subject. The grip portion may be provided with a roughened surface, to provide a tactile surface and adequate friction to be firmly held and manipulated. Alternatively, the grip portion may be formed from a resilient material, having a smooth outer surface.

Turning to Figure 7, there is shown the second end portion 12 of the tube 8 with a second embodiment of a mouthpiece, generally indicated as 402. The mouthpiece 402 has a flattened distal end portion 404, allowing it be held in the mouth of the subject and rest on the tongue of the subject. The mouthpiece 402 is provided with a bore 406 therethrough aligned with the bore of the tube 8 and through which liquid is delivered to the subject.

Referring now to Figure 8, a holder, generally indicated as 502, is shown in perspective view. The holder 502 is shown in vertical cross-section in Figure 9. The holder 502 comprises a tubular grip portion 504. In use, the user can hold the holder 502 by grasping the grip portion 504.

The holder 502 is provided with a first flange member 506 at one end of the grip portion 504, which acts as a base on which the holder may be stood. The first flange member 506 is generally circular in cross-section and extends radially outwards from the grip portion 504 a sufficient distance to hold the grip

portion clear of a surface if the holder is laying on its side. The first flange member 506 is provided with openings 508 in its outer edge, which may accommodate the tube 8, when the holder is standing on a surface. The openings 508 are sized and arranged to form a plurality of leg portions 510, which support the holder, as shown in Figure 8.

The holder 502 further comprises a second flange member 512 at the second end of the grip portion 504. The second flange member 512 is generally circular in cross-section and extends radially outwards from the grip portion 504 a sufficient distance to hold the grip portion clear of a surface if the holder is laying on its side.

In addition, the first and second flange members 506, 512, in use, bear on the fingers and hand of the subject when grasping the grip portion, preventing the holder from falling or being pulled from the hand of the subject.

As shown in Figure 9, the holder 502 is further provided with a tube retaining member 514, in the form of a tongue extending longitudinally from the inner rim of the second flange member 512. The tube retaining member 514 is provided with two holes 516 therethrough, through which the tube 8 may be threaded. In this way, the holder 502 is releasably secured to the tube 8.

The hollow body of the holder 502 provides space for storing portions of the tube 8, if the tube is not required to be fully extended. Alternatively, or in addition, the tube may be wound around the central portion 504 of the holder, between the flange members 506, 512, as a way of storing the tube, when not in use. Preferably, the second end of the tube and the mouthpiece are held within the hollow body of the holder, for example by attaching the tube to the tube retaining member 514 at or close to the second end and the mouthpiece.

The holder 502 is further provided with a removable cap 518 to cover the tube retaining member 514 and the portion of the tube 8 and the mouthpiece within the holder, as shown in Figures 8 and 9, when the system is not in use. In

this way, contamination of the tube and, more importantly the mouthpiece, may be prevented.

In use, the subject or their carer places the container 4 with the body of liquid 6 at a suitable location relative to the subject, in particular beside or below the level of the subject, to reduce the risk of liquid being siphoned out of the container. The first end 10 of the tube is inserted into the container and extended into the body of liquid. The holder 16 is applied to the tube 8 at the required position along the tube and fixed thereto. The second end 12 of the tube 8, together with the mouthpiece 14, is then moved to the mouth of the subject using the holder 16, as and when the subject requires to drink liquid from the container. Liquid may be drawn from the container by sucking the mouthpiece.

As the holder is releasable from the tube 8, the tube may be disposed of after use or renewed with fresh tube, without requiring the holder to be discarded.

CLAIMS

1. A hydration system for providing fluid to a subject, the system comprising:

a flexible tube for extending between a reservoir of a liquid and the mouth of the subject and having a first end for immersion in the reservoir of liquid and a second end;

a holder releasably attached to a portion of the tube between the first and second ends of the tube; and

a mouthpiece connected to the second end of the tube and arranged to be held in the mouth of the subject when the subject is receiving liquid from the reservoir through the tube.

2. The hydration system according to claim 1, wherein the tube is of a size to allow the subject to draw liquid from the reservoir by suction.

3. The hydration system according to either of claims 1 or 2, wherein the tube has an internal diameter of from 0.5 to 3.0 mm.

4. The hydration system according to claim 2, wherein the tube has an internal diameter of from 1.0 to 2.0 mm.

5. The hydration system according to any preceding claim, wherein the tube has a wall thickness of from 0.5 to 3.0 mm.

6. The hydration system according to claim 5, wherein the tube has a wall thickness of from 1.0 to 2.0 mm.

7. The hydration system according to any preceding claim, wherein the internal diameter and the wall thickness of the tube are substantially the same.

8. The hydration system according to any preceding claim, wherein the tube is formed from a polyolefin, polyvinylchloride, a silicone polymer, a polyurethane, a fluoropolymer, or a mixture thereof.

9. The hydration system according to any preceding claim, wherein the tube has an elongation at break of from 200 to 3000%.

10. The hydration system according to any preceding claim, wherein the tube has a Shore A hardness of from 55 to 80.

11. The hydration system according to any preceding claim, wherein the tube has a specific gravity greater than 1.0.

12. The hydration system according to claim 11, wherein the tube has a specific gravity of from 1.1 to 3.0.

13. The hydration system according to any preceding claim, wherein the tube is provided with a portion of increased density at or close to its first end.

14. The hydration system according to any preceding claim, wherein the tube has a length of from 0.5 to 5.0 m.

15. The hydration system according to claim 14, wherein the tube has a length of from 1.0 to 1.5 m.

16. The hydration system according to any preceding claim, wherein the holder comprises a grip portion for gripping and holding by a subject or their carer.

17. The hydration system according to claim 16, wherein the grip portion is elongate.

18. The hydration system according to claim 17, wherein the grip portion is generally tubular.

19. The hydration system according to claim 18, wherein the grip portion has a mid-portion of increased diameter relative to its two end portions.

20. The hydration system according to any of claims 17 to 19, wherein the holder further comprises a flange member disposed at one end of the grip portion.

21. The hydration system according to claim 20, wherein the holder comprises a flange member disposed at each end of the grip portion.

22. The hydration system according to either of claims 20 or 21, wherein the or each flange member is generally circular.

23. The hydration system according to any of claims 20 to 22, wherein a flange member acts as a base on which the support may be stood, with the grip portion upright.

24. The hydration system according to claim 23, wherein the said flange member comprises an opening for allowing the tube to pass therethrough.

25. The hydration system according to any of claims 20 to 24, wherein the flange members are of sufficient diameter to hold the grip portion clear of a surface on which the holder is lying.

26. The hydration system according to any of claims 20 to 25, wherein a flange member is provided with a hook member.

27. The hydration system according to claim 26, wherein the hook member is of a form to allow it to hook onto the fingers or hand of a subject.

28. The hydration system according to either of claims 26 or 27, wherein the hook member is provided with a hole therein, by which the holder may be held.

29. The hydration system according to any preceding claim, wherein the holder is provided with one or more couplings for releasably holding the tube.

30. The hydration system according to claim 29, wherein the coupling is provided on a flange member of the holder.

31. The hydration system according to any preceding claim, wherein the holder is hollow.

32. The hydration system according to claim 31, wherein the holder comprises a bore extending therethrough, through which the tube passes when in use.

33. The hydration system according to either of claims 31 or 32, wherein the hollow interior of the holder is sized to accommodate a portion of the tube including the second end portion and the mouthpiece.

34. The hydration system according to any of claims 31 to 33, wherein holder is provided with an elongate slit for allowing the holder to be passed around the tube.

35. The hydration system according to claim 34, wherein the width of the slit is substantially the same or less than the outer diameter of the tube.

36. The hydration system according to any preceding claim, wherein the holder is formed from a polyolefin, polyvinylchloride, a polyurethane, a silicone, or a mixture thereof.

37. The hydration system according to any preceding claim, wherein the holder is resilient.

38. The hydration system according to any preceding claim, wherein the holder is provided with a releasable cover, within which at least a portion of the tube may be stored when not in use.

39. The hydration system according to any preceding claim, wherein the mouthpiece is formed integrally with the tube.

40. The hydration system according to any preceding claim, wherein the mouthpiece has an outer dimension that is greater than the outer diameter of the tube.

41. The hydration system according to any preceding claim, wherein the mouthpiece comprises an open bore therethrough that communicates with the bore of the tube.

42. The hydration system according to any preceding claim, wherein the mouthpiece is provided with a grip portion for holding by a user.

43. The hydration system according to any preceding claim, further comprising a container for holding a reservoir of liquid to be dispensed to the subject.

44. The hydration system according to claim 43, wherein the container is a flexible bag or pouch.

45. A holder for use in a hydration system as recited in any preceding claim.

46. The use of a hydration system according to any of claims 1 to 44 in the provision of liquid to a subject.

47. The use of a tube as recited in any of claims 2 to 15 in a hydration system for providing liquid to a subject.

48. A hydration system substantially as hereinbefore described, having reference to any of the accompanying figures.

49. A holder for a hydration system substantially as hereinbefore described, having reference to any of the accompanying figures.

50. A method of providing liquid to a subject using a hydration system substantially as hereinbefore described having reference to any of the accompanying figures.

Application No:	GB1102619.2	**Examiner:**	Alex Robinson
Claims searched:	1 to 50	**Date of search:**	31 May 2011

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X,Y	X: 1 to 15, 29 to 35, 37, 39 to 41, 43, 45, 46 and 47 , Y: 42	US 4141524 A (Corvese, Jr.) Whole document
X,Y	X: 1 to 15, 29 to 35, 37, 39 to 41, 43, 45, 46 and 47, Y: 42	FR 2889807 A1 (Autonomie Medicale Lyonaise) Figures and abstracts, API Abstract Accession No.: 2007-243749
X,Y	X: 1 to 15, 29 to 35, 37, 39 to 41, 43, 45, 46 and 47, Y: 42	US 2006/0255169 A1 (Gieson) Whole document
X,Y	X: 1 to 15, 29 to 35, 37, 39 to 41, 43 to 47, Y: 42	US 2007/0012733 A1 (Horito et al.) Whole document
X,Y	X: 1 to 15, 29 to 35, 37, 39 to 41, 43 to 47, Y: 42	US 5816457 A (Croft) Whole document
X	1 to 16, 29 to 32, 36, 37, 39, 41, 43, 45,	FR 2779629 A1 (Petot Bernard) Figures and abstracts, WPI Abstract Accession No.: 2000-074975

	46, 47.	
Y	42	US 2002/0115961 A1 (Writt, SR.) Note item 106
Y	42	WO 2010/147646 A1 (Makowski et al.) Note item 230

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC[X] :

Worldwide search of patent documents classified in the following areas of the IPC

A45F; A47G; A61J

The following online and other databases have been used in the preparation of this search report

EPODOC, WPI.

International Classification:

Subclass	Subgroup	Valid From
A61J	0015/00	01/01/2006