(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 575 137 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
25.06.2025 Bulletin 2025/26

(21) Application number: **23219600.6**

(22) Date of filing: **22.12.2023**

(51) International Patent Classification (IPC):
E04F 21/02 *(2006.01)* ***E04F 21/08*** *(2006.01)*
E04G 23/02 *(2006.01)*

(52) Cooperative Patent Classification (CPC):
E04F 21/023; E04F 21/08; E04G 23/0211

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
KH MA MD TN

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(54) APPARATUS AND METHOD FOR RE-BONDING LOOSE OR HOLLOW TILES

(57) The present invention relates to a surface attachment device (1) for releasably attaching to a surface (2). The attachment device (1) comprises at least one surface engagement means (9) configured for being in an attached state (13) and a detached state (14).

The attachment device (1) comprises an adhesive applicator (20) comprising a second pliable sealing ring (21) forming an applicator chamber (25) when arranged in contact with the surface (2). The adhesive applicator (20) comprises an adhesive inlet (30) for delivering a fluid adhesive (4) into the applicator chamber (25). The adhesive inlet (30) is connected to an adhesive supply system (40) delivering the fluid adhesive (4) to the adhesive inlet (30). In use, the applicator chamber (25) is arranged comprising a surface access point (3) in the surface (2) accessible for the fluid adhesive (4).

The invention further relates to a re-bonding system (70) comprising the surface attachment device (1) and an adhesive supply system (40). Furthermore, the invention relates to a method (100) for re-bonding loose or hollow tiles using the re-bonding system (70) according to the invention.

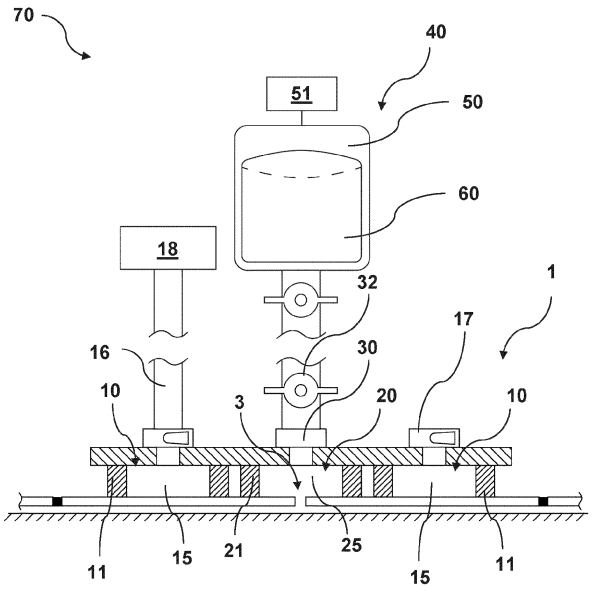

Fig 5

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Description

Field of the Invention

[0001] The present invention relates to a surface attachment device for releasably attaching to a surface. The attachment device comprises at least one surface engagement means configured for being in an attached state and a detached state. The attachment device comprises an adhesive applicator comprising a second pliable sealing ring forming an applicator chamber when arranged in contact with the surface. The adhesive applicator comprises an adhesive inlet for delivering a fluid adhesive into the applicator chamber. The adhesive inlet is connected to an adhesive supply system delivering the fluid adhesive to the adhesive inlet. In use, the applicator chamber is arranged comprising a surface access point in the surface accessible for the fluid adhesive.

[0002] The invention further relates to a re-bonding system comprising the surface attachment device and an adhesive supply system. Furthermore, the invention relates to a method for re-bonding loose or hollow tiles using the re-bonding system according to the invention.

Background of the Invention

[0003] Loose and hollow tiles is a common condition occurring when tiles or other material loosen itself from the substrate or sub-surface it originally was adhering to. Loose and hollow tiles can be identified by a hollow sound when tapping on the surface.

[0004] Loose or hollow tiles is commonly caused by deterioration of the materials over time or due to failure during installation. Today, re-bonding the tiles are labour and time intensive, while redoing the work is both costly and unsustainable due to limited recycling.

[0005] When installing the tiles, mortar or tile adhesive are often spread out evenly using a ridged tool. When curing, the ridges improve the adhesion, however, during the process of re-bonding the tiles, these ridges make it difficult to administrate or inject a re-bonding adhesive efficiently. Thus, many injectable tile re-bonding systems require providing many small holes in the grout or tiles to achieve re-bonding on larger surfaces comprising tiles. A further disadvantage with current system is requiring ventilation holes in the tiles or grout to ensure the spread of the re-bonding adhesive.

Object of the Invention

[0006] One objective of the present disclosure is to achieve an efficient system to re-bond loose and hollow tiles to a substrate or a sub-surface and provide a method of using said system.

Description of the Invention

[0007] One objective of the invention is achieved by a surface attachment device for releasably attaching to a surface.

[0008] The attachment device comprises:

- at least one surface engagement means configured for being in an attached state and a detached state; and
- an adhesive applicator comprising a second pliable sealing ring configured to be arranged in contact with the surface.

[0009] The adhesive applicator is configured to form an applicator chamber when arranged in contact with the surface. The adhesive applicator is configured for being in sealing communication with the surface when the surface engagement means is in the attached state.

[0010] The adhesive applicator comprises an adhesive inlet configured for delivering a fluid adhesive into the applicator chamber.

[0011] The adhesive inlet is configured for being connected to an adhesive supply system for delivering the fluid adhesive to the adhesive inlet.

[0012] In use, the applicator chamber is configured for being arranged such that the applicator chamber includes a surface access point in the surface such that the surface access point is accessible for the fluid adhesive.

[0013] The surface may be tile, stone, wood planks. The tiles may be in a material such as, but not limited to, ceramic, laminate, linoleum, wood, or stone.

[0014] The term tiles may be used interchangeably to describe any surface that has loosened itself from the sub-surface or substrate from which it was supposed to adhere to. The surface may be a floor, wall, countertop, archway, etc.

[0015] When the surface engagement means is in the attached state, the second pliable sealing ring may be compressed to ensure a seal between the applicator chamber and the surface. One advantage of the second pliable sealing ring being compressed is preventing that the fluid adhesive spreads on the surface outside the applicator chamber. Another advantage is ensuring the seal on an uneven surface as the second pliable sealing ring may adjust to the contours of the surface. Yet another advantage is that the second pliable sealing ring can be arranged crossing a tile grout without compromising the ability to prevent spreading the fluid adhesive on the surface outside the applicator chamber.

[0016] The state of the surface engagement means may be configured for being changed between the attached state and the detached state.

[0017] The surface engagement means may be in the detached state when the surface engagement means is arranged in contact with the surface.

[0018] The surface engagement means may be in the attached state when the surface engagement means is activated to engage the surface and enable the applicator chamber to be in sealing communication with the surface.

[0019] The surface engagement means may be in the detached state when, after activating the surface engagement means to engage the surface to achieve the attached state, the surface engagement means is released to disengage the surface engagement means from the surface.

[0020] After returning to the detached state, the second pliable sealing ring may return to its original shape and no longer be compressed.

[0021] In use, the applicator chamber may be configured for being arranged such that the surface access point is positioned inside the applicator chamber, such that the surface access point is accessible for the fluid adhesive.

[0022] One advantage of the second pliable sealing ring is preventing that the fluid adhesive spreads on the surface outside the applicator chamber and further ensures that the fluid adhesive access the surface access point and spread underneath the surface. The fluid may spread underneath the surface such as, but not limited to, in the space between a loose tile and a subfloor, or in the space between a loose tile and a wall surface.

[0023] Another advantage of the second pliable sealing ring is limiting the amount of fluid adhesive in contact with the surface, thus limiting the surface area from which the fluid adhesive needs to be removed from.

[0024] Yet another advantage of the second pliable sealing ring is providing an applicator chamber that can withstand pressure applied from the adhesive supply system when delivering fluid adhesive, under pressure, to the applicator chamber.

[0025] The second pliable sealing ring may be constructed in a flexible material and wherein the remaining fluid adhesive is easily removed after use. The remaining fluid adhesive may be removed by wiping with a cloth, washed, or peeled off.

[0026] The second pliable sealing ring may be constructed in a plastic material such as, but not limited to, silicone, PVC, rubber, etc.

[0027] The adhesive inlet may be connected to the adhesive supply system by one or more adhesive supply tubes.

[0028] The one or more adhesive supply tubes may be configured for being releasably attached to the adhesive inlet.

[0029] One advantage of the adhesive supply tubes being releasably attached to the adhesive inlet is fast and easy removal for cleaning and replacement of the adhesive supply tubes. Another advantage is replacing the adhesive supply tubes with tubes of different diameters to accommodate fluid adhesives of different viscosities. Yet another advantage is replacing the adhesive supply tubes with tubes of different lengths to accommodate locations with different layouts.

[0030] The adhesive supply system may be configured for delivering pressurized fluid adhesive to the applicator chamber. One advantage of the applicator chamber receiving fluid adhesive under pressure while remaining in sealing communication with the surface, is the ability to re-bond a larger area for each surface access point. The pressure further ensures that ventilation holes in the surface or grout is not required.

[0031] The surface access point may be arranged in the grout in between two juxtaposed tiles or in the surface of a tile. If re-bonding tiles with accessible grouts, the surface access point is preferably arranged in the grout for a more seamless repair after re-bonding.

[0032] A problem faced when using currently available tile re-bonding systems is that the ridges in the mortar or tile adhesive from the original tile installation may obstruct the fluid adhesive from accessing the hollow space underneath the tiles. Furthermore, depending on where the surface access point is provided, a ridge may fully block the fluid adhesive from entering the hollow space underneath the tiles. As a result, many small access points are provided in the tiles or grout to achieve a proper bonding, some of which are redundant.

[0033] The surface access point of the present invention may have an elongated shape. The length of the surface access point may be in a range between 20-100 mm, 20-50 mm, 30-60 mm, 40-70 mm, 50-80 mm, 60-90 mm, 40-100 mm, preferably between 50-80 mm.

[0034] The width of the surface access point may preferably be the width of the grout or in a range between 2-20 mm, 2-10 mm, 3-12 mm, 4-15 mm, 5-15 mm, 5-20 mm. An advantage of the surface access point being elongated and having the width of the access point being the same as the grout of which it is provided in, or being one the specified ranges, is that the grout can be seamlessly repaired after the tile has been re-bonded.

[0035] An advantage of the elongated shape is that it provides access to multiple ridge channels for the fluid adhesive to spread into, thus achieving a strong bonding and preventing accidentally providing unusable surface access points in the surface.

[0036] An advantage of the elongated surface access point in combination with the applicator chamber receiving fluid adhesive under pressure while remaining in sealing communication with the surface, is an improved access to the hollow space and an efficient ability to spread underneath the tiles. Thus, it is possible to cover a larger area for each surface access point and make sure the fluid adhesive access as many ridge channels as possible while providing a limited number of surface access points.

[0037] In an aspect of the surface attachment device, the adhesive delivered may have a viscosity to ensure a strong re-bonding of the tiles while achieving an effective spreadability underneath the tiles.

[0038] A further advantage of the specified viscosities is that the surface attachment device can be used to re-bond tiles on various surfaces such as, but not limited to, floors, walls, countertops, archways, etc. Current re-bonding systems are especially challenged when it comes to re-bonding on surfaces that are not substantially horizontal, such as on walls and archways.

[0039] The viscosity of the fluid adhesive may be higher when used to re-bond surfaces that are not substantially horizontal, such as on walls and archways, compared to the viscosity when used to re-bond substantially horizontal surfaces such as floors and countertops.

[0040] In one embodiment of the surface attachment device, the surface engagement means may be at least one airtight suction cup comprising at least one first pliable sealing ring.

[0041] The suction cup may be configured for achieving a suction chamber when the first pliable sealing ring is arranged in contact with the surface, and wherein the suction chamber is in fluid communication with:

- a suction mechanism for creating a vacuum inside the suction chamber; and
- a suction release mechanism for releasing said vacuum inside the suction chamber.

[0042] The suction chamber may be configured for being in an attached state and a detached state.

[0043] In an aspect, the surface attachment device may comprise one airtight suction cup comprising two first pliable sealing rings. The suction cup may be configured for achieving a suction chamber when the two first pliable sealing rings are arranged in contact with the surface. The suction cup may comprise a bridge connecting the two parts of the suction chamber, wherein each part is defined by a first pliable sealing ring. The bridge may be connecting the two parts of the suction chambers in an end opposite of the suction mechanism and the suction release mechanism. One advantage of the suction cup comprising two first pliable sealing rings is that the vacuum seal is distributed over a larger area ensuring a steady attachment to the surface on two sides of the adhesive applicator.

[0044] In another aspect, the surface attachment device may comprise a suction cup with a double pliable sealing ring defining the suction cup in between said two rings. The adhesive applicator may be arranged inside the innermost first pliable sealing ring. One advantage of the suction cup comprising double first pliable sealing rings with the adhesive applicator arranged in the middle, is that the vacuum seal may be evenly distributed to create a steady attachment on all sides of the adhesive applicator.

[0045] In yet another aspect, the surface attachment device may comprise a suction cup with a single pliable sealing ring. The single first pliable sealing ring may form a substantially U shape, wherein the adhesive applicator may be arranged substantially inside the innermost part of the first pliable sealing ring. One advantage of the suction cup comprising a single first pliable sealing ring with the adhesive applicator arranged substantially in the middle, is that the vacuum seal may be evenly distributed to create a steady attachment on three sides of the adhesive applicator.

[0046] The suction cup may have other advantageous shapes and configurations. Disregarding the configuration and shape of the suction cup, the suction chamber or chambers may distribute a vacuum seal necessary to attach to the surface when the fluid adhesive is supplied to the adhesive inlet under pressure.

[0047] The state of the suction chamber may be configured for being changed between the attached state and the detached state.

[0048] The suction chamber may be in the detached state when the suction cup is arranged with the first pliable sealing ring in contact with the surface to achieve a suction chamber.

[0049] The suction chamber may be in the attached state when the suction mechanism is activated to create a vacuum inside the suction chamber.

[0050] The suction chamber may be in the detached state when, after activating the suction mechanism to create a vacuum inside the suction chamber to achieve the attached state, the suction release mechanism is activated for releasing said vacuum inside the suction chamber.

[0051] When in the attached state, the first pliable sealing ring may be compressed to ensure an airtight seal between the suction chamber and the surface. One advantage of the first pliable sealing ring being compressed is to ensure an airtight seal on an uneven surface as the first pliable sealing ring may adjust to the contours of the surface. Another advantage is that the first pliable sealing ring can be arranged crossing a tile grout without compromising the ability to create a vacuum inside the suction chamber.

[0052] After returning to the detached state, the first pliable sealing ring may return to its original shape and no longer be compressed.

[0053] The suction mechanism may comprise a suction mechanism stop valve, configured for being in an open and in a closed position. In the open position, the suction mechanism may allow air being removed from the suction chamber, to create a vacuum inside the suction chamber. Once the desired vacuum has been achieved, the suction mechanism stop valve may be changed to the closed position to maintain the vacuum inside the suction chamber.

[0054] The suction release mechanism may be a valve, such as a stop valve, configured for allowing ambient air from outside the suction chamber to enter the suction chamber, thus releasing the vacuum inside the suction chamber by equalizing the pressure.

[0055] When the suction chamber is in the attached state, the second pliable sealing ring may be compressed to ensure a seal between the applicator chamber and the surface. One advantage of the second pliable sealing ring being compressed is preventing that the fluid adhesive spreads on the surface outside the applicator chamber. Another advantage is ensuring the seal on an uneven surface as the second pliable sealing ring may adjust to the contours of the surface. Yet another advantage is that the second pliable sealing ring can be arranged crossing

a tile grout without compromising the ability to prevent spreading the fluid adhesive on the surface outside the applicator chamber.

[0056] In one embodiment of the surface attachment device, the suction mechanism may be configured for being connected to a vacuum pump.

[0057] One advantage of the suction mechanism being connected to the vacuum pump, is achieving a suction mechanism that is easy to control and requiring a minimal amount of manual work during use.

[0058] In one embodiment, the surface attachment device may comprise a vacuum manometer connected to the suction chamber.

[0059] The term manometer is used to describe any instrument used to measure and display pressure.

[0060] One advantage of the vacuum manometer being connected to the suction chamber is that the operator of the device may continuously check the vacuum in the suction chamber. If the vacuum manometer indicates that the vacuum is declining, the suction chamber is losing vacuum, and the suction mechanism may need to be reactivated or the surface may need to be inspected to see what might cause the loss of vacuum.

[0061] By continuously checking the manometer, the operator ensures that the surface attachment device is securely fastened to the surface and that the fluid adhesive thereby is confined inside the applicator chamber and accessible for spreading underneath the surface.

[0062] In an aspect, the vacuum manometer may be connected to a sensor for alerting the operator of an insufficient amount of vacuum inside the suction chamber.

[0063] In another aspect, the vacuum manometer may be connected to a sensor for automatically stopping the supply of fluid adhesive until the vacuum has been restored. Alternatively, the sensor may activate the suction mechanism to restore the vacuum inside the suction chamber.

[0064] The vacuum manometer may be arranged at a position with a substantial distance to the suction mechanism. An advantage of arranging the vacuum manometer away from the suction mechanism is measuring in the part of the suction chamber where the vacuum is at the weakest.

[0065] In one embodiment of the surface attachment device, the suction chamber and the adhesive applicator may be connected by a safety valve.

[0066] The safety valve may terminate the supply of fluid adhesive through the adhesive inlet if the suction chamber is losing vacuum.

[0067] One advantage of the safety valve is that the supply of fluid adhesive is terminated before the decline in vacuum causes the fluid adhesive to spread on the surface outside of the adhesive chamber. Thus, the safety valve prevents unnecessary cleaning and provides additional operational safety.

[0068] In one embodiment of the surface attachment device, the adhesive inlet may comprise a stop valve.

[0069] The stop valve may be configured for enabling and disabling inflow of fluid adhesive delivered by the adhesive supply system to the adhesive inlet.

[0070] In an aspect where the adhesive inlet is connected to the adhesive supply system by one or more adhesive supply tubes, the stop valve may further prevent that remaining fluid adhesive in said supply tubes access the adhesive inlet and drips while the surface attachment device is being moved.

[0071] In one embodiment of the surface attachment device, the surface engagement means may be at least one pressure cup.

[0072] The pressure cup may comprise:

- a pin with a T-shaped crossbar configured for being inserted through an aperture in the applicator chamber and inserted through the surface access point, wherein the crossbar is configured for being in insert position, for entering and exiting the surface access point, and in a transverse position, for anchoring the crossbar in an access point;
- a support base configured for being in sealing communication with the applicator chamber, wherein the base support comprises a base end opening configured for being in open communication with the aperture; and
- displacement means displaceably connecting the pin and the support base.

[0073] The displacement means may be configured for:

- decreasing the distance between the T-shaped crossbar and the support base to achieve the attached state; and
- increasing the distance between the T-shaped crossbar and the support base to achieve the detached state.

[0074] In use, the crossbar in the insert position may be configured for being inserted in the surface access point and reoriented to the transverse position and thereby anchoring the crossbar in the surface access point underneath the surface.

[0075] In an aspect of the pressure cup, the displacement means may be a threaded communication between the pin and the support base. Displacement may be achieved by the support base being rotated around the pin to control the surface engagement means between the attached state and the detached state.

[0076] In another aspect of the pressure cup, the displacement means may be a handle with an off-centre swivel shaft movable within a slot in the support base. Displacement may be achieved by activating rotation of the handle around the swivel shaft, thus causing the swivel shaft to move within the slot to control the surface engagement means between the attached state and the detached state.

[0077] The pressure cup may be in the detached state when the support base is arranged in contact with the applicator chamber, and optionally, the crossbar is in the insert position underneath the surface.

[0078] The pressure cup may be in the attached state when the crossbar is in the transverse position, the base end opening is in open communication with the aperture, the base is in sealing communication with the applicator chamber and the second pliable sealing ring is compressed to achieve sealing communication between the applicator chamber and the surface. The applicator chamber may further comprise a third pliable sealing ring for achieving a sealing communication between the support base and the applicator chamber.

[0079] The pressure cup may be in the detached state when, after activating the surface engagement means, the displacement means increases the distance between the support base and the crossbar. Subsequently, the crossbar is reoriented to achieve the insert position.

[0080] In an aspect of the pressure cup, the pin is rotated relative to the support base into the insert position to release the anchored crossbar from the surface access point underneath the surface.

[0081] In another aspect of the pressure cup, the pressure cup is rotated relative to the surface to achieve the crossbar in the insert position to release the anchored crossbar from the surface access point underneath the surface.

[0082] When in the attached state, the third pliable sealing ring may be compressed to ensure a seal between the applicator chamber and support base. One advantage of the third pliable sealing ring being compressed is to ensure that no fluid adhesive can escape the applicator chamber.

[0083] After returning to the detached state, the second pliable sealing ring may return to its original shape and no longer be compressed.

[0084] After returning to the detached state, the third pliable sealing ring may return to its original shape and no longer be compressed.

[0085] An advantage of the surface engagement means being the pressure cup is achieving a compact surface attachment device. The compact surface attachment device is especially advantageous for achieving surface attachment in small and narrow spaces.

[0086] Another objective of the invention is achieved by a re-bonding system.

[0087] The re-bonding system comprises:

- the surface attachment device according to the invention; and
- an adhesive supply system comprising:
    - a tank in fluid communication with an external pump configured for changing the pressure inside the tank; and
    - a flexible adhesive container arranged inside said tank,

    wherein the adhesive supply system is configured for delivering a fluid adhesive to the adhesive inlet with a predetermined pressure being higher than the initial pressure inside the adhesive applicator.

[0088] The tank may comprise an air inlet for receiving pressurized air.

[0089] The pressure inside the tank may change between positive and negative pressure.

[0090] The flexible adhesive container may be a bag. The flexible adhesive container may be compressible. The flexible adhesive container may be configured for preventing air from being in contact with the fluid adhesive.

[0091] An advantage of the flexible adhesive container is that the fluid adhesive can be used over several days without curing and without the viscosity of the fluid adhesive substantially changing.

[0092] In an aspect of the re-bonding system, the flexible adhesive container may be refillable. The flexible adhesive container may comprise an inlet port for refilling fluid adhesive into the flexible adhesive container. The re-bonding system may comprise a door for accessing the flexible adhesive container. The fluid adhesive may also be suctioned into the flexible adhesive container using negative pressure in the tank.

[0093] In another aspect of the re-bonding system, the flexible adhesive container may be interchangeable. The re-bonding system may comprise a door for accessing the flexible adhesive container to remove and replace the flexible adhesive container.

[0094] In yet another aspect of the re-bonding system, the flexible adhesive container may be refillable and interchangeable.

[0095] The adhesive supply system may be connected to the adhesive inlet by one or more adhesive supply tubes.

[0096] The one or more adhesive supply tubes may be configured for being releasably attached to the adhesive inlet and to the adhesive supply system.

[0097] One advantage of the adhesive supply tubes being releasably attached to the adhesive inlet and the adhesive supply system, is fast and easy removal for cleaning and replacement of the adhesive supply tubes. Another advantage is replacing the adhesive supply tubes with tubes of different diameters to accommodate fluid adhesives of different viscosities. Yet another advantage is replacing the adhesive supply tubes with tubes of different lengths to accommodate locations with different layouts.

[0098] The adhesive supply system is configured for delivering a fluid adhesive to the adhesive inlet with a predetermined pressure being higher than the initial pressure inside the adhesive applicator while remaining in sealing communication with the surface.

[0099] One advantage of the applicator chamber receiving fluid adhesive with a predetermined pressure higher than the initial pressure while remaining in sealing

communication with the surface, is the ability to optimize and re-bond a larger area for each surface access point, thus requiring less surface access points. An additional advantage of optimizing is that less man hours are required, while ensuring quality and decreasing the environmental impact of having to redo tile work instead of simply re-bonding.

[0100] In one embodiment, the re-bonding system may comprise a control panel configured for controlling the inflow of fluid adhesive.

[0101] In an aspect of the surface attachment device comprising a vacuum manometer, the controller may further be configured for receiving information regarding loss of vacuum inside the suction chamber. In a further aspect, the controller may be configured for automatically stopping the supply of fluid adhesive until the vacuum has been restored. Alternatively, the controller may activate the suction mechanism to restore the vacuum inside the suction chamber.

[0102] In an aspect, the control panel may comprise a switch for activating the suction mechanism on the surface attachment device.

[0103] In an aspect, the control panel may comprise a suction adjuster for adjusting the amount of vacuum inside the suction chamber.

[0104] In an aspect, the control panel may comprise a switch for activating the suction release mechanism on the surface attachment device.

[0105] In an aspect, the control panel may comprise a switch for activating the external pump for changing the pressure inside the tank.

[0106] In an aspect, the control panel may comprise a tank pressure regulator for adjusting the pressure inside the tank. An advantage of adjusting the pressure inside the tank is ensuring that the fluid adhesive can access the hollow space underneath the tiles, thereby ensuring re-bonding. In an aspect, the tank pressure regulator may be configured for adjusting the pressure in the tank from 0 to 3,5 bar.

[0107] In an aspect, the control panel may comprise a switch for activating a pressure release mechanism of the adhesive supply system to equalize the pressure inside the tank.

[0108] In one embodiment, the control panel may further be configured for controlling the external pump.

[0109] The control panel may further comprise a tank vacuum manometer such that the operator of the device continuously can check the status of the pressure when there is a negative pressure inside the tank.

[0110] The control panel may further comprise a tank pressure manometer, such that the operator of the device continuously can check the status of the pressure when there is a positive pressure inside the tank.

[0111] In an aspect, the control panel may comprise a compound manometer, for measuring and displaying pressure both above and below atmospheric pressure, such that the operator of the device continuously can check the status of the pressure inside the tank, regardless of the pressure being positive or negative.

[0112] Checking the positive and/or negative pressure inside the tank may ensure that the tank is relieved.

[0113] An increase in the positive pressure may indicate that the fluid adhesive has filled the hollow space underneath the surface. It may also indicate that the access to the hollow space underneath the tiles are obstructed, e.g. by the ridges, or does not allow for a sufficient amount of fluid adhesive to pass.

[0114] In an aspect, the positive pressure during supply of fluid adhesive is between 0.1 to 0.2 bar. Preferably, the positive pressure does not exceed 0.5 bar, however, situations may occur where a higher pressure is permissible. Too much pressure may risk raising the surface.

[0115] In an aspect, the operator may be alerted that the hollow space is filled.

[0116] In another aspect, the external pump may automatically stop the supply of fluid adhesive when the positive pressure indicates that the hollow space has been filled. An advantage of automatically stopping the supply is minimizing the risk of supplying too much fluid adhesive resulting in expanding the hollow space underneath the tiles.

[0117] In yet another aspect, the external pump may be a pump integrated in the re-bonding system.

[0118] In an aspect of the suction mechanism being connected to the vacuum pump, the external pump may be said vacuum pump.

[0119] In one embodiment of the re-bonding system, the external pump is a caulking gun and the flexible adhesive container is a cartridge for a caulking gun.

[0120] An advantage of using a caulking gun with a cartridge is providing a system that is fast and easy to set up. This is especially beneficial in situations where only a couple, such as one or two, needs to be re-bonded, as some of the initial setup time is eliminated and the re-bonding system is easier to move. An additional advantage is providing a more affordable re-bonding system.

[0121] The cartridge may be an interchangeable cartridge and/or a refillable cartridge.

[0122] In one embodiment, the re-bonding system may comprise moving means to achieve a mobile re-bonding system.

[0123] The moving means may be two or more wheels. At least one of the wheels may comprise a locking mechanism for ensuring that the re-bonding system does not move unintentionally.

[0124] When the re-bonding system is in use, the wheels may be locked to achieve anchoring. When the re-bonding system have re-bonded tiles through one surface access point, the wheels may be unlocked, and the re-bonding system moved to another surface access point to re-bond another section of tiles.

[0125] The re-bonding system may further comprise at least one handle for easy manoeuvring.

[0126] An advantage of moving the re-bonding system is making it easy to cover re-bonding on large surfaces requiring multiple surface access points. A further ad-

vantage is limiting the required length of adhesive supply tubes and simplifying setting the re-bonding system up at one location and moving it to another location when finished.

[0127] In one embodiment of the re-bonding system, the adhesive supply system may be configured for withdrawing excess fluid adhesive from the adhesive inlet with a predetermined pressure being lower than the initial pressure inside the adhesive applicator.

[0128] An advantage of withdrawing excess fluid adhesive from the adhesive applicator through the adhesive inlet, is limiting both the waste of liquid adhesive and limiting the amount of fluid adhesive that has to be cleaned off of the surface after the surface attachment device has been detached.

[0129] Another advantage of withdrawing excess fluid adhesive is drastically decreasing the time it takes for the liquid adhesive to cure. By withdrawing the excess fluid adhesive and wiping the surface access point, the fluid adhesive is cured, and the surface access point is ready to be re-grouted after 1-1.5 hours. By not withdrawing the excess fluid adhesive, fluid adhesive is cured, and the surface access point is ready to be re-grouted after approximately 24 hours. Thus, by withdrawing the excess fluid adhesive, the entire surface can be re-bonded and subsequently re-grouted in a single day.

[0130] The control panel may further comprise a tank vacuum manometer or a compound manometer comprising a tank vacuum manometer.

[0131] One advantage of the tank vacuum manometer is that the operator of the device may continuously check the negative pressure in the tank. If the tank vacuum manometer indicates a decline in the vacuum, there might be a leakage or a malfunction.

[0132] By checking the tank vacuum manometer, the operator ensures that the negative pressure is applied to the tank and excessive fluid adhesive is withdrawn from the applicator chamber and back into the adhesive supply system. The vacuum manometer may further prevent too much air from entering the flexible adhesive container.

[0133] In an aspect, the negative pressure during withdrawal of fluid adhesive is between -0.4 to -0.5 bar, however, situations may occur where a higher or lower negative pressure is permissible.

[0134] In an aspect, the tank vacuum manometer may be connected to a sensor for alerting the operator of an increase or decrease of the negative pressure inside the tank.

[0135] In another aspect, the external pump may automatically stop withdrawing the excess fluid adhesive from the adhesive applicator when the pressure changes to indicate that most of the excess fluid adhesive in the adhesive applicator has been removed. An advantage of automatically stopping the external pump from withdrawing fluid adhesive is minimizing the risk of withdrawing too much fluid adhesive from underneath the surface.

[0136] In an aspect of the suction mechanism being connected to the vacuum pump, the external pump may be said vacuum pump.

[0137] Yet another objective of the invention is achieved by a method of re-bonding loose or hollow tiles.

[0138] The method comprises acts of:

- providing a surface access point in a surface comprising loose or hollow tiles;
- providing a re-bonding system according to any of claims 7-13;
- arranging the surface attachment device in contact with the surface such that the applicator chamber includes the surface access point in the surface such that the surface access point is accessible for the fluid adhesive;
- activating the surface engagement means to achieve the attachment state;
- initiating a supply of fluid adhesive from the flexible adhesive container to the adhesive applicator;
- terminating the supply of fluid adhesive;
- releasing the surface engagement means to achieve the detached state.

[0139] In an aspect, the advantages achieved by the method is substantially similar to the advantages achieved by the surface attachment device and the re-bonding system of the invention.

[0140] The surface access point may be provided by using one or more tools, such as drills and power cutter, to remove tile material or grout material from the surface to be re-bonded.

[0141] Providing the surface access point may include removing debris from the surface and from the surface access point. The debris may for instance be removed by using a vacuum cleaner. Grout material may be blocking the ridges in the mortar or tile adhesive and a hooked scraper may therefore be used to remove some of said grout material to provide better access to the hollow space underneath the surface through the surface access point.

[0142] The surface access point may have an elongated shape to provide access to multiple ridge channels for the fluid adhesive to spread into. The elongated shape may thus achieve a strong bonding and prevent accidentally providing unusable surface access points in the surface.

[0143] The length of the surface access point may be in a range between 20-100 mm, 20-50 mm, 30-60 mm, 40-70 mm, 50-80 mm, 60-90 mm, 40-100 mm, preferably between 50-80 mm.

[0144] The width of the surface access point may preferably be the width of the grout or in a range between 2-20 mm, 2-10 mm, 3-12 mm, 4-15 mm, 5-15 mm, 5-20 mm.

[0145] In an aspect, the method may further comprise an act of re-grouting or otherwise seamlessly closing the surface access point provided in the surface. Depending on the type of adhesive, the fluid adhesive may be sub-

stantially cured before performing the act of re-grouting.

[0146] An advantage of re-grouting is achieving a seamless closure by using the same or substantially similar grouting material matching the original grout. A further advantage achieved when the surface access point is elongated and having the width of the access point being the same as the grout of which it is provided in, or being one the specified ranges, is that the grout can be seamlessly repaired after the tile has been re-bonded.

[0147] In one embodiment, the method may further comprise one or more acts of:

- withdrawing excess fluid adhesive from the adhesive applicator using the external pump;
- adjusting the pressure inside the tank.

[0148] An advantage of withdrawing the excess fluid adhesive in the adhesive applicator is limiting both the waste of liquid adhesive and limiting the amount of fluid adhesive that has to be cleaned off of the surface after the surface attachment device has been detached.

[0149] An advantage of adjusting the pressure inside the tank is to make it possible to both supply fluid adhesive to the adhesive inlet and withdraw excess fluid adhesive from the applicator chamber.

[0150] Another advantage is increasing or decreasing the positive pressure inside the tank as needed to make sure the fluid adhesive is spread in the hollow space underneath the surface.

Description of the Drawing

[0151] Various examples are described hereinafter with reference to the figures. Like reference numerals refer to like elements throughout. Like elements will, thus, not be described in detail with respect to the description of each figure. It should also be noted that the figures are only intended to facilitate the description of the examples. They are not intended as an exhaustive description of the claimed invention or as a limitation on the scope of the claimed invention. In addition, an illustrated example need not have all the aspects or advantages shown. An aspect or an advantage described in conjunction with a particular example is not necessarily limited to that example and can be practiced in any other examples even if not so illustrated, or if not so explicitly described.

[0152] Exemplary embodiments of the invention are described in the figures, whereon:

Fig. 1 illustrates the re-bonding system according to the invention;
Fig. 2 illustrates the surface attachment device according to the invention;
Fig. 3 illustrates the cross section (A-A) of the surface attachment device in the released and the attached state;
Fig. 4 illustrates the cross section (A-A) of the surface attachment device during the process of re-bonding tiles;
Fig. 5 illustrates the cross section (A-A) of the surface attachment device connected to the adhesive supply system;
Fig. 6 illustrates an embodiment of the surface attachment device;
Fig. 7 illustrates a cross section (B-B) of the embodiment shown in fig. 6;
Fig. 8 illustrates two embodiments of the adhesive supply system;
Fig. 9 illustrates the control panel;
Fig 10 illustrates the method of re-bonding loose or hollow tiles.

Detailed Description of the Invention

[0153] Exemplary examples will now be described more fully hereinafter with reference to the accompanying drawings. In this regard, the present examples may have different forms and should not be construed as being limited to the descriptions set forth herein. Accordingly, the examples are merely described below, by referring to the figures, to explain aspects.

[0154] Throughout the specification, when an element is referred to as being "connected" to another element, the element is "directly connected" to the other element, "electrically connected", "fluidic connected" or "communicatively connected" to the other element with one or more intervening elements interposed there between.

[0155] The terminology used herein is for the purpose of describing particular examples only and is not intended to be limiting. As used herein, the terms "comprises" "comprising" "includes" and/or "including" when used in this specification specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.

[0156] Unless otherwise defined, all terms used herein (including technical and scientific terms) have the same meaning as commonly understood by those skilled in the art to which this invention pertains. It will be further understood that terms, such as those defined in commonly used dictionaries, should be interpreted as having a meaning that is consistent with their meaning in the context of the relevant art and will not be interpreted in an idealized or overly formal sense unless expressly so defined in the present specification.

No	Item
1	Surface attachment device
2	Surface
3	Surface access point
4	Fluid adhesive
9	Surface engagement means
10	Suction cup
11	First pliable sealing ring

(continued)

No	Item
13	Attached state
14	Detached state
15	Suction chamber
16	Suction mechanism
17	Suction release mechanism
18	Vacuum pump
19	Vacuum manometer
10i	Pressure cup
12i	Pin
13i	Crossbar
15i	Support base
18i	Displacement means
20	Adhesive applicator
21	Second pliable sealing ring
25	Applicator chamber
26	Aperture
30	Adhesive inlet
31	Safety valve
32	Stop valve
40	Adhesive supply system
50	Tank
51	External pump
52	Caulking gun
60	Flexible adhesive container
61	Cartridge
70	Re-bonding system
80	Control panel
90	Moving means
100	Method
200	Providing (surface access point)
300	Providing (re-bonding system)
400	Arranging
500	Activating
600	Initiating
700	Terminating
800	Releasing
900	Withdrawing
1000	Adjusting

[0157] Figure 1 illustrates an embodiment of a re-bonding system 70 for re-bonding loose or hollow tiles.

[0158] The re-bonding system comprises a surface attachment device 1 and an adhesive supply system 40.

[0159] In the illustrated embodiment, the re-bonding system 70 further comprises a control panel 80, configured for controlling the inflow of fluid adhesive 4, and moving means 90, to achieve a mobile re-bonding system 70. As shown in the figure, the moving means 90 comprise four wheels wherein two of the wheels comprise a locking mechanism. The re-bonding system further comprises two handles for easy maneuvering when moving the re-bonding system 70.

[0160] Figure 2 illustrate the surface attachment device 1 for releasably attaching to a surface 2 wherein the surface engagement means 9 is at least one suction cup 10.

[0161] The surface attachment device 1, as illustrated in figure 2a, comprises one airtight suction cup 10 comprising two first pliable sealing rings 11. The suction cup 10 is configured for achieving a suction chamber 15 when the two first pliable sealing rings 11 are arranged in contact with the surface 2. In the illustrated embodiment, the suction cup 10 comprises a bridge connecting the two parts of the suction chamber 15, wherein each part is defined by a first pliable sealing ring 11. In figure 2a the bridge is connecting the two parts of the suction chambers 15 in the end opposite of the suction mechanism 16 and the suction release mechanism 17.

[0162] The suction cup 10 may have other advantageous shapes and configurations, such as, but not limited to those illustrated in figures 2b and 2c. In figure 2b, the surface attachment device 1 comprises a suction cup 10 with a double pliable sealing ring 11, defining the suction cup 10 in between. In figure 2c, the surface attachment device 1 comprises a suction cup 10 with a single pliable sealing ring 11.

[0163] The suction chamber 15 is in fluid communication with a suction mechanism 16 for creating a vacuum inside the suction chamber 15. In the illustrated embodiments, the suction mechanism 16 is connected to a vacuum pump 18.

[0164] The suction chamber 15 is in fluid communication with a suction release mechanism 17 for releasing said vacuum inside the suction chamber 15.

[0165] The suction chamber 15 is configured for being in an attached state 13, whereby the surface attachment device 1 is attached to the surface 2. The suction chamber 15 is further configured for being in a detached state 14, whereby the surface attachment device 1 can be moved on and removed from the surface 2.

[0166] The surface attachment device 1 further comprises a vacuum manometer 19 connected to the suction chamber 15. In the embodiment illustrated in figure 2a, the vacuum manometer 19 is arranged in the part of the suction chamber 15 not directly connected to the suction mechanism 16.

[0167] The surface attachment device 1 comprises an adhesive applicator 20 comprising a second pliable sealing ring 21. The adhesive applicator 20 is configured for forming an applicator chamber 25 when arranged in contact with the surface 2.

[0168] The adhesive applicator 20 comprises an adhesive inlet 30 configured for delivering a fluid adhesive 4 into the applicator chamber 25,

[0169] The adhesive inlet 30 is connected to an adhesive supply system 40 (see figure 5) for delivering the fluid adhesive 4 to the adhesive inlet 30.

[0170] The suction chamber 15 and the adhesive applicator 20 is connected by a safety valve 31.

[0171] Figures 3, 4, and 5 illustrate a cross section of the surface attachment device 1 taken along lines A-A in figure 2a.

[0172] Figures 3 and 4 illustrate the suction chamber 15 in the attached state 13 and the detached state 14. The surface 2 is tiles and the surface access point 3 has been provided by removing part of the grout in between two juxtaposed tiles, however, the embodiment is not restricted to a tiled surface with grouts.

[0173] In figure 3a, the suction chamber 15 is in the detached state 14. In the illustrated embodiment, the suction mechanism 16 comprises a stop valve. The suction chamber 15 and the applicator chamber 25 is arranged in contact with the surface 2 and the applicator chamber 25 is further arranged such that it includes the surface access point 3.

[0174] In figure 3b, the suction chamber 15 is in the attached state 13. The suction mechanism stop valve is open and air is removed from the suction chamber 15 thus creating a vacuum inside the suction chamber 15. Removing the air from the suction chamber 15 causes the first pliable sealing rings 11 to be compressed. This consequently forces the adhesive applicator 20 into sealing communication with the surface 2, causing the second pliable sealing ring 21 to be compressed. Once the desired vacuum has been achieved, the suction mechanism 16 stop valve may be closed to maintain the vacuum inside the suction chamber 15.

[0175] In figure 4a, the suction chamber 15 is in an attached state 13. The suction mechanism stop valve is closed to maintain the vacuum inside the suction chamber 15. The adhesive applicator 20 is sealing communication with the surface 2, and the first and second pliable sealing ring 11,21 is compressed. The stop valve 32 of the adhesive inlet 30 is open and the adhesive supply system 40 (see figure 5) supply the fluid adhesive 4, to the adhesive inlet 30 with pressure higher than the initial pressure inside the adhesive applicator 20. Consequently, the supply of fluid adhesive 4 accesses the surface access point 3 and spreads underneath the surface 2 causing the surface 2 to re-bond to the underlying substrate or sub-surface.

[0176] After the fluid adhesive 4 has been applied filling the hollow space underneath the surface 2, an excess amount of fluid adhesive 4 may be present in the applicator chamber 25. The external pump 51 (see figure 5) may be used to reverse the pressure such that the pressure is lower than the initial pressure inside the adhesive chamber 25. Reversing the pressure creates a vacuum to withdraw the excess fluid adhesive 4 in the adhesive applicator 20, without withdrawing fluid adhesive 4 from underneath the surface 2.

[0177] Figure 4b illustrates the suction chamber 15 in the detached state, after fluid adhesive 4 has been supplied to the hollow space underneath the surface 4, and optionally, after excess fluid adhesive 4 has been withdrawn from the applicator chamber 25. The suction release mechanism 17 is open allowing ambient air from outside of the suction chamber 15, to enter into the suction chamber 15. The vacuum is thus released by equalizing the pressure and the first and second pliable sealing ring 11,21 has returned to their initial uncompressed shape.

[0178] Figure 5 illustrate a cross-section of the re-bonding system 70, comprising the surface attachment device 1 connected to the vacuum pump 18 and the adhesive supply system.

[0179] The adhesive supply system 40 comprises a tank 50, in fluid communication with the external pump for changing the pressure inside the tank, and a flexible adhesive container 60 arranged inside the tank 50. The flexible adhesive container 60 may be refillable and/or interchangeable.

[0180] In use, the adhesive supply system 40 delivers the fluid adhesive 40 to the adhesive inlet 30 with a predetermined pressure being higher than the initial pressure inside the adhesive applicator 20, see also figure 4a.

[0181] In the illustrated embodiment, an adhesive supply tube connects the adhesive supply system 40 and the adhesive inlet 20. The adhesive supply system 40 further comprises a supply system stop valve to open/close the supply of fluid adhesive 4 to the adhesive supply tube.

[0182] Figures 6 and 7 illustrate the surface attachment device 1 for releasably attaching to a surface 2 wherein the surface engagement means 9 is at least one pressure cup 10i.

[0183] The surface attachment device 1, as illustrated in figures 6 and 7, comprises one pressure cup 10i.

[0184] The pressure cup 10i comprises a pin 12i with a T-shaped crossbar 13i configured for being inserted through the aperture 26 in the applicator chamber 25. It is further configured for being inserted through the surface access point 3 in the surface 2. The crossbar 13i is configured for being in insert position, for entering and exiting the surface access point 3, and in a transverse position, for anchoring the crossbar in the surface access point 3 underneath the surface 2.

[0185] The insertion in the aperture 26 and in the surface access point 3 is best illustrated in the cross-section in figure 7.

[0186] The surface attachment device 1 comprises a support base 15i configured for being in sealing communication with the applicator chamber 25. The support base 15i comprises a base end opening configured for being in open communication with the aperture 26.

[0187] The surface attachment device 1 comprises displacement means 18i displaceably connecting the pin 12i and the support base 15i.

[0188] In use, the displacement means 18i is configured for decreasing the distance between the T-shaped crossbar 13i and the support base 15i to achieve the attached state 13, see also figure 7b.

[0189] In use, the displacement means 18i is configured for increasing the distance between the T-shaped crossbar 13i and the support base 15i to achieve the

detached state 14, see also figure 7a.

[0190] In the surface attachment device 1, as illustrated in figures 6 and 7, the displacement means 18i are the threaded communication between the pin 12i and the support base 15i. Displacement may be achieved by the support base 15i being rotated around the pin 12i to control the surface engagement 9 means between the attached state 13 and the detached state 14.

[0191] In another embodiment, the displacement means 18i (not shown) may be a handle with an off-centre swivel shaft movable within a slot in the support base 15i. Displacement in this embodiment may be achieved by activating rotation of the handle around the swivel shaft, thus causing the swivel shaft to move within the slot to control the surface engagement means 9 between the attached state 13 and the detached state 14.

[0192] As illustrated in figure 8, the adhesive supply system 40 may comprise an external pump 51 being a caulking gun 52 and a flexible container 60 being a caulking gun cartridge 61.

[0193] Figure 9 illustrates the control panel 80 configured for controlling the inflow of fluid adhesive 4. The control panel 80 is further configured for controlling the external pump 51.

[0194] In the illustrated embodiment, the control panel 80 comprises:

- a switch for activating the suction mechanism 16 on the surface attachment device 1;
- a suction adjuster for adjusting the amount of vacuum inside the suction chamber 15;
- a switch for activating the suction release mechanism 17 on the surface attachment device 1;
- a switch for activating the external pump 51 for changing the pressure inside the tank 50;
- a tank pressure regulator for adjusting the pressure inside the tank 50, ensuring that the fluid adhesive 4 can access the hollow space underneath the tiles, thereby ensuring re-bonding;
- a switch for activating a pressure release mechanism of the adhesive supply system 40 to equalize the pressure inside the tank 50:
- a tank vacuum manometer; and
- pressure manometer.

[0195] Figure 10 disclose a Method 100 of re-bonding loose or hollow tiles.

[0196] The method 100 comprises an act of providing 200 a surface access point 3 in a surface 2 comprising loose or hollow tiles.

[0197] The method 100 comprises an act of providing 300 a re-bonding system 70 according to the invention.

[0198] The method 100 comprises an act of arranging 400 the surface attachment device 1 in contact with the surface 2, such that the applicator chamber 25 includes the surface access point 3 in the surface 2. This ensures that the surface access point 3 is accessible for the fluid adhesive 4 to enter.

[0199] The method 100 comprises an act of activating 500 the surface engagement means 9 to achieve the attached state 13.

[0200] The method 100 comprises an act of initiating 600 a supply of fluid adhesive 4 from the flexible adhesive container 60 to the adhesive applicator 20.

[0201] The method 100 comprises an act of terminating 700 the supply of fluid adhesive 4.

[0202] The method 100 comprises an act of releasing 800 the surface engagement means 9 to achieve the detached state 14.

[0203] The method 100 further comprises an act of withdrawing 900 excess fluid adhesive 4 from the adhesive applicator 20 using the external pump 51.

[0204] The method 100 further comprises an act of adjusting 1000 the pressure inside the tank 50.

Claims

1. Surface attachment device (1) for releasably attaching to a surface (2), the attachment device (1) comprises:

   - at least one surface engagement means (9) configured for being in an attached state (13) and a detached state (14); and
   - an adhesive applicator (20) comprising a second pliable sealing ring (21) configured to be arranged in contact with the surface, for the adhesive applicator (20) to form an applicator chamber (25) when arranged in contact with the surface (2), and wherein the adhesive applicator (20) is configured for being in sealing communication with the surface (2) when the surface engagement means (9) is in the attached state (13),
   wherein the adhesive applicator (20) comprises an adhesive inlet (30) configured for delivering a fluid adhesive (4) into the applicator chamber (25),
   wherein the adhesive inlet (30) is configured for being connected to an adhesive supply system (40) for delivering the fluid adhesive (4) to the adhesive inlet (30).

2. Surface attachment device (1) according to claim 1, wherein the surface engagement means (9) is at least one airtight suction cup (10) comprising at least one first pliable sealing ring (11), wherein the suction cup (10) is configured for achieving a suction chamber (15) when the first pliable sealing ring (11) is arranged in contact with the surface (2), and wherein the suction chamber (15) is in fluid communication with:

   - a suction mechanism (16) for creating a vacuum inside the suction chamber (15); and

- a suction release mechanism (17) for releasing said vacuum inside the suction chamber (15),

wherein the said suction chamber (15) is configured for being in the attached state (13) and the detached state (14).

3. Surface attachment device (1) according to claim 2, wherein the suction mechanism (16) is configured for being connected to a vacuum pump (18).

4. Surface attachment device (1) according to claim 2 or 3, comprising a vacuum manometer (19) connected to the suction chamber (15).

5. Surface attachment device (1) according to any of claims 2-4, wherein the suction chamber (15) and the adhesive applicator (20) is connected by a safety valve (31).

6. Surface attachment device (1) according to any of claims 2-5, wherein the adhesive inlet (30) comprises a stop valve (32).

7. Surface attachment device (1) according to claim 1, wherein the surface engagement means (9) is at least one pressure cup (10i) comprising:

- a pin (12i) with a T-shaped crossbar (13i) configured for being inserted through an aperture (26) in the applicator chamber (25) and inserted through a surface access point (3), wherein the crossbar (13i) is configured for being in insert position, for entering and exiting the surface access point (3), and in a transverse position, for anchoring the crossbar in an access point (3) in the surface (2);
- a support base (15i) configured for being in sealing communication with the applicator chamber (25), wherein the support base (15i) comprises a base end opening configured for being in open communication with the aperture (26); and
- displacement means (18i) displaceably connecting the pin (12i) and the support base (15i),

wherein, the displacement means (18i) is configured for:

- decreasing the distance between the T-shaped crossbar (13i) and the support base (15i) to achieve the attached state (13); and
- increasing the distance between the T-shaped crossbar (13i) and the support base (15i) to achieve the detached state (14).

8. Re-bonding system (70) comprising:

- the surface attachment device (1) according to any of claims 1-7; and
- an adhesive supply system (40) comprising:

- a tank (50) in fluid communication with an external pump (51) configured for changing the pressure inside the tank (50); and
- a flexible adhesive container (60) arranged inside said tank (50),

wherein the adhesive supply system (40) is configured for delivering a fluid adhesive (4) to the adhesive inlet (30) with a predetermined pressure being higher than the initial pressure inside the adhesive applicator (20).

9. Re-bonding system (70) according to claim 8, comprising a control panel (80) configured for controlling the inflow of fluid adhesive (4).

10. Re-bonding system (70) according to claim 9, wherein the control panel (80) is further configured for controlling the external pump (51).

11. Re-bonding system (70) according to claim 8, wherein the external pump (51) is a caulking gun (52) and the flexible adhesive container (60) is a cartridge (61) for a caulking gun.

12. Re-bonding system (70) according to any of claims 8-11, comprising moving means (90) to achieve a mobile re-bonding system (70).

13. Re-bonding system (70) according to any of claims 8-12, wherein the adhesive supply system (40) is configured for withdrawing excess fluid adhesive (4) from the adhesive inlet (30) with a predetermined pressure being lower than the initial pressure inside the adhesive applicator (20).

14. Method (100) of re-bonding loose or hollow tiles, comprising one or more acts of:

- providing (200) a surface access point (3) in a surface (2) comprising loose or hollow tiles;
- providing (300) a re-bonding system (70) according to any of claims 8-13;
- arranging (400) the surface attachment device (1) in contact with the surface (2) such that the applicator chamber (25) includes the surface access point (3) in the surface (2) so that the surface access point (3) is accessible for the fluid adhesive (4);
- activating (500) the surface engagement means (9) to achieve the attached state (13);
- initiating (600) a supply of fluid adhesive (4) from the flexible adhesive container (60) to the adhesive applicator (20);

- terminating (700) the supply of fluid adhesive (4);
- releasing (800) the surface engagement means (9) to achieve the detached state (14).

15. Method (100) according to claim 14, further comprising one or more acts of:

- withdrawing (900) excess fluid adhesive (4) from the adhesive applicator (20) using the external pump (51);
- adjusting (1000) the pressure inside the tank (50).

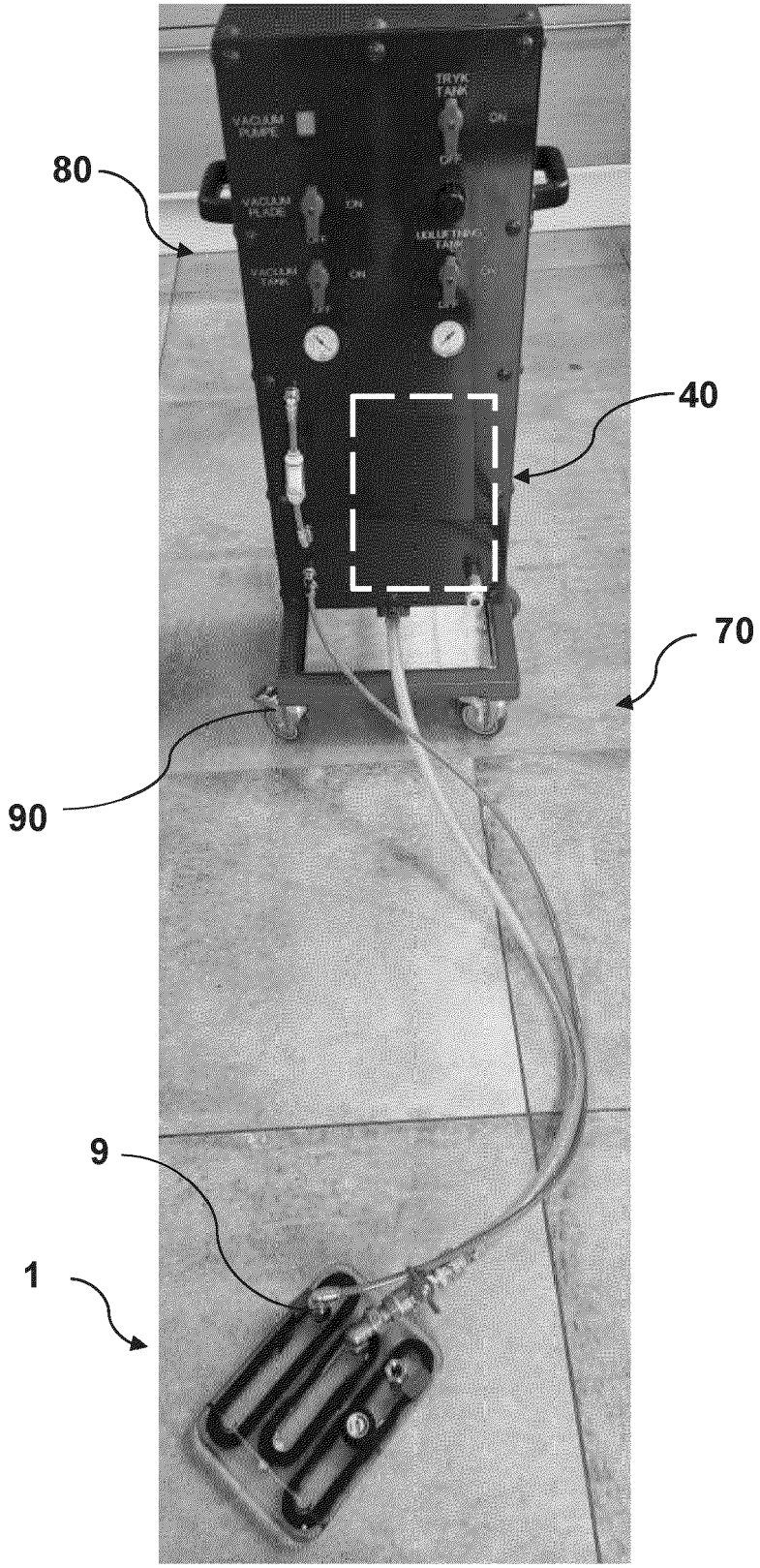

Fig 1

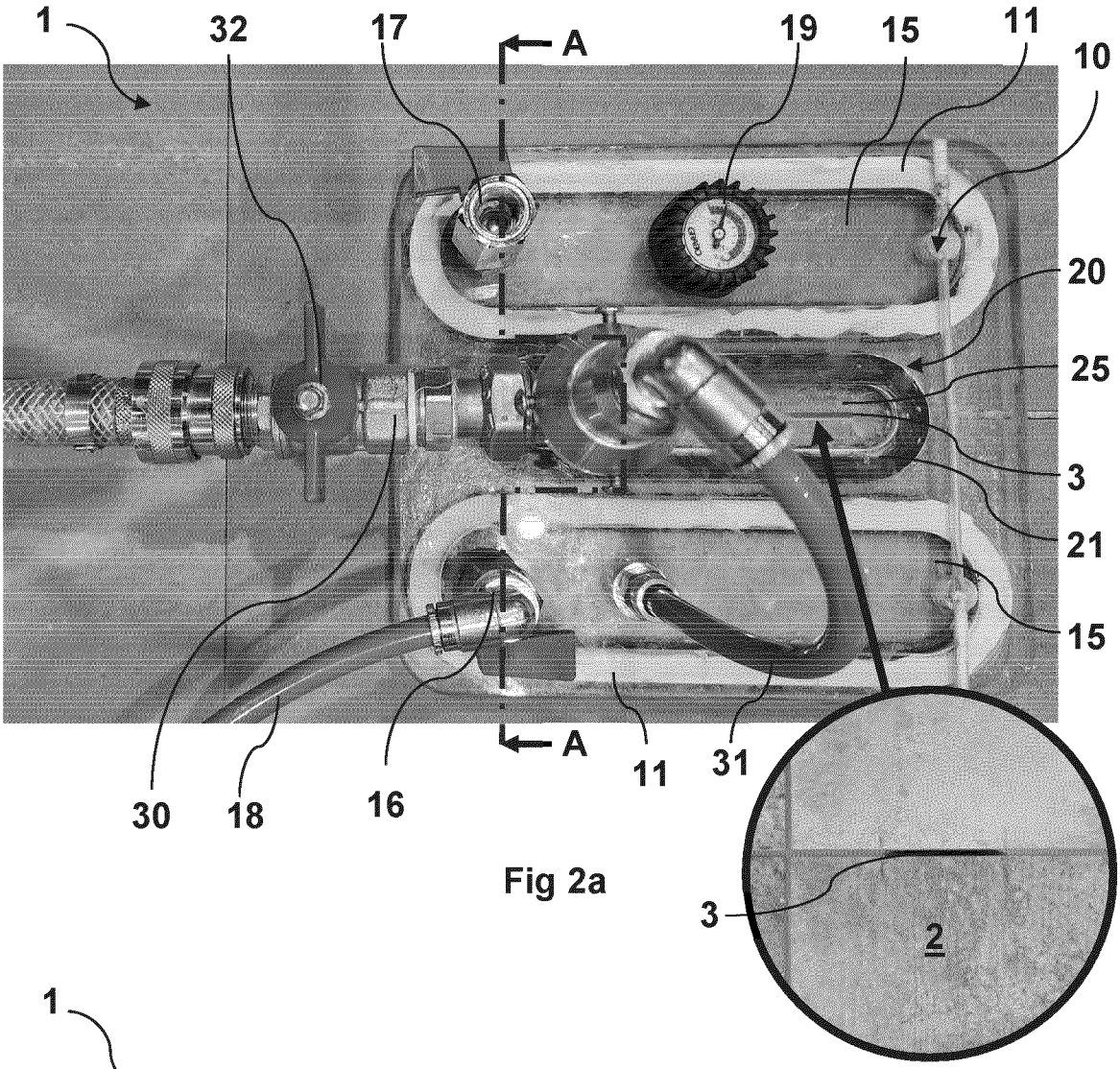

Fig 2a

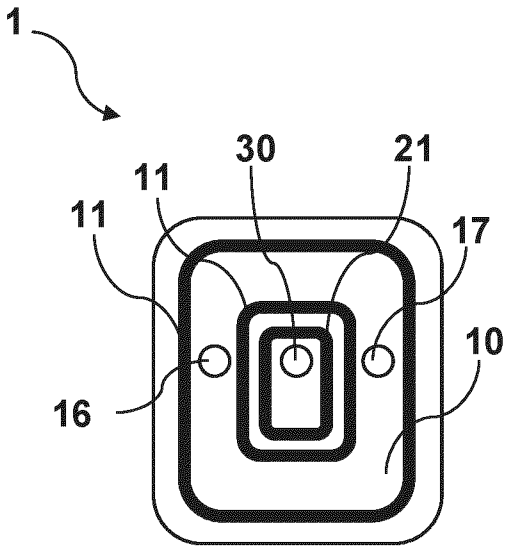

Fig 2b

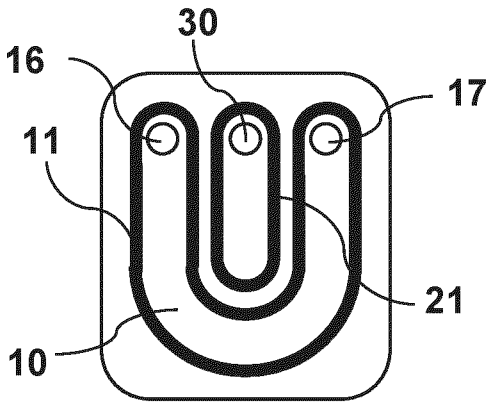

Fig 2c

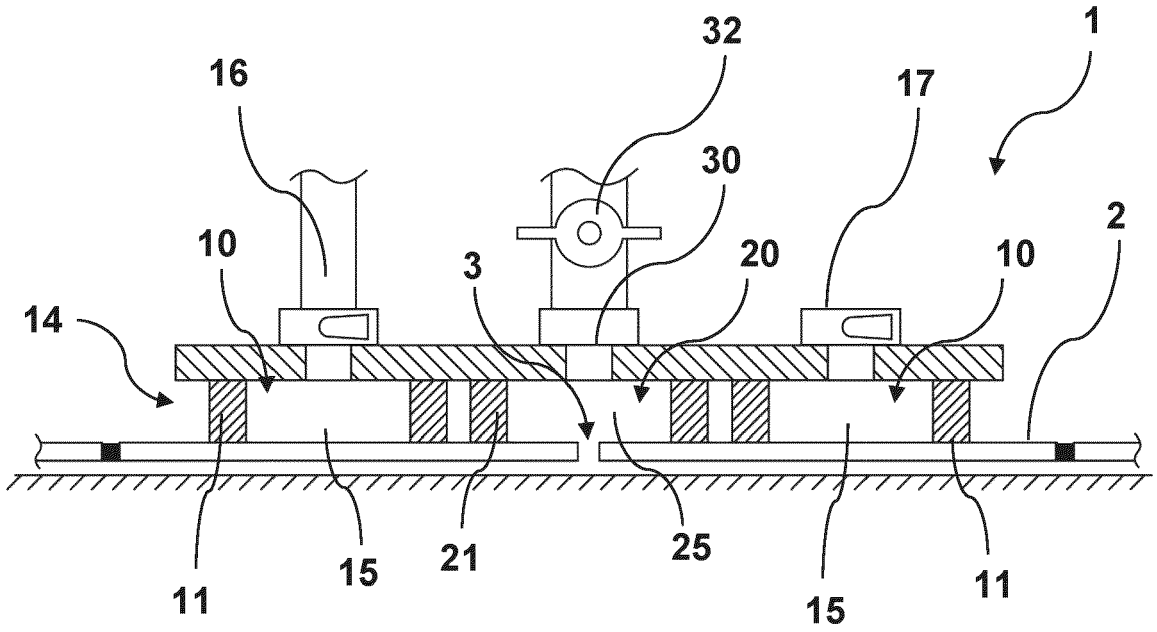
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Fig 3a

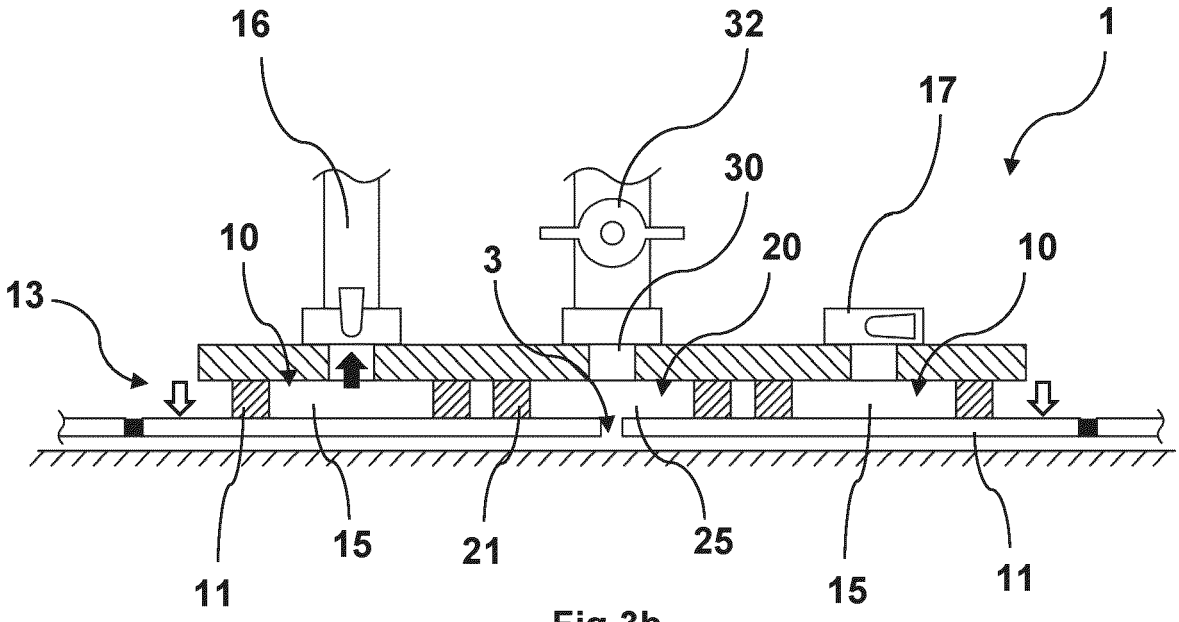
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Fig 3b

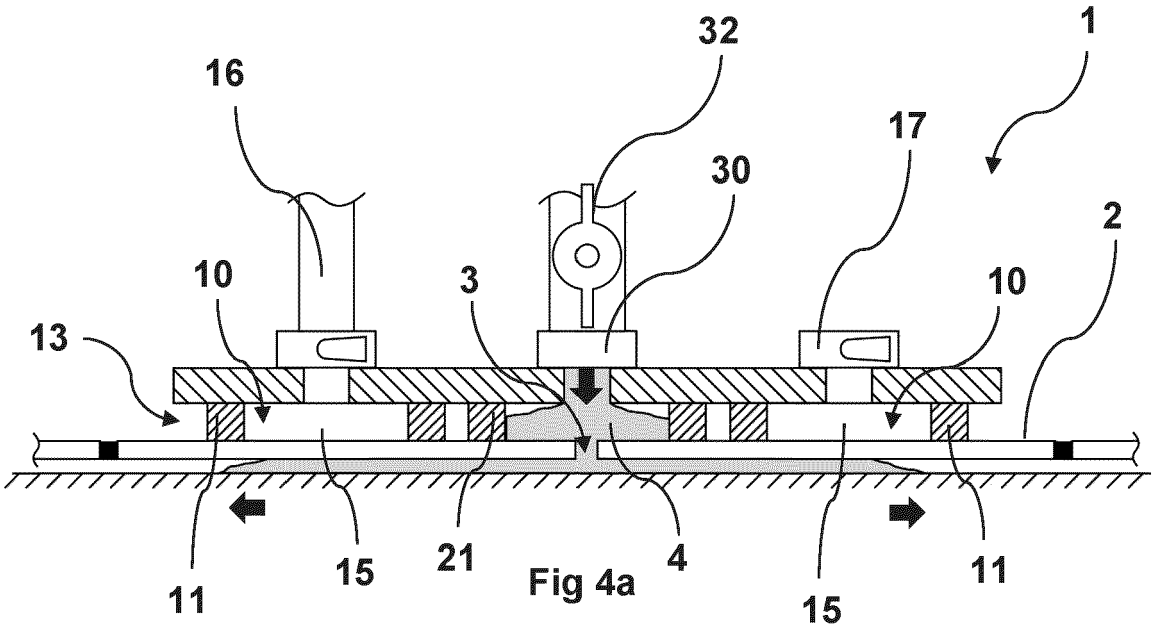
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Fig 4a

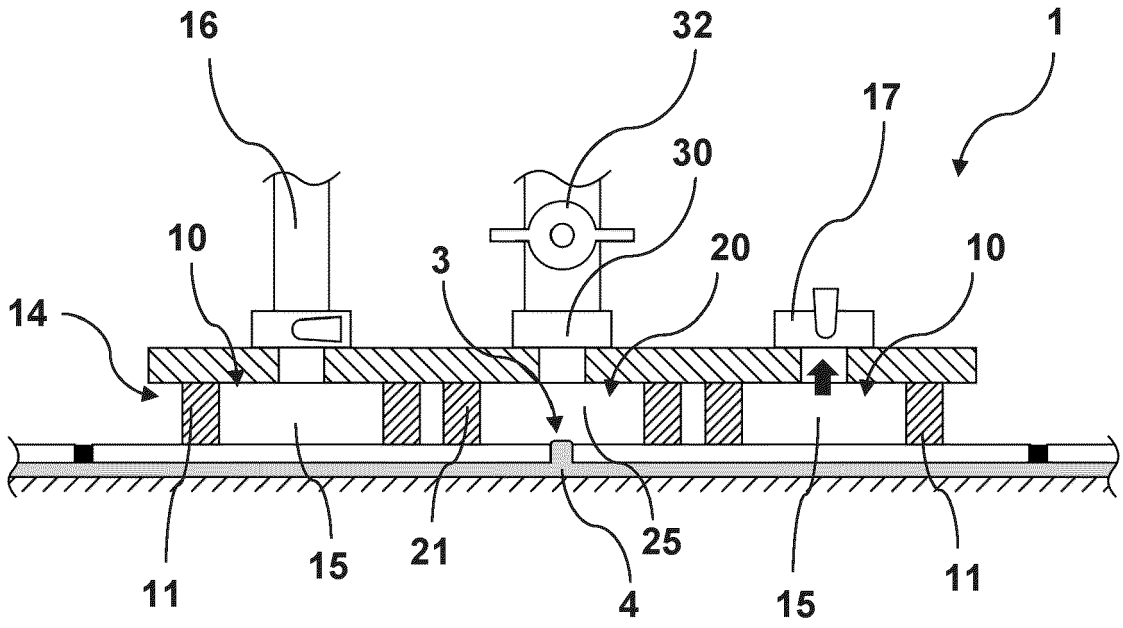
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Fig 4b

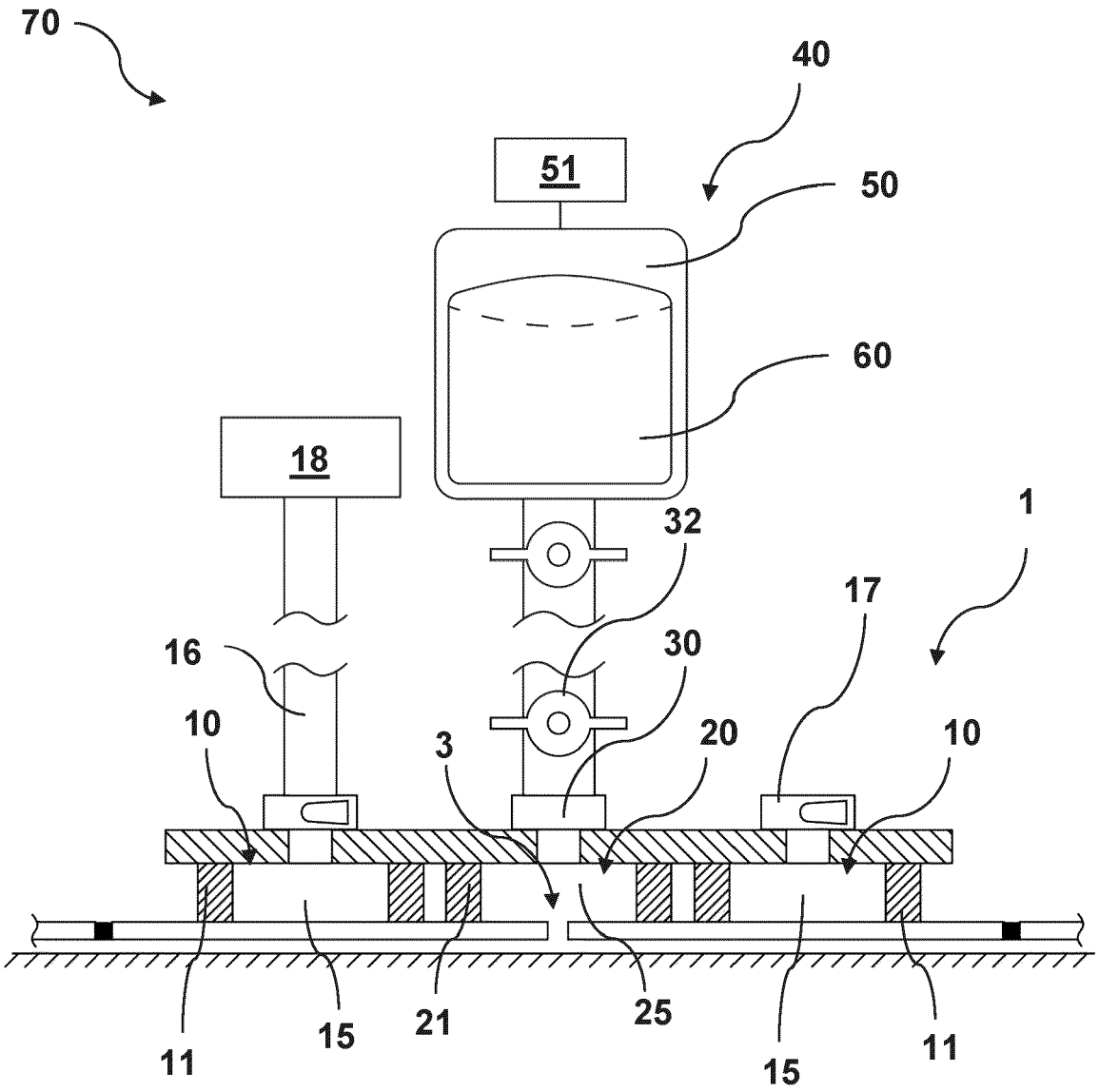

Fig 5

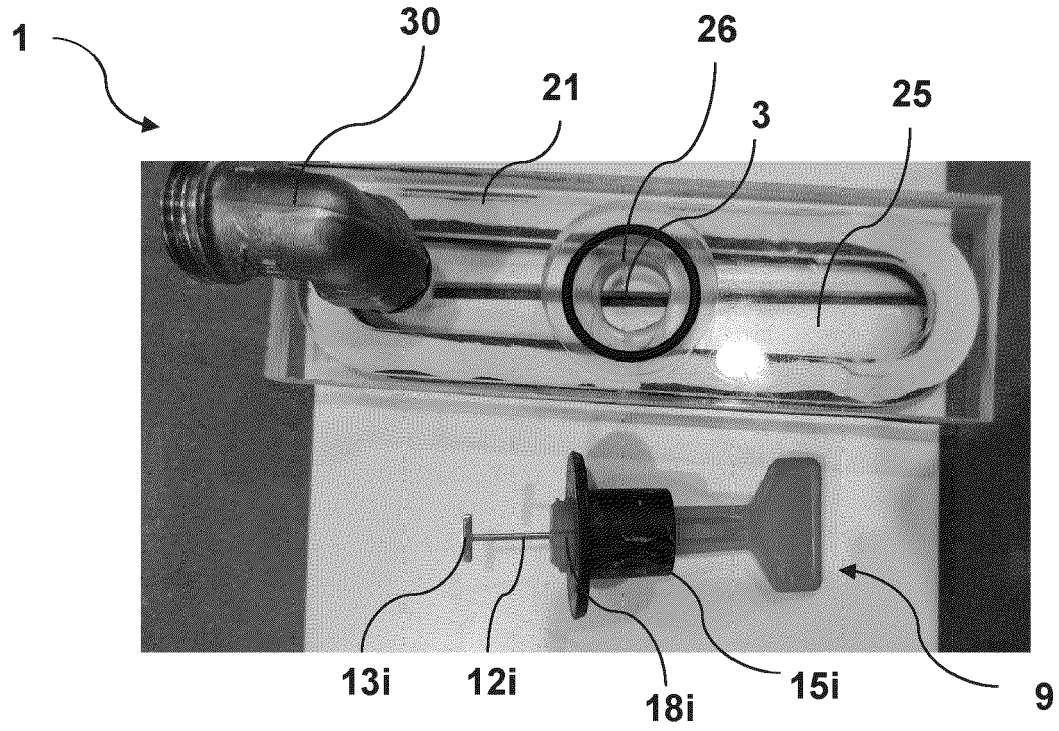

Fig 6a

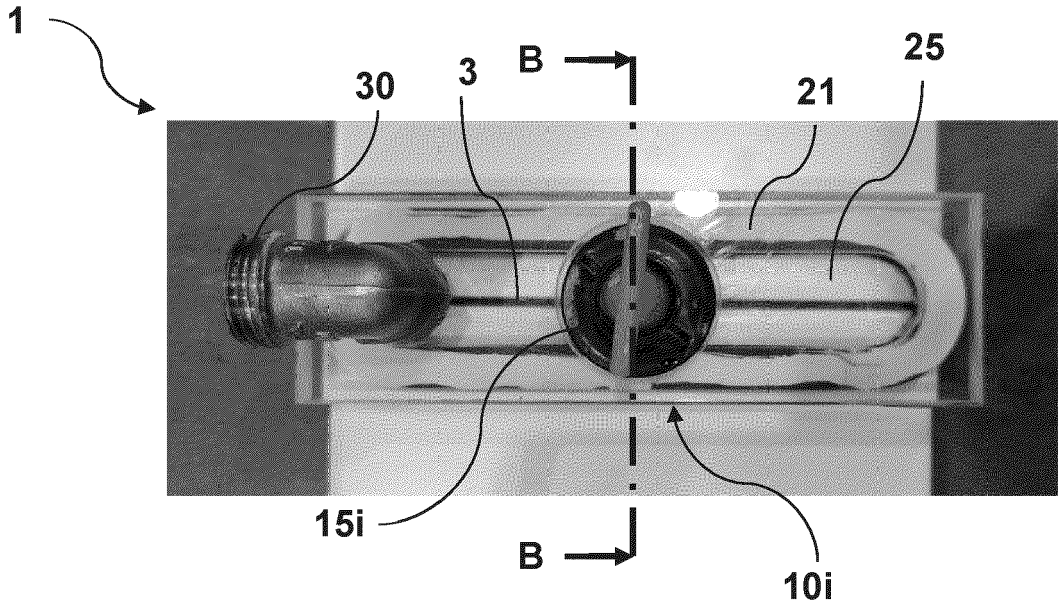

Fig 6b

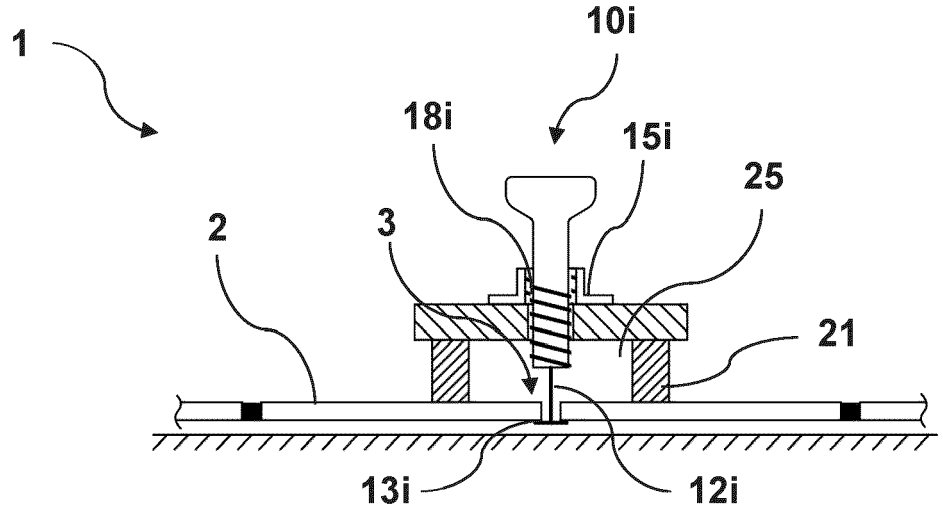

Fig 7a

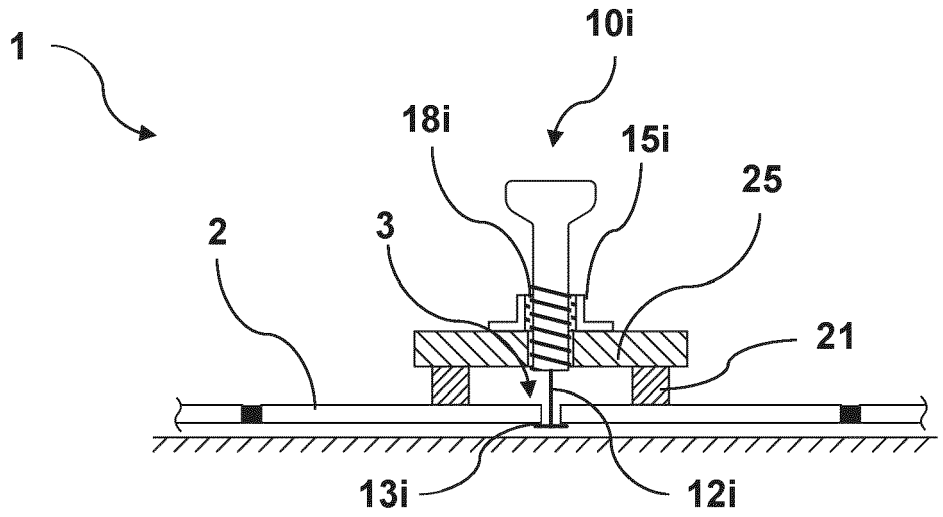

Fig 7b

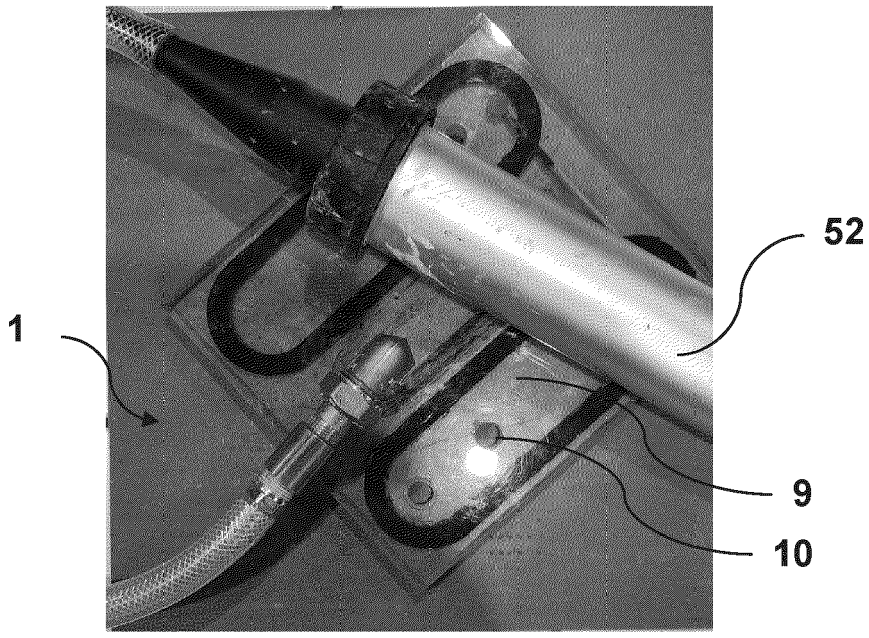

Fig 8a

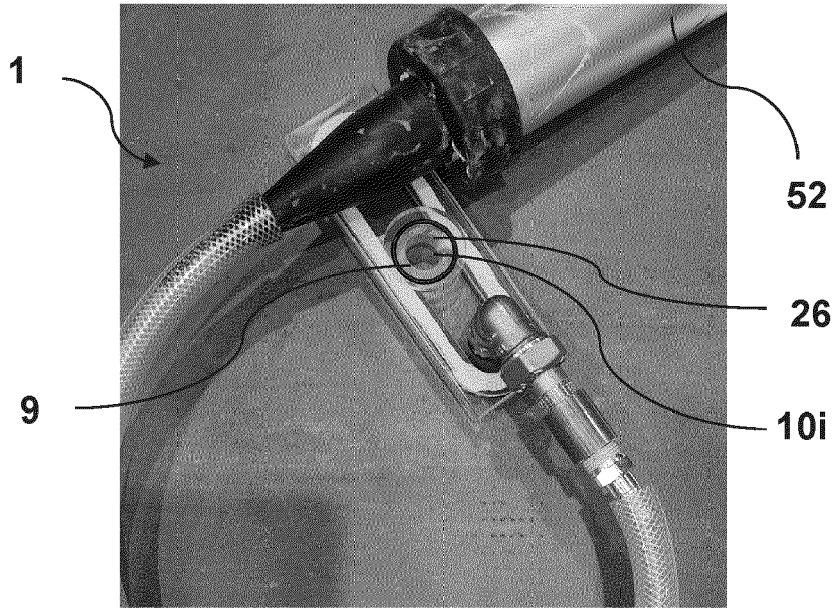

Fig 8b

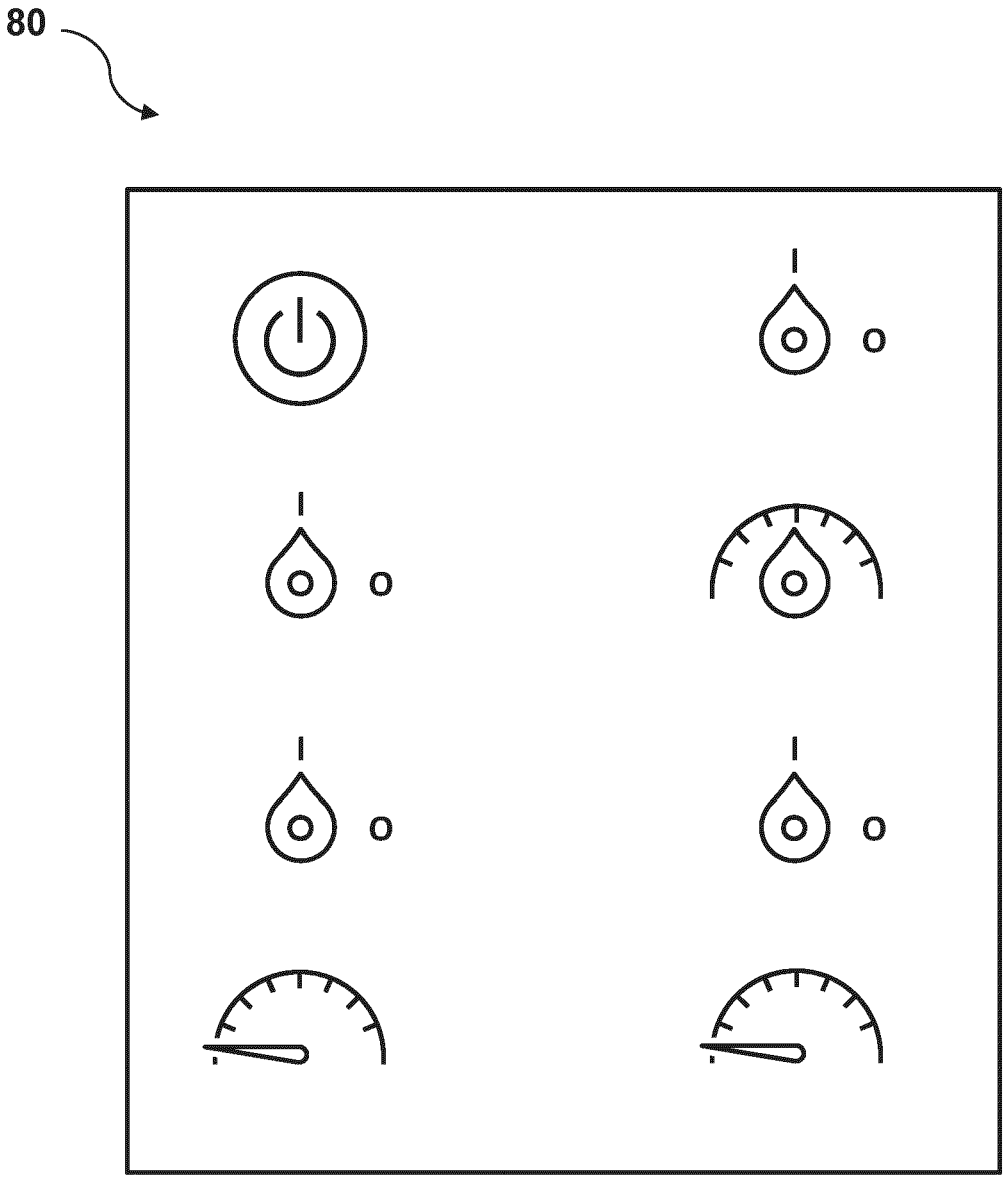

Fig 9

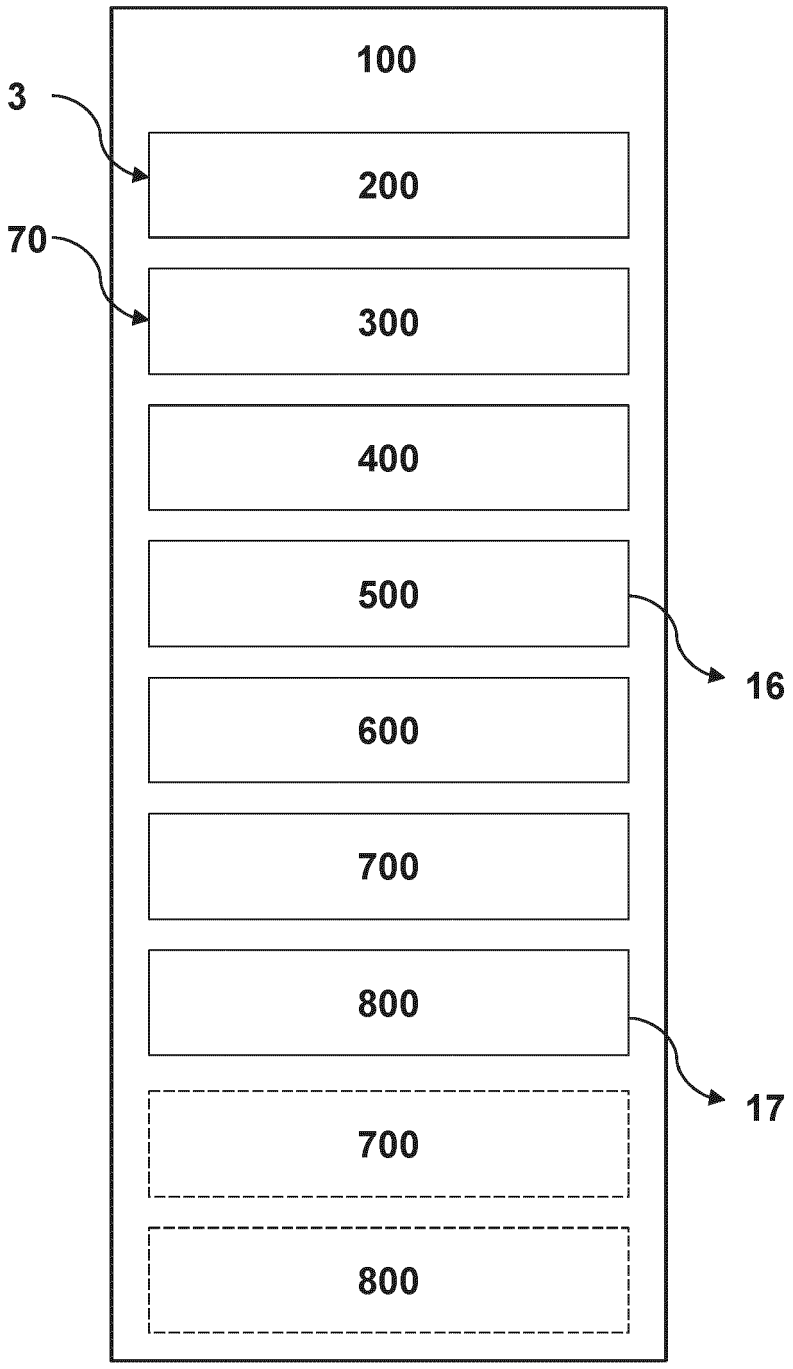

Fig 10

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EUROPEAN SEARCH REPORT

Application Number
EP 23 21 9600

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	CN 219 794 760 U (UNIV GUILIN TECHNOLOGY) 3 October 2023 (2023-10-03)	1,8-15	INV.
			E04F21/02
Y	* figures 1-3 *	2-7	E04F21/08
	* paragraph [0014] *		E04G23/02
	* paragraph [0024] *		
	* paragraph [0029] - paragraph [0033] *		
Y	CN 105 822 050 A (CHONGQING JINYOUYUAN BUILDING MAT CO LTD) 3 August 2016 (2016-08-03)	2-6	
	* figures 1-2 *		
	* paragraph [0022] *		
Y	US 2015/377280 A1 (PÖTTERS GERT [DE] ET AL) 31 December 2015 (2015-12-31)	7	
	* figures 3-4 *		
	* paragraph [0062] - paragraph [0063] *		

TECHNICAL FIELDS SEARCHED (IPC)

E04F
E04G

~~The present search report has been drawn up for all claims~~

1

Place of search	Date of completion of the search	Examiner
The Hague	29 May 2024	Estorgues, Marlène

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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Application Number
EP 23 21 9600

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

1-7(completely); 8-15(partially)

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

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LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 23 21 9600

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-7(completely); 8-15(partially)

A surface attachment device

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2. claims: 8-15(partially)

A re-bonding system comprising an adhesive supply system

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 23 21 9600

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

29-05-2024

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