

LOCKING DEVICE, SOCKET AND SWITCH

FIELD OF THE INVENTION

[0001] Embodiments of the present disclosure relate to a locking device, and more specifically to a locking device which can be detached in both a positive direction and a reverse direction. Embodiments of the present disclosure also relate to a socket and a switch that comprise such a locking device.

BACKGROUND OF THE INVENTION

[0002] Apparatuses such as a switch, a socket or the like typically comprise a base receptacle and a panel that covers the base receptacle. The base receptacle is for example fixed to a fixed wall, such as the wall of a building or an outer wall of furniture or a compartment. The panel is exposed from the fixed wall. On one hand, the panel protects various components received in the base receptacle, and on the other hand, is exposed to the outside for decorative purpose. Generally, it is required that the panel can be mounted and detached freely, and it is desired to mount and detach the panel without damaging the wall surface. Typically, a locking device (also referred to as “a lock” hereinafter) is provided between the panel and the base receptacle so that the panel can be mounted and detached as required.

[0003] Locks in the prior art have the following problems: (1) a dedicated tool is required to be mount and detach the panel; (2) when using the tool to pry the locks, the magnitude and direction of the applied force are not controllable, thus the possibility to damage the wall surface is high. Moreover, although there are some locks which do not use a dedicated tool to mount and detach the panel and the based receptacle in the prior art, these locks have strict demands on the direction of detaching; when the lock is detached in a different direction, components thereof are prone to damage.

SUMMARY OF THE INVENTION

[0004] In view of the above, one of the objectives of the embodiments of the present disclosure lies in providing a locking device which can at least address one or more technical problems existing in the above prior art. One of the objectives of the embodiments of the present disclosure also lies in providing a socket and a switch comprising such a locking device.

[0005] According to a first aspect of the present disclosure, there is provided a locking device, comprising: a locking male portion provided on a first component; and a locking female portion that is provided in a second component and mates with the locking male portion, wherein the

locking male portion cooperates with the locking female portion so as to lock the first component and the second component in a first direction; and the locking male portion is configured to be deformable in a second direction different from the first direction and a direction opposite to the second direction so as to release the locking between the first component and the second component.

[0006] According to an embodiment of the disclosure, the locking male portion and the locking female portion lock the first component to the second component by abutting with each other, and the locking male portion releases the locking between the first component and the second component by being deformed to separate the locking male portion from the locking female portion.

[0007] According to an embodiment of the disclosure, the locking male portion assumes a substantial “ㄟ” shape when viewed from a section taken along a direction of the locking device which is perpendicular to the first direction and the second direction.

[0008] According to an embodiment of the disclosure, an upright portion of the substantial “ㄟ” shape of the locking male portion is a portion where the deformation occurs when the locking is released.

[0009] According to an embodiment of the disclosure, an upright portion of the substantial “ㄟ” shape of the locking male portion is a side wall of the first component.

[00010] According to an embodiment of the disclosure, a hook-shaped extension of the substantial “ㄟ” shape of the locking male portion is provided with a first abutting portion which protrudes from a side of the hook-shaped extension.

[00011] According to an embodiment of the disclosure, the locking male portion is an open slot, and a second abutting portion which abuts against the first abutting portion is projectedly provided at a cutout side of the side wall of the open slot.

[00012] According to an embodiment of the disclosure, respective sides of the hook-shaped extension are provided with the first abutting portion, and a second abutting portion which abuts against the first abutting portion is provided at the respective two cutout sides of the side wall of the open slot.

[00013] According to an embodiment of the disclosure, the locking device is configured in such a way that when the locking male portion is deformed towards an inner side of the open slot in the second direction, the first abutting portion moves towards the inner side of the open slot so as to be separated from the second abutting portion; and when the locking male portion is deformed towards an outer side of the open slot in a direction opposite to the second direction, the first abutting portion retreats outwardly from the open slot so as to be separated from the

second abutting portion.

[00014] According to an embodiment of the disclosure, the first component is a panel of a switch or socket, and the second component is a base receptacle of a switch or a socket.

[00015] According to a second aspect of the disclosure, there is disclosed a socket comprising a locking device according to the above described aspect, wherein the first component is a panel of the socket, and the second component is a base receptacle of the socket.

[00016] According to a third aspect of the disclosure, there is disclosed a switch comprising a locking device according to the above described aspect, wherein the first component is a panel of the switch, and the second component is a base receptacle of the switch.

[00017] The locking device, socket and switch according to the embodiments of the disclosure can release locking in both directions so that the components cannot be easily damaged and the operations are facilitated.

BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWINGS

[00018] Now, the embodiments of the present disclosure will be described with reference to the accompanying drawings only in an exemplary manner, wherein:

[00019] Fig. 1 is a schematic exploded view of a socket comprising a locking device according to one embodiment of the present disclosure;

[00020] Fig. 2 is a sectional perspective view of the socket shown in Fig. 1, showing structural details of the locking device;

[00021] Fig. 3 is a sectional perspective view of the socket shown in Fig. 2 from another perspective, showing structural details of the locking device;

[00022] Fig. 4 is a schematic perspective view of a panel (or a housing) comprising a locking male portion according to one embodiment of the present disclosure;

[00023] Fig. 5 is a schematic perspective view of a base receptacle comprising a locking female portion according to one embodiment of the present disclosure;

[00024] Figs. 6a-6c show schematic views of the locking device according to one embodiment of the disclosure when being released from a second direction respectively;

[00025] Figs. 7a-7b show schematic views of the locking device according to one embodiment of the disclosure when being released from a direction opposite to the second direction respectively;

[00026] Figs. 8a-8c show another schematic views of the locking device according to one embodiment of the disclosure when being released from a direction opposite to the second direction respectively.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[00027] Hereinafter, the principle and spirit of the disclosure will be described with reference to exemplary embodiments. It should be understood that the embodiments are described merely for enabling those skilled in the art to better understand the disclosure so as to further carry out the invention, without limiting the scope of the disclosure in any way.

[00028] The locking device according to an embodiment of the invention can be used to lock two separate components so that the two components are detachably mounted together. In an exemplary embodiment, the product can for example be a switch or a socket, which comprises a panel and a base receptacle. By disposing the locking device on the panel and the base receptacle, the panel and the base receptacle can be installed and detached easily. It should be understood that the locking device according to the embodiment of the invention is not limited to an application to a switch and a socket; rather, it can be used in other mechanical connection structures. It should be understood that the term “panel” does not necessarily refer to a panel. While it is generally formed as a panel in the switch or socket field, the panel can be any housing component.

[00029] For ease of description, the socket will be taken as an example for explanation. However, it should be understood that the embodiments of the disclosure are not limited to a socket, and can for example be applied to various devices such as a switch, a cell-phone, a notebook computer or the like.

[00030] Figs. 1 to 5 show schematic structural views of a socket comprising a locking device according to one embodiment of the present disclosure. It should be understood that the drawings are merely illustrative and are not drawn to scale. Moreover, components that are irrelevant to the concept of the application are omitted in order to clearly show the structure of the embodiment of the disclosure.

[00031] As shown in Fig. 1, the socket according to the embodiment of the disclosure comprises a panel 10 and a base receptacle 20. It should be understood that the panel 10 and the base receptacle 20 are merely schematic. The panel is not necessarily a planar component, and there is no limitation to the structure thereof. The base receptacle can also be of various shapes. In addition, it should be understood that the term “panel” should not be construed as a planar member; rather, it can be another housing part of the device.

[00032] Fig. 1 is a schematic exploded view of a socket comprising a locking device according to one embodiment of the present disclosure; Fig. 2 is a sectional perspective view of the socket shown in Fig. 1, showing structural details of the locking device; Fig. 3 is a sectional

perspective view of the socket shown in Fig. 2 from another perspective, showing structural details of the locking device; Fig. 4 is a schematic perspective view of a panel comprising a locking male portion according to one embodiment of the present disclosure; and Fig. 5 is a schematic perspective view of a base receptacle comprising a locking female portion according to one embodiment of the present disclosure.

[00033] As shown, the socket according to the embodiment of the disclosure is provided with a locking device which comprises a locking male portion 12 provided on the panel 10; and a locking female portion 22 that is provided in the base receptacle 20 and mates with the locking male portion 12, wherein the locking male portion 12 can cooperate with the locking female portion 22 so as to lock the panel 10 and the base receptacle 20 in a first direction (schematically shown as the up and down direction in Figs. 6a-8c); and the locking male portion 12 is configured to be deformable in a second direction different from the first direction and a direction opposite to the second direction (schematically shown as the rightward horizontal direction and the leftward horizontal direction in Figs. 6a-8c) so as to release the locking between the panel 10 and the base receptacle 20.

[00034] According to the locking device of the disclosure, since the locking male portion 12 can be deformed in both a positive direction and a reverse direction so as to release the locking of the panel 10 from the base receptacle 20, only a force that enables the locking male portion 12 to be deformed is required to be applied to the locking male portion 12 when detaching the panel from the base receptacle. As compared to the prior art, no dedicated detaching tool is required during the detachment; moreover, since the locking male portion 12 can be deformed in both the positive direction and the reverse direction so as to release the locking of the panel 10 from the base receptacle 20, the locking male portion 12 can be deformed in both positive and reverse directions when forces are applied in different directions respectively, thus avoiding the damage of components caused by forces applied in different directions in a case where the locking male portion can be deformed only in one direction. Therefore, the apparatus comprising the locking device according to the disclosure can be easily and conveniently detached, repaired and replaced, and the components thereof are not prone to damage.

[00035] According to one embodiment of the disclosure, the locking male portion 12 and the locking female portion 22 lock the panel 10 and the base receptacle 20 by abutting with each other, and the locking between the panel 10 and the base receptacle 20 is released by deforming the locking male portion 12 so that the locking male portion 12 separates from the locking female portion 22. The locking is realized by a direct abutting action, and unlocking is realized by releasing the abutting action, thus avoiding the use of a snake hook-shaped component that

can be easily damaged. The release of locking is convenient and the structure is simple.

[00036] According to one embodiment of the disclosure, the locking male portion 12 assumes a substantial “ㄥ” shape when viewed from a section (the section shown in the schematic views of Figs. 6a to 8c) taken along a direction of the locking device which is perpendicular to the first direction and the second direction. The “ㄥ” shaped locking male portion 12 comprises an upright portion 122 and a hook-shaped extension 124. It should be understood that the term “upright portion” is not necessarily upright, and is merely used for facilitating description of the invention. For example, when the socket is placed in a vertical orientation, the upright portion 122 is at horizontal orientation. In one embodiment, the upright portion 122 is a portion that is prone to deformation when a force is applied to it. The hook-shaped extension 124 is configured to abut with the component of the locking female portion 22 and release the abutment. The upright portion 122 can be applied a force directly, and can also be applied a force indirectly through force transmission, which can be seen more obviously from the description below with reference to Figs. 6a-8c.

[00037] According to an embodiment of the disclosure, the upright portion 122 of the substantial “ㄥ” shape of the locking male portion 12 is a portion which is deformed when the locking is released. It is obvious to those skilled in the art that the rigidity of the upright portion herein should be appropriate so as to ensure a certain rigidity that can ensure the locking between the base receptacle and the panel; when a force having a sufficient magnitude is applied to the upright portion, the upright portion can be elastically deformed. It should be understood that although the upright portion can be deformed, in order to realize releasing, it does not necessarily have to be deformed in some situations; it is also possible that other portions of the locking male portion 12 are deformed.

[00038] According to an embodiment of the disclosure, the upright portion 122 of the substantial “ㄥ” shape of the locking male portion 12 is a side wall of the panel 10. In this case, the side wall of the panel can be pressed directly so that the locking male portion 12 is deformed, thus realizing release of locking. It should be understood that it is also possible that the upright portion 122 of the substantial “ㄥ” shape of the locking male portion 12 is not the side wall of the panel 10; for example, in an embodiment that is not illustrated, the inventive concept of the disclosure can be also realized by acting upon the upright portion 122 via another extension arm.

[00039] According to an embodiment of the disclosure, the hook-shaped extension 124 of the substantial “ㄥ” shape of the locking male portion 12 is provided with a first abutting portion 126 which protrudes from a side of the hook-shaped extension 124. The first abutting portion 126 is adapted to abut against the locking female portion 22. In a case where the first abutting

portion 126 is provided, the position of abutment can be conveniently controlled so as to facilitate the realization of abutment and release of abutment.

[00040] According to an embodiment of the disclosure, the locking female portion 22 is an open slot, and a second abutting portion 226 which abuts against the first abutting portion 126 is projectedly provided at a cutout side of the side wall of the open slot.

[00041] According to an embodiment of the disclosure, two sides of the hook-shaped extension 124 are provided with a first abutting portion 126 respectively, and a second abutting portion 226 which abuts against the first abutting portion 126 is provided at respective cutout sides of the side wall of the open slot respectively. Through such a symmetric arrangement, a balance of forces is easier to be realized between the locking male portion and locking female portion, and the durability of components is enhanced.

[00042] According to an embodiment of the disclosure, the locking device is configured in such a way that when the locking male portion 12 is deformed towards an inner side of the open slot in the second direction, the first abutting portion 126 moves towards the inner side of the open slot so as to be separated from the second abutting portion 226; and when the locking male portion 12 is deformed towards an outer side of the open slot in a direction opposite to the second direction, the first abutting portion 126 retreats outwardly from the open slot so as to be separated from the second abutting portion 126.

[00043] The operation of the locking device according to the disclosure will be described below with references to Figs. 6a-8c. Figs. 6a-6c show schematic views of the locking device according to one embodiment of the disclosure when being released from the second direction respectively; Figs. 7a-7b show schematic views of the locking device according to one embodiment of the disclosure when being released from a direction opposite to the second direction respectively; and Figs. 8a-8c show another schematic views of the locking device according to one embodiment of the disclosure when being released from a direction opposite to the second direction respectively.

[00044] As shown in Fig. 6a, the abutting portion of the “ㄟ” shaped locking male portion abuts against the corresponding abutting portion of the locking female portion, thus limiting a movement in the first direction (the up and down direction in the figure) and locking the panel 10 and the base receptacle 20 with each other. In such a state, when it is about to release the locking, a operator firstly exerts a force having a component substantially in the second direction (the rightward direction in the figure) to the upright portion 122 of the “ㄟ” shaped locking male portion. In one embodiment, for example, the upright portion 122 can be pressed by fingers. In a case where the upright portion 122 is a side wall of the panel 10, the operation is

more convenient. Then, as shown in Fig. 6, the upright portion 122 is deformed towards the inner side, and the hook-shaped extension 124 disengages from the abutting portion provided in the open slot at the inner side of the open slot. Then, as shown in Fig. 6c, an upward force is applied to the panel 10 to separate the panel 10 from the base receptacle 20. In an embodiment that is not illustrated, the outer side wall of the upright portion 122 is also provided with a component which is adapted to exert forces, such as a boss or protrusion, thus facilitating separation by application of forces.

[00045] Figs. 7a-7b and Figs. 8a-8c show schematic views of applying forces in a direction opposite to the second direction (the leftward direction in the figure) so as to realize unlocking.

[00046] For the panel (or housing), in particular for a panel for a socket, it has a rectangular shape and four peripheral sides. In one embodiment, the locking device according to disclosure is provided at one side, and an auxiliary locking portion for use in cooperation with the locking device is provided at an opposite side to said one side. The auxiliary locking portion is configured to accordingly release the locking at said opposite side after the locking device released the locking between the panel and the base receptacle. Since the auxiliary locking portion is irrelevant to the inventive concept of the disclosure, a detailed description thereof is omitted. For such an arrangement, in order to detach the panel, forces are typically applied at the sides where the locking device and the auxiliary locking portion are provided, thus realizing unlocking. According to one embodiment of the disclosure, no matter to which side of the locking device force is applied, the panel can be detached easily. This is very useful for the detachment of the panel, especially for some applications of the panel where the upright portion 122 of the locking female portion of the locking device of the panel cannot always be accessed.

[00047] As shown in Figs. 7a and 7b, when a force is exerted from an opposite side to the side where the locking device is disposed, e.g., when a finger or a screw driver is used to pry the opposite side of the panel, the upright portion 122 of the locking device is deformed towards the outer side from the open slot, whereby the hook-shaped extension 124 moves towards the outer side from a lower side of the abutting portion of the locking female portion, disengages from the abutting portion provided in the open slot, and further retreats from the open slot. In this way, the unlocking of the panel and the base receptacle is realized.

[00048] Figs. 8a-8c show a schematic view of another way of unlocking. When a force is exerted from the side where the locking device is disposed (see Fig. 8a), e.g., when a finger or a screw driver is used to pry this side of the panel, the upright portion 122, the upright portion 122 of the locking device is deformed towards the outer side from the open slot (see Fig. 8b), whereby the hook-shaped extension 124 moves towards the outer side from a lower side of the

abutting portion of the locking female portion, disengages from the abutting portion provided in the open slot, and further retreats from the open slot (see Fig. 8c). Similarly, the unlocking of the panel and the base receptacle can be realized.

[00049] According to the locking device of the disclosure, the locking can be released from both positive and reverse directions, thus ensuring that the locking device will not be broken or damaged. In addition, the locking can be released from different sides of the panel, thus facilitating operation, maintenance or replacement.

[00050] According to one embodiment of the disclosure, the panel 10 is a panel 10 for a switch or a socket, and the base receptacle 20 is a base receptacle 20 for a switch or a socket. According to a second aspect of the disclosure, there is provided a socket comprising the locking device according to the above aspect, wherein the panel 10 is a panel 10 for the socket, and the base receptacle 20 is a base receptacle 20 for the socket. According to a third aspect of the disclosure, there is provided a switch comprising the locking device according to the above aspect, wherein the panel 10 is a panel 10 for the switch, and the base receptacle 20 is a base receptacle 20 for the switch.

[00051] The description of the disclosure has been given for illustrative and descriptive purpose. However, it is not intended to be exhaustive or limit the invention to the disclosed forms. Those skilled in the art can envisage many modifications and variations. For example, in the illustrated embodiment, the locking male portion is provided on the panel, and the locking female portion is provided on the base receptacle. However, the same effect can be also realized by providing the locking male portion on the base receptacle and providing the locking female portion on the panel. Those skilled in the art should understand that instead of the panel, the component on which the locking male portion is disposed can be another housing component of the apparatus.

[00052] While the disclosure has been described with reference to the currently conceived embodiments, it should be understood that the disclosure is not limited to the disclosed embodiments. Rather, the disclosure aims to cover various modifications and equivalents contained in the spirit and scope of the appended claims. The scope of the following claims should be interpreted in the broadest sense so as to include all such modifications and equivalent structures and functions.

What is claimed is

1. A locking device for attaching an outer panel to a base receptacle, wherein the outer panel comprises a surface and a circumferential side wall extending substantially perpendicular to the surface, comprising:

a locking male portion provided on the circumferential side wall of the outer panel and extending inwardly therefrom; and

a locking female portion provided in the base receptacle and configured to mate with the locking male portion,

wherein the locking male portion cooperates with the locking female portion so as to lock the outer panel to the base receptacle; and

wherein a corresponding portion of the circumferential side wall of the outer panel provided with the locking male portion can be deformed inwardly and outwardly such that:

when the corresponding portion of the circumferential side wall is deformed inwardly, the locking male portion can disengage from the locking female portion to release the locking between the outer panel and the base receptacle; and

when the corresponding portion of the circumferential side wall is deformed outwardly, the locking male portion can disengage from the locking female portion to release the locking between the outer panel and the base receptacle.

2. The locking device according to claim 1, wherein the locking male portion and the locking female portion lock the outer panel to the base receptacle by abutting against each other, and the locking male portion releases the locking between the outer panel and the base receptacle by being deformed to separate the locking male portion from the locking female portion.

3. The locking device according to claim 2, wherein the locking male portion comprises a upwardly-inclined hook-shaped extension extending inwardly from the circumferential side wall.

4. The locking device according to claim 3, wherein the locking male portion along with the circumferential side wall assumes a substantial “レ” shape when viewed from a section of a assembly of the outer panel and the base receptacle.

5. The locking device according to claim 3, wherein the hook-shaped extension is provided with a first abutting portion which protrudes from a side of the hook-shaped extension.

6. The locking device according to claim 5, wherein the locking female portion is an open slot, and a second abutting portion which abuts against the first abutting portion is projectedly provided at a cutout side of a side wall of the open slot.

7. The locking device according to claim 6, wherein respective sides of the hook-shaped extension are provided with the first abutting portion and the second abutting portion which abuts against the first abutting portion is provided at respective cutout sides of the side wall of the open slot.

8. The locking device according to claim 7, wherein the locking device is configured in such a way that

when the corresponding portion of the circumferential side wall provided with the locking male portion is deformed towards an inner side of the open slot, the first abutting portion moves towards the inner side of the open slot so as to be separated from the second abutting portion; and

when the corresponding portion of the circumferential side wall provided with the locking male portion is deformed towards an outer side of the open slot, the first abutting portion retreats outwardly from the open slot so as to be separated from the second abutting portion.

9. The locking device according to claim 1, wherein the outer panel is a panel of a switch or a socket, and the base receptacle is a base receptacle of a switch or a socket.

10. A socket, comprising a locking device according to any of claims 1-8, wherein the outer panel is a panel of the socket, and the base receptacle is a base receptacle of the socket.

11. A switch, comprising a locking device according to any of claims 1-8, wherein the outer panel is a panel of the switch, and the base receptacle is a base receptacle of the switch.