Abstract: The present disclosure relates to a power supply element comprising a first module comprising at least one first power supply male connector. According to a particular embodiment, said power supply element further comprises: - a least a retractable second module, said second module being mobile between a retracted position and at least one extended position, said second module comprising at least one second power supply male connector; - first invalidating means for invalidating, at least partially, access to said first male connector when said second module is in said extended position.
TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

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Power supply element and corresponding electronic device

1. Domain of the present disclosure

The present disclosure relates to the domain of electrical power supply elements for the power supply of electronic devices. More specifically, the present disclosure relates to a power supply element comprising a first module comprising at least one first power supply male connector, and to an electronic device equipped with at least such a power supply element.

2. Prior art

Nowadays, a house is equipped with many electronic devices. Some electronic devices are often grouped together, for instance because they can be used for similar purpose (like a tuner and a CD player, both performing music rendering), or because they need to be used together. For example, a tuner, controlling the video input of a TV, of a set-top-box and of a DVD player for example, can be grouped with the TV, the set-top-box and the DVD player. Each device is often delivered to a customer with several cables (for power supply, for data exchange, ...). Thus, the grouping of electronic devices results in a huge amount of cables. As a consequence, it becomes very difficult for a user to find the "good cable", when he needs to update or remove one of the grouped device. Furthermore, because of the number and the many twists and turns of the cables, much dust can be accumulated in close vicinity of the cables. This can cause a security problem (for instance, it can cause a fire departure in case of an electrical spark).

So, there's a need to provide a user with a more ergonomic and /or safety way of grouping electronic devices.

3. Summary

The present principles enables at least one of the cited disadvantages to be resolved by proposing a power supply element, to be used for equipping an electronic device.

More specifically, the present disclosure relates to a power supply element comprising a first module comprising at least one first power supply male connector, said power supply element comprising:

- a least a retractable second module, said second module being adapted to be positioned in a retracted position and in at least one extended position, said second module comprising at least one second power supply male connector;
- first invalidating means, adapted to invalidate, at least partially, access to said first male connector when said second module is in said extended position.

According to an embodiment of the present disclosure, said power supply element further comprises second invalidating means adapted to invalidate, at least partially, access to said second connector when said second module is in said retracted position.

In at least some embodiments, where the second module is at least partially foldable into a housing of the power supply element, such a retracted position can be for instance a folded position of the second module. In other embodiments, where the second module can at least partially slide into a housing of the power supply element, such a retracted position can be for instance a position of the second module in which it is at least partially located inside the housing (for instance mostly or totally inside the body).

According to an embodiment of the present disclosure, the first and/or second power supply male connector is adapted to cooperate with a standard power supply female connector.

When the second module is retractable into the housing of the power supply element and accessible through an opening of the housing, the second invalidating means can for instance close, at least partially, said opening.

According to an embodiment of the present disclosure, said second module further comprises at least one data connector.

According to an embodiment of the present disclosure, said power supply element further comprises commuting means for moving said second module between said retracted position and said extended position, said commuting means also commanding said first invalidating means.

According to an embodiment of the present disclosure, said first invalidating means comprises a first safety panel.

According to an embodiment of the present disclosure, said second module is a sliding module and said first safety panel is a sliding panel.

According to an embodiment of the present disclosure, said commuting means comprises a sliding lever.
According to an embodiment of the present disclosure, said power supply element further comprises blocking means, said blocking means enabling said second module to be maintained in said extended or retracted position.

According to an embodiment of the present disclosure, said blocking means, when engaged with said commuting means, are adapted to limit the movement of said commuting means in at least one direction of displacement.

According to an embodiment of the present disclosure, said blocking means can be manually released. Such blocking means can comprise a button, for instance, for releasing the commuting means when pressed.

According to an embodiment of the present disclosure, said second invalidating means comprises a second safety panel, said second safety panel being mobile between an opening position and a closing position in which said second connector is not accessible.

According to an embodiment of the present disclosure, said second safety panel is a pivoting panel.

According to an embodiment of the present disclosure, said second safety panel is a sliding panel.

According to an embodiment of the present disclosure, said second invalidating means further comprises compression means, said compression means tending to maintain said second safety panel in said closing position.

According to an embodiment of the present disclosure, said second module and second safety panel each comprises face to face beveled sides.

According to another aspect, the present disclosure concerns an electronic device. According to an embodiment of the present disclosure, said electronic device comprises at least one power supply element according to any of the already cited embodiments.

According to an embodiment of the present disclosure, the mounting position and/or shape of said power supply element is adapted to permit direct power supply of said electronic device by means of said first power supply connector of said power supply element, when said second module of said power supply element is in said retracted position, and the power supply of said electronic device by means of said second power supply connector of said power supply element, when said second module of said power supply element is in said extended position.
According to an embodiment of the present disclosure, said electronic device further comprises at least one power supply female connector. Said power supply female connector can notably be adapted to be power supplied, at least indirectly, by the power supply of at least one of the first and/or second male connectors of the power supply element.

Depending upon the embodiments, and notably depending upon the respective size and/or thickness of the electronic device and/or the at least one power supply element, the power supply female connector can be comprised in the power supply element, in another power supply element also comprised in the electronic device, or in another part of the electronic device.

According to an embodiment of the present disclosure, said power supply female connector is adapted to cooperate with a power supply male connector of a second module of another power supply element according to any of the already cited embodiments.

According to an embodiment of the present disclosure, the power supply female connector can notably be adapted to cooperate with a standard power supply male connector.

According to an embodiment of the present disclosure, the power supply element is fixedly coupled with said electronic device. For instance, the coupling of said device and said power supply element can be permanent, so that they cannot be dismantled after assembly. In another embodiment, the power supply and the electronic device can only be dismantled after assembly by a voluntary action, notably requiring a tool. For instance, they can be assembled using clips, said clips preventing the assembling from being dismantled, or assembled using at least one screw.

While not explicitly described, the present embodiments related to a power supply element and/or an electronic device can be employed in any combination or sub-combination. For example, some embodiments can involve an electronic device comprising at least one power supply element comprising first and second invalidating means, commuting means and blocking means and a power supply female connector, the power supply element being fixedly mounted on the electronic device.

At least some embodiments of the present disclosure can improve the interconnection (for example AC power supply and/or data connection) of stacked
devices, in term of safety and/or ergonomics. Such an embodiment can also permit to prevent several power supply connectors to be accessible at the same time (for example, when a power supply male connector is in use, the other unused power supply male connectors can be not accessible), thus securing the unused power supply male connectors.

At least some embodiments can permit to reduce the number of cables necessary for grouped devices, notably for two stacked devices.

At least some embodiments can prevent the loss of an interconnection element mounted on an electronic device, during transportation of the electronic device to a new location, as it can be the case when using a detachable interconnection element.

Furthermore, the mounting and/or shape of the power supply element (notably the retractable nature of the second module) can be adapted for the electronic device to lie flat when it is used as a stand-alone device.

At least some embodiments, for example embodiments implementing blocking means that provide a double locking, can avoid unintentional retraction and/or extension of the retractable module and thus permit a more reliable power supply of a device.

4. Description of Drawings

The present disclosure will be better understood, and other specific features and advantages will emerge upon reading the following description, the description making reference to the annexed drawings wherein:

- Figure 1 shows a perspective view of a power supply element according to a particular embodiment, the power supply element comprising a retractable module in a retracted position;
- Figure 2 shows the power supply element of figure 1 with the retractable module being in an extended position;
- Figure 3 shows a power supply element with a retractable module in an extended position, according to a second embodiment;
- Figure 4 shows a side view of an electronic device according to a particular embodiment;
- Figure 5A and figure 5B show a partial cross section of a power supply element, in two different embodiments.
- Figures 6A to 6C illustrate second invalidating means of the power supply element according to different embodiments.

5. **Description of embodiments.**

In a general but non-restrictive way, the present disclosure relates to a power supply element intended to be comprised in an electronic device (for instance a set-top-box or an hard disk drive (or "HDD")), in order to permit the power supply of the device, either directly, for example via a cable inserted in a first module of the power supply element, either via another electronic device, thanks to a second module of the power supply element. The second module comprises at least one power supply male connector that can interconnect with a power supply female connector, notably a standard power supply female connector, for instance a power supply female connector mounted on a device (like a set-top-box) to be grouped with a device (like a HDD) on which the power supply element is mounted.

The direct power supply mode can be used for example when the device (for instance a set-top-box) is in standalone mode. It can also be used when the device is part of a group of interconnected devices. In such an embodiment, the present disclosure can notably permit to reduce the number of power supply cables needed.

Some embodiments, in which the power supply element is fixedly coupled to the device, for example in a permanent assembling, permit to make sure that the power supply element will stay in the device, even if the device is used as a standalone device during a long time, and even if the device is frequently displaced.

A particular embodiment will now be presented, in association with figures 1 and 2.

Figure 1 shows a perspective view of a power supply element 100 according to a particular embodiment, the power supply element 100 comprising a retractable module (not shown) in a retracted position.

According to the particular illustrated embodiment, the power supply element 100 comprises a housing 110. The housing 110 can comprise mounting means, such as ledges and/or recesses (not represented), in order to guide the power supply in its mounting position in an electronic device. It can also comprise fixing means (not represented), like fixing holes, clipping means (such as protrusion) in order to fixedly mount the power supply element with the electronic device. For example, the mounting can be performed thanks to cooperating fixing means of the electronic device, such as holes or clipping means, and/or of additional fixing means.
such as screws, and so on. Depending of embodiments, the shape of the housing can be diverse. For instance, as illustrated by figures 1 and 2, it can have a "L" shape, with two faces adapted to be on the outside of an electronic device (like a set-top-box or a HDD) on which the power supply element is to be mounted. It can also have a parallelepiped shape, as represented in figure 3, for instance with an opened top face (as shown in figure 3). The housing 110 can notably comprise a compartment (as shown in figure 3) adapted to receive the retracted module.

The power supply element 100 can also comprise a first module 120 equipped with an AC inlet male connector 122.

The power supply element 100 further comprises commuting means 130 for commuting the position of the retractable module. In the illustrated embodiment, the commuting means comprises a sliding lever 132 that commands the extension and/or the retraction of the retractable second module.

Figure 2 shows a perspective view of the power supply element 100 according to a particular embodiment compatible with the embodiment illustrated in figure 1, the retractable module 140 being in an extended position. Depending upon embodiments, one or several extended positions can be defined. In particular, as illustrated by figure 4, a retractable module 140 (mounted on a HDD 400) having several extended positions can be adapted to cooperate with different forms of power supply female connector 412 (for instance female connector 412 being installed in a more or less deep recess of a Set-Top-Box 402).

The Set-top-box itself can be equipped with the same power supply element (as illustrated by figure 4), or by a classical power supply connector for direct power supplying by cable. An embodiment with a retractable module 140 being totally retractable inside the power supply element can also permit, when the power supply element 100 is mounted on the basement of an electronic device 402 (as illustrated by figure 4), to keep the device comprising the power supply element on an horizontal plan when the electronic device 402 is used as a standalone. An adaptable length of the extension of the retractable module, when the power supply element 100 is mounted on the basement of an electronic device, can also permit to obtain an external length of the extended retractable module similar to the length of the feet of the device.

Similarly, when the power supply element is mounted on the top of an electronic device, a retractable module with several extended positions can permit to
help keeping another device stacked on the top of the electronic device comprising
the power supply element on a horizontal plan.

In the illustrated embodiment of figures 1 and 2, the retractable module 140 is
a sliding module. In other embodiments, it can be a pivoting module for instance.

As illustrated in figures 2 and 3, the retractable module 140 can comprise at
least one power supply male connector, with at least one electrical contact (142,
144). It can also comprise data connectors 146 in order to permit data emission
and/or reception.

In the illustrated embodiments, the power supply element 100 also comprises
first invalidating means 150, which prevent, at least partially, access to the first
power supply male connector 122 of the first module 120 when the second module is
in an extended position. Notably, such invalidating means may electrically secure the
power supply male connector. The first invalidating means 150 can let some
electrical contact still accessible. For example, a power supply connector with two
electrical contacts is secured when at least one of its electrical contacts is not
accessible, even if an electrical contact is still accessible.

In other embodiments, eventually complementary, as represented by figures 2
and 3, the first invalidating means 150 can also entirely invalidate the access to the
first power supply male connector 122. Such an invalidating position can offer, not
only an electrical protection of the connector, but also a mechanical protection of the
connector.

The first invalidating means 150 can for instance comprise a safety panel, like
a sliding or pivoting panel, as illustrated in figures 2 and 3. In some embodiments,
the first invalidation means can comprises several safety panels. Depending upon
embodiments, the safety panel can be a solid panel, or a hollow panel, like a grid.

In some embodiments, the first invalidating means can be commanded by the
commuting means 130. Such an embodiment can permit to ensure that the first
power supply connector is automatically protected when the second module is in an
extended position. In other embodiments, an extension of the second module cannot
be commanded when the first invalidating means have not been activated before.
For example, a protuberance laterally located on an extremity (like a distal extremity)
of the safety panel 150 can block the commuting means of the second module 140
when the safety panel 150 is not in its safety position.
Figure 3 shows a power supply element with a retractable module in an extended position, according to a second embodiment. In this second embodiment, the power supply element notably differs from the one presented in association with figure 2, because of the shapes of the second power supply module and of the housing.

The power supply element 100 illustrated in figure 3 can also comprise blocking means 160, enabling the second module to be maintained in its extended and/or retracted position. Those blocking means can be activated automatically and/or manually. Depending upon embodiments, such blocking means can belong, at least partially, to the second power supply module or can belong, at least partially, to a separate module.

Figures 5A and 5B illustrate such blocking means 160, 500, 510 according to two different embodiments. In both figures, the second power supply module 140 is in a retracted position. Figure 5B shows a partial cross section represented by section B-B in figure 3, in a side view, of a power supply element 100 according to an embodiment, compatible with the embodiment illustrated in figure 3. The power supply element 100 comprises a housing 110 including a back face, a second power supply module 140 and blocking means 500, comprising a button 160 and a spring 170 mounted on the back face of the housing 110.

Figure 5A shows a partial cross section represented by section A_A in figure 5B, in a bottom view of a power supply element 100 according to another embodiment, which notably differs from the power supply element of figure 5B because of the absence of spring.

In the illustrated embodiments of figures 5A and 5B, the blocking means are situated partially on the second power supply module 140 (first blocking means 510), and partially on a separate module 500 (second blocking means 500), the first and second blocking means being adapted to cooperate together. The first blocking means can for instance be a protrusion 510, located above the second blocking means 500. The second blocking means notably comprise a button 160. As illustrated, the shapes of first and second blocking means 510, 500 can be adapted to prevent the second power supply module 140 to move from a retracted position to an extended position (and/or vice-versa), even if commutation means are actuated, and to liberate the second power supply module 140 when the button 160 is pressed.
According to the particular embodiments illustrated by figures 5A and 5B, the second blocking means 500 surround the second power supply module 140, with a gap 520 between the inner wall of the second blocking means 500 and the wall of the second power supply module at the opposite side of the protrusion 510. Because of the protrusion 510, the second blocking means 500 prevent the second power supply module 140 from moving to an extended position. When the button 160 is pressed, the gap 520 disappears and a new gap is created under the protrusion 510 thus releasing the second power supply module 140. Similarly, as illustrated, the protrusion 510 and the second blocking means 500 can prevent the second power supply module 140 to retract once in an extended position. Such an embodiment can permit for instance to ensure that the retractable module 140, when in its extracted position, will withstand an insertion load during an assembly with a female power connector and not move back in the housing.

In some embodiments, as illustrated in figure 5B, the second blocking means can comprise a spring, with an extremity mounted on the back face of the housing for instance. Such embodiments offer the advantage of ensuring the return of the second blocking means in their blocking position, when the button 160 is released.

In other embodiments, the blockings means can be adapted to be engaged with said commuting means so as to prevent the movement of said commuting means in at least one direction of displacement, thus preventing the extension and/or retraction of the second power supply module.

The power supply element 100 can also comprise second invalidating means 600, as illustrated by figure 6A to 6C, in order to prevent, at least partially, access to the second power supply male connector when the second module 140 is in its retracted position. Such second invalidating means can invalidate access to at least one contact 142, 144 of the second power supply connector.

Depending upon the embodiments, and similarly to the first invalidating means 150, the second invalidating means 600 can invalidate partially and/or totally the access to all the electrical contacts 142, 144 of the second power supply male connector. Such an embodiment can notably permit a compliance of the power supply element with safety standards, for instance by passing safety tests such as a pin gauge insertion test.

In some embodiments, the second invalidating means 600 can be commanded by the commuting means 130. Such an embodiment can permit to
ensure that the access to the second power supply connector is invalidated when the second power supply connector is in its retracted position. In other embodiments, the second invalidating means can be activated regardless of the commutation means. For example, in some embodiments, as illustrated by figures 6B to 6C, the second invalidating means can comprise a second safety panel (for example a sliding panel 600 as illustrated by figure 6C or a pivoting panel 600 as illustrated by figure 6B), the panel 600 being mobile between an opening position and a closing position, in which the second safety panel 600 prevents access to at least some of the contacts of the second power supply connector. In the embodiment illustrated in figure 6C, the second safety panel 600 is spring-mounted, in order for the safety panel to automatically come back in its closing position, when no obstacle (like a part of the second power supply module) prevents the closure of the safety panel. The compression spring 610 can be adapted to permit the opening of the safety panel under the force applied by the end of the second power supply module during its extension. Depending upon embodiments, the second invalidation means can comprise one or several safety panels. Such a panel can be a solid panel or a hollow panel (like a grid).

In some embodiments, notably in the particular embodiment of figure 6C, the second power supply module and the safety panel can present face to face beveled sides (620, 630). Those face to face beveled sides (620, 630) can facilitate the opening of the safety panel 600 under the force applied by the end of the second power supply module 140 during its extension.

In some embodiments, the power supply element 100 can also comprises at least one power supply female connector, notably a standard female connector and/or a female connector adapted to cooperate with a power supply element according to at least one embodiment of the present disclosure.

For instance, such a female connector can be located, in the illustrated embodiment of figures 1 or 3, in the same face of the power supply element as the first module, below the first module. In other embodiments, it can also be located in a face perpendicular to the first module.

In some embodiments, when the power supply element comprises several safety panels, several or all safety panels can be in a closing position at the same time. Such an embodiment can permit a mechanical protection of several power
supply connector. It can offer some advantage in case of transportation of power supply element before its mounting on an electronic device.

In other embodiments, only one safety panel can be in a closing position at a given time. Such an embodiment, in which a power supply connector is unprotected, can permit to get a more easy-to-use power supply element.
CLAIMS

1. A power supply element comprising a first module comprising at least one first power supply male connector, said power supply element comprising:
   - a least a retractable second module, said second module being adapted to be positioned in a retracted position and in at least one extended position, said second module comprising at least one second power supply male connector;
   - first invalidating means adapted to invalidate, at least partially, access to said first male connector when said second module is in said extended position;
   - said power supply element being characterized in that it further comprises second invalidating means adapted to invalidate, at least partially, access to said second connector when said second module is in said retracted position.

2. A power supply element according to claim 1, said power supply element being characterized in that it further comprises commuting means for moving said second module between said retracted position and said extended position, said commuting means also commanding said first invalidating means.

3. A power supply element according to claim 1 or 2, said power supply element being characterized in that said first invalidating means comprises a first safety panel.

4. A power supply element according to any of claims 1 to 3, said power supply element being characterized in that it further comprises blocking means, said blocking means enabling said second module to be maintained in said extended or retracted position.

5. A power supply element according to any of claims 1 to 4, said power supply element being characterized in that said second invalidating means comprises a second safety panel, said second safety panel being mobile between an opening position and a closing position in which said second connector is not accessible.

6. A power supply element according to claim 5 characterized in that said second safety panel is a pivoting panel.

7. A power supply element according to claim 5 characterized in that said second safety panel is a sliding panel.

8. A power supply element according to any of claims 5 to 7 characterized in that said second module and second safety panel each comprises face to face beveled sides.
9. A power supply element according to any of claims 1 to 8, characterized in that said second module further comprises at least one data connector.

10. A power supply element according to claim 9, said power supply element being characterized in that said second invalidating means further comprises compression means, said compression means tending to maintain said second safety panel in said closing position.

11. An electronic device characterized in that it comprises at least one power supply element according of any of claims 1 to 10.

12. An electronic device according to claim 11 characterized in that the mounting position and/or shape of said power supply element is adapted to permit direct power supply of said electronic device by means of said first power supply connector of said power supply element, when said second module of said power supply element is in said retracted position, and the power supply of said electronic device by means of said second power supply connector of said power supply element, when said second module of said power supply element is in said extended position.

13. An electronic device according to claim 11 or 12 characterized in that it further comprises at least one power supply female connector adapted to be power supplied by the power supply of at least one of the first and second male connectors of the power supply element.

14. An electronic device according to any of claims 11 to 13 characterized in that said power supply element is fixedly coupled with said electronic device.
**INTERNATIONAL SEARCH REPORT**

**A. CLASSIFICATION OF SUBJECT MATTER**

INV. H01R13/447 H01R24/76 H01R103/00

ADD.

According to International Patent Classification (IPC) into both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

H01R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic database consulted during the international search (name of database and, where practicable, search terms used)

EPO-Internal, WPI Data

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

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<tr>
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<td>US 8 641 459 BI (MATSUOKA YOSHIMICHI [US] ET AL) 4 February 2014 (2014-02-04) column 7, line 9 - line 18 figures 3, 4</td>
<td>7, 10</td>
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See patent family annex.

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<tr>
<td>US 2014080337 A1</td>
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<td>US 2008298578 A1</td>
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