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## (54) A SMOKE EVACUATOR OR FIRE SHUTTER

(57) The present invention is directed to a smoke evacuator or fire shutter comprising:
- a valve movable between an armed position and an emergency position;
- a housing wherein are provided:
- a spring based actuating means for moving said valve from an armed position to an emergency position, thereby using potential energy stored in the spring;
- an electrically driven motor designed to arm said spring and moving said valve from an emergency position to an armed position;
- an electrical circuit electrically connecting said motor to a mains;
characterized in that said smoke evacuator or fire shutter further comprises an electrical battery connector reachable from outside the housing and connected to the electrical circuit powering said motor.

In addition, the present invention is directed to a ventilation system comprising such smoke evacuator or fire shutter.

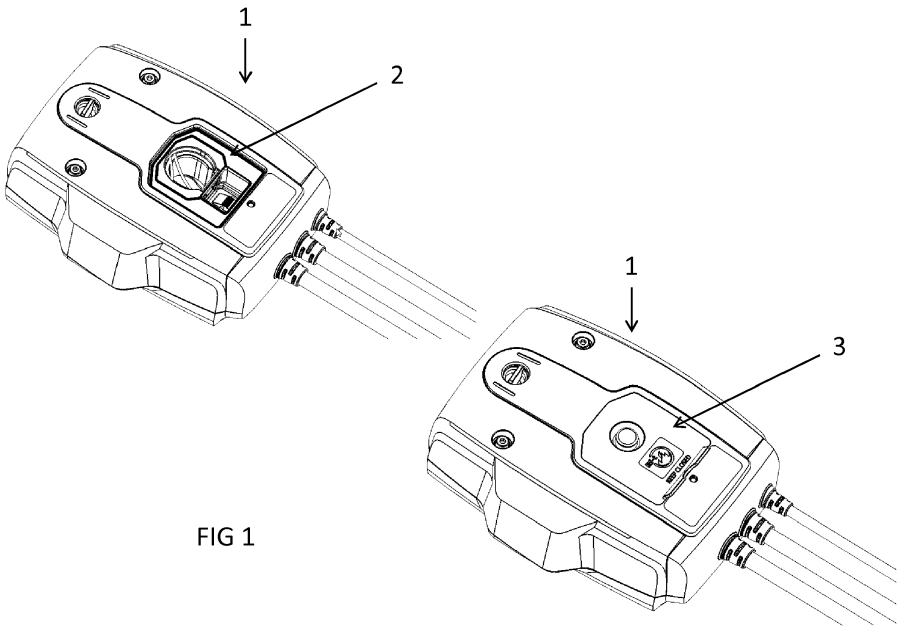


FIG 1

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## Description

### FIELD OF THE INVENTION

**[0001]** The present invention relates to a smoke evacuator or fire shutter comprising a motor designed for moving the valve, after having been actuated, from an emergency position back to an armed position.

### BACKGROUND OF THE INVENTION

**[0002]** In modern firefighting, the concept of tactical ventilation is commonly used. Tactical ventilation can be described as performing specific venting and fire isolation actions in order to evacuate smoke and heat, to provide firefighters a clear view on the seat of fire, to pull fire away from trapped occupants, and to limit property damage.

**[0003]** Since in modern buildings, modern materials, especially the polymers, produce a lot more heat than traditional materials (wood, plaster, stone, bricks, etc.), tactical ventilation is even more crucial, such that ventilation systems with dedicated smoke evacuators and fire shutters have been developed and introduced in the buildings.

**[0004]** Typically a smoke evacuator is installed in walls on a smoke evacuation duct and is default in closed position. Only in case of fire in the room where the evacuator is installed and where the evacuation of smoke and heat is desired, the valve is opened either manually by the fireman or remotely via a control system.

**[0005]** Fire shutters typically are installed where air ventilation ducts penetrate fire-resistant compartment walls. They maintain the fire resistance rating of the penetrated wall and prevent smoke propagation. A fire shutter is default in open position.

**[0006]** A general problem of conventional smoke evacuators or fire shutters is the following: upon installing, smoke evacuators and fire shutters have to be tested, i.e. proper functioning of the valve in emergency situations has to be monitored. Normally after installation the valve is brought into its stand-by armed position by powering the electrically driven motor, however since these smoke evacuators or fire shutters in a majority of the cases are installed in new or renovated buildings without mains power supply available yet, technicians have to arm and re-arm the valve manually by means of a key instead of by triggering the motor.

**[0007]** In addition, subsequently to emergency situations or power interruptions, smoke evacuators or fire shutters have to be armed and tested preferably separately. In that case, technicians have to perform an unlocking and re-arming cycle, either manually by means of a key, either they have to wait till mains power is available again.

**[0008]** Moreover, the valves are not always easy reachable since they are installed in exhaust ducts or ventilation ducts often hidden in falls ceilings, so testing or arming manually by using a key is difficult.

**[0009]** It is therefore an object of the present invention to provide a smoke evacuator or fire shutter which can be easily tested and/or (re)armed without requiring mains power supply being available yet.

### SUMMARY OF THE INVENTION

**[0010]** The present invention is directed to a smoke evacuator or fire shutter comprising:

- a valve movable between an armed position and an emergency position;
- a housing wherein are provided:
  - a spring based actuating means for moving said valve from an armed position to an emergency position, thereby using potential energy stored in the spring;
  - an electrically driven motor designed to arm said spring and moving said valve from an emergency position to an armed position;
  - an electrical circuit electrically connecting said motor to a mains;

characterized in that said smoke evacuator or fire shutter further comprises an electrical battery connector reachable from outside the housing and connected to the electrical circuit powering said motor.

**[0011]** In addition, the present invention is directed to a ventilation system comprising such smoke evacuator or fire shutter.

### BRIEF DESCRIPTION OF THE DRAWINGS

**[0012]** FIG 1 illustrates a preferred embodiment of the housing of a smoke evacuator or fire shutter in accordance with the present invention.

### DETAILED DESCRIPTION OF THE INVENTION

**[0013]** In first embodiment, the present invention is directed to a smoke evacuator or fire shutter comprising:

- a valve movable between an armed position and an emergency position;
- a housing wherein are provided:
  - a spring based actuating means for moving said valve from an armed position to an emergency position, thereby using potential energy stored in the spring;
  - an electrically driven motor designed to arm said spring and moving said valve from an emergency position to an armed position;
  - an electrical circuit electrically connecting said motor to a mains;

characterized in that said smoke evacuator or fire shutter

further comprises an electrical battery connector reachable from outside the housing and connected to the electrical circuit powering said motor.

**[0014]** By providing an electrical battery connector connected to the electrical circuit that powers the motor, (re)arming the valve can be done even in case mains power supply is not available by means of power supplied by a battery. In addition, by providing connectors reachable from outside the housing, the housing does not have to be opened for connecting a battery or for replacing an empty one.

**[0015]** In an embodiment of the present invention, at the outside of the housing of the actuating mechanism a slot may be provided comprising battery connectors wherein a battery may be removably fixed such that the battery may be held in position during testing or (re)arming the valve.

**[0016]** Alternatively, the battery connector may be designed to contact a battery yet not fix said battery in connection with the battery connector. In this case any type or size of battery can be used as long as it provides sufficient power and fits the connector by manual force.

**[0017]** Preferably as illustrated in FIG 1, a slot (2) in the housing (1) of the actuation mechanism may be provided which is designed such that the battery may be at least partially inserted for easy and efficient connection but without it being fixed therein. Thus the battery is to be kept in touch with the connectors by manual force. A benefit thereof is that a battery cannot be left in the slot after (re)arming the valve, thereby avoiding low battery issues. Moreover, such battery may simply be part of the technician's toolkit.

**[0018]** The housing (1) of the actuation mechanism may be further designed such that the battery slot (2) can be closed by means of a cover (3), preferably snap on, to keep the slot free of moisture and dust.

**[0019]** In an embodiment in accordance with the present invention, the housing of the smoke evacuator or fire shutter may be made air and dust tight. In particular, the housing may protected against dust ingress and water ingress due to water splash or spray. Preferably the housing may comply with an IP42 degree of protection according to standard IEC60529.

**[0020]** In an embodiment according to the present invention, a smoke evacuator or fire shutter may be provided comprises a motor activation switch to activate the motor after connecting a battery to the battery connector. However, preferably, connecting the battery to the battery connector may automatically trigger activation of the motor. The electrical circuit powering the motor may then be built such that if mains power supply is available, the motor may (re)arm the valve by means of mains powered, and in case mains power is not available, the motor may be powered using battery energy.

**[0021]** In a further embodiment in accordance with the present invention, the housing of the smoke evacuator or fire shutter may comprise a microcontroller coupled to the electrical circuit for selecting the power source of the motor. The microcontroller may decide to use mains power energy or battery energy for moving the valve to armed position, depending on the availability of the respective energy source.

**[0022]** Preferably the microcontroller may select the mains as power source for the motor in case mains power is detected. Consequently, even when a battery is connected with the battery connector and mains power is available as well or switched on during (re)arming, mains power energy will be used to (re)arm the valve.

**[0023]** In a preferred embodiment according to the present invention, a smoke evacuator or fire shutter may be provided wherein connecting a battery to the battery connector automatically triggers the microcontroller to activate the motor. If mains power supply is available, connecting the battery triggers the microcontroller to activate the motor and the microcontroller decides (re)arming the valve by means of mains power. In case mains power is not available and the battery triggers the microcontroller to activate the motor, the microcontroller decides powering the motor using battery energy.

**[0024]** Further, a smoke evacuator or fire shutter according to the present invention may comprise any type of valve actuating mechanism used in conventional smoke evacuators or fire shutters. Preferably in order to assure sufficiently quick movement of the valve from armed position to emergency position, the valve actuating mechanism is spring based combined with an electrically driven solenoid brake mechanism. In unpowered state the solenoid keeps the spring and the valve in armed position after being armed by activating the motor. Such electrically driven solenoid brake mechanism typically comprises a coil and a moving metal rod, also known as a plunger making a linear movement within the coil, and a switching device connecting the coil to a loaded capacitor in case of alarm. Upon the capacitor providing power to the coil, the plunger is retracted by magnetic force unlocking the latch that is holding the spring loaded mechanism, the spring is activated and the valve moves from armed position to emergency position. Typically, providing power to the coil of the solenoid may be obtained in two ways: in case of alarm, either mains power is switched on for providing a pulse loading the capacitor, followed by the relay connecting the coil with the loaded capacitor; either mains power is switched off, following by the relay connecting the coil with the already loaded capacitor.

**[0025]** Preferably, the solenoid may be coupled to the electrical circuit in such way that it can only be powered by the mains and not by the battery. So upon connecting the battery to the battery connector, the motor may be triggered to move the valve towards armed position without affecting the solenoid. The plunger of the solenoid will stay in its inactivated (armed) position ready for being powered in case of emergency. Upon removing the battery again, the solenoid will stay unaffected as well.

**[0026]** In addition, smoke evacuators or fire shutters according to the present invention, may be equipped with

a thermo-electric fuse interrupting the power supply when the temperature in the air duct in connection with the evacuator or shutter exceeds a temperature limit, for example 72°C, or with a thermo-mechanical fuse mechanically unlocking the spring loaded mechanism when temperature exceeds a limit. So the mechanism by which the valve moves remotely from armed position into emergency position may be activated by a power pulse to the solenoid or a power interruption, or automatically by the melting down of a thermic fuse due to exceeded temperature limit in the duct.

**[0027]** In a further embodiment, smoke evacuators or fire shutters according to the present invention may be equipped with a visual indicator, for example a light emitting diode (LED), indicating the status of the (re)arming process.
For example:

- when only the battery is used (both for triggering and powering the motor), the LED blinks slowly during arming
- when only the battery is used (both for triggering and powering the motor), the LED blinks fast when the battery voltage is low, for example lower than 6.5 volts
- when only the battery is used (both for triggering and powering the motor), the LED is emitting continuously when the arming was successful until the battery is removed (ps. successful arming is understood as the valve being moved into a specified position for being successfully actuated upon alarm)
- when mains power supply is used for powering the motor, the LED blinks slowly during arming and is turned on continuously as long as the power is supplied, the LED is off when no power is supplied

In addition, the smoke evacuators or fire shutters according to the present invention may be equipped with a visual or audible indicator when the valve is not successfully armed. The microcontroller may further be equipped for making a distinction between low battery and mechanical obstruction when the valve is not successfully armed. In case the microcontroller senses that the valve does not arrive into a specified position for being successfully actuated upon alarm, while the battery is not low or while mains power supply is available, the microcontroller will indicate mechanical obstruction.

**[0028]** In an additional embodiment, a ventilation system is provided using smoke evacuators or fire shutters as described in the above embodiments.

## Claims

**1.** A smoke evacuator or fire shutter comprising:

- a valve movable between an armed position and an emergency position;
- a housing wherein are provided:
  - a spring based actuating means for moving said valve from an armed position to an emergency position, thereby using potential energy stored in the spring;
  - an electrically driven motor designed to arm said spring and moving said valve from an emergency position to an armed position;
  - an electrical circuit electrically connecting said motor to a mains;

**characterized in that** said smoke evacuator or fire shutter further comprises an electrical battery connector reachable from outside the housing and connected to the electrical circuit powering said motor.

**2.** The smoke evacuator or fire shutter according to claim 1, wherein said battery connector is designed to contact a battery yet not fix said battery in connection with said battery connector.

**3.** The smoke evacuator or fire shutter according to claim 1, wherein said housing is made air and dust tight.

**4.** The smoke evacuator or fire shutter according to claim 3, said housing complies with an IP42 degree of protection according to standard IEC60529.

**5.** The smoke evacuator or fire shutter according to any of the preceding claims, comprising a microcontroller coupled to the electrical circuit and comprising a protocol for selecting the power source of the motor.

**6.** The smoke evacuator or fire shutter according to claim 5, wherein the microcontroller selects the mains as power source for the motor in case said mains power is detected.

**7.** The smoke evacuator or fire shutter according to claim 6, wherein connecting a battery to the battery connector, triggers the microcontroller to activate of the motor.

**8.** The smoke evacuator or fire shutter according to any of the preceding claims, wherein the spring based actuator means comprise an electrically driven solenoid brake mechanism for maintaining the spring in the armed position.

**9.** The smoke evacuator or fire shutter according to claim 6, wherein said solenoid is coupled to the electrical circuit such that it can only be powered by the mains and not by the battery.

**10.** A ventilation system comprising a smoke evacuator

or fire shutter according to any of the above claims.

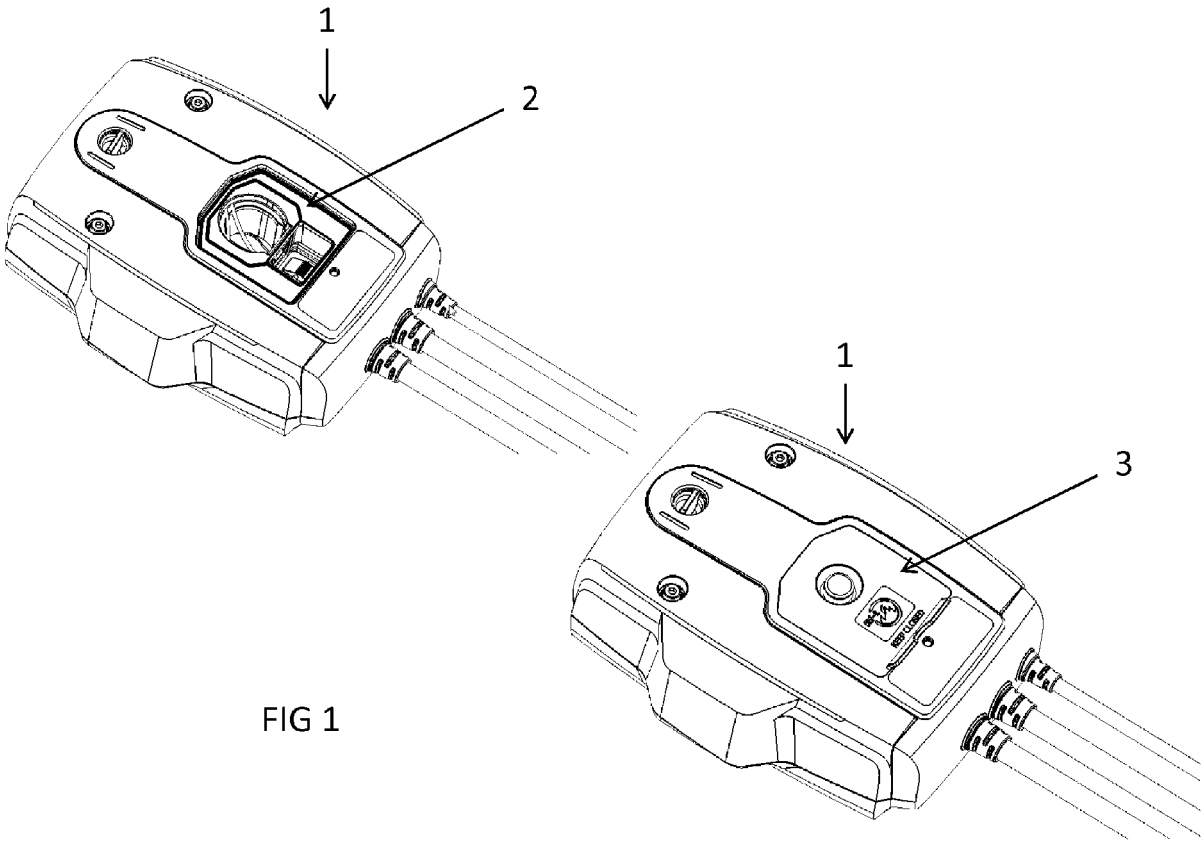


FIG 1

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# EUROPEAN SEARCH REPORT

Application Number
EP 15 19 9908

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

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