



(51) **International Patent Classification:**
H05K 7/14 (2006.01) *H01R 12/71* (2011.01)

(21) **International Application Number:**
PCT/US2014/049069

(22) **International Filing Date:**
31 July 2014 (31.07.2014)

(25) **Filing Language:** English

(26) **Publication Language:** English

(71) **Applicant:** **HEWLETT-PACKARD DEVELOPMENT COMPANY, L.P.** [US/US]; Hewlett-Packard Development Company, L.P., 11445 Compaq Center Drive West, Houston, Texas 77070 (US).

(72) **Inventors:** **CHIANG, Chin-Lung**; 10F-1, 66, Jingmao 2nd Road Nangang District, Taipei, 115 (TW). **WANG, Jyun-Jie**; 10F-1, 66, Jingmao 2nd Road Nangang District, Taipei, 115 (TW). **POTTER, Andrew**; 11445 Compaq Center Dr W, Houston, Texas 77070 (US). **VENUGO-**

PAL, Raghavan V.; 11445 Compaq Center Dr W, Houston, Texas 77070 (US).

(74) **Agents:** ADEKUNLE, Olaolu O. et al.; Hewlett-Packard Company, Intellectual Property Administration, 3404 East Harmony Road, Mail Stop 35, Fort Collins, Colorado 80528 (US).

(81) Designated States (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW

[Continued on next page]

(54) Title: NEXT GENERATION FORM FACTOR (NGFF) CARRIER

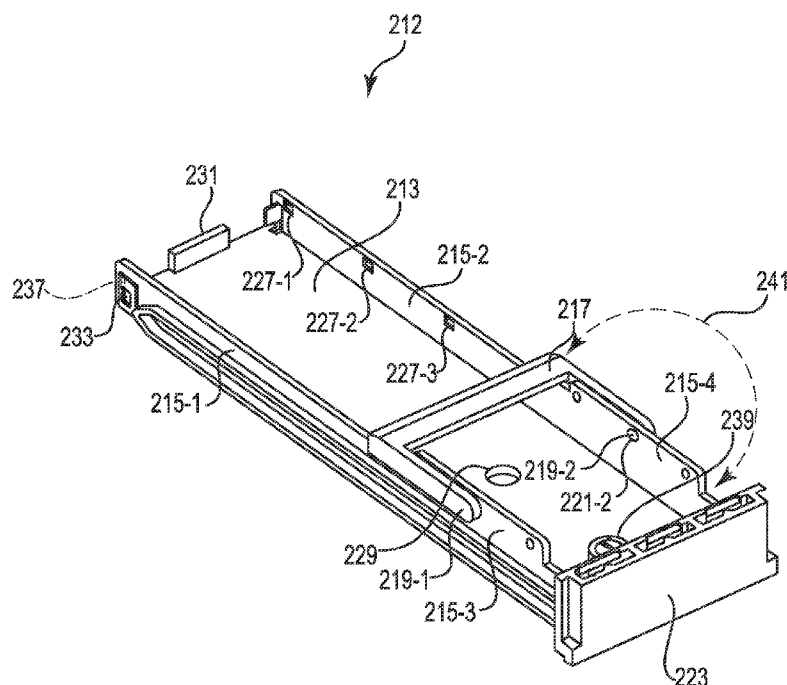


Fig. 2

(57) Abstract: A Next Generation Form Factor (NGFF) carrier includes a flat component perpendicularly connected to two flat side components to receive an NGFF module, a bar rotatably connected to the two flat side components, and a number of holds along an interior of the flat component to receive a fastener. The NGFF module is insertable in relation to the flat component when the bar is rotated to a first position and fixed on the flat component when the bar is rotated to a second position.



(84) **Designated States** (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, 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).

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))*

NEXT GENERATION FORM FACTOR (NGFF) CARRIER

Background

[0001] Connectors can be used to connect electronic components (e.g., server components, printed circuit boards, memory modules, etc.) within servers in a computing system or network to one another. Multiple portions (e.g., terminals) of the connector may be connected to an electronic component. The connector can transmit information (e.g., a signal) between the electronic components.

Brief Description of the Drawings

[0002] Figure 1 illustrates an example of an apparatus according to the present disclosure.

[0003] Figure 2 illustrates an example of an apparatus according to the present disclosure.

[0004] Figure 3 illustrates an example of an apparatus according to the present disclosure.

[0005] Figure 4 illustrates an example of an enclosure apparatus according to the present disclosure.

Detailed Description

[0006] A Next Generation Form Factor (NGFF) carrier apparatus can receive an NGFF module. The NGFF carrier can receive a number of types of NGFF modules. For example, an NGFF module associated with a 2260 NGFF configuration can be received by the NGFF carrier. An NGFF module associated with a 2280 NGFF configuration can be received by the NGFF carrier. NGFF modules of different types previously used different carriers. By providing an NGFF carrier with a capability to receive a number of NGFF types, a number of NGFF modules can be received by the same NGFF carrier. A number of NGFF module types being receivable by the same NGFF carrier allows for hot-plugging into an NGFF connector by an NGFF module.

[0007] An NGFF connector can include a plurality of upper signal pins and a plurality of upper ground (GND) pins. The GND pins can be longer than other upper pins. The NGFF connector can also include a plurality of lower signal pins and a plurality of lower power (PWR) pins. The PWR pins can be longer than other lower pins. Providing upper GND pins that are longer than other upper pins and lower PWR pins that are longer than other lower pins allows an NGFF module to be removably connected (e.g., hot-plugged) to the NGFF connector without halting the function of the NGFF connector and/or an associated computing device.

[0008] An NGFF module is a memory device that incorporates memory and an edge connector (e.g., gold finger). The NGFF module can be coupled to a NGFF connector by inserting the NGFF module into the NGFF connector. Coupling the NGFF module to the NGFF connector can include coupling the edge connector of the NGFF module to a number of lower and/or upper pins that are part of the NGFF connector. Coupling the NGFF module to the NGFF connector can give a computing device access to the memory that is associated with the NGFF module.

[0009] As used herein, hot-plugging an NGFF module into the NGFF connector is defined as establishing a connection between the NGFF connector and the NGFF module without interrupting an operation of the NGFF connector and/or the computing device. Establishing a connection between the NGFF

connector and the NGFF module includes connecting a plurality of GND pins to the NGFF module before connecting the plurality of PWR pins and the plurality of signal pins to the NGFF module. Establishing the connection between the NGFF connector and the NGFF module includes connecting the plurality of PWR pins to the NGFF module before connecting the plurality of signal pins to the NGFF module.

[0010] Figure 1 illustrates a diagram of an example of an apparatus according to the present disclosure. The apparatus in Figure 1 can include an NGFF carrier 111. The NGFF carrier 111, as used herein, includes a flat component 113. The flat component 113 is a rectangular flat piece for receiving an NGFF module on top of. The flat component 113 can be sized and/or shaped in order to be received by an NGFF enclosure carrier (e.g., enclosure carrier described in Figure 4). That is, the size and/or shape of the NGFF carrier can be determined by a size and/or shape of an enclosure carrier. The NGFF carrier 111 can include a number of components connected to the NGFF carrier 111 (e.g., a bar 117 (shown floating above the NGFF carrier 111 for illustrative purposes), a securing component 133 (shown alongside the NGFF carrier 111 for illustrative purposes), etc.).

[0011] The flat component 113 can receive an NGFF module (e.g., NGFF module 351 as illustrated in Figure 3). The flat component 113 can be perpendicularly connected to flat side components including lower portions 115-1 and 115-2 and higher portions 115-3 and 115-4 (e.g., lower portions are lower in relation to distance from the flat component 113, and higher portions extend higher (longer distance from) the flat component 113). The flat component 113 can be connected to the flat side components to each form an L-shape. That is, the flat component 113 and the lower portions 115-1 and 115-2 and higher portions 115-3 and 115-4 of the flat side components form a U-shaped bay to receive the NGFF module within.

[0012] Tabs 127-1, 127-2, and 127-3 along the lower portion 115-2 (and tabs, not pictures, of lower portion 115-1) of the flat side components hold an NGFF module (not shown in Figure 1) into the NGFF carrier 111. The tabs 127-1, 127-2, and 127-3 can protrude slightly from the lower portion 115-2 to provide

a secure hold on the NGFF module once it is secured into place. The NGFF module can be positioned between the tabs 127-1, 127-2, and 127-3 and the flat component 113. To remove the NGFF module, the NGFF module can be lifted away from the flat component 113 and around the tabs 127-1, 127-2, and 127-3 and/or the lower portions 115-1 and 115-2 can be pushed away from each other to bend the flat side components slightly outward to provide a space to lift the NGFF module out of the NGFF carrier 111.

[0013] The flat component 113 can include a number of holes 129. The number of holes 129 can be positioned along an interior of the flat component 113. The position of the number of holes 129 can be determined based on a size and/or length of the NGFF module to be received. For example, the longer an NGFF module, the more proximal (e.g., towards the proximal end 123) the hole can be to accommodate a particular length of the NGFF module. The number of holes 129 can receive a fastener 139 to secure a received NGFF module. The fastener 139 can be a screw. The screw can be screwed into threads in a hole of the number of holes 129. The screw can secure an NGFF module to the flat component 113.

[0014] The flat component 113 can include a raised portion 131 to connect with a gold finger of the NGFF module. The raised portion 131 can be a number of different lengths, heights, sizes, etc. to accommodate a number of different gold fingers of NGFF modules. For example, an NGFF module with a wider gold finger can use a wider raised portion (e.g., longer longitudinally with respect to the flat component 113) to hold the gold finger in place. An NGFF module with a gold finger of the NGFF module that is further away from the flat component 113 when inserted into the NGFF carrier would use a raised portion that is higher (e.g., extends further up) from the flat component 113 to rest on. The raised portion 131 can have a number of thicknesses depending on how much support of the gold finger is provided. For example, the thicker the raised portion, the more support along the gold finger and the more likely that the gold finger would stay in place and not bend and/or break.

[0015] A securing component 133 can include a U-shaped portion and a number of tabs 135. The number of tabs 135 can form an L-shaped portion with

the upper portion of the U-shape of the securing component 133. The number of tabs 135 of the securing component 133 can be received by an opening 137 to secure the securing component 133 to the lower portions 115-1 and 115-2 of the flat side components. The tabs 135 can be slid into the opening 137. The tabs 135 of the securing component 133 can secure an NGFF module and/or gold finger of the NGFF module into the NGFF carrier 111. For example, the tabs 135 can prevent the distal end of an NGFF module from sliding out of the NGFF carrier.

[0016] The bar 117 can be rotatably connected (as shown in Figure 2 at 241) to the higher portions 115-3 and 115-4 of the flat side components. The bar 117 can rotate such that the bar can rest on the flat side components toward a proximal end 123 of the NGFF carrier 111, toward a middle of the NGFF carrier 111, or toward a distal end of the NGFF carrier. A first position of the bar 117 can include the bar resting next to the higher portions 115-3 and 115-4 at the proximal end 123 of the NGFF carrier. A second position of the bar 117 can include the bar resting next to the higher portions 115-3 and 115-4 at the distal end of the NGFF carrier.

[0017] Figure 2 illustrates an example of an apparatus according to the present disclosure. Figure 2 illustrates a bar 217 rotatably connected (illustrated by 241) to higher portions 215-3 and 215-4 of flat side components of an NGFF carrier 212 by insertion of pegs 219-1 and 219-2 into holes 221-1 (not shown) and 221-2. The higher portions 215-3 and 215-4, along with the lower portions 215-1 and 215-2, are connected to a flat component 213. The lower portions 215-1 and 215-2 include a number of tabs 227-1, 227-2 and 227-3. The lower portions 215-1 and 215-2 can be connected to a distal component 233 through an opening 237 in the lower portions 215-1 and 215-2. The flat component can include a number of holes 229 to receive a fastener (e.g., fastener 239).

[0018] The higher portion 215-3 and 215-4 can include holes 221-1 and 221-2 to receive a bar 217 by inserting pegs 219-1 and 219-2 into the holes 221-1 and 221-2. The bar 217 can be a flexible bar to flex outside the holes 221-1 (not shown here but shown as 121-1 in Figure 1) and 221-2 of the higher

portions 215-3 and 215-4 when inserting the bar. The bar 217 can return to its non-flexed position once the pegs 219-1 and 219-2 are inside the holes 221-1 (not shown here but shown as 121-1 in Figure 1) and 221-2 in order to hold the bar 217 in place. The bar 217 can rotate in a half-spherical arc toward the proximal end 223 of the NGFF carrier 211 and rest on a proximal side of the higher portions 215-3 and 215-4 when in a first position. For example, the bar 217 can rotate in a half-spherical arc toward the lower portions 215-1 and 215-2 and rest on a distal side of the higher portions 215-3 and 215-4 when in a second position.

[0019] A fastener (e.g., fastener 239 in Figure 2) can be received in a hole based on a type of the NGFF module received by the NGFF carrier. For example, an NGFF module associated with a 2260 NGFF configuration (e.g., an NGFF connector that is 22 mm long and 60 mm wide) can have a shorter width and therefore receive a fastener in a hole further from the proximal end (e.g., proximal end 223 in Figure 2) to secure the 2260 NGFF module. In addition, an NGFF module associated with a 2280 (e.g., an NGFF connector that is 22 mm long and 80 mm wide) NGFF configuration can be wider and therefore a fastener in a hole closer to the proximal end (e.g., proximal end 223) can secure the 2280 NGFF module. The number of holes can accommodate a number of NGFF module types based on the size and/or length of the NGFF modules for each type.

[0020] Figure 3 illustrates an example of an apparatus according to the present disclosure. An example apparatus can include an NGFF carrier 314. The NGFF carrier 314 can include a bar 317 rotatably connected (e.g., 241 at Figure 2) to higher portions 315-3 and 315-4 of flat side components. The bar 317 can be in a first position when inserting an NGFF module 351. The first position can include when the bar 317 is rotated toward a proximal end 323 of the NGFF carrier 314. An NGFF module can be inserted into an NGFF carrier 314 by placing the NGFF module 351 between the higher portions 315-3 and 315-4 and lower portions 315-1 and 315-2 and pushing the NGFF module 351 down past tabs of the lower portions 315-1 and 315-2 (e.g., tabs 227-1, 227-2, and 227-3 in Figure 2). An inserted NGFF module 351 can be secured in the

NGFF carrier by a fastener 339. For example, the fastener 339 can be inserted into a hole (e.g., hole 239 in Figure 2) to secure the NGFF module 351 into the NGFF carrier 314. A gold finger 353 of the NGFF module 351 can be held in place by a raised portion (e.g., raised portion 131 in Figure 1 and 231 in Figure 2).

[0021] Figure 4 illustrates an example of an enclosure apparatus according to the present disclosure. An enclosure apparatus can include an enclosure carrier. The enclosure carrier can include a flat surface 463 to receive an NGFF module (e.g., NGFF module 351 in Figure 3). An NGFF module in an NGFF carrier can be received onto the flat surface 463 of the enclosure carrier. That is, the NGFF carrier in Figures 1, 2, and 3 can be flipped upside down from the position/layout illustrated in Figures 1, 2, 3 and slid into the enclosure carrier such that a gold finger (e.g., gold finger 353 in Figure 3) connects into an NGFF connector 461 and an NGFF module (e.g., NGFF module 351 in Figure 3) is slid onto the flat surface 463 of the enclosure carrier.

[0022] The enclosure apparatus can include flat side components 469 and 471 to receive flat side components (e.g., lower portions 215-1 and 215-2 and higher portions 215-3 and 215-4 of side components in Figure 2) of an NGFF carrier (e.g., NGFF carrier 314 in Figure 3 if flipped upside down when inserted into the enclosure carrier in Figure 4). That is, a first lower portion (e.g., lower portion 315-1 in Figure 3) of the NGFF carrier is slid along a first flat side component (e.g., flat side component 469) and a second lower portion (e.g., lower portion 315-2) is slide along a second flat side component (e.g., flat side component 469).

[0023] The NGFF module can be inserted into the enclosure carrier such that a bar (e.g., bar 317) is in contact with a resistance mechanism 465-1 to provide resistance to the NGFF module being inserted. For example, a spring and/or a flexible piece of bent metal can be used to provide pressure and/or resistance back against an inserted NGFF module. For example, the NGFF carrier can be slid into the enclosure carrier such that a bar of the NGFF module comes in contact with the resistance mechanism 465-1 in order to resistively

secure the NGFF carrier in place. A second NGFF carrier can be inserted to contact with a resistance mechanism 465-2.

[0024] The inserted NGFF module can be locked into place in the enclosure carrier by a corner mechanism 467. The corner mechanism 467 can include a moveable tab and/or locking piece that holds a corner of the NGFF carrier. The corner mechanism 467 can contact with an edge of a distal end (e.g., distal end 323 in Figure 3) of an NGFF carrier such that the NGFF carrier is locked into position. The corner mechanism can slide out of the way (e.g., by the distal end 323 in Figure 3 pushing it to slide and/or by a user sliding it out of the way) when the NGFF carrier is inserted into the enclosure carrier. When the NGFF carrier is received by the enclosure carrier (e.g., the bar is pressing against the resistance mechanism), the corner mechanism 467 can slide back into a locked position and hold the edge of the distal end of the NGFF carrier. The corner mechanism 467 holds the NGFF carrier from sliding out of the enclosure carrier. The resistance mechanism 465-1 can provide resistance to the inserted NGFF carrier to allow removal of the NGFF carrier without pulling it out of the enclosure carrier. That is, the resistance mechanism 465-1 provides resistance such that when the corner mechanism 467 is slid out of place allowing the NGFF carrier to slide out of the enclosure carrier, the resistance mechanism 465-1 pushes the NGFF carrier out without pulling the NGFF carrier out.

[0025] A gold finger extension (e.g., gold finger 353 in Figure 3) of an NGFF module held by an NGFF carrier (e.g., NGFF carrier 111 in Figure 1) can be inserted into an NGFF connector 461. The NGFF module can be coupled to an NGFF connector by inserting the NGFF module into the NGFF connector. Coupling the NGFF module to the NGFF connector can include coupling the edge connector of the NGFF module to a number of lower and/or upper pins that are part of the NGFF connector. Coupling the NGFF module to the NGFF connector can give a computing device access to the memory that is associated with the NGFF module.

[0026] The ability of the NGFF carrier to receive a number of sizes, types, and/or configurations of NGFF modules allows for hot-plugging of NGFF

modules into NGFF connectors without using a different NGFF carrier for each size, type, and/or configuration of NGFF module. In this way, an NGFF module can be replaced and/or “swapped” out in order to upgrade the computing system using a newer NGFF module inserted into the NGFF carrier and therefore into the computing system.

What is claimed:

1. A Next Generation Form Factor (NGFF) carrier comprising:
 - a flat component perpendicularly connected to two flat side components to receive an NGFF module;
 - a bar rotatably connected to the two flat side components, wherein the NGFF module is insertable in relation to the flat component when the bar is rotated to a first position and fixed on the flat component when the bar is rotated to a second position; and
 - a number of holes along an interior of the flat component to receive a fastener.
2. The NGFF carrier of claim 1, wherein:
 - the two flat side components comprise a higher portion raised higher than a lower portion in relation to the flat component; and
 - the higher portion is within a space of rotation of the bar and the lower portion is outside the space of rotation of the bar.
3. The NGFF carrier of claim 2, wherein the bar rests against the lower portion of the two flat side components in close proximity to the higher portion in the first position and the second position.
4. The NGFF carrier of claim 1, wherein a first hole of the number of holes receives the fastener when the NGFF module is a first type of NGFF module and a second hole of the number of holes receives the fastener when the NGFF module is a second type of NGFF module.
5. The NGFF carrier of claim 5, wherein each of the two flat side components comprise a number of tabs to connect with the NGFF module.
6. An Next Generation Form Factor (NGFF) system, comprising:
 - an NGFF carrier, comprising:

a flat component to receive an NGFF module, wherein the flat component comprises:

two side components perpendicularly attached to the flat component, wherein the side components include a number of tabs to secure the NGFF module;

an end component perpendicularly attached to the flat component at a distal end;

a number of holes to receive a fastener to secure the NGFF module to the flat component; and

a bar rotatably connected to the flat component;

wherein the NGFF module is held in the NGFF carrier by the bar, the fastener, and the number of tabs.

7. The NGFF carrier of claim 6, wherein the NGFF module is received such that the end component holds a gold finger extension of the NGFF module.

8. The NGFF carrier of claim 6, wherein the bar rotates to a first position to secure the NGFF module to the NGFF carrier and to a second position to remove the NGFF module from the NGFF carrier.

9. The NGFF carrier of claim 6, wherein the fastener is a screw that screws into threads on the flat component of the NGFF carrier.

10. The NGFF carrier of claim 9, wherein the screw is screwed into a first hole of the number of holes to receive an NGFF module of a first type and a second hole of the number of holes to receive an NGFF module of a second type.

11. An Next Generation Form Factor (NGFF) system, comprising:
an NGFF carrier, comprising:

a flat component to receive an NGFF module, wherein the flat component comprises:

two side components perpendicularly attached to the flat component, wherein the side components include a number of tabs to secure the NGFF module; and

a number of holes to receive a fastener to secure the NGFF module to the flat component; and

a bar rotatably connected to the flat component; and

an enclosure carrier with an opening at a proximal end to receive the NGFF carrier and an NGFF connector at a distal end to receive a golden finger of the NGFF module.

12. The NGFF system of claim 11, wherein the proximal end of the enclosure carrier comprises a latch to secure a corner of the NGFF module in the enclosure carrier.

13. The NGFF system of claim 11, wherein a flat portion of the enclosure carrier that the NGFF module slides on top of to be received by the enclosure carrier comprises a mechanism that provides resistance to the NGFF module being inserted into the enclosure carrier.

14. The NGFF system of claim 13, wherein the proximal end comprises a latch that holds the NGFF module into the enclosure carrier by providing tension against the mechanism of the enclosure carrier.

15. The NGFF system of claim 11, wherein the fastener is received by a first hole of the number of holes when the NGFF module is a 2260 NGFF module and a second hole of the number of holes when the NGFF module is a 2280 NGFF module.

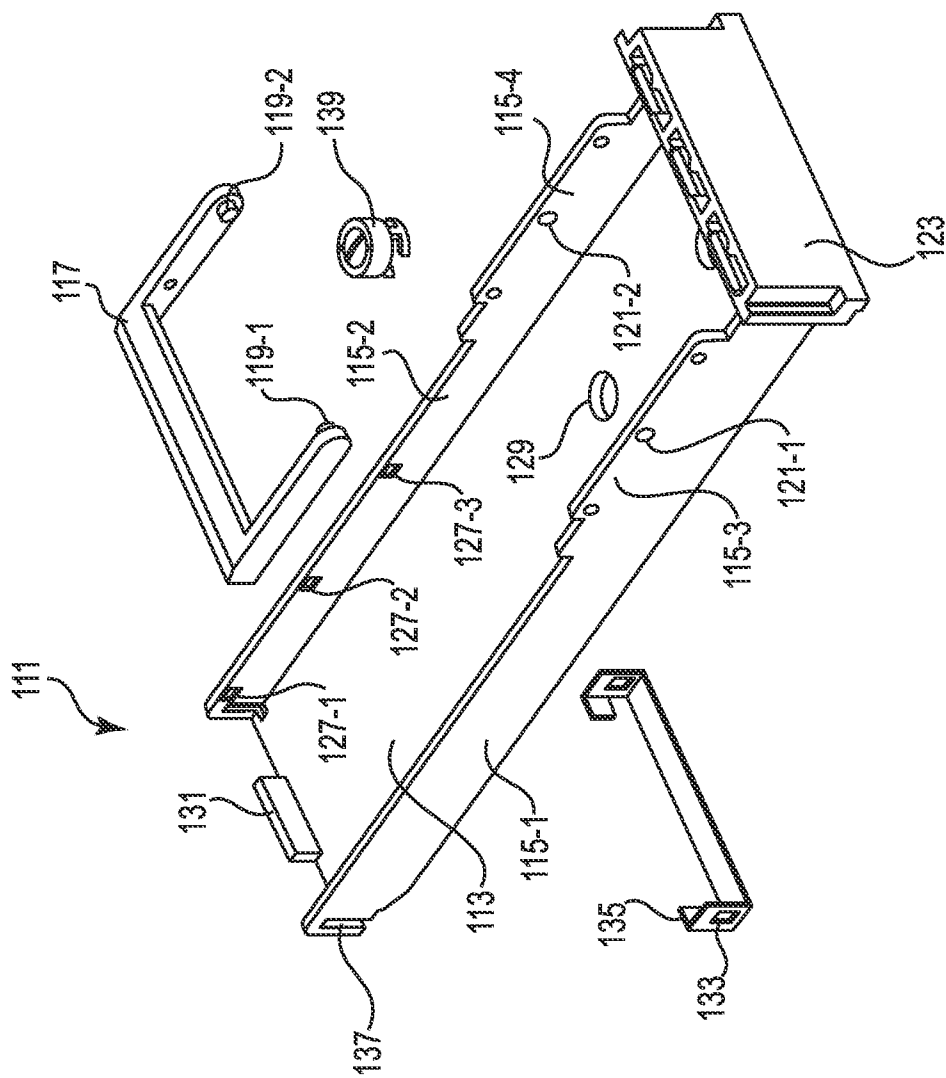


Fig. 1

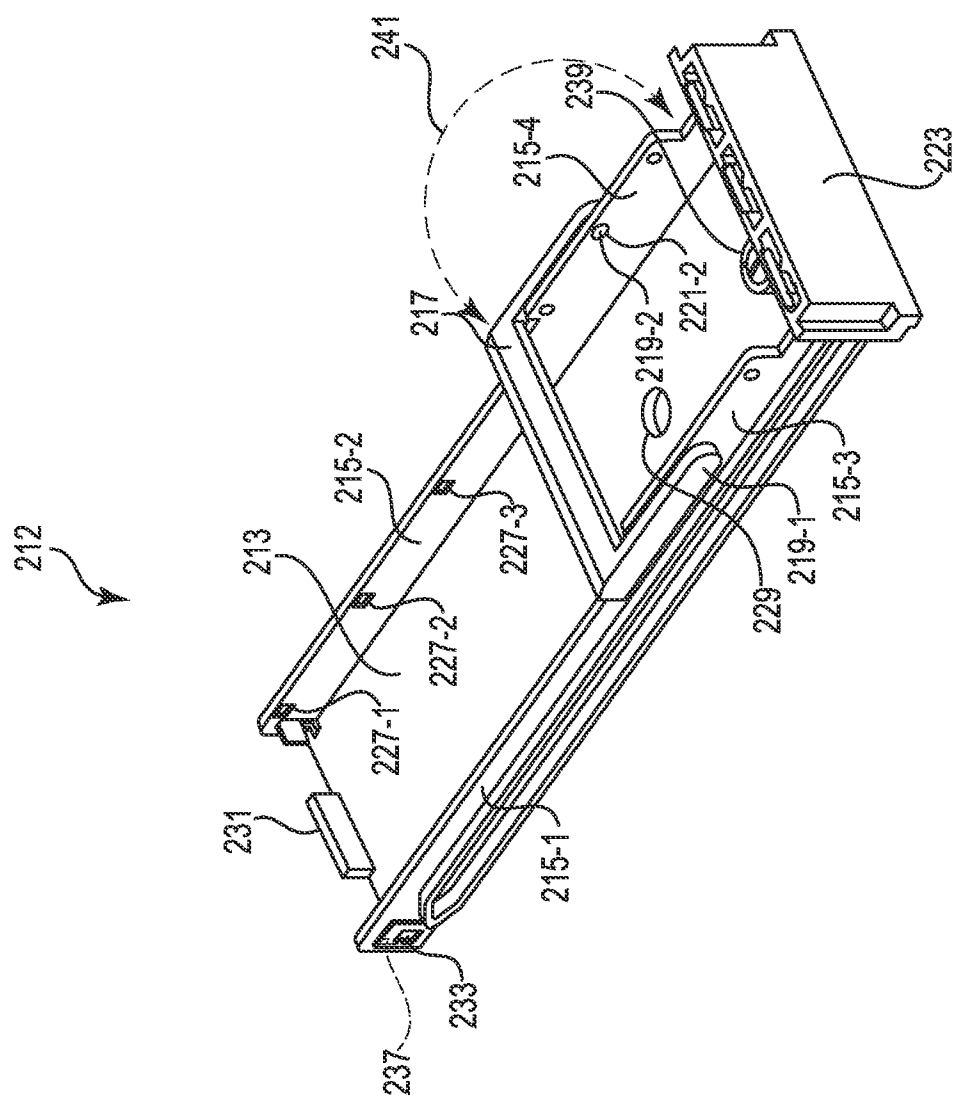
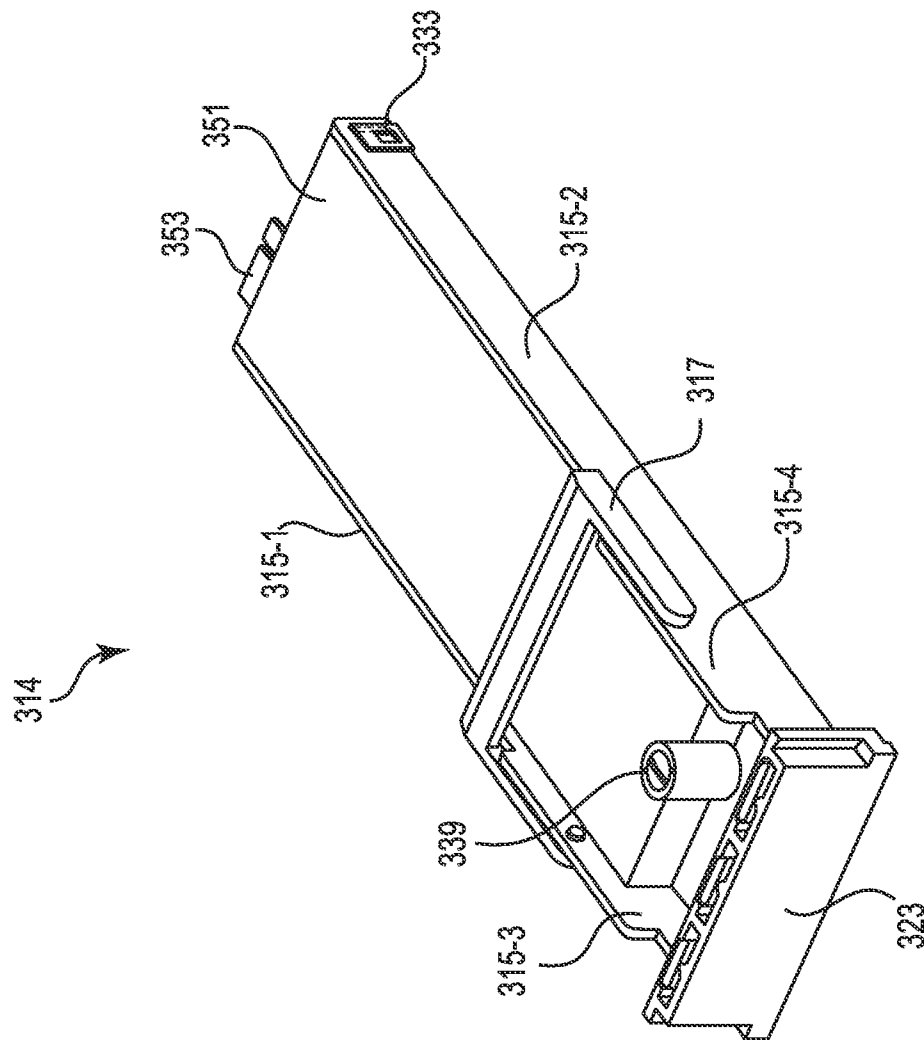


Fig. 2



இ
வ்
வ
வ

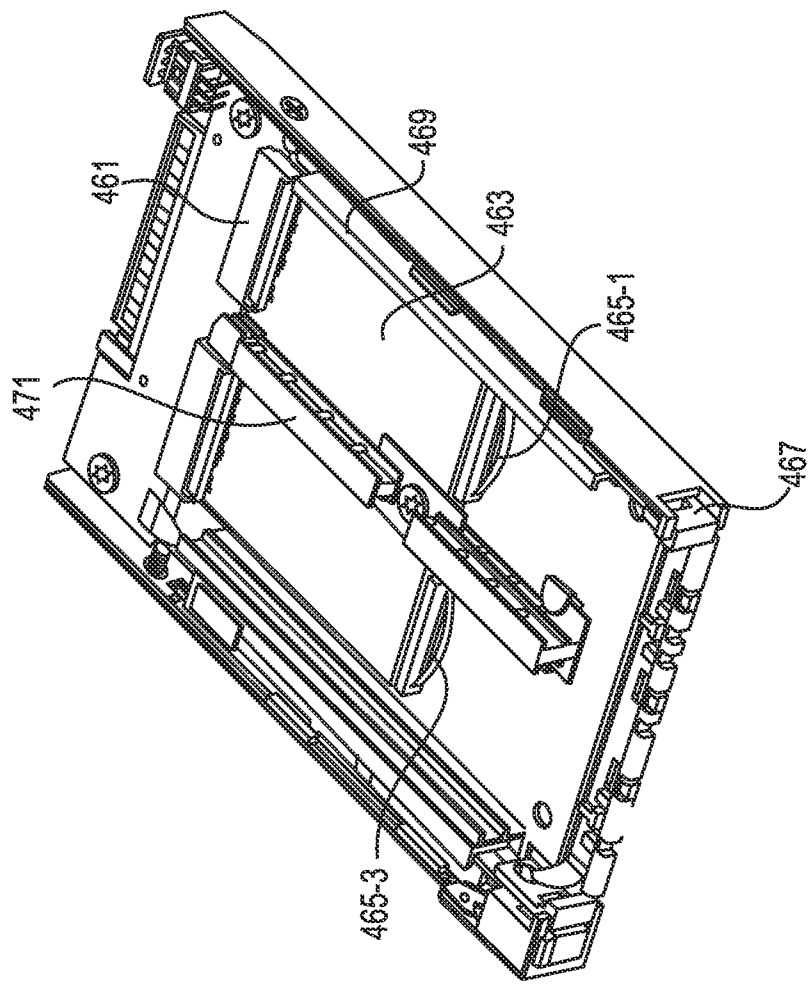


Fig. 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2014/049069**A. CLASSIFICATION OF SUBJECT MATTER****H05K 7/14(2006.01)i, H01R 12/71(2011.01)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)

H05K 7/14; H05K 7/16; H01R 13/64; H05K 1/00; H05K 5/02; H05K 5/00; H01R 12/71

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: Next Generation Form Factor (NGFF) carrier, module, bar, rotation, hole

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2006-0121794 A1 (MICHAEL FRANCIS HANLEY et al.) 08 June 2006 See abstract, paragraphs [0024]-[0028], claim 1, and figures 4-8.	1-15
A	US 2006-0250777 A1 (YUN-CHEN CHEN et al.) 09 November 2006 See paragraphs [0018]-[0020], claim 1, and figures 1-2.	1-15
A	US 2014-0070682 A1 (JOHN M. DUNHAM et al.) 13 March 2014 See paragraph [0033], claim 1, and figure 22.	1-15
A	US 4975805 A (RICHARD W. SCHMUTZLER) 04 December 1990 See column 3, lines 20-55, claim 1, and figure 1.	1-15
A	US 2007-0149005 A1 (CHRIS TOGAMI et al.) 28 June 2007 See paragraphs [0031]-[0042], claim 1, and figures 1-2.	1-15



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

23 April 2015 (23.04.2015)

Date of mailing of the international search report

24 April 2015 (24.04.2015)

Name and mailing address of the ISA/KR

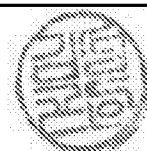
International Application Division
Korean Intellectual Property Office
189 Cheongsu-ro, Seo-gu, Daejeon Metropolitan City, 302-701,
Republic of Korea

Facsimile No. ++82 42 472 7140

Authorized officer

KIM, Sung Gon

Telephone No. +82-42-481-8746



INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2014/049069

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2006-0121794 A1	08/06/2006	US 7056156 B1	06/06/2006
US 2006-0250777 A1	09/11/2006	US 7200004 B2	03/04/2007
US 2014-0070682 A1	13/03/2014	CN 102802376 A	28/11/2012
		EP 2527953 A2	28/11/2012
		EP 2527953 A3	28/05/2014
		JP 2012-248176 A	13/12/2012
		JP 5274629 B2	28/08/2013
		KR 10-1454065 B1	27/10/2014
		KR 10-2012-0132270 A	05/12/2012
		TW 201249291 A	01/12/2012
		US 2012-299453 A1	29/11/2012
		US 8644017 B2	04/02/2014
		US 8854805 B2	07/10/2014
US 4975805 A	04/12/1990	None	
US 2007-0149005 A1	28/06/2007	US 2004-0161958 A1	19/08/2004
		US 2007-0059953 A1	15/03/2007
		US 6439918 B1	27/08/2002
		US 6533603 B1	18/03/2003
		US 7066746 B1	27/06/2006
		US 7186134 B2	06/03/2007
		US 7314384 B2	01/01/2008
		US 7507111 B2	24/03/2009