

This Sheet Has Been Replaced



**A device for the controllable transfer of a liquid and an
apparatus for dispensing transferred liquids**

The present invention relates to a device for the
controllable transfer of a liquid according to claims 1
5 and 6 and an apparatus for dispensing transferred liquids
with at least one of said devices according to claim 16.

BACKGROUND OF THE INVENTION

In order to transfer liquids it is known to use capillary
action which is dependent on the cohesion forces within
10 the liquid and the adhesion forces of the liquid to a
capillary medium comprising small channels for the
transfer of the liquid. Such a capillary medium, being
introduced through an opening into a container, can
therefore transfer a liquid out of said container by means
15 of capillary action. The transferred liquid may be used to
distribute chemical substances to the ambient air in order
to mask or generate an odour, to evoke a medical or
organoleptic effect or to affect insects.

The US 5 114 625 discloses a fragrance dispenser with a
20 fluid reservoir and a wick with a fluid receiving end
disposed in the reservoir for drawing liquid therefrom
into the wick and an portion of the wick exposed to an air
flow provided by a fan.

In order to stop the transfer of liquid the capillary
25 medium must be removed or covered. To control the amount
of fluid evaporated from the wick, the device disclosed in
US 5 114 625 comprises a wick cover that is movable

between a substantially closed position covering the exposed portion of the wick and an open position where the wick is exposed to the flow of air.

5 Removing or covering the capillary medium is inconvenient and may cause further distribution of remainders of the liquid on the cover or the removed capillary medium. The use of two or more liquids increases the inconvenience accordingly.

10 The present invention is therefore based on the object of specifying a device, which allows an easily controllable transfer of a liquid through a capillary medium and an apparatus for dispensing transferred liquids with at least one of said devices.

SUMMARY OF THE INVENTION

15 The above and other objects of the present invention are achieved by a device as specified in claim 1 and 6 and an apparatus as specified in claim 16 .

20 The inventive device allows the controllable transfer of a liquid, such as a perfume, a pharmaceutical agent, a masking agent, an insecticide or an organoleptic substance, by a first capillary medium such as a scrib-rod or wick from a container to the outlet opening, preferably further to a second capillary medium such as a gauze. The first capillary medium is designed such that it allows
25 entering of liquid at its bottom portion and is impermeable for liquid through surfaces other than those of the bottom portion, e.g. by comprising a layer of impermeable material around its lateral surfaces, e.g. a

coating, or by being a capillary or a bundle of capillaries. Preferably, the first capillary comprises a wick or a scrib-rod made of a porous or woven or non-woven natural or synthetic material, as this is cheap to
5 manufacture. Further, the position of the bottom portion of the first capillary medium is fixed relative to the container, preferably by being rigid itself or stabilised in shape by stabilising means, e.g. a sleeve or a rigid coating. Therefore, its position relative to the container
10 is maintained when the device is turned. By liquid entering only at the bottom portion of the capillary medium and the medium maintaining its location with respect to the container it is achieved that the transfer or transport of liquid can be controlled, in general can
15 be switched on and off, by altering the spatial position of the device, e.g. turning it upside-down.

In another embodiment of the invention the first capillary medium is inserted into a holder comprising a fitting being designed to embrace the capillary medium and to fit
20 into an opening of the container. Said holder further comprises a preferably non-porous sleeve which further embraces the capillary medium at least at a length which is chosen in such a way, that, in a first vertical position of the sleeve, liquid has access and in a second,
25 inverse, vertical position of the sleeve the liquid has no access to the capillary medium.

The inventive device is therefore easily controllable by turning it from a first to a second position, e.g. turning it upside-down.

In a preferred embodiment of the device the end of the sleeve extends to a side-wall of the container in such a way that in a third, horizontal position of the container access of the liquid to the capillary medium is prevented
5 as well. Preferably this embodiment is used for an apparatus comprising two or more inventive devices which in positions one and two are activated alternatively and which are both deactivated in the third position. A further advantage of this embodiment is, that two or more
10 liquids can be diffused separately.

In a further embodiment the first capillary medium is connected to a second capillary medium such as a gauze or an extended portion of the first capillary medium, from which the transferred liquid is diffused preferably under
15 the support of an the air flow generated by fan.

In a further embodiment the device comprises an annular container with one or more, preferably three, compartments respective reservoirs filled with different liquids which through a first capillary medium are guided to a second
20 capillary medium which is embraced by the container. The annular container may be moulded in one piece which can be produced at low cost. The annular container may however also consist of segments which can be separated for example for the refill of the liquids and combined
25 afterwards. Using an annular container also facilitates handling of the device and integration into an apparatus which automatically turns the device into positions in which transfer of selected liquids is initiated or terminated. For this purpose the outer surface of the

device, which is hold in a bearing, may be in contact with a drive wheel.

In order to reduce costs for the assembly of the devices the holders for the first capillary medium can be
5 integrated into the containers of the inventive devices.

The first and the second capillary medium may be made in one piece. This would be especially advantageous in cases where the container can be disassembled and reassembled, embracing the second capillary medium in the centre.

10 The inventive apparatus, which allows dispensing of transferred liquids, comprises at least one inventive device as described above being rotatably mounted on an axis of a stator between at least a first vertical and a second position, where no liquid enters the first
15 capillary medium.

In a principal embodiment the apparatus comprises two inventive devices arranged towards each other along the same axis on a rotor with the second capillary medium oriented towards the centre of the rotor in such a way
20 that in a first position of the rotor only one of the devices and in the second position the other one of the devices transfers the liquid. To increase the diversity of dispensed liquids three devices are located in the same plane perpendicular to the rotational (first) axis on an
25 imaginary circle with 120° spacing between two devices. Further, an apparatus with four to six devices located equally distributed on an imaginary sphere is advantageous as it allows to switch on and off the transfer of a single liquid out of four to six different liquids. Generally,

the shape of the device and the maximum amount of liquid contained are such that the permeable bottom part of the first capillary medium is in contact with the liquid when the device is in the „on-position“ (first position), and
5 not in contact with the liquid when moving the device from the „on-position“ to any of the „off-positions“ (second position), e.g. by turning the rotor by 90° or 120° with respect to the horizontal.

The apparatus is preferably equipped with a control unit
10 comprising a sensor for detecting the position of the rotor. Said control unit being capable to actuate the air flow generator and/or to control the air flow depending on the position of the rotor.

In the second („off“) position the diffusion of the liquid
15 is therefore immediately stopped since liquid is no longer transferred by the first capillary medium and no longer diffused at the outlet opening or from the second capillary medium.

In a further embodiment the apparatus can be fully
20 automated.

BRIEF DESCRIPTION OF THE DRAWINGS

Some of the objects and advantages of the present invention have been stated, others will appear when the
25 following description is considered together with the accompanying drawings, in which:

- Fig. 1 shows a holder 10 and a first capillary medium 3, separated from each other;
- Fig. 2 shows the holder 10 with the installed capillary medium 3;
- 5 Fig. 3 shows a container 20 with an opening 22 suitable for inserting the holder 10;
- Fig. 4 shows the container 20 with the holder 10 and the capillary medium 3 installed;
- 10 Fig. 5 shows the container 20 of Fig. 4 turned upside down;
- Fig. 6 shows a modified container 201 comprising two reservoirs 204a, 204b;
- Fig. 7 shows the first capillary medium 3 connected to a second capillary medium 5;
- 15 Fig. 8 shows the arrangement of Fig. 7 installed in a container 20 of a first and a second inventive device 1x respective 1y;
- Fig. 9 shows the two inventive devices 1x, 1y of Fig. 8 in horizontal alignment and a third, vertically
- 20 aligned inventive device 1z transferring liquid through the capillary media 3 and 5;
- Fig. 10 shows an inventive apparatus with the devices 1x, 1y of Fig. 8 installed,
- Fig. 11 shows an inventive device 101 with an annular
- 25 container 2000 comprising one reservoir;

Fig. 12 shows an inventive device 102 with an annular container 2001 comprising three reservoirs;

Fig. 13 shows the inventive device 102 of Fig. 12 cut along line A-A and

5 Fig. 14 shows a segment 102a' of an annular container.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Fig. 1 shows a first capillary medium 3 and a holder 10 (in a sectional view) comprising a fitting 11 with a
10 flange 12; said fitting 11 being connected to a sleeve 13. Fitting 11 and sleeve 13 build a tube with a channel 15 into which the capillary medium 3 can be inserted.

Fig. 2 shows the holder 10 with the installed capillary medium 3. The length of the capillary medium 3 is chosen
15 in such a way that it is longer than fitting 11 and sleeve 13 combined. When installed, one end 31 of the capillary medium 3 will extend out of the sleeve 13 respective the end 14 of the sleeve 13 and the other end 32 will extend out of the fitting 11, which tightly seals the opening 22
20 after the installation.

Fig. 3 shows in a sectional view a container 20 with an opening 22 and a corresponding fitting 24 which is suitable to receive the fitting 11 of the holder 10 in such a way that the sleeve 13 is inserted into the
25 container 20 and the flange 12 rests on the fitting 24 of the container 20 which is filled with a liquid 21 such as a perfume, a pharmaceutical agent, a masking agent, an

insecticide or an organoleptic substance. Further shown is a cover 25 with an opening 26 through which the capillary medium 3 can be guided. The cover 25 can be screwed onto the fitting 24 of the container 20.

5 Fig. 4 shows the container 20 with the holder 10 and the capillary medium 3 installed. Due to the tight sitting of the fitting 11 in the opening 22 and the tight sitting of the capillary medium 3 in the channel 15 of the holder 10 the liquid 21 is only transferable through the opening 22
10 through the capillary medium 3 by capillary action. The liquid 21 can enter only at the end 31 of the capillary medium 3 respective at the end 14 of the sleeve 13 since the sleeve 13 shields the remaining part of the capillary medium 3, introduced into the container 20, against the
15 liquid 21. The end 14 of the sleeve 13 of the installed holder 10 preferably extends to a region close to the bottom 23 of the container 20.

Therefore, when turning the container 20 upside down, as shown in Fig. 5, the liquid 21 has no access to the
20 capillary medium 3 which is shielded by the sleeve 13. Only in case that the container 20 were filled more than 95%, liquid could reach the capillary medium 3. However the capillary medium 3 and the sleeve 13 could also be extended to the bottom 23 of the container 20, comprising
25 in there narrow channels for the liquid 21 to pass through to the capillary medium 3.

Fig. 6 shows a modified container 201 comprising two reservoirs 204a respective 204b at the side-wall 202, which receive the liquid 21 whenever the container 201 is
30 turned into horizontal alignment. A clockwise rotation of

the container 201 will cause the liquid 21 to enter reservoir 204b. A counter-clockwise rotation will cause the liquid 21 to enter reservoir 204a. The liquid 21 will therefore not be in contact with the capillary medium 3 in both horizontal orientations of the container 21. The reservoirs 204a, 204b may also be part of a cylindrical extension of the side-wall 202. The modified containers 201 are recommended for the use in arrangements comprising three or more inventive devices 1x, 1y, 1z. In the arrangement shown in Fig. 9 modified containers 201 could therefore advantageously be installed.

Fig. 7 shows the first capillary medium 3 connected to a second capillary medium 5 such as a gauze or an extended portion of the first capillary medium 3 which preferably consists of a porous synthetic material from which the transferred liquid 21 is exposed to the air or to the air flow 28 generated by an air flow generator 4 (see Fig. 10). From the first or second capillary medium 3; 5 the diffused liquid 27 (see Fig. 8, 9 or 10) is forwarded to the environment.

Fig. 8 shows the arrangement of Fig. 7 installed in a container 20 of a first and a second inventive device 1x respective 1y. The first device 1x is oriented as the device 1 shown in Fig. 4. As explained above in this orientation liquid 21 is transferred by the capillary medium 3. The second device 1y is oriented as the device 1 shown in Fig. 5 preventing the transfer of liquid 21.

Fig. 9 shows the two inventive devices 1x, 1y of Fig. 8 in horizontal alignment along an axis v and a third device 1z in vertical alignment along an axis u. The third device 1z

is transferring liquid 21 through the capillary media 3 and 5 while no liquid is transferred by the horizontally aligned devices 1x, 1y, which contain only a small amount of liquid 21. Turning the arrangement around axis v by 5 90°, will cause transfer of liquid 21 to stop in device 1z as well. However, turning the arrangement around an axis w, which is perpendicular to the axis u and v, to the left or to the right by 90° will start transfer of liquid 21 in one of the devices 1x respective 1y while transfer of 10 liquid 21 in the device 1z will cease.

Adding two inventive devices 1 aligned along axis w will extend the arrangement to five devices 1 which can be turned around axis v or w into corresponding positions where liquid 21 is transferred in the corresponding 15 devices 1.

In order to allow the use of larger volumes of liquid 21 the devices 1x, 1y and 1z can be replaced by devices comprising a modified container 201 as shown in Fig. 6.

Of course the vertical and horizontal alignment need not 20 be exact and can vary in a broad angle depending on the percentage of liquid 21 in the containers 20; 201 and the form (bent, straight) and length of the sleeve 13.

It is also possible to use a single inventive device 1 preferably in a housing which can be put on a surface in 25 at least two positions in such away that in both positions (inverse and not inverse) the device 1 is at least approximately vertically aligned.

Fig. 10 shows an inventive apparatus for dispensing liquids 21 comprising a stator 7 which, on a axis 71, carries a rotor 9 with two axially aligned inventive devices 1x, 1y. Possible is also the installation of only
5 one device 1x in the apparatus. In the present position only the lower device 1y is transferring liquid 21 through the first and second capillary medium 3; 5 from where it is forwarded to the environment by a flow of air 28 being generated by a fan 4, which is preferably located in the
10 stator 7. The air flow 28 is preferably guided in channels 93 in the rotor 9 and in the stator 7 in order to maximise the efficiency. The second capillary media 5 of the first and the second device 1x, 1y may be framed and isolated from each other by a frame 91 comprising openings 92 for
15 the air flow 28. The rotor 9 can now be turned between at least a first position, e.g. as shown in Fig. 10 and a position in which the rotor 9 is turned by 180°. In the first position, liquid 21 from the first device 1y is transferred and diffused, while no liquid 21 is
20 transferred in the second device 1x. In the second position liquid 21 is transferred in the second device 1x while no liquid 21 is transferred in the first device 1y. The liquid 21 to be diffused can therefore easily be selected by turning the rotor 9. In case that no liquid 21
25 should be diffused the devices 1x and 1y are brought into a third position where they are horizontally aligned. In case that this third position is used in the apparatus, then preferably the containers 201 shown in Fig. 6 are installed.

30 The positions of the rotor 9 are preferably detected by a sensor 62 which is connected to a control unit 6 which is

controlling the fan 4 and/or a motor 63 which in a preferred embodiment is used to turn the rotor between positions. In case that the rotor 9 reaches the third position driven by the motor 63 or manually the fan 4 is
5 switched off by the control unit 6 since no liquid is transferred in this position. In a further embodiment, depending on the input from a sensor 65, which measures temperature and/or humidity, the control unit 6 adjusts the air flow generated by the fan 4 or actuates fan 4 and
10 rotor 9 in a suitable way.

The electrical devices in the apparatus are connected to a power supply 64. In order to control the apparatus preferably one or more control buttons 61 (mains switch etc.) are installed. The apparatus may also be programmable and
15 equipped with a timer. The apparatus may rest on a support 73 or may be installed on the wall by corresponding means 72.

Fig. 11 shows an inventive device 101 with an annular container 2000 comprising one reservoir which is filled with
20 a liquid 21. The annular container 2000, which may also have a toroidal form, embraces a cylindrical capillary medium 5 such as a gauze or an extended portion of a first capillary medium which is embraced by a holder 10. As described above the holder 10 is inserted into the
25 container 2000 in such a way that in the position shown in Fig. 11 liquid 21 is transferred through the first capillary medium. With a turn of the device 101 the holder 10 is lifted out of the liquid 21 thus preventing the transfer of the liquid 21.

Fig. 12 shows an inventive device 102 with an annular container 2001 with three reservoirs 102a, 102b and 102c, each being filled with a liquid 21a, 21b, 21c and being equipped with a holder 10a, 10b, 10c for a first capillary medium. In the position shown in Fig. 12 the liquid 21a is transferred through the first capillary medium in the holder 10a to the second capillary medium 5. Transfer and distribution of the other liquids 21b or 21c can be initiated by turning the device 102 by approximately 120° to the left or to the right.

Fig. 13 shows the inventive device 102 of Fig. 12 cut along line A-A. It is shown that an air flow generator 4 is installed behind the second capillary medium 5 in such a way that the air flow generated is driven through the second capillary medium 5 thus distributing the transferred liquid 21a. The second capillary medium 5 can be formed of one piece, allowing the liquids to get mixed, or three pieces separated from each other, preventing the liquids to get mixed. The number of reservoirs 102 can be two, three or more.

The annular container 2001 of the inventive device 102 shown in Fig. 12 can be moulded in one piece. However the container 2001 can also be composed of three discrete segments 102a' as shown in Fig. 14. The shown segment 102a' preferably comprises means 102x, 102y for inter-connecting all segments.

The holder 10' for the first capillary medium 3 is incorporated into the segment 102a'. Handling of this device is therefore facilitated, since liquid 21a can be refilled without removing the holder. Incorporation of the

holder 10 can advantageously also be done in the containers 20, 201 shown in Fig. 1 to Fig. 10.



CLAIMS

1. A device (1) for the controllable transfer of a liquid (21) stored in a container (20; 201) through an outlet opening (22) of said container (20; 201) with a first capillary medium (3) which bottom portion extends into a region close to the bottom (23) of the container (20; 201), wherein liquid is transferable through the opening (22) due to capillary action, **characterised in that** the surface of the first capillary medium (3) is permeable for liquid (21) at its bottom portion (10) and is impermeable for liquid (21) otherwise, wherein the position of the bottom portion (10) of the first capillary medium (3) relative to the container (20; 201) is fixed.
2. Device according to claim 1, wherein the first capillary medium (3) includes a wick, the wick preferably consisting of woven or non-woven fabric and/or a porous material, the major part of the lateral surfaces of the wick being surrounded by a layer (13 = sleeve) impermeable to the liquid.
3. Device according to claim 2, wherein the layer (13) additionally serves to stabilise the position of the first capillary medium (3) relative to the container (20; 201), preferably by being rigid.
4. Device according to claim 1, wherein the first capillary medium (3) comprises a number of capillaries.



5. Device according to one of the preceding claims, wherein the liquid transferred by the first capillary medium is exposed to air or to an air flow generated by an air flow generator (4) for evaporation.
- 5 6. A device (1) for the controllable transfer of a liquid (21) stored in a container (20; 201) through an outlet opening (22) of said container (20; 201) with a holder (10) for a capillary medium (3) which extends into a region close to the bottom (23) of the container (20; 201), said holder (10) comprising a fitting (11) being
10 designed to embrace the capillary medium (3) and to fit into the opening (22) in such a way that liquid is only transferable through the opening (22) by the capillary medium (3), **characterised in that** the holder
15 (10), adjacent to the fitting (11), further comprises a sleeve (13) which tightly embraces the capillary medium (3) up to or close to its end (31) so that the device (1) can be turned between at least a first position in which liquid (21) is transferred while
20 contacting the end (31) of the capillary medium (3) and at least a second position in which the end (14) of the sleeve (13) extends out of the liquid (21) thereby preventing contact of the liquid (21) to the capillary medium (3).
- 25 7. Device (1) according to claim 1, wherein the capillary medium (3), which is extending out of the fitting (11), is connected to a second capillary medium (5) such as a gauze or an extended portion of the first capillary medium (3), from which the transferred



liquid (21) is exposed to the air or to the air flow generated by an air flow generator (4) and evaporated.

8. Device (1) according to one of the preceding claims ,
wherein the container (201) is equipped with at least
5 one reservoir (204a, 204b) which is suitable to
receive the liquid (21) when the container (201) is
turned into a third, approximately horizontal
position.
9. Device (1) according to one of the preceding claims ,
10 wherein the opening (22) can be closed by a cover (25)
comprising an opening (26) suitable for inserting the
capillary medium (3).
10. Device (1) according to one of the claims 6 to 9 ,
wherein the fitting (11) comprises a flange (12) which
15 extends over the edges of the opening (22).
11. Device (1) according to one of the preceding claims ,
wherein the liquid (21) is a perfume, a pharmaceutical
agent, a masking agent, an insecticide or an
organoleptic substance.
- 20 12. Device (1) according to one of the claims 6 to 11,
wherein the capillary medium (3) is a scrib-rod or a
wick, the scrib-rod or wick preferably consisting of
woven or non-woven fabric and/or a porous material.
- 25 13. Device (101; 102) according to one of the preceding
claims, comprising an annular container (2000; 2001)
with at least one reservoir (102a; 102b; 102c) being
equipped with a holder (10; 10a; 10b; 10c) for the
transfer of a liquid (21; 21a; 21b; 21c) through a



first capillary medium (3) to a second capillary medium (5) which is embraced by the annular container (2000; 2001).

14. Device (102) according to claim 13 wherein the
5 container (2001), which comprises two or more reservoirs (102a; 102b; 102c), is moulded in one piece or consists of interconnectable segments (102a') comprising a reservoir (102a).
15. Device (1; 101; 102) according to one of the claims 6
10 to 14, wherein the holder (10') is incorporated in the container (20; 201, 2000, 2001) respective the segment (102a').
16. Apparatus for dispensing at least one liquid (21),
comprising at least one device (1x, 1y, 1z; 101; 102)
15 according to one of the preceding claims for the controllable transfer of a liquid (21) through an outlet opening (22) of a container (20; 201; 2000; 2001) to the air, said device (1x, 1y, 1z; 101; 102) being rotatably mounted between at least a first
20 position in which liquid (21) is transferred and a second position in which transfer of liquid (21) is prevented.
17. Apparatus according to claim 16, wherein the liquid
(21) is transferred to the air via a second capillary
25 medium (5) connected to the first capillary medium (3).
18. Apparatus according to claim 16 or 17 with a rotor (9) which can be turned around at least a first axis



(w) and with at least two devices (1x, 1y) installed in a plane perpendicular to the first axis (w) with 90°, 120° or 180° spacing of adjacent devices. in a first position of the rotor (9) liquid (21) is transferred only in a first device (1x) and that in a second position of the rotor (9) liquid (21) is only transferred in a second device (1y).

19. Apparatus according to claim 16, 17 or 18 with the rotor (9) being rotatable around the first axis (w) and a second axis (v) and with at least four devices being installed on the rotor (9) at approximately equal distances from each other on an imaginary sphere.

20. Apparatus according to one of the claims 16 to 19 with the outlet opening (22) and/or the second capillary medium (5) of the installed devices (1, 1x, 1y, 1z) being oriented towards the first axis (w) and/or the crossing point of the first and the second axis (v, w).

21. Apparatus according to one of the claims 16 to 20 with a device (101) comprising an annular container (2000; 2001) with at least one reservoir (102a; 102b; 102c) being equipped with a holder (10; 10a; 10b; 10c) for the transfer of a liquid (21; 21a; 21b; 21c) through a first capillary medium (3) to a second capillary medium (5) which is embraced by the annular container (2000; 2001).

22. Apparatus according to one of the claims 16 to 21, comprising an air flow generator (4) such as a fan



which is generating an air flow towards at least the outlet opening (22) or second capillary medium (5) of the device (1, 1x, 1y, 1z) whose first capillary medium (3) is transferring liquid (21).

- 5 23. Apparatus according to claim 22, further comprising a channel (93) to guide the air flow from the air flow generator (4) towards said outlet opening (22) or second capillary medium (3).
- 10 24. Apparatus according to one of the claims 16 to 23, with a control unit (6) comprising a switch (61) for actuating the air flow generator (4) and/or comprising a sensor (62) for detecting the position of the rotor (9) said control unit (6) being capable to actuate the air flow generator (4) and/or to control the air flow
15 depending on the position of the rotor (9).
25. Apparatus according to claim 24, said control unit (6) being programmable and capable to control a motor (8) which is used to turn the rotor (9) between the operating positions.
- 20 26. Apparatus according to one of the claims 12-19 comprising a stator (7) comprising the air flow generator (4) and a bearing for the axis (71) of the rotor (9) which carries at least one, preferably up to five devices (1x, 1y, ...).