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(54) **BACKUP POWER ASSEMBLY HAVING BLIND MATE CONNECTOR**

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(52) **U.S. Cl.**

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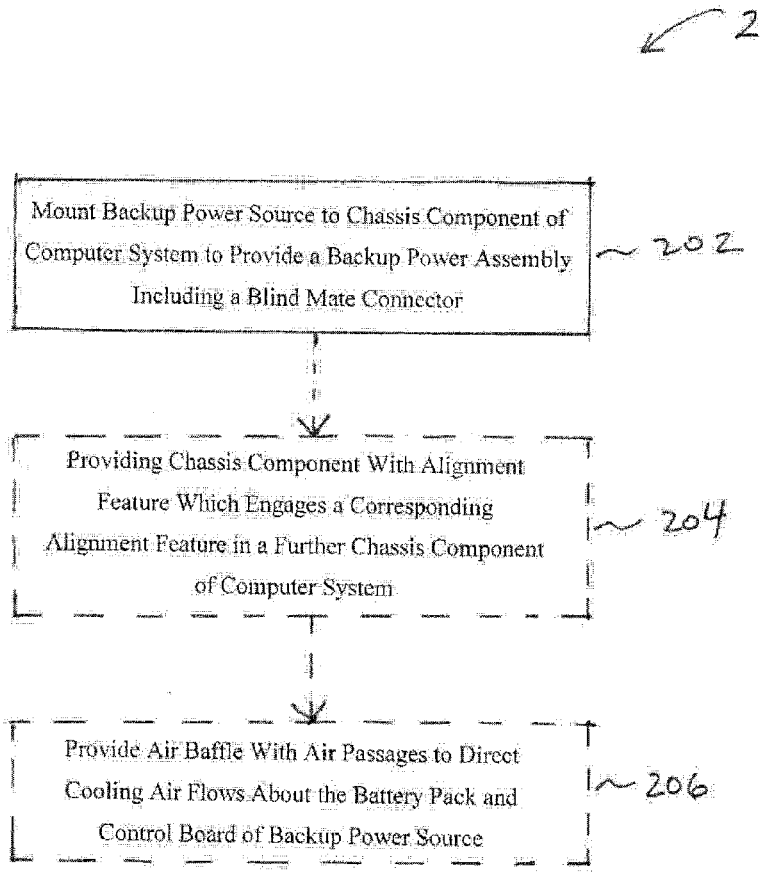
(57) **ABSTRACT**

A computer system including a chassis having a first chassis component and a backup power source. The backup power source, including a battery pack and a blind mate connector, selectively mounted to the first chassis component, the battery pack electrically connected to the blind mate connector, the backup power source and first chassis component together forming a backup power assembly, wherein the blind mate connector of the backup power source engages a corresponding blind mate connector of the computer system to electrically connect the backup power source to a power supply system of the computer system when the backup power assembly is installed in the computer system, and wherein the first chassis component provides a computer system function unrelated to the backup power source



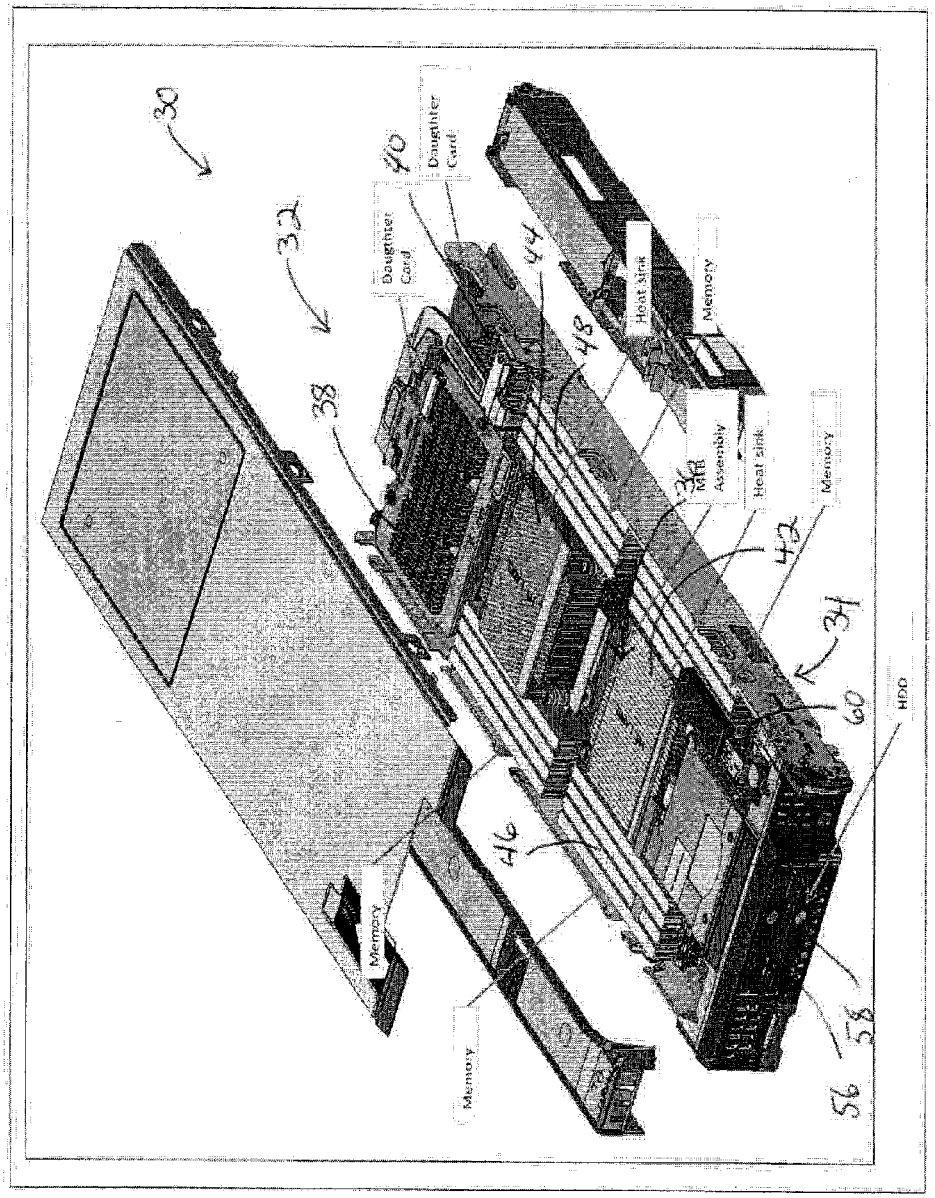

30
32
34
36
38
40
42
44
46
48
50
52
54
56
Daughter Card
Daughter Card
Heat Sink
Memory
MB Assembly
Heat Sink
Memory
Memory
Memory
HDD

Fig. 1

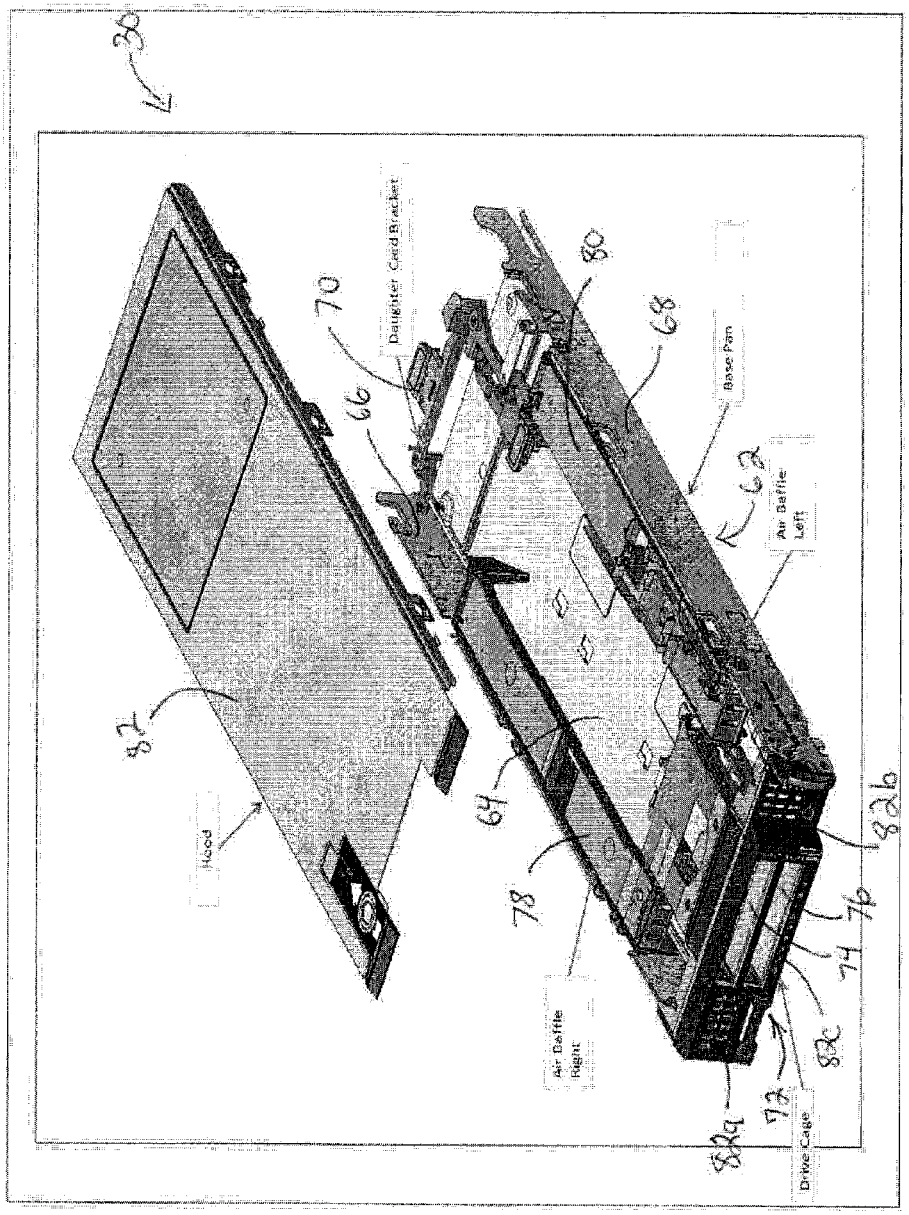

30
Daughter Card Bracket
70
66
80
68
Base Pan
62
Air Baffle Left
87
Hood
64
78
82b
76
74
82a
72
Air Baffle Right
Drive Cage

Fig. 2

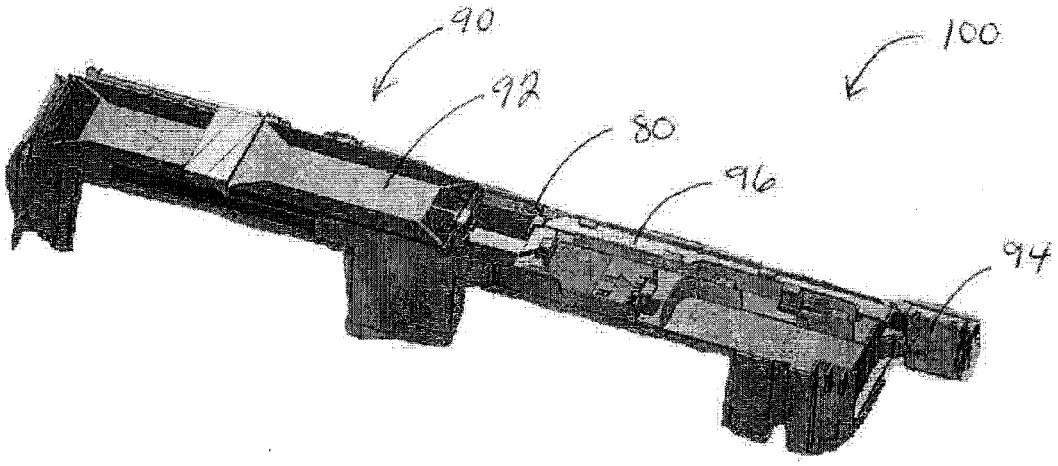


Fig. 3

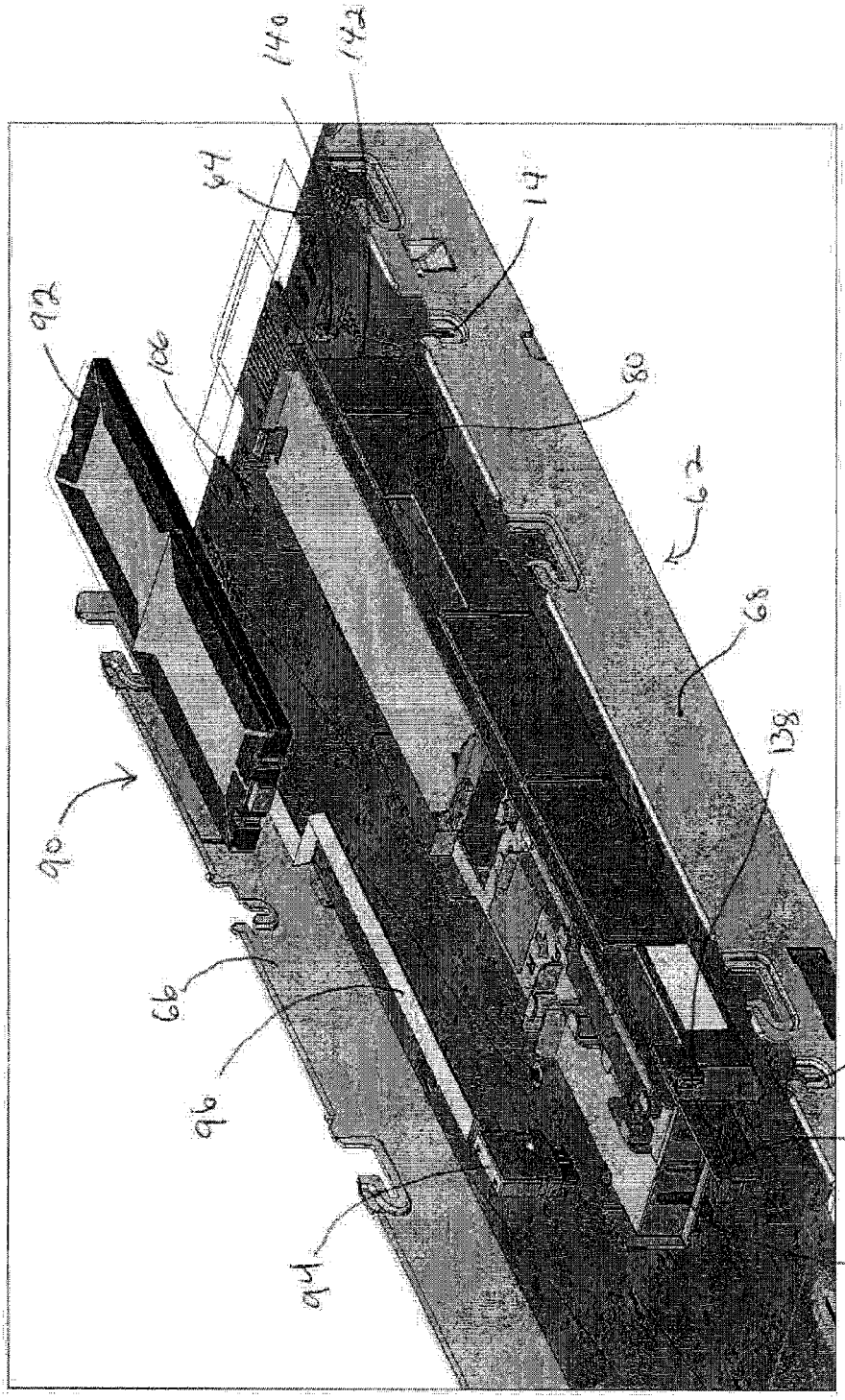


Fig. 4

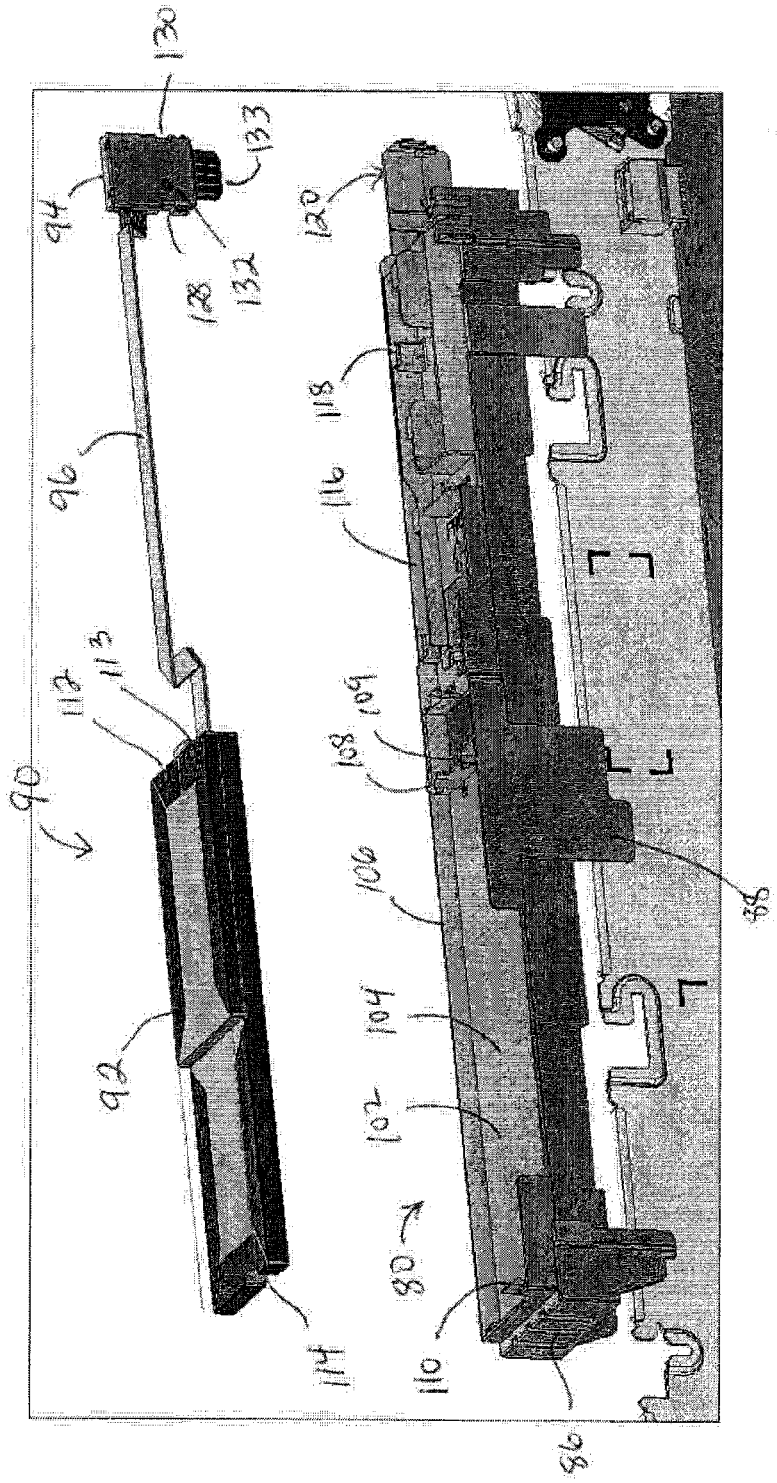

130
133
94
128
132
120
118
96
116
112
113
90
109
108
106
88
104
92
102
80
114
110
86

Fig. 5

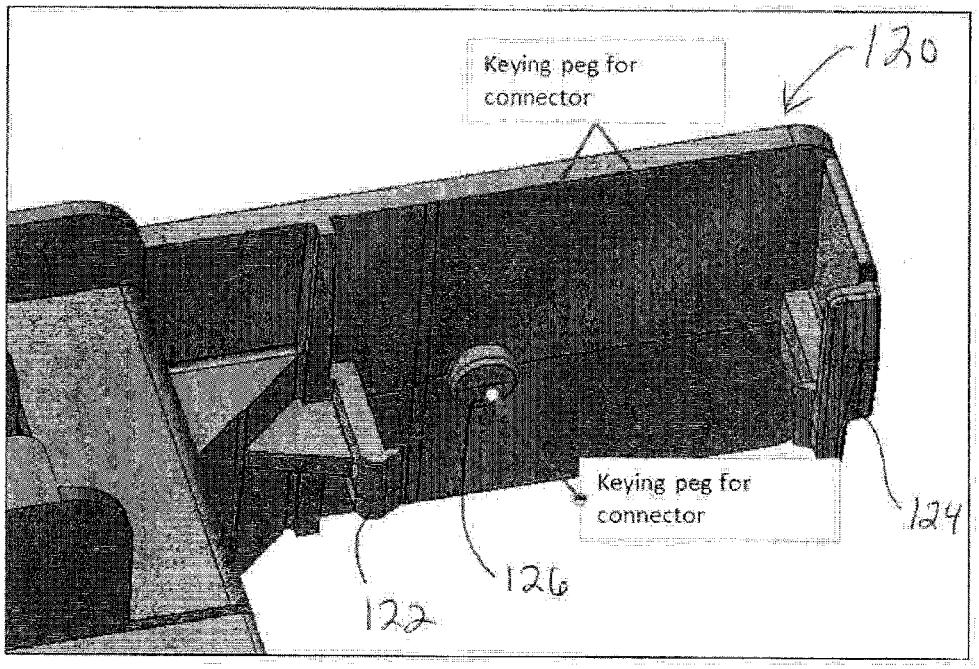

Keying peg for connector
120
Keying peg for connector
124
122
126

Fig. 6

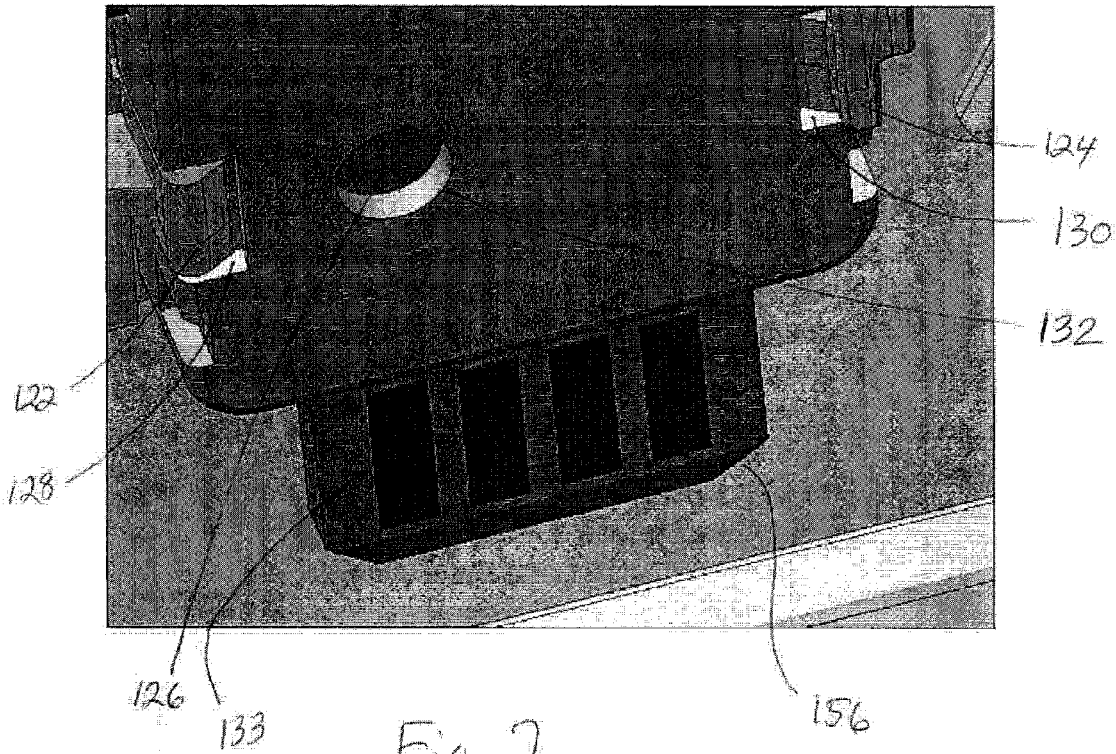


Fig. 7

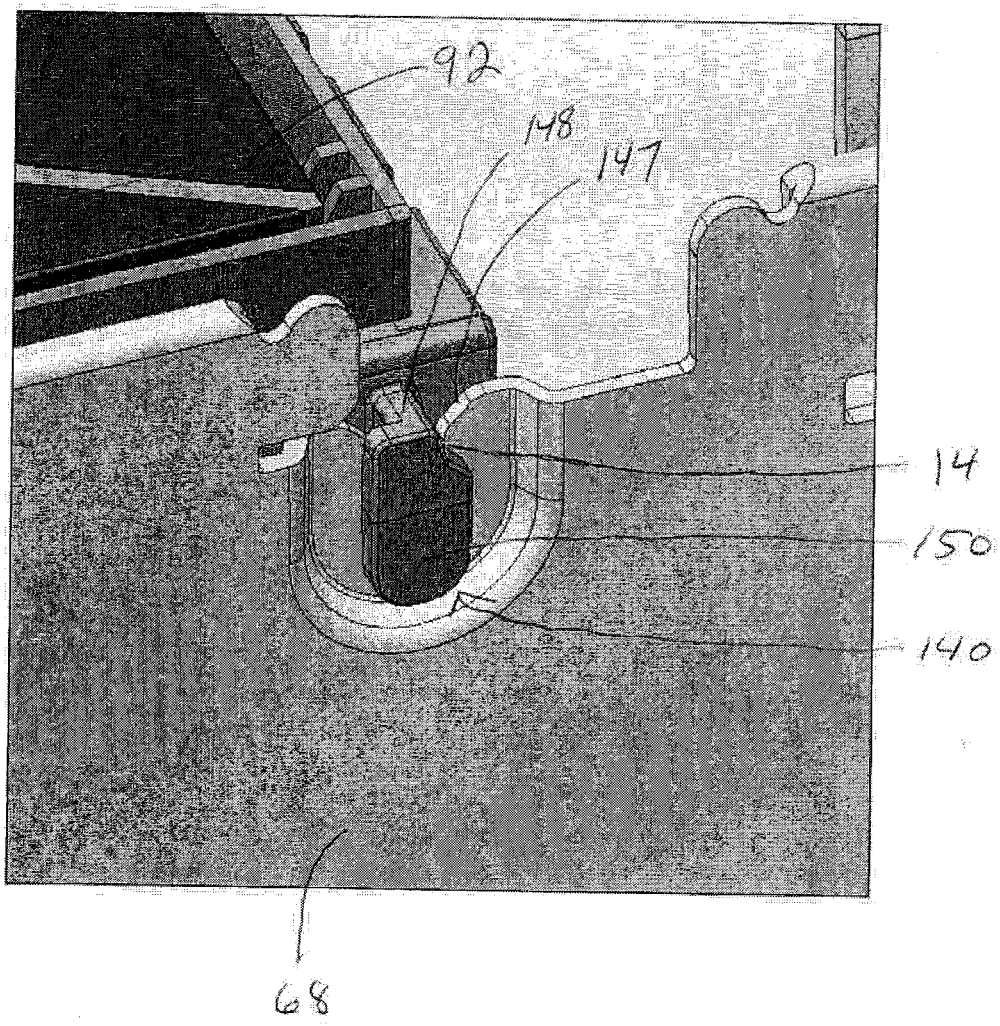


Fig. 8

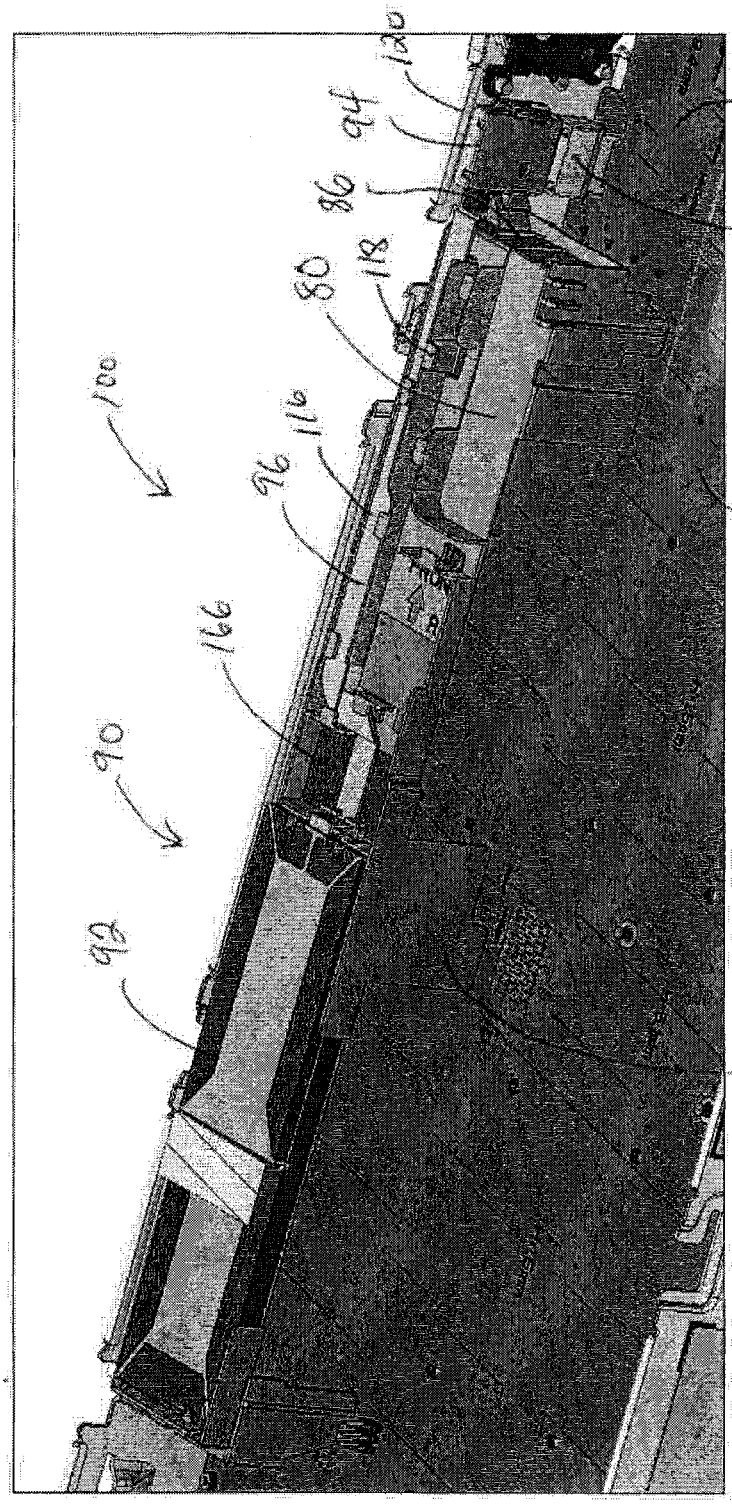


Fig. 9

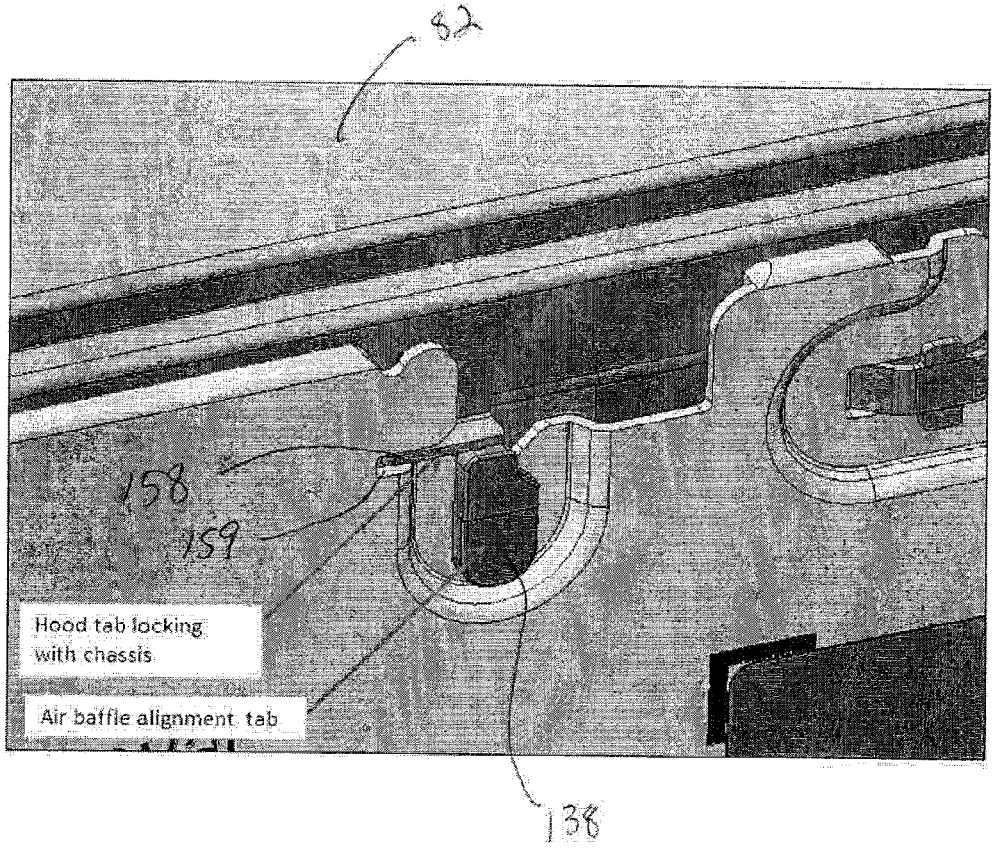

82
158
159
Hood tab locking with chassis
Air baffle alignment tab
138

Fig. 10

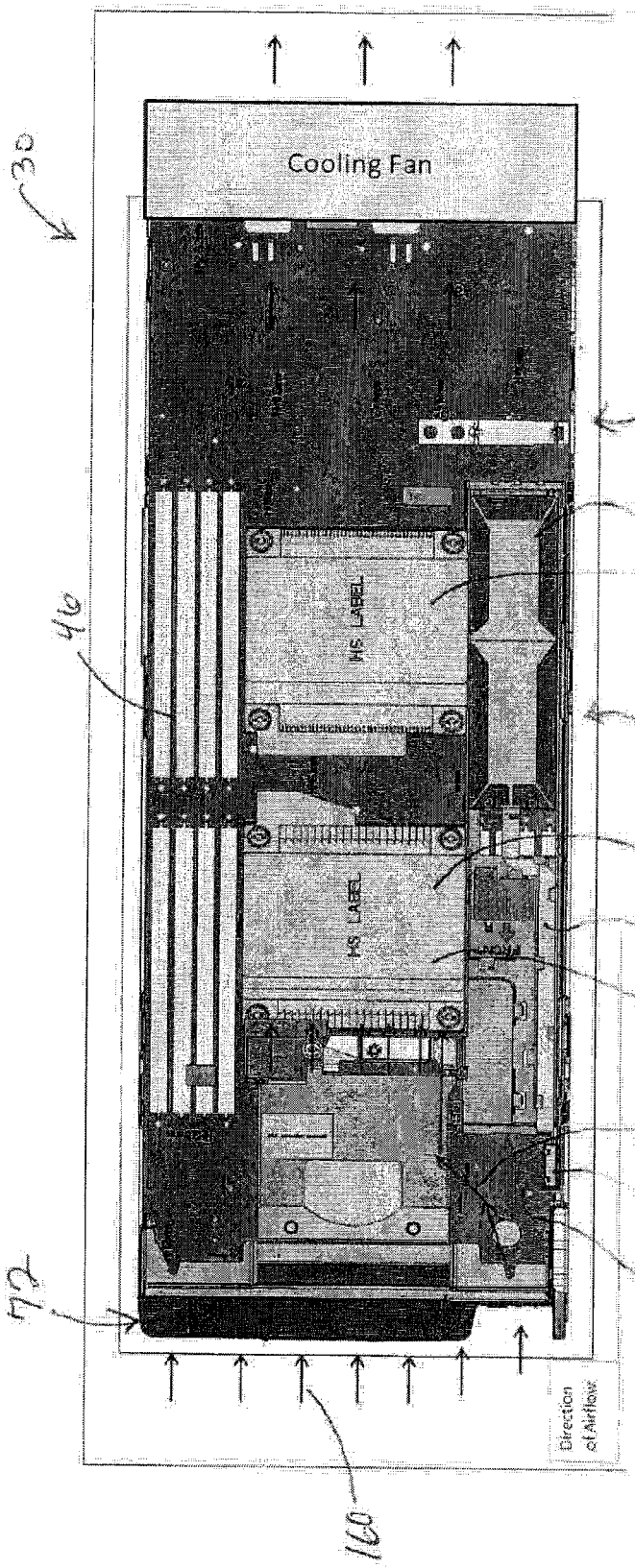

Cooling Fan
HS LABEL
HS LABEL
Direction of Airflow
30
34
93
44
46
90
32
96
42
94
160
80
72
160

Fig. 11

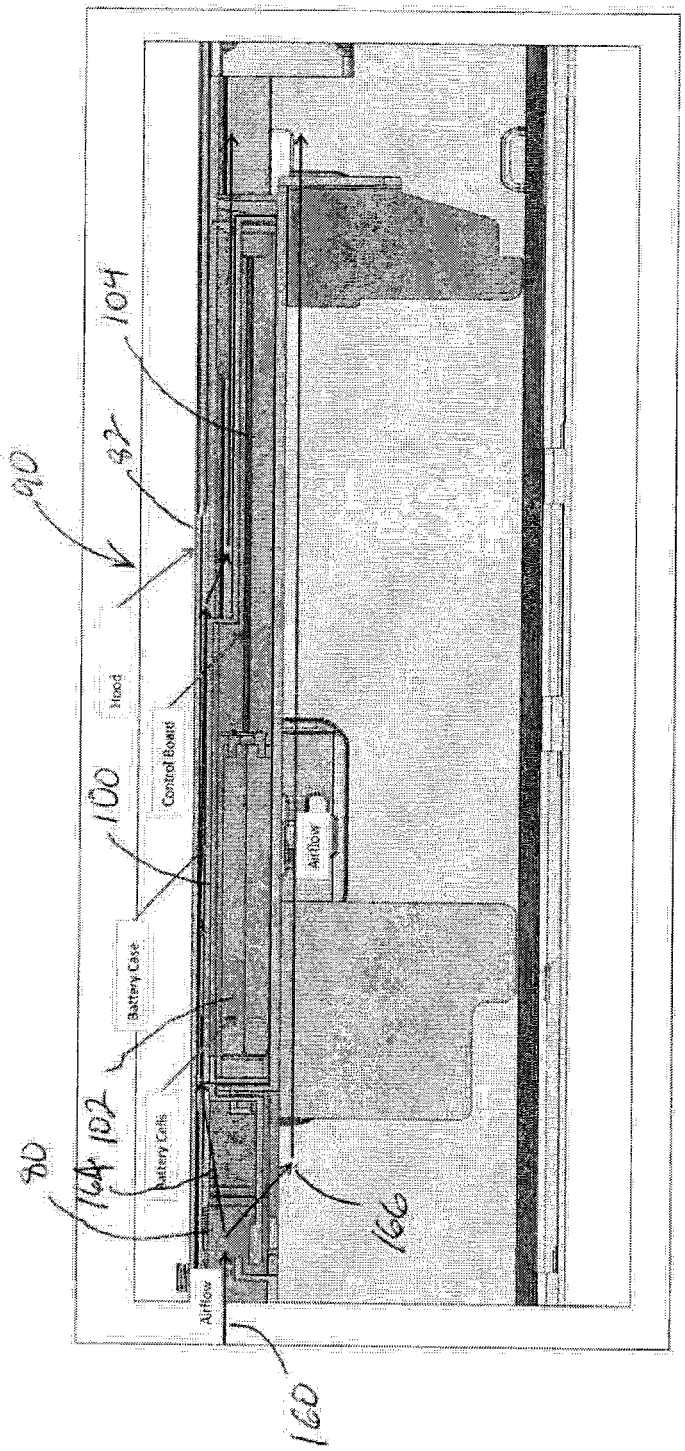

90
104
92
Hood
Control Board
100
Airflow
Battery Case
Battery Cells
102
80
164
166
Airflow
160

Fig. 17

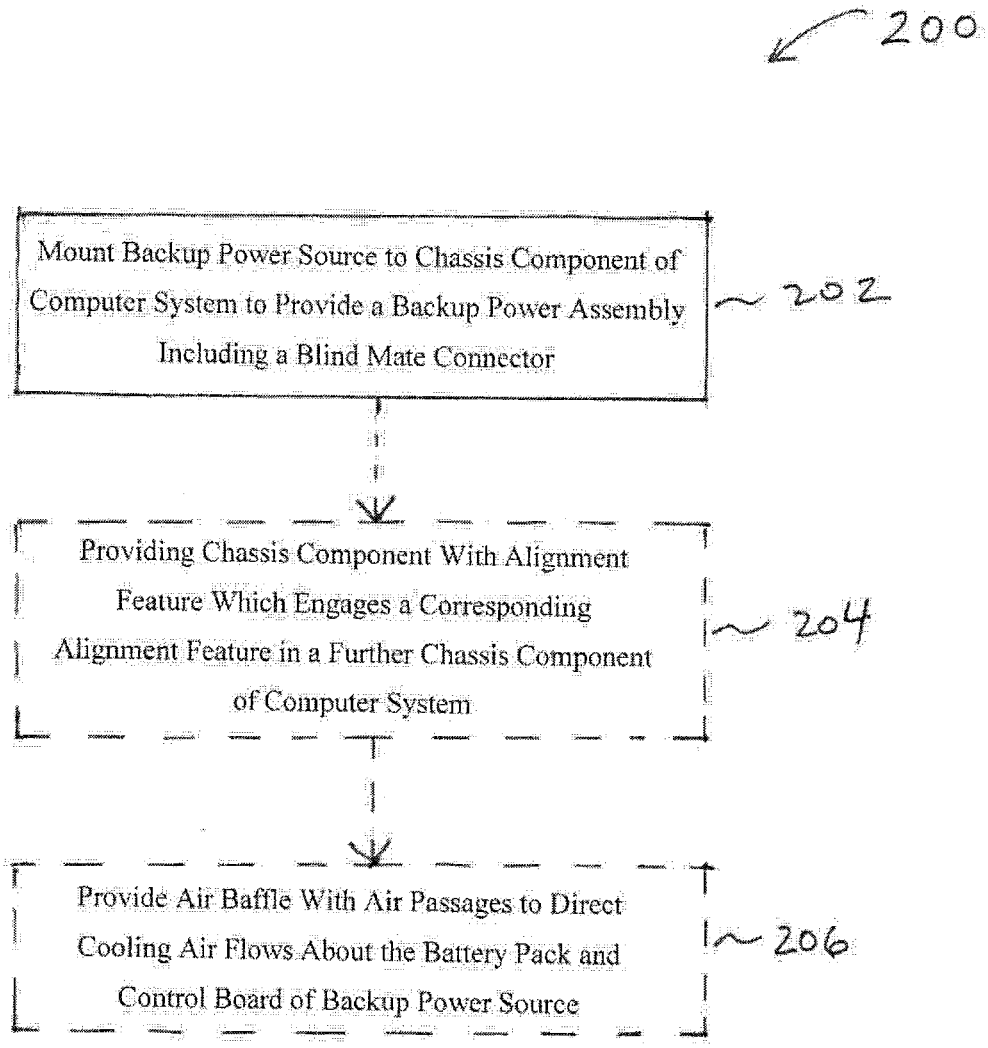

200
Mount Backup Power Source to Chassis Component of Computer System to Provide a Backup Power Assembly Including a Blind Mate Connector
202
Providing Chassis Component With Alignment Feature Which Engages a Corresponding Alignment Feature in a Further Chassis Component of Computer System
204
Provide Air Baffle With Air Passages to Direct Cooling Air Flows About the Battery Pack and Control Board of Backup Power Source
206

FIG. 13

BACKUP POWER ASSEMBLY HAVING BLIND MATE CONNECTOR

BACKGROUND

[0001] Computers, including rack servers, for example, typically employ back power sources to maintain information stored in volatile storage in the event of power failure. In this way, data will not be lost as a result of an unexpected power outage. Such power sources include replaceable battery systems that can be inserted into and removed from the computer.

BRIEF DESCRIPTION OF THE DRAWINGS

[0002] FIG. **1** is a partially exploded perspective view of portions computer system having a backup power assembly according to one example.

[0003] FIG. **2** is a partially exploded perspective view of portions computer system having a backup power assembly according to one example.

[0004] FIG. **3** is a perspective view of a backup power assembly according to one example.

[0005] FIG. **4** is a partially exploded perspective view of portions computer system having a backup power assembly according to one example.

[0006] FIG. **5** is a partially exploded perspective view of portions computer system having a backup power assembly according to one example.

[0007] FIG. **6** is a perspective view illustrating portions of a backup power assembly according to one example.

[0008] FIG. **7** is a perspective view illustrating portions of a blind mate connector of a backup power assembly according to one example.

[0009] FIG. **8** is a perspective view illustrating alignment features of a backup power assembly according to one example.

[0010] FIG. **9** is a perspective view illustrating portions of computer system including a backup power assembly according to one example.

[0011] FIG. **10** is a perspective view illustrating portions of computer system including a backup power assembly according to one example.

[0012] FIG. **11** is a perspective view illustrating portions of computer system including a backup power assembly according to one example.

[0013] FIG. **12** is a perspective view illustrating portions of computer system including a backup power assembly according to one example.

[0014] FIG. **13** is a flow diagram generally illustrating a method of providing backup power for a computer system according to one example.

DETAILED DESCRIPTION

[0015] In the following detailed description, reference is made to the accompanying drawings which form a part hereof, and in which is shown by way of illustration specific examples in which the disclosure may be practiced. It is to be understood that other examples may be utilized and structural or logical changes may be made without departing from the scope of the present disclosure. The following detailed description, therefore, is not to be taken in a limiting sense, and the scope of the present disclosure is defined by the appended claims. It is to be understood that features of the various examples described herein may be combined, in part or whole, with each other, unless specifically noted otherwise.

[0016] Computers, such as rack servers, for example, typically use volatile storage to store data during operation. In order to prevent loss of information stored in volatile storage due to unexpected power outages and maintain system operation, computers typically employ backup power systems to maintain power, at least temporarily, during outages. Such backup power systems typically include removable batteries or battery packs which must sometimes be replaced. As space is often limited, removing and installing batteries of backup power systems from computers can be difficult, particularly when connecting and disconnecting the batteries to power supply circuitry within the computer. If not done properly, both the backup power systems and components of the computer can be damaged, particularly if proper alignment is not achieved between the backup power system and corresponding components of the computer, such as between electrical connection elements.

[0017] FIGS. **1-12** below illustrate a computer **30**, in particular, a rack server **30**, having a backup power source and blind mate connector selectively coupled to a chassis component of server **30** to form a backup power assembly, according to one example, which can be readily aligned with an inserted into and removed from server **30**. In addition to supporting the backup power source and blind mate connector, the chassis component provides a function to server **30** unrelated to the backup power source. For instance, according to one example, the chassis component is an air baffle which directs cooling air flows through server **30**.

[0018] FIG. **1** is a partially exploded perspective view illustrating portions of server **30** including electronic components **32** and a chassis **34** (components of chassis **34** are illustrated in FIG. **2** below). Electronic components **32** include a main logic board (MLB) **36** and daughter cards **38** and **40**, with MLB **36** further including central processing units (CPUs) **42** and **44**, memory modules **46** and **48** (such as DIMMs, for example), hard disk drives (HDDs) **56** and **58**, and power supply circuitry **60**. Daughter cards **38** and **40** expand functionality of MLB **36** such as by providing network interface functions, communication functions, RAID (redundant array of inexpensive disk) controller functions, server management functions, and to enable installation of expansion cards, for example.

[0019] FIG. **2** is a perspective view of server **30** of FIG. **1** illustrating components of chassis **34**. Chassis **34** includes a plurality of chassis components providing physical and mechanical functions for support of electronic components **32**. In one example, chassis components include a base pan **62** having a base panel **64** and sidewalls **66** and **68**, a daughter card bracket **70**, a drive cage **72** with openings **74** and **76** for HDDs **56** and **58**, air baffles **78** and **80** (sometimes referred to as "left" and "right" air baffles), and a hood **82**. Note that left and right air baffles **78** and **80** are shown in a "removed" position in FIG. **1**, so as to more clearly illustrate memory modules **46** and **48**, over and around which left and right air baffles **78** and **80** are disposed when in an "installed" position. Drive cage **72** further includes pluralities of vent openings **82***a*, **82***b*, **82***c* which, as will be described in greater detail below, function as air intake vents for server **30**.

[0020] FIG. **3** is perspective view illustrating a backup power assembly **100**, according to one example, which

includes an air baffle, such as air baffle **80**, and a backup power source **90** which is selectively installable within and removable from server **30** as a unit. According to one example, backup power source **90** includes a battery pack **92**, a blind mate connector **94**, and a cable **96** electrically connecting battery pack **92** with blind mate connector **94**, each of which is selectively coupled to air baffle **80** so that backup power source **90** and air baffle **80** together form backup power assembly **100**.

[0021] FIGS. **4** and **5** are partially exploded perspective views illustrating base pan **62** and backup power assembly **100**, with backup power assembly being in a "removed" position from server **30** and backup power source **90** being in a "removed" position from air baffle **80**. Air baffle **80** includes air intake vents **86** which receive cooling air flows from the vent openings in drive cage **72**, such as vent openings **82***b*, and a plurality of support legs, such as support leg **88**.

[0022] In one example, air baffle **80** includes an upper surface **102** having a battery pocket **104** configured to receive battery pack **92** and which is formed by a plurality of flange elements extending from upper surface **102**, such as flange elements **106**. Air baffle **80** includes fixed retainer posts **108**, **109** and an elastic retainer clip **110** disposed within battery pocket **104** which engage corresponding notches **112**, **113**, and **114** in opposing ends of battery pack **92** and secure battery pack **92** within battery pocket **104**. Air baffle **80** also includes a channel **116** in which cable **96** is disposed, including a plurality of retainer tabs, such as retainer tab **118**, which maintain cable **96** within channel **116**.

[0023] Air baffle **80** further includes a connector pocket **120** for selectively securing blind mate connector **94**. FIG. **6** is a perspective view illustrating connector pocket **120** in greater detail. In one example, connector pocket **120** includes elastic retainer clips **122** and **124**, and a key peg **126**. As illustrated by FIG. **7**, which is a perspective view illustrating blind mate connector **94** mounted in connector pocket **120**, retainer clips **122** and **124** respectively engage notches **128** and **130** on opposing sides of blind mate connector **94**, and key peg **126** is received into a corresponding key hole **132** in blind mate connector **94**. Together, retainer clips **122**, **124**, key peg **126**, notches **128**, **130**, and key **132** selectively secure blind mate connector **94** within connector pocket **120** and maintain electrical contacts **133** of blind mate connector **94** at a desired position relative to air baffle **80**.

[0024] Although not illustrated, in other examples, blind mate connector **94** could be mounted directly to battery pack **92**, which would eliminate cable **96** and connector pocket **120**. Such an implementation could be employed where battery pack **92** is disposed proximate to a blind mate connector of power supply circuitry **60** (see blind mate connector **154** in FIG. **9** below).

[0025] Air baffle **80** further includes alignment features **138** and **140** extending from a side surface **142** which are configured to be slideably received by corresponding alignment slots **144** and **146** in sidewall **68** of chassis **62**. FIG. **8** is an enlarged perspective view illustrating alignment feature **140** positioned in alignment slot **146** in sidewall **68** of base pan **62**. According to one example, alignment features **138** and **140**, as illustrated with respect to alignment feature **140**, include a shaft portion **148** capped with a tab portion **150** which is wider than shaft portion **148** so as to form a T-shape, with shaft portion **148** extending perpendicularly to side surface **142** and tab portion **150** extending parallel to side surface **142** of air baffle **80**.

[0026] In other examples, it is noted that slot and tab configuration described above could be reversed, with the alignment slots, such as alignment slots **144** and **146**, being located on air baffle **80**, and alignment features **138** and **140** (e.g. shaft and tab **148** and **150**) being located on chassis **62**. In other examples, alignment features may be arranged between air baffle **80** and main logic board **36**. In still other example, alignment features maybe be arranged between air baffle **80** and one or more other components of chassis **62** and main logic board **36**.

[0027] When backup power assembly **100** is installed in server **30**, chamfered openings **147** of alignment slots **144** and **146** receive and guide shaft portions **148** of alignment features **138** and **140** into alignment slots **144** and **146**. Tab portions **150** engage sidewall **68** and hold alignment features **138** and **140** in place, thereby securing air baffle **80** and, thus, backup power assembly **100**, in place against sidewall **68**.

[0028] As illustrated by FIG. **9**, alignment features **138**, **140** and corresponding alignment slots **144**, **146** are positioned such that when backup power assembly **100** is installed in chassis **34**, blind mate connector **94** of backup power assembly **100** aligns with a corresponding blind mate connector **154** which is electrically connected to power supply circuitry **60** of server **30**. In one example, blind mate connector **154** is mounted on main logic board **36** of server **30**. As backup power assembly **100** is inserted into server **30** and pressed into place and alignment features **138**, **140** reach a bottom of corresponding alignment slots **144** and **146**, contacts **133** of blind mate connector **94** engage corresponding contacts in blind mate connector **154** and electrically connect backup power source **90** with power supply circuit **60**.

[0029] In one example, alignment features **138**, **140** and alignment slots **144**, **146** provide a so-called "coarse" alignment of blind mate connector **94** with corresponding blind mate connector **154**. According to such example, shaft portions **148** of alignment features **138**, **140** and alignment slots **144**, **146** are sized to enable a small amount of lateral movement of shaft portion **148** within alignment slots **144**, **146**. The small amount of lateral movement enables final alignment of blind mate connector **94** with corresponding blind mate connector **154** to be provided by chamfered edges **156** of contacts **133** of blind mate connector **94** (see FIG. **7**) which guide blind mate connector **94** into corresponding blind mate connector **154**. In one example, blind mate connector **94** is a male-type connector and corresponding blind mate connector **154** is a female-type connector.

[0030] Hood **82** (see FIG. **2**) is installed after installation of backup power assembly **100**. As illustrated by FIG. **10**, when hood **82** is installed, tabs **158** on a perimeter edge of hood **82** are received by slots **159** in sidewall **68** above alignment features **138** and **140** and lock alignment features **138** and **140** within alignment slots **144** and **146**.

[0031] FIG. **11** is a top view illustrating backup power assembly **100** installed in server **30** with hood **82** being removed. In addition to supporting backup power source **90**, air baffle **80** directs cooling air flows through server **30**. In operation, cooling air, as indicated by arrows **160**, is drawn into the interior of server **30** via vent openings **82***a*, **82***b*, **82***c* in drive cage **72** (see FIG. **2**). In the absence of air baffle **80**,

cooling air flows would travel freely through chassis **34** and pass over memory modules **48**. However, as indicated by arrow **162**, air baffle **82** directs at least a portion of cooling air flows **160** to instead pass over processing units **42** and **44**.

[0032] FIG. **12** is a cross-sectional view illustrating portions of server **30**, including backup power assembly **100**. In one example, battery pack **92** includes a battery case **100** housing battery cells **102** and a control board **104**. In addition to directing cooling air flows **162** across processing units **42** and **44**, in one example, air baffle **80** cools battery pack **92** by directing at a least a portion of cooling air flows **160** to flow above and below battery pack **92**. In one example, air baffle **80** directs a portion of cooling air flow **160** to flow above battery pack **92** between hood **82** and batter case **100**, as indicated by arrow **164**, and directs a portion of cooling air flow **160**, via an opening **166** in air baffle **80** (see FIG. **9**), to flow below battery pack **92**, as indicated by arrow **168**.

[0033] Cooling air flows become progressively warmer as they enter via drive cage **72** and pass through server **30**. In one example, backup power source **90** is mounted on air baffle **80** so that battery cells **102** are positioned closer to drive cage **72** than the portion of backup case **100** housing control board **104**. In such a position, battery cells **102** are exposed to cooler air than if positioned with control board **104** closer to drive cage **72**. In one example, such cooler air ensures proper operation and charging of battery cells **102**.

[0034] While backup power assembly **100** is described herein primarily in terms of backup power source **90** being selectively mounted to an air baffle, such as air baffle **80**, backup power source **90**, according to the present disclosure, can be mounted to any suitable component of chassis **34** to form backup power assembly **100**. For instance, in other examples, backup power source **90** may be mounted to components of chassis **34** such as base pan **62**, drive cage **72**, and hood **82**, for example.

[0035] FIG. **13** is a flow diagram illustrating a method **200** of providing backup power to a computer system, such as computer system **30**. At **202**, method **200** includes selectively mounting a backup power source, such as backup power source **90**, to a chassis component of a computer system, such as air baffle **80** of chassis **34** of computer system **30**, to form a backup power assembly, such as backup power assembly **100**. The backup power source includes a battery pack and a blind mate connector electrically connected thereto, such as battery pack **92** and blind mate connector **34** electrically connected to battery pack **92** by cable **96**.

[0036] The blind mate connector engages a corresponding blind mate connector of the computer system to electrically connect the backup power source to power supply circuitry of the computer system when the backup power assembly is installed in the computer system, such as blind mate connector **94** engaging corresponding blind mate connector **154** to electrically connect backup power source **90** to power supply circuitry **60** when backup power assembly **100** is installed in computer system **30**. In addition to providing a mounting platform for the backup power source, when installed in the computer system, the chassis component provided a function to the computer system which is unrelated to the backup power source, such as air baffle **80** directing cooling air flows through computer system **30** when backup power assembly **100** is installed therein.

[0037] In one example, as indicated at **204**, method **200** further includes providing the chassis component with at least one alignment feature which engages a corresponding alignment feature in a further chassis component of the computer system to align the blind mate connector of the backup power assembly with the corresponding blind mate connector of the computer system, such as alignment features **138**, **140** of air baffle **80** engaging corresponding alignment features **144**, **146** in sidewall **68** of base pan **62** to align blind mate connector **94** with blind mate connector **154**.

[0038] In one example, when the chassis component to which the backup power source is an air baffle, such as air baffle **80**, method **200**, at **206**, further includes providing the air baffle with passages to direct cooling flows about the battery pack and a control board of the backup power source, such as air baffle **80** directing an air flow **164** between hood **82** and battery pack **92** and directing an air flow **168** below battery pack **92** via an baffle opening **166**.

[0039] In summary, by selectively mounting backup power source **90** to a component of chassis **34** to form a backup power assembly **100** including a blind mate connector **94**, backup power source **90** can be readily installed within and removed from a computer system, such as computer system **30**, in a single step that ensures proper alignment and connection between electrical connection elements, such as blind mate connectors **94** and **154**, even in tight spaces that would otherwise be inaccessible. Additionally, by using an existing chassis component, such as air baffle **80**, which already provides an independent function to the computer system (e.g. directing cooling air flows), as a mounting platform for backup power source **90** to form backup power assembly **100**, space is conserved by not providing a separate component dedicated solely to mounting of and support of the backup power source.

[0040] Although specific examples have been illustrated and described herein, a variety of alternate and/or equivalent implementations may be substituted for the specific examples shown and described without departing from the scope of the present disclosure. This application is intended to cover any adaptations or variations of the specific examples discussed herein. Therefore, it is intended that this disclosure be limited only by the claims and the equivalents thereof.

1. A computer system comprising:

a chassis including a first chassis component; and

a backup power source, including a battery pack and a blind mate connector, selectively mounted to the first chassis component, the battery pack electrically connected to the blind mate connector, the backup power source and first chassis component together forming a backup power assembly, wherein the blind mate connector of the backup power source engages a corresponding blind mate connector of the computer system to electrically connect the backup power source to a power supply system of the computer system when the backup power assembly is installed in the computer system, and wherein the first chassis component provides a computer system function unrelated to the backup power source.

2. The computer system of claim **1**, wherein the first chassis component comprises an air baffle directing cooling air flows through the computer system.

3. The computer system of claim 2, wherein the air baffle directs cooling air flows between a hood of the chassis and the battery pack and between a base plate of the chassis and the battery pack.

4. The computer system of claim 1, wherein the first chassis component comprises one of a hood, a drive cage, and a base pan.

5. The computer system of claim 1, wherein the blind mate connector of the backup power assembly comprises a male connector the corresponding blind mate connector of the computer system comprises a female connector.

6. The computer system of claim 1, wherein the first chassis component includes alignment features which engage corresponding alignment features in a second chassis component to position the backup power assembly so that the blind mate connector of the backup power assembly aligns with the corresponding blind mate connector of the computer system.

7. The computer system of claim 1, wherein the corresponding blind mate connector of the computer system is mounted to a main logic board of the computer system.

8. A backup power assembly for a computer system comprising:

an air baffle directing cooling air flows within the computer system, the air baffle including at least one alignment element;

a first blind mate connector selectively mounted to the air baffle;

a battery pack selectively mounted to the air baffle and electrically connected to the first blind mate connector, wherein the at least one alignment element engages a corresponding guide element in at least one of a main logic board and a chassis of the computer system to align the first blind mate connector with a corresponding second blind mate connector of the computing system to electrically connect the backup power assembly to power supply circuitry of the computer system when the backup power assembly is installed in the computer system.

9. The backup power assembly of claim 8, wherein the air baffle includes passages directing cooling air flows between a hood of the chassis and the battery pack and between a base plate of the chassis and the battery pack.

10. The backup power assembly of claim 9, wherein battery cells of the battery pack are positioned upstream in the cooling air flows relative to a control board of the battery pack.

11. The backup power assembly of claim 8, wherein the at least one alignment element of the backup power assembly comprises a tab extending from a surface of the air baffle and the corresponding guide element comprises a slot in a base pan of the chassis which receives the tab.

12. The backup power assembly of claim 8, wherein the first blind mate connector comprises one of a male connector and a female connector.

13. A method of providing backup power for a computer system comprising:

selectively mounting a backup power source to a chassis component of the computer system to provide a backup power assembly, the backup power source including a battery pack and a blind mate connector electrically connected thereto, wherein the blind mate connector engages a corresponding blind mate connector of the computer system to electrically connect the backup power source to power supply circuitry of the computer system when the backup power assembly is installed in the computer system, the chassis component providing a function unrelated to the backup power assembly when installed in the computer system.

14. The method of claim 18, further including providing the chassis component with at least one alignment feature which engages a corresponding alignment feature in a further chassis component of the computer system to position the backup power assembly so that the blind mate connector of the backup power assembly aligns with the corresponding blind mate connector.

15. The method of claim 18, wherein the chassis component comprises an air baffle for directing cooling air flows through the computer system, the method further including providing the air baffle with air passages to direct cooling air flows about the battery pack and a control board of the backup power source.

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