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[Continued on next page]

- (54) **Title:** SOCKET LOCKING ASSEMBLY

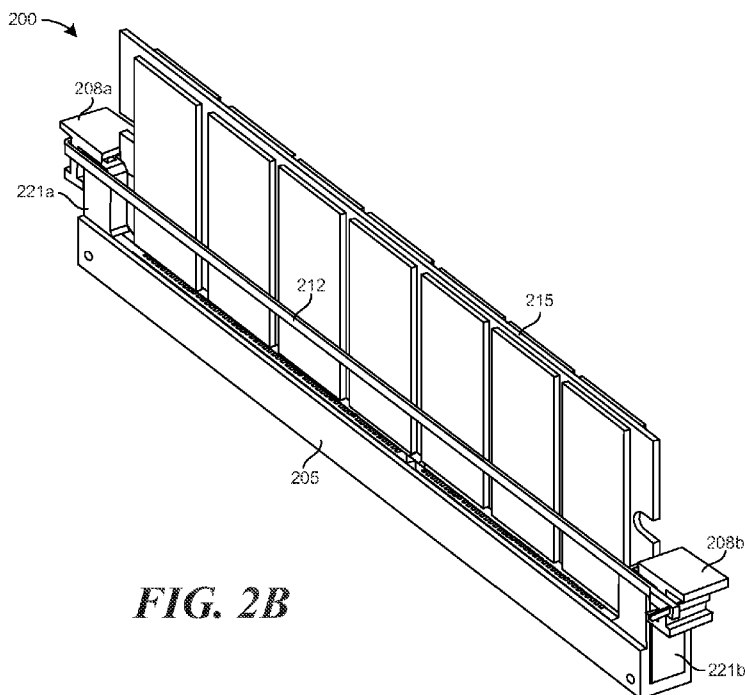


FIG. 2B

(57) **Abstract:** Embodiments of the present invention provide a socket locking assembly for a computing device. According to one example, the assembly includes a printed circuit board card and a socket configured to receive the card. The socket includes a first handle and second handle positioned at opposite ends for locking the card within the socket. A first adapter is positioned adjacent to the first handle, and a second adapter is positioned adjacent to the second handle of the socket. Furthermore, a securing band is formed around the pair of adapters to maintain the first handle and second handle of the socket in a locked position.

**Declarations under Rule 4.17:**

- *as to the identity of the inventor (Rule 4.17(i))*
- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

Published:

- *with international search report (Art. 21(3))*

- 1 -

SOCKET LOCKING ASSEMBLY

BACKGROUND

[0001] Transportation of computers and similar equipment to some regions of the world may subject such devices to extremely rough conditions including extensive shock and vibrations. As a result, there lies a great potential for damage or connectivity issues for certain internal processing components associated with the computer, such as a motherboard or printed circuit board (PCB) for example, during extended transportation routes.

[0002] One such processing component includes a dual in-line memory module (DIMM). More particularly, a DIMM socket connector provides electrical connection between the motherboard of the computing device and a DIMM card. However, rough transportation conditions may exert enough force on the DIMM socket connector to cause the DIMM card to dislodge, thus creating marginal or poor electrical contact between the DIMM card and the socket pins of the DIMM socket connector. Such a situation may cause the computer to fail either immediately upon first boot or soon thereafter.

BRIEF DESCRIPTION OF THE DRAWINGS

[0003] The features and advantages of the inventions as well as additional features and advantages thereof will be more clearly understood hereinafter as a result of a detailed description of particular embodiments of the invention when taken in conjunction with the following drawings in which:

[0004] FIGS. 1A and 1B are three-dimensional perspective views of a computing device implementing the socket locking assembly according to an example of the present invention.

[0005] FIGS. 2A and 2B are three-dimensional perspective views of the printed circuit board card and the receiving socket according to an example of the present invention.

[0006] FIGS. 3A and 3B are front views of the socket locking assembly according to an example of the present invention.

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[0007] FIGS. 4A – 4E are three-dimensional views illustrating alternative clamping adapter shapes according to an example of the present invention.

[0008] FIGS. 5A and 5B are three-dimensional views illustrating a alternative clamping adapter design in accordance with an example of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0009] The following discussion is directed to various embodiments. Although one or more of these embodiments may be discussed in detail, the embodiments disclosed should not be interpreted, or otherwise used, as limiting the scope of the disclosure, including the claims. In addition, one skilled in the art will understand that the following description has broad application, and the discussion of any embodiment is meant only to be exemplary of that embodiment, and not intended to intimate that the scope of the disclosure, including the claims, is limited to that embodiment.

[00010] The figures herein follow a numbering convention in which the first digit or digits correspond to the drawing figure number and the remaining digits identify an element or component in the drawing. Similar elements or components between different figures may be identified by the user of similar digits. For example, 143 may reference element “43” in Figure 1, and a similar element may be referenced as 243 in Figure 2. Elements shown in the various figures herein can be added, exchanged, and/or eliminated so as to provide a number of additional examples of the present disclosure. In addition, the proportion and the relative scale of the elements provided in the figures are intended to illustrate the examples of the present disclosure, and should not be taken in a limiting sense.

[00011] One solution for the aforementioned problem relies on a snap and hold locking mechanism for the card socket. However, such a solution still does not provide a strong enough locking feature between the card and socket as extremely rough transportation conditions may still present connection issues for internal components of the computer. This problem is particularly prevalent in developing countries such as India and China for example, where the

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transportation infrastructure is underdeveloped and potentially hostile. Other solutions may include the use of an adhesive such as tape for example. However, since the tape needs to be wide enough to hold the both socket locking handles in place, it also has the potential to undesirably block necessary air flow to the DIMM components (e.g., memory modules).

[00012] Embodiments of the present invention provide a socket locking assembly for a printed circuit board card and an associated receiving socket such as a DIMM card and a DIMM socket. In particular, the present examples described herein help to prevent the unintentional release of the socket handles, thereby preventing the PCB card from moving out of its socket due to board flex, shock and/or vibration – conditions that may occur during extended transportation.

[00013] Referring now in more detail to the drawings in which like numerals identify corresponding parts throughout the views, FIGS. 1A and 1B are a three-dimensional perspective views of a computing device implementing the socket locking assembly according to an example of the present invention. As shown in FIG. 1A, the computing device 100 includes internal processing components housed within a main casing 102 of the device 100. In one example, a central printed circuit board, or motherboard 107 is housed within the main casing 102 and includes a plurality of microchips or integrated circuits 104 formed thereon. According to one embodiment, the motherboard 107 also includes a plurality of connecting sockets 105a – 105c. These sockets 105a – 105c are formed as slots configured to receive a daughter printed circuit board (PCB) card 115a – 115c. Furthermore, when the PCB card is inserted, each socket 105a – 105c includes contacts for providing electrical connectivity between the motherboard 107 and the PCB cards 115a – 115c. Still further, a plurality of clamping adapters 108a – 108c are positioned adjacent to a respective PCB card 115a – 115c, while a securing band 112a – 112c is formed around each PCB card 115a – 115c. A more detailed description of the clamping adapters and securing band will be described in greater detail with reference to FIGS. 2A and 2B.

[00014] FIG. 1B depicts a notebook computer as the computing device 100. Like the previous embodiment, the notebook computer 100 includes

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a main casing 102 and internal processing components formed therein. As shown here, the computing device 100 may include an opening 103 for accommodating the socket locking assembly 119. The socket locking apparatus includes a PCB card 115 placed within or inserted into a receiving socket 105. Moreover, an identical pair of clamping adapters 108 are positioned in close proximity to the PCB card 115. As in the previous example of FIG. 1A, a securing band 112 is formed around the pair of adapters 108 so as to provide a secure and reliable locking mechanism for the socket locking assembly 119.

[00015] FIGS. 2A and 2B are three-dimensional perspective views of the printed circuit board card and the receiving socket according to an example of the present invention. As shown in the embodiment of FIG. 2A, the socket locking assembly 200 includes a printed circuit board card 215 having a plurality of memory modules 222 formed thereon. According to one example, the memory modules 222 are formed on a both surface sides of the PCB card so as to represent a dual in-line memory module (DIMM) card. The PCB card 215 also includes an electrical contact area 216 formed on a lower area thereof. The contact area 216 of the PCB card 215 is shaped to correspond to the contact area 218 of the receiving socket 205. Thus, when the card 215 is inserted into the socket 205, electrical connection and communication is provided between the PCB card 215 and the receiving socket 205 – and indirectly between the PCB card 215 and the central motherboard via the PCB socket 205 as mentioned above. The PCB card 215 further includes notches or grooves 211a and 211b formed on a front end 240 of the PCB card 215 and a back end 242 (opposite the front end 240) of the PCB card 215 respectively. Similarly, the receiving socket 205 includes locking handles 221a and 221b formed on a front end 244 and back end 246 (opposite the front end 244) respectively. The socket locking assembly 200 also includes a pair of clamping adapters 208a and 208b for holding the locking handles 221a and 221b respectively, in a reliably fixed position.

[00016] FIG. 2B depicts an assembled PCB card and receiving socket according to an example of the present invention. As shown here, the PCB card 215 has been inserted into the receiving socket 205. In one example, upon insertion of the card 215 into the socket 205, the locking handles 221a and 221b are pushed inward – either manually or automatically – so that a protrusion

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portion of each locking handle fits within at least one notch on both sides 240 and 242 of the PCB card 215. Thereafter, clamping adapters 208a and 208b are placed on a back end (i.e., end opposite protrusion portion end) of the respective locking handle 221a and 221b. Furthermore, a securing band 212 is formed tightly around both clamping adapters 208a and 208b and the PCB card 215. According to one example, the PCB card represents a DIMM card, while the receiving socket represents a DIMM socket for receiving the DIMM card. The securing band may comprise of a tie wrap, a tensile band that twists for tightening (e.g. twist tie for securing the plastic bag around a loaf of bread), an elastic band that stretches (e.g. rubber band) over the clamping adapters 208a and 208b and locking handles 221a and 221b, or a shrinkable band or other malleable material that is shrinkable via heat or some other exchange mechanism so as to tighten and secure (i.e. prevent lateral and vertical slippage) the clamping adapters 208a and 208b around the locking handles 221a and 221b. In an alternate embodiment, the shrinkable band or material may be utilized without the clamping adapters 208a and 208b as the shrinkable band/material is configured to conform around the locking handles 221a and 221b in a manner that prevents the shrinkable band/material from moving horizontally or vertically so as to securely retain the locking handles 221a and 221b in a locked or latched position.

[00017] FIGS. 3A and 3B are front views of the socket locking assembly according to an example of the present invention. As shown in the example of the FIG. 3A, the socket locking assembly includes a PCB card 315 and a receiving socket 305. More specifically, the PCB card 315 includes notches 311a and 311b formed on opposite ends thereof, while the receiving socket 305 includes locking handles 321a and 321b formed on corresponding opposite ends. Furthermore, each locking handle 321a and 321b includes respective protruding portions 333a and 333b, in addition to respective tab portions 335a and 335b. The protruding portions 333a and 333b of each locking handle 321a and 321b are configured to fit within the corresponding notches 311a and 311b of the PCB card 315 when the locking handles 321a and 321b are in a locked or upright position as shown in FIG. 3A. Accordingly, the locking handles 321a and 321b provide a simple locking mechanism for maintaining the PCB card 305 within the receiving socket 305. Still further, a pair of adapters

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308a and 308b are positioned adjacent to the locking handle 321a and 321b respectively, so as to provide additional stabilization for the locking handles. More particularly, an inner groove area 337a and 337b of each adapter 308a and 308b is formed to substantially correspond to the shape and size of the tab portions 335a and 335b of the locking handles 321a and 321b. In the present example, each adapter 308a and 308b is also formed to have a longer upper portion and shorter lower portion. Because of this formation, the adapters 308a and 308b – when positioned adjacent to the respective locking handle – are able to firmly engage and grip the tab portions 335a and 335b of the locking handles 321a and 321b, respectively.

[00018] FIG. 3B depicts a fully assembly socket locking assembly 300. As shown in this example, the PCB card 315 is fully inserted with the receiving socket 305. The locking handles 321a and 321b are in an upright and locked positioned, and the clamping adapters 308a and 308b are positioned adjacent to and engaged with respective locking handles 321a and 321b. Furthermore, a securing band 312 wraps around both clamping adapters 308a and 308b, and more specifically, the securing band 312 rests within outer groove areas 339a and 339b (shown in FIG. 3A) of the clamping adapters 308a and 308b. As shown, the securing band 312 is formed to wrap around the entire socket locking assembly 300. In one example, the securing band is tie wrap strip that is tied with a cable tie gun for establishing the appropriate locking tension, which is the strength that holds the clamping adapters 308a and 308b in a fixed position so as to prevent the locking handles 321a and 321b from opening during transportation stresses. As a result, the socket locking assembly of the present invention provides a more secure and reliable locking mechanism for the PCB card 315 and receiving socket 305.

[00019] FIGS. 4A – 4E are three-dimensional views illustrating alternative clamping adapter shapes according to an example of the present invention. As shown in FIGS. 4A, clamping adapter 400 includes an elongated upper portion 419 and a shorter lower portion 417. Here, the clamping adapter is formed to have a longer width (W) in order to secure more than one DIMM card and socket. FIG. 4B includes a clamping adapter that has a semi-closed outer groove area 425. That is, the opening of the outer groove area 425 transitions

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from a narrow opening to a larger opening as the outer groove area 425 opens from outer surface. Such a construction helps to maintain the securing band within a fixed position when placed inside the outer groove area 425 of the clamping adapter. FIG. 4C includes yet another example of an alternative clamping adapter 400. As shown in this example, the clamping adapter 400 includes a closed outer groove area 425. As a result of this type of formation, there no issue of a securing band possibly sliding out of the outer groove area 425 of the clamping adapter 400. FIG. 4D is another example of an alternative clamping adapter. In this example, the clamping adapter 400 further includes an additional engaging strap 433 configured to wrap around the tab portion (i.e. elements 335a and 335b shown in FIG. 3A) of the locking handle when the clamping adapter is adjacent to and engaged with (i.e. locked position) the locking handle as described above.

[00020] Furthermore, each adapter shown in FIGS. 4A – 4D is configured such that the upper portion 419 has a length (L), which is the perpendicular extension/protrusion from the inner groove area 423 of the clamping adapter, that is greater than the length (L) of the lower portion 417. FIG. 4E is yet another example of an alternate configuration of the clamping adapter 400. As shown here, the clamping adapter 400 includes retention areas 429a and 429b that correspond with outside edges of the locking handle. As a result, the retention areas 429a and 429b help to provide additional security by further preventing lateral movement of the clamping adapter when in a locked position with the locking handle. Unlike the previous alternate configurations shown in FIGS. 4A – 4D, the lower portion 417 and the upper portion of the clamping adapter shown in FIG. 4E are formed to have substantially the same lengths (L), or perpendicular extensions from the inner groove area 423.

[00021] FIGS. 5A and 5B are three-dimensional views illustrating a alternative clamping adapter design in accordance with an example of the present invention. In this example, the clamping adapter and tie wrap are essentially molded together to form a secondary adapter 506. More particularly and as shown in FIG. 5A, the secondary adapter 506 includes wrapping portions 517a and 517b and a rectangular opening 514 that corresponds substantially to the size and shape of the tab portion 535 of the locking handle. When in a

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locked position, the opening 514 is positioned to sit over the tab portion 535 of the locking handle 521 so as to firmly engage and grip the tab portion 535 of the locking handle in a manner similar to the adapter of the previous examples. The wrapping portions 517a and 517b may then wrap around (as indicated by the directional arrows) the locking handle 521 and couple with wrapping portions of an opposite secondary adapter or may even be tied with each other. Moreover, the opening 514 can be sized to accommodate multiple adjacent locking handles – either through inclusion of a single opening 514 or via a secondary adapter 506 having multiple integrated and adjacent openings. Still further, a plurality of secondary adapters 506 may be grouped together to accommodate multiple sockets and groups of locking handles.

[00022] Examples of the present invention provide a socket locking assembly for a computing device by utilizing two identically formed clamping adapters and a securing band. According to one example, each adapter is placed on opposing sides of a receiving socket, and particularly, over the locking handles associated with the socket. The two clamping adapters guide and reliably hold a tie wrap strip, which wraps around the entire socket locking assembly. Examples of the present invention offers an significant advantage over prior solution by reliably securing the latching mechanism of the socket in a locked position so as to prevent computer failures due to PCB card movement in rough transportation conditions.

[00023] Furthermore, while the invention has been described with respect to exemplary embodiments, one skilled in the art will recognize that numerous modifications are possible. For example, although exemplary embodiments depict a desktop and notebook computer as the computing device, the invention is not limited thereto. For example, the socket locking assembly of the present invention may be implemented in a computing device such as a netbook, a tablet personal computer, a cell phone, or any other computing device having a central motherboard and daughter printed circuit boards.

[00024] Furthermore, the clamping adapter may be constructed as a separate piece which is added to an individual securing band (e.g. tie wrap). Also, the adapter, securing band and locking handles may all be molded together into one assembly. According to one example, the socket locking assemblies

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could include locking handles of a single receiving socket that are formed to latch onto and lock multiple PCB cards depending on the width of the clamping adapters and locking handles. Thus, although the invention has been described with respect to exemplary embodiments, it will be appreciated that the invention is intended to cover all modifications and equivalents within the scope of the following claims.

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WHAT IS CLAIMED IS:

1 1. A socket locking assembly for a computing device, the assembly
2 comprising:
3 a printed circuit board card;
4 a socket configured to receive the card, wherein the socket includes a first
5 handle and second handle positioned at opposite ends thereof and configured to
6 lock the card in the socket;
7 a first adapter positioned adjacent to the first handle, and a second
8 adapter positioned adjacent to the second handle of the socket; and
9 a securing band formed around the pair of adapters to secure the first
10 handle and second handle of the socket in a locked position.

1 2. The assembly of claim 1, wherein both the first handle and second
2 handle of the socket includes an protruding portion and a tab portion formed
3 opposite the protruding portion, and
4 wherein the PCB card includes at least one groove portion for receiving
5 the protruding portion of the first handle and second handle.

1 3. The assembly of claim 2, wherein both the first adapter and the
2 second adapter include an inner groove area and an outer groove area, wherein
3 the inner groove area of each adapter corresponds substantially to a shape of the
4 tab portion of the first handle and second handle.

1 4. The assembly of claim 3, wherein when the card is in a locked
2 position with the socket, the inner groove area of the first adapter engages the
3 tab portion of the first handle and the second adapter engages the tab portion of
4 the second handle of the socket and the securing band engages the outer groove
5 area of both the first adapter and the second adapter.

1 5. The assembly of claim 1, wherein the PCB card is a dual in-line
2 memory module (DIMM).

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1 6. The assembly of claim 1, wherein the securing band is a tie wrap,
2 flexible band, or malleable material that wraps around the pair of adapters and
3 the PCB card.

1 7. The assembly of claim 1, wherein each adapter includes a upper
2 portion and a lower portion, and
3 wherein the upper portion of the adapters extends perpendicularly from the
4 inner groove area further than the lower portion of the adapters.

1 8. The assembly of claim 1, wherein both the first adapter and second
2 adapter are configured to engage a plurality of locking handles associated with
3 plurality of PCB cards.

1 9. A method for providing a socket locking assembly comprising:
2 inserting a printed circuit board card into a socket, wherein the socket
3 includes locking a pair of locking handles that engage with the card upon
4 insertion;
5 positioning a first adapter and a second adapter adjacent to the locking
6 handles of the socket;
7 fixing a securing band around both the first adapter and the second
8 adapter so as to secure the pair of locking handles of the socket.

1 10. The method of claim 9, wherein both the first handle and second
2 handle of the socket includes an protruding portion and a tab portion formed
3 opposite the protruding portion, and
4 wherein the PCB card includes at least one groove portion for receiving
5 the protruding portion of the first handle and second handle.

1 11. The method of claim 9, wherein the pair of adapters include an
2 inner groove area and an outer groove area, wherein the inner groove area of
3 each adapter corresponds to a shape of the tab portion of the first handle and
4 second handle.

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1 12. The method of claim 11, wherein when the card is in a locked
2 position within the socket, the inner groove area of the first adapter engages the
3 tab portion of the first handle and the second adapter engages the tab portion of
4 the second handle of the socket and the securing band engages the outer groove
5 area of both the first adapter and the second adapter.

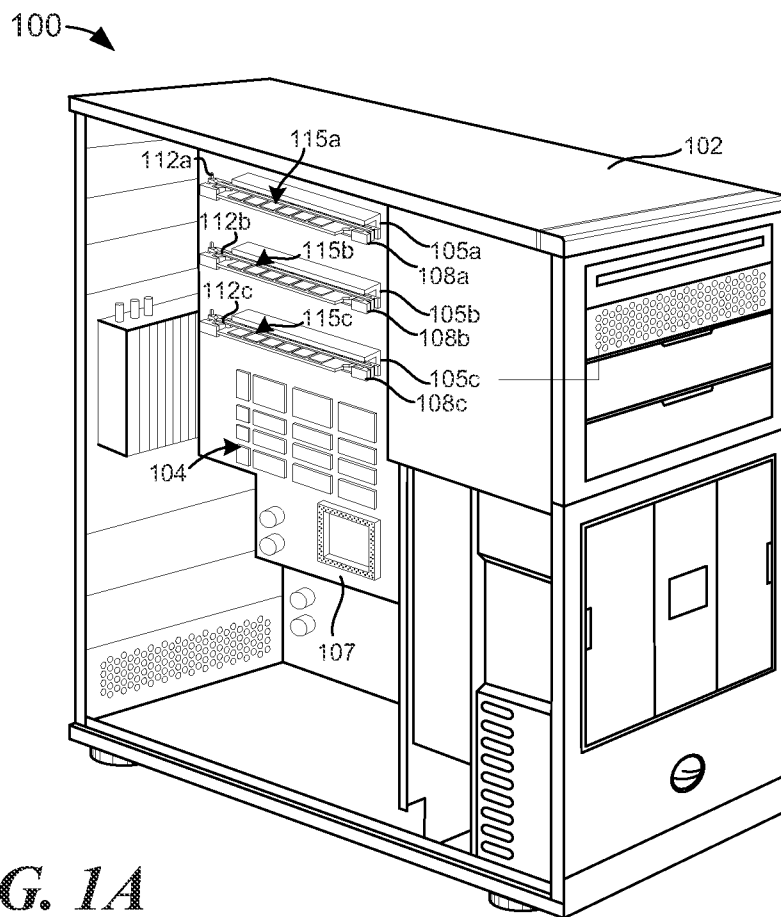
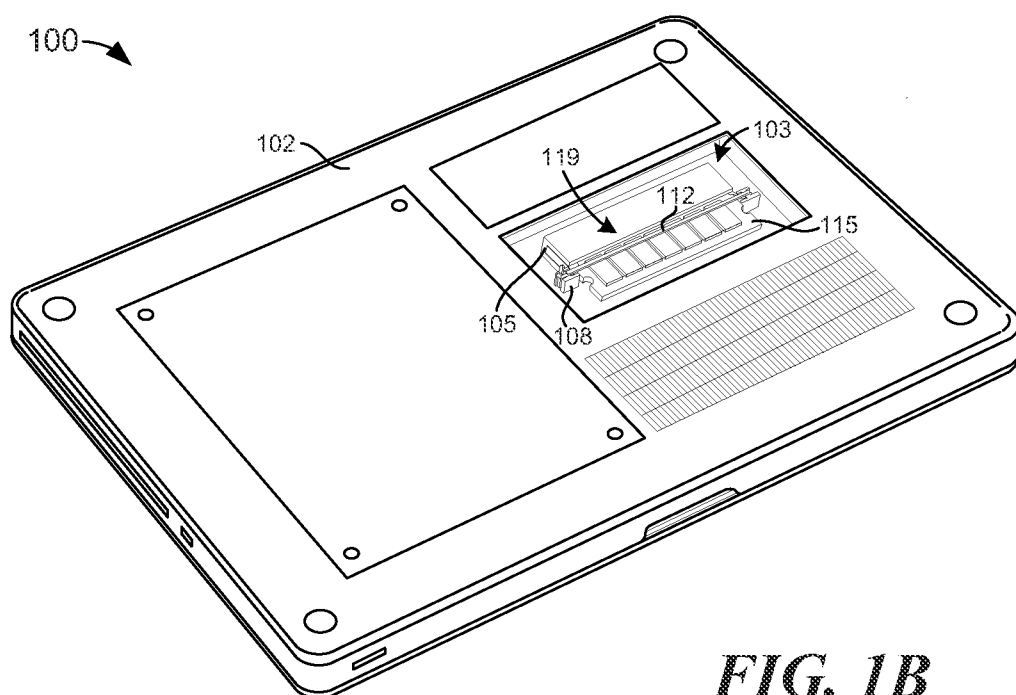
1 13. The method of claim 9, wherein the PCB card is a dual in-line
2 memory module (DIMM), and
3 wherein the securing band is a tie wrap, flexible band, or malleable
4 material that wraps around the pair of adapters and the PCB card.

1 14. A module connecting device comprising:
2 a printed circuit board card;
3 a socket configured to receive the card, wherein the socket includes a first
4 handle and second handle positioned at opposite ends thereof and configured to
5 lock the card in the socket;
6 a first adapter positioned adjacent to the first handle, and a second
7 adapter positioned adjacent to the second handle of the socket; and
8 a securing band formed around the pair of adapters to secure the first
9 handle and second handle of the socket in a locked position
10 wherein both the first handle and second handle of the socket includes an
11 protruding portion and a tab portion formed opposite the protruding portion, and
12 wherein the PCB card includes at least one groove portion for receiving
13 the protruding portion of the first handle and second handle, and
14 wherein both the first adapter and the second adapter include an inner
15 groove area and an outer groove area, wherein the inner groove area of each
16 adapter corresponds substantially to a shape of the tab portion of the first handle
17 and second handle.

1 15. The module connecting device of claim 14, wherein when the card
2 is in a locked position with the socket, the inner groove area of the first adapter
3 engages the tab portion of the first handle and the second adapter engages the

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- 4 tab portion of the second handle of the socket and the securing band engages
- 5 the outer groove area of both the first adapter and the second adapter.

**FIG. 1A****FIG. 1B**

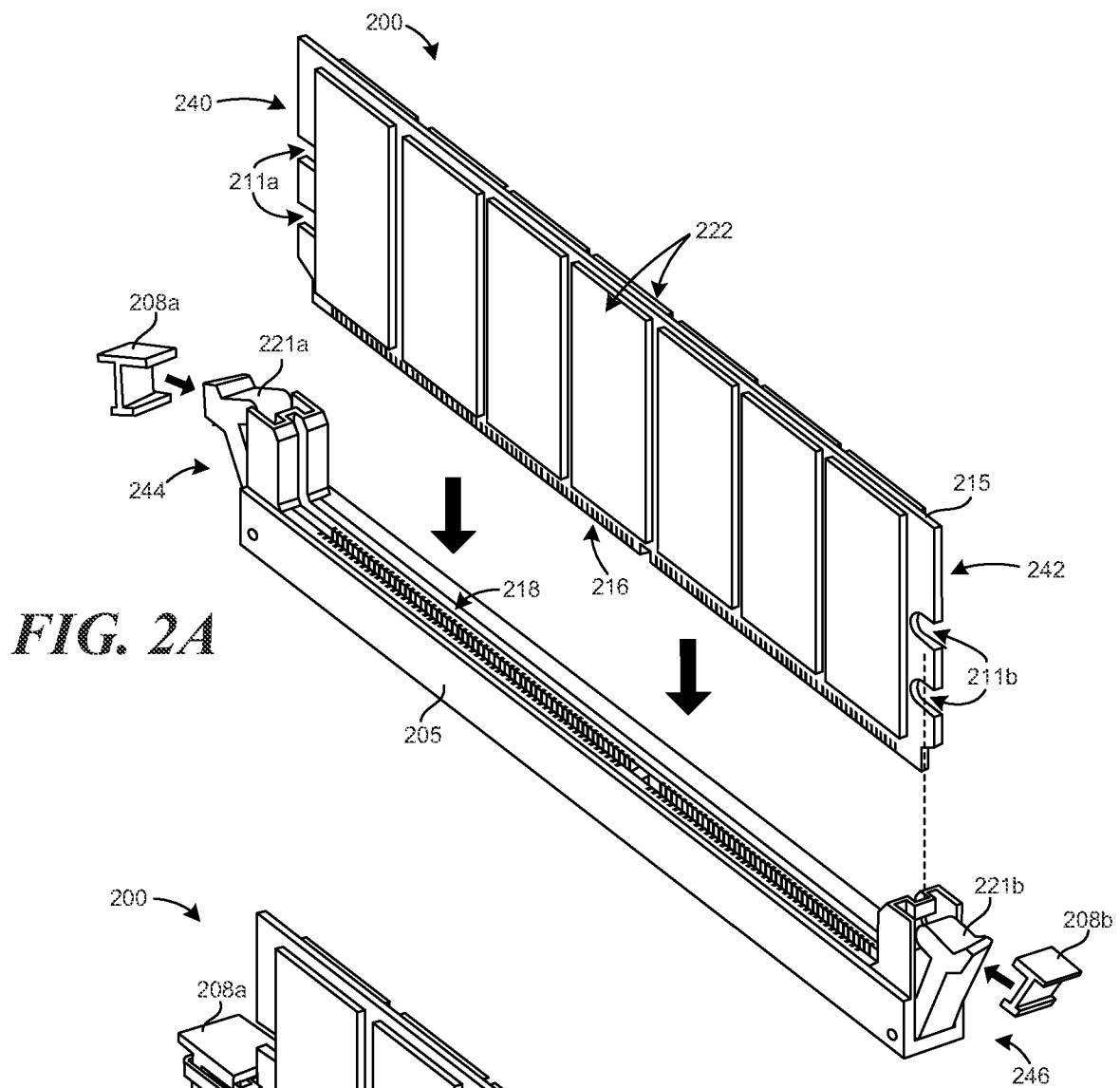
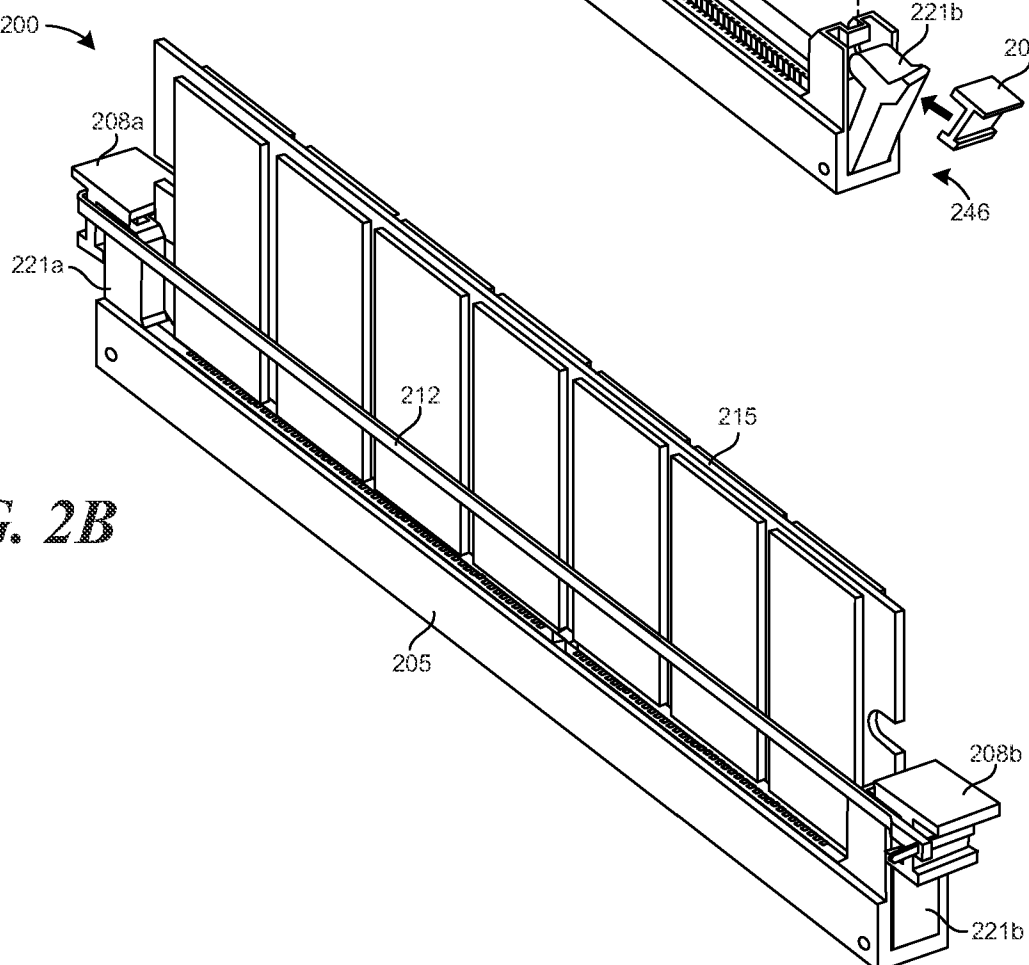


FIG. 2B



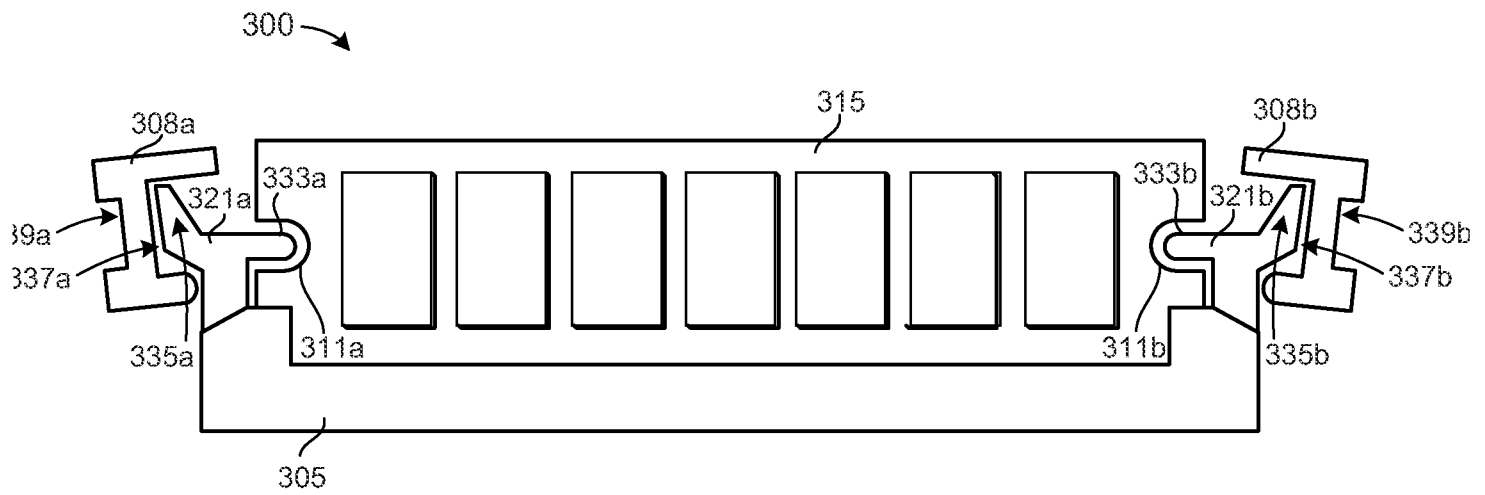


FIG. 3A

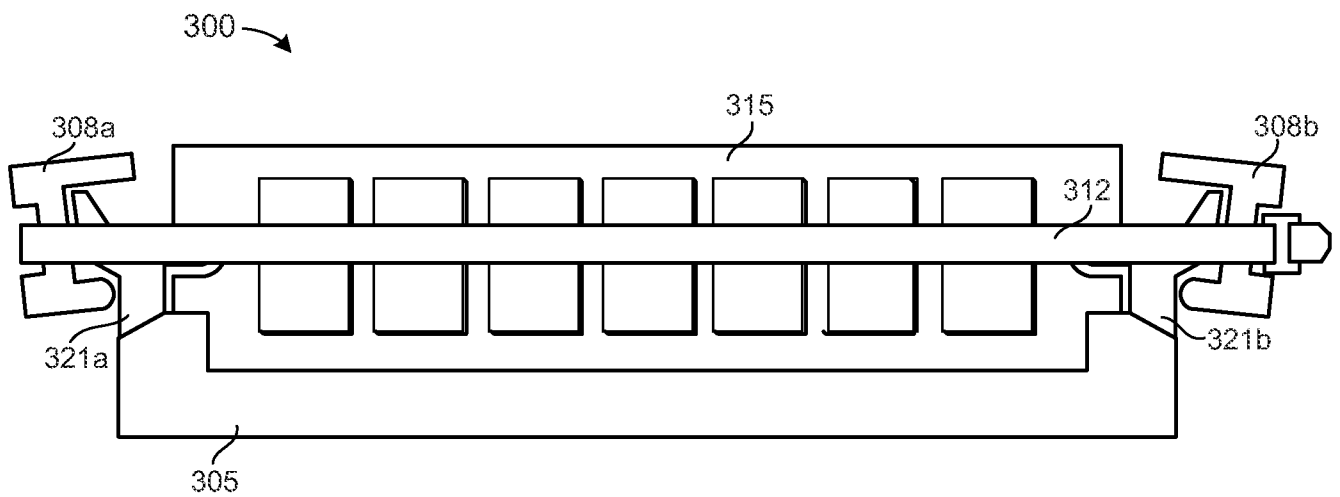


FIG. 3B

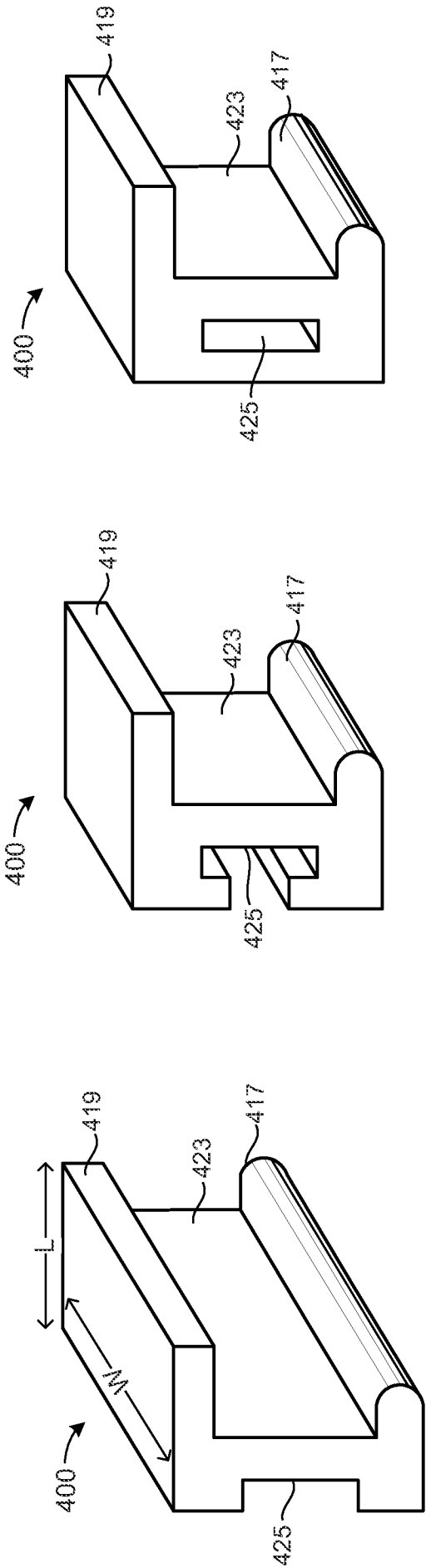


FIG. 4A

FIG. 4B

FIG. 4C

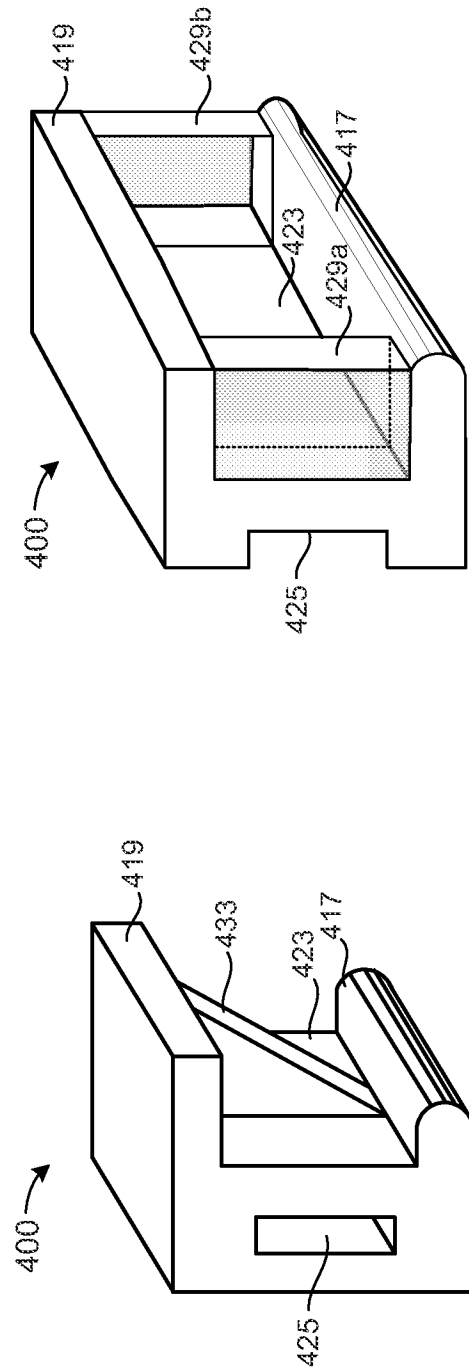


FIG. 4D

FIG. 4E

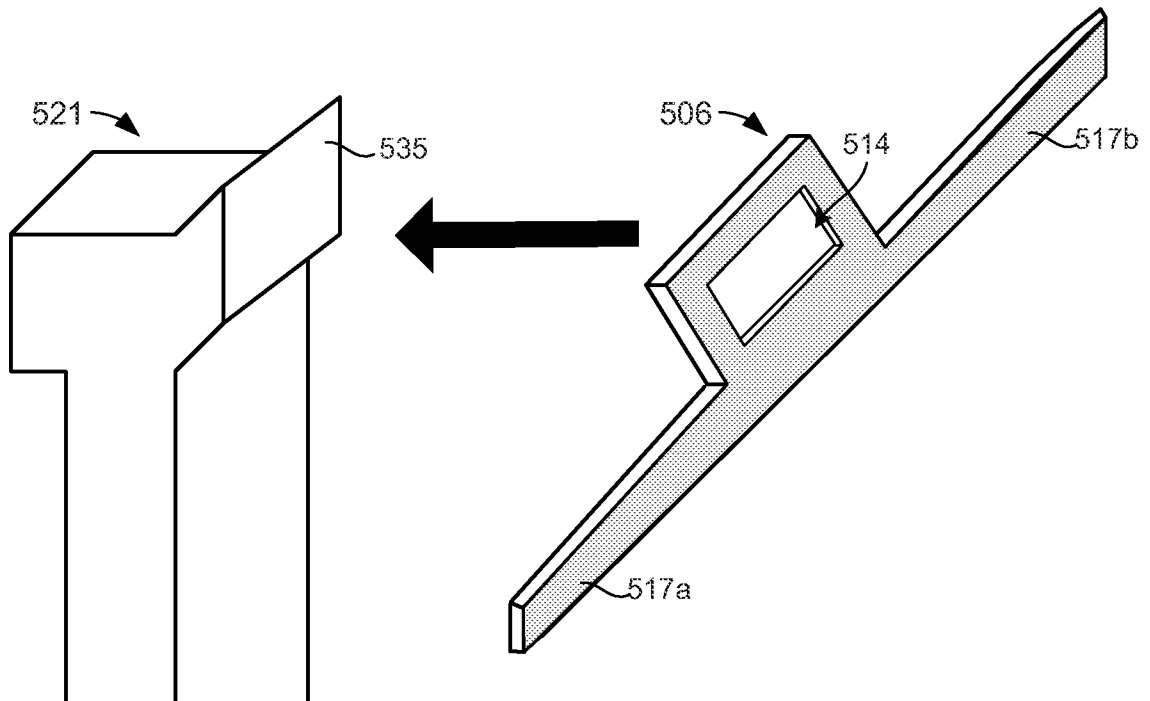


FIG. 5A

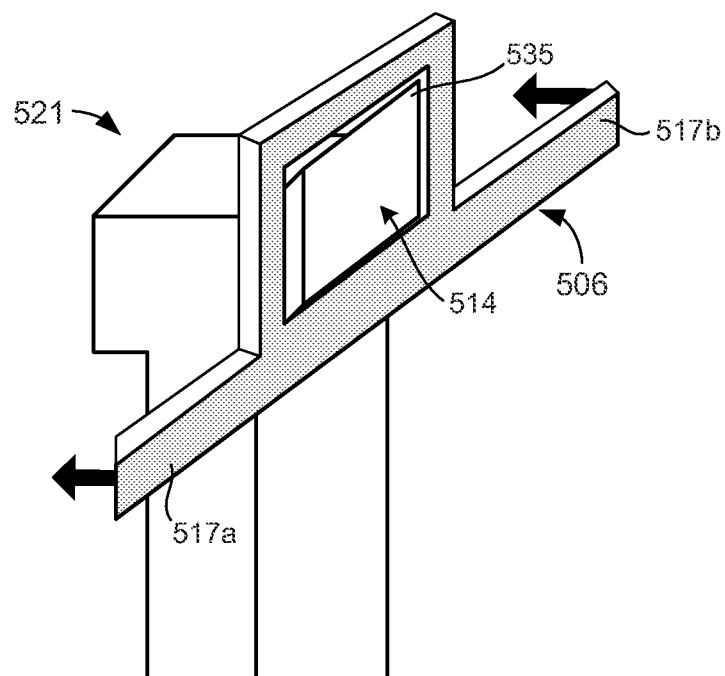


FIG. 5B

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2011/022767**A. CLASSIFICATION OF SUBJECT MATTER*****H01R 13/639(2006.01)i, H05K 7/14(2006.01)i***

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H01R 13/639; G06K 17/00; H01R 13/62; H01R 13/631

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

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

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

eKOMPASS(KIPO internal) & Keywords:card,socket,lock,retain,secure, band

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2009-0124110 A1 (WU CHAO-CHUNG et al.) 14 May 2009 See paragraph [0034] - paragraph [0039]; claim 1 and figures 3A, 3B	1-15
A	US 2007-0010121 A1 (TAKAHITO HANEISHI) 11 January 2007 See claims 5-8 and figure 4.	1-15
A	JP 3011219 U9 (KEL CORPORATION) 08 March 1995 See paragraph [0011] - paragraph [0015] and figure 1.	1-15



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

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Date of the actual completion of the international search

18 OCTOBER 2011 (18.10.2011)

Date of mailing of the international search report

19 OCTOBER 2011 (19.10.2011)

Name and mailing address of the ISA/KR

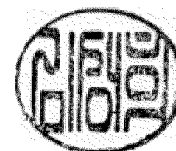
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Authorized officer

KIM, Sung Hee

Telephone No. 82-42-481-5889



INTERNATIONAL SEARCH REPORT

Information on patent family members

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