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(54) ELECTRONIC KEY FOR AUTOMOTIVE VEHICLE

(57) The disclosure provides an electronic key for an automotive vehicle, comprising a housing (113) having an inside configured to house an emergency insert (118) and a battery (136), and a key head (100) configured to engage with the housing and to connect to the housing (113). The key head (100) is further configured to rotationally disconnect from the housing and then to translationally disengage from the housing (113), thereby providing access to the inside of the housing (113). The key head (100) is configured to disengage from the housing (113) only when the key head (100) is disconnected from the housing. This forms an improved electronic key for an automotive vehicle.

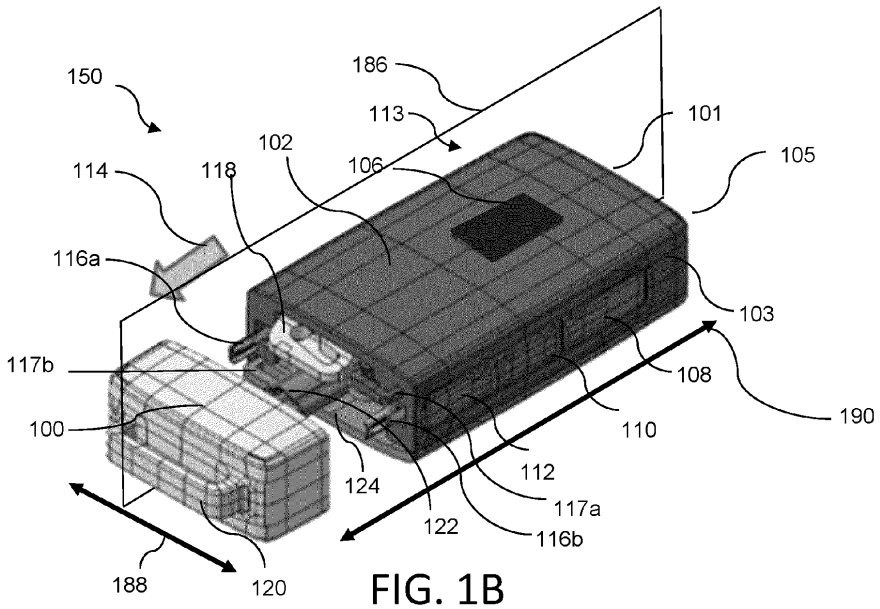

FIG. 1B

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Description

Technical field

[0001] The present disclosure relates to the field of automotive vehicles, and more specifically to the field of electronic keys for automotive vehicles.

Technical background

[0002] Keys for automotive vehicles are often capable of both manually and automatically locking and unlocking the vehicle (remote keyless entry), and often for manually and automatically starting an automotive vehicle. For the automatic locking, unlocking, and/or starting (remote keyless ignition), the key generally comprises a transmitter for transmitting a code to a receiver in the vehicle to which the key is associated, the vehicle locking or unlocking the doors of the vehicle, or starting the vehicle, upon receipt of the correct code. The key also generally comprises a battery to power the transmitter. The battery itself can be, for example, a common cell type battery that may require replacing after a certain number of years. A number of approaches exist in providing keys that facilitate removal of a section of the key housing so as to enable access to the battery for replacement. Likewise, a number of approaches exist in providing keys that facilitate removal of a section of the key housing so as to enable access to the emergency key for manual locking or unlocking of the vehicle. For example, by translating or sliding a top surface and/or key head of the housing to expose the battery beneath, the translation generally being assisted by means of a button to detach the part for translation from its initial position.

[0003] Within this context, there is still a need for an improved electronic key for an automotive vehicle and for a method for manufacturing such a key.

Summary of the invention

[0004] It is therefore the object of this disclosure to provide an electronic key for an automotive vehicle, wherein the electronic key comprises:

- a housing having an inside configured to house an emergency insert and a battery; and
- a key head configured to engage with the housing and to connect to the housing, the key head being further configured to rotationally disconnect from the housing and then to translationally disengage from the housing, thereby providing access to the inside of the housing, the key head being configured to disengage from the housing only when the key head is disconnected from the housing.

[0005] According to some examples, the housing may comprise one or more hooks and the key head may comprise one or more pegs, the one or more pegs being configured to be each inserted inside a respective hook during the connecting to the housing so as to lock the key head in translation relative to the housing, and to be each withdrawn from the respective hook during the rotationally disconnecting from the housing so as to unlock the key head in translation relative to the housing.

[0006] According to some examples, the key may comprise one or more retention blades, the engaging of the key head with the housing including the key head translationally engaging with the one or more retention blades, the disengaging of the key head from the housing including the key head translationally disengaging from the one or more retention blades, the one or more retention blades being arranged so as to, when the key head is engaged with the one or more retention blades and the key head is connected to the housing, allow the key head to rotate relative to the housing in a predetermined rotational direction when the rotational force applied to the key head along said predetermined rotational direction is above a predetermined rotational force threshold, and to retain the key head in rotation relative to the housing in the predetermined rotational direction when the rotational force applied to the key head along the predetermined rotational direction is below the predetermined rotational force threshold.

[0007] According to some examples, the one or more retention blades may be elastically deformable such that, when the key head engages with the one or more retention blades, the one or more retention blades deform and exert a restoring force so as to enable the retaining of the key head.

[0008] According to some examples, the key may have a length direction and a width direction, the translationally engaging of the key head with the one or more retention blades being along the length direction of the key, the translationally disengaging of the key head from the one or more retention blades also being along the length direction of the key, the one or more retention blades comprising two retention blades each arranged on a respective side of a half-width cross-sectional plane of the key.

[0009] According to some examples, the one or more retention blades may comprise one or more retention blades each protruding out of the exterior of the housing.

[0010] According to some examples, the key may have a length direction and a width direction, the one or more retention blades comprising two blades each protruding out of the exterior of the housing along the length direction and each arranged on a respective side delimiting the width of the key, the two blades exerting the restoring force so as to clamp the key head or push away one from another inside the key head along the width direction.

[0011] According to some examples, the one or more retention blades may comprise one or more retention blades mounted on the key head.

[0012] According to some examples, the key may have a length direction, the one or more retention blades comprising two blades exerting the restoring force so as to apply a torque to the key head around the length direction

and opposite to the predetermined rotational direction.

[0013] According to some examples, the housing may comprise a guiding element for the engaging and disengaging of the key head with the housing.

[0014] According to some examples, the guiding element may have a tubular form arranged to fix the key head in rotation when engagement is partial, the key head being free in rotation when engagement is full such that the key head may rotationally connect or disconnect from housing.

[0015] According to some examples, the key head may comprise one or more arms inside the key head that are received in corresponding one or more internal grooves of the guiding element so as to perform the fixing in rotation, wherein the key head reaches full engagement when the one or more arms fully traverse the one or more grooves to overcome the grooves so that the arms can freely rotate.

[0016] According to some examples, the key head may comprise an insert configured to interact with the guiding element to obtain the partial engagement, full engagement and connection, the arms being located at an offset along the insert.

[0017] According to some examples, the guiding element may comprise one or more slots, each respective slot being configured to incorporate each respective arm after overcoming the grooves.

Brief description of the drawings

[0018] Non-limiting examples will now be described in reference to the accompanying drawings, where:

FIG.'s 1A and 1B show illustrations of perspective views of an example of the key;

FIG. 2 shows an illustration of a perspective view of an example of two retention blades of the key;

FIG. 3 shows an illustration of a perspective view of an example of a retention blade of the key and a tooth of the key head;

FIG. 4A shows an illustration of a perspective view of an example of the key with the housing cover sliding off the key and FIG. 4B shows an illustration of an example of the key without the housing cover, the key comprising a battery;

FIG. 5 shows an illustration of a perspective view of an example of the key without the housing cover, the key comprising no battery;

FIG. 6A shows an illustration of a perspective view of an example of the key head and FIG. 6B shows an illustration of a plan view of the example of the key head;

FIG. 7 shows an illustration of a perspective view of an example of two retention blades;

FIG. 8 shows an illustration of a perspective view of an example of the key head connected to the two retention blades of FIG. 7;

FIG. 9A shows an illustration of a perspective view of an example of the guiding element and FIG. 9B shows an illustration of a plan view of the example of the guiding element;

FIG.'s 10A, 10B and 10C show illustrations of perspective views of the example of the guiding element of FIG. 9A and FIG. 9B; and

FIG. 11 shows an illustration of a perspective view of an example of the key;

FIG. 12 shows an illustration of a side exploded view of an example of the key; and

FIG. 13 shows an illustration of a perspective exploded view of an example of the key.

Detailed description

[0019] The disclosure will now be described in detail without limitation in the following description. The present disclosure makes it possible to address the need mentioned above.

[0020] In particular, it is provided an electronic key for an automotive vehicle, which comprises a housing and a key head. The housing has an inside configured to house an emergency insert and a battery, and the electronic may thus house such items inside the housing. The key head is configured to (e.g., translationally) engage with the housing and to connect to the housing (e.g., after having engaged with the housing). The key head is further configured to rotationally disconnect from the housing and then (i.e., after disconnection) to translationally disengage from the housing. The disconnection and the disengagement are thus two distinct actions, and the electronic key thus has a first state where the housing and key head are both disconnected and disengaged, a second distinct state where the housing and key head are disconnected but still engaged. When the housing and the key head are disengaged, the inside of the housing is accessible, for example for accessing and/or withdrawing the emergency key so as to use it, and/or for replacing the battery. The key head is configured to disengage from the housing only when the key head is disconnected from the housing.

[0021] This allows for a better grip or hold of the key head on the housing, which in turn enables a secure locking of the key head to the housing. Additionally, this facilitates easy user access to the inside of the housing. Consequently, the user can easily access a battery held inside the housing for replacement. The rotational connection also facilitates a simplified exterior of the key, reducing any need for, for example a button for removal of a part of the housing (for example, a housing cover) and/or the key head. The provided electronic key may thus be such that the key head can be disconnected and disengaged from the housing without ever pressing a button, and only via a user rotational movement of the key head relative to the housing followed by a translational movement of the key head relative to the housing.

[0022] By engage with the housing, a partial connecting between the housing and key head is understood,

i.e. the key head and housing are in positions primed for connection. By connect to the housing, a complete mating between the key head and key housing is understood, i.e. the key is fully closed. The key head may engage with the housing and may then (i.e. subsequently) connect to the housing. In other words, the engaging may therefore be a step prior to (or a precondition) to the connecting that primes the key head for connection with the housing. By rotationally disconnect from the housing, a partial un-mating between the key head and housing is understood, i.e. the key is partially open, the key head and housing being in positions primed for disengagement. By disengage from the housing, a complete disconnect between the key head and housing is understood. Translationally disengaging from the housing may comprise a movement in planar motion in a direction away from the housing. By connect to and rotationally disconnect from, a turning movement is understood. The key head may rotationally connect to the housing. The rotational movement, for the disconnecting (and according to some examples, for the connecting) may be about a certain point. In other words, the entire key head may rotate about a given axis. For example, the key head may be configured to rotate about the longitudinal axis of the key to carry out the connection or disconnection. The movement may be a rotation greater than an angle of 0°, for example 10°. The rotation may be an angle less than 20°. To execute the disengaging, the user may pull the key head away from the housing after the rotating, i.e. the disconnecting. The rotating followed by the pulling, or removing, may be as one fluid movement. To execute the connecting, the user may engage the key head with the housing by pushing the key head towards the housing. The pushing may according to some examples be prior to a rotational movement to complete the connecting. The pushing followed by the rotating may be as one fluid movement. This simple motion can improve the ergonomics of the key, facilitating an ease of the connecting and disconnecting for the user.

[0023] The electronic key may be a hands free key. In other words, the key may control actions of the vehicle with a reduced number of command actions by the driver. The key may unlock or lock vehicle doors (and/or, for example, the vehicle trunk) when within a certain distance from the vehicle or when within contact of a certain component of the vehicle, for example via a press-button (e.g., provided as a logo of the brand of the vehicle) and/or without need for pressing such a button. Additionally or alternatively, the key may start the vehicle when placed in contact with a certain component within the vehicle, with the assistance of the driver pressing a start button. The key is a key for an automotive vehicle (for example, a car, truck, motorcycle or scooter), meaning that the key is coupled to or paired with an automotive vehicle, the key thereby being configured to control actions of the vehicle, such as locking and/or unlocking of vehicle doors. The key may comprise a top surface and a bottom surface. The top surface and bottom surfaces may be in parallel and opposite to one another. The key may comprise a number of side surfaces, for example four side surfaces. One edge of each side surface may meet the top surface. One other edge of each side surface may meet bottom top surface. At least one other additional edge of each side surface may meet a corresponding edge of another side surface, i.e. an edge configured to meet the respective at least one other additional edge. The top surface and bottom surface may each have a surface area larger than each of the respective side surfaces alone. The key may comprise a length, a width and a thickness. The length may be greater than the width, and the width may be greater than the thickness. The length, width and thickness may be those of a bounding box of the key, i.e. the smallest right parallelepiped (i.e. rectangular parallelepiped) that encloses (bounds) the key.

[0024] The key comprises a housing, meaning a component or component assembly configured to hold a number of other key components. The housing is configured to house inside the key an emergency insert (also referred to as an "emergency key", used to manually lock and/or unlock the vehicle) and a battery. The emergency insert may be made of metal. The insert may be fixed within the housing, so that when the driver removes the key head, the insert protrudes from the housing and is manipulated by the driver by manipulation of the housing (i.e. the driver holds the insert by the housing). The housing may house inside the key a battery. The housing may temporarily house no battery during a period for which an old battery is being replaced by a new battery. In other words, the battery may removable, so to be replaced. In addition to being configured to house inside the key an emergency insert and a battery (the battery powering a circuit of the key, such that of a printed circuit board assembly (PCBA) comprising for example a transmitter for executing the locking, unlocking and/or engine start), the housing may be configured to house other key components, such as for example a battery cap, a battery sealing, and/or a battery housing. The key may comprise one or more actuators, such as one or more press-buttons, one or more digital buttons, and/or one or more slidable switches, to command actions of the vehicle (for example to lock and/or unlock the vehicle). The one or more actuators may be mounted on the key housing. Activating (e.g. in the case of a push-button, by pressing, or in the case of a slidable switch, by sliding) the one or more actuators may execute actions controlling the vehicle, for example the unlocking and/or locking of vehicle doors, if for example, the hands free does not execute the control action. Additionally or alternatively, activating the one or more actuators may execute a specific function that is not managed by the hands free, such as for example, the opening of the trunk of the vehicle.

[0025] The housing may comprise a separate housing base and a housing cover (also referred to as a "back cover"). Each of the housing base and housing cover may be integrally formed. Each of the housing base and

housing cover may be made of plastic. The housing base may comprise a housing top surface. The housing top surface may correspond in part to the top surface of the key, i.e. the housing top surface may form a part of the top surface of the key. The housing base may comprise a number of housing side surfaces, for example three side surfaces. The housing side surfaces may correspond in part to the side surfaces of the key, i.e. the housing side surface may form a part of the respective side surfaces of the key. One edge of each housing side surface may meet the housing top surface. At least one other edge of each housing side surface may meet a corresponding edge of another housing side surface, i.e. an edge configured to meet the respective at least one other edge. The top surface may have a surface area larger than each of the respective side surfaces. The housing (for example the housing base) may comprise a logo (e.g. of the vehicle manufacturer), for example on the top surface. The logo may comprise an actuator, such as any one of those previously described. The method may comprise manufacturing the housing to be of any shape suited to housing such components, for example the housing may be of a rectangular, square, circular, ovular or oblong shape, or of a substantially (i.e. not entirely) rectangular square, circular, ovular or oblong shape. The housing may have rounded edges. The top surface and/or at least one (e.g. each) of the respective side surfaces may be flat. Additionally or alternatively, the top surface and/or at least one (e.g. each) of the respective side surfaces may be curved. The housing base may comprise at least one feature for facilitating connection with a housing cover or for facilitating connection with other key components. For example, the method may comprise manufacturing the housing base to include at least one housing cover connection feature to facilitate connection with the housing cover. The at least one cover connection feature may be along at least one of the housing side surfaces. For example, at least one cover connection feature may be along each of the housing side surfaces. The at least one cover connection feature may be integrally formed with the housing base.

[0026] The housing cover may be connected to the housing base. The housing cover may comprise a housing bottom surface. The housing bottom surface may correspond in part to the bottom surface of the key. The method may comprise manufacturing the housing cover so that, when connected to the housing base, the housing base and housing cover form a single unit. In other words, the housing cover (and hence the housing bottom surface) may form a surface opposite the housing top surface. The housing cover may correspond in part to the bottom surface of the key. The cover may be configured to be slidably removable from the housing. By slidably removable, partial removal or complete removal of the cover from the housing by a translational movement is understood. The user (or driver) may slide or translate the cover along the housing until its partial removal, or complete removal or disconnect from the housing. The user may then obtain access to the interior of the housing, and therefore, the battery. Alternatively, the user may access the interior of the housing without partial removal or complete removal of the housing cover. The housing cover may be of a shape similar to that of the top surface of the housing base. Alternatively, the housing cover may be of a shape different to that of the top surface of the housing base. The method may comprise manufacturing the cover to comprise at least one housing base connection feature to facilitate connection between the housing cover and the housing base. The at least one housing base connection feature may interact with the at least one housing cover connection feature to enable the connection. The features may for example form a clip or sliding lock mechanism.

[0027] The sliding or translating for removing the cover may be possible after rotationally disconnecting the key head from the housing. Additionally or alternatively, the sliding or translating for attaching the cover may be possible after connecting the key head to the housing.

[0028] The key head may have a shape that completes an end portion of the housing and housing cover when connected to the housing. The key head may be open at one end. The key head may comprise a head top surface. The head top surface may correspond in part to the top surface of the key, i.e. the head top surface may form a part of the top surface of the key. The key head may comprise a head bottom surface. The head bottom surface may correspond in part to the bottom surface of the key, i.e. the head bottom surface may form a part of the bottom surface of the key. The head top surface and head bottom surfaces may be in parallel and opposite to one another. The key may comprise a number of head side surfaces, for example three head side surfaces. The head side surfaces may correspond in part to the side surfaces of the key, i.e. the head side surface may form a part of the respective side surfaces of the key. One edge of each head side surface may meet the head top surface. One other edge of each head side surface may meet the head bottom surface. At least one additional other edge of each key side surface may meet a corresponding edge of another head side surface, i.e. an edge configured to meet the respective at least one additional other edge. When the housing and key head connect, they may together form the top, bottom and side surfaces of the key in full. In other words, the key head may connect with the housing and housing cover to form a single unit.

[0029] The housing may be open at one end. For example, the housing and housing cover may together form a part of a shape (such as for example that of a cuboid or similar) that is open at one end, the key head fitting to the open end so as to complete the shape. The key head may be hollow and may be open at one end. The key head may comprise an interior surface comprising features facilitating connection with the housing. The key head may comprise an exterior surface comprising a handlebar or loop for attaching a key ring. The handlebar may be on an end of the key head opposite to that which

connects to the housing, so that, when connected, the handlebar is at one end of the key. Alternatively, the key head may comprise no handlebar or loop for attaching a key ring. Removal of the key head alone can enable access to the emergency key (e.g. for manual locking, unlocking and/or starting of the vehicle). Removal of the key head and/or housing cover can enable access to the battery (e.g. for replacement).

[0030] The housing may comprise one or more hooks (the hook forming, for example, a full loop) and the key head may comprise one or more pegs (such as for example a tooth or cog). The one or more pegs may be configured to be each inserted inside a respective hook during the connecting to the housing so as to lock the key head in translation relative to the housing (i.e. so as to prevent a movement of the key head in planar motion in a direction away from the housing, or , the planar motion being along a plane for example along the longitudinal axis of they key, parallel to the top and/or bottom surfaces of the key). In other words, each respective peg may fit into each respective hook so as to lock the key head and housing together until the performing of a rotational disconnecting of the key head to unlock the peg from the hook. The connecting may comprise performing the connecting with a rotational movement so as to facilitate interaction between the one or more hooks and the respective one or more pegs. By locking the key head in translation, an unintentional removal of the key head can be prevented. Each peg may be withdrawn from the respective hook during the rotational disconnecting from the housing so as to unlock the key head in translation relative to the housing. The housing may comprise at least one hook along an extremity of the housing base, at the open end of the housing. The key head may comprise at least one peg towards the opening of the key head, at a location that facilitates interaction with the respective at least one hook of the housing. The housing base may comprise at least one hook along an extremity of the housing base, at the open end of the housing, the key head comprising a corresponding peg to interact with the hook. Additionally or alternatively, the housing cover may comprise at least one hook along an extremity of the housing base, at the open end of the housing, the key head comprising a corresponding peg to interact with the hook. Providing a peg-and-hook connection between both the housing base and key head and the housing cover and key head may allow for a more reinforced retention of the key head at the end of the housing.

[0031] The housing may comprise one or more (for example, two) retention blades, i.e. blades for assisting in maintaining the connection between the housing and key head.

[0032] The engaging of the key head with the housing may include the key head translationally engaging with the one or more retention blades. The disengaging of the key head from the housing may include the key head translationally disengaging from the one or more retention blades. The one or more retention blades may be arranged so as to, when the key head is engaged with the one or more retention blades and the key head is connected to the housing, allow the key head to rotate relative to the housing in a predetermined rotational direction when the rotational force applied to the key head along said predetermined rotational direction is above a predetermined rotational force threshold. The predetermined rotational direction may be in a clockwise or anticlockwise direction. Additionally, the one or more retention blades may be arranged so as to, when the key head is engaged with the one or more retention blades and the key head is connected to the housing, retain the key head in rotation relative to the housing in the predetermined rotational direction when the rotational force applied to the key head along the predetermined rotational direction is below the predetermined rotational force threshold. This may permit the key to remain intact, i.e. for the key head and housing to remain connected in the event of any unintentional manipulation of the key which could cause a disconnect and/or disengagement of the key head and housing.

[0033] The one or more retention blades may be elastically deformable such that, when the key head engages with the one or more retention blades, the one or more retention blades deform and exert a restoring force so as to enable the retaining of the key head. The restoring force may be a force exerted by the blades on the key head, restraining the key head from coming away from the housing. The deformability of the one or more retention blades may be such that the one or more retention blades are able to deform when a sufficient rotational force is applied to the key head in the right direction, i.e. a force above the threshold along the predetermined rotational direction. This may thereby allow the key head to rotate relative to the housing in the predetermined rotational direction. The predetermined rotational force threshold may be a function of the parameters of the material of the blades. Additionally, the restoring force may be a function of the parameters of the material of the blades.

[0034] The retention blade may comprise a flat (or planar) shape, with a blade edge of a thickness that is a fraction of the surface area of the flat shape. The key head may comprise one or more retention features such as, for example, a tooth or a receptacle. The method may comprise forming each of the one or more retention blades to interact (i.e. lock) with a respective retention feature in the key head. The one or more retention blades may act to reinforce the connection between the key head and housing. The one or more retention blades may be part of a retention mechanism between the housing and the key head when the key head and housing are in a connected state.

[0035] According to some examples, the one or more retention blades may be part of a pre-locking mechanism when the housing and key head are in an engaged state. When mating the key head with the key housing, the retention blades may enter the key head and deform upon

interaction with a corresponding key head retention feature to reach an engaged state. Alternatively, according to some examples, when mating the key head with the key housing, the retention blades may be predisposed in the key head and may deform with a corresponding housing retention feature to reach an engaged, and simultaneously, a connected state.

[0036] The deformation allows the retention blade to arrive at a locked position within the key head during engagement, and to maintain the locked position during connection. Each of the respective blades may be of an elastic material. Therefore, when un-mating (i.e. disconnecting and disengaging) the key head from the key housing, the retention blade may deform with the rotational movement so as to enable the unlocking or disconnecting, the blade returning to its shape prior to the deforming once the un-mating (i.e. disconnecting and disengaging) is completed. The interaction between each retention blade and each respective retention feature, i.e. the locking mechanism, can allow for an improved connection between the housing and key head.

[0037] According to some examples, the key may have a length direction (i.e. a direction in that of the length of the key) and a width direction (i.e. a direction in that of the width of the key), the translationally engaging of the key head with the one or more retention blades being along the length direction of the key. The translationally disengaging of the key head from the one or more retention blades may also be along the length direction of the key, the one or more retention blades comprising (or consisting of) two retention blades each arranged on a respective side of a half-width (longitudinal, i.e. along length direction of key) cross-sectional plane of the key (i.e. plane perpendicular to width direction of the key and crossing the key in the middle with respect to the width). By being on a respective side of the plane, the each of the one or more blades may be positioned along a side wall of the housing. This can allow for good balance and can enable a secure connection between the key head and housing, the connection being reinforced on two opposite sides of the key.

[0038] The one or more retention blades may comprise (or consist of) one or more retention blades each protruding out of the exterior of the housing (113). In other words, each blade may extend outside of the interior of the housing. This can facilitate engagement of the key head and one or more retention blades by aligning the key head with respect to the housing and therefore allowing for an improved mechanical interaction between the key head and housing. This can also facilitate connection with the corresponding respective retention feature of the key head. The key may have a length direction (i.e. a direction in that of the length of the key, corresponding to the longitudinal axis of the key) and a width direction (i.e. a direction in that of the width of the key), the one or more retention blades comprising (or consisting of) two blades each protruding out of the exterior of the housing along the length direction and each arranged on a respective side delimiting the width of the key (i.e. towards the boundaries or extremities of the width of the key), the two blades exerting the restoring force so as to clamp the key head or push away one from another (i.e. the blade and key head applying equal and opposite forces on one another) inside the key head along the width direction.

[0039] A portion of each respective blade may remain inside the interior of the housing while another portion (i.e. the protruding portion) extends outside of the housing. This can allow for the protruding portion to be sufficiently anchored for mating with the corresponding respective retention feature of the key head. Each of the respective one or more retention blades may protrude from the key so that a thickness of the respective blade is in parallel with the top and/or bottom surface of the key. Each of the respective one or more retention blades may protrude from the key so that a width of the blade is in parallel with a side surface of the key. The blade edge may be along the thickness of the blade. The planar or flat part of the blade may be along the width of the blade. Each of the respective one or more retention blades may comprise a with flat or planar part corresponding to the width of the blade and a blade edge corresponding to the thickness of the blade. The length of the blade may be greater than the width of the blade and the width of the blade may be greater than the thickness of the blade. The flat or planar shape of the retention blade may be parallel with the side surface of the housing. In other words, the blade may protrude out of the housing so that the flat part of the blade is perpendicular to the top surface of the housing (and housing cover if intact) and the edge of the blade is in parallel with the top surface (and housing cover if intact). The retention blade may therefore be considered to protrude out of the housing on its side. In the case of there being two retention blades, the blades may be facing one another (i.e. the flat part of the blade of one retention blade may be facing towards the flat part of another blade). The protruding portion may comprise a chamfered portion along the flat part of the blade. The chamfered portion may be along the inside of the blade. The inside of the blade may be the flat part of the blade that is facing towards the flat part of the other blade. The chamfered portion may enable improved interaction with the retention feature of the key head during the rotational movement of the disconnecting, and according to some examples, the connecting also. If the one or more retention features comprises one or more teeth, the one or more teeth may be configured to deform a respective retention blade when the key head translationally engages with the one or more retention blades so as to enable retention of the key head. For example, the one or more teeth may protrude from a side wall of the key head. The chamfered portion may provide support for the part of the blade interacting (and thereby undergoing deformation) with the tooth.

[0040] According to some examples, the one or more retention blades may comprise (or consist of) one or more

retention blades mounted on the key head. The one or more blades may be mounted on the key head on the inside of the key head.

[0041] The wherein the key may have a length direction, the one or more retention blades comprising (or consisting of) two blades exerting the restoring force so as to apply a torque to the key head around the length direction (for example around an axis in parallel to the longitudinal axis of they key) and opposite to the predetermined rotational direction.

the one or more retention blades may respectively comprise a square shape. The square shape may the shape of the flat or planar portion of the blade. The square may comprise a hollow portion at the center of the square, forming a frame. A blade wing may extend from on side of the square so as to form an overhang over (i.e. above, not in line with) the hollow portion. The overhang may extend away from the hollow portion. The blade wing may comprise a bend, forming a portion that is parallel to the flat surface and the hollow portion. The key head may comprise retention features for each respective retention blade in the form of locking receptacles. Each receptacle may interact with the blade during the connecting in such a manner that the blade enters the receptacle during the connecting. The overhang portion of the blade may consequently lock into a corresponding retention feature of the housing.

[0042] The housing may comprise a guiding element for engaging and disengaging the key head with the housing. The method may comprise configuring the guiding element for reception of a corresponding insert of the key head configured to mate with the guiding element. The insert may be configured to interact with the guiding element to obtain the partial engagement, full engagement and connection. One or more arms may be located at an offset along the insert. The guiding element may extend outside the housing. The guiding element may extend in the same direction as each of the one or more retention blades. The guiding element may be between each of the one or more retention blades, and may for example be equidistant from each of the one or more retention blades. The guiding element may extend along the longitudinal axis of the key. The guiding element may have a tubular form. In other words, the guiding element may comprise a hollow part for the reception of the insert of the key head. The guiding element may fix the key head in rotation when engagement is partial, the key head being free in rotation when engagement is full such that the key head may rotationally connect or disconnect from housing. The guiding element may comprise a distal end that is open, and a proximal end that is closed, each end being on either side of the hollow part (also referred to as the interior part). The guiding element may comprise interior grooves. The grooves of the guiding element may have a curved form. The grooves may provide the interior of the guiding element with a form that is partly curved. Additionally or alternatively, the grooves may provide the interior of the guiding element with a form that is partly rectangular. Alternatively, the interior part of the guiding element may comprise any other form capable of receiving the insert of the key head. The guiding element may comprise a first rounded section along each of two first respective opposite surfaces of the element. The first rounded section may correspond to both the upper and lower surface of the guiding element. By upper and lower surfaces, it is meant surfaces running along planes parallel to those of the top and bottom surfaces of the housing. The guiding element may comprise a second rounded section along each of two second respective opposite surfaces of the element. The second opposite surfaces may form on either side of the respective upper and lower surfaces so as to form the complete tube. The guiding element may comprise joints where each first rounded section and second rounded section meet, i.e. at the intersection of each surface type. The second rounded sections may be the sections exterior to the rectangular interior sections. The first rounded sections may be the sections exterior to the partly curved interior sections. The insert may comprise a proximal end and a distal end. The distal end may be connected to the inside of the key head housing. The distal end may reach as far as (i.e. all the way to) the opening of the key head. The one or more arms of the insert may be located closer to the proximal end than the distal end. During the connecting, the one or more arms may travel through the rectangular interior of the guiding element while the curved part of the insert may travel through the curved interior of the guiding element. The guiding element may comprise one or more slots, each slot corresponding to the shape of each respective arm of the insert. The slots may be located directly opposite one another along the guiding element. Alternatively, the slots may not be located directly opposite one another along the guiding element. Each slot may extend over a joint of the guiding element. In other words, each slot may start along the curved exterior (and consequently, the rectangular interior), extend over the joint, and terminate along the flattened exterior (and consequently, the curved interior). As the arms travel through the guiding element, they may eventually arrive at each respective slot (simultaneously) and may enter each slot, locking the insert in place in the guiding element. The slots may be located closer to the proximal end of the guiding element. The guiding element may comprise second grooves that are continuations of the grooves after each respective slot. The guiding element and insert may be of similar lengths (for example, the same length). The location of the one or more arms on the insert may correspond to the location of the slots along the guiding element. In other words, the one or more arms may be along a distance of the insert that corresponds to (for example, is the same as) the distance along which the slots are located along the guiding element. When the one or more arms enter the slots, the distal end of the insert may reach the may reach the proximal end of the interior of the guiding element. For the rotational disconnecting, the rotational movement may

enable the one or more arms to disengage from the slots while simultaneously pulling the key head away from the housing.

[0043] A first example of an electronic key 150 is discussed with reference to FIG.'s 1 to 4. FIG. 1A and 1B illustrate an example of the key 150 during the disconnecting, FIG. 1A demonstrating an example of the rotational disconnecting by means of arrow 104, and FIG. 1B demonstrating an example of removing the key head 100 from the housing 113 entirely following the rotational movement by means of arrow 114. In FIG. 1B, the key 150 has a length direction 190, corresponding to that of arrow 114, and a width direction 188. The translationally engaging of the key head with the one or more retention blades may be along the length direction 190 of the key. The translationally disengaging of the key head from the one or more retention blades also may be along the length direction 190 of the key. A plane 184 illustrates a plane parallel to the width direction 188. A plane 186 illustrates a plane parallel to the length direction 190.

[0044] The key head 100 comprises a handle bar 120 at one end, for example for connection to a keyring. The housing 113 comprises a housing base 102 and a housing cover 124. The housing base 102 is in the form of a cuboid with a top surface 101 and a side surface 103 on each side of the top surface 101 (all side surfaces 103 not shown), apart from the side opposite the key head 100. The top surface 103 is slightly raised or curved. Each side surface 103 meets the top surface 101 at one edge 105 of the side surface 103. The edge 105 (and for example all edges) is curved. Alternatively, the edge 105 (and for example all edges) may not be curved. At least one side surface 103 comprises a number of buttons 112, 110, 108. Each button may have a separate function, for example to execute a locking or unlocking of the car doors. The top surface 101 comprises a logo 106. Alternatively, any other surface of the housing base 102, housing cover 124 or key head 100 may comprise a logo 106. The logo 106 may be that of the company manufacturing the vehicle. The logo 106 may comprise a button. The key head 100 rotates, for example by manipulation of a user turning the key head, in the direction of the arrow 104. In other words, the key head 100 may be fully connected to the key head before a user may start to turn the key head to initiate the disconnecting. The rotational disconnecting is an anticlockwise movement. The rotational movement forms an upward displacement (direction of arrow 104) of one portion of the key head and a downward displacement (direction opposite to arrow 104) of another portion of the key head, forming gaps 109a, 109b between the key head 100 and housing base 102 and housing cover 124. Alternatively, the rotational disconnecting may be a clockwise movement. In such a case, the directions of displacement may be reversed, the gaps 109a, 109b forming along opposite locations between the key head 100 and housing base 102 and housing cover 124. The rotational movement permits the retention blades, and any other locking feature, to disengage from the locking counterpart in the key head 100. The user may then remove the key head 100 by applying a force in the direction of arrow 114, i.e. by pulling the key head 100 away from the housing base 102. The rotational disconnecting and pulling may be as one continuous movement. Removal of the key head 100 is displayed to expose interior components of the housing base 102. Such components include an emergency key 118, retention blades 116a, 116b and guiding element 122. There are two retention blades 116a, 116b, each arranged on a respective side of a half-width cross-sectional plane 186 of the key 150. Each component extends outside of the housing base 102 and housing cover 124. The emergency key 118 is just below the top surface and above the guiding element 122. The retention blades are disposed along opposite sides surfaces 103.

[0045] The two retention blades 116a, 116b each protrude out of the exterior of the housing 113. The two blades each protrude out of the exterior of the housing 113 along the length direction 190 and are each arranged on a respective side 103 (only one side 103 of the key displayed in FIG. 1 to 5) delimiting the width 188 of the key 150, the two blades 116a, 116b exerting the restoring force so as to clamp the key head 100 along the width direction 188. In the example of FIG. 2A, the retention blades 116a, 116b can be seen to comprise a flat part 121a, 121b comprising a chamfered portion 123a, 123b. The flat portion 121a, 121b may be parallel with the side wall 103. The chamfered portion 123a, 123b are on the side of the planar portion 121a, 121b facing the interior of the housing base 102. In other words, each chamfered portion 123a, 123b are opposite one another. The chamfered portion 123a, 123b may be beneath a section 129a, 129b of the planar portion, beneath being in the direction towards to housing cover 124. In other words, a section 129a, 129b of the planar portion may remain above the chamfered portion 123a, 123b, above being in the direction of the top surface 101. The sidewall 103 extends around the open end of the housing and housing cover to form a top wing 125a, 125b and a bottom wing 127a, 127b. The blades 116a, 116b may extend between the respective top wings 125a, 125b, and respective bottom wings 127a, 127b. The housing base and housing cover also comprise hooks 117a, 117b, they are merely not shown in FIG. 2 for ease of viewing.

[0046] FIG. 3 displays an example of a section view of the key head 100 and the retention blade 116b protruding from the housing base 102. The key head 100 comprises a tooth 130 which interacts with the retention blade 116b. The section 129b of the planar portion above the chamfered portion deforms to a position underneath the tooth 130 during the connecting or when the key head 100 and housing base 102 are in a connected state. The chamfered portion 123b may act as a support for the section 129b during the deflection by the tooth 130.

[0047] FIG. 4A illustrates an example of the underside (i.e. the side opposite the top surface 101) of the housing base 102 and housing cover 124. The guiding element

122 is therefore in this instance above the emergency key 118. The figure provides an example of a hook 117a protruding from the housing cover 124, in a direction towards an open end of the housing. A hook 117b also extends from the housing base 102. The hook 117a of the housing cover 124 is diagonally opposite to the hook 117b of the housing base 102. The hooks 117a, 117b comprise a mostly rectangular shape, the hooks having each a length longer than a width of the hook. The hooks are positioned so that their lengths are in parallel with the width direction 188. Each hook 117a, 117b comprise through holes which may facilitate retaining the respective peg 158 when interacting with the respective hook 117a, 117b. The guiding element 122 extends outside the housing to facilitate mating with a key head. The guising element 122 extends in the same direction as both retention blades 116a, 116b. The guiding element 122 is between each of the retention blades 116a, 116b, and is equidistant from each of the retention blades 116a, 116b. The user applies a force to the housing cover 124 in the direction of arrow 132 so as to initiate a translational movement that allows for the removal of the housing cover 124 from the housing base 102. The translational movement in the direction of arrow 132 is in a direction that is opposite that applied for the removal of the key head 100. The housing cover 124 is shown to be partially removed, the sliding or translational motion displaying the contents of the housing 102 in the interior of the housing base 102. FIG. 4B displays the contents of the housing 202 following complete removal of the housing cover 124, the user having continued the translational movement in the direction of arrow 132 until the removal of the cover 124. The guiding element 122 connects to a battery housing 138 comprising a battery cap 140. The user opens the cap 140 in the direction of arrow 134, i.e. in a direction towards the opening of the housing base 102. Alternatively, the user may open the cap 140 in the direction opposite to that of arrow 134. Opening the cap 140 exposes the battery 136. The battery 136 may be a common cell type battery. The user may then remove the battery 136 and replace it with a new battery 136. The user may then close the cap 140 by applying a force in the opposite direction to that by which the cap 140 was opened.

[0048] A second example of an electronic key 250 is now discussed with reference to FIG.'s 5 to 13. FIG.'s 11 to 13 show examples of an entire view of the key according to this example, with FIG.'s 12 and 13 exploded views. The electronic key 250 of the second example differs from the electronic key 150 of the first example essentially in that instead of having two retention blades 116a and 116b each protruding out of the exterior of the housing that clamp the key head, the electronic key 250 comprises two retention blades 216a and 216b that exert a torque on the key head around the length direction. The hooks 217a, 217b differ from the hooks 117a, 117b of the first example in that, while also rectangular (each hook having a length greater than a width), the hooks 217a, 217b are positioned along the housing so that their widths are in parallel with the width direction 188. An inner part of each hook 217a, 217b also narrows slightly in the direction of the key head. This may assist in retaining the respective peg 158 upon its entry into the hook 217a, 217b. Each respective hook 217a, 217b comprises a blind hole. Elements which are identical or similar in both examples are described by the same numeral references.

[0049] FIG. 5 provides an example of the housing 202 for which the housing cover 124, battery cap 140, PCBA, battery 136, and any battery sealing, are removed. An example of the interior of the key head 100 can be seen in FIG. 6A and FIG. 6B. The key head is mostly rectangular (i.e. mostly in the form of a cuboid), that is to say, in this example, the wall of the key head 100 is curved. Alternatively, the wall may be partially curved, or may not be curved. The wall may be curved on the exterior of the key head 100. Additionally or alternatively, the wall may be curved on the interior of the key head 100. The key head 100 comprises two retention blade receptacles 230a, 230b. Each receptacle 230a, 230b is disposed on either side of an insert 142 and is fixed to the interior of a back wall 156 of the key head. The retention blade receptacles 230a, 230b are positioned diagonally to one another. The insert 142 is also fixed to the back wall 156. The key head 100 may also comprise pegs 158 for interaction with the housing base 102 and back plate 124. The pegs may hook into respective hooks 117a and 117b during the connecting of the key head 100 to the housing 113, thereby facilitating retention of the key head 100 on the housing 113. The connecting may be a rotational connecting so as to facilitate positioning each peg at an angle to each respective hook so that each peg can sufficiently bypass the body of each respective hook and enter into the gap of each respective hook. The receptacle 230a comprises wings 248a, 248b that fold partially over the receptacle. The receptacle 230b comprises wings 252a, 252b that fold partially beneath the receptacle. In other words, the wings 248a, 248b, of receptacle 230a fold in a direction opposite to the direction of the folding of the wings 252a, 252b of receptacle 230b. Each wing may comprise a raised portion 260 on the inside of the receptacle 230a, 230b. The insert 142 has a tubular form comprising a hollow portion 144. The insert 142 is secured to the back wall of the key head 100 by means of supports 164. The supports 164 can provide structural support to the insert 142. The method may comprise forming the supports 164, insert 142, key head 100, features 158 and/or retention blade receptacles 230a, 230b as one integrated component. The insert comprises two arms 154a, 154b. From the plan view of the example of the key head in FIG. 6B, it can be seen that the arms 154a, 154b are offset from a center line 166. This offset can facilitate locking into corresponding slots of the guiding element.

[0050] The retention blade receptacles 230a, 230b are equipped with retention blades 216a, 216b of FIG. 7. As can be seen in FIG. 8, the retention blades 216a, 216b

are mounted on the key head. Specifically, the retention blades 216a, 216b are mounted inside the receptacles, the receptacles 230a, 230b being positioned on the back wall (the wall opposite the opening of the key head). As in the first example, the key 250 has a length direction 190. In this example, the retention blades 216a, 216b exert the restoring force so as to apply a torque to the key head around the length direction and opposite to the predetermined rotational direction (corresponding to that of arrow 104). The torque may be applied to the hooks 217a, 217b as they come into contact with the blades 216a, 216b (while also interacting with pegs 158). Thanks to this interaction, sufficient support for maintaining the connection between the key head and housing can be obtained. Each blade 216a, 216b of the example comprises a flat surface in the shape of a square, comprising a void or hollow portion 268a, 268b. In other words, each blade 216a, 216b is in the form of a square-shaped frame. Alternatively, each retention blade 216a, 216b may be in the form of a rectangular-shaped frame, or any other shape of frame. Each blade 216a, 216b comprises an overhang portion 262a, 262b. Each overhang portion is connected at one end to the flat surface of the retention blades 216a, 216b and extends from the flat surface of the retention blades 216a, 216b over each of the respective void or hollow portions 268a, 268b. Each overhang portion 262a, 262b forms an angle over the respective hollow portion 268a, 268b. In other words, each overhang portion 262a, 262b does not extend over each respective hollow portion 268a, 268b in a manner that is in parallel with the flat surface of each respective blade 216a, 216b. Each overhang portion comprises an end portion 218a, 218b (i.e. a portion opposite the end connected to the flat surface of the retention blades 216a, 216b). Each respective end portion 218a, 218b is parallel to each respective flat surface of the retention blades 216a, 216b.

[0051] As can be seen in the example of FIG. 8, each respective retention blade 216a, 216b inserts into the corresponding retention blade receptacle 230a, 230b. Each respective receptacle 146a, 146b is oriented 180 degrees from one another, each corresponding retention blade 216a, 216b also being oriented 180 degrees from one another so as to insert correctly into the respective receptacle 230a, 230b. During the inserting, each raised portion 260 facilitates holding the retention blade 216a, 216b in place by exerting a force on each respective retention blade 216a, 216b. Each receptacle comprises two raised portions 260. The retention blade 216a, 216b is positioned in the receptacle so that each raised portion 260 is on either side of the overhang portion 262a, 262b. Each respective receptacle is formed so that each respective overhang portion protrudes outside of the receptacle. In other words, each over hang portion is not constrained by the respective retention blade receptacle. FIG. 9A displays an example of the guiding element 122. The guiding element if formed integrally with an upper case part 172. The upper casing part 172 may be located inside the housing 102. The upper case part 172 may be positioned beneath the top surface and above the battery housing 138, battery 136, battery cap 140, and a battery sealing. The upper case part 172 comprises a through hole 170 to provide access of a button on the housing 120 (for example, via the logo 106) to a PCBA (not shown) beneath the upper case part 172 (and beneath other battery components such as the battery housing 138, battery 136, battery cap 140, and battery sealing) comprising, for example, a switch activated by pushing the button. The guiding element 122 has a tubular form. The guiding element 122 extends along the longitudinal axis of the key 150. The guiding element is hollow and open at a distal end 178 for receiving the insert of the key head. Although tubular, the guiding element comprises an interior part (i.e. the hollow part) that is partly rectangular and partly curved in shape. This can be observed also in FIG. 9B, illustrating the opening of the guiding element and hence a transverse view of the guiding element. The interior of the tube comprises two curved surfaces opposite one another, each surface being parallel with the upper and lower surfaces of the housing base 102. The interior of the tube comprises two rectangular surfaces opposite one another, each surface being parallel with the side surfaces of the housing base 102. In other words, each of the rectangular surfaces are perpendicular to each of the curved surfaces. Alternatively, the interior part of the guiding element may comprise any other form capable of receiving the insert of the key head. Each respective rectangular surface is connected to both curved surfaces, and each respective curved surface is connected to both rectangular surfaces. The curved and rectangular surfaces form interior grooves 180, 182, configured to guide an insert 142 of the key head. The insert 142 may slide along the grooves, arms fitting into the rectangular grooves 182 and the remaining curved surface of the insert fitting into the curved grooves 180, the restriction of the movement of the arms thereby being facilitated by the grooves 180, 182.

[0052] Each exterior portion of the tube corresponding to each respective interior curved surface is a flattened surface. Each respective flattened surface has a curved shape. Each exterior portion of the tube corresponding to each respective interior rectangular surface is a rounded surface. Each respective rounded surface has a curved shape, each rounded surface being on either side of each flattened surface, so as to complete the tube exterior. Each respective curved and rounded surface are connected by a respective groove 176.

[0053] As can be seen in FIG. 9B and in FIG.'s 10A to 10C, the guiding element comprises two slots 174a, 174b, each slot corresponding to the shape of each respective arm of the insert 142. The slots are displayed in FIG. 10A to be located directly opposite one another along the guiding element. Each slot extends over a respective groove of the guiding element. Therefore, as the arms travel through the guiding element, they may eventually arrive at each respective slot (simultaneously), and hence the end of the grooves 182, and may over-

come the grooves 182 to enter each slot, locking the insert in place in the guiding element. For the rotational disconnecting, the rotational movement may enable the arms to disengage from the slots while simultaneously pulling the key head away from the housing.

Claims

1. An electronic key (150, 250) for an automotive vehicle, wherein the electronic key (150) comprises:

   - a housing (113) having an inside configured to house an emergency insert (118) and a battery (136); and
   - a key head (100) configured to engage with the housing and to connect to the housing (113), the key head (100) being further configured to rotationally disconnect from the housing and then to translationally disengage from the housing (113), thereby providing access to the inside of the housing (113), the key head (100) being configured to disengage from the housing (113) only when the key head (100) is disconnected from the housing.

2. The electronic key (150, 250) according to claim 1, wherein the housing (113) comprises one or more hooks (117a, 117b) and the key head (100) comprises one or more pegs (158), the one or more pegs (158) being configured to be each inserted inside a respective hook during the connecting to the housing (113) so as to lock the key head (100) in translation relative to the housing (113), and to be each withdrawn from the respective hook during the rotationally disconnecting from the housing (113) so as to unlock the key head (100) in translation relative to the housing (113).

3. The electronic key (150, 250) according to claim 1 or 2, wherein the key (150) comprises one or more retention blades (116a, 116b, 216a, 216b), the engaging of the key head with the housing including the key head translationally engaging with the one or more retention blades, the disengaging of the key head from the housing including the key head translationally disengaging from the one or more retention blades, the one or more retention blades being arranged so as to, when the key head (100) is engaged with the one or more retention blades and the key head is connected to the housing, allow the key head (100) to rotate relative to the housing in a predetermined rotational direction when the rotational force applied to the key head along said predetermined rotational direction is above a predetermined rotational force threshold, and to retain the key head (100) in rotation relative to the housing in the predetermined rotational direction when the rotational force applied to the key head along the predetermined rotational direction (104) is below the predetermined rotational force threshold.

4. The electronic key (150, 250) according to claim 3, wherein the one or more retention blades are elastically deformable such that, when the key head engages with the one or more retention blades, the one or more retention blades deform and exert a restoring force so as to enable the retaining of the key head.

5. The electronic key (150, 250) according to claim 3 or 4, wherein the key (150) has a length (114, 190) direction and a width direction (188), the translationally engaging of the key head with the one or more retention blades (116a, 116b) being along the length direction of the key, the translationally disengaging of the key head from the one or more retention blades (116a, 116b) also being along the length direction of the key, the one or more retention blades comprising two retention blades (116a, 116b) each arranged on a respective side of a half-width cross-sectional plane of the key.

6. The electronic key (150) according to any one of claims 3 to 5, wherein the one or more retention blades (116a, 116b) comprise one or more retention blades each protruding out of the exterior of the housing (113).

7. The electronic key (150) according to claim 6, wherein the key (150) has a length direction and a width direction, the one or more retention blades (116a, 116b) comprising two blades (116a, 116b) each protruding out of the exterior of the housing (113) along the length direction and each arranged on a respective side delimiting the width of the key, the two blades (116a, 116b) exerting the restoring force so as to clamp the key head (100) or push away one from another inside the key head (100) along the width direction.

8. The electronic key (250) according to claim 3 or 4, wherein the one or more retention blades (216a, 216b) comprise one or more retention blades mounted on the key head.

9. The electronic key (250) according to claim 8, wherein the key (150) has a length direction, the one or more retention blades (216a, 216b) comprising two blades exerting the restoring force so as to apply a torque to the key head around the length direction and opposite to the predetermined rotational direction.

10. The electronic key (150, 250) according to any one of claims 1 to 9, wherein the housing (113) comprises a guiding element for the engaging and disengaging

of the key head (100) with the housing (113).

11. The electronic key (150, 250) according to claim 10, wherein the guiding element has a tubular form arranged to fix the key head (100) in rotation when engagement is partial, the key head (100) being free in rotation when engagement is full such that the key head (100) may rotationally connect or disconnect from housing (113).

12. The electronic key (150, 250) according to claim 11, wherein the key head (100) comprises one or more arms (154a, 154b) inside the key head (100) that are received in corresponding one or more internal grooves of the guiding element so as to perform the fixing in rotation, wherein the key head (100) reaches full engagement when the one or more arms (154a, 154b) fully traverse the one or more grooves (234, 236) to overcome the grooves (180, 182) so that the arms (154a, 154b) can freely rotate.

13. The electronic key (150, 250) according to claim 11 or 12, wherein the key head (100) comprises an insert configured to interact with the guiding element to obtain the partial engagement, full engagement and connection, the arms (154a, 154b) being located at an offset along the insert.

14. The electronic key (150, 250) according to claim 13, wherein the guiding element comprises one or more slots (174a, 174b), each respective slot (174a, 174b) being configured to incorporate each respective arm after overcoming the grooves (180, 182).

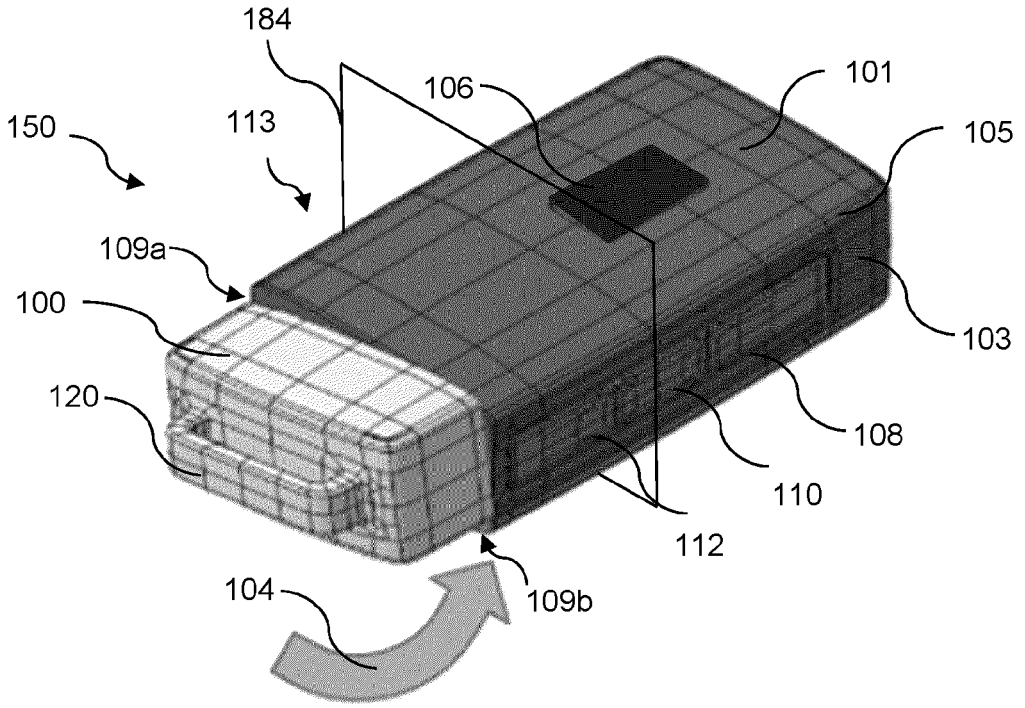

184
106
101
150
113
105
109a
100
103
120
108
110
112
104
109b

FIG. 1A

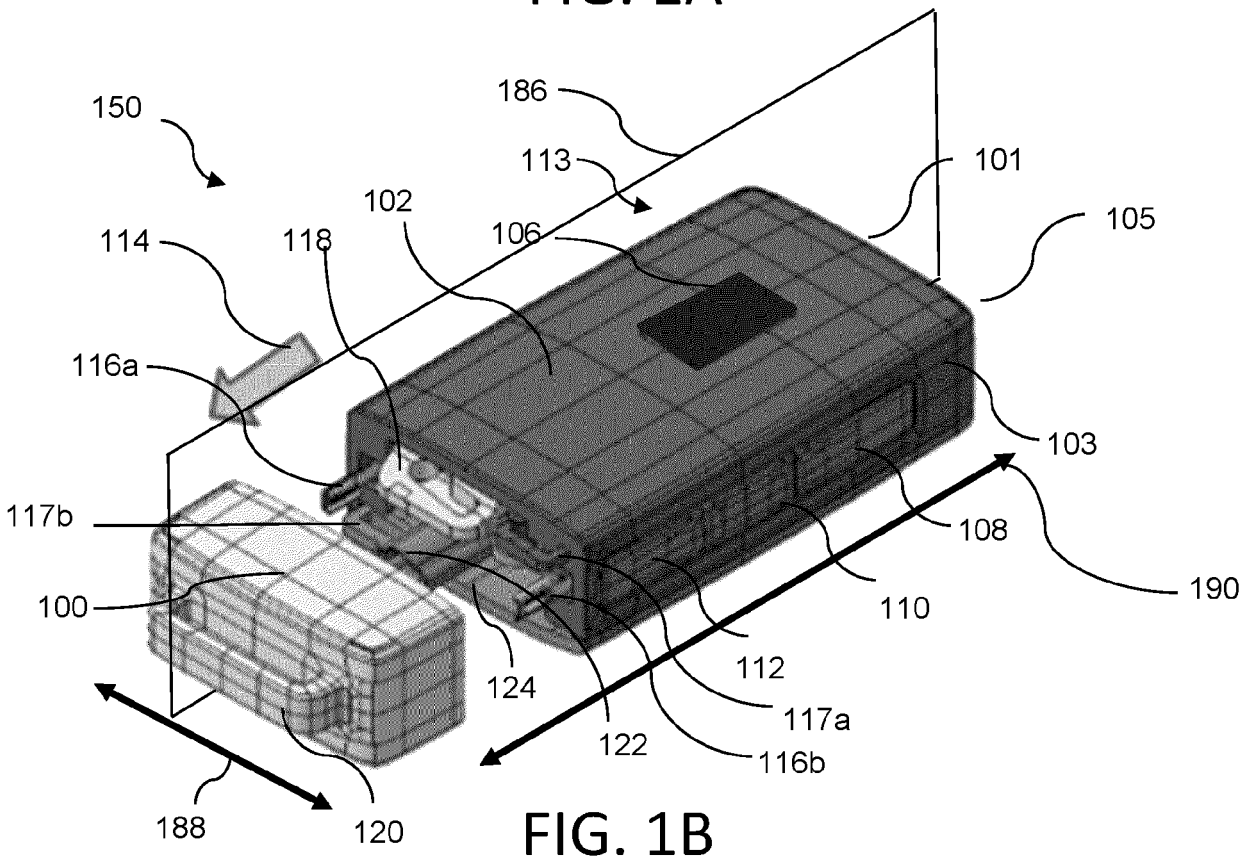

186
150
113
101
102
106
105
114
118
116a
103
117b
108
190
100
110
112
124
117a
122
116b
188
120

FIG. 1B

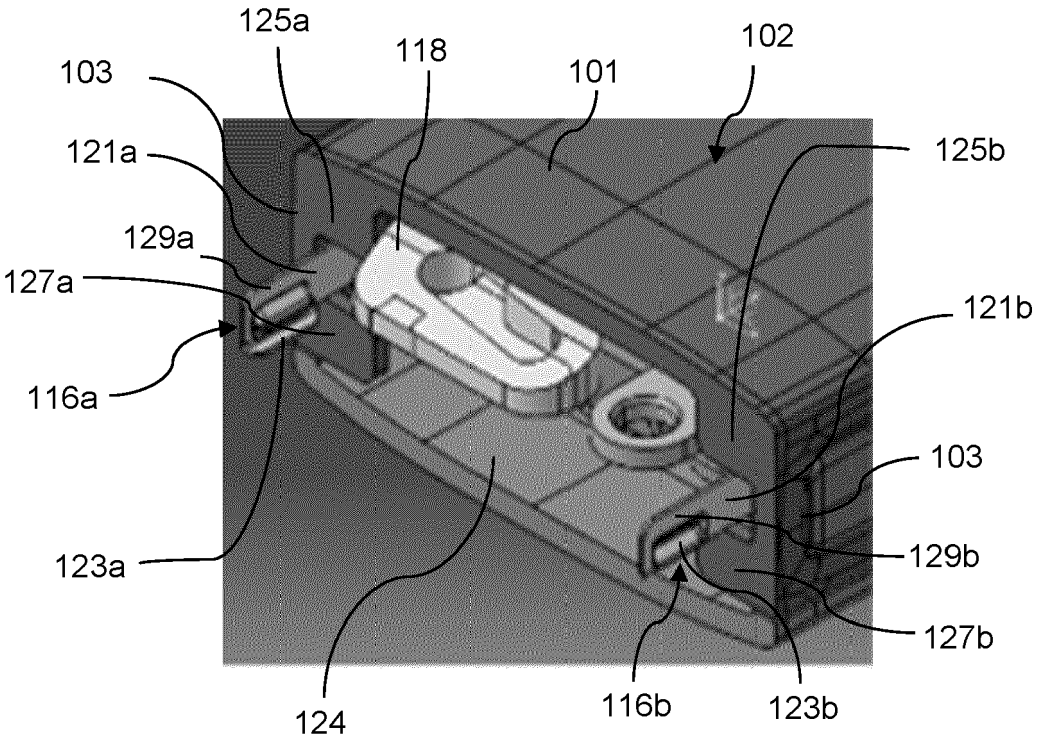

125a
118
102
103
101
121a
125b
129a
127a
121b
116a
103
123a
129b
127b
124
116b
123b

FIG. 2

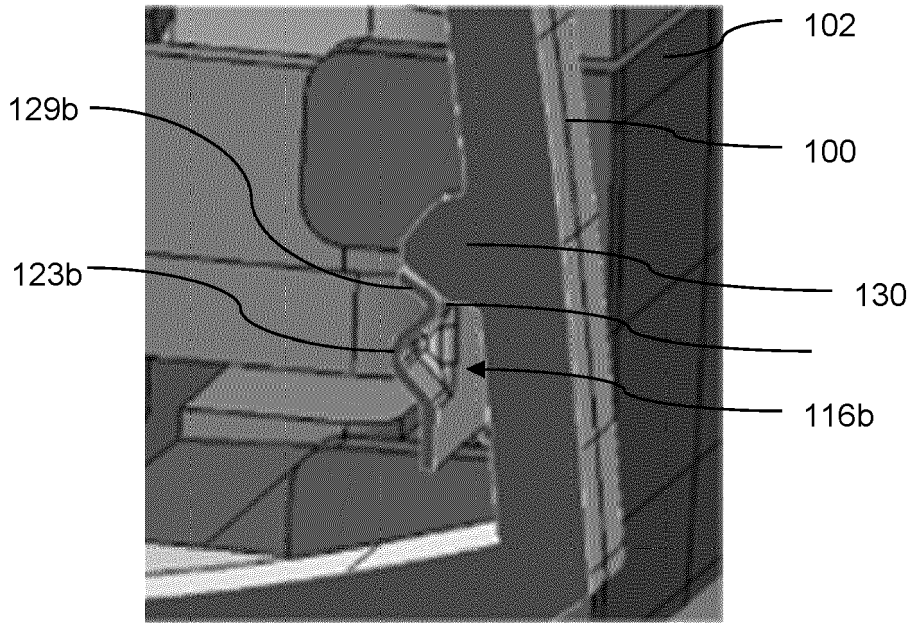
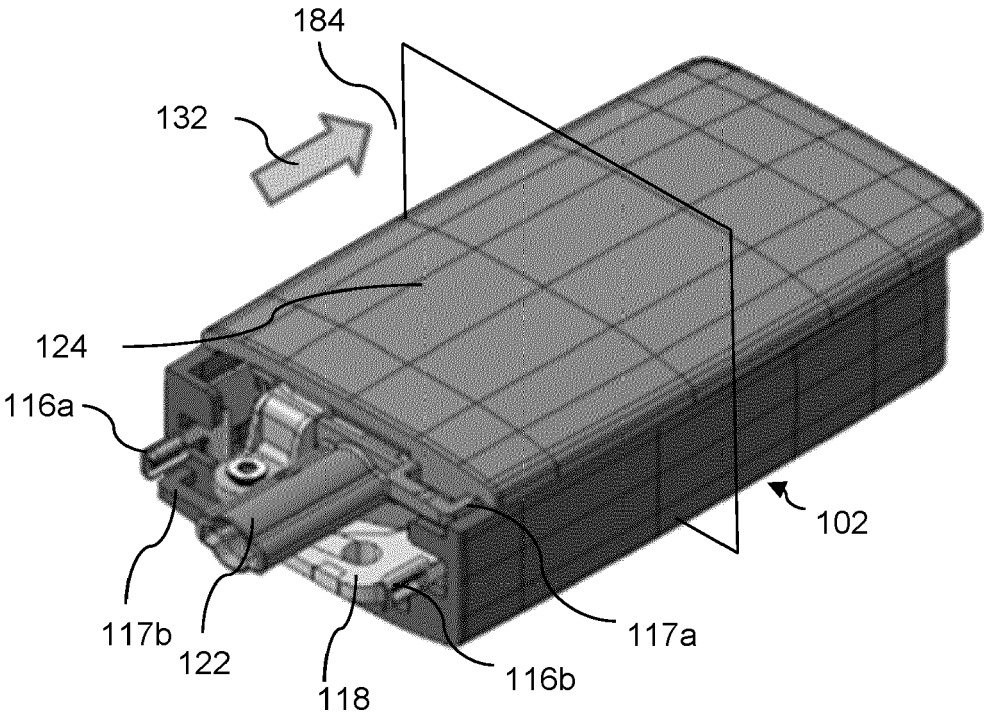

102
129b
100
123b
130
116b

FIG. 3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132
124
116a
102
117b
122
118
116b
117a

FIG. 4A

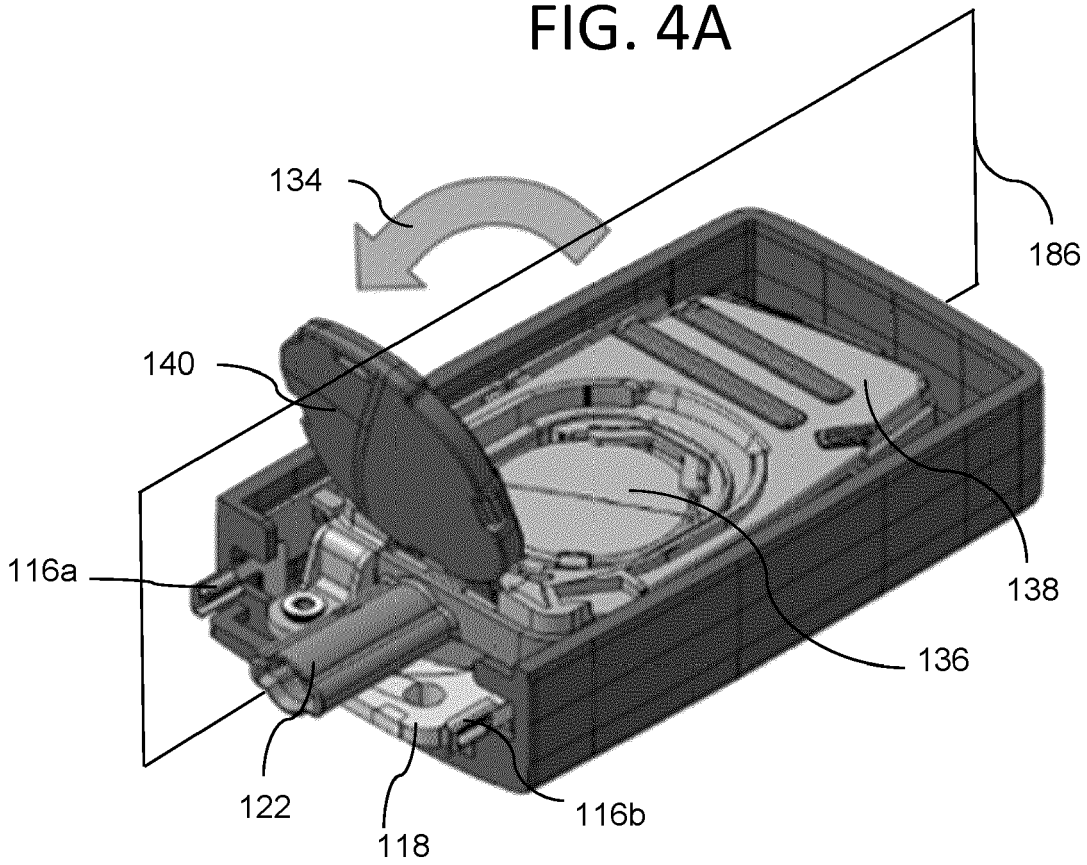

134
186
140
116a
138
136
122
118
116b

FIG. 4B

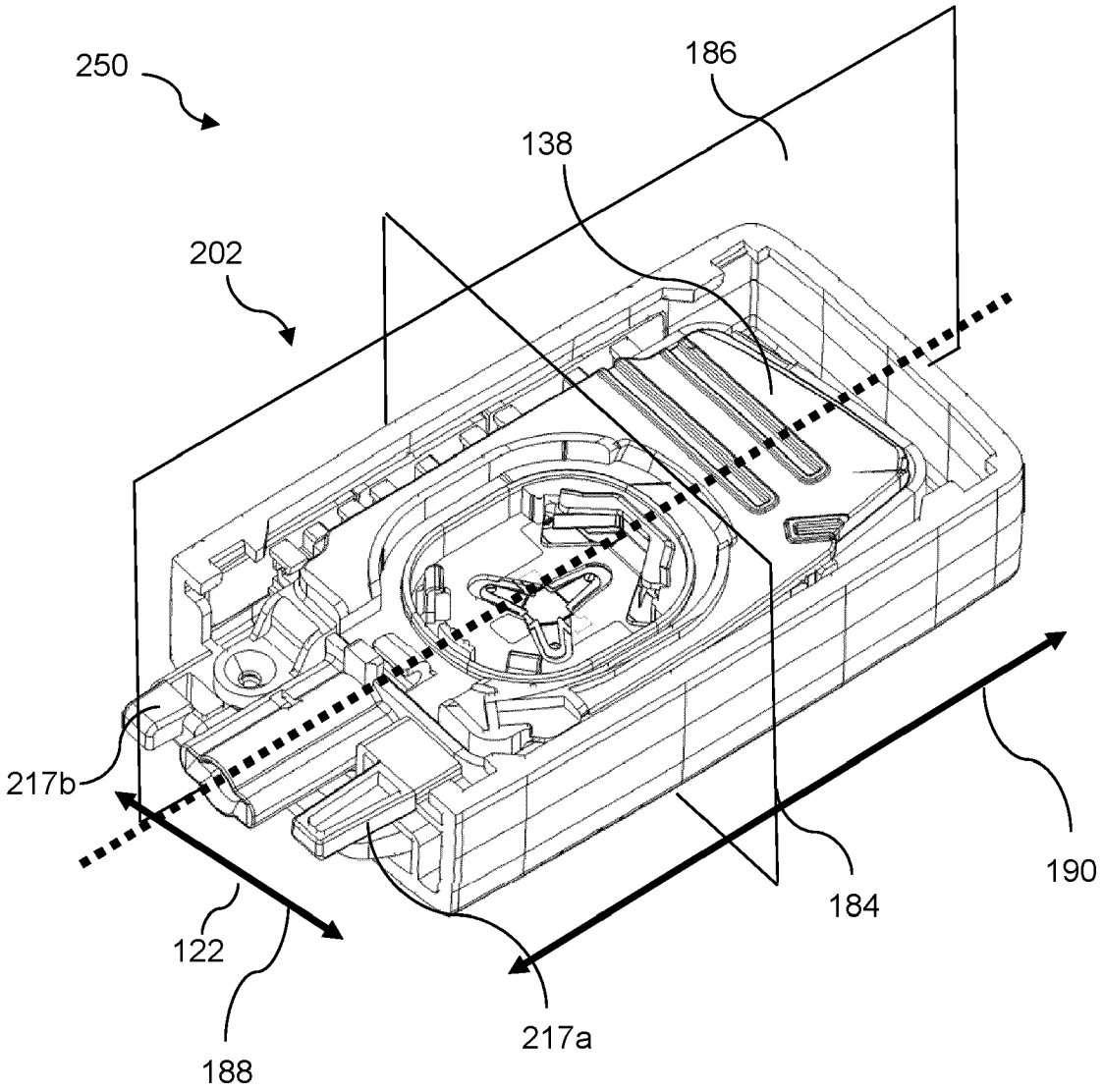


FIG. 5

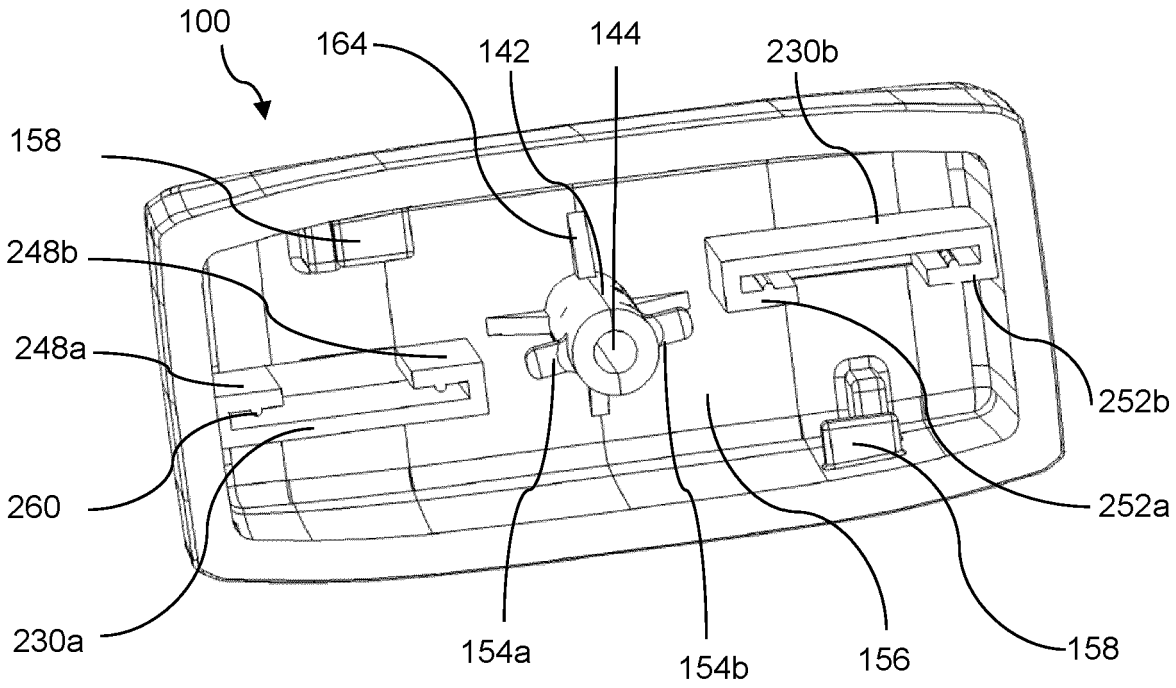
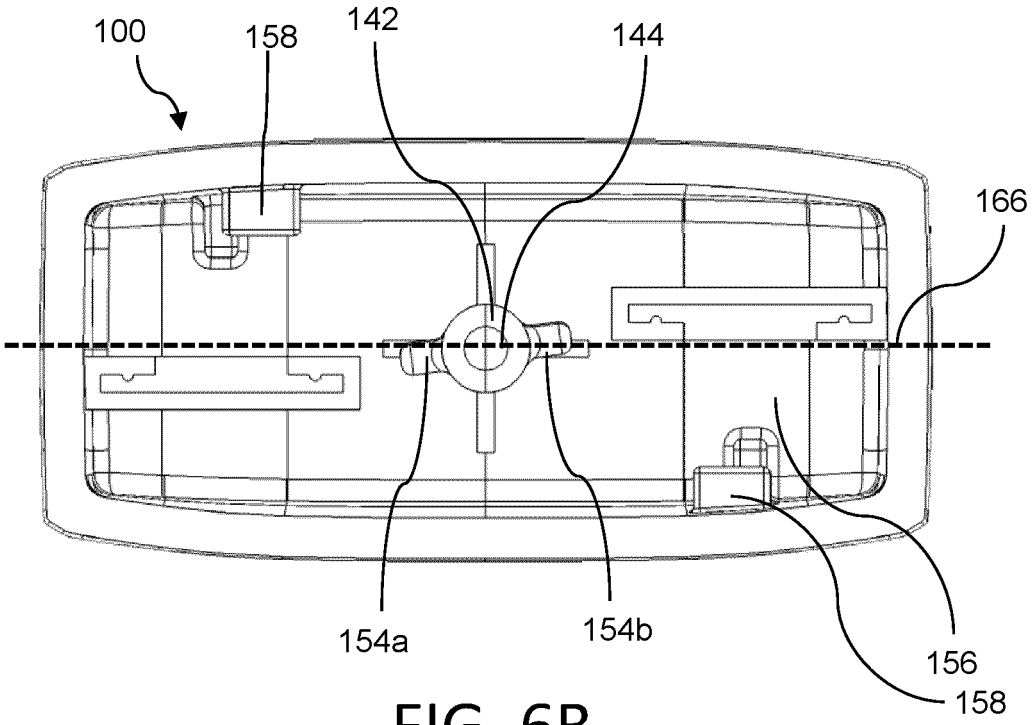

100
164
142
144
230b
158
248b
248a
260
230a
252b
252a
154a
154b
156
158

FIG. 6A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158
142
144
166
154a
154b
156
158

FIG. 6B

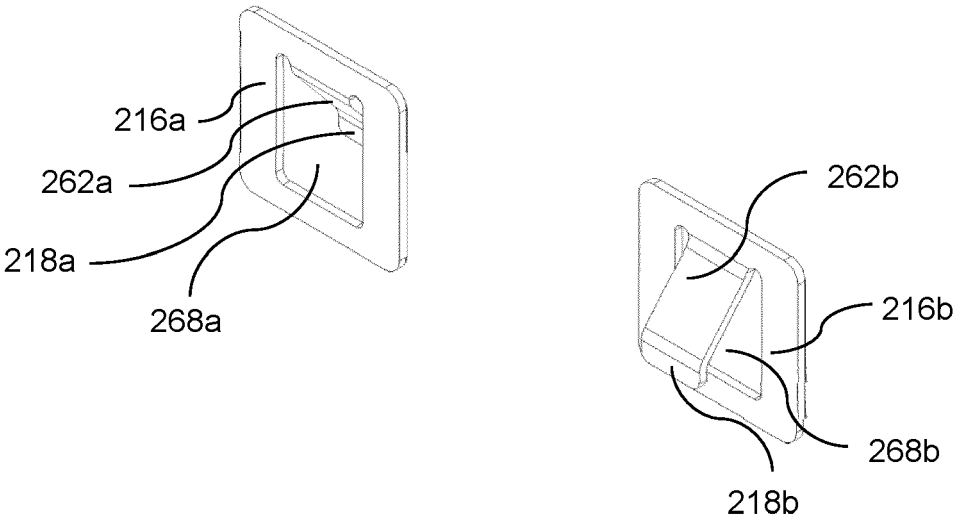
216a
262a
218a
268a
262b
216b
268b
218b

FIG. 7

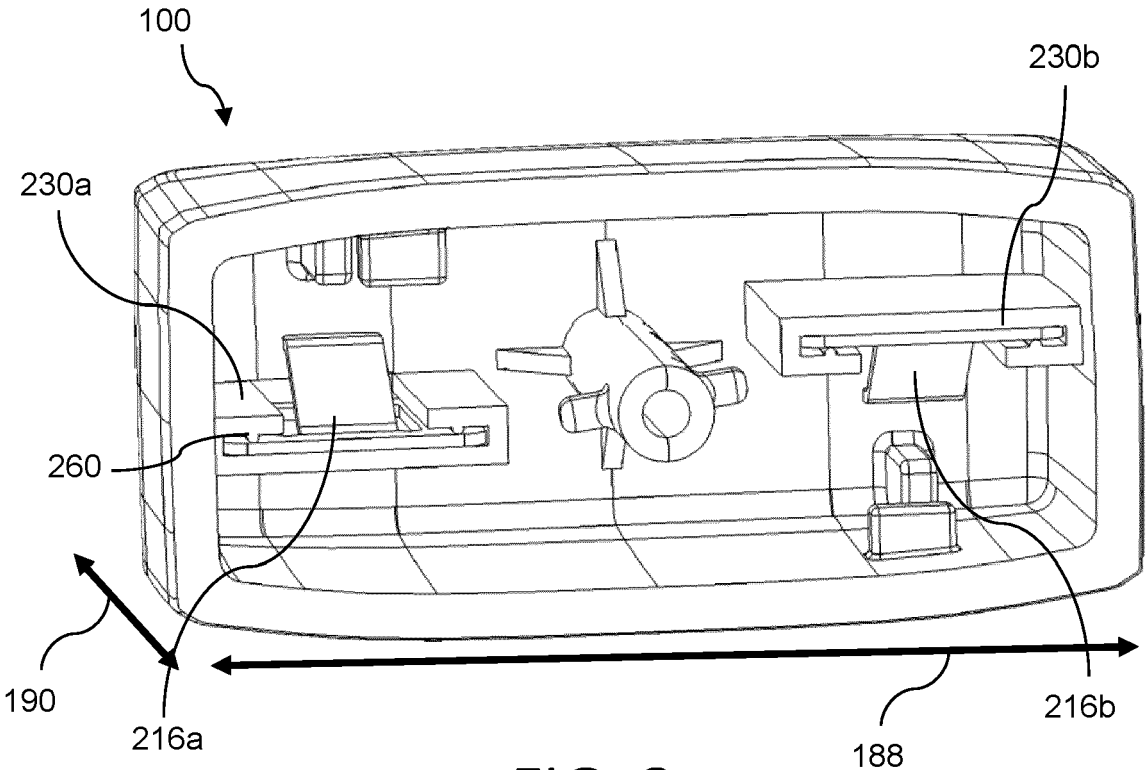
100
230b
230a
260
190
216a
188
216b

FIG. 8

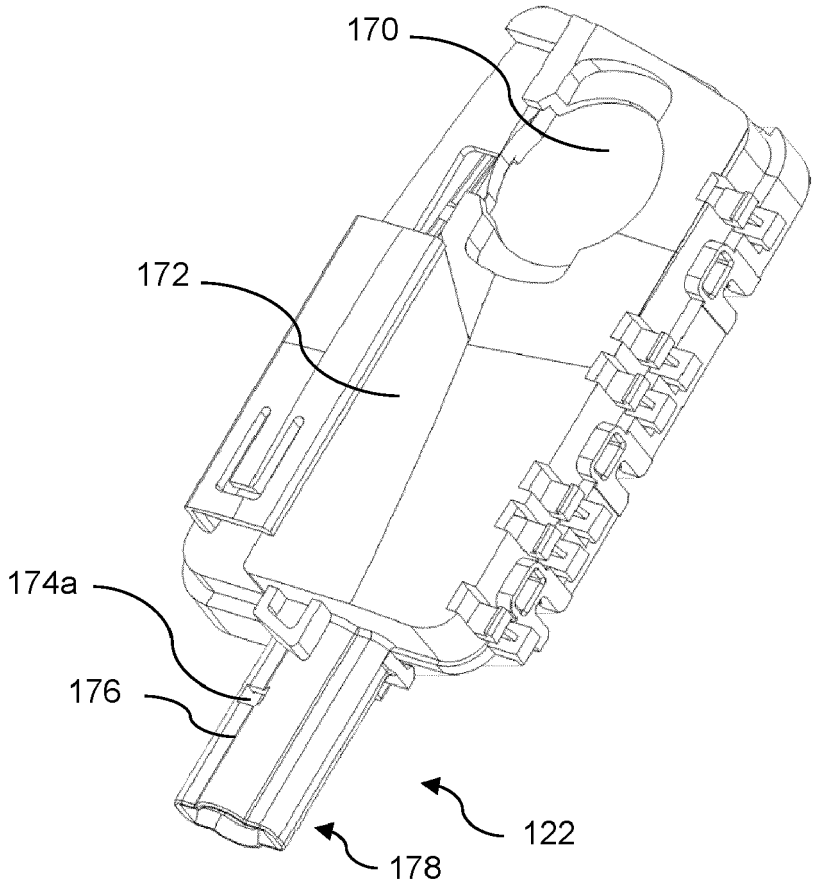

FIG. 9A

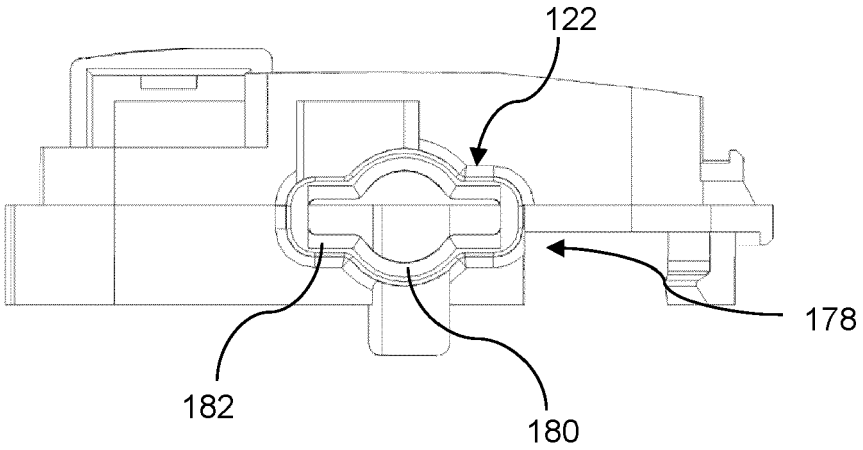

FIG. 9B

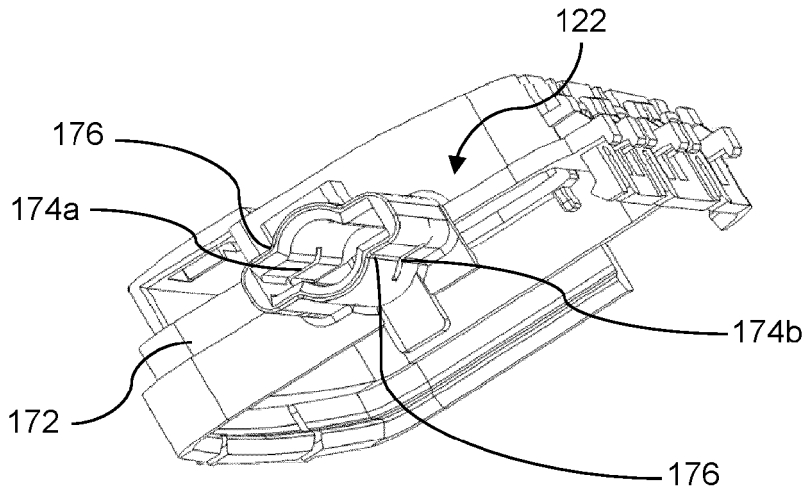

FIG. 10A

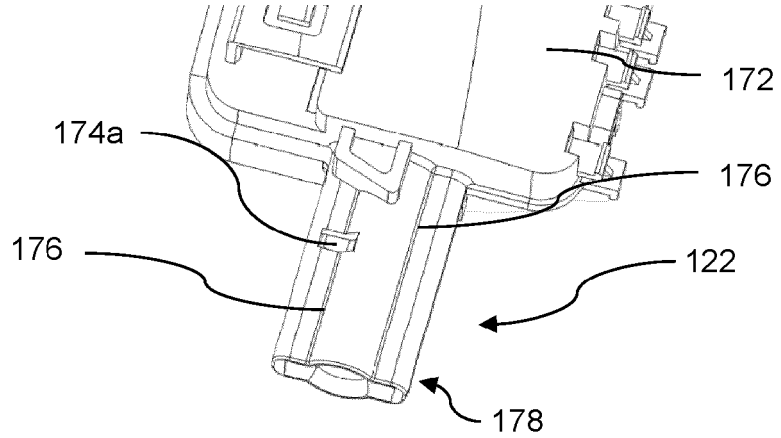

FIG. 10B

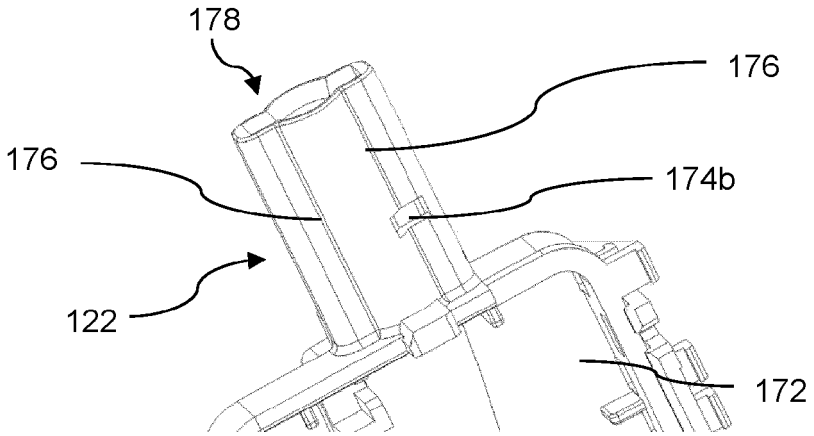

FIG. 10C

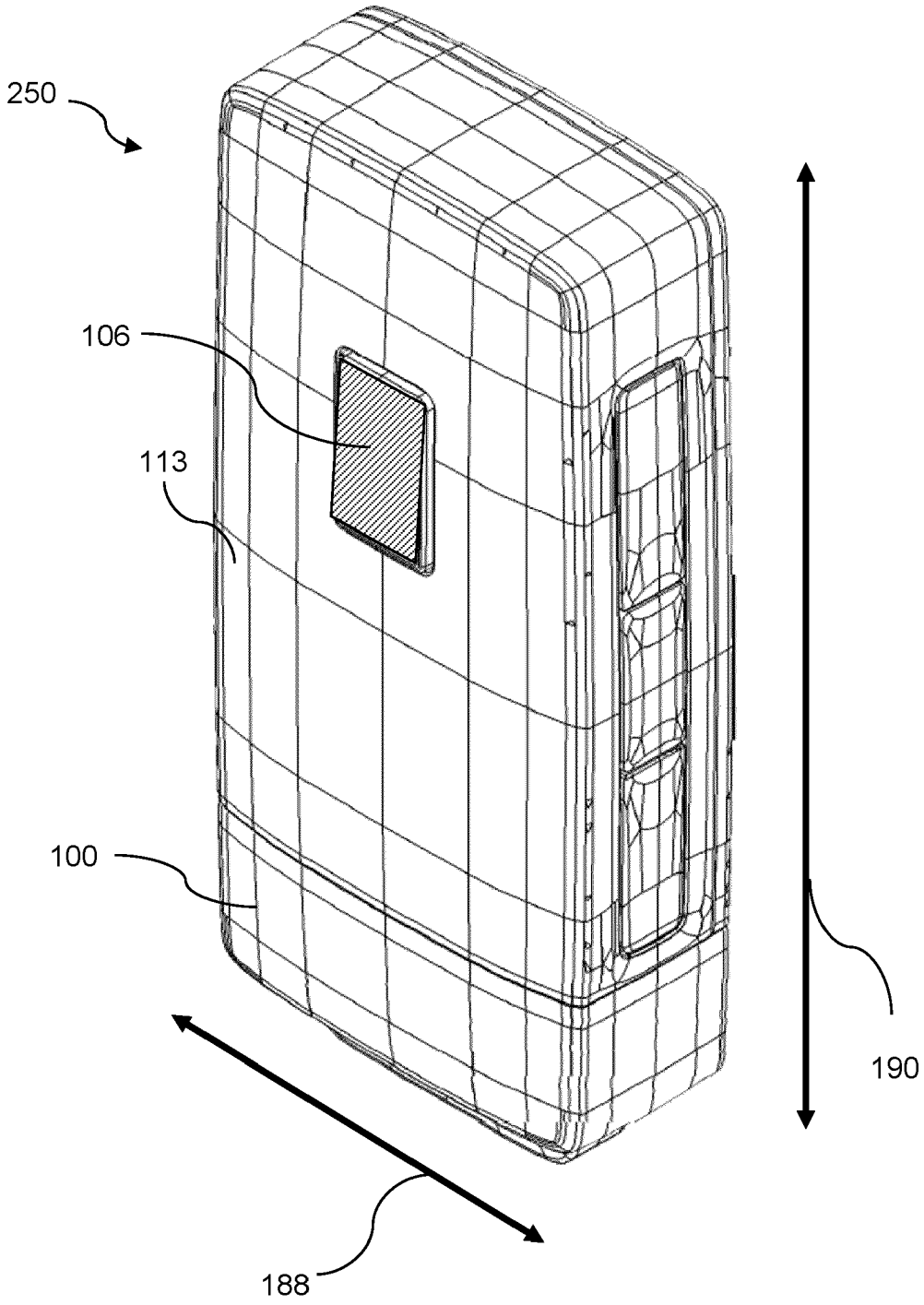

FIG. 11

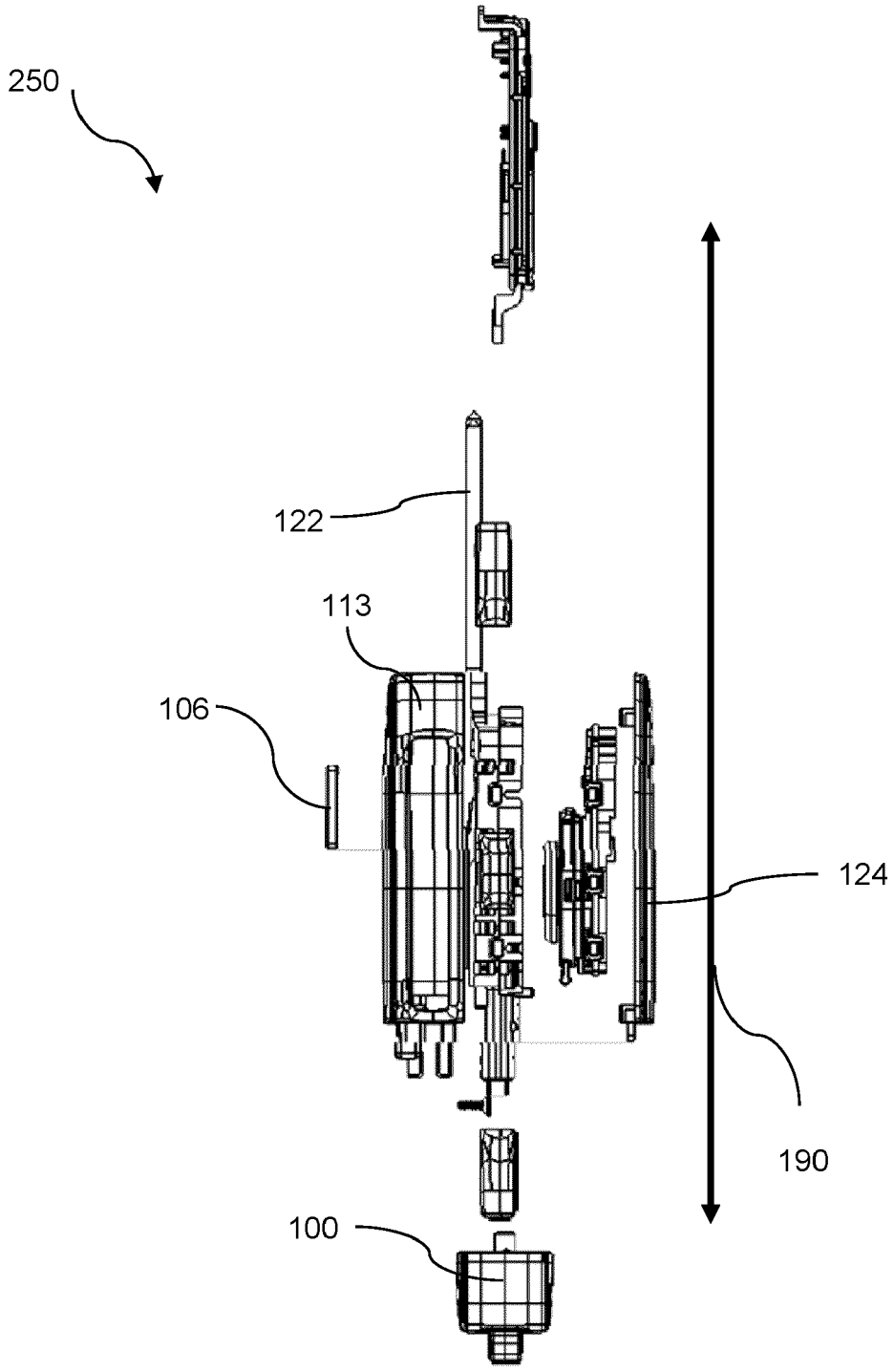

FIG. 12

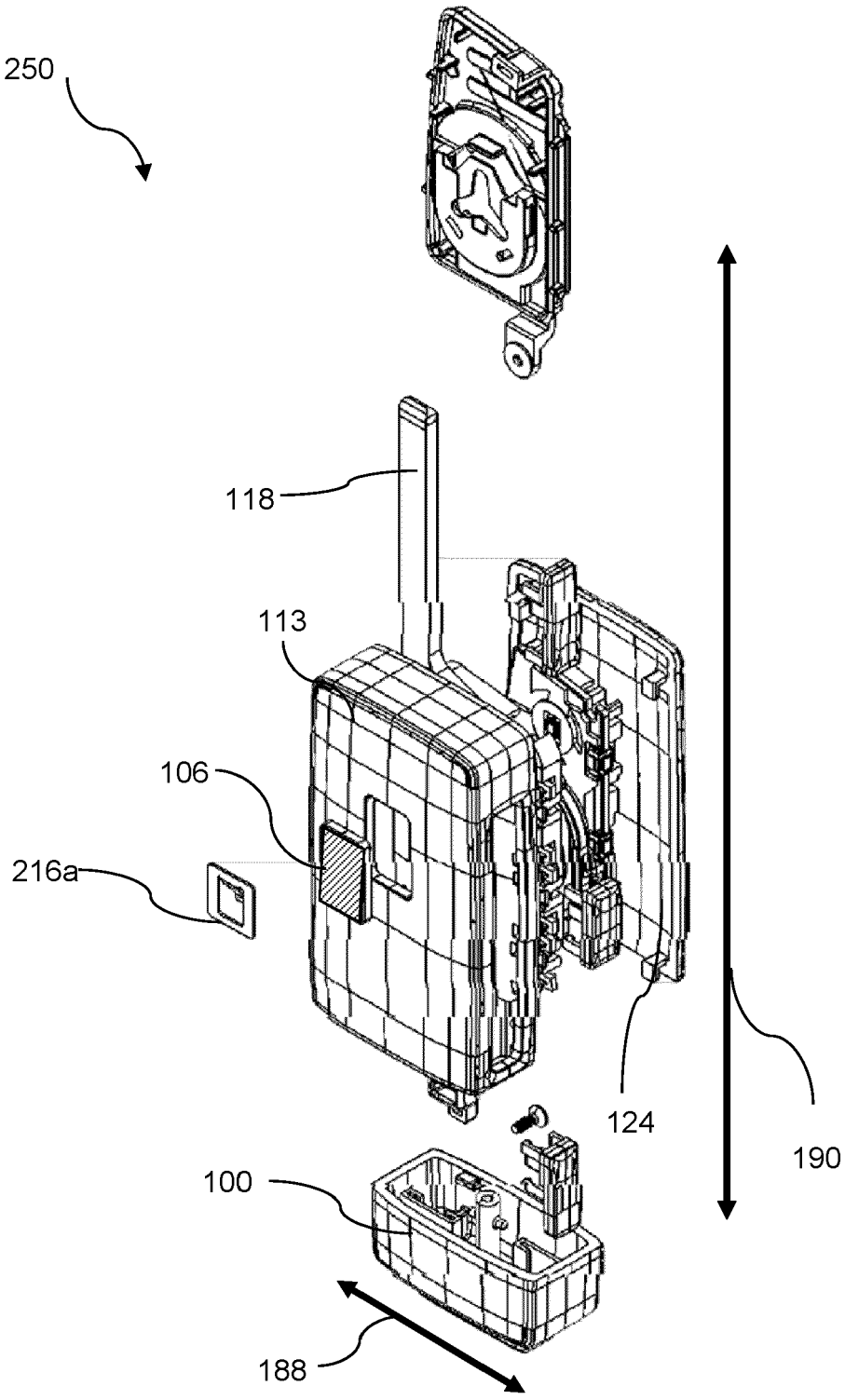

FIG. 13

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EUROPEAN SEARCH REPORT

Application Number
EP 22 21 3737

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	* the whole document *	2-9	ADD. H05K5/00
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	15 May 2023	Pfyffer, Gregor

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