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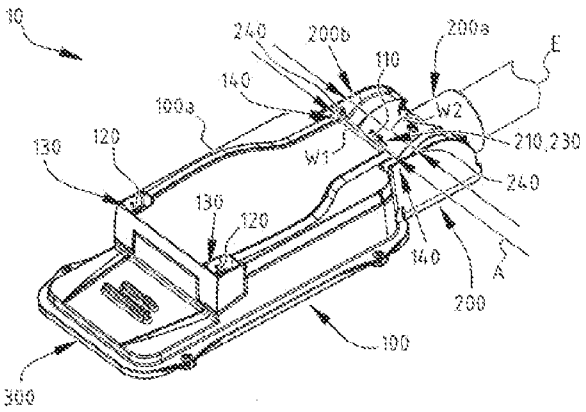
(54) **FUNCTIONAL HEAD AND METHOD FOR ASSEMBLING THE SAME**

(57) A functional head comprising a housing configured to accommodate a functional unit, said housing comprising a cover provided, with at least one first hinge element configured to enable a rotation of the cover around an axis, and a head part facing the cover, said head part comprising at least one corresponding second hinge element configured to removably accommodate and cooperate with the at least one first hinge element during said rotation. One of the cover, and the head part comprises at least one protruding portion. The other one of the cover and the head part comprises at least one corresponding slit configured to removably accommodate the at least one protruding portion, and a blocking means configured to block said rotation at a blocking angle when the at least one slit accommodates the at least one protruding portion.



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FUNCTIONAL HEAD AND METHOD FOR ASSEMBLING THE SAME

FIELD OF INVENTION

The present invention relates to functional heads and methods. Particular embodiments relate to a functional head and a method for assembling the functional head.

BACKGROUND

Generally, functional heads, such as outdoor luminaire heads, comprise a housing in which one or more electrical components are installed and connected to provide with the desired function. In the event of a malfunction, of maintenance or during commissioning of the functional head, access to the interior of the housing of the functional head, is usually needed.

Conventional functional heads may be equipped with a cover, that closes the housing and may be configured to prevent the ingress of water or dust therein. Conventional covers are usually rather simple and sometimes allow for the cover to be opened by rotating it with the help of a simple hinge mechanism. In order for an operator to access the interior of the housing, the cover then needs to be blocked in its rotation to avoid that the cover closes in an undesired manner.

A current problem occurring in the industry of functional heads, and more in particular outdoor luminaire heads, is that the blocking of the rotation of the cover is usually achieved either through an external tool, or by the operator himself, *e.g.* by holding the cover with one hand. However, functional heads can be fixed to a support, *e.g.* a wall or a pole, that may be difficult of access, *e.g.* at a height of several meters. In order to avoid making the work of the operator even more difficult, the access to the interior of the housing needs to be easy and safe, and a better blocking mechanism is needed.

SUMMARY

An object of embodiments of the invention is to provide a functional head. More in particular, embodiments of the invention aim at providing a functional head with a housing closed by a cover which can be assembled at a factory or directly on site in a convenient way, which can be secured to a support, such as a luminaire pole. The cover should allow for an easy and safe rotating opening mechanism that allows to block the rotation when access to the interior of the housing is needed.

In addition, embodiments of the invention provide a method for assembling such a functional head.

According to a first aspect of the invention, there is provided a functional head comprising a housing configured to accommodate a functional unit. The housing comprises a cover provided, preferably at a rear end, with at least one first hinge element configured to enable a rotation of the cover around an axis, and a head part facing the cover. The head part comprises at least one corresponding second hinge element configured to removably accommodate and cooperate with the at least one first hinge element during said rotation of the cover. One of the cover, preferably at said rear end, and the head part comprises at least one protruding portion. The other one of the cover, preferably at said rear end, and the head part comprises at least one corresponding slit configured to removably accommodate the at least one protruding portion, and a blocking means configured to block the rotation of the cover at a blocking angle when the at least one slit accommodates the at least one protruding portion. Thus, the above-mentioned blocking angle is defined in the context of the invention as the angle at which the blocking means is configured to block the rotation of the cover when the at least one slit accommodates the at least one protruding portion.

Preferably, the functional unit comprises any one or more of the following: a light source, an image sensing means such as a camera, a communication means such as an antenna, a sensing means such as an air quality sensor or a pollution sensor or a visibility sensor or a smoke sensor or a sound sensor (microphone) or a radio-frequency, RF, sensor or a movement sensor or a temperature sensor, a loudspeaker, a light projecting means such as a projector, a display, a laser device, a radar device, a light emitting device such as an ultraviolet (UV) light or an infrared (IR) light or a light for light fidelity (Li-Fi) communication, or a spraying/sanitizing device. The camera may correspond to a closed-circuit television (CCTV) camera. The light projecting means may be configured to project images, logos, photos, texts, and the like. Signals may be sent to and/or from the communication means via a wireless network operating over short-range or long-range communication, e.g. Bluetooth, Wi-Fi, Zigbee, LORA (IoT), IR, cellular, or via a wired network, e.g. Ethernet, DALI, DMX, RS485, USB.

More generally, the functional unit may be any kind of sensor means, communicating means, signalling means, Human Interface Device and/or receiving means. It is noted that there may be multiple functional units accommodated in the housing, and the multiple functional units may be the same or different. Some functional units may emit signals containing information. For example, in case of a laser device, a laser beam may be projected on the ground, and the laser beam may be controlled such that information is displayed on the ground or in the sky. For example, in case of a microphone, audio or speech information may be emitted.

Embodiments of the invention are based *inter alia* on the insight that access to the functional unit, *i.e.* to the interior of the housing of the functional head, is often needed in the event of a maintenance being performed on the functional head and/or during commissioning of the functional head. The supports to which functional heads may be mounted, *e.g.* a pole of a luminaire head, often cause the access to said functional heads themselves to be difficult and dangerous for an operator. Therefore, in order to avoid making the work of the operator even more difficult, the access to the interior of the housing needs to be easy and safe. This applies to luminaire heads as well as to other functional heads, for example systems comprising a camera, an antenna, a loudspeaker, or any sensor.

In the functional head of embodiments of the invention, the access to the interior of the housing is granted by a rotation of the cover and said rotation may be locked at a blocking angle, *i.e.* in a predetermined locking position. Such predetermined blocking position may be such that an easy access to the interior of the housing of the functional head is provided. Said locking feature also avoids that the cover accidentally closes while it is in an open position, thereby increasing the safety of an operator, *e.g.* a maintenance operator and/or a commissioning operator. In addition, no additional external part is needed to achieve said locking feature, thereby reducing the amount of parts of the assembly, and therefore its weight, and thereby allowing for a tool-less maintaining of the open position for the maintenance and/or commissioning procedure.

Preferred embodiments relate to a functional head for an outdoor luminaire. By outdoor luminaire, it is meant luminaires which are installed on roads, tunnels, industrial plants, stadiums, airports, harbors, rail stations, campuses, parks, cycle paths, pedestrian paths or in pedestrian zones, for example, and which can be used notably for the lighting of an outdoor area, such as roads and residential areas in the public domain, private parking areas, access roads to private building infrastructures, warehouses, industry halls, etc.

According to a preferred embodiment, the head part is a fixation assembly facing said rear end of the cover and configured to fix the housing to a support, such as a pole. According to another embodiment, the head part corresponds to a fixation assembly configured to fix the housing to a ceiling or a vertical wall of a building or a room. According to yet another embodiment, the head part corresponds to a further housing of the functional head, said further housing being configured to accommodate one or more further units, such as one or more further functional units. Preferably, the further housing encloses said one or more further units. However, the further housing may also only partially surround said one or more further units. According to yet another embodiment, the

further housing may be a hollow housing, i.e., the further housing may not enclose or surround any unit or component of the functional head.

According to a preferred embodiment, the blocking angle is comprised between 30° and 120°, preferably between 30° and 95°. For example, the housing of the functional head may be fixed to the support such that the functional head is substantially horizontal. Similarly, the cover may therefore be horizontal when in a closed position. An angle of 90° may therefore correspond to the cover being rotated by 90° compared to the horizontal, *i.e.* the cover being vertical. In this way, sufficient access to the interior of the housing and to the inside of the cover may be provided to an operator, *e.g.* a maintenance operator and/or a commissioning operator.

According to a preferred embodiment, the at least one first hinge element and the at least one second hinge element are configured to further enable a translation of the cover with respect to the head part.

In this way, the translating of the at least one first hinge element within the at least one second hinge element allows the engaging of the at least one first hinge element into the at least one second hinge element, thereby allowing the assembly of the cover in an easy manner. Reversely, the disengaging of the at least one first hinge element from the at least one second hinge element may be achieved by translating the at least one first hinge element out of the at least one second hinge element. An easy disassembly of the cover may therefore also be achieved. For example, the cover may be assembled to the head part by translating the cover in a parallel manner to the housing towards a back end of the housing. Accordingly, in case the cover needs to be disassembled from the head part, the cover may be released by translating the cover in a parallel manner to the housing but towards a front end of the housing.

According to a preferred embodiment, the at least one first hinge element has a non-rotational symmetric cross-section, preferably an elongated cross-section, and the at least one second hinge element has a non-rotational symmetric cross-section configured to cooperate with said non-rotational symmetric cross-section, preferably an elongated cross-section.

For example, the at least one first hinge element may have an elliptical cross-section or a rectangular cross-section with rounded edges. In this way, a position in which the cover may be coupled to the housing, for example by translating the at least one first hinge element within the at least one second hinge element, may be limited to certain positions or certain angles of the cover with respect to the housing. In an exemplary embodiment, the at least one first hinge element may be inserted in the at least one second hinge element through an opening in the head part. The size of the opening may be

chosen such that it is larger than a smallest dimension of the first hinge element but smaller than a longest dimension of the first hinge element. For example, in the case of a first hinge element having an rectangular cross-section, the dimension of the opening may be chosen to be larger than the short axis of the rectangle, but smaller than the long axis of the rectangle, *e.g.* the dimension of the opening may be chosen to be substantially equal to the short axis of the rectangle. The orientation for which the cover may be coupled with the housing, for example by translating the at least one first hinge element within the at least one second hinge element, may therefore be limited to only one orientation of the at least one first hinge element with respect to the at least one second hinge element, *i.e.* the translation needs to be done along the direction of the long axis of the rectangle. In this way, the assembly of the cover with the head part is limited to only one orientation of the cover with respect to the housing.

Reversely, the disassembly of the cover from the housing, for example by translating the at least one first hinge element out of the at least one second hinge element, may be limited to predetermined positions or predetermined angles of the cover with respect to the housing. This may prevent the cover from being removed from the housing in some predetermined positions, *e.g.* in a closed position and/or in a fully-opened position, *i.e.* in positions in which the disassembly is not desired. As mentioned above, in the case of a first hinge element having an rectangular cross-section and the dimension of the opening being equal to the short axis of the rectangle, the disassembly of the cover from the head part is limited to the orientation of the cover that allows the translation to be done along the direction of the long axis of the rectangular first hinge element. Otherwise, the at least one first hinge element would abut against an inner surface of the at least one second hinge element and would block the cover from being disassembled.

According to a preferred embodiment, the at least one protruding portion and the at least one slit are configured to enable a translation of the cover with respect to the head part.

During the rotation of the cover, *e.g.* when an operator needs to access the interior of the housing, the at least one first hinge element is rotated within the at least one second hinge element in which it is accommodated and the at least one protruding portion is rotated with respect to the at least one slit. At a given angle, the at least one protruding portion and the at least one slit may be aligned. By allowing the cover to be translated with respect to the head part, the at least one protruding portion may therefore be inserted in the at least one corresponding slit. In this way, the at least one protruding portion may be accommodated by the at least one slit such that the blocking means may block further rotation of the cover.

For example, the at least one protruding portion and the slit may be configured to be aligned when the cover is oriented at a first angle, *e.g.* 90°, which in the case of an horizontal housing, corresponds to the cover being vertical. To achieve the locking of the cover, an operator may rotate the cover with respect to the housing until reaching said first angle in order to align the protruding portion and the slit, may then translate the cover, *e.g.* vertically, with respect to the head part such that the protruding portion is accommodated in the slit, and may then contact the protruding portion with the blocking means such that rotation of the cover is blocked by the head part at a blocking angle. Reversely to achieve the unlocking of the rotation of the cover of the functional head, an operator may move the protruding portion from contacting the blocking means such that the cover is unblocked from the head part, may then translate the cover, *e.g.* vertically, with respect to the head part such that the protruding portion is no longer accommodated in the slit, and may then rotate the cover with respect to the housing to a desired angle, *e.g.* at an angle of 0° to contact the cover with the housing so as to close the housing. In this way, the operator is prevented from performing difficult manipulation movements to achieve the locking and unlocking of the rotation of the cover.

According to a preferred embodiment, the cover comprises the at least one protruding portion and the head part comprises the at least one slit. The at least one protruding portion is configured to fall through the at least one slit, so as to enable a substantially vertical translation of the cover with respect to the head part.

In other words, the at least one protruding portion may protrude from the cover while the slit may be formed on the head part and the at least one protruding portion may be configured to fall through the action of gravity due to its own weight through the slit. In the example above, the translation of the cover with respect to the head part may therefore be achieved under the own weight of the cover, such that no additional force, *e.g.* from an operator, is needed to lock the cover at the blocking angle. Since the translation movement is achieved by the action of gravity, the operator is prevented from having to perform any difficult manipulation movements to reach the blocking position.

According to a preferred embodiment, the at least one protruding portion has a hook cross-section, and the blocking means has a cross-section configured to cooperate with said hook cross-section, preferably an arc cross-section.

For example, the at least one protruding portion may protrude from the cover such that a first portion of the protruding portion is aligned with the longitudinal axis of the cover and a second portion at end of said first portion is formed in a direction perpendicular to said first portion, the cross-section of the protruding portion thereby forming a 90° hook. In the case of a horizontal functional head and

cover, the second portion may for example be oriented upwards. The blocking means of the head part may be configured to have a cross-section such that an internal part of the hook of the protruding portion enters in contact with a first surface of the blocking means when the protruding portion is introduced in the slit. In this way, when the at least one protruding portion is accommodated in the at least one corresponding slit, the hook-shaped protruding portion may contact said first surface of blocking means such that the blocking means blocks the cover at the blocking angle.

Preferably, the blocking means may be configured to have an arc cross-section. For example, the arc cross-section may be oriented towards the axis of rotation of the cover, *e.g.* the center of the arc cross-section may be situated on the axis of rotation of the cover, and its radius may be based on the reach of the protruding portion with respect to said axis of rotation. For example, said radius may be larger than the reach of the protruding portion with respect to said axis of rotation. In this way, the blocking means is prevented from disturbing the rotation movement of the cover, *i.e.* it is prevented that the protruding portion, *e.g.* the outside surface of the hook, is blocked by the blocking means during the rotation. In another example, said radius may be such that the distance from a second surface, on the inside part of the arc, to the axis of rotation is substantially equal to the reach of the protruding portion with respect to the axis of rotation. In this way, the protruding portion will abut said second surface of the blocking means during the rotation of the cover, thereby being provided with a guide by the blocking means during the rotation, such that the rotating movement of the cover is made easier to an operator and such that the protruding portion is guided towards the slit to achieve the locking of the cover.

According to a preferred embodiment, one of the at least one first hinge element and the at least one second hinge element is configured to be engaged into the other one of the at least one first hinge element and the at least one second hinge element according to a first angle comprised between 30° and 60°, preferably between 30° and 45°. Thus, the above-mentioned first angle is defined in the context of the invention as the angle between the cover and the housing at which the cover is configured to be engaged into the housing.

In this way, the assembly of the cover with the housing, for example by translating the at least one first hinge element within the at least one second hinge element, may be limited to some positions of the cover with respect to the housing, *i.e.* positions in which the first angle is comprised between 30° and 60°°, preferably between 30° and 45°. Reversely, the disassembly of the cover from the housing, for example by translating the at least one first hinge element out of the at least one second hinge element, may also be limited to said angular range. Said angular range may be chosen to correspond to angles in which the cover would not naturally lie in, *i.e.* orientations that need an active

intervention of an operator to be possible. In this way, the assembly and disassembly of the cover cannot happen "by accident".

According to a preferred embodiment, the at least one first hinge element and the at least one second hinge element are configured such that the cover can be rotated with respect to the housing until reaching a second angle comprised between 45° and 120°, preferably between 60° and 95°, and translated with respect to the head part such that the at least one protruding portion is accommodated in the at least one slit. Thus, the above-mentioned second angle is defined in the context of the invention as the angle between the cover and the housing at which the cover can be translated with respect to the head part such that the at least one protruding portion is accommodated in the at least one slit.

In other words, the second angle corresponding to the angle between the housing and the longitudinal axis of the cover may be chosen between 45° and 120°, preferably between 60° and 95°. Said second angle may be chosen such as to facilitate the translation movement of the cover with respect to the head part. For example, the second angle may be chosen such that the at least one protruding portion falls through the at least one slit through the action of gravity due to its own weight and/or such that the manipulation of the cover by an operator is easy and safe during the translation.

According to an exemplary embodiment, the at least one first hinge element comprises two first hinge elements, and the at least one second hinge element comprises two second hinge elements. Said two first hinge elements are each arranged at a respective substantially peripheral portion of the cover, preferably at a respective substantially peripheral portion of the rear end of the cover.

For example, the cover may be provided with two first hinge elements protruding from the cover in the direction of the rotation axis, preferably from the rear end of the cover in the direction of the rotation axis. The two first hinge elements may for example be shaped as two pins extending from two respective lateral walls of the cover, preferably from two respective lateral walls of the rear end of the cover, on either side of said rear end. In other words, the two first hinge elements may correspond to two hinge male portions, each arranged at a respective substantially peripheral portion of said cover, for example at the rear end. On the other hand, the head part may be provided with two corresponding second hinge elements, which may be formed on two respective lateral walls of the head part, on either side of said head part. In other words, the two second hinge elements may correspond to two hinge female portions, each arranged at a respective substantially peripheral portion of said head part. It should be clear to the skilled person that in other embodiments the at least one second hinge element may correspond to a hinge male element, such as the above-

mentioned hinge pin, and the at least one first hinge element may correspond to a hinge female element configured to removably accommodate and cooperate with the at least one hinge male element during said rotation of the cover.

By having two first hinge elements and two second hinge elements, the rotation of the cover is more stable.

According to another exemplary embodiment, the at least one first hinge element is arranged at a substantially central portion of the cover, preferably at a substantially central portion of the rear end of the cover.

According to an exemplary embodiment, either the at least one protruding portion, or the at least one slit and the blocking means, is arranged at a substantially central portion of the cover, preferably at a substantially central portion of the rear end of the cover.

According to another exemplary embodiment, the at least one protruding portion comprises two protruding portions, the at least one slit comprises two slits, and the blocking means comprises two blocking elements. Either said two protruding portions, or said two slits and said two blocking elements, are each arranged at a respective substantially peripheral portion of the cover, preferably at a respective substantially peripheral portion of the rear end of the cover.

In this way, the blocking force may be better distributed.

According to yet other embodiments, the at least one protruding portion may comprise three protruding portions, the at least one slit may comprise three slits, and the blocking means may comprise three blocking elements. Two of said three protruding portions may be each arranged at a respective substantially peripheral portion of the cover, preferably at a respective substantially peripheral portion of the rear end of the cover, and the third one of said three protruding portions may be each arranged at a respective substantially central portion of the cover, preferably at a respective substantially central portion of the rear end of the cover. Accordingly, two of said three slits and two of said three blocking elements may be each arranged at a respective substantially peripheral portion of the head part, and the third one of said three slits and the third one of said three blocking elements may be each arranged at a respective substantially central portion of the head part.

According to a preferred embodiment, each of said two protruding portions, each of said two slits, and each of said two blocking elements are arranged at a vicinity of a respective one of said two first hinge elements and of a respective one of said two second hinge elements.

According to a preferred embodiment, the at least one first hinge element extends over at least 5 %, preferably over at least 10 %, of a width of the cover along the rotation axis, preferably of a width of the rear end of the cover along the rotation axis.

In this way, a better support is provided during the rotation of the cover. In addition, the risk that the lateral surfaces of the cover abut on the lateral surfaces of the head part is reduced.

According to a preferred embodiment, either the at least one protruding portion, or the at least one slit and the blocking means, extends over at least 10%, preferably over at least 20%, of a width of the cover along said axis, preferably of a width of the rear end of the cover along said axis.

In this way, the blocking force may be better distributed.

According to a preferred embodiment, the housing is provided, preferably at a rear portion thereof, with a through-hole configured to accommodate an electrical wire extending through the head part.

In this way, electrical signals and/or power may be delivered to the interior of the housing through the head part, for the feeding of electrical/electronic components arranged inside the housing. For example, a cable gland may be provided in the through-hole in order to accommodate the electrical wire in a water-tight manner. The cable gland may for example protrude from the through-hole towards the head part.

According to a preferred embodiment, the housing comprises any one or more of the following electrical components: a light source driving means, a light source dimming means, surge protection circuitry, electrostatic discharge protection circuitry, a connecting means, a fuse, a metering circuitry, a driving and/or control circuitry for any electrical components of the functional unit.

Surge protection circuitry is provided to absorb energy and protect the driving means, typically including a LED driver circuit, and optionally a light source dimming means. The role of an ESD protection circuitry is to reduce the risk of accumulating electrostatic charge to a critical level so as to avoid that ESD happen through an insulation layer and damage semiconductor components such as LEDs.

According to an exemplary embodiment, the any one or more of the electrical components are configured to be attached to an inner surface of the cover.

In this way, easy access to the components may be granted when the cover is in a locked open position. These considerations have been described in detail in at least Dutch patent application NL 2031305 in the name of the applicant, and in PCT publications WO 2021/160853 A1, WO 2022/129193 A1, and WO 2020/152227 A1 in the name of the applicant, which are included herein by reference.

In addition, in this way, the one or more electrical components may be attached on the cover prior to the cover being assembled on the housing of the functional head. In the example of a luminaire head being mounted on a support pole at several meters from the ground, this allows the operator to change and/or modify the one or more electrical components at ground level, where more tools may be available to the operator, and then assemble the cover to the housing and finally connect said components to the source of the electrical signals driving the luminaire. In addition, in the event where a malfunctioning of the functioning head has been diagnosed, a second cover with the same electrical components as the ones that are present on the cover of the functioning head may be brought on site, such that the cover comprising the malfunctioning components may be disassembled from the housing and replaced by the second cover, and the malfunctioning components may for example be tested at the factory. These considerations have been described in detail in at least PCT publications WO 2016/110486 A1, WO 2021/191454 A1, and WO 2021/165315 A1 in the name of the applicant, which are included herein by reference.

Furthermore, in this way, this also provides more space to attach the one or more electrical components that are present inside of the housing. Indeed, in addition to having a substrate within the housing, the inner surface of the cover provides with additional attaching locations for the electrical components.

According to a preferred embodiment, the functional head further comprises a receptacle arranged on an outer surface of the cover, said receptacle being configured to receive an external module.

The external module may comprise any one or more of the following: a sensor (e.g. a light sensor, a motion sensor, a passive infrared sensor, an environmental sensor, a visibility sensor, an image sensor, a radar sensor, a sound sensor, a voice recorder, a pollutant sensor, a microphone, a detector of CO2, NOx, smoke, etc.), communication circuitry, control circuitry, protection circuitry (e.g. an

SPD or a fuse), a metering circuitry, an actuator, an energy storage element, etc. More generally the external module may comprise any component that needs to be powered, any component involved in the transmission and/or reception of signals, any component completing the circuitry inside the luminaire head, such as protection circuitry, etc.

It is further noted that the external module may be configured to receive a further external module. In other words, a stack of interconnected external modules may be arranged in the receptacle, wherein some functionalities may be included in a first external module and other functionalities in a second external module. In that manner, the system is given an extra degree of modularity.

Providing an external module to a functional head, such as a luminaire head, has been described in detail in at least PCT applications PCT/EP2021/071616 and PCT/EP2022/050240 in the name of the applicant, and in PCT publications WO 2017/133793 A1, WO 2020/212515 A1, WO 2021/001544 A1, WO 2020/099393 A1, and WO 2021/001556 A1 in the name of the applicant, which are included herein by reference. Preferably, the receptacle, also called a socket, is a NEMA receptacle fulfilling the requirements of the ANSI C136.10-2017 standard or of the ANSI C136.41-2013 standard, and the external module is a control module configured to be plugged in such receptacle. Alternatively, the receptacle may be a Zhaga receptacle fulfilling the requirements of the Zhaga Interface Specification Standard (Book 18, Edition 1.0, July 2018, see https://www.zhagastandard.org/data/downloadables/1/0/8/1/book_18.pdf), and the external module may be a control module configured to be plugged in such receptacle. According to an exemplary embodiment, the receptacle may be implemented as described in the above-mentioned PCT publication WO 2017/133793 A1. Optionally, the receptacle and the external module may be configured and/or mounted as described in the above-mentioned PCT publications WO 2020/212515 A1 and WO 2021/001544 A1. The receptacle and the control module may be configured to be coupled through a twist-lock mechanism, e.g. as described in ANSI C136.10-2017 standard or ANSI C136.41-2013 standard, which are included herein by reference.

According to an exemplary embodiment, the receptacle has a housing comprising a substantially cylindrical front portion at a front side of the receptacle, and a rear portion protruding rearwardly at a rear side of the substantially cylindrical front portion and configured to extend through an opening in the housing, preferably an opening in an upper wall of the housing.

According to an exemplary embodiment, the receptacle houses a plurality of receptacle contacts. Each receptacle contact is provided, at a front end, with a front contact portion configured for being

electrically connected with a contact of the external module, and at a rear end, with a wire receiving contact portion fixing a wire end of a wire to be connected to components of the functional head.

According to an exemplary embodiment, a receptacle contact of said plurality of receptacle contacts is provided, at said rear end, with one wire or with two or more wires.

According to an exemplary embodiment, the plurality of receptacle contacts comprises at least two first receptacle contacts for carrying power signals and/or one or more second receptacle contacts for carrying data or control signals, and/or the plurality of receptacle contacts comprises one or more receptacle contacts for carrying both power signals and data or control signals.

According to an exemplary embodiment, seen in a radial direction around a central axis of the receptacle, the plurality of second receptacle contacts may be positioned further away from the central axis than the plurality of first receptacle contacts. The plurality of second receptacle contacts may extend in an axial direction, substantially along a first (virtual) cylindrical surface around the central axis, and the plurality of first receptacle contacts may extend in an axial direction, substantially along a second (virtual) cylindrical surface around the central axis, said second cylindrical surface having a smaller diameter than said first cylindrical surface.

According to an exemplary embodiment, the receptacle is provided, at a rear end, with seven wire receiving contact portions, respectively fixing wire ends of seven wires to be connected to components of the functional head. The receptacle may fulfil the requirements of the ANSI C136.41-2013 standard. Three receptacle contacts may be configured for carrying power signals, and four receptacle contacts may be configured for carrying data or control signals. Thus, the seven receptacle contacts may comprise three first receptacle contacts and four second receptacle contacts. Seen in a radial direction around a central axis of the receptacle, the four second receptacle contacts may be positioned further away from the central axis than the three first receptacle contacts. The four second receptacle contacts may extend in an axial direction, substantially along a first (virtual) cylindrical surface around the central axis, and the three first receptacle contacts may extend in an axial direction, substantially along a second (virtual) cylindrical surface around the central axis, said second cylindrical surface having a smaller diameter than said first cylindrical surface.

According to an exemplary embodiment, said plurality of wire receiving contact portions may correspond to a plurality of poke-in or push-in connectors for receiving and fastening in a tool-less manner the wire ends of said plurality of wires, for example of said three wires carrying power signals.

Said plurality of wire receiving contact portions enables to fasten in a tool-less manner the wire ends of the plurality of wires, for example of the three wires carrying power signals. Thus, said plurality of wire ends, for example said three power wire ends, may be inserted into the corresponding plurality of wire receiving contact portions without needing to use screws or the like.

According to an exemplary embodiment, the rear portion further comprises a plurality of releasable securing elements configured to cooperate with the plurality of wire receiving contact portions. For example, each releasable securing element may be arranged at a vicinity of a corresponding wire receiving contact portion. For example, the rear portion further comprises three releasable securing elements, each arranged at a vicinity of a corresponding wire receiving contact portion of each first receptacle contact. Together with said plurality of wire receiving contact portions, said plurality of releasable securing elements may enable to fasten and to release in a tool-less manner the wire ends of the plurality of wires.

According to a preferred embodiment wherein the head part is a fixation assembly, the fixation assembly comprises a first fixation portion configured to receive and secure a pole end, and a corresponding second fixation portion configured to be attached to the housing and to cooperate with said first fixation portion so as to enable a rotation of the functional head with respect to the pole end.

In this way, the functional head may be oriented in a way to better suit the needs. For example, to adjust the light distribution of an outdoor luminaire head that would otherwise not adequately light the environment, or to achieve that a camera within the functional head captures images in a given direction, it may be necessary to rotate the functional head. The second fixation portion therefore allows different head angles to be achieved depending on the site to be monitored, sensed, or illuminated and/or the specific application. In this way, the functional head may therefore be more adaptable to the environment in which it is placed, *e.g.* to the width of different road surfaces or the height at which the functional head is placed, thereby decreasing the manufacturing costs by not requiring to design a different functional head for each environment.

According to an exemplary embodiment, the first fixation portion and the second fixation portion are each provided with a plurality of interengaging surfaces configured to cooperate with each other so as to enable a rotation of the second fixation portion with respect to the first fixation portion. Such a tiltable fixation assembly has been described in detail in PCT publication WO 2020/144191 A1 in the name of the applicant, which is included herein by reference. Alternative fixation assemblies

have been described in detail in PCT publications WO 2019/229045 A1 and WO 2022/069368 A1 in the name of the applicant, which are included herein by reference.

According to an exemplary embodiment, the first fixation portion comprises a fixation member provided with an outer cylindrical surface section having an axis and opposing bearings aligned with said axis, said outer cylindrical surface section being provided with a plurality of first interengaging surfaces. The second fixation portion comprises a fixation housing provided with a pair of axially-aligned receiving surfaces, and an inner cylindrical surface provided with a plurality of second interengaging surfaces configured to interengage the plurality of first interengaging surfaces. The fixation member of the first fixation portion is configured for being housed within the fixation housing of the second fixation portion, and the axis of the pair of axially-aligned bearings are substantially parallel to the axis of the pair of axially-aligned receiving surfaces. Preferably, the plurality of first and second interengaging surfaces are a plurality of first and second interengaging teeth, respectively.

In this way, the first and second fixation portions are designed such that the second fixation portion partially houses the first fixation portion. Having a partial housing for the fixation assembly increases the protection of the adjustment mechanism for the inclination of the functional head. Not only the adjustment mechanism will have additional protection, but the complementary areas of the first fixation portion and the overlying second fixation portion will be suitable for implementing contact surfaces between the fixation portions. This available contact area may be used to design a sizable set of interengaging surfaces, which provides mechanical stability and a broad adjustment range. Moreover, the overall cylindrical shapes of the fixation portions are well adapted to a rotation of the first fixation portion within the second fixation portion for an uncomplicated tilt of the fixation assembly.

According to a preferred embodiment, the fixation assembly further comprises a first and second shaft portions extending in alignment with the pair of axially-aligned bearings, such that a pivot axis is defined. The fixation assembly further comprises a fixation means configured for fixing the first and second shaft portions to the second fixation portion, enabling the engagement of at least a portion of the plurality of first interengaging surfaces with at least a portion of the plurality of second interengaging surfaces, and enabling the release of said engagement such that a rotation movement of the fixation housing relative to the fixation member is enabled with respect to the pivot axis defined by the first and second shaft portions.

In this way, the first and second fixation portions are joined or released from each other through the action of a first and second shaft portions and a fixation means. The first and second shaft portions extending in alignment with the longitudinal axis of the first fixation portion serve as a support for the fixation means which is fastened to the second fixation portion. Due to the coaxial design of the cylindrical shapes of the first and second fixation portions, the engaging force exerted by the combined use of the first and second shaft portions and the fixation means is directed towards the central axis of the cylindrical shapes. The engaging force, thus, reliably engages the second fixation portion to the first fixation portion for a stable positioning.

According to an exemplary embodiment, a first and second shaft comprises the first and second shaft portion, respectively, i.e., the first shaft portion and the second shaft portion may be separate elements. According to another embodiment, a single shaft may comprise the first and second shaft portions, i.e., the first shaft portion and the second shaft portion may form a single shaft.

The embodiments below are described in relation to a functional head corresponding to a luminaire head, i.e., in relation to a functional unit comprising a light source.

According to a preferred embodiment, the housing comprises a light cover covering the light source and configured to be releasably attached to the housing.

According to a preferred embodiment, the light source comprises a light support, such as a PCB, on which a plurality of light emitting diodes (LEDs) is mounted. The LEDs may be arranged in an array of multiple columns and rows.

According to a preferred embodiment, the luminaire head is provided with a heat sink including a plurality of cooling fins. Said plurality of cooling fins may be provided at the exterior and/or at the interior of the luminaire head. Examples of cooling fins have been described in detail in PCT publication WO 2021/180706 A1 in the name of the applicant, which is included herein by reference. A heat sink enables dissipation of heat generated by the light source towards the outside of the luminaire head. According to an exemplary embodiment, the housing is provided with said heat sink. Additionally or alternatively, the cover is provided with said heat sink. Said heat sink may be provided at an internal and/or external surface of the said housing and/or said cover. also applies to functional heads other than a luminaire head, for example the above-mentioned different types of functional heads.

According to a preferred embodiment, one or more optical elements are associated with the light source. The one or more optical elements may comprise a plurality of lens elements associated with the plurality of LEDs, e.g. grouped in a lens plate. However, also other types of optical elements may be additionally or alternatively present, such as reflectors, backlights, prisms, collimators, diffusors, and the like. In the context of the invention, a lens element may include any transmissive optical element that focuses or disperses light by means of refraction. It may also include any one of the following: a reflective portion, a backlight portion, a prismatic portion, a collimator portion, a diffusor portion. For example, a lens element may have a lens portion with a concave or convex surface facing a LED, or more generally a lens portion with a flat or curved surface facing the LED, and optionally a collimator portion integrally formed with said lens portion, said collimator portion being configured for collimating light transmitted through said lens portion. Also, a lens element may be provided with a reflective portion or surface or with a diffusive portion. Further, the light source may comprise additional optical elements like anti-glare louvers, a ribbed frame, etc. Anti-glare louvers have been described in detail in PCT publications WO 2020/058282 A1 and WO 2020/249684 A1 in the name of the applicant, which are included herein by reference.

Optionally, a flux exhauster may be arranged at a side of the functional head, around the light source. In addition or alternatively, an inner surface of said side may be painted or coated to fulfill the function of flux exhauster itself. A flux exhauster in the context of the present invention is typically plate-like and has a surface with good reflective properties. Such a flux exhauster has been described in detail in PCT publication WO 2021/116441 A1 in the name of the applicant, which is included herein by reference.

According to an exemplary embodiment, the light source may comprise a plurality of first light elements such as LEDs and one or more associated first optical elements configured to output a first light beam having a first color temperature according to a first intensity distribution within a first solid angle, and a plurality of second light elements such as LEDs and one or more associated second optical elements configured to output a second light beam having a second color temperature according to a second intensity distribution within a second solid angle. The second intensity distribution may be different from the first intensity distribution. Also, the second color temperature may be different from the first color temperature. Exemplary embodiments of such light sources are disclosed in Dutch patent application with application number NL2024571 in the name of the applicant which in included herein by reference.

According to a preferred embodiment, the light source comprises different types of light units and/or optical elements. In an example, the light source may comprise a first light unit having at least one

LED of a first color, and a second light unit having at least one LED of a second color different from said first color. In another example, the light source may comprise a first light unit associated with at least one first optical element, such as a collimating element, and a second light unit associated with at least one second optical element, such as an asymmetrical lens. More generally, each light unit in the light source may possess its own light distribution, its own light color temperature, its own light intensity, etc., and the aforementioned lighting characteristics may be controlled separately for the first light unit and for the second light unit. Such a separate control of lighting characteristics has been described in detail in PCT publication WO 2019/020366 A1 in the name of the applicant, which is included herein by reference.

According to an exemplary embodiment, the light source may comprise RGB and/or RGBW and/or RGBA LEDs and associated control circuitry for controlling the color emitted by the light source.

According to an exemplary embodiment, the luminaire head further comprises a transparent or translucent portion facing the light source. Optionally, a color filter arranged between the light source and the transparent or translucent portion. For example, the color filter may be a sheet arranged above the transparent or translucent portion. The color filter is configured to absorb a portion of the light emitted by the light source in specific wavelength ranges so as to change the color of the light emitted by the luminaire head. Preferably, the color filter is accessible by opening the luminaire head, in particular the light module. In that way, the color filter can be easily changed, e.g. when it is desirable to change the color of the emitted light for a special occasion or festivity.

According to embodiments of the invention, the luminaire head comprises a housing wherein the light source, the electrical/electronic components, and optionally the heat sink and flux exhauster are arranged. The above-mentioned transparent or translucent portion facing the light source may be part of the housing. Preferably, the transparent or translucent portion and the housing form a sealed housing. In some embodiments, the luminaire head may have an overall polyhedral shape, such as a cubic or parallelepipedal shape. In other embodiments, the luminaire head can have an overall round shape, i.e., any one or more of the components of the luminaire head may have a round shape. Thus, any one or more of the components of the luminaire head may have a polyhedral shape. Also mixed shapes are possible. This also applies to functional heads other than a luminaire head, for example the above-mentioned different types of functional heads.

According to exemplary embodiments, the luminaire head may correspond to an outdoor luminaire head, with suitable ingress protection (IP) rating such as IP66 or IP67, or to an indoor luminaire head, with suitable IP rating such as IP22-IP24 or more.

According to a second aspect of the invention, there is provided a method for assembling and closing the functional head of any one of the above-mentioned embodiments. The method comprises the following steps: coupling the cover to the head part by engaging the at least one first hinge element and the at least one second hinge element together according to a first angle comprised between 30° and 60°, preferably between 30° and 45°, rotating the cover with respect to the housing, and contacting the cover with the housing so as to close the housing. The above-mentioned first angle may correspond to the first angle defined in the first aspect of the invention.

The skilled person will understand that the hereinabove described technical considerations and advantages for the functional head embodiments of the first aspect also apply to the corresponding method embodiments of the second aspect, *mutatis mutandis*.

According to a third aspect of the invention, there is provided a method for blocking a rotation angle of the functional head of any one of the above-mentioned embodiments. The method comprises the following steps: rotating the cover with respect to the housing until reaching a second angle comprised between 45° and 120°, preferably between 60° and 95°, translating the cover with respect to the head part such that the at least one protruding portion is accommodated in the at least one slit, and contacting the at least one protruding portion with the blocking means such that the cover is blocked by the head part at said blocking angle. The above-mentioned second angle may correspond to the second angle defined in the first aspect of the invention.

The skilled person will understand that the hereinabove described technical considerations and advantages for the functional head embodiments of the first aspect also apply to the corresponding method embodiments of the third aspect, *mutatis mutandis*.

BRIEF DESCRIPTION OF THE FIGURES

This and other aspects of the present invention will now be described in more detail, with reference to the appended drawings showing a currently preferred embodiment of the invention. Like numbers refer to like features throughout the drawings.

Figures 1A-1E illustrate several perspective views and a cross-sectional view of a functional head according to an exemplary embodiment;

Figure 1F illustrates a perspective top view of a functional head according to three exemplary embodiments;

Figures 2A-2D illustrate several perspective views and a cross-sectional view of an interface between the cover and the fixation assembly of a functional head according to an exemplary embodiment;

Figures 3A-3C illustrate cross-sectional views corresponding to method steps for assembling and closing a functional head according to an exemplary embodiment;

Figures 4A and 4B illustrate cross-sectional views corresponding to method steps for blocking a rotation angle of a functional head according to an exemplary embodiment;

Figures 5A-5D respectively illustrate two alternative mechanisms for securing the cover to the housing of a functional head according to two exemplary embodiments;

Figures 6A-6C illustrate perspective views of the fixation assembly of a functional head according to an exemplary embodiment; and

Figures 7A and 7B respectively illustrate a front perspective view and a rear perspective view of the receptacle of a functional head according to an exemplary embodiment.

DESCRIPTION OF THE EMBODIMENTS

Figures 1A-1E illustrate several perspective views and a cross-section view of a functional head 10 according to an exemplary embodiment.

As illustrated in Figures 1A-1E, there is provided a functional head 10, comprising a housing 100 and a head part 200. The housing 100 is configured to accommodate a functional unit 300 (see Figure 1E). The functional unit 300 may comprise any one or more of the following: a light source 310 (see Figure 1E), an image sensing means such as a camera, a communication means such as an antenna, a sensing means such as an air quality sensor or a pollution sensor or a visibility sensor or a smoke sensor or a sound sensor (microphone) or a radio-frequency, RF, sensor or a movement sensor or a temperature sensor, a loudspeaker, a light projecting means such as a projector, a display, a laser device, a radar device, a light emitting device such as an ultraviolet (UV) light or an infrared (IR) light or a light for light fidelity (Li-Fi) communication, or a spraying/sanitizing device. In the embodiment of Figures 1A-1F, the functional unit 300 comprises a light source 310. It should be clear to the skilled person that in other embodiments, the functional unit 300 may comprise any one or more of the other components mentioned above, in addition to or as an alternative of the light source 310.

The housing 100 comprises a cover 100a provided, preferably at a rear end, with at least one first hinge element 140 (see Figure 1C) configured to enable a rotation of the cover 100a around an axis A (see Figures 1A and 1B). More details on the at least one first hinge element 140 will be provided in connection with Figures 2A-2D and 3A-3C.

The head part 200 faces the cover 100a, preferably said rear end of the cover 100a. The head part 200 comprises at least one corresponding second hinge element 240 configured to removably accommodate and cooperate with the at least one first hinge element 140 during said rotation of the cover 100a. More details on the at least one second hinge element 240 will be provided in connection with Figures 2A-2D and 3A-3C.

In the embodiment of Figures 1A-1E, the head part 200 is a fixation assembly 200 configured to fix the housing 100 to a support, such as a pole P (see Figure 1A). According to another embodiment, the head part may correspond to a fixation assembly configured to fix the housing to a ceiling or a vertical wall of a building or a room. According to yet another embodiment, the head part may correspond to a further housing of the functional head, said further housing being configured to accommodate one or more further units, such as one or more further functional units. Preferably, the further housing encloses said one or more further units. However, the further housing may also only partially surround said one or more further units. According to yet another embodiment, the further housing may be a hollow housing, i.e., the further housing may not enclose or surround any unit or component of the functional head. The above considerations also apply to the embodiments of Figures 1F-7B.

In the embodiment of Figures 1A-1E, the at least one first hinge element 140 corresponds to a hinge male element, such as a hinge pin, and the at least one second hinge element 240 corresponds to a hinge female element configured to removably accommodate and cooperate with the at least one hinge male element 140 during said rotation of the cover 100a. It should be clear to the skilled person that in other embodiments the at least one second hinge element 240 may correspond to a hinge male element, such as the above-mentioned hinge pin, and the at least one first hinge element 140 may correspond to a hinge female element configured to removably accommodate and cooperate with the at least one hinge male element 240 during said rotation of the cover 100a.

One of the cover 100a, preferably at said rear end, and the fixation assembly 200 comprises at least one protruding portion 110 (see Figures 1A, 1C, and 1D), and the other one of the cover 100a, preferably at said rear end, and the fixation assembly 200 comprises at least one corresponding slit 210 (see Figure 1C) configured to removably accommodate the at least one protruding portion 110, and a blocking means 230 (see Figure 1D) configured to block the rotation of the cover 100a at a blocking angle when the at least one slit 210 accommodates the at least one protruding portion 110. The blocking angle may be comprised between 30° and 120°, preferably between 30° and 90°. More

details on the at least one protruding portion 110, the at least one slit 210, and the blocking means 230 will be provided in connection with Figures 2A-2D, 3A-3C, and 4A-4B.

In the embodiment of Figures 1A-1E, the cover 100a comprises, preferably at said rear end, the at least one protruding portion 110, and the fixation assembly 200 comprises the at least one slit 210 and the blocking means 230. It should be clear to the skilled person that in other embodiments the fixation assembly 200 may comprise the at least one protruding portion 110, and the cover 100a may comprise, preferably at said rear end, the at least one slit 210 and the blocking means 230.

In the embodiment of Figures 1A-1E, the at least one first hinge element 140 comprises two first hinge elements 140, and the at least one second hinge element 240 comprises two second hinge elements 240. Said two first hinge elements 140 are each arranged at a respective substantially peripheral portion of the cover 100a, preferably at a respective substantially peripheral portion of the rear end of the cover 100a. Accordingly, said two second hinge elements 240 are each arranged at a respective substantially peripheral portion of the fixation assembly 200 (see Figures 1A and 1C).

It should be clear to the skilled person that in other embodiments there may be only one first hinge element 140 arranged at a substantially central portion of the cover 100a, preferably at a substantially central portion of the rear end of the cover 100a. Accordingly, there may be only one second hinge element 240 arranged at a substantially central portion of the fixation assembly 200.

In yet other embodiments, the at least one first hinge element 140 may comprise three first hinge elements 140, and the at least one second hinge element 240 may comprise three second hinge elements 240. Two of said three first hinge elements 140 may be each arranged at a respective substantially peripheral portion of the cover 100a, preferably at a respective substantially peripheral portion of the rear end of the cover 100a, and the third one of said three first hinge elements 140 may be each arranged at a respective substantially central portion of the cover 100a, preferably at a respective substantially central portion of the rear end of the cover 100a. Accordingly, two of said three second hinge elements 240 may be each arranged at a respective substantially peripheral portion of the fixation assembly 200, and the third one of said three second hinge elements 240 may be each arranged at a respective substantially central portion of the fixation assembly 200.

In the embodiment of Figures 1A-1E, the at least one protruding portion 110 is arranged at a substantially central portion of the cover 100a, preferably at a substantially central portion of the rear end of the cover 100a. Accordingly, the at least one slit 210 and the blocking means 230 are arranged at a substantially central portion of the fixation assembly 200 (see Figures 1A and 1C).

It should be clear to the skilled person that in other embodiments the at least one protruding portion 110 may comprise two protruding portions 110, the at least one slit 210 may comprises two slits 210, and the blocking means 230 may comprise two blocking elements 230. Said two protruding portions 110 may be each arranged at a respective substantially peripheral portion of the cover 100a, preferably at a respective substantially peripheral portion of the rear end of the cover 100a. Accordingly, said two slits 210 and said two blocking elements 230 may be each arranged at a respective substantially peripheral portion of the fixation assembly 200.

In yet other embodiments, the at least one protruding portion 110 may comprise three protruding portions 110, the at least one slit 210 may comprise three slits 210, and the blocking means 230 may comprise three blocking elements 230. Two of said three protruding portions 110 may be each arranged at a respective substantially peripheral portion of the cover 100a, preferably at a respective substantially peripheral portion of the rear end of the cover 100a, and the third one of said three protruding portions 110 may be each arranged at a respective substantially central portion of the cover 100a, preferably at a respective substantially central portion of the rear end of the cover 100a. Accordingly, two of said three slits 210 and two of said three blocking elements 230 may be each arranged at a respective substantially peripheral portion of the fixation assembly 200, and the third one of said three slits 210 and the third one of said three blocking elements 230 may be each arranged at a respective substantially central portion of the fixation assembly 200.

In an alternative embodiment wherein there are two first hinge elements 140, two second hinge elements 240, two protruding portions 110, two slits 210, and two blocking elements 230, each of said two protruding portions 110, each of said two slits 210, and each of said two blocking elements 230 may be arranged at a vicinity of a respective one of said two first hinge elements 140 and of a respective one of said two second hinge elements 240.

In all the above-mentioned embodiments, the at least one first hinge element 140 may extend over at least 5 %, preferably over at least 10 %, of a width W1 of the cover 100a along said axis A, preferably of a width W1 of the rear end of the cover 100a along said axis A (see Figure 1A). Accordingly, the at least one second hinge element 140 may extend over at least 5 %, preferably over at least 10 %, of a width W2 of the fixation assembly 200 along said axis A (see Figure 1A). In an embodiment wherein there is one substantially central first hinge element 140 and one corresponding substantially central second hinge element 240, said first hinge element 140 may extend over at least 10 %, preferably over at least 20 %, of said width W1, and said second hinge element 240 may extend over at least 10 %, preferably over at least 20 %, of said width W2.

In all the above-mentioned embodiments, the at least one protruding portion 110 may extend over at least 10%, preferably over at least 20%, of said width W1 (see Figure 1A). Accordingly, the at least one slit 210 and the blocking means 230 may extend over at least 10%, preferably over at least 20%, of said width W2 (see Figure 1A). In an embodiment wherein there are two substantially peripheral protruding portions 110, two substantially peripheral slits 210, and two substantially peripheral blocking elements 230, said two protruding portions 110 may extend over at least 5 %, preferably over at least 10 %, of said width W1, and said two slits 210 and two blocking elements 230 may extend over at least 5 %, preferably over at least 10 %, of said width W2.

As illustrated in Figures 1B and 1D, the housing 100 may be provided at a rear portion thereof with a through-hole H configured to accommodate an electrical wire extending through the fixation assembly 200 for feeding the electrical/electronic components arranged inside the housing 100. A cable gland G (see Figure 1D) may be provided in the through-hole H in order to accommodate the electrical wire in a water-tight manner. As illustrated in Figure 1D, the cable gland G may protrude from the through-hole H towards the fixation assembly 200. The housing 100 may comprise any one or more of the following electrical/electronic components: a light source driving means 410 (see Figures 1B and 1D), a light source dimming means, surge protection circuitry, electrostatic discharge protection circuitry, a connecting means 420 (see Figures 1B and 1D), a fuse, a metering circuitry, a driving and/or control circuitry for any electrical components of the functional unit 300. The any one or more of the electrical components may be configured to be attached to an inner surface of the cover 100a, as illustrated in Figures 1B and 1D. It should be clear to the skilled person that in other embodiments the any one or more of the electrical components may be configured to be attached to and/or arranged on a lower inner surface of the housing 100.

As illustrated in Figures 1C and 1D, the functional head 10 may further comprise a receptacle 500 arranged on an outer surface of the cover 100a, said receptacle 500 being configured to receive an external module. It should be clear to the skilled person that in other embodiments the receptacle 500 may be arranged on an outer surface of the housing 100, preferably a lower outer surface of the housing 100. More details on the receptacle 500 will be provided in connection with Figures 7A and 7B.

As illustrated in Figures 1A-1D, the fixation assembly 200 may comprise a first fixation portion 200a configured to receive and secure a pole end E (see Figure 1A), and a corresponding second fixation portion 200b configured to be attached to the housing 100 and to cooperate with said first fixation portion 200a so as to enable a rotation of the functional head 10 with respect to the pole end E. The

fixation assembly 200 may be integrally formed with the housing 100. In particular, the second fixation portion 200b may be integrally formed with the housing 100, as illustrated in Figures 1A-1D. In other embodiments, the fixation assembly 200 may be provided as a separate component of the functional head 10, and may be mechanically coupled with the housing 100, in particular with the rear end of the housing 100, using any suitable means in the art.

The first fixation portion 200a and the second fixation portion 200b may be each provided with a plurality of interengaging surfaces configured to cooperate with each other so as to enable a rotation of the second fixation portion 200b with respect to the first fixation portion 200a. More details on the fixation assembly 200 will be provided in connection with Figures 6A-6C.

As illustrated in Figure 1E, the functional unit 300 may comprise a light source 310. In other words, the functional head 10 may correspond to a luminaire head 10. The light source 310 may face a lower surface of the housing 100, and the above-mentioned electrical/electronic components, such as the light source driving means 410 and the connecting means 420, may be arranged in the housing 100 above the light source 310, and may be attached to the cover 100a. The housing 100 may comprise a light cover covering the light source 310 and configured to be releasably attached to the housing 100. The light cover may comprise a transparent or translucent portion. Optionally, a color filter may be arranged between the light source 310 and the transparent or translucent portion of the light cover. For example, the color filter may be a sheet arranged above the transparent or translucent portion. The color filter is configured to absorb a portion of the light emitted by the light source in specific wavelength ranges so as to change the color of the light emitted by the functional head 10. Preferably, the color filter is accessible by opening the functional head 10. In that way, the color filter can be easily changed, e.g. when it is desirable to change the color of the emitted light for a special occasion or festivity.

The light source 310 may comprise a light support, such as a PCB, on which a plurality of light emitting diodes (LEDs) is mounted. The LEDs may be arranged in an array of multiple columns and rows. The light source 310 may comprise RGB and/or RGBW and/or RGBA LEDs and associated control circuitry for controlling the color and/or the color temperature emitted by the light source 310. The number (e.g., 6, 12, 16, 24, 28, 36, 52, etc.) and/or the arrangement (e.g. square(s), (concentric) circle(s), etc.) of the LEDs on the light support may vary. Thus, the overall light color and/or light pattern and/or light intensity of the functional head 10 may vary.

One or more optical elements are associated with the light source 310. The one or more optical elements may comprise a plurality of lens elements associated with the plurality of LEDs, e.g.

grouped in a lens plate. However, also other types of optical elements may be additionally or alternatively present, such as reflectors, backlights, prisms, collimators, diffusors, and the like. In the context of the invention, a lens element may include any transmissive optical element that focuses or disperses light by means of refraction. It may also include any one of the following: a reflective portion, a backlight portion, a prismatic portion, a collimator portion, a diffusor portion. For example, a lens element may have a lens portion with a concave or convex surface facing a LED, or more generally a lens portion with a flat or curved surface facing the LED, and optionally a collimator portion integrally formed with said lens portion, said collimator portion being configured for collimating light transmitted through said lens portion. Also, a lens element may be provided with a reflective portion or surface or with a diffusive portion.

Thus, as illustrated in Figures 1A-1E, the functional head 10 may comprise a housing 100 wherein the light source 310, the optical elements, the electrical/electronic components, and optionally a heat sink and a flux exhauster are arranged. The above-mentioned transparent or translucent portion facing the light source 310 may be part of the housing 100. Preferably, the light cover and the housing 100 form a sealed functional head 10. A first seal may be arranged at an interface between the housing 100 and the light cover, either on the housing 100 or on the light cover. In addition, preferably the housing 100 and the cover 100a form a sealed functional head 10. A second seal may be arranged at an interface between the housing 100 and the cover 100a, either on the housing 100 or on the cover 100a. The functional head 10 may correspond to an outdoor functional head, with suitable ingress protection (IP) rating such as IP66 or IP67, or an indoor functional head, with suitable IP rating such as IP22-IP24 or more.

Figure 1F illustrates a perspective top view of a functional head 10 according to three exemplary embodiments. The functional head 10 illustrated in the top subfigure of Figure 1F corresponds to the embodiment of Figures 1A-1E. The functional heads 10 illustrated in the middle and bottom subfigures of Figure 1F corresponds to two alternative embodiments.

In the embodiments of Figure 1F, the housing 100 has an overall substantially parallelepipedal shape. In other embodiments, the housing 100 may have an overall round shape. Also mixed shapes are possible. The housing 100 may comprise a front portion wherein the functional unit 300 is arranged, and a rear portion wherein the above-mentioned electrical/electronic components are arranged.

In the embodiments of Figure 1F, the functional unit 300 comprises a light source 310. The front portion of the housing 100, wherein the light source 310 is arranged, may be substantially flat, and may be provided with a heat sink on an upper outer surface thereof. The heat sink may comprise a

plurality of cooling fins. The rear portion of the housing 100 may be substantially thicker than the front portion, to enclose the above-mentioned electrical/electronic components. A height of the rear portion may be at least twice a height of the front portion, preferably at least three times said height, more preferably at least four times said height. The cover 100a may be configured to cover only said rear portion, as illustrated in Figure 1F. In other embodiments, the cover 100a may be configured to cover both front and rear portions. In such other embodiments, the front portion and the rear portion may have substantially the same height.

In the embodiment of the middle subfigure of Figure 1F, the front portion is longer than the front portion in the embodiment of the top subfigure of Figure 1F. Thus, the light source 310 in the embodiment of the middle subfigure of Figure 1F covers more surface than the light source 310 in the embodiment of the top subfigure of Figure 1F, e.g. covers a surface which is substantially twice the surface in the top subfigure of Figure 1F. For example, in the embodiment of the middle subfigure of Figure 1F the functional unit 300 may comprise a further light source, or a light source comprising substantially twice the amount of LEDs compared to the embodiment of the top subfigure of Figure 1F. Accordingly, the front portion of the housing 100 may be provided with a further heat sink on an upper outer surface thereof. Besides, the rear portion may be substantially the same in the embodiments of the top and middle subfigures of Figure 1F.

In the embodiment of the bottom subfigure of Figure 1F, the housing 100 may have a substantially square shape, wherein a length of the housing 100 is substantially equal to a width of the housing 100, whereas in the in the embodiments of the top and middle subfigures of Figure 1F the housing 100 has a substantially rectangular shape, wherein a length of the housing 100 is substantially larger than a width of the housing 100. In the bottom subfigure of Figure 1F, a width of the housing 100 is substantially larger than a width of the housing 100 in the top and middle subfigures. Besides, in the bottom subfigure of Figure 1F, a length of the rear portion is substantially smaller than a length of the rear portion in the top and middle subfigures. Also, the heat sink may cover substantially the entire surface of an upper outer surface of the front portion.

In the embodiments of Figure 1F, the functional head 10 comprises the same fixation assembly 200. In other words, the same fixation assembly 200 may be used irrespective of the shape and dimensions of the housing 100.

Figures 2A-2D illustrate several perspective views and a cross-sectional view of an interface between the cover 100a and the fixation assembly 200 of a functional head 10 according to an exemplary

embodiment. Figure 2B illustrates an enlarged view of the interface illustrated in Figure 2A. The embodiment of Figures 2A-2D may correspond to the embodiment of Figures 1A-1F.

As illustrated in Figures 2A-2D, the cover 100a is provided, preferably at a rear end, with two first hinge elements 140 configured to enable a rotation of the cover 100a around an axis A. The two first hinge elements 140 may protrude from the rear end of the cover 100a in the direction of the axis A. The two first hinge elements 140 may be shaped as two pins extending from two respective lateral walls of the rear end of the cover 100a, on either side of said rear end. In other words, the two first hinge elements 140 may correspond to two hinge male portions, each arranged at a respective substantially peripheral portion of said rear end. The two first hinge elements 140 may have a non-rotational symmetric cross-section, preferably an elongated cross-section, such as an elliptical cross-section, or a rectangular cross-section with rounded edges as illustrated in Figure 2C. Each of the two first hinge elements 140 may extend over at least 5 %, preferably over at least 10 %, of a width W1 of the rear end of the cover 100a along said axis A (see Figure 2A).

As illustrated in Figures 2A-2D, the fixation assembly 200 comprises two corresponding second hinge elements 240 configured to removably accommodate and cooperate with the two first hinge elements 140 during said rotation of the cover 100a. The two second hinge elements 240 may be formed on two respective lateral walls of the fixation assembly 200, on either side of said fixation assembly 200. In other words, the two second hinge elements 240 may correspond to two hinge female portions, each arranged at a respective substantially peripheral portion of said fixation assembly 200. The two second hinge elements 240 may have a non-rotational symmetric cross-section configured to cooperate with the above-mentioned non-rotational symmetric cross-section of the two first hinge elements 140, preferably an elongated cross-section, such as an elliptical cross-section, or a rectangular cross-section with rounded edges as illustrated in Figures 2B and 2C. Each of the two second hinge elements 240 may extend over at least 5 %, preferably over at least 10 %, of a width W2 of the fixation assembly 200 along said axis A (see Figure 2A).

As illustrated in Figures 2A-2D, the fixation assembly 200 may comprise a first fixation portion (not shown; see first fixation portion 200a in Figures 1A and 1C) configured to receive and secure a pole end (not shown; see pole end E in Figure 1A), and a corresponding second fixation portion 200b configured to be attached to the housing 100 and to cooperate with said first fixation portion so as to enable a rotation of the functional head 10 with respect to the pole end. The second fixation portion 200b may have two, spaced apart, lateral walls which are joined by a third wall extending between said two lateral walls. The third wall of the second fixation portion 200b may have a curved surface so as to accommodate and cooperate with said first fixation portion. The two second hinge elements

240 may be formed on said two respective lateral walls of the second fixation portion 200b, on either side thereof. The third wall may be integrally formed with said two lateral walls, as best illustrated in Figure 2B. In other embodiments, the third wall may be provided as a separate component of the second fixation portion 200b, and may be mechanically coupled with said two lateral walls of the second fixation portion 200b using any suitable means in the art.

As illustrated in Figures 2A-2D, the cover 100a comprises, preferably at said rear end, one protruding portion 110. The protruding portion 110 may have a hook cross-section, as best illustrated in Figures 2C and 2D. The protruding portion 110 may be arranged at a substantially central portion of the rear end of the cover 100a. The protruding portion 110 may extend over at least 10%, preferably over at least 20%, of a width W1 of the rear end of the cover 100a along said axis A (see Figure 2A).

As illustrated in Figures 2A-2D, the fixation assembly 200 comprises one corresponding slit 210 configured to removably accommodate the protruding portion 110, and a blocking means 230 configured to block the rotation of the cover 100a at a blocking angle when the slit 210 accommodates the protruding portion 110. The blocking means 230 may have a cross-section configured to cooperate with the hook cross-section of the protruding portion 110, preferably an arc cross-section, as best illustrated in Figures 2C and 2D. The slit 210 and the blocking means 230 may be arranged at a substantially central portion of the fixation assembly 200, in particular at a substantially central portion of the second fixation portion 200b. The slit 210 and the blocking means 230 may extend over at least 10%, preferably over at least 20%, of a width W2 of the fixation assembly 200 along said axis A (see Figure 2A).

As illustrated in Figures 2A-2C, the two first hinge elements 140 are configured to be engaged into the two second hinge elements 240 according to a first angle comprised between 30° and 60°, preferably between 30° and 45°. Said first angle is defined between the cover 100a and the housing 100, in particular between a first plane defined by the cover 100a and a second plane defined by the housing 100. As best illustrated in Figure 2C, the first angle may substantially correspond to 30°. The two second hinge elements 240 may each comprise an opening which enables the two first hinge elements 140 to be engaged into the two second hinge elements 240 according to the first angle. As best illustrated in Figure 2C, a longitudinal axis A1 of the two first hinge elements 140 may not be aligned with a longitudinal axis A2 of the cover 100a, i.e., an angle between said longitudinal axes A1, A2 may be different from 0°. Said angle between said longitudinal axes A1, A2 may correspond to said first angle, such that the two first hinge elements 140 may be engaged into the two second hinge elements 240 according to said first angle. Figures 2A-2C illustrate the cover 100a in an intermediate open position with respect to the housing 100, at said first angle.

As illustrated in Figure 2D, the cover 100a is in a closed position with respect to the housing 100, i.e., at an angle of substantially 0°. Thus, the cover 100a may be configured to be rotated with respect to the housing 100 to contact the cover 100a with the housing 100 so as to close the housing 100. The two first hinge elements 140 and the two second hinge elements 240 may be configured and shaped such that, when the cover 100a is in a closed position with respect to the housing 100 as illustrated in Figure 2D, the cover 100a cannot be removed from the housing 100 by simply translating the cover 100a parallel to the housing 100 towards a front end of the housing 100. Indeed, as best understood from Figure 2C, when the cover 100a is in a closed position with respect to the housing 100, the two first hinge elements 140 would abut against an inner surface of the two second hinge elements 240 if the cover 100a were translated parallel to the housing 100, thereby preventing the cover 100a from being removed from the housing 100 in said closed position. The above-mentioned angle between said longitudinal axes A1, A2, which may correspond to said first angle, may enable to achieve the above-mentioned effect.

Figures 3A-3C illustrate cross-sectional views corresponding to method steps for assembling and closing a functional head 10 according to an exemplary embodiment. The embodiment of Figures 3A-3C may correspond to the embodiments of Figures 1A-1F and 2A-2D.

As illustrated in Figures 3A-3C, the method for assembling and closing the functional head 10 comprises the following steps: coupling the cover 100a to the fixation assembly 200 by engaging the two first hinge elements 140 into the two second hinge elements 240 according to a first angle comprised between 30° and 60°, preferably between 30° and 45° (see Figure 3A), rotating the cover 100a with respect to the housing 100 (see Figure 3B), and contacting the cover 100a with the housing 100 so as to close the housing 100 (see Figure 3C).

As illustrated in Figures 3A-3C, the two first hinge elements 140 and the two second hinge elements 240 are configured and shaped such that the two first hinge elements 140 are enabled to translate within the two second hinge elements 240 during the rotation of the cover 100a with respect to the housing 100. Indeed, the two first hinge elements 140 are configured to be engaged into the two second hinge elements 240 via two openings provided to a lower portion of the two second hinge elements 240 (see Figure 3A), then are configured to translate within the two second hinge elements 240 during the rotation of the cover 100a with respect to the housing 100 (see Figure 3B) towards an upper portion of the two second hinge elements 240 (see Figure 3C).

Reversely, a method for opening and disassembling the functional head 10 comprises the following steps: lifting the cover 100a from the housing 100 so as to open the housing 100, rotating the cover 100a with respect to the housing 100, and decoupling the cover 100a from the fixation assembly 200 by disengaging the two first hinge elements 140 from the two second hinge elements 240 according to a first angle comprised between 30° and 60°, preferably between 30° and 45°.

Figures 4A and 4B illustrate cross-sectional views corresponding to method steps for blocking a rotation angle of a functional head according to an exemplary embodiment. The embodiment of Figures 4A and 4B may correspond to the embodiments of Figures 1A-1F, 2A-2D, and 3A-3C.

As illustrated in Figures 4A and 4B, the cover 100a comprises one protruding portion 110 and the fixation assembly 200 comprises one corresponding slit 210 and a blocking means 230. The method for blocking a rotation angle of the functional head 10 comprises the following steps: rotating the cover 100a with respect to the housing 100 until reaching a second angle comprised between 45° and 120°, preferably between 60° and 90° (Figure 4A), translating the cover 100a with respect to the fixation assembly 200 such that the protruding portion 110 is accommodated in the slit 210 (Figure 4B), and contacting the protruding portion 110 with the blocking means 230 such that the cover 100a is blocked by the fixation assembly 200 at said blocking angle (derived from Figure 4B). Said blocking angle may be comprised between 30° and 120°, preferably between 30° and 90°.

Said second angle is defined between the cover 100a and the housing 100, in particular between a first plane defined by the cover 100a and a second plane defined by the housing 100. As illustrated in Figures 4A and 4B, the second angle may substantially correspond to 90°. Likewise, said blocking angle is defined between the cover 100a and the housing 100, in particular between a first plane defined by the cover 100a and a second plane defined by the housing 100.

Although not illustrated in Figures 4A and 4B, by further rotating the cover 100a with respect to the housing 100 towards the housing 100, the blocking means 230 will block the cover 100a at said blocking angle. The protruding portion 110 may have a hook cross-section, and the blocking means 230 may have a cross-section configured to cooperate with said hook cross-section, preferably an arc cross-section as illustrated in Figures 4A and 4B. The hook-shaped protruding portion 110 is configured to contact the arc-shaped blocking means 230 such that the blocking means 230 blocks the cover 100a at said blocking angle.

As illustrated in Figures 4A and 4B, the two first hinge elements 140 and the two second hinge elements 240 may be configured to further enable a translation of the cover 100a with respect to the

fixation assembly 200. Indeed, from Figure 4A to Figure 4B, the cover 100a may be translated with respect to the fixation assembly 200 through the slit 210. The protruding portion 110 and the slit 210 may be configured to enable said translation of the cover 100a. The protruding portion 110 may be configured to fall, i.e., through the action of gravity due to its own weight, through the slit 210, so as to enable a translation of the cover 100a with respect to the fixation assembly 200.

Reversely, a method for unblocking a rotation angle of the functional head 10 comprises the following steps: moving the protruding portion 110 from the blocking means 230 such that the cover 100a is unblocked from the fixation assembly 200 at an unblocking angle corresponding to said blocking angle, translating the cover 100a with respect to the fixation assembly 200 such that the protruding portion 110 is no longer accommodated in the slit 210, and rotating the cover 100a with respect to the housing 100 from said second angle comprised between 45° and 120°, preferably between 60° and 90°, to a third angle different from said second angle. Said unblocking angle may be comprised between 30° and 120°, preferably between 30° and 90°. Said third angle is defined between the cover 100a and the housing 100, in particular between a first plane defined by the cover 100a and a second plane defined by the housing 100. Said third angle may be smaller than said second angle. For example, said third angle may be substantially 0°, in order to contact the cover 100a with the housing 100 so as to close the housing 100. Alternatively, said third angle may be larger than said second angle, such that the cover 100a rests in equilibrium on an outer surface of the fixation assembly 200, in particular of the second fixation portion 200b, as illustrated in Figure 1B. In that case, said third angle may be comprised between 90° and 120°, preferably between 100° and 110°, for example 105°. Although the cover 100a may rest in equilibrium on an outer surface of the fixation assembly 200 at said third angle, it is noted that the cover 100a is not blocked by any means in the configuration illustrated in Figure 1B, and thus that the cover 100a may then freely rotate with respect to the housing 100 towards the housing 100.

Figures 5A-5D respectively illustrate two alternative mechanisms for securing the cover 100a to the housing 100 of a functional head 10 according to two exemplary embodiments. The embodiments of Figures 5A-5D may correspond to the embodiments of Figures 1A-1F, 2A-2D, 3A-3C, and 4A-4B. Said two alternative mechanisms are further visible in Figures 1A-1C and 1F.

As illustrated in Figures 5A-5D, both mechanisms are arranged at a front end of the housing 100, on either side of the housing 100. When the cover 100a is in a closed position with respect to the housing 100, as described above in connection with Figures 2D and 3C, the cover 100a may simply contact the housing 100, i.e., may rest on the housing 100, without being secured to the housing 100. Accordingly, said two mechanisms may enable to secure the cover 100a to the housing 100.

Optionally, a mechanism as described in detail in PCT publication WO 2019/115443 A1 in the name of the applicant, which is included herein by reference, may be used in the present invention.

As illustrated in Figures 5A and 5B, the first mechanism comprises two spring elements 120 for securing the cover 100a to the housing 100, one arranged on each side of the front end of the housing 100, as illustrated in Figures 1A-1C and 1F. Only one of the two spring elements 120 is illustrated in Figures 5A and 5B. The spring element 120 may be arranged in a cavity 130 defined in the cover 100a, and may be fastened to a lower wall 130a of said cavity 130, e.g. using a first screw as illustrated in Figure 5B. In other embodiments, the spring element 120 may be integrally formed with the cavity 130, in particular with the lower wall 130a. Said lower wall 130a may be part of the housing 100 (see Figure 5B).

The spring element 120 may be shaped as a zigzag, i.e., may have a plurality of segments 120a-120d connected to each other via elbows, and may contact, at one segment 120c thereof, an upper wall 130b of the cavity 130, as illustrated in Figure 5B. Said upper wall 130b may be part of the cover 100a (see Figure 5B). The spring element 120 may exert a restoring force such that the cover 100a is secured to the housing 100 due to the contact of the segment 120c of the spring element 120 with the upper wall 130b of the cavity 130. To open the cover 100a, the spring element 120, in particular the segment 120d, can be pushed towards the front end of the housing 100 so as to move the segment 120c from the upper wall 130b and free the cover 100a. The spring element 120 may be coated with a layer of plastic in order to avoid corrosion of the spring element 120, in particular of the segment 120c, due to rain or snow falling into the cavity 130, and to avoid wearing off the paint when closing the cover 100a. In another embodiment, the spring element 120 may be covered by an injected plastic cover piece in order to avoid contact corrosion and to avoid wearing off the paint when closing the cover 100a. In yet other embodiments, the spring element 120 may be coated with a layer of a material different from plastic, or may be covered by a cover piece of a material different from injected plastic, said different material enabling to achieve the same above-mentioned effects.

Thus, the first mechanism corresponds to a tool-less mechanism for securing the cover 100a to the housing 100. Optionally, if needed, a second screw may extend through the upper wall 130b of the cavity 130 and in the housing 100 in order to further fasten the cover 100a to the housing 100.

Compared to the first mechanism illustrated in Figures 5A and 5B, as illustrated in Figures 5C and 5D, the second mechanism involves the same cavities 130 on either side of the front end of the housing 100, but does not correspond to a tool-less mechanism as it does not comprise the above-mentioned spring elements 120. Instead, the second mechanism comprises two screws 120', each

extending through the upper wall 130b of a respective cavity 130 and in the housing 100 in order to fasten the cover 100a to the housing 100, as illustrated in Figure 5D. Only one of the two screws 120' is illustrated in Figures 5A and 5B. Optionally, another screw or a cap may be provided to the lower wall 130a of the cavity 130 so as to cover the hole visible in Figures 5B and 5D. Said hole may be present in the housing 100, whether the above first or the second mechanism is used, such that the same housing 100 and the same cover 100a may be used independently of the mechanism chosen to secure the cover 100a to the housing 100.

Figures 6A-6C illustrate perspective views of the fixation assembly 200 of a functional head 10 according to an exemplary embodiment. The embodiments of Figures 6A-6C may correspond to the embodiments of Figures 1A-1F, 2A-2D, 3A-3C, 4A-4B, and 5A-5D.

As illustrated in Figures 6A-6C, the fixation assembly 200 may comprise a first fixation portion 200a configured to receive and secure a pole end E (not shown; see pole end E in Figure 1A), and a corresponding second fixation portion 200b configured to be attached to the housing 100 and to cooperate with said first fixation portion 200a so as to enable a rotation of the functional head 10 with respect to the pole end. The fixation assembly 200 may be integrally formed with the housing 100. In particular, the second fixation portion 200b may be integrally formed with the housing 100, as illustrated in Figure 6A. In other embodiments, the fixation assembly 200 may be provided as a separate component of the functional head 10, and may be mechanically coupled with the housing 100, in particular with the rear end of the housing 100, using any suitable means in the art.

The first fixation portion 200a and the second fixation portion 200b may be each provided with a plurality of interengaging surfaces configured to cooperate with each other so as to enable a rotation of the second fixation portion 200b with respect to the first fixation portion 200a. Such a tiltable fixation assembly has been described in detail in PCT publication WO 2020/144191 A1 in the name of the applicant, which is included herein by reference.

As illustrated in Figures 6A and 6B, the first fixation portion 200a may comprise a fixation member 211a provided with an outer cylindrical surface section having an axis and opposing bearings 212a, 213a aligned with said axis, said outer cylindrical surface section being provided with a plurality of first interengaging surfaces 214a. The second fixation portion 200b may comprise a fixation housing 211b provided with a pair of axially-aligned receiving surfaces 212b, 213b, and an inner cylindrical surface provided with a plurality of second interengaging surfaces 214b configured to interengage the plurality of first interengaging surfaces 214a. The fixation member 211a of the first fixation portion 200a may be configured for being housed within the fixation housing 211b of the second

fixation portion 200b, and the axis of the pair of axially-aligned bearings 212a, 213a may be substantially parallel to the axis of the pair of axially-aligned receiving surfaces 212b, 213b.

As illustrated in Figures 6A and 6B, the fixation assembly 200 may further comprise a first and second shaft portions 215, 216 extending in alignment with the pair of axially-aligned bearings 212a, 213a, such that a pivot axis PA may be defined. The fixation assembly 200 may further comprise a fixation means 217, 218 configured for fixing the first and second shaft portions 215, 216 to the second fixation portion 200b, enabling the engagement of at least a portion of the plurality of first interengaging surfaces 214a with at least a portion of the plurality of second interengaging surfaces 214b, and enabling the release of said engagement such that a rotation movement of the fixation housing 211b relative to the fixation member 211a is enabled with respect to the pivot axis PA defined by the first and second shaft portions 215, 216. The plurality of first and second interengaging surfaces 214a, 214b may be a plurality of first and second interengaging teeth, respectively, as illustrated in Figures 6A-6C with respect to the plurality of first interengaging surfaces 214a and in Figures 3A-3C with respect to the plurality of second interengaging surfaces 214b.

As illustrated in Figures 6A and 6B, a first and second shafts may comprise the first and second shaft portions 215, 216, respectively. In other words, the first shaft portion 215 and the second shaft portion 216 may be separate elements. In other embodiments, a single shaft may comprise the first and second shaft portions 215, 216. In other words, the first shaft portion 215 and the second shaft portion 216 may form a single shaft.

As illustrated in Figure 6C, the fixation assembly 200 may further comprise a means for indicating an inclination angle of the functional head 10 with respect to a horizontal direction. The first fixation portion 200a may comprise a plurality of markings 219a on an upper outer surface thereof, for example next to said plurality of first interengaging surfaces 214a, said markings 219a corresponding to a plurality of values of said inclination angle. Accordingly, the second fixation portion 200b may be provided with an aperture 219b on an upper surface thereof, said aperture 219b being configured to indicate the current value of said inclination angle.

Figures 7A and 7B respectively illustrate a front perspective view and a rear perspective view of the receptacle 500 of a functional head 10 according to an exemplary embodiment.

As illustrated in Figures 7A and 7B, the functional head 10 may further comprise a receptacle 500 arranged on an outer surface of the cover 100a, said receptacle 500 being configured to receive an

external module. It should be clear to the skilled person that in other embodiments the receptacle 500 may be arranged on an outer surface of the housing 100, preferably a lower outer surface of the housing 100. The external module may comprise different functionalities, such as control functionalities and/or sensing functionalities and/or communication functionalities. Preferably, the receptacle 500, also called a socket, is a NEMA receptacle 500, and the external module is a control module configured to be plugged in such receptacle 500. The receptacle 500 and the control module may be configured to be coupled through a twist-lock mechanism, e.g. as described in the above-mentioned ANSI C136.10-2017 standard or ANSI C136.41-2013 standard.

As illustrated in Figures 7A and 7B, the receptacle 500 may have a housing comprising a substantially cylindrical front portion 501 at a front side of the receptacle 500 (see Figure 7A), and a rear portion 502 protruding rearwardly at a rear side of the substantially cylindrical front portion 501 (see Figure 7B) and configured to extend through an opening in the housing 100, preferably an opening in an upper wall of the housing 100 (not shown; see Figures 1C and 1D). The receptacle 500 may house a plurality of receptacle contacts 510a-g. Each receptacle contact 510a-g may be provided, at a front end, with a front contact portion 511a-g configured for being electrically connected with a contact of the external module. Each receptacle contact 510a-g may be provided, at a rear end, with a wire receiving contact portion 512a-g fixing a wire end of a wire (not shown) to be connected to components of the functional head 10. A receptacle contact of said plurality of receptacle contacts 510a-g may be provided, at said rear end, with one wire or with two or more wires. As illustrated in Figure 7B, the receptacle 500 is provided, at a rear end, with seven wire receiving contact portions 512a-g, respectively fixing wire ends of seven wires (not shown) to be connected to components of the functional head 10. The receptacle 500 as illustrated in Figures 7A and 7B may fulfil the requirements of the ANSI C136.41-2013 standard. In another embodiment, the receptacle may be a Zhaga receptacle fulfilling the requirements of the Zhaga Interface Specification Standard (Book 18, Edition 1.0, July 2018, see https://www.zhagastandard.org/data/downloadables/1/0/8/1/book_18.pdf), and the external module may be a control module configured to be plugged in such receptacle.

As illustrated in Figures 7A and 7B, the plurality of receptacle contacts 510a-g may comprise at least two receptacle contacts for carrying power signals and/or one or more receptacle contacts for carrying data or control signals and/or one or more receptacle contacts for carrying both power signals and data or control signals. In the embodiment of Figures 7A and 7B, the receptacle contacts 510a-c may be for carrying power signals, and the receptacle contacts 510d-g may be for carrying data or control signals. Thus, the plurality of receptacle contacts 510a-g may comprise a plurality of first receptacle contacts 510a-c and a plurality of second receptacle contacts 510d-g. Seen in a radial

direction around a central axis of the receptacle 500, the plurality of second receptacle contacts 510d-g may be positioned further away from the central axis than the plurality of first receptacle contacts 510a-c. The plurality of second receptacle contacts 510d-g may extend in an axial direction, substantially along a first (virtual) cylindrical surface around the central axis, and the plurality of first receptacle contacts 510a-c may extend in an axial direction, substantially along a second (virtual) cylindrical surface around the central axis, said second cylindrical surface having a smaller diameter than said first cylindrical surface.

In the embodiment of Figures 7A and 7B, said plurality of wire receiving contact portions 512a-g may correspond to a plurality of poke-in or push-in connectors for receiving and fastening in a tool-less manner the wire ends of said plurality of wires, for example of said three wires carrying power signals. Said plurality of wire receiving contact portions 512a-g may enable to fasten in a tool-less manner the wire ends of the plurality of wires, for example of the three wires carrying power signals. Thus, said plurality of wire ends, for example said three power wire ends, may be inserted into the corresponding plurality of wire receiving contact portions 512a-g without needing to use screws or the like. The rear portion 502 may further comprise a plurality of releasable securing elements (not shown in Figures 7A and 7B) configured to cooperate with the plurality of wire receiving contact portions 512a-g. For example, each releasable securing element may be arranged at a vicinity of a corresponding wire receiving contact portion 512-a-g. For example, the rear portion 502 may further comprise three releasable securing elements, each arranged at a vicinity of a corresponding wire receiving contact portion 512a-c of each first receptacle contact 510a-c. Together with said plurality of wire receiving contact portions 512a-g, said plurality of releasable securing elements may enable to fasten and to release in a tool-less manner the wire ends of the plurality of wires.

Whilst the principles of the invention have been set out above in connection with specific embodiments, it is to be understood that this description is merely made by way of example and not as a limitation of the scope of protection which is determined by the appended claims.

CONCLUSIES

1. Een functionele kop (10), omvattende:
een behuizing (100) geconfigureerd om een functionele eenheid (300) op te nemen, waarbij de behuizing (100) een deksel (100a) omvat dat aan de achterrand daarvan is voorzien met ten minste één eerste scharnierelement (140) geconfigureerd om een rotatie van het deksel (100a) rond een as (A) mogelijk te maken; en
een kopdeel (200) gericht naar het deksel (100a), waarbij het kopdeel (200) ten minste één overeenkomstig tweede scharnierelement (240) omvat dat is geconfigureerd om het ten minste één eerste scharnierelement (140) verwijderbaar op te nemen en om daarmee samen te werken gedurende de rotatie van het deksel (100a);
waarbij één van het deksel (100a), bij voorkeur aan de achterrand daarvan, en het kopdeel (200) ten minste één uitstekend gedeelte (110) omvat; en
waarbij de andere van het deksel (100a), bij voorkeur aan de achterrand daarvan, en het kopdeel (200) ten minste één overeenkomstige sleuf (210) geconfigureerd om het ten minste één uitstekende gedeelte (110) verwijderbaar op te nemen omvat, en een blokkeermiddel (230) geconfigureerd om de rotatie van het deksel (100a) op een blokkeerhoek te blokkeren wanneer de ten minste één sleuf (210) het ten minste één uitstekende gedeelte (110) opneemt, omvat.

2. De functionele kop volgens conclusie 1, waarbij het kopgedeelte (200) een bevestigingssamenstel (200) is, dat gericht is naar het deksel (100a), bij voorkeur naar de achterrand daarvan, en is geconfigureerd om de behuizing (100) aan een steun, zoals een paal (P) te bevestigen.

3. De functionele kop volgens conclusie 1 of 2, waarbij de functionele eenheid (300) één of meer van de volgende omvat: een lichtbron (310), een beeldsensormiddel zoals een camera, een communicatiemiddel zoals een antenna, een sensormiddel zoals een luchtkwaliteitsensor of een rooksensor of een microfoon of een radiofrequentie, RF, sensor of een luidspreker of een lichtprojectiemiddel zoals een projector, een beeldscherm, of een laserinrichting.

4. De functionele kop volgens één der voorgaande conclusies, waarbij de blokkeerhoek tussen 30° en 120°, bij voorkeur tussen 30° en 90°, is.

5. De functionele kop volgens één der voorgaande conclusies, waarbij het ten minste één eerste scharnierelement (140) en het ten minste één tweede scharnierelement (240) zijn

geconfigureerd om een translatie van het deksel (100a) ten opzichte van het kopgedeelte (200) mogelijk te maken.

6. De functionele kop volgens één der voorgaande conclusies, waarbij het ten minste één eerste scharnierelement (140) een niet-rotatiesymmetrische doorsnede, bij voorkeur een langwerpige doorsnede, heeft, en waarbij het ten minste één tweede scharnierelement (240) een niet-rotatiesymmetrische doorsnede heeft die geconfigureerd is om met de voorgenoemde niet-rotatiesymmetrische doorsnede, bij voorkeur de langwerpige doorsnede, samen te werken.

7. De functionele kop volgens één der voorgaande conclusies, waarbij het ten minste één uitstekende gedeelte (110) en de ten minste één sleuf (210) zijn geconfigureerd om een translatie van het deksel (100a) ten opzichte van het kopgedeelte (200) mogelijk te maken.

8. De functionele kop volgens één der voorgaande conclusies, waarbij het deksel (100a) het ten minste één uitstekende gedeelte (110) omvat en het kopgedeelte (200) de ten minste één sleuf (210) omvat, waarbij het ten minste één uitstekende gedeelte (110) is geconfigureerd om doorheen de ten minste één sleuf (210) te vallen, zodat een in hoofdzaak verticale translatie van het deksel (100a) ten opzichte van het kopgedeelte (200) mogelijk is gemaakt.

9. De functionele kop volgens één der voorgaande conclusies, waarbij het ten minste één uitstekende gedeelte (110) een haakvormige doorsnede heeft, en het blokkeermiddel (230) een doorsnede geconfigureerd om met de haakvormige doorsnede samen te werken heeft, bij voorkeur een boogvormige doorsnede.

10. De functionele kop volgens één der voorgaande conclusies, waarbij één van het ten minste één eerste scharnierelement (140) en het ten minste één tweede scharnierelement (240) is geconfigureerd om in de andere van het ten minste één eerste scharnierelement (140) en het ten minste tweede scharnierelement (240) te grijpen volgens een eerste hoek tussen 30° en 60°, bij voorkeur tussen 30° en 45°.

11. De functionele kop volgens één der voorgaande conclusies, waarbij het ten minste één eerste scharnierelement (140) en het ten minste één tweede scharnierelement (240) zo zijn geconfigureerd dat het deksel (100a) kan worden geroteerd ten opzichte van de behuizing (100) tot een tweede hoek tussen 45° en 120°, bij voorkeur tussen 60° en 90°, en zo kan

worden getranslateerd ten opzichte van het kopgedeelte (200) dat het ten minste één uitstekende gedeelte (110) in de ten minste één sleuf (210) is opgenomen.

12. De functionele kop volgens één der voorgaande conclusies, waarbij het ten minste één eerste scharnierelement (140) twee eerste scharnierelementen (140) omvat, en het ten minste één tweede scharnierelement (240) twee tweede scharnierelementen (240) omvat;
waarbij de twee eerste scharnierelementen (140) elk aan een respectief in hoofdzaak perifeer gedeelte van het deksel (100a) zijn aangebracht, bij voorkeur aan een respectief in hoofdzaak perifeer gedeelte van de achterrand van het deksel (100a).

13. De functionele kop volgens één der voorgaande conclusies, waarbij het ten minste één eerste scharnierelement (140) aan een in hoofdzaak centraal gedeelte van het deksel (100a) is aangebracht, bij voorkeur aan een in hoofdzaak centraal gedeelte van de achterrand van het deksel (100a).

14. De functionele kop volgens één der voorgaande conclusies, waarbij of het ten minste één uitstekende gedeelte (110), of de ten minste één sleuf (210) en het blokkeermiddel (230), aan een in hoofdzaak centraal gedeelte van het deksel (100a) is aangebracht, bij voorkeur aan een in hoofdzaak centraal gedeelte van de achterrand van het deksel (100a).

15. De functionele kop volgens één der voorgaande conclusies, waarbij het ten minste één uitstekende gedeelte (110) twee uitstekende gedeelten (110) omvat, waarbij het ten minste één sleuf (210) twee sleuven (210) omvat, en waarbij het blokkeermiddel (230) twee blokkeerelementen (230) omvat;
waarbij, bij voorkeur, of de twee uitstekende gedeelten (110), of de twee sleuven (210) en de twee blokkeerelementen (230), elk aan een respectief in hoofdzaak perifeer gedeelte van het deksel (100a) zijn aangebracht, bij voorkeur aan een respectief in hoofdzaak perifeer gedeelte van de achterrand van het deksel (100a).

16. De functionele kop volgens conclusies 12 en 15, waarbij elk van de twee uitstekende gedeelten (110), elk van de twee sleuven (210) en elk van de twee blokkeerelementen (230) nabij een respectievelijk element van de twee eerste scharnierelementen (140) en nabij een respectievelijk element van de twee tweede scharnierelementen (240) zijn aangebracht.

17. De functionele kop volgens één der voorgaande conclusies, waarbij het ten minste één eerste scharnierelement (140) zich over ten minste 5%, bij voorkeur over ten minste 10%, van een

breedte (W1) van het deksel (100a) langs de as (A), bij voorkeur van een breedte (W1) van de achterrand van het deksel (100a) langs de as (A), uitstrekt.

18. De functionele kop volgens één der voorgaande conclusies, waarbij of het ten minste één uitstekende gedeelte (110), of de ten minste één sleuf (210) en het blokkeermiddel (230), zich over ten minste 10%, bij voorkeur over ten minste 20%, van een breedte (W1) van het deksel (100a) langs de as (A), bij voorkeur van een breedte (W1) van de achterrand van het deksel (100a) langs de as (A), uitstrekt.

19. De functionele kop volgens één der voorgaande conclusies, waarbij de behuizing (100), bij voorkeur aan een achterrand gedeelte daarvan, van een doorstekend gat (H) is voorzien, dat is geconfigureerd om een elektrisch draad die zich door het kopgedeelte (200) uitstrekt, te accommoderen.

20. De functionele kop volgens één der voorgaande conclusies, waarbij de behuizing (100) één of meer van de volgende elektrische componenten omvat: een lichtbronaandrijfmiddel (410), een lichtbrondimmiddel, een overspanningsbeveiligingscircuit, elektrostatischeontlading beveiligingscircuit, een verbindingsmiddel (420), een zekering, een meetcircuit, een aandrijf en/of controlcircuit voor één van de elektrische componenten van de functionele eenheid (300).

21. De functionele kop volgens conclusie 20, waarbij de één of meer elektrische componenten zijn geconfigureerd om aan een binnenoppervlak van het deksel (100a) bevestigd te worden.

22. De functionele kop volgens één der voorgaande conclusies, verder omvattende een contactdoos (500) aan een buitenoppervlak van het deksel (100a) is aangebracht, waarbij de contactdoos (500) is geconfigureerd om een externe module te ontvangen.

23. De functionele kop volgens conclusie 2, optioneel in combinatie met één der voorgaande conclusies, waarbij het bevestigingssamenstel (200) een eerste bevestigingsgedeelte (200a) geconfigureerd om een paaluiteinde (E) te ontvangen en te bevestigen, en een overeenkomstig tweede bevestigingsgedeelte (200b) geconfigureerd om aan de behuizing (100) te worden bevestigd en om met het eerste bevestigingsgedeelte (200a) zo samen te werken dat een rotatie van de functionele kop (10) ten opzichte van het paaluiteinde (E) mogelijk wordt gemaakt, omvat.

24. De functionele kop volgens conclusie 23, waarbij het eerste bevestigingsgedeelte (200a) en het tweede bevestigingsgedeelte (200b) elk van een aantal met elkaar gekoppelde oppervlakken zijn voorzien die zijn geconfigureerd om zo met elkaar samen te werken dat een rotatie van het tweede bevestigingsgedeelte (200b) ten opzichte van het eerste bevestigingsgedeelte (200a) mogelijk wordt gemaakt.

25. Een werkwijze voor het assembleren en het sluiten van de functionele kop (10) volgens één der voorgaande conclusies, omvattende de volgende stappen:
het koppelen van het deksel (100a) aan het kopgedeelte (200) door het aan elkaar koppelen van het ten minste één eerste scharnierelement (140) en het ten minste één tweede scharnierelement (240) volgens een eerste hoek tussen 30° en 60°, bij voorkeur tussen 30° en 45°;
het roteren van het deksel (100a) ten opzichte van de behuizing (100);
het in contact brengen van het deksel (100a) met de behuizing (100) zodat de behuizing (100) wordt afgesloten.

26. Een werkwijze voor het blokkeren van een rotatiehoek van de functionele kop (10) volgens één der conclusies 1-24, omvattende de volgende stappen:
het roteren van het deksel (100a) ten opzichte van de behuizing (100) tot een tweede hoek tussen 45° en 120°, bij voorkeur tussen 60° en 90°;
het transleren van het deksel (100a) ten opzichte van het kopgedeelte (200) zodat het ten minste één uitstekende gedeelte (110) in de ten minste één sleuf (210) opgenomen is; en
het in contact brengen van het ten minste één uitstekende gedeelte (110) met het blokkeermiddel (230) zodat het deksel (100a) door het kopgedeelte (200) op de blokkeerhoek is geblokkeerd.

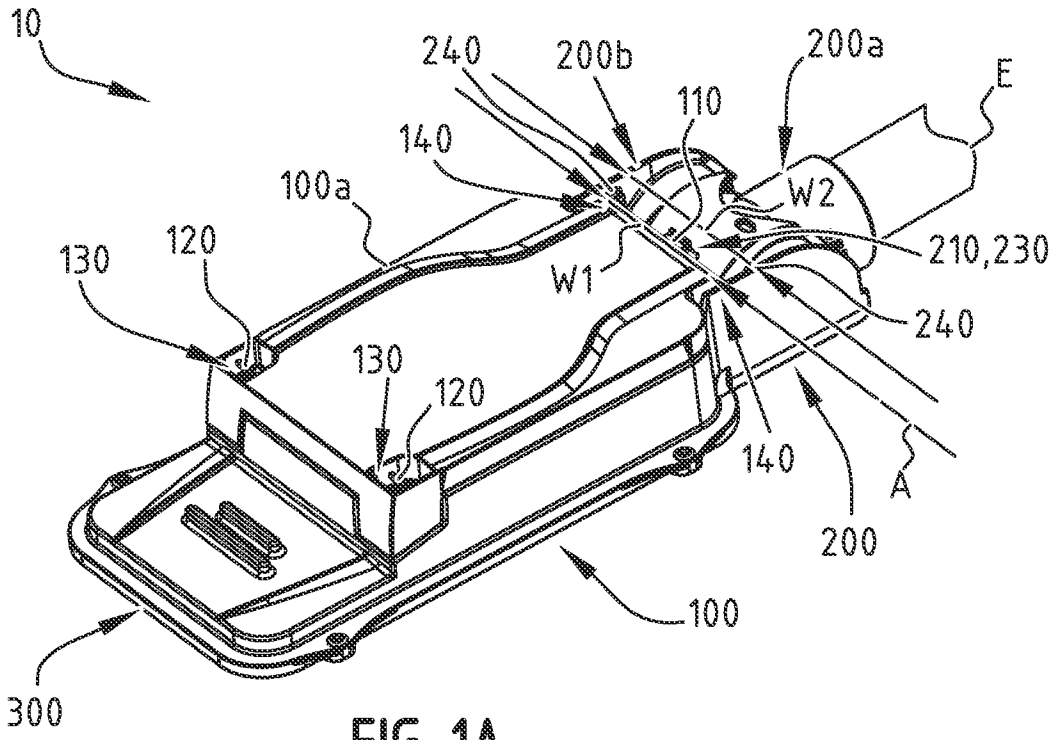
10
240
200b
200a
E
110
140
100a
W2
120
130
W1
210,230
240
130
120
140
A
200
100
300

FIG. 1A

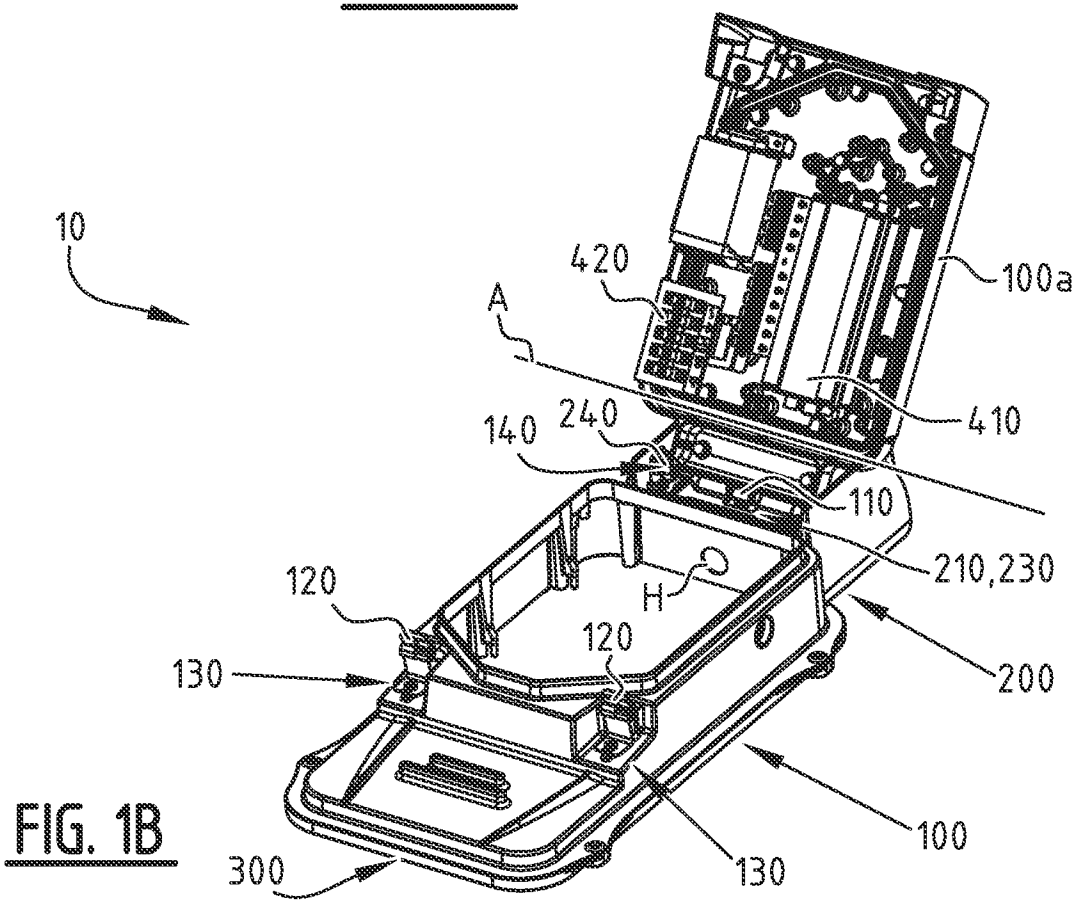
10
420
100a
A
410
140
240
110
210,230
120
H
120
130
200
100
300
130

FIG. 1B

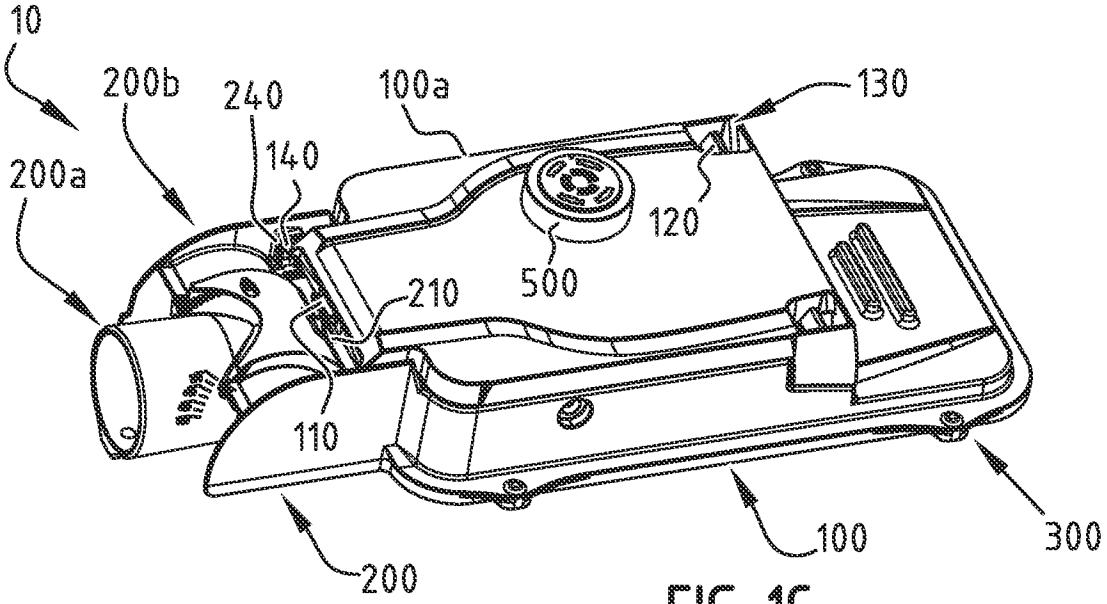

FIG. 1C

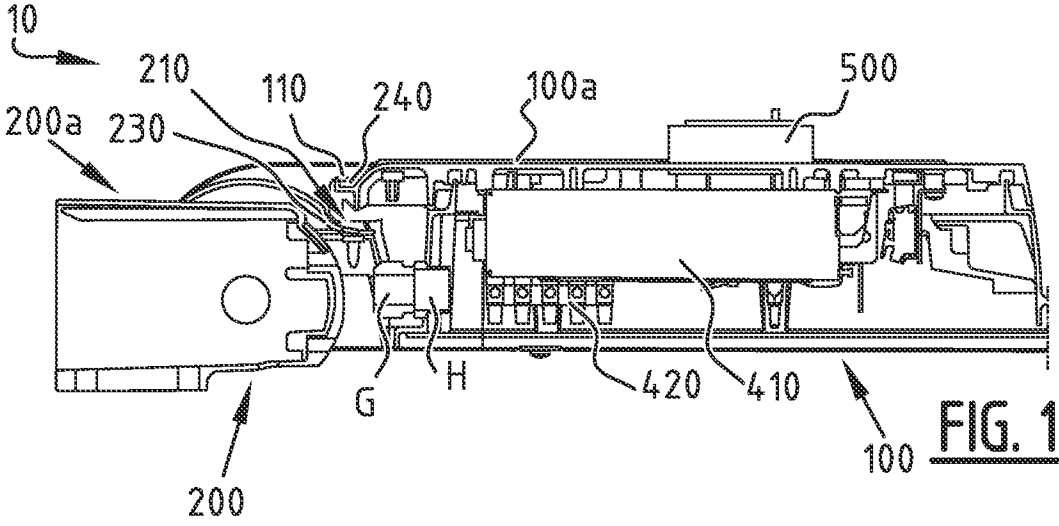

FIG. 1D

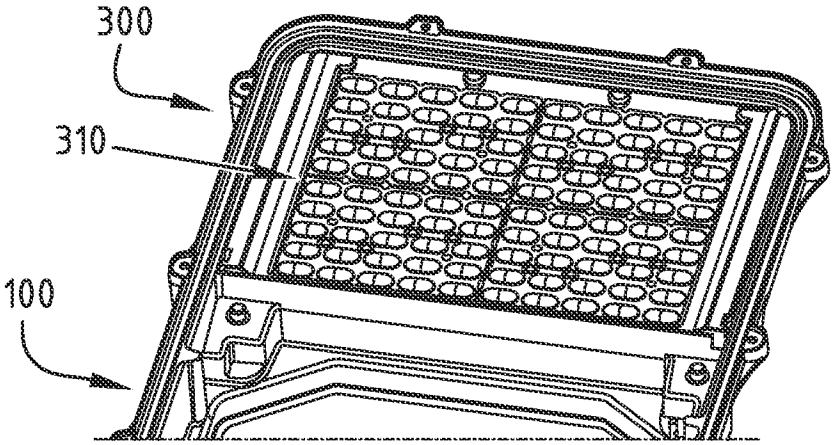

FIG. 1E

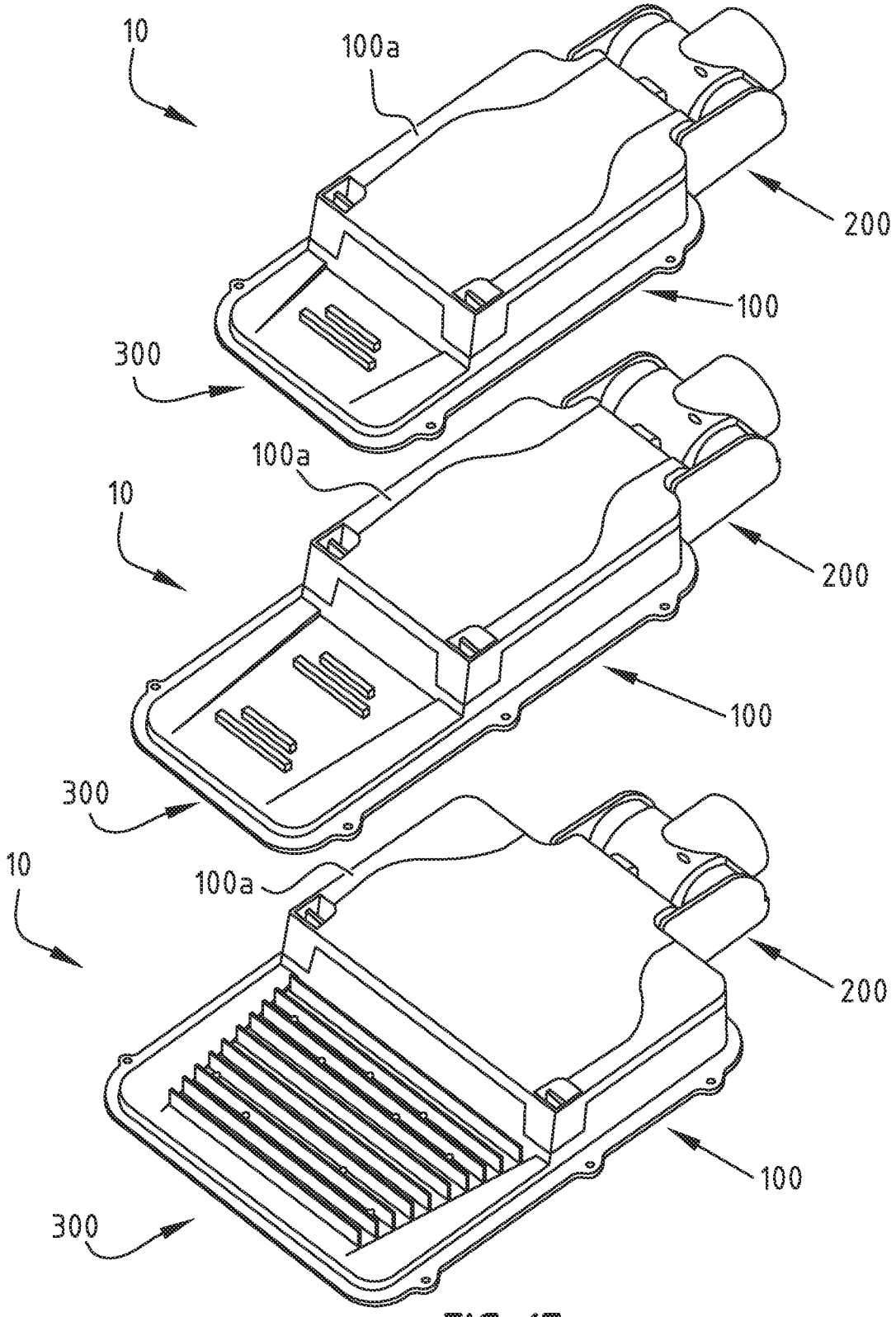

FIG. 1F

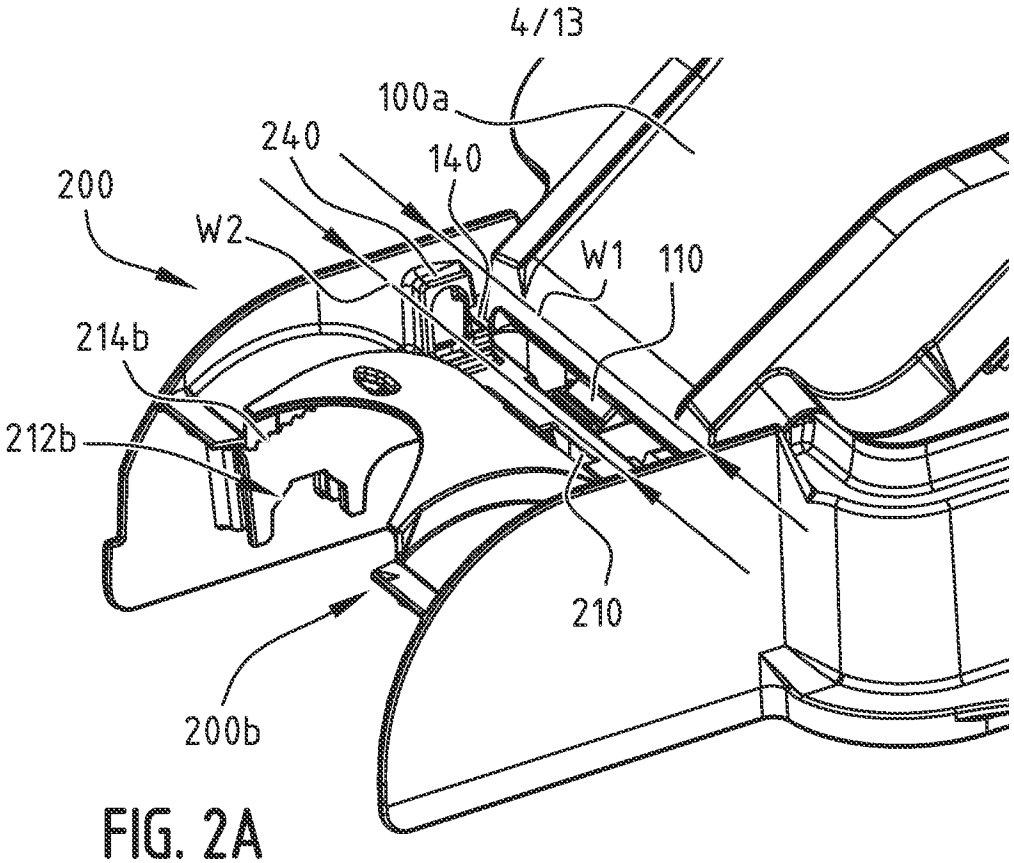

FIG. 2A

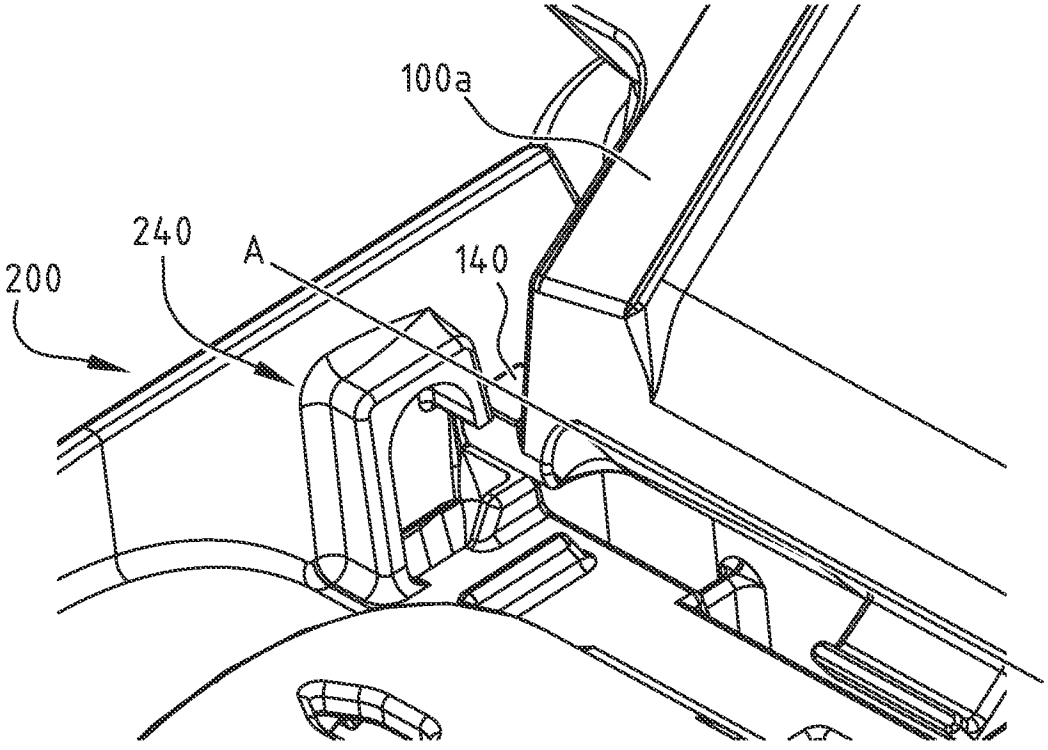

FIG. 2B

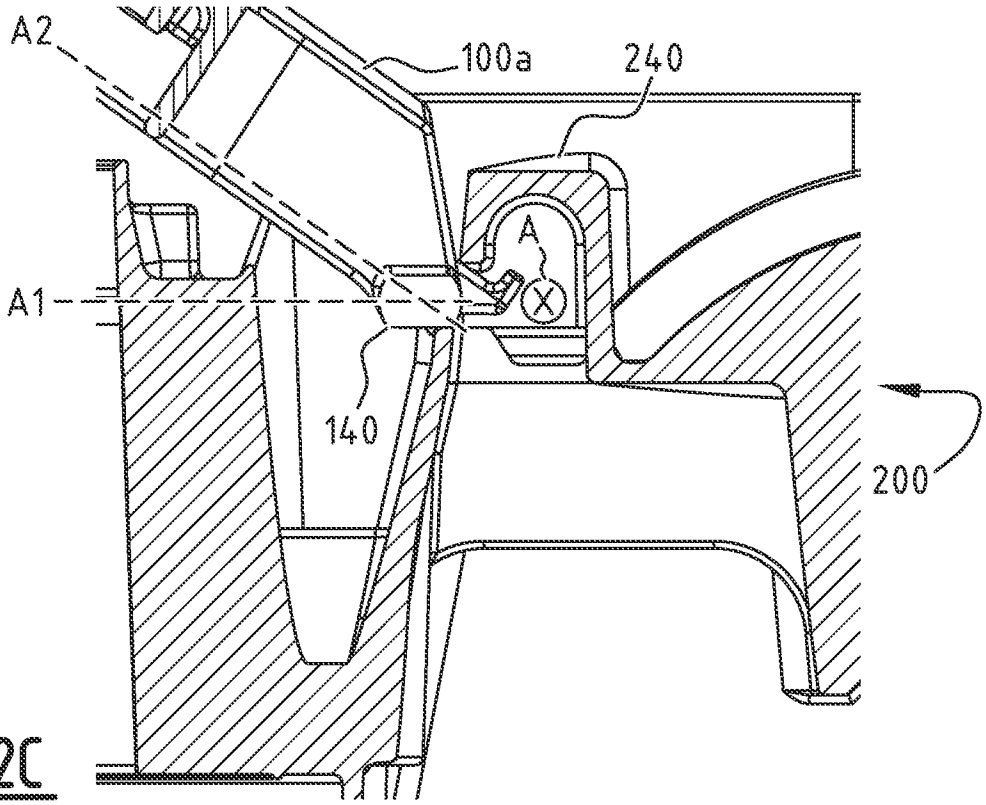
A2
100a
240
A
A1
140
200

FIG. 2C

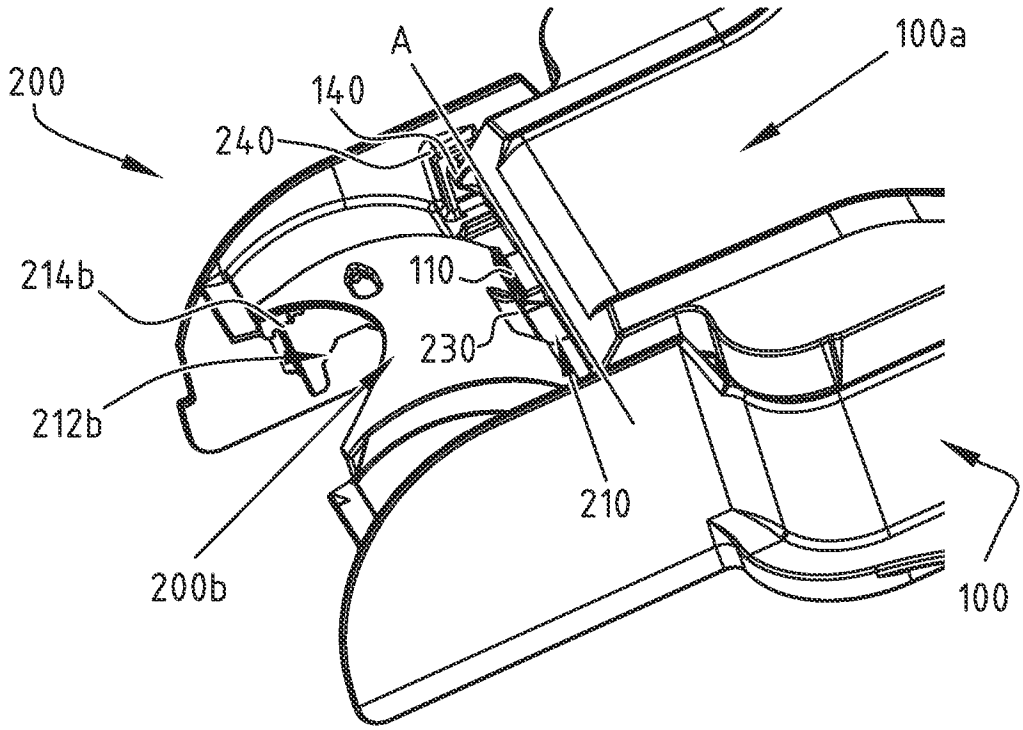
A
100a
200
140
240
214b
110
230
212b
210
200b
100

FIG. 2D

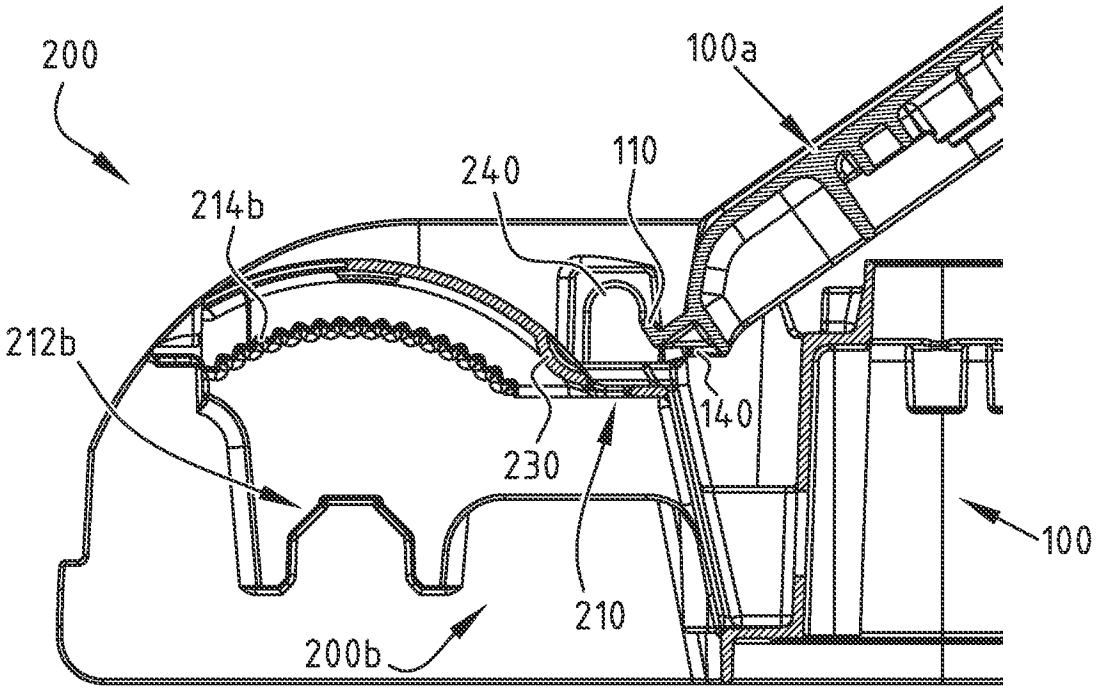
200
100a
240
110
214b
212b
140
230
100
210
200b

FIG. 3A

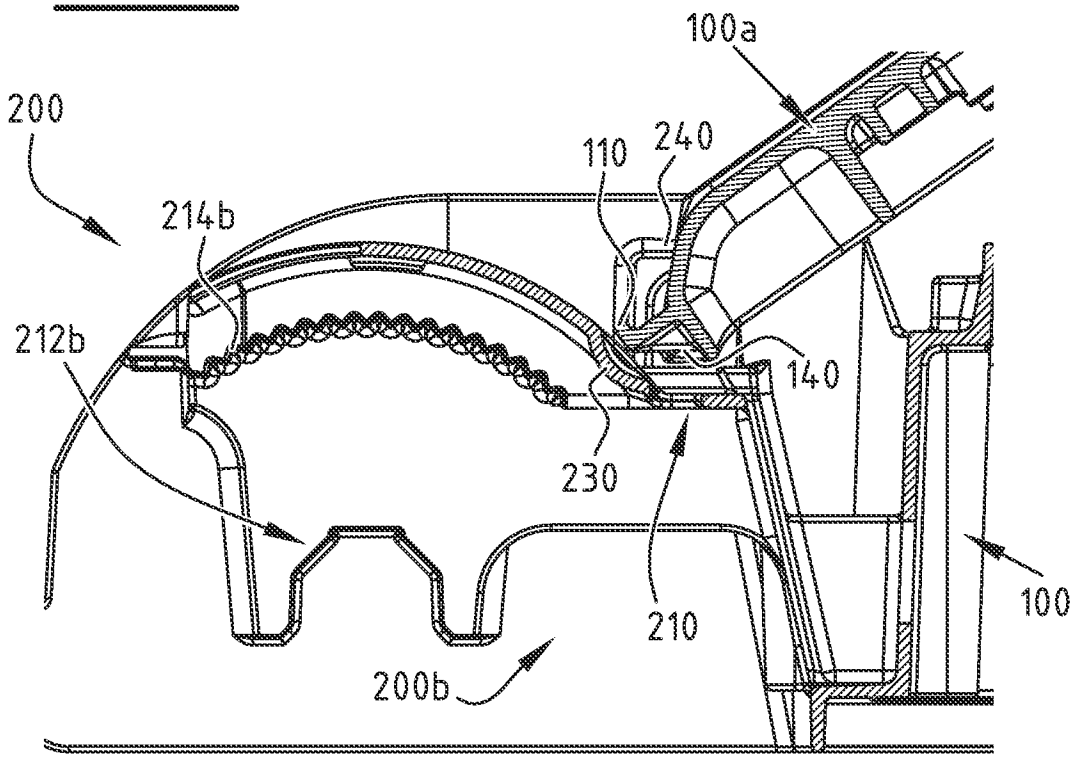
100a
200
110
240
214b
212b
140
230
100
210
200b

FIG. 3B

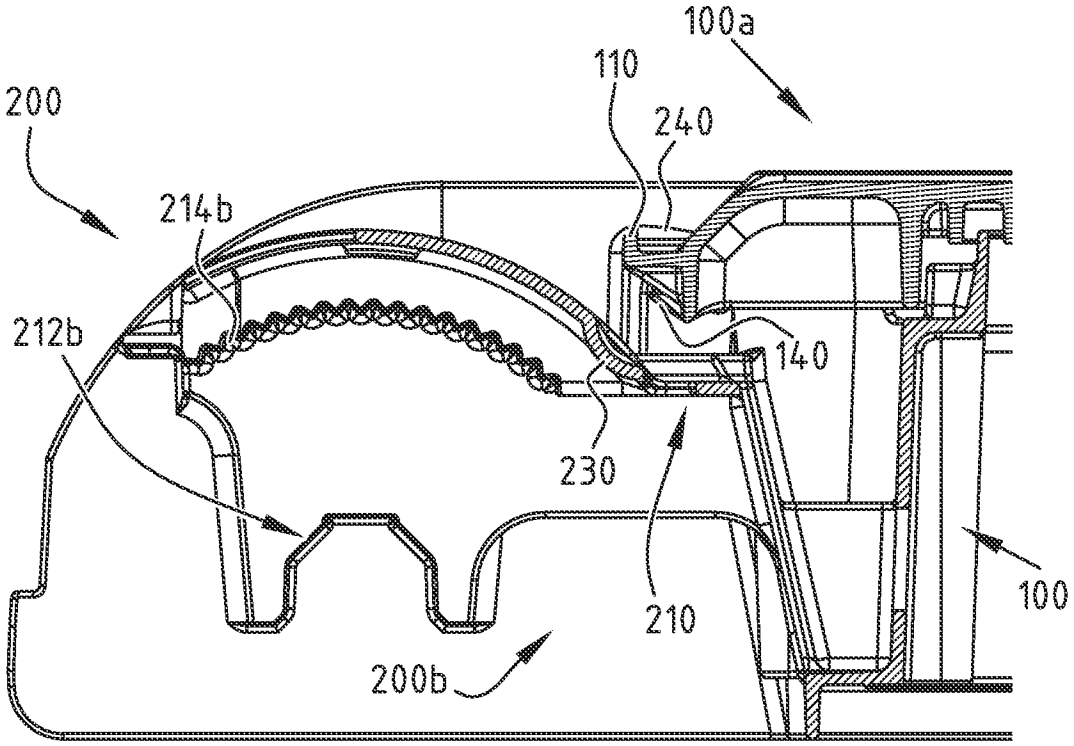

FIG. 3C

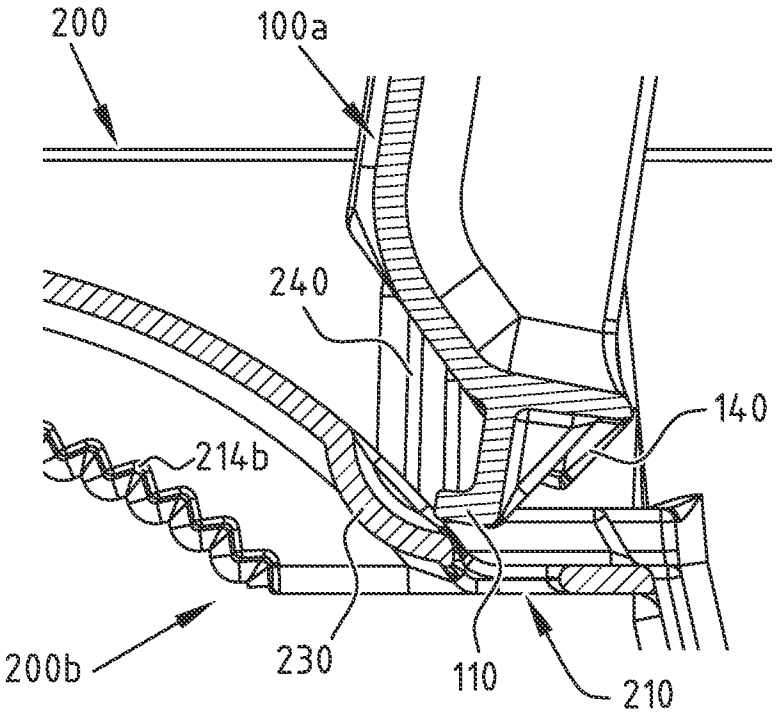
200
100a
240
140
214b
200b
230
110
210

FIG. 4A

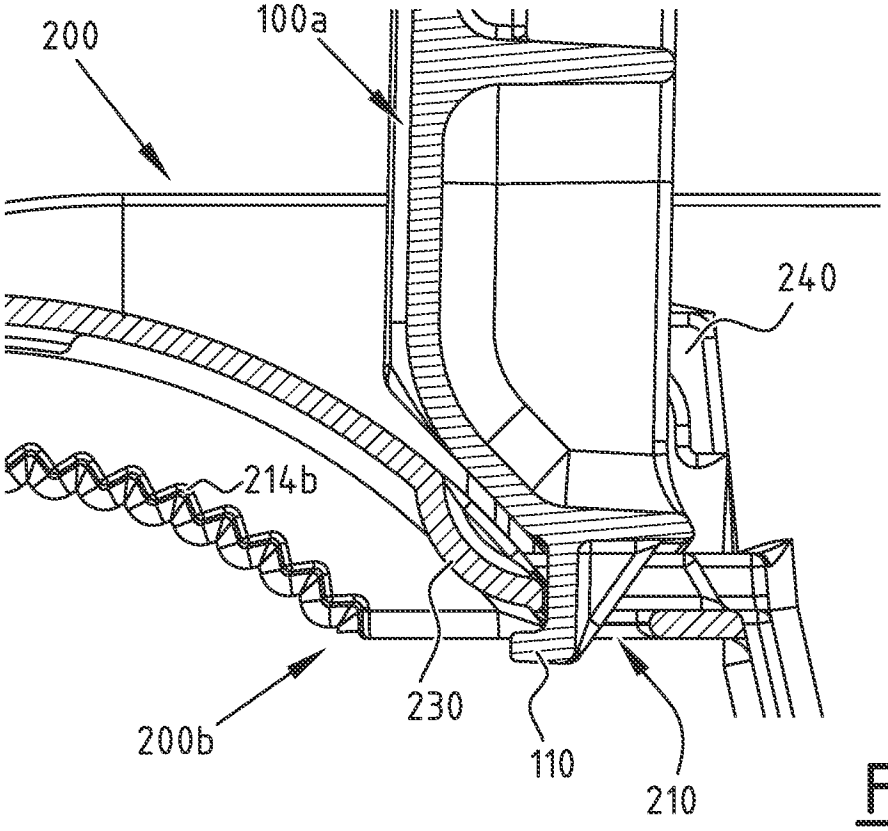
200
100a
240
214b
200b
230
110
210

FIG. 4B

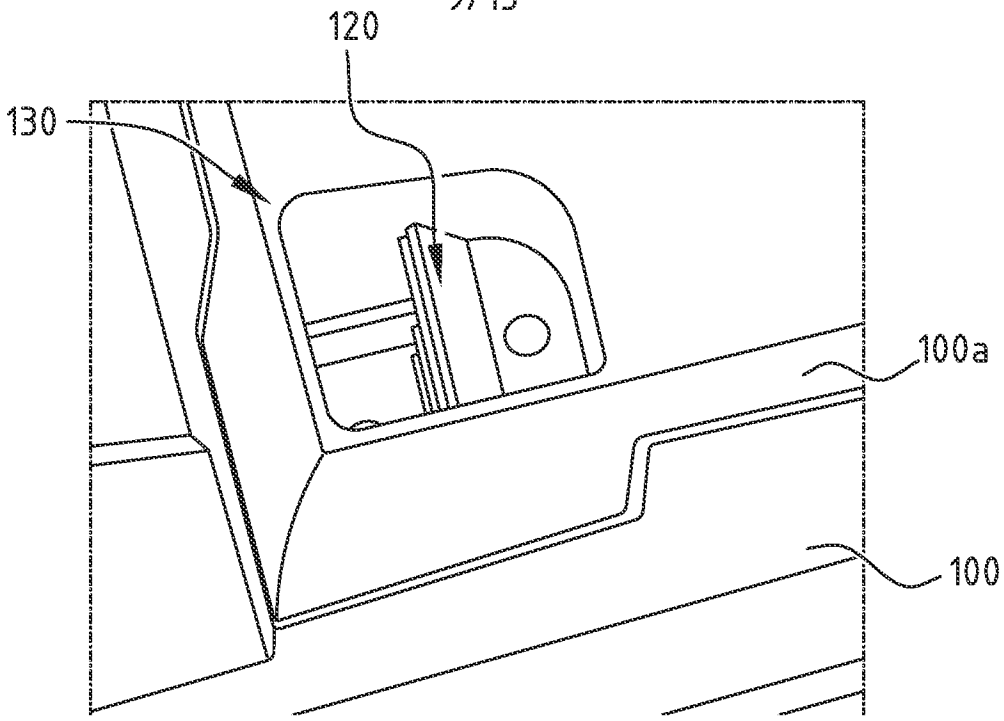
120
130
100a
100

FIG. 5A

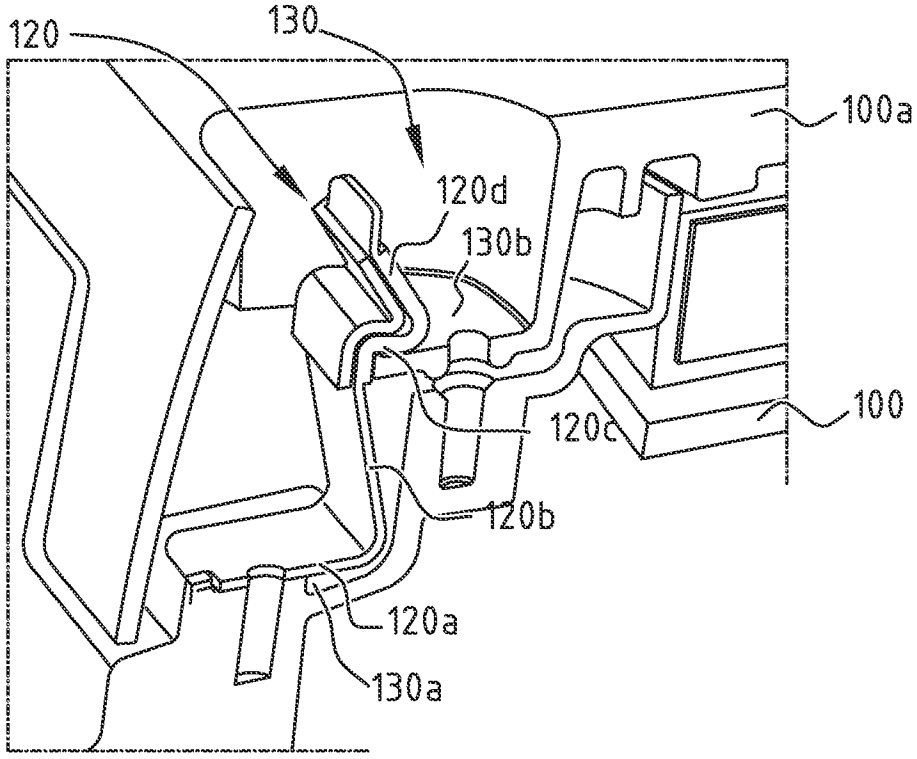
120
130
100a
120d
130b
100
120c
120b
120a
130a

FIG. 5B

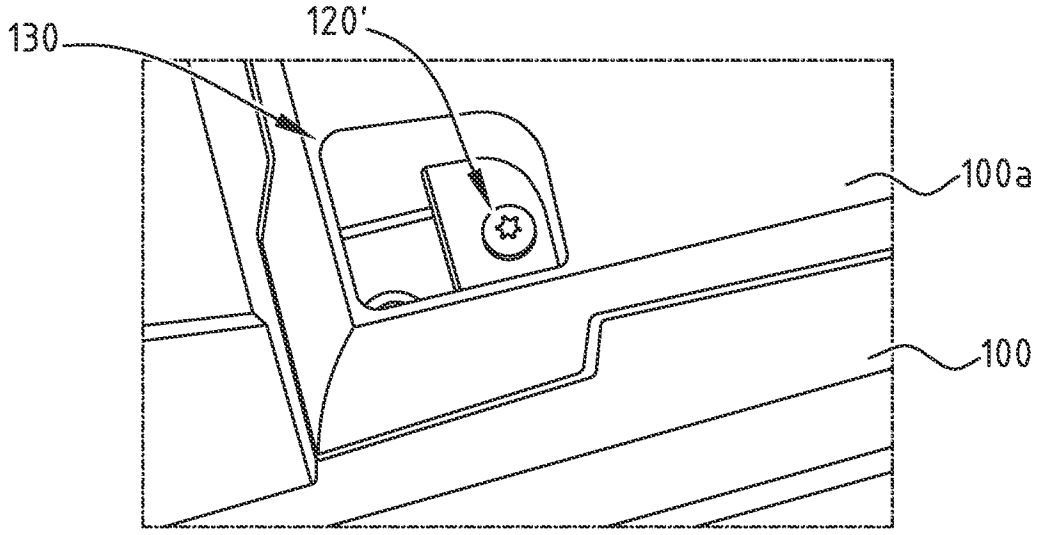

FIG. 5C

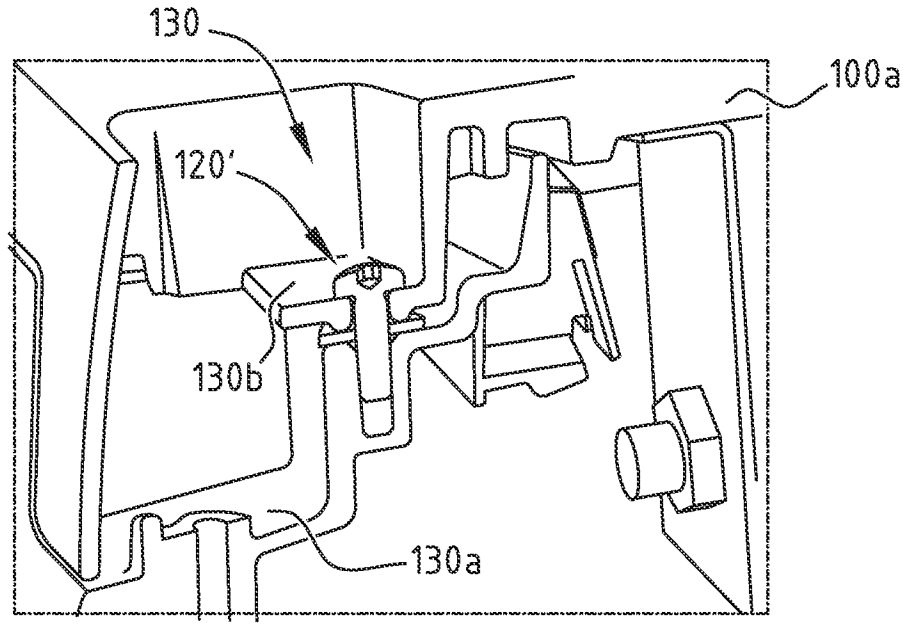

FIG. 5D

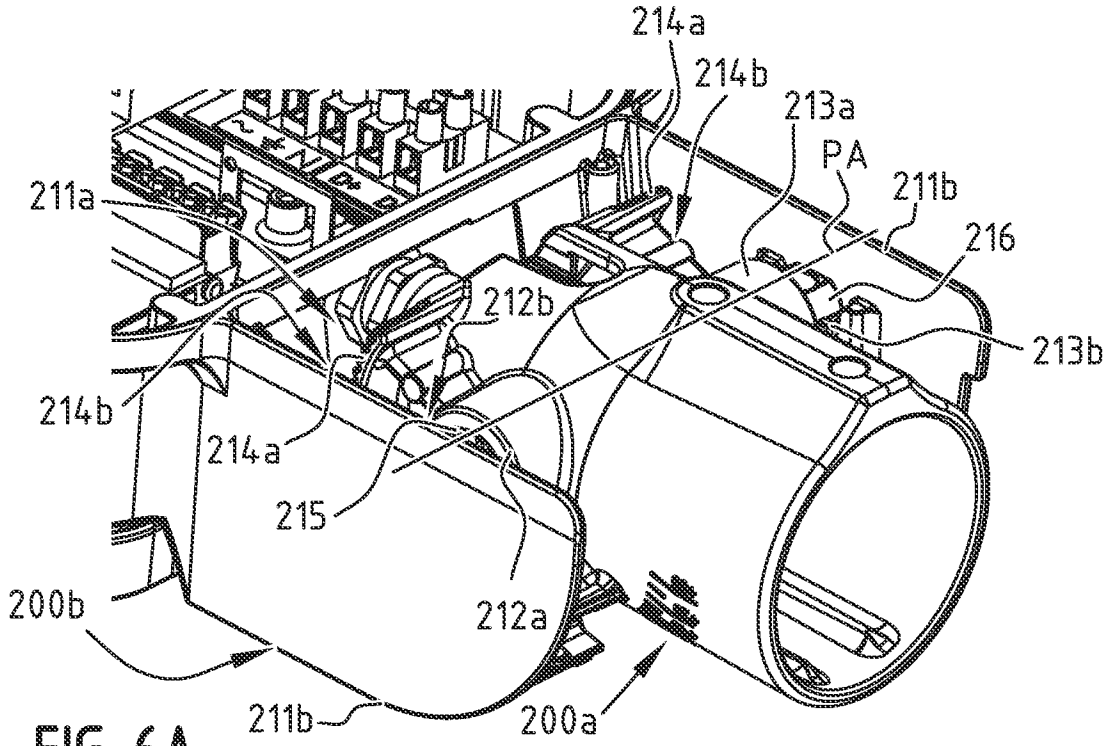
214a
214b
213a
PA
211b
216
211a
212b
213b
214b
214a
215
212a
200b
211b
200a

FIG. 6A

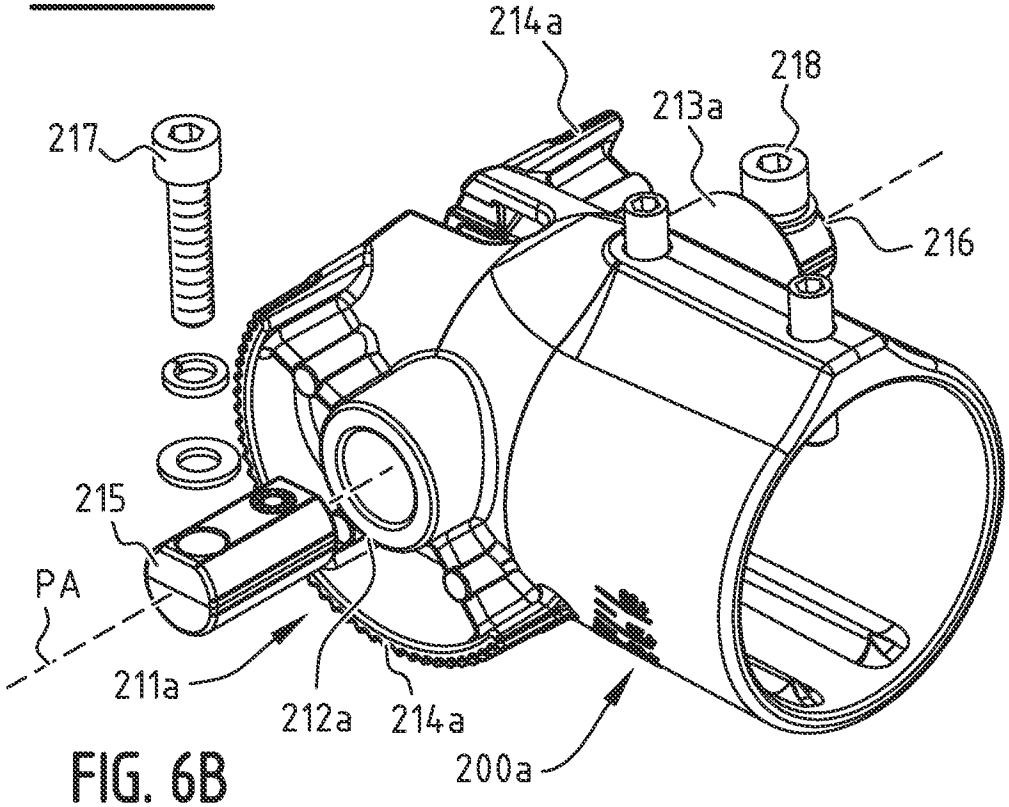
214a
218
213a
217
216
215
PA
211a
212a
214a
200a

FIG. 6B

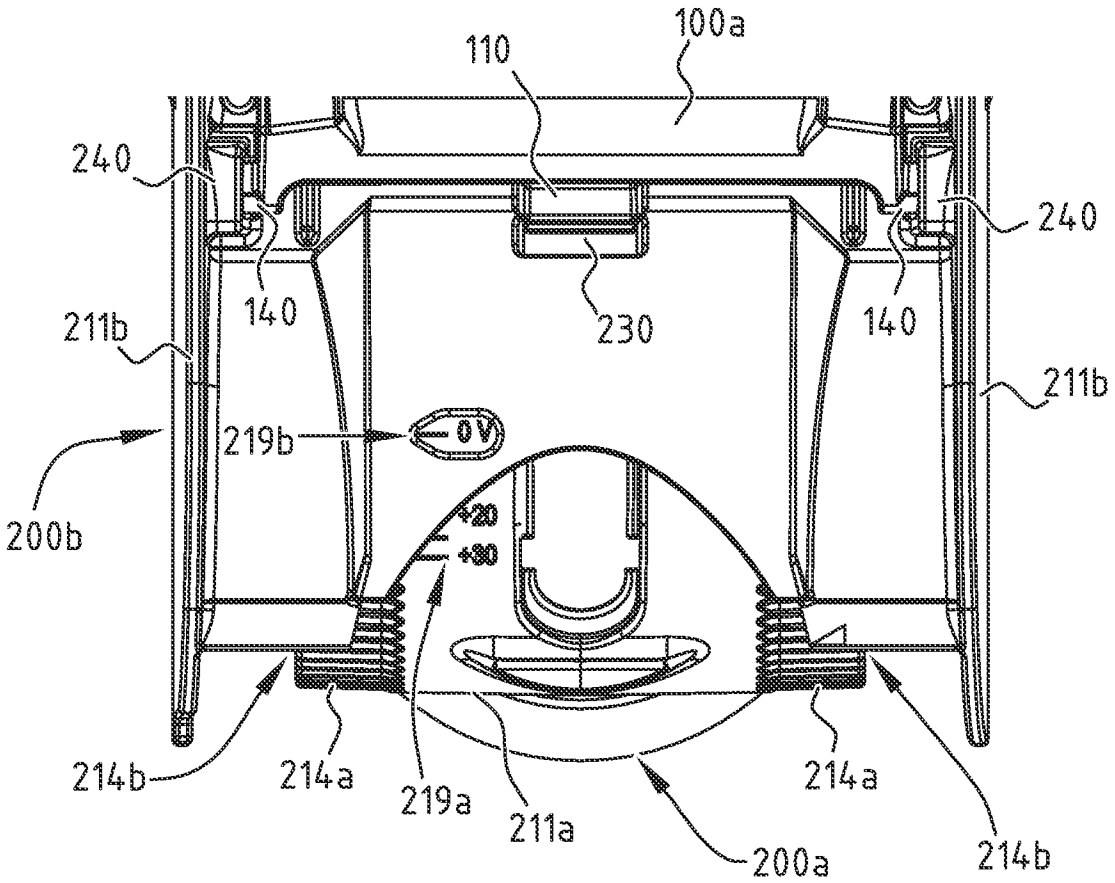
100a
110
240
240
140
140
230
211b
211b
219b
0V
200b
+20
+80
214b
214a
214a
219a
211a
200a
214b

FIG. 6C

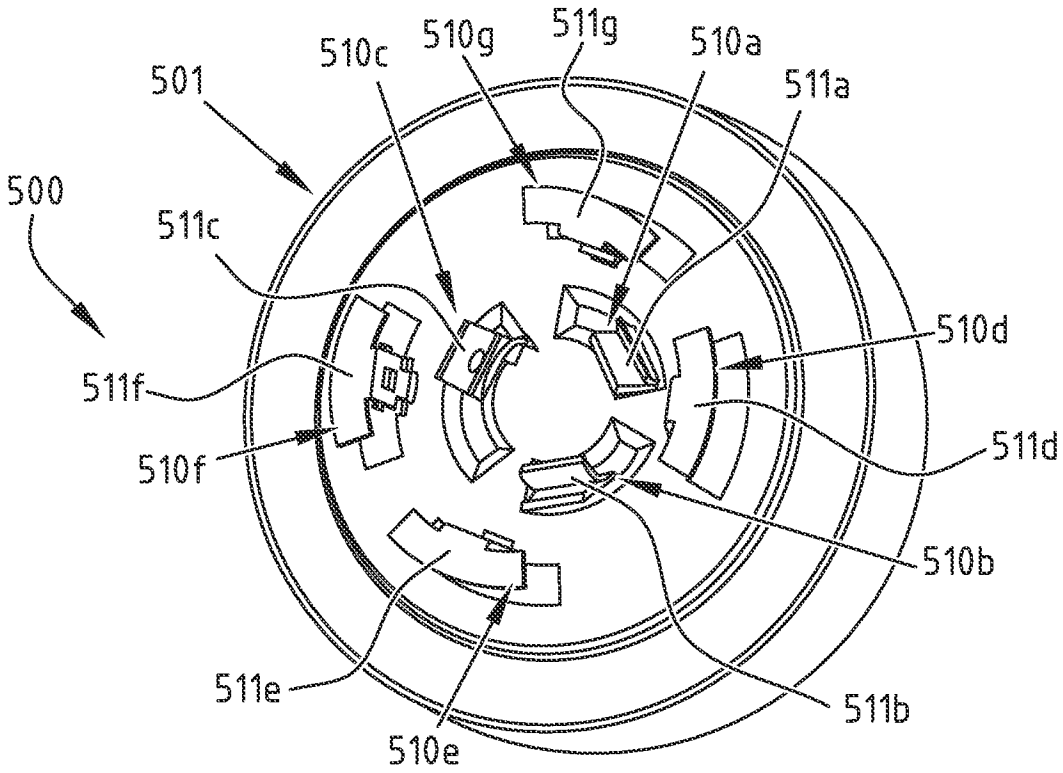
510c
510g
511g
510a
501
511a
500
511c
510d
511f
511d
510f
510b
511e
511b
510e

FIG. 7A

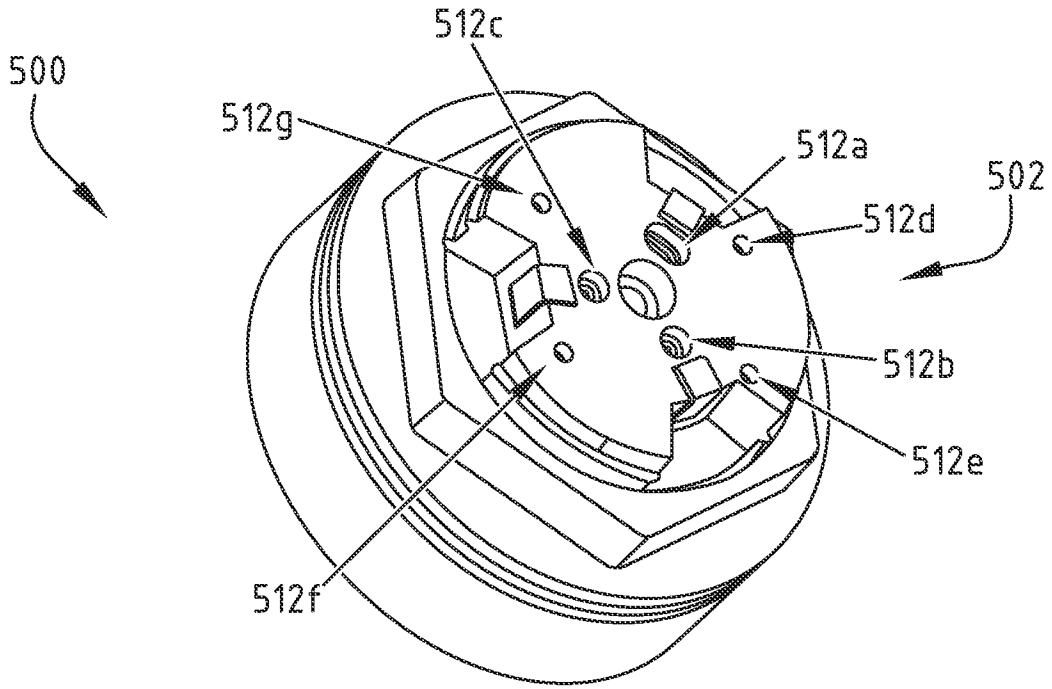
512c
500
512g
512a
502
512d
512b
512e
512f

FIG. 7B

SAMENWERKINGSVERDRAG (PCT)

RAPPORT BETREFFENDE NIEUWHEIDSONDERZOEK VAN INTERNATIONAAL TYPE

IDENTIFICATIE VAN DE NATIONALE AANVRAGE	KENMERK VAN DE AANVRAGER OF VAN DE GEMACHTIGDE
Nederlands aanvraag nr. **2033601**	Indieningsdatum **23-11-2022**
	Ingeroepen voorrangsdatum
Aanvrager (Naam) **SCHREDER S.A.**	
Datum van het verzoek voor een onderzoek van internationaal type **11-03-2023**	Door de Instantie voor Internationaal Onderzoek aan het verzoek voor een onderzoek van internationaal type toegekend nr. **SN83418**

I. CLASSIFICATIE VAN HET ONDERWERP (bij toepassing van verschillende classificaties, alle classificatiesymbolen opgeven)

Volgens de internationale classificatie (IPC)

Zie onderzoeksrapport

II. ONDERZOCHTE GEBIEDEN VAN DE TECHNIEK

Onderzochte minimumdocumentatie

Classificatiesysteem	Classificatiesymbolen
IPC	**Zie onderzoeksrapport**

Onderzochte andere documentatie dan de minimum documentatie, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen

III.	☐	**GEEN ONDERZOEK MOGELIJK VOOR BEPAALDE CONCLUSIES**	(opmerkingen op aanvullingsblad)
IV.	☐	**GEBREK AAN EENHEID VAN UITVINDING**	(opmerkingen op aanvullingsblad)

ONDERZOEKSRAPPORT BETREFFENDE HET RESULTAAT VAN HET ONDERZOEK NAAR DE STAND VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE

Nummer van het verzoek om een onderzoek naar de stand van de techniek
NL 2033601

A. CLASSIFICATIE VAN HET ONDERWERP

INV. F21S8/08 F21V17/10 F21V23/00 F21V15/01
ADD. F21W131/103

Volgens de Internationale Classificatie van octrooien (IPC) of zowel volgens de nationale classificatie als volgens de IPC.

B. ONDERZOCHTE GEBIEDEN VAN DE TECHNIEK

Onderzochte miminum documentatie (classificatie gevolgd door classificatiesymbolen)

F21S F21V F21W

Onderzochte andere documentatie dan de mimimum documentatie, voor dergelijke documenten, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen

Tijdens het onderzoek geraadpleegde elektronische gegevensbestanden (naam van de gegevensbestanden en, waar uitvoerbaar, gebruikte trefwoorden)

EPO-Internal, WPI Data

C. VAN BELANG GEACHTE DOCUMENTEN

Categorie °	Geciteerde documenten, eventueel met aanduiding van speciaal van belang zijnde passages	Van belang voor conclusie nr.
X	JP 6 790815 B2 (IWASAKI ELECTRIC CO LTD) 25 november 2020 (2020-11-25)	1-20, 22-26
Y	* het gehele document *	21

X	EP 3 812 655 A1 (GUANGDONG UNILUMIN ENERGY SAVINGS TECH CO LTD [CN] ET AL.) 28 april 2021 (2021-04-28)	1-26
Y	* het gehele document *	21

X	KR 2009 0078878 A (LEE WON JAE [KR]; LEE MOON JAE [KR]) 21 juli 2009 (2009-07-21)	1,3,4,6, 10-20, 25,26
Y	* het gehele document *	21

X	CN 216 924 080 U (HONGTAI INTELLIGENT TECH DONGGUAN CO LTD) 8 juli 2022 (2022-07-08)	1-4,6, 10-20, 22-26
Y	* het gehele document *	21

	-/--	

[X] Verdere documenten worden vermeld in het vervolg van vak C.

[X] Leden van dezelfde octrooifamilie zijn vermeld in een bijlage

° Speciale categorieën van aangehaalde documenten

"A" niet tot de categorie X of Y behorende literatuur die de stand van de techniek beschrijft

"D" in de octrooiaanvrage vermeld

"E" eerdere octrooi(aanvrage), gepubliceerd op of na de indieningsdatum, waarin dezelfde uitvinding wordt beschreven

"L" om andere redenen vermelde literatuur

"O" niet-schriftelijke stand van de techniek

"P" tussen de voorrangsdatum en de indieningsdatum gepubliceerde literatuur

"T" na de indieningsdatum of de voorrangsdatum gepubliceerde literatuur die niet bezwarend is voor de octrooiaanvrage, maar wordt vermeld ter verheldering van de theorie of het principe dat ten grondslag ligt aan de uitvinding

"X" de conclusie wordt als niet nieuw of niet inventief beschouwd ten opzichte van deze literatuur

"Y" de conclusie wordt als niet inventief beschouwd ten opzichte van de combinatie van deze literatuur met andere geciteerde literatuur van dezelfde categorie, waarbij de combinatie voor de vakman voor de hand liggend wordt geacht

"&" lid van dezelfde octrooifamilie of overeenkomstige octrooipublicatie

Datum waarop het onderzoek naar de stand van de techniek van internationaal type werd voltooid	Verzenddatum van het rapport van het onderzoek naar de stand van de techniek van internationaal type
26 mei 2023	

Naam en adres van de instantie	De bevoegde ambtenaar
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	**Thibaut, Arthur**

1

ONDERZOEKSRAPPORT BETREFFENDE HET RESULTAAT VAN HET ONDERZOEK NAAR DE STAND VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE

Nummer van het verzoek om een onderzoek naar de stand van de techniek
NL 2033601

C.(Vervolg). VAN BELANG GEACHTE DOCUMENTEN

Categorie °	Geciteerde documenten, eventueel met aanduiding van speciaal van belang zijnde passages	Van belang voor conclusie nr.
X	JP 2019 179657 A (KOITO ELECTRIC IND LTD) 17 oktober 2019 (2019-10-17)	1-8, 10-20, 22-26
Y	* het gehele document *	21

1

ONDERZOEKSRAPPORT BETREFFENDE HET RESULTAAT VAN HET ONDERZOEK NAAR DE STAND VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE

Informatie over leden van dezelfde octrooifamilie

Nummer van het verzoek om een onderzoek naar de stand van de techniek

NL 2033601

In het rapport genoemd octrooigeschrift	Datum van publicatie	Overeenkomend(e) geschrift(en)	Datum van publicatie
JP 6790815 B2	25-11-2020	JP 6790815 B2	25-11-2020
		JP 2018106990 A	05-07-2018
EP 3812655 A1	28-04-2021	AU 2019371560 A1	18-02-2021
		CN 208935937 U	04-06-2019
		EP 3812655 A1	28-04-2021
		WO 2020087776 A1	07-05-2020
KR 20090078878 A	21-07-2009	GEEN	
CN 216924080 U	08-07-2022	GEEN	
JP 2019179657 A	17-10-2019	JP 6800907 B2	16-12-2020
		JP 2019179657 A	17-10-2019

WRITTEN OPINION

File No.	Filing date *(day/month/year)*	Priority date *(day/month/year)*	Application No.
SN83418	23.11.2022		NL2033601

International Patent Classification (IPC)
INV. F21S8/08 F21V17/10 F21V23/00 F21V15/01 ADD. F21W131/103

Applicant
SCHREDER S.A.

This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☒ Box No. VII Certain defects in the application
- ☐ Box No. VIII Certain observations on the application

	Examiner
	Thibaut, Arthur

Application number

WRITTEN OPINION

NL2033601

Box No. I Basis of this opinion

1. This opinion has been established on the basis of the latest set of claims filed before the start of the search.

2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the application, this opinion has been established on the basis of a sequence listing:

   a. ☐ forming part of the application as filed.

   b. ☐ furnished subsequent to the filing date for the purposes of search,

      ☐ accompanied by a statement to the effect that the sequence listing does not go beyond the disclosure in the application as filed.

3. ☐ With regard to any nucleotide and/or amino acid sequence disclosed in the application, this opinion has been established to the extent that a meaningful opinion could be formed without a WIPO Standard ST.26 compliant sequence listing.

4. Additional comments:

Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty	Yes:	Claims	9
	No:	Claims	1-8, 10-26
Inventive step	Yes:	Claims	
	No:	Claims	1-26
Industrial applicability	Yes:	Claims	1-26
	No:	Claims	

2. Citations and explanations

see separate sheet

Box No. VII Certain defects in the application

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1 Reference is made to the following documents:

D1 JP 6 790815 B2 (IWASAKI ELECTRIC CO LTD) 25 november 2020 (2020-11-25)

D2 EP 3 812 655 A1 (GUANGDONG UNILUMIN ENERGY SAVINGS TECH CO LTD [CN] ET AL.) 28 april 2021 (2021-04-28)

D3 KR 2009 0078878 A (LEE WON JAE [KR]; LEE MOON JAE [KR]) 21 juli 2009 (2009-07-21)

D4 CN 216 924 080 U (HONGTAI INTELLIGENT TECH DONGGUAN CO LTD) 8 juli 2022 (2022-07-08)

D5 JP 2019 179657 A (KOITO ELECTRIC IND LTD) 17 oktober 2019 (2019-10-17)

1.1 The present application does not meet the criteria of patentability, because the subject-matter of claim1 is not new.

1.1.1 D1 discloses **(fig. 1-9)**:

Een functionele kop **(fig. 1)**, omvattende:
een behuizing **(10)** geconfigureerd om een functionele eenheid **(50)** op te nemen, waarbij de behuizing **(10)** een deksel **(22)** omvat dat aan de achterrand daarvan is voorzien met ten minste één eerste scharnierelement **(8, 27, 28, fig. 5)** geconfigureerd om een rotatie van het deksel **(22)** rond een as **(axis of the shaft 27)** mogelijk te maken **(see fig. 8-9)**; en
een kopdeel **(11)** gericht naar het deksel **(22, see fig. 4)**, waarbij het kopdeel **(11)** ten minste één overeenkomstig tweede scharnierelement **(19)** omvat dat is geconfigureerd om het ten minste één eerste scharnierelement **(8, 27, 28)** verwijderbaar **(see fig. 5, the lid 22 is removed by removing the screws 9)** op te nemen en om daarmee samen te werken gedurende de rotatie van het deksel **(see fig. 8-9)**;
waarbij één van het deksel **(22)**, bij voorkeur aan de achterrand daarvan, en het kopdeel ten minste één uitstekend gedeelte **(31, fig. 6-9)** omvat; en
waarbij de andere van het deksel, bij voorkeur aan de achterrand daarvan, en het kopdeel **(11)** ten minste één overeenkomstige sleuf **(35, 36)** geconfigureerd

om het ten minste één uitstekende gedeelte **(31)** verwijderbaar op te nemen **(see fig. 8A-9B)** omvat, en een blokkeermiddel **(see fig. 9A, the protruding portion 31 is blocked by the edge of the groove 36, in the same way as the present application wherein the protruding portion 110 is blocked by the edge 230 of the groove 210)** geconfigureerd om de rotatie van het deksel op een blokkeerhoek **(see fig. 9A)** te blokkeren **([0035]-[0036])** wanneer de ten minste één sleuf **(35, 36)** het ten minste één uitstekende gedeelte **(31)** opneemt **(fig. 9A)**, omvat.

1.1.2 Documents D2-D4 also disclose all the features of claim 1.

1.1.3 Therefore, the subject-matter of claim 1 is not new.

1.2 The present application does not meet the criteria of patentability, because the subject-matter of claim 25 is not new.

D1 discloses **(fig. 8A-9B)**:

Een werkwijze voor het assembleren en het sluiten van de functionele kop **(fig. 1)**, omvattende de volgende stappen:
het koppelen van het deksel **(22)** aan het kopgedeelte **(11)** door het aan elkaar koppelen van het ten minste één eerste scharnierelement **(8, 27, 28)** en het ten minste één tweede scharnierelement **(19)** volgens een eerste hoek tussen 30° en 60°, bij voorkeur tussen 30° en 45° **(see fig. 9B)**;
het roteren van het deksel **(22)** ten opzichte van de behuizing **(11)**;
het in contact brengen van het deksel **(22)** met de behuizing **(11)** zodat de behuizing **(see fig. 8A)** wordt afgesloten **(as visible in fig. 5 and 8A, to attach and close the lid 22 on the housing 10, the lid is implicitly rotated through at least a position between 30° and 60° of fig. 9B)**.

1.2.1 Documents D2-D4 also disclose all the features of claim 25.

1.2.2 Therefore, the subject-matter of claim 25 is not new.

1.3 The present application does not meet the criteria of patentability, because the subject-matter of claim 26 is not new.

D1 discloses **(fig. 8A-9B)**:

Een werkwijze voor het blokkeren van een rotatiehoek van de functionele kop **([0035]-[0036])**, omvattende de volgende stappen:
het roteren van het deksel **(22)** ten opzichte van de behuizing **(10)** tot een tweede hoek tussen 45° en 120° **(see fig. 8A-9A, approximately 90°)**;

het transleren **(see fig. 8B and 9B)** van het deksel **(22)** ten opzichte van het kopgedeelte **(11)** zodat het ten minste één uitstekende gedeelte **(31)** in de ten minste één sleuf **(36)** opgenomen is; en het in contact brengen van het ten minste één uitstekende gedeelte **(31)** met het blokkeermiddel **(edge of the groove 35-36)** zodat het deksel **(22)** door het kopgedeelte **(11)** op de blokkeerhoek is geblokkeerd **([0035]-[0036])**.

1.3.1 Documents D2-D4 also disclose all the features of claim 26.

1.3.2 Therefore, the subject-matter of claim 26 is not new.

1.4 Dependent claims 2-24 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of novelty and/or inventive step.

1.4.1 **Claims 2-3 are not novel:**

Document D1 further discloses that the head portion (11) is a mounting assembly (see 5 in fig. 1) facing the lid (22) and is configured to mount the housing (10) to a support, such as a post (see 5 in fig. 1) and that the functional unit comprises one or more of a light source (50).

1.4.2 **Claim 4 is not novel:**

Document D1 discloses that the blocking angle is between 30° and 120° (see fig. 9A, approximately 90°).

1.4.3 **Claims 5-6 are not novel:**

Document D1 discloses that the first hinge member (8, 27, 28) and the at least one second hinge member (9, 19) allow translation of the lid (22) relative to the head portion (11, see fig. 8B-9A, [0034]-[0036]) and that the first hinge element (8, 27, 28) has a non-rotation symmetrical cross section and the second hinge element (9, 19) has a non-rotation symmetrical cross section configured to cooperate with the aforementioned non-rotation symmetrical cross section (see fig. 8-9).

1.4.4 **Claims 7-8 are not novel:**

Document D1 discloses that the protruding portion (31) and the at least one slot (35-36) are configured to allow translation of the lid (22) with respect to the head portion (11, see fig. 8B-9A). Furthermore, the cover (22) comprises the protruding portion (31) and the head portion (11) comprises the at least one slot

(35-36), the protruding portion (31) being configured to fall through the at least one slot (35-36), such that a substantially vertical translation of the cover (22) relative to the head portion (11) is enabled (see fig. 8B-9A).

1.4.5 **Claim 9 is not inventive:**

The feature of claim 9 is merely one of several straightforward possibilities of design options from which the skilled person would select, in accordance with circumstances, without the exercise of inventive skill, in order to provide corresponding cooperating shapes in the lid 22 and head portion 11 of document D1.

1.4.6 **Claims 10-11 are not novel:**

Document D1 discloses that the first hinge member (8, 27, 28) and the second hinge member (9, 19) is configured to engage the other of the at least one first hinge member and the at least second hinge member according to a first angle of between 30° and 60° (see fig. 9B). Furthermore, the at least one first hinge member (8, 27, 28) and the at least one second hinge member (9, 19) are configured such that the lid (22) can be rotated relative to the housing (10) to a second angle between 45° and 120° (90°, fig. 9A). The protruding portion (31) is translated relative to the head portion (11) so that the at least one protruding portion (31) is received in the at least one slot (35, 36, see fig. 8B-9A).

1.4.7 **Claims 12-13 are not new:**

Document D2 discloses that the first hinge element (210) comprises two first hinge elements (210), and the at least one second hinge element (102) comprises two second hinge elements (102); wherein the two first hinge elements (210) are each disposed on a respective substantially peripheral portion of the lid (200, fig. 2), on a substantially central portion of the lid (see fig. 2)

1.4.8 **Claim 14 is not novel:**

Document D1 discloses that the at least one protruding portion (31) is arranged on a substantially central portion of the lid (see fig. 2).

1.4.9 **Claims 15-16 are not novel:**

Document D2 discloses that the protruding portion (600) comprises two protruding portions (600), wherein the at least one slot (205) comprises two slots (slots on each portion 210 of the lid 200), and wherein the blocking means comprises two blocking elements (edges of the slots 205).

Furthermore, each of the two protruding portions (600), each of the two slots (205) and each of the two blocking elements (600) are arranged near a respective element of the two first hinge elements (210) and near a respective element of the two second hinge elements (102, fig. 3).

1.4.10 **Claims 17-18 are not novel:**

Document D1 (fig. 2 and 4) discloses the dimension specified in claims 17-18.

1.4.11 **Claim 19 is not novel:**

Document D1 discloses that the housing (10) is provided with a through hole (23, fig. 5) configured to accommodate an electrical wire extending through the head portion (11).

1.4.12 **Claims 21-22 are not novel:**

Document D2 discloses an overvoltage protection circuit (320, [0036]) attached to an inner surface of the lid (200, fig. 9).

1.4.13 **Claim 22 is not novel:**

Document D4 discloses a socket (see hole in lid 100 shown in fig. 2) disposed on an outer surface of the lid (100a), the socket (500) configured to receive an external module.

1.4.14 **Claim 23-24 are not novel:**

Document D1 discloses that the mounting assembly (5) comprises a first mounting portion configured to receive and mount a pile end, and a corresponding second mounting portion configured to be attached to the housing and to cooperate with the first mounting portion so as to allow rotation of the functional head relative to the pile end (see fig. 1) wherein the first fixing portion and the second fixing portion are each provided with a plurality of mutually coupled surfaces configured to cooperate with each other so as to allow rotation of the second fixing portion relative to the first fixing portion (see curved surfaces in fig. 1).

2 **Re Item VII**

Certain defects in the application

2.1 The relevant background art disclosed in the cited prior art is not mentioned in the description, nor are these documents identified therein.