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(54) METHOD FOR CLEANING DRAINAGE CHANNELS USING A DRAINAGE CHANNEL CLEANING DEVICE AND USE THEREOF

(57) There is disclosed a method for cleaning drainage channels (3) using a drainage channel cleaning device (1), as well as a use thereof. The drainage channels (3) are preferably drainage channels in floors, preferably covered by one or more grating elements (4). The lower end of channel cleaning device (1) is connected with a transverse nozzle boom (12) with nozzles (15). The nozzle boom (12) is surrounded by a screen (11) adapted for abutment against the upper edge of the channel (3) and/or the top side of the grating elements (4). The method includes moving the drainage cleaning device (1) one or more times in longitudinal direction of a drainage channel (3) and upon the channel and/or upon the grating element(s) of the channel for laying a foaming cleaning agent on the inner surfaces of the channel (3). This is succeeded by one or more flushing steps.

Efficient cleaning of the inner side of the channel (3) is achieved. In addition, the bottom side of the grating elements (4) is cleaned due to backwash of the cleaning fluids without removing the grating (4) from the channel (3).

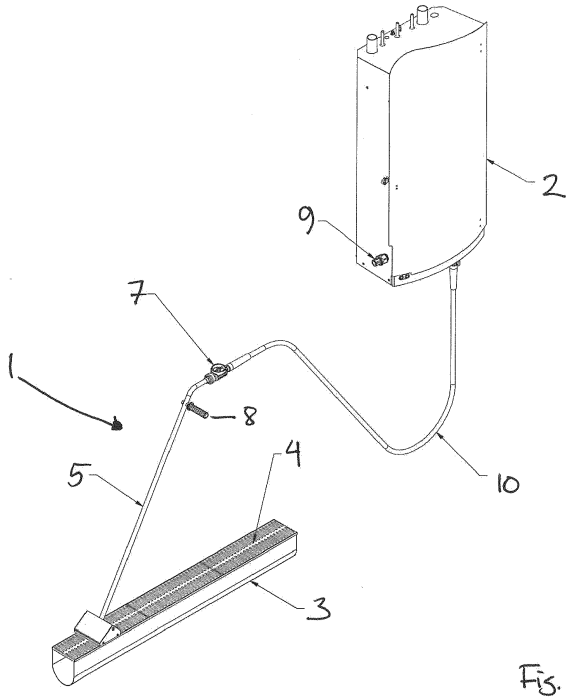

Fig. 1

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Description

Field of the Invention

[0001] The present invention concerns a method for cleaning drainage channels using a drainage channel cleaning device, such as drainage channels in floors, including in particular drainage channels covered by one or more grating elements, including particular channel-shaped floor drains.

[0002] The invention also concerns use of a drainage channel cleaning device for cleaning drainage channel, including particularly drainage channels in floors, for example drainage channels covered by one or more grating elements,

Background of the Invention

[0003] It is prior art to use machines or hand-held tools for cleaning floors, particularly in industrial cleaning.

[0004] It is not uncommon that these machines or handheld tools for industrial cleaning apply liquids and/or cleaning agents under pressure, e.g. up to 25 bar.

[0005] Such tools normally use water-based cleaning agents. The cleaning agents and/or flushing liquids, often water, are applied with machines or handheld tools using nozzle for applying the water and/or the cleaning agents on the surface to be cleaned. Depending on the design, the nozzles can apply a layer of cleaning agent on a surface and/or they can generate a concentrated jet that due to the working pressure also applies a mechanical action on the surface, contributing to increased effect of the cleaning process.

[0006] However, these machines are designed for efficient cleaning of large surfaces in a short time and are not suited for cleaning channels, including channel-shaped floor drains, and in particular drainage channels covered by one or more grating elements.

Object of the Invention

[0007] It is the object of the invention to provide a method for cleaning drainage channels using a drainage channel cleaning device and use of the drainage channel cleaning device that easily and efficiently clean channels, including in particular channel-shaped floor drains.

[0008] It is also the object of the invention to provide a method for cleaning channels using a drainage channel cleaning device and a use of the drainage channel cleaning device that enable cleaning of channels, including in particular channel-shaped floor drains covered by one or more grating elements.

[0009] It is also the object of the invention to provide a method for cleaning drainage channels using a drainage channel cleaning device and a use of the drainage channel cleaning device that enable cleaning of drainage channels covered by one or more grating elements while at the same time cleaning the bottom side of the grating elements without removing the grating elements.

Description of the Invention

[0010] These objects are achieved by a method according to the invention for cleaning channels such as drainage channels in floors, including in particular drainage channels covered by one or more grating elements, using a drainage channel cleaning device.

[0011] The method includes moving the drainage channel cleaning device one or more times in longitudinal direction of a channel and upon the channel and/or upon the grating element(s) of the channel for laying a foaming cleaning agent on the inner surfaces of the channel, followed by a one or more flushing steps in which the drainage channel cleaning device is moved one or more times in longitudinal direction of the drainage channel and upon the channel and/or upon the grating element(s) of the channel, wherein the bottom side of the grating elements of the channel are cleaned by backwash of cleaning and/or flushing fluid from the bottom and/or sides of the channel.

[0012] Common washing machines for plane surfaces are not suited for specifically cleaning floor drain channels, and in particular not the bottom side of the grating element(s) of the channel covering drain channels in floors. The method is used for efficient cleaning of drainage channels, including particularly drainage channels in floors, including in particular drainage channels covered by one or more grating elements. It is also achieved that the bottom side of the gratings covering the drainage channels are cleaned effectively simultaneously with the cleaning of the channels.

[0013] The drainage channel cleaning device includes an elongated handle in the form of a tubular element which at its upper end is equipped with connecting means for connecting a hose for conducting cleaning fluids to the drainage channel cleaning device, and which at its lower end is connected with a nozzle boom at which is mounted one, two or more nozzles, and wherein the nozzle boom is surrounded by a screen adapted for abutment against the upper edge of the channel and/or the top side of the grating elements.

[0014] Hereby is achieved that the cleaning fluid and/or the subsequent flushing liquid are/is directed down into the channel, thereby effectively cleaning the channel.

[0015] The drainage channel cleaning device is intended for coupling to a hose which is connected to a pump station. The pump station pressurises the cleaning fluids. The pump station can additionally contain an injector system that mixes water, compressed air and cleaning agent, generating a foam mixture which is laid on the inner surfaces of the channels via the nozzles. Common water or foam mixture are typically pressurised to 10-25 bar, preferably to 15-20 bar, if used for flushing in connection with flushing out the cleaning agent, e.g. the foam layer. In one variant it is possible for the pump station to dose a disinfection agent, e.g. by mixing a concentrated

disinfection agent with water before laying.

[0016] The drainage channel cleaning device is equipped at its upper end with connecting means for connection to a hose for conducting cleaning liquids to the drainage channel cleaning device.

[0017] Connection means for coupling the drainage channel cleaning device to the hose may be traditional hose couplings like hose clamps, connectors and similar if a permanent connection between the drainage channel cleaning device and the hose is desired. However, it is preferred that the drainage channel cleaning device and the hose are connected by a snap-action coupling. This entails that the drainage channel cleaning device is detachable and thereby easily replaced such that the pump station can be used for other cleaning tools.

[0018] The drainage channel cleaning device includes an elongated handle in the form of a tubular element. In the interior of the tube cleaning agents are conducted from the hose and down to the nozzle boom for performing cleaning of the drainage channels.

[0019] It is preferred that the tube is designed with a bend at a distance from the upper end. The bend is made such that an obtuse angle is formed between the upper part and lower part of the tube. This will allow the upper part of the tube or a valve element coupled to this part of the tube, e.g. on the coupling element, to serve as a handle for the person operating the drainage channel cleaning device. This will make the drainage channel cleaning device ergonomic in use. The person operating the drainage channel cleaning device can thereby use it for a long time without experiencing any discomfort.

[0020] The length of the tube is adapted so that the person operating the drainage channel cleaning device can walk upright while the screen is in contact with the grating and/or the upper edge of the channel in the floor. The length of the tubular handle is therefore preferably 900-1400 mm, in particular 1100-1300 mm, between the nozzle boom and the bend above the handle. This will further contribute to increased comfort during use for the person operating the drainage channel cleaning device.

[0021] The drainage channel cleaning device is connected to a nozzle boom at its lower end, the nozzle boom being provided with one, two, three or more nozzles. For example, there may be provided four, five, six, seven, eight or more nozzles on the nozzle boom, depending on the width of the nozzle boom. The width of the nozzle boom is adapted to the width of the drainage channels to be cleaned, and is often in the range 50-500 mm.

[0022] The nozzle boom is also tubular, and the interior of the nozzle boom communicates with the interior of the tubular handle for conducting the cleaning liquids through the interior of the drainage channel cleaning device to the nozzle mounted in the nozzle boom.

[0023] The nozzle boom is transverse in relation to the tubular handle, preferably rectangular to the tubular handle. The tubular handle is preferably mounted at the centre of the nozzle boom in a T-configuration. Alternatively, the tubular handle is mounted at one end of the nozzle boom in an L-configuration.

[0024] The nozzles are provided on the nozzle boom such that the nozzles are downwardly directed when the tubular handle is in its position of use for a person of average height, whereby the nozzles are directed down into the channel to be cleaned.

[0025] The nozzles are preferably flat-jet nozzles, as they allow effective spreading of the cleaning liquids on the inner surface of the channels. The flat-jet nozzles are preferably slightly rotated relative to the longitudinal axis of the nozzle boom, preferably at an angle of 5-15°, including 8-12°, in order to avoid that the jets are crossing each other, since it otherwise may reduce the effect and thereby the mechanical action of the impact of the jets against the inner surface of the channel.

[0026] The nozzle boom is surrounded by a screen adapted for abutment against the upper edge of the channel and/or the top side of the grating elements. The screen contributes to conducting the cleaning liquid downward into the channel to be cleaned, preventing splashes from being spread to the surroundings during the cleaning process itself, the preceding and/or subsequent flushing described in more detail below.

[0027] The screen is fastened to the nozzle boom and/or to the tubular handle. It is preferred that the screen is mounted rotatable around the nozzle boom. The handle and the nozzle boom can thereby be pivoted relative to the screen when the lower edge of the screen rests on the edge of the channel and/or the grating elements on the channel. The angle between the screen and the handle is thereby automatically adapted to the user's height as users who are not so high can have a more acute angle between the surface of the channel and the tubular handle than high users. The screen is fastened to the nozzle boom by traditional fastening means, e.g. screw connections that allow rotation of the screen relative to the nozzle boom. The screen is preferably fastened to the ends of the nozzle boom and preferably through the end faces of the screen, see below.

[0028] When the tubular handle and the nozzle boom have T-configuration or L-configuration as described above, the top side of the screen includes an aperture through which the tubular handle is passed. The aperture is preferably elongated such that the tubular handle can be pivoted in relation to the screen, allowing adaptation of the position of use to the height of the user. By T-configuration, the aperture will be provided approximately at the middle of the screen, and by L-configuration, the aperture will be provided close to one sidewall of the screen. If the tubular handle and the nozzle boom are in L-configuration as described above, the aperture can instead be disposed in one sidewall of the screen for passage of the nozzle boom through the aperture.

[0029] The screen surrounds the nozzle boom, and the lower edge is preferably lying in the same plane such that the lower edge of the screen can abut on the upper edge of the channel and/or the top side of the grating elements.

[0030] The shape of the screen is not essential if it only surrounds the nozzle boom. The screen may therefore be designed with approximately vertical or inclining front and rear walls, and with a curving surface between the latter. Alternatively, the screen has two or more inclining surfaces between front wall and rear wall, providing cover across the nozzle boom. In order to close the screen at the ends of the nozzle boom, the screen is designed with sidewalls at the ends.

[0031] It is preferred that at least a part of the lower edges of the screen is equipped with a flexible edge strip, providing ample abutment on the edges of the channel and/or the surface of the grating elements. Thereby is achieved a better contact between the lower edges of the screen and the edges of the channel and/or the surface of the grating element, and the risk of splashing of the cleaning liquid from the channel and/or spreading of the cleaning liquid from the nozzles to the surrounding is reduced. The flexible edge strip is preferably made of a suitable soft type of rubber, e.g. ABS rubber (acrylic nitrile butadiene styrene)

[0032] At the upper end of the handle there may preferably be fitted at valve. The valve serves to interrupt the inflow of cleaning liquids to the drainage channel cleaning device and may at the same time serve as handle for the user. The valve can be mounted on the drainage channel cleaning device itself. In a preferred embodiment, the valve constitutes a separate part mounted on the hose on the pump station. The drainage channel cleaning device can thereby be disconnected from the hose without the user needing to interrupt the liquid supply on the pump station.

[0033] On the upper part of the tubular handle, fastening means are fitted for mounting a handle. The handle is preferably mounted perpendicularly or about perpendicularly to the tubular handle, and preferably perpendicularly or about perpendicularly to the direction of movement. The user hereby achieves effective grip on the drainage channel cleaning device so that it is easy to manoeuvre.

[0034] The fastening means is e.g. a screw connection, a snap-action coupling, a snaplock or similar that interacts with corresponding elements on or in the handle.

[0035] The drainage channel cleaning device preferably has fastening means allowing mounting of the handle in a right as well as a left position, allowing both right-handed and left-handed users to operate the drainage channel cleaning device.

[0036] It is preferred that the screen is equipped with at least two wheels, preferably four or more wheels, at the bottom edge of the screen, ensuring that the drainage channel cleaning device can easily and unhindered be moved over the channel in longitudinal direction.

[0037] The drainage channel cleaning device is preferably made of stainless steel and thereby easy to clean. The wheels are preferably of a suitable type of plastic, preferably a hard type of plastic as e.g. polyester/PET, PE, PP or similar.

[0038] As mentioned above, the drainage channel cleaning device is intended for coupling to a hose connected to a pump station that pressurises the cleaning liquids and generates a foam mixture which is laid on the inner surfaces of the channels via the nozzles in the drainage channel cleaning device.

[0039] Preferably, conventional foaming industrial cleaning agents are used for generating the foam mixture laid out in the channel. An example of a suitable foaming cleaning agent is Foam 42 from ITW Novadan.

[0040] The foam is laid out by moving the drainage channel cleaning device one or more times along the upper edge of the channel, e.g. upon the grating elements. There is e.g. applied a foam layer with a thickness of 5-25 mm, e.g. 10-15 mm, ensuring that the foam layer does not disappear before expiry of the active period of time. The active time is variable and depends on the foam layer and the degree of contamination of the channel. The active time is typically 5-20 minutes, such as 10-15 minutes.

[0041] When the channel is covered by grating elements, these are preferably not removed during the cleaning. This implies that the bottom side of the grating elements of the channel are cleaned by backwash of cleaning, disinfection and/or flushing liquid from the bottom and/or sides of the channel.

[0042] The shape of the channel combined with the supply of pressurised cleaning liquids from the nozzles provides backwash and laying of foaming cleaning agent or disinfection agent at the bottom side of the grating elements. This efficient spreading of cleaning liquids to the bottom side of the grating elements is particularly pronounced and particularly even in channels with U-shaped cross-section where the sidewalls are approximately vertical and the bottom is round and curving upwards. This means that the cleaning agents can be supplied with lower pressure to such channels, resulting in reduced risk of inadvertent spreading of cleaning liquids to the surroundings.

[0043] There is also observed some backwash of cleaning liquids to the bottom side of the grating elements in channels with a different shape, for example rectangular cross-section or channels with V-shape, V-shaped bottom or similar, but it may be necessary to increase the pressure with which the cleaning liquids are applied in order to ensure even spreading of the cleaning agents on the bottom side of the grating elements in such channels.

[0044] It is preferred that the method includes one or more preceding flushing steps and/or preceding or subsequent disinfection steps in which the drainage channel cleaning device is moved one or more times in longitudinal direction of the drainage channel and upon the channel and/or upon the grating element(s) of the channel with flushing the channel with liquid or spreading of a disinfecting agent in the channel.

[0045] In one variant it is thus possible that the pump station can dose a disinfection agent, e.g. by mixing a

concentrated disinfection agent with water before laying in the channel with the drainage channel cleaning device. By disinfection is used conventional disinfecting agents. An example of a suitable disinfection agent is Oxivit Active Plus from ITW Novadan.

[0046] The invention also concerns use of a drainage channel cleaning device according to the invention, including an elongated handle in the form of a tubular element which at its upper end is equipped with connecting means for connecting a hose for conducting cleaning fluids, and which at its lower end is connected with a nozzle boom on which is mounted one, two or more nozzles, and wherein the nozzle boom is surrounded by a screen adapted for abutment against the upper edge of the channel and/or grating elements for cleaning channels, such as drainage channels in floors, including in particular drainage channels covered by one or more grating elements.

[0047] In this application, channels are in particular drainage channels in floors or other horizontal or approximately horizontal surfaces, including particularly floor drains with drain channels covered by one or more grating elements provided in the upper opening of the channel and in succession.

Description of the Drawing

[0048] The invention will now be explained below with reference to the drawing, where:

Fig. 1	shows a drainage channel cleaning device according to the invention coupled to a pump station;
Figs. 2a-2b	show the drainage channel cleaning device from the side and from behind, respectively;
Fig. 3	shows an exploded view of the upper and lower ends of the drainage channel cleaning device; and
Figs. 4	and 4a are views of screen and nozzle boom from below and enlarged, respectively.

Detailed Description of Embodiments of the Invention

[0049] Fig. 1 shows a drainage channel cleaning device 1 according to the invention. The drainage channel cleaning device is used for cleaning channels 3, such as drainage channels in floors, including in particular drainage channels covered by one or more grating elements 4. The drainage channel cleaning device is intended for being coupled to a hose which is connected to a cleaning or pumping station 2 via a hose 10. The pump station 2 pressurises the cleaning fluids.

[0050] The drainage channel cleaning device 1 comprises an elongated handle 5 in the form of tubular element and equipped at its upper end with connecting means 6, in the shown example a snap-action coupling for connecting the hose 10, for conducting cleaning liquids from the cleaning station 2 to the drainage channel cleaning device 1.

[0051] It is preferred that the tubular handle is designed with a bend 5' at a distance from the upper end. The bend 5' is made such that an obtuse angle is formed between the upper part and lower part of the tube 5.

[0052] The elongated tubular handle 5 is connected to a transverse nozzle boom 12 at its lower end, the nozzle boom 12 being provided with one, two, three or more downwardly directed nozzles 15. The nozzle boom 12 is surrounded by a screen 11 adapted for abutment against the upper edge of the channel 3 and/or the top side of the grating elements 4. For example, there may be provided four, five, six, seven, eight or more nozzles 15 on the nozzle boom 12, depending on the width of the nozzle boom 12, most often within the range 50-500 mm. The nozzles 15 are preferably flat-jet nozzles, as they allow effective spreading of the cleaning liquids on the inner surface of the channels. The flat-jet nozzles are preferably slightly rotated at an angle a (Fig. 4a) relative to the longitudinal axis 14 of the nozzle boom, preferably at an angle of 5-15°, including 8-12°, in order to prevent the jets from crossing each other

[0053] The nozzle boom 12 is also made of tubes, and the interior of the nozzle boom communicates with the interior of the tubular handle 5 for conducting the cleaning liquids through the interior of the drainage channel cleaning device to the nozzles 15 mounted in the nozzle boom.

[0054] The tubular handle 5 is preferably mounted at the centre of the nozzle boom in a T-configuration (Fig. 3). Alternatively, the tubular handle is mounted at one end of the nozzle boom in an L-configuration (not shown).

[0055] The nozzle boom 15 is surrounded by a screen 11 adapted for abutment against the upper edge of the channel 3 and/or the top side of the grating elements 4. The screen 11 contributes to conducting the cleaning liquid downwards into the channel 3.

[0056] The screen is fastened to the nozzle boom 15 and/or the tubular handle 5, preferably such that the screen 11 is rotatably mounted around the nozzle boom 15 so that the handle 5 and the nozzle boom 15 can be pivoted in relation to the screen 11. The screen is fastened to the nozzle boom 15, preferably at its ends and through the end faces of the screen 11, by traditional fastening means, e.g. screw connections that allow rotation of the nozzle boom 15 in relation to the screen 11.

[0057] The top side of the screen includes an aperture 19 through which the tubular handle 5 is passed through the screen. The aperture 19 is preferably elongated such that the tubular handle can be pivoted in relation to the screen 11.

[0058] At least a part of the lower edges of the screen is equipped with a flexible edge strip 16, increasing abutment against the edges of the channel 3 and/or the surface of a grating element 4.

[0059] At the upper end of the handle 5 there may pref-

erably be fitted at valve 7. The valve serves to interrupt the flow of cleaning liquids to the drainage channel cleaning device and may at the same time serve as handle for one hand of the user. The valve 7 can be mounted on the drainage channel cleaning device 1 itself or on the hose 10.

[0060] At the upper end of the tubular handle 5 there is fitted at least one handle 8, preferably perpendicularly or approximately perpendicularly to the tubular handle 5 and to the direction of movement.

[0061] The handle 8 can be mounted in a right as well as a left position.

[0062] The screen 11 is equipped with at least two wheels 17, preferably four or more wheels, at the bottom edge of the screen, ensuring that the drainage channel cleaning device 1 can easily and unhindered be moved over the channel 3 in longitudinal direction.

[0063] The method also includes a method for cleaning channels while using a drainage channel cleaning device as described above, including moving the drainage cleaning device 1 one or more times in longitudinal direction of a drainage channel 3 and upon the channel 3 and/or upon the grating element(s) 4 of the channel for laying a foaming cleaning agent on the inner surfaces of the channel 3. This is followed by one or more flushing steps where the drainage channel cleaning device 1 is moved one or more times in longitudinal direction of the channel and upon the channel and/or upon the grating element(s) of the channel while supplying flushing liquid, which normally is water, whereby the channel is subsequently flushed clean.

[0064] The pump station 2 pressurises the cleaning liquids, generating a foam mixture which is laid upon the inner surface of the channels 3 via the nozzles 15 in the drainage channel cleaning device 1. The foam is laid by moving the drainage channel cleaning device 1 once or more along the upper edge of the channel 3, preferably upon the grating elements 4, typically in the form of a foam layer with at thickness of 5-25 mm, e.g. 10-15 mm. As mentioned above, the active period of time of the foam is typically 5-20 minutes, such as 10-15 minutes.

[0065] When the channel 3 is covered by grating elements, these are not removed during the cleaning as the bottom side of the grating elements of the channel are cleaned by backwash of cleaning, disinfecting and/or flushing liquid from the bottom and/or sides of the channel, as described above.

[0066] It is preferred that the method includes one or more preceding flushing steps and/or preceding or subsequent disinfection steps in which the drainage channel cleaning device 1 is moved one or more times in longitudinal direction of the channel 3 and upon the channel 3 and/or upon the grating element(s) 4 of the channel during an initial flushing of the channel 3 with water or spreading of a disinfecting agent in the channel conducted from the pump station 2 to the drainage channel cleaning device 1.

[0067] The cleaning steps, i.e. flushing, laying of foam or disinfection agent, are selected by a function selector 9 on the cleaning station, or alternatively by a remote control, which is a separate unit or possibly incorporated in the drainage channel cleaning device 1 or the valve 7.

List of reference numbers:

[0068]

1. drainage channel cleaning device
2. cleaning station
3. drainage channel
4. grating element(s)
5. tube piece, tubular handle
6. snap-action coupling
7. valve
8. handle;
8a. fastening means for handle
9. function selector on cleaning station
10. hose
11. screen
12. nozzle boom
13. fastening elements for fastening screen to nozzle boom
14. longitudinal axis of nozzle boom
15. nozzles
16. edge strip
17. wheels
18. fastening elements for wheels
19. aperture in screen

Claims

1. A method for cleaning drainage channels using a drainage channel cleaning device, including particularly cleaning drainage channels in floors, including in particular drainage channels covered by one or more grating elements, the drainage channel cleaning device including an elongated handle in the form of a tubular element which at its upper end is equipped with connecting means for connecting a hose for conducting cleaning fluids, and which at its lower end is connected with a transverse nozzle boom at which is mounted one, two or more nozzles, and wherein the nozzle boom is surrounded by a screen adapted for abutment against the upper edge of the channel and/or the top side of the grating elements, the method including moving the drainage channel cleaning device one or more times in longitudinal direction of a drainage channel and upon the channel and/or upon the grating element(s) of the channel for laying a foaming cleaning agent on the inner surfaces of the channel, followed by a one or more flushing steps in which the drainage channel cleaning device is moved one or more times in longitudinal direction of the drainage channel and upon the channel and/or upon the grating element(s) of

the channel, and wherein the bottom side of the grating elements of the channel are cleaned by backwash of cleaning and/or flushing fluid from the bottom and/or sides of the channel.

2. A method for cleaning drainage channels according to claim 1, **characterised by** including one or more preceding flushing steps and/or preceding or subsequent disinfection steps in which the drainage channel cleaning device is moved one or more times in longitudinal direction of the drainage channel and upon the channel and/or upon the grating element(s) of the channel.

3. Use of a drainage channel cleaning device including an elongated handle in the form of a tubular element which at its upper end is equipped with connecting means for connecting a hose for conducting cleaning fluids, and which at its lower end is connected with a transverse nozzle boom at which is mounted one, two or more nozzles, and wherein the nozzle boom is surrounded by a screen adapted for abutment against the upper edge of the channel and/or the top side of the grating elements, for cleaning drainage channels, such as drainage channels in floors, including in particular drainage channels covered by one or more grating elements.

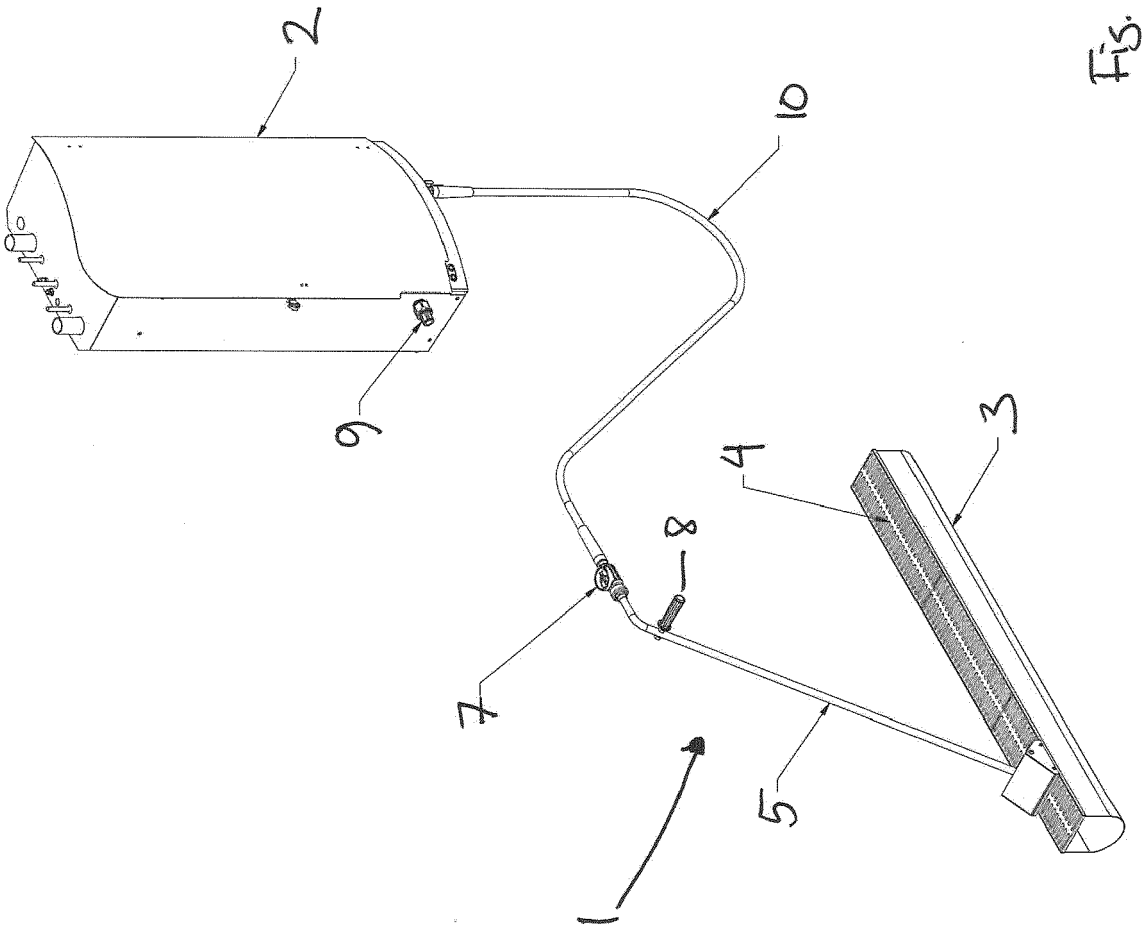

Fig. 1

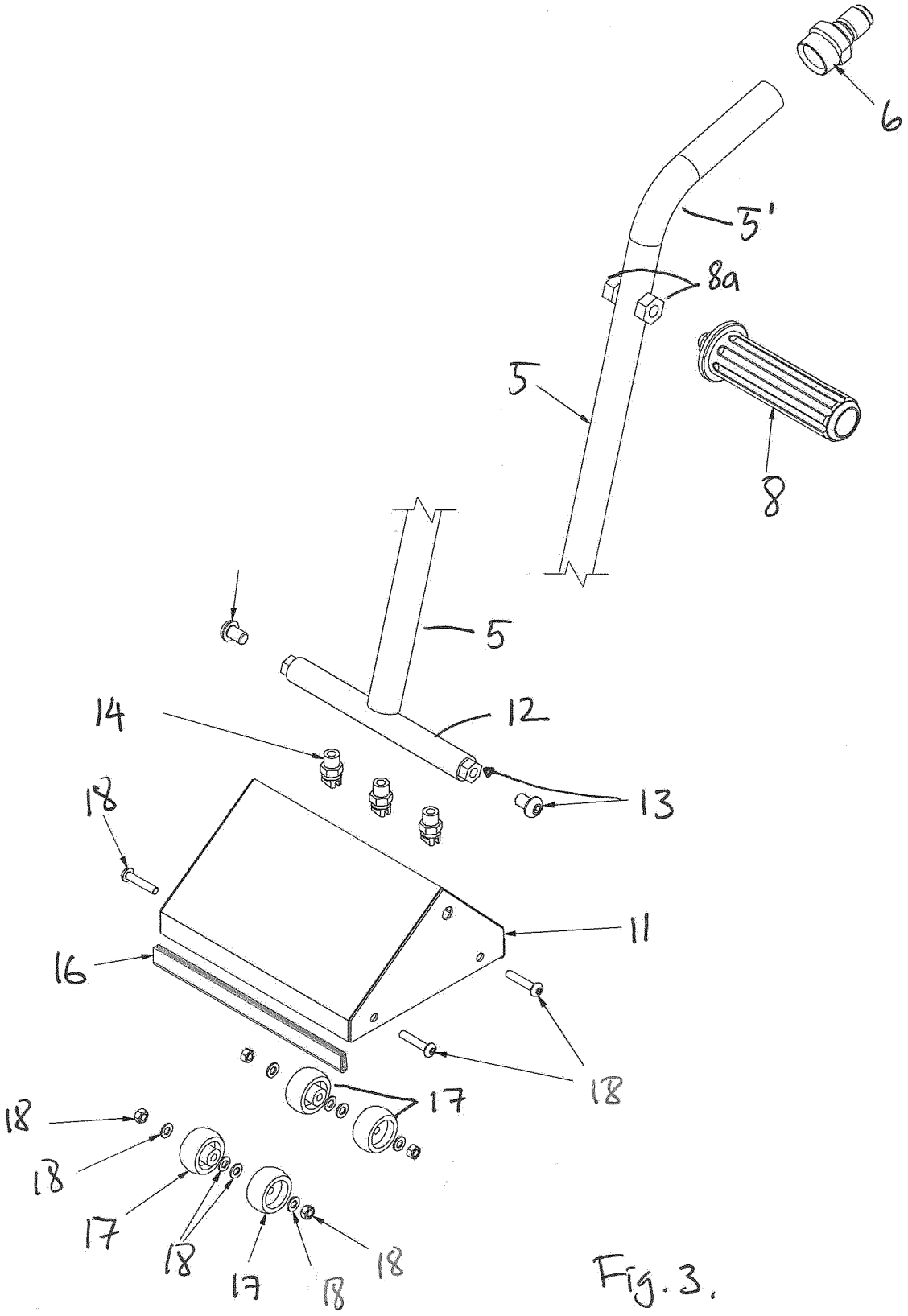

Fig. 3.

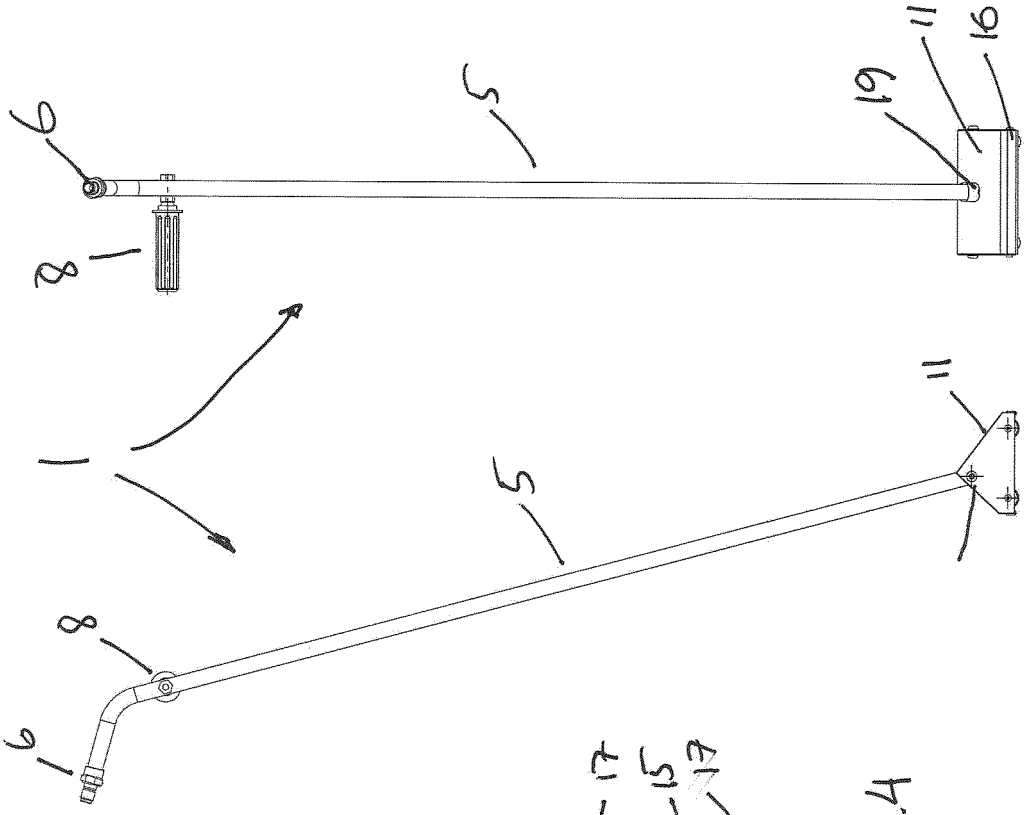

Fig. 2b.

Fig. 2a

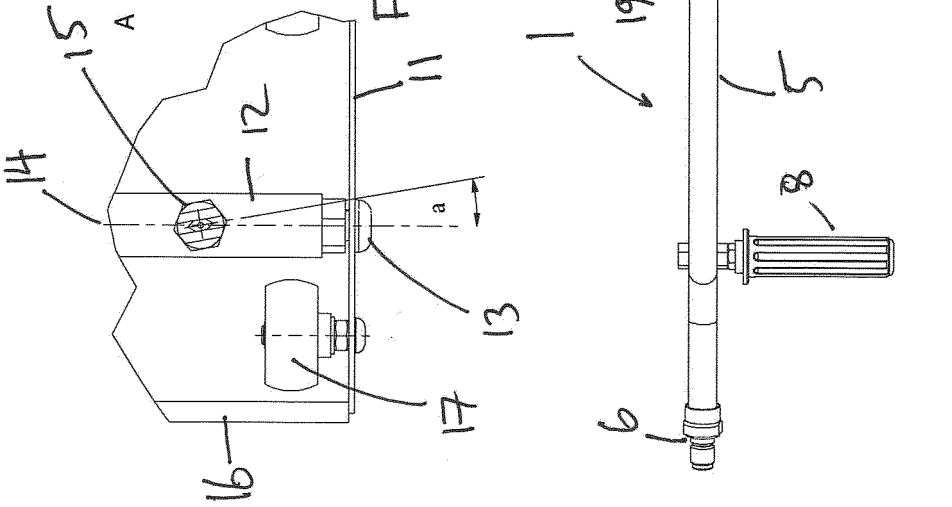

Fig. 4a

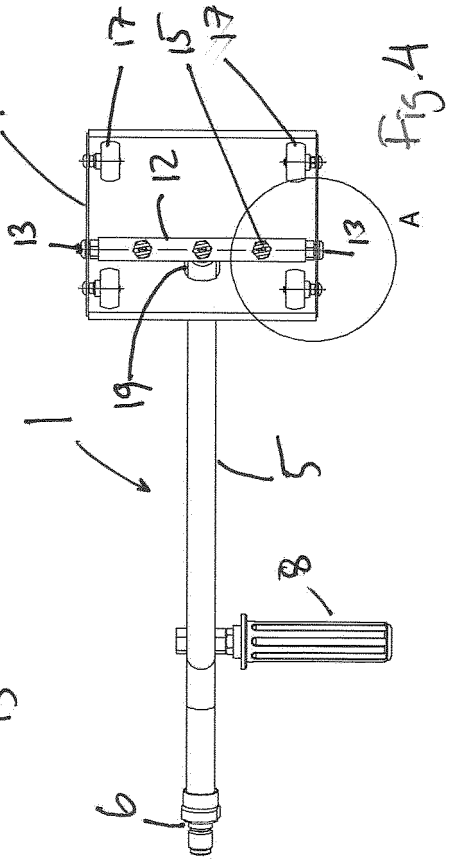

Fig. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 17 18 7902

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	EP 1 143 080 A1 (ADVANCED TECHNICS COMPANY S A [BE]) 10 October 2001 (2001-10-10)	3	INV. E03F3/04 E04H4/16
A	* figures 1,3 * * paragraphs [0010], [0018] - [0020], [0030], [0032], [0034], [0044] *	1,2	
Y	US 4 521 935 A (JOHNSTON CHARLES R [US] ET AL) 11 June 1985 (1985-06-11)	3	
A	* the whole document *	1,2	

TECHNICAL FIELDS SEARCHED (IPC)

E03F
A47L
E04H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	9 January 2018	Schnedler, Marlon

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 17 18 7902

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
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