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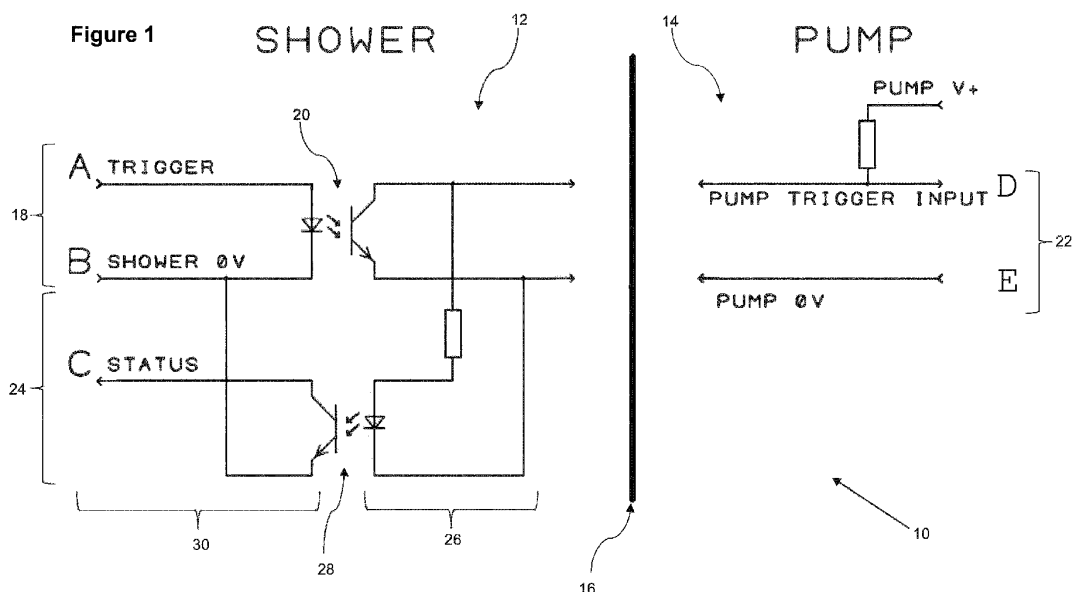
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ELECTRONICALLY-CONTROLLED SHOWER SYSTEM HAVING FAILSAFE FEEDBACK CONNECTION

- (57) An electronically-controlled shower system 10 is provided comprising an electronically-controlled shower 12 having a shower controller, an electric waste pump 14 having a pump controller, and a wired connector 16 between the electronically-controlled shower 12 and the electric waste pump 14. A triggerable pump-control switch is arranged to complete a pump control circuit 22 to activate the electric waste pump 14 on triggering by the shower controller. There is also a feedback connection 24 comprising a pump-side feedback circuit 26 having a triggerable feedback switch and being connected to the wired connector 16, and a shower-side feedback circuit 30 being connected to a pump trigger circuit 18 and a controller override connection C associated with the shower controller, the triggerable feedback switch being arranged to complete the shower-side feedback circuit 30 during a detected active state of the electric waste pump 14.



Description

[0001] The present invention relates to an electronically-controlled shower system having a failsafe feedback connection. The invention further relates to an electronically-controlled shower suitable for use with such a system, as well as to a method of deactivating an electronically-controlled shower in the event of failure of a wired electric waste pump associated therewith.

[0002] Where an electric shower or digital mixer shower is provided where gravity alone will not cause adequate drainage through the waste outlet, a dedicated electric waste pump is provided, which is triggered electrically via the starting or stopping of the shower. There are two types of electric waste pump: wired pumps, which have a physical electrical connection to the shower unit; and wireless pumps, which communicate via wireless means with the shower unit. Wireless pumps are prone to radio-frequency interference, and can therefore often operate poorly or non-synchronously with the shower. For instance, a shower may automatically shut-down in the event of a lost communications signal, even where the pump is correctly operating.

[0003] For wired electric waste pumps, failure can occur when there is a fault in the wire connection, in which case the pump will stop, but the shower will continue to flow. This can cause serious water damage if the shower tray or floor becomes overfull.

[0004] The present invention seeks to provide a solution to the above-mentioned problems by providing a failsafe mechanism for this scenario.

[0005] According to a first aspect of the invention, there is provided an electronically-controlled shower system having a failsafe feedback connection, the system comprising: an electronically-controlled shower having a shower controller, a pump trigger circuit including a trigger input connection in communication with the shower controller, a shower ground connection, and a triggerable pump-control switch, and a controller override connection in communication with the shower controller; an electric waste pump having a pump controller; a wired connector between the electronically-controlled shower and the electric waste pump, the wired connector forming a pump control circuit having a pump input connection in communication with the pump controller, and a pump ground connection, the triggerable pump-control switch being arranged to complete the pump control circuit to activate the electric waste pump; and a feedback connection comprising a pump-side feedback circuit having a triggerable feedback switch and being connected to the wired connector, and a shower-side feedback circuit being connected to the pump trigger circuit and the controller override connection, the triggerable feedback switch being arranged to complete the shower-side feedback circuit during a detected active state of the electric waste pump.

[0006] The present invention provides a feedback connection which provides an input directly to the shower

controller in the form of a status signal. This is achieved by monitoring on the wired connector for any disruption of the connection which might otherwise be indicative of pump failure. Doing so ensures that shutdown of the shower also occurs where the pump is not operational, reducing the risk of flooding.

[0007] Preferably, the triggerable pump-control switch may be an opto-isolator or a relay. Additionally, or alternatively, the triggerable feedback switch may be an opto-isolator or a relay.

[0008] Optionally, the shower-side feedback circuit may be connected to the shower ground connection of the pump trigger circuit.

[0009] The pump-side feedback circuit may be connected to the pump input connection and the pump ground connection.

[0010] Spanning the circuit on the wired connector side is one mechanism to determine the status of the connection between the electronically-controlled shower and electric waste pump simply.

[0011] In one preferable embodiment, the electric waste pump may comprise a status output from the pump controller, and the wired connector includes a pump status connection in communication with the status output, and wherein the pump-side feedback circuit is connected to the pump ground connection and the pump-status connection.

[0012] Electric waste pumps may advantageously have a status output which indicates a fault status of the pump. By connecting the feedback connection to both the wired connector and the pump status output not only indicates whether there is damage or disruption to the wired connector, but also whether there is a specific operational fault with the pump that may also lead to a flooding scenario.

[0013] Optionally, the shower controller may be configured to deactivate the electronically-controlled shower in the event that an output of the controller override connection does not match an expected output thereof.

[0014] The purpose of the invention is to ensure that a flooding condition does not occur, and therefore providing a means for the feedback connection to override the shower controller is a desirable objective.

[0015] According to a second aspect of the invention, there is provided an electronically-controlled shower for use with a wired electric waste pump, the electronically-controlled shower comprising: a shower controller; a pump trigger circuit including a trigger input connection in communication with the shower controller, a shower ground connection, and a triggerable pump-control switch; and a controller override connection in communication with the shower controller for deactivating the electronically-controlled shower in the event that an output of the controller override connection does not match an expected output thereof.

[0016] The electronically-controlled shower may further comprise a wired connector for connecting to an electric waste pump, the wired connector forming a pump

control circuit having a pump input connection in communication with the pump controller, and a pump ground connection, the triggerable pump-control switch being arranged to complete the pump control circuit to activate the electric waste pump, and further comprising a feedback connection comprising a pump-side feedback circuit having a triggerable feedback switch and being connected to the wired connector, and a shower-side feedback circuit being connected to the pump trigger circuit and the controller override connection, the triggerable feedback switch being arranged to complete the shower-side feedback circuit during a detected active state of the electric waste pump.

[0017] According to a third aspect of the invention, there is provided a method of deactivating an electronically-controlled shower in the event of failure of a wired electric waste pump associated therewith, the method comprising the steps of: a) activating the electronically-controlled shower via a shower controller, the shower controller sending a pump activation signal to the electric waste pump via a pump trigger circuit, a triggerable pump-control switch of the pump trigger circuit completing a pump control circuit of a wired connector between the electronically-controlled shower and the electric waste pump; and b) deactivating the electronically-controlled shower in the event that an output of a controller override connection of the electronically-controlled shower does not match an expected output, the output of the controller override connection being generated by a feedback connection comprising a pump-side feedback circuit having a triggerable feedback switch and being connected to the wired connector, and a shower-side feedback circuit being connected to the pump trigger circuit and the controller override connection, the triggerable feedback switch being arranged to complete the shower-side feedback circuit during a detected active state of the electric waste pump.

[0018] The invention will now be more particularly described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 shows a schematic drawing of a first embodiment of an electronically-controlled shower system in accordance with the first aspect of the invention;

Figure 2 shows a schematic drawing of a first embodiment of an electronically-controlled shower system in accordance with the second aspect of the invention;

Figure 3 shows a schematic drawing of a first embodiment of an electronically-controlled shower system in accordance with the third aspect of the invention; and

Figure 4 shows a schematic drawing of a first embodiment of an electronically-controlled shower sys-

tem in accordance with the fourth aspect of the invention.

[0019] Referring to Figure 1 there is shown a representation of an electronically-controlled shower system 10, and in particular, the electronic interfacing components of an electric shower 12 and an electric waste pump 14 as part of the system. The electric shower 12 and electric waste pump 14 are physically spaced apart from one another, and are connected by a wired connector, represented by the thick black line at 16. Whilst an electric shower 12 is shown, it will be appreciated that this is equally applicable to digital mixer showers or other electronically-controlled showers, and these terms will be used interchangeably throughout. Furthermore, the term electronically-controlled showers refers to any shower capable of being controlled electronically, rather than by mechanical triggers. This includes arrangements where microprocessor functionality is integral to the electric shower 12, but also to remote electronic control systems, where processing functionality remotely communicates with more limited onboard electronics of the electric shower 12.

[0020] The electric shower 12 has a shower controller which controls the functionality of the electric shower 12, and connected with this shower controller is a pump trigger circuit 18, which includes a trigger input connection A, labelled as the TRIGGER connection, in communication with the shower controller and a shower ground connection B, labelled as the SHOWER 0V connection. On the pump trigger circuit 18 is a triggerable pump-control switch, which is here illustrated as a pump-control opto-isolator 20. There is also a controller override connection C, labelled as the STATUS connection, in communication with the shower controller.

[0021] The electric waste pump 14 has a pump controller, which drives a motor of the electric waste pump 14, connected via the control connection, labelled at PUMP V+.

[0022] The wired connector 16 interconnects the electric shower 12 and the electric waste pump 14 electrically. The wired connector 16 forms a pump control circuit 22 having a pump input connection D, labelled at PUMP TRIGGER INPUT, in communication with the pump controller, and a pump ground connection E, labelled at PUMP 0V. The pump-control opto-isolator 20 is arranged to complete the pump control circuit 22 to activate the electric waste pump 14 upon triggering by the electric shower 12.

[0023] In practice, the electric shower 12 pulses on the pump trigger circuit 18, with the pump-control opto-isolator 20 providing an output to complete the pump control circuit 22. This pulses the pump input connection D to the pump ground connection E. The pump controller detects the presence of the pulsing in the pump control circuit 22, and initiates the pump motor. This is the behaviour when the wired connector 16 is operational.

[0024] Were the wired connector 16 to become dam-

aged or otherwise defective, then the pump control circuit 22 would be broken, and the pump motor would not activate. Flooding of the shower could occur in this scenario, where the pump is not active.

[0025] To overcome this issue, there is a feedback connection 24 provided comprising a pump-side feedback circuit 26 having a triggerable feedback switch, here illustrated as a feedback opto-isolator 28. The pump-side feedback circuit 26 is connected to the wired connector 16 in some form. In the depicted embodiment, there is one connection to the pump input connection D and one connection to the pump ground connection E. Current will only flow through the pump-side feedback circuit 26 where the wired connector 16 is undamaged to complete the pump control circuit 16.

[0026] The feedback connection 24 further comprises a shower-side feedback circuit 30 being connected to the pump trigger circuit 18, at the shower ground connection B, and to the controller override connection C. The feedback opto-isolator 28 is arranged to complete the shower-side feedback circuit 30 during a detected active state of the electric waste pump 14.

[0027] When the wired connector 16 is undamaged, the pump-control opto-isolator 20 completes the pump control circuit 22. This triggers the active state of the motor, and a current in the pump-side feedback circuit 26. This causes the feedback opto-isolator 28 to close the shower-side feedback circuit 30, and a signal is returned to the controller override connection C, indicating to the shower controller that the electric waste pump 14 is operating correctly. No interruption of water flow occurs in this scenario.

[0028] Where the wired connector 16 is damaged, or otherwise disconnected from the electric waste pump 14, when the pump-control opto-isolator 20 triggers, the pump control circuit 22 is not completed. The feedback opto-isolator 28 does not activate to close the shower-side feedback circuit 30, and no signal is returned to controller override connection C, indicating to the shower controller that the electric waste pump 14 is not operating correctly. Water flow is thus interrupted in this scenario, as the shower controller is configured or programmed to shut down in this circumstance.

[0029] An alternative electronically-controlled shower system 110 is shown in Figure 2. Identical or similar components of the invention are referenced using identical or similar reference numerals, and further detailed description is omitted for brevity.

[0030] The electric waste pump 114 is provided with a status output F, referred to as PUMP STATUS OUTPUT, from the pump controller, which provides an indication as to whether the electric waste pump 114 has a fault which might prevent its operation; for example, a voltage may be present but there may be a jam at the motor, which might otherwise deceive the feedback connection 124, since the wired connection 116 is unbroken, but would still result in flooding. This may be achieved by the pump controller applying a DC voltage to the status out-

put F when the motor is running correctly.

[0031] The pump-side feedback circuit 126 has a connection to the pump ground connection E, and to the status output F here, and therefore for the feedback opto-isolator 128 to be triggered, not only must there be a current flow in the pump control circuit 122, but the status output F must also register an absence of faults of the electric waste pump 114. In this scenario, the feedback opto-isolator 128 can trigger as normal, to complete the shower-side feedback circuit 130 in the electric shower 112, and water flow can occur.

[0032] On the other hand, if either there is a fault in the electric waste pump 114, or in the wired connector 116, then the feedback opto-isolator 128 will not trigger, and an override command will be returned to the shower controller.

[0033] Figures 3 and 4 show alternative counterpart electronically-controlled shower systems 210; 310 to those in Figures 1 and 2 respectively. The electric waste pumps 214; 314 are identical to those in Figures 1 and 2. The difference here is that, in the pump trigger circuits 218; 318, the triggerable pump-control switch is not provided as an opto-isolator, but instead as a relay switch 220; 320.

[0034] It may be feasible to provide the triggerable pump-control switch be provided as any appropriate sort of conditional switching arrangement which allows for one circuit to be triggered based on a signal provided from another at the shower side.

[0035] Indeed, it may be possible to provide the triggerable feedback switch as a relay switch, or any other kind of conditional switching arrangement, much in the way that Figures 3 and 4 demonstrate the change for the triggerable pump-control switch.

[0036] Whilst the whole electronically-controlled shower system has thus far been described, it will be apparent that the electric shower and electric waste pump may be provided as separate components and distributed separately. In this scenario, the wired connection will be applied after installation. As such, the feedback connection may be provided on one or other of the components, most likely onboard the electric shower, for ease of installation.

[0037] It is therefore possible to provide an electronically-controlled shower system in which a determination can be made as to the operational status of an electric waste pump which is in wired connection with the electric shower. This allows for flood prevention by ensuring that the water flow is not present when the pump is not capable of operation. The invention also relates to an electric shower provided having the controller override connection which makes it suitable for engagement with the feedback connection, as well as to the method of overriding the shower controller.

[0038] The words 'comprises/comprising' and the words 'having/including' when used herein with reference to the present invention are used to specify the presence of stated features, integers, steps, or components,

but do not preclude the presence or addition of one or more other features, integers, steps, components, or groups thereof.

[0039] It is appreciated that certain features of the invention, which are, for clarity, described in the context of separate embodiments, may also be provided in combination in a single embodiment. Conversely, various features of the invention which are, for brevity, described in the context of a single embodiment, may also be provided separately or in any suitable sub-combination.

[0040] The embodiments described above are provided by way of examples only, and various other modifications will be apparent to persons skilled in the field without departing from the scope of the invention as defined herein.

Claims

1. An electronically-controlled shower system (10) having a failsafe feedback connection, the system (10) comprising:

an electronically-controlled shower (12) having a shower controller, a pump trigger circuit (18) including a trigger input connection in communication with the shower controller, a shower ground connection, and a triggerable pump-control switch, and a controller override connection © in communication with the shower controller; an electric waste pump (14) having a pump controller; a wired connector (16) between the electronically-controlled shower (12) and the electric waste pump (14), the wired connector (16) forming a pump control circuit having a pump input connection in communication with the pump controller, and a pump ground connection, the triggerable pump-control switch being arranged to complete the pump control circuit (22) to activate the electric waste pump (14); and a feedback connection (24) comprising a pump-side feedback circuit (26) having a triggerable feedback switch and being connected to the wired connector, and a shower-side feedback circuit (30) being connected to the pump trigger circuit (18) and the controller override connection (C), the triggerable feedback switch being arranged to complete the shower-side feedback circuit (30) during a detected active state of the electric waste pump (14).

2. An electronically-controlled shower system (10) as claimed in claim 1, wherein the triggerable pump-control switch is an opto-isolator or a relay.
3. An electronically-controlled shower system (10) as claimed in claim 1 or claim 2, wherein the triggerable

feedback switch is an opto-isolator or a relay.

4. An electronically-controlled shower system (10) as claimed in any one of the preceding claims, wherein the shower-side feedback circuit (30) is connected to the shower ground connection of the pump trigger circuit (18).
5. An electronically-controlled shower system as claimed in any one of the preceding claims, wherein the pump-side feedback circuit (26) is connected to the pump input connection and the pump ground connection.
6. An electronically-controlled shower system (10) as claimed in any one of claims 1 to 4, wherein the electric waste pump (14) comprises a status output from the pump controller, and the wired connector includes a pump status connection in communication with the status output, and wherein the pump-side feedback circuit (26) is connected to the pump ground connection and the pump-status connection.
7. An electronically-controlled shower system (10) as claimed in any one of the preceding claims, wherein the shower controller is configured to deactivate the electronically-controlled shower (12) in the event that an output of the controller override connection © does not match an expected output thereof.
8. An electronically-controlled shower (12) for use with a wired electric waste pump, the electronically-controlled shower (12) comprising:
 - a shower controller;
 - a pump trigger circuit (18) including a trigger input connection in communication with the shower controller, a shower ground connection, and a triggerable pump-control switch; and
 - a controller override connection (C) in communication with the shower controller for deactivating the electronically-controlled shower in the event that an output of the controller override connection (C) does not match an expected output thereof.
9. An electronically-controlled shower (12) as claimed in claim 8, further comprising a wired connector (16) for connecting to an electric waste pump (14), the wired connector (16) forming a pump control circuit having a pump input connection in communication with the pump controller, and a pump ground connection, the triggerable pump-control switch being arranged to complete the pump control circuit to activate the electric waste pump (14), and further comprising a feedback connection comprising a pump-side feedback circuit having a triggerable feedback switch and being connected to the wired connector,

and a shower-side feedback circuit being connected to the pump trigger circuit and the controller override connection (C), the triggerable feedback switch being arranged to complete the shower-side feedback circuit (30) during a detected active state of the electric waste pump (14). 5

10. A method of deactivating an electronically-controlled shower (12) in the event of failure of a wired electric waste pump (14) associated therewith, the method comprising the steps of: 10

a] activating the electronically-controlled shower (12) via a shower controller, the shower controller sending a pump activation signal to the electric waste pump (14) via a pump trigger circuit (18), a triggerable pump-control switch of the pump trigger circuit completing a pump control circuit (22) of a wired connector between the electronically-controlled shower (12) and the electric waste pump (14); and 15 20

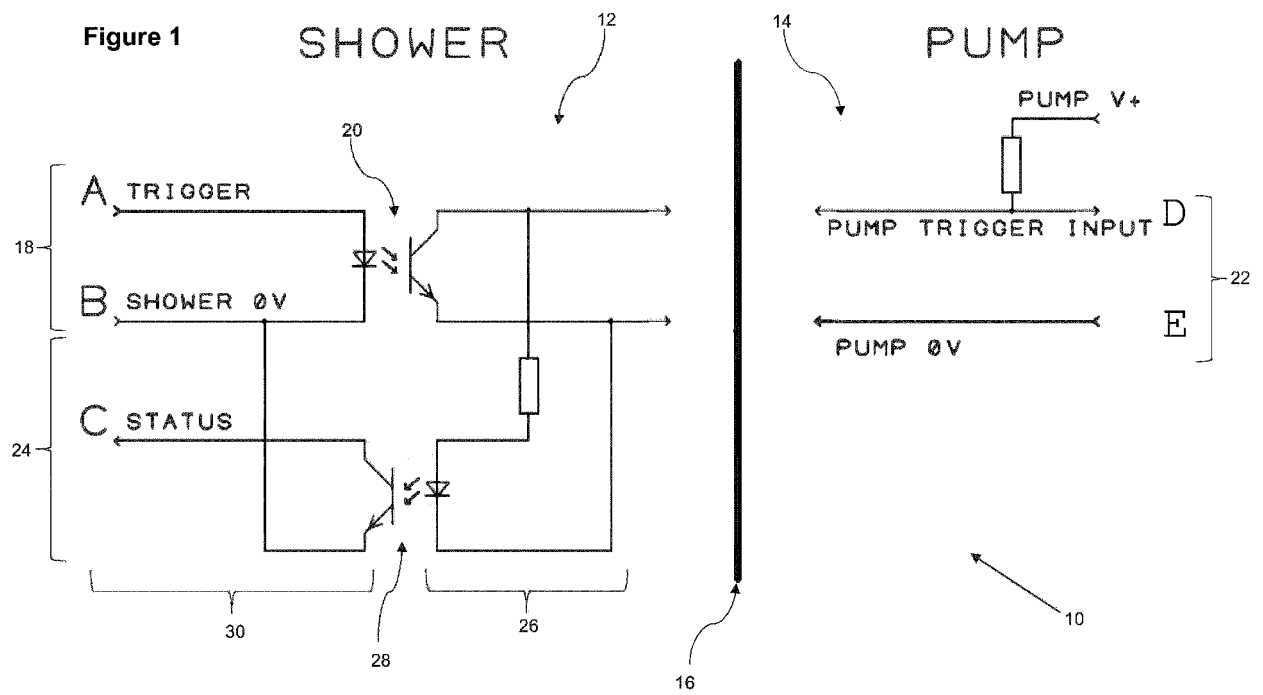
b] deactivating the electronically-controlled shower in the event that an output of a controller override connection of the electronically-controlled shower (12) does not match an expected output, the output of the controller override connection (C) being generated by a feedback connection (24) comprising a pump-side feedback circuit (26) having a triggerable feedback switch and being connected to the wired connector (16), and a shower-side feedback circuit (30) being connected to the pump trigger circuit and the controller override connection (C), the triggerable feedback switch being arranged to complete the shower-side feedback circuit (30) during a detected active state of the electric waste pump (14). 25 30 35

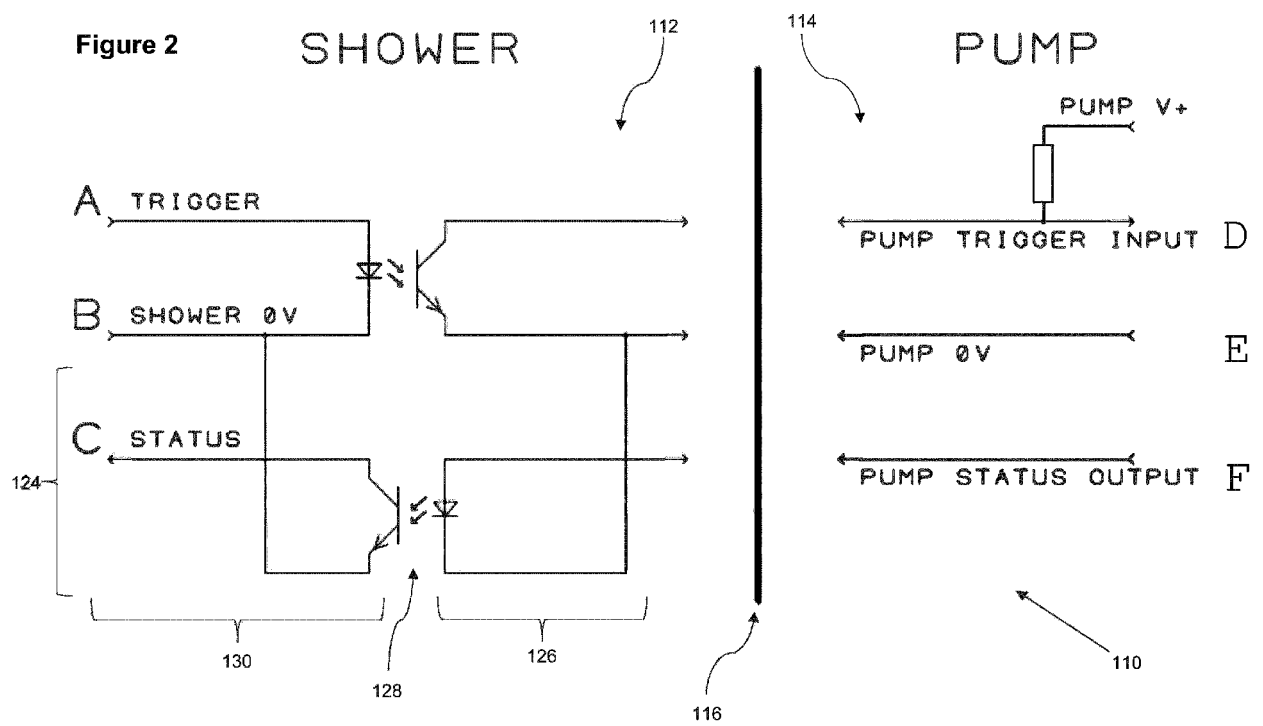
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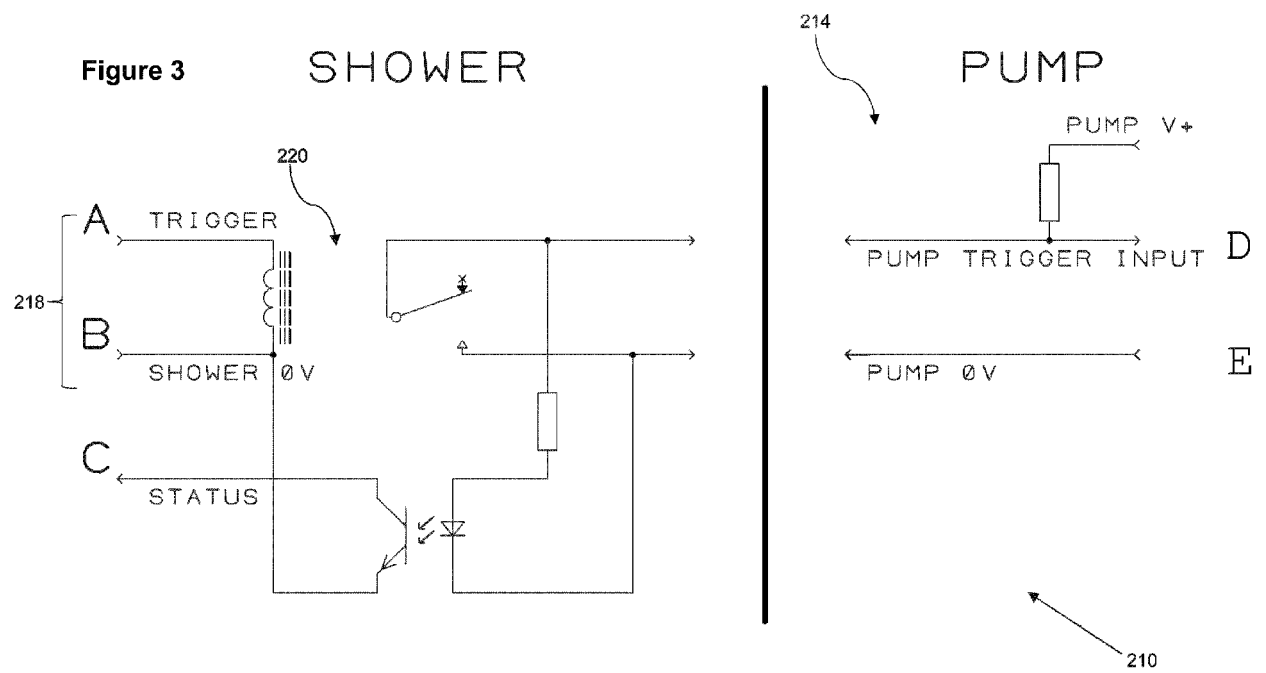
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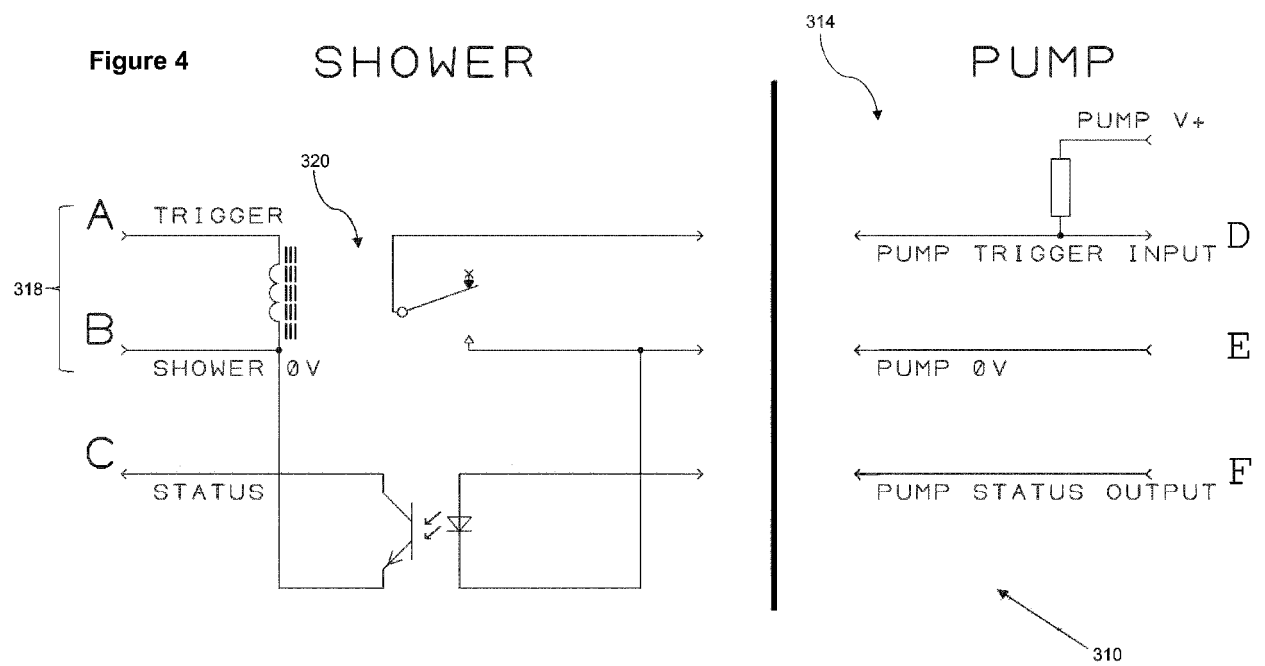
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Application Number

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EPO FORM 1503 03.82 (P04C01)

DOCUMENTS CONSIDERED TO BE RELEVANT			
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A	EP 2 363 540 A2 (GONTAR ANTONI HAROLD NIKOLAS [GB]; TAYLOR FREDERICK JAMES [GB] ET AL.) 7 September 2011 (2011-09-07) * paragraphs [0079], [0080] * -----	1-10	
			TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 24 September 2024	Examiner Posavec, Daniel
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	

ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.

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5 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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