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(54) Benævnelse: **URINTESTSTRIMMEL**

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Description

The invention relates to a urine test strip device

Apparatuses for analysis of urine and, if appropriate, of other bodily fluids are known and generally serve the purpose of analyzing a defined quantity of urine with regard to their chemical or proportional composition, respectively. For this purpose, urine test strips are usually used, which are contacted with a defined quantity of urine. The evaluation or observation, respectively, of a change in an optically detectable parameter, i.e. in particular of a color change, of a analysis region of a urine test strip thereby allows drawing conclusions to the chemical or proportional composition, respectively, of the urine.

Up to now, it was standard to manually wet corresponding urine test strips with a defined quantity to urine, which is realized, e.g., by dipping a urine test strip into a sample container. The urine test strips, which are wetted with urine, are subsequently examined in a spectrometer. This represents a process, which is comparatively complex and is thus in need of improvement, for realizing an analysis of urine.

A test strip known from US 5 087 556 A is composed of several layers, namely an upper transparent PE layer onto which a membrane is laminated. A PVC layer is in turn laminated onto the latter. The PVC layer closes off the actual analysis region from the bottom, the PE layer from the top, the membrane being located between them. Finally, the PVC film is also covered with a peel-off film, which protects the strip from the bottom. This is necessary because the PVC film is perforated at two locations. Two holes are punched into the PVC film by means of the punch devices. These holes serve to form the accesses to the first and second open reservoirs. Accordingly, when the protective film is peeled off, these two reservoirs are thus open and accessible.

WO 2006/065705 A2 describes a test sensor in which, by way of

an inlet, a test liquid can be introduced into an analysis region, to which a ventilation opening can also be assigned. After introduction of the liquid, the analysis portion can be closed by a cover or closure.

US 5 271 895 A discloses a test strip which likewise has an open inlet and an open outlet.

The invention is thus based on the object of specifying a urine test strip device, which is improved in comparison.

In order to solve the object, a urine test strip device according to Patent Claim 1 is provided.

In order to use the urine test strip device according to the invention, use is made of an an apparatus for analysis of urine, which apparatus comprises at least:
a delivery and discharge device, which is set up to deliver a defined quantity of urine to an analysis chamber of a urine test strip having at least one analysis region and for discharging a defined quantity of urine from an analysis chamber of a urine test strip having at least one analysis region, wherein the delivery and discharge device has at least one movably mounted delivery and/or discharge element for delivering a defined quantity of urine to a delivery region of the analysis chamber of the urine test strip and/or for discharging a defined quantity of urine from a discharge region of the analysis chamber of the urine test strip, and a detection device, which is set up to detect an at least local change of at least one optically detectable parameter of the at least one corresponding analysis region of the or a corresponding urine test strip, which parameter changes in an optically detectable manner as a function of the composition of a quantity of urine contacting the analysis region, and to generate detection information which describes at least one optically detected parameter of the or a corresponding analysis region or which describes a change in such a parameter.

The apparatus for analysis of urine, hereinafter referred to in short as apparatus, thus comprises a delivery and discharge device and a detection device as essential components. It goes without saying that the apparatus can also comprise several delivery and discharge devices or several detection devices, respectively.

The delivery and discharge device serves to deliver a defined quantity of urine to an analysis chamber having at least one analysis region of a urine test strip and to discharge a defined quantity of urine from an analysis chamber of a urine test strip having at least one analysis region. The delivery and discharge device accordingly has at least one movably mounted delivery and/or discharge element for delivering a defined quantity of urine to a delivery region of the analysis chamber of the urine test strip and/or for discharging a defined quantity of urine from a discharge region of the analysis chamber of the urine test strip. Via the delivery and discharge device or the at least one delivery and/or discharge element belonging thereto, respectively, a delivery and/or discharge of a defined quantity of urine, generally of a defined quantity of fluid, to a corresponding delivery region or from a corresponding discharge region and thus into or from a urine test strip analysis chamber, respectively, in which a corresponding analysis region is present, can thus be realized.

Even though the delivery and discharge of a defined quantity of urine is generally possible via a single delivery and discharge element, which serves to deliver a defined quantity of urine to a corresponding delivery region as well as to discharge a defined quantity of urine from a corresponding discharge region, the delivery and discharge device typically has at least one separate delivery element for delivering a defined quantity of urine to a corresponding delivery region and at least one separate discharge element for discharging a defined quantity of urine from a corresponding discharge region.

The movable mounting of a corresponding delivery and/or discharge element provides for specific movements thereof to corresponding delivery and discharge regions of the urine test strip or away from corresponding delivery and discharge regions, respectively, of the urine test strip. The movement of a corresponding delivery and/or discharge element is typically possible between two movement end points. A first movement end point is thereby defined in that a delivery of a defined quantity of urine to a corresponding delivery region of the urine test strip or a discharge of a defined quantity of urine from a corresponding discharge region of the urine test strip, respectively, is possible in said first movement end point. A second movement end point is accordingly defined in that a delivery of a defined quantity of urine to a corresponding delivery region of the urine test strip or a discharge of a defined quantity of urine from a corresponding discharge region of the urine test strip, respectively, is not possible in said second movement end point.

The movement of a corresponding delivery and/or discharge element typically takes place along a defined, in particular linear or translatory, respectively, movement axis or movement path, respectively, Other movement axes or movement paths, respectively, namely, e.g., curved ones, are conceivable on principle.

Provided that several delivery and/or discharge elements are provided, they are movable along uniform or non-uniform movement axes or movement paths, respectively. The movement of the delivery and/or discharge elements can take place at the same time or with a time delay. However, the movement of several delivery and/or discharge elements advantageously takes place at the same time along parallel movement axes or movement paths, respectively.

The detection device serves to detect an at least local change of at least one optically detectable parameter of a corresponding analysis region of a urine test strip. The

optically detectable parameter changes in an optically detectable manner as a function of the composition of a quantity of urine wetting or contacting, respectively, the analysis region, namely, e.g., by changing the color and/or by changing the color intensity. The color or the color intensity, respectively, of the analysis region is thus a corresponding optically detectable parameter. To detect a corresponding change of the or of an optically detectable parameter, the detection device comprises suitable, in particular optical detection means. Such a detection means can be, e.g., one or several optical scanners.

In addition to the detection of an at least local change of at least one optically detectable parameter of a corresponding analysis region of a urine test strip, the detection device also serves to generate detection information. Detection information generated by the detection device describes at least one optically detectable or detected parameter, respectively, of the analysis region or a change therein. Detection information can thus describe, e.g., a color, a color intensity or a color change of the analysis region.

Due to the fact that the detection device is advantageously set up to communicate with at least one evaluation device which is set up to evaluate detection information generated by the detection device and to acquire evaluation information describing an analysis of the quantity of urine located on the analysis region of the urine test strip, the detection information can be transmitted to corresponding evaluation devices, in which conclusions can be drawn to the proportional or chemical composition, respectively, of the quantity of urine applied to the analysis region, based on the detection information. For this purpose, the apparatus advantageously comprises a sending and/or receiving device, which is assigned to the detection device and which provides for a wired or wireless transmission of corresponding detection information. The apparatus can thus also be connected to a local or global data network, namely, e.g., to a local intranet or to the

internet, or can be integrated therein, respectively, e.g., via Bluetooth, WLAN, etc..

The operation of the delivery and discharge device as well as the operation of the detection device is typically controlled via a control device of the apparatus assigned thereto. At least one control rule is typically stored in the control device, according to which a concentrated, i.e. coordinated control of the operation of the delivery and discharge device, of the detection device, and, if appropriate, of further devices, which in particular belong to the apparatus, is possible. The latter include in particular the following devices, which will be described below: pressure-determining devices, pump devices as well as valve devices installed in a bypass line.

Different operating modes of the apparatus can be realized via the control device or the at least one control rule stored therein, respectively. Corresponding operating moves provide in particular for a removal of a defined quantity of urine, the delivery of the or of a removed defined quantity of urine into a urine test strip analysis chamber, the discharge of the or of a removed defined quantity of urine from a urine test strip analysis chamber, flushing operations of the delivery and discharge device, flushing operations of the delivery and/or discharge elements, flushing operations of certain line sections or feed lines and withdrawal lines, respectively, leading into the delivery and/or discharge elements, flushing operations of a urine test strip, i.e. in particular of a urine test strip analysis chamber, etc..

Corresponding operating modes of the apparatus can be activatable or deactivatable or can be activated or deactivated, respectively, in different ways. The activation or deactivation can take place, for example, by means of mobile terminals, which are to be understood as, e.g., mobile phones, smartphones, laptops, tablets, etc., which can communicate via a communication connection with a sending and/or receiving device of the apparatus. A control can also take place, for example,

via voice command, whereby the apparatus is equipped with a suitable voice recognition device in this case. It goes without saying that corresponding operating modes of the apparatus can also be activated or deactivated in a fully- or partially automated manner.

As a whole, the apparatus provides for a comparatively simple and integrated analysis of urine and thus represents an improvement as compared to the above-described prior art.

The apparatus can be assigned to a sanitary facility comprising a water closet, in short a %flush toilet, or can be integrated in such a sanitary facility, respectively, as will be described below. Corresponding analyses of urine, and generally also of other body secretions, can thus take place in a practical way at a location where urine is secreted. For analysis of the urine, it is thus no longer necessary to transfer it into corresponding containers customary to date, in order to correspondingly wet urine test strips. The analysis of the urine can thus take place inside the sanitary facility or a sanitary facility accommodating the apparatus.

To realize movements of corresponding delivery and/or discharge elements, the delivery and discharge device advantageously has at least one drive device coupled to the at least one delivery and/or discharge element. The at least one delivery and/or discharge element is movable towards the or a delivery and/or discharge region of the urine test strip in such a way via the drive device that a tip, in particular a cannula-like tip, of the delivery and/or discharge element penetrates the delivery and/or discharge region of the urine test strip in order to deliver and/or discharge the or a defined quantity of urine into or from the urine test strip analysis chamber. The drive device comprises, e.g., a motor drive, i.e. for example an electric motor, or is configured as such, respectively, for this purpose.

It should be mentioned in general at this point that a corresponding delivery and/or discharge element typically has a

cannula- or tube-shaped design. A corresponding delivery and/or discharge element is thus typically configured as a hollow cylindrical body surrounded by a cavity, through which a fluid can flow. The tip of the delivery and/or discharge element can structurally be designed to taper or slope diagonally, respectively, such that a penetration or a perforation, respectively, of an element, which covers a delivery and/or discharge region of the urine test strip, in particular of a capsule element, which will be described below, is possible.

Advantageously, the apparatus comprises at least one conveying device, which is set up to convey at least one urine test strip to a detection region defined on the apparatus, in which detection region an at least local change of the at least one optically detectable parameter can be detected by means of the detection device, and/or which is set up to convey the at least one urine test strip out of the detection region or one such detection region. One or several urine test strips can thus be conveyed specifically to a or out of, respectively, a corresponding detection region of the detection device via such a conveying device. The conveying device thus provides for a single or multiple conveying of corresponding urine test strips. The conveying device can be set up to continuously or discontinuously convey corresponding urine test strips.

To convey corresponding urine test strips, the conveying device can comprise, or is configured as, e.g., at least one rotatably mounted conveyor element with conveying sections for conveying at least one urine test strip. The conveyor element can be, e.g., a knobbed wheel with conveying sections formed by knobs arranged a certain distance apart around the circumference for conveying at least one urine test strip. The knobs, which typically protrude radially from the knobbed wheel thus define conveying sections, by means of which urine test strips can be conveyed by rotation of the knobbed wheel. In the alternative or in addition, the conveying device can comprise or can be configured as at least one conveyor belt with conveying sections for conveying at least one urine test strip. Again in the

alternative or in addition, the conveying device can comprise at least one conveying roller from which a set of several urine test strips interconnected like a band or belt, which will be described in more detail below, can be unrolled or onto which a set of several urine test strips interconnected like a band or belt can be rolled. The conveying rollers can also each be equipped with conveying sections for conveying at least one urine test strip. The conveying rollers can in particular also be corresponding knobbed wheels.

The conveying device can in particular comprises at least two conveying rollers, so that a set of several urine test strips interconnected like a band or belt can be unrolled from a first conveying roller in such a way that at least one urine test strip to be conveyed to the detection region is movable or moved to the detection region, and can be rolled up onto a second conveying roller in such a way that the at least one urine test strip is movable or moved out of the detection region. This is a particularly practical principle, according to which unused urine test strips can be stored on a corresponding first conveying roller so as to be rolled up in the form of a corresponding set and can be unrolled therefrom. Used urine test strips, i.e. in particular urine test strips, which have been moved to the detection region, have been contacted with urine by means of the delivery and discharge device, and have correspondingly been “scanned” by means of the detection device, can be rolled onto a second conveying roller and can be collected on the latter.

To determine whether a urine test strip has reached the detection region and is thus in a position required for the detection of a corresponding optically detectable parameter of a analysis region of a urine test strip or for the detection of a change in such a parameter, respectively, the apparatus can comprise at least one position determining device. Such a position determining device is thus set up to determine a positioning of a urine test strip, which is required or correct, respectively, with regard to the detection of a corresponding optically

detectable parameter of a analysis region of a urine test strip or the detection of a change in such a parameter, respectively, by means of the detection device. For this purpose, the position determining device can comprise, e.g., light barriers or can be configured as such. A position determination of a urine test strip realized by means of a position determining device can thus generally take place optically.

The apparatus can further comprise at least one separation device, which is arranged downstream from the detection device and which is set up to separate at least one urine test strip from a set of several urine test strips interconnected like a band or belt. Individual or several correspondingly used urine test strips can thus be released from the set by means of such a separation device and can thus be handled separately, i.e. in particular disposed of. The separation device thus generally serves to separate used urine test strips from unused urine test strips and to release them from a corresponding set. The separation device can comprise, e.g., a cutting edge or a laser for this purpose or can be configured as such.

The apparatus advantageously comprises at least one housing part, which is configured to hold the delivery and discharge device, the detection device and, if appropriate, further devices of the apparatus, i.e. which will also be named below. The housing part thus provides for a comparatively compact accommodation of the devices belonging to the apparatus.

At least one accommodating compartment, which is configured to accommodate used urine test strips, i.e. which have meanwhile in particular been filled with a defined quantity of urine, in particular after the detection of an at least local change of the at least one optically detectable parameter of the analysis region of the urine test strip by means of the detection device, is releasably fastenable or is fastened to the housing part.

At least one support section for supporting at least one corresponding conveying device, in particular in the form of a

conveying roller, can further be configured on the housing part. The support section can structurally be a bolt- or pin-like protrusion, on which a corresponding conveying device, in particular in the form of a conveying roller, is rotatably storable or is stored. The bolt- or pin-like protrusion thereby typically forms the axis of rotation of the conveying device, i.e. in particular of the conveying roller.

In particular in connection with the flushing of the delivery and discharge device mentioned further above, as well as generally with different operating modes of the apparatus or of a sanitary facility comprising said apparatus, respectively, it can be advantageous when at least one bypass line is present, which connects a feed line leading into a delivery element and a withdrawal line leading from a discharge element. At least one valve device for opening and closing the bypass line is installed in the bypass line.

To convey urine through the apparatus, i.e. in particular deliver it to a corresponding urine test strip analysis chamber or to discharge it from a corresponding urine test strip analysis chamber, respectively, at least one pump device installed in a feed line leading into a delivery element and/or at least one pump device installed in a withdrawal line leading out of a discharge element is present. The at least one pump device installed in a feed line leading into a delivery element is set up to convey a defined quantity of urine to the or a delivery region of the urine test strip or to a corresponding urine test strip analysis chamber, respectively. The at least one pump device installed in a withdrawal line leading out of a discharge element is set up to convey a defined quantity of urine from the or a discharge region of the urine test strip or from a corresponding urine test strip analysis chamber. The pump devices can comprise conventional pumps, such as, e.g., rotary piston pumps etc., or can be configured as such.

The apparatus can further comprise at least one pressure-determining device, which is set up to determine the pressure

of the or of a quantity of urine guided to the delivery region of the urine test strip, in particular of the pressure of the quantity of urine guided by the or a delivery element. Conclusions can be drawn to gas bubbles, in particular air bubbles, which may be present in the quantity of urine and can, if appropriate, impact the significance of the detection information, by means of the pressure, which can be determined via such a pressure-determining device, of a quantity of urine guided to the delivery region of the urine test strip.

According to Patent Claim 1, the invention provides a urine test strip device, comprising at least one urine test strip with an analysis chamber having at least one analysis region for analysis of urine, wherein the analysis region is surrounded by at least one encapsulating element to form a fluid-tight encapsulation, wherein the encapsulating element has an upper encapsulating element portion, surrounding the exposed surface of the analysis region, and a lower encapsulating element portion, surrounding the surface of the analysis region facing away from the exposed surface of the analysis region, wherein the lower encapsulating element portion, at least in the regions lying opposite the delivery region and/or the discharge region, is designed as a septum and has elastic properties, in such a way that it sealingly encloses a delivery and/or discharge element perforating it and penetrating into the delivery and/or discharge region.

The general setup of the urine test strip device according to the invention comprises at least one urine test strip. The urine test strip comprises at least one analysis chamber, which has at least one analysis region for analysis of urine. The analysis region comprises or is formed by at least one analysis reactant, respectively.

The analysis reactant is generally a chemically reactive substance, which, upon contact with urine, performs a chemical reaction such that an optically detectable change of at least one optically detectable parameter takes place. The optically

detectable parameter of the chemically reactive substance or of the analysis reactant, respectively, thus changes a function of the composition of a quantity of urine contacting it in an optically detectable manner, namely, e.g., by changing the color and/or by changing the color intensity. The color, the color intensity or a color change of the analysis region is thus an optically detectable parameter of the analysis region.

The urine test strip device according to the invention is in particular characterized by a complete fluid-tight encapsulation of the analysis region. The encapsulation is realized by means of at least one encapsulating element, which surrounds the analysis region or certain sections of the analysis region. Depending on arrangement and geometric design of the encapsulating element, a certain spatial distance can be formed between said encapsulating element and the analysis region, which forms the or a part of the urine test strip analysis chamber. The encapsulating element can accordingly delimit at least a part of the urine test strip analysis chamber.

The analysis region, which is attached to or formed on, respectively, a carrier element, if appropriate, is thus protected in all cases by means of the or an encapsulating element against external influences, which can impact the quality of a corresponding analysis reactant, which, upon contact with urine, undergoes an optically detectable change of an optically detectable parameter, namely, e.g., a color change. Corresponding external influences are at hand in particular due to moisture and wetness, because they can lead to a degradation of corresponding analysis regions or corresponding analysis reactants forming them, respectively. The urine test strip device according to the invention also addresses the currently existing problem of a long-term storage of urine test strips, in the case of which a degradation of the analysis regions can currently only be excluded with difficulty in this way. Without corresponding encapsulation, corresponding external influences can also be at hand due to mechanical impacts, which can lead to damages to the analysis region.

An encapsulating element can also be understood to be a multi-part, in particular multi-ply or multi-layer structure. This can be advantageous in particular when a fluid-tight encapsulation against chemically different fluids is to be realized, so that certain plies or layers of the encapsulating element provides for a specific encapsulation against certain fluids.

The analysis region is advantageously configured between a delivery region for delivering a defined quantity of fluid, in particular quantity of urine, to the analysis chamber, and a discharge region for discharging a defined quantity of fluid, in particular quantity of urine, from the analysis chamber. The delivery region and/or the discharge region is advantageously surrounded by the or at least one further encapsulating element by forming a fluid-tight encapsulation. Not only an encapsulation of the analysis region, but also an encapsulation of corresponding delivery and/or discharge regions, which communicate or are connected to the analysis region, respectively, can thus be realized.

To facilitate an insertion of a delivery and/or discharge element to corresponding delivery and/or discharge regions of the urine test strip, it is advantageous when the delivery region and/or the discharge region has an, in particular dome-shaped or spherical segment-shaped bulge, A flow-through of the analysis chamber can likewise be facilitated, which can improve the analysis and thus the significance of the urine test strip. Corresponding, in particular dome-shaped or spherical segment-shaped bulges, respectively, can also be referred to or considered to be a so-called puncture eye, respectively. Alternatively to dome-shaped or spherical segment-shaped geometries, respectively, a corresponding bulge can, for example, also have conical, polyhedral or cylindrical geometries.

The encapsulating element is divided into at least two encapsulating element sections. The at least two encapsulating

element sections form the encapsulating element. The encapsulating element thereby has an upper encapsulating element section surrounding the exposed face of the analysis region and a lower encapsulating element section surrounding the face of the analysis region directed away from the exposed surface of the analysis region.

The upper and lower encapsulating element sections can differ, e.g., in their geometric-structural dimension, their shape and their materiality. A corresponding upper encapsulating element section can in particular be a three-dimensionally complexly shaped molded part, while the corresponding lower encapsulating element section can be a flat face part extending essentially two-dimensionally, namely, e.g., a film.

The upper encapsulating element section is typically at least locally made of a transparent material, in particular a transparent plastic material. This is advantageous insofar as a detection of a change in an optically detectable parameter, namely, e.g., a color change, of the analysis region is possible in this way. The term “transparent” is to thus in particular be understood in such a way that the upper encapsulating element section allows for a detection of an optically detectable parameter. In particular transparent plastics, such as, e.g., PC, PMMA, are possible as suitable materials for forming the upper encapsulating element section.

The lower encapsulating element section, in contrast, does not need to mandatorily be made of a transparent material. According to the invention, the lower encapsulating element section is formed elastically at least in the regions located opposite the delivery region and/or the discharge region in such a way that it encloses a delivery and/or discharge element, which perforates said region and penetrates into the delivery and/or discharge region so as to locally form a seal. The lower encapsulating element section can thus cling to a delivery or discharge element, respectively, which penetrates into the delivery or discharge region, respectively. It can be ensured

in this way that no leakages occur during the delivery or discharge, respectively, of a defined quantity of urine into the or from the urine test strip.

In particular plastics, such as, e.g., PE and/or PET, are possible as materials, which are suitable to form the lower encapsulating element section, i.e. which are correspondingly elastic. The use of thermoplastic elastomers, such as, e.g., TPO and/or TPV, which are structurally characterized by a comparatively high elasticity and thus highly elastic properties, is also conceivable. The materials are typically present as films with a strength or thickness, respectively, in a range of between 30 and 120 µm, in particular in a range of between 70 and 110 µm.

The elastic properties of corresponding films forming the lower encapsulating element section, i.e. in particular plastic films, can be influenced specifically as part of the production or processing thereof, respectively, e.g., by means of stretching. The use of metallic films of composite films, which are made of composite materials formed from different materials, e.g., plastic and metal, are also conceivable to configure the lower encapsulating element section.

It is likewise advantageous when the lower encapsulating element section is configured elastically in such a way at least in the regions located opposite to the delivery region and/or the discharge region that a perforated region is closed so as to form a seal by means of the material sections of the lower encapsulating element section delimiting said perforated region. The lower encapsulating element section is thus be configured as septum or as closure membrane, respectively, at least in some regions. In particular the above-mentioned materials, i.e. in particular plastic materials or composite materials, respectively, can be considered for the configuration of the lower encapsulating element section.

The urine test strip device advantageously does not only comprise one, but several urine test strips. The urine test strips are thereby interconnected like a band or belt by forming a set comprising several urine test strips. A corresponding set thus includes a plurality of urine test strips. On the one hand, this is associated with the advantage that the apparatus has to be equipped with urine test strips only in comparatively large time intervals. The securing of the operation of the apparatus can be ensured for a comparatively long time period in this way. On the other hand, the simple handling of a corresponding set, which is rolled onto a conveying device in the form of a conveying roller, e.g., in a simple manner or which can be unrolled therefrom, respectively, results in practical advantages.

The connection or the set, respectively, between corresponding urine test strips can thereby be formed in particular via respective encapsulating elements, which can be at least locally interconnected by forming continuous or discontinuous connecting regions. The encapsulating elements can generally be interconnected in a positive and/or non-positive manner and/or by means of a substance-to-substance bond in the connecting regions. Concretely, the encapsulating elements of respective urine test strips can be, e.g., adhered or welded to one another.

For the exemplary case, in which corresponding urine test strips each have a rectangular basic shape, the connection of the urine test strips can take place via respective longitudinal sides of the urine test strips. It goes without saying that the bond in the case of corresponding urine test strips with rectangular basic shapes can also take place via respective front sides. The location of the connection of corresponding urine test strips is generally determined according to the respective basic shape thereof, as a function of which suitable connecting regions are to be determined. In particular the type of the storage and delivery of a set of corresponding urine test strips in a detection device of the apparatus is to thereby also be taken into account.

Further described is a sanitary facility comprising a flush toilet, especially of the type suspended on a wall or floor-mounted, with a base body, especially made of ceramic, and with an apparatus as described further above. All statements with regard to the apparatus thus generally apply analogously with regard to the sanitary facility.

The sanitary facility comprises a flush toilet configured to be suspended on a wall or floor-mounted. The flush toilet can thus be fastened or mounted, respectively, to a wall or a floor. The flush toilet comprises a, in particular ceramic base body. Based on the properly mounted state of the base body, the latter has in particular upper face sections for mounting a lid and/or seat part as well as inner face sections having an inner region, into which secretions, i.e. in particular fecal matter and urine, can be secreted by a user.

With regard to the apparatus, the flush toilet has accommodating or fastening regions for accommodating or fastening the apparatus or individual parts of the apparatus. The apparatus, i.e. in particular a housing part belonging to the apparatus, if appropriate, can generally be fastened or is fastened to the base body in a positive and/or non-positive manner and/or by means of a substance-to-substance bond. For this purpose, suitable fastening means, which provide for, e.g., a locking, screw or adhesive connection of the apparatus to the flush toilet base body, are present in corresponding flush toilet accommodating or fastening regions. It goes without saying that corresponding fastening means can also be present on the apparatus.

With regard to a concrete geometric-structural design of a base body, corresponding flush toilet accommodating or fastening regions, respectively, are to advantageous be arranged in such a way that the apparatus is not visible for a user. For this purpose, cover elements can be provided, e.g., in the form of apertures, which make it possible to cover the apparatus.

Corresponding cover elements can be fixed relative to the flush toilet base body with regard to their location and position by means of suitable fastening elements, e.g., in the form of fastening brackets.

To make it possible to remove a defined quantity of urine, which is to be analyzed by means of the apparatus, at least one removal device is formed or arranged in the base body. The removal device comprises at least one tubular element, which is arranged in an opening in the base body and which is movably mounted relative to a closing element between an open position and a closed position. The closing element is typically arranged or fastened, respectively, in a positionally fixed manner on the base body. In the open position, a flow-through of the tubular element is possible. The closed position is thus defined in that a flow-through of the tubular element is not possible in said closed position A defined quantity of urine can thus be removed via a concerted control of the movement of the tubular element against the closing element, which can be realized, e.g., by moving the tubular element into the open position and moving the tubular element into the closed position, which takes place after a certain time interval has lapsed, e.g., a time interval of between 1 and 5 seconds.

Movements of the tubular element are advantageously realized via a drive device coupled thereto. The tubular element is movable in particular between the open and the closed position via the drive device. For this purpose, the drive device comprises, e.g., a magnetic drive, i.e. for example a rotary magnet or a motor drive, i.e. for example an electric motor, or is formed as such, respectively. To move the tubular element into the closed position or to support the movement of the tubular element into the closed position, respectively, spring means can further be provided, via which a spring force, which moves the tubular element into the closed position or secures it in the closed position, can be applied to said tubular element.

It goes without saying that a reverse kinematics is generally also conceivable, according to which a movably supported closing element is movable between an open and a closed position relative to a tubular element, which is arranged or fastened, respectively, on the base body in a positionally fixed manner.

The removal device, i.e. in particular the closing element belonging thereto, is typically arranged in such a way that it protrudes at least locally into corresponding inner face sections of the base body. In the closed position, the removal device, i.e. in particular the closing element belonging thereto, is typically flush with inner face sections of the base body, that (essentially) a uniform surface results.

The tubular element is typically connected via a line connection to a feed line, which leads to the delivery and discharge device of the apparatus and via which a quantity of urine removed by means of the removal device can be guided to the delivery and discharge device and further into a urine test strip analysis chamber. The tubular element thus advantageously has, on or in the region of its free end directed away from the base body, an attachment means for attaching to the or a delivery and discharge device of the apparatus.

At least one tank, in which a defined quantity of urine, e.g., approx. 200 ml, can be collected and stored prior to the actual delivery to the delivery and discharge device of the apparatus, can be installed in a feed line leading into a corresponding delivery and discharge device. The or a corresponding tank is thus installed between the removal device and the delivery and discharge device of the apparatus. The or a corresponding tank can be provided with at least one ventilating and/or at least one fill level determining device. A ventilating device can comprise, e.g., a ventilating valve or can be configured as such. A fill level determining device can comprise, e.g., a fill level sensor or can be configured as such.

It is expedient, in particular after the analysis of the urine, to return the latter back into the flush toil and to thus deliver it to a flush toilet drain. Accordingly, it is advantageous when a withdrawal line leading from the or a discharge device of the apparatus leads into an internal space delimited by the base body. The internal space of the base body accordingly comprises internal face sections of the base body.

The sanitary facility or the flush toilet belonging thereto, respectively, typically comprises at least one flushing device for carrying out a flushing operation of the flush toilet. At least one fluid line of the flushing device is thereby advantageously connectable or connected to the or a feed line leading into a delivery device of the apparatus. Flushing or cleaning operations, respectively, of the apparatus can be realized in this way, which is expedient, e.g., to prevent an unwanted formation of buildups and/or smells.

In addition to the flushing device, the sanitary facility or the flush toilet belonging thereto, respectively, can also comprise a shower device, by means of which a cleaning of certain body regions of a user can be carried out after using the sanitary facility. Accordingly, a drying device can be provided as well, which provides for a drying of body regions of a user cleaned accordingly by means of the shower device.

Further advantages, features and details of the invention follow from the exemplary embodiments described below as well as on the basis of the drawings, wherein:

Figs. 1-5 each show a schematic diagram of a sanitary facility;

Fig. 6 shows a schematic diagram of a removal device of a sanitary facility;

Figs. 7-10 each show a schematic diagram of an apparatus for analysis of urine;

Figs. 11-13 each show a schematic diagram of a urine test strip device according to an exemplary embodiment of the invention; and

Figs. 14-19 each show a schematic illustration of different operating modes of a sanitary facility.

Figs. 1-5 each show a schematic diagram of a sanitary facility 1. Figs. 1-3 thereby each show perspective views and Figs. 4, 5 each show sectional views of the sanitary facility 1. The sectional direction as well as the viewing direction are suggested in Fig. 1 by means of the general section line A-A. The sanitary facility 1 is equipped with an apparatus 2 for analysis of urine. An analysis or an examination, respectively, of urine or other body fluids discharged into the sanitary facility 1 can be carried out in a simple way via the integration of such an apparatus 2 in the sanitary facility 1.

The sanitary facility 1 comprises a flush toilet 3 of the type suspended on a wall or floor-mounted. The flush toilet 3 comprises a ceramic base body 4. The base body 4 has different face sections, of which only the face sections 4a-4d will be described in more detail below. Based on the properly mounted state of the base body 4, the latter has upper face sections 4a for mounting a lid and/or seat part (not shown), inner face sections 4b, which delimit an inner bowl-like region, into which a user can discharge secretions or body fluids, respectively, i.e. in particular feces and urine, rear face sections 4c, via which an attachment to a tubing (not shown), which is connected to a sewage system, is possible, and front face sections 4d.

The apparatus 2 is not visible in Fig. 1, because it is located behind a cover element 5 in the form of a ceramic aperture. The cover element 5 can be fixed in its location and position relative to the flush toilet base body 4 by means of suitable fastening elements (not shown), e.g., in the form of fastening brackets. In Figs. 2, 3, the cover element 5 is removed, so that

the apparatus 2 can be seen or components belonging thereto can be seen, respectively.

Figs. 4-5 show the apparatus 2 or a housing part 6 belonging thereto, respectively, in or on which the essential parts or functional components, respectively, of the apparatus 2 are accommodated or stored, respectively, without a corresponding cover element 5.

A delivery and discharge device 7, which is set up to deliver a defined quantity of urine into an analysis chamber 9 of a urine test strip 10 having at least one analysis region 8, and for discharging a defined quantity of urine from a or the analysis chamber 9, respectively, having at least one analysis region 8, of a or the urine test strip 10, respectively, belongs to the essential parts or functional components, respectively, of the apparatus 2. Setup and function of the delivery and discharge device 8 will be described in more detail in particular in connection with Figs. 7-10.

A detection device 11, which is set up to detect an at least local change of at least one optically detectable parameter of the or of a corresponding analysis region 8 of the or of a urine test strip 10, further belongs to the essential parts or functional components, respectively, of the apparatus 2. The optically detectable parameter changes in an optically detectable manner as a function of the composition of a quantity of urine contacting a corresponding analysis region 8 of a urine test strip, namely, e.g., by changing the color and/or by changing the color intensity. The color or the color intensity, respectively, of the analysis region 8 is thus a corresponding optically detectable parameter. The detection device 11 is further set up to generate detection information, which describes at least one such optically detectable or detected parameter, respectively, of an analysis region 8 or a change thereof. The detection device 11 comprises optical detection means in the form of optical scanners for detecting a corresponding change of an optically detectable parameter. The

function of the detection device 11 will likewise be described in more detail in particular in connection with Figs. 7-10.

As can in particular be seen on the basis of Figs. 2 and 5, a conveying device 12 in the form of a conveying roller is rotatably mounted on the housing part 6 of the apparatus 2. The conveying device 12 is set up to convey at least one urine test strip 10 into a detection region defined on the apparatus side, in which detection region a detection of an at least local change of a corresponding optically detectable parameter of an analysis region 8 of a urine test strip can be detected by means of the detection device 11, and/or which is set up to convey the at least one urine test strip out of one such detection region. A set 13, which is described in more detail in particular in the context of Fig. 13, of several urine test strips 10 interconnected like a band or belt, can be unrolled from the conveying device 12 configured as conveying roller or can be rolled onto the conveying device 12 configured as conveying roller, respectively.

Fig. 1 further shows a flush toilet base body removal device 14. The removal device 14 is arranged in an opening in the region of the inner face sections 4b of the main body 4. When a user urinates into the flush toilet 3, the removal device 14 serves to remove a defined quantity of urine, which is to be delivered to the apparatus 2 for analysis purposes. Setup and function of the removal device 14 will be described in more detail with reference to Fig. 6.

It can be seen from Figs. 2, 3 that a first line section 15a of a feed line 15 leads from the removal device 14 into the delivery and discharge device 7 of the apparatus to a tank 16. A tank 16, in which a defined quantity of urine, e.g., approximately 200 ml, can be collected and stored prior to the actual delivery to the device 2 or to the delivery and discharge device 7 of the apparatus, is thus installed in a feed line 15 leading to the apparatus 2. The tank 16 is thus installed between the removal device 14 and the delivery and discharge device 7 of the

apparatus. The tank 16 is equipped with a ventilating device, which is not identified in more detail, in the form of a ventilating valve, and a fill level determining device, which is not identified in more detail, in the form of a fill level sensor.

Starting at the tank 16, a second line section 15b of the feed line 15 leads to the delivery and discharge device 7 of the apparatus. The first line section 15a of the feed line 15 is, e.g., a flexible fabric tube, the second line section 15b of the feed line 15 is, e.g., a laboratory tube with a diameter, which is smaller as compared to the or a fabric tube.

As can be seen, a fresh water feed line 17, which is connected to a flushing device 43 of the flush toilet (see Figs. 14 et seqq.), leads into the first line section 15b of the feed line 15. Upstream of as well as downstream from the opening region of the fresh water feed line 17 into the feed line 15, a valve device 18, e.g., in the form of a magnetic valve, is installed in the first line section 15a of the feed line 15, thus on the feed side. A corresponding valve device 18 is also arranged upstream of the opening region on the fresh water feed line side.

It can further be seen on the basis of Figs. 2, 3 that a withdrawal line 19 leads from the apparatus 2, i.e. in particular from the delivery and discharge device 7 of the apparatus arranged in the housing part 6, into the interior of the flush toilet 3, which is delimited by the inner face sections 4b of the base body 2. It is possible in this way to return urine back into the flush toilet 3 again after the analysis, which is carried out by means of the apparatus 2, and to thus deliver it to a flush toilet drain. The withdrawal line 19 can likewise be a laboratory tube.

The releasable fastening of the housing part 6 of the apparatus on the flush toilet base body 4 is to be described on the basis of Figs. 4, 5. Fig. 4 shows the flush toilet base body 4 without

housing part 6 fastened thereto, Fig. 5 shows the flush toilet base body 4 with the housing part 6 fastened thereto. As can be seen on the basis of Fig. 4, the base body 4 is provided with fastening elements 20 in the region of the exposed front face sections 4d. The fastening elements 20 are fastened to the base body 4, e.g., by means of an adhesive connection. The fastening elements 20 comprise bolt-shaped fastening sections, which are not identified in more detail, which have threads and via which the housing part 6 can be fastened thereto in a non-positive manner, i.e. in particular by means of a screw connection. It goes without saying that the housing part 6 has corresponding thread seats or through holes for realizing the fastening, i.e. in particular of the screw connection. Three corresponding fastening elements 20 are typically provided on the base body, so that a three-point fastening of the housing part 6 on the base body 4 can be realized.

Fig. 6 shows a schematic illustration of a removal device 14 of the or of a sanitary facility 1, respectively. The removal device 14 shown in Fig. 6 in an individual view comprises a hollow cylindrical tubular element 21, which permeates an opening of the base body 4 and which is movably mounted relative to a fixedly mounted, disk-shaped closing element 22 of the base body between an open and a closed position. The movability of the tubular element 21 between the open and the closed position is suggested in Fig. 6 by the double arrow.

In the open position shown in Fig. 6, the tubular element 21 is moved away from the closing element 22 by means of a funnel-shaped section, which similarly forms the free end of the tubular element 21, in such a way that urine can flow out of the interior of the base body 4 into or through the tubular element 21, respectively, and can thus reach into the first line section 15a of the feed line adjacent to the removal device 14 into the delivery and discharge device 7. For this purpose, the tubular element 21 has, on or in the region of its free end directed away from the base body 4, an attachment means (not shown) for attaching to the feed line 15 leading into the delivery and

discharge device 7. A screen can be present in the attachment means or upstream of the attachment means.

In the closed position, the tubular element 21 can be closed so as to form a seal by means of sealingly abutting the closing element 22. In other words, the tubular element 21 is moved against the closing element 22 so as to form a seal in the closed position. The sealing abutting is supported by a sealing element, which is not identified in more detail, e.g., in the form of an O-ring, which is arranged on the closing element 22 around the circumference.

Movements of the tubular element 21 are realized via a drive device 23 coupled thereto, via which the tubular element 21 is movable in particular between the open and the closed position. For this purpose, the drive device 23 comprises, e.g., a magnetic drive in the form of a rotary magnetic, which is coupled to the tubular element 21 via a pinion or gear element 24, respectively. To move the tubular element 21 into the closed position or to support the movement of the tubular element 21 into the closed position, spring means (not shown) can be provided, via which a spring force, which moves the tubular element 21 into the closed position or secures it in the closed position, can be applied to said tubular element 21.

Figs. 7-10 each show a schematic diagram of an apparatus 2 for analysis of urine. Figs. 7, 8 thereby each show sectional views of different exemplary embodiments of an apparatus fastened to the flush toilet, Fig. 9 shows an enlarged partial view of the apparatus 2 according to the exemplary embodiment shown in Fig. 7, and Fig. 10 shows an enlarged partial view of a top view onto the apparatus 2.

With regard to the exemplary embodiment shown in Fig. 7, it is important to note that the housing part 6 of the apparatus, as compared to the illustration shown in Fig. 3, has a slightly different geometric-spatial design, which generally allows

drawing a conclusion to a possible design flexibility of the apparatus 1 or of the parts belonging thereto, respectively.

The essential difference between the different exemplary embodiments of the apparatus 2 shown in Figs. 7, 8 lies in the number of the conveying rollers belonging to the conveying device 12. While in the case of the exemplary embodiment shown in Fig. 7, only one conveying device 12 with a single conveying roller, from which a corresponding set 13 of several urine test strips 10 interconnected like a band or belt can be unrolled from a first conveying roller in such a way that at least one urine test strip 10, which is to be conveyed to the detection region of the detection device 11, can be unrolled is present, a conveying device 12 with two conveying rollers is provided in the exemplary embodiment shown in Fig. 8, and, arranged upstream or downstream thereof, respectively, deflection rollers, which are smaller as compared to the conveying rollers, are provided in the exemplary embodiment. In the exemplary embodiment shown in Fig. 8, it is thus possible that a set 13 of several urine test strips 10 interconnected like a band or belt is movable or is moved into the detection region and can be rolled onto a second conveying roller in such a way that it is movable or is oved out of the detection region.

In the exemplary embodiment shown in Fig. 7, a separation device 25 arranged downstream from the detection device 11 (see Fig. 9) is provided, which is set up to separate at least one urine test strip 10 from the set 13 of several urine test strips 10, which are interconnected like a band or belt. Individual or several used urine test strips 10 can be released from the set 13 by means of the separation device 25 and can thus be handled separately, i.e. in particular disposed of. For this purpose, the separation device 25 generally comprises, e.g., a cutting edge, which is not identified in more detail, or a laser.

Urine test strips 10 separated from the set 13 can be accommodated and collected in an accommodating compartment 35, which is configured to accommodate used urine test strips 10,

i.e. which have meanwhile in particular been filled with a defined quantity of urine, and is releasably fastened to the housing part 6.

Fig. 9 shows an enlarged view of the exemplary embodiment of the apparatus 2 shown in Fig. 7. As can be seen, a corresponding set 13 of interconnected urine test strips 10 extends here between a gap formed between the detection device 11 and the delivery and discharge device 7, and thus through a corresponding detection region of the detection device 11. The guidance and positioning of the set 13 is supported by a rotatably supported knobbed wheel 26, which likewise forms a part of the conveying device 12. The knobbed wheel 26 comprises conveying sections formed by knobs 27, which are arranged a certain distance apart around the circumference and which extend radially, for conveying at least one urine test strip 10. The urine test strips 10 can be conveyed continuously or discontinuously through the detection region by rotation of the knobbed wheel 26.

It can be seen on the basis of Figs. 9, 10 that the delivery and discharge device 7 has a cannula-like delivery element 28, which is supported so as to be movable in a linear or translatory manner, and a cannula-like discharge element 29, which is supported so as to be movable accordingly. The delivery element 28 serves to deliver a defined quantity of urine to a delivery region 33 of an analysis chamber 9 of a urine test strip 10, the discharge element 29 serves to discharge a defined quantity of urine from a discharge region 34 of an analysis chamber 9 of a urine test strip 10.

To realize movements of the delivery element 28 and of the discharge element 29, the delivery and discharge device 7 has a drive device 32 coupled thereto. The drive device 32 comprises an electric motor (not shown). The delivery or discharge element 28, 29, respectively, is movable against the or a delivery region 33 of the urine test strip or discharge region 34, respectively, via the drive device 32 in such a way that a cannular-like tip of the delivery or discharge element 28, 29, respectively,

penetrates the delivery and/or discharge region 33, 34 of the urine test strip in order to deliver and/or discharge a defined quantity of urine into the or from the urine test strip analysis chamber 9. The movable support and thus the movement axis of the delivery element 28 and of the discharge element 29 are suggested by the double arrow.

As can be seen, the drive device 32 is coupled to the delivery and the discharge element 28, 29 via several components, such as, e.g., a gear wheel 30 and a gear rack 31 meshing therewith, so that rotatory movements of a drive shaft (not shown) of the drive apparatus can be converted into translatory movements of the delivery element 28 and of the discharge element 29 via the gear wheel 30 and the gear rack 31.

The apparatus 2 is further equipped with a position determining device 36, which is arranged above the detection device 11 and which is set up to determine a positioning of a urine test strip 10, which is correct with regard to the detection of a corresponding optically detectable parameter of an analysis region 8 of a urine test strip or the detection of a change in such a parameter, respectively, by means of the detection device 11. A further position determining device 36 arranged below the detection device 11 is set up to determine an initial position of the separation device 25. The initial position of the separation device 25 is defined in that no separation of a urine test strip 10 from the set 13 takes place in said separation device 25. The position determining devices 36 each comprise light barriers for the mentioned purposes.

Even though it cannot be seen in Figs. 7-10, the apparatus 2 further comprises a pump device 37 installed in a feed line 15 leading into a delivery element 28 and a pump device 37 installed in a withdrawal line 19 leading out of a discharge element 29. However, the pup devices 37 are illustrated schematically in Figs. 14 et seqq.. The pump devices 37, which can be, e.g., small-sized rotary piston pumps, serve in particular to convey urine through the apparatus 2, i.e., to convey or pump it,

respectively, in particular into a corresponding urine test strip analysis chamber 9 or to convey or pump it, respectively, out of a corresponding urine test strip analysis chamber 9.

The apparatus 2 is likewise equipped with a pressure-determining device 38, which is set up to determine the pressure of a quantity of urine guided into the delivery region 33 of the urine test strip, in particular of the pressure of the quantity of urine guided by the delivery element 28. The pressure-determining device 38 comprises pressure sensors, which are suitable for this purpose. The pressure-determining device 38 is likewise illustrated schematically in Figs. 14 et seqq.. Conclusions can be drawn to gas bubbles, in particular air bubbles, which may be present in the quantity of urine and which can, if appropriate, impact the significance of the detection information, by means of the pressure, which can be determined via such a pressure-determining device 38, of a quantity of urine guided to the delivery region 33 of the urine test strip.

The apparatus 2 further comprises a bypass line 41, which is shown schematically in Figs. 14 et seqq., which connects the feed line 15 leading into a delivery element 28 and a withdrawal line 19 leading from a discharge element 29. A valve device 42 for opening and closing the bypass line 41 is installed in the bypass line 41.

Fig. 10 shows an enlarged partial illustration of a top view onto the apparatus 2. Based on Fig. 10, the movable support of the delivery and discharge element 28, 29 belonging to the delivery discharge device 7 is again suggested by a double arrow. In the illustration shown in Fig. 10, the delivery and discharge elements 28, 29, which are typically driven or moved, respectively, simultaneously and uniformly, are spaced apart from the urine test strip 10 or a corresponding delivery region 33 of the urine test strip and a discharge region 34 of the urine test strip. A delivery or discharge, respectively, of a defined quantity of urine into the urine test strip analysis chamber 9 is only possible when the delivery element 28 has

penetrated into the delivery region 33 of the urine test strip and the discharge element 29 into the discharge region 34 of the urine test strip. As can be seen, the delivery region 33 of the urine test strip as well as the discharge region 34 of the urine test strip is structurally defined by a dome-shaped or spherical segment-shaped bulge, respectively.

The further setup of a urine test strip 10 forming a part of a urine test strip device 39 will be described below with reference to Figs. 11-13, which each show a schematic diagram of a urine test strip device 39 according to an exemplary embodiment of the invention. Fig. 11 thereby shows an individual urine test strip 10 in a perspective view, Fig. 12 shows a sectional view along the section lines XII-XII shown in Fig. 11, and Fig. 13 shows a top view onto a set 13 of several urine test strips 10 interconnected like a band or belt.

Based on Fig. 11, it can be seen that an individual urine test strip 10 typically has a rectangular basic shape. An analysis chamber 9 having an analysis region 8 for analysis of urine is located between an upper encapsulating element section 40a and a lower encapsulating element section 40b. Together, the upper encapsulating element section 40a and the lower encapsulating element section 40b form an encapsulating element 40, via which the analysis region 8 is encapsulated and is thus protected against external influences, i.e. in particular against moisture.

The upper encapsulating element section 40a is configured as three-dimensionally complexly formed molded part and has an essentially flat central wall section delimiting the analysis chamber 9, and two lateral wall sections, which are curved in a dome-shaped or spherical segment-shaped manner delimiting the delivery region 33 and the discharge region 34. It goes without saying that a passage between the delivery and discharge region 33, 34 and the analysis chamber 8 exists, which thus communicate with one another.

The upper encapsulating element section 40a is made of a transparent plastic material, such as, e.g., PC. The plastic material is transparent such that it allows for a detection of a change in an optically detectable parameter of the analysis region 8, namely, e.g., a color change, by means of the detection device 11.

The lower encapsulating element section 40b is not formed three-dimensionally complex, but is configured to be flat or in a film-like manner, respectively. The lower encapsulating element section 40b is thus present as face part or as film, respectively. Its thickness typically lies in a range of between 30 and 120 µm, in particular in a range of between 70 and 110 µm.

The lower encapsulating element 40b is made of an elastic plastic material, such as, e.g., PE and/or PET, or a plastic composite material, respectively. With regard to the elastic properties, the lower encapsulating element section 40b can also be made of a thermoplastic elastomer, namely, e.g., TPO and/or TPV.

The elastic properties of the lower encapsulating element section 40b make it possible that a delivery or discharge element 28, 29, respectively, which penetrates into the delivery or discharge region 33, 34, respectively, and perforates it, can be enclosed so as to locally form a seal. The lower encapsulating element section 40b thus clings to a delivery or discharge element 28, 29, respectively, which penetrates or has penetrated, respectively, into the delivery or discharge region 33, 34, respectively, so that it is ensured that that no leakage occurs during the delivery or discharge, respectively, of a defined quantity of urine into the or from the urine test strip 10.

The elastic properties of the lower encapsulating element section 40b likewise make it possible that a perforated region is or will be sealingly closed, respectively, by means of the material sections delimiting said region. The lower

encapsulating element segment section 40b thus also serves as septum or as closure membrane, respectively, whereby it is ensured that no leakage occurs even after the delivery or discharge, respectively, of a defined quantity of urine from the urine test strip 10.

Fig. 13 shows a set 13 of several urine test strips 10. The urine test strips 10 are thereby interconnected like a band or belt. The set 13 can thus be identified or considered, respectively, to be a band having several urine test strips 10 or as belt having several urine test strips 10, respectively. As can be seen, the urine test strips 10 are interconnected in the region of their respective longitudinal sides. The connection between corresponding urine test strips 10 is thereby formed in particular via respective encapsulating elements 40, which are at least locally interconnected by forming continuous or discontinuous connecting regions. The encapsulating elements 40 of urine test strips 10, which are each arranged adjacently, can thereby be adhered or welded, e.g..

Based on Figs. 14-19, which each show a schematic illustration of different operating modes of a sanitary facility 1, different exemplary embodiments of a method for operating a sanitary facility 1 with an apparatus 2 belonging thereto will be described below. The description of the operating modes is based on a configuration of the sanitary facility 1 or of the apparatus 2, respectively, as described above and as in each case illustrated in Figs. 14 et seqq.. Fluid flows are generally suggested in Figs. 14 et seqq. by means of arrows. A pump device of the flushing device is likewise provided with reference numeral 37.

An exemplary operating mode for realizing a removal of a defined quantity of urine and an analysis thereof, i.e. in particular an acquisition of corresponding detection information, is shown in Fig. 14. The quantity of urine removed via the removal device 14 is conveyed or pumped, respectively, into the urine test strip 10 by means of the pump devices 37 via the feed line 15,

i.e. via the analysis region 8 and thus through the analysis chamber 9. The quantity of urine is subsequently, i.e. in particular after the analysis and generation of the detection information, conveyed or pumped, respectively, from the urine test strip 10 and from the apparatus 2 via the withdrawal line 19. It goes without saying that corresponding delivery elements 28 or discharge element 29, respectively, of the apparatus have previously penetrated into corresponding delivery or discharge regions 33, 34, respectively, of the urine test strip. The valve device 42 installed in the bypass line 41 is thereby closed. The detection device 11 generate corresponding detection information, which, as will be described below, is transmitted in particular to an evaluation device (not shown), which is integrated in the apparatus 2 or which is arranged externally, i.e., spatially separated from the apparatus 2.

Fig. 15 shows an exemplary operating mode for realizing an emptying of the feed line 15 and of the withdrawal line 19. The valve device 42 installed in the bypass line 41 is thereby open, so that residues of a quantity of urine, which are present in the feed line 15 and the withdrawal line, if appropriate, can be pumped off.

Fig. 16 shows an exemplary operating mode for realizing a flushing of the feed line 15 as well as of the removal device 14 arranged upstream thereof. As can be seen, a flushing fluid, in particular water, provided by a flushing device 43 of the flush toilet via the fresh water supply 17 is conveyed or pumped, respectively, through the feed line 15 as well as through the removal device 14. The valve devices 18 as well as the valve device 42 installed in the bypass line 41 are thereby installed in such a way that an inflow of the flushing fluid is neither possible into the delivery and discharge device 7 nor into the withdrawal line 19.

Fig. 17 shows an exemplary operating mode for realizing an emptying of the feed line 15, which follows the flushing of the feed line 15, as well as of the removal device 14 arranged

upstream thereof. The emptying of the feed line 15 as well as of the removal device 14 takes place by opening the valve device 42 installed in the bypass line 41, so that flushing fluid residues can be conveyed or pumped, respectively, via the withdrawal line 19 out of the feed line 15 and the removal device 14.

Fig. 18 shows an exemplary operating mode for realizing a flushing of the delivery and discharge device 7 as well as of a urine test strip 10. As can be seen, a flushing fluid, in particular water, provided by the flushing device 43 of the flush toilet via the fresh water supply 17 is conveyed or pumped, respectively, through the delivery and discharge device 7 as well as the urine test strip 10, i.e. in particular through the urine test strip analysis chamber 9. The valve devices 18 as well as the valve device 42 installed in the bypass line 41 are thereby installed in such a way that an inflow of the flushing fluid into the delivery line 15 is not possible.

Finally, Fig. 19 shows an exemplary operating mode for realizing a flushing of the withdrawal line 19, which can follow the flushing of the delivery and discharge device 7 as well as of the urine test strip 10. As can be seen, flushing fluid, in particular water, provided by a flushing device 43 of the flush toilet via the fresh water supply 17 is thereby conveyed or pumped, respectively, through the withdrawal line 19. The valve devices 18 as well as the valve device 42 installed in the bypass line 41 are thereby installed in such a way that an inflow of the flushing fluid is neither possible into the feed line 15 nor into the delivery and discharge device 7.

The operation of the sanitary facility 1 or of the apparatus 2, respectively, i.e. in particular also the performance of the operating modes described with reference to Figs. 14-19, are controlled by means of a central control device (not shown).

For this purpose, the control device communicates in particular with all devices of the apparatus. At least one control rule is

typically stored in the control device, according to which a concerted, i.e. coordinated control of the operation of the delivery and discharge device 7, of the detection device 11, as well as of further devices belonging to the apparatus 2 is possible. The latter include in particular corresponding pressure-determining devices 38, pump devices 37, as well as the valve devices 18, 42.

The detection device 11 is typically set up to communicate with at least one evaluation device, which is set up to evaluate detection information generated by the detection device and to acquire evaluation information describing an analysis of the quantity of urine located on the analysis region of the urine test strip. As mentioned, the evaluation device can be part of the apparatus 2 or external. In the latter case, the apparatus 2 comprises a sending and/or receiving device (not shown) assigned to the detection device 11, which provides for a wired or wireless transmission of corresponding detection information. The sanitary facility 1 or the apparatus 2, respectively, is thus connected to a local or global data network, namely, namely, e.g., to a local intranet or to the internet, or can be integrated therein, respectively, via Bluetooth, WLAN, etc.. Detection information can accordingly be transmitted to corresponding evaluation devices, in which conclusions can be drawn to the proportional or chemical composition, respectively, of the quantity of urine applied to the analysis region, based on the detection information.

Patentkrav

1. Urinteststrimmelanordning (39) omfattende i det mindste en urinteststrimmel (10) med et analysekammer (9), som har i det mindste et analyseområde (8) til analyse af urin, idet analyseområdet (8) under dannelse af en fluidtæt indkapsling er omgivet af i det mindste et indkapslingselement (40), idet indkapslingselementet (40) har et øvre indkapslingselementafsnit (40a), som omgiver den fritliggende flade på analyseområdet (8), og et nedre indkapslingselementafsnit (40b), som omgiver den flade på analyseområdet (8), som omgiver den fritliggende overflade på analyseområdet (8), som vender væk fra fladen på analyseområdet (8), idet det nedre indkapslingselementafsnit (40b) i det mindste i de områder, som ligger over for tilførselsområdet (33) og/eller fraledningsområdet (34), er udformet som septum og er udformet elastisk på en sådan måde, at det tætnende omslutter et tilførings- og/eller udledningselement (28, 29), som perforerende trænger ind i tilførings- og/eller udledningsområdet.

2. Urinteststrimmelanordning ifølge krav 1, kendetegnet ved, at analyseområdet (8) er udformet mellem et tilførselsområde (33) til tilførsel af en bestemt fluidmængde, navnlig urinmængde, til analysekammeret (9) og et fraledningsområde (34) til fraledning af en bestemt fluidmængde, navnlig urinmængde, fra analysekammeret (9), idet tilførselsområdet (33) og/eller fraledningsområdet (34) under dannelse af en i det mindste afsnitsvis fluidtæt indkapsling i det mindste afsnitsvis er omgivet af indkapslingselementet (40) eller i det mindste et yderligere indkapslingselement (40).

3. Urinteststrimmelanordning ifølge krav 2, kendetegnet ved, at tilførselsområdet (33) og/eller fraledningsområdet (34) har en navnlig kuglesegmentformet udbugtning.

4. Urinteststrimmelanordning ifølge et af de foregående krav, kendetegnet ved, at det øvre indkapslingselementafsnit (40a) i

det mindste afsnitsvis er udformet af et transparent materiale, navnlig af et transparent kunststofmateriale.

5. Urinteststrimmelanordning ifølge et af de foregående krav, kendetegnet ved, at det nedre indkapslingselementafsnit (40b) i det mindste i de områder, der ligger over for tilførselsområdet (33) og/eller udledningsområdet (34), er udformet elastisk på en sådan måde, at et perforeret område ved hjælp af materialeafsnit, der begrænser dem, på det nedre indkapslingselementafsnit (40b) kan lukkes tætnende eller er lukket tætnende.

6. Urinteststrimmelanordning ifølge et af de foregående krav, kendetegnet ved, at det nedre indkapslingselementafsnit (40b) er udformet af et elastisk kunststofmateriale, navnlig PE og/eller PET.

7. Urinteststrimmelanordning ifølge et af de foregående krav, kendetegnet ved, at den omfatter flere urinteststrimler (10), som under dannelse af et bundt (13), som omfatter flere urinteststrimler (10), er forbundet bånd- eller bælteformet med hinanden.

FIG. 1

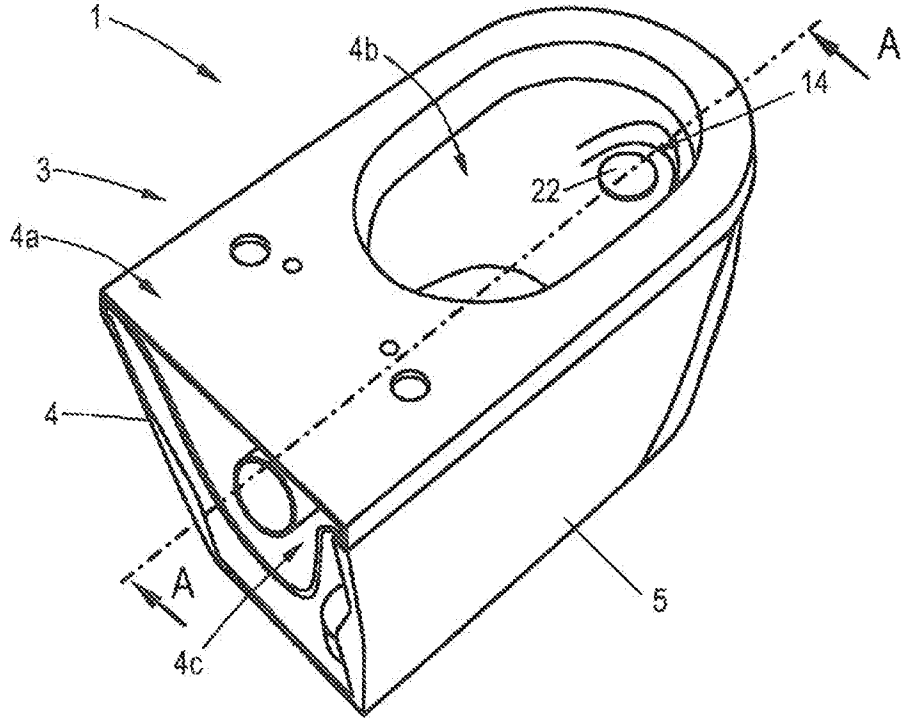

FIG. 2

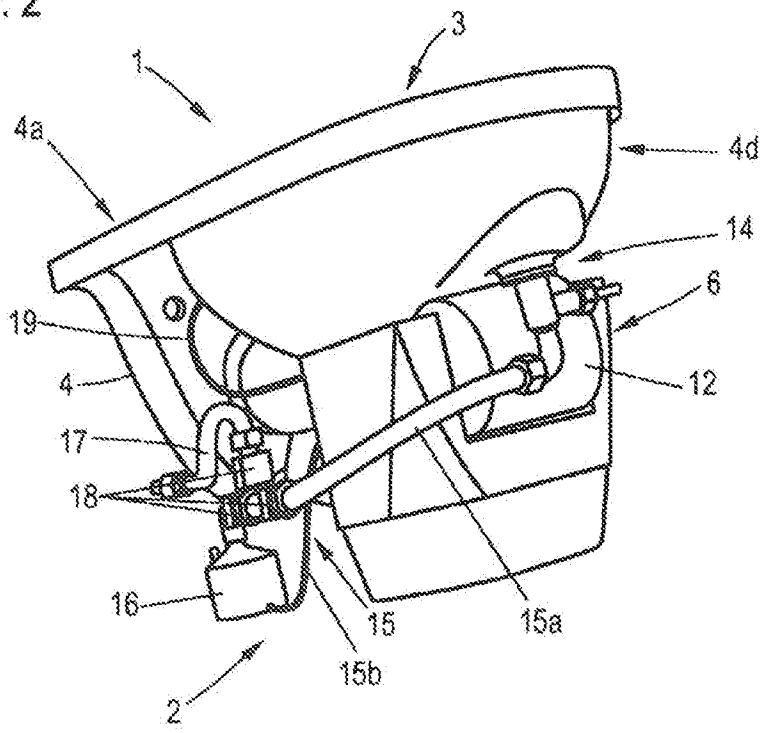

FIG. 3

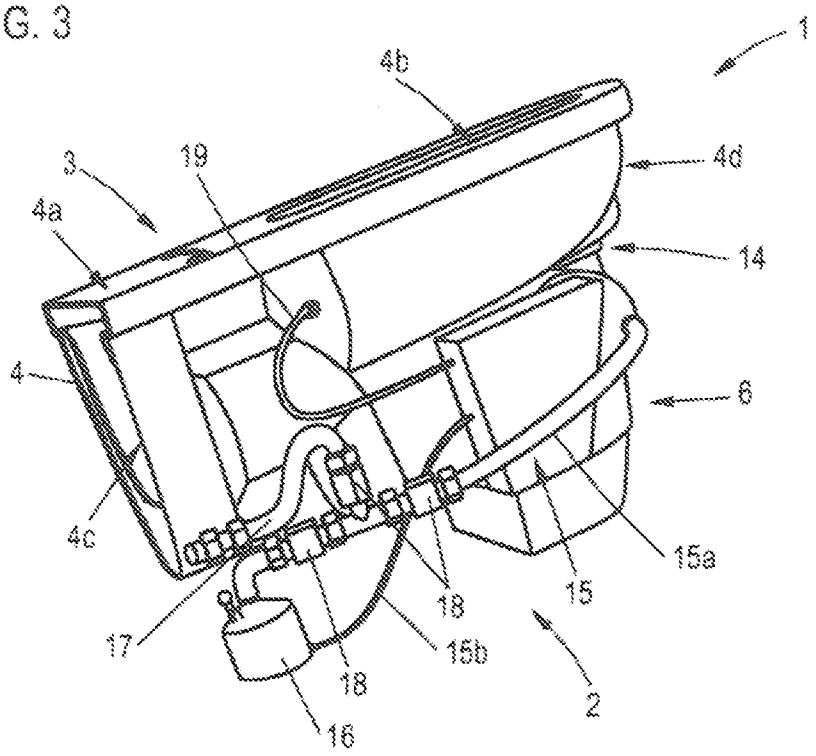

FIG. 4

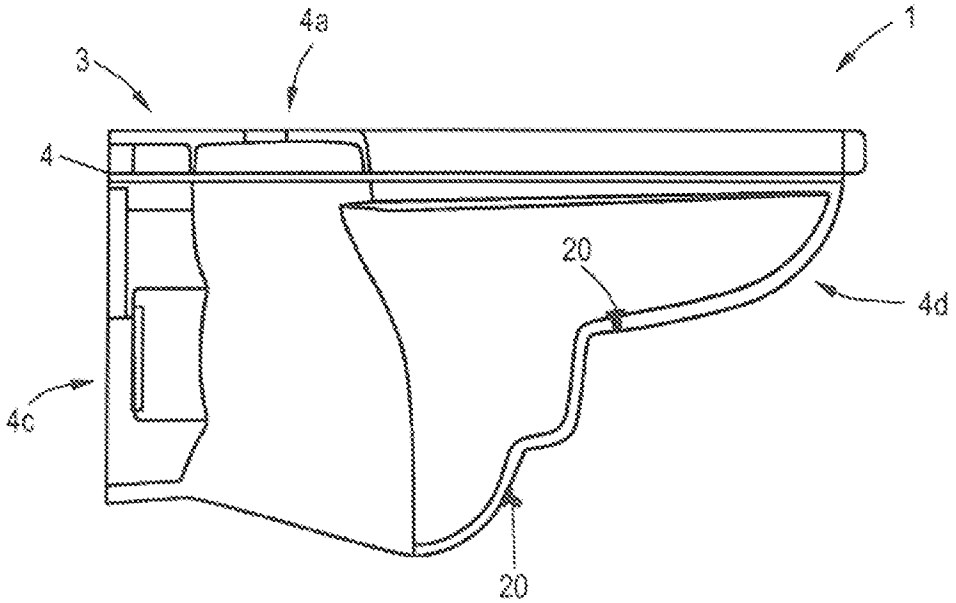

FIG. 5

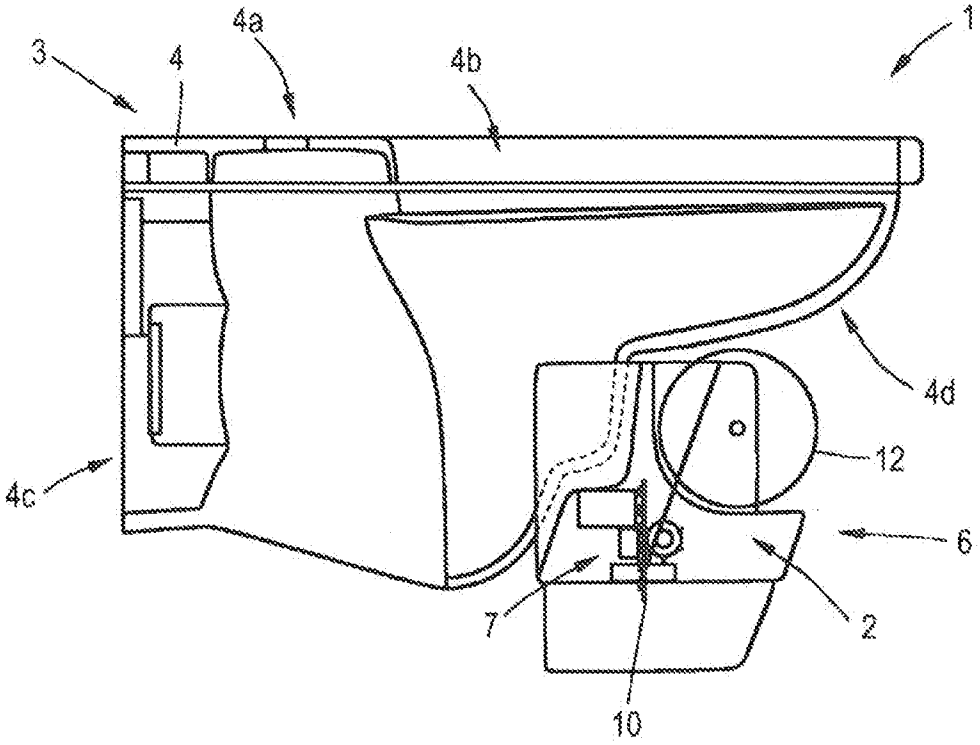

FIG. 6

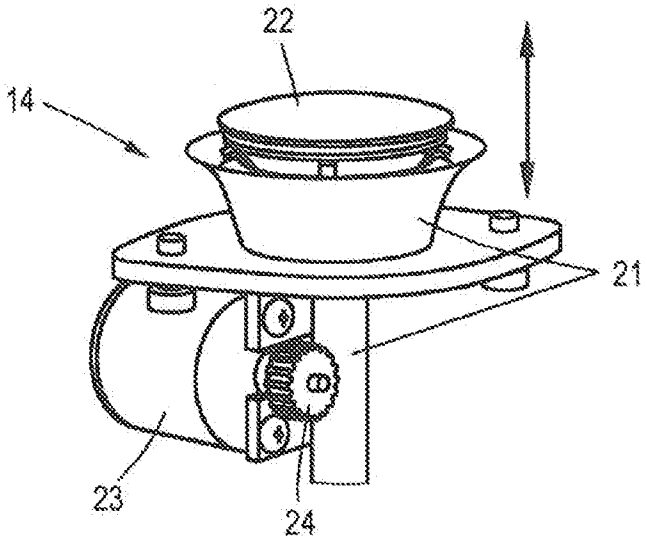

FIG. 7

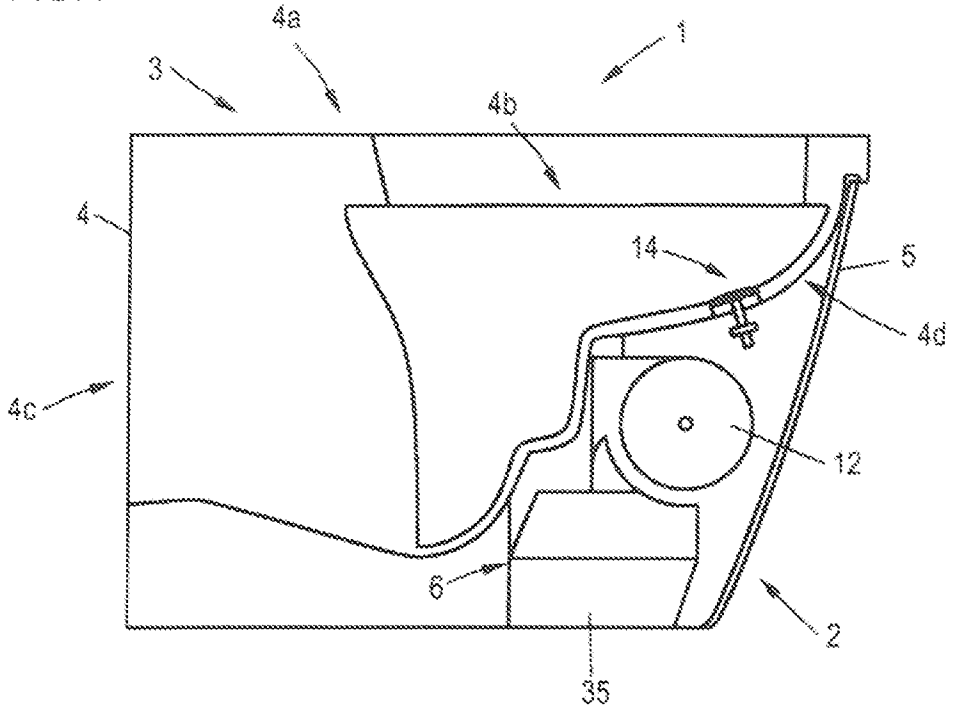

FIG. 8

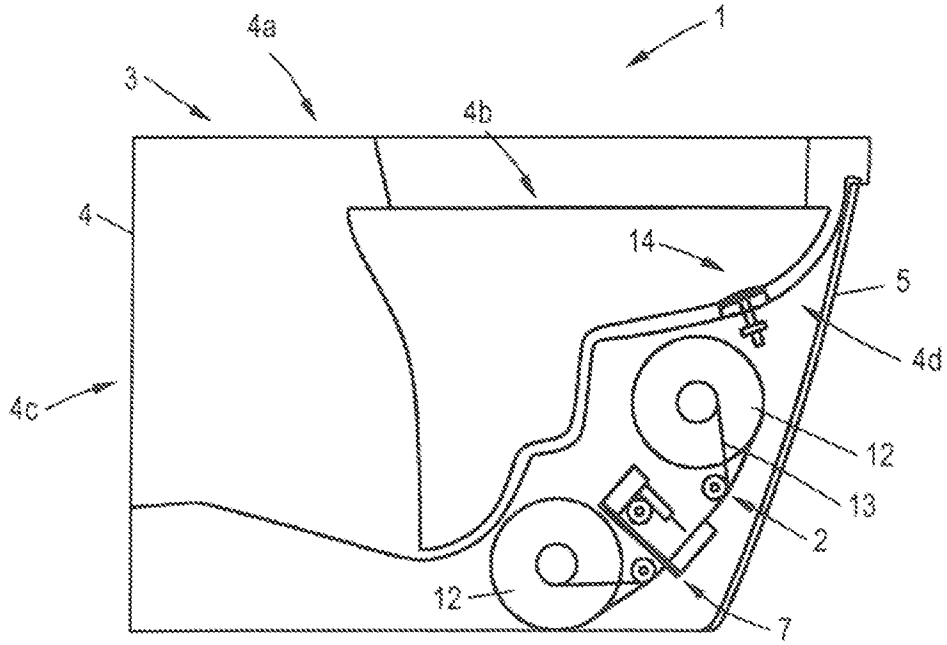

FIG. 9

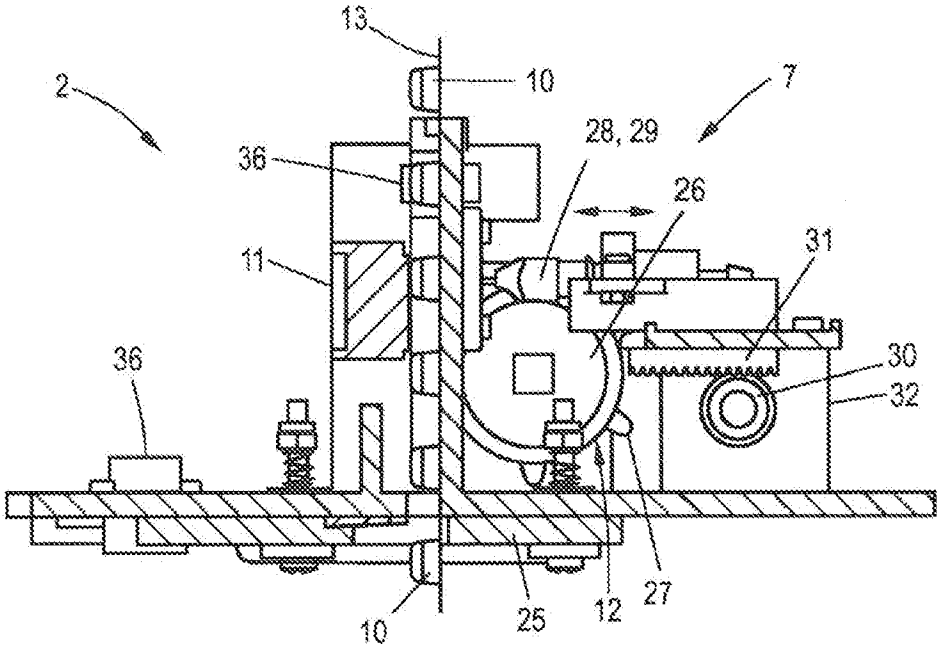

FIG. 10

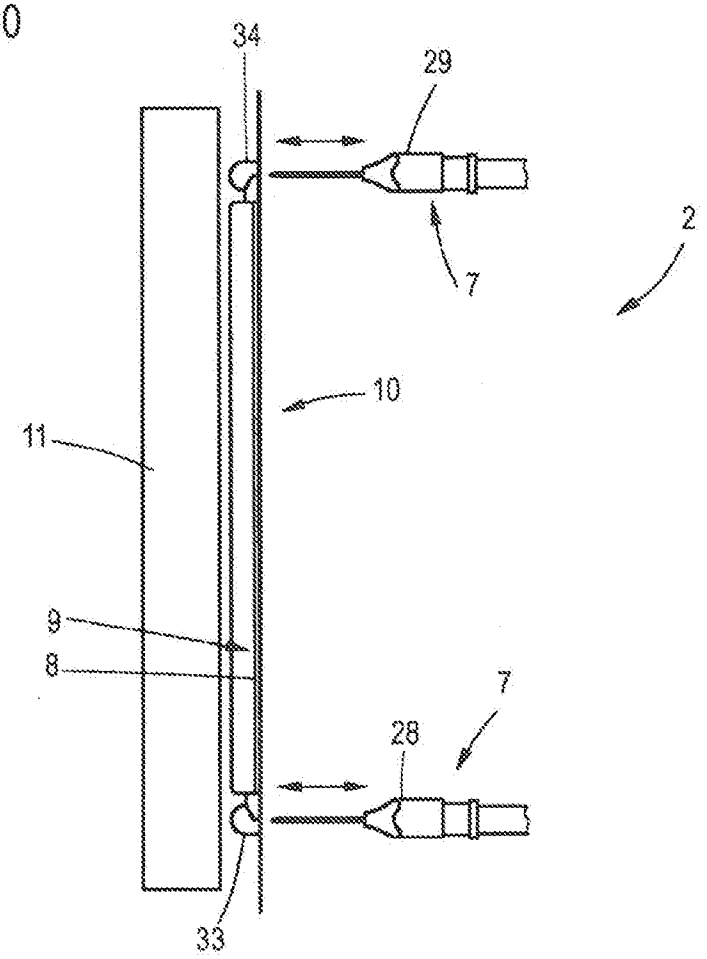

FIG. 11

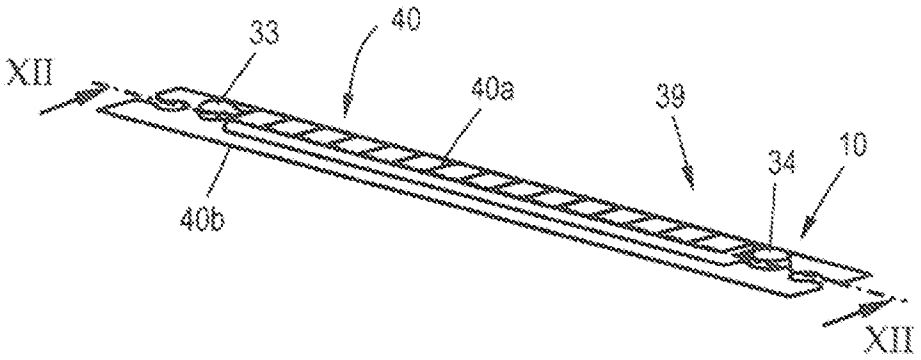

FIG. 12

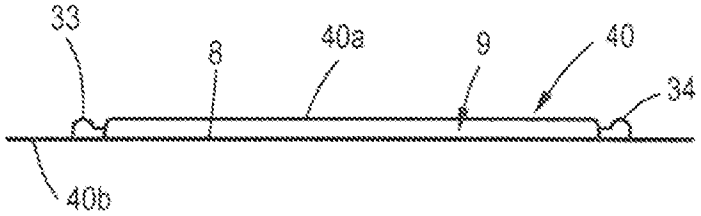

FIG. 13

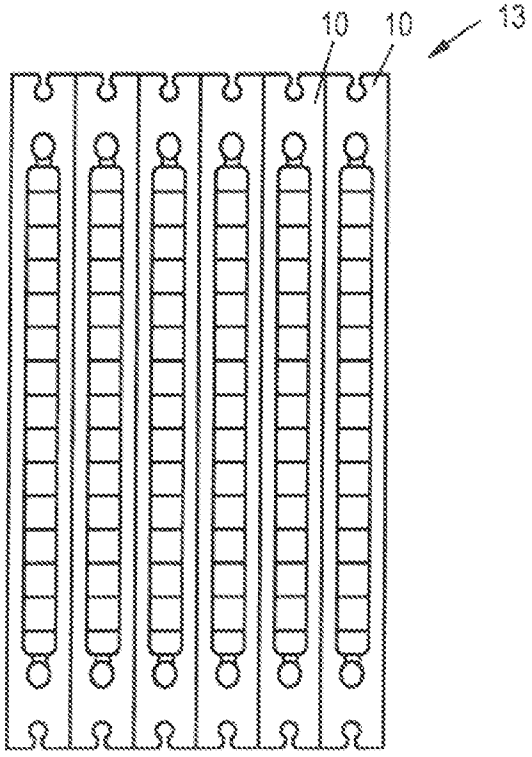

FIG. 14

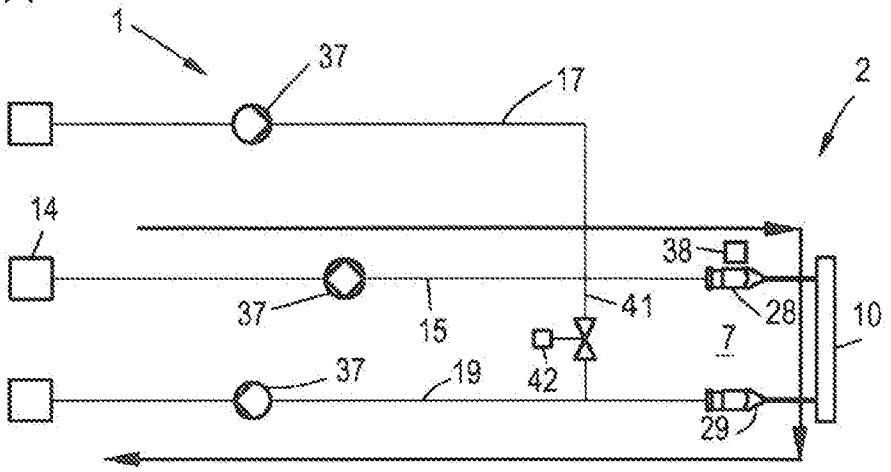

FIG. 15

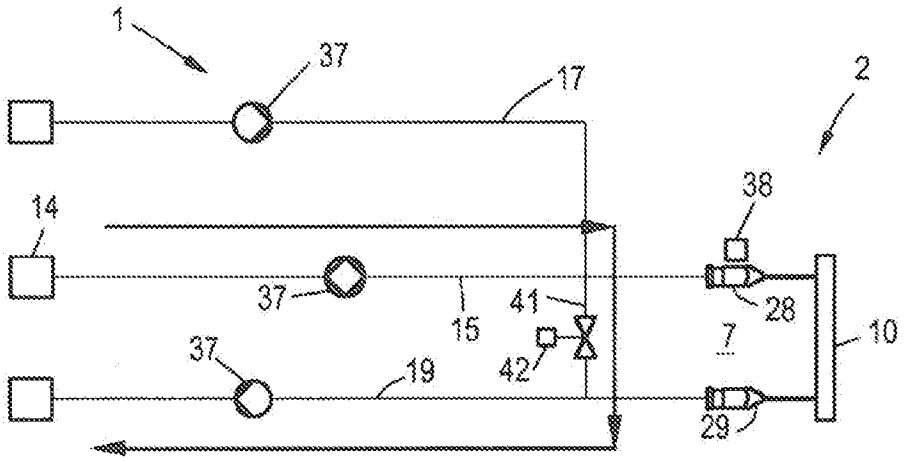

FIG. 16

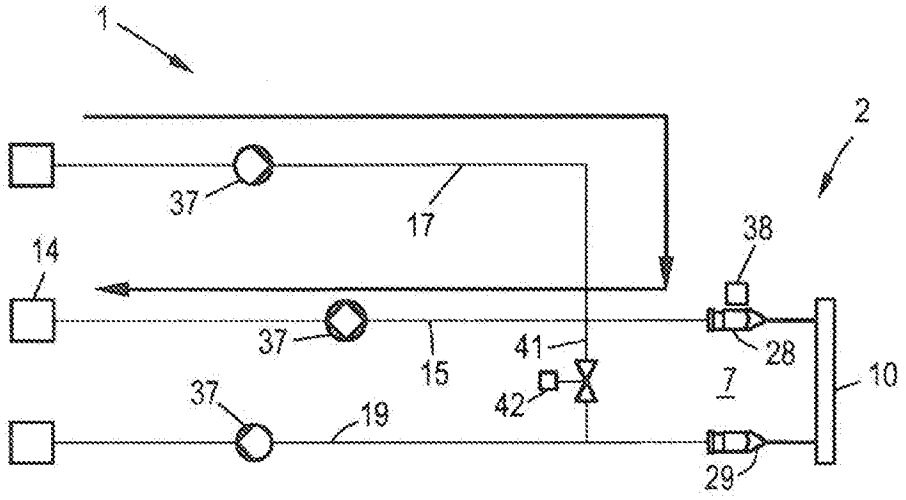

FIG. 17

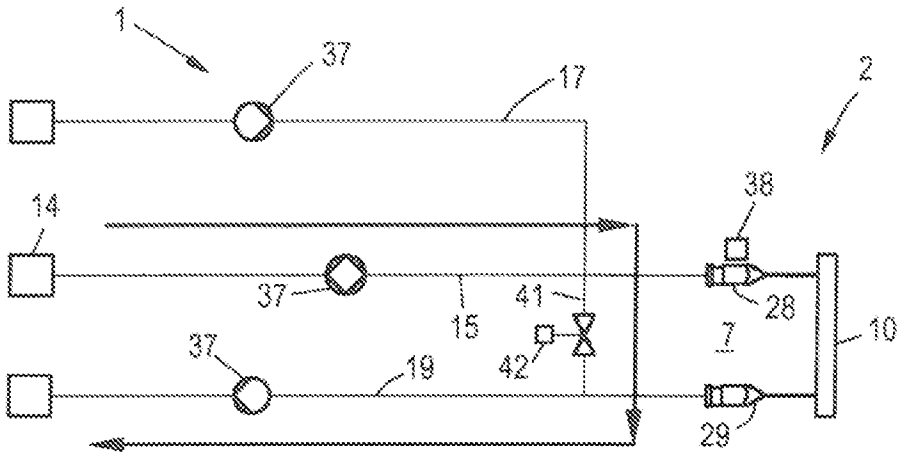

FIG. 18

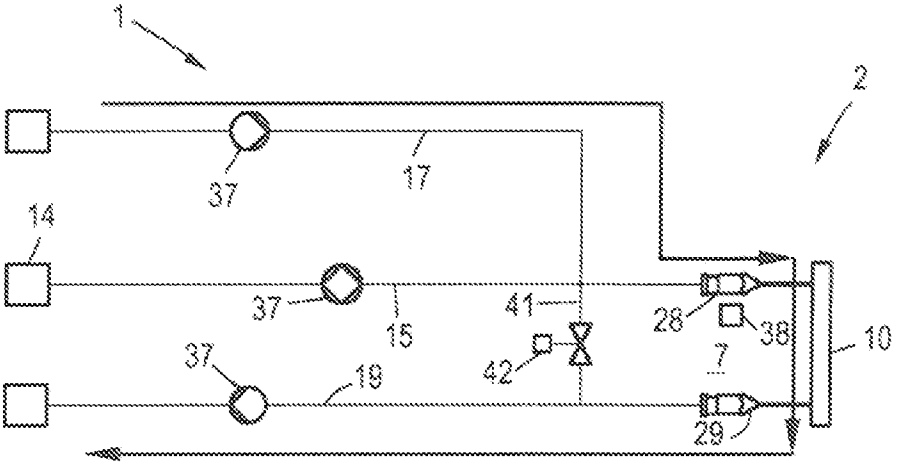

FIG. 19