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Young

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(54) **SIMPLE EMERGENCY POWER CONNECTION SWITCH**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 299 days.

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Related U.S. Application Data

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(51) **Int. Cl.**
H02J 7/00 (2006.01)
H02J 9/00 (2006.01)

(52) **U.S. Cl.** **307/64**; 307/42; 307/65; 307/70; 307/125

(58) **Field of Classification Search** 307/64, 307/65, 70, 43, 125; 361/118
See application file for complete search history.

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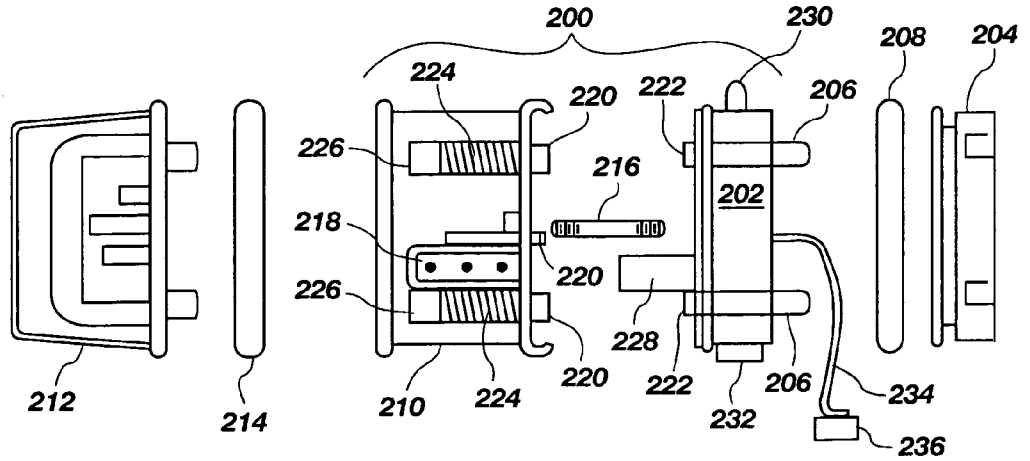
(57) **ABSTRACT**

This invention creates a simple, low cost mechanical transfer switch (called Gen/Safe) which provides users the ability to connect nearly any portable household generator to supply whole house power (to the limit of the particular generator) in the event of an emergency outage. Installed by the utility in less than five minutes, the switch provides visual confirmation of utility isolation while still allowing user supplied power not only from emergency sources, but also allows PV, wind, and other on-site power to operate normally to supply the home directly without interruption when possible. This connection is also suitable as an ongoing utility connection for user generated alternate energy power systems while providing an additional utility safety isolation factor for alternate power sources which must shut down when utility power fails; (to protect repair personnel).

10 Claims, 6 Drawing Sheets



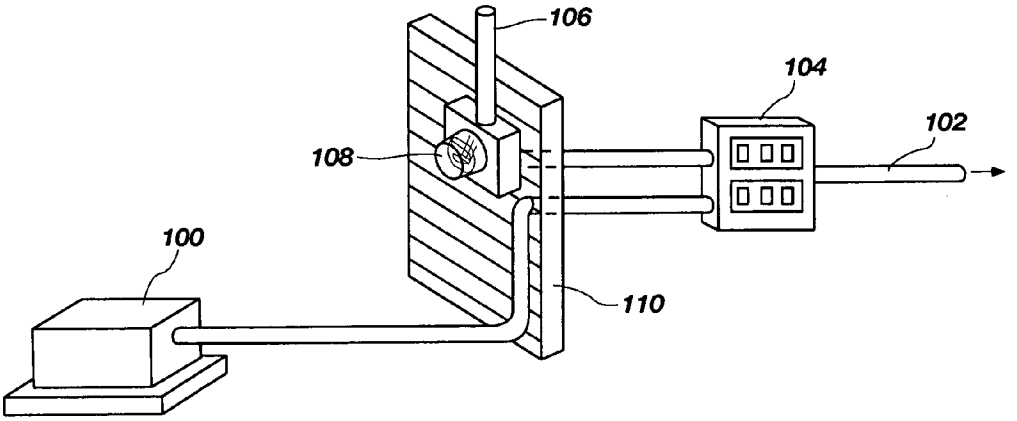


FIG. 1a
(PRIOR ART)

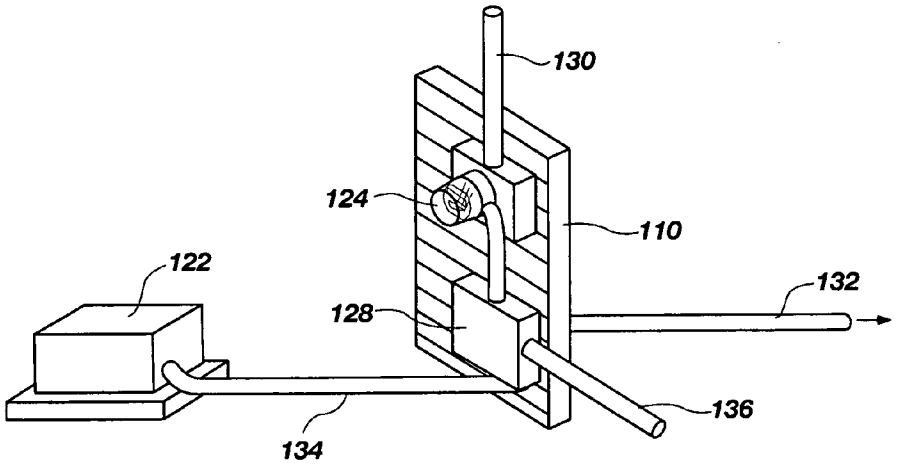


FIG. 1b
(PRIOR ART)

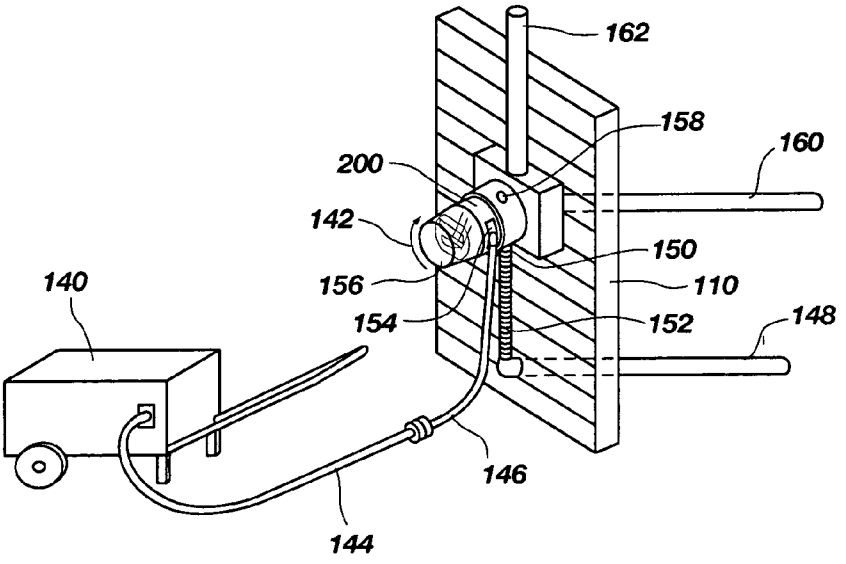

162
158
160
200
142
150
140
156
110
154
152
148
146
144

FIG. 2

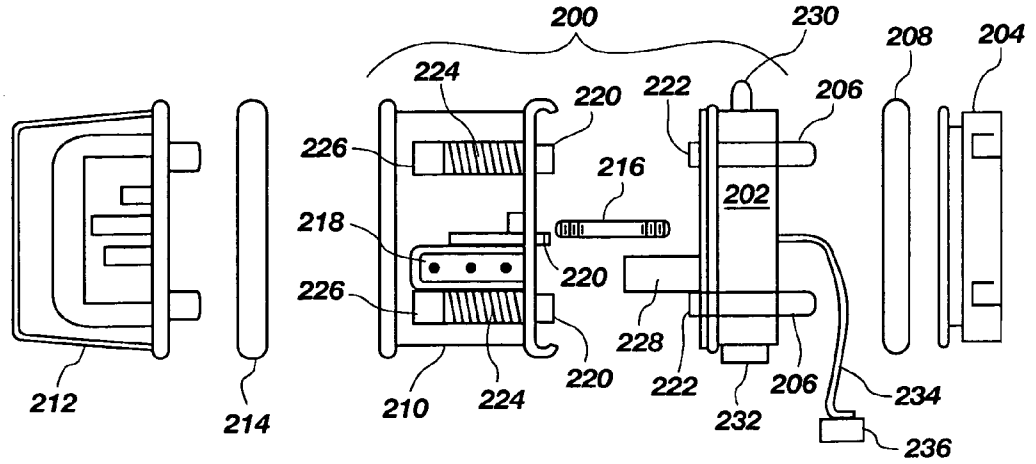

200
230
208
204
224
220
222
206
226
216
202
218
220
226
228
212
214
210
224
220
222
206
234
232
236

FIG. 3

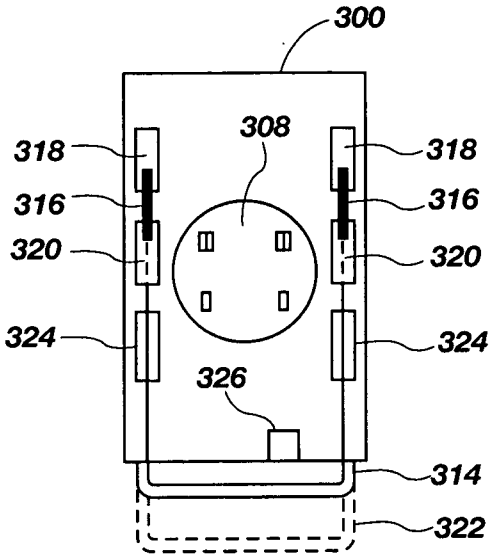

300
308
318
318
316
316
320
320
324
324
326
314
322

FIG. 4a

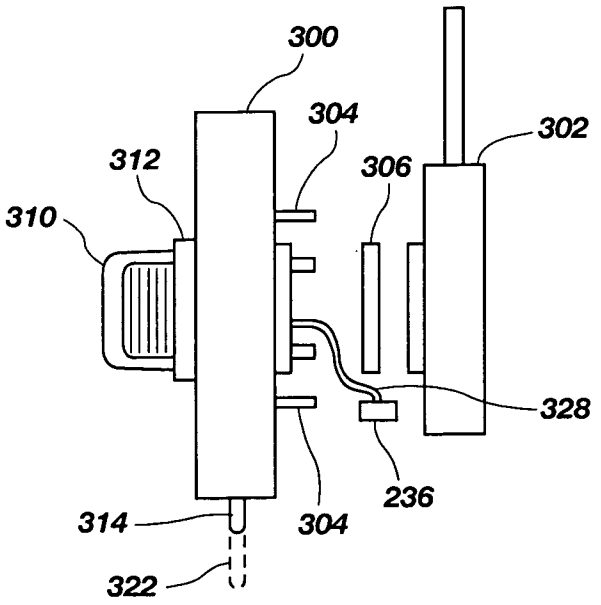

300
304
302
312
306
310
328
236
314
304
322

FIG. 4b

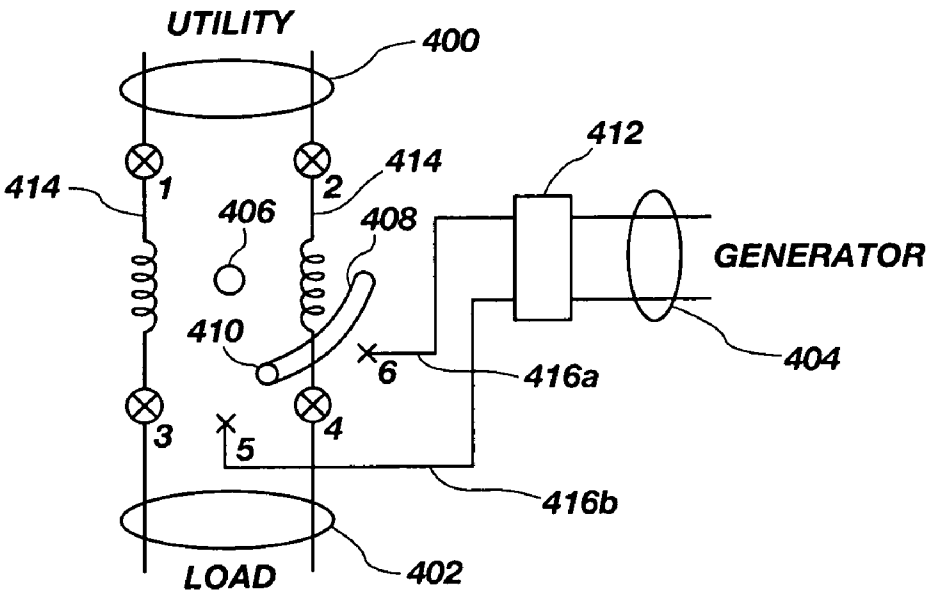

UTILITY
400
412
414
1
2
414
406
408
GENERATOR
410
6
416a
404
3
4
5
416b
LOAD
402

FIG. 5a

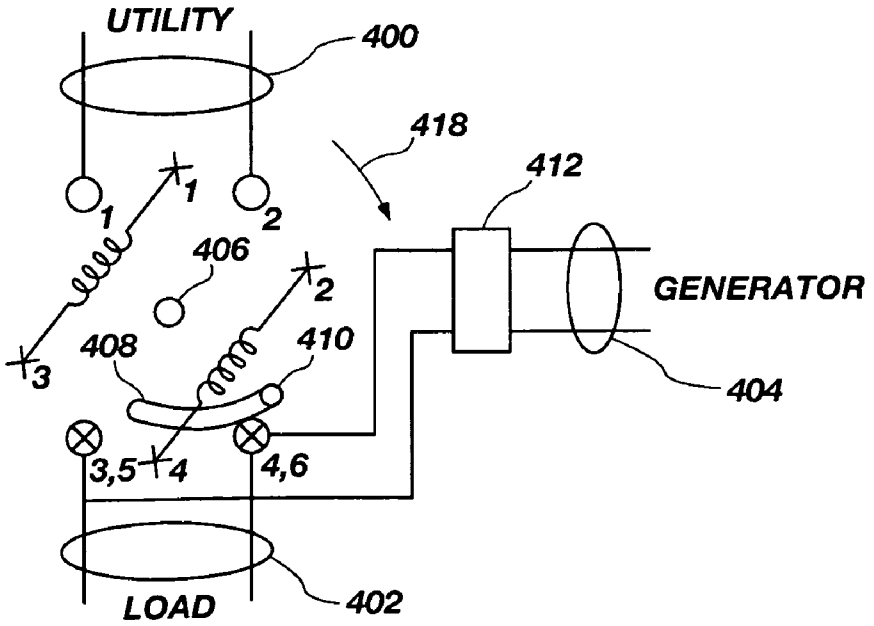

UTILITY
400
418
412
1
1
2
406
2
GENERATOR
3
408
410
404
3,5
4
4,6
LOAD
402

FIG. 5b

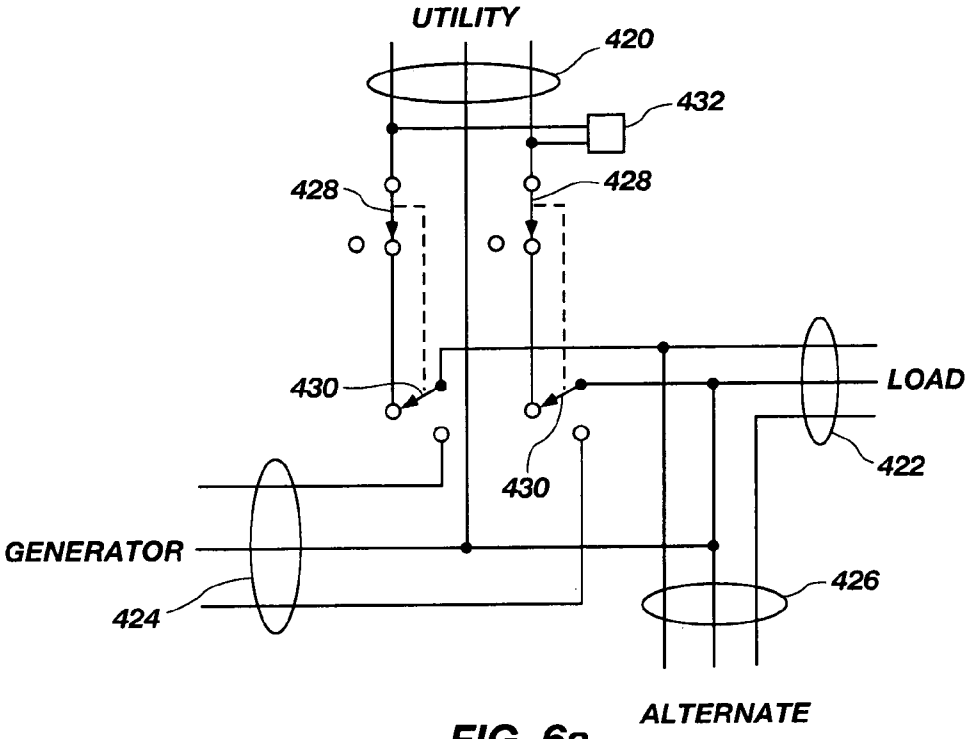

UTILITY
420
432
428
428
430
430
LOAD
422
GENERATOR
424
426
ALTERNATE

FIG. 6a

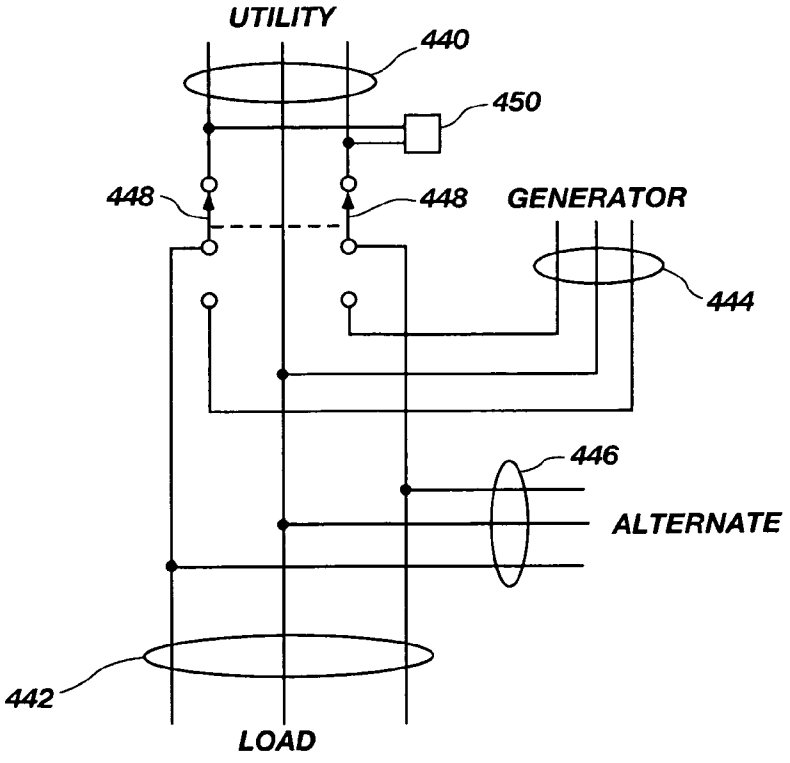

UTILITY
440
450
448
448
GENERATOR
444
446
ALTERNATE
442
LOAD

FIG. 6b

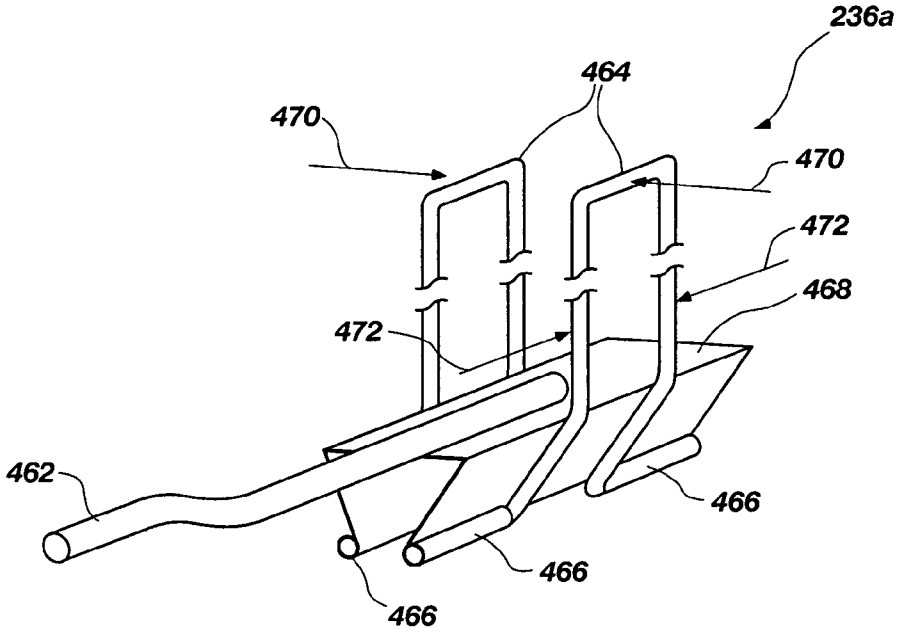

236a
464
470
470
472
468
472
462
466
466
466

FIG. 7a

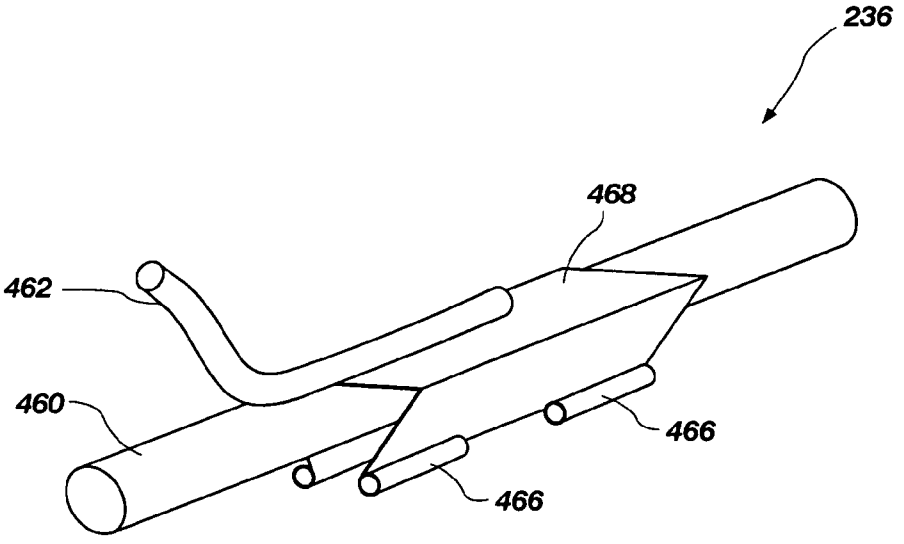

236
468
462
460
466
466

FIG. 7b

SIMPLE EMERGENCY POWER CONNECTION SWITCH

CROSS-REFERENCE TO RELATED APPLICATIONS

This non-provisional patent application claims priority from U.S. provisional patent application No. 61/204,176 filed Jan. 2, 2009.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

Not applicable.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to electrical switching assemblies. In particular, the present invention relates to transfer switch assemblies for interconnecting emergency power and retaining alternate energy power to a building when utility power has failed.

2. Description of Related Art

Long term power outages often occur during storms, earthquakes and many other types of conditions. Because we are all so dependent on electric power, it is desirable to provide emergency power sources for individual utility customers to provide furnace, lighting and refrigeration operation among many other needs during these outages. Often in the case of ice storms, earthquakes and other difficulties it will be many days before power is fully restored. Backup power is exceedingly desirable, but homeowners and other small users are limited either to buying a generator and powering necessary loads with multiple extension cords or having complex transfer switches installed by professional installers at high cost along with permanently mounted outside generators and automatic transfer switch capabilities. In an effort to make generator connection easier and perhaps less costly, several inventors have suggested switch housings which fit between the utility meter base and the utility meter to allow easier connections to be made, and switching functions to be accomplished between external generators and the user load. Most of these units either contain costly switching relays operated automatically, or require an external control box mounted somewhere near the meter and connected by conduit as part of a permanent installation to function properly. These units are also difficult and costly to install and may be subject to failure. The following U.S. Pat. Nos. are representative of the art: U.S. Pat. No. 6,074,246 to Seefedt et al., U.S. Pat. No. 6,200,158 to Robinson, U.S. Pat. No. 6,663,422 to Robinson and U.S. Pat. No. 7,040,920 to Johnson, Jr. et al.

A SHORT DESCRIPTION OF THE DRAWINGS

Drawings in this application explain the many unique features of this approach.

FIG. **1***a* is a drawing of a typical costly, permanently installed generator with an inside manual transfer switch as an example of current technology.

FIG. **1***b* is a drawing of a typical current meter base adapter installation with a generator.

FIG. **2** is a drawing of a simple installation of an embodiment of the low cost switch (Gen/Safe) according to the present invention.

FIG. **3** shows an exploded view of the Gen/Safe round unit shown in FIG. **2** with construction features.

FIGS. **4***a* and **4***b* show front and side views of a second embodiment of the device designed for higher power generators and different mounting needs.

FIG. **5***a* shows an example of the switching mechanism used in the round unit of FIG. **2** in normal or utility position.

FIG. **5***b* shows an example of the switching mechanism used in the round unit of FIG. **2** in generator position after rotation.

FIG. **6***a* shows a schematic of the electrical connections used in the round unit of FIG. **2**.

FIG. **6***b* shows a schematic of the electrical connections used in the high current unit.

FIGS. **7***a* and **7***b* shows the design of the rapid connection clip for connection to the user's neutral wire to save installation time. More particularly, FIG. **7***a* shows the rapid connection clip with disposable insulated wire levers and FIG. **7***b* shows the rapid connection clip without the disposable insulated wire levers and attached to the user's neutral wire.

DISCLOSURE OF PREFERRED EMBODIMENTS OF THE INVENTION

The intent of the current invention is to supply a very low cost switching device (also referred to herein as a "utility meter connection means" or the "Gen/Safe unit") which is designed primarily for extended emergency use with low cost plug-in generators. This unit has unique safety features both for the user and the utility and is designed to be manually operated (by rotating the meter or moving a special handle) while providing visual indication of utility isolation. The unit can also be used as a standardized connection point for alternate energy systems which transmit excess energy back into the utility lines. It is designed to be used in significant emergency situations where the inability to automatically switch between utility and emergency power is not a problem and the ability to install this switch in less than five minutes keeps installation costs low as well.

By keeping all costs low, it is hoped that a large number of the 23 million residential power connections in the U.S. may take advantage of Gen/Safe and the opportunity to provide both 120 and 240 volt AC power (if available from the generator) during a short or extended power outage. The inventor believes the need to operate a single switch manually in a very low cost unit will be well offset by the low cost opportunity to live a mostly normal life during extended power outages even if only a modest system is affordable. Gen/Safe can also be used in multiple meter banks such as those existing in apartments where there is little space between mounted power meters.

Although the two embodiments shown are preferred, other embodiments are also contemplated which would be included in the material in this application.

FIG. **1***a* shows a typical permanent generator **100** connection to a customer load **102** through a manual load transfer switch/customer fuse box **104** capable of transferring individual loads at the customer fuse box **104** to an external generator **100** on external wall **110**. The manual load transfer switch **104** requires extensive professional work to connect, and testing on completion is required to insure no alternate power from the generator **100** can activate external utility lines **106** through the meter **108** and utility input lines **106**.

FIG. **1***b* shows a typical permanent generator **122** connection to a customer utility load **132** using a meter plug in connection **124** on wall **110**. The generator **122** is connected to an automatic on-off relay **128** known as a "transfer switch relay". On-off relay **128** consists basically of a double-pole double-throw set of contacts which in one position connect

both incoming lines **130** from the utility 120/240 volt source to the customer load **132**. In the unenergized state, the load **132** is connected to a second set of contacts (not shown in FIG. **1***b*) which are normally connected to the alternate generator supply lines **134**. On-off relay **128** is also a controller which is often used to start the generator **122** and re-connect the load **126** to utility lines **130** when power is restored. If the controller **128** also has a connection for a premise-based alternate energy power source **136** such as that provided by a solar or wind generator **136**, such an alternate energy power source connection **136** is required to disconnect using a system (not shown) which is part of the alternate energy power source system (not shown) when utility power fails, so as not to energize utility lines **130** during power outages for safety considerations during repair. The automatic shut down of the alternate energy system connected at lines **136** may be disabled in some cases, if the transfer switch relay **128** provides isolation. But, there are several regulatory and safety issues involved and utility power company personnel also have issues with this sort of system.

FIG. **2** is a drawing of the simple installation of the Gen/Safe unit **200** outlined in this application. In this installation, the portable generator **140** is connected to the meter connection plug **154** in the Gen/Safe unit **200** on wall **110** by an extension cord **144** which is only installed when utility power **162** fails and which requires a short additional adapter cord **146** in series with the extension cord **144** to adapt any standard generator cord to the specialized Gen/Safe unit connector **150** outlined in FIG. **3** (described in further detail below). An optional connection conduit **148** from an alternate energy power source to the non-rotating part **202** of the Gen/Safe unit **200** is also shown in FIG. **3**. The connector **150** for this alternate energy power source may be plugged in or disconnected at any time because of flexible armored cable **152** allowing sufficient movement. Gen/Safe unit **200** is designed to offer manual disconnect only.

In order to operate a disconnect from utility power lines **162** to supply generator power **140** and provide access to the generator plug-in connector **150**, the utility meter **156** itself is rotated approximately 45 degrees clockwise (see curved arrow **142**) as allowed by the Gen/Safe plug in unit **200**. To reconnect to the utility power lines **162**, the utility meter **156** is then rotated back to the original utility position. An indicator of the presence of power in utility power lines **162** at any time is provided by LED pilot light **158** so that the owner may know when utility power is once again present and it is possible to switch back to that source.

If alternate power source **148** is present and the Gen/Safe unit **200** is switched to generator **140** power, the alternate power source **148** will once again also supply power when the generator **140** is started as the alternate power source **148** now assumes utility power **162** has been restored and is allowed to reconnect to what it perceives as restored utility power **162**, but which is actually the generator **140** simulating utility input. This is a desirable situation as the generator **140** may run at a low output while the alternate power source **148** operates at a much higher power level thereby saving fuel in the generator **140** while still providing the maximum power output from the alternate source **148** to the load **160**.

FIG. **3** shows an exploded view of the Gen/Safe unit **200** with construction features. The non-rotating switch deck **202** is connected to the existing utility meter base housing **204** by standard meter pins **206** and security collar seal **208**. The rotating portion **210** of the Gen/Safe unit **200** allows for plug-in of the standard utility meter **212** with a second security collar **214**. This allows the meter **212** itself to rotate as part of rotating portion **210**. Rotating portion **210** and non-rotating switch deck **202** are held together and allowed to rotate by bolt **216** which also serves as a rotating neutral/ground when a generator (not shown) is plugged into Gen/Safe connection **218**. Bolt **216** also allows connector pins **220** (three shown) to rotate across contacts **222** (two shown) in non-rotating switch deck **202** to perform the switching functions outlined in FIG. **5***a* and FIG. **5***b*. In order to provide proper high amperage connections, all contacts on rotating portion **210** (such as connector pins **220**) are spring loaded **224** as shown. This allows for moving connections across the switch deck **202** and performance of various connection functions as shown in FIG. **5***a* and FIG. **5***b*. The non-rotating base deck **202** of the Gen/Safe unit **200** has large contacts **222** firmly attached to standard meter plug-in connections **206** on the other side of the base plate or non-rotating switch deck **202**, which fit and are plugged into the existing utility meter base housing **204** in place of the original utility meter **212**. The utility meter **212** is plugged into the Gen/Safe socket **226** on the rotating portion **210**. FIG. **3** also shows the stationary connector cover **228** which is part of the non-rotating switch deck **202** and serves to cover the opening to the generator connector **218** when the rotating portion **210** is in the original utility position. This prevents plugging in the generator extension cord adapter (**144** and **146** FIG. **2**)) into the Gen/Safe unit A unless the utility power lines **162** (FIG. **2**) are disconnected thereby removing any remote remaining possibility of a shock hazard to utility personnel. A small pilot indicator **230** is connected to the utility lines **162** (FIG. **2**) to indicate when power is restored so the user may switch the unit back to utility power, i.e., the original utility position. Again, since there is no automatic restoration of power because of much lower cost manual operation of the device, this indicator is useful for the user.

In the event it is desired to connect an alternate energy power supply to the Gen/Safe unit **200**, this may be accomplished by plugging the source into connector **232** which is installed on the non-rotating switch deck **202** where connections may be made to the connections going to the user load **160** (FIG. **2**) connected to meter base **204** in that circuit. When the alternate system is in normal operation with utility power present, the utility meter will run backwards to credit the alternate energy produced. It is necessary to connect a short neutral wire from the generator socket to the user's building neutral and this is usually a difficult project using a split bolt connector (not shown) or other means of connection. The Gen/Safe round unit **200** provides this connection with a short, flexible neutral wire **234** ending in a novel "quick clip" **236** outlined in FIG. **7** and related discussion below.

FIGS. **4***a* and **4***b* show front and side views, respectively, of a second embodiment of the Gen/Safe rectangular unit **300** designed for higher power loads which the smaller contacts in the rotating round unit **200** (FIG. **3**) are not able to handle. This Gen/Safe rectangular unit **300** also plugs into an existing meter base **302** and is held in place by fasteners **304** as well as a security collar **306** as it weighs more than the smaller Gen/Safe round unit **200** (FIG. **3**). Internally, the Gen/Safe rectangular unit **300** consists of a standard meter socket **208** allowing the original utility meter **310** to be plugged in and retained by a second standard security collar **312**. On either side of the standard meter socket **308** is a double pole, single throw switch mechanism (referenced collectively as **316**, **318**, **320**, **322** and **324**) operated by both sides of lower handle **314**. This handle **314** (composed of insulating material) connects to metal rods **316** which in FIG. **4***a* connect upper and middle tubular metal cylinders **318** and **320** internally. Upper tubular metal cylinders **318** represent utility connections made through the meter plug-in on the rear of Gen/Safe

rectangular unit **300**. Middle tubular metal cylinders **320** represent connection to the user load (not shown in FIGS. **4***a* and **4***b*).

If the lower handle **314** is pulled down to position **322** (shown in dotted lines), the metal rods **316** are connected from middle tubular metal cylinders **320** to lower tubular metal cylinders **324** providing a connection between the user load (not shown) and the generator connector **326**. Thus, the combination of these means provides the double pole single throw switching function outlined. When the handle **314** is in the upper position, the generator connector **326** is physically blocked by the handle **314** providing a second security measure to prevent any generator connection to the utility lines from being made by plugging in a generator plug. This feature is similar to the embodiment of FIG. **3** where a cover **228** (FIG. **3**) prevents connection of a generator **140** (FIG. **2**) unless the meter **212** is rotated as a second security measure to disconnect the utility lines **162** (FIG. **2**) from the load **160** (FIG. **2**). Electrical connections are shown in FIG. **6***b*. The generator neutral **328** is brought out of the Gen/Safe rectangular unit **300** in a manner similar to that in FIG. **3** and connected through clip **236** (see also, FIG. **7** and related discussion below) to the load neutral in the existing meter base **302**.

FIGS. **5***a* and **5***b* outline the switching method used in the round unit **200** (FIG. **3**) embodiment of Gen/Safe in the low-cost rotating contact scheme used. In FIG. **5***a*, lines **400** represent the utility connection, lines **402** represent the load connection, and lines **404** represent the generator connection. In order to represent the two sets of contacts used (one on the lower stationary plate and the second on the upper rotating plate which in the drawings are stacked on top of one another and difficult to show easily) lower contacts on the stationary base connected to the original utility meter base are represented by circles $\circ_1$-$\circ_4$, while the upper contacts representing those on the rotating set of contacts are represented by x marks, i.e., x_1-x_6. Rotating connection **406** correspond to the bolt **216** shown in FIG. **3**. FIG. **5***a* also shows meter internal connections **414**. The rotation of the upper deck **210** (FIG. **3**) is limited by a slot **408** and stationary pin **410** which stops rotation of the upper deck **210** (FIG. **3**) when contacts are aligned properly. Note that two additional contacts, x_5 and x_6, for the generator connection lines **404** are shown coming from generator connector **412** and ending in connections **416** on the rotating portion **210** (FIG. **3**).

FIG. **5***b* shows the connections made when the connectors of FIG. **5***a* have been rotated clockwise as shown by arrow **418**. Slot **408** has now been rotated so that pin **410** is now at the other end of travel and the utility lines **400** have now been disconnected from the meter (not shown) and the meter has been disconnected from the user load **402**. The generator connections **404** have now been moved to the user load lines **402**, thus providing generator power to the user load.

FIG. **6***a* is a schematic representation of the electrical connections for the round version of Gen/Safe **200** (FIG. **3**). In FIG. **6***a* the complete electrical connections are shown. The switching between utility lines **420** and generator lines **424** is represented by switches **428** and **430** as they are moved from utility to generator positions in the Gen/Safe round unit **200**. The connection of alternate energy power is also shown by lines **426**, and the utility power indicator which shows connection to the utility lines when power is present is shown by **432**. This indicator **432** shows 220 VAC power in the utility lines **420** when the indicator **432** is active.

FIG. **6***b* shows the switching action of the larger rectangular embodiment of Gen/Safe **300** (FIGS. **4***a-b*) for higher currents. The utility lines **440**, user load **442**, generator **444** and alternate power connection **446** are controlled by switches **448** as outlined in FIG. **4***a* (see **316**, **318**, **320** and **324**) in two double pole, single throw switches **448** as previously outlined. Indicator **450** is also present as outlined in FIG. **6***a*.

FIG. **7***a* shows a new and unique quick connect clip **236** for rapid and safe connection to the neutral line **460** of the user's connection. This unique connection means allows the generator neutral **462** (or any other wire where a rapid high current permanent but removable connection is required) to be connected to maintain the desirable less-than-five-minute connection time to keep user costs low. To connect the clip **236** in FIG. **7***a* to the wire **460** in FIG. **7***b*, two disposable insulated wire levers **464** are connected into recesses **466** in the bottom of clip **468** which is made of highly conductive material such as spring copper, phosphor bronze or other material so that when pressed together as shown by arrows **470** the clip **468** is opened wide. (The insulated wire levers **464** may be much longer than shown in FIG. **7***a* to provide safe installation and also provide a long lever arm for considerable force to open the clip **468** fully.) When open and coated with any desired oxide inhibitor if needed, the clip **468** is slid over the bare neutral wire **460** and the levers **464** are relaxed and removed from the recesses **466** by pressing the sides of each insulated lever **464** together as shown by arrows **472**. This leaves the clip **468** in FIG. **7***b* securely fastened in a three point connection with neutral conductor **460**. The clip **468** can be removed if necessary by re-inserting the levers **464**.

The invention claimed is:

1. An electrical power switch for mechanically switching between utility power and a generator, comprising:

a non-rotating switch deck configured for mounting to an existing electrical utility meter base housing having utility lines and load lines connectable to meter pins;

a rotating portion including a meter socket configured for receiving an electrical utility meter;

a bolt rotationally mounted between the non-rotating switch deck and the rotating portion configured for rotational switching engagement of rotating portion electrical contacts relative to the non-rotating switch deck electrical contacts between a utility position and a generator position;

a generator connector mounted within the rotating portion configured for receiving an adapter cord carrying generator lines connected to a generator;

a generator connector cover extending from the non-rotating switch deck configured to mechanically block adapter cord connection to the generator connector when the rotating portion is rotated into the utility position, thereby physically preventing connection of the adapter cord;

the utility position connecting the utility lines to the load lines; and

the generator position connecting generator lines to the load lines.

2. The electrical power switch according to claim **1**, further comprising a pilot indicator providing visual indication of presence or absence of utility power on the utility lines.

3. The electrical power switch according to claim **1**, further configured for providing 120 and/or 240 volts AC power to the load lines.

4. The electrical power switch according to claim **1**, further comprising a flexible neutral wire connected to a generator neutral contact at one end and configured with a quick-connect clip at an opposite end for quick connection to a load line neutral wire.

5. The electrical power switch according to claim 1, further comprising a rotating switch.

6. An electrical power switch for mechanically switching between utility power and a generator, comprising:

a meter socket on one side configured for receiving an electrical utility meter;

meter pins on an opposite side configured for connection to an existing meter base, the meter base having utility lines and load lines;

a generator connector for receiving generator lines through an adaptor cable connected to a generator;

a rotating switch mechanism for selectively switching between a utility position and generator position;

a generator connector cover configured to mechanically block connection to the generator connector when the rotating switch mechanism is rotated into the utility position, thereby physically preventing connection of the adapter cable;

the utility position connecting the utility lines to the load lines; and

the generator position connecting generator lines to the load lines.

7. The electrical power switch according to claim 6, further comprising a pilot indicator providing visual indication of presence or absence of utility power on the utility lines.

8. The electrical power switch according to claim 6, further configured for providing 120 and/or 240 volts AC power to the load lines.

9. The electrical power switch according to claim 6, further comprising a flexible neutral wire connected to a generator neutral contact at one end and configured with a quick-connect clip at an opposite end for quick connection to a load line neutral wire.

10. The electrical power switch according to claim 9, wherein the quick-connect clip further comprises:

a clip electrically connectable to the neutral load line, the clip comprising two opposing jaws, each jaw comprising two recesses, the clip formed of a highly conductive material selected from the group consisting of: spring copper and phosphor bronze; and

two disposable insulated wire levers each configured for quick connection to, and removal from, one of the two opposing jaws via each of the two associated recesses.

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