



HU000034861T2

(19) **HU****MAGYARORSZÁG****Szellemi Tulajdon Nemzeti Hivatala**(11) Lajstromszám: **E 034 861**(13) **T2**

## EURÓPAI SZABADALOM SZÖVEGÉNEK FORDÍTÁSA

(21) Magyar ügyszám: **E 14 728450**(22) A bejelentés napja: **2014. 06. 03.**(51) Int. Cl.: **E03D 13/00** (2006.01)**E03C 1/28** (2006.01)

(96) Az európai bejelentés bejelentési száma:

**EP 20140728450**

(86) A nemzetközi (PCT) bejelentési szám:

**PCT/EP 14/001485**

(97) Az európai bejelentés közzétételi adatai:

**EP 3003407 A1** **2014. 12. 11.**

(87) A nemzetközi közzétételi szám:

**WO 14195006**

(97) Az európai szabadalom megadásának meghirdetési adatai:

**EP 3003407 B1** **2017. 03. 22.**

(30) Elsőbbségi adatok:

**102013009189****2013. 06. 03.****DE**

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**Tömítőfolyadék**

Az európai szabadalom ellen, megadásának az Európai Szabadalmi Közlönyben való meghirdetésétől számított kilenc hónapon belül, felszólalást lehet benyújtani az Európai Szabadalmi Hivatalnál. (Európai Szabadalmi Egyezmény 99. cikk(1))

A fordítást a szabadalmas az 1995. évi XXXIII. törvény 84/H. §-a szerint nyújtotta be. A fordítás tartalmi helyességét a Szellemi Tulajdon Nemzeti Hivatala nem vizsgálta.

## Sealing liquid



5 The invention relates to a sealing liquid for waterless sanitary systems based on an oil.

As it becomes increasingly more important to save water, there is an interest in sanitary systems such as toilets and urinals which are designed to minimize the  
10 amount of water used in the flushing operation, in order to reduce excessive demands on water supply systems and sewerage disposal systems. Recently, however, water shortages as well as new environmental concerns have given rise to an increased awareness of the need to save water. As water costs rise, the interest in waterless sanitary systems which can be used for a broad field of  
15 applications has increased. Most waterless sanitary systems of the generic type use liquid-sealing odour traps.

In order to avoid unpleasant odours in waterless sanitary systems, liquids have been developed which seal the air space above a drain pipe or water trap. The  
20 liquids serve in this respect as a sealing medium and as an odour trap for the mouth of the drain pipe, in order to prevent odours from rising from the sewage system into sanitary interior.

The use of oil as a sealing liquid in sanitary systems is generally known.  
25

For example, the use of oil in sanitary systems to form an odour trap is described in German patent DE 121356. However, the patent specification does not disclose which oils can specifically be used.

30 In contrast, DE 20 2006 002 906 U1 describes the specific use of glycerin oil as a sealing liquid in sanitary systems which are in direct communication with a with the sewer. The document discloses an odour trap for a water trap which contains a liquid based on glycerin. Although this has the advantage that

odours from the water trap can no longer escape into the air surrounding a sanitary system, this takes place only until such time as the glycerin used has mixed with the aqueous constituents of urine and/or as long as a reaction of the glycerin with constituents of urine has not taken place. If a reaction with the constituents of urine takes place, deposits can form inside the water trap, which deposits accumulate into layers and can lead to blocking of the water trap and, as well as requiring cleaning of the water trap, require immediate replacement of the glycerin.

The use of ethylene glycol as a sealing liquid in toilets and urinals is further known from DE 28 214 79 B1. However, ethylene glycol, which is used in automotive engineering as a brake fluid and antifreeze for coolant, is toxic. Contact of a user or cleaner with a sealing liquid of this type can thus lead to poisoning or chemical burns. In addition, there is the risk of oxidation of the ethylene glycol by atmospheric oxygen to aldehydes and carboxylic acids which, when reacted with constituents of the urine that is introduced, can form deposits inside the water trap of a toilet or urinal. This leads on the one hand to the gradual consumption of the sealing liquid and on the other hand to the gradual blocking of the water trap.

From JP 2009-127355 A there is known a water evaporation inhibitor for sewer systems such as sanitary systems, which can comprise a water-insoluble component such as paraffin oil, in particular also white oil, and has a density of less than 1.0 and a vapour pressure lower than that of water. The water-insoluble component comprises from 1 to 99% by weight and can additionally also contain colourings, fragrances, pigments and also surfactants.

VWO 2010/001595 A1 discloses a sealing water agent for pipework in baths and toilets for preventing bad odours, which comprises oil, water and a surfactant.

The described oils can be in the form of liquid paraffin oil, wherein the surfactant that is present is preferably a polyoxyethylene derivative.

JP 2005-118519 A describes a liquid for sealing containers such as, for

example, WCs, which consist of liquid paraffin and can comprise additives. There are mentioned as additives  $\text{Fe}^{2+}$ , titanium dioxide or activated carbon, in order to prevent odours and to achieve an optical effect.

5 In DE 10 2011 117 750 A1 there are described sealing liquids such as, for example, oils, which are sparingly miscible with the sewage and have a density which is lower than that of the sewage.

From DE 10 2010 033 798 A1 there are known sealing liquids which comprise  
10 oils or oil mixtures and preferably comprise antimicrobial, bacteriostatic to bactericidal and/or odour-absorbing additives.

Finally, WO 2005/024146 A1 discloses sealing liquids as an odour trap for waterless urinals, wherein the sealing liquids can also comprise fragrances.

15 However, for the permanent effectiveness of odour traps of waterless sanitary systems, such as toilets and urinals, for example in the form of water traps, there are some key factors which must be taken into account. One important factor is the amount of sealing liquid loss which occurs under normal operating  
20 conditions over time periods and the frequency of use, since if the sealing liquid is used up it cannot be ensured that odours are permanently stopped. In addition, there are costs for persons who must monitor the consumption of the sealing liquid, and costs for the necessary re-filling of the sealing liquid.

25 The object of the invention is, therefore, to provide a sealing liquid for waterless toilets or urinals which on the one hand provides the best possible odour trap for the water trap with respect to sewer pipes and on the other hand scarcely has to be replaced or renewed.

30 The object is achieved according to Claim 1.

In comparison with known sealing liquids based on an oil, on the one hand virtually no deposits occur in the water trap of waterless sanitary systems in the

case of the sealing liquid according to the invention, and on the other hand, in the event that deposits do occur, they are rendered odourless and physiologically harmless by the additive or additives. Furthermore, the urea derivatives and proteins contained in urine can be removed from the sealing liquid by the additive or additives, so that no odour-intensive compounds escape to the outside and deposits, for example in the form of proteins contained in urine, can be removed from the sealing liquid again.

For rendering deposits physiologically harmless or breaking them down, and for ensuring odour neutrality, according to the invention there are added to the sealing liquid, for example, liquids having a content of silver compounds in a concentration range from 0.01 to 0.1 ml/l or between 0.2 and 2.00 ppm. There come into consideration as silver compounds any antibacterially active silver compounds, such as silver ions, in particular in the form of silver nitrate, silver sulfate, silver chloride, silver chlorate, or also organic silver complexes such as, for example, silver chelates. These are added to the sealing liquid until the desired concentration range is established, which can be chosen in dependence on the antibacterial action.

The sealing liquid can further comprise an addition of silica gel particles, which can be present in the sealing liquid as an alternative to or together with the silver compounds. The silica gel particles can be, for example, an adsorbent of silica gel particles having one or more magnetic cores and having a pore size within the range from 2 to 50 nm, preferably from 5 to 30 nm, and an internal surface area within the range from 0.1 to 400 m<sup>2</sup>/g, preferably from 10 to 200 m<sup>2</sup>/g, which can be added to the sealing liquid. The proteins contained in urine can be adsorbed onto the silica gel particle solid phase, whereby the separation of the adsorbed proteins takes place by application of a magnetic field.

The proteins bound to the silica gel particles can also be separated from the sealing liquid by means of pressure, gravitational force or centrifugal force.

The silica gel particles can be present in the form of isolated spherical particles,

in the form of monolithic silica gel phases or in the form of membranes.

The silica gel particles generally have a diameter within the range from 20 nm to 500  $\mu\text{m}$ , preferably from 200 nm to 10  $\mu\text{m}$ , particularly preferably from 500 nm to 1.3  $\mu\text{m}$ .

The adsorbent of silica gel particles having a magnetic core can be produced by coating iron-oxide-containing particles with silica gel.

The coating of iron-oxide-containing particles with silica gel is known *per se* (J. Colloid Interface Sci. 1968, 26, 62 to 69; Langmuir 2005, 21, 10763 to 10769; J. Colloid Interface Sci. 2005, 283, 392 to 396).

The coating of iron-oxide-containing particles with silica gel for the method according to the invention can be carried out, for example, as follows:

Tetraethyl orthosilicate (TEOS) is added, with vigorous stirring, in the presence of ammonia, to a suspension of iron-oxide-containing particles in an alcohol (e.g. isopropanol) for coating. The thickness of the coating can be controlled by the amount of tetraethyl orthosilicate added.

The coated iron-oxide-containing particles are washed with an alcohol (e.g. methanol) and stored in water.

For the method according to the invention, particular preference is given to silica gel particles which consist of a mesoporous layer which is applied to the magnetic core and has a layer thickness within the range from 10 to 100 nm.

Magnetic cores for the silica gel particles according to the invention can be particles, known *per se*, of iron oxide ( $\text{Fe}_2\text{O}_3$ ) and silicon dioxide, polystyrene and/or polyvinyl alcohol.

For the method according to the invention there are preferably used iron oxide

particles having a mesoporous silica gel coating, as is formed in the presence of polyethylene glycol as porous agent.

Particular preference is given to silica gel particles which consist of a  
5 mesoporous layer which is applied to the magnetic core and has a layer thickness within the range from 10 to 100 nm, wherein the magnetic cores comprise maghemite and/or magnetite within the range from 30 to 95% by weight and have a mean diameter within the range from 10 nm to 500  $\mu$ m, wherein the silica gel particles have a mean diameter within the range from 20  
10 nm to 500  $\mu$ m, preferably from 200 nm to 10  $\mu$ m, particularly preferably from 500 nm to 1.5  $\mu$ m.

A preferred embodiment for the production of the magnetic silica gel particles, from 1.5 to 4 parts by weight, preferably from 2 to 3 parts by weight, of a polar,  
15 organic solvent and from 0.02 to 0.50 parts by weight, preferably from 0.05 to 0.40 parts by weight, are added to the silica gel particles.

The silica gel particles having a magnetic core can be separated off by means of a magnetic separator.

20 After the proteins have been separated off, the sealing liquid that remains contains only a small amount of proteins, the sealing liquid being available for further use. The proportion of proteins in the sealing liquid that remains is generally less than 0.0001% by weight.

25 The sealing liquid according to the invention comprises oil in the form of a paraffin oil which has a proportion of unsaturated and/or aromatic hydrocarbons of less than 1 percent by weight and an amount of sulfur compounds of less than 65 mg/kg.

30 In addition, it is important for the sealing liquid according to the invention that a reaction with  $O_2$  and urine constituents does not take place or takes place to only a very small degree, since such reactions yield products which can entail

on the one hand consumption of the sealing liquid and on the other hand blocking of the water trap by deposits. In order to avoid this problem, the sealing liquid according to the invention generally consists of straight-chained or branched, aliphatic, saturated hydrocarbons having a chain length of from C<sub>20</sub> to C<sub>30</sub>. In this respect, the sealing liquid according to the invention has a proportion of unsaturated and/or aromatic hydrocarbons of less than 1 percent by weight and a proportion of sulfur compounds of less than 65 mg/kg. Owing to this chemical structure, the sealing liquid according to the invention is inert towards O<sub>2</sub> and urine constituents. The sealing liquid according to the invention is not oxidized by O<sub>2</sub> and urine constituents, and other chemical reactions do not take place or take place to only a very small degree. This has the result that there is virtually no consumption of the sealing liquid according to the invention in waterless sanitary systems, because oxidation resistance with respect to the ambient air and inertness of the sealing liquid towards faecal constituents such as, for example, urine are ensured by the long-chained, saturated structure of the paraffin oil.

Thus, for example, a reaction with uric acid will not take place or will take place to only a very small degree. Because of the inertness of the sealing liquid used, virtually no reaction products are formed which can lead to deposits in the water trap of waterless sanitary systems such as toilets and urinals. In the event that some of the compounds remaining in the urine nevertheless cause reactions, odour pollution and microbial contamination can be avoided, on the one hand, and removal of the proteins that are present can be effected, on the other hand, by the additives according to the invention. In this respect, the sealing liquid remains permanently usable in terms of its structure and permits long-lasting sealing of the water trap with respect to the external environment which does not have to be renewed.

The sealing liquid according to the invention can further contain a paraffin oil in the form of a white oil which, apart from additives such as, for example, silver compounds in the form of silver nitrate, tocopherol, and/or silica gel particles, does not contain any additives. Owing to the possible, but only very small

proportion of silver compounds in the sealing liquid, no lasting physiological damage to persons who come into contact with the sealing liquid is to be feared. This is also supported by the choice of the paraffin oil according to the invention. There are generally two types of white oil, technical white oil and medicinal white oil. Owing to its particular purity, medicinal white oil is also used in the foodstuffs industry. Neither medicinal white oil nor technical white oil, which can form part of the sealing liquid alone or together, exhibits any toxic effects on cutaneous contact. Allergic reactions of persons who come into contact with the sealing liquid according to the invention, such as, for example, on contact with the skin, are therefore not or only in a very small amount is to be feared.

As a result of the straight-chained or branched, aliphatic, saturated hydrocarbons having a chain length of from  $C_{20}$  to  $C_{30}$ , the sealing liquid according to the invention has a melting point which ensures a liquid state of aggregation to below  $-10^{\circ}\text{C}$ . This is important because waterless sanitary systems are also used in regions in which the ambient temperature is below  $0^{\circ}\text{C}$ . Urine constituents that are introduced thus remain dissolved within a range from  $0^{\circ}\text{C}$  to  $-20^{\circ}\text{C}$  and not on the surface of the sealing liquid. The high boiling range of from  $350^{\circ}\text{C}$  to  $460^{\circ}\text{C}$  with a vapour pressure within a range of  $< 0.1$  hPa at usual ambient temperatures also ensures that only small amounts of the sealing liquid according to the invention escape into the environment and the oil must be renewed to only a very limited extent.

Owing to the additional good viscosity properties within a range of approximately from  $20^{\circ}\text{C}$  to  $100^{\circ}\text{C}$  with a viscosity of from  $50\text{ mm}^2/\text{s}$  to  $4\text{ mm}^2/\text{s}$  in the above-mentioned temperature ranges, the gliding ability of the sealing liquid remains such that urine constituents are able to pass through the liquid into the water trap almost independently of the ambient temperatures.

In addition, the sealing liquid according to the invention is hydrophobic on account of its chemical property and, with a density within a range from 600 to

1000 kg/m<sup>3</sup>, preferably from 700 to 900 kg/m<sup>3</sup>, has a lower density than water. This allows urine constituents to pass through when waterless sanitary systems such as toilets and urinals are used and ensures that the water trap, which opens into the sewer, is sealed with respect to the external environment.

5 Because of the lower density of the sealing liquid according to the invention as compared with aqueous urine constituents, the aqueous phase is covered with a layer of the sealing liquid according to the invention, so that a reaction with secondary products of the aerobic, bacterial decomposition of uric acid to NH<sub>4</sub>OH cannot take place. The consequence is that odour pollution in the  
10 environment is suppressed and no or only slight deposits form inside the water trap emerge.

The low density of the sealing liquid also ensures that the sealing liquid does not mix or mixes to only a very small degree with uric acid. As a result of the  
15 chemical structure and density, objects such as, for example, cigarette ash remain on the surface of the sealing liquid according to the invention and do not enter the water trap or sewer.

The sealing liquid according to the invention can have a straight-chained or a  
20 branched structure, the use of the straight-chained or branched structure is being governed by the intended use of the sealing liquid. Thus, the flashpoint of the proportion of the sealing liquid according to the invention is above about 200°C and auto-ignition takes place only within the range above 320°C to 360°C.

25 Unsaturated compounds such as, for example, unsaturated vegetable oils, if they are distributed over a large surface area, can generate sufficient heat by direct oxidation with atmospheric oxygen to trigger a smouldering fire and finally an open fire under corresponding conditions. However, owing to its saturated  
30 structure, the sealing liquid according to the invention ensures that oxidations by atmospheric oxygen and corresponding heat generation do not take place. Since the oxidation ability of substances generally increases as the temperature

risers, it is possible that the use of the sealing liquid according to the invention with its proportion of unsaturated hydrocarbons within a range of less than 1 percent by weight can also take place safely within a temperature range from -20°C to 200°C. Thus, when the sealing liquid according to the invention is used  
5 in waterless sanitary systems such as urinals and toilets, auto-ignition is virtually ruled out even at ambient temperatures within a range from -20°C to 200°C even with catalytic induction, such as, for example, if burning cigarette butts are thrown into toilets or urinals.

10 In a particular embodiment, the sealing liquid according to the invention further has an additional proportion of an additive which has a solubility of not more than 0.001 percent by weight in the sealing liquid.

By adding such an additive it is possible in waterless toilets or urinals to indicate  
15 to third parties how much sealing liquid is in the WC or urinal bowl.

In a preferred embodiment, an additive is added to the sealing liquid according to the invention in order, as an indicator, to indicate, by means of a colour change, when proteins introduced by urine should be removed from the sealing  
20 liquid. The additive can comprise, for example, biuret reagent or ninhydrin. The low solubility of the additive in the paraffin oil according to the invention has the advantage that only a very small amount of an additional substance is required for the sealing liquid and pronounced contamination of the paraffin oil according to the invention is thus prevented. This minimizes an undesired reaction of the  
25 body to foreign substances, such as, for example, an allergic reaction or irritant reaction, for all persons who come into contact with the sealing liquid.

In a particular embodiment, the additive can be coloured blue or green. In connection with cleaning agents or disinfectants in the cleaning sector, a blue  
30 or green colour is associated with toxicological safety.

In a further embodiment according to the invention, the sealing liquid according

to the invention can comprise an additive as an addition in the form of a surfactant. Such an additive can be added to the sealing liquid in order to dissolve deposits inside the water trap of a sanitary system and possibly make cleaning easier. In a particular form, the surfactant can be biodegradable.

5

It is also possible to add to the sealing liquid as an additive an odorous substance, such as a perfume. This is usually carried out for reasons of odour composition. All known lipophilic odorous substances or perfumes are able to dissolve in the sealing liquid according to the invention. The change in the odour perception of the users of sanitary systems such as toilets or urinals can be more or less pronounced depending on the odorous substance and the concentration of the odorous substance, so that both a very intensive and a very discreet odour composition can be chosen. Generally, the proportion of the perfume as an additional constituent of the sealing liquid according to the invention is within a range from 0.05 to 0.15 percent by weight.

15

A further embodiment of the present invention of the present invention is the use of the paraffin oil according to the invention having a proportion of unsaturated and/or aromatic hydrocarbons of less than 1 percent by weight and a melting point within the range from -10 to -20°C, a boiling range from 350°C to 460°C and a vapour pressure within a range  $< 0.1$  hPa in a temperature range of 20°C as a sealing liquid in waterless sanitary systems.

20

The use of paraffin oils having a viscosity, within a range from 20°C to 100°C, having a viscosity of 50 mm<sup>2</sup>/s to 4 mm<sup>2</sup>/s and a mean density within the range from 600 kg/m<sup>3</sup> to 1000 kg/m<sup>3</sup> as a sealing liquid for waterless sanitary systems is also an aspect of the invention which is essential to the invention.

25

The sealing liquid according to the invention is preferably suitable for use in waterless urinals.

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Szabadalmi igénypontok

1. Tömítőfolyadék vízmentes, szaniter berendezések számára olaj alapon,  
azzal jellemezve, hogy az olaj paraffinolaj, amely telítetlen és/vagy aromás szénhidrogéneket kisebb, mint  
1 tömegszázalék arányban tartalmaz és a paraffinolaj antibakteriális anyagok és/vagy szilikagél-részecskék  
5 adalékával rendelkezik, ahol az adalék ezüstvegyületeket 0,01 ml/l - 0,1 ml/l koncentrációban és/vagy  
szilikagél részecskéket tartalmaz, amelyeknek van egy vagy több mágneses magja van.
2. Az 1. igénypont szerinti tömítőfolyadék, azzal jellemezve, hogy a szilikagél részecskének egy vagy  
több mágneses magja és 20 nm - 500 µm tartományban levő átmérője van.
3. Az 1-2. igénypontok bármelyike szerinti tömítőfolyadék, azzal jellemezve, hogy  
10 az olaj paraffinolajat tartalmaz fehér olaj formájában és olvadáspontja -10 °C - -20 °C tartományban van,  
forrástartománya 350 °C - 460 °C és párányomása < 0,1 hPa tartományban van 20 °C hőmérsékleten.
4. Az 1-3. igénypontok bármelyike szerinti tömítőfolyadék, azzal jellemezve, hogy az olaj viszkozitása a  
20 °C - 100 °C hőmérséklettartományban 50 mm<sup>2</sup>/s - 4 mm<sup>2</sup>/s és sűrűsége 600 kg/m<sup>3</sup> - 1000 kg/m<sup>3</sup>  
tartományban van.  
15
5. Az 1-4. igénypontok bármelyike szerinti tömítőfolyadék, azzal jellemezve, hogy az olaj lobbanáspontja  
200 °C felett van és az öngyulladás 320°C - 360 °C tartományban történik.
6. Az 1-5. igénypontok bármelyike szerinti tömítőfolyadék, azzal jellemezve, hogy a tömítőfolyadék  
20 adalékot tartalmaz indikátor és/vagy szaganyag formájában.
7. Tömítőfolyadék felhasználása paraffinolajok formájában, amelynek telítetlen és/vagy aromás  
szénhidrogéneket kisebb, mint 1 tömegszázalék arányban tartalmaz, ahol a paraffinolaj antibakteriális  
anyagok adalékát ezüstvegyületek formájában 0,01 ml/l - 0,1 ml/l koncentrációban és/vagy szilikagél  
25 részecskéket tartalmaz, amelyeknek van egy vagy több mágneses magja, vízmentesen működtetett piszoár  
számára.

